IUCN/Species Survival Commission

The Species Survival Commission (SSC) is one of six volunteer commissions of IUCN – The World Conservation Union, a union of sovereign states, government agencies and non-governmental organizations. IUCN has three basic conservation objectives: to secure the conservation of nature, and especially of biological diversity, as an essential foundation for the future; to ensure that where the earth's natural resources are used this is done in a wise, equitable and sustainable way; and to guide the development of human communities towards ways of life that are both of good quality and in enduring harmony with other components of the biosphere.

The SSC's mission is to conserve biological diversity by developing and executing programs to save, restore and wisely manage species and their habitats. A volunteer network comprised of nearly 7,000 scientists, field researchers, government officials and conservation leaders from nearly every country of the world, the SSC membership is an unmatched source of information about biological diversity and its conservation. As such, SSC members provide technical and scientific counsel for conservation projects throughout the world and serve as resources to governments, international conventions and conservation organizations.

The IUCN/SSC Action Plan series assesses the conservation status of species and their habitats, and specifies conservation priorities. The series is one of the world's most authoritative sources of species conservation information available to nature resource managers, conservationists and government officials around the world.

IUCN Species Survival Commission
Rue Mauverney 28, CH-1196 Gland, Switzerland
Tel: +41 22 999 01 55, Fax: +41 22 999 00 15
E-mail: mgd@hq.iucn.org

IUCN Publications Services Unit
219c Huntingdon Road, Cambridge, CB3 0DL, UK
Tel: +44 1223 277894, Fax: +44 1223 277175
E-mail: info@books.iucn.org

IUCN
The World Conservation Union

SPECIES SURVIVAL COMMISSION

Gantelopes: Global Survey and Regional Action Plans Part 4: North Africa, The middle east and Asia

IUCN

Status Survey and Conservation Action Plan 2001

Antelopes

Global Survey and Regional Action Plans

Part 4: North Africa, the Middle East and Asia

Compiled by D. P Mallon and S. C. Kingswood

IUCN
The World Conservation Union

Donors to the SSC Conservation Communications Programme and the *Antelopes Action Plans*

The IUCN/Species Survival Commission is committed to communicate important species conservation information to natural resource managers, decision-makers and others whose actions affect the conservation of biodiversity.The SSC's Action Plans, Occasional Papers, news magazine (Species), Membership Directory and other publications are supported by a wide variety of generous donors including:

The Sultanate of Oman established the Peter Scott IUCN/SSC Action Plan Fund in 1990. The Fund supports Action Plan development and implementation; to date, more than 80 grants have been made from the Fund to Specialist Groups. As a result, the Action Plan Programme has progressed at an accelerated level and the network has grown and matured significantly. The SSC is grateful to the Sultanate of Oman for its confidence in and support for species conservation worldwide.

The Council of Agriculture (COA), Taiwan has awarded major grants to the SSC's Wildlife Trade Programme and Conservation Communications Programme. This support has enabled SSC to continue its valuable technical advisory service to the Parties to CITES as well as to the larger global conservation community. Among other responsibilities, the COA is in charge of matters concerning the designation and management of nature reserves, conservation of wildlife and their habitats, conservation of natural landscapes, coordination of law enforcement efforts as well as promotion of conservation education, research and international cooperation.

The World Wide Fund for Nature (WWF) provides significant annual operating support to the SSC. WWF's contribution supports the SSC's minimal infrastructure and helps ensure that the voluntary network and Publications Programme are adequately supported. WWF aims to conserve nature and ecological processes by: (1) preserving genetic, species, and ecosystem diversity; (2) ensuring that the use of renewable natural resources is sustainable both now and in the longer term; and (3) promoting actions to reduce pollution and the wasteful exploitation and consumption of resources and energy. WWF is one of the world's largest independent conservation organisations with a network of National Organisations and Associates around the world and over 5.2 million regular supporters. WWF continues to be known as World Wildlife Fund in Canada and in the United States of America.

The Department of the Environment, Transport and the Regions (DETR), UK supports a Red List Officer post at the SSC Centre in Cambridge, UK, where the SSC Trade Programme staff are also located. Together with two other Government-funded agencies, Scottish Natural Heritage and the Royal Botanic Gardens, Kew, the DETR is also financing a specialist plants officer. Further support for the centre is being offered by two NGO members of IUCN: the World Wide Fund for Nature - UK, and Conservation International, US.

The Center for Marine Conservation (CMC), with its headquarters in the US, provides valuable in-kind and funding support to the marine work of SSC. It is the major funder of the Marine Turtle Specialist Group, employs the MTSG Programme Officer, and administers funds on behalf of the Shark and Cetacean Specialist Groups. A CMC staff member acts as SSC staff liaison for the marine specialist groups and the marine focal point for SSC, and also supports the development of SSC's work in the marine realm. CMC serves as the marine focal point for the IUCN/SSC Red List Programme. It is dedicated to protecting ocean environments and conserving the global abundance and diversity of marine life through science-based advocacy, research and public education.

Global Survey and Regional Action Plans

Antelopes

Part 4: North Africa, the Middle East, and Asia

Compiled by D.P. Mallon and S.C. Kingswood

IUCN
The World Conservation Union

SPECIES SURVIVAL COMMISSION

Sultanate of Oman

WWF

COUNCIL OF AGRICULTURE

DETR
ENVIRONMENT TRANSPORT REGIONS

CENTER FOR MARINE CONSERVATION

Published by: IUCN, Gland, Switzerland and Cambridge, UK.

Citation: Mallon, D.P. and Kingswood, S.C. (compilers). (2001). *Antelopes. Part 4: North Africa, the Middle East, and Asia*. *Global Survey and Regional Action Plans.* SSC Antelope Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK. viii + 260pp.

ISBN: 2-8317-0594-0

Cover photo: Arabian oryx *(Oryx leucoryx).* Tim Wacher.

Layout by: IUCN Publications Services Unit

Produced by: IUCN Publications Services Unit

Printed by: Page Bros (Norwich) Ltd, UK

Available from: IUCN Publications Services Unit
219c Huntingdon Road, Cambridge CB3 0DL, United Kingdom
Tel: +44 1223 277894, Fax: +44 1223 277175
E-mail: info@books.iucn.org
http://www.iucn.org
A catalogue of IUCN publications is also available.

The text of this book is printed on Fineblade Extra 90gsm made from low-chlorine pulp.

Contents

Foreword

The IUCN/SSC Antelope Specialist Group was created in 1978 and currently has more than 100 members based in over 40 countries. A key objective of the group is to monitor the conservation status of all antelope species. The publication of Part 4 of *Antelopes: Global Survey and Regional Action Plans* is an important and eagerly awaited milestone in achieving this objective. Following on from Parts 1 to 3, which dealt with the antelopes of sub-Saharan Africa, Part 4 completes the Antelope Specialist Group's efforts to summarise current knowledge of the status of each antelope species in all of its range states, and to develop Regional Action Plans for antelope conservation.

The completion of Part 4 is a tribute to the unstinting efforts and persistence of the compilers. They have produced a comprehensive work, which is a major addition to our knowledge of antelopes and will be of lasting value to antelope conservation. As the compiler of Parts 1 to 3 of *Antelopes: Global Survey and Regional Action Plans*, I am uniquely placed to understand the magnitude of the compilers' task. This is exacerbated by the relatively large number of species and range states that are covered by the Antelope Specialist Group. I warmly congratulate David Mallon and Steven Kingswood on their successful completion of this mammoth undertaking.

With almost 100 species globally, antelopes achieve an exceptionally high diversity compared to most other groups of medium to large-sized mammals. The living antelope species represent the continuation of a major and relatively recent evolutionary heritage and are among the most successful groups of large herbivores that have ever existed on Earth. They are also important flagship species for the conservation of natural environments. Flourishing antelope populations are key indicators of healthy grasslands, woodlands, forests, and deserts in many parts of Africa, the Middle East, and Asia. Hence, the conservation of antelopes is a vital component of biodiversity conservation throughout these regions. In addition, the beauty and grace of antelopes give them high aesthetic value. They are also an important natural resource in economic terms, through consumptive uses such as hunting for trophies, meat, and skins, and non-consumptive uses such as game-viewing tourism.

Threats to the survival of antelopes arise fundamentally from the growth of human and domestic livestock populations, which result in increasing degradation and destruction of natural habitats and excessive offtake by hunting for meat and skins. Unfortunately, these processes are even more advanced in much of the region covered by Part 4 of *Antelopes: Global Survey and Regional Action Plans* than in sub-Saharan Africa. Consequently, antelope populations have been severely depleted or exterminated over large parts of North Africa, the Middle East, and Asia. Nevertheless, viable and sometimes substantial remnants of most of the region's antelope species survive.

Emphasis must now shift to the implementation of the conservation priorities identified in the Regional Action Plan, within the context of sustainable development and the conservation of biological diversity. Co-ordinated efforts by government and non-government agencies and conservation organisations will be essential to implement the protection and management regimes which are required to assure the long-term survival of representative examples of this spectacular group of mammals and their natural habitats.

Rod East
Co-Chair, Antelope Specialist Group

Compilers' Note and Acknowledgements

The Regional Action Plan is the result of the combined efforts of Antelope Specialist Group (ASG) members with expertise on the region and antelope conservation in general. The accuracy of each country report is the responsibility of the author(s), although we accept responsibility for any errors or omissions. Information will be gratefully received from any reader who finds errors or omissions in this volume, or has more recent or detailed information on the status of any antelopes in the countries included in this account. If possible, completion of an Antelope Inventory Report Form (Appendix 1) will be especially useful. We are very grateful for the willing assistance we have received from ASG members and other conservationists in compiling the country accounts for this report. Richard Estes and Rod East, Co-Chairs of ASG, have provided support and encouragement throughout the process of compiling this report. We are especially grateful to Rod East for reading and commenting on all the country reports, to Arlene Kumamoto and Helen Perkins for providing particularly useful comments, and to William Duckworth, Bill Robichaud, and George Schaller for comments on various parts of the draft. In addition, we thank Terry Hall and Mick Hoult for producing the maps used in this volume, and the individuals and organisations who allowed us to use their photographs. Additional acknowledgements are given in individual chapters. We also thank the SSC staff involved in editing Action Plans, including Linette Humphrey, Mariano Gimenez-Dixon, and Anne-Marie Gillesberg, for guidance in developing this document. We are indebted to the Zoological Society of San Diego for the institutional support given to Steve Kingswood, and to HM Sultan Qaboos of Oman for financial support through the Sir Peter Scott IUCN/SSC Action Plan Fund, which covered much of the cost of this publication.

David P. Mallon and Steven C. Kingswood

Executive Summary

The Antelope Specialist Group (ASG) established the Global Antelope Survey to determine the distribution and status of the world's antelope species and to identify conservation priorities. The first three parts covered the countries of sub-Saharan Africa. This final part covers North Africa, the Middle East, and Asia. This region contains 37 countries in which antelopes occur or recently occurred, and the individual country accounts form the major part of this report. Less than one quarter of the world's antelope species are found within this region, in habitats varying from subtropical forests to cold desert plateaux. Herds numbering in the tens of thousands formerly occurred across the steppes and semideserts of Eurasia and India, but these have nearly all been reduced to fractions of their earlier size, and antelope populations are fragmented across the region. Five species currently have populations exceeding 100,000, while several others are highly threatened. Several species have disappeared altogether from the region during recent decades, and the principal challenge facing antelope conservation in the 21st century is to ensure that other species whose status is currently precarious do not follow them into extinction.

Threats facing antelopes in the region include hunting, loss of habitat, population fragmentation, inadequate protected area coverage, poorly developed administrative structures, under-resourcing of conservation programmes, and lack of enforcement of existing legislation. In addition, details of distribution and status of many taxa are unclear, and little is known of the ecology of several species. Hunting remains the most significant threat, frequently leading to a mass slaughter, which has extirpated populations and even whole species across the region during the second half of this century. Protected area coverage in some countries is excellent, but is poor or non-existent in others and the present system does not adequately protect all antelope species. An important step towards long-term conservation of the region's antelopes would be to implement the detailed recommendations for extensions to the protected area system made in each country report.

Rising human population growth and economic development constantly increase pressure on land and natural resources. There is a consequent need for integrated rural development and community-based conservation projects, which have the full participation of local people at both the planning and execution stages. These should ensure that the material benefits of conservation programmes are made available to local people. A determined effort will have to be made through education programmes to persuade people of the need for conservation of antelopes.

Successful captive-breeding schemes exist for many species and reintroductions of antelopes into their former ranges have begun to reverse the declining trend, but many more such projects are needed. Actions to conserve antelope populations are listed in each country report and summarised in the Regional Action Plan. Above all, these measures need full financial support and considerable political will to implement them.

Current Addresses of Authors

I. Abdusalyamov, Apartment 57, Rudaky Avenue 85, Dushanbe 1, Republic of Tajikistan.

M.A. Al Dosari, Al Areen Wildlife Park, P.O. Box 5792, Bahrain.

Y. Al Hamar, Head of Biological Studies Branch, Environment Department, Ministry of Municipal Affairs and Agriculture, P.O. Box 7634, Doha, Qatar.

A. Almutai, Biological Studies Branch, Environment Department, Ministry of Municipal Affairs and Agriculture, P.O. Box 7634, Doha, Qatar.

Khalf Al-Robaae, Director, Natural History Museum, University of Basrah, P.O. Box 432, Basrah, Iraq.

M. Al-Safadi, Biology Department, Faculty of Science, Sana'a University, P.O. Box 13499, Sana'a, Republic of Yemen.

L. Amgalan, Institute of General and Experimental Biology, Mongolian Academy of Sciences, Ulaanbaatar 51, Mongolia.

David Ashwell, P.O. Box 2321, Phnom Penh, Cambodia.

Stéphane Aulagnier, Institut de Recherche sur les Grands Mammifères, C.R.A. Toulouse, B.P. 27, Castanet-Tolosan Cedex, France.

A.B. Bekenov, Director, Institute of Zoology and Genetic Fund of Animals, National Academy of Sciences, Almaty, Kazakhstan.

David A. Blank, P.O. Box 677, Eilat 88000, Israel.

Jelle Boef, Postjesweg 111-3e, 1057 DZ Amsterdam, The Netherlands.

Adnan Boudari, Royal Society for Conservation of Nature, Amman, Jordan.

Bill Clark, Nature and National Parks Protection Authority, 78 Yirmeyahu Street, Jerusalem 94467, Israel.

David A. Clayton, Department of Biology, College of Science, Sultan Qaboos University 123, P.O. Box 36, Al-Khod, Sultanate of Oman.

Peter J. Cowan, Gleann Cottage, Glenlomond, Kinross KY13 7HF, Scotland. (recently with the Department of Zoology, Kuwait University)

François Cuzin, Laboratoire de Biogéographie et Ecologie des Vertébrés, Ecole Pratique des Hautes Etudes, Place Eugène Bataillon, 34095 Montpellier Cedex 5, France.

Koen De Smet, Ministerie van de Vlaamse Gemeenschap, Afdeling Natuur, Emile Jacqmainlaan 156, bus8-1000 Brussel, Belgium.

S. Dulamtseren, Institute of General and Experimental Biology, Mongolian Academy of Sciences, Ulaanbaatar 51, Mongolia.

Kevin M. Dunham, King Khalid Wildlife Research Centre, c/o NCWCD, P.O. Box 61681, Riyadh 11575, Saudi Arabia. (Current address: P.O. Box CH385, Chisipite, Harare, Zimbabwe).

Jonathan Eames, BirdLife International Vietnam Programme, 293B Tay Son, Dong Da, Hanoi, Vietnam.

Rod East, Director of Operations, NIWA, Gate 10 Silverdale Road, Box 11-115, Hamilton, New Zealand.

E. Frankenberg, Nature and National Parks Protection Authority, 78 Yirmeyahu Street, Jerusalem 94467, Israel.

Yu. Gorelov, All-Russian Research Institute for Nature Protection, M-628 Znamenskoye Sadki, 113628 Moscow, Russia.

Yu. Grachev, Institute of Zoology and Genetic Fund of Animals, National Academy of Sciences, Almaty, Kazakhstan.

Colin P. Groves, Department of Archeology and Anthropology, Australian National University, Canberra, Australia.

Peter Grubb, 35 Downhills Park Road, London N17 6PE, United Kingdom.

Khushal Habibi, IUCN Biodiversity Project, Baber Road, P.O. Box 506, Gilgit, Northern Areas, Pakistan. (Current address: 5956, N. Hagadorn Road, E. Lansing, MI 48823, USA).

E.M. Hadjiev, Director, Shirvan State Reserve, A. Hasanov Street 32, Salyan, 373800, Azerbaijan.

T.D. Hall, 146 Station Road, Pendlebury, Manchester M27 6BT, United Kingdom.

Mahmoud R. Hemami, Faculty of Natural Resources, Isfahan University of Technology, Isfahan, Iran.

David H. Insall, Directorate-General of Nature Protectorates, Ministry of Regional Municipalities and Environment, P.O. Box 405, Madinah As Sultan Qaboos, Postcode 115, Sultanate of Oman.

Eugene Joubert, NCWCD, P.O. Box 61681, Riyadh 11575, Saudi Arabia.

Nabil H. Khairallah, 37 South Drive, St. Catharines, Ontario L2R 4V1, Canada.

M.A.R. Khan, Head of Zoo Section, Dubai Zoo, P.O. Box 67, Dubai, United Arab Emirates.

K. Khattabi, Wildlife Technical Committee, Tripoli, Libya.

Steven C. Kingswood, Center for Reproduction of Endangered Species, Zoological Society of San Diego, P.O. Box 120551, San Diego, CA, 92112-0551, USA.

Khaldoun Kiwan, Reserves Section and Reintroduction Unit, Royal Society for Conservation of Nature, Amman, Jordan.

Badamjaviin Lhagvasuren, Director, Society for the Conservation of the Mongolian Gazelle, Institute of

SECTION 1

Introduction

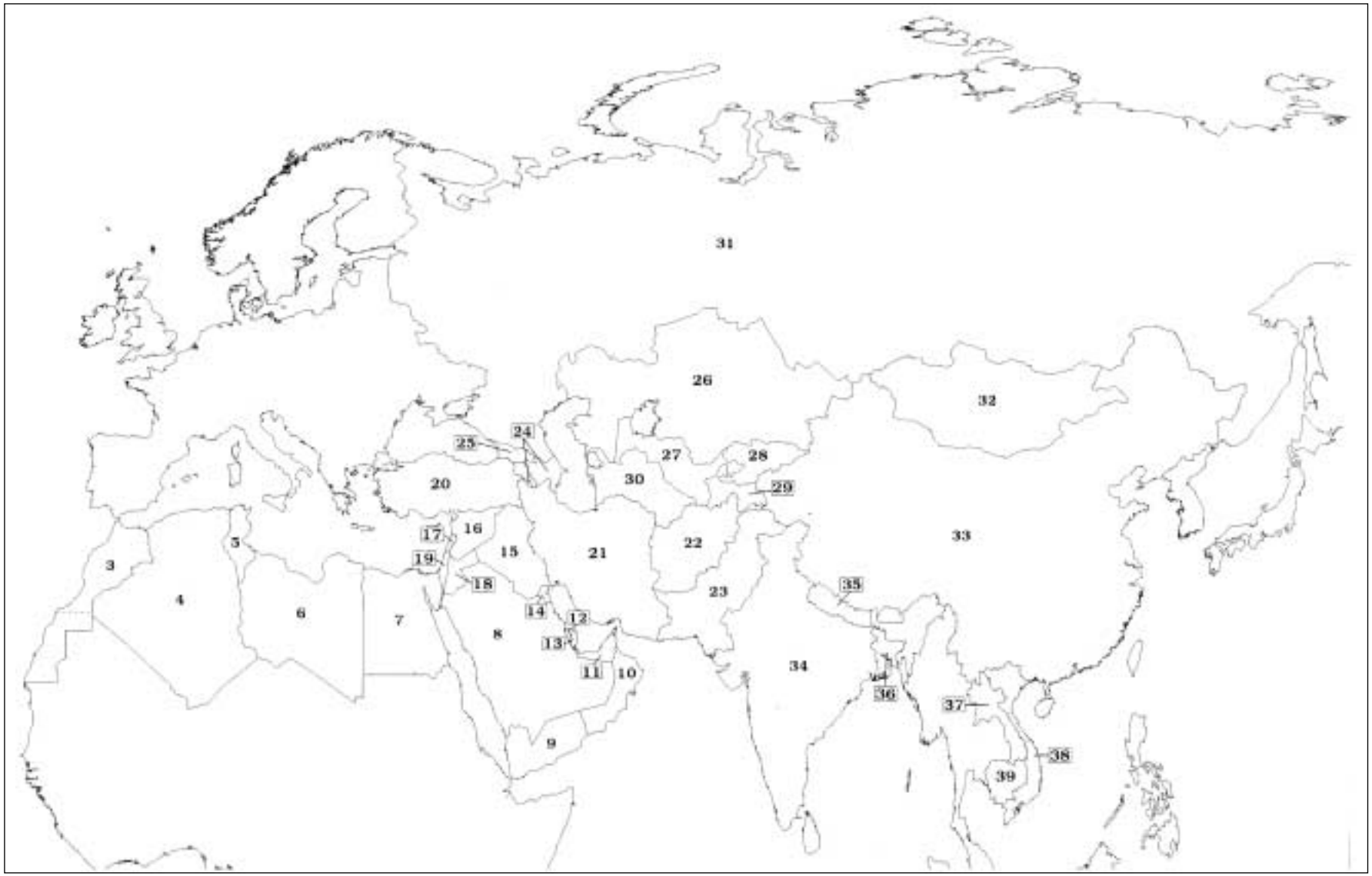


Fig. 1.1 Countries of North Africa, the Middle East and Asia included in Part 4 of the Antelope Survey. Numbers relate to the country reports in Section 2.

***Key*: 3. Morocco and Western Sahara; 4. Algeria; 5. Tunisia; 6. Libya; 7. Egypt; 8. Saudi Arabia; 9. Yemen; 10. Oman; 11. United Arab Emirates; 12. Bahrain; 13. Qatar; 14. Kuwait; 15. Iraq; 16. Syria; 17. Lebanon; 18. Jordan; 19. Israel; 20. Turkey; 21. Iran; 22. Afghanistan; 23. Pakistan; 24. Azerbaijan; 25. Georgia; 26. Kazakhstan; 27. Uzbekistan; 28. Kyrgyzstan; 29. Tajikistan; 30. Turkmenistan; 31. Russia; 32. Mongolia; 33. China; 34. India; 35. Nepal; 36. Bangladesh; 37. Laos; 38. Vietnam; 39. Cambodia.**

Chapter 1. Objectives, Scope, and Limitations of the Antelope Survey

D.P. Mallon, S.C. Kingswood, and R. East

1.1 General introduction to Part 4 of the Antelope Survey

This is the fourth and final part of the Antelope Specialist Group's Global Survey of Antelopes. Part 4 covers North Africa, the Middle East, and Asia and extends into the southeastern corner of Europe, so completing geographic coverage of the Survey. It includes 37 countries where antelopes occur or occurred until recently (Fig. 1.1). This vast and disparate region contains great ecosystem diversity. Antelopes inhabit the hyperarid interior of the Sahara, temperate grasslands of Eurasia, the high plateau of Tibet, most of the Indian Subcontinent, and montane forests of Southeast Asia. The inclusion of Southeast Asia in the Antelope Survey arose through the recent discovery of the saola (*Pseudoryx nghetinhensis*) in montane forests along the Laos–Vietnam border, and a second bovid (*Pseudonovibos spiralis*), discovered recently in Vietnam and Cambodia, may also prove to be a new species of antelope.

Part 4 includes 25 antelope species (see Chapter 2), 18 of which are endemic to the region. However, two species have long been extinct (*Gazella arabica* and *G. rufina*); one is now considered to be extinct (*Gazella bilkis*), another three became extinct in the wild this century (*Oryx dammah*, *Oryx leucoryx,* and *Gazella saudiya*), while a further two species no longer occur within the region (*Addax nasomaculatus* and *Alcelaphus buselaphus*). North Africa, the Middle East, and Asia lack the diverse antelope communities of sub-Saharan Africa; over half the countries in the region are home to only one or two species. Nonetheless, large numbers of antelopes were formerly present. Herds of 10,000 blackbuck (*Antilope cervicapra*) were reported in northern India by Jerdon (1874); 15,000–20,000 Tibetan antelope (*Pantholops hodgsonii*) were observed by Rawling (1905) and herds of up to 80,000 Mongolian gazelle (*Procapra gutturosa*) have been reported. Large herds have since vanished from most of the region, and today only in Kazakhstan, Mongolia, and perhaps northern Tibet is it still possible to see concentrations of antelopes numbering in the thousands. In addition to the disappearance of almost all the large herds and extinctions at global and regional levels, antelope populations across the region have undergone a severe decline this century. With few exceptions, numbers have decreased to a fraction of the totals present several decades ago, and distributions have shrunk markedly in extent or have been split into fragments that are often completely isolated from each other.

Across the region, few really large areas of individual ecosystems remain intact. Those relevant to antelopes are: the steppes of eastern Mongolia, which represent the most extensive remaining area of their kind in the world (Sokolov *et al*. 1982); the northern Tibetan Plateau, with its important community of wild ungulates (Schaller 1998); and the Sahara Desert.

The many factors contributing to the decline of antelopes include hunting (legal and illegal), habitat destruction, competition with livestock, the growing human population, and development. Antelopes have been hunted for millennia, but the firepower and accuracy of modern weapons combined with the mobility provided by motor vehicles have greatly increased the destructive potential of hunting. Uncontrolled hunting remains a significant threat to surviving antelopes in the region. At its worst extreme, hunting takes the form of well-organised expeditions consisting of four-wheel-drive vehicles and refrigerated trucks, which systematically exterminate antelopes and other wildlife in the areas they visit.

Wide expanses of grassland have been converted to agriculture or subjected to increased levels of livestock grazing. Other large areas have been degraded or destroyed by overgrazing and soil erosion. Overuse of ground water has led to problems of desertification and increased salinity. In some arid areas, drilling of wells has led to changes in patterns of pastoral land use by allowing herders and their stock to remain in one place all year-round.

Construction of settlements and industrial enterprises further encroach on antelope habitat. New roads open up remote areas to exploitation, facilitate hunting, and enable herders to transport flocks into areas previously used only by wild herbivores, while roads, railways, and canals impose physical barriers which may reinforce isolation of fragmented populations and interrupt migration routes. Wars and civil conflicts, which have affected several countries in the region (notably Afghanistan, Iraq, Kuwait, and Lebanon), inevitably have an adverse impact on antelopes by making law enforcement difficult or impossible, and hindering conservation measures. Under deteriorating economic conditions, people will naturally seek to utilise large mammal populations as a source of food.

Antelopes are also affected indirectly through displacement to range margins or areas of sub-optimal habitat, and through disturbance that raises energy requirements and stress levels. These effects may increase vulnerability to natural factors, such as disease epidemics and adverse climatic conditions (e.g., drought or severe winters). For

example, much of Central Asia periodically experiences exceptional winter conditions when compacted snow or formation of an ice crust prevent access to forage, resulting in heavy mortality among antelope populations.

Across North Africa, the larger species of antelopes have been extirpated and, in the Arabian Peninsula, antelope populations have also been wiped out in many localities. In the countries of the former Soviet Union, political and economic changes since 1989 have resulted in a sharp increase in illegal hunting and wildlife exploitation as former protection systems collapsed (Flint and Pereladova 1993).

Wildlife conservation policies and legislation vary greatly among the countries of the region. Several countries lack a National Conservation Strategy or National Biodiversity Action Plan or otherwise give a low priority to the wildlife sector. While adequate legal frameworks for wildlife protection exist in most countries, they are widely ignored or undermined by lack of enforcement. Coverage of protected areas in the region is also variable. In some countries, the existing protected area network is adequate for the protection of antelopes, but in others, satisfactory systems are lacking. Under-resourcing is also a problem; designated protected areas may lack effective management, sufficient funding, or properly trained staff. The existence of many antelope populations outside protected areas and the requirement for large areas to sustain viable populations point to the need for long-term conservation strategies that cover larger areas through integrated land-use management plans. These are especially important for migratory species, such as saiga and Mongolian gazelle, which need extensive areas of suitable habitat.

Antelope populations have often shown the capacity to expand rapidly in numbers once direct persecution has been eliminated. Reintroductions of oryx and gazelles in Oman, Saudi Arabia, and Israel, and projected reintroductions in Jordan, Tunisia, and elsewhere, have begun to redress the problem of antelope extinctions at regional and global levels. Successful reintroductions demonstrate what is possible when financial resources, political will, and good planning are combined with the crucial support and involvement of the local people. Where a species has become extinct in the wild, reintroduction may be the only solution, but it is not a remedy for all population declines and it is important to concentrate conservation efforts on *in situ* measures that are focused on remaining wild populations.

In North Africa, the Middle East, and Asia, the long-term survival of viable populations of antelopes and other wildlife depends upon: (1) stringent protection from illegal hunting and strengthening of legal frameworks where these are inadequate; (2) completion of a comprehensive, effectively managed network of protected areas to cover all antelope species in the region; (3) imaginative schemes, including sustainable harvests and sport hunting, to integrate conservation of antelopes and other wildlife into rural development plans; (4) greater public awareness of the need for, and value of, wildlife conservation, including establishment at the local level of wildlife-utilisation schemes which allow rural populations to benefit materially from conservation.

1.2 Objective

The goal for international antelope conservation suggested in earlier parts of the Antelope Survey (East 1988; 1989; 1990) is “to ensure the long-term survival of all antelope species by maintaining as many viable populations as possible of each species in as wide a range of its habitats as is practical.” In North Africa, the Middle East, and Asia, the added problem of extinctions needs to be addressed, and the goal of international antelope conservation is therefore extended here to include “the restoration of recent antelope populations and communities where feasible.” Restoration should begin at sub-regional levels, such as North Africa and the Arabian Peninsula. Key words in this goal are ”possible" and “practical”; to succeed, conservation of antelope populations must not be an end in itself, but part of an overall environmental conservation strategy that is integrated with human development needs. The Convention on Biological Diversity, signed in 1992, comprehensively addressed all aspects of biodiversity conservation, including sustainable use of natural resources and sharing of benefits. The most immediate constraints in the region are the lack of effective protection on the ground from illegal hunting, inadequate resources for wildlife conservation, and continuing degradation and destruction of habitat.

The ASG considered that establishing the Antelope Survey was the most appropriate action it could take towards attainment of this goal of antelope conservation. The objectives of the survey are to determine the current distribution, abundance, and conservation status of antelopes, identify species and subspecies for which knowledge is seriously inadequate, and identify antelopes whose survival is threatened. As an integral part of the survey, the information gathered is used to establish priorities for international action, including preparation of Regional Action Plans for antelope conservation. The information gathered can also contribute directly to national biodiversity conservation strategies.

1.3 Scope of the Antelope Survey

This survey is concerned solely with antelopes. Integration of the results of the Antelope Survey and Action Plans with those prepared by other SSC Specialist Groups (e.g., Duncan 1992; Shackleton 1997) will be necessary for the establishment of overall conservation priorities.

Chapter 2 contains the classification of the region’s antelopes adopted for the Antelope Survey. Section 2 (Chapters 3–39) contains a country report for each of the 37 countries covered by Part 4 (Fig. 1.1). Section 3 (Chapters 40–41) considers the regional implications and outlines priorities. In Chapter 40, information from the country reports on antelope populations is used to assess regional status of

antelopes and to identify species and areas for conservation action. The Regional Action Plan (Chapter 41) identifies measures designed to maintain the diversity of antelopes on a region-wide basis. The inventory report form used for the Antelope Survey is presented in Appendix 1, and the status of species occurring within the region is summarised in Appendix 2.

The reports on individual countries have been prepared according to the same format used in earlier parts of the Antelope Survey, and include:

1. a brief introduction to the country;
2. an overview of the country's antelope fauna and its current conservation status, with a tabulation of the authors' assessments of species known to occur (currently or formerly) within the country; these status assessments are based on the following old Red Data Book categories and apply only to the status within each country, not the global status of the species:
   Extinct: no longer occurs in the wild;
   Endangered: in danger of extinction and unlikely to survive if the causal factors continue operating;
   Vulnerable: declining and likely to move into the endangered category in the near future if the causal factors continue operating;
   Rare: population small, not endangered or vulnerable at present, but at risk;
   Indeterminate: known to be endangered, vulnerable, or rare, but not enough information available to determine which of these categories is appropriate;
   Satisfactory: survival not threatened; this category often includes species whose total populations in the country may be declining, but which are well represented by viable, stable, or increasing populations within protected areas;
   Note: In one or two cases where a species is wholly endemic to one country, the global status has been used in the country report to avoid allocating two different status categories to the same population. These have been italicised and are indicated in the appropriate table. Global status of each species is listed in Chapter 40.
3. a brief overview of conservation measures taken to protect antelope populations;
4. an outline of conservation measures proposed;
5. accounts of individual species that give information on distribution (including a range map), population (numbers and trends), habitat, food, and reproduction (where available), status (based on the categories above), conservation measures taken, and conservation measures proposed.

1.4 Limitations of the Antelope Survey

Logistical and physical difficulties have hindered research and surveys on several species. For species occurring over expansive, open areas, aerial census is probably the best method to enumerate and monitor populations. However, aerial census is expensive compared to alternatives on the ground. In addition, aerial censuses in particular often suffer from an unknown level of under-counting bias. On the other hand, ground censuses demand far more extrapolation from smaller samples, with greater possibility for initial error and inaccurate or unrepresentative samples to be magnified.

The value of the Antelope Survey is limited by the accuracy and extent of the available information. While every attempt has been made to obtain as much up-to-date information as possible, many gaps remain in our knowledge of antelope distribution, abundance, and conservation status, as acknowledged in individual country reports and in Section 3. The rapidity and unpredictability of events, which may influence antelope populations, will inevitably make some parts of the survey results out-of-date in the near future. Nevertheless, sufficient information on the status of antelopes in each country has been gathered by experienced and knowledgeable observers in Chapters 3–39 to allow at least a broad overview of the regional status of each species.

As much quantitative information as possible on antelope populations is included in the country reports to provide a baseline for future comparisons. Where the sources of population estimates are not referenced, they have arisen from the authors' research or observations. This information on antelope populations is used to assess regional status in Chapter 40, but we strongly emphasise that all population estimates must be treated with great caution. Most estimates of antelope populations have large statistical sampling errors and wide confidence intervals. Because of these limitations, population estimates generally allow the reliable detection of only large-scale changes in numbers between sampling occasions.

It is beyond the scope of the Antelope Survey (and would exceed the role of IUCN/SSC Specialist Groups) to prepare detailed, area-specific plans for conservation action. Such plans may range from brief outlines of the factors affecting conservation areas and key antelope populations and communities, to detailed management plans based on in-depth analyses of the socio-economic and biological factors involved. Preparation of detailed, specific conservation plans is properly the role of national conservation agencies, with or without assistance from international agencies. The Antelope Survey and Regional Action Plans identify key areas where international assistance to antelope conservation should receive high priority.

References

Duncan, P. (Editor). 1992. *Zebras, asses and horses: An action plan for the conservation of wild equids*. IUCN, Gland.

East, R. (Compiler). 1988. *Antelopes: Global survey and regional action plans. Part 1. East and northeast Africa.* IUCN, Gland.

East, R. (Compiler). 1989. *Antelopes: Global survey and regional action plans. Part 2. Southern and south-central Africa.* IUCN, Gland.

East, R. (Compiler). 1990. *Antelopes: Global survey and regional action plans. Part 3. West and central Africa*. IUCN, Gland.

Flint, V.E. and Pereladova, O. 1993. Endangered species conservation in Russia. *Species* 20:38–39.

Jerdon, T. 1874. *The mammals of India*. John Weldon, London.

Rawling, C.G. 1905. *The great plateau*. Edward Arnold, London.

Schaller, G.B. 1998. *Wildlife of the Tibetan steppe*. University of Chicago Press, Chicago.

Shackleton, D.M. (Editor). 1997. *Wild sheep and goats and their relatives. Status survey and conservation action plan for Caprinae*. IUCN, Gland, Switzerland and Cambridge, UK.

Sokolov, V.E., Dash, Ya., Lushchekina, A.A., and Neronov, V.M. 1982. [Contemporary distribution and population of the dzeren in the MPR]. Pp. 7–21 *in:* [*Zoological researches in the MPR*]. Nauka, Moscow (in Russian).

Chapter 2. Classification of Antelopes Adopted for the Antelope Survey

S.C. Kingswood, D.P. Mallon, and P. Grubb

Antelope species

The species is the taxonomic unit of the Antelope Survey. Twenty-five species are recognised as occurring, or having once occurred, in 37 countries of North Africa, the Middle East, and Asia:

Family Bovidae	
Subfamily Bovinae	
Tribe Boselaphini	
Boselaphus tragocamelus (Pallas 1766)	Nilgai
Tetracerus quadricornis (de Blainville 1816)	Four-horned Antelope/Chousingha
Subfamily Hippotraginae	
Oryx dammah (Cretzschmar 1826)	Scimitar-horned Oryx
Oryx leucoryx (Pallas 1777)	Arabian Oryx/White Oryx
Addax nasomaculatus (de Blainville 1816)	Addax
Subfamily Alcelaphinae	
Alcelaphus buselaphus (Pallas 1766)	Common Hartebeest
Subfamily Antilopinae	
Tribe Antilopini	
Antilope cervicapra (Linnaeus 1758)	Blackbuck
Gazella dorcas (Linnaeus 1758)	Dorcas Gazelle
Gazella saudiya (Carruthers and Schwarz 1935)	Saudi Gazelle/Afri
Gazella bennettii (Sykes 1831)	Chinkara/Indian Gazelle
Gazella gazella (Pallas 1766)	Mountain Gazelle/Idmi
Gazella bilkis (Groves and Lay 1985)	Queen of Sheba's Gazelle/Yemen Gazelle
Gazella arabica (Lichtenstein 1827)	Arabian Gazelle
Gazella cuvieri (Ogilby 1841)	Cuvier's Gazelle/Edmi
Gazella rufina (Thomas 1894)	Red Gazelle
Gazella subgutturosa (Güldenstaedt 1780)	Goitered Gazelle
Gazella leptoceros (Cuvier 1842)	Slender-horned Gazelle/Rhim
Gazella dama (Pallas 1766)	Dama Gazelle/Addra Gazelle
Procapra picticaudata (Hodgson 1846)	Tibetan Gazelle/Goa
Procapra przewalskii (Büchner 1891)	Przewalski's Gazelle
Procapra gutturosa (Pallas 1777)	Mongolian Gazelle/Dzeren
Tribe Saigini	
Pantholops hodgsonii (Abel 1826)	Tibetan Antelope/Chiru
Saiga tatarica (Linnaeus 1766)	Saiga
Subfamily Uncertain	
Tribe Uncertain	
Pseudoryx nghetinhensis (Dung *et al*. 1993)	Saola/Vu Quang Ox
Pseudonovibos spiralis (Peter and Feiler 1994)	Khting Vohr/Linh-duong

The arrangement of subfamilies and tribes is based on Ellerman and Morrison-Scott (1951) and Ansell (1971), except that the tribe Saigini is placed in the subfamily Antilopinae instead of the Caprinae, as by Grubb (1993). Although Gentry (1992) placed *Pantholops* in the Caprinae, it has not been included in the Action Plan for Caprinae (Shackleton 1997), making it more appropriate (and necessary) to cover *Pantholops* here. The species list follows that used by Grubb (1993).

In recording all recently extant species that may have once occurred in North Africa, the Middle East, and Asia, the above list includes taxa that are now believed extinct either

globally, as in the case of *Gazella rufina*, or within the region, such as wild populations of *Oryx dammah*, *Addax nasomaculatus*, and *Alcelaphus buselaphus*. The status of *Gazella arabica* is also a mystery because it is known from only one specimen, attributed to the Farasan Islands; however, the gazelle that now occurs on the Farasans is *G. gazella farasani* (Thouless and Al Bassri 1991). In addition, two specimens of lesser kudu (*Tragelaphus imberbis*) have been obtained from local hunters on the Arabian Peninsula (Harrison and Bates 1991). However, there are no other reports of this conspicuous species and it is generally considered that these specimens do not represent a wild former population.

Classification of the gazelles is problematic, and considering that they represent more than half of the species on the above list, the following remarks briefly address a few of the notable problems. In the genus *Gazella*, for example, the Saudi gazelle was formerly assigned to *G. dorcas*, and the Indian gazelle and Cuvier's gazelle were sometimes regarded as conspecific with *G. gazella*, but here they are treated as distinct species, *G. saudiya*, *G. bennettii*, and *G. cuvieri*, respectively, following Groves (1988). Similarly, the central Asian gazelles *Procapra picticaudata* and *P. przewalskii* were sometimes considered conspecific, but the classification adopted here treats them as distinct species and places them in the genus *Procapra* as an alternative to placing them in the genus *Gazella* (see Groves 1967). The taxonomy of gazelles is likely to undergo further revision. For example, the recently described *G. bilkis* is now regarded as a subspecies of *G. arabica* by Groves (1996), while in the same paper, *G. gazella erlangeri* is recognised as a sibling species of *arabica*, *G. erlangeri*, occurring within the range of *G. gazella cora*. However, the 14 species of gazelles included in the regional species list above are an adequate representation for the Antelope Survey.

The recently discovered *Pseudoryx nghetinhensis* has been assigned to the Bovinae on the basis of its colour pattern and mitochondrial DNA (Dung *et al*. 1993), but a thorough analysis of cranial characters suggests it is related to the Caprinae, retaining primitive features of this group (Thomas 1994). However, other characteristics of *P. nghetinhensis* are typical of neither Bovinae nor Caprinae, such as the remarkable development of its maxillary glands and the presence of facial nodules (Robichaud 1998). *Pseudonovibos spiralis* was described even more recently from horns of six individuals (Peter and Feiler 1994). Additional material includes two frontlets collected in 1929 and previously identified as female kouprey *Bos sauveli* (Hoffmann 1986). Morphology of nine horns from six different animals was documented by Dioli (1997). The horns in all specimens of *Pseudonovibos* are boldly annulated, suggesting an affinity with the Antilopinae. Further studies of these specimens are awaited.

Antelope subspecies

For most species of antelopes in the survey region, the validity and precise distribution of many described subspecies are uncertain, preventing accurate determinations of the population and conservation status of subspecies. One problem with the classification of subspecies is that distribution, intergradation, and clinal variation in these taxa have not been adequately addressed, largely due to the fact that few specimens have been available for study. This issue has been complicated by the introduction of certain taxa (e.g., gazelles) into areas where they may not have naturally occurred and by hybridisation between subspecies in captivity. Therefore, the Antelope Survey is focused on assessing the status of antelopes at the species level. In keeping with previous parts of the Antelope Survey, however, we have recorded subspecies that may be considered distinctive (e.g., morphologically, behaviourally, or geographically) by wildlife managers (see East *et al*. 1988; 1990). Such subspecies in North Africa, the Middle East, and Asia include:

Alcelaphus buselaphus buselaphus	Bubal Hartebeest
Gazella dorcas massaesyla	Moroccan Dorcas Gazelle
Gazella gazella acaciae	Acacia Gazelle/ Arava Gazelle
Gazella gazella cora	Arabian Mountain Gazelle
Gazella gazella farasani	Farasan Island Gazelle
Gazella gazella gazella	Palestine Mountain Gazelle
Gazella gazella muscatensis	Muscat Gazelle
Gazella subgutturosa hillieriana	Mongolian Goitered Gazelle
Gazella subgutturosa marica	Arabian Sand Gazelle/Reem
Gazella subgutturosa subgutturosa	Persian Goitered Gazelle
Gazella dama mhorr	Mhorr Gazelle
Saiga tatarica mongolica	Mongolian Saiga
Saiga tatarica tatarica	Russian Saiga

The selection of subspecies included on this list is somewhat subjective. The extinct subspecies *A. b. buselaphus* is the only representative of the species in the survey region. A majority of subspecies recorded above represent taxa recognised as threatened and/or those for which a captive population is recommended as a component of a conservation program (Sausman and Correll 1994; IUCN 1996; U.S. Fish and Wildlife Service 1996). Using such criteria, others could also be included, for example, the Rio de Oro (*G. d. osiris*) population of dorcas gazelle and the form of mountain gazelle from southwestern Arabia (*G. g. erlangeri*). These additional subspecies are mentioned in the appropriate country reports and Section 3.

In closing, it is important to note that as wildlife conservationists our goal is to maximise the preservation of adaptive

genetic variation. Although taxonomy is the tool we depend on to define natural variation, to date, we have discovered but a relatively small portion of it. Thus, as we consider what action must be taken to save species, and possibly subspecies, we should also be mindful of the potential significance of each and every antelope population.

References

Ansell, W.F.H. 1971. Order Artiodactyla. Part 15 of Meester, J. and Setzer, H.W. (Editors). *The mammals of Africa. An identification manual*. Smithsonian Institution Press, Washington.

Corbet, G.B. 1978. *The mammals of the Palaearctic region: A taxonomic review*. British Museum (Natural History), London.

Corbet, G.B. and Hill, J.E. 1991. *A world list of mammalian species. Third edition*. Oxford University Press, Oxford.

Dioli, M. 1997. Notes on the morphology of the horns of a new artiodactyl mammal from Cambodia: *Pseudonovibos spiralis*. *Journal of Zoology* 241:527–531.

Dung, V.V., Giao, P.M., Chinh, N.N., Tuoc, D., Arctander, P., and MacKinnon, J. 1993. A new species of living bovid from Vietnam. *Nature* 363:443–445.

East, R., Grubb, P., and Wilson, V.J. 1988. Classification of antelopes adopted for the antelope survey. Pp. 3–4 *in:* East, R. (Compiler). *Antelopes: Global survey and regional action plans. Part 1. East and Northeast Africa*. IUCN, Gland, Switzerland and Cambridge UK.

East, R., Grubb, P., and Wilson, V.J. 1990. Classification of antelopes adopted for the antelope survey. Pp. 4–5 *in:* East, R. (Compiler). *Antelopes: Global survey and regional action plans. Part 3. West and Central Africa*. IUCN, Gland, Switzerland and Cambridge UK.

Ellerman, J.R. and Morrison-Scott, T.C.S. 1951. *Checklist of Palaearctic and Indian mammals, 1758 to 1946*. British Museum (Natural History), London.

Gentry, A.W. 1971. Genus *Gazella*. Part 15.1 of Meester, J. and Setzer, H.W. (Editors). *The mammals of Africa. An identification manual*. Smithsonian Institution Press, Washington.

Gentry, A.W. 1992. The subfamilies and tribes of the family Bovidae. *Mammal Review* 22:1–32.

Groves, C.P. 1967. On the gazelles of the genus *Procapra* Hodgson, 1846. *Zietschrift für Säugetierkunde* 32:144–149.

Groves, C.P. 1985. An introduction to the gazelles. *Chinkara* 1:4–16.

Groves, C.P. 1988. A catalogue of the genus *Gazella*. Pp. 193–198 *in:* Dixon, A. and Jones, D. (Editors). *Conservation and biology of desert antelopes*. Christopher Helm, London.

Groves, C.P. 1996. Taxonomic diversity in Arabian gazelles: The state of the art. Pp. 8–39 *in:* Greth, A., Magin, C., and Ancrenaz, M. (Editors). *Conservation of Arabian gazelles*. National Commission for Wildlife Conservation and Development, Riyadh.

Groves, C.P. and Harrison, D.L. 1967. The taxonomy of the gazelles (genus *Gazella*) of Arabia. *Journal of Zoology* 152:381–387.

Grubb, P. 1993. Order Artiodactyla. Pp. 377–414 *in:* Wilson, D.E. and Reeder, D.M. (Editors). *Mammal species of the world. A taxonomic and geographic reference. Second edition*. Smithsonian Institution Press, Washington.

Harrison, D.L. and Bates, P.J.J. 1991. *The mammals of Arabia. Second edition*. Harrison Zoological Museum, Sevenoaks, England.

Hoffmann, R.S. 1986. A new locality record for the kouprey from Viet-Nam, and an archaeological record from China. *Mammalia* 50:391–395.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge UK.

Peter, W.P. and Feiler, A. 1994. Eine neue Bovidenart aus Vietnam und Cambodia (Mammalia: Ruminantia). *Zoologische Abhandlungen Staatliches Musem für Tierkunde Dresden* 48:169–176.

Robichaud, W.G. 1998. Physical and behavioral description of a captive saola, *Pseudoryx nghetinhensis*. *Journal of Mammalogy* 79:394–405.

Sausman, K. and Correll, T. (Editors). 1994. *Antelope conservation assessment and management plan and global captive action recommendations. Draft 4*. IUCN/SSC Captive Breeding Specialist Group, Apple Valley, Minnesota.

Shackleton, D.M. (Compiler). 1997. *Wild sheep and goats and their relatives. Status survey and conservation action plan for Caprinae*. IUCN, Gland, Switzerland and Cambridge, UK.

Thomas, H. 1994. Anatomie cranienne et relations phylogénétiques du nouveau bovidé (*Pseudoryx nghetinhensis*) découvert dans la cordillère annamitique au Vietnam. *Mammalia* 58:453–481.

Thouless, C.R. and Al Bassri, K. 1991. Taxonomic status of the Farasan Island gazelle. *Journal of Zoology* 223:151–159.

U.S. Fish and Wildlife Service. 1996. *Endangered and threatened wildlife and plants*. U.S. Government Printing Office, Washington.

SECTION 2

Country Reports

Chapter 3. Morocco

S. Aulagnier, F. Cuzin, C. Loggers, and M. Thévenot

Introduction

Morocco, located in the northwestern corner of Africa (Fig. 3.1), extends from 21^0 to 36^0 N latitude and covers 710,850km^2 (including Western Sahara). It is the most mountainous country in North Africa. The Rif Mountains run parallel to the north coast, rising abruptly from the Mediterranean to an elevation of 2,456m at Jbel Tidighine. Three Atlas mountain chains divide the Eastern Plateaux and the pre-desert and Saharan hamadas from Atlantic Morocco. The Middle Atlas, the northernmost chain, extend northeast to southwest and rise to 3,340m (Jbel Bou Nasser). The High Atlas, the largest chain, run from the Atlantic Coast eastward for more than 650km and contain several peaks higher than 3,500m, including Jbel Toubkal (the highest peak in North Africa at 4,167m), Ighil Mgoun (4,071m) and Jbel Ayachi (3,737m). The Anti-Atlas Mountains extend southward from the High Atlas to the Atlantic Ocean. The pre-desert Eastern Plateaux and hamadas lie to the east and south of the Atlas Mountains and rise to more than 1,000m above sea level. The Atlantic side of Morocco contains the Atlantic plains of the Rharb, Chaouia, Doukkala, and Souss; the Central Plateau; and the arid central plains of Tadla and Haouz.

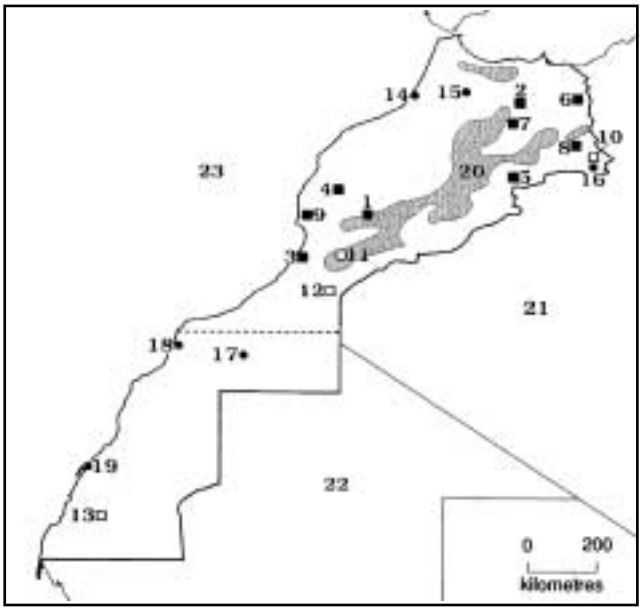


Fig. 3.1 Morocco. Protected Areas containing antelopes or of potential importance for antelope conservation. National Parks: 1. Toubkal; 2. Tazzeka; 3. Souss-Massa. Natural reserves: 4. M'Sabih Talâa; 5. El Kheng. Permanent hunting reserves: 6. Chekhar; 7. Outat El Haj; 8. Tamelelt. Temporary reserve: 9. Tafingoult. Proposed protected areas: 10. Jbels Grouz and Maiz; 11. Anezi region; 12. Lower Drâa; 13. Adrar Souttouf. Geographical features: 14. Rabat; 15. Fez; 16. Figuig; 17. Smara; 18. La'youne; 19. Dakhla; 20. Atlas Mountains; 21. Algeria; 22. Mauretania; 23. Atlantic Ocean.

Morocco's climate is hot temperate and consists of two main seasons: an arid, hot summer and a mild, rainy winter. Rainfall varies considerably by region and by year. The Rif and some parts of the Middle Atlas receive the most precipitation, sometimes more than 1,000mm per year. East and south of the Atlas Mountains, and in the central plains, annual rainfall averages between 200mm and 400mm, decreasing to less than 200mm in Western Sahara.

Vegetation in northern Morocco is typical of western Mediterranean plant communities. Forests of cedar (*Cedrus atlantica*), pine (*Pinus halepensis, P. pinaster*), fir (*Abies maroccana*), juniper (*Juniperus thurifera, J. phoenicea*), Lusitanian and evergreen oak (*Quercus faginea, Q. ilex*), and thuya (*Tetraclinis articulata*) grow in the mountains. The last four species, mixed with cork oak (*Quercus suber*) and oleaster (*Olea europea*), grow in the Atlantic plains and plateaux where agriculture and pastoralism allow woods, or at least matorrals, to persist. Alfa (*Stipa tenacissima*) grasslands and sagebrush (*Artemisia herba-alba*) steppes cover the Eastern Plateaux. In southern Morocco, sparse forests or steppes of argan (*Argania spinosa*), acacia (*Acacia gummifera*), jujube (*Zizyphus lotus*), and red juniper (*Juniperus phoenicea*) grade into pre-Saharan and Saharan steppes that contain sagebrush, halophytes (Chenopodiaceae), and acacias (*A. raddiana* and *A. ehrenbergiana*).

Current status of antelopes

At the turn of the 20th century, up to six species of antelopes inhabited what is now Morocco (Table 3.1). By then, humans had already decimated the largest species (Meakin 1901). Three species were extirpated during the first half of this century; bubal hartebeest (*Alcelaphus buselaphus buselaphus*) were extirpated before 1930, and addax (*Addax nasomaculatus*) and scimitar-horned oryx (*Oryx dammah*) have not been sighted since the 1950s, except for a lone oryx in 1973 reported by Le Houérou (1992). Dama gazelle (*Gazella dam*a) is on the verge of extinction. Populations of dorcas gazelle (*Gazella dorcas*) and Cuvier's gazelle (*Gazella cuvieri*) continue to decline; these two species can be classified as rare and endangered (Cabrera 1932; Morales Agacino 1949; 1950; Panouse 1957; Valverde 1957; Ansell 1971; Aulagnier and Thévenot 1986a; Loggers *et al*. 1992).

Table 3.1 Current status of antelopes in Morocco.

Species	Status[1]	GPS[2]
Scimitar-horned Oryx (*Oryx dammah*)	Extinct	–
Addax (*Addax nasomaculatus*)	Extinct	–
Bubal Hartebeest (*Alcelaphus buselaphus buselaphus*)	Extinct	–
Dorcas Gazelle (*Gazella dorcas*)	Vulnerable	<3%
Cuvier's Gazelle (*G. cuvieri*)	Vulnerable	35–60%
Dama Gazelle *(G. dama)*	Endangered	<5%

[1]*See Chapter 1 for definition of status categories*

[2]*Global population share*

There is one unconfirmed record of slender-horned gazelle (*G. leptoceros*) in Morocco (Loggers *et al*. 1992).

This accelerated reduction in antelope populations is due mainly to loss of habitat, though poaching, feral dog predation, and past over-hunting with modern weapons are also factors. Like most countries, Morocco faces the challenge of balancing economic development with environmental conservation. The rapidly growing human population needs more food and timber off the same land. Agriculture, working of forest products, and production of animal fodder reduce and fragment available wildlands. In pre-desert areas, grazing by domestic livestock is dramatically increasing as pastoralists sink new waterholes and transport animals by truck to temporary pastures. Hunting by VIPs, dignitaries from the Arabian Peninsula, and soldiers in Western Sahara continues. Series of droughts exacerbate the worsening situation.

Due to intense human land use, no antelopes remain in the northwestern part of the country, except for a small population of dorcas gazelles in the enclosed M'Sabih Talâa Reserve, 80km west of Marrakech. Remnant gazelle populations are located either in mountainous or desert areas of eastern and southern Morocco. Even in these harsh areas, gazelles and aoudad (*Ammotragus lervia*) seem to be restricted to *de facto* reserves, true reserves devoted to gazelles, no-grazing areas designed for pasture improvement, young woodland coppices, and Saharan areas where public use is more or less prohibited for military purposes.

Extensive areas that could potentially contain important gazelle populations remain poorly surveyed. The largest of these occur in Western Sahara, southeast of a line joining Assa, Smara, and Dakhla. A few gazelles may also roam the Saharan sector of the Algerian border from Foum el Hassan to Figuig and in the Saharan Atlas.

Conservation measures taken

The legal basis for wildlife conservation in Morocco includes texts related to the status of protected areas and habitat management, and texts on hunting rules. The Ministère de l'Agriculture et de la Mise en Valeur Agricole has administrative responsibility for protected areas. In the Administration des Eaux et Forêts et de la Conservation des Sols, the Direction de la Conservation des Resources Forestières is responsible for general management and activity co-ordination. At a lower level, the Division de la Chasse, de la Pêche et de la Protection de la Nature deals with day-to-day activities in national parks, biological reserves, and game preserves. Since 1995, a ministry deals with the environment and, in accordance with the main resolutions of the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, this ministry has launched a biodiversity monitoring programme. According to Morocco's game legislation, hunting of Cuvier's gazelle and dorcas gazelle has been completely outlawed by ministerial orders since 1958 and 1961, respectively (Chapuis 1973).

The Ministerial Order of 21 May 1921 regulates rights to use common pastures within state forests. The *dahir* of 11 September 1934 established national parks as protected areas while maintaining rights of previous use. Then, three national parks were created: Toubkal National Park in 1942, Tazekka National Park in 1950, and Souss-Massa National Park in 1991 (none of these parks are inhabited by wild antelopes). Ministerial decrees in 1962 and 1978 established hunting reserve areas. These areas receive complete protection from commercial exploitation, grazing, building, and hunting. Of the 13 nature and wildlife reserves (mainly wetlands), only two, M'Sabih Talâa Reserve (1,987ha) in the semi-arid Haouz Plain, and El Kheng Reserve (4,000ha) in the Tafilalt, are devoted to gazelles. None of the parks or reserves meets international standards (Bousquet 1992).

Hunting is also prohibited in the 80 permanent hunting reserves (600,000ha) and is temporarily closed in biennial reserves. Biennial reserves (10,000,000ha) are distributed relatively evenly over the country and are closed on a rotational basis for two-year periods. Morocco's system of reserves is completed by 10 hunting reserves managed by a private hunting society; Royal Reserves, four of which are hunted each year; and reserve areas for dune stabilisation, reforestation, or soil erosion control (e.g., Tafingoult in the western High Atlas Mountains). The whole Western Sahara is considered a permanent hunting reserve.

The current system of reserve and park management is of limited success in protecting large animal species. Without enforcement of their boundaries, the reserves are of little value. Economic constraints are so important that only locally supported programmes with obvious and quick benefits can be successful. In this way, the Ministry of Tourism became interested in national parks and is studying jointly with the Ministry of Agriculture the development of a tourism industry based upon nature and wildlife.

Finally, two non-governmental organisations (NGOs), Société Marocaine du Droit de l'Environment (SOMADE) and Association Marocaine de Protection de l'Environnement (ASMAPE) were founded during the 1980s to promote conservation of natural resources. More recently, the Comité des Programmes de Conservation de la Nature (CCPN) has been created by several Moroccan and international NGOs in order to contribute to the conservation of Morocco's natural heritage. Its main purpose is to develop collaboration between Moroccan and international organisations involved in conservation programmes in the country.

Conservation measures proposed

In Morocco, existing wildlife management strategies do not protect the rarer species of wildlife. The threats to most remaining gazelle populations are the same for most large mammals: habitat degradation from overgrazing by domestic animals (even inside reserves), hunting, poaching and human disturbance (Aulagnier and Thévenot 1986b; Loggers *et al*. 1992). Essentially, few incentives exist to conserve wildlife or habitats. Establishment of effectively protected and managed conservation areas that support viable antelope populations is essential to reverse this trend (East 1992).

Morocco cannot remedy this situation without significant legislative and institutional changes. Most legislation relating to wildlife originated in the 1920s and does not reflect human demographic expansion and economic shifts. Therefore, laws should be updated and enforced. But updating laws will not be sufficient to maintain gazelle populations long term as local people, often very poor and steeped in traditional rights, do not accept laws that they feel are unjust and are often against the creation of new reserves. Ministerial groups must work with rural inhabitants to develop incentives to properly manage public resources while providing at least wood and forage. Moreover, a reasonable but controlled access by tourists could support local employment. This statement, simple to make, is extremely difficult to implement in diverse cultural, economic, and ecological situations, especially with constrained budgets.

At the national level, the different administrative units should co-operate around the indubitable authority of the Ministry of Interior with the help of research institutions. Locally, a single managing organisation, collaborating with local and regional representatives and the main authorities in rural communes, should be mandated to advise on all activities inside and around each park or reserve.

Wildlife also needs some more protected areas. Protected areas in the sense of strict nature reserves (i.e., removing humans) may not be feasible, but alternatives exist if creativity is not limited. Areas with high potential for gazelles to respond positively to management include Jbels Grouz and Maiz (arid hills near Figuig), and parts of the rocky argan bush area in the western Anti Atlas, near Anezi. Two national parks would be of great interest in Western Sahara: in the north, from the lower Oued Drâa Valley (Aouinet Torkoz Region) to the Aydar, and in the south, in the Adrar Souttouf. In those areas, hunting needs to be strictly forbidden, grazing controlled, and regulation supervised by enough specially trained wildlife guards. These areas are part of a system of 154 sites of ecological and biological interest (SIBE), the main natural areas to be protected in order to conserve major ecosystems, as well as threatened species. The SIBE list was completed in 1995 by the Administration des Eaux et Forêts. Investigating poorly known Saharan areas would probably identify other potential faunal refuges.

Finally, wildlife needs more respect. We cannot deny others the opportunity to enjoy the same goods and services that westerners have, but an appreciation of natural resources should be developed through education. The Moroccan Government needs to work with local people in rural areas to assist in habitat management for wildlife and domestic animals. In cities, conservation awareness is developing and should be cultivated. A long-term programme must be developed to convince people that natural resources are not as endless as the human imagination to use them.

Species accounts

Scimitar-horned Oryx (*Oryx dammah*)

Distribution and population: Scimitar-horned oryx formerly inhabited the main sub-desert regions of North Africa, where people used their skin to make tough shields (Epaulard 1980). Overhunting and habitat loss reduced both numbers and distribution of this antelope. Records from the 1900s are scarce, and are all from south of the Sequiat el Hamra (Chudeau 1920; Spatz 1926; Morales Agacino 1949; Valverde 1957). These animals, probably transients, visited the *Aristida plumosa* steppe after unusual, abundant vegetation growth. A single animal was seen in 1973 (Le Houérou 1992) (Fig. 3.2).

Habitat, food and reproduction: Not documented in Morocco.

Status within the country: Extinct.

Conservation measures taken: Five animals were brought from zoos in 1995 to an enclosure at Souss-Massa National Park. A further 15–20 animals were expected to arrive in 1996. Global status is Extinct in the Wild (East 1999).

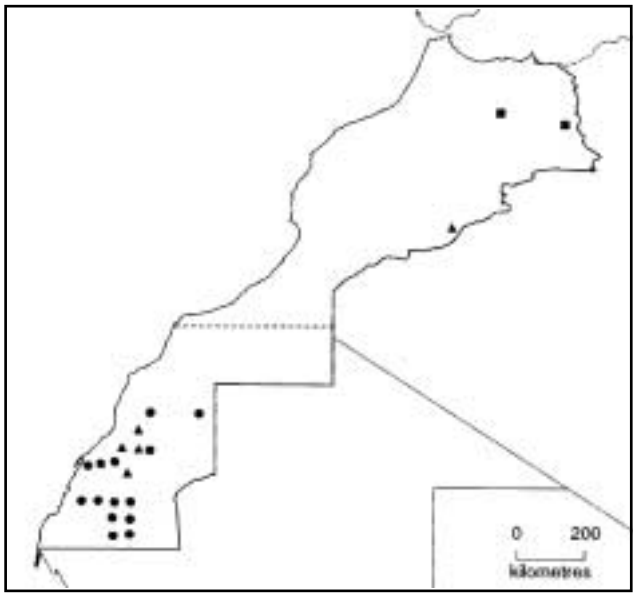


Fig. 3.2 Former records in Morocco and Western Sahara of scimitar-horned oryx (*Oryx dammah*) (circles), addax (*Addax nasomaculatus*) (triangles) and bubal hartebeest (*Alcelaphus b. buselaphus*) (squares).

Conservation measures proposed: The animals could be released in the area of the lower Drâa Valley-Aydar, where a large faunal refuge, perhaps open to tourism, should be established. The dense vegetation of the area would probably limit movements of antelope able to make long distance movements during droughts. The Adrar Souttouf area, which is drier, seems to be less favourable, though it is also a possible release site.

Addax (*Addax nasomaculatus*)

Distribution and population: Formerly widespread over the Sahara, but rather rare at the western edge of their range. The infrequent Moroccan reports are restricted to the Sequiat el Hamra and the Wad ed Dahab in Western Sahara (Spatz 1926; 1927; Morales Agacino 1934; 1949; 1950) and southeast of Zagora (Marçais 1937) (Fig. 3.2). These addax may have been only transients. Herds were exterminated by hunters with modern weapons (Morales Agacino 1949), and Valverde (1957) concluded that this antelope was extirpated in the region.

Habitat, food and reproduction: No information specific to Morocco is available.

Status within the country: Extinct.

Conservation measures taken: Twenty-seven animals, originating from Niger and Chad, were brought from zoos to a large enclosure in the Souss-Massa National Park during 1994, and 26 more were added in 1995. Global status is Critically Endangered (East 1999).

Conservation measures proposed: These desert animals could be released in the Adrar Souttouf, part of the planned Dakhla National Park. Forage could be supplemented there, particularly during dry years, to limit their movements to unsafe areas.

Bubal Hartebeest (*Alcelaphus buselaphus buselaphus*)

Distribution and population: Hartebeest were formerly common in Moroccco, but numbers were severely reduced by hunting during the 19th century (Fig. 3.2). The last known specimens in Morocco were shot in 1925 in the upper Moulouya Valley (Loggers *et al.* 1992).

Status within the country: Extinct. Global status of this subspecies is Extinct and of *A. buselaphus* Lower Risk/ conservation dependent (IUCN 1996).

Conservation measures proposed: Reintroduction of captive-bred animals belonging to another subspecies could be considered at some point in the future.

Dorcas Gazelle (*Gazella dorcas*)

Distribution and population: Formerly widespread, but instead of the large herds of the 1800s, only scattered, small herds now inhabit a portion of their former range (Aulagnier 1992). In Morocco (Fig. 3.3), dorcas gazelles occurred in all the northern plains, including the Rharb and Chaouia (Epaulard 1980). Now, only one group of about 80 animals (down from about 200 in 1990; Loggers 1992) remains northwest of the High Atlas in the M'Sabih Talâa Reserve (Cuzin 1996). East and south of the Atlas Mountains, small groups of dorcas gazelles are widely scattered throughout the Moulouya River Valley (20–50 animals); along the Moroccan-Algerian border (*c.*100 in the Figuig Region); on the plains between Zagora and Tafilalt (<50 animals), and throughout the Oued Drâa Valley (*c.*100 animals). In 1995, the total number of dorcas gazelles in Morocco (excluding Western Sahara, south of Oued Drâa Valley) was estimated to be 200–600 (Cuzin 1996). Dorcas gazelles were formerly abundant in Western Sahara, except along the coast between Lâayoune and Boujdour (Morales Agacino 1949; 1950; Valverde 1957). They are now scarce, but this region is believed to house the largest population (several hundred animals), in particular in the Adrar Souttouf in the south (information from this region is rare as travel there is still restricted).

Habitat, food and reproduction: The dorcas gazelle is an animal of flat or rolling grasslands and steppes. In M'Sabih Talâa Reserve, the habitat consists of *Stipa retorta* grasslands containing the forbs *Cladanthus arabicus, Medicago* spp. and Asteraceae, and dotted with *Zizyphus lotus* and *Retama monosperma* shrubs (Loggers 1991). Dorcas gazelles roam *Zizyphus-Stipa* or Chenopodiaceae steppes in eastern Morocco. In the Oued Drâa Valley, their habitat contains trees and shrubs such as *Tamarix*

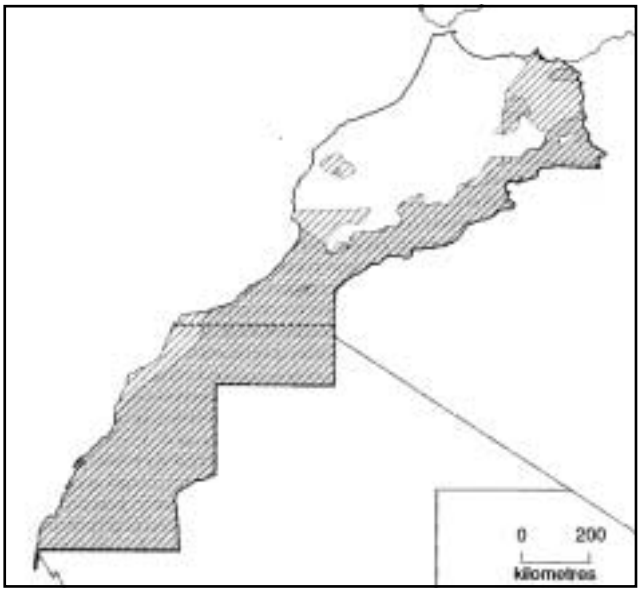


Fig. 3.3 Current distribution (shaded) and 1950s distribution (hatched) of dorcas gazelle (*Gazella dorcas*) in Morocco and Western Sahara.

spp-*Limoniastrium ifniense* or *Acacia* spp. Near the mouth of the Oued Drâa and along the Atlantic coast, dorcas gazelles inhabit the *Euphorbia* matorral. In Western Sahara, they occupy the *Acacia raddiana* and *Opophytum theurkauffii* steppes, moving according to the quality of pastures (Valverde 1957). Availability of water seems to control reproduction. When forage is suitable, each female usually gives birth to one young per year after a 24–25 week pregnancy (Alados 1984). Births occur mainly during October–November in the Haouz Plain (Loggers 1990), but more irregularly in Western Sahara (the two main periods are September–November and March–April). Normally, the first fawn is born when the female is about one and a half years old, but a number of females produce their first fawn when one year old (Alados 1984).

Status within the country: Vulnerable. Threatened mainly by habitat loss from expanding permanent agriculture and overgrazing by sheep and goats, but also by poaching (gazelles provide protein to some inhabitants and soldiers in Western Sahara), by illegal hunting by VIPs (especially those from the Arabian Peninsula), and by predation by dogs (Loggers *et al.* 1992).

Conservation measures taken: In 1958, the annual ministerial order that regulates hunting restricted the shooting of gazelles, which was limited to five days hunting in 1960. Since 1961, dorcas gazelles have been fully protected. A 1,987ha permanent hunting reserve was established in 1952 at M'Sabih Talâa Reserve (near Sidi Chiker, $31^0$48'N, $8^0$30'W) to preserve the remnant northern plains population. The reserve's perimeter has been fenced since 1960, but part of it is now in very bad condition. Feral dogs and periodic poaching are the major mortality factors on the reserve (Loggers 1990). The effect of drought on the population may be significant. In the early 1990s, El Kheng Reserve was established near Tarda, between Er Rachidia and Goulmima ($31^0$51'N, $4^0$33'W). It covers 4,000ha, of which 600ha are fenced. In 1994, a small herd of 10–15 gazelles was observed there. Small bands of dorcas gazelles may periodically occupy other permanent (mostly small) hunting reserves, but none of these has been established expressly for this species. More than 240 animals, originating from various areas of Morocco, are kept in enclosures (e.g., Temara National Zoo; the Royal farms of Bouznika, near Rabat, and Douyiet, near Fes; the Royal reserves of Rmila, near Marrakech, and Souss, near Agadir; and in the Souss-Massa National Park). Global status is Vulnerable (East 1999).

Conservation measures proposed: Some of the proposed protected areas are of major interest for this species. A reserve in Jbel Grouz could gather scattered animals of eastern Morocco. In Western Sahara, establishing the lower Drâa-Aydar and Adrar Souttouf as a faunal refuge could assure the protection of the largest known remaining populations. Moreover, an enlargement of El Kheng Reserve could provide an opportunity to preserve the Tafilalt population. The fence at M'Sabih Talâa Reserve should be quickly repaired. In the Atlantic plains, the establishment of a second reserve, restocked with animals from M'Sabih Talâa Reserve and perhaps open to tourism, could ensure the survival of a somewhat small population that is threatened by possible disease and occasional drought. There is also a need to reintroduce the species into the northern and eastern parts of the pre-Saharan range from where the species was nearly extirpated during the 1980s (Cuzin 1996). These reintroductions could be planned in the largest hunting reserves of the Eastern Plateaux and upper Moulouya Valley: Chekhar (10,000ha, east of Ain Beni Mathar, $34^0$15'N, $2^0$03'W), Outat el Haj (10,000ha, $33^0$25'N, $3^0$50'W), and Tamelelt (220,000ha, west of Bou-Arfa, $32^0$25'N, $2^0$00'W).

Additional remarks: According to Panouse (1957) and Gentry (1972), three subspecies of dorcas gazelle occur in Morocco: *G. dorcas massaesyla* in the northern plains, *G. d. dorcas* south to the High Atlas, and *G. d. neglecta* in Western Sahara. Some authors consider only two subspecies, either *G. d. massaesyla* and *G. d. osiris*, including *neglecta* (Groves 1969; 1981), or *G. d. dorcas* and *G. d. neglecta* (Alados 1987). No recent study has investigated systematics. The taxonomic status of the M'Sabih Talâa population may be compromised by several possible origins.

Cuvier's Gazelle (*Gazella cuvieri*)

Distribution and population: Cuvier's gazelle, or edmi, formerly lived in all the high plateaux and mountainous regions of Morocco, except the western Rif (Cabrera 1932; Heim de Balsac 1936; Panouse 1957). Now, reduced and fragmented populations inhabit the southern side of the eastern Middle Atlas, the whole southern High Atlas, and

the Anti-Atlas Mountains (especially between Anezi and Bou Izakarn), extending to the northern Sahara (Fig. 3.4). Northeastern populations are probably extirpated. Small transient herds were recently sighted in the High Atlas between Ouarzazate and Rich at altitudes up to 2,500m in summer in the Msemrir-Agoudal region (Cuzin 1996). In the Sahara, Cuvier's gazelles still occupy the hills from the Oued Drâa Valley to the Aydar region, northeast of Smara. This population consists of a few hundred animals and is probably the largest in Morocco. It exceeds the number in the western Anti-Atlas Mountains (50–150 animals). In 1995, there were estimated to be 500–1,500 animals in the wild (Cuzin 1996).

Habitat, food and reproduction: Cuvier's gazelles occupy a variety of steppes, matorrals, and open forest habitats. Where their range overlaps with dorcas gazelles, Cuvier's gazelles are found in more rugged terrain and at higher elevations, though they are limited by snowfall. In their former range in Atlantic Morocco, they lived in cork oak (*Quercus suber*) forests. On the rocky high plateaux of eastern Morocco, their habitat contains *Tetraclinis articulata* scrub, *Rosmarinus officinalis,* and *Stipa tenacissima*. Towards the Middle Atlas, *Quercus ilex, Pinus* spp., *Olea europaea,* and *Pistacia lentiscus* scrub enter this mosaic. In the Anti-Atlas Mountains, their habitat includes *Tetraclinis articulata*, *Argania spinosa,* and *Atriplex* spp. Their western High Atlas habitat resembles that of the Anti-Atlas, but often contains *P. lentiscus* (Loggers *et al.* 1992). Further east, their habitat includes *Juniperus phoenicea* and high-altitude, xerophytic, low scrub. In northern Sahara, their habitat includes *Acacia raddiana, A. ehrenbergiana, Argania spinosa,* spiny *Euphorbia,* and Chenopodiaceae steppes. In Almería, Spain, reproduction of captive animals from the Sahara is related to rainfall; births (often twins) occur in spring, and secondarily in October–November (Olmedo *et al.* 1985). Middle-aged females can produce two litters in one year when forage and water are available (Alados and Escos 1991). However, this higher reproductive rate is related to a shorter longevity and a lower survival rate compared to dorcas and dama gazelles (Alados *et al.* 1988).

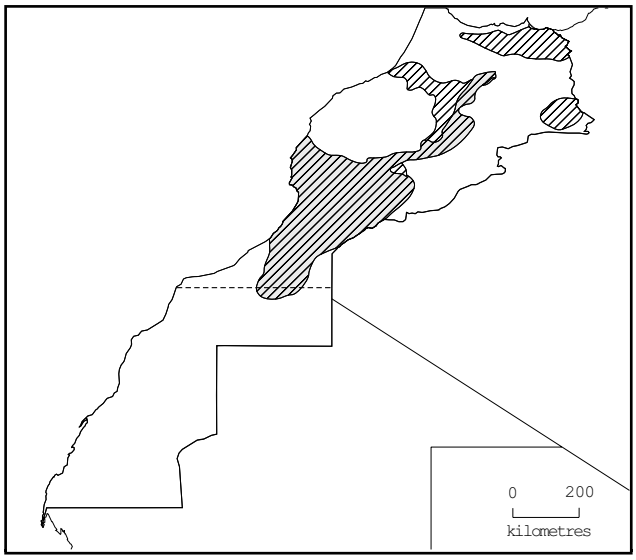


Fig. 3.4 Current distribution (shaded) and 1950s distribution (hatched) of Cuvier's gazelle (*Gazella cuvieri*) in Morocco and Western Sahara.

Status within the country: Vulnerable. Cuvier's gazelle populations are threatened by local poaching although their remote mountainous habitat shields them more than dorcas gazelles against modern hunting. They are also threatened by expansion of agriculture, pastoralism, and wood production.

Conservation measures taken: Hunting was prohibited in 1958, but this legal protection did not stop the severe decrease of most populations. The Royal Hunting Reserve of Outat el Haj, in the upper Moulouya Valley, shelters *c.*15 animals. The northern fringe of Western Sahara, inhabited by a somewhat larger population, is considered a hunting reserve. On the southern slope of the western High Atlas at Tafingoult ($30^0$45'N, $8^0$22'W), 1,300ha of argan woodland has been protected from domestic livestock grazing from 1990 until 2001. A small herd gathered there and increased from 15 animals up to *c.* 60 in 1995. On the northern slope of the western High Atlas, at the edge of the Toubkal National Park, near Ouirgane, a recently created reserve has been fenced for reintroduction purposes. A previous attempt to reintroduce Cuvier's gazelle into Souss-Massa National Park, south of Agadir, failed because dogs killed the animals (Loggers *et al.* 1992). A captive herd is kept at Temara National Zoo, near Rabat (14 animals in 1995), and at least one herd originating from northern Sahara is kept in the Estación Experimental de Zonas Aridas in Almería, Spain.

Conservation measures proposed: General conservation measures stated above apply to this species. In the eastern High Atlas, the extension towards the east of a planned national park would secure some animals. The Ida ou-Tanane National Park studied by Guillaume and Bons (1975) could have secured western High Atlas populations, but the temporary Tafingoult Reserve could meet the same conservation aim if its duration and range were extended. In the western Anti-Atlas Mountains, two reserves, one near Anezi ($29^0$36'N, $9^0$23'W) and one in the Aït Erkha-Tazeroualt region ($29^0$22'N, $9^0$38'W) could enhance the protection of herds of up to 20 animals. In the same area, management of leased hunting reserves should be strict. Finally, a large faunal refuge in the lower Drâa-Aydar area would protect the largest remnant populations in Morocco. Cuvier's gazelles bred at the Temara National Zoo or at the Estación Experimental de Zonas Aridas in Spain could be used to enhance or reintroduce populations where the factors controlling their decline lessen, especially in the northern part of their former range.

Photo 3.1 Dama gazelle (*Gazella dama mhorr*).
S.C. Kingswood.

Dama Gazelle (*Gazella dama*)

Distribution and population: The dama gazelle was formerly distributed from the Oued Nun (Assaka) region to the southern part of Western Sahara (Bennett 1833; Valverde 1957). In the northern Sahara, the last published record was reported from the Tindouf Hamada in 1985 (De Smet 1989) (Fig. 3.5). More recently, in 1993, nomads sighted one animal in the Oued Drâa Valley. Dama gazelles could still live in the Adrar Souttouff, in the extreme south of Western Sahara (Cuzin 1996). No accurate population estimate is available, but there are probably less than 100 animals in total.

Habitat, food and reproduction: The dama gazelle is an inhabitant of steppes, argan forest, and acacia mattoral, and it moves long distances to find pastures. This behaviour makes it difficult to protect the animals or their habitat. Dama gazelles live in harem herds of up to 15 animals. In Western Sahara, births (one young per female) occur in February–March. In captivity, females breed when they reach two years of age (Alados and Escos 1991), and they have one to two young per year.

Status within the country: Endangered. Nearly extirpated in the northern part of Western Sahara.

Conservation measures taken: No conservation measures specific to dama gazelle have been taken. This species has been included in the list of protected mammals since 1958. A group captured in 1969 near Dawra in Western Sahara and bred at the Estación Experimental de Zonas Aridas, provided the nucleus for most dama gazelles (*G. dama mhorr*) in zoos around the world (Loggers *et al.* 1992). In 1992, dama gazelles originating from Western Sahara were sent to the Rmila enclosure near Marrakech, where the population is now 14 animals. In 1994, seven animals from the München Zoo (bred at Almería) were released in an enclosure of the Souss-Massa National Park, and four animals of the same origin were added in 1995. Global status is Endangered (IUCN 1996).

Conservation measures proposed: The northern population is nearly extirpated, but more survey work is needed in the Aydar region and further to the east in order to define its status and suggest possible conservation measures. At the present time, efforts should be concentrated on establishing a large reserve at Adrar Souttouf in the extreme south. Results of research carried out there would direct further conservation measures towards protection of viable populations, enhancement of severely depleted populations, or reintroduction of acclimatised animals.

Additional remarks: Two subspecies of dama gazelle, identified primarily by coat colour, apparently occupy Morocco, namely *G. dama mhorr*, south of the Anti Atlas Mountains, and *G. dama lozanoi* in Western Sahara. *G. dama lozanoi* is not recognised by Cano Perez (1984). *G. dama mhorr* may be extirpated in a few years.

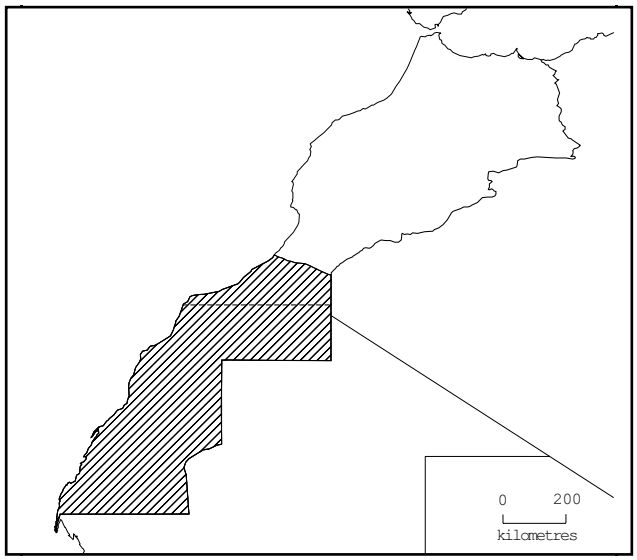


Fig. 3.5 Distribution in the 1950s of dama gazelle (*Gazella dama*) in Morocco and Western Sahara (shaded).

References

Alados, C. 1984. La reproducción en *Gazella dorcas*. *Doñana Acta Vertebrata* 11:243–261.

Alados, C. 1987. A cladistic approach to the taxonomy of the dorcas gazelles. *Israel Journal of Zoology* 34: 33–49.

Alados, C. and Escós, J. 1991. Phenotypic and genotypic characteristics affecting lifetime reproductive success in female Cuvier's, dama and dorcas gazelles (*Gazella cuvieri*, *G. dama* and *G. dorcas*). *Journal of Zoology* 223:307–321.

Alados, C.L., Escos, J., and Vericad, J-R. 1988. Captive populations of northwest African Antilopinae and Caprinae at the Estacion Experimental de Zonas Aridas. Pp. 199–211 *in:* Dixon, A. and Jones, D. (Editors). *Conservation and biology of desert antelopes*. Christopher Helm, London.

Ansell, W.F.H. 1971. Order Artiodactyla. Part 15 of Meester, J. and Setzer, H.W. (Editors). *The mammals of Africa: An identification manual*. Smithsonian Institution Press, Washington.

Aulagnier, S. 1992. Zoogeography and status of the Moroccan wild ungulates. "*Ongulés/Ungulates 91*": 365–369.

Aulagnier, S. and Thévenot, M. 1986a. Catalogue des mammifères sauvages du Maroc. *Travaux de l'Institut Scientifique Série Zoologie* (*Rabat*) 41:1–163.

Aulagnier, S. and Thévenot, M. 1986b. Les ongulés sauvages du Maroc: Constat d'une régression alarmante. *Courrier de la Nature* 104:16–25.

Bennett, E.T. 1833. Characters of a new species of Antilope (*Antilope Mhorr*). *Proceedings of the Zoological Society of London* 1833:1–3.

Bousquet, B. 1992. *Guide des parcs nationaux d'Afrique. Afrique du Nord, Afrique de l'Ouest*. Delachaux Niestlé, Neuchâtel.

Cabrera, A. 1932. Los mamíferos de Marruecos. *Trabajos del Museo Nacional de Ciencias Naturales, Serie Zoologico* 57:1–361.

Cano Perez, M. 1984. Revision der Systematik von *Gazella (Nanger) dama*. *Zeitschrift des Kölner Zoo* 27:103–107.

Chudeau, R. 1920. Remarques sur quelques mammifères du Sahara et du nord du soudan. *Association Francaise pour l'Avancement des Sciences 44è Session, Strasbourg* 1920:307–312.

Chapuis, M. 1973. La conservation de la faune suavage et les parcs nationaux. *Nature Forêts* 4: 24–42.

Cuzin, F. 1996. Répartition actuelle, statut et conservation des grands mammifères sauvages du Maroc (Primates, Carnivores, Artiodactyles). *Mammalia* 60:101–124.

De Smet, K.J.M. 1989. Studie von de verspreiding en biotoopkeuze van de grote Mammalia in Algerije in het kader van het natuurbehoud. PhD thesis, University of Gent.

East, R. 1992. Conservation status of antelopes in North Africa. *Species* 18:35–36.

East, R. 1999. *African antelope database 1998*. IUCN/SSC Antelope Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.

Epaulard, A, 1980. *"Description de l'Afrique" par Jean Leon l'Africain 1550*. 2 vols. Maisonneuve, Paris.

Gentry, A.W. 1972. Genus *Gazella*. Part 15.1 of Meester, J. and Setzer, H.W. (Editors). *The mammals of Africa: An identification manual*. Smithsonian Institution Press, Washington.

Groves, C.P. 1969. On the smaller gazelles of the genus *Gazella* de Blainville, 1816. *Zeitschrift für Säugetierkunde* 34:38–60.

Groves, C.P. 1981. Notes on the gazelles. 3. The dorcas gazelles of North Africa. *Anali del Museo Civico di Storia Naturale di Genova* 83:455–471.

Guillaume, C.P. and Bons, J. 1975. Contribution à l'etude du futur parc national des Ida ou Tanane (Haut Atlas marocain). II. Vertébrés terrestres. *C.N.R.S., Travaux R.C.P. 249* 3: 235–252. [Etude de certains milieux du Maroc et de leur évolution récente.]

Haltenorth T. and Diller, J. 1980. *A field guide to the mammals of Africa including Madagascar*. Collins, London.

Heim de Balsac, H. 1936. Biogéographie des mammifères et des oiseaux de l'Afrique du nord. *Bulletin Biologique France/Belgique* 21 (supplément): 1–446.

IUCN. 1996. *1996 IUCN Red List of threatened animals.* IUCN, Gland, Switzerland and Cambridge, UK.

Le Houérou, H.N. 1992. Outline of a biological history of the Sahara. *Journal of Arid Environments* 22:3–30.

Loggers, C. 1990. Food habits and population characteristics of dorcas gazelles, and statuses and distributions of wild ungulates in Morocco. MSc thesis, University of Montana, Missoula.

Loggers, C. 1991. Forage availability versus seasonal diets, as determined by fecal analysis, of dorcas gazelles in Morocco. *Mammalia* 55: 255–267.

Loggers, C. 1992. Population characteristics of dorcas gazelles in Morocco. *African Journal of Ecology* 30: 301–308.

Loggers, C., Thévenot, M., and Aulagnier, S. 1992. Status and distribution of Moroccan wild ungulates. *Biological Conservation* 59:9–18.

Marçais J. 1937. Quelques observations zoologiques dans le sud et le sud-est du Maroc. *Comptes Rendues de la Société des Sciences Naturelles du Maroc* 3:33–35.

Meakin, B. 1901. *The land of the Moors: A comprehensive description*. Swan Sonnenschein, London.

Morales Agacino, E. 1934. Mamíferos colectados por la expedición L. Lozano en el Sahara español. *Boletín de la Real Sociedad Española de Historia Natural* 34:449–457.

Morales Agacino, E. 1949. Datos y observaciones sobre ciertos mamíferos del Sahara occidental e Ifni. *Boletín de la Real Sociedad Española de Historia Natural* 47:13–44.

Morales Agacino E. 1950. Datos y observaciones sobre ciertos mamíferos del Sahara occidental. *Comptes Rendues de la 1ère Conférence Internationale de l'Afrique de l'Ouest* 1: 217–227.

Olmedo, G., Escós J., and Gomendio, M. 1985. Réproduction de *Gazella cuvieri* en captivité. *Mammalia* 49:501–507.

Panouse, J.B. 1957. Les mammifères du Maroc. *Travaux de l'Institut Scientifique Chérifien, Série Zoologique* 5:1–206.

Spatz, P. 1926. Meine Reise nach Rio de Oro. Reise Bericht und Beobachtungen an Säugetiere. *Zeitschtrift für Säugetierkunde* 1: 23–28.

Spatz, P. 1927. Über nordafrikanischen Gazellen und Antilopen. *Zeitschtrift für Säugetierkunde* 2:27–29.

Valverde, J.A. 1957. Mamíferos. Pp. 354–406 *in: Aves del Sahara español, estudio ecologica del desierto*. Consejo Superior de Investigación Cientifica. Madrid.

Chapter 4. Algeria

K. De Smet and T.R. Smith

Introduction

The Democratic and Popular Republic of Algeria is the second largest country in Africa and covers an area of 2,332,164km^2. It extends from the Mediterranean coast through the Sahara to Sahelian acacia savanna in the extreme south (Fig. 4.1). More than 90% of the human population of 25 million live in the Mediterranean region, which covers only about 15% of the country's area. This region comprises a fertile coastal strip and two parallel mountain ranges running east-west, the Tell Atlas and the Saharan Atlas. The Tell Atlas is the more northerly and consists of a series of ranges running along the coast and reaching an altitude of 2,308m above sea level. The highest peak of the Saharan Atlas is 2,236m. Between these two ranges lies the Hauts Plateaux, an undulating area at elevations of 900–1,000m. The remaining 85% of Algeria is occupied by the Sahara, which contains vast areas of sand dunes (*erg*), expanses of bare rock and stones (*hammada*), and gravel plains (*reg*). The main areas of dunes are the Grand Erg Occidental, Grand Erg Oriental, and Erg Iguidi. In the south of Algeria lie the Hoggar Mountains (highest point 3,003m) and to their east, the Tassili Mountains. Farther west on the southern border is a third area of upland, the northern fringe of the Adrar des Iforhas Massif, most of which is situated in Mali.

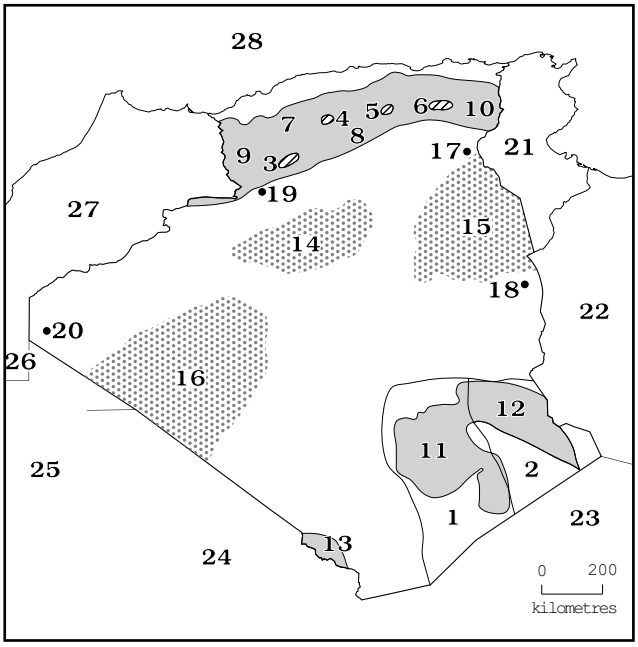


Fig. 4.1 Algeria. Protected Areas containing antelopes: 1. Hoggar National Park (4,500,000ha); 2 .Tassili NP (1,140,000ha); 3. Saharan Atlas NP (200,000ha); 4. Theniet el Had NP (3,610ha); 5. Mergueb Nature Reserve (32,500ha); 6. Belezma NP (26,500ha). Geographical features and localities mentioned in the text: 7. Tell Atlas; 8. Saharan Atlas; 9. Hauts Plateaux; 10. Nementcha Mountains; 11. Hoggar Mountains; 12. Tassili Mountains; 13. Adrar des Iforhas; 14. Grand Erg Occidental; 15. Grand Erg Oriental; 16. Erg Iguidi; 17. El Oued; 18. In Amenas; 19. El Abiod Sidi Cheikh; 20. Tindouf; 21. Tunisia; 22. Libya; 23. Niger; 24. Mali; 25. Mauretania; 26. Western Sahara; 27. Morocco; 28. Mediterranean Sea.

Northern Algeria has a Mediterranean climate, with hot dry summers and mild, damp winters. Some of the northern mountains may hold snow until June. Annual rainfall exceeds 1,500mm in some coastal areas, then decreases southwards to below 50mm in the desert interior, where maximum temperatures can reach >40^{0}C. Daily temperature fluctations may exceed 35^{0}C, and frost occurs more frequently in the Sahara than on the Mediterranean coast. Some forests of cedar (*Cedrus atlantica*), pine (*Pinus halepensis*), and oak (*Quercus* spp.) occur in the north. The Hauts Plateaux area is dominated by grasses, especially *Stipa tenacissima*. Vegetation in the desert is sparse, often ephemeral, and is concentrated in dry riverbeds (*oueds*) where some underground water sources are available.

Even in Algeria's Mediterranean region, less than 50% of the land is used for agriculture and urban development, which leaves a large area available for wildlife. Forests and scrub cover up to 40,000km^2 and *Stipa tenacissima* grass steppe covers more than 30,000km^2. Unfortunately, the land has been overused by nearly all the civilizations in the Mediterranean, and overgrazing by domestic animals has reduced the productivity of the land, often to the point where no vegetation remains. The Sahara Desert has not suffered from overgrazing, but hunting and poaching are major threats to wildlife there.

Current status of antelopes

Eight species of antelopes have been recorded in Algeria (Table 4.1): scimitar-horned oryx (*Oryx dammah*), addax (*Addax nasomaculatus*), bubal hartebeest (*Alcelaphus b. buselaphus*), dorcas gazelle (*Gazella dorcas*), Cuvier's gazelle (*G. cuvieri*), red gazelle (*G. rufina*), slender-horned gazelle (*G. leptoceros*), and dama gazelle (*G. dama*). The large antelopes have all been exterminated. Hartebeest became extinct about 1930. Addax disappeared in the 1960s, though a few may reach the southeastern border of the country in some years. The last scimitar-horned oryx

Table 4.1 Current status of antelopes in Algeria.

Species	Status[1]	GPS[2]
Scimitar-horned Oryx (*Oryx dammah*)	Extinct	–
Addax (*Addax nasomaculatus*)	Extinct	–
Bubal Hartebeest (*Alcelaphus buselaphus buselaphus*)	Extinct	–
Red Gazelle (*G. rufina*)	Extinct	–
Dorcas Gazelle (*Gazella dorcas*)	Vulnerable	?
Cuvier's Gazelle (*G. cuvieri*)	Endangered	20–35%
Slender-horned Gazelle (*G. leptoceros*)	Endangered	?
Dama Gazelle (*G. dama*)	Endangered	<2%

[1]*See Chapter 1 for definition of status categories*

[2]*Global population share*

were shot in 1987. *G. rufina* is an enigmatic species, known only from three museum specimens obtained during the last century. All four remaining gazelle species have been reduced in range and numbers. Current status of dama gazelle is precarious, with only a very small, remnant population in the extreme south of Algeria. The precise status of slender-horned gazelle is difficult to assess, as it inhabits the most inaccessible areas of dunes. Cuvier's gazelles number little more than 500, but no significant decline has occurred since the last major survey in 1971. Dorcas gazelle remains the most widespread species.

All species have suffered from the effects of excessive, uncontrolled hunting, as well as from habitat degradation resulting from overgrazing by domestic livestock and conversion of rangelands to agriculture. However, more effective protection and a widening of the protected area network have been positive influences, and a ban on all hunting since 1994 as a consequence of the political unrest in the country has led to a rise in gazelle numbers. Another beneficial development has been the decline in oil exploration and geological surveys. This has meant that motorised hunting parties, which were formerly very common in desert areas, have become less frequent, which has had a positive impact on desert species, particularly slender-horned gazelle.

Conservation measures taken

The Agence de la Nature, a part of the Ministry of Agriculture, is responsible for hunting regulation and wildlife conservation. The central administration is located in Algiers, and in each province (*wilaya*) there is a conservation officer, generally an agricultural engineer with a specialisation in nature protection. Wildlife legislation was inadequate between 1962 and 1966. Some measures on hunting and wildlife protection were taken during 1966–1982, but these remained ineffective or only partly effective until 1983, when laws protecting the environment and wildlife were promulgated in Decree No. 83-509 (Sellami *et al.* 1990). A decree in 1984 on forest management also covered creation and management of protected areas and protection of wild animals. A new hunting council was also set up to establish hunting reserves and to recommend a list of species that could be hunted (IUCN 1992). Cuvier's gazelle was protected in 1975 and all antelopes, along with almost all other wild animals, have been protected since 1983. It is not only forbidden to kill antelopes but also to sell any part of the animal, such as trophies or skins. As a result, stuffed gazelles, skins, and horns, which were once found in every market and souvenir shop, are no longer seen on display. Even people living far away from towns and police stations are well aware that gazelle hunting is banned. This makes poaching less open, which in turn increases the survival of small, relict populations. However, law enforcement has been a major problem, and the former French tradition of shooting anything that is edible is still widespread. Due to the unstable political situation, hunting has been forbidden all over Algeria since 1994 and the effect on most wildlife species has been positive; numbers of gazelles have risen everywhere. This suggests that poaching is still a very important factor and certainly as important as habitat destruction in depressing antelope populations.

The first national parks were created in Algeria about 1930, but were situated in the Tell Atlas Mountains, where gazelles do not occur. Following independence, hunting reserves saved the last Cuvier's gazelles in the steppe zone. Nature reserves and national parks have now been established throughout the country. National parks are also the responsibility of the Agence de la Nature, but they have a separate administration and their own budgets. Three large national parks (Saharan Atlas, Tassili, and Hoggar) are the responsibility of the Ministry of Culture because they contain important rock paintings. All hunting is forbidden in these national parks. There are also some national hunting reserves and, at the *wilaya* (province) level, state-owned or communal land can be declared a hunting reserve in cooperation with the local hunting associations.

Antelopes occur in several protected areas. Hoggar National Park (4,500,000ha, established 1987) contains large numbers of dorcas gazelles and a very small number of dama gazelles; a few addax might cross the frontier into the national park from Niger in good years (e.g., 1994–1995). Tassili National Park (1,400,000ha, established 1972) has large numbers of dorcas gazelles and unknown numbers of slender-horned gazelle; addax have been extirpated there, and the last scimitar-horned oryx in the area were killed in 1987. Saharan Atlas National Park (200,000ha, established 1992) has 100 Cuvier's gazelles. Belezma National Park (26,500ha, established 1984) has an unknown number (20?) of Cuvier's gazelles. Mergueb State Nature Reserve (32,000ha, established 1983) contains 50 Cuvier's gazelle. Small numbers of Cuvier's gazelle also occur in Djebel Senalba National State Forest (20,000ha) and three very small hunting reserves: Djebel Achch (400ha, established 1986), Djebel Nadour (200ha, established 1978), and Djebel Aissa (500ha, established before 1975).

Conservation measures proposed

Continued rigorous enforcement of legal protection for all antelopes is vital to secure their future survival in Algeria. It is also important to complete the network of nature reserves, hunting reserves, and national parks in order to cover all habitats and geographical areas of the country. Several localities outside the current protected area system contain significant antelope populations, and protected area status for these is recommended:

1. The western part of the Hauts Plateaux, to ensure survival of the typical subspecies of dorcas gazelle;
2. The flat sub-desert steppes between El Abiod Sidi Cheikh and Taghit, which contain the southernmost population of Cuvier's gazelle;
3. The acacia-steppe south of Tindouf, and parts of the Erg Iguidi near the western borders of the country, which are important for dama gazelle and potentially for slender-horned gazelle and oryx; and
4. The Grand Erg Oriental southeast of El Oued. A sand dune national park in this area, near Djebil National Park in Tunisia, would protect a population of slender-horned gazelle and would preserve an area of typical Saharan sand dunes. It also provides optimum habitat for addax and so would protect animals dispersing from the proposed reintroduction project in Djebil NP.

Species accounts

Scimitar-horned Oryx (*Oryx dammah*)

Distribution and population: Formerly inhabited sub-desert and steppe regions both north and south of the Sahara (Fig. 4.2), but it has long been extinct in northern Algeria

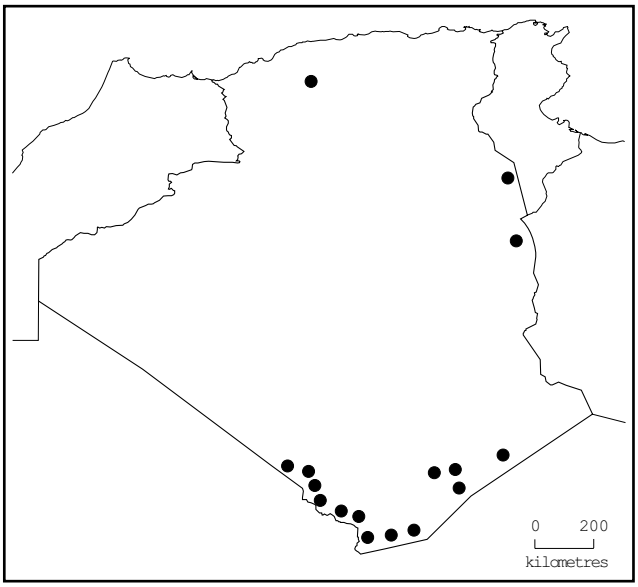


Fig. 4.2 Records of former occurrence of scimitar-horned oryx (*Oryx dammah*) in Algeria (after Kowalski and Rzebik-Kowalska 1991).

(Kowalski and Rzebik-Kowalska 1991). The last oryx in Algeria were shot in 1987 in the Tassili region in the extreme south of the country. Scimitar-horned oryx were considered to be probably extinct in Mali (Heringa 1990) and Niger (Grettenberger and Newby 1990), and global status is now Extinct in the Wild (East 1999), so recolonisation from the south is no longer a possibility.

Status within the country: Extinct.

Conservation measures taken: Fully protected by law.

Conservation measures proposed: A reintroduction project is planned in Tunisia and dispersing oryx may eventually reach Algerian territory.

Addax (*Addax nasomaculatus*)

Distribution and population: Formerly occurred throughout the Algerian Sahara, but were wiped out by hunting. Recorded localities extend from the southern borders north to the Saharan Atlas, though there are few records from the southwest and west (Fig. 4.3). A few sightings were reported in the 1960s and one was killed near In Amenas in 1970 (Kowalski and Rzebik-Kowalska 1991). A few addax may occasionally cross the frontier from Niger into the Hoggar region of the extreme south during good years, such as 1994–1995. A small addax population may survive in the Adrar des Iforhas in Mali (Heringa 1990) close to the southern border of Algeria, and this represents a potential source of vagrants.

Status within the country: Extinct/Rare Vagrant.

Conservation measures taken: Protected by law. Hoggar National Park would protect most animals wandering from the south. Global status is Critically Endangered (East 1999).

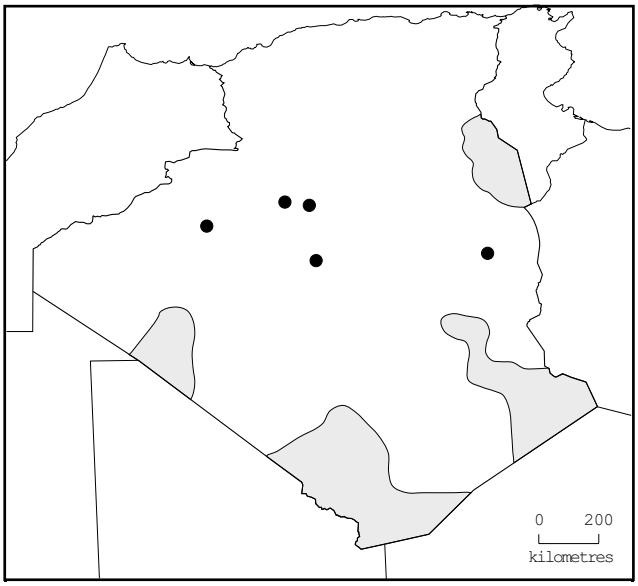


Fig. 4.3 Approximate limits of former distribution of addax (*Addax nasomaculatus*) in Algeria (shaded) and isolated records (circles) (after Kowalski and Rzebik-Kowalska 1991).

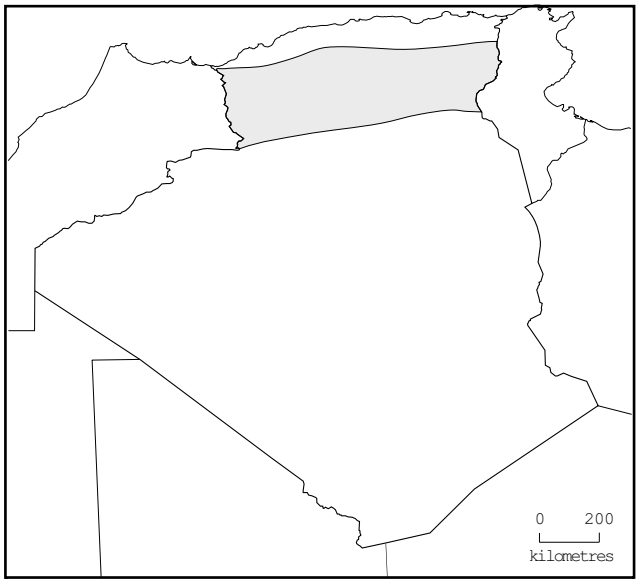


Fig. 4.4 Probable former distribution of bubal hartebeest (*Alcelaphus b. buselaphus)* in Algeria (after Kowalski and Rzebik-Kowalska 1991).

Conservation measures proposed: Ensure effective protection in Hoggar and Tassili National Parks. The Grand Erg Oriental provides optimum habitat conditions for addax and creation of a sand dune national park in this area, situated close to Djebil National Park in Tunisia, would provide protection for any addax dispersing from planned reintroductions there.

Bubal Hartebeest (*Alcelaphus buselaphus buselaphus*)

Distribution and population: Hartebeest once inhabited steppes of the Hauts Plateaux and nearby mountains (Fig. 4.4). They probably became extinct in Algeria about 1930, surviving longest in the western part of the Saharan Atlas, near the border with Morocco (Kowalski and Rzebik-Kowalska 1991).

Status within the country: Extinct.

Conservation measures taken: Global status of this subspecies is Extinct and of *A. buselaphus* Lower Risk/ conservation dependent (IUCN 1996).

Conservation measures proposed: Dupuy (1967) proposed the reintroduction of hartebeest into Algeria from sub-Saharan countries. The subspecies occurring in West Africa is *A. b. major* which is considered to be the closest form to the extinct *A. b. buselaphus* of North Africa.

Dorcas Gazelle (*Gazella dorcas*)

Distribution and population: Formerly recorded from almost the entire country, including the Chelif plains not far from the coast, where they were present until the middle of the 19th century (Kowalski and Rzebik-Kowalska 1991). They survived in the steppes of the Hauts Plateaux until the late 1800s and early 1900s. Today, the northern limit of the species is generally marked by the Saharan Atlas, but a few survive on the Hauts Plateaux near the border with Morocco. To the south, the range of *G. dorcas* includes most of the Algerian Sahara, although it avoids the larger areas of sand dunes and it is apparently much rarer in the southwest of the country (Fig. 4.5). No estimate of numbers is available, but this species is believed to be still in decline as a result of overhunting. Formerly, herds of up to 150 individuals were not uncommon, but now the largest groups do not exceed a few dozen.

Habitat, food and reproduction: Dorcas gazelle inhabits desert, sub-desert, and steppes, but avoids extensive sandy regions. In the Hoggar Mountains, it ascends to over 2,000m (Dupuy 1967). It does not drink and never approaches temporary water-holes in the desert. It migrates according to the state of the vegetation. The rut takes place at the end of autumn, gestation period lasts about 6 months, and young (usually one, rarely two) are born in March or April (Lavauden 1926).

Status within the country: Vulnerable

Conservation measures taken: Large numbers occur in Tassili (1,400,000ha) and Hoggar (4,500,000ha) national parks. Dorcas gazelles are protected by law, but they are still affected by poaching. Global status is Vulnerable (East 1999).

Conservation measures proposed: Ensure that legal protection is enforced and survey remaining populations to assess their current status. Create a reserve in the western Hauts Plateaux to protect dorcas gazelles in that area.

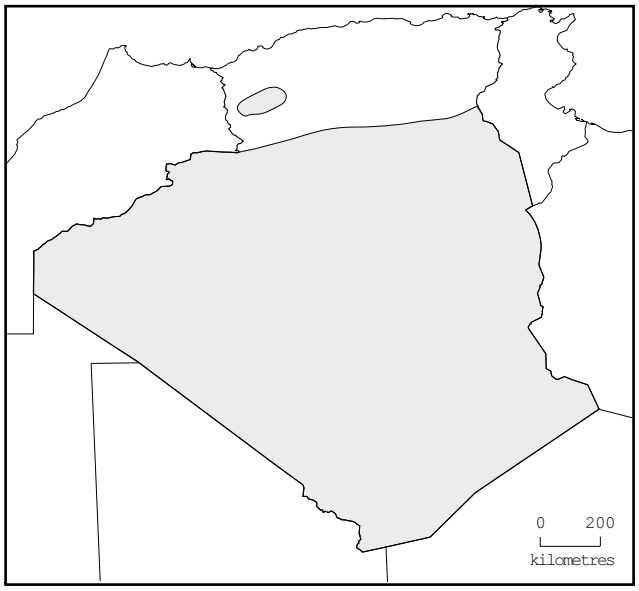


Fig. 4.5 Current general distribution of dorcas gazelle (*Gazella dorcas*) in Algeria.

Additional remarks: Alados (1987) suggests that two subspecies of dorcas gazelle occur in Algeria: *G. d. neglecta* in the Hoggar Mountains and the widely distributed *G. d. dorcas*.

Cuvier's Gazelle (*Gazella cuvieri*)

Distribution and population: Restricted to northern Algeria, from the Tell Atlas to the Saharan Atlas (Fig. 4.6). Current distribution does not differ substantially from that reported by Petrov (1971). In the northwest, the species is far more widespread than was formerly believed. Nearly all the vast state forests of Aleppo pine (*Pinus halepensis*) have small populations and there is contact between most of these. They are also quite common in the hills between Mascara, Relizane, Tiaret, and Frenda, where they live in open country with a mixture of wheat fields, vineyards, and hilltop grasslands. They have even been seen occasionally in the cultivated Chelif plains. In the Saharan Atlas, most of the highest and undisturbed peaks between Bechar and Biskra still have scattered groups of gazelles, the most important occurring near Djelfa (Khirreddine 1977). The most recent information from the local forest service indicates that populations near Bou Saad are increasing. The easternmost populations are found in the Aures Mountains, the Nementcha Mountains, and hills near the Tunisian border. There is a major concentration of gazelles near Tebessa, associated with Djebel Chambi National Park in Tunisia. Cuvier's gazelle has disappeared from only a few localities in recent years, and these are mostly in the northern part of its range. Populations in the western Tell Atlas, Batna-Biskra, and the Aures Mountains are no longer contiguous, and some local groups in the Saharan Atlas have been exterminated. However, Cuvier's gazelles are very mobile

Photo 4.1 Cuvier's gazelle (*Gazella cuvieri*). Zoological Society of San Diego.

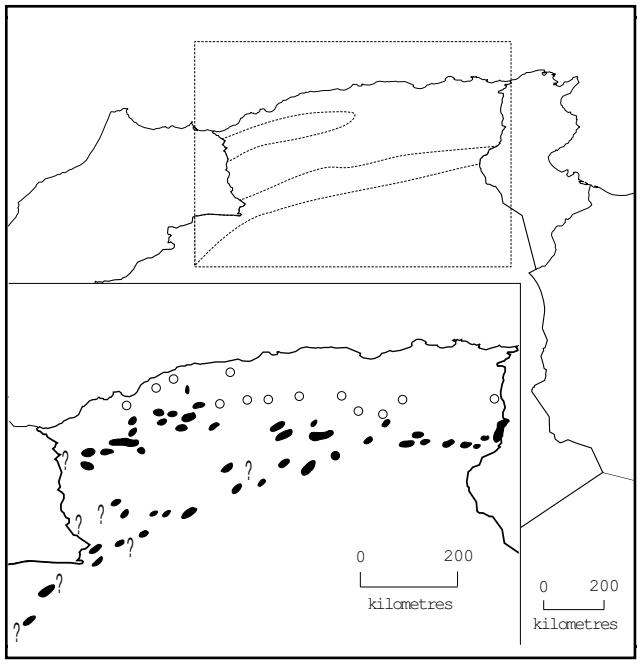


Fig. 4.6 Current distribution of Cuvier's gazelle (*Gazella cuvieri*) in Algeria (black), former localities (open circles) and areas from which there is no recent information (?).

and they could recolonize these areas. They have been absent from the Mediterranean littoral since 1930 (Lavauden 1926; Joleaud 1929; Seurat 1930). The total population was estimated by Sellami *et al.* (1990) at 400 and by De Smet (1991) at 560, comprising Tell Atlas (235), Saharan Atlas (140), eastern mountains (135), and the Mergueb area (50). The latter figure may be an underestimate, because other populations might still be found, especially in the southern part of their range.

Habitat, food and reproduction: The largest number of gazelles live in the southern Tell Atlas, which are covered with forests of *Pinus halepensis*. These hills have been overgrazed for centuries and, as a result, the forests are mainly open. There are patches of regenerating forest, open areas with annual herbs, and some heavily eroded barren areas. In the open forests, understorey species are *Quercus ilex*, *Q. coccifera,* and *Phylleria* spp., while the most common herbs are *Globularia* spp. and *Rosmarinus* spp., and the dominant grass is *Stipa tenacissima*. However, their habitat also includes desert *hammadas* near Bechar and open oak forests in the Mascara region 50km from the Mediterranean. These forests are a mixture of cork oak (*Quercus suber*) and holm oak (*Q. ilex*). Annual rainfall is about 600mm, the altitude is 700–800m, and snow is usual in winter.

Status within the country: Endangered.

Conservation measures taken: The species was officially protected in Algeria in 1975, but poaching continued. Better protection inside reserves and stricter law enforcement have improved the situation of this species in recent years. Cuvier's gazelle is more difficult to hunt than other gazelles, because its rocky, tree-covered habitat enables the animals to hide quickly. The species occurs in the following protected areas: Saharan Atlas National Park (200,000ha, 100 Cuvier's gazelles), Belezma National Park (26,500ha, unknown number, perhaps 20), Mergueb State Nature Reserve (32,000ha, 50), and Djebel Senalba National State Forest (20,000ha, 30). Small numbers also occur in Djebel Sahari Hunting Reserve (30,000ha) and three local hunting reserves: Djebel Achch (400ha), Djebel Nadour (200ha), and Djebel Aissa (500ha). Global staus is Endangered (IUCN 1996).

Conservation measures proposed: Reintroductions of Cuvier's gazelle are planned in Belezma and Teniet el Had National Parks. Establishment of a reserve in the sub-desert steppes between El Abiod Sidi Cheikh and Taghit would protect Algeria's southernmost population of Cuvier's gazelle.

Red Gazelle (*Gazella rufina*)

Distribution and population: Known from only three specimens bought in Algeria towards the end of the 19th century, but their origin is unknown. According to Lavauden (1930), it inhabited forests and bushes in the region of Saida and was regarded as distinct from Cuvier's gazelle by the fur traders of Oran (Fig. 4.8). Heim de Balsac (1936) suggests *G. rufina* may have also lived in the Chelif River area of northern Algeria. It is listed as a possible subspecies of *G. rufifrons* by Ellerman and Morrison-Scott (1951), but Gentry (1964) states that, on the basis of skull morphology, it represents a separate species related to *G. cuvieri*.

Status within the country: Extinct.

Slender-horned Gazelle (*Gazella leptoceros*)

Distribution and population: Widely distributed south of the Saharan Atlas Mountains, with records from the Grand Erg Oriental, Grand Erg Occidental, and Erg Admer, but is now apparently absent from the Erg Iguidi in the far west of Algeria (Kowalski and Rzebik-Kowalska 1991) (Fig. 4.7). Their horns were once common in Algerian shops (Spatz 1928), but the population has declined because of hunting. No estimate of current numbers is available.

Habitat, food and reproduction: Slender-horned gazelles are closely connected with sand dunes and sandy areas. According to Heim de Balsac (1936), their principal food is drinn (*Artistida pungens*). They live in small groups.

Status within the country: Indeterminate, but probably Endangered.

Conservation measures taken: They are legally protected, but probably still hunted. Unknown numbers of slender-horned gazelle occur in Tassili National Park (1,400,000ha). This species has benefited from the decline in oil exploration and geological surveys that has reduced the frequency of motorised hunting parties in the desert interior. Global status is Endangered (IUCN 1996).

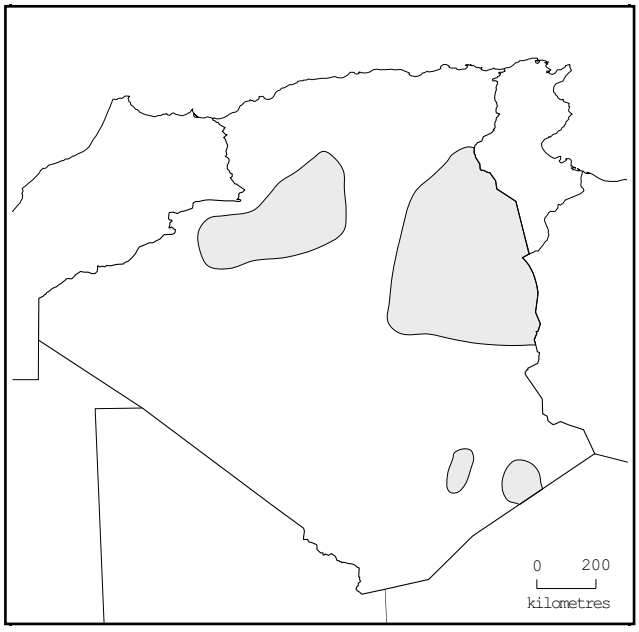


Fig. 4.7 Probable distribution of slender-horned gazelle (*Gazella leptoceros*) in Algeria.

Conservation measures proposed: Carry out field surveys to assess current status in Algeria. Establishment of a sand dune national park in the Grand Erg Oriental close to the Djebil National Park in Tunisia would provide optimal habitat for slender-horned gazelle. Nature reserves should also be established in the acacia-steppe south of Tindouf and in parts of the Erg Iguidi near the western borders of the country, which are potentially important areas for slender-horned gazelle.

Dama Gazelle (*Gazella dama*)

Distribution and population: Known only from the western border area and the southern desert (Fig. 4.8). In the west, isolated individuals formerly occurred in Oued de Tindouf and Tindouf *hammada* (Heim de Balsac 1936; Monteuil 1951). In the south, it has been recorded from scattered localities, including Silet, Adrar Ahnet, Tadmait, Temassin, Tanezroult, Tamanrasset, Plaine d'Admer, Mouydir, Amguid, and Ideles. Dama gazelles are now very rare in Algeria and only a small remnant population occurs in the Hoggar region of the extreme south.

Habitat, food and reproduction: Inhabits the sub-desert zone of the Sahara. It avoids mountains and dunes and prefers gravel and rocky areas (*reg* and *hammada*). In Algeria, it is usually observed singly or in small groups. Because of its large size, it was particularly valued as a game animal.

Status within the country: Endangered.

Conservation measures taken: Fully protected by law. A very small population occurs in the Hoggar National Park (4,500,000ha). Global status is Endangered (IUCN 1996).

Conservation measures proposed: The remnant Hoggar population should be afforded strict protection from illegal hunting. A nature reserve should be established in the acacia-steppe south of Tindouf and part of the Erg Iguidi near the western borders of the country, which are potentially important areas for dama gazelle.

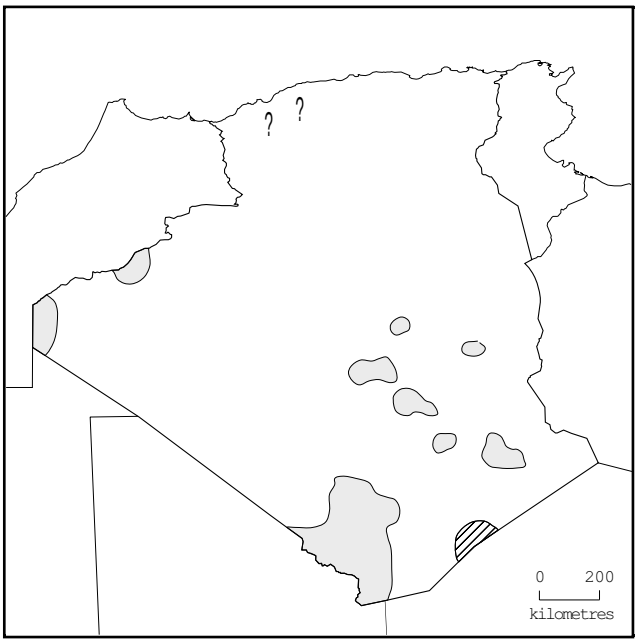


Fig. 4.8 Former distribution of dama gazelle (*G. dama*) in Algeria (shaded) and current distribution in Hoggar NP (hatched). Possible former distribution of red gazelle (*Gazella rufina*) is indicated by (?).

References

Alados, C.L. 1987. A cladistic approach to the taxonomy of the dorcas gazelle. *Israel Journal of Zoology* 34:33–49.

De Smet, K. 1991. Cuvier's gazelle in Algeria. *Oryx* 25: 99–104.

Dupuy, A. 1967. Répartition actuelle des espèces ménacées de l'Algérie. *Bulletin de la Société des Sciences Naturelles Physiques du Maroc* 47: 355–386.

East, R. 1998. *African antelope database 1999*. IUCN/SSC Antelope Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.

Ellerman, J.R. and Morrison-Scott, T.C.S. 1951. *Checklist of Palaearctic and Indian mammals 1758 to 1946*. British Museum (Natural History), London.

Gentry, A.W. 1964. Skull characters of African gazelles. *Annals and Magazine of Natural History* (13) 7:353–382.

Grettenberger, J.F. and Newby, J.E. 1990. Niger. Pp. 14–22 *in:* East, R. (Compiler). *Antelopes. Global survey and regional action plans. Part 3. West and Central Africa.* IUCN, Gland.

Heim de Balsac, H. 1936. Biogéographie des mammifères et des oiseaux de l'Afrique du Nord. *Bulletin Biologique France-Belgique. Supplément* 21:1–447.

Heringa, A.C. 1990. Mali. Pp. 8–14 *in:* East, R. (Compiler). *Antelopes. Global survey and regional action plans. Part 3. West and Central Africa.* IUCN, Gland.

IUCN. 1992. *Protected areas of the world: A review of national systems: Vol. 2: Palaearctic*. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN. 1996. *1996 IUCN Red List of threatened animals.* IUCN, Gland, Switzerland and Cambridge, UK.

Joleaud, L. 1929. Etudes de la géographique zoologique sur la Berbérie. *Bulletin de la Société Zoologique de France* 54:438–457.

Khirreddine, A. 1977. Etude écologique pour un aménagement cynégétique dans le massif Senalba Chergui à Djelfa. Thèse Ir. Agr. Institut National d'Agronomie, El Harrach.

Kowalski, K. and Rzebik-Kowalska, B. 1991. *Mammals of Algeria*. Polish Academy of Sciences, Wroclaw.

Lavauden, L. 1926. Les gazelles du Sahara central. *Bulletin de la Société de l'Histoire Naturelle de l'Afrique du Nord* 17:11–27.

Lavauden, L. 1930. Notes de mammalogie nord-Africaine. La gazelle rouge. *Bulletin de la Société Zoologique de France* 55:327–332.

Monteuil, V. 1951. Contribution à l'étude de la faune du Sahara occidental. *Notes et Documents de l'Institut des Hautes Etudes du Maroc* 8:1–169.

Petrov, P. 1971. Répartition du gibier en Algérie et mesures à prendre en vue de la conservation et son développement. Unpublished report, Direction des Forêts.

Sellami, M., Bouredjli, H.A., and Chapuis, J.L. 1990. Répartition de la gazelle de Cuvier (*Gazella cuvieri* Ogilby, 1841) en Algérie. *Vie Milieu* 40:234–237.

Seurat, L.G. 1930. *Exploration zoologique de l'Algérie de 1830 à 1930*. Masson et Cie., Paris.

Spatz, P. 1928. Über nordafrikanische Gazellen und Antilopen. *Zeitschrift für Säugetierkunde* 2:27–29.

Chapter 5. Tunisia

T.R. Smith, D.P.Mallon, and K. De Smet

Introduction

Tunisia encompasses an area of 164,150km^2 at the apex of northern Africa, between Algeria and Libya (Fig. 5.1). It has more than 1,200km of coastline (IUCN 1992) and spans three distinct physiographic regions (phytochoria, White 1983). The northern third of the country is mountainous, dominated by the eastern terminus of the Atlas Mountains, known as the Dorsale Range. This region lies within the Mediterranean regional centre of endemism (White 1983). The highest peak is Djebel (Mount) Chambi (1,544m), at the Algerian border. North of the Dorsale Range is the broad Medjerda Valley, with some low limestone hills along the northern coast. The Mediterranean climate of this region is characterised by hot, dry summers and mild, damp winters. Annual rainfall is typically >1,000mm and may be as great as 1,500mm in the northwest. Cork oak (*Quercus suber*), pine (*Pinus halepensis*), and juniper (*Juniperus phoenicea* and *J. oxycedrus*) forests formerly covered most of the mountains and northern hills, but have been progressively removed by humans over the past 2,000 years. Today, small remnant stands of forest constitute about 3% of the total acreage of the country (IUCN 1992).

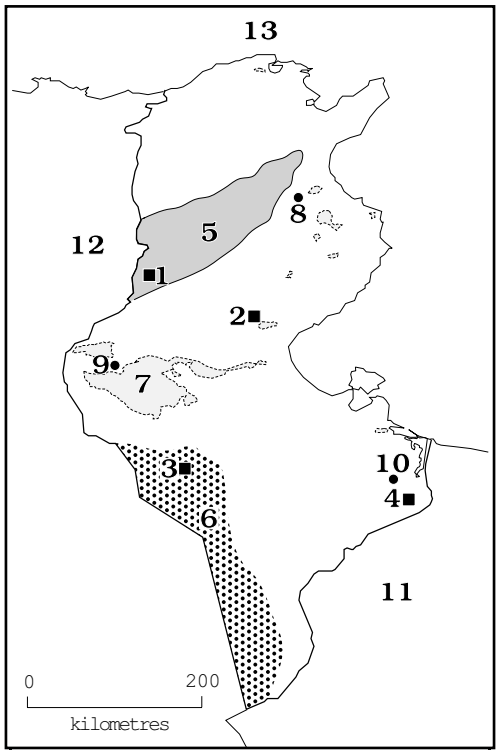


Fig. 5.1 Tunisia. Protected Areas containing antelopes: 1. Djebel Chambi National Park (6,723ha); 2. Bou-Hedma NP (16,448ha); 3. Djebil NP (150,000ha); 4. Sidi Toui NP (6,l35ha). Geographical features and localities mentioned in the text: 5. Dorsale Mountains; 6. Grand Erg Oriental; 7. Chott el Djerid; 8. Kairouan; 9. Tozeur; 10. Tatouine; 11. Libya; 12. Algeria; 13. Mediterranean Sea.

South of the mountainous Mediterranean region, a band of semidesert steppe extends across the central portion of the country from Algeria to the Mediterranean Sea and south-east into Libya; this region lies within the Mediterranean/ Sahara Regional Transition Zone (White 1983). Vegetation is characterised by associations of shrubs (e.g., *Periploca laevigata*, *Rhus tripartitum*, *Astragalus* spp., and *Retama* spp.) and grasses (e.g., *Stipa tenacissima* and *Aristida* spp.). With the exception of a remnant *Acacia tortilis* forest in Bou-Hedma National Park, tree cover, primarily *Acacia*, has been removed from the steppe region.

To the south and west of the steppe lies desert with extensive salt flats, including the Chott el Djerid, and, further southwest, sand dunes of the Great Eastern Erg, which encompasses an area of approximately 100,000km^2, largely in neighbouring Algeria. This region represents the northern limit of the Sahara Regional Transition Zone (White 1983) and has a continental climate, with wide fluctuations in diurnal temperature, summer maxima frequently >40^{0}C, and mean annual precipitation <50mm.

The area under agriculture in Tunisia, primarily in the mountain and steppe regions, has increased from 1,200,000ha in 1922 to 5,000,000ha today, and forest cover has been reduced by 60% in the past 60 years. Deforestation and subsequent overgrazing by domestic livestock have led to the disappearance of endemic flora in several areas of the country (Kacem *et al.* 1994). The human population is estimated to number about 8,400,000 (IUCN 1992).

Current status of antelopes

Six species of antelope formerly occurred in Tunisia: addax (*Addax nasomaculatus)*, scimitar-horned oryx (*Oryx dammah*), bubal hartebeest (*Alcelaphus buselaphus buselaphus*), dorcas gazelle (*Gazella dorcas*), Cuvier's gazelle (*G. cuvieri*), and slender-horned gazelle (*G. leptoceros*) (Table 5.1). Dama gazelle (*G. dama*) also reportedly once occurred in Tunisia (Kacem *et al.* 1994; Kingdon 1997), but confirmed records of the species are lacking (Abaigar *et al.* 1997).

Antelopes and other large mammals in Tunisia and elsewhere in North Africa, particularly in the fertile Mediterranean region, have been exploited for centuries by

Table 5.1 Current status of antelopes in Tunisia.

Species	Status[1]	GPS[2]
Scimitar-horned Oryx (*Oryx dammah*)	Extinct	–
Addax (*Addax nasomaculatus*)	Extinct	–
Bubal Hartebeest (*Alcelaphus buselaphus buselaphus*)	Extinct	–
Dorcas Gazelle (*Gazella dorcas*)	Vulnerable	<10%
Cuvier's Gazelle (*G. cuvieri*)	Endangered	20–35%
Slender-horned Gazelle (*G. leptoceros*)	Endangered	?
Dama Gazelle (*G. dama*)	Extinct[3]	–

[1] *See Chapter 1 for definition of status categories*
[2] *Global population share*
[3] *Assuming the species occurred historically in Tunisia*

various human populations that have occupied the area; the Romans reportedly exported vast numbers of animals for use in circuses and gladiatorial arenas (Schomber and Kock 1961; Hufnagl 1972). During French colonisation in the late 19th and early 20th centuries, populations of the larger antelopes suffered tremendous losses due to uncontrolled hunting and habitat degradation. Hartebeest became extinct before the end of the 19th century. Scimitar-horned oryx were exterminated by the 1910s and addax by the 1930s.

Among the gazelles, *G. dama* (assuming it once occurred in Tunisia) is believed to have become extinct between the 17th and 19th centuries (Kacem *et al.* 1994). *G. cuvieri* suffered tremendously from overhunting and habitat loss during the 20th century and was on the verge of extinction until revision of conservation laws in the 1960s provided sanctuary for a handful of small, remnant populations. *G. leptoceros* and *G. dorcas* also have suffered major reductions in distribution and abundance due to uncontrolled hunting during the 20th century, particularly after the larger antelopes had been extirpated. The status of these extant species of the semidesert and desert zones of the country is poorly known.

Conservation measures taken

Wildlife (hunting) reserves were established in Tunisia as early as the first century AD under Pliny the Elder. Some reserves established as long ago as the 13th century, during the Hafside Dynasty, continued through the Ottoman period (late 19th century) when wildlife conservation was determined by Islamic law (IUCN 1992). Under French administration, an ordinance was enacted in 1884 to regulate hunting and, in the 1930s, legal provisions were made for protection of the environment, including establishment of national parks.

Current legislation for wildlife conservation is based on the Forestry Code (Code Forestier), which was established in 1966 (Law 66–60), seven years after independence, and revised in 1988 (Law No. 88–20). Components of this code concern activities relevant to antelope conservation, such as regulation of hunting, conservation of game species, protection of flora and fauna, and establishment of protected areas (national parks, nature reserves, recreational forests, etc.). Implementation of the Forestry Code is the responsibility of the Direction Générale des Forêts (DGF) within the Ministry of Agriculture.

The DGF's sub-Directorate of Hunting and National Parks, under the Director of Conservation, is responsible for management of protected areas, where most measures for antelope conservation are taking place. DGF envisages a protected area system that will include a national park or nature reserve in all habitat types represented in Tunisia. In 1983, DGF and the German Technical Co-operation Organization (Deutsche Gesellschaft für Technische Zusammenarbeit [GTZ]) began a 10-year co-operative agreement entitled "Promotion of natural resources and exploitation of wild fauna in the arid zone", which made a significant contribution towards development of protected areas and wildlife conservation in Tunisia (Kacem *et al.* 1994).

Between 1980 and 1990, six small (<20km^2) national parks were created in the northern half of the country. Two of these lie within the Mediterranean/Sahara Regional Transition Zone and are important for antelope conservation; two new national parks in the south of the country are also important for antelopes (Fig. 5.1 and Table 5.2). Mount Chambi National Park (Parc National du Djebel Chambi), a biosphere reserve, was created in 1980 and encompasses 6,723ha in the Dorsale Mountain Range, west of Kasserine and just east of the Algerian border. This fenced reserve was established to protect a remnant population of Cuvier's gazelle, which has grown from a few dozen to approximately 200 at present.

Mount Bou-Hedma National Park (Parc National du Djebil Bou-Hedma), also a biosphere reserve, was created in 1980 and encompasses 16,448ha of mountainous and undulating steppe east of Gafsa. However, the area had been proposed for protection in the 1960s to conserve a remnant stand of *Acacia tortilis* (Schomber and Kock 1961), and the DGF began a programme to restore the vegetation at the site

Table 5.2 National Parks important for antelopes in Tunisia.

Name	Area (ha)	Current species	Potential species
Djebel Chambi	6,723	*G. cuvieri, G. dorcas*	*A. buselaphus*
Bou-Hedma	16,448	*O. dammah*[1], *A. nasomaculatus*[1], *G. dorcas G. dama*[2]	*A. buselaphus, G. cuvieri*
Sidi Toui	6,135	*G. dorcas*	*O. dammah, G. cuvieri*
Djebil	150,000	*G. leptoceros, G. dorcas*	*A. nasomaculatus, O. dammah, G. cuvieri*?

[1]*Captive (reintroduced)*
[2]*Captive (introduced)*

in 1970. Bou-Hedma National Park was a focal point of the DGF-GTZ development project. During the project, livestock grazing and wood gathering were largely eliminated in the park, particularly in two partially fenced Total Protection Zones (TPZ) of 2,000ha and 1,000ha, and vegetation recovered well. Captive herds of *Oryx dammah*, *Addax nasomaculatus,* and *Gazella dama mhorr* have been established in the TPZs, where a native, free-ranging population of *G. dorcas* also occurs. The TPZs are patrolled daily by guards on foot and monthly censuses of addax, oryx, and dama gazelle herds are conducted on foot and by vehicle. However, there is no formal monitoring of demographics, genetic diversity, or ecology. Captive herds of oryx and addax are increasing rapidly, but original plans to expand the park appear unlikely to materialise.

Two national parks recently created in the sub-desert/desert region have particular significance for antelope conservation. Sidi Toui National Park encompasses 6,135ha of undulating semidesert steppe in southeastern Tunisia near the Libyan border. It was officially gazetted in 1996 after several years of development during the DGF-GTZ project. In 1993, a barbed-wire fence was completed and horse-mounted rangers were employed to deter entry of livestock and domestic dogs. Later, an eco-museum was constructed and, in 1997, a 5ha enclosure was established in preparation for a proposed captive breeding and reintroduction project for scimitar-horned oryx. The DGF plans to enlarge the park to 15,000ha, if and when support from local inhabitants is obtained (Kacem *et al.* 1994). Dorcas gazelle occurs in Sidi Toui National Park and its vicinity, and habitat in the area is suitable for scimitar-horned oryx, Cuvier's gazelle, slender-horned gazelle, and possibly addax. Although the park *per se* is not large enough to support reintroduction of scimitar-horned oryx, thousands of square kilometres of relatively undisturbed steppe habitat lie immediately to the south in Tunisia and to the east in Libya. This area, which was identified decades ago as a site for restoration and management of desert antelopes (Schomber and Kock 1961; Riney 1965), has the potential to support a viable oryx population, if properly managed (Smith *et al.* 1997), and would be appropriate for a trans-frontier protected area.

Djebil National Park (Parc National Saharien du Djebil), the most recently gazetted and largest (150,000ha) of Tunisia's protected areas, is located in the southeastern quarter of the country, south of the Chott el Djerid (Djerid Salt Flat) at the edge of the Great Eastern Erg. Approximately 85% (130,000ha) of the park consists of sand dunes within the erg, and the remainder is undulating semidesert steppe to the north (Kacem *et al.* 1994). *Gazella dorcas* and *G. leptoceros* occur in the park. The sand dunes of Djebil National Park and the adjacent Erg are particularly suitable for *Addax nasomaculatus* and *G. leptoceros*, and the area has good potential for restoration and conservation of these species in the northern Sahara. The habitat of the park and vicinity is also suitable for *Oryx dammah*. Livestock currently grazes the steppe zone of Djebil National Park, but vegetative cover remains relatively good. A guard/ranger force has not been established and poaching is a problem, despite the presence of a police station on the northern border of the park. In 1997, DGF completed the first of three guard stations to be situated along the northern and eastern (i.e., steppe) boundary. The DGF plans to fence a portion of the steppe zone to exclude livestock and protect reintroduced antelope populations, but such action may be unnecessary if moderate levels of vehicle patrols by rangers are established (Smith *et al.* 1997).

A number of NGOs are involved in wildlife conservation in Tunisia, including the Association for Nature and the Environment (Association Tunisienne pour la Nature et l'Environnement), National Federation of Hunting Associations (Fédération Nationale des Associations des Chasseurs), Superior Hunting Council (Conseil Supérieur de la Chasse), National Institute of Forest Research (Institut National des Recherches Forestières), and the World Wide Fund for Nature (WWF-Tunisia).

Conservation measures proposed

In 1987, DGF launched an ambitious, long-term programme to restore the wild fauna of Tunisia, including the reintroduction of all antelope species which formerly occurred in the country. Captive breeding groups of addax, scimitar-

horned oryx, and dama gazelle have been established at Bou-Hedma National Park and, with the exception of dama gazelle, are increasing rapidly. Original expectations to expand Bou Hedma have not materialised, and the area is too small to support viable, free-ranging populations of these large antelopes. After a recent evaluation of the situation, it has been proposed that addax be removed from the area because it is outside the species' historical range, and that translocation of scimitar-horned oryx to Sidi Toui and/or Djebil National Parks be initiated (Smith *et al.* 1997).

In an effort to advance DGF's plans to reintroduce antelopes at Sidi Toui and Djebil National Parks, members of the IUCN/SSC Antelope Specialists Group have drafted proposals for reintroduction of scimitar-horned oryx and addax at these sites, respectively. Approval of the proposals has been obtained from DGF, and arrangements for technical and financial support from external organizations have been made, subject to enhancement of the infrastructure at the parks, specifically technical staff and enclosures (Smith *et al.* 1997). Management plans specifying objectives, timescales, and budgets for antelope reintroductions at all sites are needed.

Djebil National Park has particularly good potential for the restoration and conservation of *Addax nasomaculatus* and *G. leptoceros*. The Ministry of Agriculture's timeframe for Djebil places initiation of antelope reintroductions in the ninth year of the park's development (i.e., *c.* 2005), but it has been proposed that an earlier start to the project, with the presence of captive herds in pre-release enclosures, will promote public awareness of the DGF's activities in the area and generate support from government and private sectors for further development of the park (Smith *et al.* 1997).

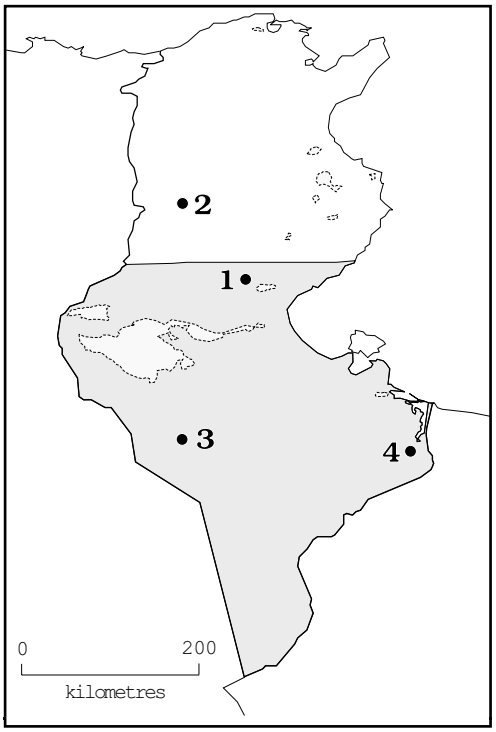


Fig. 5.2 Probable former distribution of scimitar-horned oryx (*Oryx dammah*) in Tunisia (shaded). Numbers 1–4 indicate protected areas, see Fig. 5.1.

Photo 5.1 Scimitar-horned Oryx *(Oryx dammah).* Ron Garrison/Zoo1ogica1 Society of San Diego**.**

Species accounts

Scimitar-horned Oryx (*Oryx dammah*)

Distribution and population: Scimitar-horned oryx historically occurred in the semidesert and desert regions of southern Tunisia, as far north as the steppe of the High Plateau (Fig. 5.2) (Lavauden 1926b). Its dried meat (*tichtar*) was once a common item in the market at Ghadames, on the Tunisian-Algerian-Libyan border (Sclater and Thomas 1894–1900; Lavauden 1920), indicating that the species was common in the area. However, *O. dammah* became extinct in Tunisia about 1910, due to overhunting (Lavauden 1926b).

Habitat, food and reproduction: Information on the ecology of scimitar-horned oryx in the wild in Tunisia is limited to a few anecdotal comments (e.g., Lavauden 1920; 1926a). Captive-bred animals held in a 2,000ha enclosure at Bou-Hedma National Park since 1985 have exhibited behaviours described for the species in the sub-Saharan portion of its range (Gillet 1966; Newby 1988), such as preference for rocky versus sandy terrain and avoidance of steep topography; selective use of a variety of foods, primarily grasses, but also legumes and leaves and fruit of trees and shrubs; primarily crepuscular activity; formation of stable social groups with distinct dominance hierarchies (adult males>adult females>subadults); asynchronous reproduc-

tion, solitary behaviour of parturient females immediately before and after calving and post-partum estrous; high reproductive rate; and low mortality rates among all age-sex classes (Wacher 1986; Gordon and Gill 1993; Kacem *et al.* 1994).

Status within the country: Extinct. A captive population has been established at Bou-Hedma National Park.

Conservation measures taken: Fully protected by law. In November 1985, 10 subadult oryx were translocated from zoos in the United Kingdom to Bou-Hedma National Park (Gordon and Gill 1993). After 18 months in a 10ha acclimatization pen, the oryx were released into a 1,500ha fenced total protection zone. They soon became independent of pens and rationed foods and exhibited social behaviours, habitat use, and feeding habits described for wild oryx. The captive herd has steadily increased from 10 in 1985/86 to 21 in 1991, 40+ in 1993, 70 in July 1996, and 81 in June 1997 (H. Lazhar *pers. comm.*). Global status is Extinct in the Wild (East 1999).

Conservation measures proposed: There appears to be little hope that original plans to enlarge Bou-Hedma National Park will materialize and, consequently, that scimitar-horned oryx can be released into the wild in the park and vicinity. The captive herd is growing rapidly, and inevitably, numbers will have to be controlled. To resolve this problem, it has been proposed that translocation of oryx from Bou-Hedma to Sidi Toui and Djebil National Parks be initiated immediately (Kacem *et al.* 1994; Smith *et al.* 1997). This action should be well planned by the DGF and co-ordinated with international studbook keepers and managers of the species in captivity, so that herds at Bou-Hedma, Sidi Toui, and Djebil are managed as a demographically and genetically diverse megapopulation to produce animals suitable for release into the wild in Tunisia and elsewhere in North Africa. Proposals to establish captive-breeding herds and initiate reintroductions of scimitar-horned oryx at Djebil and Sidi Toui National Parks could be realized by 1999, with reasonable effort and support from the DGF and the international conservation and development communities (Smith 1996; Smith and De Smet 1997a; 1997b; Smith *et al.* 1997).

Addax (*Addax nasomaculatus*)

Distribution and population: Addax formerly occurred in the desert region of southern Tunisia at least as far north as the Djerid Salt Flat, in the vicinity of Tozeur and Nefta, approximately 34°N (Trouessart 1905; Lavauden 1926a) (Fig. 5.3). In the late 19th century, it was still found in the vicinity of Douz, just southeast of the salt flats near what is now Djebil National Park (Lavauden 1926a). Like scimitar-horned oryx, addax were overhunted during the early 20th century and reportedly became extinct in Tunisia by the early 1930s (Kacem *et al.* 1994).

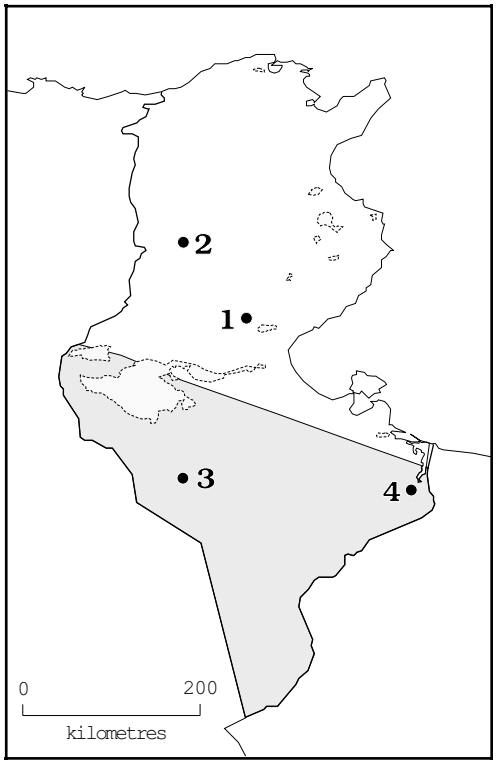


Fig. 5.3 Probable former distribution of addax (*Addax nasomaculatus*) in Tunisia (shaded).

Habitat, food and reproduction: Addax disappeared from the wild in Tunisia and elsewhere in North Africa, with little recorded information on its distribution and ecology in the region. Anecdotal information indicates that the species' habitat requirements and behaviour in the northern Sahara were similar to those reported in its sub-Saharan range (e.g., Newby 1974; Lamarche 1980). Notably it prefers sandy, extremely arid habitats, particularly interdunal depressions, where it feeds on scant, ephemeral vegetation that sprouts following rainfall, which it can sense; it is highly mobile and moves great distances to exploit grazing; it obtains most, if not all its water requirements from vegetation; and it is gregarious and associates in small groups (Lavauden 1926a; Heim de Balsac 1936). Unlike the southern Sahara, where addax migrate northward into the Sahara during the rainy season and southward toward the Sahel in the dry season (Lamarche 1980), movements of addax in the northern Sahara, where the climate is continental rather than tropical, are not seasonally predictable (Heim de Balsac 1936).

Like wild addax in the sub-Sahara, captive animals in a 2,000ha enclosure at Bou-Hedma National Park attain sexual maturity by two years of age and have a gestation period of about 300 days. Females dissociate from the herd a few days prior to parturition and are typically accompanied by an adult male, which remains with the female and calf through post-partum estrous when they re-associate with the herd. Addax at Bou-Hedma do not take water directly and

apparently meet their water requirements by selectively feeding on succulents, such as *Anabasis oropediorum*, *Arthrophytum schmittianum*, *Atriplex mollis,* and *Colocynthis vulgaris* (Kacem *et al.* 1994). The bulk of their diet, however, is perennial grasses, such as *Aristida* spp., *Cenchrus ciliaris*, *Digitaria commutata,* and *Stipa* spp., similar to addax in the southern Sahara (Newby 1974; Lamarche 1980). Addax at Bou-Hedma travelled through steep terrain at 600m elevation to reach pastures where rain had recently fallen (Kacem *et al.* 1994).

Status within the country: Extinct. A captive-breeding herd has been established at Bou-Hedma National Park.

Conservation measures taken: Protected by law. As part of the programme to restore the fauna of Tunisia, 14 addax were transferred from Germany and the USA to Bou-Hedma National Park between September 1985 and March 1988. After early losses due to interspecific conflicts with scimitar-horned oryx (Gordon 1991) and, presumably, calf predation (Gordon and Gill 1993), the herd has increased steadily from 17 in 1991 to 50 in June 1997 (H. Lazhar *pers. comm.*). Global status is Critically Endangered (East 1999).

Conservation measures proposed: Because Bou-Hedma National Park is outside the addax's historical range, and given problems at the park with overcrowding and inter-specific competition with scimitar-horned oryx, it has been proposed to translocate most of the captive animals to Djebil and/or Sidi Toui National Parks, which are within the species' former range. A small group of 15–20 individuals could be retained at Bou-Hedma for public awareness (Smith *et al.* 1997). Djebil National Park has particularly good potential for an *in situ* captive-breeding programme and for restoring the species to the wild in the vast (100,000km^2) Great Eastern Erg.

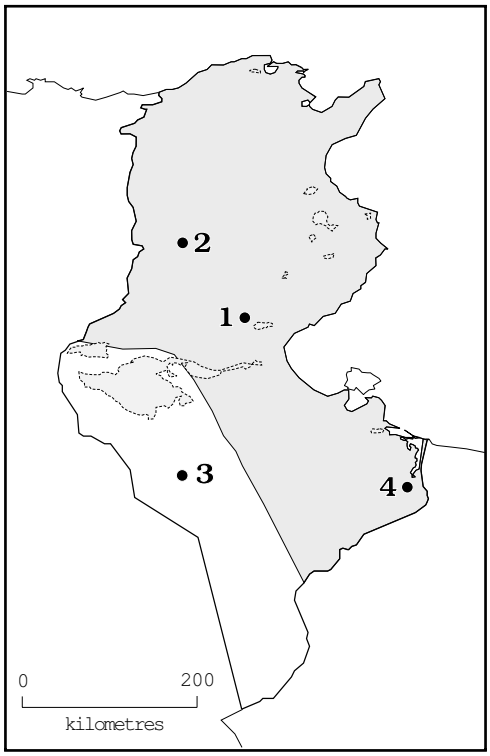


Fig. 5.4 Probable former distribution of bubal hartebeest (*Alcelaphus b. buselaphus*) in Tunisia (shaded).

Bubal Hartebeest (*Alcelaphus buselaphus buselaphus*)

Distribution and population: This endemic form of the common hartebeest was formerly distributed throughout North Africa as far north as the Atlas Mountains and High Plateau (Heim de Balsac 1931; Kacem *et al.* 1994). This would include the Dorsale Range and areas south of approximately 36^{0}N, i.e, the Mediterannean/Sahara (sub-desert) and Sahara (desert) Transition Zones. Bubal hartebeest was still widespread in the mountains of southern Tunisia and Algeria as late as 1870 (Fig. 5.4), but it was hunted to extinction in Tunisia at about the turn of the 20th century. What is presumed to be the last individual was shot in 1902 at the edge of the Great Eastern Erg, southwest of Tataouine (Lavauden 1926b).

Habitat, food and reproduction: Lavauden (1926a) reported that bubal hartebeest was formerly distributed throughout sub-desert steppe and semi-forested habitats of North Africa, and preferred rocky habitats to dunes. The species also has been reported in mountainous woodland, plateau (*hammada*), salt flats, and sand dunes (Heim de Balsac 1936; Kacem *et al.* 1994), indicating that it utilised a wide variety of habitats.

Status within the country: Extinct. Global status of this subspecies is Extinct, and of *A. buselaphus* Lower Risk/ conservation dependent (IUCN 1996).

Conservation measures proposed: Kacem *et al.* (1994) proposed that *Alcelaphus buselaphus* could be reintroduced to Bou-Hedma, Sidi Toui, and Chambi National Parks using *A. b. major,* which is regarded as the closest relative to the extinct North African form and is widely distributed and not threatened in Senegal and Burkina Faso (East 1995). Such action would be consistent with international guidelines for reintroductions (IUCN/SSC/RSG 1995).

Dorcas Gazelle (*Gazella dorcas*)

Distribution and population: The historical range of dorcas gazelle included all of Tunisia south and east of the Dorsale Range (Fig. 5.5) (Whitaker 1896; Lavauden 1926a). In the late 19th century, before French occupation of the country, the species remained well distributed and abundant in Tunisia as far north as the Kairouan Plains (Lavauden 1920). From that time until the present, however, the range and numbers of the species have markedly decreased. By 1920, the northern and eastern limits of its distribution had contracted substantially (Lavauden 1920). In the 1960s,

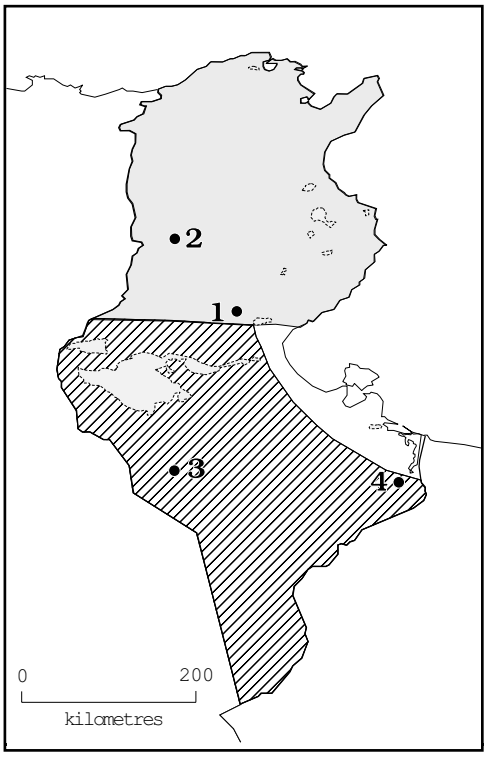


Fig. 5.5 Current distribution of dorcas gazelle (*Gazella dorcas*) in Tunisia (hatched) and former distribution (shaded).

dorcas gazelle still occurred north of the Djerid salt flat as far as the Saharan Atlas (Muller 1966), but it had largely disappeared from the northern portion of its former range (the Atlas Mountains and associated plateaus) and was markedly less abundant in the central and southern districts of the country (Schomber and Kock 1961). Currently, it is distributed in highly fragmented, small populations in the southern half of Tunisia, south of a line running from Tamerzna, at the Algeria border, eastward to Gafsa and Maknassy, southward to Matmata, and southeastward to Medenine and Ben Gardane, near the Libya border (Kacem *et al.* 1994). There are no population estimates of dorcas gazelle in the wild in Tunisia, but the total number is unlikely to exceed 1,000, and may be only a few hundred.

Habitat, food and reproduction: Lavauden (1920) referred to *Gazella dorcas* as the "plains gazelle," and Heim de Balsac (1936) indicated that it was a steppe species associated with flat, open landscapes. Rangewide, it appears to favour gravelly plains, broad riverbeds (*wadis*), and undulating steppe, but it has also been reported in a variety of other habitats, including high mountains (2,000m), canyons, salt flats, sebkas, and linear sand dunes (Lavauden 1926a; Heim de Balsac 1936; Dupuy 1966; Kacem *et al.* 1994; Yom Tov *et al.* 1995). The species probably formerly occurred in all habitats in Tunisia, from the Atlas Mountains southward (Muller 1966). Dorcas gazelles rarely drink, and obtain most of their water needs from dew or plants, especially succulents. In Bou-Hedma National Park, they are primarily browsers; approximately two-thirds of their diet consists of shrubs and the remainder is grasses and herbs (Kacem *et al.* 1994). The species associates in groups of various sizes. In Tunisia, these were formerly as large as several hundred animals; however, by the early 20th century, when populations were much smaller, groups larger than 30 were rare (Lavauden 1926a). Such large groups probably represented temporary concentrations at food sources. Elsewhere, the species commonly occurs in groups of 20 or fewer and most frequently one to five (Agacino 1950; Dupuy 1966; Newby 1974). Dominant adult males are territorial, and the primary rut occurs in Tunisia in late autumn. After a gestation of approximately 164 days, generally one, rarely two, or exceptionally three calves are born (Lavauden 1926a, Kacem *et al.* 1994). In favourable years, post-partum oestrus may occur in September and calving the following spring (Muller 1966), as observed in nearby Algeria and Libya (Dupuy 1966; Essghaier and Johnson 1981).

Status within the country: Vulnerable.

Conservation measures taken: Dorcas gazelle is among the species identifed in the DGF programme to restore the wild fauna of Tunisia, but no measures specifically aimed at restoration of the species have been taken. It has undoubtedly benefitted from protection in Bou-Hedma, Sidi Toui, and Djebil National Parks. Approximately 120–150 animals utilize the 2,000ha TPZ at Bou-Hedma, and an undetermined number occur outside the park and surrounding area. An estimated 30 dorcas gazelles occur in Sidi Toui National Park, and the species reportedly occurs in small numbers in the immediate vicinity of the park. Estimates of the number of dorcas gazelles in Djebil National Park are not available, but numbers are probably low. Global status is Vulnerable (East 1999).

Conservation measures proposed: Proposed management for scimitar-horned oryx and dama gazelle at the three national parks in the sub-desert and desert zones will benefit dorcas gazelle as well. Illegal hunting is the greatest threat to the species, and strict enforcement of hunting laws is essential. There also is a need to determine the status, distribution, and abundance of the species in the wild, and subsequently to identify areas where conservation measures can restore the species, such as through protection of remnant populations or reintroduction of captive-bred animals.

Cuvier's Gazelle (*Gazella cuvieri*)

Distribution and population: Cuvier's gazelle formerly occurred throughout the northern half of Tunisia (Fig. 5.6). It was typically associated with the high plateau and mountainous regions of the central and northern sections of the country (Sclater and Thomas 1894–1900), but occurred as far south as the Tebaga Mountains south of the Djerid Salt Flat. In the 1930s, the species was still quite numerous throughout the Dorsale Range, from the Algerian frontier to Djebel Bou Kornine, 17km south of Tunis, but numbers

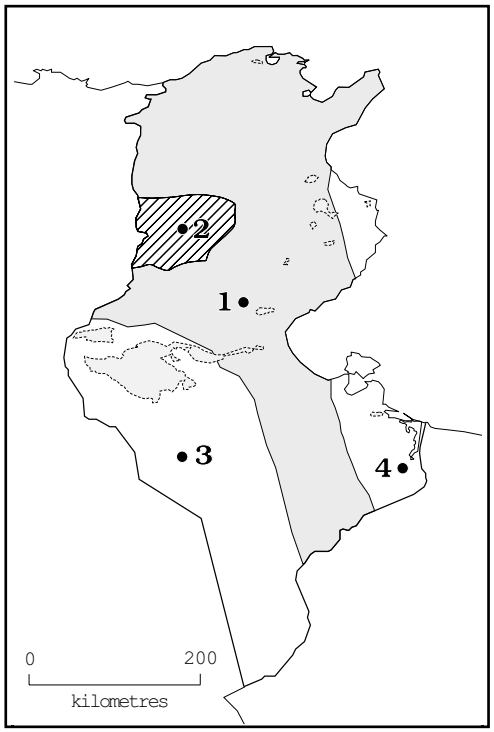


Fig. 5.6 Current distribution of Cuvier's gazelle (*Gazella cuvieri*) in Tunisia (hatched) and approximate former distribution (shaded).

have declined sharply since then as a result of overhunting and events during World War II (1941–44). By the early 1960s, it had been almost exterminated across North Africa (Kacem *et al.* 1994). It now survives in Tunisia in 13 massifs and hunting reserves, which cover a total area of about 72,400ha (Kacem *et al.* 1994). Observations in 1991 in the region of Siliana indicated that the distribution of Cuvier's gazelle was spreading towards the northeast in the Dorsale. A population of over 300 occurs in the Djebel Chambi and Djebel Khchem el Kelb Massifs on the Algerian border. The current population in Tunisia probably numbers <500.

Habitat, food and reproduction: Cuvier's gazelle inhabits steep and undulating terrain in mountains and steppe that is typically vegetated with associations of *Pinus halepensis*, *Juniperus phoenicea*, *Rosmarinus* sp., and alfa grass *Stipa tenacissima.* It feeds mainly on grasses, acorns of *Quercus ilex*, and young leaves of legumes, and it takes water from springs. The species associates in small groups, typically less than five, but occassionally as large as 20 (Lavauden 1920). Dominant males are territorial during the rut, which occurs in winter (Kowalski and Rzebik-Kowalska 1991), and calving occurs in April after a gestation of approximately 170–175 days (Kacem *et al.* 1994).

Status within the country: Endangered. Increased protection measures have improved the conservation status of the species, but it remains threatened.

Conservation measures taken: Cuvier's gazelle is fully protected under the revised Code Forestier. Since 1974, the areas inhabited by Cuvier's gazelle have been converted into hunting reserves. In 1975, a 300ha protected area (fenced on three sides) was established for the species at Mount Keche near Mount Chambi. In 1980, Djebil Chambi National Park was gazetted primarily for conservation of the species, and hunting, livestock grazing, and wood gathering were forbidden. Global status is Endangered (IUCN 1996).

Conservation measures proposed: To assist recolonisation of the Dorsale Range, protection measures in all the relevant governorates should be intensified. Other faunal reserves, similar to those at Kechem el Kelb, should be strictly managed to allow the species to re-populate the entire Dorsale between Chambi National Park and Boukornine National Park at the northeastern end of the range. The species should be re-established at Boukornine National Park by reintroduction of captive-bred animals or translocation of wild animals from the Kechem el Kelb Reserve (Kacem *et al.* 1994). Reintroduction of Cuvier's gazelle also should be initiated at Bou-Hedma and Sidi Toui National Parks, where habitat is suitable for the species (Smith *et al.* 1997).

Slender-horned Gazelle (*Gazella leptoceros*)

Distribution and population: Slender-horned gazelle formerly occurred throughout the desert region of Tunisia as far north as the Djerid Salt Flat (Fig. 5.7) (Schomber and Kock 1961; Muller 1966). The species was particularly well distributed in the Great Eastern Erg (Lavauden 1926a; Heim de Balsac 1936). It has suffered considerably from excessive, illegal hunting and today appears to survive only in the most remote, largely impenetrable parts of the Erg. Its distribution is poorly known, however, and there are no estimates of its abundance in Tunisia.

Habitat, food and reproduction: There is very little information on ecology of the slender-horned gazelle in Tunisia and elsewhere in its range. It is considered a strictly desert species that inhabits sand dunes (Lavauden 1926a; Joleaud 1929; Heim de Balsac 1936; Muller 1966). However, Dupuy (1966) suggested that *G. leptoceros* was formerly found in a variety of desert habitats and that its recent distribution in remote desert areas may be partly due to persecution by man. It feeds on grasses, herbs, shrubs, and plants rich in water, e.g., *Anabasis articulata, Arthrophytum schmittianum*, *Helianthemum kahiricum*, and the fruits of *Colocynthus vulgaris.* It is nomadic and wide-ranging in search of sparse, ephemeral pasture in its arid habitat (Kacem *et al.* 1994). The species typically associates in small groups of 15 or fewer individuals (Lavauden 1920; Kacem *et al.* 1994). Calving reportedly occurs in January and February after a gestation of about 165 days (Kacem *et al.* 1994), so the rut presumably occurs in late summer (August–September). Litter size for the species is one to two (Flower 1932), and twinning is reportedly not uncommon (Pease 1896).

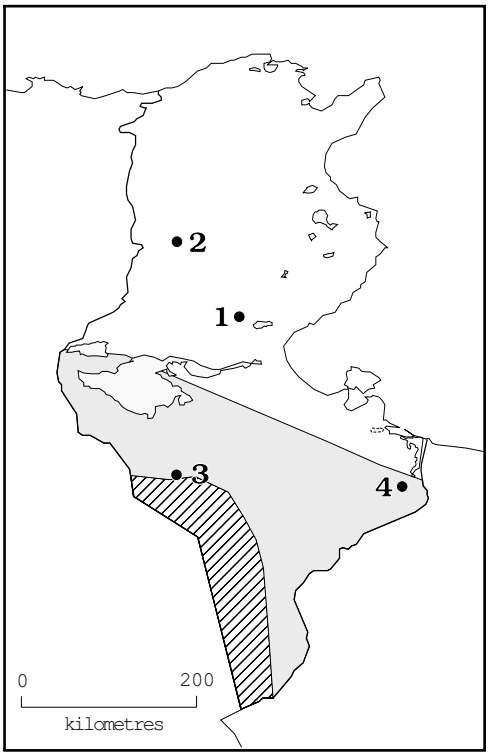


Fig. 5.7 Current distribution of slender-horned gazelle (*Gazella leptoceros*) in Tunisia (hatched) and approximate former distribution (shaded).

Status within the country: Insufficiently known, presumably Endangered.

Conservation measures taken: G. leptoceros is fully protected by law. It occurs in the newly gazetted Djebil National Park, but the park has yet to be staffed and, at present, the species receives little protection in the area from local police. Global status is Endangered (IUCN 1996).

Conservation measures proposed: The DGF plans to establish a camel-mounted ranger staff and guard patrol at Djebil National Park in the near future, which, if effectively planned and implemented, should reduce reported poaching of gazelles in the area. There is an urgent need to conduct a systematic survey of Djebil National Park and adjacent parts of the Great Eastern Erg to determine the distribution and abundance of remnant populations of slender-horned gazelles. The area has international significance for conservation of *G. leptoceros* and is an ideal site for development of a captive-breeding and reintroduction programme that will lead to restoration and conservation of a viable wild population of this species in the northern Sahara (Smith *et al.* 1997). Sidi Toui National Park also contains slender-horned gazelle habitat and is a suitable site for captive-breeding and reintroduction of the species.

Dama Gazelle (*Gazella dama*)

Distribution and population: There are no confirmed records of dama gazelle from Tunisia, but the species is believed to have formerly occured in the southern section of the country and to have disappeared some time between the 17th and 19th centuries (Fig. 5.8) (Kacem *et al.* 1994). *G. dama* occurred historically throughout adjacent Algeria (Joleaud 1929), and it is likely that it was distributed across the desert and sub-desert zones of Tunisia as well.

Habitat, food and reproduction: Heim de Balsac (1936) stated that the distribution of dama gazelle in North Africa was correlated with that of *Acacia,* its staple diet, and that it inhabited stony plains, inter-dunal depressions with shallow sandy soils, hills, and undulating foothills and steppes. In Chad, dama gazelles exhibit a preference for stony plains (*regs*) and plateaus, avoid mountains and dunes, and are both grazers and browsers (Newby 1974). The species typically occurs in mixed groups of 10–15, composed of a dominant adult male, several adult females, and young (Lavauden 1920; Kacem *et al.* 1994). Solitary individuals and pairs are not uncommon; however, congregations of several hundred individuals are sometimes observed. Group size may be related to population density and habitat quality (Grettenberger and Newby 1986). Calving occurs during winter in the central Sahara (Lavauden 1920), and usually a single calf is born after a gestation of approximately 200 days (Kacem *et al.* 1994).

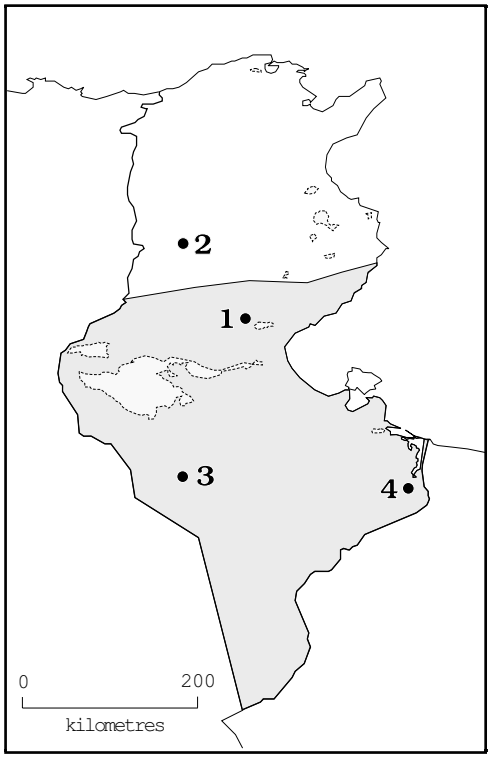


Fig. 5.8 Probable former range of dama gazelle (*G. dama*) in Tunisia (shaded).

Status within the country: Extinct, if it formerly occurred in Tunisia.

Conservation measures taken: Dama gazelle is identified in the DGF's programme to restore the native fauna of Tunisia. Eight captive-bred animals were released into the 2,000ha fenced TPZ at Bou-Hedma National Park betwen 1990 and 1992 (Abaigar *et al.* 1997). In 1994, when the herd numbered seven, 14 additional captive-bred animals were translocated to the area. Reproductive recruitment has occurred but the herd has not increased, presumably due to predation of both calves by jackals (*Canis aureus*). In June 1997, the herd numbered 21 (H. Lazhar *pers. comm.*). Global status is Endangered (IUCN 1996).

Conservation measures proposed: Systematic monitoring of reproductive histories, mortality, habitat requirements, social organization, and behaviours of the captive herd at Bou-Hedma should be initiated. This information is essential for development of a captive-breeding and reintroduction programme for the species in Tunisia. Releases at Sidi Toui and Djebil National Parks are under consideration.

References

Abaigar, T., Cano, M., Espeso, G., and Ortiz, J. 1997. Introduction of Mhorr gazelle *Gazella dama mhorr* in Bou-Hedma National Park, Tunisia. *International Zoo Yearbook* 35:311–316.

Agacino, E.M. 1950. Datos y observaciones sobre ciertos mamiferos del Sahara Occidental e Ifni. *Boletin de la Real Sociedad Española* 47(4):13–44.

Dupuy, A. 1966. Les gazelles du Sahara Algérien. *Science et Nature* 78:15–22.

East, R. 1995. Evaluation of African antelopes using IUCN Red List categories. *Antelope Survey Update* 1:31–36.

East, R. 1999. *African antelope database 1998*. IUCN/SSC Antelope Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.

Essghaier, M.F.A. and Johnson, D.R. 1981. Distribution and use of dung heaps by dorcas gazelle in western Libya. *Mammalia* 45:153–155.

Flower, S.S. 1932. Notes on the recent mammals of Egypt, with a list of the species recorded from that kingdom. *Proceedings of the Zoological Society, London* 1932:368–450.

Gillet, H. 1966. The scimitar oryx and the addax in the Tchad Republic (Part I). *African Wild Life* 20:103–115.

Gordon, I.J. 1991. A case of intense interspecific aggression between scimitar horned oryx, *Oryx dammah* and addax *Addax nasomaculatus*. *Journal of Zoology* 218:335–337.

Gordon, I.J. and Gill, J.P. 1993. Reintroduction of scimitar-horned oryx to Bou-Hedma National Park, Tunisia. *International Zoo Yearbook* 32:69–73.

Grettenberger, J.F. and Newby, J.E. 1986. The status and ecology of the dama gazelle in the Aïr and Tenéré National Nature Reserve, Niger. *Biological Conservation* 38:207–216.

Heim de Balsac, H. 1931. Le cheptel d'animaux desertiques des anciennes civilisations Africaines, possibilité de sa restauration en régions sahariennes. *Proceedings of the 6th International Congress of Tropical and Subtropical Agriculture, Paris.* 3:309–313.

Heim de Balsac, H. 1936. Biogéographie des mammifères et des oiseaux de l'Afrique du Nord. *Bulletin Biologique de France et de Belqique, Suppléments* 21:1–446.

Hufnagl, E. 1972. *Libyan mammals*. The Oleander Press, Stoughton, Wisconsin and Harrow, England.

IUCN. 1992. *Protected areas of the world: A review of national systems, Palearctic,* vol. 2. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN/SSC/RSG. 1995. *Re-introduction guidelines. As approved by the 41st meeting of IUCN Council*. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Joleaud, L. 1929. Etudes de géographie zoologique sur la Berberie. *Bulletin de la Société Zoologique de France* 59:438–445.

Kacem, S.B.H., Muller, H-P., and Wiesner, H. 1994. Gestion de la faune sauvage et des parcs nationaux en Tunisie: reintroduction, gestion, et amenagement. Direction Générale des Forêts and Deutsche Gesellschaft für Technische Zusammenarbeit, Tunis.

Kingdon, J. 1997. *The Kingdon field guide to African mammals*. Academic Press, San Diego.

Kowalski, K. and Rzebik-Kowalska, B. 1991. *Mammals of Algeria*. Polish Academy of Sciences, Wroclaw.

Lamarche, B. 1980. L'addax *Addax nasomaculatus* (Blainville): I Biologie. Report to WWF/IUCN, Gland.

Lavauden, L. 1920. *La chasse et la faune cynégétique en Tunisie*. Imprimerie Centrale, Tunis.

Lavauden, L. 1926a. *Les vertébrés du Sahara*. Imprimerie Albert Guenard, Tunis.

Lavauden, L. 1926b. Les gazelles du Sahara central. *Bulletin de la Société de l'Histoire Naturelle de l'Afrique du Nord* 17:11–27.

Muller, H.P. 1966. Les gazelles en Tunisie. *Bulletin de la Société des Sciences Naturelles* 10:155–158.

Newby J. 1974. The ecological resources of the Ouadi Rimé-Ouadi Achim faunal reserve. UNDP/FAO.

Newby, J.E. 1988. Aridland wildlife in decline: The case of the scimitar-horned oryx. Pp. 146–166 *in:* Dixon, A. and Jones, D. (Editors). *Conservation and biology of desert antelopes*. Christopher Helm, London.

Pease, A.E. 1896. On the antelopes of the Aures and eastern Algerian Sahara. *Proceedings of the Zoological Society of London* 1896:809–814.

Riney, T. 1965. Possibilités d'utilisation de la faune sauvage dans les zones forestières. Report no. 1983, FAO, Rome.

Schomber, H.W. and Kock, D. 1961. Wildlife protection and hunting in Tunisia. *African Wild Life* 15*:*137–150.

Sclater, P.L. and Thomas, O. 1894–1900. *The book of antelopes*. R.H. Porter, London.

Smith, T.R. 1996. Reintroduction of scimitar-horned oryx at Djebil National Park, Tunisia: An appeal for support. Unpublished report, Institut Royal des Sciences Naturelles de Belgique, Bruxelles.

Smith, T.R. and De Smet, K. 1997a. Restoration and economic development of Sahelo-Saharan wildlife resources. Unpublished report, Institut Royal des Sciences Naturelles de Belgique, Bruxelles, and Flemish Nature Department, Brussels.

Smith, T.R. and De Smet, K. 1997b. Start-up of a scimitar-horned oryx reintroduction and captive breeding project at Sidi Toui National Park, Tunisia. Unpublished report, Institut Royal des Sciences Naturelles de Belgique, Bruxelles, and Flemish Nature Department, Brussels.

Smith, T.R., De Smet, K., and Wakefield, S. 1997. An evaluation of antelope reintroduction sites in Tunisia: Bou Hedma National Park, Djebil National Park, and Sidi Toui National Park: Report of a trip from 4–11 June 1997. Unpublished report, Institut Royal des Sciences Naturelles de Belgique, Bruxelles.

Trouessart, E. 1905. La faune des mammifères de l'Algérie, du Maroc, et de la Tunisie. *Causeries Scientifiques de la Société Zoologique de France* 1:353–410.

Wacher, T. 1986. The reintroduction of scimitar-horned oryx, *Oryx dammah*, from the United Kingdom to Tunisia. Report No. 2, April–May 1986, Zoological Society of London.

Whitaker, J.S. 1896. On the gazelles of Tunisia. *Proceedings of the Zoological Society of London* 1896:815–817.

White, F. 1983. *The vegetation of Africa*. UNESCO, Paris.

Yom-Tov, Y., Mendelssohn, H., and Groves, C.P. 1995. Gazella dorcas. *Mammalian Species* 491:1–6.

Chapter 6. Libya

K. Khattabi and D.P. Mallon

Introduction

The People's Socialist Libyan Arab Jamahiriya is the fourth largest country in Africa, occupying a land area of *c.* 1,759,540km^2. Libya has a long coastline along the Mediterranean Sea, and shares land borders with Tunisia and Algeria to the west, Niger and Chad to the south, Sudan to the southeast, and Egypt to the east (Fig. 6.1). The human population is 4,552,000. The country is divided administratively into the western, eastern, and southern regions, which correspond to the former provinces of Tripolitania, Cyrenaica, and Fezzan, respectively.

The dominant geographical feature of Libya is the Sahara Desert, which occupies most of the country. Narrow strips of more fertile land are found along the western and eastern coasts and these contain most settlements and most of the human population. Between these two strips lies the barren desert coast of the Gulf of Sidra. Inland from the two coastal strips, a series of hills, steppes, and escarpments gives way to semidesert and then desert. In the eastern coastal area, the Jabal al Akhdar reaches an elevation of 865m and receives the highest rainfall in the country. The only natural forest remnants in the country are found there. In the west lies Jabal Nafhusa. The desert interior consists of vast areas of rocky plateaus, gravel plains, and sand dunes. The largest areas of dunes are the Calansho (Kalanshiyu) sand sea of eastern Libya, the Rebiana sand sea (Ramlat Rabyanah) in the southeast, and the Murzuq and Ubari sand seas (Idhan Murzuq and Idhan Awbari) in the southwest of the country. The only significant mountainous areas in the interior are the Tibesti (ca. 2,287m) on the southern border with Chad, and the isolated Jabal Uweinat (1,893m) in the extreme southeast on the border with Egypt and Sudan. There are no permanent rivers, but the many wadis in the north of the country carry water temporarily, following infrequent heavy rain, which may also flood clay basins (*playas*) in the desert. Cultivation is limited to the coastal strips and sparse oases in the interior. Extensive aquifers lie beneath the Sahara, and these have been increasingly exploited to expand areas under cultivation in the desert. A major project to bring water from these desert aquifers via 2,400km of pipelines to the coastal cities of Tripoli and Benghazi, and to increase irrigation in the eastern desert, began in 1984 and was completed in 1996.

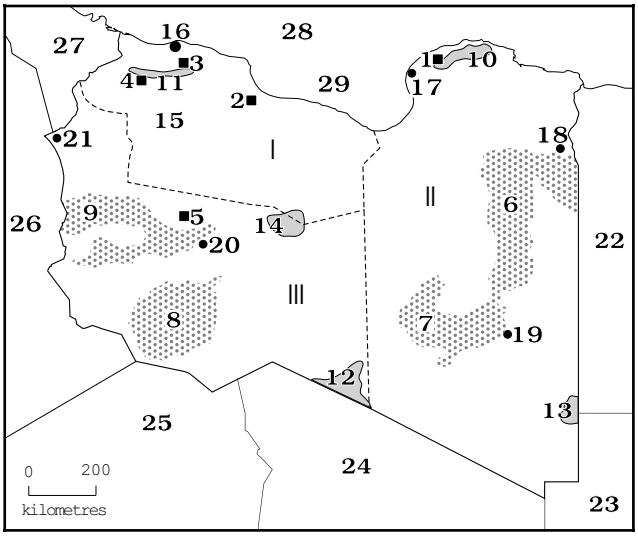


Fig. 6.1 Libya. Administrative divisions: I. Western region (Tripolitania); II. Eastern region (Cyrenaica); III. Southern region (Fezzan). Protected Areas containing antelopes or of potential importance for antelope conservation: 1. El Kouf National Park (35,000ha); 2. New Hisha Reserve (100,000ha); 3. Tripoli Reserve (700ha); 4. Nafhusa Reserve (20,000ha); 5. Zellaf Reserve (100,000ha). Sand seas: 6. Kalanshiyu; 7. Rabyanah; 8. Murzuq; 9. Awbari. Other geographical features and localities mentioned in the text: 10. Jabal Akhdar; 11. Jabal Nafhusa; 12. Tibesti Mountains; 13. Jabal Uweinat; 14. Haruj El Aswad; 15. Hamada Al Hamra; 16. Tripoli; 17. Benghazi; 18. Jaghbub; 19. Kufra; 20. Sebha; 21. Ghadames; 22. Egypt; 23. Sudan; 24. Chad; 25. Niger; 26. Algeria; 27. Tunisia; 28. Mediterranean Sea; 29. Gulf of Sidra.

Coastal areas have a Mediterranean climate with hot summers and mild winters, during which most of the annual precipitation falls. The interior has a continental climate with extremely hot summers and sharp diurnal fluctuations in temperature. Annual rainfall in the interior of the Sahara is 50mm or less. The highest rainfall (400–600mm) falls on the Jabal al Akhdar in the eastern coastal region. Summer temperatures regularly exceed 40°C, but are lower in midwinter with occasional night-time frosts.

On Jabal al Akhdar, a few remnants of forest survive, consisting of pine (*Pinus halepensis*), juniper (*Juniperus phoenicea*), and cypress (*Cupressus sempervivens*). The original forests of the coast have been removed over the course of centuries by cutting for timber and fuel and by the effects of grazing. Large numbers of trees have been planted in recent decades including non-indigenous *Eucalyptus*. The coastal regions still retain some areas of typical Mediterranean macchia or maquis, with olive (*Olea europaea*), carob (*Ceratonia siliqua*), oaks (*Quercus* spp.), and species of *Arbutus* and *Lentiscus*. The rolling hills lying between the coastal plain and the desert proper have steppe vegetation consisting of species of *Retama*, *Artemisi*a, *Asphodelu*s, *Stipa*, *Pistacia*, *Zizyphu*s, and *Arthrophytum*. Over wide areas of desert, vegetation is virtually absent and

Table 6.1 Current status of antelopes in Libya.

Species	Status[1]	GPS[2]
Scimitar-horned Oryx (*Oryx dammah*)	Extinct	–
Addax (*Addax nasomaculatus*)	Extinct	–
Bubal Hartebeest (*Alcelaphus buselaphus buselaphus*)	Extinct	–
Dorcas Gazelle (*Gazella dorcas*)	Endangered	?
Slender-horned Gazelle (*G. leptoceros*)	Indeterminate	?
Dama Gazelle (*G. dama*)	Extinct	–

[1] *See Chapter 1 for definition of status categories*
[2] *Global population share*

is confined to wadi beds and depressions where scattered growth of a few trees and shrubs is found: *Colligonum*, *Tamarix*, *Aristid*a, *Alhagi*, and *Acacia raddiana*, *A. ehrenbergiana,* and *A. tortilis*. Other species include *Citrullus colocynthis,* whose fruits provide a valuable source of food for wild herbivores, and the grass *Panicum turgidum*.

All over the Sahara, rock paintings can be found showing animals such as lion (*Panthera leo*), rhinoceros (*Diceros* sp.), hippopotamus (*Hippopotamus amphibius*), elephant (*Loxodonta africana*), giraffe (*Giraffa camelopardalis*), and crocodile (*Crocodylus* sp.), which attest to the wetter climate and rich wildlife of former times. Roman mosaics also show a rich fauna, including addax (*Addax nasomaculatus*), scimitar-horned oryx (*Oryx dammah*), and hartebeest (*Alcephalus buselaphus*). Many of the large mammals of the coastal areas were exterminated by the Romans, who exported them in huge quantities to Rome to be killed in public arenas (Hufnagl 1972). In more recent times, the introduction of the motor car together with the presence of numerous oil-production facilities in the desert have further contributed to the destruction of wildlife in the desert interior. Relentless pusuit of gazelles by jeep until they die from exhaustion and shooting of barbary sheep (*Ammotragus lervia*) from helicopters was reported by Hufnagl (1972). Only a few studies of the mammals of Libya have been undertaken, all limited in nature, and the status, distribution, and biology of most species are not well known.

Current status of antelopes

Six species of antelope have been reported from Libya (Table 6.1): scimitar-horned oryx (*Oryx dammah*), addax (*Addax nasomaculatus*), bubal hartebeest (*Alcephalus buselaphus buselaphus*), dorcas gazell*e* (*Gazella dorcas*), slender-horned gazelle (*G. leptoceros*), and dama gazelle (*G. dama*). In addition to these, De Beaux (1928) reported finding a horn of *Gazella cuvieri* at Al Jaghbub in eastern Libya, but he was unsure whether it originated in that area and there have been no other records of this species.

The last confirmed record of addax dates from the mid-1960s (Hufnagl 1972), but more recent reports have occasionally been received from the southwest of the country, close to the border with Niger. Scimitar-horned oryx were formerly widespread in Libya but are now extinct. Hartebeest are known from rock paintings and Roman and Greek accounts, but became extinct in Libya a long time ago (Hufnagl 1972). Dama gazelle has always been a rare species in Libya, restricted in distribution to the far south. Slender-horned and dorcas gazelles have suffered a great decline in recent decades, especially since the 1960s, and they have been extirpated in many areas. *G. leptoceros* remains rare, though its precise status and distribution are unclear. *G. dorcas* is widespread in scattered pockets. The decline in gazelle populations is mainly the result of uncontrolled and illegal motorised hunting, especially in areas of oil exploration and production. Hunting has continued despite a ban introduced in 1970. Rapidly dwindling numbers of gazelles led Hufnagl (1972) to predict the inevitable extinction of all species in Libya. Fortunately, better enforcement of protection measures has since led to an improvement in the situation.

Conservation measures taken

A wildlife protection law was passed in 1955 and strengthened in 1965. Hunting was banned from 1970–1975 and, in 1975, the sale of weapons and ammunition was also banned temporarily to aid conservation of endangered species, but hunting continued despite these measures (Essghaier 1980). In theory, the laws on hunting are excellent: no female gazelles may be killed; no young gazelle may be captured and sold; hunters need a licence and the official hunting season for gazelles is short, lasting for only a few weeks from mid-August. Hunting from vehicles or from aircraft is banned as is the trade in gazelle meat. Unfortunately, these laws were not enforced and many hunters were not even aware of them (Hufnagl 1972). In 1982, attempts were made to strengthen the wildlife protection laws. Although these were unsuccessful, the issue of hunting licences and permits was transferred to security centres, and stricter regulation was introduced. Following these measures, an increase in the numbers of game species was seen in several areas. Overgrazing and associated habitat degradation have also been factors in the decline of antelope

populations, but at least in some areas shared use of rangelands with domestic sheep and goats does not appear to be detrimental to gazelles.

Some areas have been planted as forest reserves and some protected areas have been established. One of the aims of the protected area system is to enable restoration of indigenous species (IUCN 1992). National parks are under the overall responsibility of the Secretariat of Agriculture and the Wildlife Technical Committee. The Wildlife Technical Committee has initiated a programme to establish a representative network of protected areas (national parks and nature reserves) throughout the country. The first phase covering northern Libya has been completed, and several protected areas in the north of the country were approved by resolutions No. 631/92 and 991/93 of the General Popular Committee. Protected areas established to date are: El-Kouf National Park (8,500ha), which has a small reintroduced population of *G. dorcas*, El-Naggazzan National Park (1,200ha), Garabulli National Park (8,000ha), Abugelan National Park (4,500ha), Sorman National Park (1,250ha), Sabratha National Park (1,200ha), Bir Aiaad Reserve (12,000ha), Nefhusa Protected Area (20,000ha), and New Hisha Reserve (100,000ha), which contains about 150 dorcas gazelles. Tripoli Reserve is a fenced area covering 700ha, situated 15km south of the capital, which holds captive herds of antelopes and other species. Zellaf Nature Reserve (100,000ha) is situated in the southwestern desert, to the north of Sebha. It contains large areas of dunes, which may hold remnant populations of *G. leptoceros* and it is regarded as a potential site for the reintroduction of *Addax nasomaculatus* and *Oryx dammah*. Outside protected areas, the nature of the terrain in some places may offer a measure of additional protection from motorised hunting: sand dunes in the case of *G. leptoceros,* and areas of rocky ridges in the case of *G. dorcas*.

The National Society for Wildlife Conservation, an NGO, is taking an increasing role in wildlife conservation activities. Dorcas gazelles are commonly kept as pets. The Sidi Mesri Agricultural Experimental Station kept a few selected males for use as stud animals for privately owned females (Hufnagl 1972).

Conservation measures proposed

More protected areas are planned for the south of the country, under the supervision of the Wildlife Technical Committee. These will prove important in the event of recolonization of border areas by antelopes such as addax and scimitar-horned oryx from further south, and also as sites for future reintroductions. Reserves should be established wherever surviving antelope populations have some hope of recovery and the habitat remains suitable. The ban on all hunting and live capture of antelopes should be strictly enforced. Research is needed into current distribution and numbers of any surviving gazelles, especially *G. leptoceros*. All current captive breeding efforts should be maintained, but it is important to ensure the taxonomic purity of captive herds. Reintroductions to secure areas will be essential for the long-term future of antelope species in Libya. Education programmes to promote wildlife conservation are also necessary. Co-operation with international conservation organisations is also desirable, especially while wildlife conservation in the country is in its early stages.

Species accounts

Scimitar-horned Oryx (*Oryx dammah*)

Distribution and population: Oryx were described as widespread in Fezzan (southwestern Libya) and the Kufra region of the southeast by Lavauden (1920), but they have since disappeared from both localities and there are no confirmed recent records from Libyan territory. Hufnagl (1972) quotes a sight record from Wadi Jerari, south of Jabal al Akhdar in 1942, and a possible sighting in 1964 from the Cyrenaica-Tripolitania border in northern Libya (Fig. 6.2). *Oryx dammah* was previously common in northern Chad, close to the Libyan border, and in summer it moves north into the central Sahara and may have reached southern Libya (Hufnagl 1972). The Chad population was estimated to number in the very low hundreds or less (Thommasey and Newby 1990), and the species is now considered Extinct in the Wild (East 1999).

Habitat, food and reproduction: Semidesert plains and steppe bordering the Sahara. Move great distances in search of ephemeral flushes of desert grasses. Feed mainly on grasses and also eat herbs, shrubs, and fruit (Hufnagl, 1972).

Status within the country: Extinct.

Conservation measures taken: Listed as a protected species in the hunting laws. A captive herd is kept at the Tripoli Reserve (seven in 1994).

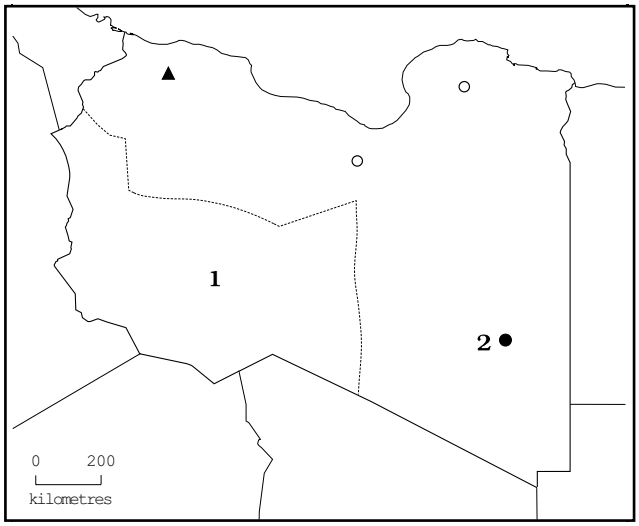


Fig. 6.2 Sites of former occurrence of Scimitar-horned oryx (*Oryx dammah*) in Libya: 1. Fezzan; 2. Kufra. Open circles denote unconfirmed sightings from the 1940s.

Conservation measures proposed: Captive-bred animals could be released into suitable protected areas provided that protection from hunting can be guaranteed. In the long term, it is possible that oryx dispersing from the proposed reintroduction site at Sidi Toui National Park in Tunisia could reach western Libya.

Addax (*Addax nasomaculatus*)

Distribution and population: Records of its former occurrence (Fig. 6.3) are widely scattered and include the Hamada al Hamra in northwest Libya; Wadi Ali, north of Gikherra; Haruj al Aswad; Ain Mazzar near Kufra, and Jabal Uweinat, both in the southeast (Hufnagl 1972; Misonne 1977). Three addax were seen, and one shot, in 1956 in the Murzuq sand sea in the southwest (Le Houérou 1991) and one addax was shot in 1970 near In Amenas in Algeria, close to Libya's western border (Kowalski and Rzebik-Kowalska 1991). It was described as one of the rarest mammals in Libya by Setzer (1957). The last definite Libyan record was of a few animals shot in 1966 to the north of Thamad bu Hashisha. According to local reports, addax still survived some years later in southeastern Libya (Hufnagl 1972). Local hunters and herdsmen have occasionally reported small numbers of addax in southwestern Libya near the border with Niger. In theory, addax could wander northwards into Libya from the small populations surviving in Chad and Niger (East 1992). However addax are described as endangered in both countries, with estimated populations of 200 in Chad (Thomassey and Newby 1990) and <200 in Niger (Grettenberger and Newby 1990).

Habitat, food and reproduction: Inhabits open, flat, or hilly country. Feeds on species of *Artemisia, Aristida, Acacia,* and *Citrullus*. No definite breeding season has been observed. Addax undertake fairly extensive migratory movements that are not obviously linked to seasonal changes in climate (Hufnagl 1972).

Status within the country: Extinct. Rare vagrants possibly reach Libya occasionally from the south or southwest.

Conservation measures taken: Included on the list of protected species. A captive herd is kept at the Tripoli Reserve (nine in 1994). Global status is Critically Endangered (East 1999).

Conservation measures proposed: Captive-bred animals could be released into suitable protected areas provided that protection from hunting can be guaranteed. In the long term, it is possible that addax dispersing from planned reintroduction programmes in Tunisia could reach western Libya.

Bubal Hartebeest (*Alcelaphus buselaphus buselaphus*)

Distribution and population: Very little information specific to Libya is available (Fig. 6.4). Osborn and Helmy (1980) said that bubal hartebeest formerly occurred across most of the Western Desert including Libya, and their distribution map included a small area south of Al Jaghbub on the eastern border of Libya. Lavauden (1920) reported that some hartebeest were probably still present in Tunisia on the hammada between Bir-Aouïn and Ghadamès on the Libyan border. It has long been extinct in Libya according to Hufnagl (1972).

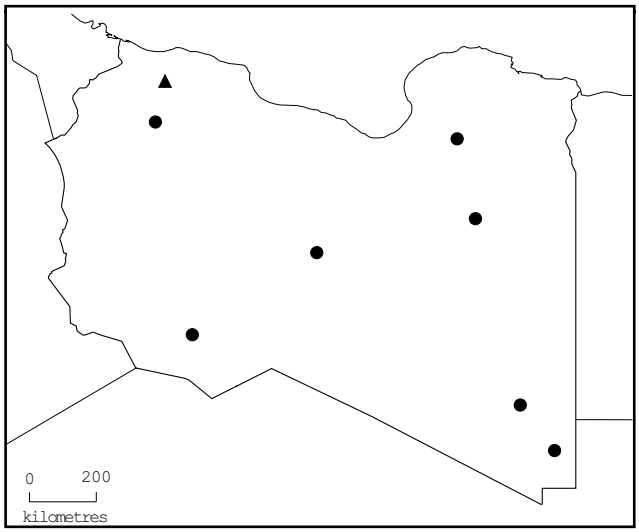


Fig. 6.3 Records of addax (*Addax nasomaculatus*) in Libya. The triangle indicates the captive herd at Tripoli Reserve.

Photo 6.1 Addax *(Addax nasomaculatus).* Zoological Society of San Diego.

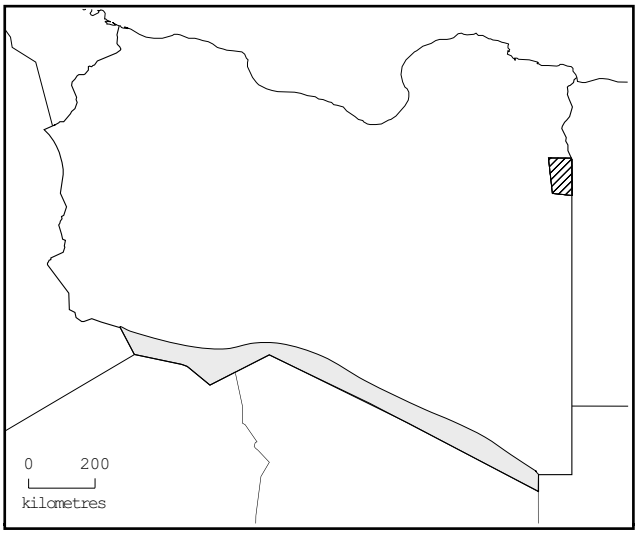


Fig. 6.4 Reported former occurrence of bubal hartebeest (*Alcelaphus b. buselaphus*) in Libya (hatched) and probable former distribution of dama gazelle (*Gazella dama*) (shaded).

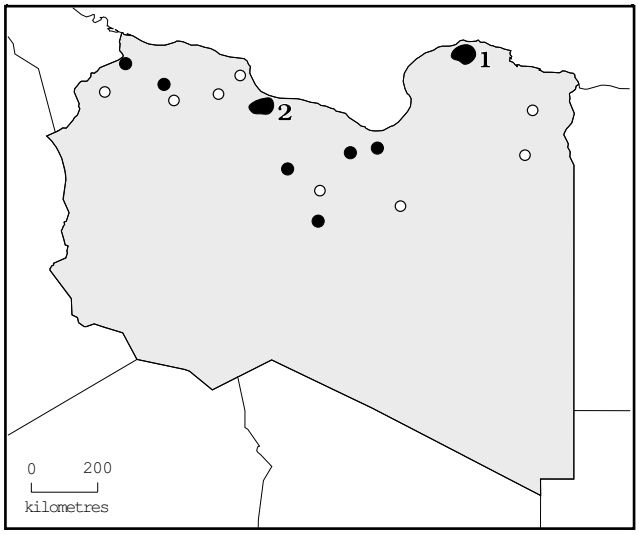


Fig. 6.5 Former general distribution of dorcas gazelle (*Gazella dorcas*) in Libya (shaded). Post-1980 records (solid circles), post-1980 unconfirmed sightings (open circles). 1. El Kouf National Park; 2. New Hisha Reserve.

Status within the country: Extinct. Global status of this subspecies is Extinct and of *A. buselaphus* Lower Risk/ conservation dependent (IUCN 1996).

Dorcas Gazelle (*Gazella dorcas*)

Distribution and population: Formerly widely distributed, but now extirpated from many areas, although it remains the most widespread antelope species in the country (Fig. 6.5). Numbers were dwindling rapidly at the end of the 1960s, and herds of 40 were exceptional by 1972, whereas a few years previously herds of 50–60 were not uncommon (Hufnagl 1972). Misonne (1977) described the dorcas gazelle as quite common in southeastern Libya in 1968–69, and estimated more than 100 in the Jabal Uweinat region, with a further 30–40 in Wadi Ghazal. On the Hamada al Hamra in western Libya, herds of up to 100 dorcas gazelles could be seen in the 1960s, but numbers had fallen by the mid-1970s when only small groups were encountered (Essghaier 1980).

Habitat, food and reproduction: Inhabits all kinds of dry, open country, but prefers wadis with some vegetation. Occurred in areas with *Acacia raddiana-Panicum turgidum* vegetation in the southeast (Misonne 1977). Most young are born March to May according to Hufnagl (1972), but in the Jabal Uweinat area, births apparently took place around the end of November (Misonne 1977). Males use latrines to mark their territory (Essghaier and Johnson 1981).

Status within the country: Endangered.

Conservation measures taken: Protected by law. An estimated 150 dorcas gazelles occur in the New Hisha Nature Reserve (100,000ha). Fifteen were introduced from the Sudan into the El-Kouf National Park (8,500ha) in 1991 by the Wildlife Technical Committee. The Nefhusa Protected Area (20,000ha) lies at the northern end of the Hamada al Hamra, which is a former stronghold of the species, and some may still occur there. Global status is Vulnerable (East 1999).

Conservation measures proposed: Ensure that protection in reserves and national parks is effective. Encourage breeding of private captive stock to enable future reintroductions to be made. Release of animals originating from outside Libya should only be made with appropriate genetic stock that ideally represent the same taxonomic unit originally present in the country.

Slender-horned Gazelle (*Gazella leptoceros*)

Distribution and population: Known from a few, widely scattered localities (Fig. 6.6). Hufnagl (1972) reported it from north of the Zella Oasis in western Libya, and along the Egyptian border in the east. Essghaier (1980) said that small numbers were sometimes seen south of Jaghbub on the eastern border, and he reported specimens from near Dahra in north-central Libya. Misonne (1977) found three skulls in the vicinity of Jabal Uweinat in the southeast. Toschi (1951) also recorded it from a few localities in Fezzan in the southwest; there have been a few recent reports from this area, from the area southwest of Sebha. Wacher (1997) reported that a small population around Lake Shiyata in western Egypt, close to the Libyan border, probably crossed into Libya periodically. This species may survive more widely in the vast sand seas of southwest, southeast, and eastern Libya. It has apparently always been rare in Libya, but no estimates of numbers are available.

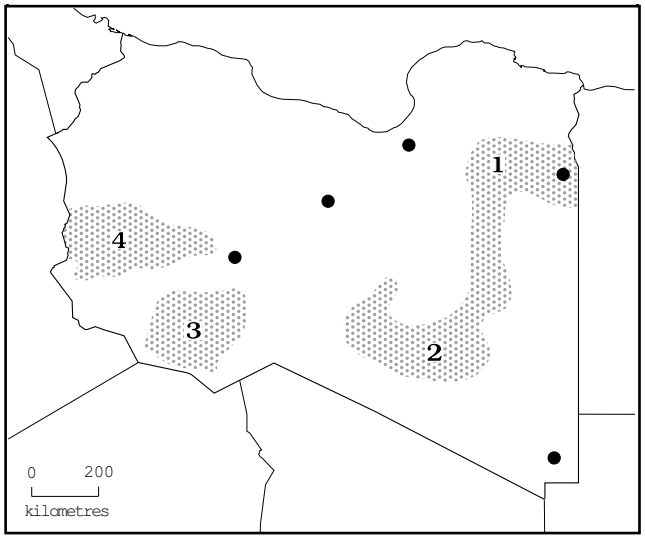


Fig. 6.6 Recorded localities of slender-horned gazelle *(Gazella leptoceros)* in Libya (solid circles). Approximate extent of major sand seas (shaded). 1. Kalanshyu; 2. Rabyanah; 3. Idhan Murzuq; 4. Idhan Awbari.

Photo 6.2 Slender-horned Gazelle (*Gazella leptoceros*). Zoological Society of San Diego.

Habitat, food and reproduction: Prefers sand dunes and areas of fine-grained sand to which it is well adapted, and which offer some protection from pursuit by man.

Status within the country: Indeterminate.

Conservation measures taken: Protected by law. May occur within Zellaf Nature Reserve (100,000ha) in the south-western desert. Global status is Endangered (IUCN 1996).

Conservation measures proposed: Aerial and ground surveys of areas of potential habitat should be carried out to establish its current status and distribution.

Dama Gazelle (*Gazella dama*)

Distribution and population: This has always been the rarest of the Libyan gazelles and it is known only from the far south of the country (Fig. 6.4) (Hufnagl 1972). No recent records were reported by Essghaier (1980), but a small number could conceivably survive in the extreme south.

Status within the country: Probably Extinct.

Conservation measures taken: Protected by law. Global status is Endangered (IUCN 1996).

Conservation measures proposed: Surveys are required to establish whether any dama gazelles still occur in the border areas of the far south. If so, they should be granted immediate protection.

References

De Beaux, O. 1928. Risultati zoologici della missione inviata dalla R. Società Geografica Italiana per l'esplorazione dell'oasi di Giarabub (1926–27). Mammiferi. *Annali del Museo Civico di Storia Naturale Giacomo Doria, Genova* 53:39–76.

East, R. 1992. Conservation status of antelopes in North Africa. *Species* 18:35–36.

East, R. 1999. *African antelope database 1998*. IUCN/SSC Antelope Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.

Essghaier, M.F.A. 1980. A plea for Libya's gazelles. *Oryx* 15:384–385.

Essghaier, M.F.A. and Johnson, D.R. 1981. Distribution and use of dung heaps by dorcas gazelle in western Libya. *Mammalia* 45:153–155.

Grettenberger, J.F. and Newby, J.E. 1990. Niger. Pp. 14–22 *in:* East, R. (Compiler). *Antelopes. Global survey and regional action plans. Part 3. West and Central Africa.* IUCN, Gland.

Hufnagl, E. 1972. *Libyan mammals*. Oleander Press, Stoughton, Wisconsin.

IUCN. 1992. *Protected areas of the world: A review of national systems, vol. 2. Palaearctic.* IUCN, Gland, Switzerland and Cambridge, UK.

IUCN. 1996. *1996 IUCN Red List of threatened animals.* IUCN, Gland, Switzerland and Cambridge, UK.

Kowalski, K. and Rzebik-Kowalska, B. 1991. *Mammals of Algeria*. Polish Academy of Sciences, Wroclaw.

Lavauden, L. 1920. *La chasse et la faune cynégétique en Tunisie*. Imprimerie Centrale, Tunis.

Le Houérou, H.N. 1991. Outline of a biological history of the Sahara. Pp. 147–174 *in:* McNeely, J.A. and Neronov, V.M. (Editors). *Mammals in the Palaearctic desert: Status and trends in the Sahara-Gobian region*. The Russian Academy of Sciences, the Russian Committee for the UNESCO Programme on Man and the Biosphere (MAB), Moscow.

Misonne, X. 1977. Mammifères du Jebel Uweinat, désert de Libye. *Annales du Musée Royal de l'Afrique Central, Tervuren* 217:1–33.

Osborne, D.J. and Helmy, I. 1980. The contemporary land mammals of Egypt (including Sinai). *Fieldiana Zoology, New Series* 5:1–579.

Setzer, H.W. 1957. A review of Libyan mammals. *Journal of the the Egyptian Public Health Association* 32:41–82.

Thomassey, J-P. and Newby, J.E. 1990. Chad. Pp. 22–28 *in:* East, R. (Compiler). *Antelopes. Global survey and regional action plans. Part 3. West and Central Africa.* IUCN, Gland.

Toschi, A. 1951. Mammiferi della Libia. *Ricerca Zoologia Appl. Caccia* 2: 137–177.

Wacher, T. 1997. *Large mammal survey: The Qattara Depression, Siwa and Wadi Riyan*. Unpublished report. Egyptian Environmental Affairs Agency, Cairo.

Chapter 7. Egypt

M.A. Saleh

Introduction

Egypt occupies the northeastern corner of Africa, north of latitude 22^0N and east of longitude 25^0E, and has a total area of about one million km^2. Except for the Mediterranean littoral and a few mountain peaks, where an arid climate prevails, the climate of Egypt is considered hyperarid with extremely meagre rainfall and intense heat and sunshine (Ayyad and Ghabbour 1986). The River Nile divides Egypt into two distinct geomorphological regions, the western flat expanse and the eastern dissected plateau (Ayyad *et al.* 1993). While the land to the east of the Nile forms one geomorphological region, it is divided geographically into the Eastern Desert and the Sinai Peninsula, separated by the Gulf of Suez (Fig. 7.1). West of the Nile, the Western or Libyan Desert extends from the narrow Nile Valley to the Libyan border, and from the Mediterranean Sea to the Sudanese border. This vast desert is mostly a flat and featureless rocky plateau, occupying more than two-thirds of the total land area of Egypt. The mountain massif of Gabal El Uweinat (1,907m) and the plateau of El Gilf El Kebeir (1,000m), both at the extreme southwestern corner of that desert, are the only exceptions to the flat topography. Numerous closed depressions (often with springs or near-surface, subterranean water) and saline lakes are scattered throughout the Western Desert. In some depressions, major oases such as Siwa, Bahariya, Farafra, Dakhla, and Kharga, and many smaller ones are found. The Western Desert is also characterised by extensive expanses of aeolian sand deposits, particularly in the Great Sand Sea, which is one of the largest sand-covered areas in the world.

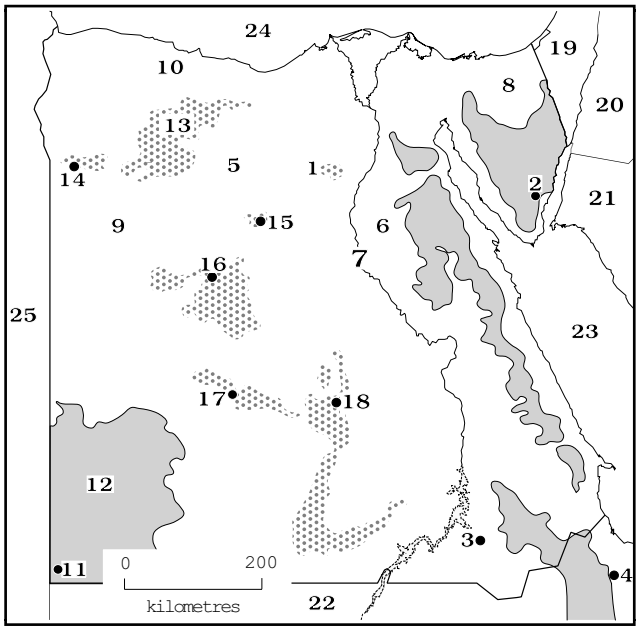


Fig. 7.1 Egypt. Protected Areas containing or recently containing antelopes: 1. Wadi El Raiyan (20,800ha); 2. Nabaq; 3. Wadi El Allaqi (27,500ha); 4. Gabal Elba (480,000ha). Geographical features and localities mentioned in the text: 5. Western Desert; 6. Eastern Desert; 7. Nile Valley; 8. Sinai Peninsula; 9. Great Sand Sea; 10. Mediterranean Coastal Desert; 11. Gabal Uweinat; 12. Gilf El Kebeir; 13. Qattara depression; 14. Siwa Oasis; 15. Bahariya Oasis; 16. Farfara Oasis; 17. Dakhla; 18. Kharga. Shaded areas indicate land over 500m. 19. Israel; 20. Jordan; 21. Saudi Arabia; 22. Sudan; 23. Libya; 24. Mediterranean Sea.

The northern part of the Western Desert, which extends 30–50km inland, is known as the Mediterranean Coastal Desert. This coastal belt receives an average annual precipitation of 100–150mm and supports a sparse, yet more or less continuous cover of desert vegetation (Saleh 1993a). South of the littoral belt, rainfall becomes progressively lower and, in some places, is virtually non-existent. Vegetation becomes rare and generally restricted to depressions where ground water is sufficiently close to the surface, or to the few wadis of the extreme southwestern highlands (Saleh 1993a). The vegetated depressions of the Western Desert represent isolated islands of life in a vast, lifeless desert.

The Eastern Desert extends from the Nile Valley eastwards to the Red Sea and the Gulf of Suez. Its dominant geomorphological feature is a backbone of rugged mountains of igneous and metamorphic rock, skirted on the north and west by limestone and sandstone plateaus. Gravel plains of varying width extend between these mountains and the Red Sea and Gulf of Suez. On the western side of the mountains, the inland desert extends to the Nile Valley. These mountains are drained by numerous wadis flowing either to the Red Sea or the Nile Valley.

Rainfall is very low throughout the Eastern Desert, but higher at the Gulf of Suez coastal area due to the orographic influence of the Red Sea coastal mountains (Ayyad *et al.* 1993), and vegetation is generally restricted to the drainage system. Orographic precipitation on some of the high peaks, however, provides sufficient moisture to create relatively lush, moist oases, the most notable of which is Gabal Elba at the extreme south.

The Sinai Peninsula is characterized by a narrow coastal belt similar to that of the Western Desert, followed by a wide expanse of sand-covered terrain extending southward for some 50km. Prior to construction of the Suez Canal, this plain formed a natural extension of the northern plain of the Eastern Desert. South of the northern plain, the rugged

Table 7.1 Current status of antelopes in Egypt.

Species	Status[1]	GPS[2]
Scimitar-horned Oryx (*Oryx dammah*)	Extinct	–
Addax (*Addax nasomaculatus*)	Extinct	–
Bubal Hartebeest (*Alcelaphus buselaphus buselaphus*)	Extinct	–
Mountain Gazelle (*Gazella gazella*)	Extinct	–
Dorcas Gazelle (*Gazella dorcas*)	Vulnerable	<10%
Slender-horned Gazelle (*Gazella leptoceros*)	Endangered	?

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

central part of the Peninsula is made of an extensive limestone plateau, which is drained by numerous, mostly northward-flowing wadis. The southern third of the Peninsula is dominated by steep mountains of igneous and metamorphic rocks. Rocky wadis drain these mountains eastwards into the Gulf of Aqaba and westwards into the Gulf of Suez. The Mediterranean coastal desert of the Sinai and the northern plains receive relatively higher rainfall, and thus support a sparse, but more or less continuous vegetation cover. In central and southern Sinai, vegetation is mostly restricted to drainage channels.

Current status of antelopes

Six species of antelopes were recorded from Egypt during the first half of this century (Osborn and Helmy 1980; Saleh 1993b). Four of these are now extinct, one of the two surviving species is endangered, and the other is vulnerable (Table 7.1). In addition to these six species, Talbot (1960) said that Arabian oryx (*Oryx leucoryx*) occurred in Sinai around 1800, but there are no confirmed specimens from this area. Egypt's antelopes have suffered a great reduction in numbers and range over the last 20 years. The most important and direct cause of this decline is uncontrolled hunting. Several laws prohibit the hunting of wild antelopes in Egypt, but these laws have never been enforced. Antelopes are, and have for many years been, freely hunted throughout the country at all seasons and in any numbers. Animals of all age groups and of both sexes are hunted. Illegal hunting of antelopes in Egypt has reached an unprecedented scale in the last few years. Military-style hunting expeditions from the Gulf states have been allowed into Egypt during autumn and winter. Equipped for extended desert travel, some of these expeditions include over 40 off-road vehicles, trucks, freezers, generators, and supplies to last for several weeks. They penetrate to the most remote areas of the desert and have devastating effects on wildlife wherever they go. Gazelles have been wiped out from most of the Western Desert as a direct result of the activities of these hunting expeditions.

Another factor contributing to the fast and catastrophic decline of antelopes in Egypt is commercial exploitation. Large numbers of gazelles and other species, such as ibex (*Capra ibex*), are trapped and sold locally or exported. Stuffed gazelles, ibex, and many other mammals, and their horns or skins are openly sold throughout the country and are often exported. The Egyptian Government, however, has made little effort to stop this activity until recently.

Habitat loss plays a less significant role in the decline of antelopes in Egypt. The development of some uninhabited oases and of the Mediterranean coastal belt has deprived gazelles of some of their natural habitats, but this does not appear to be the main factor to blame for the decline of these animals.

At the present time, Egyptian antelopes are restricted to the most remote and inaccessible areas and survive in very small and fragmented populations. Most of these populations, whether inside or outside protected areas, are subjected to severe hunting pressure. With no actions taken to protect these animals, the total extinction of at least the endangered slender-horned gazelle (*Gazella leptoceros*) is probable.

Conservation measures taken

Hunting of all antelope species in Egypt is prohibited by law. However, the law is not enforced and wild antelopes are regularly hunted at all seasons and throughout the country, including most of the protected areas. In addition, the local trade in and export of wild antelopes and their products, although also illegal, has always continued uninterrupted until very recently.

According to the 1994 Environmental Protection Law, the Egyptian Environmental Affairs Agency (EEAA) is the governmental authority responsible for the protection of wildlife. The Protected Areas Department of that agency is responsible for the management of wildlife resources both inside and outside protected areas, and for co-ordination of efforts to enforce wildlife protection laws with law enforcement agencies. That department, however, is severely under-staffed and under-funded. No plans have been developed by the Protected Areas Department to control hunting of wild antelopes. Prior to the issuing of the Environmental Protection Law, wild antelopes were protected by a series of

decrees issued by the Minister of Agriculture, and the Ministry of Agriculture was the responsible authority for the enforcement of these decrees. Until recently, however, efforts have not been made by that agency to combat illegal hunting of antelopes. The EEAA has now taken on a more positive role and, together with the recently formed Environmental Police, has taken measures to combat the illegal trade in wildlife by raiding bazaars and tourist shops and confiscating skins and stuffed animals. In February 1997, the EEAA also refused permission for a large Saudi party to hunt in the Western Desert (Hoath 1997).

At the present time, Egypt has 16 protected areas, but these were not developed within a system plan framework and none was established specifically for the protection of wild antelope species. Although many of the present protected areas contain antelopes, most of the present populations are found outside declared protected areas, including Egypt's entire population of the endangered slender-horned gazelle (*Gazella leptoceros*). Gabal Elba/Bir Abraq Protected Area (480,000ha) in southeastern Egypt, the largest protected area in the country, contains the largest number of dorcas gazelles of all protected areas in Egypt. However, the area has no actual protection or management at all, and wild animals, including the very rare Barbary sheep (*Ammotragus lervia*), are relentlessly hunted there. Wadi El Allaqi Biosphere Reserve (27,500ha), located in the southern part of the Eastern Desert, appears to contain the largest population of dorcas gazelles now under effective protection in Egypt. The exact size of that population, however, is not known. Very small populations of dorcas gazelles are also found in Wadi El Raiyan (20,00ha) and Nabaq protected areas, but both areas currently receive only limited management and protection.

Several NGOs are active in antelope conservation in Egypt, mostly in the area of public awareness, particularly the mobilization of public opinion against visiting hunting parties. Several journalists have carried out active campaigns against antelope hunting in several national newspapers. The issue was even a subject of parliamentary inquiry to the government in 1994. However, permits continue to be issued to these visiting hunting campaigns by high government officials on political grounds, against the advice of the EEAA.

Conservation measures proposed

The two main threats facing wild antelopes in Egypt are hunting and commercial exploitation, which are both prohibited by law. Effective enforcement of the law is, therefore, a key necessity to save the remaining antelope populations. In addition, practices such as the chasing of gazelles with vehicles, or preventing ibex from drinking at water-holes reserved for camels or other livestock in particularly dry years, should be prohibited. It is also necessary to develop and implement a species management plan for each of these threatened species, which may include the establishment of special sanctuaries or captive breeding. Special sanctuaries are particularly needed for the highly threatened species such as slender-horned gazelle (*Gazella leptoceros*), whose entire population in Egypt currently occurs outside protected areas. Captive breeding of this endangered species is also necessary. Protection and management of present protected areas, such as Gabal Elba/Bir Abraq, should be made effective.

Species accounts

Scimitar-horned Oryx (*Oryx dammah*)

Distribution and population: Formerly inhabited most of the Western Desert. Localities where it has been recorded include Siwa and Kharga Oases, El Faiyum area, western Giza, and Wadi El Natrun (Fig. 7.2). The last live individual in Egypt was seen in 1975 near the Siwa road, 130km south of Matruh (Osborn and Helmy 1980). Extensive searches of former habitat of this species and numerous inquiries to local bedouins did not result in any evidence of its recent occurrence, and the species is now extinct in Egypt (Saleh 1993b).

Habitat, food and reproduction: Apparently inhabited vegetated depressions and oasis-like habitats in the Western Desert. No information is available on the biology of this species in Egypt.

Status within the country: Extinct.

Conservation measures taken: None. Global status is Extinct in the Wild (East 1999).

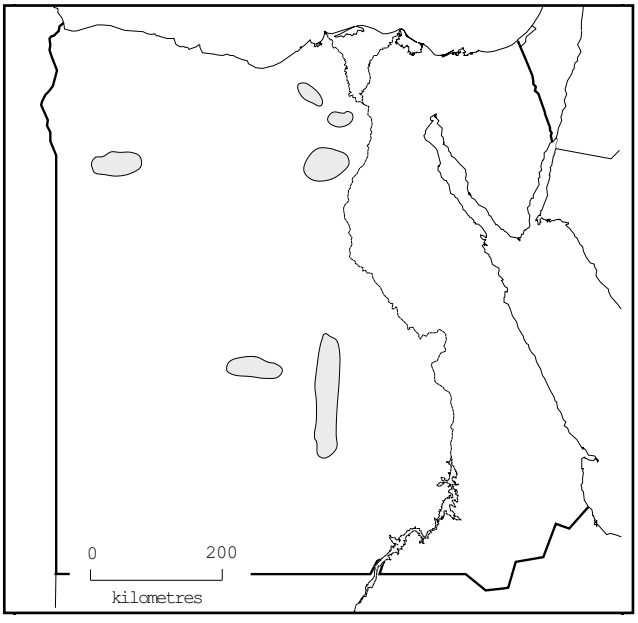


Fig. 7.2 Former distribution of scimitar-horned oryx *(Oryx dammah)* in Egypt (shaded).

Conservation measures proposed: Some of the former habitats of this species are now under protection and a reintroduction programme should be considered.

Addax (*Addax nasomaculatus*)

Distribution and population: Formerly ranged periodically over most of the Western Desert, depending on the availability of food (Osborn and Helmy 1980). Localities where it has been recorded include the Mediterranean coastal belt, north of El Faiyum; oases of middle and upper Egypt; south of Beni Suef; El Gilf El Kebeir; Bir Tarfawi; Minqar Abu Dweiss in the Qattara Depression; Mariut District west of Alexandria; Bir Dibbis; and Uweinat (Osborn and Helmy 1980) (Fig. 7.3). Most of these localities were investigated recently, but no evidence for the recent presence of the species was found (Saleh 1993b). Osborn and Krombein (1969) suggested that the El Uweinat area is presently the most likely to be visited by addax grazing northwards. However, addax is regarded as endangered in Sudan and there may no longer be a resident population in the country (Hillman and Fryxell 1988).

Habitat, food and reproduction: Formerly inhabited the Mediterranean coastal belt and vegetated depressions of the Western Desert. Nothing is known about its biology in Egypt.

Status within the country: Extinct.

Conservation measures taken: None. Global status is Critically Endangered (East 1999).

Conservation measures proposed: Reintroduction into suitable protected habitat should be considered.

Bubal Hartebeest (*Alcelaphus buselaphus buselaphus*)

Distribution and population: Formerly distributed over most of the Western Desert. Reported localities included the western Mediterranean coastal desert, El Bahrain, west of Lake Qarun (possibly Wadi El Raiyan), and Siwa (Osborn and Helmy 1980) (Fig. 7.4). Extensive searches of these and other localities provided no evidence of the recent presence of this species in Egypt (Saleh 1993b).

Habitat, food and reproduction: Formerly inhabited oases, oasis-like depressions, and the Mediterranean coastal belt of the Western Desert. Nothing is known about its biology in Egypt.

Status within the country: Extinct.

Conservation measures taken: None. Global status of this subspecies is Extinct and of the species *A. buselaphus* Lower Risk/conservation dependent (IUCN 1996).

Conservation measures proposed: Bubal hartebeest exists neither in the wild nor in captivity. Other subspecies of the common hartebeest (*A. buselaphus*) should be considered for reintroduction into suitable protected habitat.

Dorcas Gazelle (*Gazella dorcas*)

Distribution and population: Widely distributed in arid and hyperarid areas of Egypt, including the deserts west and east of the Nile and the Sinai Peninsula (Osborn and Helmy 1980). The species was numerous throughout the country up to the early 1980s, but it has since suffered a catastrophic decline as a result of hunting and, to a lesser extent, habitat

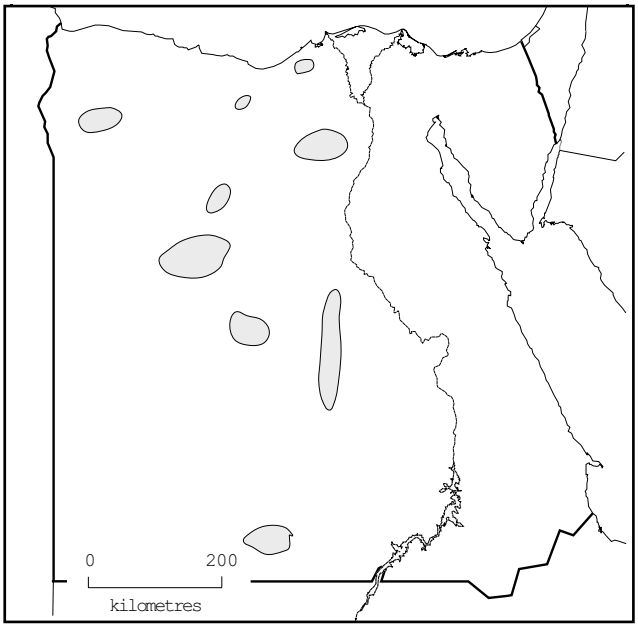


Fig. 7.3 Former distribution of addax *(Addax nasomaculatus)* in Egypt (shaded).

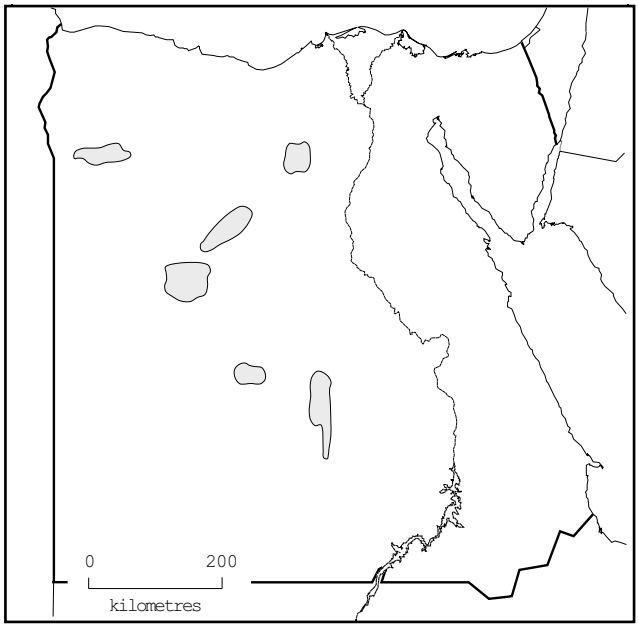


Fig. 7.4 Former distribution of bubal hartebeest *(Alcelaphus b. buselaphus)* in Egypt (shaded).

destruction (Saleh 1987; 1993b). The present population in Egypt is estimated to total 1,000–2,000 animals, and is rapidly decreasing. Wacher (1996) reported recent sightings of gazelles in Wadi Salf, Sinai that were probably this species. Wacher (1997) reported tracks and sightings from the northern, southern, and western edges and the floor of the Qattara Depression in 1996. Current distribution in Egypt is shown in Fig. 7.5.

Habitat, food and reproduction: In the Western Desert, it inhabits oasis-like depressions and formerly the Mediterranean coastal belt. It is also found in wadis of Gabal El Uweinat and El Gilf El Kebeir in the extreme southwest. In the Eastern Desert and Sinai, it is restricted to isolated wadis and vegetated coastal plains of the Red Sea and the Gulfs of Aqaba and Suez (Osborn and Helmy 1980; Saleh 1987; 1993a; 1993b). Several desert plants are eaten by this gazelle. In the Western Desert, the thorny *Alhagi maurorum* and leaves and fruits of *Nitraria retusa* and *Calligonum commosom* are the staple foods (Saleh and Salem, in press). Other plants taken by this gazelle are *Acacia raddiana, Molkiopsis ciliata, Anabasis articulata, Citrullus colocynthis, Convolvulus lanatus, Stragulus spinosus,* and *Suaeda* spp. (Osborn and Helmy 1980). In the Eastern Desert and Sinai, dorcas gazelles browse upon *A.raddiana, A. ehrenbergiana, N.retusa, Psoralea plicata, Astragulus vogelii,* and several other desert plants (Osborn and Helmy 1980).

Status within the country: Vulnerable. The species is declining throughout the country as a result of uncontrolled hunting (Saleh 1987; 1993b).

Conservation measures taken: Hunting this gazelle is prohibited by law, but enforcement is totally lacking. A small portion of the total population is found within protected areas. Most of these protected areas, however, are not adequately protected and poaching is commonplace. Global status is Vulnerable (East 1999).

Conservation measures proposed: Enforcement of existing law prohibiting gazelle hunting is essential. More stringent management of protected areas is also necessary.

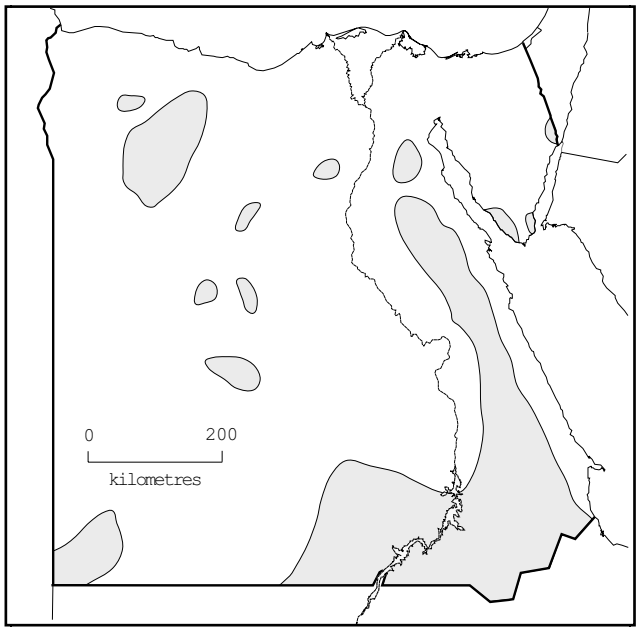


Fig. 7.5 Current distribution of dorcas gazelle *(Gazella dorcas)* in Egypt (shaded).

Photo 7.1 Dorcas Gazelle *(Gazella dorcas).* Khushal Habibi.

Mountain Gazelle (*Gazella gazella*)

Distribution and population: Formerly occurred in the northeastern and possibly central parts of the Sinai Peninsula, including Wadi El Arish and its tributaries (Flower 1932; Osborn and Helmy 1980) (Fig. 7.6), but it now appears to be extinct (Saleh 1993b). Wacher (1996) reported some recent sightings of gazelles from south Sinai, and considered the remote possibility that mountain gazelles might survive in suitable habitat there.

Habitat, food and reproduction: Appears to have inhabited the coastal plains of northern Sinai. Nothing is known about its biology in Egypt.

Status within the country: Extinct. The last report of this species in Egypt was by Flower (1932).

Conservation measures taken: None. Global status is Lower Risk/conservation dependent (IUCN 1996).

Conservation measures proposed: Studies are now in progress for establishing a new protected area in Gabal El Maghara, Yallaq, and El Halal in northern Sinai, an area that was possibly inhabited by this gazelle in the past. The reintroduction of mountain gazelles into this protected area should be considered.

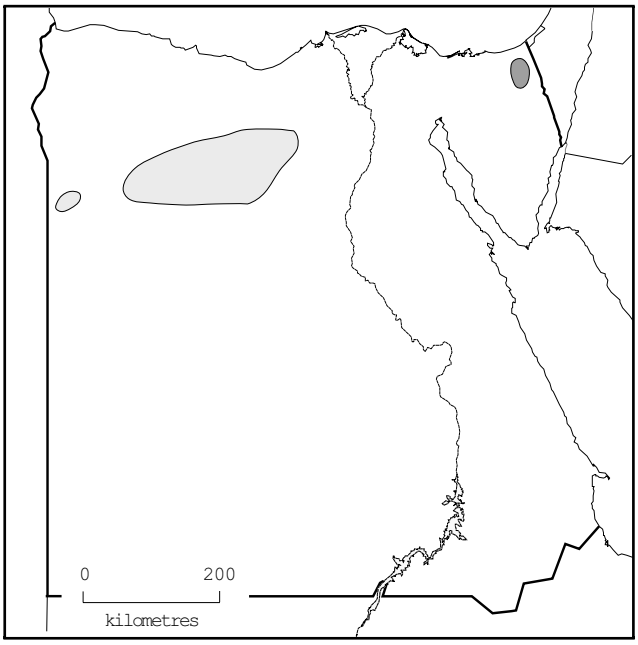


Fig. 7.6 Current distribution of slender-horned gazelle *(Gazella leptoceros)* in Egypt (light shading) and former distribution of mountain gazelle *(G. gazella)* (dark shading).

Slender-horned Gazelle (*Gazella leptoceros*)

Distribution and population: Formerly occupied the northern part of the Western Desert, south of the Mediterranean coastal belt, and possibly the vicinity of Gabal El Uweinat (Osborn and Helmy 1980). A small population was found in the Wadi El Raiyan Protected Area up to the late 1980s (Saleh 1987), but it has since been killed by hunters. Wacher (1997) found abundant tracks and observed four individuals around Lake Shiyata, west of Siwa, in 1997, and said the species had been reported in Wadi Raiyan during the last 10 years. The current population size of this species in Egypt is unknown, but it appears to be very small and scattered in groups of very few individuals over a great area of the desert (Saleh, 1989; 1993b). Figure 7.6 shows the approximate limits of the area where this species has been reported during the last decade.

Habitat, food and reproduction: Inhabits hyperarid desert areas, particularly sandy depressions with sparse desert vegetation and isolated groves of *Acacia raddiana* (Osborn and Helmy 1980; Saleh 1987; 1989; 1993a; Saleh *et al.* 1988). The species appears to be highly nomadic, moving from one desert depression to another, crossing vast areas of flat, open desert, where it can be highly vulnerable to hunters in vehicles. It is a browser, feeding mostly on *A. raddiana, Nitraria retusa, Calligonum caumosum, Cornulaca monocantha,* and *Pituranthos tortuosus* (Osborn and Helmy 1980). Calving occurs in winter and early spring, when one, but sometimes two young are born after a gestation period of about 167 days (Flower 1932).

Status within the country: Endangered. The current population is very small and is scattered over a vast area entirely outside the present system of protected areas in Egypt (Saleh 1987; 1989; 1993b). Because of its rarity, it is relentlessly sought by trophy hunters.

Conservation measures taken: Hunting this species is prohibited by law; however, the law is not enforced. The small population formerly found in Wadi El Raiyan was exterminated by hunters immediately prior to the area being given protected status. Global status is Endangered (IUCN 1996).

Conservation measures proposed: Strict enforcement of the law prohibiting hunting of gazelles is essential. In addition, the establishment of a special reserve at an appropriate locality and the relocation of the few remaining individuals now scattered over a very large area into that reserve would greatly improve the chances of survival of the species in Egypt. Captive breeding might also be necessary in view of the very small population now remaining.

References

Ayyad, M., Kassas, M., Springuel, I., and Zahran, M. 1993. Plant ecology. *Publications of National Biodiversity Unit, Cairo* 1*:*7–62.

Ayyad, M. and Ghabbour, S. 1986. Hot deserts of Egypt and the Sudan. Pp. 149–202 *in:* Evenari, M., Noy-Meir, I., and Goodall, D. (Editors). *Ecosystems of the world, Vol. 12B. Hot deserts and arid shrublands*. Elsevier, Amsterdam.

East, R. 1998. *African antelope database 1998*. IUCN/SSC Antelope Specialist Group Report, Gland, Switzerland and Cambridge UK.

Flower, S. 1932. Notes on the recent mammals of Egypt, with a list of the species recorded from that kingdom. *Proceedings of the Zoological Society of London* 1932:368–450.

Hillman, J.C. and Fryxell, J.M. 1988. Sudan. Pp. 5–16 *in:* East, R. (Compiler). *Antelopes: Global survey and action plans. Part 1. East and Northeast Africa.* IUCN, Gland.

Hoath, R. 1997. Eco-police finally bust the bazaars. *BBC Wildlife* 15(4):52.

IUCN, 1996. *1996 IUCN Red List of threatened animals.* IUCN, Gland, Switzerland and Cambridge, UK.

Osborn, D.J and Helmy, I. 1980. The contemporary land mammals of Egypt (including Sinai). *Fieldiana Zoology, New Series* 5:1–579.

Osborn, D. and Krombein, K. 1969. Habitats, flora, mammals, and wasps of Gebel 'Uweinat, Libyan Desert. *Smithsonian Contributions to Zoology* 11:1–18.

Saleh, M. 1987. The decline of gazelles in Egypt. *Biological Conservation* 39:83–95.

Saleh, M. 1989. The imminent extinction of the slender-horned gazelle *Gazella leptoceros leptoceros*. *The Fifth International Theriological Congress, Rome* 1989: 713.

Saleh, M. 1993a. Habitat diversity and land vertebrates of Egypt. *Publications of National Biodiversity Unit, Cairo* 1:66–131.

Saleh, M. 1993b. Threats facing wildlife in Egypt. Pp. 1–17 *in: Proceedings of the International Conference on National Parks and Sustainable Development*, Sharm El Sheikh, Egypt.

Saleh, M., Saber, S., and Salem, M. 1988. The structure of the sand dune ecosystem of Wadi El Raiyan, Egypt. *Journal of Arid Environments* 15:283–295.

Saleh M. and Salem, M. (in press). Feeding ecology of the dorcas gazelle *Gazella dorcas* in a sand dune ecosystem.

Talbot, L.M. 1960. A look at threatened species. *Oryx* 5:240–247.

Wacher, T. 1996. Large mammal survey: St Katherine's Protectorate, South Sinai. Unpublished report. Egyptian Environmental Affairs Agency, Cairo.

Wacher, T. 1997. Large mammal survey: The Qattara Depression, Siwa and Wadi Riyan. Unpublished report. Egyptian Environmental Affairs Agency, Cairo.

Chapter 8. Saudi Arabia

K.M. Dunham, D.T. Williamson, and E. Joubert

Introduction

Saudi Arabia occupies most of the Arabian Peninsula (Fig. 8.1) and covers an area of 2.3 million km^2. It is often assumed to consist of nothing but an empty expanse of sandy desert, but it is more diverse than is usually appreciated, both in terms of landscape and biodiversity. Landscape diversity includes the Red Sea coastal plain (*tihamah*); high mountains of the west, such as the Asirs with peaks over 3,000m above sea level; basaltic lava fields (*harrah*); the dunes of the great Nafud Desert in the north; the sand sea of the Rub al Khali (Empty Quarter) that occupies much of the south; sedimentary escarpments such as the Jabal Tuwayq; and the coastal flats of the Arabian Gulf. Biodiversity is positively influenced by landscape diversity and the region's location at the intersection of three biogeographic zones, but is negatively influenced by climate. Annual rainfall is generally <100mm, and the combination of low rainfall and high temperatures provides harsh conditions for terrestrial plants and animals in most places. In the southwest and in the high mountains, rainfall is greater, and plant diversity and biomass are both higher. The human population of Saudi Arabia now numbers 17,119,000 and is currently growing at or around the biological maximum. The population has doubled three times since the 1930s, when it was about 1.5 million. Economic growth has been even more spectacular and Saudi Arabia has changed enormously since the early 1970s. A vast inflow of oil revenue has provided the means to construct a modern infrastructure with extraordinary speed and has led to a radical increase in the scope and intensity of human activity. Consequently, the country has experienced very widespread and intense environmental disturbance in recent decades.

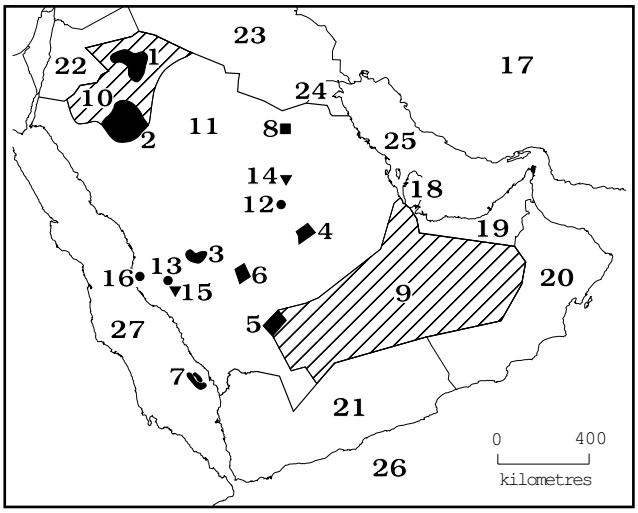


Fig. 8.1 Saudi Arabia. Protected Areas containing antelopes: 1. Harrat al Harrah (1,377,500ha); 2. Al Khunfah (3,422,500ha); 3. Mahazat as-Sayd (224,400ha); 4. Ibex Reserve (236,900ha); 5. Uruq Bani Ma'arid (550,000ha); 6. Majami Al Hadb (340,000ha); 7. Farasan Islands (60,000ha); 8. Hafar Al Batin. Non-Hunting Zones: 9. Rub Al Khali (64,000,000ha); 10. Northern (10,087,500ha). Geographical features and localities mentioned in the text: 11. Nafud; 12. Riyadh; 13. Taif; 14. King Khalid Wildlife Research Centre; 15. National Wildlife Research Centre; 16. Jeddah. 17. Iran; 18. Qatar; 19. UAE; 20. Oman; 21. Yemen; 22. Jordan; 23. Iraq; 24. Kuwait; 25. Arabian Gulf; 26. Arabian Sea; 27. Red Sea.

Current status of antelopes

Antelope species recorded in Saudi Arabia (Table 8.1) are: Arabian oryx (*Oryx leucoryx*), Saudi gazelle or *afri* (*Gazella saudiya*), mountain gazelle or *idmi* (*G. gazella*), and Arabian sand gazelle or *reem* (*G. subgutturosa marica*) (Harrison and Bates 1991; Habibi 1992). The Arabian gazelle (*G. arabica*) was described from the skull and skin of a single specimen, reputedly obtained from the Farasan Islands, but this animal is unlike the gazelles which currently inhabit the islands (Thouless *et al.* 1991). The origin of this specimen is doubtful and the gazelles now on the Farasan Islands are regarded as *G. gazella* (Thouless and Al Bassri 1991). A single specimen of lesser kudu (*Tragelaphus imberbis*) was shot in Saudi Arabia about 1968 (Büttiker 1982), but private collections of captive antelopes are common in Saudi Arabia and often contain animals imported from across the Red Sea. In the absence of any other evidence that this species is native to Saudi Arabia, it seems probable that this specimen of lesser kudu had escaped from such a collection. The distribution and conservation status of gazelles in Saudi Arabia were comprehensively reviewed by Thouless *et al.* (1991), and gazelle distribution in Arabia has also been reviewed by Harrison and Bates (1991). These publications make the best of the available information, but given the paucity of historical information and the scale and intensity of recent disturbance, it is difficult to see how a clear picture of former gazelle distribution and abundance can ever be constructed. For instance, it is far from clear how many gazelle species and subspecies occurred in the country. Relict populations are now isolated and widely scattered, and so the relationships between them are unclear. This creates severe problems for taxonomy, which will need sophisticated research and analyses to solve.

Table 8.1 Current status of antelopes in Saudi Arabia.

Species	Status[1]	GPS[2]
Arabian Oryx (*Oryx leucoryx*)	Endangered	76%
Saudi Gazelle (*Gazella saudiya*)	Extinct	–
Mountain Gazelle (*G. gazella*)	Vulnerable	5–6%
Arabian Gazelle (*G. arabica*)	Extinct	–
Arabian Sand Gazelle (*G. subgutturosa marica*)	Vulnerable	35% (of *G. s. marica*)

[1]*See Chapter 1 for definition of status categories.*
[2]*Global population share*

Several gazelle subspecies have been described for the region, mainly on the basis of museum skins and skulls (Groves 1989; 1996). The Farasan Island gazelles were described as *Gazella gazella farasani* on the basis that they were smaller and their coats more grey, and the females almost hornless when compared with mainland *G. gazella* (Thouless and Al Bassri 1991). Mainland *idmi* gazelles are generally regarded as *G. g. cora*, which is supposedly differentiated from *G. g. gazella* of Palestine by its lighter-coloured coat and face and more outbowed horns (Groves 1989). It is not known where the geographic dividing line between *G. g. cora* and *G. g. gazella* occurs, because these subspecies were described in the absence of *G. gazella* specimens from northern Saudi Arabia, the area that lies between the reported geographic ranges of the two subspecies (Thouless *et al.* 1991). *G. g. erlangeri* is smaller and stockier, and has a much darker coat than either *G. g. cora* or *G. g. gazella* (Greth *et al.* 1993). Captive *G. g. erlangeri* in Saudi Arabia apparently originate from Yemen and there is no evidence that this subspecies occurs naturally in Saudi Arabia, although the possibility that its range does, or did include a small area south of Najran near the Saudi Arabia/Yemen border (Magin and Greth 1994) cannot yet be ruled out. Legitimate doubts can be raised about some of these subspecies of *G. gazella*. Until taxonomic issues have been resolved, there is little point in using scanty data to describe the status of uncertain taxa that have a high probability of changing. Gazelle taxonomy is currently one subject of research at King Khalid Wildlife Research Center, near Riyadh, and the Zoological Society of London, using up-to-date cytogenetic and molecular genetic techniques; thus, greater clarity of gazelle taxonomy at the subspecies level can be expected as this research progresses.

Saudi gazelle or *afri* (*G. saudiya*) has caused great confusion, to the point where it is not even clear whether the word "*afri*" refers to one or two species. One source of confusion is the result of cytogenetic research on animals in three collections in the Gulf states: Al-Areen Wildlife Park in Bahrain, Al Ain Zoo and Aquarium in the United Arab Emirates, and the Al-Wabra estate in Qatar. The animals in all three collections are said to be *afri*, but those from Al-Wabra are karyotypically very different from those in the other two collections. The Al-Wabra animals have similar karyotypes to those of African dorcas gazelle (*G. dorcas*), while those from the other two collections have variable karyotypes, which most closely resemble those of the chinkara or Indian gazelle *G. bennettii* (Kumamoto *et al.* 1995). Recent DNA profiling has suggested that the gazelles identified as *G. saudiya* at Al-Areen Wildlife Park may be hybrids with *G. bennettii* (Rebholz and Harley 1997). It is claimed that the founders of the Al-Wabra group were obtained in Saudi Arabia, but the origins of the groups in the other two collections are unknown. Taxonomic problems also exist in relation to important private collections of captive animals. On the positive side, these collections contain genetic resources that would otherwise have been lost. On the negative side, their unscientific management has resulted in hybridization and inbreeding, which reduce the conservation value of the stock. These collections have played an important role in providing breeding stock for the International Arabian Oryx Programme and they have the potential to contribute much to gazelle conservation as well, although not without a good deal of work to sort out taxonomic and genetic problems.

Two forms of human activity have had special relevance to antelope conservation, namely livestock husbandry and hunting. The environmental impact of livestock, mainly sheep and camels, has increased drastically because their numbers have soared and the area grazed by them has greatly expanded. Government subsidies and incentives encouraged people to increase herd sizes, and the availability of vehicles enabled people to feed and water their animals anywhere and to move them to any place where grazing became available after rain. It is hardly an exaggeration to say that the range became a giant feedlot, where animals grazed whatever wild plants were available until they were finished, and were then fed with subsidised barley and watered with tankers financed by oil money. Not surprisingly, widespread range degradation has occurred with detrimental effects for antelopes dependent on these areas.

The impact of hunting has been more direct and more severe. Since the World War II, the numbers of vehicles and firearms have increased by several orders of magnitude and the practice of motorised hunting has become extremely widespread. This involves pursuing animals until they are immobilized by exhaustion and then shooting them. This form of hunting has had a devastating impact on antelope populations in many semi-arid and arid environments,

because there is literally no place for the animals to hide. The full extent of the damage caused by hunting will never be known because the pre-disturbance situation was poorly and patchily documented. What is abundantly clear is that all species of Arabian antelopes have been drastically affected by hunting and habitat degradation. These factors caused the extinction of Arabian oryx in the wild. The Saudi gazelle is almost certainly extinct in the wild and the other two species, Arabian sand gazelle and mountain gazelle, have been reduced to a few relict populations.

Conservation measures taken

There are at least three agencies with the potential to influence conservation in Saudi Arabia: the Meteorology and Environment Protection Agency, the Ministry of Agriculture, which administers the Asir National Park and also is responsible for range management throughout the country, and the National Commission for Wildlife Conservation and Development (NCWCD). In practice, NCWCD has done all the work which affects antelope conservation. Since its inception during 1986, NCWCD has made impressive progress in setting up a national conservation programme. It has a secretariat in Riyadh, which administers the organisation and also runs an energetic and well-resourced public information and education programme that produces printed material and good-quality videos. The secretariat also administers two research facilities, the National Wildlife Research Center (NWRC) near Taif and the King Khalid Wildlife Research Center (KKWRC) near Riyadh, and a growing network of protected areas (Fig. 8.1). NCWCD has issued a draft Memorandum of Understanding for Cross-Border Ungulate Conservation to aid discussion of regional issues in conservation of oryx and other ungulates (Ostrowski *et al.* 1998).

NWRC is responsible for the captive-breeding and reintroduction of oryx, while KKWRC is responsible for the captive-breeding, reintroduction, and conservation of gazelles. After a difficult start, NWRC's oryx programme has been very successful. Breeding stock was obtained mainly from King Khalid's collection at Thumamah near Riyadh. NWRC was initially confronted with a severe problem with tuberculosis in the herd and also major management difficulties because of the complete absence of pedigree information on most of the animals. Both problems were rigorously addressed and successfully overcome, and the greatest difficulty in the future lies in finding areas in which captive-bred animals can be reintroduced. For details of the oryx captive-breeding project in Saudi Arabia, see Ostrowski *et al.* (1998). At KKWRC there were similar problems with tuberculosis amongst the gazelles and other management difficulties, including a lack of pedigree information and taxonomic uncertainties. These problems have also been overcome and, by early 1990, the centre was making gazelles available for reintroduction. The success of captive-breeding programmes for oryx and gazelles would not have been possible without a large investment by NCWCD in animal accommodation, sophisticated laboratory equipment, suitably trained staff (mainly expensive expatriates), and expert guidance from consultants. NCWCD has also supported field surveys, both by its own staff and by consultants, to establish the status of gazelles in the wild. Given the size of the country, this is an immense task which has yet to be completed. It has been facilitated by appealing successfully to the public on national television and in the press for information about surviving populations of gazelles.

Planning of a protected area network was supported by IUCN and involved production of a well-documented and rigorously formulated systems plan (Child and Grainger 1990). The plan envisages a network of more than 100 reserves and provides an excellent basis for future development. By 1997, the Ministers' Council had approved 15 terrestrial and marine areas for protection. These NCWCD protected areas are mostly controlled hunting reserves in which hunting has been banned. All the established protected areas which contain antelopes are staffed with rangers who are responsible for enforcing the hunting ban, but most of the more recently approved protected areas are unstaffed at present. In 1995, the entire Rub al Khali (64,000,000ha) was declared a non-hunting zone and, subsequently, a northern non-hunting zone was also designated (Fig. 8.1). From the standpoint of antelope conservation, the most important protected areas are: Harrat al-Harrah (1,377,500ha, established 1987) and Al-Khunfah (3,422,500ha, established 1987), both located in the north of the country; the Ibex Reserve (236,900ha, established 1988) at Howtah Bani Tamim near Riyadh; Mahazat as-Sayd (224,400ha; established 1988) near Taif; the Farasan Islands (60,000ha, established 1989); and Uruq Bani Ma'arid (550,000ha, established 1994). Harrat al-Harrah, in an area of basaltic lava fields, and Al-Khunfah lie to the north and west of the Nafud sand desert. The Ibex Reserve protects part of the Jabal Tuwayq Escarpment and includes a number of magnificent wadi systems lined with tall limestone cliffs. Mahazat as-Sayd was formerly a hunting area and is unique in being fenced along its entire boundary. The Farasan Islands are situated in the Red Sea, off the southwestern corner of Saudi Arabia. Uruq Bani Ma'arid is on the western edge of the Great Sand Sea of the Rub al Khali and includes superb dune landscapes. Oryx and gazelle reintroductions are already taking place in established protected areas.

Several negative trends in the status of antelopes have been effectively reversed by the energetic and well-supported conservation measures implemented by NCWCD. Given the continuation of NCWCD's programmes, it is reasonable to expect that the status of antelopes in the areas under its control or influence will continue to improve. As far as antelopes are concerned, a problem with NCWCD protected areas is that only the fenced Mahazat as-Sayd Reserve is protected from grazing by do-

mestic livestock, and antelopes in all other protected areas compete for food with domestic livestock. In the country at large, serious problems, such as the status of relict gazelle populations, remain unresolved, but it is not unrealistic to hope for wider acceptance by the public of conservation policies and goals. This could lead to a gradual improvement in the status of antelopes outside protected areas.

Conservation measures proposed

One of the most interesting issues in gazelle conservation in Arabia is the future role of captive animals. Because all gazelle species have been radically depleted in the wild, the role of the substantial numbers of captive animals in restoring free-ranging populations could vary from being important, in the case of *G. subgutturosa marica*, to being absolutely essential in the case of *G. saudiya*. The role that captive animals will actually have in restoring free-ranging populations will depend on how idealistic or pragmatic attitudes are and on whether the problems associated with captive animals can be successfully overcome. Decisions have to be made in restoration projects as to whether it is better to make use of animals already in captivity, even if there are questions about their origins and taxonomic status, or whether it is better to capture wild animals and start new captive populations for eventual replenishment of wild populations. Common problems which have to be overcome when working with captive animals are ignorance about their origins and pedigree, and lack of genetic variability due to inbreeding or an inadequate number of founders. On the other hand, determining the taxonomic status of animals of unknown origin can be a very difficult problem. This is one context in which modern cytogenetic and molecular genetic techniques are likely to prove of great value. Application of such techniques is warranted because captive populations may serve as a repository of genetic material that has been lost in the wild.

Good management of captive stocks requires a sophisticated understanding and application of the principles of taxonomy and genetic management, which cannot realistically be expected from the many private animal collections in the Gulf region. Because many of these collections could contain valuable genetic resources for gazelle conservation, there is an urgent need to devise ways of screening them, and encouraging and assisting their owners to maintain the conservation value of the animals in their custody.

Although the role of captive-breeding in gazelle conservation is important and interesting, it is vital to remember that there are compelling reasons for giving priority to *in situ* conservation of surviving free-ranging populations. In particular, the extent to which biodiversity can be replenished by reintroduction and restoration is subject to financial, practical, and theoretical limits, which preclude the possibility of ever recreating the past. Protecting intact habitats and their resident fauna is, therefore, not only the most efficient way of conserving diversity, but also the only defence against its continuous erosion. This makes it imperative to give more priority to protecting surviving wild populations, even though this is more difficult than working in areas under NCWCD's control. Working outside protected areas will require the deployment of innovative measures such as the community game guard programme proposed by Magin and Greth (1994). Although hunting of gazelles is illegal throughout the country, at present no serious attempt is made to enforce this law except in NCWCD protected areas.

Species Accounts

Arabian Oryx (*Oryx leucoryx*)

Distribution and population: Arabian oryx formerly occurred over most of Saudi Arabia, except in the western mountains. They survived longest against the onslaught of modern man in the sandy deserts of the Rub al Khali and the Nafud. By the 1960s, oryx were confined to the southern borders of Saudi Arabia and they became extinct in the wild by the mid-1970s. Oryx were reintroduced to the Mahazat as-Sayd Protected Area east of Taif beginning during March 1990, and to the Uruq Bani Ma'arid Protected Area on the western edge of the Rub al Khali during 1995 (Fig. 8.2). By June 1997, the Mahazat as-Sayd population numbered >300 and the Uruq Bani Ma'arid population numbered >100 making a total of >400 free-ranging oryx in Saudi Arabia. At the same time, there were also >260 oryx in the NCWCD captive-breeding herd and an unknown number in private collections (Seddon *et al. pers. comm.*).

Status within the country: Endangered. Overall numbers are still relatively low, but the population has been increasing for the last decade. If this trend continues, a lower category of threat may become appropriate.

Conservation measures taken: During early stages of management of the NCWCD breeding herd, animals were received from collections in neighbouring countries and from the USA. Founder members of the captive herd were infected with tuberculosis, and management procedures have been adopted to prevent the release of tuberculosis- infected oryx into protected areas. These procedures include regular tuberculosis testing and hand-rearing of calves (Flamand *et al.* 1994). The NCWCD captive herd now contains the most diverse gene pool for the species. The genetic management programme at NWRC aims to maintain at least 90% of the founder population's genetic variability over a period of 200 years and to provide animals genetically fit to survive in the wild. During June 1997, NCWCD held 15 captive oryx at KKWRC and 249 at NWRC. Careful selection of animals for release has minimised inbreeding within the reintroduced populations. Mahazat as-Sayd Protected Area (224,400ha) was fenced in 1989 and ranger staff were appointed. The previously overgrazed vegetation responded

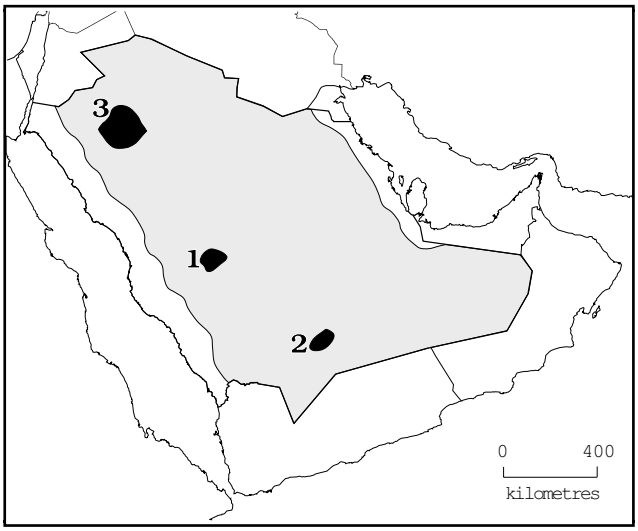


Fig. 8.2 Former distribution of Arabian oryx *(Oryx leucoryx)* in Saudi Arabia (shaded). Reintroduced populations: 1. Uruq Bani Ma'arid; 2. Mahazat as-Sayd. Proposed reintroduction site: 3. Al-Khunfah.

quickly to the removal of domestic livestock. Seventeen captive-born oryx from collections in the USA were released into the protected area during March 1990. Twenty-one oryx from collections in neighbouring countries and 34 captive-born oryx from NWRC were released later. The population at Mahazat as-Sayd now exceeds 300. Since early 1995, 83 oryx have been released in Uruq Bani Ma'arid Protected Area (550,000ha). Seven males have died as a result of fighting, but 63 births have been registered. This population was estimated to number 131 at the end of February 1998 (T. Wacher *in litt.*). Global status is Endangered (IUCN 1996).

Conservation measures proposed: NCWCD will release more oryx from its captive herd into Uruq Bani Ma'arid Protected Area during 1998–99, including 18 in April 1998, selected to increase the contribution of Qatari bloodlines, currently under-represented in the release group (T. Wacher *in litt.*). Also during 1998–99, NCWCD will begin releasing oryx into Al-Khunfah Protected Area (3,422,500ha) in northern Saudi Arabia. Any new protected areas created within the former geographic range of Arabian oryx will become possible sites for further reintroductions. The NCWCD conservation strategy calls for the creation of self-sustaining, free-ranging populations of oryx. In the future, sustainable use of these populations through hunting could be possible.

Saudi Gazelle or *Afri* (*Gazella saudiya*)

Distribution and population: Historically, this species was recorded on the western side of the Arabian Peninsula, with all records west of 47^0E except for one anomalous specimen from Kuwait, which reached the British Museum after a period of captivity at London Zoo. *G. saudiya* was found on gravel and sandy plains along the east side of Arabia's western mountains, between 16^0N and 28^0N (Fig. 8.3). Occasional reports of this species from rangers in the Harrat al-Harrah and Al-Khunfah Protected Areas probably refer to *G. gazella*. A record of *afri* from the far north of Saudi Arabia by Lewis *et al.* (1965) is doubtful because their photograph appears to show an Arabian sand gazelle (*G. subgutturosa marica*). Recent DNA studies indicate that a record for Iraq (Harrison and Bates 1991) refers to a sand gazelle (R. Hammond *pers. comm.*). Gross (1987) reports that *G. saudiya* occurs on an island in the Arabian Gulf, but most of the islands in the Gulf that support gazelles have been artificially stocked and so there must be serious doubts about the origins of these animals.

Status within the country: Extinct.

Conservation measures taken: Individuals reported to be of this species are kept in several collections in Saudi Arabia and neighbouring states, but their identification remains to be confirmed (Rebholz and Harley 1997). Global status is Extinct in the Wild (IUCN 1996).

Conservation measures proposed: The taxonomic status of putative specimens of *G. saudiya* requires further research. Recently, staff at KKWRC used the polymerase chain reaction to amplify DNA from the museum skins of wild-caught Saudi gazelles. The DNA profiles from these individuals will be compared with reputed Saudi gazelles in captivity in order to identify live specimens of this taxon. These captive animals could then form a breeding population to provide stock for reintroduction to the wild.

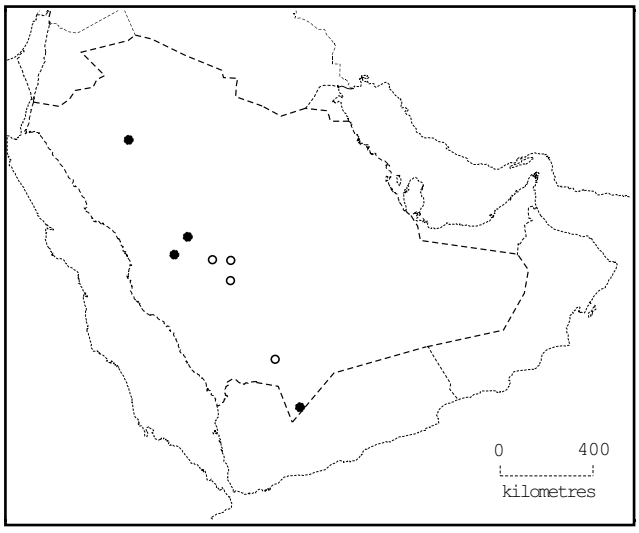


Fig. 8.3 Records of Saudi gazelle *(Gazella saudiya)* in Saudi Arabia (solid circles) and sightings (open circles). After Thouless *et al* (1991).

Mountain Gazelle or *Idmi* (*Gazella gazella*)

Distribution and population: Mountain gazelles occur on the Farasan Islands, an NCWCD protected area in the Red Sea. An aerial survey during May 1997 confirmed that >1000 mountain gazelles live on Kebir Island, the largest island of the group (Wacher and Al Toum 1997). This represents the largest population of mountain gazelles in Saudi Arabia. Small numbers of mountain gazelles live in the southwestern mountains, on the Tihamah coastal plain along the Red Sea, in the Al-Khunfah Protected Area in the north of the country, and maybe in the Harrat al-Harrah Protected Area, also located in the north (Thouless *et al.* 1991; Magin and Greth 1994; T. Wacher *pers. comm.*). Although published records show that mountain gazelles were formerly common along the western side of the country (Harrison and Bates 1991), they also used to occur in wadis draining the backslope of the Tuwayq Escarpment, which runs for about 900km from north to south through central Arabia. Local inhabitants have confirmed that mountain gazelles once lived there and have produced a horn from a gazelle shot about 1970 in the area now designated as the Ibex Reserve, 150km south of Riyadh (Fig. 8.4). Populations outside NCWCD protected areas are threatened with extinction by illegal hunting (Magin and Greth 1994).

Status within the country: Vulnerable.

Conservation measures taken: NCWCD holds the world's largest collection of mountain gazelles (252 at the end of June 1997) at KKWRC. Eighty-four captive-bred mountain gazelles from KKWRC were released into the Ibex Reserve during 1991–1995 and this population was estimated to number about 200 gazelles during 1995 (Dunham *et al.* 1993; Dunham 1997a; Dunham 1997b). During 1996–97, 73 mountain gazelles from KKWRC were freed in the Uruq Bani Ma'arid Protected Area, towards the southern end of the Tuwayq Escarpment and on the western edge of the Rub Al Khali. During 1996, 20 mountain gazelles from KKWRC were released into an 8,000ha fenced area at the Jebel al-Rar military base in southwestern Saudi Arabia. Global status is Lower Risk/conservation dependent (IUCN 1996).

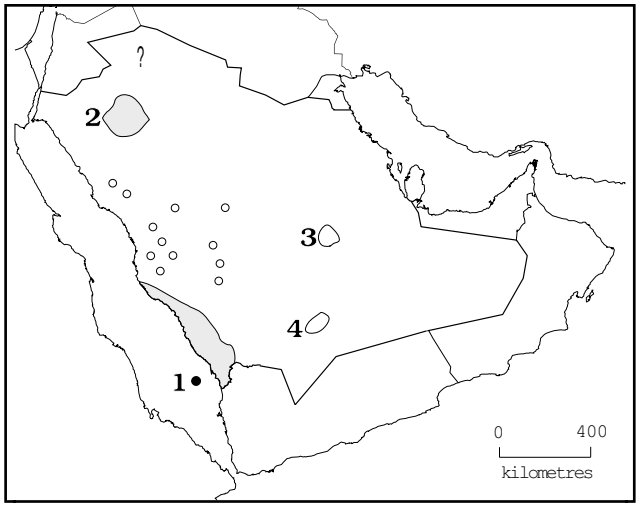


Fig. 8.4 Current distribution of mountain gazelle *(Gazella gazella)* in Saudi Arabia (shaded) and former records (open circles). 1. Farasan Islands; 2. Al-Khunfah. Reintroduction sites: 3. Ibex Reserve; 4. Uruq Bani Ma'arid.

Conservation measures proposed: NCWCD proposes to release mountain gazelles in Majami al-Hadb Protected Area (340,000ha) during 1998, but at present, this area is heavily used by local people and their livestock.

Arabian Sand Gazelle or *Reem* (*Gazella subgutturosa marica*)

Distribution and population: There are historical records of sand gazelles as far apart as the gravel plains and basalt deserts to the north and west of the Nafud Desert, and the northeastern and southeastern fringes of the Rub al Khali. They were also recorded on the plains to the east of Medina and Mecca and on the coastal plains along the Arabian Gulf. Populations may well have been migratory or nomadic, and recorded herd sizes ranged from 50–100 to thousands. Probably the only areas of Saudi Arabia where sand gazelles have survived are in Harrat al-Harrah and Al-Khunfah, to the north and west of the Nafud Desert (Fig. 8.5). An aerial survey during November 1996 by T. Wacher (*pers. comm.*) estimated that >1,000 sand gazelles lived in Harrat al-Harrah Protected Area (1,377,500ha). During March 1995, it was estimated that 150 sand gazelles lived in Al-Khunfah Protected Area (3,422,500ha) (T. Wacher *pers. comm.*), but since then, NCWCD rangers have reported serious poaching of gazelles. An NCWCD expedition to the Rub al Khali during 1990 collected the remains of sand gazelles freshly hunted along the northeastern edge of this desert, probably in Oman. A few animals may still survive in this area.

Status within the country: Vulnerable.

Conservation measures taken: NCWCD holds the world's largest captive collections of sand gazelles at KKWRC (306 at the end of June 1997) and Qassim (>1200 during May 1997). It is hoped that uncertainties about the origins of these collections will be resolved by current genetic studies at KKWRC. Captive-born sand gazelles from KKWRC and Qassim were reintroduced during 1991–94 into Mahazat as-Sayd, a 224,400ha NCWCD protected area with a fenced boundary (Nayerul Haque and Smith 1996). During 1995–96, 204 sand gazelles from KKWRC were released in the Uruq Bani Ma'arid Protected Area (550,000ha) on the western edge of the Rub al Khali Desert. Initial indications are that the reintroduced population is thriving (T. Wacher *pers. comm.*). Sand gazelles have also been released in two areas controlled by the military, where human access and livestock grazing are regulated: 55 were freed near Hafar Al Batin in northern Saudi Arabia, and 20 were released into a 100km^2 fenced area near Al Kharj, south of Riyadh. Global status of *reem* is Vulnerable (IUCN 1996).

Photo 8.1 Arabian Sand Gazelle (*Gazella subgutturosa marica*). Tim Wacher.

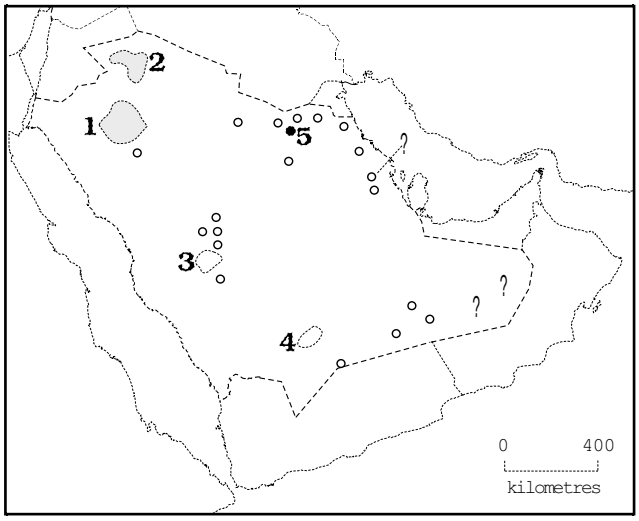


Fig. 8.5 Current distribution of Arabian sand gazelle *(Gazella Gazella subgutturosa marica)* in Saudi Arabia (shaded): 1. Al-Khunfah; 2. Harrat al Harrah. Reintroduced populations: 3. Mahazat as-Sayd; 4. Uruq Bani Ma'arid; 5. Hafar Al Batin. Open circles denote former localities. Possible occurrence in Rub al Khali (?).

Conservation measures proposed: Verifying reports of this species in the Rub al Khali would clearly be worthwhile. It is essential to investigate the origins and pedigrees of animals in captive herds.

References

Büttiker, W. 1982. The lesser kudu (*Tragelaphus imberbis*) (Blyth 1869). *Fauna of Saudi Arabia* 4:483–487.

Child, G. and Grainger, J. 1990. *A system plan for protected areas for wildlife conservation and sustainable rural development in Saudi Arabia,* 2 vols. National Commission for Wildlife Conservation and Development, Riyadh.

Dunham, K. M. 1997a. Population growth of mountain gazelles *Gazella gazella* reintroduced to central Arabia. *Biological Conservation* 81:205–214.

Dunham, K. M. 1997b. The re-introduction of gazelles in Arabia. *In:* Habibi, K., Abuzinada, A.H., and Nader, I. (Editors). *The gazelles of Arabia*. National Commission for Wildlife Conservation and Development, Riyadh.

Dunham, K.M., Kichenside, T.B. Lindsay, N., Rietkerk, F.E., and Williamson, D.T. 1993. The reintroduction of mountain gazelle *Gazella gazella* in Saudi Arabia. *International Zoo Yearbook* 32:107–116.

Flamand, J.R.B., Delhomme, A., and Ancrenaz, M. 1994. The hand rearing of Arabian oryx *Oryx leucoryx* at the National Wildlife Research Center, Saudi Arabia. *International Zoo Yearbook* 33:269–274.

Greth, A., Williamson, D., Groves, C,. Schwede, G., and Vassart, M. 1993. Bilkis gazelle in Yemen – status and taxonomic relationships. *Oryx* 27:239–244.

Gross, C. 1987. *Mammals of the southern Gulf*. Motivate Publishing, Dubai.

Groves, C.P. 1989. The gazelles of the Arabian Peninsula. Pp. 237–248 *in:* Abuzinada, A.H., Goriup, P.D., and Nader, I.A. (Editors). *Wildlife conservation and development in Saudi Arabia*. National Commission for Wildlife Conservation and Development, Riyadh.

Groves, C.P. 1996. Taxonomic diversity in Arabian gazelles: The state of the art. Pp. 8–39 *in:* Greth, A., Magin, C., and Ancrenaz, M. (Editors). *Conservation of Arabian gazelles*. National Commission for Wildlife Conservation and Development, Riyadh.

Habibi, K. 1992. *Arabian gazelles*. National Commission for Wildlife Conservation and Development, Riyadh.

Harrison, D.L. and Bates, P.J.J. 1991. *The mammals of Arabia*, Second edition. Harrison Zoological Museum, Sevenoaks, England.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Kumamoto, A.T., Kingswood, S.C., Rebholz, W.E.R., and Houck, M.L. 1995. The chromosomes of *Gazella bennetti* and *Gazella saudiya*. *Zeitschrift für Säugetierkunde* 60:159–169.

Lewis, R.E., Lewis, J.H., and Harrison, D.L. 1965. On a collection of mammals from northern Saudi Arabia. *Proceedings of the Zoological Society of London* 144:61–74.

Magin, C. and Greth, A. 1994. Distribution, status, and proposals for the conservation of mountain gazelle *Gazella gazella cora* in south-west Saudi Arabia. *Biological Conservation* 70:69–75.

Nayerul Haque, M. and Smith, T.R. 1996. Reintroduction of Arabian sand gazelle *Gazella subgutturosa marica* in Saudi Arabia. *Biological Conservation* 76:203–207.

Ostrowski, S., Bedin, E., Lenain, D.E., and Abuzinada, A.H. 1998. Ten years of Arabian oryx conservation breeding in Saudi Arabia – achievements and regional perspectives. *Oryx* 32:209–222.

Rebholz, W.E.R. and Harley, E.H. 1997. Cytochrome *b* sequences from the endangered Saudi gazelle (*Gazella saudiya*) suggest hybridization with chinkara (*G. bennetti*). *Conservation Biology* 11:251–255.

Thouless, C.R. and Al Bassri, K. 1991. Taxonomic status of the Farasan Island gazelle. *Journal of Zoology, London* 223:151–159.

Thouless, C.R., Grainger, J.G., Shobrak, M., and Habibi, K. 1991. Conservation status of gazelles in Saudi Arabia. *Biological Conservation* 58:85–98.

Wacher, T. and Al Toum, M. 1997. Gazelle survey Farasan Islands. Unpublished report.

Chapter 9. Yemen

D.P. Mallon and M. Al-Safadi

Introduction

The Republic of Yemen lies in the southwest of the Arabian Peninsula (Fig. 9.1). The current state was formed in 1990 following unification of the former Yemen Arab Republic and Peoples' Democratic Republic of South Yemen. It covers an area of more than 531,000km^2 which includes a number of islands, the largest of which is Socotra in the Indian Ocean. Yemen has land borders with Oman and Saudi Arabia, some of which are disputed, and coastlines along the Red Sea and Gulf of Aden. The human population exceeds 10 million.

Yemen is topographically very diverse. The western part of the country (more or less corresponding to the former Yemen Arab Republic) can be divided into four broad zones from west to east: the Tihamah coastal plain, western escarpment, central highlands, and eastern plateau (Varisco *et al.* 1992; Evans 1994). The Tihamah, along the Red Sea, stretches inland for up to 65km and consists of stone and gravel plains, low dunes, and saline mudflats (*sabkha*). Vegetation is sparse, consisting mainly of low bushes and xerophytic shrubs, with some areas of scattered *Acacia* and *Commiphora* woodland (Cornwallis and Porter 1982; Martins, 1996). East of the Tihamah is a band of foothills rising steeply to the western escarpment, a rugged range of mountains that contains the highest point on the Arabian Peninsula, Jabal al-Nabi Shu'ayb (3,666m). The escarpment is intensively cultivated, often by means of extensive terraces; it becomes more rounded to the south around Ta'izz. Natural vegetation has been extensively degraded, but some

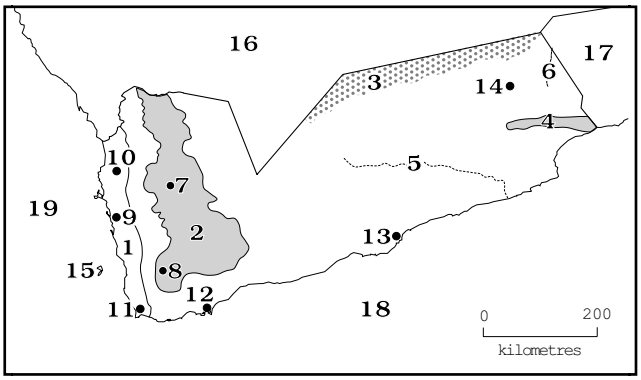


Fig. 9.1 Yemen. Geographical features and localities mentioned in the text: 1. Tihamah. 2. Central Highlands; 3. Rub al Khali; 4. Mahra Mountains; 5. Wadi Hadhramawt; 6. Wadi Mitan; 7. Sana'a; 8. Ta'izz; 9. Hodeida; 10. Al Zuhra; 11. Bab al Mandeb; 12. Aden; 13. Al Mukalla; 14. Sanau; 15 Al Hanish al Kabir; 16. Saudi Arabia; 17. Oman; 18. Arabian Sea; 19. Red Sea.

Euphorbia ammak scrub occurs in the southern part of the escarpment (Cornwallis and Porter 1982). The escarpment is cut by numerous valley systems; the seven major wadis contain water throughout the year and may have a number of trees and shrubs, such as *Cordia abyssinica*, *Breonadia salicina,* and *Ficus* spp. (Scholte 1992). To the east of the escarpment lie the central highlands, which consist of a series of hills and basins at altitudes of 2,000–2,750m. The eastern plateau is mainly barren and continues eastwards along the northern border of the country, eventually reaching the sands of the Rub al Khali or Empty Quarter. Eastern Yemen (corresponding largely to the former state of South Yemen) consists of a coastal plain which extends northwards into an area of sandy and rocky deserts. These deserts of eastern Yemen include a limestone plateau, the Jol, north of which lie the sands of the Rub al Khali along the border with Saudi Arabia. Several major wadi systems cross eastern Yemen, some of which contain permanent water; the largest of these is Wadi Hadhramawt, which runs approximately east then southeast into the Gulf of Aden. In the Mahra region on the eastern border, a small area of mountains contiguous with those in the Omani Province of Dhofar is densely wooded, as it is affected by the southwest monsoon. The vegetation there is dominated by *Anogeissus dhofarica*, *Commiphora habessinica,* and *Adenium obesum* (Martins 1996). A national vegetation map of western Yemen (Scholte *et al.* 1991) provides the basis for a more detailed analysis of habitat types.

The country's position close to the Palaearctic and Afrotropical realms has ensured a mixing of faunal and floral elements, and its isolation has promoted the development of numerous endemic highland forms, especially of birds and plants, although Yemen's biodiversity is being drastically reduced by habitat degradation (Varisco *et al.* 1992). Forest cover was once much more extensive than at present, but trees have been systematically cut down for fuel over the centuries and forests are now almost absent. Scattered *Acacia* savanna woodland occurs sporadically along the coast and in some inland areas, but rapidly thins out eastwards into the desert. A few pockets of juniper (*Juniperus* spp.) woodland remain in the highlands, for example on Jabal Iraf, between Aden and Ta'izz (Martins 1996).

The climate is generally hot, though modified by altitude, and frost and snow are not uncommon in winter at high elevations (Cornwallis and Porter 1982). Humidity is high on the Red Sea coast, lower elsewhere. Precipitation is highest in the highlands of the west and decreases inland. Eastern Yemen is very arid, except for the Mahra region in

Table 9.1 Current status of antelopes in Yemen.

Species	Status[1]	GPS[2]
Arabian Oryx (*Oryx leucoryx*)	Extinct	–
Saudi Gazelle (*Gazella saudiya*)	Extinct	–
Mountain Gazelle (*G. gazella*)	Indeterminate	?1–1.5%
Queen of Sheba's Gazelle (*G. bilkis*)	Extinct	–
Arabian Sand Gazelle (*G. subgutturosa marica*)	Indeterminate	?

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

the extreme east, which has a three-month rainy season in summer as a result of the southwest monsoon. The highland plateau and western escarpments are heavily cultivated, the latter by means of extensive terraces. Eastern Yemen is far more sparsely populated and has a mainly pastoral economy, except for the larger wadis that contain extensive areas of agriculture.

Current status of antelopes

Five species of antelopes have been reported from Yemen (Table 9.1): Arabian oryx (*Oryx leucoryx*), Saudi gazelle (*Gazella saudiya*), mountain gazelle (*G. gazella*), Queen of Sheba's or Yemen gazelle (*G. bilkis*), and Arabian sand gazelle (*G. subgutturosa marica*) (Harrison and Bates 1991). The status of a further species, lesser kudu (*Tragelaphus imberbis*), is doubtful. The only record is of a single set of horns obtained in 1967 from an animal reputedly shot in Jabal Halmayn, southeast of Dhala (Harrison and Bates 1991). There are no other records from Yemen, although another specimen was shot in Saudi Arabia around 1968 (Harrison and Bates 1991). Lesser kudu is a large and distinctive antelope, which is unlikely to have been overlooked. The absence of other records or hunting trophies makes it unlikely that this specimen represents a former wild population in Yemen. It could have originated from an animal that had escaped from a private collection or one that had been deliberately released.

Details of the former distributions of antelope species in Yemen are poorly known, and many areas of the country have not been surveyed thoroughly. What is clear, however, is that heavy hunting pressure throughout the country has severely affected all antelope species, exterminating them from wide areas. Powerful weapons are widely available, indiscriminate hunting is common, and large mammals are generally overhunted. Economic development following the discovery of oil is increasing habitat destruction, and new roads give improved access to previously remote areas (Varisco *et al.* 1992; Greth *et al.* 1993). At least three species of antelopes are now extinct in Yemen. *Oryx leucoryx* became extinct in Yemen soon after 1962, and *G. saudiya* is now extinct in the wild throughout its range. *G. bilkis* is endemic to Yemen, but is known only from five specimens obtained in 1951. It was regarded as a distinct species on the basis of its darker colour, horn shape, and skull characters (Groves and Lay 1985). Its relationship with *G. gazella cora*, which it closely resembles, and with which it is sympatric, requires clarification (Groves 1988). Greth *et al.* (1993) also suggest that *G. bilkis* may turn out to be conspecific with *G. g. erlangeri,* a dark form of the mountain gazelle described from the southwest of the Arabian Peninsula. There have been no new records of *G. bilkis* since the original specimens were obtained in 1951, and subsequent searches of its former range have failed to find any sign of it, so it too is considered Extinct. *G. subgutturosa* has been recorded from only a few localities in eastern Yemen and it is not known whether any currently occur in the country. *G. gazella*, the most widely distributed species, has disappeared from many areas and survives in pockets or in remote areas of Yemen. Two subspecies of mountain gazelle, *G. g. cora* and *G. g. erlangeri*, have been reported from Yemen (Harrison and Bates 1991; Groves 1996).

Several reports indicate that gazelles are currently very rare or absent from large areas of the country. For example, A. Greth (*in litt*. 1995) found no indication of gazelle presence during two visits to Yemen. No gazelles were seen near Ta'izz or in other parts of western Yemen on a visit in 1995 (C. Stuart *in litt*. to R. East 1996). No gazelles were observed during a seven-week ornithological survey of eastern Yemen in spring 1993 (Showler 1996). On the positive side, mountain gazelles are reported to survive in Lahej, Abyan, Shabwa, and Hadhramawt Provinces of southern and eastern Yemen. Greth (1992) saw captive mountain gazelles in Ta'izz that had been obtained in Wadi Surdud in the Tihamah, and he also reported recent sightings of unidentified gazelles in sand dunes on the Aden-Al Mukalla road, as well as local accounts of gazelle hunters still active north of Aden and near Hodeida. Other reports of unidentified gazelles in western Yemen dating from the late 1980s to the early 1990s originate from the northern and southern ends of the Tihamah (near Al Zuhra, north of Hodeida, and between Mocha and Bab el Mandeb, respectively) and in the Wadi Rima-Madinat as-Sharq area (Scholte 1992; Varisco *et al.* 1992). Most of these reports probably relate to *G. gazella*, but it is possible that some relate to other species. Following an ornithological survey of northeastern Yemen in February 1977, between Wadi

Hadhramawt and the international border, Jennings (1997) reported that gazelles were apparently widespread but uncommon in the area; these gazelles could be *G. gazella* or *G. subgutturosa marica*.

Conservation measures taken

The Department of Wildlife and Zoos in the Ministry of Agriculture and Water Resources is responsible for wildlife conservation, but it lacks trained staff. The Environmental Protection Council (EPC) was formed in 1987 to co-ordinate wildlife conservation and research, legislation, and environmental education programmes (Evans 1994). In 1977, Command Council Decree No. 40 prohibited the hunting of all gazelles for a 10-year period, but this has not been renewed and, at present, antelopes are not protected by law. Some bird species have been given legal protection, but no legislation currently covers wildlife protection, habitats, or forests. A biodiversity assessment reviewed the state of the environment in Yemen (focused mainly on the western part of the country) and identified conservation priorities (Varisco *et al.* 1992). A conservation action plan was drawn up by the EPC in 1995, but implementation has been hindered by the absence of infrastructure and trained staff. The EPC's current priorities include establishment of a protected area network and formulation of habitat and wildlife protection legislation. At present, there are no protected areas for gazelles or other indigenous wildlife in Yemen. Proposals for the establishment of protected areas have been made by several bodies, including IUCN and the International Council for Bird Preservation, but none have yet been established, in part because of the land ownership system and local opposition. Some areas have restricted access and so receive some *de facto* protection, but these are relatively small. Yemen acceded to CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, in May 1997. There are plans to establish a captive-breeding facility for endangered wildlife species at Sana'a University. Gazelles are traditionally kept in private collections in Yemen, but the number in captivity is unknown. These collections are not usually subject to any scientific management, and gazelles of different origins are frequently kept together and are thus able to interbreed.

Conservation measures proposed

The absence of legislation, an administrative infrastructure, and a protected area system represent major obstacles to wildlife conservation in Yemen. Until these fundamental problems are addressed, any possible practical measures should be taken to protect the country's surviving antelopes. Given the incomplete and unsatisfactory current state of the data on antelopes in Yemen, high priority should be given to extensive field surveys in order to identify remaining populations and to assess their current status. These surveys should initially concentrate on areas where reports indicate continued gazelle presence, such as the mountains of the western escarpment, the Tihamah Plain, and the north-eastern desert. Once the existence of any remnant populations is established, immediate and complete protection from hunting will be essential to safeguard their future survival. Proposals to survey antelope populations in Yemen have been put forward on several occasions, but they have not been carried out owing to a lack of funding. It has been suggested that a major project to reintroduce gazelles or ibex (*Capra ibex nubiana*) would provide a suitable subject for a high-profile media campaign to encourage wildlife conservation in Yemen (Varisco *et al.* 1992).

Several organisations have put forward recommendations for protected areas in Yemen and two of them may still support gazelle populations. These are in an area of undisturbed *Tamarix* woodland near Al Zuhra, north of Hodeida, and an area of grass and dwarf shrub plains between Mocha and Bab el Mandeb at the southern end of the Tihamah coastal plain (Varisco *et al.* 1992). The latter area lies in a restricted military zone and is virtually undisturbed.

The situation for antelopes will remain extremely bleak until the chronic problem of overhunting is addressed. The best hope for antelopes in the future would seem to lie with reintroductions of indigenous species to their former ranges in Yemen, or with natural recolonisation from populations in neighbouring countries. However, before any releases are undertaken, wildlife protection legislation must be in place; there must be effective enforcement of hunting laws and a network of professionally managed protected areas should be established. Similar measures will also be needed to guarantee the survival of any antelopes that wander into Yemen from outside the country.

Species accounts

Arabian Oryx (*Oryx leucoryx*)

Distribution and population: Harrison and Bates (1991) listed records from the Hadhramawt and other localities in eastern Yemen, as well as an unconfirmed record from Wadi Jauf in northern Yemen. Thesiger (1959) reported oryx from the Uruq al Zaza on the edge of the Rub al Khali (Fig. 9.2). Very few oryx remained in eastern Yemen in 1962 when three were captured near Sanau to form part of the original captive World Herd (Shepherd 1965), and the species is believed to have become extinct in this area soon after.

Status within the country: Extinct.

Conservation measures taken: Not protected by law; no protected areas exist. Global status is Endangered (IUCN 1996).

Saudi Gazelle (*Gazella saudiya*)

Distribution and population: Harrison and Bates (1991) recorded the Saudi gazelle from several scattered localities

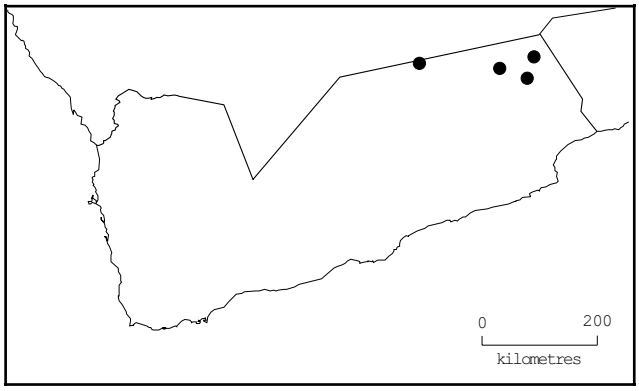


Fig. 9.2 Records of Arabian oryx *(Oryx leucoryx)* in Yemen.

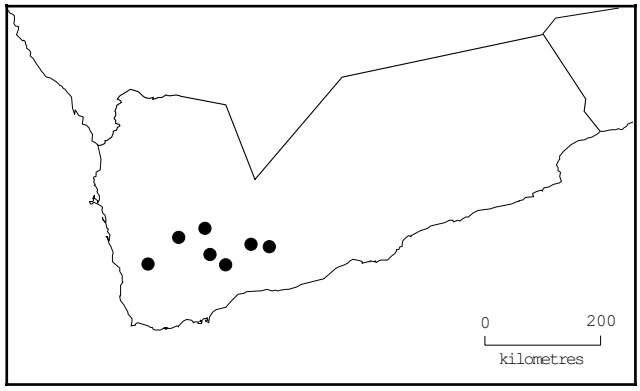


Fig. 9.3 Records of Saudi gazelle *(Gazella saudiya)* in Yemen (after Harrison and Bates 1991).

in the north (Arq Abu Da'ir, Alam Abyadh, and Ruwaik Tract) and the south (Jau al Khudaif, Taraf al Ain, Wadi Markha and Wadi Naq'a) (Fig. 9.3). No information is available on former numbers in Yemen. The species is now Extinct in the Wild (IUCN 1996).

Status within the country: Extinct.

Mountain Gazelle (*Gazella gazella*)

Distribution and population: Formerly widely distributed (Fig. 9.4), and recorded from the following localities: Ma'bar, Sudaiat, and Arq Abu Da'ir in northern Yemen; Aden, Sheikh Othman, Lahej, and the desert interior in southern Yemen; and Al Hanish al Kabir Island in the Red Sea (Harrison and Bates 1991). Current distribution and status are unclear. Greth (1992) reported seeing two groups of gazelles, apparently of this species, in private collections; one animal had been captured in Wadi Surdud, in the Tihamah coastal strip. Greth (1992) also quoted local reports that gazelles, apparently this species, still occurred in Wadi Saham, near Hodeida in the north of the country, and at a locality 30km north of Aden. Unidentified gazelles reported in Wadi Rima in the western highlands during 1989–90 (Scholte 1992), Al Zuhra near Hodeida, and between Mocha and Bab el Mandeb (Varisco *et al.* 1992) were probably this species. Local reports indicate that mountain gazelles also survive in Lahej, Abyan, Shabwa, and Hadhramawt Provinces in southern and eastern Yemen.

Habitat, food and reproduction: Seen in groups of five to eight on barren plains near Ma'bar (Sanborn and Hoogstraal 1953).

Status within the country: Indeterminate; probably Endangered.

Conservation measures taken: Not protected by law; no protected areas exist. Global status is Lower Risk/ conservation dependent (IUCN 1996).

Conservation measures proposed: A few are kept in private collections and there are plans to establish a captive-breeding population at Sana'a University.

Queen of Sheba's Gazelle or Yemen Gazelle (*Gazella bilkis*)

Distribution and population: The five known specimens were collected in 1951 in the mountains near Ta'izz (Fig. 9.5). Localities included Wadi Maleh, Usaifira, and Jabal

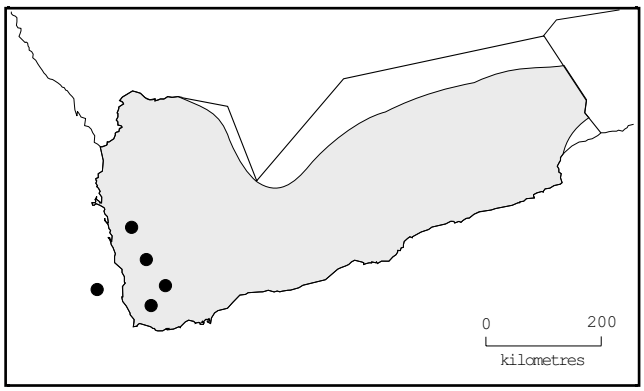


Fig. 9.4 Probable former distribution of the mountain gazelle *(Gazella gazella)* in Yemen (shaded). Current distribution consists of small scattered populations. Circles denote recent reports of gazelles, which are probably this species.

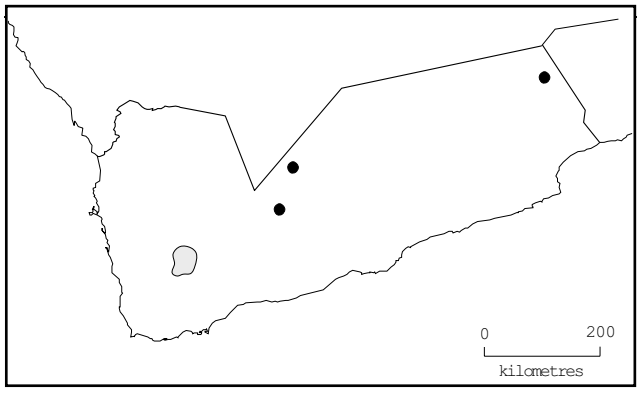


Fig. 9.5 Former distribution of Queen of Sheba's gazelle *(Gazella bilkis)* in Yemen (shaded) and records of Arabian sand gazelle *(Gazella subgutturosa marica)* (circles).

Zarba (Groves and Lay 1985; Greth *et al.* 1993). In 1951, they were very common around Ta'izz according to Sanborn and Hoogstraal (1953), but no further information has been obtained since then. No gazelles or signs of their presence were found during a limited survey of the mountains south of Ta'izz in 1992, and local people reported that gazelles had not been seen in the area for several decades (Greth *et al.* 1993). The absence of any sightings or other reports since 1951, and the failure to locate this species recently, all support the conclusion that it is Extinct.

Habitat, food and reproduction: Seen in small groups of one to three on *Euphorbia*-covered hill slopes at altitudes of 1,230–2,150m. None were seen in cultivated areas or near roads (Sanborn and Hoogstraal 1953). Nothing is known about its biology.

Status within the country: Extinct. Hunted for food by army officers in 1951 (Sanborn and Hoogstraal 1953). None are kept in captivity.

Conservation measures taken: Not protected by law; No protected areas exist.

Arabian Sand Gazelle (*Gazella subgutturosa marica*)

Distribution and population: Harrison and Bates (1991) listed records dating from about 50–60 years ago from Uruq al Zaza (northwest of Wadi Hadhramawt) and Afalil. Shepherd (1965) reported sightings and tracks of this species in Wadi Mitan on the eastern border. These localities lie on the fringes of the Rub al Khali (Fig. 9.5) and former distribution may have included all areas of suitable habitat along the northern border of eastern Yemen. It is not known whether any survive at present in Yemen, but gazelles reported in northeastern Yemen in February 1997 (Jennings 1997) may have been this species. In time, sand gazelles from the reintroduced population in Uruq Bani Ma'Arid Protected Area on the western edge of the Rub al Khali in Saudi Arabia could conceivably disperse as far as Yemen, but they are unlikely to survive for long unless their protection from hunting can be guaranteed.

Habitat, food and reproduction: Generally an inhabitant of sand deserts. No information specific to Yemen is available.

Status within the country: Indeterminate. Probably endangered, if not already extinct.

Conservation measures taken: Not protected by law; no protected areas exist. Global status of *reem* is Vulnerable (IUCN 1996).

Conservation measures proposed: Conduct field surveys in the sand deserts of the Rub al Khali along the northern border of eastern Yemen to identify surviving populations of sand gazelle. Ensure that any remnant populations are protected.

Acknowledgements

We gratefully acknowledge the assistance of Richard Porter in compiling this report.

References

Cornwallis, L. and Porter, R.F. 1982. Spring observations on the birds of north Yemen. *Sandgrouse* 4:1–36.

Evans, M.I. (Compiler). 1994. *Important bird areas in the Middle East*. BirdLife International, Cambridge.

Greth, A. 1992. Vanishing gazelles. *Gnusletter* 11(3):21–22

Greth, A., Williamson, D., Groves, C., Schwede, G., and Vassart, M. 1993. Bilkis gazelle in Yemen – status and taxonomic relationships. *Oryx* 27:239–244.

Groves, C.P. 1988. A catalogue of the genus *Gazella*. Pp. 193–211 *in:* Dixon, A. and Jones, D. (Editors). *Conservation and biology of desert antelopes*. Christopher Helm, London.

Groves, C.P. 1996. Taxonomic diversity in Arabian gazelles: The state of the art. Pp. 8–39 *in:* Greth, A., Magin, C., and Ancrenaz, M. (Editors). *Conservation of Arabian gazelles*. National Commission for Wildlife Conservation and Development, Riyadh.

Groves, C.P. and Lay, D.M. 1985. A new species of the genus *Gazella* (Mammalia : Artiodactyla : Bovidae) from the Arabian Peninsula. *Mammalia* 49:27–36.

Harrison, D.L. and Bates, P.J.J. 1991. *The mammals of Arabia,* Second edition. Harrison Zoological Museum, Sevenoaks, England.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Jennings, M.C. 1997. ABBA survey 20: Eastern Yemen, February 1997. *Phoenix* 14:3–6.

Martins, R.P. 1996. Some aspects of southern Yemen: An introduction for field ornithologists and conservationists. *Sandgrouse* 17:15–21.

Sanborn, C.C. and Hoogstraal, H. 1953. Some mammals of Yemen and their ectoparasites. *Fieldiana: Zoology* 34:229–252.

Scholte, P. 1992. The birds of Wadi Rima, a permanently flowing mountain wadi in western Yemen. *Sandgrouse* 14:93–108.

Scholte, P.T., Al Khuleidi, A.W., and Kessler, J.J. 1991. The vegetation map (1:500,000) of the Republic of Yemen (western part). DHV Consultants and Environmental Protection Council, Amsterdam.

Shepherd, A. 1965. *The flight of the unicorns*. Elek Books, London.

Showler, D.A. 1996. Mammal observations in Yemen and Socotra, Spring 1993. *Sandgrouse* 17:165–169.

Thesiger, W. 1959. *Arabian sands*. Longmans, Green and Co., London.

Varisco, D.M., Ross, J.P., and Milroy, A. 1992. *Biological diversity assessment of the Republic of Yemen*. ICBP, Study Report No. 52. Cambridge.

Chapter 10. Oman

D.H. Insall

Introduction

The Sultanate of Oman lies at the eastern extremity of the Arabian Peninsula, extending from the eastern border of the Republic of Yemen in the south, along the southeastern border of the Kingdom of Saudi Arabia, to the United Arab Emirates in the north (Fig. 10.1). Separated by some 95km of United Arab Emirates territory is the Governorate of Musandam whose northern coast extends to the Strait of Hormuz. The tropic of Cancer passes through Oman just south of the capital, Muscat. The area of Oman is 314,000km^2.

In the north, the topography is dominated by the Northern Mountains, or Hajar Range, a range of high relief limestone and dolomite escarpments stretching from Musandam to Sur and rising to 3,000m above sea level, flanked by, and in some places interspersed with, lower mountains of ophiolite, an igneous rock originating from upheavals of oceanic crust. To the north and east of the range is the alluvial plain of the Batinah bordering the Gulf of Oman. To the west and south of the range are gravel plains stretching southwards to the southern Governorate of Dhofar. These plains cover some 80% of the land surface of Oman and border the Arabian Sea. In the west, along the border with the Kingdom of Saudi Arabia are the extensive sand dunes of the Rub al Khali. The separate Wahibah Sands, some 9,300km^2 in area, lie to the east, near the southernmost extremity of the Northern Mountains. In Dhofar, the gravel plains rise southwards to the escarpment of the Dhofar Mountains, reaching 1,800m and comprising mainly tertiary rocks, including calcareous shale, limestone, and massive gypsum. The escarpment falls sharply to the sea in the west and to the alluvial plains in the centre, around Salalah, but it narrows to the east.

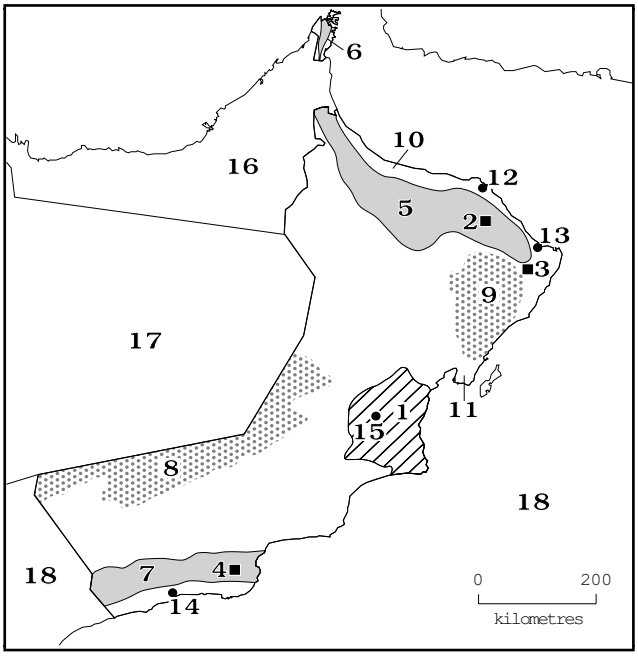


Fig. 10.1 Oman. Protected areas containing antelopes: 1. Arabian Oryx Sanctuary (2,700,000ha); 2. Wadi Sareen Thar Reserve (80,000ha). Proposed protected areas: 3. Al Kamil; 4. Jebel Samhan. Geographical features and localities mentioned in the text: 5. Hajar Mountains; 6. Musandam; 7. Dhofar Mountains; 8. Rub al Khali; 9. Wahibah Sands; 10. Batinah; 11. Barr Al Hikman; 12. Muscat; 13. Sur; 14. Salalah. 15. Jaaluni; 16. United Arab Emirates; 17. Saudi Arabia; 18. Yemen; 19. Arabian Sea.

The climate of Dhofar is dominated by the southwest monsoon, which brings dense mists and some rain to the escarpment and the Salalah Plain during the months of July, August, and September, resulting in a belt of grass and woodland on the mountain region, with dense vegetation on the escarpment facing south to the Arabian Sea. The remainder of the country is arid with sporadic winter rain and occasional thunderstorms in summer. However, fog moisture, especially in the spring and autumn, benefits the vegetation of the central plains of the Jiddat al-Harasis. The Northern Mountains experience higher precipitation than the arid plains adjoining them, resulting in more vegetation, but limited by lack of soil in the rugged terrain. The mean annual rainfall over most of the country is <100mm.

The flora of the Sultanate reflects the influence of that of Iran in the north, with an increasing influence of African species evident from the eastern regions of the Northern Mountains southwards to Dhofar. Of approximately 1,200 species found in Oman, some 87 are endemic or near endemic. Of these, 75 are endemic to Dhofar and are mainly found in the verdant monsoon belt of the mountain region. Desert woodlands consist mainly of *Acacia tortilis* and *A. ehrenbergiana*, with *Prosopis cineraria* established in many areas where the latter's much deeper tap roots have been able to find water. *Ziziphus spina-christi* is common, especially flanking seasonal water courses in the Northern Mountains. *A. eburnea* is found at higher altitudes in the Northern Mountains, and more scarcely in Dhofar in the arid belt north of the mountains. The recently discovered *Ceratonia oreothauma*, related to the carob tree, is endemic to the Eastern Hajar Range of the Northern Mountains.

Current status of antelopes

Three species of antelopes occur in Oman: Arabian oryx (*Oryx leucoryx*), mountain gazelle (*Gazella gazella*), and

Table 10.1 Current status of antelopes in Oman.

Species	Status[1]	GPS[2]
Arabian Oryx (*Oryx leucoryx*)	Endangered	18%
Mountain Gazelle (*Gazella gazella*)	Satisfactory	>50%
Arabian Sand Gazelle (*G. subgutturosa marica*)	Endangered?	10%? (of *G .s .marica*)

[1] *See Chapter 1 for definition of status categories*
[2] *Global population share*

Arabian sand gazelle (*G. subgutturosa marica*) (Table 10.1). In 1972, the last herd of *Oryx leucoryx* was eliminated from the wild by a hunting party, but in 1982 the first captive-bred oryx were released into the wild in the central desert of Oman under the White Oryx Project (for details, see Stanley-Price 1989; Spalton 1993). Although active ranger protection has enabled gazelle populations to increase in some parts of Oman, both species of gazelle have been illegally poached for sale outside the country and, since February 1996, poaching has significantly reduced the size of the oryx population.

Generally, since the beginning of rapid development in the country in 1970, gazelle numbers have decreased in areas where housing, agricultural, and industrial development for a rapidly increasing human population have taken place. Increases in the number of domestic livestock in some of these areas have left limited grazing resources available to gazelles. The advent of widespread vehicle ownership, virtually non-existent in 1970, has made illegal hunting easier. Soil compaction from off-road vehicle movement, as well as increased numbers of domestic and feral ungulates, threaten the habitat of all antelopes.

Drought conditions in some areas in the 1980s and early 1990s, causing high mortality and low fertility, have probably limited the expansion of protected herds and thus their ability to recolonise depleted areas. There are, however, increasing reports by rangers of small groups of two–three animals in many different places away from the known larger groups. It is also noticeable that after good rains the gazelle populations increase rapidly and this has occurred in the rainy years since 1994.

Conservation measures taken

In 1975, the Diwan of Royal Court established a ranger unit in the Wadi Sareen Nature Reserve to protect the Arabian tahr (*Hemitragus jayakari*), as well as a small population of the mountain gazelle (*Gazella gazella*). In the same year, a captive-bred herd of gazelles was established within the reserve (see below). In 1976, a Ministerial Decision was issued banning the hunting or capture of several mammal species, including all antelopes. In 1979, the Breeding Centre for Omani Mammals was established under the Diwan of Royal Court. The centre maintains small herds of Arabian oryx, mountain gazelle, and sand gazelle, as well as other mammals. Also in 1979, the White Oryx Project of the Diwan of Royal Court began its work, following a detailed study of the area.

In 1982, a comprehensive Royal Decree was issued to cover environmental protection. Amongst many measures, it required that all development projects be subjected to environmental scrutiny prior to approval being granted. One of the effects of its implementation has been to strengthen the protection of important wildlife habitat. The issue of environmental permits for development projects is the responsibility of the Ministry of Regional Municipalities and Environment, which also has overall responsibility for wildlife management. In 1993, a Ministerial Decision was issued, banning the hunting or capture of all species of wild fauna, extending the existing protection given by the 1976 law. Penalties were increased by Royal Decree in 1996. A comprehensive wildlife law has been drafted and is in the process of consultation. The establishment of the Terrestrial Mammal Group in 1996, under the auspices of the Ministry of Regional Municipalities and Environment, has provided an advisory forum for discussion of antelope conservation issues and production of action plans.

The Arabian Oryx Sanctuary, some 2,700,000ha officially designated by Royal Decree in January 1994, was inscribed on the list of World Heritage sites in December the same year. The Ministry of Regional Municipalities and Environment is in the process of finalising a management and land-use plan. A large wooded plain near Al Kamil in the Ja'alan has recently been designated by Royal Decree as a natural park and already contains a population of gazelles. Jebel Samhan in the Governorate of Dhofar also contains a gazelle population and has also been designated by Royal Decree as a national park.

Apart from the existing protection given by rangers of the Diwan of Royal Court in the Wadi Sareen Wildlife Reserve, the coastal plain north of Sur, and the Jiddat al-Harasis, the Ministry of Regional Municipalities and Environment has ranger units to protect gazelle populations in the Ja'alan and Sur regions. These units were expanded in 1994 and expansion continues. Small units now give protection over wide areas of the Northern Mountains and surrounding plains from the Governorate of Musandam to Sur, throughout the Wahibah Sands, along the eastern coast of central Oman, the island of Masirah, and throughout most of the Governorate of Dhofar. Their implementation includes a system of formal reporting of animal sightings, as well as a

programme of public awareness amongst the local population from whom they are recruited. No NGOs currently exist in Oman for the conservation of antelopes.

Conservation measures proposed

The process of formal designation of reserves in the Eastern Hajar, encompassing the gazelle populations of Wadi Sareen, the coastal plain north of Sur and the Ja'alan, and totalling some 400,000ha, is at the consultation stage. The expanding ranger organisation is tasked to promote public awareness in remoter regions, to gather wildlife data and to increase deterrence of poaching. The level of domestic stock grazing in protected areas will be addressed during the management planning process following formal designation of these areas. The question of import/export controls on exotic species, as well as that of feral populations, is the subject of current action.

Species accounts

Arabian Oryx (*Oryx leucoryx*)

Distribution and population: Occurs in the central plains of the Jiddat al-Harasis, in the Arabian Oryx Sanctuary (Fig. 10.2), following the White Oryx Project. From the first release of captive-bred oryx in 1982, the population reached approximately 450 animals in January 1996, of which all but 22 were wild born. The oryx were monitored by staff of the White Oryx Project and were utilising an area of approximately 16,000km^2. In February 1996, oryx were illegally caught for sale outside the country for the first time since reintroduction began. This form of poaching continued and the population decreased from an estimated 310 in March 1998, to 138 in September of that year, of which only 28 were females. Consequently, a number of oryx were transferred from the wild to the enclosure at Jaaluni, where the captive herd numbered 40 in February 1999, while an estimated 85 males and 11 females remained in the wild (Spalton *et al.* 1999).

Habitat, food and reproduction: Ranges over the limestone plains of the Jiddat al-Harasis, preferring the shade and vegetation of the *Acacia tortilis*-dominated habitat of the central and southern areas. Primarily a grazer, eating a range of grasses and herbs, the oryx will favour grass species of the genus *Stipagrostis* after rainfall and in drought will browse on fresh growth of *Acacia* spp. and *Prosopis cineraria* trees. It can go for long periods without drinking, deriving enough moisture from the vegetation it eats. Moves large distances (over 120km) to find new grazing, responding to wind-borne information on rainfall and settling for long periods where grazing is available. Occurs in herds of two to 30, with a herd bull, subadult males, and females with following calves; a dominant female usually leads the herd. Adult males are often solitary and some are territorial. In favourable conditions, females calve annually from 22 months of age, usually producing one calf, but twins have been recorded. Conception can occur as little as 10 days after parturition, but is more typically three months (Stanley Price 1989; Tear 1994; Spalton 1995).

Fig. 10.2 Probable former distribution of Arabian oryx *(Oryx leucoryx)* in Oman (light shading) and reintroduction site (dark shading): 1. Arabian Oryx Sanctuary.

Status within the country: Endangered.

Conservation measures taken: In the Arabian Oryx Sanctuary, anti-poaching measures have been strengthened and a Royal Decree passed in September 1998 has reinforced existing laws to protect wildlife in the sanctuary and throughout Oman. Some of the remaining female oryx have been brought into captivity at Jaaluni for a programme of captive-breeding and eventual re-stocking of the wild population once the poaching has been stopped. A pilot environmental tourism project has been launched in the sanctuary (October 1998) as part of a package of proposals to facilitate greater understanding of the value of the protected area and to bring additional benefit to the local people. Global status is Endangered (IUCN 1996).

Conservation measures proposed: Consideration is being given to a regional initiative to address the issue of international trade in wildlife that has driven the poaching of oryx and gazelles in Oman. The Arabian Oryx Sanctuary is currently in the process of land-use and management planning, addressing issues of grazing competition from domestic livestock, vehicle-track damage, and further proposals to bring greater benefits to the peoples of the area.

Fig. 10.3 Distribution of mountain gazelle *(Gazella gazella)* in Oman (shaded). Populations of widely differing size occur within this general area. Areas containing known concentrations are hatched.

Mountain Gazelle or *Idmi* (*Gazella gazella*)

Distribution and population: Occurs throughout most of Oman (Fig. 10.3) in populations of widely differing size. The largest is that of the Jiddat al-Harasis, and coastal areas to the east, which is thought to number around 10,000. Other significant populations occur on the coastal plain north of Sur (around 1,000), near Al Kamil in the Ja'alan (1,000), and in the Wadi Sareen Tahr Reserve (1,000), all of which are protected by rangers. A small population still exists in the southern areas of Wahibah Sands. Small groups of two to three animals have been reported by rangers over a wide range of areas elsewhere, including near to the capital, Muscat, and in the foothills on either side of the Northern Mountains (including the Musandam Mountains). Two subspecies of mountain gazelle have been reported in Oman, *G. g. cora* and *G. g. muscatensis* (Harrison and Bates 1991; IUCN 1996). Records of *G. g. muscatensis* are restricted to the Batinah coastal strip, an area which now supports few, if any, gazelles. However, the taxonomy of these gazelles is uncertain and it is unlikely that resources will be available in the near future to determine different subspecies in Oman, if indeed the differences exist at all. In the areas protected by rangers the populations are thought to be increasing or at least stable.

Habitat, food and reproduction: Living in mountains, foothills, gravel and coastal plains, the mountain gazelle's habitat coincides largely with that of the acacia tree. Not usually a gregarious species, it is most often seen singly or in small parties. A dominant male will control an area of territory and the females within it. Primarily a grazer, it mainly eats grasses during the growing season of December to March, turning to dicotyledons, such as *Ziziphus spina-christi*, in the hotter months when it also benefits from the good shade provided by this tree. In the desert, it enjoys the fruit of *Acacia tortilis* taken from the ground, or from the tree itself whilst standing on its hind legs. Young are born throughout the year with peaks in January and July/August, the mother giving birth alone. Sexual maturity in the species is reached at 18 months of age, and females give birth to their first young at the age of two years (Harrison and Bates 1991). In Oman, a birth peak has been observed during the period December–March (A. Spalton *pers. comm.* 1997).

Photo 10.1 Mountain Gazelle (*Gazella gazella*). Tim Wacher**.**

Status within the country: Satisfactory; however, *G. g. muscatensis*, if it is a valid form, is Insufficiently Known.

Conservation measures taken: Mountain gazelles are well protected by rangers in the areas indicated above. The Ministry of Regional Municipalities and Environment's ranger organisation has recently been expanded and is well-equipped. A captive-breeding herd was established in 1975 in the Wadi Sareen Tahr Reserve to re-populate the reserve's plains and foothills, and the last animals were released in 1996. A second captive-breeding herd was established near Muscat in the early 1970s by the Diwan of Royal Court, and moved to the Breeding Centre for Omani Mammals established in 1979. Global status is Lower Risk/conservation dependent (IUCN 1996).

Conservation measures proposed: Expansion of the ranger organisation will continue under the 1996–2000 Development Plan, enabling further public awareness, increased formal data collection, and more widespread protection of wildlife to be carried out throughout Oman, both outside and inside protected areas. The designation in 1997 of As Saleel Natural Park in the Ja'alan specifically addresses the mountain gazelle population. Implementation of management plans for this, as well as for the Arabian Oryx Sanctuary and Jebel Samhan National Park,

will further increase protection of the species. Additional areas are proposed for designation.

Arabian Sand Gazelle or *Reem* (*Gazella subgutturosa marica*)

Distribution and population: They have been seen after good rains in the northern Jiddat al- Harasis in groups of four to 20. They are also reported infrequently in the Barr Al Hikman area at the southern end of the Wahibah Sands. There is a possibility that populations also exist in the northern desert regions of the Governorate of Dhofar (Fig. 10.4). Unlike mountain gazelles, sand gazelles are shy animals, easily scared, and are, therefore, only seen moving fast in the distance.

Habitat, food and reproduction: Reem live in gravel plains, limestone plateaux, and sand deserts. They feed on perennial dwarf shrubs supplemented by herbage that follows winter rains. Young are dropped in March and April, with a high proportion of twins. Sexual maturity is attained in the first year of life (Harrison and Bates 1991).

Status within the country: Probably endangered, but no estimate of the population has been made.

Conservation measures taken: Protection exists through the ranger units in the Jiddat al- Harasis, Barr Al Hikman, and northern Dhofar. Global status of *reem* is Vulnerable (IUCN 1996).

Conservation measures proposed: Management planning for the Arabian Oryx Sanctuary will take account of this species as a matter of priority. Further expansion of ranger units of the Ministry of Regional Municipalities and Environment in the central region will enable data to be collected and protection to be increased.

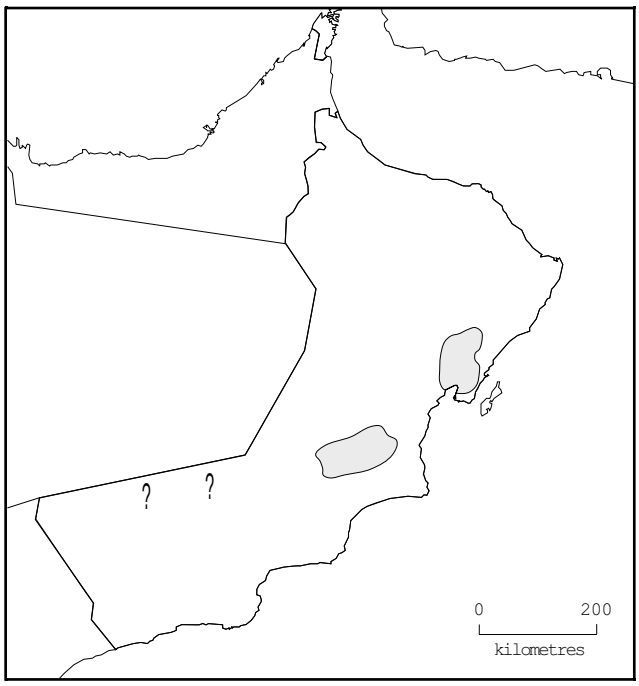


Fig. 10.4 Known distribution of Arabian sand gazelle *(Gazella subgutturosa marica)* in Oman (shaded) and possible localities in the Rub al Khali (?).

Acknowledgements

The assistance of R.H. Daly, Sadiq Al Muscati, M.D. Gallagher, Mehdi bin Ahmed bin Jaffar, H.J.W. Grobler, and J.A. Spalton in the compilation and editing of this chapter is gratefully acknowledged.

References

Harrison, D.L. and Bates, P.J.J. 1991. *The mammals of Arabia.* Second edition. Harrison Zoological Museum, Sevenoaks, England.

IUCN. 1996. *1996 IUCN Red List of threatened animals.* IUCN, Gland, Switzerland and Cambridge, UK.

Spalton, A. 1993. A brief history of the reintroduction of the Arabian oryx *Oryx leucoryx* into Oman 1980–1992. *International Zoo Yearbook* 32:81–90.

Spalton, J.A. 1995. Effects of rainfall on the reproduction and mortality of the Arabian oryx *Oryx leucoryx* (Pallas) in the Sultanate of Oman. PhD thesis, University of Aberdeen, United Kingdom.

Spalton, J.A., Lawrence, M.W., and Brend, S.A. 1999. Arabian oryx reintroduction in Oman: Successes and setbacks. *Oryx* 33:168–175.

Stanley-Price, M.R. 1989. *Animal re-introductions: The Arabian oryx in Oman*. Cambridge University Press, Cambridge.

Tear, T.H. 1994. Foraging strategies, social system and viability analysis: The development of a reintroduced Arabian oryx population. PhD thesis, University of Idaho, Moscow.

Chapter 11. United Arab Emirates

J.H. Samour

Introduction

The United Arab Emirates (UAE) is located in the southeast of the Arabian Peninsula at 22^0–$26^0$30'N, 51^0–$56^0$30'E. It borders the Arabian Gulf to the north; the Sultanate of Oman, the Kingdom of Saudi Arabia, and Qatar to the west, and the Sultanate of Oman and Arabian Gulf to the east (Fig. 11.1). The UAE is a federation of seven independent emirates, formerly known as the Trucial States. The federation was formed on 2 December 1971 and comprises: Abu Dhabi, Dubai, Sharjah, Ajman, Umm Al Quwain, Ras Al Khaimah, and Fujairah Emirates. The country has an area of approximately 83,000km^2 and a population of 2,500,000 (1997 estimate). The capital of the UAE is the city of Abu Dhabi.

The country can be divided into two distinct physiographical regions: the eastern mountains and the western deserts. The eastern mountain region, approximately 80km north-south and 30km east-west, forms part of the Hajar Mountain Range, which continues southwards into the neighbouring Sultanate of Oman. There are two mountain massifs separated from the Hajar Range: Jebel Faiya and Jebel Sumaini, both Cretaceous in origin, and Jebel Hafit, which is of Oligocene origin, near the oasis city of Al Ain. The highest peaks within these mountains range from 2,400m to 3,000m in elevation. An extensive gravel plain with scattered *Acacia tortilis* trees separates the mountains from the desert region to the west. This plain is known as the Jiri Plain in the northern Emirates, and regional divisions towards the south are called Dhaid, Gharif, and Madam Plains. These plains include some of the most fertile and productive agricultural land in the country. West of the gravel plains lies a belt of dunes with *ghaf* (*Prosopis* sp.) trees. The western deserts are characterised mainly by sand and shingle low-scrub desert, aeolian dunes, and the coastal plateau. In the south, the dunes form the northern edge of the Rub al Khali or Empty Quarter. The sand and shingle desert joins the northern sand zone and extends towards the coast, forming low ridges and intervening gravel and salt flats. Coastal sand dunes consist mainly of white carbonate sands formed from powdered marine shells, while the inland sand dunes are reddish in colour and formed of powdered quartz rock. In the north, the sand dunes are low and partially covered by low vegetation, whereas in the south, the dunes are higher with little or no vegetation. The coastal plain consists of extensive intertidal mud flats, shallow lagoons, and extensive salt flats (*sabkah*). The Arabian Gulf Coast still has extensive areas of mangroves (*Avicennia marina*). The main plant communities and habitats of the UAE were described by Western (1989).

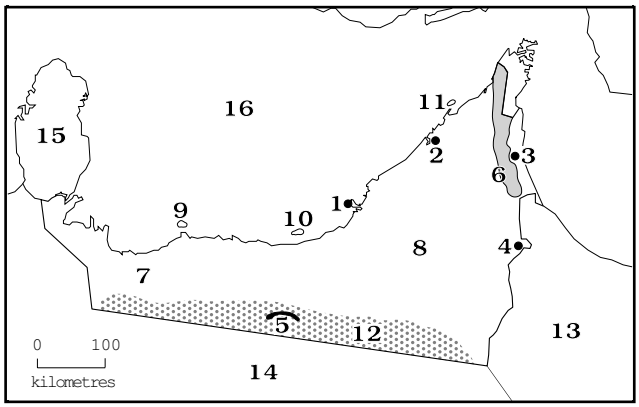


Fig. 11.1 United Arab Emirates. Geographical features and localities mentioned in the text: 1. Abu Dhabi; 2. Dubai; 3. Fujairah; 4. Al Ain; 5. Liwa Oasis; 6. Hajar Mountains; 7. Baynunah; 8. Khatam; 9. Sir Bani Yas; 10. Abu Al Abyad; 11. As Sinniyah; 12. Rub al Khali; 13. Oman; 14. Saudi Arabia; 15. Qatar; 16. Arabian Gulf.

Temperatures during summer (May–September) range from 38^0C to 55^0C and in winter (October–April) range from 20^0C down to 4^0C. The climate is humid along the coast, becoming much drier inland. Rain falls mainly in winter and averages 80mm annually. The wettest months are February and March, with an average of 38mm and 34mm of precipitation, respectively, between 1971 and 1989 (Anonymous 1993).

The UAE has one of the highest per capita gross domestic products (GDP) in the world, with an estimated $36.7 billion in 1994. Just over 33% of this wealth comes from oil and gas revenues. Non-oil revenues, mainly from commerce and industry, account for an estimated $1 billion per year. Since the discovery of oil in the UAE in 1958, the country has gone through a rapid phase of transformation in common with other states in the Gulf region. The unexpected and newly discovered wealth has brought progress and prosperity to the country through enormous development programmes. Although great advances have been made in developing the country and its infrastructure during the last two decades, wildlife conservation is still in its infancy. The creation and establishment of Al Ain Zoo as a centre for breeding endangered Arabian species, and several private breeding programmes across the country, reflect the interest of the government and private individuals in promoting the preservation of Arabia's natural heritage.

Table 11.1 Current status of antelopes in the United Arab Emirates.

Species	Status[1]	GPS[2]
Arabian Oryx (*Oryx leucoryx*)	Extinct	–
Mountain Gazelle (*Gazella gazella*)	Insufficiently known	c.2%?
Arabian Sand Gazelle (*G. subgutturosa marica)*	Insufficiently known	c.5% (of *G. s. marica*)

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

Current status of antelopes

There is very little data available on the antelopes that may have formerly occurred in the UAE. Out of the six species of antelopes that have inhabited the Arabian Peninsula (Groves 1989; Harrison and Bates 1991), only three have been definitely identified in the UAE (Table 11.1). Sadly, the Arabian oryx (*Oryx leucoryx*), which used to be quite numerous in the western part of the UAE, is now extinct there. This may have occurred around the late 1960s and early 1970s, about the same time that oryx became extinct throughout the Arabian Peninsula. The two species currently known to occur in the UAE are the mountain gazelle (*Gazella gazella*) and Arabian sand gazelle or *reem* (*G. subgutturosa marica*). There have been two unconfirmed reports of Saudi gazelle (*G. saudiya*) in the UAE, although no specimens from the UAE or adjacent areas of eastern Arabia were reported by Harrison and Bates (1991). Thesiger (1949) reported gazelles known as "damani" near the Oman Mountains and in the Khatam Sands, and indicated that these were probably Saudi gazelle*,* not *reem*. A herd of gazelles (>100) on As Siniyyah Island, off the coast of Umm Al Quwain Emirate, was described as *G. dorcas saudiya* by Gross (1987). Photographs of these gazelles have been studied recently by C. Groves (*pers. comm.*), who suggests that they could be the species now denominated as *G. saudiya.* The origin of these gazelles is not clear, but they live freely on the island. According to the ruler of Umm Al Quwain, the gazelles have always occurred on the island. It is hoped to investigate this population in the near future to establish the origin, structure, and dynamics of the herd, and, if possible, to undertake taxonomic and genetic studies to confirm the preliminary observations. However, gazelles have been introduced to many islands in the Gulf, often involving animals from different origins. Two islands contain gazelles which are said to originate from uncorrupted native stock (P. Hellyer *in litt.* 1997). These are Balghelam, northeast of Abu Dhabi, where gazelles were released in the 1950s, and Futaisi, just west of Abu Dhabi, to which gazelles cross at low tide from the adjacent island of Bu Khushaishah.

Additionally, there have been reports over at least the last five years, mainly from Dubai and Fujairah Emirates, of gazelles whose description does not conform to that of either *G. gazella* or *G. s. marica*. These reports may be due to the presence of undescribed gazelle species in the country, to uncontrolled introductions of non-native species, or even of hybrid gazelles. It is known that there have been several unregulated releases of gazelles in certain areas of the country, mainly in Dubai and Fujairah Emirates. Some of these gazelles have come from Sir Bani Yas Island, others have come from private breeding herds, of which there are many. Gazelles from Sir Bani Yas have been released on repeated occasions in the area around Baynunah. Information about these releases is scanty, and the dates, exact location, number of gazelles, and the species involved are unfortunately unknown. Sir Bani Yas is home to a large collection of mainly free-ranging antelopes, which contains several Arabian and African species, including mountain gazelle (*G. gazella*), goitered gazelle (*G. subgutturosa*), dorcas gazelle (*G. dorcas*), Grant's gazelle (*G. granti*), blackbuck *(Antilope cervicapra*), eland (*Taurotragus oryx*), beisa oryx (*Oryx gazella beisa*), and gemsbok (*Oryx gazella*), scimitar-horned oryx (*O. dammah*), and Arabian oryx (*O. leucoryx*) (C. Stuart *in litt.* to R. East 1996).

Conservation measures taken

Since 1971, the federal government and the governments of individual emirates have introduced various laws that regulate and control the hunting of mammals and birds in the country. In 1983, the President of the UAE, H.H. Sheikh Zayed bin Sultan Al Nahyan, issued Federal Decree-Law No. 9, which prohibited the hunting of birds and mammals (UAE 1983). This law specifically mentions "gazelles of all kind" and other species such as the Arabian desert hare (*Lepus capensis arabicus*), dugong (*Dugong dugon*), and spiny-tailed lizard (*Uromastix aegyptius*).

The Federal Environment Agency (FEA), established in 1993, has a wide remit and bears overall responsibility for conservation of wildlife and the environment. A Biodiversity Conservation Committee was recently established within the FEA and has reviewed the status of the UAE's wildlife and the threats facing it (Aspinall 1996a; Hornby 1996a). Individual emirates may also have their own departments, such as Abu Dhabi's Environment and Wildlife Research and Development Agency.

Another important sign of interest in wildlife conservation from a relatively young country was the signing of

the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in May 1990. In 1989, the National Avian Research Center (NARC) was created to help preserve the houbara bustard (*Chlamydotis undulata*) as a quarry for the ancient sport of falconry. NARC also exists to promote nature conservation and is dedicated to the sustainable use of wildlife. The Wildlife Management Unit was established within NARC to promote the study of conservation and to assist in the establishment of a national network of protected areas. NARC has now been absorbed into the Environmental Research and Development Agency.

The UAE does not yet have a formal network of nature reserves. Several private reserves have been decreed by the rulers of individual emirates. The country's first formally designated marine reserves were created by the ruler of Fujairah Emirate in June 1995. Areas of potential importance for conservation of birds in UAE have been identifed (Evans 1994). There are also some very active volunteer groups promoting natural history and conservation, such as the Emirates Natural History Group, a member of IUCN, and the Arabian Leopard Trust.

There are several private collections of ungulates in the UAE. Most are maintained on off-shore islands, in particular Sir Bani Yas, Abu Al Abyadh, Bel Ghelam, and Bu Khushaysha Islands. Amongst other species, these collections have large numbers of *G. gazella* and *G. subgutturosa marica*. Sir Bani Yas and Abu Al Abyadh Islands alone may hold together as many as 5,000 individuals of each of these species. Al Ain Zoo has breeding groups of Arabian oryx, mountain gazelle, Arabian sand gazelle, and possible Saudi gazelle, as well as other Arabian ungulates.

Conservation measures proposed

Various proposals for nature reserves have been prepared by the National Avian Research Center and the Federal Environmental Agency (P. Osborne and R. Hornby *pers. comm.*), UAE University (A. Al Midfa, *pers. comm.*), and the Arabian Leopard Trust (M. Jongbloed, *pers. comm.*). The need for federal legislation, requirements for a national protected area network, including the necessary legislation, and a list of potential sites were identified by Aspinall (1996b). A few of the proposed sites currently contain gazelle populations. All existing wild populations of gazelles in the country should be surveyed to assess their status. It is very important to take measures to discourage unauthorised releases of antelopes, particularly those involving non-indigenous taxa. Past management practices in many collections allowed animals of different species and origins to mix together and interbreed, so careful screening of these animals should be undertaken to assess their value as a potential source for reintroductions.

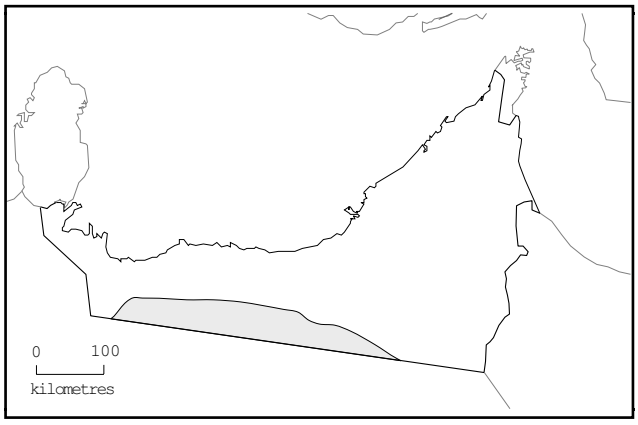


Fig. 11.2 Probable former range of Arabian oryx *(Oryx leucoryx)* in the UAE (shaded).

Species accounts

Arabian Oryx (*Oryx leucoryx*)

Distribution and population: Oryx were formerly quite numerous in the western part of the UAE, in the Manasir, Dhafrah, and Liwa areas (Fig. 11.2), their range extending into the central Rub al Khali (Philby 1933). Oryx probably became extinct in the UAE around the late 1960s or early 1970s.

Status within the country: Extinct.

Conservation measures taken: Several captive-breeding herds of oryx are kept in government and private collections. Global status is Endangered (IUCN 1996).

Conservation measures proposed: Plan reintroduction of the species into suitable areas once protection can be ensured.

Mountain Gazelle (*Gazella gazella*)

Distribution and population: This is the most commonly reported species of gazelle in the country and is widely distributed in the UAE, in the mountains of the north, and in the desert (Fig. 11.3). Records exist from Wadi Sahem, Wadi Safad, Wadi Hail, Liwa Oasis, and areas around Al Faqaa, Umm az Zumul, Baynunah, Sweihan, Jebel Ali, Muraqqab, Margham, Hatta, Fili, and Saqamqan (Anonymous, 1977–1995; S. Aspinall, C. Gross, P. Hellyer, and M. Jongbloed, *pers. comm.*). On a survey during March 1996 in the desert of Abu Dhabi and Dubai, gazelles were found at 21 localities within an area covering a little over 3,000km^2 (Hornby 1996b). The mountain gazelles occurring in the UAE are usually considered to be the subspecies *G. g. cora* (Harrison and Bates 1991). However, gazelles occurring in the mountains are smaller and darker than those of the desert, and it has been suggested that these could represent a different subspecies (Hornby 1996a), though this has not been confirmed. The issue is complicated by the

Fig. 11.3 Known areas of distribution of mountain gazelle *(Gazella gazella)* in the UAE (hatched).

possibility that animals have escaped or have been released from private collections, many of which are known to contain hybrid specimens. It will only be possible to resolve the issue of exactly which taxa of free-ranging gazelles occur in UAE when a comprehensive study of skeletal material and DNA analyses have been undertaken.

Habitat, food and reproduction: Commonly associated with sand and gravel plains containing low scrub vegetation, wadis, foothills, and mountains. They occur singly or in small groups of two to three. Mountain gazelles do not have a distinct breeding season as they breed almost throughout the year, but young gazelles are more frequently seen in early spring (March–April). Usually only one young is born, but twins are regularly observed in the wild and in captive herds. In captivity, twinning may account for up to 20% of births.

Status within the country: Insufficiently known. Appears to be increasing in numbers, but no adequate field surveys have been undertaken, and numbers and population structure figures are not available.

Conservation measures taken: Hunting is prohibited. Global status is Lower Risk/conservation dependent (IUCN 1996).

Conservation measures proposed: Survey remaining populations to assess their current status. Establish protected areas where the best populations are located, develop management plans to aid their long-term conservation, and enforce the ban on hunting.

Arabian Sand Gazelle or *Reem* (*Gazella subgutturosa marica*)

Distribution and population: More commonly observed in the past. According to Thesiger (1949), *reem* were rare or extinct in the Taff, Qufa, Dhafara, and Rabadh areas (i.e., most of the western and central deserts of UAE), but they survived on several offshore islands and on rocky headlands along the Arabian Gulf Coast. The only recent records are of sightings from around the Liwa Oasis in the southern UAE (Anonymous 1977–1995), and unconfirmed reports of a small group which crosses periodically from Oman into the area south of Al Waqan in the southeast of the country (Fig. 11.4).

Habitat, food and reproduction: Associated with sand and gravel plains. Occurs singly or in small groups of three to four animals. From observations of captive herds, the young are usually born in the spring. Twinning has been observed regularly, but one offspring is more usual.

Status within the country: Insufficiently known.

Conservation measures taken: Hunting is prohibited. Global status of *reem* is Vulnerable (IUCN 1996).

Conservation measures proposed: Survey the remaining population to assess numbers and status. Enforce the ban on hunting. Reintroduction of sand gazelles into suitable protected habitat could be considered.

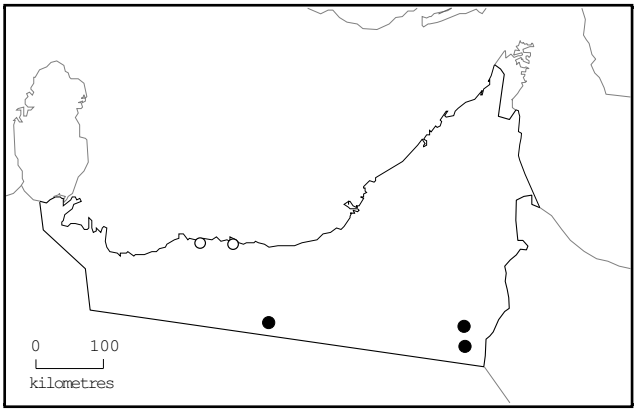


Fig. 11.4 Recent records of Arabian sand gazelle *(Gazella subgutturosa marica)* in the UAE (closed circles) and former records (open circles).

Acknowledgements

I would like to thank and to pay tribute to M. Jongbloed, C. Gross, P. Hellyer, and S. Aspinall for their dedication to natural history and conservation in the UAE and for providing records of gazelle observations. Their unstinting help and support is greatly appreciated.

References

Anonymous. 1977–1995. [Records of gazelles in the UAE]. *Emirates Natural History Society Bulletin* 1–40 and *Tribulus* 1–5.

Anonymous. 1993. *The national atlas of the United Arab Emirates*. UAE University, Al Ain.

Aspinall, S. 1996a. Time for a protected area network in the UAE. *Tribulus* 6(1):5–9.

Aspinall, S. 1996b. *The breeding birds of the United Arab Emirates*. Hobby Publications, Liverpool, United Kingdom and Dubai, United Arab Emirates.

Evans, M.I. (Compiler). 1994. *Important bird areas in the Middle East*. BirdLife International, Cambridge.

Gross, C. 1987. *Mammals of the southern Gulf.* Motivate Publishing, Dubai.

Groves, C.P 1989. The gazelles of the Arabian peninsula. Pp. 237–248 *in:* Abu-Zinada, A.H., Goriup, P.D., and Nader, I.A. (Editors). *Wildlife conservation and development in Saudi Arabia*. National Commission for Wildlife Conservation and Development, Riyadh.

Harrison, D.L. and Bates, P.J.J. 1991. *The mammals of Arabia*. Second edition. Harrison Zoological Museum, Sevenoaks.

Hornby, R. 1996a. A red list of mammals for the U.A.E. *Tribulus* 6(1):13–14.

Hornby, R. 1996b. A census of mountain gazelles. *Tribulus* 6(1):15–17.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Philby, H.St.J.B. 1933. *The Empty Quarter.* Constable, London.

Thesiger, W. 1949. A further journey across the Empty Quarter. *Geographical Journal* 113:21–46.

UAE. 1983. *United Arab Emirates official gazette*, No 133, Year 13. Abu Dhabi.

Western, A.R. 1989. *The flora of the United Arab Emirates*. UAE University, Al Ain.

Chapter 12. Bahrain

S.A. Mohamed and M.A. Al Dosari

Introduction

The State of Bahrain consists of more than 33 islands that vary in size and elevation and lie in the southwestern waters of the Arabian Gulf, some 25km to the east of Saudi Arabia at 26^{O}N, 50^{O}35' E (Fig. 12.1). The total area of all the islands is about 700km^2. The largest island, Bahrain, covers an area over 500km^2 and is formed from an anticlinal dome of sedimentary limestone rocks. Jebel Al-Dukhan, around 122.4m above sea level, is the highest point of Bahrain and is located in the middle of the island.

The main island of Bahrain is divided into five physiographic regions: the central plateau with scattered hills, surrounded by a shallow interior basin; multiple escarpments; a main backslope; and coastal lowlands (Doornkamp *et al.* 1980). Bahrain is part of the Arabian Peninsula and is typically hot and arid. The average annual rainfall is approximately 77mm, with March being the wettest month, but there is considerable variation over the years. For example a total of 236mm fell in March 1995. Air temperatures show less variation from year to year. The average daily temperature ranges from 14.7^{O}C in winter to 37.7^{O}C in summer. The lowest temperature ever recorded was 2.8^{O}C in January 1964 and the maximum temperature recorded was 46.7^{O}C in May 1972.

Although Bahrain is an oil-producing country, with an annual income reaching $1.5 billion, and a human population of only about 500,000 (Anonymous 1992), wildlife still faces problems due to the small size of the country. There is a continuous high demand for land in various parts of the island, which puts pressure on critical natural habitats, including desert areas. Despite Bahrain's small size, the diversity of its fauna and flora is remarkable. For example the flora includes 307 species (Cornes and Cornes 1989; El-Oqlah and Abbas 1994).

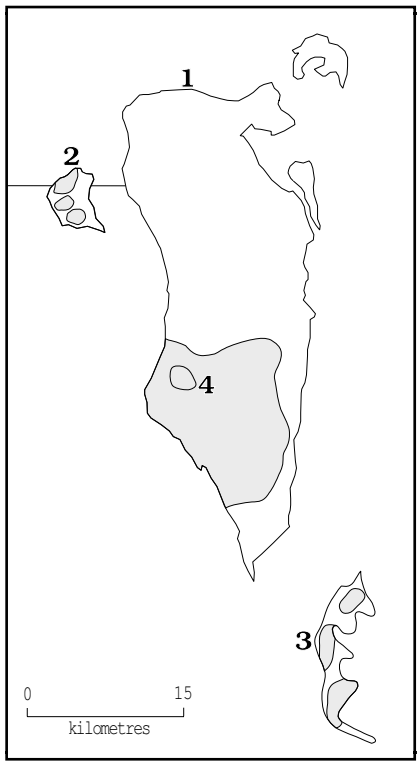


Fig. 12.1 Bahrain, showing current distribution of Arabian sand gazelle *(Gazella subgutturosa marica)* (shaded). 1. Bahrain Island; 2. Umm-Nasan Island; 3. Hawar Island; 4. AI-Areen Wildlife Park.

Current status of antelopes

The only antelope native to Bahrain is the Arabian sand gazelle or *reem* (*Gazella subgutturosa marica*) (Al-Khalili 1990; Harrison and Bates 1991) (Table 12.1). Gazelles are present on only three islands: Bahrain, Umm-Nasan, and Hawar. Umm-Nasan Island has the largest number of gazelles. However, the nominate form of goitered gazelle (*G. s. subgutturosa*) was introduced to Umm-Nasan a long time ago, and it has probably hybridised there with *reem* (*G. s. marica*). Hawar Island has a few herds of gazelles that together total >200 animals. During the last three decades,

Table 12.1 Current status of antelopes in Bahrain.

Species	Status[1]	GPS[2]
Arabian Sand Gazelle (*Gazella subgutturosa marica*)	Satisfactory	15% (of G. s. marica)

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

land development has increased rapidly and more people are inhabiting the open areas towards the southern part of the main island. This has forced the wild gazelle population to move further south.

Conservation measures taken

In January 1995, the Amir issued a law by decree for the protection of wildlife in Bahrain. All hunting is illegal in Bahrain and the law is more strictly enforced for gazelles. No protected areas have been formally designated so far, but the southern part of the island of Bahrain (over 200km^2) is not accessible to the public and represents the largest open area available to wild gazelles. The island of Umm Nasan (20km^2) also has restricted access and disturbance is kept to a minimum. This has allowed the herds to increase in size and become the largest group of gazelles in Bahrain. Establishment of Al Areen Wildlife Park was one of the first steps taken by the government towards conservation and protection of wildlife in the region. It was established in 1976 as a centre for endangered wildlife and wildlife education. The wildlife park contains a number of Arabian and African ungulates, and an important captive-breeding collection of Arabian and Asian gazelles, which are housed in a special compound (Samour *et al.* 1989). Al Areen also has a reserve section covering 400ha, which contains threatened Arabian species, including Arabian oryx (*Oryx leucoryx*) and a herd of about 40–50 *reem* (*Gazella subgutturosa marica*). The captive-breeding herd of Arabian oryx has already supplied animals for use in reintroductions and captive-breeding programmes in Oman, Saudi Arabia, and Jordan (Samour *et al.* 1989).

Many agencies have worked together to increase public awareness of nature and wildlife in Bahrain. The National Committee for Wildlife Protection (NCWP), established in October 1993, is concerned with the promulgation of regulations related to conserving rare and endangered species, and the management of protected areas. The principal NGO concerned with wildlife conservation is the Bahrain Natural History Society.

Conservation measures proposed

Legislation related to the protection of the gazelle will soon be issued, which will enable NCWP to provide official protection from hunting for this species. The NCWP is working with the government to declare the southern region of the main island of Bahrain a protected area. This would decrease the pressure for range on the gazelle population there.

Species account

Arabian Sand Gazelle or *Reem* (*Gazella subgutturosa marica*)

Distribution and population: Reem occur on the southern part of Bahrain Island and on Hawar Island (Fig. 12.1), where they number >250 and about 230, respectively. A large number (>1,500) of gazelles are present on Umm-Nasan Island and probably represent *G. s. marica*, *G. s. subgutturosa,* and hybrids thereof. A few herds of *reem* totalling 40–50 individuals are also present in the reserve section of Al Areen Wildlife Park.

Habitat, food and reproduction: Reem are found in the central depression and sandy lowlands. They feed on a variety of plants, including *Heliotropium crispum, Helianthemum lippii, Sporobolus,* and *Cyperus* spp. (Mohamed *et al.* 1991). Females give birth during late spring and early summer (April–May), a period that follows spring rains and high plant cover.

Status within the country: Satisfactory. Not threatened in protected areas.

Conservation measures taken: A captive-breeding herd occurs in the reserve section of Al Areen Wildlife Park. Access to the south of Bahrain Island and to Umm-Nasan Island is restricted, which contributes to protection of their gazelle populations. Global status of *reem* is Vulnerable (IUCN 1996).

Conservation measures proposed: Legislation to be adopted will protect *reem* from hunting and will designate the southern part of Bahrain Island as a protected area.

References

Al-Khalili, A.D. 1990. New records and a review of the mammalian fauna of the State of Bahrain, Arabian Gulf. *Journal of Arid Environments* 19:95–103.

Anonymous. 1992. *Statistical abstracts*. Central Statistics Organisation, Directorate of Statistics, Bahrain.

Cornes, M.D. and Cornes, C.D. 1989. *The wild flowering plants of Bahrain*. Immel, London.

Doornkamp, J.C., Brunsden, D., and Jones, D.K.C. 1980. *Geology, geomorphology and pedology of Bahrain*. Geo Abstracts, Norwich, England.

El-Oqlah, A.A. and Abbas, J.A. 1994. A checklist of vascular plants of Bahrain. *Dirasat* 21B: 95–118.

Harrison, D.L. and Bates, P.J.J. 1991. *The mammals of Arabia*, Second edition. Harrison Zoological Museum, Sevenoaks.

IUCN. 1996. *1996 IUCN Red List of threatened animals.* IUCN, Gland, Switzerland and Cambridge, UK.

Mohamed, S.A., Abbas, J., and Saleh, M. 1991. Natural diet of the Arabian rheem gazelle (*Gazella subgutturosa marica*). *Journal of Arid Environments* 20:371–374.

Samour, J., Irwin-Davies, J., Mohanna, M., and Faraj, E. 1989. Conservation at Al-Aren Wildlife Park, Bahrain. *Oryx* 23:142–145.

Chapter 13. Qatar

Y. Al Hamar and A. Almutai

Introduction

The State of Qatar is situated on the eastern side of Arabia and consists of a peninsula, approximately 160km from north to south, and covering an area of 11,437km^2 (Fig. 13.1). The whole country is characterised by flat, stony desert, with a few sand dunes in the southeast (Evans 1994). Natural vegetation is sparse, and heavy grazing by livestock has affected all desert habitats (Vine and Casey 1992). Some acacia and scrub communities occur in the north, but there are few, if any, endemic species (IUCN 1992). The climate has a typical desert character, with low rainfall and hot summers (up to 46^{0}C). The human population numbers about 650,000.

Current status of antelopes

Antelopes no longer occur in the wild in Qatar (Vine and Casey 1992) and no records from Qatar were listed by Harrison and Bates (1991). Nevertheless, it is possible that at least one species, Arabian sand gazelle (*Gazella subgutturosa marica*), may have formerly occurred in Qatar, since it occurs in the neighbouring states of Saudi Arabia, Bahrain, and the United Arab Emirates. Three collections of captive antelopes are kept in fenced reserves controlled by the government at Al Shahaniyah (*c.*100ha; established 1979), Ushoyrig (1991), and Al Massahbiya (1997). There are also several private collections, the largest of which is at Al Wabra. In total, there are approximately 170 Arabian oryx (*Oryx leucoryx*) and 2000 gazelles (*Gazella gazella* and *G. subgutturosa*) in Qatar, distributed between the official fenced reserves, private farms, and the national zoo. These collections could provide stock for future reintroductions, though the extent of grazing, agriculture, oil exploration, and other human activities limit the areas in Qatar where releases could take place.

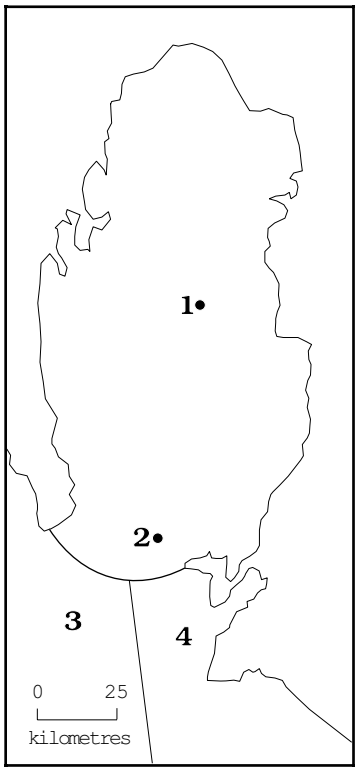


Fig. 13.1 Qatar. Captive breeding centres for antelopes: 1. Al Shahaniyah; 2. Almasshabiya; 3. Saudi Arabia; 4. United Arab Emirates.

Conservation measures taken

Qatar has no effective legislation covering conservation of wildlife or establishment of protected areas, and both hunting and falconry are carried out without controls (IUCN 1992). The Environmental Protection Committee (EPC), established in 1981, bears overall responsibility for environmental policy. Three captive-breeding centres are under the control of the Environment Department in the Ministry of Municipal Affairs and Agriculture. These are operated according to a mandate on the conservation of nature issued by the ministry in 1993. The Center for Scientific and Applied Research at the University of Qatar has undertaken studies of the fauna and flora of the country. The principal NGO concerned with wildlife is the Qatar Natural History Society (IUCN 1992). Qatar has one of the largest captive herds of Arabian oryx in existence, which is descended from animals originally brought from the Rub al Khali by the late Sheikh Qassin bin Hamad al-Thani. This herd has provided stock for Al Shahaniyah in 1979, for reintroductions in Saudi Arabia, and for collections in Jordan, UAE, and Bahrain. There are, in addition, several small, private herds of captive oryx in the country. A proposal to release Arabian oryx into a large fenced area in the south of Qatar was implemented at Almashabia Protected Area in 1997. Gazelles are also kept at Al Wabra and in other private collections and these may prove to be of value in captive-breeding and reintroduction programmes. However, except for the three government-controlled herds, the origins of many animals are not documented, and some collections have not been subject to

scientific management. As a result, animals of different origins, or even different taxa, have been kept together, which has allowed them to interbreed. The Al Wabra private collection contains a captive herd of gazelles that were previously considered to be Saudi gazelle (*G. saudiya*), but cytogenetic studies of two individuals from the herd show that they are karyotypically similar to *G. dorcas* (Kumamoto *et al.* 1995).

Conservation measures proposed

The captive herd of Arabian oryx has great conservation value as a source of stock for future reintroductions in the Arabian Peninsula. It is, therefore, important to continue the captive-breeding programme, and to manage the herd to maintain its genetic diversity. Co-operative agreements to provide animals for release should be entered into with countries where reintroductions of oryx have taken place, or are planned. Captive herds of gazelles, especially any putative *G. saudiya*, should be carefully screened to identify their precise taxonomic status and to assess their value for future reintroductions. Management efforts should be concentrated on collections identified as containing pure herds of gazelles indigenous to the Arabian Peninsula. Owners of private collections should be encouraged to manage their herds scientifically, and to avoid mixing animals of different taxa or of different origins.

Acknowledgements

The assistance of Robert and Helen Nation in compiling this report is gratefully acknowledged.

References

Evans, M.I. 1994. *Important bird areas in the Middle East*. BirdLife International, Cambridge.

Harrison, D.L. and Bates, P. 1991. *The mammals of Arabia*. Harrison Zoological Museum, Sevenoaks.

IUCN. 1992. *Protected areas of the world: A review of national systems. Vol. 2: Palaearctic.* IUCN, Gland, Switzerland and Cambridge, UK.

Kumamoto, A.T., Kingswood, S.C., Rebholz, W.E.R., and Houck, M.L. 1995. The chromosomes of *Gazella bennetti* and *Gazella saudiya*. *Zeitschrift für Säugetierkunde* 60:159–169.

Vine, P. and Casey, P. 1992. *The heritage of Qatar*. Immel, London.

Chapter 14. Kuwait

S.C. Kingswood, P.J. Cowan, and D.A. Clayton

Introduction

Kuwait is located between Iraq and Saudi Arabia at the northern end of the Arabian Gulf (Fig. 14.1). Biogeographically, Kuwait is a part of the Anatolian-Iranian Desert in the Palaearctic realm. Most of Kuwait's 17,800km^2 is flat to gently undulating desert plain consisting of sparse scrub dominated by the dwarf-shrubs *Rhanterium* and *Haloxylon*, with perennial herbs and ephemerals. The most striking topographical feature is the Jal Az-Zor escarpment, which borders the northern shore of Kuwait Bay for 80km and reaches a height of 145m above sea level. The country experiences very hot, dry summers and cool to mild, relatively wet winters. Being in close proximity to the Afrotropical and Indomalayan realms, Kuwait has a varied fauna and flora, but with relatively few species, particularly endemics (Green *et al.* 1991; IUCN 1992; Evans 1994).

Although only about 4% of Kuwait is permanently inhabited with people (just over two million at the start of 1990), the average population density (110 persons/km^2 at the start of 1990) is relatively high for a desert country. Urban and industrial expansion and recreational activity, for example, have caused environmental problems. Overgrazing by domestic livestock, cutting or uprooting of woody shrubs, off-road use of vehicles, and hunting have long been uncontrolled and have resulted in considerable environmental degradation. The war between Iran and Iraq during the 1980s brought Bedouin and their herds of camels, goats, and sheep into northern Kuwait and added to the overgrazing problem. The Iraqi occupation of Kuwait in 1990 and the resulting Gulf War in 1991 had a major environmental impact. Several designated conservation areas (e.g., Jal Az-Zor National Park and a proposed national park at Al-Batin) were badly damaged as a result of the occupation and war. Oil fires and slicks severely polluted the air, soil, and water, and large numbers of migratory birds died after being trapped in lakes formed by the slicks of uncapped oil wells (IUCN 1992; Evans 1994; Omar and Abdulraheem 1996).

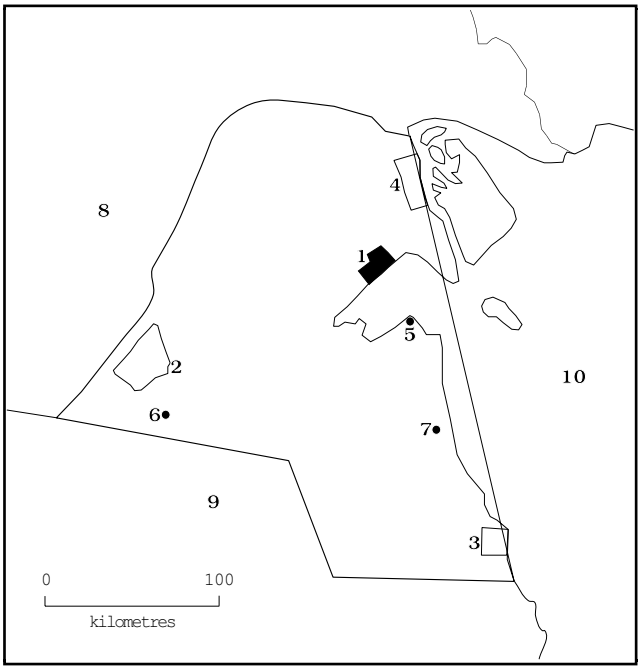


Fig. 14.1 Kuwait. Protected areas that have potential significance for antelopes. Designated protected area: 1. Jal Az-Zor National Park (33,300ha). Proposed protected areas: 2. AI-Batin (91,000ha); 3. AI-Khiran (13,000ha); 4. Umm Niga (24,600ha). Other geographical features: 5. Kuwait City; 6. Fahaheel and Fintas; 7. Dibdibbah. Adapted from Omar and Abdulraheem (1996). 8. Iraq. 9. Saudi Arabia. 10. Arabian Gulf.

Current status of antelopes

Three species of antelopes could have once occurred in Kuwait: Arabian oryx, Saudi gazelle, and Arabian sand gazelle (Stewart 1963; Harrison and Bates 1991; Table 14.1). Prior to the Iraqi occupation in 1990, faunal surveys were conducted throughout the country by the Ahmadi Natural History and Field Studies Group. However, neither oryx nor gazelles have been sighted in Kuwait for a number of years, and it is unlikely that populations of antelopes still survive there. In 1972, there was a report of five gazelles that were seen grazing with a flock of sheep and goats in the area of Fahaheel and Fintas, south of the city of Kuwait (Anonymous 1972). The extermination of antelopes in Kuwait presumably was the result of overhunting, overgrazing by domestic livestock, and agriculture, as it was throughout the Arabian Peninsula (East 1992).

Conservation measures taken

Traditional means of nature protection in Kuwait originated over 2,000 years ago, and these were later adopted by the prophet Mohammed with a legal system governing protected areas (*hema*). Kuwait has long been regarded as a vast *hema*, but since the 1970s, this tradition has been eroded by urban development and industrialisation (IUCN 1992). In 1980, Decree Law Number 62 established a general policy of environmental protection, including sections on preservation of the desert environment and designation of

Table 14.1 Current status of antelopes in Kuwait.

Species	Status[1]
Arabian Oryx (*Oryx leucoryx*)	Extinct
Saudi Gazelle (*Gazella saudiya*)	Extinct
Arabian Sand Gazelle (*Gazella subgutturosa marica*)	Extinct

[1]*See Chapter 1 for definition of status categories.*

protected areas. The Kuwait Institute for Scientific Research (KISR) was then contracted by the government (Kuwait Municipality) to plan the development and management of the country's first national park and, in 1990, the now 33,000ha Jal Az-Zor National Park was created. A system of protected areas has since been proposed by KISR (Green *et al.* 1991; IUCN 1992; Evans 1994).

Kuwait's proposed system of protected areas includes three desert parks or reserves (Al-Batin, Al-Khiran, and Umm Niga); however, one of these sites (Al-Khiran) is threatened by urban development. The primary objectives of national parks and nature reserves in Kuwait are to preserve natural and ecological components of the environment and to provide areas for environmental and ecological research. National parks also function to provide education through proper land use and to provide facilities for education and training. Nature reserves are designated to preserve all natural and ecological components of the environment and, as such, restrict human activity to a greater extent than national parks. In parks and reserves, livestock grazing is restricted and hunting is prohibited. Outside protected areas, hunting is permitted throughout the country and there are no laws for its regulation (IUCN 1992; Evans 1994; Omar and Abdulraheem 1996).

Conservation measures proposed

Development of a network of protected areas is a high priority for the conservation of threatened species in Kuwait. In the case of Kuwait's antelope fauna, conservation will first require the reintroduction of these extirpated species to protected areas within their former range. KISR has recommended reintroduction of Arabian oryx and Arabian sand gazelles to Jal Az-Zor National Park (Omar and Abdulraheem 1996). Other sites identified for reintroduction of threatened species include a proposed protected area at Umm Niga, a locality believed to be within the former range of *G. saudiya* (Green *et al.* 1991). Populations of Arabian oryx, Saudi gazelles, and Arabian sand gazelles exist in reserves and zoos outside Kuwait, indicating that stock would likely be available for reintroduction efforts (Sausman and Correll 1994). However, all known populations of Saudi gazelles may actually consist of *G. saudiya* x *G. bennettii* hybrids (Kumamoto *et al.* 1995; Rebholz and Harley 1997); thus, the taxonomic status of putative specimens of *G. saudiya* should be resolved prior to including them in reintroduction projects. Similarly, some populations of goitered gazelles (*G. subgutturosa*) on islands in the Arabian Gulf were introduced, and they may consist of *G. s. subgutturosa*, *G. s. marica*, and their hybrids (East 1992). Since *G. s. marica* is apparently the goitered gazelle native to Kuwait (Harrison 1968), reintroduction efforts should involve this subspecies and not *G. s. subgutturosa* or hybrids thereof.

For reintroduction of antelopes to succeed in Kuwait, management of protected areas will need to eliminate the threats of habitat loss, competition with livestock, and hunting, and it will require monitoring the reintroduced populations (Sausman and Correll 1994). Measures for the establishment of protected areas in Kuwait include fencing and patrolling these areas to prohibit incursions by hunters and livestock (IUCN 1992). Much of the fencing of the Jal Az-Zor National Park was destroyed or removed during the Iraqi occupation (Evans 1994), though enclosure with a new fence is nearing completion. Protection and management schemes should facilitate the rehabilitation of degraded habitats.

The establishment of minimum viable populations of antelopes in Kuwait is more problematic. For example, it is estimated that a protected area of 67,000km^2 will be needed to support a minimum viable population (N = 500) of Arabian oryx, based on an average group size of 15 and home range of 2,000km^2 (Green *et al.* 1991). With the entire country encompassing only 17,800km^2, a reintroduced population of oryx in Kuwait should be managed as part of a regional effort to maintain a minimum viable population. This could be achieved by protecting sufficiently large areas through joint efforts with neighbouring countries. Green *et al.* (1991) point out that only about 4.2% (96,307 of 2,317,661km^2) of the Anatolian-Iranian Desert is currently protected, and many threatened taxa there are not covered within a network of protected areas. If threatened species are to receive adequate protection throughout the region, there should be a high priority placed on increasing the area protected by parks and reserves (Green *et al.* 1991).

Species accounts

Arabian Oryx (*Oryx leucoryx*)

Distribution and population: Prior to 1900, this species probably occurred in the western desert of Kuwait (Fig. 14.2) (Stewart 1963). There have been no recent sightings of any antelopes in Kuwait, and the three indigenous species are considered to be locally extinct.

Habitat, food and reproduction: Arabian oryx inhabited gravel plains, sand dunes, and wadis. Gravel plains were probably preferred for their food and shade, and sand dunes were preferred for their refuge from disturbance. Succulent grasses and shoots of *Tamarix* and other shrubs are pre-

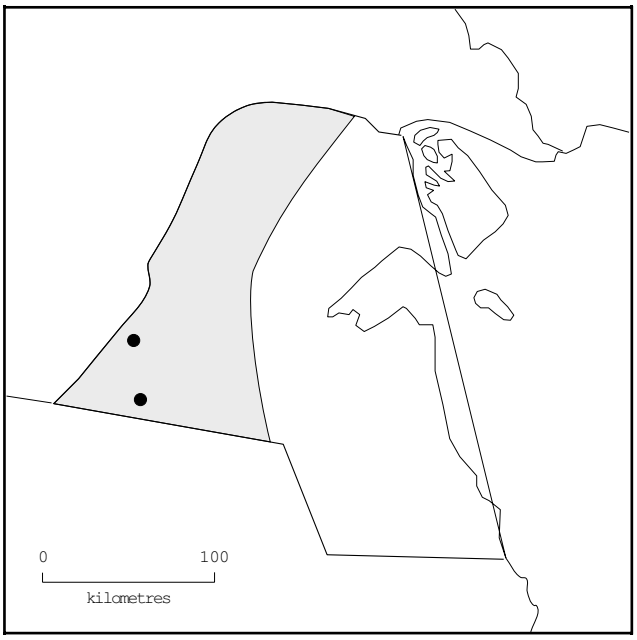


Fig. 14.2 The shaded area shows the approximate former distribution of Arabian oryx *(Oryx leucoryx)* in Kuwait (Stewart 1963). Circles denote records of Arabian sand gazelle *(Gazella subgutturosa marica)* (Harrison and Bates 1991).

ferred foods; bulbs and tubers provide moisture. Herds of up to 100 animals have been reported, but in recent times, group sizes have been about 10 animals or less. Oryx are known to wander great distances in search of pasture. A single calf is born after a gestation period of 240–260 days. In northern populations (i.e., those that probably lived in Kuwait), calving occurred during winter (Stewart 1963; Harrison and Bates 1991).

Status within the country: Extinct.

Conservation measures taken: Global status is Endangered (IUCN 1996).

Conservation measures proposed: Reintroduce Arabian oryx to protected areas within their former range (e.g., Al-Batin probably should be considered pending protection of this site); monitor and manage reintroduced populations; and manage oryx habitat by eliminating the threats of habitat loss, competition with livestock, and hunting.

Saudi Gazelle (*Gazella saudiya*)

Distribution and population: This desert gazelle, sometimes referred to as *Gazella dorcas saudiya*, is reported to have occurred in Kuwait, but is now believed to be extinct on the Arabian Peninsula (Harrison and Bates 1991; East 1992).

Habitat, food and reproduction: The Saudi gazelle was once found in gravel plains and sand deserts of Arabia (Harrison and Bates 1991). A gazelle of *Acacia* country, it occurred singly or in groups of up to 20 (Morrison-Scott 1939; Foster-Vesey-Fitzgerald 1952). Females give birth to one calf at a time (Gross 1987), but little else is known regarding the biology of this species.

Status within the country: Extinct.

Conservation measures taken: Global status is Extinct in the Wild (IUCN 1996).

Conservation Measures Proposed: Reintroduce Saudi gazelles to protected areas within their former range (e.g., Umm Niga may have been within the range of *G. saudiya*); monitor and manage reintroduced populations; and manage their habitat by eliminating the threats of habitat loss, competition with livestock, and hunting. The taxonomic status of putative specimens of *G. saudiya* should be resolved prior to including them in reintroduction projects.

Arabian Sand Gazelle or *Reem* (*Gazella subgutturosa marica*)

Distribution and population: Records include specimens of Arabian sand gazelles from Al-Batin and Dibdibbah (Fig. 14.2), but they are probably now extinct in Kuwait (Harrison 1968; Harrison and Bates 1991; East 1992).

Habitat, food and reproduction: Desert plains, salt flats, and sand dunes were likely habitats in Kuwait. Primarily a browser, but grasses and forbs are also eaten. Group sizes are usually one to nine, but herds may number in the hundreds or thousands; herds have been known to migrate long distances in response to rainfall and availability of forage. Usually, one or two calves are born after a gestation period of five to six months. Calving is seasonal to coincide with the maximum food availability that follows winter and spring rains (Kingswood and Blank 1996).

Status within the country: Extinct.

Conservation measures taken: Global status is Vulnerable (IUCN 1996).

Conservation measures proposed: Reintroduce *reem* to protected areas within its former range (e.g., Al-Batin probably should be considered pending protection of this site); monitor and manage reintroduced populations; and manage their habitat by eliminating the threats of habitat loss, competition with livestock, and hunting. Reintroduction efforts should involve specimens known to represent *G. s. marica,* and not *G. s. subgutturosa* or their hybrids.

Acknowledgements

We thank Z. Amr, A. Budieri, and D. Shafei for reviewing this manuscript. S. Omar provided useful information for the manuscript and Fig. 14.1.

References

Anonymous. 1972. Mammals. *Ahmadi Natural History and Field Studies Group Newsletter* 8:3.

East, R. 1992. Conservation status of antelopes in Asia and the Middle East, Part 1. *Species* 19:23–25.

Evans, M.I. 1994. *Important bird areas in the Middle East*. BirdLife International, Cambridge.

Foster-Vesey-Fitzgerald, D. 1952. Wildlife in Arabia. *Oryx* 1:232–235.

Green, M.J.B., Drucker, G.R.F., and Day, S.I. 1991. Current status of protected areas and threatened mammal species in the Sahara-Gobian region. Pp. 5–69 *in:* McNeely, J.A. and Neronov, V.M. (Editors). *Mammals in the Palaearctic desert: Status and trends in the Sahara-Gobian region*. Russian Academy of Sciences and Russian Committee for the UNESCO programme on Man and the Biosphere, Moscow.

Gross, C. 1987. *Mammals of the southern Gulf*. Motivate Publishing, Dubai.

Harrison, D.L. 1968. *The mammals of Arabia*. Ernest Benn, London.

Harrison, D.L. and Bates, P.J.J. 1991. *The mammals of Arabia, Second edition*. Harrison Zoological Museum, Sevenoaks, England.

IUCN. 1992. *Protected areas of the world: A review of national systems, vol. 2. Palaearctic*. IUCN, Gland and Cambridge.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Kingswood, S.C. and Blank, D.A. 1996. Gazella subgutturosa. *Mammalian Species* 518:1–10.

Kumamoto, A.T., Kingswood, S.C., Rebholz, W.E.R., and Houck, M.L. 1995. The chromosomes of *Gazella bennetti* and *Gazella saudiya*. *Zeitschrift für Säugetierkunde* 60:159–169.

Morrison-Scott, T.C.S. 1939. Some Arabian mammals collected by Mr. H.St.J.B. Philby, C.I.E., *Novitates Zoologicae* 41:181–211.

Omar, S.A.S. and Abdulraheem, M.Y. 1996. Measures to conserve the wildlife of Kuwait. Pp. 149–158 *in:* Greth, A., Magin, C., and Ancrenaz, M. (Editors). *Conservation of Arabian gazelles*. National Commission for Wildlife Conservation and Development, Riyadh.

Rebholz, W.E.R. and Harley, E.H. 1997. Cytochrome *b* sequences from the endangered Saudi gazelle (*Gazella saudiya*) suggest hybridization with chinkara (*Gazella bennetti*). *Conservation Biology* 11:251–255.

Sausman, K. and Correll, T. (Editors). 1994. *Antelope conservation assessment and management plan and global captive action recommendations, Draft 4*. IUCN/SSC Captive-Breeding Specialist Group, Apple Valley, Minnesota.

Stewart, D.R.M. 1963. The Arabian oryx (*Oryx leucoryx* Pallas). *East African Wildlife Journal* 1:103–117.

Chapter 15. Iraq

K. Al-Robaae and S.C. Kingswood

Introduction

Iraq encompasses 446,713km^2 between Iran, Kuwait, Saudi Arabia, Jordan, Syria, and Turkey (Fig. 15.1). The country can be divided into five biogeographical regions: (1) the Arabian and Syrian Deserts, respectively, of southern and western Iraq, which are barren and sometimes rugged plains that rise in broad, low steps to the Arabian Plateau; (2) Al Jazirah, a region to the north of the Syrian Desert, consisting of either undulating plains or low plateaux; (3) Mesopotamia, an area in central and southern Iraq of alluvial plains and wetlands of the Euphrates and Tigris Rivers; (4) the upper plains and foothills, a region including the country between the mountains and the Tigris, and much of the land between the Euphrates and Tigris above Baghdad; and (5) the mountains of northeastern Iraq. Desert vegetation is sparse, but *Haloxylon*, *Artemisia*, and *Astragalus* thrive in wadis. Natural vegetation of Mesopotamia and the upper plains and foothills includes thickets of *Phragmites*, *Tamarix*, and *Populus*, but much of these regions consists of cultivated land, orchards, or uncultivated grassland that is used for grazing sheep and other livestock. In the foothills and mountains, there are open woodlands and forests of *Quercus* and *Pinus* in association with other trees, such as *Juniperus*; however, many of the slopes are unforested today. Most of the country experiences hot, dry summers and mild, wet winters; annual rainfall is about 125mm in lower Mesopotamia and 1,000mm in the northern mountains (Evans 1994; Al-Robaae 1996).

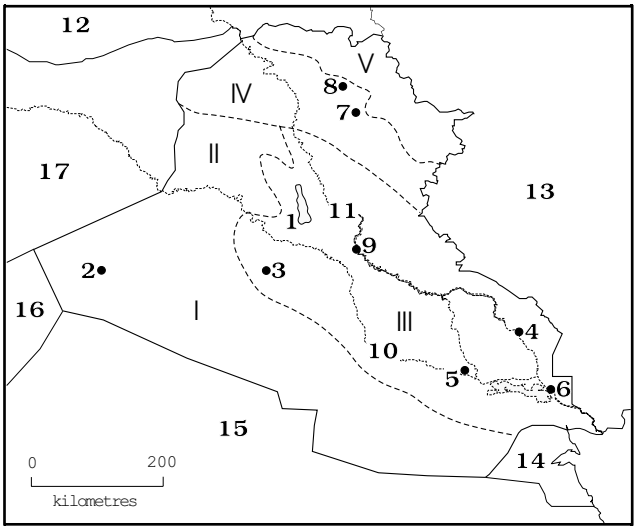


Fig. 15.1 Iraq. Areas that have been identified for protection of goitered gazelles, and possibly other desert antelopes: 1. Mahzam and Tharthar Lake; 2. Rutba. Other geographical features: 3. Abu al Jir; 4. Al Jazirah; 5. Amara; 6. An Nasiriya; 7. Basrah; 8. Erbil; 9. Kirkuk; 10. Euphrates River; 11. Tigris River. Biogeographical regions: I. Desert; II. Al Jazira; III. Mesopotamia; IV. Foothills; V. Northern Mountains.

Foothills of the northern mountains have been cultivated for about 7,000 years, and the development of Mesopotamia, often considered the cradle of civilisation, began at least 6,000 years BP. Extensive alteration of the environment occurred as early as 5,000 BP when Babylonians and later civilisations drained land and constructed complex irrigation systems. By the early 1990s, extensive areas of land were devoted to cultivation (seven million hectares), the oil industry, and date plantations. Major environmental problems include: agricultural, industrial, and organic pollution of the Tigris and Euphrates Rivers; flood-type irrigation causing increases in the groundwater level and salinity of soils, and potentially causing damage to aquifers throughout the country; and air pollution from the corrosive emissions of industrial plants and oil refineries (IUCN 1992).

Current status of antelopes

Goitered gazelles, either Arabian sand gazelles (*G. s. marica*), Persian goitered gazelles (*G. s. subgutturosa*), or intergrades thereof, are reported to occur in three regions of Iraq: east of the Tigris River from lower Mesopotamia to the northern foothills and mountains, the area between Rutba and the Jordanian border, and in Al Jazirah. The Rutba animals probably represent *G. s. marica*, while the other populations could be either *G. s. subgutturosa* or intergrades. There may be at least 1,500 goitered gazelles in the country, with an estimated 1,000 in the Rutba population (Al-Robaae 1996). This species has also been reported as "rare" at Mahzam and Tharthar Lake, an area of *c.*455,000ha in Mesopotamia east of Al Jazirah (Evans 1994). Arabian oryx and probably Saudi gazelles once occurred in the country; however, the Arabian oryx has apparently been extinct there since 1914 and the Saudi gazelle is also thought to be extinct in Iraq (Hatt 1959; Harrison and Bates 1991; Al-Robaae 1996; Table 15.1). Occurrence of the mountain gazelle and nilgai in Iraq, although suggested, has not been substantiated (Hatt 1959). A recent survey found no evidence of mountain gazelles in the country (Al-Robaae 1996).

Antelope populations in Iraq have been reduced or exterminated probably as a result of several factors, including:

Table 15.1 Current status of antelopes in Iraq.

Species	Status[1]	GPS[2]
Arabian Oryx (*Oryx leucoryx*)	Extinct	–
Saudi Gazelle (*Gazella saudiya*)	Extinct	–
Goitered Gazelle (*Gazella subgutturosa*)	Vulnerable	1.5% (15% of *G. s. marica*)

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

(1) increase in Iraq's human population, accompanied by an improvement in the standard of living, which has allowed more people to possess a private car, hunting rifle, and other hunting equipment; (2) inability of government to control antelope hunting; and (3) disturbance of antelope habitats by activities of oil companies, such as drilling wells and laying pipelines, and of military units during recent wars (Al-Robaae 1996). As in many areas of the Middle East, antelope populations in Iraq have also declined because of overgrazing by domestic livestock and agriculture (East 1992). Until recently, antelopes living in northern Mesopotamia and the area between the Euphrates River and Syria and Saudi Arabia suffered from uncontrolled hunting, partly due to the easy access of these places to people. For example, gazelles were regularly seen during the 1960s by local hunters in the area between An Nasiriya and the Saudi border; however, they apparently no longer occur there (Al-Robaae 1996).

Conservation measures taken

Iraq has legislation relating to forest protection and conservation, wildlife protection, and wildlife preserves. The Ministry of Agriculture is responsible for administering environmental legislation and managing the natural environment. Forest reserves are established and managed under Forestry Law No. 75 of 1955, which provides for protection measures in forest reserves, such as the prohibition of livestock. Conservation of forest reserves is addressed by Ordinance No. 4 of 1958, which restricts logging and charcoal burning. Additional legislation from 1958 relates to the hunting of wildlife in specified localities (Green *et al.* 1991; IUCN 1992). In 1989, antelope hunting was controlled throughout Iraq by Decree No. 463 of the Revolution Command Council. This decree imposes heavy fines and penalties for offenders (Al-Robaae 1996), but Evans (1994) suggests enforcement of hunting regulations is minimal. Protection of wildlife is also addressed in a 1981 law enabling the designation of preserves; nevertheless, existing legislation is considered inadequate for the protection of important ecosystems and natural areas in Iraq (Green *et al.* 1991; IUCN 1992). A National Forests Foundation has been established, in part to preserve nature (Evans 1994).

There are a number of wildlife preserves in Iraq that have been set up under the Forestry Department for the protection and propagation of particular species, often large mammals, including introduced species. These areas or breeding stations can be categorised as having either natural vegetation and native fauna or planted habitats and introduced species of fauna and flora. Breeding stations offer partial protection to wildlife through such measures as the presence of wardens to ensure that hunting bans are enforced, and the use of fencing to contain wildlife and control human incursion (Green *et al.* 1991; IUCN 1992). However, they have little significance for *in situ* conservation of wildlife (Evans 1994).

Wildlife breeding stations in Iraq include: Darr Bandar Bazyan/al-Sulaymaniyah (75ha), Days al Ta`min (80ha), Hajran/Arbil (90ha), Kusaybah (25ha), Rawdat al-Maha (50ha), Saba-Nisan (21ha), Sanjar/Ninwa (90ha), and Zawayta/Dahuk (110ha). Goitered gazelles are reportedly kept at Kusaybah, Rawdat al-Maha, and Saba-Nisan. During the last 15 years, Arabian oryx were reintroduced to protected areas within or likely to have been within their former distribution, such as the breeding station at Saba-Nisan (Green *et al.* 1991). The current status of these supposedly captive populations of antelopes is unknown.

Conservation measures proposed

Special attention should be given to the establishment of protected areas in Iraq, particularly the area near Rutba, which is reported to have a population of about 1,000 goitered gazelles (Al-Robaae 1996). Another site proposed for protection is Mahzam and Thartar Lake, where goitered gazelles are reported to be "rare" (Evans 1994). If wild populations of Arabian oryx and Saudi gazelles are to be re-established in the country, increased emphasis on protected areas will be required. The successful reintroduction of antelopes requires that their populations be monitored and managed, and that their habitats be managed by eliminating the threats of habitat loss, competition with livestock, and hunting. Thus, there is an urgent priority to plan, establish, and manage a comprehensive network of protected areas in Iraq (IUCN 1992).

Major obstacles to the formation of a good system of national parks and nature reserves are the lack of adequate

enabling legislation and administration to establish and manage critical sites. Instituting legislation for protected areas and appointing an effective body to co-ordinate conservation activities are considered essential (IUCN 1992). Establishment of an academic centre and research facilities would permit regular surveys and studies of Iraq's wildlife. In addition, wildlife managers in Iraq have limited expertise, and they would benefit by receiving coursework and training abroad (Al-Robaae 1996).

The necessity of having protected areas of a sufficient size is another important factor if reintroduction of large species of mammals is being considered. For example, it is estimated that a protected area of 67,000km^2 will be needed to support a minimum viable population (N = 500) of Arabian oryx, based on an average group size of 15 and home range of 2,000km^2. Throughout southwestern Asia, only about 4.2% (96,307 of 2,317,661km^2) of the Anatolian-Iranian Desert and 1.2% (38,305 of 3,164,424km^2) of the Arabian Desert are currently protected, and many threatened taxa there are not covered within a network of protected areas. If threatened species are to receive adequate protection throughout the region, there should be a high priority placed on increasing the area protected by parks and reserves (Green *et al.* 1991).

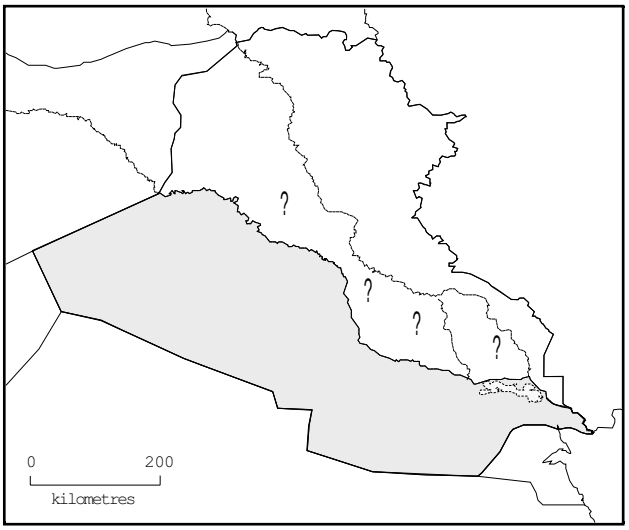


Fig. 15.2 Approximate limit of former range of Arabian oryx *(Oryx leucoryx)* in Iraq (shaded) and unconfirmed reports (?).

Species accounts

Arabian Oryx (*Oryx leucoryx*)

Distribution and population: This species occurred in the southern deserts as far north and east as Mesopotamia (Fig. 15.2), but is now absent from Iraq. Extirpated throughout its range as a result of excessive hunting, the last individual in Iraq was reportedly shot in 1914 (Hatt 1959; Harrison and Bates 1991). Status of the captive population at Saba-Nisan is unknown.

Habitat, food and reproduction: Arabian oryx inhabited gravel plains, sand dunes, and wadis. Gravel plains were probably preferred for their food and shade, and sand dunes were preferred for their refuge from disturbance. Succulent grasses and shoots of *Tamarix* and other shrubs are preferred foods; bulbs and tubers provide moisture. Herds of up to 100 animals have been reported, but in recent times, group sizes have been about 10 animals or less. Oryx are known to wander great distances in search of pasture. A single calf is born after a gestation period of 240–260 days. In northern populations (i.e., those that once occurred in Iraq), calving occurred during winter (Stewart 1963; Harrison and Bates 1991).

Status within the country: Extinct.

Conservation measures taken: Global status is Endangered (IUCN 1996).

Conservation measures proposed: Reintroduce Arabian oryx to protected areas within their former range; monitor and manage reintroduced populations; and manage oryx habitat by eliminating the threats of habitat loss, competition with livestock, and hunting.

Saudi Gazelle (*Gazella saudiya*)

Distribution and population: A putative former inhabitant of the southern and western deserts, the Saudi gazelle probably no longer occurs in Iraq (Hatt 1959; Al-Robaae 1996). Harrison and Bates (1991) list a young male specimen from Abu al Jir that is provisionally referred to as *Gazella dorcas saudiya*, but recent DNA studies indicate that this specimen may represent *G. subgutturosa marica* (see the *G. saudiya* account in Chapter 8 (Saudi Arabia) of this publication), and adult material is required for confirmation in the country (Al-Robaae 1996). Fairly large numbers may have existed in southern Iraq during the 1960s, where the terrain was too broken to allow motorised hunting (Harrison 1968); however, they usually inhabited gravel plains (hammadas), on which motorised vehicles could drive and where gazelles were easily hunted (H. Mendelssohn *in litt.*). Because of the age-old practice in Arabia of keeping small gazelles as pets, distribution of this species in more settled areas of Iraq may not have been completely natural as animals were traded over long distances (Uerpmann 1986).

Habitat, food and reproduction: The Saudi gazelle was once found in gravel plains and sand deserts of Arabia (Harrison and Bates 1991). A gazelle of *Acacia* country, it occurred singly or in groups of up to 20 (Morrison-Scott 1939; Foster-Vesey-Fitzgerald 1952). Females give birth to one calf at a time (Gross 1987), but little else is known regarding the biology of this species.

Status within the country: Extinct.

Conservation measures taken: Global status is Extinct in the Wild (IUCN 1996).

Conservation measures proposed: If the former occurrence of Saudi gazelles in Iraq is confirmed, reintroduce them to protected areas within their former range; monitor and manage reintroduced populations; and manage their habitat by eliminating the threats of habitat loss, competition with livestock, and hunting. The taxonomic status of putative specimens of *G. saudiya* should be resolved prior to including them in reintroduction projects.

Goitered Gazelle (*Gazella subgutturosa*)

Distribution and population: G. subgutturosa once occurred in arid and semi-arid regions throughout Iraq; there are records from Erbil and Kirkuk in the north and Amara, An Nasiriya, and Basrah in the south (Hatt 1959; Harrison and Bates 1991). Currently, the species is reported to occur in three regions of Iraq: east of the Tigris River from lower Mesopotamia to the northern foothills and mountains, the area between Rutba and the Jordanian border, and in Al Jazirah (Fig. 15.3). There may be at least 1,500 goitered gazelles in the country, with an estimated 1,000 in the Rutba population (Al-Robaae 1996). Specimens from northern Iraq are referred to as the Persian goitered gazelle, *G. s. subgutturosa*, and those from the south are referred to as the Arabian sand gazelle, *G. s. marica* (Harrison and Bates 1991). *G. s. marica* and *G. s. subgutturosa* intergrade in Kurdistan and the lower Tigris-Euphrates Valley (Groves and Harrison 1967). Thus, the Rutba animals probably represent *G. s. marica*, while the other populations could be either *G. s. subgutturosa* or intergrades. As with many antelopes in the Middle East, populations of *G. subgutturosa* have declined or have been exterminated as a result of overhunting, overgrazing by domestic livestock, and agriculture (East 1992). Populations inhabiting sand deserts, where driving and hunting are difficult, may have survived better than those in more accessible areas (H. Mendelssohn *in litt.*). Status of the captive populations at Kusaybah, Rawdat al-Maha, and Saba-Nisan is unknown.

Habitat, food and reproduction: Deserts, grasslands, and cultivated areas are habitats in Iraq. Primarily a browser, but grasses and forbs are also eaten; in the Rutba area, foods include species of *Artemisia*, *Avena*, and *Hordeum*. Group sizes are usually one to nine, but herds may number in the hundreds or thousands; herds have been known to migrate long distances in response to rainfall and availability of forage. Usually, single or twin calves are born after a gestation period of five to six months. In Iraq, births may occur throughout the year, but they peak during April and May. Calving is seasonal to coincide with the maximum food availability that follows winter and spring rains. During 1994 and 1995, respectively, there were 291 and 384 newborns in the Rutba area; however, wolves (*Canis lupus*) have exerted heavy predation on this population (Al-Robaae 1996; Kingswood and Blank 1996).

Status within the country: Vulnerable.

Conservation measures taken: Global status of *G. subgutturosa* (including *G. s. subgutturosa*) is Lower Risk/near threatened, but *G. s. marica* is listed as Vulnerable (IUCN 1996).

Conservation measures proposed: Establish protected areas within the range of goitered gazelles (e.g., Rutba, Mahzam and Tharthar Lake); in those areas where they have been extirpated, reintroduce either Arabian sand gazelles or Persian goitered gazelles (depending on which taxon formerly occurred at the reintroduction site); monitor and manage natural and reintroduced populations; and manage their habitat by eliminating the threats of habitat loss, competition with livestock, and hunting.

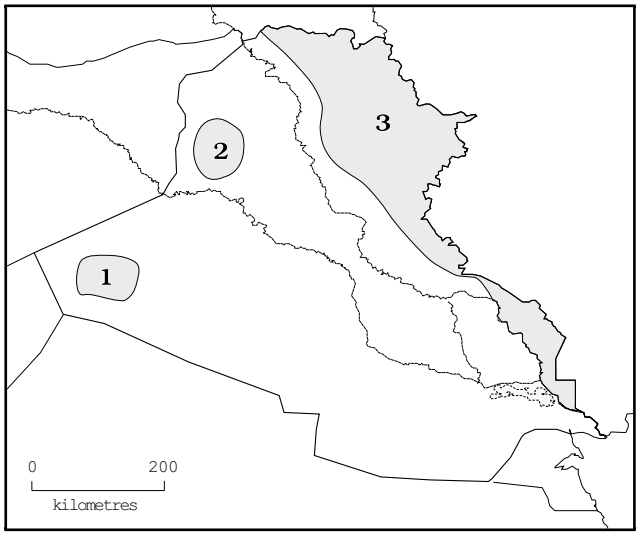


Fig. 15.3 Current known distribution of goitered gazelle *(Gazella subgutturosa)* in Iraq. 1. Arabian sand gazelle *(G. s. marica)*. 2–3. Persian goitered gazelle *(G.s. subgutturosa,* and intergrade populations).

Acknowledgements

We thank H. Mendelssohn for sharing his insights on gazelles and Z. Amr, A. Budieri, and D. Shafei for reviewing this manuscript.

References

Al-Robaae, K. 1996. The antelops [sic] (gazelles and oryx) in Iraq. Unpublished report, Natural History Museum, University of Basrah.

East, R. 1992. Conservation status of antelopes in Asia and the Middle East, Part 1. *Species* 19:23–25.

Evans, M.I. 1994. *Important bird areas in the Middle East*. BirdLife International, Cambridge.

Foster-Vesey-Fitzgerald, D. 1952. Wildlife in Arabia. *Oryx* 1:232–235.

Green, M.J.B., Drucker, G.R.F., and Day, S.I. 1991. Current status of protected areas and threatened mammal species in the Sahara-Gobian region. Pp. 5–69 *in:* McNeely, J.A. and Neronov, V.M. (Editors). *Mammals in the Palaearctic desert: Status and trends in the Sahara-Gobian region*. Russian Academy of Sciences and Russian Committee for the UNESCO Programme on Man and the Biosphere, Moscow.

Gross, C. 1987. *Mammals of the southern Gulf*. Motivate Publishing, Dubai.

Groves, C.P. and Harrison, D.L. 1967. The taxonomy of the gazelles (genus *Gazella*) of Arabia. *Journal of Zoology* 152:381–387.

Harrison, D.L. 1968. *The mammals of Arabia*. Ernest Benn, London.

Harrison, D.L. and Bates, P.J.J. 1991. *The mammals of Arabia, Second edition*. Harrison Zoological Museum, Sevenoaks, England.

Hatt, R.T. 1959. The mammals of Iraq. *Miscellaneous Publications, Museum of Zoology, University of Michigan* 106:1–113.

IUCN. 1992. *Protected areas of the world: A review of national systems, vol. 2. Palaearctic*. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Kingswood, S.C. and Blank, D.A. 1996. Gazella subgutturosa. *Mammalian Species* 518:1–10.

Morrison-Scott, T.C.S. 1939. Some Arabian mammals collected by Mr. H.St.J.B. Philby, C.I.E., *Novitates Zoologicae* 41:181–211.

Stewart, D.R.M. 1963. The Arabian oryx (*Oryx leucoryx* Pallas). *East African Wildlife Journal* 1:103–117.

Uerpmann, H.P. 1986. Remarks on the prehistoric distribution of gazelles in the Middle East and Northeast Africa. *Chinkara* 2:2–11.

Chapter 16. Syria

S.C. Kingswood, M.F. Wardeh, and D.T. Williamson

Introduction

Syria is situated near the northeastern corner of the Mediterranean Sea with Turkey to the north, Iraq to the east, Jordan to the south, and Israel and Lebanon to the southwest (Fig. 16.1). Arid steppe and desert of the interior are separated from the humid coastal strip by the Jibal al-Nusyriyah (1,562m), and the Lebanon (3,086m) and Anti-Lebanon (2,814m) mountain ranges. The arid interior comprises most of Syria's 185,180km^2 and biogeographically belongs to either the Anatolian-Iranian Desert (156,245km^2) or the Arabian Desert (17,360km^2). Vegetation of the deserts and steppes is sparse and consists of dwarf shrubs, with scattered *Pistacia* and *Amygdalus* trees in more mesic areas such as foothills. In northeastern Syria, forests occur on low hills of the Kurdo-Zagarosian steppe. Forests are found on slopes of the Jibal al-Nusyriyah (*Abies*, *Quercus*, *Arbutus*, and *Cedrus*) and Anti-Lebanon Mountains (*Abies*, *Pinus*, and *Quercus*), and alpine communities occur above 2,000m. The narrow plain along the Mediterranean Coast is typically

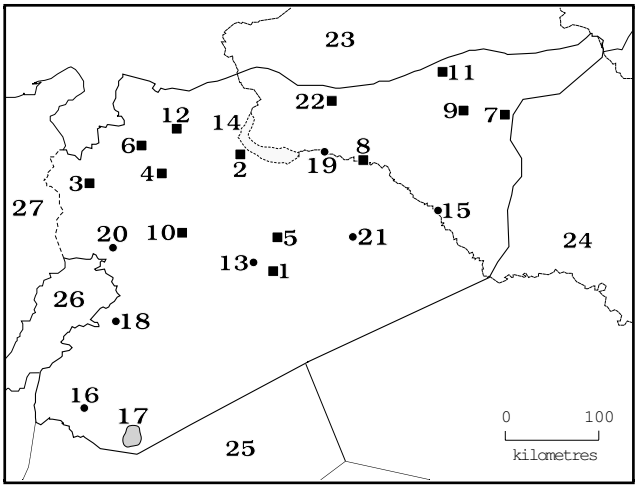


Fig. 16.1 Areas of Syria that are existing reserves and those that are either proposed as nature reserves or identified for protection. Existing reserves: 1. At Talila reserve (20,000ha); 2. Choula Game Protection Area (22,000ha); 3. Jabal Shuah forest reserve (*c.* 4,000ha). Proposed nature reserve: 4. Wadi al-Azib. Enclosed Rangeland Reserve (24,200ha). Areas identified for protection: 5) Aburejumain (22,500ha); 6. Al Idami (15,000ha); 7. Buhayrat al-Khatuniyah (80,000ha); 8. Euphrates valley (*c.* 42,000ha); 9. Jabal Abdul Aziz (45,000ha); 10) Jabal al-Bilas (40,000ha); 11. Ras al-Ayn (100,000ha); 12. Sabkhat al-Jabbul (*c.* 15,000ha); 13. Tadmur (Palmyra) and Sabkhat Muh (45,000ha). Other geographical features: 14. Buhayrat al-Assad; 15. Deir Ez Zoor; 16. Hauran; 17. Jabal Druz; 18. Jerud; 19. Rakka; 20. Salamiyah; 21. Sukne; 22. Tell Abiad.

Sarcopterium maquis and *Astragalus* thorn scrub (Udvardy 1975; Green *et al.* 1991; Evans 1994).

Human activity has resulted in the degradation of most natural vegetation in Syria. Because of excessive tree cutting, once vast forests of the mountains and hills have been reduced to remnants that cover less than 3% of the country. Along the coast and the Euphrates River and its tributaries, most areas are under cultivation; about 32% of the land in Syria is used for agriculture. Continuous cultivation and overgrazing by domestic livestock, especially sheep, have led to problems of desertification, particularly over much of the steppe that covers nearly half of the country (Talbot 1960; IUCN 1992; Evans 1994).

Most, if not all, environmental problems in Syria can be attributed to the increasing human population. In 1990, the population of 12.5 million was growing at 3.6% per year. The growing number of people has, in turn, led to increased demand for cultivated land, livestock, fuel, technology, and recreation land. In the late 1960s, the Euphrates Dam flooded 630km^2 to create Buhayrat al-Assad. This project has increased the supply of water for irrigation and led to a decline in the area of natural steppe as additional land was brought under cultivation. Industrial and oil pollution have also become major threats to the environment on the coast and in northeastern Syria (IUCN 1992). Uncontrolled hunting has seriously depleted wildlife populations, particularly the large herds of gazelles that once inhabited the deserts and steppes (Talbot 1960).

Current status of antelopes

As many as four species of antelopes are thought to have occurred in Syria: Arabian oryx, Saudi gazelle, Palestine mountain gazelle, and goitered gazelle (Harrison and Bates 1991; Table 16.1). Goitered gazelles still survive in Syria, but now they are rare and occur primarily in small groups; two sites where they occur are Jezel, which is about 30km west of Tadmur, and Jlayerin, which is on the Syrian-Jordanian border east of Jabal Druz. Mountain gazelles may still occur in the western mountains according to reports from 1994 and the late 1970s (East 1992), but their current status in the country needs confirmation, particularly in view of the fact that Green *et al.* (1991) list this species as being present. There is little doubt that Arabian oryx became extinct in Syria, but whether or not Saudi gazelles ever occurred there is uncertain (Kumerloeve 1975; East 1992). According to Harrison and Bates (1991), the last report of Arabian oryx in Syria comes from just after World War I.

Table 16.1 Current status of antelopes in Syria.

Species	Status[1]	GPS[2]
Arabian Oryx (*Oryx leucoryx*)	Extinct	–
Saudi Gazelle (*Gazella saudiya*)	Extinct[3]	–
Palestine Mountain Gazelle (*Gazella gazella gazella*)	Insufficiently Known	?
Goitered Gazelle (*Gazella subgutturosa*)	Indeterminate	?

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*
[3]*If previous occurrence in the country is confirmed*

In Syria and throughout the Middle East, the extermination of antelopes presumably has been the result of overhunting, overgrazing by domestic livestock, and agriculture (East 1992). There are captive goitered gazelles in Tadmur, Deir Ez Zoor, and at Markaz Al Akrim in Salamiyah. Reintroduction projects involving Arabian oryx and goitered gazelles are underway at the At Talila Reserve, and there are plans to reintroduce goitered gazelles to a proposed reserve near Rakka.

Conservation measures taken

In Syria up until the 1950s and 60s, rangeland was traditionally protected with a system of reserves (Mahmeya), similar to *hema* protection of the Arabian Peninsula. The number of these reserves is diminishing, but a few still exist in the Badhia region. During Ottoman rule in the latter half of the 1800s, there were limited attempts to control tree cutting in both government and private forests. The few forests that remained in 1935 were given legal protection and, in 1946, legislation recognised the need to protect and manage forests, and to rectify forest degradation (IUCN 1992).

Current conservation laws in Syria address hunting and protection of aquatic life, forests, and rangeland. Forest and rangeland legislation provides for the establishment and management of protected reserves and restricts the use of these areas. Under the Ministry of Agriculture and Agrarian Reform, the Directorate of Forests and Afforestation has established a considerable area of protected forest and, as of 1980, its reforestation projects have involved an area of 600km^2 (IUCN 1992).

The Directorate of Steppe, Rangelands and Sheep has protected steppe communities to encourage the growth of vegetative cover in these arid regions. Wadi al-Azib (24,200ha) was established as an enclosed rangeland reserve in 1968 to conserve vegetation resources for grazing. This reserve also serves as a captive-breeding site for gazelles, presumably *G. subgutturosa,* used in release projects (Evans 1994). In 1983, two fenced reserves were designated as sanctuaries that provide partial protection for their resident wildlife: Choula Game Protection Area (22,000ha) and Kassir al-Hir/Al-Gharbi Hunting Reserve (15,000ha; Green *et al.* 1991). Although legislation provides for the patrolling of forest reserves and for the regulation (or at times prohibition) of hunting, enforcement of hunting laws is extremely ineffectual. Hunting laws are strict, but hunting is reported to be increasing and many people hunt illegally (IUCN 1992; Evans 1994).

The Ministry of State for Environmental Affairs is primarily concerned with the impact of pollution, but it also investigates the need for environmental legislation (and is currently drafting a nature conservation law) and for establishment of protected reserves and preservation of wildlife. Semi-governmental organisations involved with wildlife conservation include the Department of Zoology at the University of Damascus and the Arab Center for the Study of Arid Zones and Dry Lands (ACSAD). Both groups conduct surveys to identify important conservation areas, and ACSAD works to enhance natural vegetation and wildlife habitats. Reviews or surveys of certain biological resources and systems have been conducted throughout Syria, but prior to an April 1998 survey of the basaltic lava fields (*harrats*) near the Syrian-Jordanian border (Habibi 1998), antelope surveys had not been undertaken during the last two decades. The Ministry of Agriculture and Agrarian Reform has had an interest in reintroducing antelopes and wild asses (*Equus hemionus*) into steppe regions (IUCN 1992; Evans 1994). Arabian oryx and goitered gazelles are being reintroduced to the At Talila Reserve. These projects are encouraging developments for Syria's wildlife; however, conservation there is at a rudimentary stage, and the country will need a great deal of support to develop an effective conservation programme.

Conservation measures proposed

The current status of gazelles in Syria should be determined as soon as possible and before specific measures are proposed for their conservation. A country-wide survey of gazelle populations is, therefore, recommended, and perhaps this could be undertaken by an organisation with an interest in wildlife conservation, such as the Department of Zoology at the University of Damascus. Green *et al.* (1991) and an

anecdotal report indicate that mountain gazelles were present in Syria during the 1980s and as recently as 1994, and that Saudi gazelles still occur in the country; however, these reports should be considered unsubstantiated.

Pending results of a comprehensive survey of gazelle populations, reintroduction of certain taxa will be necessary if wild populations of all of Syria's native antelope fauna are to be restored. One such antelope that has been considered for reintroduction is the Arabian oryx. Although extirpated in Syria and throughout the Middle East, Arabian oryx have been reintroduced to protected reserves in other countries within their former range (East 1992). It has been recommended that Syria's financing and management of its protected areas be reviewed and reformed (IUCN 1992). Such a review would seem necessary if wild populations of Arabian oryx (and possibly gazelles) are to be re-established, particularly as reintroduction efforts generally require that wildlife populations and their habitats be carefully monitored and managed. Thus, plans to restore native populations of antelopes in Syria should include an evaluation as to whether or not a well-managed and sufficiently large network of protected areas exists to support oryx and gazelles.

Throughout southwestern Asia, only about 4.2% (96,307 of 2,317,661km^2) of the Anatolian-Iranian Desert and 1.2% (38,305 of 3,164,424km^2) of the Arabian Desert are currently protected, and many threatened taxa there are not covered within a network of protected areas. If threatened species are to receive adequate protection throughout the region, there should be a high priority placed on increasing the area protected by parks and reserves. For example, it is estimated that a protected area of 67,000km^2 will be needed to support a minimum viable population (N = 500) of Arabian oryx (Green *et al.* 1991). However, it may not be possible to re-establish viable, free-ranging populations of oryx in certain areas of the Middle East because the large amount of space they need is not available. In cases such as these, protection of populations in habitat/species management areas (i.e., IUCN Category IV), such as 1,000ha enclosures, might be considered as an alternative.

Syria has plans to increase the area of protected land by proposing that the Wadi al-Azib Enclosed Rangeland Reserve and the Choula Game Protection Area be designated as nature reserves. Additional sites that have been identified for protection include: Aburejumain (22,500ha), Al Idami (15,000ha), Buhayrat al-Khatuniyah (80,000ha), the Euphrates Valley (*c.*42,000ha), Jabal Abdul Aziz (45,000ha), Jabal al-Bilas (40,000ha), Ras al-Ayn (100,000ha), Sabkhat al-Jabbul (*c.*15,000ha), and Tadmur and Sabkhat Muh (45,000ha). Goitered gazelles reportedly occur in Buhayrat al-Khatuniyah, the Euphrates Valley, Jabal Abdul Aziz, Jabal al-Bilas, Ras al-Ayn, Sabkhat al-Jabbul, and Tadmur and Sabkhat Muh (Green *et al.* 1991; Evans 1994). Mountain gazelles are said to have occurred in Choula (Green *et al.* 1991) and they reportedly occur in the Jabal Shuah Forest Reserve; however, these localities are north of the range indicated by Mendelssohn *et al.* (1995).

Species accounts

Arabian Oryx (*Oryx leucoryx*)

Distribution and population: This species may have once occurred in southern Syria. Oryx were reported near Hauran during the late 1800s and in the hills near Jerud after World War I (Harrison and Bates 1991; Fig. 16.2). They were not found in Syria by Kumerloeve (1975).

Habitat, food and reproduction: Arabian oryx inhabited desert habitats, such as gravel plains, sand dunes, and wadis. Gravel plains were probably preferred for their food and shade, and sand dunes were preferred for their refuge from disturbance. Succulent grasses and shoots of *Tamarix* and other shrubs are preferred foods; bulbs and tubers provide moisture. Herds of up to 100 animals have been reported, but in recent times, group sizes have been about 10 animals or less. Oryx are known to wander great distances in search of pasture. A single calf is born after a gestation period of 240–260 days. In northern populations (i.e., those that may have once occurred in Syria), calving occurred during winter (Stewart 1963; Harrison and Bates 1991).

Status within the country: Extinct.

Conservation measures taken: Global status is Endangered (IUCN 1996). Reintroduction has been initiated with the transfer of eight animals from Shaumari Wildlife Reserve in Jordan to the At Talila Reserve.

Conservation measures proposed: Reintroduce Arabian oryx to protected areas within their former range; monitor and manage reintroduced populations; and manage oryx habitat by eliminating the threats of habitat loss, competition with livestock, and hunting.

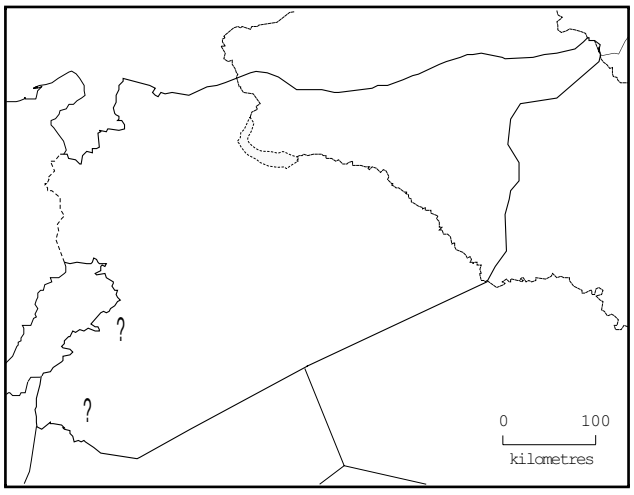


Fig. 16.2 Reported former localities for Arabian oryx *(Oryx leucoryx)* in Syria (indicated by "?"; see Harrison and Bates 1991).

Saudi Gazelle (*Gazella saudiya*)

Distribution and population: Occurrence of the Saudi gazelle in Syria requires confirmation (Harrison and Bates 1991). Gazelles referred to as *G. dorcas* by Misonne (1957) may have actually been *G. gazella* (Kumerloeve 1975). In addition, because of the age-old practice in Arabia of keeping small gazelles as pets, distribution of this species in more settled areas of Syria may not be completely natural as animals are traded over long distances (Uerpmann 1986).

Habitat, food and reproduction: The Saudi gazelle was once found in gravel plains and sand deserts of Arabia (Harrison and Bates 1991). In Syria, Misonne (1957) reported that it was also found along the borders of cultivated areas and marshland. Saudi gazelles occurred singly or in groups of up to 20 (Morrison-Scott 1939; Foster-Vesey-Fitzgerald 1952). Females give birth to one calf at a time (Gross 1987), but little else is known regarding the biology of this species.

Status within the country: Extinct.

Conservation measures taken: Global status is Extinct in the Wild (IUCN 1996).

Conservation measures proposed: Reintroduce Saudi gazelles to protected areas within their former range; monitor and manage reintroduced populations; and manage their habitat by eliminating the threats of habitat loss, hunting, and competition with livestock. The taxonomic status of putative specimens of *G. saudiya* should be resolved prior to including them in reintroduction projects.

Palestine Mountain Gazelle (*Gazella gazella gazella*)

Distribution and population: Once occurring in the Southwestern Mountains (Fig. 16.3), *G. g. gazella* has been overhunted and has not been reported there since the late 1970s (East 1992; Mendelssohn *et al.* 1995; H. Mendelssohn *in litt.*). Mountain gazelles are said to have occurred in Choula (Green *et al.* 1991). During 1994, there was an unconfirmed report of gazelles, possibly *G. gazella*, in the Jabal Shuah Forest Reserve, located east of Latakia in the Jibal al-Nusyriyah. Choula and Jabal Shuah are considerably north of the mountain gazelle's known distribution in southwestern Syria.

Habitat, food and reproduction: Mountain gazelles can live in many habitats, including steep slopes and cultivated fields, but they avoid dense chaparral and forest and rocky areas. Depending on seasonal availability of forage, they are primarily grazers (winter) or browsers (summer). Herds number up to 40 individuals; adult males maintain individual territories of 0.2–0.5km^2, and females roam freely over a home range of 0.2–2km^2. A single calf is born after a gestation period of six months. Calving peaks during spring (April–June), but in agricultural areas where food and water

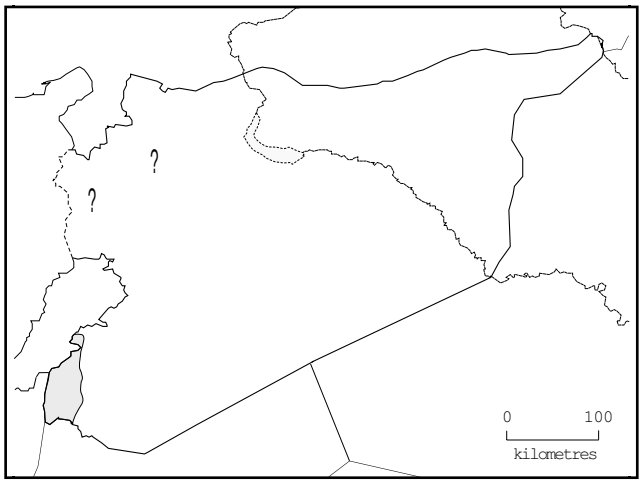


Fig. 16.3 Limits of the former range of Palestine mountain gazelle *(Gazella g. gazella),* now greatly reduced or eliminated in Syria (shaded); "?" indicates reports from Choula and Jabal Shuah.

are always available, young are born throughout the year (Mendelssohn *et al.* 1995).

Status within the country: Insufficiently known.

Conservation measures taken: Global status is Lower Risk/conservation dependent (IUCN 1996). Mountain gazelles may occur in Choula Game Protection Area and Jabal Shuah Forest Reserve.

Conservation measures proposed: Survey suitable habitats in western Syria to determine if and where mountain gazelles still survive; establish and/or manage protected areas where they occur (or once occurred); and reintroduce and/or manage them in these protected areas.

Goitered Gazelle (*Gazella subgutturosa*)

Distribution and population: This species is found in desert and semidesert areas of eastern and central Syria (Fig. 16.4). Reported as "rare" in Buhayrat al-Khatuniyah, the Euphrates Valley, Jabal Abdul Aziz, Jabal al-Bilas, Ras al-Ayn, Sabkhat al-Jabbul, and Tadmur (Palmyra) and Sabkhat Muh (Evans 1994). Goitered gazelles also occur at Jezel, which is in mountainous terrain about 30km west of Tadmur, and at Jlayerin, which is on a basaltic plain (harrat) east of Jabal Druz. Jlayerin is on the Syrian-Jordanian border and this population moves between both countries. A total of 101 animals was observed during a survey of the Syrian harrat in April 1998 (Habibi 1998). Former localities also included Rakka, Sukne, and Tell Abiad. Specimens from these locales are referred to as Persian goitered gazelle, *G. s. subgutturosa*; however, specimens from Jordan are referred to as Arabian sand gazelle, *G. s. marica* (Kumerloeve 1975; Harrison and Bates 1991). Where in this region the two subspecies meet and whether or not they intergrade there as they do in Iraq, is not precisely known. Captive females said to come from the Jlayerin population

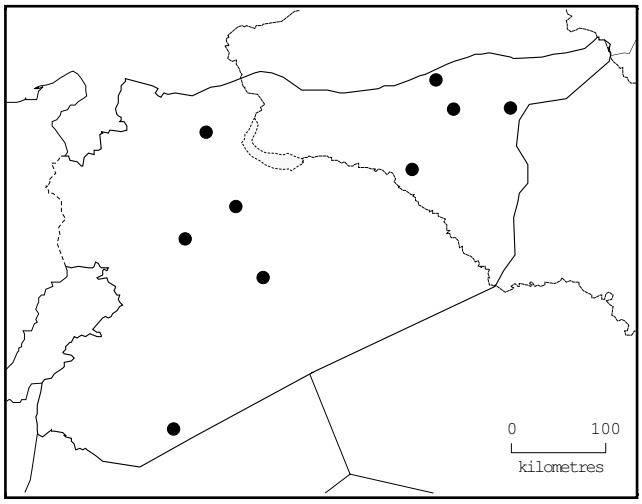
have horns, suggesting that they represent *G. s. marica*. Goitered gazelles are now rare in Syria due to overhunting and habitat degradation (East 1992; Evans 1994). There are captive groups of goitered gazelles in Tadmur, Deir Ez Zoor, and at Markaz Al Akrim in Salamiyah.

Habitat, food and reproduction: Goitered gazelles occur in deserts, grasslands, and cultivated areas. Primarily a browser, but grasses and forbs are also eaten. Mean group size in Syria during an April 1998 survey was 7.21 animals (range one to 31) and herds of 50 and 93 were seen during the year preceding the survey, but they once numbered in the hundreds or thousands. Herds have been known to migrate long distances in response to rainfall and availability of forage. Usually, one or two calves are born after a gestation period of five to six months. Calving is seasonal (late March and April) to coincide with the maximum food availability that follows winter and spring rains (Kingswood and Blank 1996; Habibi 1998).

Status within the country: Indeterminate.

Conservation measures taken: Global status of *G. subgutturosa* (including *G. s. subgutturosa*) is Lower Risk/near threatened, but *G. s. marica* is listed as Vulnerable (IUCN 1996). A recent survey of the Syrian harrat sighted 101 gazelles (Habibi 1998). Reintroduction has been initiated with the transfer of 30 *G. s. marica* from the captive population at King Khalid Wildlife Research Center in Saudi Arabia to the At Talila Reserve.

Conservation measures proposed: Complete surveys of the arid and semi-arid regions of eastern Syria to determine where goitered gazelles still survive; establish protected areas within their range and reintroduce them to those areas where they have been extirpated; monitor and manage natural and reintroduced populations; and manage their habitat by eliminating the threats of habitat loss, hunting, and competition with livestock. There are plans to reintroduce goitered gazelles to a proposed reserve near Rakka.



16.4 Limits of the known former distribution of goitered gazelle *(Gazella subgutturosa)* in Syria (shaded), but this area is not one of continuous occurrence. Recent localities are shown by black circles.

Acknowledgements

We thank H. Mendelssohn for sharing his field notes and Z. Amr, A. Budieri, and D. Shafei for reviewing this manuscript.

References

East, R. 1992. Conservation status of antelopes in Asia and the Middle East, Part 1. *Species* 19:23–25.

Evans, M.I. 1994. *Important bird areas in the Middle East*. BirdLife International, Cambridge.

Foster-Vesey-Fitzgerald, D. 1952. Wildlife in Arabia. *Oryx* 1:232–235.

Green, M.J.B., Drucker, G.R.F., and Day, S.I. 1991. Current status of protected areas and threatened mammal species in the Sahara-Gobian region. Pp. 5–69 *in:* McNeely, J.A.and Neronov, V.M. (Editors). *Mammals in the Palaearctic desert: Status and trends in the Sahara-Gobian region*. Russian Academy of Sciences and Russian Committee for the UNESCO programme on Man and the Biosphere, Moscow.

Gross, C. 1987. *Mammals of the southern Gulf*. Motivate Publishing, Dubai.

Habibi, K. 1998. Sand gazelle in the Syrian harrat. *Gnusletter* 17(1):17–18.

Harrison, D.L. and Bates, P.J.J. 1991. *The mammals of Arabia, Second edition*. Harrison Zoological Museum, Sevenoaks, England.

IUCN. 1992. *Protected areas of the world: A review of national systems, vol. 2. Palaearctic*. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Kingswood, S.C. and Blank, D.A. 1996. Gazella subgutturosa. *Mammalian Species* 518:1–10.

Kumerloeve, H. 1975. Die Säugetiere (Mammalia) Syriens und des Libanon. *Veröffentlichungen der Zoologischen Staatssammlung München* 18:159–225.

Mendelssohn, H., Yom-Tov, Y., and Groves, C.P. 1995. Gazella gazella. *Mammalian Species* 490:1–7.

Misonne, X. 1957. Mammifères de la Turquie Sud-orientale et du Nord de la Syrie. *Mammalia* 21:53–68.

Morrison-Scott, T.C.S. 1939. Some Arabian mammals collected by Mr. H.St.J.B. Philby, C.I.E., *Novitates Zoologicae* 41:181–211.

Stewart, D.R.M. 1963. The Arabian oryx (*Oryx leucoryx* Pallas). *East African Wildlife Journal* 1:103–117.

Talbot, L.M. 1960. A look at threatened species. A report on some animals of the Middle East and southern Asia which are threatened with extermination. *Oryx* 5:1–137.

Udvardy, M.D.F. 1975. A classification of the biogeographical provinces of the world. *IUCN Occasional Paper* 18:1–48.

Uerpmann, H.-P. 1986. Remarks on the prehistoric distribution of gazelles in the Middle East and Northeast Africa. *Chinkara* 2:2–11.

Chapter 17. Lebanon

S.C. Kingswood and N.H. Khairallah

Introduction

The Republic of Lebanon is one of the smallest countries in the Middle East, encompassing an area of 10,452km^2. Situated on the eastern shore of the Mediterranean Sea (Fig. 17.1), Lebanon's coastal strip gives rise to the Lebanon (3,086m) and Anti-Lebanon (2,814m) mountain ranges, which are separated by the alluvial plains of the Beka'a Valley. In the past, much of the country was forested; now, Lebanon largely consists of scrub vegetation. Western slopes of the coastal maquis are typified by *Ceratonia*, *Pistacia*, and *Quercus*, and the Anti-Lebanon Mountains support *Amygdalus* and *Pistacia* scrub. Forests of *Pinus* and stands of *Cedrus* still occur on western slopes and along the middle altitudes (*c.*2,000m) of the Lebanon Mountains, but once extensive forests of *Abies*, *Cedrus*, and *Juniperus* have been reduced to isolated remnants of less than 5% of their original extent, leaving many mountain slopes barren and susceptible to extensive soil erosion. Subalpine and alpine communities are found above 2,500m (Talbot 1960; IUCN 1992; Evans 1994).

Human activities, such as logging, raising of domestic livestock, and agriculture, have drastically altered Lebanon's environment over the course of its history. The mountains of Lebanon were known for their valuable timber as early as 2600BC, and logging and use of fuelwood were considerable from the early 1800s into the 1900s. Reforestation programmes have been in place since the 1950s, but have been hampered by the continued presence of goats and overharvest of wood for charcoal, and more recently by civil war. Since the mid-1900s, extensive wetlands in the Beka'a Valley have been drained for agricultural use. Wildlife of the remnant marshes of Ammiq are further threatened by widespread shooting, and as many as 15–20 million migratory birds/year are killed by this indiscriminate and uncontrolled shooting that involves at least 500,000 hunters out of a total population of about four million. Civil and military conflicts that have continued to plague Lebanon have also delayed environmental programs, such as establishment of a system of protected areas. For the time being, however, the political instability has also halted several dam projects considered to be potentially damaging to the environment (IUCN 1992; Evans 1994).

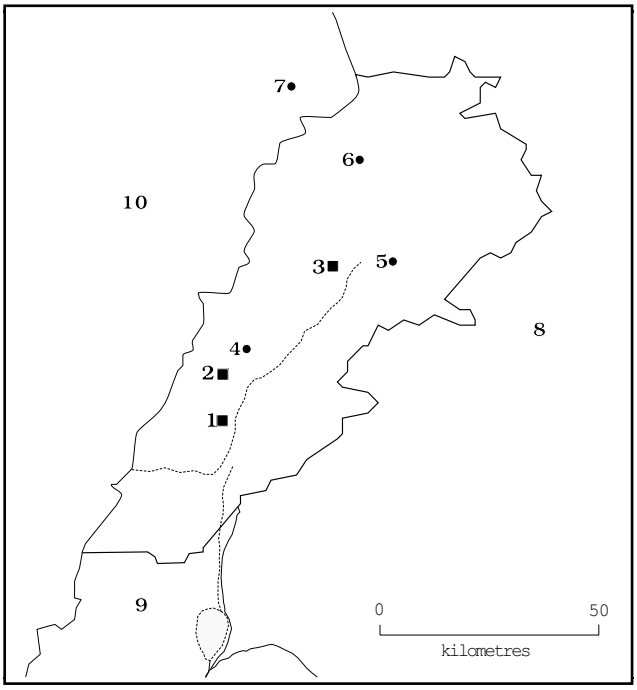


Fig. 17.1 Protected areas in Lebanon that are probably within the former range of Palestine mountain gazelles: 1. Mashgara National Park (3,500ha); 2. Barouk Mountain (2,700ha); 3. Khallet Khazen Farm and Nature Reserve (202ha). Other geographical features: 4. Ammiq; 5. Baalbek; 6. Ehden Forest; 7. Palm Islands; 8. Syria; 9. Israel; 10. Mediterranean Sea.

Current status of antelopes

Few large mammals survive in Lebanon, owing to intensive cultivation, severe overgrazing by domestic livestock, and heavy hunting pressure (Talbot 1960). The Palestine

Table 17.1 Current status of antelopes in Lebanon.

Species	Status[1]	GPS[2]
Palestine Mountain Gazelle (*Gazella gazella gazella*)	Extinct/Endangered	–

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

mountain gazelle is the only extant species of antelope to have occurred in Lebanon, but it is believed to have been extirpated there as a result of overhunting (Table 17.1). Other species of large mammals that are probably extinct in Lebanon include brown bear (*Ursus arctos*), ibex (*Capra ibex*), Mesopotamian fallow deer (*Dama mesopotamica*), and roe deer (*Capreolus capreolus*; Harrison and Bates 1991). Mountain gazelles have been reported by Harrison and Bates (1991) as far north as Baalbek. In the years just after World War I, their range may have included the slopes of the western mountains to the northeast of Beirut. Further anecdotal information suggests that they still occurred in southern Lebanon during the 1930s (H. Mendelssohn *in litt.*). Mountain gazelles probably became extinct in Lebanon since the end of World War II (Lewis *et al.* 1968). However, a report of three gazelles in the Barouk Mountain area during 1998 indicates that they may survive in small numbers (A. Serhal *pers. comm.*).

Conservation measures taken

Protection of natural areas in Lebanon can be legalised in two ways. One mechanism provides legal protection through government decree followed by the House of Parliament's ratification. The other mechanism allows for protection through decree by any of the following ministries: Agriculture, Environment, Interior, Municipalities, or Tourism. In 1992, the first and only law pertaining to the conservation of a natural area was ratified by the Parliament under Law No. 121. This action legalised protection of two sites, Ehden Forest Reserve/National Park (1,100ha) and Palm Islands Marine Reserve (40ha). The declaration of this law was the outcome of a strong lobbying campaign launched by the NGO, Friends of Nature. On the basis of field research, the Friends of Nature also prepared the scientific preambles that accompanied the proposal for Law No. 121 (Evans 1994; El-Haber and Semaan 1996).

There are three protected areas in southern Lebanon that are probably within the former range of mountain gazelles: Mashgara National Park (3,500ha), Barouk Mountain (2,700ha), and Khallet Khazen Farm and Nature Reserve (202ha). Mashgara and Barouk Mountain were given protection by ministerial decrees in 1987 and 1991, respectively, and the privately-owned Khallet Khazen Farm and Nature Reserve has been protected for the last 50 years. According to decree by the Ministry of Agriculture, national parks are to preserve all fauna and flora in a natural, undisturbed state; agriculture, livestock, and hunting are prohibited. Currently, strict measures are being taken by the Ministry of Agriculture to implement protection. These measures are supported by conservation education programmes of the Society for Protection of Nature and Natural Resources (IUCN 1992; El-Haber and Semaan 1996).

Conservation measures proposed

Two measures are proposed for the conservation of mountain gazelles in Lebanon: (1) establish and manage a system of protected areas in southern Lebanon, preferably within the area of their former distribution; and (2) reintroduce and manage mountain gazelles in these protected areas. Real progress toward developing a system of protected areas has been delayed by the continuation of civil war and military conflict. Therefore, the success of any environmental programmes in Lebanon, including establishing and managing protected areas for mountain gazelles, will surely depend upon peaceful resolution of the current hostilities. Talbot (1960) indicates that areas in Lebanon which are devastated by agricultural and grazing misuse can, once protected, again support their original vegetation. Elsewhere, numbers of Palestine mountain gazelles in the wild and in captivity (Sausman and Correll 1994; Mendelssohn *et al.* 1995) suggest that animals would likely be available for reintroduction. Thus, if Lebanon is able to develop a well-managed system of protected areas, careful attempts to re-establish mountain gazelles there should have a good chance of success.

Species account

Palestine Mountain Gazelle (*Gazella gazella gazella*)

Distribution and population: The Palestine mountain gazelle formerly occurred in southern Lebanon and as far north as the Beka'a Valley, where it was once a common

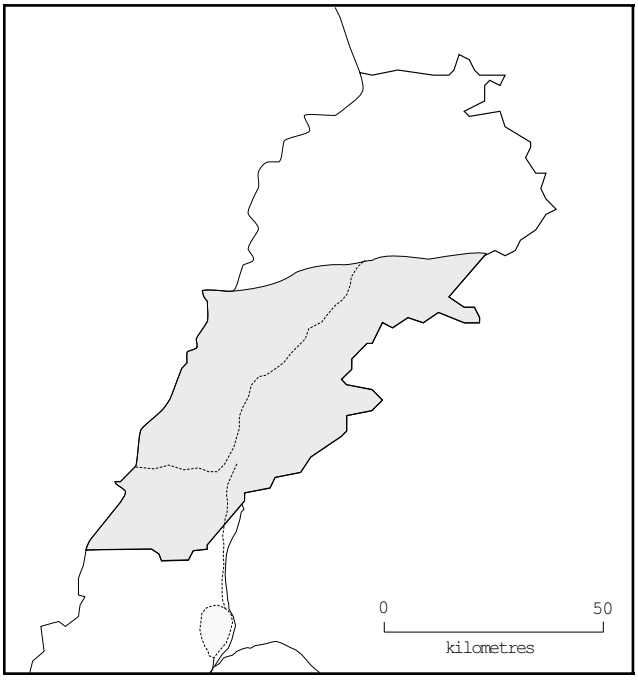


Fig. 17.2 Approximate former distribution of Palestine mountain gazelle *(Gazella g. gazella)* in Lebanon.

species (Lewis *et al.* 1968; Kumerloeve 1975; Mendelssohn *et al.* 1995; Fig. 17.2). It was nearly extinct in Lebanon in 1934, but H. Mendelssohn (*in litt.*) found tracks in eastern areas that were sparsely populated by humans. Lewis *et al.* (1968) suggest that the mountain gazelle became extinct in Lebanon after World War II, probably because of overhunting (East 1992). However, three gazelles were reportedly observed in the Barouk Mountain area during 1998 (A. Serhal *pers. comm.*).

Habitat, food and reproduction: Mountain gazelles can live in many habitats, including steep slopes and cultivated fields, but they avoid dense chaparral and forest and rocky areas. Depending on seasonal availability of forage, they are primarily grazers (winter) or browsers (summer). Herds number up to 40 individuals; adult males maintain individual territories of 0.2–0.5km^2, and females roam freely over a home range of 0.2–2 km^2. A single calf is born after a gestation period of six months. Calving peaks during spring (April–June), but in agricultural areas where food and water are always available, young are born throughout the year (Mendelssohn *et al.* 1995).

Status within the country: Extinct/Endangered. Believed extinct until a recent report suggested that small numbers may occur in Lebanon.

Conservation measures taken: Global status is Lower Risk/conservation dependent (IUCN 1996).

Conservation measures proposed: Establish and manage a system of protected areas in southern Lebanon, preferably within the area of their former distribution; and reintroduce and manage Palestine mountain gazelles in these protected areas.

Acknowledgements

We thank H. Mendelssohn and A. Serhal for the information they shared and Z. Amr, A. Budieri, D. Shafei, and an anonymous reviewer for their comments on the manuscript.

References

East, R. 1992. Conservation status of antelopes in Asia and the Middle East, Part 1. *Species* 19:23–25.

El-Haber, R. and Semaan, M. 1996. The protected areas in Lebanon. The Biodiversity Country Study, Project:GF/6105–92–72.

Evans, M.I. 1994. *Important bird areas in the Middle East*. BirdLife International, Cambridge.

Harrison, D.L. and Bates, P.J.J. 1991. *The mammals of Arabia, Second edition*. Harrison Zoological Museum, Sevenoaks.

IUCN. 1992. *Protected areas of the world: A review of national systems, vol. 2. Palaearctic*. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Kumerloeve, H. 1975. Die Säugetiere (Mammalia) Syriens und des Libanon. *Veröffentlichungen der Zoologischen Staatssammlung München* 18:159–225.

Lewis, R.E., Lewis, J.H., and Atallah, S.I. 1968. A review of Lebanese mammals. Carnivora, Pinnipedia, Hyracoidea and Artiodactyla. *Journal of Zoology, London* 154:517–531.

Mendelssohn, H., Yom-Tov, Y., and Groves, C.P. 1995. Gazella gazella. *Mammalian Species* 490:1–7.

Sausman, K. and Correll, T. (Editors). 1994. *Antelope conservation assessment and management plan and global captive action recommendations, Draft 4*. IUCN/SSC Captive-Breeding Specialist Group, Apple Valley, Minnesota.

Talbot, L.M. 1960. A look at threatened species. A report on some animals of the Middle East and southern Asia which are threatened with extermination. *Oryx* 5:1–137.

Chapter 18. Jordan

K. Kiwan, J. Boef and A. Boudari

Introduction

The Hashemite Kingdom of Jordan is situated in the northern Arabian Peninsula and covers an area of 89,210km^2. It shares land borders with Saudi Arabia, Iraq, Syria, and Israel, and also has a very short coastline at the head of the Gulf of Aqaba (Fig. 18.1). The Dead Sea, located in the Rift Valley, lies 400m below sea level, the lowest point on earth, and the highest peaks reach *c.*1,750m above sea level. The human population numbers 4,936,000 and is concentrated in the capital city (Amman), the Jordan River Valley, and the highlands east of the Rift Valley. About 80% of Jordan's towns and villages are situated in this western part of the country, which has a Mediterranean climate. The eastern 90% of Jordan is arid or semi-arid, with annual precipitation <200mm. Rainfall decreases from west to east and from north to south. The vegetation is characterised by Mediterranean, Irano-Turanian, and Saharo-Arabian elements (Evans 1994).

The three principal natural divisions of the country are the Rift Valley, highlands to the east, and the eastern desert or Badia, which covers *c.*75% of the country. The Rift Valley runs north-south along the western edge of the country and is a northern extension of the African Rift Valley. The Jordan River flows southwards into the Dead Sea through the northern part of the Rift Valley, forming Jordan's most important agricultural area. The southern Rift Valley, extending south to the Gulf of Aqaba, is known as Wadi Araba, which is up to 25km wide and consists of desert plains and sand dunes. It is used mainly as pasture, but has been less affected by overgrazing than many other areas of the country. Vegetation is sparse and contains some trees and shrubs, including species of *Acacia, Tamarix, Calotropis, Ziziphus, Balanites, Salvadora, Maerua, Ochradenus,* and *Panicum*. The highlands east of the Rift Valley consist of a series of escarpments, hills, and mountains cut by numerous shallow, stony wadis, and there is extensive cultivation of olives, wheat, and other crops. The eastern desert plateau, or Badia, is part of the Arabian Desert. It lies at altitudes of 500–900m and is gently undulating. It contains wide expanses of gravel or flint and chert plains (*hammada*), and black basalt boulder fields (*harrat*), with extensive areas of sand dunes in the south. The desert interior contains numerous clay basins, some of which may flood following occasional heavy rain. Vegetation is sparse and consists mainly of small shrubs (*Artemisia, Anabasis, Zizyphus, Astragalus,* and *Trigonella*) and occasional grasses. This region is heavily used for livestock grazing and some areas have been converted to arable land.

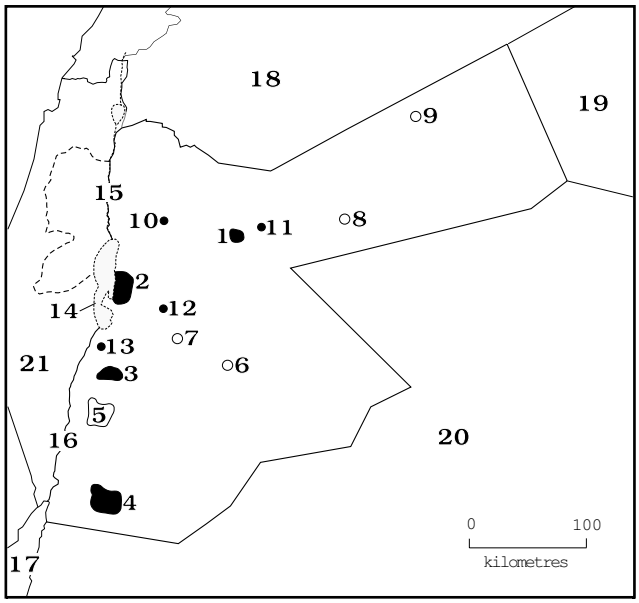


Fig. 18.1 Jordan. Protected areas containing antelopes or of potential significance for antelope conservation: 1. Shaumari (2,200ha); 2. Wadi Mujib (21,200ha); 3. Dana (23,000ha); 4. Wadi Rum (55,000ha). Proposed protected areas: 5. Jebel Mas'udi (46,000ha); 6. Bayer (44,000ha); 7. Abu Rukbah (41,000ha); 8. Wadi Rajil (86,000ha); 9. Burqu (95,000ha). Geographical features and localities mentioned in the text: 10. Amman; 11. Azraq; 12. Al Katrane; 13. Wadi Fidan; 14. Dead Sea; 15. Jordan Valley; 16. Wadi Araba; 17. Gulf of Aqaba; 18. Syria; 19. Iraq; 20. Saudi Arabia; 21. Israel.

At one time, Jordan was well known for its forests, but most of these have disappeared as a result of centuries of overgrazing, cutting for timber and fuel, and fires (Hatough-Bouran and Disi 1991). Some fragments of pine (*Pinus halepensis*) and oak (*Quercus*) forest survive in the highlands, but the total area is only about 25,000ha. Overgrazing has also affected rangelands, in some places severely. Ministry of Agriculture figures show that between 1930 and 1985, numbers of sheep increased from 229,100 to 1,121,000 and numbers of goats from 289,500 to 505,000, while the area of natural pasture declined over the same period (Hatough-Bouran and Disi 1991). The area of rangeland has been reduced by conversion to agriculture, and a further problem is over-exploitation of groundwater resources, resulting in increased salinity.

Current status of antelopes

Four species of antelopes have been recorded in Jordan (Table 18.1): Arabian oryx (*Oryx leucoryx*), mountain ga-

Table 18.1 Current status of antelopes in Jordan.

Species	Status[1]	GPS[2]
Arabian Oryx (*Oryx leucoryx*)	Extinct	–
Dorcas Gazelle (*Gazella dorcas*)	Endangered	<1%
Mountain Gazelle (*G. gazella)*	Insufficiently Known	c.0.5%
Arabian Sand Gazelle (*G. subgutturosa marica*)	Endangered	c.3%

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

zelle (*Gazella gazella*), goitered gazelle (*G. subgutturosa*), and dorcas gazelle (*G. dorcas*). A record of Saudi gazelle (*G. saudiya*) from Amman (Harrison and Bates 1991) refers to a specimen found in archaeological excavations, and there are no other records of this species of gazelle from Jordan. Former distributions of all species of antelopes are imprecisely known, but all have suffered great declines in range and numbers during this century, in common with the rest of Arabia. *Oryx leucoryx* became extinct in Jordan in the 1930s. *G. subgutturosa* is currently regarded as endangered, and *G. gazella* is confined to the Rift Valley and its margins. A small number of dorcas gazelles (*G. d. isabella*) are found in Wadi Araba. There are very few specimens or other records of antelopes from the eastern and southeastern deserts of Jordan, though this may reflect lack of observers rather than absence of gazelles.

Antelopes have been hunted in Arabia for millennia, but two aspects have been particularly destructive: the use in earlier times of traps called "desert kites" and the advent of motorised hunting in recent decades. Desert kites are extensive, funnel-shaped stone enclosures, into which gazelles are driven. They were constructed in many parts of the eastern lava deserts frequented by gazelles, and along gazelle migration routes. Gazelles were caught by the hundred in these kites and their use drastically reduced gazelle populations in these areas (Mendelssohn 1974; Hatough- Bouran and Disi 1991). In recent years, improved protection, greater awareness of wildlife conservation, and development of a protected area network have helped to create a far more favourable climate for wildlife in Jordan. A programme to reintroduce oryx and goitered gazelle has been formulated.

Conservation measures taken

Wildlife conservation has assumed increased importance at a national level. The environment was included as a priority in the 1986–1990 Development Plan and a national environmental strategy was prepared in 1991 (Ministry of Municipal and Rural Affairs and the Environment 1991). The Ministry of Agriculture bore overall responsibility for wildlife conservation and protection of forests and rangelands until recently, but a new General Corporation for the Environment has been established. However, there is no department or other administrative unit directly responsible for wildlife conservation and many functions have been delegated to an NGO, the Royal Society for the Conservation of Nature (RSCN), formed in 1966. These functions include establishment and management of protected areas, research, co-operation with international agencies, enforcement of wildlife protection laws, and administration of all hunting activities. RSCN maintains captive-breeding herds of several threatened species, and also undertakes Jordan's responsibilities under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

All antelopes are protected by law. Hunting is controlled by laws dating from 1973. RSCN has divided Jordan into six hunting areas and set quotas and close seasons for all species. RSCN's Hunting Committee meets monthly to review controls in the light of the latest information. The difficulty in travelling through some of the *harrat* boulder fields in the northeastern desert provides some practical protection from hunting, and extensive military zones in Wadi Araba also provide indirect protection for wildlife.

There are three categories of protected area: wildlife reserve, grazing reserve, and national park. Wildlife reserves are the only category whose main function is the protection of wildlife, especially threatened species and habitats. All activities that may adversely affect the site, such as grazing and agriculture, are banned within their boundaries. Seven wildlife reserves have been established so far. Three of these, covering a combined area of 46,400ha, contain antelopes, and another, Wadi Rum Wildlife Reserve (55,000ha), is under establishment. Research has shown that Jordan's reserves can be effective in increasing biomass and diversity of plants, as well as animal populations (Hatough *et al.* 1986).

A key site for antelope conservation is Shaumari Wildlife Reserve (2,200ha), which was originally established as a grazing reserve in 1958 and later taken over by RSCN as a centre for reintroduction of indigenous wildlife. It lies in the eastern desert within the former range of *Oryx leucoryx* and is completely fenced. An initial herd of 11 oryx was established in 1978 and, by 1996, numbers had increased to more than 225, which is considered to be about carrying capacity. Shaumari Wildlife Reserve also contains a captive herd of *Gazella subgutturosa,* but breeding has not been very successful. The other protected areas important for antelopes are: Wadi Mujib Wildlife Reserve (21,200ha), Dana Wildlife Reserve (23,000ha), and Wadi Rum Wildlife

Reserve (55,000ha). *G. gazella* formerly occurred in the Wadi Mujib and Dana Reserves. Dana, situated in southern Jordan on the eastern side of the Rift Valley, is involved in a project funded by the Global Environment Facility to promote biodiversity conservation. The reserve is mainly staffed by people from villages around the reserve, and socio-economic development work in these villages benefits many families; the reserve became self-financing by the end of 1997.

Grazing reserves are established by the Ministry of Agriculture to protect rangelands and restore vegetation cover. While grazing reserves do not have a direct nature conservation mandate, any increase in plant cover and species variety is of potential benefit to wild herbivores, including antelopes. National parks are organised by the Ministry of Tourism for tourism and amenity use, and their objectives do not encompass nature conservation.

The RSCN has initiated a project to reintroduce indigenous species of wildlife to Jordan. In addition to the successful breeding of Arabian oryx in Shaumari Wildlife Reserve, the project has also seen the successful re-establishment of the Asiatic wild ass (*Equus hemionus*) in Shaumari. Other releases include roe deer (*Capreolus capreolus*) and Nubian ibex (*Capra ibex nubiana*), while the possibility of reintroducing the leopard (*Panthera pardus*) is being investigated. Fauna and Flora International (FFI), a British NGO, has been involved in co-operative projects with RSCN since 1992, including capacity-building and management of protected areas.

Conservation measures proposed

Five further wildlife reserves that are of actual or potential significance for antelopes have been proposed for the desert zone: Burqu, in the extreme northeast, where *G. subgutturosa* has been recorded; Wadi Rajil, east of Azraq; Bayer, southeast of Shaumari; Jarba and Jabal Mas'udi, both lying east of Wadi Araba in the southern desert; and Abu Rukbah. These have a combined area of 312,000ha. Releases of Arabian oryx and Arabian sand gazelles into the eastern desert, using stock from Shaumari, have been proposed. Efforts will focus on four main areas: Wadi Bayir, Rajil, Burqu, and Wadi Rum-Batn al-Ghul (100km east of Wadi Rum). Azraq Desert Grazing Reserve (33,000ha) was proposed as a wildlife reserve by Clark (1978), but it has not yet been designated as such.

Species accounts

Arabian Oryx (*Oryx leucoryx*)

Distribution and population: Formerly occurred in the eastern desert, where a few specimens were obtained in the early part of this century (Harrison and Bates 1991) (Fig. 18.2). Precise limits of the former distribution are unknown. Oryx were formerly seen in hundreds in the Azraq area (Hatough-Bouran and Disi 1991), but they became extinct

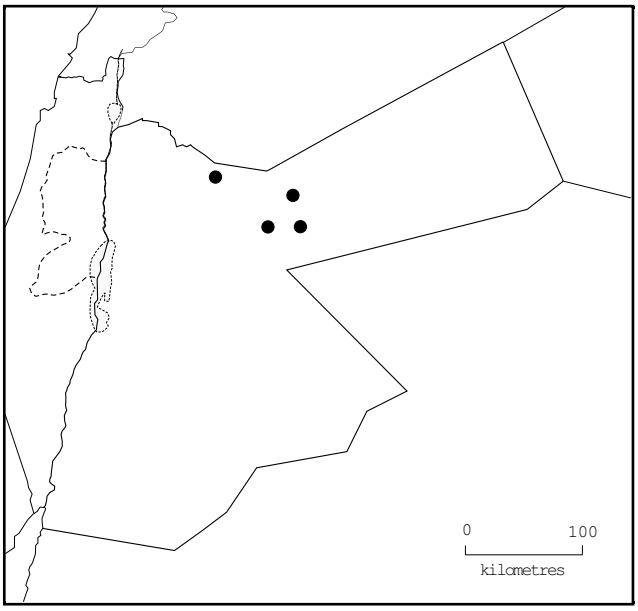


Fig. 18.2 Former records of Arabian oryx *(Oryx leucoryx)* in Jordan.

in Jordan by the 1930s, mainly as a result of overhunting. The last records of oryx relate to a few animals which entered Jordan from Saudi Arabia in 1930, but were soon exterminated by hunters (Hatough and Al-Eisawi 1988).

Habitat, food and reproduction: Arabian oryx occur in all parts of the fenced Shaumari Wildlife Reserve, but they generally concentrate in wadis and other areas where the most luxuriant vegetation grows and where shade is provided by tall bushes of *Atriplex halimus* and *Seidlitzia rosmarinus*. Nevertheless, oryx have also been observed to stand for several hours in areas of open hammada during the midday heat of summer (Hatough and Al-Eisawi 1988). They feed mainly on grasses, of which 13 species grow at Shaumari, and when these are not available, oryx eat shrubs such as *Seidlitzia, Capparis, Citrullus,* and *Tamarix* (Abu Jafar and Hays-Shahin 1988). They scrape out hollows *c.*25cm deep in which they spend the night (Hatough and Al-Eisawi 1988). Males exhibit a clear social hierarchy, and in the breeding season they engage in fights with other males for possession of females. These fights may end in injury or death and are the major cause of adult mortality (Abu Jafar and Hays-Shahin 1988). Females give birth in densely vegetated areas overlooking gravel plains or on high ground, and they flatten the chosen site by rolling on it a few days before parturition (Hatough and Al-Eisawi 1988). Gestation is 240 days and single young are born as a rule; the majority of births at Shaumari occur October–May (Abu Jafar and Hays-Shahin 1988).

Status within the country: Extinct. A captive-breeding herd has been established at Shaumari Wildlife Reserve.

Conservation measures taken: Oryx are fully protected by law, and the object of a successful captive-breeding programme based at Shaumari Wildlife Reserve (2,200ha). The Shaumari herd was established in 1978 with 11 animals

and this was later augmented by additions of oryx from various sources. In 1996, the population reached 225, considered to be about the maximum carrying capacity. A programme to reintroduce oryx to protected areas in the eastern desert has been proposed. Global status is Endangered (IUCN 1996).

Conservation measures proposed: A reintroduction and recovery programme for Arabian oryx in Jordan was discussed by RSCN in January 1995, and a three-year strategy was drawn up incorporating the following components: (1) initiate a high-profile public awareness campaign about the proposed releases and the benefits to local communities; (2) carry out intensive veterinary screening of oryx at Shaumari in preparation for release; (3) conduct surveys of potential release sites in the eastern desert; (4) recruit and train local Bedouin as rangers to protect and monitor released oryx.

Dorcas Gazelle (*Gazella dorcas*)

Distribution and population: There are no reliable historical records of this species in Jordan. The first confirmed records came from observations in Wadi Araba and the discovery of two dead specimens in Wadi Fidan (Amr and Disi 1988). A survey in 1995 found *G. d isabella* near Dana Wildlands Wildlife Reserve and at four other areas within the Wadi Araba depression: Bir Madhkur, Risha, Rahma, and Aqabah (Fig. 18.3). All these populations are near-continuous with those of *G. dorcas* in Israel. The total population in Jordan is conservatively estimated at 180–200.

Habitat, food and reproduction: In Jordan, dorcas gazelles are found in flat gravel plains, gravel plateaux with acacia woodlands, and mixed gravel and sand dune areas with *Haloxylon persicum* (Boef and Mashaqbah 1995). Most feeding activity and sign is found under or near acacia trees in gravel deserts, and trees are frequently used as resting and latrine sites. In well-vegetated wadis containing *Nitraria*, *Anabasis,* and other shrubs, latrine sites are also found near favoured food plants. The preferred habitat type of *Acacia raddiana, Zilla spinosa,* and *Ochradenus baccatus* bushes corresponds to the findings in Israel of Baharav (1982). The mating season begins in late September and may last for up to six weeks. Young are born March–April.

Status within the country: Endangered. Regarded as one of Jordan's most threatened species. Unless immediate conservation measures are taken, the remaining population in Jordan may disappear in five to 10 years. Distribution is limited by continued habitat encroachment and illegal hunting, and economic development activities for the area proposed at the 1995 Amman Economic Summit.

Conservation measures taken: Dorcas gazelles are protected by law and they occur in the proposed Jebal Mas'udi Wildlife Reserve. Global status is Vulnerable (East 1999).

Conservation measures proposed: Improve species legislation and RSCN's law enforcement capabilities. Extend the buffer zone of the Dana Wildlife Reserve westwards to afford complete protection to one breeding nucleus. This would include a representative part of Wadi Araba. The Reserve's ranger force should be increased to control grazing, wood collection, and other land use in order to promote increased use of the reserve by gazelles. Establish the proposed Jabal Mas'udi Wildlife Reserve (from Bir Madhkur south to Risha) 40km south of Dana. Establish the proposed Gharandal Strict Nature Reserve and translocate the species to this site. Carry out a census of the entire dorcas gazelle population in Wadi Araba during autumn or spring.

Mountain Gazelle (*Gazella gazella*)

Distribution and population: Recorded from several localities along the Rift Valley of western Jordan (Hatough-Bouran and Disi 1991; Quemsiyeh *et al.* 1996) (Fig.18.3). Hatough-Bouran and Disi (1991) also mapped two localities in the eastern desert, but there have been no recent records from the area. One was killed in the Salt Mountains in 1986. This was formerly the most widespread antelope species in Jordan. A few still occur in the Jordan Valley, especially near the Yarmouk and Jordan Rivers, and these animals cross the international border with Israel. They are regularly observed by local people and military personnel. Current numbers are unknown, but it is described as rare by Quemsiyeh *et al.* (1996).

Habitat, food and reproduction: In winter, mountain gazelles feed mainly on grasses, and in the dry season they are associated with *Zizyphus spina-christii* and *Prosopis farcata* vegetation (Baharav 1982). Young are usually born in spring in Jordan, after a gestation of six months (Nelson 1973; Quemsiyeh *et al.* 1996).

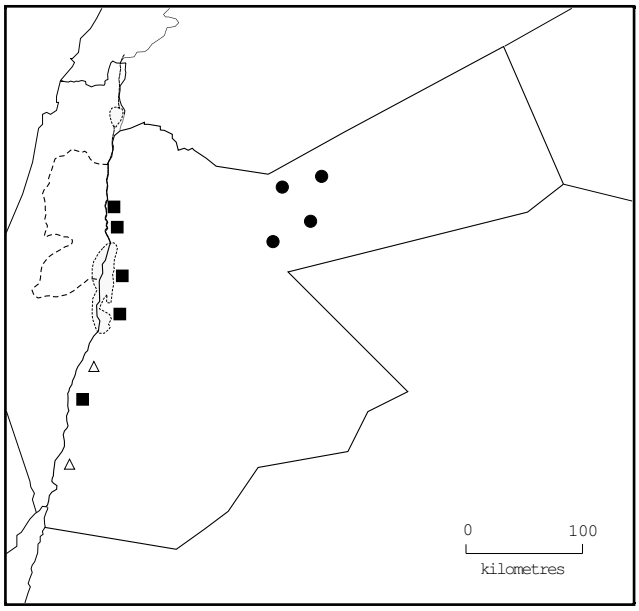


Fig. 18.3 Records of gazelles in Jordan: dorcas gazelle *(G.dorcas)* (open triangles); mountain gazelle *(Gazella gazella)* (squares); Arabian sand gazelle (*Gazella subgutturosa marica*) (circles).

Status within the country: Insufficiently known.

Conservation measures taken: Mountain gazelles are protected by law. They no longer occur in Wadi Mujib and Dana Wildlife Reserves. An attempt was made to reintroduce the species to Shaumari Reserve, but this proved unsuccessful. Their area of occurrence in the Jordan Valley near the frontier with Israel used to be protected by the army, but pressure from hunters and farmers has increased since the peace process began. RSCN is undertaking a comprehensive review of proposed protected areas and a survey of other sites for establishment as protected areas. Global status is Lower Risk/conservation dependent (IUCN 1996).

Conservation measures proposed: Survey the northern Rift Valley for remnant populations and draw up protection measures for any that survive. Ensure effective protection on the ground for any animals crossing from adjacent areas of Israel. Maintain captive-breeding efforts to provide stock for future release into suitable protected areas within the former range of the species in Jordan.

Arabian Sand Gazelle or *Reem* (*Gazella subgutturosa marica*)

Distribution and population: Known from the eastern desert, where specimens have been obtained from El Katrane and 160km southeast of Hibar (Harrison and Bates 1991; Hatough-Bouran and Disi 1991) (Fig. 18.3). The goitered gazelles occurring in Jordan are usually considered to be *G. s. marica*, but goitered gazelles are imported illegally from Iraq and, as these females are hornless, they may represent either *G. s. subgutturosa* or intergrades. The current Jordan population is estimated at <100 (Quemsiyeh *et al.* 1996).

Status within the country: Endangered.

Conservation measures taken: Sand gazelles are protected by law. A captive-breeding herd is present in the fenced Shaumari Wildlife Reserve, but breeding has not been very successful to date. The herd numbered 22 in 1990–91 and 14 in 1994. Moreover, Quemsiyeh *et al.* (1996) report that the original captive herd of 10 animals donated to RSCN in 1978 may have been hybrids between *G. subgutturosa* and *G. dorcas*. Global status of *reem* is Vulnerable (IUCN 1996).

Conservation measures proposed: Determine the taxonomic status of captive populations and maintain captive-breeding herds of pure *G. s. marica*. Stock from these herds should eventually be released into protected areas containing suitable habitat. Survey the eastern desert for remnant populations to establish their current status and then ensure their protection. *Reem* have been recorded from the area of the proposed Burqu Reserve in the northeast.

References

Abu Jafar, M.Z. and Hays-Shahin, C. 1988. Re-introduction of the Arabian oryx into Jordan. Pp. 35–40 *in:* Dixon, A. and Jones, D. (Editors), *Conservation and biology of desert antelopes*. Christopher Helm, London.

Amr, Z.S. and Disi, A.M. 1988. *Jordanian mammals acquired by the Jordan University Natural Museum*. University of Jordan, Amman.

Baharav, D. 1982. Food habits of the mountain gazelle in semi-arid habitats of of eastern Lower Galilee. *Journal of Arid Environments* 4:63–69.

Boef, J. and Mashaqbah, S. 1995. Wadi Araba gazelle survey. Unpublished report, UNDP/World Bank-GEF project for conservation of Dana Wildlands.

Clark, J.E. 1978. Azraq Desert Reserve, Jordan: Development plan. RSCN, Amman.

East, E. 1999. *African antelope database 1998.* IUCN/SSC Antelope Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.

Evans, M.I. (Compiler). 1994. *Important bird areas in the Middle East*. BirdLife International, Cambridge.

Harrison, D.L. and Bates, P.J.J. 1991. *The mammals of Arabia*. Second edition. Harrison Zoological Museum, Sevenoaks.

Hatough, A. and Al-Eisawi, D. 1988. The Arabian oryx in Jordan. *Journal of Arid Environments* 14:291–300.

Hatough, A.M.A., Al-Eisawi, D.M.H., and Disi, A.M. 1986. The effect of conservation on wildlife in Jordan. *Environmental Conservation* 13:331–335.

Hatough-Bouran, A. and Disi, A.M. 1991. History, distribution and conservation of large mammals and their habitats in Jordan. *Environmental Conservation* 18:19–32, 44.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Mendelssohn, H. 1974. The development of the populations of gazelles in Israel and their behavioral adaptations. Pp. 722–743 *in:* Geist, V. and Walther, F. (Editors), *Behavior of ungulates and its relation to management.* University of Calgary, Alberta, Canada.

Ministry of Municipal and Rural Affairs and the Environment. 1991. *National Environmental Strategy for Jordan*. IUCN, Gland, Switzerland and Cambridge UK.

Nelson, J.B. 1973. *Azraq: Desert oasis*. Nelson, London.

Quemsiyeh, M.B., Amr, Z.S., and Budari, A.M. 1996. Status and conservation of Artiodactyla (Mammalia) in Jordan. *Mammalia* 60:417–430.

Status within the country: Insufficiently known.

Conservation measures taken: Mountain gazelles are protected by law. They no longer occur in Wadi Mujib and Dana Wildlife Reserves. An attempt was made to reintroduce the species to Shaumari Reserve, but this proved unsuccessful. Their area of occurrence in the Jordan Valley near the frontier with Israel used to be protected by the army, but pressure from hunters and farmers has increased since the peace process began. RSCN is undertaking a comprehensive review of proposed protected areas and a survey of other sites for establishment as protected areas. Global status is Lower Risk/conservation dependent (IUCN 1996).

Conservation measures proposed: Survey the northern Rift Valley for remnant populations and draw up protection measures for any that survive. Ensure effective protection on the ground for any animals crossing from adjacent areas of Israel. Maintain captive-breeding efforts to provide stock for future release into suitable protected areas within the former range of the species in Jordan.

Arabian Sand Gazelle or *Reem* (*Gazella subgutturosa marica*)

Distribution and population: Known from the eastern desert, where specimens have been obtained from El Katrane and 160km southeast of Hibar (Harrison and Bates 1991; Hatough-Bouran and Disi 1991) (Fig. 18.3). The goitered gazelles occurring in Jordan are usually considered to be *G. s. marica*, but goitered gazelles are imported illegally from Iraq and, as these females are hornless, they may represent either *G. s. subgutturosa* or intergrades. The current Jordan population is estimated at <100 (Quemsiyeh *et al.* 1996).

Status within the country: Endangered.

Conservation measures taken: Sand gazelles are protected by law. A captive-breeding herd is present in the fenced Shaumari Wildlife Reserve, but breeding has not been very successful to date. The herd numbered 22 in 1990–91 and 14 in 1994. Moreover, Quemsiyeh *et al.* (1996) report that the original captive herd of 10 animals donated to RSCN in 1978 may have been hybrids between *G. subgutturosa* and *G. dorcas*. Global status of *reem* is Vulnerable (IUCN 1996).

Conservation measures proposed: Determine the taxonomic status of captive populations and maintain captive-breeding herds of pure *G. s. marica*. Stock from these herds should eventually be released into protected areas containing suitable habitat. Survey the eastern desert for remnant populations to establish their current status and then ensure their protection. *Reem* have been recorded from the area of the proposed Burqu Reserve in the northeast.

References

Abu Jafar, M.Z. and Hays-Shahin, C. 1988. Re-introduction of the Arabian oryx into Jordan. Pp. 35–40 *in:* Dixon, A. and Jones, D. (Editors), *Conservation and biology of desert antelopes*. Christopher Helm, London.

Amr, Z.S. and Disi, A.M. 1988. *Jordanian mammals acquired by the Jordan University Natural Museum*. University of Jordan, Amman.

Baharav, D. 1982. Food habits of the mountain gazelle in semi-arid habitats of of eastern Lower Galilee. *Journal of Arid Environments* 4:63–69.

Boef, J. and Mashaqbah, S. 1995. Wadi Araba gazelle survey. Unpublished report, UNDP/World Bank-GEF project for conservation of Dana Wildlands.

Clark, J.E. 1978. Azraq Desert Reserve, Jordan: Development plan. RSCN, Amman.

East, E. 1999. *African antelope database 1998.* IUCN/SSC Antelope Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.

Evans, M.I. (Compiler). 1994. *Important bird areas in the Middle East*. BirdLife International, Cambridge.

Harrison, D.L. and Bates, P.J.J. 1991. *The mammals of Arabia*. Second edition. Harrison Zoological Museum, Sevenoaks.

Hatough, A. and Al-Eisawi, D. 1988. The Arabian oryx in Jordan. *Journal of Arid Environments* 14:291–300.

Hatough, A.M.A., Al-Eisawi, D.M.H., and Disi, A.M. 1986. The effect of conservation on wildlife in Jordan. *Environmental Conservation* 13:331–335.

Hatough-Bouran, A. and Disi, A.M. 1991. History, distribution and conservation of large mammals and their habitats in Jordan. *Environmental Conservation* 18:19–32, 44.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Mendelssohn, H. 1974. The development of the populations of gazelles in Israel and their behavioral adaptations. Pp. 722–743 *in:* Geist, V. and Walther, F. (Editors), *Behavior of ungulates and its relation to management.* University of Calgary, Alberta, Canada.

Ministry of Municipal and Rural Affairs and the Environment. 1991. *National Environmental Strategy for Jordan*. IUCN, Gland, Switzerland and Cambridge, UK.

Nelson, J.B. 1973. *Azraq: Desert oasis*. Nelson, London.

Quemsiyeh, M.B., Amr, Z.S., and Budari, A.M. 1996. Status and conservation of Artiodactyla (Mammalia) in Jordan. *Mammalia* 60:417–430.

Chapter 19. Israel (including West Bank and Gaza)

B. Clark and E. Frankenberg

Introduction

Despite its relatively small area (20,772km^2), the State of Israel has extraordinary biological and geographical diversity. Starting at the subalpine habitats of Mount Hermon (2,813m) in the north, Israel extends southwards for 425km to Eilat at the northern terminus of the Red Sea (Fig. 19.1). Between these two extremities, one finds four major biogeographic regions:

1. a well-watered Mediterranean region, comprised of forest types ranging from high maquis to garrigue;
2. an Irano-Turanian dry Asian steppe;
3. Arabian desert that connects to the Saharan sands; and
4. pockets of tropical Sudanese vegetation. Within these four general regions, there are numerous sub-regions created by topographical and climatic variations. Israel's geographic location as the keystone in the land-bridge linking Africa and Eurasia also assures continued biological influences from both of these great landmasses.

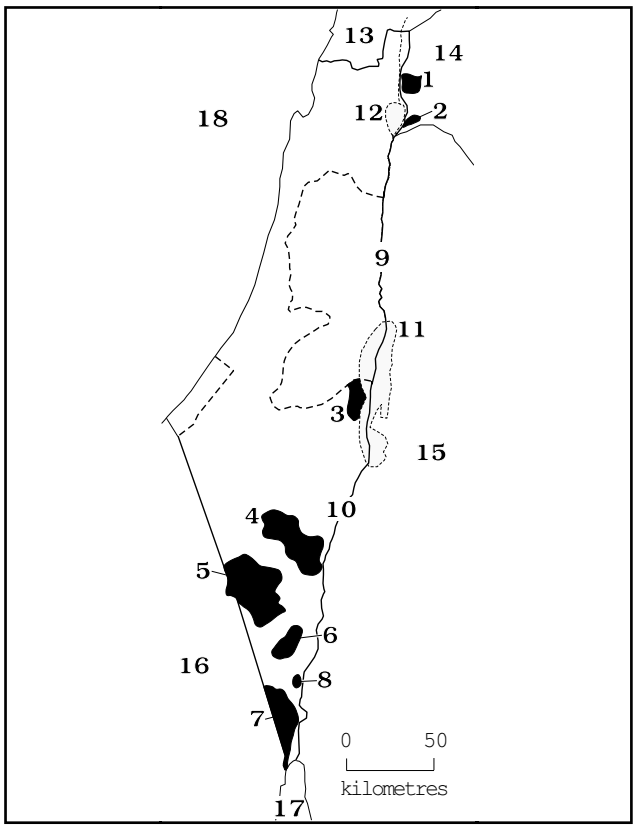


Fig. 19.1 Israel (and the West Bank). Protected areas containing antelopes: 1. Ya'ar Yehudiah (6,200ha); 2. Mezukai Herev (2,290ha); 3. En Gedi (1,435ha); 4. Mezukai Hazinim (55,600ha); 5. Har Hanegev (104,900ha); 6. Hanaholim Hagdolim (24,800ha); 7. Masiv Eilat (39,900ha); 8. Hai Bar (3,200ha). Geographical features and localities mentioned in the text: 9. Jordan Valley; 10. Wadi Arava; 11. Dead Sea; 12. Sea of Galilee; 13. Lebanon; 14. Syria; 15. Jordan; 16. Egypt; 17. Red Sea; 18. Mediterranean Sea.

Israel's climate is defined by winters which are relatively short, mild, and rainy, and summers which are long, hot, and dry. Annual precipitation may average >1000mm or <50mm, depending upon location. Topographic features, similarly, offer dramatic variety with rugged central mountains, coastal plains, rolling steppe zones, coastal dune areas and the deepest sector of the Rift Valley. Some biogeographical zones are of commercial interest, thus there is keen competition for land and water reserves in certain parts of the country. Nevertheless, Israel has a policy of protecting significant examples of every natural habitat type found within its borders. To date, slightly more than 20% of the national land area has been formally protected as nature reserves.

Current status of antelopes

The introduction of modern firearms during the early decades of the 20th century was catastrophic for all three antelope species in Israel (Table 19.1). The Arabian or white oryx (*Oryx leucoryx*) was locally exterminated by 1920. Mountain gazelles (*Gazella gazella*) were reduced to a few hundred and dorcas gazelles (*Gazella dorcas*) were similarly persecuted (Mendelssohn 1974). Since the passage of the Wild Animal Protection Law in 1955 and the creation of the Nature Reserves Authority (NRA) in 1964, antelope populations in Israel have generally enjoyed improved protection, and numbers of *G. gazella* and *G. dorcas* have increased. Adequate protected habitat exists to assure a secure future for antelope species and illegal hunting is effectively policed.

Persecution also affected the Arava gazelle or acacia gazelle (*G. g. acaciae*), a remnant population of the mountain gazelle, found in an isolated, 6km^2 habitat of relatively dense growth of *Acacia raddiana* and *A. tortilis* in the Arava Valley. This area, about 40km north of Eilat, is totally protected as a nature reserve (Shalmon 1991). There is consensus that these gazelles, which have a declining population of only 12 individuals, may have become isolated at the close of the most recent ice age, when temperate climatic patterns in the Negev gave way to a desert regime. The

Table 19.1 Current status of antelopes in Israel.

Species	Status[1]	GPS[2]
Arabian Oryx (*Oryx leucoryx*)	Endangered (reintroduced)	5%
Dorcas Gazelle (*Gazella dorcas*)	Rare	<10%
Mountain Gazelle (*G. g. gazella*)	Satisfactory	35–40%
Arava Gazelle (*G. g. acaciae*)	Endangered	100%

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

isolated gazelles apparently adapted and survived. Hundreds (possibly thousands) of gazelles were present in the Arava Valley in the 1950s (Yom-Tov 1987), but these had been reduced to about 68 by 1967 (Shalmon 1991). The main reasons for their decline are poaching, predation by dogs, greatly increased development of the area and, in particular, increased water extraction, which caused springs to dry up and led to changes in vegetation composition (Blank 1996). However, there is considerable taxonomic disagreement concerning the identity of these gazelles, and whether they constitute a valid subspecies or are merely a discrete population of *Gazella gazella cora.*

Conservation measures taken

The Wild Animal Protection Law was passed in 1955. This law has provision for appropriate protection and management of all wild species. Revisions of Israel's wildlife laws in 1992 have provided the country with a sound legal basis for conserving and managing its antelope populations. The Nature Reserves Authority recently merged with the department responsible for national parks to form a new agency, the Nature and National Parks Protection Authority (NNPPA), which is responsible for enforcing the law. Further, Israel is party to several international agreements, such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention on the Conservation of Migratory Species of Wild Animals (CMS), which are important to the worldwide conservation status of various species, including antelopes.

More than 300 nature reserves have been established, with most being relatively small. Larger nature reserves that contain antelopes include: Ya'ar Yehudia (6,200ha, established 1984), Mezukai Herev (2,290ha), En Gedi (1,435ha, established 1971), Mezukai Hazinim (55,600ha, established 1989), Har Hanegev (104,900ha, established 1989), Hanahalim Hagdolim (24,800ha, established 1986), and Masiv Elat (39,900ha, established 1986).

Strict control of hunting and the creation of nature reserves in important antelope habitats provide basic security for antelopes. However, because of the small size of Israel and the existing land distribution patterns, there are numerous occasions when expanding antelope populations, particularly mountain gazelles, come into conflict with human enterprise, particularly agriculture. To alleviate conflicts, the NNPPA offers farmers various means, other than hunting, to protect their crops from damage by gazelles and other wild animals. Non-lethal electric fences, in particular, have proven very effective. However, fencing tends to fragment and concentrate gazelle populations. Fragmentation has serious negative consequences for any wildlife population, and thus calls for creative management techniques. Very dense concentrations, similarly, are dangerous situations. For example, certain contagious diseases tend to be more virulent as density increases. Within an 80km^2 region of Israel, foot-and-mouth disease reduced a population of 3,400 mountain gazelles in 1985, to 1,300 individuals in 1986 (Frankenberg 1992). Fortunately, immediate action prevented the disease from spreading very far, and thus most of Israel's population of about 10,000 mountain gazelles were spared the consequences of this disease. Nevertheless, difficulties associated with fragmentation and high densities remain serious problems. When non-lethal means prove inadequate, the NNPPA authorizes a strictly controlled hunt of mountain gazelles. Such hunting is conducted on specified dates and within carefully defined areas, and is closely monitored by NNPPA rangers. Killed gazelles must be brought to a control station for veterinary examination (Frankenberg 1992). Alternative management measures, such as encouragement of natural predation and translocations, are also conducted.

Dorcas gazelle habitat is essentially desert which, in Israel, is only sparsely populated by humans. Much of Israel's Negev Desert is, however, an important training area for the Israel Defence Forces (IDF), and so the military has control over much dorcas gazelle habitat. Agreements between the NNPPA and IDF have produced several accommodations that permit military exercises, but also provide good conservation of the desert's dorcas gazelles. For example, live firing exercises are not permitted in certain gazelle habitats, although the region can be used for other training exercises that do not put the gazelles at risk.

One nature reserve at Nahal Zenifim is important gazelle habitat because of the concentration of desert vegetation along a long and narrow streambed. But it also transects important military training areas. To resolve the conflict,

two well-marked paths have been strategically located across the reserve, and military units may pass from one side to the other with only insignificant disturbance. Military law in Israel today respects natural values, and severe penalties can be imposed on soldiers who violate such law (Clark 1984).

Although *Oryx leucoryx* was exterminated in Israel about 80 years ago, efforts are now being made to reintroduce this species. There are now 26 reintroduced animals living freely in the northern Arava Valley. About 80 oryx are kept in the Hai-Bar Nature Reserve and other zoological institutions throughout Israel. The two separate oryx populations at Hai-Bar each inhabit approximately 800ha of fenced, natural desert habitat. The animals are encouraged to exercise a wide spectrum of natural behaviours, whilst at the same time benefiting from management applications, such as periodic veterinary attention.

Israel's Hai-Bar programme also manages small, captive populations of scimitar-horned oryx (*Oryx dammah*) and addax (*Addax nasomaculatus*). The NNPPA has been negotiating with national authorities of both Senegal and Tunisia for the use of these North African antelopes as a breeding nucleus for reintroduction into those countries. Eight *Oryx dammah* were delivered to the Gueumbeul Faunal Reserve in Senegal in early 1999 for subsequent reintroduction to Ferlo National Park. The Society for the Protection of Nature in Israel (SPNI) has over 700,000 members and is the largest NGO in the country concerned wtith conservation of wildlife.

Conservation measures proposed

Although mountain gazelles are the most common species of antelope in Israel, they also face the most uncertain future. One large population of this species occurs on the Golan Heights, which, depending on political decisions in the future, may eventually revert to Syrian sovereignty. Other mountain gazelle populations within the pre-1967 borders of Israel face continued threats of fragmentation, particularly as agriculture becomes more and more sophisticated. Creative management, such as translocations to avoid inbreeding depression, may become standard practice in the future. On the other hand, implementation of a comprehensive peace agreement in the region may result in a decreased need for large regions devoted to security and military training. This could open up yet more land for conversion to strict nature reserves. Reintroduction of *Oryx leucoryx* is now underway, with the necessary habitat assessments and feasibility studies complete. This initiative may be enhanced by exchanging breeding stock with other countries. The three greatest challenges for the future will be: continuing to assure adequate amounts of good habitat; finding innovative management techniques to resolve difficulties, such as population fragmentation; and finding the financial resources to conduct the required studies and management exercises.

Species accounts

Arabian Oryx or White Oryx (*Oryx leucoryx*)

Distribution and population: Oryx have recently been reintroduced to the northern Arava Valley in the eastern Negev Desert; 26 animals have been released so far and further releases are planned (Fig. 19.2). The captive population presently comprises about 80 animals, most of which are kept in two groups at the Hai-Bar Nature Reserve.

Habitat, food and reproduction: The Arabian oryx is well adapted to extreme desert conditions. It generally prefers open gravel plains, but has also been reported in various other habitats, including sand dunes. It feeds on a wide variety of plants and often migrates significant distances to areas where rains have stimulated growth of fresh vegetation. There is no seasonality in reproduction and the cow gives birth to a single calf.

Status within the country: Extinct in the wild. Reintroduction is being conducted.

Conservation measures taken: A breeding nucleus has been acquired from zoo stock, and these animals have been brought to the Hai-Bar Reserve for acclimatisation and breeding. Reintroduction plans have been developed, and surveys and site selections are now complete. Global status is Endangered (IUCN 1996).

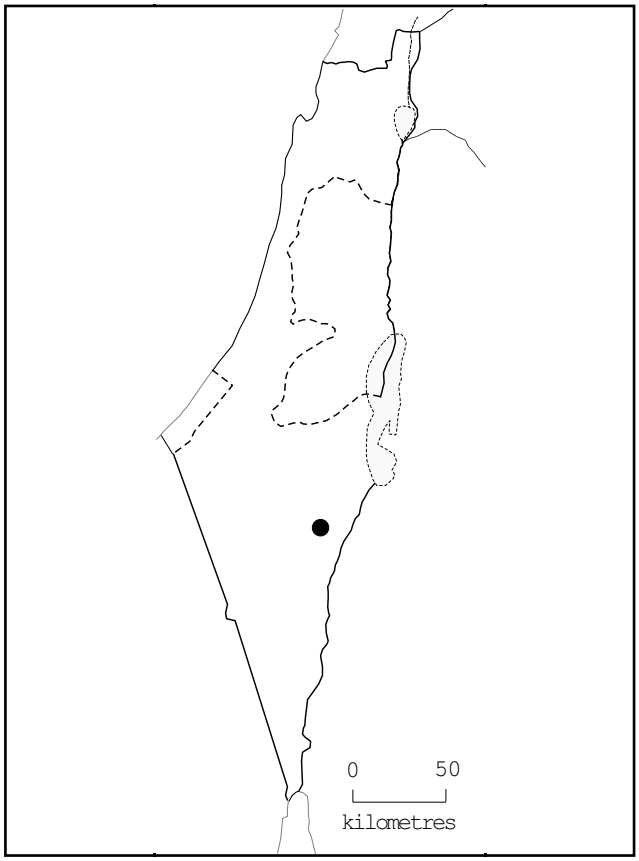


Fig. 19.2 Reintroduced population of Arabian oryx *(Oryx leucoryx)* in Israel.

Conservation measures proposed: The reintroduction process must be completed, with follow-up monitoring conducted. There are possibilities for future co-operation on joint conservation initiatives with other countries, including the exchange of breeding stock.

Dorcas Gazelle (*Gazella dorcas*)

Distribution and population: The dorcas gazelle occurring in Israel is *G. d. isabella.* It is essentially a North African gazelle which has extended its range into the Middle East. In Israel, it inhabits suitable areas south of the 150mm isohyet (Fig. 19.3). The population is censused regularly and numbers rose from 150 in 1964 to >2,000 in 1995 (Blank 1996).

Habitat, food and reproduction: Dorcas gazelles tend to inhabit dry water courses (wadis) which have subterranean water reserves to support growths of *Acacia* spp. These trees provide both shade and highly nutritious food for the gazelles (Baharav 1980).

Status within the country: Rare. Although the population is stable and not considered to be at serious risk, the low total number distributed over such a wide range suggests a rare status.

Conservation measures taken: Legally protected. Their habitat encompasses approximately 2,400km^2 of nature reserves, including Mezukai Hazinim (55,600ha), Har Hanegev (104,900ha), Hanahalim Hagdolim (24,800ha), and Masiv Elat (39,900ha) Nature Reserves. Agreements have been reached between the NNPPA and military authorities in order to avoid damage to its population in military training areas in the Negev Desert. Global status is Vulnerable (East 1999).

Conservation measures proposed: Several new nature reserves have been proposed in the Negev Desert, which will increase protection of the species.

Mountain Gazelle (*Gazella gazella*)

Distribution and population: Occurs throughout Israel north of the 150mm isohyet with concentrations in western upper Galilee, southern Golan and the eastern shore of the Sea of Galilee, along the Jordan River, and in the northwestern Negev (Fig. 19.4). The form occurring over most of the country is *G. g. gazella*. Total population is approximately 10,000. The remnant population of Arava gazelle *G. g. acaciae* is restricted to a 6km^2 area of habitat in the Arava Valley, 40km north of Eilat. Hundreds of gazelles occurred in the Arava Valley in the 1950s, but they had declined to about 68 by 1967 (Yom-Tov 1987; Shalmon 1991). Only 12 animals remained in March 1996 (Blank, 1996).

Fig. 19.3 General distribution of dorcas gazelle *(Gazella dorcas)* in Israel (shaded).

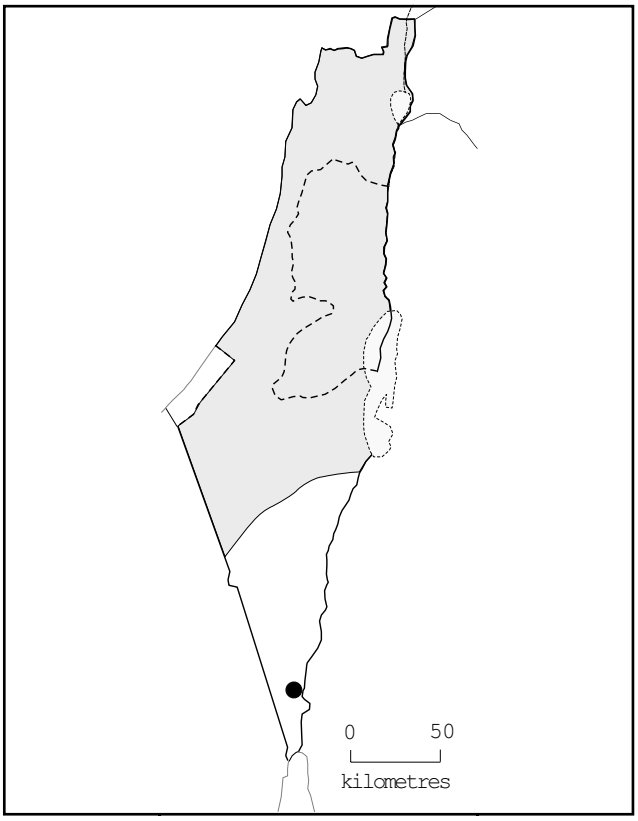


Fig. 19.4 General distribution of mountain gazelle *(Gazella gazella)* in Israel (shaded). The solid circle shows the location of the surviving population of Arava gazelle *(G.g. acaciae).*

Habitat, food and reproduction: Found mostly in hilly regions with good vegetative cover, especially in areas near irrigated cultivation, which become particularly attractive towards the end of the dry season when natural foods are dry and of low nutritional value. Mountain gazelles can also be found in many other habitats, including the coastal dunes south of Tel Aviv and even within the city limits of Jerusalem. Although there are only about 30,000ha of nature reserves within their main habitats, mountain gazelles are commonly found, and remain legally protected, in other habitats outside the reserves. Several studies have been conducted on this animal (e.g., Grau 1974; Baharav 1983; Ayal and Baharav 1985; Frankenberg 1992).

Status within the country: Satisfactory (*G .g. gazella*); Endangered (*G. g. acaciae*).

Conservation measures taken: Measures include provision of legal protection and various management regimes. Mountain gazelles occur in several protected areas, including Ya'ar Yehudia (6,200ha), Mezukai Herev (2,290ha), and En Gedi (1,435ha) Nature Reserves. The Arava gazelle population is legally protected within a strict nature reserve which is closed to the general public. The NNPPA has commissioned and received a study of the population with recommendations (Shalmon 1991). Global status is Lower Risk/conservation dependent (IUCN 1996).

Conservation measures proposed: More imaginative management may help to reduce or eliminate the need for lethal methods of control currently used in certain zones. As far as the Arava gazelle is concerned, some proposals suggested by Shalmon (1991) have been attempted, but without significant success. The creation of a physically protected, captive-breeding population at the nearby Hai-Bar reserve may serve to reduce wolf predation. Other measures proposed include construction of a fence around their remaining habitat; establishment of a captive-breeding nucleus at Hai Bar Nature Reserve; and provision of additional water points (Blank 1996).

References

Ayal, Y. and Baharav, D. 1985. Conservation and management plan for the mountain gazelle in Israel. Pp. 269–278 *in:* Beasom, S.L. and Roberson, S.F. (Editors). *Game harvest management*. Caesar Kleberg Wildlife Research Institute, Kingsville, Texas.

Baharav, D. 1980. Habitat utilization of the dorcas gazelle in a desert saline area. *Journal of Arid Environments* 3:161–167.

Baharav, D. 1983. Observation on the ecology of the mountain gazelle in the upper Galilee, Israel. *Mammalia* 47:59–69.

Blank, D. 1996. The acacia gazelle: Extinction of a subspecies. *Gnusletter* 15(2):7–9.

Clark, B. 1984. The army and the Negev. *Ariel* 54:53–58.

East, R. 1998. *African antelope database 1999.* IUCN/SSC Antelope Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.

Frankenberg, E. 1992. Management of mountain gazelles in Israel. *Ongulés/Ungulates* 91:353–355.

Grau, G.A. 1974. Behavior of mountain gazelle in Israel. PhD thesis, Texas A & M University, College Station.

IUCN. 1996. *1996 IUCN Red List of threatened animals.* IUCN, Gland, Switzerland and Cambridge, UK.

Mendelssohn, H. 1974. The development of the populations of gazelles in Israel and their behavioural adaptations. Pp. 722–743 *in:* Geist, V and Walter, F. (Editors). *The behavior of ungulates and its relation to management*. IUCN, Morges.

Shalmon, B. 1991. Conservation program for the gazelle *Gazella gazella acaciae*. Nature Reserves Authority, Jerusalem.

Yom-Tov, Y. 1987. The numerical status of *Gazella dorcas* and *Gazella [g. acaciae?]* in the southern Negev Desert, Israel. *Biological Conservation* 40:245–253.

Chapter 20. Turkey

S. Y. Ölçer

Introduction

The Republic of Turkey stretches from southeastern Europe to the Middle East and covers an area of 779,452km^2. The western part of the country (Trakya) borders Greece and Bulgaria. Asian Turkey (Anatolia) has long coastlines along the Mediterranean and Black Seas, and land borders in the east with Georgia, Armenia, Iran, Iraq, and Syria (Fig. 20.1). The human population of Turkey exceeds 58,000,000, but large parts of the country are sparsely populated. Turkey is, in general, a mountainous country with an average elevation >1,000m. Anatolia consists of a central plateau surrounded by mountains. In the north, the Pontic Mountains run parallel to the Black Sea coast and reach their highest point in the Kaçkar Range of the northeast (3,932m). The plateau is bordered on the south by the Toros Mountains, which have numerous peaks >3,000m and a highest point of 4,116m. Eastern Anatolia contains a number of mountains, including Agri Dagi (Mount Ararat) close to the eastern border with Armenia, which reaches an altitude of 5,137m and is the highest point in Turkey (Kence and Tarhan 1997). In southeastern Turkey, a low plateau lies to the south of the eastern Toros Mountains. The central plateau is semi-arid and largely covered by steppe vegetation, while the Pontic Mountains contain deciduous and coniferous forests. Three phytogeographic regions meet in Turkey, namely Euro-Siberian, Mediterranean, and Irano-Turanian, and the country's rich flora includes *c.*2,400 endemic plant species (IUCN 1992). The climate is varied. Coastal regions have a typical Mediterranean climate. Inland, the Anatolian Plateau is semi-arid and has a continental climate with cold winters (extremes of -40ºC) and hot summers. Southeastern Anatolia has a semi-arid, Mediterranean climate with summer temperatures reaching 46ºC and very low precipitation (Bari 1989). Turkey can be divided into seven broad geographical regions (Bari 1989). Antelopes occur in only one of these, southeast Anatolia, an area of arid steppes and semidesert, lying south of the eastern Toros Mountains.

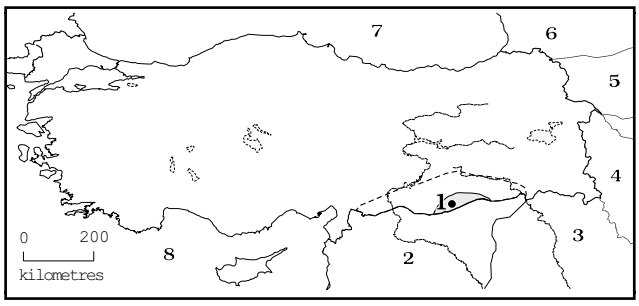


Fig. 20.1 Turkey, showing approximate current distribution (shaded) and former distribution (broken line) of goitered gazelle *(Gazella subgutturosa).* 1. Ceylanpinar State Farm; 2. Syria; 3. Iraq; 4. Iran; 5. Armenia; 6. Georgia; 7. Black Sea; 8. Mediterranean Sea.

Current status of antelopes

Only one species of antelope is present in Turkey, goitered gazelle (*Gazella subgutturosa*) (Table 20.1). Its distribution is restricted to the semideserts of southeastern Anatolia, along the border with Syria. Gazelle numbers have fallen sharply over the last 20 years because of illegal hunting and conversion of its habitat for agriculture. An early report of the occurrence of *G. dorcas* in the Adana area of southern Turkey has not been confirmed and is regarded as erroneous (Kumerloeve 1975).

Conservation measures taken

Responsibility for conservation of endangered species and management of protected areas lies with the General Directorate of National Parks, Game and Wildlife in the Ministry of Forestry. Gazelles are protected by law, but illegal hunting remains a problem. The main categories of protected area in Turkey are national park, nature park, natural monument, natural reserve area, and special protected area; there are also several kinds of game-breeding station, (IUCN 1992). No protected area has been established within the range of goitered gazelles in Turkey, but a breeding and protection programme has been set up at

Table 20.1 Current status of antelopes in Turkey.

Species	Status[1]	GPS[2]
Goitered Gazelle (*Gazella subgutturosa*)	Endangered	0.25%

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

Ceylanpinar State Farm (260ha) and goitered gazelles are reproducing successfully there. The main NGOs concerned with wildlife conservation include the Turkish Association for the Conservation of Nature and Natural Resources (Türkiye Tabiatini Koruma Dernegi), the Society for Protection of Wildlife (Dogal Hayati Koruma Dernegi), the Environment and Woodlands Protection Society (Çevre Koruma ve Yesillendirme Dernegi) and the Environmental Problems Foundation of Turkey (Türkiye Çevre Sorunlari Vakfi) (IUCN 1992). Turkey became a signatory to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in December 1996.

Conservation measures proposed

Many of the ungulate populations in Turkey are not well surveyed, and accurate data are needed on their current distribution and status (Ogurlu 1992). The location of the remnant gazelle population in a sensitive border zone has hindered survey work and research. Enforcement of laws on hunting is essential to protect remaining gazelles and to ensure the safety of future releases from the state breeding farm. Another priority is to conduct field surveys to determine the size of the remaining gazelle population, the extent of the habitat used, and whether the gazelles cross the border into Syria. If this is the case, then co-operation with the Syrian authorities on trans-border measures may be needed to safeguard this population.

Species account

Goitered Gazelle (*Gazella subgutturosa*)

Distribution and population: Distribution is restricted to the vicinity of the Turkish-Syrian border in southeastern Anatolia (Fig. 20.1). In the past, goitered gazelles were reported from as far west as Kilik (Harrison 1968), but there are no specimens from this area and these reports are regarded as doubtful by Kumerloeve (1975). A few gazelles still occur in the area around Ceylanpinar, between Kirikhan and Mardin. There were reported to be about 3,000 gazelles in southeastern Anatolia in 1968, but 10 years later the population had decreased to 300 (Ogurlu 1992). About 300 are currently estimated to survive in the wild.

Habitat, food and reproduction: Gazelle habitat around Ceylanpinar consists of semi-arid steppes and plains. However, many areas have already been converted into agriculture and suitable habitat is confined to a few remnants (Grimmett and Jones 1989).

Status within the country: Endangered. Increasing use of their habitat for agriculture poses a problem, and damage to the environment caused by overuse of pesticides has also caused concern (Ogurlu 1992).

Conservation measures taken: Gazelles are protected by law. A breeding centre and protection programme were set up at Ceylanpinar State Farm (260ha) in 1978. Breeding has been successful and 812 gazelles were present there in October 1995. Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: The principal measures required are protection of the remaining gazelles from illegal hunting, surveys of the current population, and establishment of a protected area in remaining areas of their habitat. It is essential to continue the captive-breeding programme at Ceylanpinar and reintroduce gazelles to suitable areas of habitat when protection from hunting can be guaranteed.

References

Bari , Y.S. 1989. Turkey's bird habitats and ornithological importance. *Sandgrouse* 11:42–51.

Grimmett, R.F.A. and Jones, T.A. 1989. *Important bird areas in Europe.* International Council for Bird Preservation, Cambridge.

Harrison, D.L. 1968. *The mammals of Arabia*. 2 Volumes. Ernest Benn, London.

IUCN. 1992. *Protected areas of the world: A review of national systems, vol.ume 2. Palaearctic.* IUCN, Gland, Switzerland and Cambridge, UK.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Kence, A. and Tarhan, M.S. 1997. Turkey. Pp. 134–138 *in:* Shackleton, D.M. (Editor). *Wild sheep and goats and their relatives. Status survey and conservation action plan for Caprinae*. IUCN, Gland, Switzerland and Cambridge, UK.

Kumerloeve, H. 1975. Die Säugetiere (Mammalia) der Türkei. *Veröffentlichungen der Zoologischen Staatssammlung München* 18:69–158.

Ogurlu, I. 1992. Wild ungulates of Turkey. *Ongulés/Ungulates* 91:575–577.

Chapter 21. Iran

M.R. Hemami and C.P. Groves

Introduction

The Islamic Republic of Iran is situated between the Caspian Sea and the Persian Gulf, and covers an area of 1,648,184km^2, which includes several islands. It has a 2,700km southern coastline along the Persian Gulf and Gulf of Oman, and a shorter northern coastline along the southern shore of the Caspian Sea. Iran has land borders with Iraq and Turkey to the west, Armenia and Azerbaijan to the north-west, and Turkmenistan, Afghanistan, and Pakistan to the east and northeast (Fig. 21.1). The human population exceeds 64,800,000. About 52% of the country consists of mountains and arid biotopes. True deserts occur in inland basins or *kavirs.* The largest of these are the Dasht-e-Kavir and Dasht-e-Lut Deserts of central and eastern Iran, respectively. Smaller areas of desert occur in Baluchistan and along the south coast. The remainder of the country includes: 19 million ha of forests, rangelands, and scrublands; 10 million ha of pastures; 13.5 million ha of arable land, of which 6.3 million ha is under irrigation and 7.5 million ha is rain-fed; 8 million ha of fallow land; and 28.5 million ha of marginal land. Most of the country lies at elevations of 1,500–2,000m above sea level. Central Iran consists of an extensive plateau bordered by mountain ranges. The most important mountains are: the Alborz Range, which runs along the southern shore of the Caspian Sea and contains the highest peak in Iran, Damavand (5,604m); the Zagros Mountains, which run northwest-southeast through western Iran and contain several peaks above 4,000m; and the Kopet Dag Range along the northeastern frontier with Turkmenistan.

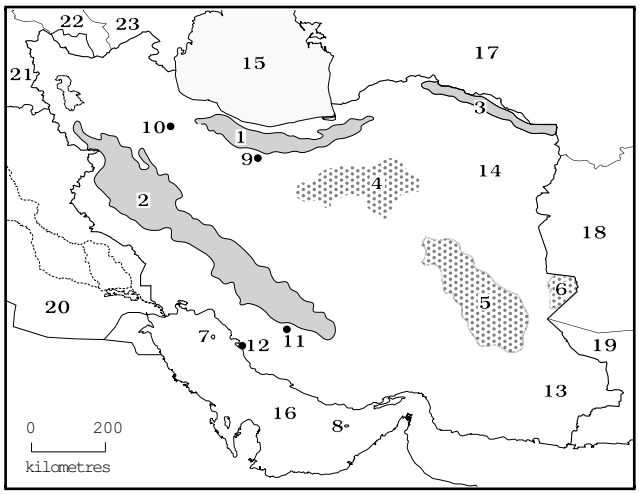


Fig. 21.1 Iran. Geographical features and localities mentioned in the text: 1. Alborz Mountains; 2. Zagros Mountains; 3. Kopet Dag Mountains; 4. Dasht-e-Kavir; 5. Dasht-e-Lut; 6. Seistan Basin; 7. Kharg Island; 8. Farur Island; 9. Tehran; 10. Zanjan; 11. Shiraz; 12. Bushehr; 13. Baluchistan; 14; Khorasan; 15. Caspian Sea; 16. Persian Gulf; 17. Turkmenistan; 18. Afghanistan; 19. Pakistan; 20. Iraq; 21. Turkey; 22. Armenia; 23. Azerbaijan.

The climate is humid-temperate in the Caspian coastal zone, with average annual rainfall >1,000mm. The southern coast is hot-subtropical and summer temperatures reach 450 C. In the interior, the climate is continental, arid, or semi-arid, with average annual precipitation 100–300mm. Winter temperatures are 5–100 C in the south, decreasing northwards and with altitude, reaching –200 C in the Alborz and Zagros Mountains.

Iran's size, topographic variety, and its position in the Palaearctic faunal region have endowed the country with a diversity of fauna and flora unequalled in any other part of the Middle East. Iran is also a centre of speciation for Holarctic desert flora. semi-arid and arid vegetation types predominate, and *Artemisia-Astragalus* steppes cover a large area. Alpine zones occur in the Alborz and Zagros Ranges and more locally elsewhere. Overall, forest types form a small percentage of the land area. These consist of some temperate broad-leaved forests in the northwest and on the Caspian slopes of the Alborz Range, oak (*Quercus*) woods in the Zagros Range, and drier types of *Juniperus* and *Pistacia* steppe woodlands elsewhere. To date, more than 160 species of mammals and 500 species of birds have been recorded in Iran. Large tracts of the country have been affected by traditional human activities, such as grazing and cultivation, and more recently by economic and industrial development.

Current status of antelopes

Three species of gazelles occur in Iran (Table 21.1). Goitered gazelle (*Gazella subgutturosa;* Farsi: *ahu*) and chinkara (*G. bennettii*; Farsi: *gebeer* or *jebeer*) are fairly widely distributed (Hemami 1994). A population of mountain gazelle (*G. gazella*) was recently reported from Farur Island in the Gulf and named as a new subspecies, though the precise origin of these gazelles remains unclear (Karami and Groves 1993). The taxonomy of Iranian gazelles at the subspecies level has been the subject of much debate: three forms of *G. bennettii* have been identified by Groves (1993), and the goitered gazelles occurring west of the Zagros Mountains apparently represent a different subspecies from those occurring in the rest of the country. Populations of all gazelle species have declined as a result of poaching, habitat

Table 21.1 Current Status of Antelopes in Iran.

Species	Status[1]	GPS[2]
Chinkara or Indian Gazelle (*Gazella bennettii*)	Vulnerable	1–1.5%
Mountain Gazelle (*G. gazella*)	Vulnerable	<1.5% (introduced?)
Goitered Gazelle (*G. subgutturosa*)	Vulnerable	7.5–9%

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

Table 21.2 Protected Areas in Iran that contain or recently contained antelopes (numbers refer to Fig. 21.2).

	Protected Area	Area (ha)	Year Established	*G. subgutturosa*	*G. bennettii*	*G. gazella*
	National Parks					
1	Bamou	47,440	1962	390	–	–
2	Golestan	91,895	1957	220	–	–
3	Kavir	420,000	1964	60	100	–
4	Sorkeh Hesar	9,380	1982	20	–	–
	Wildlife Refuges					
5	(Bakhtegan)	310,438	1968	Extinct	–	–
6	Ghamishloo	37,000	1971	1,010	–	–
7	Khabr-va-Rouchoon	169,200	1971	–	200	–
8	Khosh Yeilagh	154,400	1963	15	–	–
9	Kola Ghazi	50,000	1964	1,130	–	–
10	Miandasht	52,000	1974	250	?	–
11	Mooteh	163,250	1964	2,170	–	–
12	(Mehrouyeh)	7,468	1971	–	Extinct	–
13	Touran	565,000	1973	180	30	–
	Preserved Areas					
14	(Arjan)	66,750	1972	Extinct		
15	Bahram-e-Gour	385,000	1973	Extinct	60	–
16	Bidouieh	94,275	1997	750	–	–
17	(Bijar)	31,250	1970	Extinct	–	–
18	(Dez)	10,633	1960	Extinct	–	–
19	Farur Island	2,620	1987	–	–	360
20	Gandu	382,430	1971	–	6	–
21	(Gano)	27,500	1972	–	Extinct	–
22	(Ghorkhod)	34,000	1971	Extinct	–	–
23	(Haftad Gholleh)	82,000	1970	Extinct	–	–
24	Hamoun	193,500	1967	Extinct	unknown	–
25	(Hara)	85,686	1972	–	Extinct	–
26	Hormud	151,284	1976	–	50	–
27	Kalmand-va-Bahadoran	17,500	1991	1,500	20	–
28	(Karkheh)	9,427	1960	Extinct	–	–
29	Kavir	250,000	1976	As Kavir NP		
30	Mond	46,700	1976	250	–	–
31	Nayband	195,000	1978	–	15	–
32	Parvar	59,840	1962	Migrants	–	–
33	Salook	16,000	1973	1,100	–	–
		TOTAL		>9,045	389	360

degradation due to overgrazing and removal of shrubs and bushes, conversion of land to agriculture, construction, mining, and military activities (Karami 1992). Eight years of imposed war that followed the Islamic Revolution in Iran had a severely detrimental effect on the environment and wildlife conservation. Approximately 70% of protected areas and 50% of wildlife refuges located in affected areas lost all of their value for wildlife. Overall, 50–80% of wildlife populations and 80% of protected areas were damaged. The large herds of gazelles containing several thousand individuals, which could formerly be seen in some parts of the country (e.g., Mooteh Wildlife Refuge), have declined tenfold during the last two decades. In the same period, gazelles have been extirpated in 10 protected areas and in others, such as Kavir Preserved Area and Sorkheh Hesar National Park, gazelles are nearly extinct. However, due to improved implementation of conservation measures in recent years, populations of gazelles are recovering their numbers in some protected areas. Mooteh Wildlife Refuge contains over 2,000 gazelles and four others now contain more than 1,000 goitered gazelles. It appears that in a few protected areas, increasing numbers of gazelles have produced more favourable conditions for Asiatic cheetah (*Acinonyx jubatus venaticus*).

Conservation measures taken

The Environmental Protection and Enhancement Act of 1974, based on the 1967 Game and Fish Law, now governs wildlife conservation. Responsibility for administration of the law lies with the Department of the Environment, which came into being in March 1971, replacing the Game and Fish Department. There are four categories of protected areas in Iran: national park (*park-e-melli*), wildlife refuge (*panahgah-e-hayat-e-vahsh*), preserved area (*mantaqe-ye-hefazat-shode*), and national nature monument (*athar-tabiee-ye-melli*). Nine protected areas are also managed as biosphere reserves. In addition, there are five protected rivers, 18 Ramsar sites, and about 25 restricted areas where hunting is forbidden for a specified period of time. There are also 65 forest reserves and 18 natural forest parks, which come under the jurisdiction of the Department of Forests and Rangelands. Most of the remaining ungulate populations in Iran occur in protected areas. Gazelles occur in at least 23 protected areas (some of which are contiguous) throughout Iran and they occurred, until relatively recently, in 10 more (Table 21.2 and Fig. 21.2). However, poaching remains a problem in some protected areas (Ziaie 1997).

Conservation measures proposed

Detailed national surveys are required to assess the current status and population of goitered gazelle and chinkara. Further investigations of the taxonomy, genetics, and ecology of Iranian gazelles are also needed to enable existing

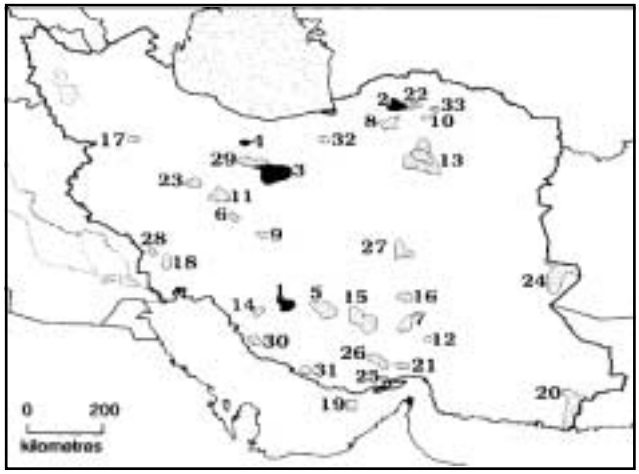


Fig. 21.2. Protected areas in Iran that contain or recently contained antelopes. 1. Bamou NP (47,440ha); 2. Golestan NP (91,895ha); 3. Kavir NP (420,000ha); 4. Sorkeh Hesar NP (9,380ha); 5. Bakhtegan WR (310,438ha); 6. Ghamishloo WR (37,000ha); 7. Khabr-va-Rouchoon WR (169,200ha); 8. Khosh Yeilagh WR (154,400ha); 9. Kola Ghazi NP (50,000ha); 10. Miandasht WR (52,000ha); 11. Mooteh WR (163,250ha); 12. Mehrouyeh WR (7,468ha); 13. Touran WR (565,000ha); 14. Arjan PA (66,750ha); 15. Bahram-e-Gour PA (385,000ha); 16. Bidouieh PA (94,275ha); 17. Bijar PA (31,250ha); 18. Dez PA (10,633ha); 19. Farur Island PA (2,620ha); 20. Gandu PA (382,430ha); 21. Gano PA (27,500ha); 22. Ghorkhod PA (34,000ha); 23. Haftad Gholleh PA (82,000ha); 24. Hamoun PA (193,500ha); 25. Hara PA (85,686ha); 26. Hormud PA (151,284ha); 27. Kalmand va Bahadoran PA (17,500ha); 28. Karkheh PA (9,427ha); 29. Kavir PA (250,000ha); 30. Mond PA (46,700ha); 31. Nayband PA (195,000ha); 32. Parvar PA (59,840ha); 33. Salook PA (16,000ha). (NP = national park; WR = wildlife refuge; PA= preserved area).

populations to be managed effectively. Captive-breeding centres, especially for populations of goitered gazelle in the western Zagros, would further benefit conservation efforts for gazelles in Iran. Gazelles are excellent indicators of the quality of arid lands. In suitable habitat, they can produce large populations that compete only slightly with domestic livestock. Maintenance of good populations of gazelles in Iran will depend on the prevention of poaching inside protected areas and strictly controlled hunting outside protected areas.

Species accounts

Indian Gazelle or Chinkara (*Gazella bennettii*)

Distribution and population: Chinkara occur from Kavir National Park in southern Tehran Province, east to Touran Preserved Area in southern Semnan Province, then sporadically southwards to the shores of the Persian Gulf and east to the Pakistan border (Fig. 21.3). Their distribution does not extend west of the Zagros Mountains. The full range of chinkara in Iran has been underestimated in the past because of confusion between the pale western and

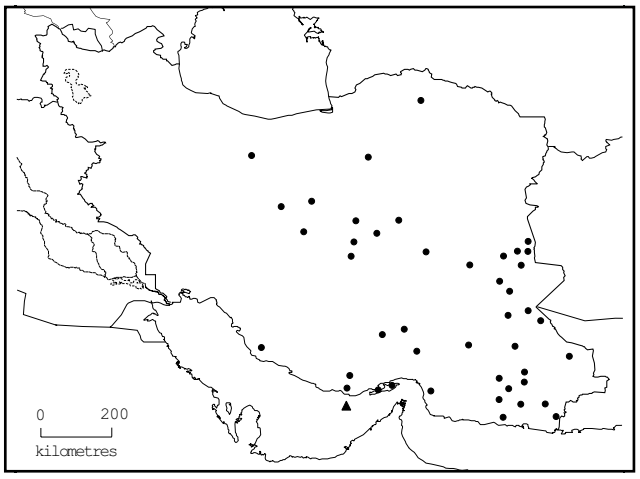


Fig. 21.3 Current distribution of chinkara *(Gazella bennettii)* (circles) and mountain gazelle (G. *gazella)* (triangle) in Iran.

northern form *G. b. shikarii* and similarly coloured *G. subgutturosa*. Recent surveys indicate that the chinkara population in Iran totals about 389 animals within protected areas, and at least 983 outside.

Habitat, food and reproduction: Characteristic plants of chinkara habitat are *Zygophyllum* spp., *Haloxylon* spp., *Alhagi persarum*, *Atraphaxis spinosa*, *Tamarix* spp., *Ephedra* spp., *Salsola* spp., *Calligonum* sp., *Astragalus* spp., *Seidlitzia rosmarinus*, *Artemisia* spp., *Ziziphus* spp., and *Acacia* spp. In desert basins (*kavirs*), plants such as *Zygophyllum* are also used as a source of water. Chinkara typically limit their habitat to the edge of deserts, and they avoid farms and human settlements, unlike goitered gazelles. In Iran, they are often seen singly or in small herds of two to six. There may be more than one breeding season in the south. For example, in the Nayband Preserved Area, fawns have been seen in May, but in Chahgah (28º28'N, 51º41'E) in southern Bushehr, game guards have seen fawns in May and in autumn.

Status within the country: Vulnerable.

Conservation measures taken: Chinkara are protected by law. Small populations currently occur in at least nine protected areas and were formerly found in three others (Table 21.2). Global status is Lower Risk/conservation dependent (IUCN 1996).

Conservation measures proposed: Ensure that protection within protected areas is effective and prevent illegal hunting outside them.

Additional remarks: The taxonomy of this species in Iran has been poorly understood. According to Groves (1993), there are three subspecies: the dark-coloured *G. b. fuscifrons* in the southeast and along the Makran coast; the pale *G. b. shikarii* from the north and west-central districts (Touran west to Tehran, southwest to Shiraz and beyond); and the small, poorly known *G. b. karamii*, which is restricted to a few pockets near Bushehr.

Mountain Gazelle (*Gazella gazella*)

Distribution and population: The mountain gazelle is known only from Farur Island in the Persian Gulf (Fig. 21.3), where its presence was discovered in 1986 (Karami and Groves 1993). These gazelles have been described as a new subspecies *G. g. darehshourii*, similar to *G. g. muscatensis* of the Oman coast, although photographs show it to be much paler in colour than *muscatensis*. The origin of these gazelles is unclear, but they apparently come from somewhere in Arabia. The population numbers about 360 and has undergone periodic declines due to disease and drought.

Status within the country: Vulnerable.

Conservation measures taken: Protected by law. Farur Island is a protected area (2,620ha). Global status is Lower Risk/conservation dependent (IUCN 1996).

Conservation measures proposed: Conduct detailed research on the identity and origin of these gazelles, and monitor the population on a regular basis.

Goitered Gazelle (*Gazella subgutturosa*)

Distribution and population: Goitered gazelles occur from Mond Preserved Area in Bushehr Province of southwest Iran, north to Sehrin in Zanjan Province, east to Khorasan, and south to the northern Seistan Basin (Fig. 21.4). The species also occurs on four islands in the Persian Gulf. It has disappeared from the far northwest of Iran, the Caspian Sea coast, and the southeast. A national survey of its distribution in 1994 found approximately 50 populations of goitered gazelle, numbering from five to 1,000–1,500. There are currently estimated to be >9,045 goitered gazelles within protected areas. At least 1,622 are estimated to occur outside protected areas, of which *c.*1,100 are found on Kharg Island.

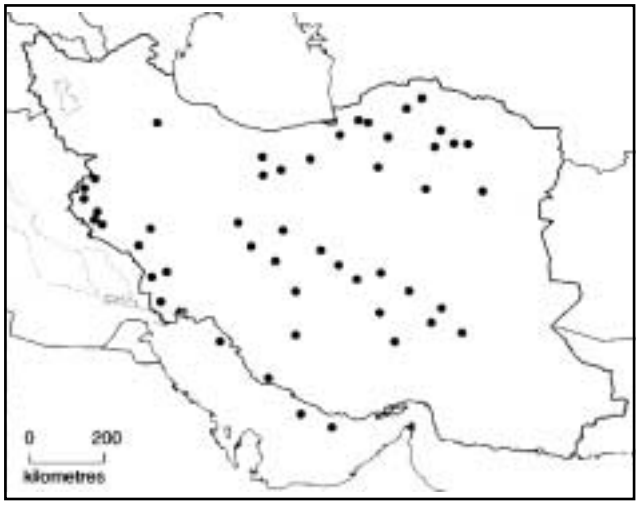


Fig. 21.4 Current distribution of goitered gazelle *(Gazella subgutturosa)* in Iran.

During the last three years, numbers of gazelles in some protected areas have shown a significantly increasing trend.

Habitat, food and reproduction: Goitered gazelles prefer steppe areas, especially plains and adjacent hill slopes with plants such as *Artemisia* and *Salsola*. A study of food preferences in Khosh Yeilagh Wildlife Refuge by Mowlavi (1978) showed that shrubs composed 86% of the diet, followed by grasses (11%), with forbs comprising only 3% of the diet. Analysis of the rumen content of a female in Ghamishloo Wildlife Refuge during October 1992 indicated that *Salsola* was the most common component of the diet, followed by grasses. In southern Iran, they feed on shrubs, grasses, and forbs in winter and early spring, but browsing increases during the rest of the year. They also feed in farmland at night, when they may be trapped by villagers. In central Iran, the rut takes place in December and young are born in May. In the south, where the weather is warmer, the rut is earlier. Goitered gazelles seem better able to withstand hot conditions than chinkara and mountain gazelles, and they often rest in direct sun during the day.

Status within the country: Vulnerable. The form occurring west of the Zagros, which may represent a new subspecies for Iran, is probably Endangered.

Conservation measures taken: Goitered gazelles occur in 15 protected areas (Table 21.2). The largest populations are found in Mooteh Wildlife Refuge (2,170), Kalmand-va-Bahadoran Preserved Area (1,500), Kolah Ghazi National Park (1,130), Salook Preserved Area (1,100), and Ghamishloo Wildlife Refuge (1,010). Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: Ensure that protection within protected areas is effective and prevent illegal hunting outside them. Establish captive-breeding herds, particularly of the population living west of the Zagros Mountains, which may represent a different subspecies from populations in the rest of Iran.

References

Groves, C.P. 1993. The chinkara (*Gazella bennetti*) in Iran, with the description of two new subspecies. *Journal of Sciences of the Islamic Republic of Iran* 4:166–178.

Hemami, M.R. 1994. Taxonomic status and distribution of Iranian gazelles. MSc thesis, University of Tehran.

IUCN. 1996. *1996 IUCN Red List of threatened animals.* IUCN, Gland, Switzerland and Cambridge, UK.

Karami, M. 1992 Nature reserves in the Islamic Republic of Iran. *Species* 19:11

Karami, M. and Groves. C.P. 1993. A mammal species new for Iran: *Gazella gazella* Pallas, 1766 (Artiodactyla, Bovidae). *Journal of Sciences of the Islamic Republic of Iran* 4:81–89.

Mowlavi, M. 1978. Ecological studies of the goitered gazelle (*Gazella subgutturosa*) in Khosh Yeilagh Wildlife Refuge, Iran. MS thesis, Michigan State University, East Lansing.

Ziaie, H. 1997. Iran. Pp. 49–55 *in:* Shackleton, D.M. (Editor). *Wild sheep and goats and their relatives. Status survey and conservation action plan for Caprinae*. IUCN, Gland, Switzerland and Cambridge, UK.

Chapter 22. Afghanistan

K. Habibi

Introduction

The land-locked Republic of Afghanistan encompasses an area of 652,225km^2. It is bounded mainly by Iran, Tajikistan, Turkmenistan, and Uzbekistan, except where the narrow Wakhan Corridor runs 240km northeast to reach the border with China (Fig. 22.1). Most of Afghanistan lies between 600m and 3,050m above sea level and can be divided into three distinct regions: the northern plains, the southwestern plateau, and the central highlands. The central highlands encompass 50% of Afghanistan's total area. They consist principally of the Hindu Kush Mountains (an extension of the Himalaya) and outlying ranges, and a small area of the adjoining Pamir Range in the Wakhan Corridor. The central mountains form northern and southern drainages, with each side having its unique floral and faunal elements. The highest mountains are located in the Wakhan where some peaks exceed 7,000m. Several large glaciers also occur in this region, and more than 75% of the land lies above 3,000m. Wide valleys between major mountain ranges provide sites for human habitation and are used seasonally by pastoralists. The northern plains cover around 30% of the country, and extend from the Iranian border eastwards to the foothills of the Darwaz Peninsula. The region is part of the Central Asian Steppe and is separated from it by the Amu Darya River, which runs along the north-central border with Turkmenistan, Uzbekistan, and Tajikistan. This region averages about 600m above sea level and it is one of the country's major agricultural areas. It is also densely populated. The southwestern plateau averages 915m in altitude, and accounts for approximately 20% of Afghanistan. It consists mainly of semidesert and desert, including the vast Regestan Desert in the south. The human population was estimated at 16,557,000 in 1990.

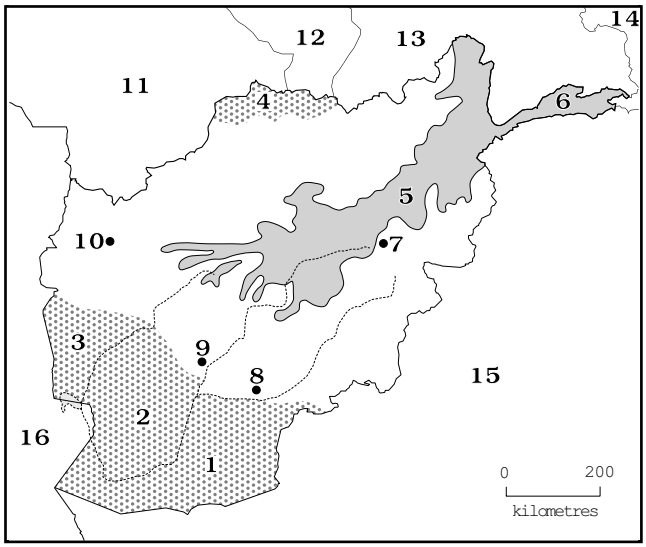


Fig. 22.1 Afghanistan. Geographical features and localities mentioned in the text: 1. Regestan Desert; 2. Dasht-e-Margo; 3. Hamadan Desert; 4. Hairatan Desert; 5. Hindu Kush Mountains; 6. Wakhan; 7. Kabul; 8. Kandahar. 9. Grishk; 10. Herat; 11. Turkmenistan; 12. Uzbekistan; 13. Tajikistan; 14. China; 15. Pakistan; 16. Iran.

Precipitation is greatest in the mountain regions, increasing from west to east, especially along the border with Pakistan where it comes under the influence of the southwest monsoon. These rains bring an average of 400mm of annual precipitation, whereas in the arid lowlands of the south and west, there may be only 76mm of rain per year. Vegetation is naturally scarce in the arid lowlands, where rains fall mainly in the early spring. By contrast, some mountain slopes are covered at low elevations by mixed, predominantly deciduous, hardwood forests of oak (*Quercus baloot* and *Q. dilatata*) and other species. Junipers (*Juniperus* spp.) occur on drier slopes. Above these are cedar (*Cedrus deodara*) forests up to 1,700–2,200m, and at higher elevations a coniferous forest zone consisting of mainly tall pine (*Pinus gerardiana*) and spruce (*Picea smithiana*), whose average upper altitudinal limit is just over 3,000m. Areas of pistachio forest (*Pistacia khinjuk* and *P. vera*) occur in places in the northern and central regions of the country. However, Sayer and van der Zon (1981) reported that the forests which originally covered much of the country have been removed as a result of overgrazing and cutting for fuel. They estimated that forest covered only about 3.4% of the country, with the remainder made up of 84% rangeland and 12% arable. Rangeland is still being overused and degraded (IUCN 1993). The military conflict with the former Soviet Union from 1979–1991, and subsequent civil conflicts, have caused enormous damage to the environment of Afghanistan and especially to the remaining forests (Formoli 1995).

Current status of antelopes

There are few reports and publications dealing with the biology and management of antelopes in Afghanistan (e.g., Aitchison 1889; Habibi 1977; Hassinger 1968). Due to the civil war, information on current status of antelopes is scanty and difficult to obtain. Hopefully, two species of antelopes are still found in Afghanistan (Table 22.1), but

Table 22.1. Current status of antelopes in Afghanistan.

Species	Status[1]	GPS[2]
Chinkara (*Gazella bennettii*)	Indeterminate	?
Goitered Gazelle (*G. subgutturosa*)	Indeterminate	?

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

due to the current internal skirmishes and difficulty in travelling, their status is insufficiently known.

The goitered gazelle (*Gazella subgutturosa*) mainly inhabited scree-covered semideserts, arid plains, and treeless areas (Habibi 1977). Because of its distribution at low elevations, it was vulnerable to large-scale hunting, which was started by expatriate groups working on development projects in the western deserts of Afghanistan. As four-wheel drive vehicles became available, this form of massacre was continued by local inhabitants, resulting in large-scale destruction of the population. Little information is available on the status of the species at present due to the current political situation.

The chinkara or Indian gazelle (*Gazella bennettii*) is reportedly found in the southern deserts along the border with the Balochistan Province of Pakistan. Poachers from Pakistan penetrating into these deserts are reported to bring carcasses of the animals, attesting to the presence of the species in this part of Afghanistan (A.Virk *pers. comm.*).

A wildlife management programme was underway prior to the war to protect species threatened by habitat degradation and excessive hunting. The proliferation of weapons and the ineffectiveness of the central government in controlling unregulated hunting in rural areas culminated in destruction of wildlife as the government lost control over the established protected areas and lawlessness spread in the country (Alexander 1980). Shortages in food supplies further intensified illegal hunting.

Conservation measures taken

Wildlife conservation in Afghanistan started with the establishment of royal hunting reserves in the early part of this century. However, since then there has been no legislation allowing for the establishment and management of protected areas or protection of wildlife. Some areas were gazetted through royal or presidential decrees, and efforts were made to stop unregulated hunting in the 1970s. The Department of Forests and Range in the Ministry of Agriculture was responsible for wildlife conservation and protected areas, while the Afghan Tourist Organisation was responsible for commercial hunting of wildlife. In the late 1970s, the goitered gazelles were given protection by restrictions on large-scale hunting. However, it was difficult to implement the ban due to lack of control measures. Afghanistan ratified the World Heritage Convention in 1979 (IUCN 1992). A few protected areas were established during the 1970s, including Band-e-Amir National Park (41,000ha), Ajar Valley Wildlife Reserve (40,000ha), and a few waterfowl sanctuaries; none of these contain gazelles (IUCN 1993).

Conservation measures proposed

Comprehensive surveys are required to assess the status of antelopes in the country. Such work will provide information on which management plans could be developed. Serious problems exist due to the continuing conflict between various armed groups and the government in areas where the goitered gazelle is found. Discussions between Afghanistan, Iran, and Pakistan, together with IUCN, will be necessary to implement trans-frontier antelope management in the region.

Species accounts

Chinkara or Indian Gazelle (*Gazella bennettii*)

Distribution and population: The chinkara has been reported from the Regestan Desert in the southwest of the country (Fig. 22.2). This desert lies within the arid belt extending from northwestern India across Pakistan into Iran, and in which chinkara are known to occur. Specimens col-

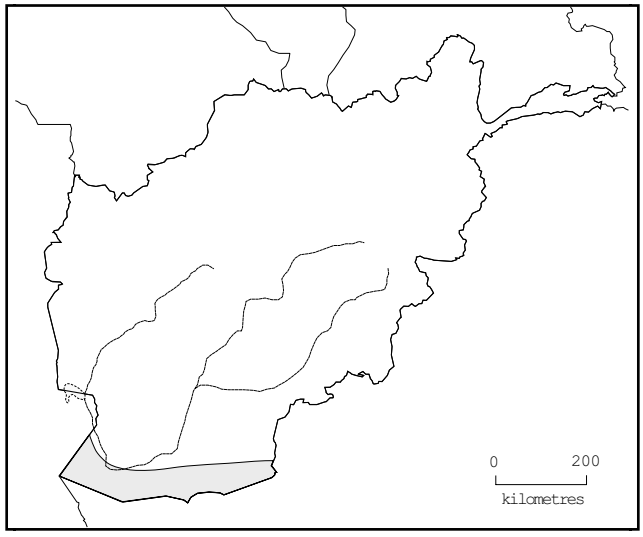


Fig. 22.2 Probable limit of former distribution of chinkara *(Gazella bennettii)* in Afghanistan (shaded).

lected by hunters show that it still survives in the scree deserts of southwestern Afghanistan (A.Virk *pers. comm.*).

Status within the country: Indeterminate.

Conservation measures taken: No measures were taken in the country prior to the breakdown of civil administration. The species does not occur in any protected area. Global status is Lower Risk/conservation dependent (IUCN 1996).

Conservation measures proposed: Surveys are needed to determine the extent and range of the species in Afghanistan. Discussions may be required between the governments of Afghanistan, Iran, and Pakistan to develop and implement a trans-border antelope management programme which will enhance the biodiversity of the region.

Goitered Gazelle (*Gazella subgutturosa*)

Distribution and population: Once widespread in the steppes and semideserts of the western and southwestern regions of the country, and Aitchison (1899) describes a distribution extending from Quetta to Kandahar and Herat (Fig. 22.3). Its numbers were drastically reduced with the construction of irrigation projects in its range in the Helmand and Kandahar Provinces and the building of the Kandahar-Herat Highway. The Street Expedition in 1965 collected and observed the species in Grishk and Kalat (Hassinger 1968). Naumann and Nogge (1973) observed goitered gazelles in the Regestan and Margo Deserts. In northern Afghanistan, the goitered gazelle was sparsely distributed in the Khulm Plain and parts of Hairatan Desert and young gazelles collected from these areas were seen on sale in Kabul in 1973 (Habibi 1977). In the mid-1970s, a small group of gazelles was seen in the Hamadan Desert by officials of the Herat Livestock Company. By the late 1970s, the species was reduced to a small portion of its former range, and the continuation of war may have further threatened its survival in the deserts of Afghanistan. No estimate of numbers is available.

Status within the country: Indeterminate.

Conservation measures taken: Within Afghanistan, the species had no legal protection prior to the war. The species does not occur in any protected area. Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: Surveys are required to determine if the species still occurs in Afghanistan and to assess the status of any remnant populations. Immediate protection from hunting will be necessary for any that are found.

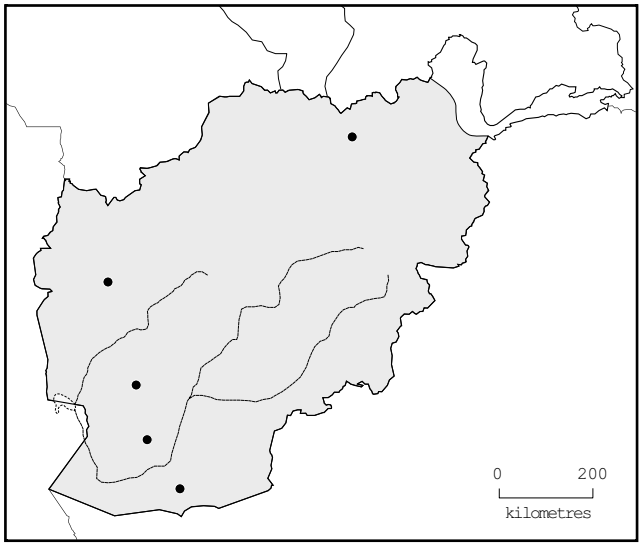


Fig. 22.3 Maximum limit of former distribution of goitered gazelle *(Gazella subgutturosa)* in Afghanistan (shaded) and post-1965 records (circles).

References

Aitchison, J.E.T. 1889. The zoology of the Afghan Delimitation Commission. *Transactions Linnaean Society of London, Serial II* 5:53–144.

Alexander, D. 1980. Report from a troubled land. *International Wildlife* 10:45–48.

Formoli, T.A. 1995. Impacts of the Afghan-Soviet War on Afghanistan's environment. *Environmental Conservation* 22:66–69.

Habibi, K. 1977. The mammals of Afghanistan: Their distribution and status. FO:DP/AFG/74/016. Field Document No. 1. FAO, Rome.

Hassinger, J.D. 1968. A survey of mammals of Afghanistan resulting from the 1965 Street Expedition (excluding bats). *Fieldiana (Zoology)* 60:1–195.

IUCN. 1992. *Protected areas of the world: A review of national systems, vol. 2. Palaearctic*. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN. 1993. *Nature reserves of the Himalaya and mountains of Central Asia.* IUCN, Gland, Switzerland and Cambridge UK.

IUCN. 1996. *1996 IUCN Red List of threatened animals.* IUCN, Gland, Switzerland and Cambridge, UK.

Naumann, C. and Nogge, G. 1973. Die Grossäuger Afghanistans. *Zeitschrift des Kölner Zoo* 16:79–93.

Sayer, J.A. and van der Zon, A.P.M. 1981. *National parks and wildlife management. Afghanistan. A contribution to a conservation strategy*. 2 vols. UNDP/FAO, Rome.

Chapter 23. Pakistan

K. Habibi

Introduction

Pakistan is situated at the northwestern end of the Indian Subcontinent and covers an area of 803,940km^2. It lies between 24^0 and 37^{0}N and between 61^0 and 78^{0}E (Fig. 23.1). It borders Iran and Afghanistan to the west, China to the north, and India to the east. To the south, there is a 1,000km long coastline along the Arabian Sea. The human population is over 85,000,000. Nearly 60% of the land is mountainous in character, while the rest is lowland below 300m. The main physiographic divisions are: the northern mountains; western highlands and Balochistan Plateau; Indus Plain; and the desert. The northern mountains consist of parts of the Karakoram, Himalaya, and Hindu Kush Ranges, which form a 320km-wide belt along the northern border, averaging 5,000–6,000m above sea level (Hess *et al.* 1997). Several peaks exceed 8,000m, including K2 (8,611m), the world's second highest mountain and Nanga Parbat (8,126m) near Gilgit, which is regarded as forming the northwestern end of the Himalaya. The arid western highlands of the country are separated from the northern highlands by the Kabul River and consist of the Waziristan Hills, Sulaiman, Ras Koh, Kirthar, and other smaller mountain ranges. This zone also includes the Balochistan Plateau, which occupies the southwest of the country. The extensive Indus Plain stretches inland from the coast for more than 1,000km and covers most of Punjab and Sindh Provinces. Most of this region is highly cultivated and densely populated. The eastern desert zone, consisting of the Cholistan and Thar Deserts, is contiguous with the deserts of western India. The major river system of Pakistan is the Indus, and its main tributaries, the Sutlej, Ravi, Chenab, and Jhelum. These rivers have their sources in the Himalaya and Karakoram Mountains.

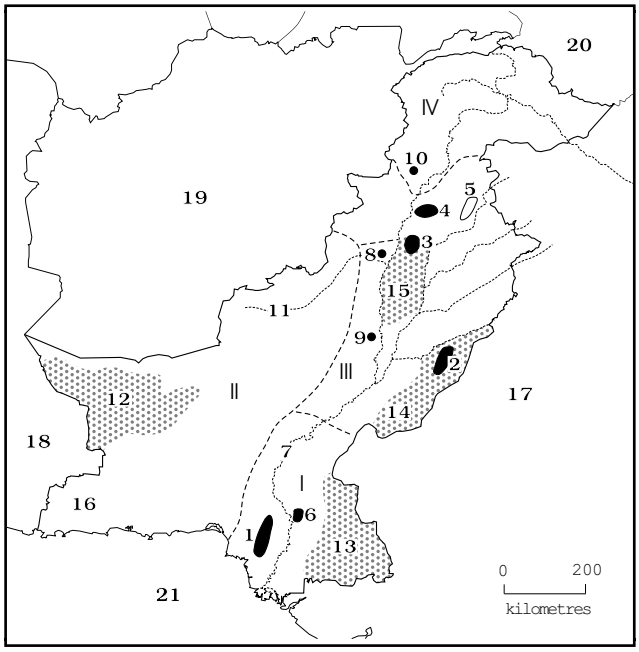


Fig. 23.1 Pakistan. Provinces: I. Sindh; II. Balochistan; III. Punjab; IV. North West Frontier Province. Protected areas containing or recently containing antelopes: 1. Kirthar National Park (308,730ha); 2. Lal Suhanra NP (51,426ha); 3. Kalabagh Game Reserve (1,550ha); 4. Kala Chitta Game Reserve (132,611ha); 5. Margalla Hills (17,386ha); 6. Takkar WS (43,5l3ha). Geographical features and localities mentioned in the text: 7. River Indus; 8. Dera Ismail Khan; 9. Dera Ghazi Khan; 10. Mardan; 11. Zhob Valley; 12. Chagai Desert; 13. Thar Desert; 14. Cholistan Desert; 15. Thal Desert; 16. Makran; 17. India; 18. Iran; 19. Afghanistan; 20. China; 21. Arabian Sea.

Much of Pakistan is arid, having <250mm of annual rainfall, with some of the desert regions receiving less than half that amount. There is a strip of humid subtropical terrain in the central part of the country in Punjab and some of the southern Himalayan slopes are affected by the southwest monsoon. Temperatures are heavily influenced by altitude, with summer temperatures averaging 35–40^{0}C in the central plains. Winter temperatures in the northern mountains remain below freezing for several months (ALIC 1981). The flora and fauna of the country are composed of a mixture of Palaearctic and Indomalayan elements, with some groups from the Ethiopian region. The rate of endemism is low, but the blending of elements from different origins has ensured a diverse arrangement of plants and wildlife (WCMC 1991).

Current status of antelopes

Four species of antelopes are found in the country (Table 23.1): nilgai (*Boselaphus tragocamelus*), blackbuc*k* (*Antilope cervicapra*), chinkara or Indian gazelle (*Gazella bennettii*), and goitered gazelle (*Gazella subgutturosa*). Nilgai (*Boselaphus tragocamelus*) is endemic to the Indian Subcontinent. Its former range just reached the eastern border of Pakistan, where it occurred as an occasional wanderer or in small pockets in Punjab, Azad Kashmir, and Sindh (Roberts 1977). It survives precariously, in very small numbers along the border in Punjab and Azad Kashmir Provinces.

The main stronghold of the blackbuck (*Antilope cervicapra*) used to be in the northern part of the Cholistan

Table 23.1 Current status of antelopes in Pakistan.

Species	Status[1]	GPS[2]
Nilgai (*Boselaphus tragocamelus*)	Endangered	<0.1%
Blackbuck (*Antilope cervicapra*)	Extinct	–
Chinkara or Indian Gazelle (*Gazella bennettii*)	Endangered	<3.5%?
Goitered Gazelle (*G. subgutturosa*)	Endangered	<0.1

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

Desert in Punjab Province. It also occurred on the edge of Thar Desert, though it was never common in the area (Roberts 1977). The species became extinct in Pakistan two decades ago, but efforts are underway to reintroduce it into the wild. At present, captive populations are being raised in Lal Suhanra National Park, Khar Wildlife Breeding Centre in Kirthar National Park, and at 13 breeding centres in Punjab. The present status of blackbuck in Pakistan is that of an irregular vagrant, as some individuals move into Pakistani territory along the border areas with India from Rajastan and the Rann of Kutch.

The chinkara (*Gazella bennettii*) is the most widespread species, occurring in arid regions of Balochistan and Sindh Provinces. Scattered populations are also found in the sub-mountainous tracts of Punjab. It is an adaptable species and is capable of existing in stony plateaux, low hilly regions, and sandy deserts down to sea level. Its numbers have been severely reduced in the desert regions along Pakistan's eastern border with India. The Salt Range around Kalabagh and the Kala Chitta Hills in Punjab contain scattered populations of chinkara and the broken nature of the ground with steep erosion gullies affords them adequate cover. It was once plentiful around the plains of Mardan and Peshawar in the Northwest Frontier Province, but it has now been exterminated from these regions. In Balochistan, the chinkara occurs in the stony valleys beyond the Hindu Bagh Range and in the Zhob Valley. It is also found in the Sibi plains and Makran. In Sindh, the chinkara survives in Kirthar National Park and Takkar Wildlife Sanctuary, but the presence of military troops in the border regions of Thar Desert and Bahawalpur have led to virtual extermination of the once widespread gazelle populations in this vast area (Roberts 1977). Cross-border movements from India used to replenish the populations in Cholistan and Thar Deserts, but these have been curtailed after the erection of barbed-wire fencing along the border prevented gazelles from crossing.

The goitered gazelle (*Gazella subgutturosa*) is confined mainly to the border region of Balochistan contiguous with the Regestan Desert in southern Afghanistan. In Balochistan, it is found around Chagai and Nushki and on the Chaman Plain. Its distribution is limited to the Zhob, Pishin, and Chagai Hills in the western regions of the province. It is mainly found in desolate plains or plateaux between mountain ranges below 2,100m.

Surviving populations of antelopes in Pakistan are concentrated in the most rugged or remote regions of their former habitats to escape senseless slaughter by motorised hunting parties. If the animals are protected, numbers could recover as they are capable of surviving under extremely harsh and rugged environmental conditions.

Conservation measures taken

Wildlife is protected in Pakistan through various acts and ordinances at the provincial level such as the Sindh Wildlife Protection Ordinance (1972), Punjab Wildlife Act (1974), Balochistan Wildlife Protection Act (1974), and North-West Frontier Province Wildlife Act (1975). Separate laws have been passed for the Northern Areas, Azad State of Jammu and Kashmir, and the Federal Capital Territory of Islamabad. The wildlife legislation of Pakistan includes the conservation of habitats and wildlife other than game species. All of these statutes have provisions that include the creation of protected areas. All four species of antelopes found in Pakistan are protected by law, and hunting is banned. However, enforcement is lax in protected areas and weak outside them. Export of live specimens and their products is also banned by law, as is the capture and killing of antelopes for commercial use. Nevertheless, illegal export of chinkara to the Gulf states takes place due to the high market value of these animals in Middle Eastern countries.

Federal agencies involved in research and protection of wildlife are the National Council for Conservation of Wildlife, the Zoological Survey Department, and the Pakistan Forestry Institute. At the provincial level, the Punjab Wildlife and Parks Department, Sindh Wildlife Department, and NWFP Wildlife Department are responsible for wildlife conservation in those provinces. In Balochistan and the northern areas, the forestry departments have responsibility for wildlife conservation and in Azad Kashmir, the Tourism and Wildlife Department handles matters related to wildlife conservation.

The main categories of protected areas are: national park, wildlife sanctuary, and game reserve. Protected areas cover about 9% of the total land area, but many are not given effective protection (IUCN 1990; 1993). Antelopes occur in several protected areas. Kirthar National Park is located in

the southwest of Sindh Province, 80km north of metropolitan Karachi. It comprises the southeast extension of the Kirthar Range, to the west of the Indus River. Kirthar was declared a national park in 1974 by the government of Sindh. The area has a long history of protection dating back to 1940 when attempts were made to restrict the decline in wildlife of the area. The park has an area of 308,773ha and is part of a larger protected area complex, being contiguous with Mahal Kohistan Wildlife Sanctuary (70,557ha), Hab Dam Wildlife Sanctuary (27,219ha), and Surjan, Sumbak, Eri, and Hothiano Game Reserves (40,632ha). In 1977, over 2,000 chinkara were counted in the park and adjacent Surjan, Sumbak, Eri, and Hothiano Game Reserves (Mirza and Asghar 1980). However, a 1990 estimate of chinkara in the park was less than 150 (IUCN 1990). Captive-breeding of blackbuck has been undertaken at the Khar Wildlife Breeding Centre since 1984. It is planned to introduce the species to the park, but most of the potential blackbuck habitat is overused by the human population. Considerable damage has been caused by cultivation, overgrazing, wood cutting, and hunting. Encroachment remains a serious problem in many parts of the park. The park is composed of a number of hill ranges aligned north-south and separated by wide, undulating valleys. The soils contain fragments of rocky material, much of which is limestone, with about 90% sand and 10% clay at the surface. Considerable erosion has occurred on the plateau, the hills and plain, but good soil depths remain in the valleys and depressions protected from the wind and floods. The vegetation is dominated by open communities of xerophytic deciduous trees and shrubs. Three principal communities have been identified: a post-climax community of *Acacia nilotica-Indigofera oblongifolia-Ziziphus nummularia* occurs on mesic sites; a climax community of *Capparis decidua-Prosopis cineraria-Commiphora mukul* on sites with deep sandy soils with weak structure and low calcium, magnesium, and carbonate content at the surface; and *Euphorbia caudicifolia-Grewia tenax-Acacia senegal*, a sub-climax community associated with shallow, loamy soils with low carbonate and high potassium content (IUCN 1990).

Lal Suhanra National Park (51,426ha) was established in 1972 by the government of Punjab. The park is located in the Cholistan Desert and is relatively flat, interspersed with sand dunes that are about four metres high, some of which are unstable. Soils are predominantly sandy loam, with clay flats between the sand dunes (Masud 1980). The main plant communities are composed of thorn forest, dominated by *Acacia nilotica, Suaeda-Salsola* scrub, and riverine *Tamarix* forest. The blackbuck population became extinct in the Cholistan Desert about two decades ago, but the species has been reintroduced in large enclosures, together with the chinkara in the park (Sheikh 1982). The enclosures established for the blackbuck breeding programme are included within special areas to which entry is restricted. A study of the behaviour of chinkara and blackbuck is in progress, supported by the Punjab Government.

Kala Chitta Game Reserve (132,611ha) is situated in the Kala Chitta Hills of Punjab Province about 160km southwest of Islamabad. This area is important for chinkara, which still occur there. The area was declared a game reserve in 1983, having previously been protected as a reserved forest. Parent rocks in the reserve are limestone and sandstone. The limestone areas have shallow soil adequate for tree growth, while the sandstone areas are devoid of humus and support only xerophytes (Aleem 1977). The hills are covered by dry-subtropical broad-leaved forests. In limestone areas, *Olea ferruginea* is dominant on northern aspects and *Acacia modesta* on the southern slopes (Champion *et al.* 1965).

Kalabagh Game Reserve (approximately 1,550ha) lies at the western extremity of the Salt Range, about 30km southeast of Kalabagh town. The reserve is noted for its population of chinkara, with 75–100 animals recorded within an area of 7.5km^2 (Schaller 1976). Blackbuck were introduced into the reserve as part of a national effort to re-establish the species in Pakistan (Anonymous 1987), but the effort has not been successful. The reserve was established in 1966 by the late Nawab of Kalabagh. Geologically, the reserve is composed of hills that rise gently from a flat plain, entering a rugged escarpment whose edges drop vertically to boulder-strewn beds of sharply tilted strata of rock and limestone bluffs, culminating in a series of ridges (Schaller and Mirza 1974). Vegetation consists of *Acacia* scrub woodland, dominated by *A. modesta*, which grows on the slopes and along streambeds in association with *Salvadora oleoides*, *Ziziphus nummularia,* and other trees. Shrubs are sparse, except in some of the ravines where they occur with several species of grasses.

Among the NGOs involved with conservation in Pakistan, IUCN-Pakistan has taken a pioneering role in developing a national conservation strategy for the country, enacting policy and advising the Ministry of Food and Agriculture in protection and conservation of natural resources. It has also been active in producing management plans for the Kirthar and Margalla Hills National Parks. Field programmes concerned with protected area issues involve the Korangi/Phitti Creek in the Indus Delta, juniper forests in Balochistan, a study of the wildlife of Khunjerab National Park, and biodiversity conservation in the Northern Areas and NWFP. The World Wide Fund for Nature (WWF-Pakistan) has been instrumental in promoting the conservation of pheasants, a study of the brown bear (*Ursos arctos*) in Deosai plains in the Northern Areas, migratory birds in Chitral, the conservation of *chilgoza* (pine nut) forests in NWFP and Balochistan, and protection of wildlife and promotion of trophy hunting in the Bar Valley, Gilgit Agency. The Pakistan Wildlife Conservation Foundation (founded 1979) is a charity with a mandate to promote wildlife conservation activities through provision of funds in accordance with the policies of the National Council for Conservation of Wildlife. The Journalists' Resource Centre for the Environment (JRC) was established in 1988 to centralise

environmental information on Pakistan; to promote the National Conservation Strategy; to produce information and raise awareness; and to act as a communication unit for IUCN-Pakistan (JRC 1990). In the northern areas, IUCN-Pakistan, the government of Pakistan, UNDP, and the Aga Khan Rural Support Programme are collaborating on a community development project that assists villagers with implementing biodiversity management and sustainable use of natural resources (Hess *et al.* 1997).

Conservation measures proposed

Increasing pressure on wildlife habitats has resulted in a general demise of ungulate species in the country. There is an urgent need to conserve remnant populations of antelopes in Pakistan. The status of remaining populations should be investigated and appropriate conservation measures taken. These measures should not just be focused on writing management plans for the species, but should involve local communities, regional, and provincial administration to provide protection for the animals in their fast-dwindling habitats. The attempt to captive breed the blackbuck should be further enhanced. *In situ* and *ex situ* captive-breeding of the goitered gazelle should also be undertaken. After rehabilitation of the captive-bred stock, measures should be taken to release them in reserves set aside for the purpose in different parts of the country.

Where wildlife is released, efforts should be made to minimise disturbance and competition with livestock. People living in settlements around the reserves should be educated on the merits of wildlife so that they take an interest in these programmes and feel a part of the process. High priority should be given to law enforcement to control the pressure of poaching in national parks and reserves. This will require increasing the numbers of wardens and guards, providing them with facilities and equipment to conduct their protection duties effectively, and improving the infrastructure of various provincial wildlife divisions to cope with the problems of poaching and unchecked grazing in protected areas. Such programmes will be successful if the people living in or around the reserves are provided with alternative means of survival, and if they can be undertaken through co-operative management schemes in which the local people participate in efforts to conserve wildlife.

Fig. 23.2 Current distribution (black) and former distribution (shaded) of nilgai *(Boselaphus tragocamelus)* in Pakistan.

Species accounts

Nilgai (*Boselaphus tragocamelus*)

Distribution and population: Nilgai formerly occurred in small pockets along the border with India in Punjab, Sindh, and Azad Kashmir (Roberts 1977). They were never widespread or common, as the habitat is generally unsuitable. Nilgai may have been relatively numerous in two districts of the Punjab at the beginning of the century, but numbers have declined as forest and scrub areas have been cleared for agriculture, and they have been hunted and shot when they raid crops (Roberts 1977). Small populations survive in the Changa Manga Forestry Plantation south of Lahore and possibly at a few other localities in Punjab and Azad Kashmir (Fig. 23.2). Numbers are very small, with three herds of 15–20 animals counted in Punjab Province in 1990 (A.A. Chaudhry *in litt.*).

Status within the country: Endangered. The tiny remnant populations are very vulnerable to hunting or to habitat degradation.

Conservation measures taken: Nilgai are protected under the wildlife conservation acts. Captive-breeding is being undertaken in breeding centres in the Punjab. Global status is Lower Risk/conservation dependent (IUCN 1996).

Conservation measures proposed: Their habit of raiding crops and the unsuitability of the habitat mean that nilgai are unlikely to establish substantial populations in the country, but strict control of hunting could secure their survival in suitable areas along the Indian border.

Blackbuck (*Antilope cervicapra*)

Distribution and population: Prior to its extinction in the wild in Pakistan, the blackbuck was widely found in semi-desert tracts along the border with India (Roberts 1977) (Fig. 23.3). The main stronghold of the blackbuck was in the northern part of Cholistan. They also occurred on the edge of the Thar Desert, although they were not common in this area. Numbers have been severely reduced since the 1950s and currently there are no permanent populations of black-

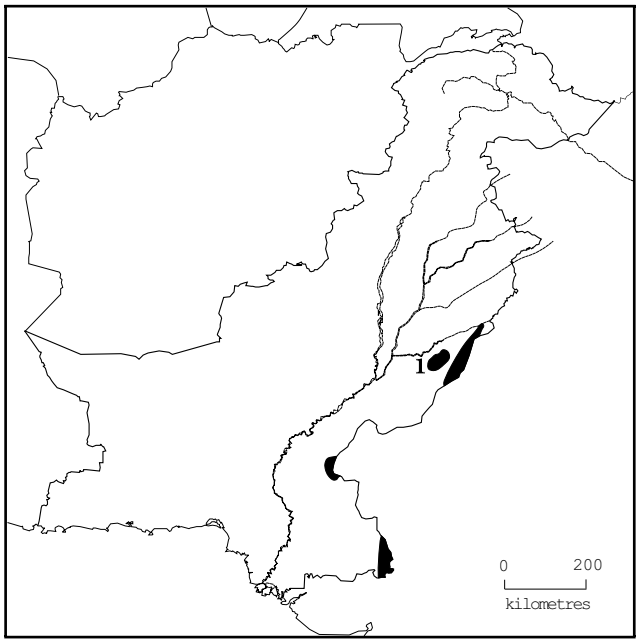


Fig. 23.3 Recent distribution of blackbuck *(Antilope cervicapra)* in Pakistan. 1. Attempted reintroduction site in Lal Suhanra National Park.

Fig. 23.4 Current distribution of chinkara *(Gazella bennettii)* in Pakistan (shaded). 1. Scattered populations occur within this general area.

buck in Pakistan. Vagrants sometimes occur in the desert regions of the southeast.

Habitat, food and reproduction: Primarily a grazing animal that avoids forested areas. It survives in semidesert regions, where it can find scattered vegetation. Blackbuck are diurnal feeders, surviving mainly on grasses, and can live without drinking water (Schaller 1967). In the Cholistan Desert, they have occasionally been observed browsing on acacia trees. Mature male blackbuck establish a territory during the rut, which they mark by depositing faeces in selected areas. They become extremely aggressive during the rut, driving all other males from the territory. There are two main breeding seasons, with most rutting activity during February and March and a second peak at the end of the monsoon season from mid-August to mid-October (Schaller 1967). The gestation period is about six months and a single offspring is the norm (Crandall 1964).

Status within the country: Extinct. A captive-breeding herd is present in a large enclosure in Lal Suhanra National Park. Threatened by illegal hunting and a high rise in human population, which has resulted in severe encroachment on its habitats and clearing of natural vegetation.

Conservation measures taken: The blackbuck is protected under the wildlife conservation acts. Efforts have been made to reintroduce blackbuck to Lal Suhanra National Park through a captive-breeding programme under the auspices of the Worldwide Fund for Nature (WWF) and the government of Punjab. Global status is Vulnerable (IUCN 1996).

Conservation measures proposed: The continued survival of the blackbuck will depend on proper protection of the species in the areas where it will be released. The improvement of its habitat in Cholistan and Thar is essential for the survival of viable populations. Suitable recovery plans need to be implemented and the co-operation of the local people sought in conserving the species through awareness and environmental education programmes.

Chinkara or Indian Gazelle (*Gazella bennettii*)

Distribution and population: The chinkara is the most widespread antelope species in Pakistan. It is adapted to sand dune areas, as well as regolith plains and hilly regions up to 1,500m. It is found in the Salt Range around Kalabagh, the Kala Chitta Hills, and Cholistan and Thar Deserts in Punjab (Fig. 23.4). The broken nature of the ground in their habitat provides them with good cover. Formerly, they were plentiful in Dera Ghazi Khan and Dera Ismail Khan Districts and the Thal Desert, but populations there have been exterminated. A few animals also survived in the Margalla Hills and the plains of Mardan in the North-West Frontier Province. These populations have been exterminated in recent years. In Balochistan, they are known to occur near Hindu Bagh, the Zhob Valley, and Mekran. To the south, chinkara are found in Las Bela and the Kirthar Range in Sindh Province. Some animals also survive in the Takkar Wildlife Sanctuary in that province.

Habitat, food and reproduction: It is an inhabitant of arid areas, where it is found from sea level up to an elevation of 1,500m among low-lying hills. It inhabits sand dunes, stony plateaux, and hilly regions (Roberts 1977). Chinkara are adapted to browsing and are known to feed on various bushes including *Leptadenia spartium* and *Acacia*

Photo 23.1 Chinkara *(Gazella bennettii).* Khushal Habibi.

jacquemontii. When food is scarce, they browse on the green twigs of *Calligonum polygonoides* (Roberts 1977). During the rainy season, after the appearance of fresh vegetation, they graze on new growth of grasses. In winter, they are not dependent on water, but will seek water in the hotter months when the ambient temperature rises above 40^0C during the daytime. They can eat the toxic, melon-like fruits of *Citrullus colocynthis*, which grows in sandy areas and contains a high percentage of water. They are fond of raiding fields cultivated with rape seed and sorghum in desert regions. Male chinkara form territories that they defend vigorously. The rut appears to occur in two seasons, one starting in late summer and continuing up to early October and the other one in late spring. The gestation period appears to be about five and a half months (Dunbar Brander 1931).

Status within the country: Endangered. Chinkara populations have been severely reduced in all parts of the country. Even though the surviving populations are widespread, and it lives in areas where motorised hunting is difficult, poaching and loss of habitat pose a major threat to its survival. The presence of military troops in the border regions of the Thar Desert have led to virtual extermination of the once abundant chinkara populations in the area.

Conservation measures taken: The chinkara is protected under the wildlife conservation acts, through which the hunting of the species is prohibited. In Punjab Province, the chinkara is protected in Lal Suhanra National Park and Kala Chitta and Kalabagh Game Reserves. It is also provided legal protection in Kirthar National Park in Sindh Province. Chinkara also survive in Takkar Wildlife Sanctuary in Sindh. The Conservator of Forests in Bahawalpur enforced a total ban on the hunting of the species in the Cholistan region in 1969–70. Global status is Lower Risk/ conservation dependent (IUCN 1996).

Conservation measures proposed: Being an adaptable animal with a widespread distribution in desert regions, the chinkara is vulnerable to indiscriminate hunting. Proper enforcement of the law by the wildlife departments of all four provinces of Pakistan is essential if remnant populations of chinkara are to survive. Measures are also needed to stop poaching in reserves and national parks. A nationwide survey of the distribution and status of the species is required to assess its status in the various regions where it is found to enable management of the populations on a scientific basis.

Goitered Gazelle (*Gazella subgutturosa*)

Distribution and population: Occurs in the desolate flat plains of Balochistan at elevations ranging from 1,000m to 2,100m. It is confined mainly to the border region of Balochistan, contiguous with the southern deserts of Afghanistan (Fig. 23.5). It was never common and, due to increased persecution by local and foreign hunters, populations have been drastically reduced in the wild. How many, if any, survive at present is unknown.

Habitat, food and reproduction: It frequents sand dunes, gravel plains, or mud flats. Their habitat is devoid of water and has little vegetation (Roberts 1977). They survive by grazing among tufts of grass and forbs. They are also known to browse on xerophytic bushes, such as *Calligonum polygonoides* which grows in shifting sand dune regions (Roberts 1977). Goitered gazelles are capable of surviving without drinking free water, maintaining their water needs from the plants they eat. They can lie down in the heat of the sun during the hottest hours of the day, making no attempt to seek shade. The rut occurs from the second week in December until early January. During the rut the males become highly excited and aggressive, and they frequently call with a guttural grunt. Females come into oestrus for a short period. The gestation period is about 156 days. Young

Fig. 23.5 Current distribution of goitered gazelle *(Gazella subgutturosa)* in Pakistan (hatched).

hide and do not follow their mothers. They remain secluded among bushes and have a tendency to hide from danger rather than running away. Because of this habit they can be caught during the first week of life.

Status within the country: Endangered. There is the possibility that it may already be extinct in Pakistan.

Conservation measures taken: This species is protected under the wildlife conservation acts that prohibit hunting of the species. Other than that, no systematic effort has been made to conserve the species. Some animals are maintained in captivity in Khanewal. Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: There is an urgent need to protect the goitered gazelle, whose populations are rapidly declining in Pakistan. Captive-breeding centres within its former range need to be established to raise stock for reintroduction into areas where it was once found. However, prior to release, adverse factors, such as destruction of habitat and hunting, need to be curtailed.

References

Aleem, A. 1977. Punjab urial in Chak Tabbi area – Kala Chitta Range. *Pakistan Journal of Forestry* 27:130–138.

ALIC 1981. *Draft environmental profile. The Islamic Republic of Pakistan.* USAID/US National Parks Service/US Man and the Biosphere Secretariat. Arid Lands Information Center, Office of Arid Lands Studies, University of Arizona, Tucson.

Anon 1987. Pakistan restores blackbuck. *Oryx* 21:251.

Champion, H.G., Seth, S.K., and Khattak, G.M. 1965. *Forest types of Pakistan.* Pakistan Forest Institute, Peshawar.

Crandall, L.S. 1964. *The management of wild mammals in captivity.* University of Chicago Press, Chicago.

Dunbar Brander, A.A. 1931. *Wild animals in central India.* Edward Arnold, London.

Hess, R., Bollmann, K., Rasool, G., Chaudhry, A.A., Virk, A.T., and Ahmad, A. 1997. Pakistan. Pp. 239–260 *in:* Shackleton, D.M. (Editor). *Wild sheep and goats and their relatives. Status survey and conservation action plan for Caprinae*. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN 1990. *IUCN directory of South Asian protected areas.* IUCN, Gland, Switzerland and Cambridge, UK.

IUCN. 1993. N*ature reserves of the Himalaya and the mountains of Central Asia*. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

JRC. 1990. *IUCN–The World Conservation Union. The Pakistan programme.* Journalists' Resource Centre for the Environment – IUCN Pakistan, Karachi.

Masud, R.M. 1980. *Master plan for Lal Suhanra National Park, Bhawalpur, Pakistan, 1980 to 1985.* National Council for Conservation of Wildlife in Pakistan, Islamabad.

Mirza, Z.B. and Asghar, M. 1980. Census of Sind ibex (*Capra hircus blythi*) and some estimates of populations of chinkara (*Gazella gazella*) in Kirthar National Park and Sumbak Game Reserve, Sind. *Pakistan Journal of Zoology* 12:268–271.

Roberts, T.J. 1977. *The mammals of Pakistan.* Ernest Benn, London.

Schaller, G.B. 1967. *The deer and the tiger – a study of wildlife in India.* University of Chicago Press, Chicago.

Schaller, G.B. 1976. A note on the population of *G. g. bennetti*. *Journal of the Bombay Natural History Society* 73:209–211.

Schaller, G.B. and Mirza, Z.B. 1974. On the behaviour of the Punjab urial (*Ovis orientalis punjabensis*). Pp. 306–323 *in:* Geist, V. and Walther, F. (Editors). *The behavior of ungulates and its relation to management*. IUCN, Morges.

Sheikh, K.H. 1982. Lal Suhanra National Park. *World Wildlife Fund Pakistan Newsletter* 4–6:4–8.

WCMC 1991. *Biodiversity guide to Pakistan.* World Conservation Monitoring Centre, Cambridge.

Chapter 24. Azerbaijan

Yu. M. Shchadilov and E. M. Hadjiev

Introduction

Azerbaijan is situated in eastern Transcaucasia and covers an area of 86,600km^2 including the enclave of Nakhichevan, which lies between Armenia and Iran. To the east, Azerbaijan is bordered by the Caspian Sea, to the south by Iran, to the west by Armenia, and to the north by Georgia and Russia (Fig. 24.1). The human population is 7,625,000 (1997). The northeast of the country is occupied by the Greater Caucasus Mountain Range and the southwest by ridges and plateaux of the Lesser Caucasus. In between lies a wide plain crossed by the country's major rivers, the Kura and Araks. In the extreme southeast lie the Talish Mountains, with a narrow coastal strip running along their foot. Peaks in the Greater Caucasus reach 4466m and their slopes contain an alpine meadow zone, and broad-leaved and coniferous forests. The Kura-Araks Plain consists primarily of semidesert and has a dry, subtropical climate, with an average annual precipitation of 200–300mm. Steppe vegetation covers the foothills and lower mountain slopes, and a few fragments of riverine woodland remain along the Kura and Araks Rivers. As a result of many centuries of human activity, Azerbaijan is heavily developed, particularly the Kura-Araks Plain. This area contains many settlements, numerous herds of domestic livestock, large areas of cultivation, and a network of irrigation and drainage canals.

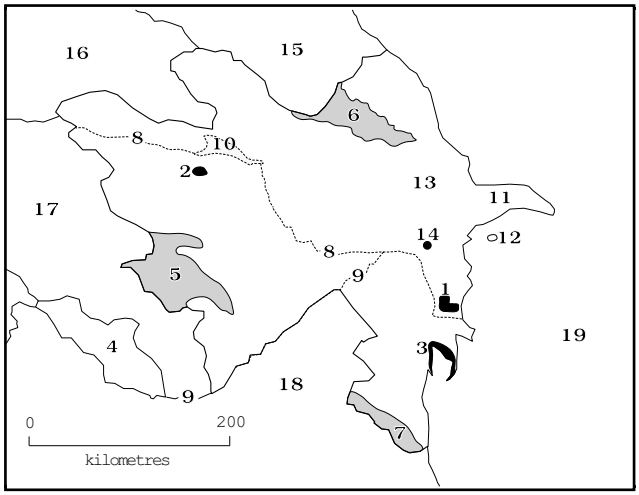


Fig. 24.1 Azerbaijan. Protected areas containing antelopes: 1. Shirvan Nature Reserve (59,700ha); 2. Kerchai Wildlife Sanctuary (15,000ha). Other protected areas: 3. Kizil Agach Nature Reserve (88,360ha). Geographical features and localities mentioned in the text: 4. Nakhichevan; 5. Lesser Caucasus; 6. Greater Caucasus; 7. Talish Mountains; 8. River Kura; 9. River Araks; 10. Mingechaur Reservoir; 11. Apsheron Peninsula; l2. Bulla Island; 13. Gobustan Plateau; 14. Murgab; 15. Russia; 16. Georgia; 17. Armenia; 18. Iran; 19. Caspian Sea.

Current status of antelopes

Only one species of antelope, the goitered gazelle (*Gazella subgutturosa*), occurs in Azerbaijan (Table 24.1). The Transcaucasian population has been isolated from other populations of goitered gazelles for centuries, probably since prehistoric times (Heptner *et al.* 1961). During the 19th century, goitered gazelles ranged through Azerbaijan into Georgia and Armenia; in Azerbaijan they occupied all semidesert steppes and low, hilly areas. Goitered gazelles probably also occurred in the Araks Valley, between Nakhichevan and Erevan in Armenia, but they had become extinct there before the end of the 19th century (Heptner *et al.* 1961). Numbers of gazelles in Azerbaijan were estimated to be 40,000 in the mid-1920s when a sharp decline began. Up to 2,000 were killed annually by hunters during the 1930s in the Transcaucasian region (Heptner *et al.* 1961). The rate of decline increased and, by 1961, it was estimated that fewer than 200 remained in Azerbaijan. Three wildlife sanctuaries were established in 1961 to conserve the remaining populations. Numbers then increased steadily, reaching 1,700 in 1973 and 4,000 in 1982 (Borodin 1984). At the present time, almost all the remaining gazelles in Azerbaijan occur in the Shirvan steppes, predominantly in protected areas. The recent military conflict with Armenia has undoubtedly affected many species of wildlife and their habitats in parts of Azerbaijan. Saiga (*Saiga*

Table 24.1 Current status of antelopes in Azerbaijan.

Species	Status[1]	GPS[2]
Goitered Gazelle (*Gazella subgutturosa*)	Endangered	3–3.75%

[1] *See Chapter 1 for definition of status categories*
[2] *Global population share*

tatarica) occurred in Azerbaijan in the Middle Pleistocene; 20 were released onto Bulla Island in the Caspian Sea in 1950 and more were released there during the 1960s, but these have since died out (Gadjiev and Rakhmatulina 2000).

Conservation measures taken

Goitered gazelle is listed in the *Red Book of the Azerbaijan SSR* (Adygezalov 1989). For the last 35 years, hunting of goitered gazelle has been forbidden and is subject to legal penalties. Protection of wildlife and natural habitats is the responsibility of the Azerbaijan State Committee for Ecology (ASCE) and its local representatives (nature reserve officials). Capture of gazelles is allowed only by special licence for the purpose of creating new populations.

The main categories of protected areas, established during the Soviet era, are state reserve (*zapovednik*) and wildlife sanctuary (*zakaznik*). State reserves are strict nature reserves. Wildlife sanctuaries are partial reserves, created for a set period of time, where some economic activities may be allowed. There are at present 14 state reserves in Azerbaijan with a total area of 191,200ha. (2.22% of the country), and 20 state protected areas. Some reserves are too small to be effective and economic conditions mean that funding is generally inadequate and poaching is still a factor. Kizil Agach Nature Reserve is an internationally significant site listed under the Ramsar Convention (Sokolov and Syroechkovskii 1990).

The Bandovan, Gerchay, and Apsheron Wildlife Sanctuaries were established in 1961, when goitered gazelles were close to extinction in Azerbaijan, to protect the remaining populations. The largest population occurred in Bandovan Wildlife Sanctuary (*c.* 50,000ha) situated in the southeast Shirvan steppes. Some gazelles from elsewhere in the country were translocated there to augment numbers. To increase protection of goitered gazelles, Shirvan State Reserve was created in 1969 when a 17,800ha sector of Bandovan Sanctuary was given the upgraded status of state reserve. A further 8,000ha were added in 1982, making a total area of 25,800ha. Bandovan Sanctuary now covers about 30,000ha. These two contiguous protected areas together contain over 95% of the Azerbaijan gazelle population. A small number of gazelles remain in Gerchay Sanctuary (15,000ha), but Apsheron Sanctuary has been rendered ineffective by rising sea levels. The Shirvan/ Bandovan area is isolated by barriers, both natural (sea and rivers) and human-made (canals, highways, and settlements).

The Azerbaijan Society for Protection of Animals and several other NGOs concerned with the environment and biodiversity have become increasingly active during recent years. Azerbaijan became a member of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) at the end of 1998.

Conservation measures proposed

Effective protection from persecution and the creation of new reserves are essential to ensure the survival of goitered gazelles in Azerbaijan. A long-term programme for the conservation and restoration of goitered gazelles should be formulated, which includes the setting up of captive-breeding centres, translocation of animals to augment remnant populations, and reintroduction to suitable areas of former range when protection can be assured. The best long-term prospects for the translocation of gazelles are the Bozdag range, the Ajinour Steppe, and the Jeiranchol Steppe, which are all located around Mingechevir Reservoir in the north of the country.

It is important to note that goitered gazelles in Azerbaijan have adapted well to co-existence with humans and centres of economic activity, provided that the animals are not directly persecuted and that economic activity does not disrupt their life cycle to a significant extent. For example, in Shirvan State Reserve/Bandovan Sanctuary, where the largest population lives, gazelles share the grazing from November to May with tens of thousands of sheep and hundreds of cattle. In addition, oil wells and the fishing industry function year- round, so disturbance is a permanent factor (Shchadilov 1986). According to Gadjiev and Rakhmatulina (2000), there is little feeding competition with domestic animals because the gazelles feed on species that are not eaten or only eaten in small quantities by livestock.

Species account

Goitered Gazelle (*Gazella subgutturosa*)

Distribution and population: Formerly distributed over all steppe and semidesert zones, but now reduced to five

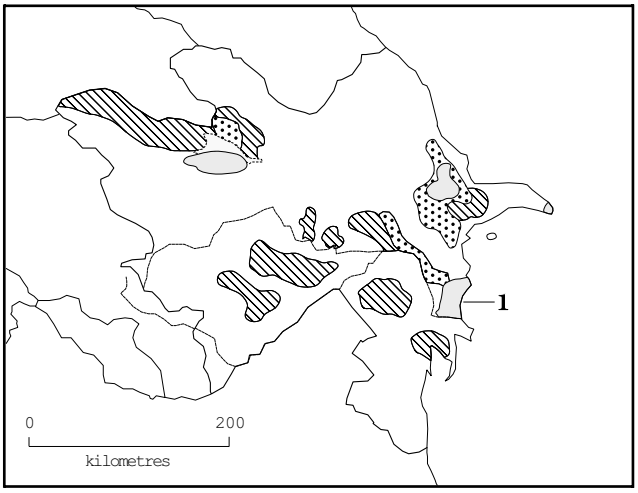


Fig. 24.2 Current distribution of goitered gazelle *(Gazella subgutturosa)* in Azerbaijan (shaded), areas of sporadic occurrence (dotted), and areas of suitable habitat (hatched). 1. Shirvan Nature Reserve.

separate populations (Fig. 24.2). The main population is located in the southeast Shirvan steppes in Shirvan State Reserve/Bandovan Sanctuary. Latest estimates put the current population at 3,000–4,500. The others are in the Bozdag Range and adjacent plains to the south of Mingechevir Reservoir (100–150); the eastern end of the Apsheron Peninsula (30–40); a part of the Gobustan Plateau (an unknown number, but certainly very few); and the descendants of a small, introduced population on Bulla Island in the Caspian Sea (15). Gazelles also occur sporadically in the Murgab Steppe, along the left bank of the lower Kura and possibly in the Ajinour Steppe, northeast of Mingechevir Reservoir. The total goitered gazelle population in Azerbaijan, estimated from aerial census and other methods, consisted of about 13,000 in 1989 and about 10,000 in 1990. The largest and most stable population is on the Shirvan Steppe, and this numbered 11,400 in 1989 and 8,900 in 1990. Latest data suggest that the total had dropped to around 4,500 in 1994, 90% of which occurred in Shirvan Nature Reserve. The second largest population occurs in the region of Mingechevir Reservoir. The remaining small populations are doomed to gradual disappearance unless special measures are taken, such as ensuring effective protection from hunting and reinforcing their populations by translocation of gazelles from Shirvan (Akhundov 1989).

Habitat, food and reproduction: Goitered gazelles mainly inhabit flat and undulating *Artemisia* and *Artemisia-Salsola* semideserts. Their diet in Azerbaijan includes more than 45 species of plants, mainly grasses and annual herbs (Gadjiev and Rakhmadulina 2000). The rut takes place in December, and one or two young are born in May–June (Vereshchagin 1939; 1959; Heptner *et al.* 1961).

Status within the country: Endangered.

Conservation measures taken: Protected by law. Over 90% of the remaining population occurs within Shirvan State Reserve/Bandovan Sanctuary. A few gazelles still occur in the Gerchay Protected Area. Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: Ensure that the ban on hunting is applied strictly until numbers have fully recovered. Strengthen management of Shirvan Nature Reserve/Bandovan Sanctuary. Set up captive-breeding centres and translocate goitered gazelles from the Shirvan population to augment surviving remnants. The main priority for releases should be the areas south, west, and east of Mingechevir Reservoir. Strengthen protection in Gerchay Sanctuary and establish a new protected area in the Ajinour Steppe. Investigate the taxonomic status of the Azerbaijan population by molecular genetic analysis.

References

Akhundov, A.N. 1989. [Account of the conduct of aerial census of goitered gazelle and aerial research on their habitat on the territory of the Azerbaijan SSR 23–27 October 1989]. Goskompriroda Azerbaijanskoi SSR, Baku (in Russian).

Alekperov, H.M. 1989. [Goitered gazelle]. Pp. 41–42 *in:* Adygezalov, B.M. (Editor). [*Red book of the Azerbaijan SSR*]. Ishyg, Baku (in Azeri and Russian).

Borodin, A.M. 1984. (Editor). [*Red book of the USSR*], Second edition, Vol. 1. Lesnaya Promyshlennost, Moscow (in Russian).

Gadjiev, D.V. and Rakhmatulina, I.K. (eds). 2000. [*Wildlife of Azerbaijan, Vol. 3. Vertebrates*]. Azerbaijan Academy of Sciences and Elm Publishers, Baku (in Russian).

Heptner, V.G., Nasimovich, A.A., and Bannikov, A.G. 1961. [*Mammals of the Soviet Union, vol. I. Artiodactyla and Perissodactyla*]. Vysshaya Shkola, Moscow (in Russian).

IUCN. 1996. *1996 IUCN Red List of threatened animals.* IUCN, Gland, Switzerland and Cambridge, UK.

Shchadilov, Yu.M. 1986. [Goitered gazelle in Azerbaidzhan]. Pp. 41–43 *in:* Flint, V.E. and Prisyazhniuk, V.E. (Editors). [*Protection and perspectives on the restoration of goitered gazelle in the USSR*]. All-Union Institute of Nature Protection, Moscow (in Russian).

Sokolov, V.E. and Syroechkovskii, V.E. (Editors). 1990. [*Nature reserves of the USSR*]. Mysl, Moscow (in Russian).

Vereshchagin, N.K. 1939. [Goitered gazelle in Azerbaijan]. *Trudi Zoologicheskogo Instituta Azerbaidzhanskogo Filiala Akademia Nauk SSSR* 10. (in Russian).

Vereshchagin, N.K. 1959. [*Mammals of the Caucasus*]. Academy of Sciences, Moscow and Leningrad (in Russian).

Chapter 25. Georgia

I. Shavgulidze

Introduction

Georgia lies in western Transcaucasia on the southeastern shore of the Black Sea and shares land borders with Turkey, Russia, Armenia, and Azerbaijan (Fig. 25.1). Its area is 69,700 km^2, and the human population numbers 5,493,000. The Greater Caucasus Range runs along most of the northern border, and contains several peaks exceeding 5,200m above sea level. The Lesser Caucasus Range occupies a smaller area of southern Georgia. Between these two ranges lie the lowlands of the Rioni and Kura Valleys. Broadleaved and coniferous forests are found in the Caucasus, with an alpine meadow zone at higher elevations. Much of the Rioni Valley and the coastal plain now consists of agricultural land. There is an area of dry steppe in the southeastern corner of the country. The climate along the coast is subtropical, with mild winters. The climate becomes more continental inland, and minimum winter temperatures in the southeastern steppes reach –25^{0}C (Rashek 1983). Annual precipitation in most areas is 900–1,400mm, but may reach 1,900mm at higher elevations in the mountains.

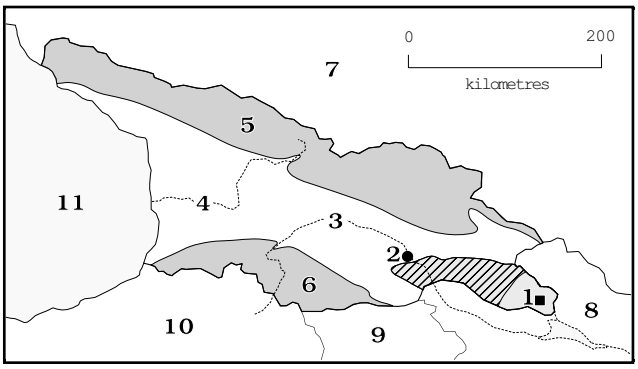


Fig. 25.1 Georgia, showing approximate range of goitered gazelle *(Gazella subgutturosa)* at the end of the 19th century (broken line) and area of sporadic sightings during the 1980s (hatched). 1. Vashlovani reserve (8,034ha); 2. Tbilisi; 3. River Kura; 4. River Rioni; 5. Greater Caucasus; 6. Lesser Caucasus; 7. Russia; 8. Azerbaijan; 9. Armenia; 10. Turkey; 11. Black Sea.

Current status of antelopes

Goitered gazelle (*Gazella subgutturosa*) is the only antelope species recorded in Georgia (Table 25.1). At the end of the 19th century, the Transcaucasian population of goitered gazelle occupied a much wider range than at present and included the steppes of southeastern Georgia. The species was common in suitable habitat during the 19th century, but disappeared from Georgia during the first decades of the 20th century (Vereshchagin 1959; Heptner *et al.* 1961). In the 1980s, single animals and small groups were seen in steppes of southeastern Georgia (Baratashvili 1986). These animals are presumed to have originated from the population in adjacent areas of Azerbaijan, which had been increasing since the early 1970s following improved protection measures. The possibility of natural recolonisation has diminished somewhat with the recent decline of the Azerbaijan gazelle population and the proximity of the Georgian border to areas of conflict in Azerbaijan. An attempt to reintroduce goitered gazelles to Georgia in 1988 was unsuccessful. Furthermore, since Georgia's independence in 1989 hunting has increased throughout the country, even in protected areas, and all large mammal populations have decreased.

Table 25.1 Current status of antelopes in Georgia.

Species	Status[1]
Goitered Gazelle (*Gazella subgutturosa*)	Extinct

[1]*See Chapter 1 for definition of status categories*

Conservation measures taken

The Ministry of the Environment is responsible for conservation of wildlife and environmental policy. Georgia became a signatory to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1995. Hunting reserves (*korugi*) were established by the beginning of the 18th century. Several protected areas were established during the Soviet era (Borodin and Syroechkovskii 1983). A new law covering protected areas was issued in March 1996 and work on developing the protected area system has begun with WWF. There are now 22 protected areas in the country with a total area of 168,000ha. The only protected area situated within the former range of goitered gazelle in Georgia is Vashlovani Nature Reserve (8,034ha), established in 1935 and which has existed within its current boundaries since 1969 (Rashek 1983). It is situated in the southeastern corner of the country, adjacent to the Shirak Steppe. The Noah's Ark Centre for Recovery of Endangered Species (NACRES) has recently been established in Georgia for the captive-breeding and release of various indigenous species, including gazelles.

Conservation measures proposed

NACRES has been examining the possibility of establishing a transboundary protected area in the semi-arid zone of Transcaucasia, between Georgia, Azerbaijan, and Armenia. This project will pay special attention to recovery of the goitered gazelle.

Species account

Goitered Gazelle (*Gazella subgutturosa*)

Distribution and population: Goitered gazelles formerly occurred in the dry steppes of southeastern Georgia (Fig. 25.1). The northwestern limit of goitered gazelle distribution reached Avchal in the Kura Valley, 10km west of Tbilisi, a point which marked the limit of *Salsola* steppes (Heptner *et al.* 1961). At the end of the 19th century, goitered gazelles were common in Georgia in suitable habitat, but they disappeared during the first decades of the 20th century (Vereshchagin 1959). In the 1980s, single animals and small groups began to appear on winter grazing grounds in the Shirak and Eldar Steppes of southeastern Georgia (Baratashvili 1986). These animals presumably originated from adjacent areas of Azerbaijan, where the population had increased since the early 1970s following improved protection measures. However, gazelles did not re-establish a permanent population in Georgia, and the decline of the gazelle population in adjacent areas of Azerbaijan makes natural recolonisation less likely.

Habitat, food and reproduction: Fifteen species of grasses and annual herbs are known in the diet of gazelles in Transcaucasia (Heptner *et al.* 1961). No significant migrations have been noted in the Transcaucasian population. The rut takes place from November until the first half of December, and young are born in May (Heptner *et al.* 1961). Goitered gazelles are adversely affected by severe winter conditions and heavy snowfall, which occur on average every 15–20 years in Transcaucasia, much less frequently than in Central Asia (Vereshchagin 1959; Heptner *et al.* 1961).

Status within the country: Extinct.

Conservation measures taken: A project to re-establish goitered gazelles in Georgia began in 1988 with the transfer of 10 animals from the Bukhara Captive-Breeding Centre in Uzbekistan to Vashlovani Nature Reserve (8,034ha). Unfortunately, these animals died out within two years owing to disease and predation by wolves. It is estimated that Vashlovani Reserve could potentially support a population of up to 1,000 goitered gazelles. Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: It is essential to eliminate illegal hunting from protected areas and to continue a programme of captive-breeding to provide stock for reintroduction into Vashlovani and other parts of the southeastern steppes where protection can be guaranteed. Animals for reintroduction should, if possible, be obtained from Azerbaijan.

References

Baratashvili, T.K. 1986 [Perspectives on the restoration of goitered gazelle in Georgia]. *In* [*Regional aspects of the biology of goitered gazelle*]. Moscow (in Russian). Flint, V.E. and Prisyazhnuik, V.E. (Editors). [Protection and perspectives on the restoration in numbers of goitered gazelle in the USSR] All-Union Institute of Nature Protection, Moscow (in Russian).

Borodin, A.M. and Syroechkovskii, E.E. (Editors). 1983. [*Nature reserves of the USSR*], second edition. Lesnaya Promyshlennost, Moscow (in Russian).

Heptner, V.G., Nasimovich, A.A., and Bannikov, A.G. 1961. [*Mammals of the Soviet Union, vol. I. Artiodactyla and Persissodactyla*]. Vysshaya Shkola, Moscow (in Russian).

IUCN. 1996. *1996 IUCN Red List of threatened animals.* IUCN, Gland, Switzerland and Cambridge, UK.

Rashek, V. L. 1983. [Vashlovan reserve]. P. 177 *in:* Borodin, A.M. and Syroechkovskii, E.E. (Editors). [*Nature reserves of the USSR*], Second edition. Lesnaya Promyshlennost, Moscow (in Russian).

Vereshchagin, N.K. 1959. [*The mammals of the Caucasus*]. Academy of Sciences of the USSR, Moscow and Leningrad (in Russian).

Chapter 26. Kazakhstan

A.B. Bekenov, D.A. Blank, Yu. A. Grachev, and K.N. Plakhov

Introduction

The Republic of Kazakhstan is 2,717,300km^2 in area. It extends approximately 2,925km from the Caspian Sea in the west to the Altai Mountains and the Chinese border in the east, and 1,600km from the Ural Mountains in the north, to the Kyzyl Kum Desert in the south (Fig 26.1). Altitudes range from 104m below sea level near the Caspian Sea, to 6,695m above sea level at the highest point, Han-Tengri Peak in the Tien Shan Range, on the border with Kyrgyzstan and China. Extensive plains cover about two-thirds of Kazakhstan, and about one-third consists of mountains and uplands. Most rivers drain into closed interior basins, but three (Irtish, Ishim, and Tobol) flow north to the Ob River and on to the Arctic Ocean. The human population numbers 17,190,000.

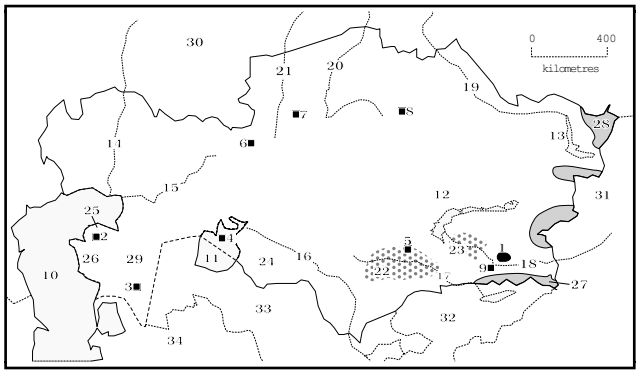


Fig. 26.1 Kazakhstan. Protected areas containing antelopes: 1. Altyn Emel NP (250,000ha); 2. Buzachinsk WS (182,000ha); 3. Ustyurt NR (227,000ha); 4. Barsakelmes NR (30,000ha); 5. Andasai NR (1,000,000ha); 6. Turgai WS (343,000ha); 7. Naurzum NR (87,694ha); 8. Kurgantube NR (237,000ha); 9. Almaty NR (73,342ha); (NP = national park; NR = nature reserve; WS = wildlife sanctuary). Geographical features and localities mentioned in the text: 10. Caspian Sea; 11. Aral Sea; 12. Lake Balkhash; 13. Lake Zaisan; 14. R. Ural; 15. R. Emba; 16. R. Syr Darya; 17. R. Chu; 18. R. Ili; 19. R. Irtysh; 20. R. Ishim; 21. R. Tobol; 22. Muyunkum sands; 23. Taukum sands; 24. Kyzyl Kum; 25. Buzachi Peninsula; 26. Mangyshlak Peninsula; 27. Tien Shan Mountains; 28. Altai Mountains; 29. Ustyurt; 30. Russia; 31. China; 32. Kyrgyzstan; 33. Uzbekistan; 34. Turkmenistan.

From north to south, the vegetation changes from mixed grass and *Festuca sulcata-Stipa* steppes to *Artemisia*-grass semideserts and *Artemisia-Salsola* deserts. In the foothills, there are dry steppes, with coniferous forests in the middle altitudes of the mountains, and subalpine and alpine meadows above. Numbers of species recorded in Kazakhstan include about 5,000 plants, 178 mammals, 488 birds, 49 reptiles, 12 amphibians, and 104 fishes (Bikov 1969; Kovshar 1989). The climate is markedly continental. Mean January temperatures range from –18^{0}C to –3^{0}C in the north and south respectively, and mean July temperatures range from 19^{0}C to 28–30^{0}C. Mean annual rainfall varies from 300mm in the north to <100mm in the deserts of the south. In the mountains, annual precipitation reaches 1,600mm (Shvareva 1969).

Current status of antelopes

Two antelope species occur in Kazakhstan, goitered gazelle (*Gazella subgutturosa*) and saiga (*Saiga tatarica*). A third species, Mongolian gazelle (*Procapra gutturosa*), was reported in the extreme northeast of the country at the beginning of this century, but it is now extinct (Table 26.1). Saiga and goitered gazelle were once widely distributed across Kazakhstan. Both species have undergone reductions in range and numbers during this century and have since recovered to varying degrees thanks to improved protection.

Table 26.1 Current status of antelope species in Kazakhstan.

Species	Status[1]	GPS[2]
Goitered Gazelle (*Gazella subgutturosa*)	Vulnerable	25–35%
Mongolian Gazelle (*Procapra gutturosa*)	Extinct	–
Saiga (*Saiga tatarica*)	Vulnerable	>80%

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

The overall situation has deteriorated to some extent in the changed conditions that followed the break-up of the USSR.

Saiga were formerly abundant across Kazakhstan. Numbers began to decline during the second half of the 19th century as a result of hunting and severe winter conditions. The decline in range and numbers continued into the beginning of the 20th century and by the 1930s, saiga were close to extinction, with only a few hundred or perhaps a thousand remaining in remote areas of Kazakhstan. Implementation of protective measures allowed the population to recover rapidly and, by the 1950s, saiga had re-occupied more or less the whole of their 19th century range. They are split into three separate populations, each with its own summer and winter range. The population peaked in the mid-1970s, reaching 1,200,000 in 1974. Numbers remained fairly stable at around 800,000–970,000, but by 1998 had fallen to around 570,000, mainly due to intense poaching pressure. Kazakhstan currently holds about 80% of the world saiga population and this proportion is growing, as the only other significant population in Russia declines under anthropogenic pressures. A drastic decline over the last 2–3 years has reduced the population to an estimated 160,000–200,000.

Saiga are an important economic resource and have long been hunted for meat, hide, and especially their horns, exported in large quantities to China and elsewhere for use in traditional medicine. Licences for commercial and non-commercial hunting are issued annually. More than 500,000 saiga were harvested in 1975. In recent years, the annual harvest has fluctuated between 62,000–112,000, but was reduced to around 30,000 by 1996 and 40,000 in 1998 because of concern over the effects of poaching and a lack of effective conservation measures. Demand for saiga horn intensified in 1987–88, when private organisations were allowed to participate in foreign trade and opportunities to export them appeared as international borders were opened. Since then, systematic poaching has steadily increased, despite laws and regulations, and illegal permits were even issued by the government (Sokolov *et al.* 1991). Poaching has now become a social institution. Saiga were once hunted only during September–November for meat, but they are now shot year-round for their horns. The Central Hunting Administration has been disbanded and wildlife inspectors are poorly equipped. The result has been a sharp decrease in the number of adult male saiga and, if this trend continues, it may adversely affect reproduction. The official harvest was suspended in 1999–2000 on the recommendation of the Institute of Zoology (E.J. Milner-Gulland *in litt*) but this has failed to reverse the decline. A number of military areas that partly protected saiga have been abandoned, with the result that poachers can pursue saiga virtually anywhere (A.A. Lushchekina (*in litt.*). Other factors that threaten saiga are conversion of rangeland for cultivation, construction of roads, settlements, irrigation canals, and fenced pastures. These may interrupt saiga migration routes and contribute to habitat fragmentation. For a detailed history of saiga in Kazakhstan and details of the populations see Bekenov *et al.* (1998).

Saiga are very vulnerable to harsh winter conditions, especially formation of an ice crust or heavy snow which prevents access to forage. These conditions, known as *dzhut,* have caused heavy mortality and extinctions over wide areas. Severe *dzhuts* during the 19th century were a contributory factor in the decline of the saiga in the country. In 1971–72, over 400,000 saiga died in an area of about 36,000km^2. In 1975–76, >100,000 saiga died over 15,000–20,000km^2 and the population in Kazakhstan was reduced by 50% (Bekenov *et al.* 1998). An estimated 45,000 died in 1987–88 (Grachev and Bekenov 1993). Saiga are also very vulnerable to epidemics of pasteurellosis, foot-and-mouth, and other diseases which cause heavy mortality. For example, 50,000 young saiga died in 1967 during an outbreak of foot-and-mouth disease. Pasturellosis caused the death of >70,000 saiga in an area of 1,300km^2 during May 1981 (Fadeev and Sludskii 1982) and an estimated 270,000 in May 1988 (Bekenov *et al* 1998). Shepherds' dogs and stray dogs also are significant predators of saiga, especially calves; Sludskii (1963) estimated that dogs kill >10,000 saiga calves in Betpak-dala each year.

Goitered gazelles formerly had an unbroken range throughout the semidesert and desert zones of Kazakhstan, when the northern limit of their range reached 46–48^{0}N. The gazelle population was estimated to be more than 200,000 in the 1930s, but declined steadily and only about 10,000 remained at the end of the 1970s (Afanasiev *et al.* 1953; Sludskii 1977; Zhevnerov and Bekenov 1983). The main factors in this decline were overhunting, development of the habitat, and adverse climatic conditions. The government harvested gazelle meat intensively during 1942–1950; for example, in 1944, soldiers shot 14,000 gazelles in the Ili Depression alone (Sludskii 1963; Zhevnerov and Bekenov 1983). In addition to the legal harvest, poaching was completely uncontrolled. As a result, gazelle numbers decreased rapidly and they disappeared from most areas of their habitat. During the 1940s and 1950s, there was rapid opening up of new lands and development of industry. Following constant expansion of the area under cultivation, the area of available rangeland decreased and numbers of domestic livestock increased. As a result of overgrazing, as much as 63–64% of the pastures became degraded (Kurochkina *et al.* 1986). Goitered gazelles are also susceptible to the effects of winter *dzhuts* that cause periodic mass mortality (every seven to eight years on average).

Improved protection led to a gradual recovery, and numbers currently stand at 30,000–50,000, though populations are fragmented. Largest numbers occur in Mangistau District in western Kazakhstan, and Altyn-Emel National Park in the Ili Valley of the east. Current population trends are varied, with a gradual increase in the two main populations and a decrease in the smaller fragmented populations. Factors beneficial to the larger populations are: low human

population of these areas; regulation of oil and gas production facilities; creation of new protected areas in Mangistau; improvement of protection in Altyn-Emel National Park; and reduction in grazing by domestic livestock. Factors adversely affecting the smaller populations include a rise in illegal hunting, creation of farming enterprises without taking account of nature conservation, and transformation of the habitat.

Conservation measures taken

The Ministry of Ecology and Biological Resources has overall responsibility for wildlife conservation. Day-to-day responsibility lies with state wildlife inspectors and the staff of protected areas. There is a long history of wildlife legislation in the former USSR and Kazakhstan, but laws and resolutions have not always been fulfilled in practice. The first wildlife legislation in Kazakhstan dates from 1921, but this law was poorly observed, especially during and after the World War II. In March 1951, hunting of goitered gazelles was prohibited (Smirnov 1965). Goitered gazelles were classified as Endangered in the first edition of the national Red Data Book (Fadeev 1978). The second edition of the Red Data Book noted that the status of goitered gazelles had improved, but new negative factors had appeared in addition to poaching and it was listed as a threatened species (Blank 1991a). Because of its inclusion in the national Red Data Book, goitered gazelles have a specially protected status under the current law on protection, breeding, and utilisation of wildlife. Saiga was listed on Appendix II of CITES in 1994, but Kazakhstan is not yet a signatory to CITES, which undermines the effectiveness of this listing.

On 23 August 1991, the Cabinet of Ministries of the Republic of Kazakhstan adopted a decree "on additional measures for conservation, reproduction, and rational utilisation of saiga antelope," which considered the protection of saiga and its habitat. Conservation of saiga is carried out by state or regional inspectorates and the Ministry of Ecology and Biological Resources, in co-operation with the State Hunting Inspectorate. Nevertheless, protection is still not adequate to deal with the recent increase in poaching of saiga.

The main categories of protected areas are nature reserve (*zapovednik*), nature sanctuary (*zakaznik*), national park, and state hunting reserve. Nature reserves are the most strictly protected, while nature sanctuaries are partial reserves, created for a set period of time, or where some economic activities may be allowed. National parks have a mix of objectives, including tourism and amenity use, as well as wildlife conservation. Hunting reserves are managed for one or more game species, and although controlled hunting is allowed, they are generally well protected.

Currently, eight nature reserves, 52 nature sanctuaries, two national parks, and several hunting reserves have been established. Goitered gazelles occur in the following protected areas: Ustyurt Nature Reserve (227,000ha, established in 1985) in Mangistau District; Altyn-Emel National Park (250,000ha, established in 1991) situated on the right bank of the Ili Valley, north of the Kapchagai Reservoir; and Buzachinsk Wildlife Sanctuary (85,000ha, established in 1985) in Mangistau (formerly Mangyshlak) District. A few also occur in Almaty Nature Reserve (15,000ha). Barsakelmes Nature Reserve (30,000ha), established in 1939 on the island of the same name in the Aral Sea has introduced populations of goitered gazelles and saiga. However, falls in sea level have left the former island connected to the shore, and thus removed effective protection.

Saiga's widely separated summer and winter ranges, and variations in migration routes between them, mean that protected areas offer only seasonal protection. Andasai Nature Reserve (1,000,000ha) was established in 1966 to protect the winter range of the Betpak-dala saiga population. It is situated north of the Chu River in Djambul District. The following protected areas lie within summer range: Turgai Nature Sanctuary (*c.*343,000ha), between the Turgai and Irgiz Rivers; Kurgantube Nature Reserve (237,000ha established in 1958) in Akmolinsk District; and, in some years, Naurzum Nature Reserve (87,000ha, established in 1930) in Kostanai District. Ustyurt Nature Reserve (227,000ha, established in 1985) protects part of the Ustyurt population. The number of saiga occurring within reserves fluctuates from year to year, due to variation in migration routes and in the overall size of the population.

Conservation measures proposed

The fundamental problems facing the survival of wild animals in Kazakhstan are the sharp increase in illegal hunting and habitat destruction. The legal framework requires strengthening and existing laws should be rigorously enforced. The hunting industry must be given independent economic status, equal to that of agriculture and industry. This will make it easier to establish protected areas for saiga. The powers of hunting inspectors should be increased to make them equal to those of the police. Stricter penalties for poaching are needed, including confiscation of vehicles and weapons used by poachers. Effectiveness of state and regional conservation services should be increased by improving their transport, communications, and other equipment. It is essential that Kazakhstan sign the CITES agreement in order to make their listing effective.

A general scheme for development of protected areas has been proposed, but has not yet been put into effect. The current network of protected areas should be expanded to ensure adequate protection of both antelope species throughout their ranges in Kazakhstan (for details see Species Accounts).

Fig. 26.2 Current distribution of goitered gazelle *(Gazella subgutturosa)* in Kazakhstan (hatched) and approximate distribution in the 1940s (broken line). Main populations: 1. Ustyurt-Mangyshlak; 2. Kyzyl Kum; 3. Muyunkum; 4. Ili Valley; 5. Barsakelmes Island. The shaded area (6) shows the approximate former distribution of Mongolian gazelle *(Procapra gutturosa)* in Kazakhstan.

Species accounts

Goitered Gazelle (*Gazella subgutturosa*)

Distribution and population: Formerly inhabited all semi-desert and desert zones of Kazakhstan, with a continuous range from the Caspian Sea to the Ili Basin on the Chinese border, reaching north to 46^0–48^0N (Zhevnerov and Bekenov 1983). Since the 1930s, this range has decreased considerably and has become fragmented into several large populations and many small ones (Fig. 26.2). Populations in the Ili Basin, Taukum, Muyunkum, Kyzyl Kum, and Ustyurt-Mangistau have all become isolated (Blank 1991a). Currently, the most important areas are the Buzachi and Mangyshlak Peninsulas on the eastern shore of the Caspian Sea, and the Ili Valley in eastern Kazakhstan. In the mid-1930s, estimated numbers were 200,000, of which as many as 100,000 occurred in the Ustyurt and Mangistau area. A sharp decline followed and, by the end of the 1970s, fewer than 10,000 remained (Zhevnerov and Bekenov 1983). Current numbers are 30,000–50,000, of which almost half live on the Buzachi Peninsula and other parts of Mangistau District, an area encompassing only 1.5% of their natural habitat (Blank 1991a; 1991b). The second largest population is found in Altyn-Emel National Park in the Ili Valley. During summer, 5,000–6,000 gazelles occur here (compared to 2,000–3,000 in the mid-1980s) and in winter numbers may increase to 10,000. The two main populations in Mangistau and Altyn-Emel National Park are currently increasing slowly, but the smaller fragmented populations are decreasing.

Habitat, food and reproduction: Goitered gazelles are widespread in semideserts, sand, clay, and salt deserts, dry riverbeds covered with groves of saxaul (*Haloxylon*) or other shrubs, open hilly areas, and mountain foothills (Blank 1991a). Basic habitat requirements are the availability of water, shallow snow cover in winter, and broken terrain or groves of saxaul for use as cover. More than 70 species of plants (grasses, forbs, shrubs, and lichens) have been recorded in their diet. Composition of the diet varies seasonally and according to the region. Daily intake of food is up to six kilograms of green matter (Sludskii 1977; Zhevnerov and Bekenov 1983). They can tolerate saline water of concentrations up to 20g of salt per litre. Goitered gazelles follow a semi-nomadic way of life, undertaking limited but regular seasonal movements. Males hold individual territories during the rut in November–December (Blank 1985). Some females conceive at six or seven months of age; most at one and a half years. Males may breed at one and a half years of age, but most do not before the age of two and a half years. Gestation lasts five to five and a half months. One or two young are born from the end of April to the beginning of July, with most births occurring between 15–25 May (Zhevnerov and Bekenov 1983; Blank 1992).

Status within the country: Vulnerable. Listed as Threatened (Category II) in the latest edition of the national Red Data Book (Blank 1991a). Numbers are stable, but gazelles are threatened by new economic development and poaching.

Conservation measures taken: Hunting of gazelles has been prohibited by law since 1951. Goitered gazelles are listed as a threatened species in the national Red Data Book. They occur in Altyn-Emel National Park (250,000ha; 5,000–6,000 gazelles in summer, 10,000 in winter), Ustyurt Nature Reserve (227,000ha), Aktau-Buzachinsk Wildlife Sanctuary (85,000ha), and a number of state hunting reserves. A few still occur in Almaty Nature Reserve (15,000ha). Protected areas now contain 20–30% of all gazelles in Kazakhstan. Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: It is vitally important to increase protection against poaching, which will require increased funding for the hunting inspectorate to allow it to operate effectively. New protected areas are required to protect the existing population. These should include nature reserves (*zapovednik*) in the Taukum Desert, Kyzyl Kum Desert, and Buzachi Peninsula, each with an area of 30,000–50,000ha; a large new national park, connecting the left bank of the Ili Valley to the existing Altyn–Emel National Park; and new wildlife sanctuaries (*zakaznik*) in Muyunkum (up to 1,000,000ha), Zhabaushkan, and Besbulak (each at least 100,000ha).

Mongolian Gazelle or Dzeren (*Procapra gutturosa*)

Distribution and population: At the beginning of this century, Mongolian gazelles were noted around the north-eastern border of Kazakhstan in the Ili Basin and Irtysh Valley (Antipin 1941), but they later disappeared there completely (Afanasiev *et al.* 1953) (Fig. 26.2).

Status within the country: Extinct.

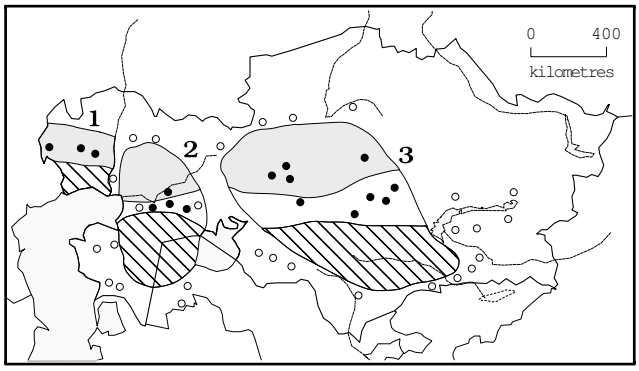


Fig. 26.3 Approximate distribution of saiga *(Saiga tatarica)* in Kazakhstan. 1. Ural population; 2. Ustyurt population; 3. Betpak-dala population. Summer ranges (shaded), winter ranges (hatched), occasional sightings (open circles), usual calving areas (solid circles).

Photo 26.1 Saiga *(Saiga tatarica).* D.G. Huckaby/Mammal Slide Library, American Soc. Mammalogists.

Saiga (*Saiga tatarica*)

Distribution and population: Current distribution covers desert and semidesert areas from the Caspian Sea and Volga River in the west, to Lake Balkhash in the east, and from the Tien Shan Mountains in the south, north to about latitude 50^0N. Within this overall range, there are three separate populations: Ural (between the Volga and Ural Rivers in western Kazakhstan); Ustyurt (between the Caspian and Aral Seas); and Betpak-dala (central and eastern Kazakhstan). Each of the three populations occupies separate summer and winter ranges, migrating north or northwest in spring, and south or southeast in autumn (Fig. 26.3). There is also a small, introduced saiga population on Barsakelmes Island in the Aral Sea. Numbers increased from 1988 to 1993, but population size is subject to sharp variation because of severe winter conditions (*dzhut*), incidence of disease, particularly pasteurellosis, and forage shortage. From 1991 to 1995, total numbers fluctuated between 540,000 and 970,000, and are currently below 600,000. The Ural population was estimated at 274,000 in 1994, but declined due to heavy winter mortality in 1995/96. In 1998, it was estimated at 104,000 and the failure to recover attributed to heavy poaching. The Ustyurt population numbered around 248,000 in 1998 and was in a relatively stable condition as a result of the low human population and consequent lack of severe hunting pressure. The Betpak-dala population declined from 510,000 to 282,000 following unusually heavy snowfall in the Muyunkum area of their winter range during the winter of 1993–94. It was estimated at 248,000 in 1996 and apparently remains in a depressed state because of hunting pressure. See Bekenov *et al.* (1998) for a detailed history of the Kazakhstan saiga population. A steep decline has occurred over the last two years and current estimates are: Ural 17,500; Ustyurt 116,000, and Betpak-dala 10,000–20,000 (E.J. Milner-Gulland *in litt.*).

Habitat, food and reproduction: Saiga generally require even terrain with low vegetation. They require fairly good watering places and shallow snow cover in winter. They spend most of the time in winter in gravel, sand, and clay deserts, and in summer in semideserts and, rarely, steppes. Saiga migrate over distances that may exceed 1,000km in autumn, when they move south to their winter ranges, and again in spring, when they return to their summer ranges. More than 80 species of plants and lichens have been recorded in their diet, especially grasses (*Elymus*, *Poa,* and *Festuca sulcata*), Chenpodiaceae (*Kochia* and *Nanophyton erinaceum*), Compositae (especially *Artemisia*), and Leguminosae (*Salsola* and *Medicago*) (Rakov 1956; Fadeev and Sludskii 1982). Composition of the diet and importance of individual forage species vary throughout the year. Saiga drink water (fresh and saline) and in winter they consume snow. Male saiga reach sexual maturity at the age of 19 months and females at the age of seven to eight months. Mating takes place on a large scale during December. Gestation lasts 138–140 days. Mass calving usually takes place over a period of five to eight days generally during the last three weeks of May. Females giving birth for the first time have one young, rarely twins. Older females more often have twins, and rarely a single young. Triplets are very rare. Variations in fecundity are observed in all populations and result from differences in forage, climate, and other conditions. Large concentrations of saiga form in calving areas and these sometimes contain >100,000 animals. For full details of habitat and ecology, see Fadeev and Sludskii (1982) and Bekenov *et al.* (1998).

Status within the country: Vulnerable. Protection measures are still required because numbers are affected by increases in illegal hunting. Saiga are now hunted illegally year-round for their horns.

Conservation measures taken: Some saiga are protected seasonally in reserves. Part of the Betpak-dala population winters in Andasai Nature Reserve (*c.* 1,000,000ha) and summers in Turgai Nature Sanctuary (*c.* 343,000ha), Kurgantube Nature Reserve (237,000ha), and, in some years, in Naurzum Nature Reserve (87,000ha). Ustyurt Nature

Reserve (227,000ha) covers part of the winter range of the Ustyurt population. The number of saiga occurring within reserves fluctuates from year to year due to variations in migration routes and the overall size of the population. A government decree on supplementary measures for saiga conservation was adopted in 1991 by the Cabinet of Ministries. Conservation of saiga is carried out by state and regional inspectorates and the Ministry of Ecology and Biological Resources in co-operation with the State Hunting Inspectorate, but protection is not sufficient to cope with the recent increase in poaching. Commercial exploitation of saiga is subject to special controls. The Institute of Zoology of the Kazakhstan Academy of Sciences makes annual recommendations on the number of saiga to be hunted and from which age and sex groups. Recommendations are based on maintaining optimum numbers and population structure. For each of the three populations, aerial counts are made annually in April. Sex/age structure is analysed, estimates are made of reproductive success, mortality, and population growth, natural limiting factors are evaluated, and epizootic infections are investigated. Calculations are then based on a mathematical model developed over a period of time (Milner-Gulland 1994). Global status has been recently reassessed as Endangered.

Conservation measures proposed: It is important to fully control the legal harvest. All measures to strengthen law enforcement and improve effectiveness of hunting inspectors, as listed above, should be implemented. In addition, money obtained from fines should be used on measures to protect saiga. Andasai Nature Reserve should be extended westwards for 100–120km to cover a wider area of the winter range of the Betpak-dala population. Saiga calving areas should be protected by temporary nature sanctuaries, *zakazniks,* which impose restrictions on motor vehicles and livestock grazing. These measures have been implemented in West Kazakhstan District and should be extended to all parts of the country. Protection is essential where migration routes cross the Chu, Zhilanshik, Turgai, and Ul'koiak Rivers. Bridges or crossings should be constructed over rivers, irrigation canals, gas and oil pipelines, railways, and roads to aid migration between summer and winter ranges. Water points should be created by sinking wells or building dams to collect rainwater, and, in some places, it will be necessary to make arrangements with collective farms for alternate use of water points by livestock and saiga. It is important for Kazakhstan to sign CITES, so as to make the listing of saiga on Appendix II fully effective. The legal trade in harvested horns should be strictly regulated and fully certified.

References

Afanasiev, A.V., Bazhanov, V.S., Korelov, M.N., Sludskii, A.A. and Strautman, E.I. 1953. [Persian gazelle]. Pp. 484–488 *in:* Afanasiev, A.V. (Editor). [*Wild animals of Kazakhstan*]. Academy of Sciences of Kazakh SSR, Alma-Ata (in Russian).

Antipin, V.M. 1941. [*Mammals of Kazakhstan*]. *Vol. 3*. KazOGIZ, Alma-Ata (in Russian).

Bekenov, A.B., Grachev, Iu.A., and Milner-Gulland, E.J. 1998. The ecology and management of the saiga antelope in Kazakhstan. *Mammal Review* 28:1–52.

Bikov, B.A. 1969. [Flora and origin of vegetation]. Pp. 222–227 *in* Gerasimov, I.P. (Editor). [*Kazakhstan*]. Academy of Sciences, Moscow (in Russian).

Blank, D.A. 1985. Peculiarities of social and reproductive behaviour of *Gazella subgutturosa* in the Ili Valley. *Zoologicheskii Zhurnal* 64:1059–1070 (in Russian, English summary).

Blank, D.A. 1991a. [Goitered gazelle]. Pp. 82–85 *in:* Gvozdev, E.V. (Editor). [*Red Book of the Kazakh SSR*, *Vol. 1*], Second Edition. Gylym of Kazakh SSR, Alma-Ata (in Russian).

Blank, D.A. 1991b. [Numbers and distribution of goitered gazelle in the Ustyurt Plateau and Mangyshlak Peninsula]. Pp. 268–273 *in:* Kovshar, A. F. (Editor). [*Rare birds and animals of Kazakhstan*]. Gylym of Kazakh SSR, Alma-Ata (in Russian).

Blank, D.A. 1992. Social and reproductive behavior of the Persian gazelle. PhD thesis. University of Tel-Aviv.

Fadeev, V.A. 1978. [Goitered gazelle] Pp. 72–74 *in:* Gvozdev, E.V. (Editor). [*Red book of the Kazakh SSR. Part 1. Vertebrates*]. Kainar, Alma-Ata (in Russian).

Fadeev, V.A and Sludskii, A.A. 1982. *The saiga in Kazakhstan*. Alma Ata.

Grachev, Yu. A. and Bekenov, A.B. (1993). [The present state of saiga populations in Kazakhstan]. *Zoologicheskiye issledovaniya v Kazakhstane* 2:165–189 (in Russian).

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Kurochkina, L.Ya., Osmanova, L.T., and Karibaeva, K.I., 1986. [*Fodder resources of Kazakhstan deserts*]. Nauka of Kazakh SSR, Alma-Ata (in Russian).

Milner-Gulland, E.J. 1994. A population model for the management of the saiga antelope. *Journal of Applied Ecology* 31:25–39.

Rakov, N.V. 1956. [Saiga in western Kazakhstan]. *Trudi Instituta Zoologii AN KazSSR* 6:28–60 (in Russian).

Shvareva, U.N. 1969. [Climate, the common description]. Pp. 90–97 *in:* Gerasimov, I.P. (Editor). [*Kazakhstan*]. Academy of Sciences of USSR, Moscow (in Russian).

Sludskii, A.A. 1963. [Dzhuts in Eurasian steppes and semideserts]. *Proceedings of the Institute of Zoology, Academy of Sciences of the Kazakh SSR* 20:5–88 (in Russian).

Sludskii, A.A. 1977. [Goitered gazelle]. Pp. 28–61 *in:* [*Ungulate animals*]. Lesnaya promishlennost, Alma-Ata (in Russian).

Smirnov, I.A. 1965. [*The influence of hunting on trapper's fauna of Kazakhstan*]. Kainar, Alma Ata (in Russian).

Sokolov, V.E., Zhirnov, L., Eremeev, A., Shubaev, Yu., and Visiashev, G. 1991. [Hard currency fever and saiga]. *Okhota i Okhotnich'e Khozyaistvo* 4:1–3 (in Russian).

Zhevnerov, V.V. and Bekenov, A.B. 1983. [*Mammals of Kazakhstan*]*, Vol. 3*. Nauka of Kazakh SSR, Alma-Ata (in Russian).

Chapter 27. Uzbekistan

N.V. Marmazinskaya and B.K. Mardanov

Introduction

The Republic of Uzbekistan covers an area of 446,700km^2. It shares borders with Afghanistan, Tajikistan, and Kyrgyzstan to the southeast, Kazakhstan to the northeast, and Turkmenistan to the southwest (Fig. 27.1). The human population of Uzbekistan numbers 24,100,000 (1999). The main physical features are the Kyzyl Kum Desert, Ustyurt Plateau, and the southern mountains. Kyzyl Kum occupies most of the country, stretching from the Amu Darya River across Uzbekistan into Kazakhstan. It consists of a central plateau and numerous closed basins, generally at altitudes of 50–300m, with some rocky massifs that exceed 700m. Ustyurt is a sand and gravel desert plateau lying between Turkmenistan, Kazakhstan, and northwest Uzbekistan. East of Ustyurt, the southern half of the Aral Sea also lies within northern Uzbekistan. The area of the sea has been shrinking for decades, as a result of over-extraction of water from its main feeder rivers for irrigation. In the south and southeast of Uzbekistan, there are several outlying ranges of the Tien Shan Mountain system: the Hissar (4,630m), Turkestan (3,400m), Zarafshan, and Nuratau Ranges. The main rivers are the Amu Darya, which flows northwest along the border with Turkmenistan into the Aral Sea and the Zarafshan.

Deserts of varying types (sand, sand-gravel, loess-clay, and saline) cover 75% of Uzbekistan. The southern mountains are largely covered with montane steppe. Some patches of riverine woodland (*tugai*) remain along the Amu Darya and Zarafshan Rivers. These are composed mainly of willows (*Salix*) and tamarisks (*Tamarix*), and they provide the habitat of the endangered Bactrian red deer (*Cervus elaphus bactrianus*). Over the whole country the climate is sharply continental. Large fluctuations in diurnal and annual temperatures are typical. The hottest month is July, and the coldest is January. On the Ustyurt Plateau, maximum summer temperatures reach 42^{0}C and winter minimum is -40^{0}C; in Kyzyl Kum, summer maximum is 45^{0}C and winter minimum -32^{0}C. Average annual precipitation over most of the country is 70–180mm, except in the southern mountains where it reaches 400–600mm (An *et al.* 1980; Babaev *et al.* 1986).

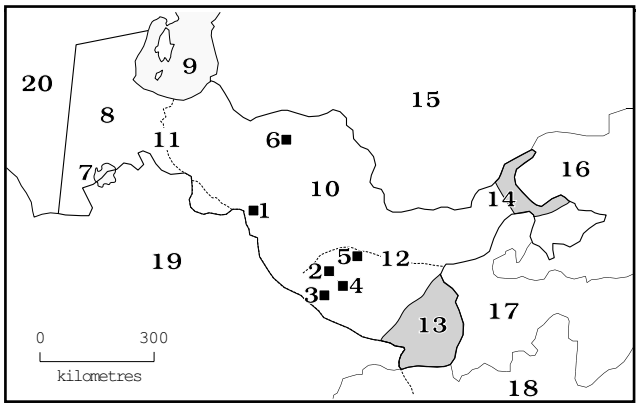


Fig. 27.1 Uzbekistan. Protected areas containing antelopes: 1. Kyzylkum Nature Reserve (5,721ha); 2. Ecocentre "Jeiran"; 3. former Karakul NR (1,021ha); 4. Dengizkul Wildlife Sanctuary (8,620ha); 5. Tudakul Wildlife Sanctuary (30,000ha). Geographical features and localities mentioned in the text: 6. Bukantau; 7. Sarykamysh Lake; 8. Ustyurt; 9. Aral Sea; 10. KyzI Kum; 11. River Amu Darya; 12. River Zarafshan; 13. Zerafshan, Hissar and Turkestan ranges; 14. Chatkal range; 15. Kazakhstan; 16. Kyrgyzstan; 17. Tajikistan; 18. Afghanistan; 19. Turkmenistan.

Current status of antelopes

Two species of antelope occur in Uzbekistan, goitered gazelle (*Gazella subgutturosa*) and saiga (*Saiga tatarica*) (Table 27.1). Saiga from the Kazakhstan population winter on the Ustyurt Plateau and some animals reach northwest Uzbekistan. Numbers of saiga occurring in Uzbekistan and the area occupied vary from year to year, depending on the severity of the winter. The wintering population is often effectively hunted twice, once in Kazakhstan and once in Uzbekistan (A.A. Lushchekina *in litt.).*

Table 27.1 Current status of antelopes in Uzbekistan.

Species	Status[1]	GPS[2]
Goitered Gazelle (*Gazella subgutturosa*)	Endangered	3.5–4%
Saiga (*Saiga tatarica*)	Vulnerable	5–20% (winter only)

[1] *See Chapter 1 for definition of status categories*
[2] *Global population share*

Goitered gazelles were formerly distributed across most of Uzbekistan's deserts and semideserts. They have undergone a severe decline and now occur in greatly reduced numbers, and in more or less isolated pockets. The largest remaining populations are found in the north of the country, one in southern Ustyurt and the other in Kyzyl Kum to the southeast of the Aral Sea. This decline was caused by a substantial rise in poaching and habitat destruction. Large areas of gazelle habitat have been destroyed or altered by improvement and ploughing, or by the planting of cotton and other crops. In a number of areas, gazelles have come under pressure from competition with increased numbers of domestic livestock. Goitered gazelles have, in many cases, been forced onto poor-quality grazing land, such as areas of loose sand and broken terrain with ravines and dry watercourses.

During the first half of the 20th century, goitered gazelles were widely distributed in the Fergana Valley of the southeast, but as a result of intensive development they have disappeared from most of this area, and now occur only in small numbers in the foothills of the Kuraminskii and Chatkal Ranges.

In the north, large numbers of goitered gazelles were once common all over the Ustyurt Plateau, which had a sparse human population and remained relatively undisturbed until the middle of this century. During the 1950s, intensive development of the area began, involving construction of settlements, drilling of oil wells, and construction of gas pipelines, railways, and watercourses. Grazing by camels and sheep also increased and there was a large increase in motor transport. Surveys during 1981–84 indicated that goitered gazelles had become absent from the central and eastern parts of Ustyurt (almost one-third of the total area), and that they were extremely rare in the southern and northeastern parts. The only part of Ustyurt where gazelles are still more or less common is an area of about 6,000km^2 of the Sam and Magaikum Sands, near the Sarykamysh Depression in the south of Ustyurt (Sabilaev and Koptsev 1986). Current numbers do not exceed 400–500. This means the Ustyurt gazelle population has decreased by more than 10–12 times in 30–35 years.

In the Kyzyl Kum Desert, gazelle numbers have also decreased by 12–13 times over the last 30 years as a result of development of their habitat. By 1983–84, goitered gazelles had either become rare or had disappeared completely from an area of about 30,000km^2. A relatively numerous and stable population of about 1,200 gazelles survives in northwestern Kyzyl Kum, in sands southeast of the Aral Sea, in the area of the Zhanadarinskiy and Akcha-Darinskiy old rivers, and some also in northeast Kara Kum, partially on the Bukano-Mereiskiy Massif (Reimov *et al.* 1989).

Both goitered gazelles and saiga are very sensitive to heavy snowfall and the set of severe winter conditions known as *dzhut*, when an ice-crust prevents access to forage. These conditions occur periodically and result in heavy mortality and widespread local extinctions (Borodin 1984).

Conservation measures taken

Appendix No. 3 to the Statute on Hunting and the Conduct of the Hunting and Fishing Economy on the Territory of the Republic of Uzbekistan was confirmed by the Cabinet of Ministers on 10 April 1991. Under this ordinance, hunting of goitered gazelles is forbidden, and the fine for killing a gazelle is fixed at 100 times the offender's salary. Government agencies which have responsibility for wildlife protection are the State Committee for the Protection of Nature and the State Committee for Forestry. Uzbekistan acceded to the Convention on International Trade in Endangered Wild Fauna and Flora (CITES) in July 1997 and to the Convention on the Conservation of Migratory Species (Bonn Convention) in 1998. The only NGO active in antelope conservation is Ekolog, which began work in Uzbekistan in 1987. Ekolog maintains links between scientists working on biodiversity conservation and disseminates information on the problems of wildlife protection. Goitered gazelle is listed as an endangered species in the *Red Book of the Uzbek SSR* (Anonymous 1983).

The main categories of protected area in Uzbekistan established during the Soviet era are nature reserve (*zapovednik*), nature sanctuary (*zakaznik*), and hunting reserve. Nature reserves are the most strictly protected, while nature sanctuaries are partial reserves established for a specified period of time, or where some economic activities are allowed. Hunting reserves are managed for their game species and limited hunting is allowed, but they are generally well protected. However, no reserves have been established specifically for antelopes and the existing protected area system does not contain a significant population of either species. There are no protected areas within saiga range in Uzbekistan. Small numbers of goitered gazelles occur occasionally in three reserves. Kyzylkum Nature Reserve (5,721ha, established in 1971) lies in the western part of central Kyzyl Kum and consists of two natural zones, *tugai* forest (3,177ha) and sandy desert (2,544ha). The reserve was established to protect the endangered Bactrian red deer *Cervus elaphus bactrianus*. A few gazelles sometimes enter the desert part of the reserve, but exact numbers are unknown. Tudakul Nature Sanctuary (30,000ha, established 1960) and Dengizkul Nature Sanctuary (8,620ha, established 1973) protect migratory water birds around Lakes Tudakul and Dengizkul, respectively. Goitered gazelles occur around the shores of the lakes and use them for drinking, but numbers are unknown. Some gazelles were protected in the former Karakul Nature Reserve (21,021ha), which was denotified in 1984 (An *et al.* 1980).

A goitered gazelle breeding centre covering 5,126ha was established in 1977 about 40km southeast of Bukhara. It is now called the Scientific-Productive Centre for Breeding of Rare Animal Species, or Goitered Gazelle Ecocentre. From a founder population of 36 individuals, gazelle numbers have grown steadily, reaching a maximum of 1,224 in 1989; there were 650 in 1993. A few years ago, the Ecocentre was

given administrative control of an adjoining 20,000ha. About 100 gazelles occur there and livestock grazing is prohibited, but because of the lack of resources, including vehicles and fuel, the area is poorly protected and poaching still occurs.

Conservation measures proposed

The basic threats to antelopes in Uzbekistan are illegal hunting, agricultural development, livestock grazing, and road construction. A conservation strategy for antelopes in Uzbekistan should include anti-poaching measures, expansion of the protected area system, establishment of additional captive-breeding centres, and a publicity and awareness campaign. Another high priority is to determine the precise current distribution and status of goitered gazelle. The most important measure to conserve remaining populations is to protect them against poaching. This presents great difficulties when animals are widely dispersed in sparsely inhabited, desert habitats. It requires an effective campaign against motorised and other forms of illegal hunting by mobile teams of rangers, concentrating in areas of the greatest gazelle concentrations, and in winter in areas where saiga are present.

Two new protected areas are needed to conserve the largest remaining populations of goitered gazelle. These should be located in the northern Kyzyl Kum, in the sands southeast of the Aral Sea, and in the Sam and Magaikum sands in southern Ustyurt. Other reserves should be established where scattered populations survive, or in suitable areas of former range. Goitered gazelles can survive in desert habitats with moderate levels of human land use, provided hunting pressure is completely lifted, and if additional measures are taken, such as drilling of boreholes to provide water. Therefore, it is not necessary to exclude land from agricultural use in order to conserve goitered gazelles. In any case, creation of strict nature reserves (*zapovednik*) is a long and difficult process. It is more effective to establish nature sanctuaries (*zakaznik*), where hunting is completely prohibited and livestock grazing is controlled (including controls on shepherds' dogs). These sanctuaries provide protection for wildlife, and their establishment does not meet the same opposition from local inhabitants as the creation of strict nature reserves. However, sanctuaries must be large enough in area to protect significant gazelle populations. A network of breeding centres for goitered gazelle should be created to provide animals for release into protected areas, and other areas of former range, as part of a plan to restore goitered gazelle populations. Any legal harvest of saiga should be fully controlled and based on carefully calculated quotas. Stringent efforts should be made to prevent any illegal trade in saiga horn.

Species accounts

Goitered Gazelle (*Gazella subgutturosa*)

Distribution and population: Formerly occurred in all the desert and semidesert zones of the country. However, numbers and range have decreased sharply over the last 30–40 years, especially during the 1970s. The range of the species is steadily shrinking and fragmenting, and surviving populations have become isolated (Fig. 27.2). Only a few gazelles survive in the foothills bordering the Fergana Valley of southeastern Uzbekistan. They have disappeared from much of the Ustyurt Plateau, where they were common until 1950, and the only sizeable population in that area is located in the Sam and Magaikum Sands. In the Kyzyl Kum Desert, gazelle distribution is sporadic, with one stable population in sands of the northwest. Recent estimates of the Uzbekistan population are 8,000–10,000 and still declining (Anonymous 1983), and 5,000 (Flint and Prisyazhniuk 1986). Full details of former numbers are unavailable, but the 1983 estimate is believed to represent a decline of 10–12 times from levels in the 1950s. Many examples of local declines and extinctions have been reported.

Habitat, food and reproduction: Goitered gazelles inhabit flat or gently hilly areas, grass-*Salsola* semideserts and steppes, low-shrub deserts, consolidated sand dunes, and areas with occasional clumps of saxauls (*Haloxylon aphyllum*). Basic habitat requirements are availability of water and succulent forage. In spring, abundance of green vegetation allows the gazelles to move a significant distance from water sources. They occur in desert foothills and may penetrate up mountain valleys to altitudes of 2,000–3,000m (Anonymous 1983; Borodin 1984). Eighty-four plant species have been recorded in the diet of this species in various parts of its range (Mambetzhumaev 1970; Sludskiy 1977; Mardanov, 1993). The period of the rut varies according to region, from the beginning of October to the end of December (Mambetzhumaev 1970; Sludskiy 1977).

Status within the country: Endangered.

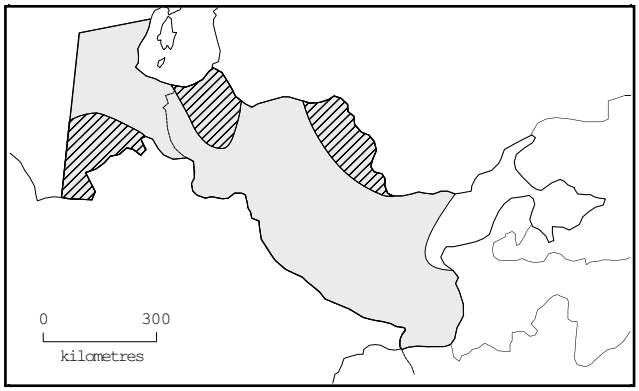


Fig. 27.2 Current distribution of goitered gazelle *(Gazella subgutturosa)* in Uzbekistan (hatched) and former distribution (shaded).

Conservation measures taken: Hunting of goitered gazelle has been prohibited since 1950. Listed in the national Red Data Book (Anonymous 1983). Representation in protected areas is poor. A few gazelles occur in the Kyzylkum Nature Reserve (5,721ha), Tudakul Nature Sanctuary (30,000ha), and Dengizkul Nature Sanctuary (8,620ha) (An *et al.* 1980). A captive-breeding centre was established near Bukhara in 1977 and contained 650 gazelles in 1993. Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: Strict protection measures are required immediately to conserve the surviving population. An effective campaign against motorised and other forms of illegal hunting should be launched. In order to restore numbers, two large reserves should be created, one southeast of the Aral Sea in Kyzyl Kum and one in the Sam and Magai Kum sands in Ustyurt (Sabilaev and Koptsev 1986). The Bukantau Range and adjacent strip of Kyzyl Kum have been identified as suitable sites for the reintroduction of wild ass, or kulan (*Equus hemionus*), and a reserve there would also contribute to conservation of goitered gazelle (Volozheninov 1982). It is essential to carry out detailed surveys to determine current distribution and status of the remaining goitered gazelles in Uzbekistan. The strategy to conserve and restore this species should also include creation of a network of captive-breeding centres to provide stock for releases, and increased publicity highlighting the importance of wildlife conservation.

Saiga (*Saiga tatarica*)

Distribution and population: Some saiga from the Kazakhstan population winter in northwest Uzbekistan on the Ustyurt Plateau (Fig. 27.3). Saiga normally winter to the west of the Aral Sea, but in severe winters they move farther south and may reach the edge of the Sarykamysh Depression on the border with Turkmenistan. Wintering animals arrive from their summer range in Kazakhstan in November, and begin the return migration northwards in March–April. Numbers vary from year to year, but may be considerable; in 1974 approximately 199,000 saiga were counted in Uzbekistan (Ishunin 1984).

Habitat, food and reproduction: On the Ustyurt Plateau, saiga mainly occupy saline areas. Most of the plant associations are represented by salt-tolerant species, such as *Anabasis salsa, Salsola arbuscula, Statice suffruticosa*, *Halocnemum strobilaceum, Artemisia,* and in places *Stipa* (Ishunin 1961). Saiga mostly eat *Salsola, Artemisia, Anabasis eryopoda,* and *Statice suffruticosa*. In spring, when fresh growth appears, they feed on grasses and annual herbaceous plants. Saiga can do without water for long periods, particularly if feeding on green grass (Ishunin 1961). Preparation for the rut on Ustyurt begins in the second half of November and mating takes place in mid-December (Reimov and Karabekov 1987). Young are usually born outside Uzbekistan during the spring migration back to the summer range.

Status within the country: Vulnerable. The recent sharp decline decline in the Kazakhstan population affects the numbers entering Uzbekistan and constant monitoring of the population is essential.

Conservation measures taken: At the beginning of the 20th century, this species was on the verge of total extinction. Thanks to protection measures, saiga numbers have again increased to a level that allows a commercial harvest. In 1976, the government of Uzbekistan sanctioned a harvest of saiga and, until 1982, about 24,000 saiga were shot annually for meat, hides, and horns. The figure was based on scientific recommendations by zoologists in the Academy of Sciences, and the harvest was supervised by the State Hunting Inspectorate and zoologists (Ishunin 1984). Global status has been recently reassessed as Endangered.

Conservation measures proposed: The latest detailed data on saiga in Uzbekistan were collected in 1975–1985, so new field research in their habitat is essential. It would be desirable to establish seasonal nature sanctuaries (*zakazniks*) in areas where the rut takes place. It is essential to ensure strict observance of existing wildlife protection laws and to eliminate illegal hunting as far as possible.

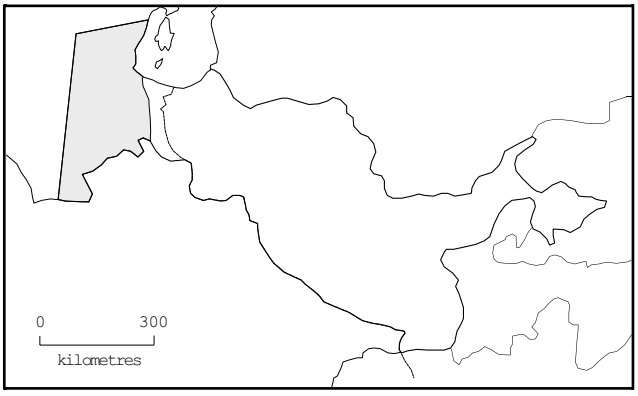


Fig. 27.3 Usual limits of winter range of saiga *(Saiga tatarica)* in Uzbekistan (shaded).

References

An, E.S., Botman, K.S., Goncharov, V.E. Dudura, I.M., and Kul'bashnaya, L.Ya. 1980. [*Protected areas of Uzbekistan*]. Tashkent (in Russian).

Anonymous. 1983. [*Red book of the Uzbek SSR*], Vol. 1. Fan, Tashkent (in Russian).

Babaev, A.G., Zonn, I.S., Drozdov, N.N., and Freikin, Z.G. 1986. [*Deserts*]. Moscow (in Russian).

Borodin, 1984. [*Red book of the USSR*]. Lesnaya Promyshlennost, Moscow (in Russian).

Flint, V.E. and Prisyazhniuk, V.E. 1986. [Condition of the population, protection and perspectives on restoration of goitered gazelle in USSR]. Pp. 3–8 *in:* Flint, V.E. and Prisyazhniuk, V.E. (Editors). [*Protection and perspectives on the restoration in numbers of goitered gazelle in the USSR*]. All-Union Institute of Nature Protection, Moscow (in Russian).

Ishunin, G.I. 1961. [*Fauna of the Uzbek SSR*], Vol. 3. Academy of Sciences of the Uzbek SSR, Tashkent (in Russian).

Ishunin, G.I. 1984. *Hunting and nature protection in Uzbekistan*. Tashkent (in Russian).

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Mambetzhumaev, A. 1970. [*Goitered gazelle*]. Fan, Tashkent (in Russian).

Mardanov, B.K. 1993. [Feeding dynamics of goitered gazelle of vegetation in different seasons of the year]. *In:* [Ecological problems of of the Amudarya regions of central Asia]. Chardzhou (in Russian).

Pereladova, O.B. and Pereladov, S.V. (1986). [Reproduction of goitered gazelle in the enclosures of the breeding centre of the Syunt-Khasardagskii reserve]. Pp. 49–59 *in:* Flint, V.E. and Prisyazhniuk, V.E. (Editors). [*Protection and perspectives on the restoration in numbers of goitered gazelle in the USSR*]. All-Union Institute of Nature Protection, Moscow (in Russian).

Reimov, R. and Karabekov, M. 1987. [Particularities of the reproduction of the Ustyurt population of saiga and protection measures for it]. Pp. 24–27 *in:* [*Mammals and birds of Uzbekistan*]. Fan, Tashkent (in Russian).

Reimov, R., Nuratdinov, T., and Karabekov, M. 1989. [Condition of the ungulate population of the south Aral region included in the red book of the USSR]. Pp. 72–73 *in:* [*Ecology, morphology, use and protection of wild ungulates*]. Part 1. Moscow (in Russian).

Sabilaev, A.S. and Koptsev, L.A. 1986. [Past and present numbers of goitered gazelle in the Karakalpak part of Ustyurt and Kyzylkum]. Pp. 12–16 *in:* Flint, V.E. and Prisyazhnuik, V.E. (Editors). [*Protection and perspectives on the restoration in numbers of goitered gazelle in the USSR*]. All-Union Institute of Nature Protection, Moscow (in Russian).

Sludskiy, A.A. 1956. [Reproduction of goitered gazelle]. *Trudi Instituta Zoologii Academii Nauk Kazakhskoi SSR* 6:78–108 (in Russian).

Sludskiy, A.A. 1977. [Goitered gazelle]. Pp. 28–61 *in:* [*Rare animals of the USSR*]. Moscow, (in Russian).

Volozheninov, N.N. 1982. [On the restoration of the kulan and protection of the goitered gazelle in Kyzylkum]. Pp. 34–35 *in:* [*Protection and reproduction of the wildlife of Uzbekistan*]. Tashkent (in Russian).

Chapter 28. Kyrgyzstan

A.T. Toktosunov and D.P. Mallon

Introduction

Kyrgyzstan is situated in southern central Asia and covers an area of 198,500km^2. It shares borders with Kazakhstan, Uzbekistan, Tajikistan, and China (Fig. 28.1) and has a human population of 4,613,000. The Tien Shan Mountains and its outlying ranges dominate the country, rising in the east to 7,439m above sea level. The lowest point, in the west of the country, is *c.*500m. This wide altitudinal range is reflected in distinct habitat zones which include desert and semidesert plains, montane steppe in the foothills, extensive coniferous forests, subalpine meadows, and an alpine zone. The climate is continental, but heavily influenced by altitude. Annual precipitation ranges from <100mm to *c.*1,000mm in the higher mountains.

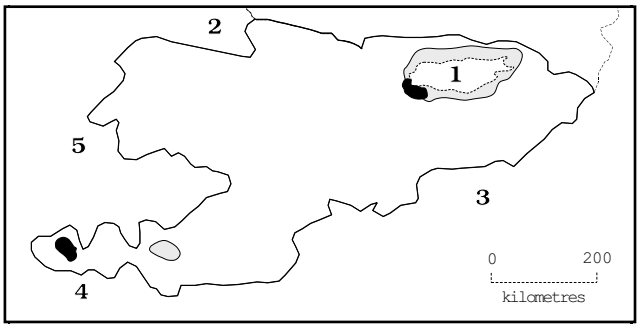


Fig. 28.1 Former distribution of goitered gazelle *(Gazella subgutturosa)* in Kyrgyzstan (shaded) and latest known range (black): 1. Issyk Kul Lake; 2. Kazakhstan; 3. China; 4. Tajikistan; 5. Uzbekistan.

Current status of antelopes

The only species of antelope to occur in Kyrgyzstan is the goitered gazelle (*Gazella subgutturosa*) (Table 28.1). It is distributed in two separate areas of the country, the basin of Lake Issyk Kul in the northeast and the western spurs of the Turkestan Range of the southwest. Numbers have decreased sharply in both areas and had reached very low levels by the 1970s. The species has now been reduced to the verge of extinction in Kyrgyzstan and it may even have already been extirpated. The main reasons for the drastic reduction in distribution and numbers are habitat destruction, increased numbers of domestic livestock, which displace gazelles into unsuitable habitat, illegal hunting, and persecution by shepherds' dogs. Goitered gazelles once occupied most of the Issyk Kul Basin. Several decades ago, there was contact between gazelles in the Kalmak-Ashu area, on the northeast shore of the lake, and gazelles in Kazakhstan, but they have long been absent from this locality. In the 1930s–1940s, gazelles occurred over approximately 60km of the southwest side of Lake Issyk Kul, from Kok-Moinok State Farm to the Ak–Sai River, in the foothills of the Terskei Ala-Too Range (Aizin 1986). In the 1950s, gazelles were recorded in the Kochkorskii Valley. The gazelle population around Lake Issyk Kul was also undoubtedly affected by construction of the Ortotokoiskii Reservoir and the consequent increase in transport pressure along the Bishkek-Rybache-Kochkorka-Naryn Highway. Gazelles have now disappeared completely from the Kochkorskii Valley (Aizin 1986). In the southwest, goitered gazelles were also common during the 1930s–1940s in the Pre-Ferganskii region of the Turkestan Range, but they have declined steadily since then and numbers have dwindled to very low levels.

Conservation measures taken

Goitered gazelles are protected by law and are listed in the national Red Data Book (Anonymous 1985). Categories of protected areas, established during the Soviet era, are nature reserve (*zapovednik*), nature sanctuary (*zakaznik*), and hunting reserve. Nature reserves are the most strictly protected, while nature sanctuaries are given partial or seasonal protection. Hunting reserves are managed for one or more game species and hunting is allowed within limits, but they are generally well protected. No protected areas are situated in current goitered gazelle range. Issyk Kul Nature Reserve (17,310ha, established 1948) is situated in the eastern part of Issyk Kul Basin, but gazelles have been absent from this locality for many years.

Table 28.1 Current status of antelopes in Kyrgyzstan.

Species	Status[1]	GPS[2]
Goitered Gazelle (*Gazella subgutturosa*)	Endangered/Extinct?	<0.1%

[1] *See Chapter 1 for definition of status categories*
[2] *Global population share*

Conservation measures proposed

Thorough surveys should be carried out in areas of former range to determine the current status of goitered gazelles in the country. Remaining populations will need immediate protection from hunting.

Species account

Goitered Gazelle (*Gazella subgutturosa*)

Distribution and population: Former distribution covered two small areas: the basin of Lake Issyk Kul in northeast Kyrgyzstan and the foothills of the Turkestan Range in the southwest (Fig. 28.1). Current numbers are extremely low. The Issyk Kul population is completely isolated and is restricted to the areas around Chon-Dzhuketei and Kichik-Dzhuketei, in the foothills of the Terskei Ala-Too Range. The total area occupied there is only about 200km^2. Only 29 gazelles were counted there in 1968 and 15 in 1981 (Anonymous 1985; Aizin 1986). In 1985, 10 were seen and there were no confirmed sightings between 1986 and 1991 (E.P. Koshkarev *in litt.*). In the Turkestan Range of southwest Kyrgyzstan, gazelles occur in the Lyailyakskii area (northwest spurs of the Turkestan Range). Recorded localities include Arka, Kyzyl-Otyok, Goro-Tyek, Kara-Sai, and Ak-Chechek (Anonymous 1985). These gazelles may maintain contact with the population in the adjoining area of northern Tajikistan. Only about 100 gazelles remained in 1975, and these had declined to an estimated 50 by 1985 (Aizin 1986). The current status of this subpopulation, and even if any survive, is unknown.

Habitat, food and reproduction: In the Issyk Kul Basin, goitered gazelle habitat consists of semidesert tracts with scanty vegetation of *Artemisia*, *Ephedra,* and *Tamarix*; in places, there are sparse grasses and herbaceous plants. In the Turkestan Range, gazelles inhabit *Artemisia-Salsola* desert (Aizin 1986).

Status within the country: Endangered, possibly extinct.

Conservation measures taken: Protected by law. Listed an endangered species in the national Red Data Book (Anonymous 1985). Gazelles do not occur in any protected area in Kyrgyzstan. Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: The most immediate priority is to carry out field surveys of gazelle habitat to establish the precise current status of the species in Kyrgyzstan. To conserve any remnant populations, a nature reserve covering 12,000ha should be created in the Issyk Kul Basin. Efforts to combat poaching and predation by stray dogs should be strengthened and made fully effective. Regular monitoring of any remnant gazelle populations should be carried out. Lastly, education and publicity work should be undertaken among shepherds and other people living in areas of gazelle distribution to persuade them of the need to conserve gazelles and other wildlife.

References

Anonymous. 1985. [*Red book of the Kirgiz SSR*]. Academy of Sciences of the Kirgiz SSR, Frunze (in Russian).

Aizin, B.M. 1986. [Distribution, numbers and perspectives on protection of goitered gazelle in Kirgizia]. Pp. 39–41 *in:* Flint, V.E. and Prisyazhniuk, V.E. (Editors). [*Protection and perspectives on the restoration of numbers of goitered gazelle in the USSR*]. All-Union Institute of Nature Protection, Moscow (in Russian).

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Chapter 29. Tajikistan

I.A. Abdusalyamov

Introduction

Tajikistan is situated in south-central Asia and covers an area of 143,100km^2. It is bordered by China, Afghanistan, Uzbekistan, and Kyrgyzstan (Fig. 29.1) and has an estimated human population of 6,100,000 (1999). More than 90% of the country is mountainous. Elevations are lowest in the north and the southwest, where small areas of desert and semidesert occur. The Pamir Mountains dominate eastern Tajikistan, and other major ranges include the Alai, Zerafshan, and Turkestan Mountains. Altitudes range from 325m in the southwest to 7,495 in the Pamirs. The high mountains contain more than 9,000 glaciers, the largest of which is 70km long. Vegetation types include arid, lowland desert and semidesert, montane steppe, coniferous forests, and extensive subalpine and alpine zones. More than 6,000 species of plants have been recorded (Buzurukov and Muratov 1994). The southwest has a subtropical continental climate with *c.*200mm annual precipitation, <20 days of snow in winter, and hot, dry summers; conditions become progressively more severe as elevation increases.

Current status of antelopes

Goitered gazelle (*Gazella subgutturosa*) is the only species of antelope occurring in Tajikistan (Table 29.1). In the past, it occurred in all the desert and semidesert areas of the north and the southwest of the country. However, a radical decline took place between 1935 and 1985, and numbers have dwindled to the edge of extinction. The reasons for the decline include: heavy mortality during the severe winter of 1944–45; development of the desert and semidesert habitat; intensification of livestock rearing; and illegal hunting (Sapozhnikov 1976; Sokov 1986). The area of available habitat has continued to decrease, especially since 1991–92, because large numbers of people have moved to the south of the country. Economic problems following the dissolution of the USSR and independence have led to increased use of natural resources by local people, and have hampered efforts to protect the environment. Internal armed conflicts that have taken place since independence may also have adversely affected the remnant gazelle population.

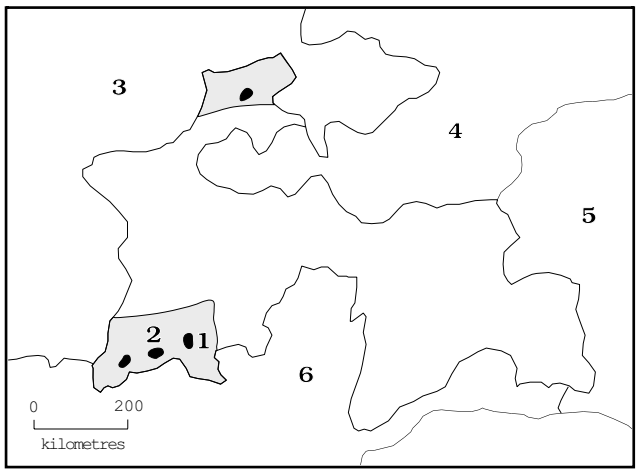


Fig. 29.1. Former range of goitered gazelle *(Gazella subgutturosa)* in Tajikistan (shaded) and current distribution (black): 1. Karatau Wildlife Sanctuary (14,100ha); 2. Tigerbulk Nature Reserve (50,000ha); 3. Uzbekistan; 4. Kyrgyzstan; 5. China; 6. Afghanistan.

Conservation measures taken

The Ministry of Environmental Protection is responsible for conservation of wildlife and protected areas. Goitered gazelles have full legal protection and the species is listed in the national Red Data Book (Anonymous 1988). The main categories of protected areas established during the Soviet era are nature reserve (*zapovednik*), nature sanctuary (*zakaznik*), and hunting reserve. Nature reserves are the most strictly protected, while nature sanctuaries are given partial protection. Hunting reserves are managed for one or more game species and hunting is allowed within limits, but they are generally well protected. Tajikistan currently has 19 protected areas covering a total of about 623,000ha, 4.4% of the country (Buzurukov and Muratov 1994). The only significant protected area for gazelles is Tigerbulk (Tigrovaya Balka) Nature Reserve in southwestern Tajikistan, which was established in 1938 and currently covers about 50,000ha. It is situated on the flood plain of the Pyandj and Vakhsh Rivers, and consists of riverine scrub (*tugai*) and semidesert (Rashek 1983). Karatau Nature

Table 29.1 Current status of antelopes in Tajikistan.

Species	Status[1]	GPS[2]
Goitered Gazelle (*Gazella subgutturosa*)	Endangered	<0.1

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

Sanctuary also lies within the former range of goitered gazelle. The Social-Ecological Society is the main NGO active in wildlife conservation in the country.

Conservation measures proposed

It is important to make protection of gazelles fully effective, especially in Tigerbulk Nature Reserve. The protected area system should be expanded to include more areas of importance for wildlife, and the public should be made more aware of the need for wildlife conservation through education and publicity programmes.

Species account

Goitered Gazelle (*Gazella subgutturosa*)

Distribution and population: Formerly distributed in all areas of suitable habitat in the north and southwest of the country, but its range is now greatly reduced. In the north, gazelles occur only on the right bank of the Syr Darya River, at the foot of Mahatau Mountains and the low ridges of Akbeltau. The total area of this habitat is only 35–45km^2. In southwest Tajikistan, its distribution was formerly more extensive. Gazelles inhabited the lower parts of the Pyandj, Vakhsh, and Kafirnigan Valleys, the Dangarinskii Plateau, and occasionally also the Kashkakum and Kurdjalakum deserts. Gazelles were most common on the Dangarinskii Plateau, but they no longer occur there. They have also disappeared from the Beshkent Valley, the valleys of the Tairsu-Kyzylsu interfluve, and a series of other localities covering, in total, about 500km^2. Current distribution in the southwest is limited to a few pockets: the foothills of the Karatau Mountains, the area around the confluence of the Vakhsh and Pyandj Rivers, and the lower reaches of the Kafirnigan River near Aivadj (Fig. 29.1). The maximum area of goitered gazelle distribution is only 300–350km^2 at present and within 150–200km^2 of this, occurrence is only sporadic. The gazelle population was estimated at about 200 in 1986 (including 10–20 in the north, 90–120 in Tigerbulk Reserve, and 50–80 in the foothills of the southwest) and 100 in 1989 (Sokov 1986; 1989). Currently only 70–80 gazelles survive in Tajikistan.

Habitat, food and reproduction: No information specific to Tajikistan is available.

Status within the country: Endangered.

Conservation measures taken: Protected by law and included in the national Red Data Book (Anonymous 1988). A few gazelles survive in the semidesert part of Tigerbulk (Tigrovaya Balka) Nature Reserve (*c.*50,000ha). Attempts were made to establish a captive-breeding centre at Tigerbulk, but these attempts ceased in 1992 because of the deep economic crisis in the country. Karatau Nature Sanctuary (14,400ha) is situated within their former range in the southwest. Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: Protection of remaining gazelles on the ground should be made more effective by providing transport and essential equipment to wildlife protection officials. However, only captive-breeding and subsequent release into areas of former range will ensure the survival of this species in Tajikistan. It is essential to upgrade Karatau Nature Sanctuary into a full nature reserve and to expand its area to include the whole Karatau Range. Gazelles can then be reintroduced into the Tuyuntau, Aruktau, and Tereklitau Hills, and other places in the southwest. In northern Tajikistan, a captive-breeding centre with an area of 5,000ha should be established in the Akbel'tau area. Finally, a publicity and awareness campaign to point out the importance of gazelle conservation should be conducted throughout Tajikistan.

References

Anonymous. 1988. [*Red book of the Tadzhik SSR*]. Danish, Dushanbe (in Russian).

Buzurukov, A. and Muratov, R. 1994. Snow leopard conservation in Tajikistan. Pp. 29–32 *in:* Fox, J.L. and Jizeng, D. (Editors). *Proceedings of the seventh international snow leopard symposium*. International Snow Leopard Trust, Seattle.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Rashek, V. L. 1983. [Tigrovaya Balka Nature Reserve]. Pp. 220–221 *in:* Borodin, A.M. and Syroechkovskii, E.E. (Editors). [*Nature reserves of the USSR*], Second edition. Lesnaya Promyshlennost, Moscow (in Russian).

Sapozhnikov, G.N. 1976. [The wild ungulates of Tadzhikistan]. Pp. 113–124 *in:* Sokolov, V.E. (Editor.) [*Rare mammals of the fauna of the USSR*]. Academy of Sciences, Moscow (in Russian).

Sokov, A.I. 1986. [Distribution, numbers and condition of the population of goitered gazelle in Tadzhikistan]. Pp. 37–39 *in:* Flint, V.E. and Prisyazhniuk, V.E. (Editors). [*Protection and perspectives on the restoration of numbers of goitered gazelle in the USSR*]. All-Union Institute of Nature Protection, Moscow (in Russian).

Sokov, A.I. 1989. [Condition of rare ungulates and methods for protecting them in Tajikistan]. Pp. 79–81 *in:* [*Ecology, morphology, exploitation and protection of wild ungulates*]. Academy of Sciences, Moscow (in Russian).

Chapter 30. Turkmenistan

Yu. K. Gorelov

Introduction

The Republic of Turkmenistan is situated in south-central Asia to the east of the Caspian Sea and covers an area of 488,100km^2. It shares land borders with Afghanistan, Iran, Kazakhstan, and Uzbekistan (Fig. 30.1). The main physical feature is the Kara Kum Desert, which occupies most of the country. The southern part of Ustyurt Plateau extends into northwest Turkmenistan and adjoining it is the Sarykamysh Depression, which covers an area 180km by 90km. Kara Kum is bordered to the south and southeast by areas of highland. The Kopet Dag Mountains (2,335m) lie in the southwest and run partly along the border with Iran. The Badkhyz and Karabil uplands occupy the south of Turkmenistan. Badkhyz, situated between the Tejen and Murgab Rivers, consists of high plains at elevations of 700–800m with low ridges up to 900m and contains some of the best pastures in the country (Kuznetsov 1986). The Kugitangtau Range, whose peaks exceed 3,000m, occupies the extreme southeast. Major rivers are the Amu Darya, which flows along much of the northeastern border with Uzbekistan, the Murgab, Tejen, and Atrek. The climate is arid and continental with marked daily and annual fluctuations in temperature, low humidity, and high solar radiation. Annual precipitation ranges from 80mm in the desert to 350mm in the Kopet Dag Mountains. Desert vegetation predominates on the plains. On mountain slopes, there are *Stipa* and *Agropyron* grass steppes, and in Badkhyz, areas of *Pistacia* woodland. A few strips of riverine woodland (*tugai*) remain in the major river valleys, composed of species of *Tamarix* and *Salix*. The Sarykamysh Depression contains dense stands of saxaul (*Haloxylon* spp.) trees.

The human population of Turkmenistan numbers over 4,350,000 (1999). Most human settlements are located in river valleys, along canals, and in oases of the Kopet Dag foothills. Until now, economic development has been limited and, with the exception of oil and gas production facilities, there are few industrial enterprises. Agriculture is mostly dependent on irrigation from the major rivers and from the 1,000km–long Kara Kum Canal, which crosses the country from east to west.

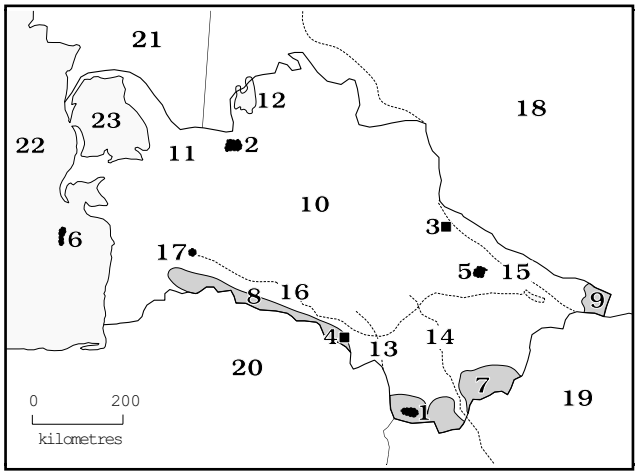


Fig. 30.1 Turkmenistan. Protected areas containing antelopes: 1. Badkhyz NR (88,640ha); 2. Kaplankyr NR (570,000ha); 3. Amudarinskiy NR (50,500ha); 4. Meana-Chaachinsk HR (60,000ha); 5. Repetek NR (34,600ha); 6. Ogurchinsk Island WS (<4,500ha). (NR = nature reserve; WS = wildlife sanctuary; HR = hunting reserve). Geographical features and localities mentioned in the text: 7. Karabil; 8. Kopet Dag Mountains; 9. Kugitangtau Mountains; 10. Kara Kum; 11. Ustyurt; 12. Sarykamysh lake/depression; 13. River Tejen; 14. River Murgab; 15. River Amu Darya; 16. Karakum Canal; 17. Gyzylarbat; 18. Uzbekistan; 19. Afghanistan; 20. Iran; 21. Kazakhstan; 22. Caspian Sea; 23. Kara Boghaz Gol.

Current status of antelopes

Two species of antelopes occur in Turkmenistan (Table 30.1), goitered gazelle (*Gazella subgutturosa*) and saiga (*Saiga tatarica*). During the first half of the 19th century, the

Table 30.1 Current status of antelopes in Turkmenistan.

Species	Status[1]	GPS [2]
Goitered Gazelle (*Gazella subgutturosa*)	Vulnerable	3–4%
Saiga (*Saiga tatarica*)	Vulnerable	0.5–1.5% (sporadic winter visitors)

[1] *See Chapter 1 for definition of status categories*
[2] *Global population share*

southern limit of saiga range ran from Kara Bogaz Gol on the Caspian coast eastwards across northwestern Turkmenistan (Heptner *et al.* 1961). Now, saiga occur only during severe winters when animals from the Kazakhstan population are forced southwards and reach northern Turkmenistan. At the beginning of this century, *Gazella subgutturosa* inhabited all the plains and wide river valleys in the foothills (about 76% of the country) and their numbers may have reached 250,000–300,000. At the beginning of the 1940s, there were still an estimated 100,000 gazelles, but by the 1960s, gazelles had been extirpated from many areas and numbers had declined to 15,000 (Rustamov *et al.* 1986). Better protection at the beginning of the 1980s led to a small increase in numbers. However, during the summer of 1983, extremely high temperatures and a drought caused heavy mortality through direct effects of the drought or poisoning from drinking saline water. In Badkhyz alone, at least 700 gazelles died (Kuznetsov 1986).

Goitered gazelle distribution now covers only about 3% of the country and their numbers total no more than a few thousand. Most of the remaining population is concentrated in southern Turkmenistan, in Badkhyz, and in Karabil. There are smaller numbers in the north (Sarykamysh depression and Kaplankyr), in the sands around Katta–Shor Lake (in the middle course of the Amu Darya), and in a few other scattered localities. The massive decline in range occurred despite the fact that hunting of gazelles was prohibited in 1950. Goitered gazelles have declined mainly because of illegal hunting and also development of roads and canals, which interrupted traditional migration routes and isolated smaller populations.

In southwest Turkmenistan, goitered gazelles were common during the 1940s and 1950s, but they were greatly reduced by the end of the 1960s and are now completely absent (Gorbunov and Zarkhidze 1986). In western Turkmenistan, gazelles were still numerous during the 1960s, but they declined sharply during the 1970s and current numbers are very low. In the north, the population in the Sarykamysh Depression and adjoining areas was estimated to number 1,700 in 1982–85 (Chernov 1986), but today only a few hundred remain. In the northwest, gazelles were still common during the 1950s and 1960s, but numbers have dropped to a fraction of their former level.

The Mangyshlak Steppes have lost much of their former productivity as a result of excessive collection of bushes and other vegetation for fuel (Gorbunov and Zarkhidze 1986), but most gazelle habitat in Turkmenistan has not been overgrazed or degraded. Most of the country is sparsely settled, except for the river valleys and the foothill strip of the Kopet Dag. In the absence of direct hunting pressure and persecution by humans, gazelles could reach a population of several tens of thousands. A large part of the region is devoid of surface water and is used by gazelles only during the autumn-spring wet season. Provision of artificial water sources, such as bore wells, could allow gazelle numbers in Turkmenistan to reach 100,000 or more. The presence of human habitation near watering places does not in itself deter gazelles from these areas (Rustamov *et al.* 1986).

Conservation measures taken

The Ministry for Nature is responsible for all aspects of wildlife conservation and protected areas. Goitered gazelles were first given legal protection in 1950 and were included in both editions of the national Red Data Book (Shcherbina 1975; Babayev 1985). Gazelles and saiga are protected by hunting regulations and other legal measures, but during the last few years, protection systems have deteriorated and gazelles have again suffered the effects of illegal hunting.

The main categories of protected area, established during the Soviet era, are strict nature reserve (*zapovednik*), nature sanctuary (*zakaznik*), and hunting reserve. Nature reserves are the most strictly protected, while nature sanctuaries provide partial protection, established for a specified period of time or where some economic activities are allowed. Hunting reserves are managed for game species, so hunting is controlled, and they are generally well-protected. Nature reserves are sometimes adjoined by a sanctuary or hunting reserve, which may also be administered by the nature reserve authorities. Eight nature reserves, several nature sanctuaries, and a few hunting reserves have been established in the country. However, during the last four to five years, conditions in protected areas have deteriorated and protection has become less effective.

Goitered gazelles occur in six protected areas (Fig. 30.1): five nature reserves (or the adjoining wildlife sanctuary) and one wildlife sanctuary not bordering a reserve. The most important protected area for antelopes is Badkhyz Nature Reserve, established in 1941 and covering 88,640ha, of which 70,000ha are utilised by gazelles (Gorelov 1972). It is situated in southern Turkmenistan, in the uplands between the Murgab and Tejen Rivers. For many years, protection was effective in Badkhyz and adjoining areas, but the situation has deteriorated since 1993, when the system of protection began to break down. The gazelle population in Badkhyz reached 5,000–7,000 in the 1980s, but now there are only about 2,000. This reserve constitutes one of the key areas for the conservation of goitered gazelles in central Asia, despite the fall in numbers. Kaplankyr Nature Reserve (*c.*570,000ha, established in 1979) is located in northern Turkmenistan. In the mid-1980s, the gazelle population was 1,700, but currently, the area is almost unprotected and only a few hundred gazelles remain at the most. These are mainly confined to the Sarykamysh Depression, where a 210,400ha nature sanctuary bordering the reserve has been created. Sarykamysh is also an occasional wintering ground for saiga and thousands of animals may occur in some years.

Ogurchinsk Nature Sanctuary is situated on Ogurchinsk Island near the southeast shore of the Caspian Sea. At the beginning of the 1980s, its area was 4,500ha, but this has been reduced by a rise in sea level. A gazelle population was established in 1982, when animals were transferred from

several areas of Turkmenistan and Uzbekistan. Numbers are currently about 400. Protection of the sanctuary is helped by its island location. Gazelles also occur in the Meana-Chaachinsk Hunting Reserve (60,000ha, established 1976), which is administered by the Kopet Dag Nature Reserve. Currently the reserve holds only a few tens of gazelles, most of which move between Iran and Turkmenistan.

Amudarinsk Nature Reserve (50,500ha) in the Kyzyl Kum Desert provides suitable habitat for goitered gazelle, but only a few tens of gazelles live in the reserve and adjoining areas along both banks of the River Amu Darya. Repetek Nature Reserve, established in 1912 and encompassing 34,100ha of sand desert, was once inhabited by a few tens of gazelles during the wet season. Now, only individual animals are encountered and the reserve is virtually unprotected.

In 1982, a captive-breeding programme for goitered gazelles was initiated at Gaurskii Captive-Breeding Centre. The Turkmenian Society for Protection of Nature, a member organisation of IUCN, is the only NGO in the country concerned with nature conservation.

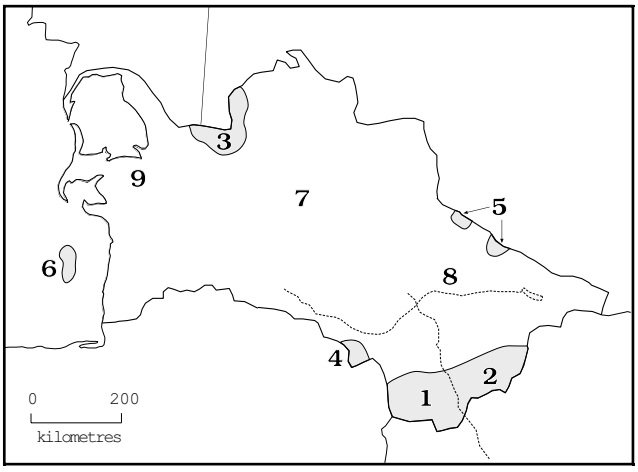


Fig. 30.2 Current distribution of goitered gazelle *(Gazella subgutturosa)* in Turkmenistan (shaded). Main populations: 1. Badkhyz; 2. Karabil; 3. Kaplankyr; 4. Kopet Dag foothills; 5. Right bank of the Amu Darya; 6. Ogurchinsk Island. Small, scattered populations: 7) Central Kara Kum; 8) Eastern Kara Kum; 9. Northwest Turkmenistan.

Conservation measures proposed

The main threat to remaining goitered gazelles is illegal hunting. It is, therefore, vital to establish well-equipped, mobile protection teams (in order of priority) in Badkhyz, Karabil and adjacent steppes, Kaplankyr, and northwest Turkmenistan. The last two would also protect most of the saiga that winter in Turkmenistan and increased patrols against poaching should be instigated in years when they occur. Management of nature reserves where gazelles currently occur should be strengthened. Gazelles should also be guaranteed undisturbed access to water at natural and artificial sources, such as rivers, reservoirs, canals, springs, and livestock-watering areas. Approximately 80% of the range formerly occupied by gazelles still consists of suitable habitat and is not greatly affected by economic activity. If goitered gazelles are not directly persecuted, they can coexist with domestic livestock and the operations of the oil and gas extraction industry. Given this favourable situation, a programme to restore them to their former range should be formulated.

Species accounts

Goitered Gazelle (*Gazella subgutturosa*)

Distribution and population: Goitered gazelle distribution formerly covered 76% of the country, but is now only 3% (Fig. 30.2). The population declined from an estimated 100,000 at the beginning of the 1940s, to 15,000 in the 1960s and 4000–5,600 in 1993. The main area of current distribution lies in the south: in Badkhyz (between the Tejen and Murgab Rivers, *c.* 2,000 gazelles), and Karabil (between the Murgab River and the Karakum Canal, 1,000–2,000). Gazelles also occur in Kaplankyr in the north (probably 300–500); northwest Turkmenistan (<100); eastern Kara Kum (probably 100–300); the Kopet Dag foothills (<100); and the right bank of the Amu-Darya River (a few animals). Gazelles are extremely rare in the central Kara Kum (no data, but very few), and they are completely absent from southwest Turkmenistan. There is an introduced population on Ogurchinsk Island in the Aral Sea (400 in 1994). Most of the remaining animals are found in protected areas.

Habitat, food and reproduction: Occur in semidesert and desert areas. Gazelle mortality from natural disasters, such as winters with heavy snowfall and sudden cold spells, may reach 20%. Summer mortality from drought and consumption of saline water is rare compared to that in winter and usually does not exceed 20%. Reproduction may be adversely affected in regions where the population is extremely fragmented and is on the verge of extinction. Goitered gazelles undertake local and/or seasonal movements and, in some areas of the country, they make longer migrations. In Badkhyz, gazelles congregate during winter in low basins and hollows, which remain snow-free (Kuznetsov 1986).

Status within the country: Vulnerable. Declining rapidly and, if current trends continue, likely to be threatened with extinction in a few years.

Conservation measures taken: Protected by law since 1950. Listed in the national Red Data Book (Babayev 1985). Goitered gazelles occur in five protected areas: Badkhyz (88,640ha), Kaplankyr (570,000ha), Repetek (34,100ha), and Amudarinsk (50,500ha) Nature Reserves, Ogurchinsk Nature Sanctuary (4,500ha), and Meana-Chaachinsk Hunting Reserve (60,000ha). Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: The most important measure is to improve protection against illegal hunting within reserves and in other areas with known populations. This requires the establishment of teams of wardens in Badkhyz, Karabil and adjacent steppes, Kaplankyr, and northwest Turkmenistan. Most former habitat has not been damaged or degraded. Drilling wells in areas currently without surface water sources would allow gazelles to utilise these areas year-round, and could lead to an expansion of the population. With this provision, the population could, in theory, eventually reach 100,000. Kuznetsov (1986) identified the basins of central Badkhyz, where many gazelles died during the 1983 drought, as an important locality for the creation of water points. Captive-breeding efforts should be continued in order to provide stock for reintroductions and to augment natural expansion of the population.

Saiga (*Saiga tatarica*)

Distribution and population: Saiga only occur in Turkmenistan during severe winters, when animals wintering on the Ustyurt Plateau in Kazakhstan move south and may reach the northwest of the country, principally the Sarykamysh Depression (Fig. 30.3). In some years, saiga may move even further south and they have occurred near Gyzylarbat at the northwest end of the Kopet Dag Range (Shcherbina 1975). Numbers reaching Turkmenistan vary, depending on the severity of the winter weather and the condition of the Kazakhstan population. During the winters of 1965–66, 1968–69, and 1973–75, several thousand saiga reached Turkmenistan and wintered in the Sarykamysh Depression (Ishadov 1975).

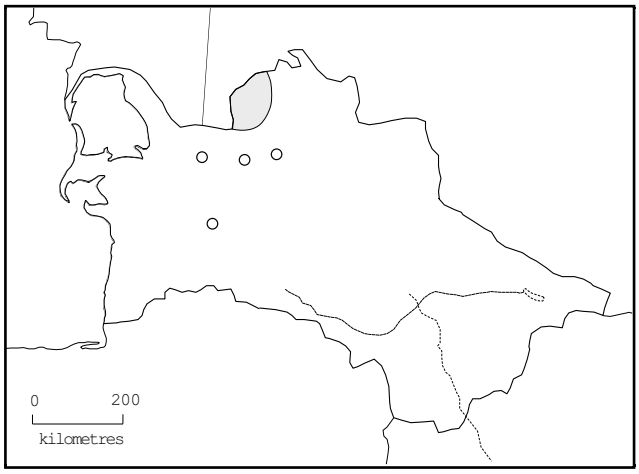


Fig. 30.3 Approximate limit of winter distribution of saiga (*Saiga tatarica*) in Turkmenistan (shaded) and occasional occurrence (open circles).

Status within the country: Vulnerable.

Conservation measures taken: Protected by law, and all hunting is prohibited. Wintering animals may enter the Kaplankyr Nature Reserve from the north. Global status has been recently reassessed as Endangered.

Conservation measures proposed: Measures taken to prevent illegal hunting of goitered gazelle in northern Turkmenistan may also benefit saiga. Extra patrols should be implemented in Kaplankyr and Sarykamysh in years when saiga are present. Border checks should be implemented to prevent smuggling of saiga horn from Kazakhstan.

References

Babayev, A.G. 1985. (Editor). [*Red book of the Turkmen SSR*]. Turkmenistan Publishers, Academy of Sciences of the Turkmen SSR, Ashkhabad (in Russian).

Chernov, V.Yu. 1986. [Population and distribution of goitered gazelle in Sarykamysh depression]. Pp. 28–31 *in:* Flint, V.E. and Prisyazhnyuk, V.E. (Editors). [*Protection and perspectives on the restoration in numbers of goitered gazelle in the USSR*]. All-Union Institute of Nature Protection, Moscow (in Russian).

Gorbunov, A.V. and Zarkhidze, V.A. 1986. [Fluctuation in numbers, contemporary distribution and perspectives on the restoration of the goitered gazelle population in western Turkmenistan.]. Pp. 22–28 *in:* Flint, V.E. and Prisyazhnyuk, V.E. (Editors). [*Protection and perspectives on the restoration in numbers of goitered gazelle in the USSR*]. All-Union Institute of Nature Protection, Moscow (in Russian).

Gorelov, Yu. K. 1972. [Reproduction of the goitered gazelle and problems of restoring its numbers in Badkhyz]. *Teriologiya* 1:420–424 (in Russian).

Heptner, V.G., Nasimovich, A.A., and Bannikov, A.G. 1961. [*Mammals of the Soviet Union*, vol. I. *Artiodactyla and Persissodactyla*]. Vysshaya Shkola, Moscow (in Russian).

Ishadov, N. 1975. [Migration and winter range of the saiga in Turkmenistan]. Pp. 96–98 *in:* [*Ungulate fauna of the USSR*]. Moscow (in Russian).

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Kuznetsov, V.I. 1986. [Goitered gazelle in Badkhyz region]. Pp. 31–36 *in:* Flint, V.E. and Prisyazhnyuk, V.E. (Editors). [*Protection and perspectives on the restoration in numbers of goitered gazelle in the USSR*]. All-Union Institute of Nature Protection, Moscow (in Russian).

Rustamov, A.K., Atamuradov, Kh.I., Sopyev, O.S., Kurbanov, O.R., and Koshunov, M.A. 1986. [Goitered gazelle in Turkmenistan: Condition of the population, breeding and methods of protection]. Pp. 17–21 *in:* Flint, V.E. and Prisyazhnyuk, V.E. (Editors). [*Protection and perspectives on the restoration in numbers of goitered gazelle in the USSR*]. All-Union Institute of Nature Protection, Moscow (in Russian).

Shcherbina, E.I. 1975. [*Red book of nature*]. Academy of Sciences of the Turkmen SSR, Ashkhabad (in Russian).

Chapter 31. Russia

L.V. Zhirnov

Introduction

The Russian Federation covers an area of 17,045,400km^2 and stretches more than 11,000km from its western borders eastwards to the northern Pacific Ocean (Fig. 31.1). The human population numbers 150,500,000. Extensive steppes and plains cover western and central Russia. The principal mountain ranges are the Urals, running north-south and conventionally regarded as the boundary between Europe and Asia, the Caucasus on the southern border, the Altai and Sayan Ranges along the border with Mongolia, and several ranges in northeastern Siberia. There is great topographical and natural diversity. Vegetation zones include Arctic tundra, taiga, broad-leaved forests, steppes, and semideserts. However, antelopes occur only within a relatively small area of the country.

Current status of antelopes

Two species of antelopes occur in Russia (Table 31.1), Mongolian gazelle (*Procapra gutturosa*) and saiga (*Saiga tatarica*). Mongolian gazelles were formerly found at three localities along the border with Mongolia. They now only occur in very small numbers as sporadic visitors to one of these localities, the steppes of southeastern Transbaikalia. Saiga are an important economic resource and are hunted for their meat, hide, and horn. Meat and skins mainly serve the internal Russian market, but special state enterprises prepare saiga horn, which is a valuable item in Chinese and Korean medicine. Saiga formerly occurred widely across southern Russia, but now they are restricted to the arid steppes and semideserts southwest of the Volga River and northwest of the Caspian Sea, an area which lies within the administrative borders of the Autonomous Republic of Kalmykia. By the end of the 19th century and the beginning of the 20th century, saiga were reduced to near-extinction by uncontrolled hunting. A complete ban on hunting and other protection measures halted the decline and, between 1930 and 1950, the population again expanded its range and numbers (Bannikov *et al.* 1961). During 1956–1960, the Kalmykian population reached a peak of 600,000–800,000 and its range was also at its maximum extent, about 160,000km^2. Total numbers then declined sharply, peaked again during the late 1970s, reaching about 715,000 in 1978, and then plunged to a low of 143,000 in 1987 (Teer *et al.* 1996). Since then, the population remained at around 150,000 (142,000–168,000) until very recently. At the same time, saiga range has shrunk to 20,000–25,000km^2. Because of this decline, state authorities stopped the commercial harvest in 1987; this moratorium has remained in effect to the present day, with the exception of 1990 when the Kalmyk state hunting organisation was permitted to shoot

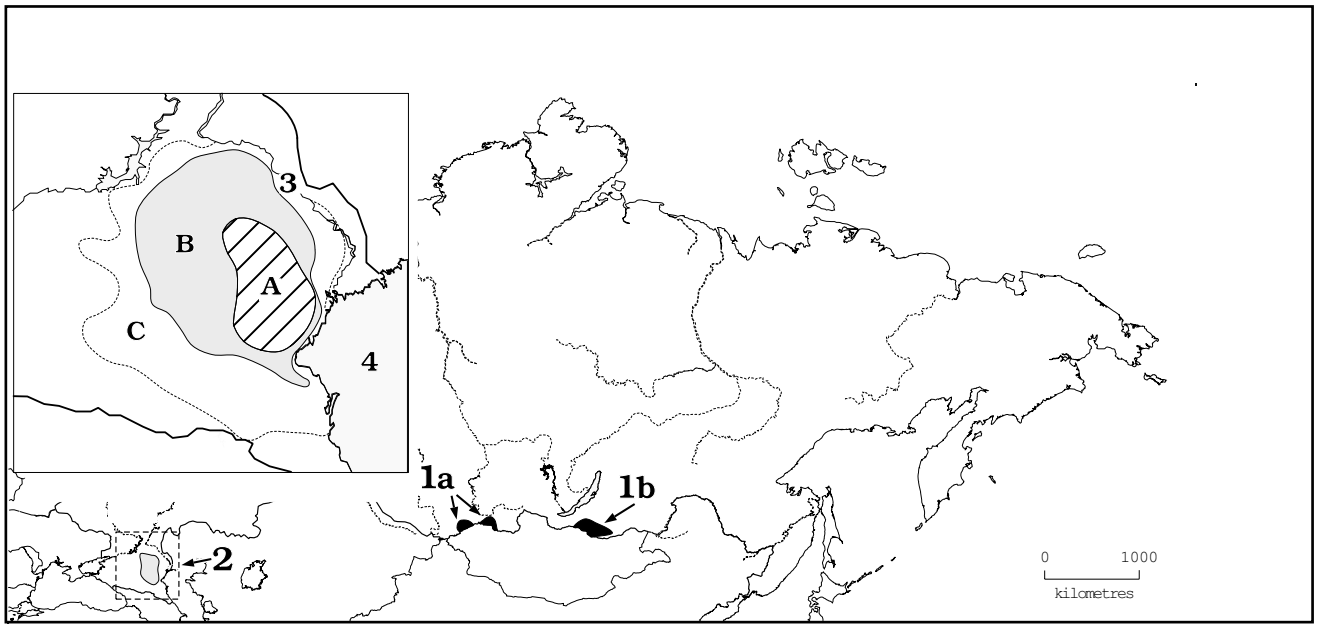


Fig. 31.1 Russia. 1. Distribution of Mongolian gazelle *(Procapra gutturosa):* 1a. former range in the 1940s; 1b. Sporadic occurrence in Transbaikalia. 2. Distribution of saiga *(Saiga tatarica).* Inset: A. Current distribution; B. Distribution 1950–65; C. Occurrence during droughts and severe winters.

Table 31.1 Current status of antelopes in Russia.

Species	Status[1]	GPS[2]
Mongolian Gazelle (*Procapra gutturosa*)	Endangered	<1% (sporadic visitors)
Saiga (*Saiga tatarica*)	Endangered	20%

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

11,000 saiga, and 1993, when 200 licences were issued (Teer *et al.* 1996). Over the last two to three years the decline has become even more drastic principally due to hunting for meat and an aerial survey and census in spring 2000 suggest a current population of only 25,000–30,000 (A.A. Lushchekina *in litt.).*

The main reasons for the saiga's decline are overgrazing, habitat degradation and construction of roads and canals, and, more recently, poaching on an intensive scale. Numbers of livestock, particularly sheep, have increased enormously and the rangelands of Kalmykia, formerly grazed only in winter, have since 1972 been used as pasture throughout the year. The quality of the remaining pastures has thus deteriorated sharply because of many years of overgrazing by domestic livestock. Large areas of rangeland have been lost through ploughing for cultivation and through short-term water projects. As a result, former areas of good-quality steppe and semidesert rangeland have been replaced by tracts of loose sand and saline marshes. On winter "black earth" pastures, areas of blown sand comprised no more than 2–3% in 1953–59, but by 1985, they comprised 33%. This process of desertification is still continuing. As a result, saiga have been driven to regions of poor pasture in southern Kalmykia. Economic development during the last 10–15 years has involved construction of a network of irrigation canals, highways, and wire fences (so-called "cultural pastures"). These interrupted saiga migration routes and sometimes led directly to increased mortality. For example, in spring 1977, 14,000 young saiga perished in canals below Yashkul. Saiga are no longer able to complete seasonal migrations in Kalmykia and so, in essence, the population has become sedentary or semi-sedentary. The lack of good seasonal pastures and the effects of increased disturbance have lowered fecundity and increased mortality. Thus, the population has lost its capacity to increase rapidly. In recent years, mortality of young and adult animals has risen significantly, while fecundity has fallen to 30–50% of the norm and resilience to adverse climatic factors has also decreased.

After the ending of the state monopoly on foreign trade in 1988–89 and the easing of border controls with China, poaching severely affected saiga and the value of their horns on the export market rose from US$350 to $600 per kilogram in a few years. Large numbers of poachers from all parts of the former USSR invaded saiga range and began illegally shooting saiga or buying horns on the local market at high prices; this in itself stimulated further mass poaching. Some "looters" even went as far as digging up graves containing bodies of saiga which had died from epizootics. Poachers killed at least 15,000–20,000 saiga annually, mostly adult males. As a result, the proportion of males in the population decreased. According to a census in July–August 1992, the proportion of males in the population was 4.6%, compared to 24.3% in 1991. This disrupted optimal herd structure and lowered female fecundity (Sokolov *et al.* 1991; Zhirnov and Maksimuk 1994; Chan *et al.* 1995).

Some reports indicate some improvement in environmental conditions in Kalmykia; sheep numbers are reported to have fallen since 1987, and some pastures are said to be recovering. The Black Soils Restoration Commission has also made progress in restoring degraded soils, although this progress is still exceeded by additional degradation (Teer *et al.* 1996). However, it is too early to judge whether or not optimism over these reported improvements is justified.

Conservation measures taken

The State Committee for Environmental Protection had responsibility for wildlife conservation, threatened species, protected areas, and hunting and fishing until May 2000, when its functions were transferred to the Ministry of Natural Resources. Management of saiga habitat is the responsibility of the Kalmykia Department of Environment Protection. Threatened species are listed in five categories in the Red Data Book of the former USSR (Borodin 1984). The main types of protected areas, established during the Soviet era, are nature reserve (*zapovednik*), nature sanctuary (*zakaznik*), national park, and state hunting reserve. Nature reserves are the most strictly protected, while nature sanctuaries are partial reserves, offering protection for a specific period of time or where some economic activities are allowed. In 1996, there were 90 *zapovedniks* covering almost 23 million hectares (*c.*1.5% of the country). National parks have a mix of objectives, including tourism and amenity use, as well as wildlife conservation. Hunting reserves are managed for one or more game species and, although controlled hunting of designated species is allowed, they are usually well protected. Russia has a network of long-established and well-managed protected areas, though antelopes are poorly represented in them. The only protected

area within saiga range is Cherniye Zemli Biosphere Reserve (93,800ha), which was established in 1990 to conserve the steppe and semidesert ecosystem of Kalmykia, but only small numbers of saiga occur there. A nature sanctuary was established in Gorno-Altai Region for Mongolian gazelle, but the species is now extinct in this area.

The Russian Society for Nature Conservation is the largest NGO in the country concerned with wildlife conservation. Unfortunately, all organisations working in the wildlife conservation sector, both state and private, have been adversely affected by a catastrophic lack of funding since the dissolution of the USSR. The consequences are a drastic curtailment of scientific research, greatly reduced budgets for protected area management, and withdrawal of much of the anti-poaching effort as even basic necessities, such as fuel for vehicles, have become unavailable.

Conservation measures proposed

The Kalmykia Department of Environmental Protection already devotes much effort to anti-poaching activities and stations inspection teams in calving areas. However, resources have fallen to very low levels and staff salaries, funds for transport, and basic equipment are all inadequate. The commercial harvest is still banned. However, it is imperative to realise that a complete ban on hunting, even for a substantial period of time, does not have a positive effect on the saiga on its own when the habitat is subject to such heavy pressure. A wide-ranging strategy is needed to reverse declines in saiga range and numbers. This will have to include measures to combat desertification and salination of the rangelands. The problem of overgrazing may have to be addressed through some kind of compensation scheme. Strict control of any harvest of saiga horn needs to be retained by the state authorities, and the possibility of raising saiga on game farms, for their horns or for foreign sport hunters, should also be investigated (Zhirnov and Maksimuk 1994; Teer *et al.* 1996). Restoration of the Mongolian gazelle in Russia is dependent on an increase in the Mongolian population and subsequent expansion back towards the border.

Species accounts

Mongolian Gazelle or Dzeren (*Procapra gutturosa*)

Distribution and population: Mongolian gazelles formerly occurred in three areas of eastern Russia bordering Mongolia (Fig. 31.1): the Chuya or Chuiiskaia Steppes of the Kosh-Agach Region in the Altai; the southern part of Tuva Autonomous Republic south of the Tannu-Ola Range and the northern edge of the Uvs Nuur Basin; and southeast Transbaikalia, on the steppes between the Rivers Onon and Arguni, penetrating north to about $50^0$30' (Heptner *et al.* 1961). In the past, the species occasionally reached the Selenga Valley (Bannikov 1954). There is no longer a permanent population of Mongolian gazelle in Russia. They disappeared from Tuva and the Chuya Steppe as their range in Mongolia contracted and, in recent years, they have only occurred in Transbaikalia. Even there, occurrence is only sporadic and depends on migrations from the core population in Mongolia. Mongolian gazelles have appeared in Russia during all seasons of the year, but mainly in winter. During the 1930s and 1940s, hundreds were seen regularly on the Chuya Steppe, along the Tes-Khem River in southern Tuva and in the Uvs Nuur Basin. They were most numerous in Transbaikalia, where in a few winters (e.g., 1925–26 and 1944–45) several thousand were seen (Bannikov 1954; Heptner *et al.* 1961). By the mid-1970s, total numbers reaching Transbaikalia were at most 200 and, from 1975 to 1981, only small groups and individual animals were seen between the Onon and Arguni Rivers (Borodin 1984).

Habitat, food and reproduction: They primarily inhabit steppes, but also river valleys and intermontane basins. They prefer level or gently hilly terrain, and ascend valleys and plateaux up to 1,500–2,000m.

Status within the country: Endangered.

Conservation measures taken: Listed as Endangered in the national Red Data Book (Borodin 1984) and protected by law. A nature sanctuary was created in Gorno-Altai Autonomous *oblast* (region) for conservation of this species, though it no longer occurs there. Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: Strengthening the enforcement of the ban on hunting will safeguard animals wandering from Mongolia, and may eventually allow the establishment of a permanent population.

Saiga (*Saiga tatarica*)

Distribution and population: Current distribution is limited to steppes and semideserts southwest of the Volga River and northwest of the Caspian Sea in the Autonomous Republic of Kalmykia (Fig. 31.1). Current distribution covers only 20,000–25,000km^2, a significant reduction from the 100,000–120,000km^2 occupied when their range was at its greatest extent in 1957–60. Numbers were about 148,000–160,000 from 1985 to 1993, compared with the 1957–60 estimates of 600,000–800,000. A sudden drastic decline has occurred and numbers are now estimated to be no more than 25–30,000. In severe winters, saiga may penetrate south to Dagestan in the eastern Caucasus. Much former habitat has been degraded by overgrazing, converted to agricultural land, or subjected to construction of irrigation canals and roads. Traditional migration routes have been interrupted, and saiga no longer move between different summer and winter ranges.

Habitat, food and reproduction: Current range is in sub-optimal, semidesert habitat, where saiga have been

driven by livestock competition and hunting pressure. Sixty-seven species of plants from 25 families have been recorded in the diet; the most important are grasses (Graminae), *Kochia prostrata*, *Salsola* spp., *Artemisia* spp. and *Ephedra distichya* (Bannikov *et al.* 1961). Mating takes place over a period of seven to 10 days, mainly in mid-December. Males form harems of up to 25 females. Saiga have high fecundity and females are able to breed at the age of eight months. Young are born between the end of April and the end of May; most births occur in mid-May (Bannikov *et al.* 1961).

Status within the country: Endangered. A drastic reduction in numbers and range caused by habitat degradation and poaching has reduced the population to an unstable condition. The population has lost its commercial significance and the official harvest has been banned since 1987. The situation has been made worse by the ineffectiveness of protection, which has sharply decreased in recent years due to insufficient funding, lack of fuel for vehicles, and low wages for the staff. Therefore, mass poaching, combined with the deteriorating conditions of the State Hunting Inspectorate and the degradation of saiga habitat, may bring the population to the edge of extinction in the very near future.

Conservation measures taken: Hunting is controlled through the Kalmykia Department of Environmental Protection. The harvest was closed in 1984 and again from 1987 onwards, except in 1990 when 11,000 were harvested. The Chernye Zemli Biosphere Reserve (93,800ha) was established in 1990 to conserve arid steppe and semidesert habitats in Kalmykia. Its aims include conservation of the saiga, but the relatively small area of the reserve, which contains little suitable habitat, cannot guarantee full protection of the population. The Kalmykia saiga population has been studied for several decades and has greatly contributed to our understanding of the population dynamics of this antelope (Bannikov *et al.* 1961). Global status has been changed to Endangered.

Conservation measures proposed: It is essential to establish seasonal or temporary nature sanctuaries (*zakazniks*) in saiga calving areas and in winter and summer ranges; as much as 200,000ha should be excluded from agricultural use (Zhirnov and Maksimuk 1994). A protected area should be created in northern Dagestan, where saiga migrate during severe winters. To eliminate poaching and strengthen protection of saiga, it is important to increase staffing of the Department of Environmental Protection, provide the wardens with sufficient funding, and supply them with reliable transportation, radio links, night-viewing instruments, and other equipment.

References

Bannikov, A.G. 1954. [*Mammals of the Mongolian People's Republic*]. Academy of Sciences, Moscow (in Russian).

Bannikov, A.G., Zhirnov, L.V. Lebedeva, L.S., and Fandeev, A.A. 1961. [*Biology of the saiga*]. Izdatel'stvo Sel'skokhozyaistvennoi Literatury, Moscow (in Russian). (English translation: Israel Program for Scientific Translations, Jerusalem, 1967).

Borodin, A.M. (Editor). 1984. [*Red Data Book of the USSR*]. Lesnaya Promyshlenost, Moscow (in Russian).

Chan, S., Maksimuk, A.V., and Zhirnov, L.V. 1995. *From steppe to store: The trade in saiga antelope horn*. TRAFFIC International, Cambridge.

Heptner, V.G., Nasimovich, A.A., and Bannikov, A.G. 1961. [*Mammals of the USSR. Artiodactyla and Perissodactyla*]. Academy of Sciences, Moscow (in Russian).

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Sokolov, V., Zhirnov, L., Eremeev, A., and Visyashev, G. 1991. [Hard-currency fever and saiga]. *Okhota i Okhotnich'e Khozyaistvo* 1991(4):1–3 (in Russian).

Teer, J.G., Neronov, V.M., Zhirnov, L.V., and Blizniuk, A.I. 1996. Status and exploitation of the saiga antelope in Kalmykia. Pp. 75–87 *in:* Taylor, V.J. and Dunstone, N. (Editors). *The exploitation of mammal populations*. Chapman and Hall, London.

Zhirnov, L.V. and Maksimuk, A.V. 1994. [Strategy for the protection of saiga]. *Okhota i Okhotnich'e Khozyaistvo* 1994(5):15–17 (in Russian).

Chapter 32. Mongolia

B. Lhagvasuren, S. Dulamtseren, and L. Amgalan

Introduction

Mongolia is situated in the middle of the Asian continent, bordering Russia to the north and China to the south, and it covers an area of 1,565,000km^2 (Fig. 32.1). Mongolia is mountainous in the north and west, and flatter and more open in the east and south. The average elevation is estimated to be 1,580m above sea level. The principal mountain ranges are the Altai (highest point 4,365m), which stretches for 1,500km from the northwest corner of the country southwards, then southeast and east; the Hangai Mountains (3,900m) in central Mongolia; and the Hentei Mountains (2,977m) between the capital, Ulaanbaatar, and the border with Russia. There are other small ranges in the north around Lake Hövsgöl, and several isolated massifs are situated in the desert zone south of the Altai. A small part of the Great Hingan Range lies in the southeastern corner of Mongolia. Otherwise, the east and southeast consist of relatively low, level plains at altitudes of 900–1,500m. There are many large lakes, both fresh and saline; many of these are located in the Great Lake Basin of northwestern Mongolia.

Principal vegetation zones, from north to south, are taiga (coniferous forest), forest-steppe, steppe, semidesert, and desert. There is also a small alpine zone above the treeline in the higher mountains. The taiga zone is an extension of the Siberian taiga and is confined to the northern mountains. The forest-steppe zone is characterised by low hills and mountains whose south- and east-facing slopes are bare and covered with steppe vegetation, while the northern and western slopes are forested. The steppe zone lies almost entirely in eastern Mongolia and consists of level or undulating plains covered with rich pasture. The semidesert zone runs in a broad band from the Uvs Nuur Basin in the northwestern corner of Mongolia across the country to the southeast. It consists of dry plains and hills and contains several patches of steppe and desert vegetation. The desert zone proper (consisting of the Transaltai Gobi and Dzungarian Gobi) lies to the south of the Altai Range. It consists mainly of stone- and gravel-covered plains interspersed with isolated mountains and there are few sandy areas.

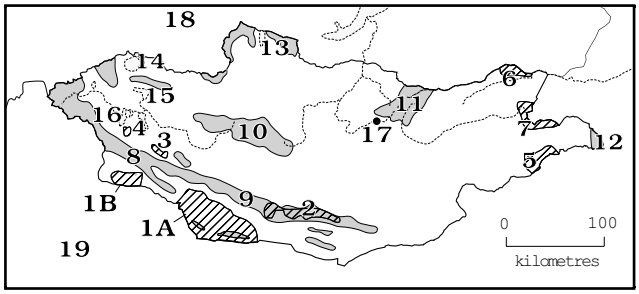


Fig. 32.1 Mongolia. Protected areas containing antelopes: 1. Great Gobi NP (5,311,700ha); 1A. Transaltai Gobi sector; 1B. Dzungarian Gobi sector; 2. Gurvan Saikhan Gobi NCP (2,170,000ha); 3. Sharga NR (286,000ha); 4. Mankhan NR (30,000ha); 5. Dornod-Mongoliin Tal NP (570,400ha); 6. Mongol-Daguur NP (103,000ha); 7. Proposed Kherlen-Menen NP. (NP = national park; NCP = nature conservation park; WR = wildlife reserve). Geographical features and localities mentioned in the text: Mountains (shaded) 8.Mongol Altai; 9. Gobi Altai; 10. Hangai; 11. Hentei; 12. Great Hingan. Lakes: 13. Hövsgöl; 14. Uvs Nuur; 15. Hiargas Nuur; 16. Har-Us Nuur. Other localities: 17. Ulaanbaatar; 18. Russia; 19. China.

The climate is sharply continental with well-marked seasons of the year. It is characterised by large diurnal and annual variations in temperature, low relative humidity and low precipitation, of which approximately 70% falls during the summer months. Annual precipitation ranges from about 50mm in parts of the south to over 400mm in the northern mountains. The average number of days each year with snow cover increases from 60–70 in the south to above 170 in the north. Mongolia's human population is a little over 2.5 million (July 1999 estimate), making it one of the most sparsely inhabited countries of the world.

Table 32.1 Current status of antelopes in Mongolia.

Species	Status[1]	GPS[2]
Goitered Gazelle (*Gazella subgutturosa*)	Vulnerable	40–50%
Mongolian Gazelle (*Procapra gutturosa*)	Satisfactory	92–96%
Mongolian Saiga (*Saiga tatarica mongolica*)	Endangered[3]	100%

[1] *See Chapter 1 for definition of status categories*
[2] *Global population share*
[3] *Global status; endemic to Mongolia*

Current status of antelopes

Antelopes formerly occupied all the steppe, semidesert, and desert zones, which together comprise two-thirds of Mongolia's land area. Three species of antelope occur (Table 32.1): goitered gazelle (*Gazella subgutturosa*), Mongolian gazelle (*Procapra gutturosa*), and saiga (*Saiga tatarica*). Bannikov (1954) suggested that a fourth species, Tibetan gazelle (*Procapra picticaudata*), could be an occasional visitor to the southern desert zone, but there are no confirmed records of its occurrence in Mongolia. These reports should, in any case, probably refer to Przewalski's gazelle (*P. przewalskii*), previously regarded as a race of *P. picticaudata* (Mallon 1985). Relatively light snow cover in winter, the sparse human population density, and other ecological factors have created favourable conditions for antelopes. Nonetheless, all three species have declined significantly over the past 50 years.

Both subspecies of saiga formerly occurred in Mongolia. Distribution of the nominate form (*S. t. tatarica*) extended eastwards into the desert of southwest Mongolia, but it has not been seen in this area for about 40 years and is considered extinct there (Dulmaa and Shagdarsuren 1973; Sokolov *et al.* 1978). The distinctive and endemic Mongolian saiga (*S. t. mongolica*) has an isolated distribution to the north of the Altai Mountains in western Mongolia. Its range has been reduced to about 20% of its original extent and current distribution is restricted to two relatively small areas (Dulamtseren and Amgalan 1995). Male saiga have been systematically hunted for the supposed medicinal properties of their horns and for meat (Zevegmid and Dawaa 1973).

Mongolian gazelles were formerly distributed in steppes and semideserts across the whole country from west to east. Between the 1940s and 1960s, its range was reduced by 70%. Large concentrations still occur in the steppes of eastern Mongolia, but only small, scattered populations remain in central and southern Mongolia. The Ulaanbaatar-Beijing Railway that runs through the habitat of Mongolian gazelle has been fenced on both sides to prevent livestock straying onto the track. This has effectively divided Mongolian gazelle range in Mongolia, preventing movement between populations and hindering recolonisation of former range to the west.

Goitered gazelles have a wide distribution across the semidesert and desert zones of western, central, and southern Mongolia. Although their range and numbers decreased by 30% during the 1940s–1960s, they remain widespread. In recent years, a small increase in numbers has been noted and they have reappeared in some parts of their former range.

Various factors have contributed to the decline of antelope populations, including climate, disease, hunting, and increasing numbers of domestic livestock. Relevant climatic factors are drought and, in particular, the set of severe winter conditions known as *dzuud*, when a frozen ice-crust covers the ground, hindering or preventing access to forage. *Dzuuds* occur irregularly, with the average interval being seven years since records began in 1932. These factors affect all three species of antelopes, causing the death of thousands of animals and resulting in local extinctions. For example, Bannikov (1954) recorded the disappearance of Mongolian saiga from part of the Great Lake Basin following the *dzuud* of 1948. Extensive steppe and forest fires ravaged parts of northern Mongolia during the first half of 1996, but did not affect antelope populations.

Photo 32.1 Mongolian Gazelle (*Procapra gutturosa*).
D. Mallon.

Animal husbandry is a very important part of the Mongolian economy; there were 26.8 million head of livestock in Mongolia in 1994 (Honhold 1995), which compete for grazing and access to water with antelopes and other wild herbivores. The problem of grazing competition is more acute in the desert zone, where resettlement during the last 50 years and increasing use of water-holes by domestic stock have affected wild mammals for some time (Dash *et al.* 1977). In the Gobi, the problem of permanent occupation of water sources by herders and their livestock was made worse by a drought in the 1980s, and several water sources had still not recovered by late 1995 (Reading *et al.* 1995).

Hunting for meat and furs is widespread, both for the domestic market and for export. Foreign exchange is also earned through the sale of licences to foreign hunters. The most highly valued species are ibex (*Capra ibex*) and argali (*Ovis ammon*), but goitered gazelle and Mongolian gazelle are also available to foreign hunters. Hunting is regulated, with closed seasons, licensing, and quotas for most species, but in the sparsely populated interior, law enforcement is difficult. Illegal hunting is widespread and has also contributed to the decline of antelope species.

Illegal hunting and competition with livestock have increased recently as a result of major political and economic changes in Mongolia following its transformation to a market economy and the break-up of the former USSR. The subsequent weakening of central authority, a severe economic crisis, an increase in the growth rate of the human population, and the importance of meat in the Mongolian

diet have all combined to increase the amount of illegal hunting of large mammals, including antelopes (Mallon *et al.* 1997). Many people have reacted to the difficult economic situation by moving from cities back to the countryside. An increase in the number of herding families has occurred, as well as an increase in livestock numbers and the use of many new areas for grazing (Honhold 1995).

Mongolian gazelles are an important economic resource and have always been hunted for their high quality meat, tongue, skin, horn, and sub-products (liver, heart, lungs, kidneys, and fat). The durable skin is used for making good quality box-calf and chamois. Previously, most of the meat was exported, but in 1993 all of it remained in Mongolia. Hunting has been state controlled since 1932. The government hunting organisation carries out an annual harvest during the official hunting season, from 15–20 November until 10 December, stopping just before the peak of the rutting season. Over 100,000 gazelles were harvested annually by the state during 1941–45 (Bannikov 1954) and the official harvest remained relatively high until 1978, when hunting was temporarily banned (Sokolov *et al.* 1982). About 18,000 were harvested in 1992 and a quota of 10,000 was set for 1993. However, in addition to the official harvest, poaching is carried out on a large scale and is a serious threat. Poaching is also selective for males, reinforcing the selectivity of the official harvest. Calculations suggest that each year poachers hunt approximately 80,000 animals in total, at least 80–85% of which are male (Lhagvasuren and Milner-Gulland 1997). This figure includes animals shot by Chinese border guards actively hunting Mongolian gazelles as they migrate across the border. A further important consideration is the interaction between harsh winters and hunting on gazelle population dynamics, so that as hunting mortality rates increase, the influence of *dzuuds* on the population will be proportionally greater (Milner-Gulland 1994). Periodic epidemics also influence the Mongolian gazelle population. In 1974, for example, an unknown disease killed about 140,000 gazelles in eastern Mongolia (Sokolov *et al.* 1982). The same type of epizootic has occurred regularly since then, but with fewer deaths. A major die-off of gazelles occurred in summer 1998 following an outbreak of bacterial infection (Schaller and Lhagvasuren 1998).

Conservation measures taken

Legislation on hunting in Mongolia appeared as early as the 13th century, when laws were issued forbidding the hunting of swans and birds of prey (Namnandorj 1976). In the 16th and 17th centuries, laws with the title "Oird tsaaz" and "Khalkh juram" contained defined periods for hunting. In 1930, the Law on Hunting prohibited the hunting of saiga. Further legislative measures in 1965 banned hunting of goitered gazelle, and the hunting of Mongolian gazelle from motor vehicles was also banned. Several new laws have been passed recently or submitted to the Great Khural (Parliament). The most important of these are the Protected Areas Law of 1994, the Hunting Law of 1994, and a Land Law (Wingard 1996). Saiga and goitered gazelle were listed as threatened species in the national Red Data Book (Shagdarsuren 1987).

Primary responsibility for wildlife conservation rests with the recently established Ministry for Nature and the Environment, which published a Biodiversity Conservation Action Plan in 1996. The National Commission on Endangered Animals is another new government body. Mongolia recently became a signatory to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Biodiversity Convention. The Mongolia Biodiversity Project, administered by UNDP and funded by the Global Environment Facility, began in 1993. Its work has included endangered species, protected areas, training programmes, and wildlife research (Mallon *et al.* 1997).

Mongolia's protected area system has expanded considerably since 1991. The most significant measure for antelope conservation came in 1993, when Sharga Nature Reserve (286,900ha) and Mankhan Nature Reserve (30,000ha) were created to protect the two remaining areas of distribution of Mongolian saiga. Great Gobi National Park was established in 1976 and recently became a biosphere reserve. It consists of two sectors situated in the Dzungarian Gobi and Transaltai Gobi of the southern desert, and covering a total of 5,311,700ha. Goitered gazelles occur in both sectors of Great Gobi National Park, in Gurvan Saikhan Gobi National Conservation Park (2,170,000ha) in the South Gobi and in Sharga and Mankhan Nature Reserves. The German Technical Co-operation Advisory Organisation (GTZ) began a 10-year project in 1994 to strengthen management of protected areas in South Gobi. A number of new reserves have been proposed for the south Gobi, and goitered gazelles are expected to occur in several of these. In eastern Mongolia, Dornod-Mongol National Park (570,400ha) and Mongol Daguur National Park (103,000ha) were established in 1992 with support from World Wide Fund for Nature. Dornod-Mongol National Park lies within the distribution of Mongolian gazelle, but is not an area of major importance for this species, and Mongol Daguur National Park is even more peripheral to its distribution.

The Mongolian Association for Conservation of Nature and Environment (MACNE) is a voluntary organisation concerned with wildlife conservation and has over 320,000 members. The Society for the Conservation of the Mongolian Gazelle was formed by Mongolian scientists and specialists concerned with this species. Both of these NGOs collaborate on nature conservation measures with foreign and international organisations. Most field research on wildlife has been carried out by scientists of the Institute of General and Experimental Biology of the Mongolian Academy of Sciences, the Mongolian National and

Pedagogical Universities, and recently, the Forestry and Hunting Institute of the Ministry for Nature and the Environment. Mongolian scientists have conducted many joint zoological expeditions and conservation research projects with scientists from the former USSR, East Germany, Poland, and Hungary, as well as with international organisations, such as WWF, Wildlife Conservation Society, and Nature Conservation International. Hunting is co-ordinated by the Mongolian Hunters Society, which works closely with companies that organise hunting tours for foreigners.

Conservation measures proposed

To assure the long-term future of viable antelope populations, the problems of illegal hunting and grazing competition need to be addressed. Enforcement of the existing laws is difficult over such large sparsely inhabited areas but steps should be taken to improve this. Livestock numbers seem likely to continue to increase, further limiting the access of antelopes to grazing land and water. Where this problem is most acute, such as in the Transaltai Gobi, management plans to regulate use of water sources may have to be formulated. Any proposed development of new water sources needs careful consideration to ensure that it does not lead to further increases in numbers of people and livestock in the region, as has happened in the past.

An extension corridor to the Dornod-Mongol National Park has been proposed to protect migration routes and calving grounds of the Mongolian gazelle. The proposed Kherlen-Menen Reserve on the eastern border will protect part of the Menengiin Tal Steppe, which is also of importance for Mongolian gazelle and which could form the basis of a trans-border reserve for this species. These, and other proposals to extend existing protected areas and create new ones, should be ratified as soon as possible. This is particularly important in the case of the proposed extension to the Dornod-Mongol National Park, which will protect calving areas of the Mongolian gazelle. The existing protected area network needs managing by trained personnel and should be provided with adequate financial resources. The importance of wildlife conservation, in general, needs to be promoted through education programmes for the public, especially herding families. Translocations of Mongolian gazelle have proved successful in helping to increase one isolated population in the west of the country. This could be an effective way of restoring other scattered populations that are isolated to the west of the Ulaanbaatar-Beijing Railway.

Species accounts

Goitered Gazelle (*Gazella subgutturosa*)

Distribution and population: Goitered gazelles formerly occupied the whole of the semidesert and desert zones, northwest through the Great Lake Basin to the basin of Lake Khiargas Nuur at 49^0N (Bannikov 1954). Their range has contracted by about 30% during the last 70 years, and they are no longer found in the Khiargas Nuur area. Current range (Fig. 32.2) covers *c.* 470,000km^2 and extends east to about 113^0E in the Ongon District of Sukhbaatar *aimag* (province). Some areas of former habitat are being reoccupied as numbers slowly increase. Numbers decreased sharply in the 1950s and 1960s (Tsevegmid and Dashdorj 1974). Recent estimates of the population are about 53,000 (Shagdarsuren 1987) and 60,000 at the beginning of the 1990s (Amgalan 1995). Numbers are currently believed to be increasing slowly.

Habitat, food and reproduction: Occupies deserts and semi-deserts, valleys, and mountain slopes, ascending in summer to an altitude of 2,700m (Bannikov 1954; Sokolov *et al.* 1978; Amgalan 1984; 1995). The most important food items recorded are *Stipa gobica*, *Anabasis brevifolia*, *Allium* spp., and *Halogeton* sp. (Bannikov 1954). In spring, autumn, and dry summers, gazelles move over short distances in search of water and pasture. The rut takes place in December and females give birth in June of the following year, usually to two young.

Status within the country: Vulnerable. Still threatened in places by illegal hunting and susceptible to the effects of *dzuud* conditions in winter. In the desert zone, competition with domestic livestock has increased and permanent occupation of waterholes by livestock prevents gazelles from gaining access to water.

Conservation measures taken: Hunting was completely forbidden in 1965. In 1987, goitered gazelle was listed in the *Red Book of the Mongolian Peoples' Republic* in the lower category of threat (Shagdarsuren 1987). Goitered gazelles occur in both sectors of the Great Gobi National Park (2000 estimated by Long 1989), Gurban Saikhan Nature Conservation Park, Sharga Nature Reserve (286,900ha), and Mankhan Nature Reserve (30,000ha). Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: It is important to regulate water sources so they are available for gazelles and to strengthen controls on illegal hunting. Goitered gazelle should occur in several new protected areas proposed for the

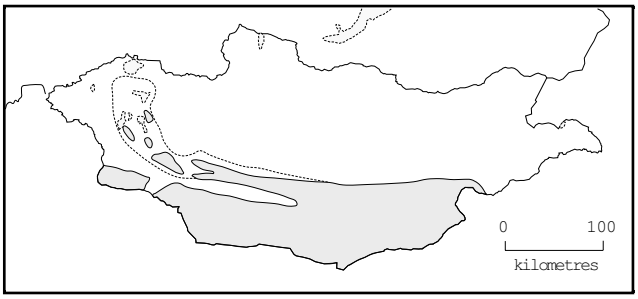


Fig. 32.2 Current distribution of goitered gazelle *(Gazella subgutturosa)* in Mongolia (shaded) and approximate distribution in the 1940s (broken line).

South Gobi area. Reintroduction of the species to the northern part of the Great Lakes Basin could be considered.

Mongolian Gazelle or Dzeren (*Procapra gutturosa*)

Distribution and population: Until about 1950, Mongolian gazelles were distributed over almost all the steppe and semidesert zones of the country within a range of 780,000km^2, and they numbered 1,500,000 (Bannikov 1954). Their range has now been reduced to about 190,000km^2, 24% of what it was 50 years ago (Fig. 32.3). Mongolian gazelles were once common in the west of the country, but by the end of the 1970s, this species had virtually disappeared from western Mongolia and only one isolated population now remains on the Khomin Tal Steppe in Zavhan *aimag* (province) to the southeast of Har-Nuur Lake. This population has been augmented by transfers of animals from eastern Mongolia and is currently increasing. A few scattered herds occur in central and southern Mongolia (Lhagvasuren and Milner-Gulland 1997). The centre of Mongolian gazelle distribution lies in the eastern steppes, mainly in Dornod, Khentii, Sukhbaatar, and Dornogov provinces, where they have always been most common. Mongolian gazelles in central and western Mongolia are effectively isolated from the large eastern population by the fenced Ulaanbaatar-Beijing Railway line, so recolonisation of their former range is, therefore, unlikely by natural means. The present size of the population in Mongolia is unclear. Bannikov (1954) estimated the population at about 1,000,000 in the 1940s. Recent estimates have put their numbers at 250,000–270,000 in 1978 (Tsagaan 1980), 180–200,000 in 1975–1976, 250,000 in 1979, and 300,000–400,000 in 1982 (Lushchekina 1990). From an aerial survey in 1989, Mongolian zoologists estimated a population of about 400,000. However, another aerial survey in 1994 carried out jointly by Nature Conservation International, the UNDP Mongolian Biodiversity Project, and Mongolian zoologists, estimated a population of about 2,000,000 gazelles (Lhagvasuren and Milner-Gulland 1997). This figure needs verification by another survey at the same time of year. Most of the population is concentrated in the eastern steppes. In the early 1990s, only about 25,000 animals were counted to the west of Ulaanbaatar-Beijing Railway. A 1995 survey showed that the Khomin Tal population has risen to more than 3,500 gazelles and that it continues to increase. An outbreak of foot rot, a bacterial infection caused by *Fuscobacterium necroforum* causing swelling of the feet above the hooves, killed large numbers of gazelles during summer 1998 and resulted in cancellation of the commercial hunt in 1998 (Schaller and Lhagvasuren 1998).

Habitat, food and reproduction: Mongolian gazelles inhabit plains, hilly steppes, semideserts, intermontane basins, and broad valleys. They avoid rocky or broken terrain, narrow valleys, high-altitude steppes, forests, shrub thickets, and

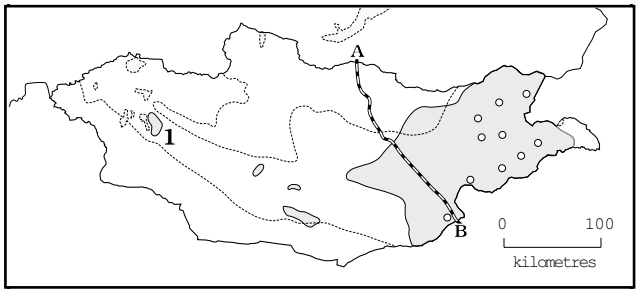


Fig. 32.3 Current distribution of Mongolian gazelle *(Procapra gutturosa)* in Mongolia (shaded) and approximate distribution in the 1940s (broken line). Open circles denote major calving areas. 1. Khomin Tal. A-B = Moscow-Ulaanbaatar-Beijing railway line.

sand dunes, unless driven there by exceptional circumstances (Bannikov 1954). The dry steppes of eastern Mongolia form the optimal habitat for Mongolian gazelles. This consists of level or undulating, arid steppes at altitudes of 800–1000m, with average annual precipitation of 200–300mm and low levels of human disturbance (Sokolov *et al.* 1982; Lushchekina *et al.* 1985). Vegetation is typically dominated by feather grasses (*Stipa* spp.) with *Artemisia frigida*, *Anabasis brevifolia*, *Nanophyton erinaceum,* and *Allium polyrrhiza* (Bannikov 1954; Lushchekina *et al.* 1985). The main food plants are *Allium polyrrhizum, Stipa capillata, S. gobica, Agropyrum pseudoagropyrum, Kochia prostrata, Koeleria gracilis,* and *Artemisia* spp. (Lushchekina *et al.* 1985). *Allium* makes up about 80% of the stomach contents in August (Lushchekina 1990). The rut takes place between mid-November and the first week of February, although dates vary from year to year depending principally on climate. One male can mate with six to 25 females, but the average harem size is 13 females. Males are sexually mature at the age of two and a half years and females at one and a half years. Females usually give birth from mid-June to mid-July, but about 90% of females giving birth do so over a period of only four to seven days. Occurrence of twins is 2.5–8.2% (Lhagvasuren 1985; Lushchekina 1990). The annual rate of population increase has been 19–29% in recent years, with various factors, such as climate, disease, and hunting, affecting the figure from year to year (Lhagvasuren 1985; 1990; Lushchekina 1990). Mongolian gazelle occur singly and in small groups, commonly 20–30. Larger assemblies take place in June–July, when females gather in huge herds during the calving period, when 40,000 animals may remain for two weeks within an area of 35km^2, and again in August–September, when as many as 80,000 have been observed together. Only during the mating and birthing seasons do they stay in particular places for a short time. Otherwise they move constantly around their range. Part of the population migrates annually across the Mongolia-China border, migrating to China in March–April and back to Mongolia in August–October (Tsagaan 1980). During migration, gazelles can easily cover 40–80km per day. Movement

patterns in general are still poorly understood. Distribution is also influenced by plagues of the vole *Lasiopodomys brandti.* Over the last 10 years, a sharp increase in the vole population has degraded pastures over a huge area of Dornod and Sukhbaatar provinces, and the gazelles have left these areas and moved north (Lhagvasuren and Milner-Gulland 1997).

Status within the country: Satisfactory. Although a large range reduction has occurred during the past 40–50 years, the population has not declined significantly over the past 10 years and some increase has been noted in a few areas. The core population in the eastern steppes seems to be secure at present, particularly if the recent census figure of 2,000,000 proves to be accurate.

Conservation measures taken: Mongolian gazelles are harvested by the state hunting organisation, with quotas set annually. Unlicensed hunting is prohibited by law. In 1995, a new hunting law set a fine of 150,000–320,000 tugriks ($30–$40) for each gazelle killed illegally. Despite the law, illegal or unofficial hunting of Mongolian gazelle is common and widespread. Some gazelles occur in Dornod-Mongol National Park (570,400ha) and Mongol Daguur National Park (103,000ha), which were established in 1992. Neither of these protected areas is of major importance for this species. The wolf (*Canis lupus*) is the main natural predator of Mongolian gazelles and, in several areas of eastern Mongolia, wolves are controlled to protect livestock, a measure which also benefits gazelles. An attempt to re-establish Mongolian gazelle in the west of the country was made in 1978, when several adults were transferred by air to an area in Uverkhangai Province, but the outcome is unknown. A second, successful project was carried out in 1988–1990, when a total of 600 gazelles were transported by air from eastern Mongolia to the Khomin Tal Steppe in Dzavkhan Province, where the local gazelle population had decreased to about 600 animals. Numbers of Mongolian gazelle there exceeded 3,500 in 1996 (Lhagvasuren and Milner-Gulland 1997). Biological and ecological research on the Mongolian gazelle is carried out by the Institute of General and Experimental Biology of the Mongolian Academy of Science. From 1975 to 1985, it was studied by a team from the Joint Biological Expedition of the Mongolian and Soviet Academies of Science. Although a lot of research has been carried out on the species, a number of questions remain to be answered. Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: Probably the most important long-term measure is to strengthen anti-poaching activities and ensure that hunting is managed on a sustainable basis. This should be carried out through creation of a management programme for the major populations of Mongolian gazelle, and should include information and education about the gazelle for local people. An extensive northwestward extension corridor to the Dornod-Mongol National Park has been proposed in order to protect migration routes and especially calving grounds. The proposed Kherlen-Menen Nature Reserve on the eastern border is situated in an area important for Mongolian gazelle, and it could form the basis of a trans-border reserve. Joint agreements between Mongolia, China, and Russia on the conservation of Mongolian gazelles in areas where their range is adjacent to or crosses national borders are also important. Protective measures are especially needed in rutting and calving areas. Aerial surveys should be conducted twice a year (before young are born and at the start of the hunting season). Detailed research on migration routes, using satellite telemetry, and investigation of epidemics and their causes should be conducted. Further translocations of gazelles to areas of former habitation in western and central Mongolia may be appropriate, if factors which caused the original decline have been addressed.

Saiga (*Saiga tatarica*)

Distribution and population: The nominate subspecies *S. t. tatarica* once occurred in the Dzungarian Gobi of southwestern Mongolia, but became extinct there about 40 years ago (Bannikov 1954; Dulmaa and Shagdarsuren 1973; Sokolov *et al.* 1978; Shagdarsuren 1987). The range of the endemic Mongolian subspecies *S. t. mongolica* is separated from that of the nominate form by the Altai Mountains. Mongolian saiga originally occurred from the Uvs Nuur Basin, in the northwest corner of Mongolia, southeastwards through the Great Lakes Basin to the Khuisiin Gobi and Shargyn Gobi. Saiga were occasionally recorded further to the southeast in the lake basins of Beger Nuur, Boon Tsagaan Nuur, and Orog Nuur, east to approximately 101^0E (Bannikov 1954; Namnandorj 1976). During this century, their range has contracted significantly, especially in the southeast, to about 20% of the original extent. Current distribution is in two areas (Fig 32.4). The main population is situated in the Shargyn Gobi, a semidesert basin lying north of the Gobi Altai Range, at altitudes of 1,000–1,900m and covering an area of more than 2,000km^2 (Dulamtseren and Amgalan 1995). The second population consists of a remnant in Mankhan District, situated to the south of Lake Khar Us Nuur and some 200km to the north of Sharga. This area covers about 200km^2 and lies at elevations of 1,200–2,000m. The Sharga population was described as being on the verge of extinction by Zevegmid and Dawaa (1973) and was estimated at only 200 by Dash *et al.* (1977). Improved protection allowed a recovery to take place and, during the last 15 years, numbers have fluctuated between 600 and 1,600. A survey in summer 1999 by the Institute of Ecology and Evolution, Moscow and WWF-Mongolia estimated the population at around 3,000 (E.J. Milner-Gulland *in litt.*) However, the Mankhan population has steadily decreased for the last 20 years, from 200 to 35 animals, and is now on the verge of complete disappearance (Dulamtseren and Amgalan 1995). A survey of Sharga in 1997 found an

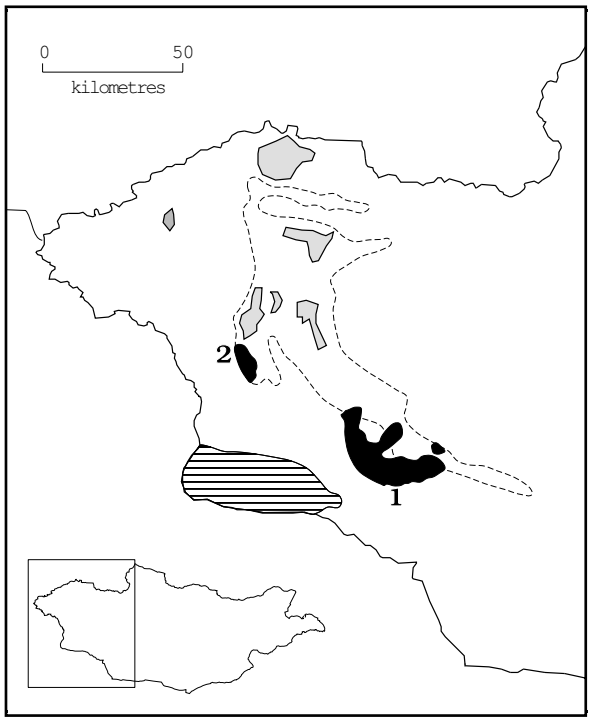


Fig. 32.4 Current distribution of Mongolian saiga (*S.t. mongolica)* (black) and approximate distribution in the 1930s. 1. Sharga population; 2. Mankhan population. The approximate distribution of the nominate form of saiga (*S.t. tatarica)* in the 1930s is also shown (hatched).

expansion of range to the northeast, but this may represent a temporary movement due to drought (Lushchekina *et al.* 1999). Between 1985–89, 54 Mongolian saiga were transferred from Sharga to the Transaltai Gobi in an attempt to establish a new population, but the results are unknown (Lushchekina *et al.* 1999).

Habitat, food and reproduction: Typical habitat consists of level or gently sloping semidesert and shallow stony slopes at altitudes of 900–1,600m. They avoid even slightly broken terrain, deserts, and bushy areas. Saiga frequently move around their range, depending on the availability of water and forage, but unlike the nominate form, Mongolian saiga do not undertake large-scale migrations. In winter, they gather in herds of up to 50. During the summer, herds separate into small groups or individual animals. Saiga feed on more than 30 species of plants, especially from the genera *Stipa*, *Allium,* and *Anabasis*. In spring, autumn, and drought-afflicted summers, they use water sources and, in winter, they quench their thirst with snow. When *Allium* and other vegetation is abundant, however, they do not need to go to water (Dulamtseren and Tulgat 1993). Mating takes place in January and young are born between May and mid-June. About 16–20% of the births consist of twins. Males gather harems and fight for possession of females, often resulting in serious injury. Reproduction in females begins at the age of 19 months, and at 30 months in most males (Dulamtseren and Amgalan 1995).

Status within the country: Endangered. One of the rarest mammal species in Mongolia. The population is small and subject to wide fluctuations, its range is limited, and it is subject to constant competition with domestic livestock for pasture and access to water (Dulamtseren and Amgalan 1995). Numbers of livestock have increased considerably in recent years. Mongolian saiga are also susceptible to the effects of drought and *dzuud* conditions in winter. In addition, Mongolian saiga are affected by a parasitic botfly (*Pallasiomyia antilopum*); mass subcutaneous infestation by the larvae can debilitate the animals and may be a serious limiting factor. The parasite also affected the nominate form of saiga, but disappeared from the countries of the former Soviet Union when saiga numbers dropped to extremely low levels in the first part of the century (Lushchekina *et al.* 1999). Poaching occurs although apparently at a low level, though this still a concern.

Conservation measures taken: Saiga were first granted legal protection in 1930 and were listed in the most threatened category of the national Red Data Book (Shagdarsuren 1987). In 1993, Sharga Nature Reserve (286,900ha) and Mankhan Nature Reserve (30,000ha) were established to protect the two remaining populations, but no practical management measures have been implemented in the two reserves. The Institute of General and Experimental Biology of the Academy of Science of Mongolia has carried out research on the behaviour, biology, and ecology of the species and has investigated captive-breeding and reintroduction. Global status of *S. t. mongolica* is Endangered (IUCN 1996). The nominate subspecies has been recently reassessed as Endangered.

Conservation measures proposed: Further work on captive-breeding of saiga is vital to facilitate reintroduction to former areas of their range. To conserve existing populations it will be necessary to: intensify the campaign against poaching; regulate livestock access to pastures and water sources; reduce the number of new vehicle routes passing through the saiga's range to prevent disturbance; continue ecological and behavioural studies of this species; and implement an ongoing monitoring programme of the population. In addition, a suitable site for translocation should be identified within the former range in the Great Lakes Basin in order to establish a new subpopulation.

References

Amgalan, L. 1984. [Particularities of the distribution of goitered gazelle herds in Jungarian Gobi]. *Trudy Instituta Obshchei i Eksperimental'noi Biologii* 19:208–213.

Amgalan, L. 1995. [Distribution and population dynamics of goitered gazelle in Mongolia]. *In:* [Theses of reports of the conference "Biology – 30 years"]. Mongolian Academy of Sciences, Ulaanbaatar (in Mongolian).

Bannikov, A.G. 1954. [*Mammals of the Mongolian Peoples Republic*]. Moscow, Academy of Sciences (in Russian).

Dash, Y., Szaniawski, A., Child, G.S., and Hunkeler, P. 1977. Observations on some large mammals of the Transaltai, Djungarian and Shargyn Gobi, Mongolia. *La Terre et la Vie* 31:587–597.

Dulmaa, A. and Shagdarsuren, O. (Editors). 1973. [*Game animals and hunting protection in Mongolia*]. Ulaanbaatar (in Mongolian).

Dulamtseren, S. 1970. [*Guide to the mammals of the Mongolian People's Republic*]. Academy of Sciences, Ulaanbaatar (in Mongolian).

Dulamtseren, S. and Amgalan, L. 1994. Daten zur Reproduction der mongolischen Saiga-antilope (Saiga tatarica mongolica Bannikov 1946). *Beiträge zur Jagd und Wildforschung* 19:125–127.

Dulamtseren, S. and Amgalan, L. 1995. [Distribution and contemporary population of Mongolian saiga (*Saiga tatarica mongolica* Bannikov)]. Pp. 45–51 *in:* Badamkhand, Zh. (Editor). [*Natural conditions and biological resources of the Great Gobi Reserve*]. Ministry of Nature, Ulaanbaatar (in Mongolian).

Dulamtseren, S. and Tulgat, R. 1993. [Account of the census of Mongolian saiga in Shargyn Gobi]. Unpublished report, Institute of Biology of the Mongolian Academy of Sciences, Ulaanbaatar (in Mongolian).

Ganzorig, S. and Dash, Ya. 1982. [*The organization of Mongolian gazelle herds in the summer*]. Works of the Institute of General and Experimental Biology of the Mongolian Academy of Sciences, Ulaanbaatar (in Russian).

Ginsberg, J.R. and Milner-Gulland, E.J. 1994. Sex-biased harvesting and population dynamics: Implications for conservation and sustainable use. *Conservation Biology* 8:157–166.

Honhold, N. 1995. [Livestock population and productivity and the human population of Mongolia, 1930 to 1994]. Ministry of Food and Agriculture, Ulaanbaatar (in Mongolian).

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Khaidav, Ts., Tsendem, Ts., Purevsuren, G., Tchanginjav, L., Dondov, P., Dash, Ya., and Neronov, V.M. 1986. [A preparation from the horns of the Mongolian Gazelle] *In:* [Prirodniye usloviya biologicheskiye resursi MNR]. Moscow (in Russian).

Lhagvasuren, B. 1985. Dynamics of Mongolian gazelle numbers and recent population status. In: *Science-Youth*. Mongolian Academy of Sciences, Ulaanbaatar (in Mongolian).

Lhagvasuren, B. 1990. [Population ecology of Mongolian gazelle. Report of field work 1981–1990]. Unpublished report. Mongolian Academy of Sciences, Ulaanbaatar (in Mongolian).

Lhagvasuren, B. and Milner-Gulland, E.J. 1997. The status and management of the Mongolian gazelle *Procapra gutturosa* population. *Oryx* 31:127–134.

Long, G. 1989. Mission report on Mongolia. Report to UNESCO/MAB Committee of the Mongolian People's Republic.

Lushchekina, A.A. 1990. [Eco-geographical basis for conservation and rational use of Mongolian gazelle in Mongolia]. Abstract of PhD thesis. Russian Academy of Sciences, Moscow (in Russian).

Lushchekina, A.A., Dulamtseren, S., Amgalan, L., and Neronov, V.M. 1999. The status and prospects for conservation of the Mongolian saiga *Saiga tatarica mongolica*. *Oryx* 33:21–30.

Lushchekina, A., Neronov, V., Ogureeva, G., and Sokolova, A. 1985. Verbreitung, Ökologie und Schutz der Mongolischen Kropfantilope, *Procapra gutturosa* Pallas, 1777. *Archiv für Naturschutz und Landschaftsforschung* 25:57–69.

Mallon, D.P. 1985. The mammals of the Mongolian People's Republic. *Mammal Review* 15:71–102.

Mallon, D.P., Bold, A., Dulamtseren, S., Reading, R.P., and Amgalanbaatar, S. 1997. Mongolia. Pp. 193–201 *in:* Shackleton, D.M. (Editor). *Wild sheep and goats and their relatives. Status survey and conservation action plan for Caprinae*. IUCN, Gland, Switzerland and Cambridge, UK.

Milner-Gulland, E.J. 1994. A population model for the management of the saiga antelope. *Journal of Applied Ecology* 31:25–39.

Ministry for Nature and the Environment. 1996. Biodiversity conservation action plan for Mongolia. Ministry for Nature and the Environment, Ulaanbaatar.

Namnandorj, O. 1976. [*Nature reserves and animals of the MPR*]. Ulaanbaatar (in Mongolian).

Reading, R.P., Amgalanbaatar, S., Batbold, J., and Boldgev, B. 1995. Biological assessment of Three Beauties of the Gobi National Conservation Park, with recommendations for special zone (core area) locations, tourist routes, and park management. Unpublished report, German Technical Advisory Group (GTZ) and the Ministry for Nature and the Environment, Ulaanbaatar.

Shagdarsuren, O. (Editor). 1987. [*Red book of the Mongolian People's Republic*]. Academy of Sciences, Ulaanbaatar (in Mongolian).

Schaller, G.B. and Lhagvasuren, B. 1998. A disease outbreak in Mongolian gazelles. *Gnusletter* 17(2):17–18.

Sokolov, V.E., Dulamtseren, S., Hotolhuu, N., and Orlov, V.N. 1978. [Rare ungulate species of the Great Gobi nature reserve of the MPR: contemporary condition and perspectives]. Pp. 7–10 *in:* [*Geography and dynamics of the plant and animal life of the MPR*], vol. 10. Moscow (in Russian).

Sokolov, V.E., Dash, Ya., Lushchekina, A.A., and Neronov, V.M. 1982. [Contemporary distribution and population of the dzeren in the MPR]. Pp. 7–21 *in:* [Zoological researches in the MPR]. Moscow (in Russian).

Tsagaan, S. 1980. [*Distribution, migration, herd structure and numbers of the Mongolian gazelle*]. Works of the Institute of General and Experimental Biology of the Mongolian Academy of Sciences, Ulaanbaatar (in Mongolian)

Tsevegmid, D. and Dashdorj, A. 1974. Wild horses and other endangered wildlife in Mongolia. *Oryx* 12:361–370.

Wingard, J.R. 1996. Report on Mongolian environmental laws. Mongolia Biodiversity Project, Ministry for Nature and the Environment, Ulaanbaatar.

Zevegmid, D. and Dawaa, N. 1973. Die seltenen Grossäuger der Mongolischen Volksrepublik und ihr Schutz. *Archiv für Naturschutz und Landschaftsforschung* 13:87–106.

Chapter 33. China

Zhigang Jiang and Wang Sung

Introduction

The People's Republic of China is the largest country in Asia, almost as large as all of Europe and covering an area of 9,560,900km^2. At its greatest extent, the country stretches for about 4,000km from the Pacific Ocean in the east to the Sino-Kazakhstan border in the west, and about 3,200km from its southern frontier with Vietnam to the northern border at the Heilongjiang River. China has land borders with 14 countries and a long eastern coastline (Fig. 33.1). The human population, almost 1.2 billion, is the world's largest.

Topography is extremely diverse and includes humid subtropical plains, deserts, high mountains, and high-altitude, cold desert plateaux. The highest point is Qomolangma (Mount Everest) at 8,848m above sea level while the lowest point, in the Turfan depression, is more than 150m below sea level. Eastern China is generally low-lying and consists broadly of the basins of the Yellow (Huang He), Yangtze (Chang Jiang), and Pearl (Xi Jiang) Rivers. Western China is occupied by a series of mountain ranges, deserts, and plateaux. The Tibetan Plateau, whose average elevation exceeds 4,000m, is the most extensive area of upland. The plateau is bounded on the south by the Himalaya and on the north by the Kunlun Range. Other major mountain ranges in western China are the Tien Shan, Pamir, and Altai. Main areas of desert are the Takla Makan, Tarim Basin, and Dzungarian (Zuangker) Basin. Semideserts and steppes occupy almost the entire northern border area of China through Ningxia and Inner Mongolia. Extensive mountainous areas are also found in Gansu, Sichuan, and Yunnan, south to the borders with Myanmar, Laos, and Vietnam. The Greater Khingan Range runs through northeastern China.

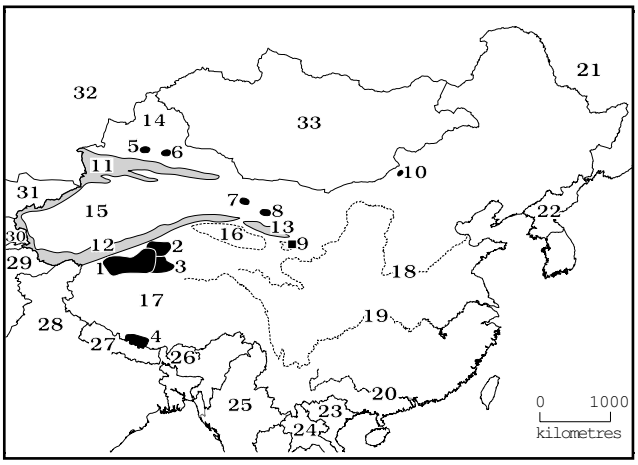


Fig. 33.1. China. Protected areas containing antelopes: 1. Qiantang Nature Reserve (24,712,000ha); 2. Arjin Shan NR (4,512,000ha); 3. Kokoxili NR (4,500,000ha); 4. Qomolangma NR (3,500,000ha); 5. Boghdad Mountain Biosphere Reserve (217,000ha); 6. Kalamaili Mountain NR (1,700,000ha); 7. Yanchiwan NR (424,800ha); 8. Ganhaizi NR (300ha); 9. Bird Island NR (53,550ha); 10. Ludansuolin NR (28,000ha). Geographical features and localities mentioned in the text: 11. Tien Shan Mountains; 12. Kun Lun Mountains; 13. Nan Shan Mountains; 14. Dzungarian Basin; 15. Tarim Basin; 16. Qaidam Basin; 17. Tibetan Plateau; 18. Yellow River; 19. Yangtze River; 20. Pearl River; 21. Russia; 22. North Korea; 23. Vietnam; 24. Laos; 25. Myanmar; 26. Bhutan; 27. Nepal; 28. India; 29. Pakistan; 30. Tajikistan; 31. Kyrgyzstan; 32. Kazakhstan; 33. Mongolia.

China's fauna and flora are characterised by Palaearctic and Indomalayan elements. The boundary between these lies approximately along a line between the Qinling Shan Mountains and Huihe River, with the Oriental region lying

Table 33.1 Current status of antelopes in China.

Species	Status[1]	GPS[2]	Protected status[3]
Goitered Gazelle (*Gazella subgutturosa*)	Vulnerable	?	II
Tibetan Gazelle (*Procapra picticaudata*)	Satisfactory	>99%	II
Przewalski's Gazelle (*Procapra przewalskii*)	Critically Endangered[4]	100%	I
Mongolian Gazelle (*Procapra gutturosa*)	Vulnerable	4–8%[5]	II
Tibetan Antelope (*Pantholops hodgsonii*)	Endangered	100%	I
Saiga (*Saiga tatarica*)	Extinct	–	I

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*
[3]*I = hunting is prohibited; II = hunting is controlled*
[4]*Global status (IUCN 1996), endemic to China*
[5]*Permanent population. More occur seasonally*

to the south of this line and east of the Himalaya. The size of the country, its topographical variety, and its position across two major zoogeographic realms result in great habitat and biological diversity. Seven faunal regions have been recognised in China (Wang *et al.* 1997) and antelopes occur within two of these: Inner Mongolia-Xinjiang and Qinghai-Xizang Plateau. These two regions together cover western and most of northern China. The climate is also very diverse. Much of southern and southeastern China has a subtropical climate; this becomes more continental northwards and westwards. Monsoon rains affect the east coast, while the desert interior of the west has very low rainfall.

Current status of antelopes

Six species of antelopes have been recorded in China (Table 33.1): goitered gazelle (*Gazella subgutturosa*), Tibetan gazelle (*Procapra picticaudata*), Przewalski's gazelle (*P. przewalskii*), Mongolian gazelle (*P. gutturosa*), Tibetan antelope (*Pantholops hodgsonii*), and saiga (*Saiga tatarica*). These are distributed widely across the vast steppes, semideserts, deserts, and alpine grasslands of northern and western China (Allen 1940; Wang 1962; Wang *et al.* 1963; Corbet 1978). Przewalski's gazelle is endemic to China. Tibetan antelope and Tibetan gazelle are virtually endemic, as over 99% of their populations are confined to the country. Mongolian gazelle occurs only in China and Mongolia, and part of its population migrates seasonally between the two countries. Therefore, China has an extremely important role in the conservation of Asian antelopes. Saiga are now extinct in China, mainly as a result of hunting for their horns. During the 1930s, 50,000 pairs of saiga horns were reportedly sold in the traditional medicine market in a single year (Zheng 1994). At the same time, some of their natural habitat was turned into agricultural land. Range and numbers of the other five species of antelopes have also declined in recent decades. In particular, the current status of Przewalski's gazelle is giving serious cause for concern, as the total estimated population was below 150 in 1998. Problems which have adversely affected antelopes include hunting, cultivation of rangelands, habitat degradation, and desertification, increasing competition with domestic livestock, road building, and economic development, as well as growth of the human population. In western Inner Mongolia, all large mammals, including antelopes, have declined severely and now occur at very low levels (Wang and Schaller 1996). Illegal hunting of Tibetan antelope for their valuable underfur (*shahtoosh*) has greatly increased over the past two decades and has reached alarming levels, leading to large population declines.

Conservation measures taken

Since the 1950s, many measures have been taken to protect and restore wildlife populations in China. In 1956, the former Ministry of Forestry issued two legal documents: "Regulations of Natural Forest Reserve" and "Regulations of Game Hunting", which for the first time recognised the importance of nature reserves in maintaining biodiversity and the importance of sustainable use of wildlife resources. After the Cultural Revolution, the state legislature passed a series of laws in the field of wildlife and environmental protection. According to Article 9 of the 1982 Constitution, "the State guarantees reasonable use of natural resources, protects rare animals and plants, forbids any organisation or individuals to take or exploit the natural resource illegally by any means." The State Council also announced "Management Methods of Natural Reserves for Conserving Forest and Wildlife" to standardise management of nature reserves as wildlife habitat in the country. Another important landmark was the passing by the State legislature of the Wildlife Protection Law in 1989. In the same year, the "Namelist of State Key Protected Wildlife Species" was also drawn up, listing threatened species in two categories. The most threatened species are included in Category I and hunting of these species is prohibited. Category II species may be hunted subject to controls. The Tibetan antelope was given protected status in 1956. Saiga and goitered gazelle were protected by law in 1980, and Przewalski's gazelle was protected in 1984. All six species were included in the list of protected species in 1989, three of them in Category I (saiga, Tibetan antelope, and Przewalski's gazelle) and the others in Category II (Table 33.1). At the provincial level, Inner Mongolia passed a Wildlife Act in 1989 that made it illegal to kill any large mammal except the wolf (*Canis lupus*), but there is no sign that this law is properly enforced (Wang and Schaller 1996).

China's first protected area, Dinghushan Nature Reserve, was established in 1956. Ten years later, the number of nature reserves had increased to 19, which covered only 0.07% of China's land area. By 1976, China had established 333 nature reserves, covering 2% of the country. By the end of 1997, 926 nature reserves had been established, with a total area of 76,979,000ha, representing about 7.64% of the national territory. However, only a few reserves contain important antelope populations. Qiantang Nature Reserve in northern Tibet was established in 1993 in order to conserve the high-altitude ecosystem of the Tibetan Plateau and its ungulate communities, which include good numbers of Tibetan antelope and Tibetan gazelle. This enormous reserve is located from $31^{0}44'$ to $36^{0}32'$N and $85^{0}13'$ to $91^{0}15'$E, and is of great potential importance to the conservation of China's biodiversity. According to official figures, it covers 24,712,000ha, but according to Schaller (1998) its area is in fact 28,400,000ha. Qiantang Nature Reserve adjoins Arjin Mountains (A Er Jin Shan) Nature Reserve (4,512,000ha) in Xinjiang and the recently-established Kokoxili Nature Reserve (4,500,000ha), both of which contain Tibetan antelope and Tibetan gazelle populations. Tibetan gazelles also occur in Qomolangma Nature Reserve (3,500,000ha), located in southern Tibet (IUCN

1992) and in Yanchiwan Reserve (424,800ha) in Gansu (Zheng *et al.* 1989). Bird Island Nature Reserve (53,550ha) in Qinghai holds a very small number of Przewalski's gazelles. Kalamaili Mountain (Ka La Mai Li Shan) Nature Reserve (1,400,000ha), Boghdad Mountain Biosphere Reserve (217,000 ha), and Ganhaizi Nature Reserve (300ha) contain goitered gazelle populations (IUCN 1993). A few goitered gazelles also occur in Ludansuosulin Reserve (28,000ha) in Inner Mongolia (106º30'–107ºE), which is maintained by the local prefecture (Wang and Schaller 1996). However, the effectiveness of protection within nature reserves varies. Arjin Mountains Nature Reserve and others have been subject to increased livestock grazing and poaching by local people and officials (Wang *et al.* 1997). The inaccessible character of some areas has provided additional protection for antelopes in the past, but this factor is becoming of less importance as roads are constructed into previously remote areas, allowing them to be utilised by herders and invaded by poachers.

In 1997, a Department of Conservation Biology was established in the Institute of Zoology of the Chinese Academy of Sciences. The Department's work will focus on biodiversity conservation and on preservation of threatened and endangered species in China.

Conservation measures proposed

China plans to have 1,000 nature reserves by the year 2000. A great deal of effort has been expended on the conservation of wildlife in China, but due to the level of economic development, educational standards, and population density, there is still much to be done before the natural environment can be restored to a state where it meets the needs of both human beings and wild animals. The following essential measures should be taken: 1) improve enforcement of wildlife protection laws; 2) promote and diversify the indigenous economy in these regions; 3) carry out public awareness programmes with help from NGOs in China and abroad, and offer local people education classes and workshops in order to develop environmental consciousness; 4) establish more nature reserves in regions which are of importance for antelopes; 5) ensure effective protection and good management of protected areas, especially the very large Qiantang and Arjin Mountains Nature Reserves; and 6) survey and monitor antelope populations, especially those in remote areas.

We propose the establishment of trans-boundary protected areas such as the Altai Natural Reserve, Tien Shan Nature Reserve across the China-Kazakhstan border, and a reserve across the China-Mongolia border to protect Mongolian gazelle. These reserves will help to protect and restore the habitats and populations of saiga, goitered gazelle, Mongolian gazelle, and other ungulate species. Furthermore, improving the living standards of people in or around wildlife reserves by developing the local economy, and encouraging local people to participate in nature conservation are key steps to the successful conservation of antelope species. Since antelopes live in remote and underdeveloped regions in China, daily patrolling in these regions by wildlife wardens must cover all habitats of protected antelopes.

Species accounts

Goitered Gazelle (*Gazella subgutturosa*)

Distribution and population: Goitered gazelles occur widely in western and northern China, in Xinjiang, northern Qinghai, Gansu, and Inner Mongolia (Fig. 33.2). The eastern limit of their distribution lies at approximately 115^0N (Heptner *et al.* 1961). Isolated populations are found in the Tarim Basin in Xinjiang, and Qaidam Basin in Qinghai Province. Goitered gazelle used to be an important game species in northwest China, but it has become rare due to over-exploitation. Estimates of current numbers are not available. In Inner Mongolia, goitered gazelles were formerly abundant. They have been exterminated, or almost so, on the Ordos Plateau and most other areas, with only small numbers surviving, mainly close to the border with Mongolia in the west and in the southern and western margins of the Tengger Desert (Wang and Schaller 1996). The isolated population in the Qaidam Basin was reported to be declining and possibly in danger of extirpation (Cai *et al.* 1990). Surveys near the southern edge of the Zuangker Basin in northern Xinjiang during 1992–93 located a total of 221 gazelles along 19 transect routes (818km), with a mean density of 0.71 (± 0.17) per km^2 (Gao *et al.* 1996).

Habitat, food and reproduction: Goitered gazelles inhabit steppes, alpine grasslands, and semideserts. They feed on a variety of desert plants, such as *Haloxylon ammodendron, Stipa gobica, Allium* spp., *Salsola* spp., *Artemisia* spp., and *Iljina regelii*. Herd size varies from one to 12 in northern Xinjiang (Gao *et al.* 1996), but groups of 20–30 form in

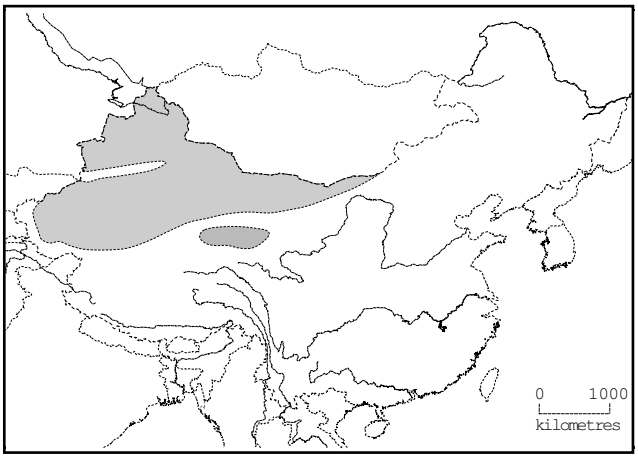


Fig. 33.2 General distribution of goitered gazelle (*Gazella subgutturosa*) in China. Current range is not continuous.

winter. Mating takes place from late November–February, and young are born in May or June.

Status within the country: Vulnerable. The main threats are poaching and habitat destruction.

Conservation measures taken: Classified as a Category II protected species since 1989. Occurs in Kalamaili Mountain Nature Reserve (1,400,000ha), Boghdad Mountain Biosphere Reserve (217,000ha), and Ganhaizi Nature Reserve (300ha) (IUCN 1993). A few occur in Ludansuosulin Reserve (28,000ha) in Inner Mongolia (Wang and Schaller 1996). Global status is Lower Risk: near threatened (IUCN 1996).

Conservation measures proposed: The Wildlife Protection Law must be enforced in the natural habitat of the goitered gazelle; additional protected areas need to be established, especially for the populations in the Tarim and Qaidam basins.

Additional Remarks: Four subspecies of goitered gazelle have been named in China: *G. s. sairensis* in northern Xinjiang, *G. s. hillieriana* in Inner Mongolia, *G. s. reginae* in the Qaidam, and *G. s. yarkandensis* in the Tarim Basin. The Qaidam population is isolated, but geographic boundaries between the other forms have not been clearly identified. Only *hillieriana* and *yarkandensis* were recognised by Corbet (1978).

Tibetan Gazelle (*Procapra picticaudata*)

Distribution and population: The Tibetan gazelle is found throughout the Tibetan Plateau, from the northern side of the Himalaya to the Nan Shan Range, and in parts of Gansu (Fig. 33.3). Overhunting had caused its disappearance from large areas, particularly around the margins and in eastern Qinghai (Schaller *et al.* 1988). There has been no detailed census of the species, mainly due to inaccessibility of the habitat (Feng and Cai 1986; Cai *et al.* 1992). The population was estimated at 182,000 in 1987–88 (Piao and Liu 1993) and at 186,000 in 1989 (Yin and Liu 1993). However, a much lower estimate (20,000) was given by Feng (1992). Schaller (1998) said that the total could not be estimated accurately but may be 100,000. Schaller *et al.* (1988) estimated a few hundred gazelles in a 20,000km^2 study area in southwest Qinghai. Gao (1995a) indicated that Tibetan gazelle only occurred in small numbers in the central Kunlun Mountains of Xinjiang.

Habitat, food and reproduction: Tibetan gazelles are found in alpine grasslands, shrublands and mountain steppes. In southeast Tibet, they occupy the shrubby meadow zone at 4,000–4,500m (Feng *et al.* 1981). In northeast Qinghai, where their range overlaps that of *P. przewalskii*, Tibetan gazelle prefers mountains, whereas Przewalski's gazelle occurs in valleys and on the Koko Nor Plateau (Stroganov 1949). No detailed field studies have been reported and few details of its ecology are known. Diet consists of forbs and grasses, and they feed mainly at dawn and dusk in the summer, but they may graze all day in winter. They usually occur alone or in small groups. The rut takes place in December–January; occasionally, males compete for a mate. Young are born in June.

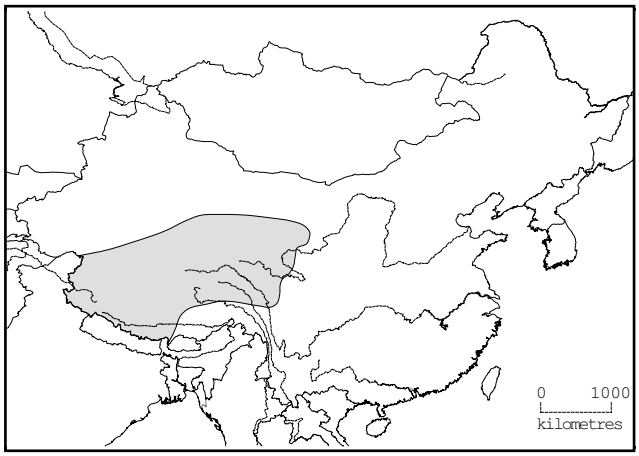


Fig. 33.3 General distribution of Tibetan gazelle (*Procapra picticaudata*) in China.

Status within the country: Satisfactory. Tibetan gazelles are hunted for their meat and hide. About 8,000 skins were collected annually in Sichuan alone up to the mid-1980s (Hu and Wang 1984) and poaching still occurs. Their habitat is shrinking in area and deteriorating in quality due to agricultural encroachment and growing numbers of domestic livestock, which are associated with increasing exploitation of the Tibetan Plateau interior by herders.

Conservation measures taken: Tibetan gazelle is a Category II protected species. An estimated 16,000–19,000 occur in Qiantang Nature Reserve (24,712,000ha) in northern Tibet (Schaller 1998). It also occurs in Arjin Mountains (A Er Jin Shan) Nature Reserve (4,512,000ha) in Xinjiang, Qomolangma Nature Reserve (3,500,000ha) in southern Tibet, and Yanchiwan Reserve in Gansu (Zheng *et al.* 1989; IUCN 1993). Tibetan gazelles probably gain additional protection by their dispersed distribution over the plateau, which includes some remote areas that are difficult for hunters to reach, although such areas are becoming fewer in number. Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: Effective wardening of the Qiantang Nature Reserve will protect an extensive population, and protection should be strengthened in Arjin Shan Mountains Nature Reserve. Anti-poaching measures throughout its range would also benefit this species.

Przewalski's Gazelle (*Procapra przewalskii*)

Distribution and population: Przewalski's gazelle is endemic to northwestern China where it is known to have occurred in three areas: the western part of the Ordos

Plateau in Inner Mongolia; the western Yellow Soil Plateau in Gansu; and the vicinity of Qinghai Hu Lake and the Koko Nor Plateau in Qinghai (Wallace 1913; Allen 1940; Stroganov 1949; Jiang *et al.* 1995). Details of former range are poorly known. The eastern limit of the distribution described by Allen (1940) lies at approximately 111^0E. No evidence for its continued existence in Gansu and Inner Mongolia was found by Wang and Schaller (1996) and current distribution appears to have been reduced to the area around Qinghai Lake ($36^0$32'–$37^0$15'N, $99^0$36'–$100^0$47'E). Currently, three small subpopulations survive on the eastern and northwestern shores (Fig. 33.4). These have been monitored regularly in recent years (Jiang *et al.* 1994; 1996; 2000; Li *et al.* 1999). The three subpopulations are almost completely isolated from each other by roads and fenced pastures and all are declining. About 350 Przewalski's gazelles remained in this area in 1986 (Cai *et al.* 1992) and only about 200 in 1994. The population has continued to decline: on the western shore of Qinghai Lake only seven were counted in 1998, and the two populations on the eastern shore numbered 51 and 56 in 1997 (Jiang *et al.* 2000).

Habitat, food and reproduction: Przewalski's gazelle inhabits steppe plateaux and open valleys, including broken and undulating terrain of stabilised dunes containing steppe vegetation (Hoffmann 1991). The habitat of the remaining population around Qinghai Lake lies at elevations of 3,194–5,174m. Average temperatures in this area range from -12.3^0 to -14.7^0C in January and from 10.3^0 to 11.9^0C in July. Annual precipitation is 290–580mm. Vegetation covering the sand dunes and moraines includes the shrubs *Myricaria squamosa*, *Hippophae rhamnoides,* and *Sabina vulgaris*. Alpine grassland is dominated by *Salix oritrepha, Potentilla fruticosa, Stipa* spp., *Achnatherum splendens,* and *Agropyron cristatum*. Wetlands are occupied by *Kobresia* spp., *Carex condilapis,* and *Blysmus sinocompressus.* A habitat analysis has recently been completed using a Geographic Information Systems (GIS) model and a population viability analysis (Li 1997). Przewalski's gazelle selectively grazes the tender tips of grasses and sedges and also feeds on legumes, such as *Astragalus* spp., which are said to be poisonous to livestock. The rut takes place during late autumn. Males roar, chase, and challenge each other when competing for females but there is rarely serious fighting. Females give birth in mid-June, normally to a single young (Jiang *et al.* 1994).

Status within the country: Critically Endangered (IUCN 1996). Endemic to China, so global status and status within the country are identical. Gazelles on the eastern shore of Qinghai Lake have been fenced out of their main feeding grounds since 1994, and the population on the western shore declined from 37 to seven between 1992 and 1998 (Jiang *et al.* 1994; 2000). Most of their habitat has already been lost to the increasing human population, farming activities, and desertification. Predation by wolves (*Canis lupus*) appears to be having a negative impact on two of the three subpopulations.

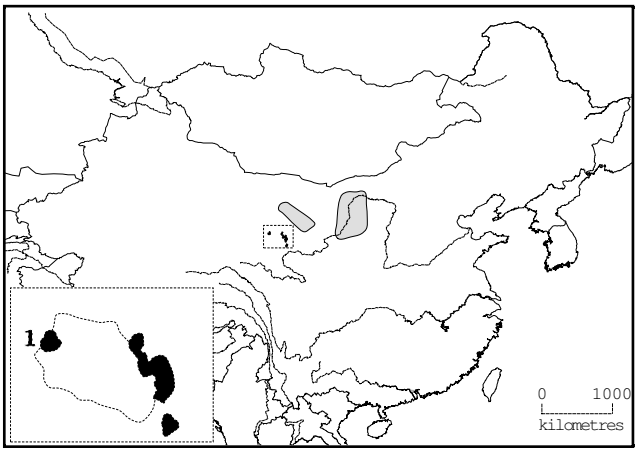


Fig. 33.4 Approximate former distribution of Przewalski's gazelle (*Procapra przewalski*) in China based on reported localities (shaded) and current distribution around Qinghai Lake (insert).

Conservation measures taken: Przewalski's gazelle is a Category I protected species, but law enforcement is difficult in remote areas where the gazelles live and poaching still occurs. A few occur in Bird Island Nature Reserve (53,550ha) in Qinghai. A research team was formed in 1994 to monitor the population and to study the behaviour of Przewalski's gazelle.

Conservation measures proposed: Action must be taken quickly if the species is to survive and should include: (1) the establishment of a Przewalski's Gazelle Nature Reserve to protect the Hudong-Ketu population on the eastern side of Qinghai Lake, with a habitat corridor to the Yuanzhe population; (2) strict protection from poaching; (3) field surveys in other parts of its former range to investigate whether or not any small populations survive; (4) investigation of the role of wolf (*Canis lupus*) predation in the decline of Przewalski's gazelle and control measures if necessary; and (5) identification of suitable sites for translocation in former range in northwest China.

Mongolian Gazelle (*Procapra gutturosa*)

Distribution and population: Former distribution extended through seven provinces of northern and northeastern China: Gansu, Ningxia, Shaanxi, Hobei, Inner Mongolia, Heilongjiang, and Jilin. Precise limits of the historical range are unclear; Mongolian gazelle reached the Beijing plains at the beginning of this century, but they had disappeared from south of the Great Wall by 1950 (Bannikov 1954). Overhunting has considerably reduced their range and numbers. From the 1950s to the 1970s, Mongolian gazelle range covered an estimated 290,592km^2, which was reduced to 123,840km^2 by the 1980s. Current distribution covers an area of about 73,152km^2, just *c.* 25% of the range in the

Photo 33.1 Przewalski's Gazelle *(Procapra przewalskii).* Zhigang Jiang.

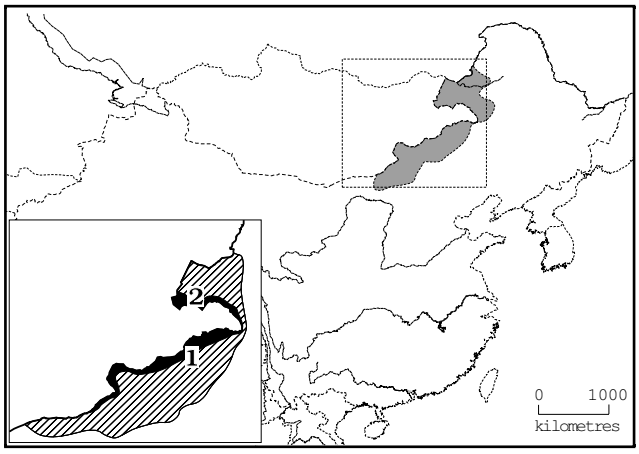


Fig. 33.5 Recent distribution of Mongolian Gazelle (*Procapra gutturosa*) in China (shaded). Insert: distribution in the 1980s (hatched) and current distribution (dark shading). 1. Dongwuqi; 2. Xinbaragyouqi. Adapted from Wang *et al.* (1997).

1950s–1970s (Wang *et al.* 1997). Distribution (Fig. 33.5) is now limited to the province of Inner Mongolia and consists of a narrow band along the international border with Mongolia, from $43^0$30' to $48^0$48'N and $110^0$30' to $119^0$10'E (Wang *et al.* 1997). Two main population centres have been identified: the Xinbaragyouqi region (near Lake Hulun Nur) in eastern Inner Mongolia (Chao 1963; Jiang *et al.* 1993) and Dongwuqi County (Wang *et al.* 1997). Part of the population migrates annually across the border into Mongolia. The Chinese population was estimated at 800,000–1,000,000 gazelles in the early 1960s (Anonymous 1994), 2,000,000 in the 1950s–1970s, and at least 500,000 in the 1980s (Wang *et al*, 1997). Gao (1995b) estimated about 200,000 in winter 1992 and 300,000 in winter 1993. Wang *et al.* (1997) reported 250,000 Mongolian gazelles during winter 1994–95, and estimated that one-third of these remained on Chinese territory (i.e., 80–85,000 are permanently present in China). Numbers have been greatly reduced by excessive hunting for their meat. About 2,500,000 were killed in China from 1956–61 and, until the late 1980s, hundreds of thousands of Mongolian gazelles were slaughtered annually for their meat (Wang *et al.* 1997). Average annual harvest was *c.* 100,000 in 1987–89 in Xinbaragyouqi County alone, and the actual number killed was doubtless much higher than the official harvest. Hunting has almost exterminated the Mongolian gazelle in western Inner Mongolia, where it was probably once the most abundant ungulate species (Wang and Schaller 1996). The hunting season also coincides with the rutting season, further increasing the adverse impact on the population.

Habitat, food and reproduction: The habitat of the Mongolian gazelle includes arid steppes and grasslands (Chao 1963; Jiang *et al.* 1993). Steppes are characteristically 1,000–1,500m above sea level, with average annual precipitation of 150–250mm, average annual temperature of 22–25^0C, and high winds. Dominant plants are species of *Stipa*, *Cleistogenes,* and *Allium.* Meadow grassland occupies hilly areas at elevations of 700–1200m, with average annual precipitation 350–450mm, high winds, and an average annual temperature of 16–20^0C. The most common plants are *Filifolium sibiricum, Stipa baicalensis, Calamagrostis epigejos,* and *Poa* spp. Large herds of Mongolian gazelles form during the rut in November–December and again in the summer (Wang *et al.* 1997). Young are born from mid-June to the end of July. Twins are very rare. Male to female sex ratio in Inner Mongolia was 1:4 (Wang *et al.* 1997).

Status within the country: Vulnerable. The main threat to survival of the species is illegal hunting in winter. Even though the species is protected by law, poaching is still reported. Habitat degradation is also a threat, and increased stocking rates of domestic animals are reducing the amount and quality of available forage.

Conservation measures taken: Mongolian gazelle is a Category II protected species and has had limited legal protection since 1989. In 1990, the Chinese and Mongolian Governments signed an environmental protection agreement, in which protection of the natural habitat of Mongolian gazelle was of special concern. Since 1991, some field surveys have been conducted (Jiang *et al.* 1993; Wang *et al.* 1997). Some action has been taken at a local level. In the Xinbaragyouqi region, the local authorities have implemented measures to eliminate illegal hunting of Mongolian gazelle and in Dongwuqi, the other main population centre, the local authorities have also established a series of regulations to protect the species (Wang *et al.* 1997). Protected areas for Mongolian gazelle have not yet been established in Inner Mongolia. Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: The most important measure is to establish the Xinbaragyouqi Mongolian Gazelle Nature Reserve ($115^0$32'–$117^0$32'E, $47^0$38'–$48^0$40'N) to protect a core population of Mongolian gazelle and its natural habitat. A protected area has also been proposed in Dongwuqi County, where another large population has been

identified (Wang *et al.* 1997). Additional protection measures would include implementation of the trans-border agreement with Mongolia and strict enforcement of the laws on hunting. The Inner Mongolia Wildlife Department does not have sufficient funds to protect Mongolian gazelle in the remaining portion of Mongolian steppe ecosystem in China; thus, international co-operation and support will be necessary to provide these resources (Wang *et al.* 1997).

Tibetan Antelope or Chiru (*Pantholops hodgsonii*)

Distribution and population: Tibetan antelope is endemic to the Tibetan Plateau and is distributed through Tibet, Qinghai, and Xinjiang, north to the Nan Shan and Kun Lun Ranges (Fig. 33.6). It is absent from the mountainous areas of southeastern Tibet (Feng *et al.* 1981). Range has been reduced in some places in recent years, particularly around the margins in the south and east. In Qinghai, it is now extinct in the east and southeast. In Xinjiang, it is mainly found south of the Kun Lun and Arjin Shan Ranges, west of Aksai Chin plains (Schaller 1998). Current range covers an estimated 800,000km^2 and the main area of distribution is located in northwest Tibet, north of 32^{0}N (Schaller *et al.* 1991). Feng (1992) estimated that there were 100,000 Tibetan antelopes on the Tibetan Plateau. However, a large decline in numbers has taken place over the last 10 years. Schaller (1998) estimated that the remaining population was fewer than 75,000. Reported densities include: 0.2–1.6/km^2 in study areas in Xinjiang (Schaller *et al.* 1991) and 1.47/km^2 in Qinghai (Schaller and Ren 1988). The two largest areas studied had densities of 0.22/km^2 (in 17,500km^2) and 0.29/km^2 (in 10,500km^2) (Schaller 1998). In the Kunlun, Gao (1995a) reported 0.1/km^2 in the western part of the region and 17/km^2 in the centre; the latter figure no doubt represents a temporary aggregation (G.B. Schaller *pers. comm.*).

Photo 33.2 Tibetan Antelope or Chiru *(Pantholops hodgsonii).* George Schaller**.**

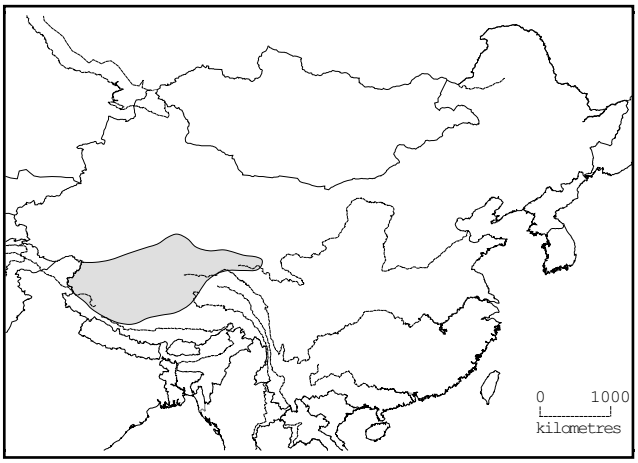


Fig. 33.6 Approximate current distribution of Tibetan antelope (*Pantholops hodgsonii*) in China.

Habitat, food and reproduction: Tibetan antelopes inhabit high, rolling plains, bare plateaux, and broad, montane valleys at elevations of 3,700–5,500m. In Qinghai, they concentrate on rolling uplands above 4,600m during winter (Schaller *et al.* 1991). They usually live in groups of one to 20, but large concentrations of up to 1,000 may occur at the rut and on migration females and young are occasionally observed. Some herds migrate long distances during winter and early spring. Sexes are normally segregated in summer (Rawling 1905; Schaller 1998). Most females and young migrate northwards in spring to calving grounds and return in late summer, though a few do not migrate or move only a short distance. Some males are sedentary, while others make short summer movements and still others move far from winter areas (Schaller 1998). The proportion of each population that is migratory and the details of migration patterns are still unclear. They feed mainly on forbs, grasses, and sedges. Mating occurs in late November–December. Males gather groups of females, and fighting between males at this time may result in serious injury. Young are born from mid-June to early July, often in remote calving grounds, such as the Kokoxili region. For a full account, see Schaller (1998).

Status within the country: Endangered. Tibetan antelopes are still threatened by poaching and shrinking of their habitat. The price of the underfur (*shahtoosh*) now exceeds $1,000 per kilogram in India, so high profits are an incentive to poachers. In the Haixi region of Qinghai, >800 Tibetan antelopes were poached in 1990. The animals are trapped by local herdsmen using leg hold traps, and shot by gold prospectors and others (Wright and Kumar 1997). The *shahtoosh* is smuggled to India where it is made into expensive shawls in Kashmir and then exported. Their horns are also used in traditional medicine in China. The Shuanhu region in northern Tibet was almost uninhabited until about 30 years ago. However, Tibetan immigrants moved into the region in the mid-1970s and, since then, several hundred square kilometres of antelope habitat have been occupied by

domestic animals, although there is little direct conflict between livestock and Tibetan antelopes. Severe winter weather may also cause the death of large numbers of antelopes (Schaller and Ren 1988); winter conditions in 1997–98 were extremely severe across the Tibetan Plateau, but the effects on antelope populations are not yet known.

Conservation measures taken: Tibetan antelope is classified as a Category I protected species. It occurs in three contiguous protected areas: Arjin Mountains (A Er Jin Shan) Nature Reserve in Xinjiang (4,512,000ha) (Achuff and Petocz 1988), Qiantang Nature Reserve (at least 24,712,000ha) in northern Tibet, and Kokoxili Nature Reserve (4,500,000ha). Kokoxili is an important calving area, but the reserve does not include the whole area used in migration. Global status is now Endangered.

Conservation measures proposed: Proposals to extend the protected areas of northern Tibet are under consideration. Effective management and patrolling of the existing reserves are needed, as well as socio-economic measures that will improve the rural economy in key areas of habitat. Strict anti-poaching measures in the remote areas inhabited by Tibetan antelope are needed, and wider measures to control the *shahtoosh* trade at all stages should be taken.

Saiga (*Saiga tatarica*)

Distribution and population: Saiga were formerly found in the Zuangker (Dzungarian) Basin of Xinjiang (Fig. 33.7). One population occurred in the west of the basin and migrated seasonally across the border with Kazakhstan. Another population inhabited the eastern Dzungarian Basin, in the area of the Beita Shan Mountains on the Sino-Mongolian border (Liang 1986). Three saiga skulls were found in Xinjiang during the 1960s, but several large-scale field surveys carried out in the 1970s failed to find saiga, and it was declared extinct in the country (Gao 1991; Zheng 1994). A few saiga were reported by herders around the Ala Shankou Pass on the Sino-Kazakhstan border in 1984 (Gao 1991) and were no doubt vagrants from the Kazakhstan population.

Habitat, food and reproduction: Saiga habitat in Xinjiang consists of semidesert and desert with sparse vegetation dominated by *Artemisia* and *Salsola* spp. Few field observations have been made on the species in China.

Status within the country: Extinct. Extirpated due to overhunting, mainly for its horns.

Conservation measures taken: Saiga is a Category I protected species. The Wildlife Conservation Breeding Center in Wuwei, Gansu Province, established a captive-breeding herd of 10 saiga in 1988 and there have been reports of successful breeding. Global status has recently been reassessed as Endangered.

Conservation measures proposed: Reintroduction of saiga to areas of their former distribution in northwest China will be necessary for the species to again be a part of China's wildlife. Protection against poaching for any animals released will have to be guaranteed if a future reintroduction is to be successful.

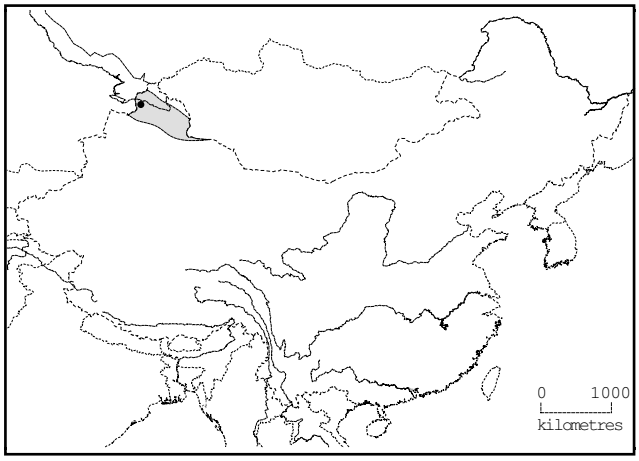


Fig. 33.7 Approximate former distribution of saiga (*Saiga tatarica*) in China. The circle shows the location of 1984 sighting.

References

Allen, G.M. 1940. *Mammals of China and Mongolia,* vol. 2. American Museum of Natural History, New York.

Anonymous. 1994. *The report of a feasibility study of the Mongolian gazelles' natural reserve*. Grassland Environment Monitoring Station of Inner Mongolia Autonomous Region and Environment Protection Monitoring Station of Inner Mongolia Autonomous Region (in Chinese).

Bannikov, A.G. 1954. [*Mammals of the Mongolian Peoples' Republic*]. Academy of Sciences, Moscow (in Russian).

Corbet, G.B. 1978. *The Mammals of the Palaearctic region: A taxonomic review.* Cornell University Press, London.

Cai, G., Liu, Y., and O'Gara, B.W. 1990. Observations of large mammals in the Qaidam Basin and its peripheral mountainous areas in the People's Republic of China. *Canadian Journal of Zoology* 68:2021–2024.

Cai, G., Liu, Y., Feng, Z., Lin, Y., Zhao, X., and Zhao, G. 1992. Report of investigation on mammals in the typical habitats in Qinghai Province. *Acta Biologica Plateau Sinica* 11:63–90 (in Chinese).

Chao, K. 1963. Biology and game hunting of Mongolian gazelle. *Biology Bulletin* 1:19–20 (in Chinese).

Feng, Z. 1992. Current status of mammals on Tibetan Plateau. Pp. 187–195 *in: Proceedings of the First Symposium of Qinghai-Tibetan Plateau Association*. Beijing, Science Press (in Chinese).

Feng, Z. and Cai, G. 1986. *Tibetan mammals*. Science Press, Beijing (in Chinese).

Feng, Z., Zheng, C., and Cai, G. 1981. On mammals from southeastern Xizang. Pp. 1013–1019 *in:* Liu, D-s (Editor). *Geological and ecological studies of Qinghai-Xizang Plateau*. Science Press, Beijing.

Gao, X. 1991. Animals for medicine in Xinjiang. Pp. 122–134 *in: Animal research in Xinjiang*. Science Press, Beijing (in Chinese).

Gao, X. 1995a. Mammals in the middle-part of Kunlun Mountains. Pp. 221–229 *in:* Zhang, J. *et al.* (Editors). *Researches in biology of Chinese mammals* (in Chinese).

Gao, X. 1995b. Study on Mongolian gazelle. *Journal of North-Eastern Forestry University* [in press].

Gao, X., Xu, K., Yao, J., and Jia, Z. 1996. The population structure of goitered gazelle in Xinjiang. *Acta Theriologica Sinica* 16:14–18 (in Chinese).

Heptner, V.G., Nasimovich, A.A., and Bannikov, A.G. 1961. [*Mammals of the Soviet Union*, *Artiodactyla and Persissodactyla*], vol. I. Vysshaya Shkola, Moscow (in Russian).

Hoffmann, R.S. 1991. The Tibetan Plateau fauna. A high altitude desert associated with the Sahara-Gobi. Pp. 285–297 *in:* NcNeely, J. and Neronov, V.M. (Editors). *Mammals in the Palaearctic desert: Status and trends in the Sahara-Gobian region*. Russian Academy of Sciences, Moscow.

Hu, J. and Wang, Y. (Editors). 1984. *Sichuan fauna economica, II*. Science and Technology Publishing House, Chengdu (in Chinese).

IUCN. 1993. *Nature reserves of the Himalaya and mountains of Central Asia*. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN. 1996. *1996 IUCN Red List of threatened animals.* IUCN, Gland, Switzerland and Cambridge, UK.

Jiang, Z., Fen, Z., Wang, Z., Chen, L., Cai, P., and Li, Y. 1995. Historical and current distributions of the Przewalski's gazelle. *Acta Theriologica Sinica* 15:241–245 (in Chinese).

Jiang, Z., Fen, Z., and Wang, Z. 1996. Przewalski's gazelle in China. *Conservation Biology* 13: 324–325.

Jiang, Z., Feng, Z., Wang, Z., Chen, L., Cai, P., and Li, Y. 1994. Saving the Przewalski's gazelle. *Species* 23:59–60.

Jiang, Z., Li, D., and Wang, Z. 2000. Population declines of Przewalski's gazelle around Qinghai Lake, China. *Oryx* 34:129–135.

Jiang, Z., Ma, X., and Gao, Z. 1993. A study on population structure and dynamic trend of Mongolian gazelle in China. *Acta Theriologica Sinica* 13:16–20 (in Chinese, English summary).

Li, D. 1997. Habitat analysis of the Przewalski's gazelle. Postdoctoral report, Institute of Zoology, Chinese Academy of Sciences, Beijing (in Chinese).

Li, D., Jiang, Z., and Wang, Z. 1999. Activity patterns and habitat characteristics of the Przewalski's gazelle. *Acta Theriologica Sinica* 19:17–24 (in Chinese, English summary).

Liang, C. (Editor). 1986. *Wildlife of Xinjiang.* Forestry Publishing House, Beijing (in Chinese).

Piao, R. and Liu, W. 1993. The present status of Tibetan gazelle population. *In:* Xia, W. and Zhang, J. (Editors). *The successional changes of mammals in China under the influence of human activities.* Chinese Science and Technology Press, Beijing (in Chinese).

Schaller, G.B. 1998. *Wildlife of the Tibetan Steppe.* University of Chicago Press, Chicago.

Schaller, G.B. and Ren, J. 1988. Effects of a snowstorm on Tibetan antelope. *Journal of Mammalogy* 69:631–634.

Schaller, G.B., Ren J., and Qiu, M. 1988. Status of the snow leopard *Panthera uncia* in Qinghai and Gansu provinces. *Biological Conservation.* 45:179–194.

Schaller, G.B., Ren J., and Qiu M. 1991. Observations on the Tibetan antelope (*Pantholops hodgsoni). Applied Animal Behaviour Science* 29:361–378.

Stroganov, S.U. 1949. [On the systematics and distribution of some antelopes of central Asia]. *Byulleten' Moskovskogo Obshchestva Ispytatelei Prirody, Otdelenie Biologii* 54:15–26 (in Russian).

Wallace, H. 1913. *The big game of central and western China*. John Murray, London.

Wang, S. 1962. Bovidae. Pp. 481–509 *in:* Shaw, Z.H. (Editor). *The economic fauna of China: Mammals*. Science Press, Beijing (in Chinese).

Wang, S., Gu, J., Hu, D., Ning, L., Zhang, Y., Wang Z., Yang, R., and Cai, G. 1997. China. Pp. 148–172 *in:* Shackleton, D.M. (Editor). *Wild sheep and goats and their relatives. Status survey and action plan for Caprinae*. IUCN, Gland, Switzerland and Cambridge, UK.

Wang, X. and Schaller, G.B. 1996. Status of large mammals in western Inner Mongolia, China. *Journal of East China Normal University* 1996 (12):93–104.

Wang, X., Sheng, H., Bi, J., and Li, M. 1997. Recent history and status of the Mongolian gazelle in Inner Mongolia, China. *Oryx* 31:120–126.

Wang, Z.Y., Wang, S., Lu, C.K., and Zhang, R.Z. 1963. Taxonomy, distribution and utilization of bovids in China. *Biological Bulletin* 5:24–30 (in Chinese).

Wright, B. and Kumar. A. 1997. *Fashioned for extinction.* Wildlife Protection Society of India, New Delhi.

Yin, B. and Liu, W. (Editors). 1993. *Wild animal protection in Tibet.* Chinese Forestry Publications, Beijing (in Chinese).

Zhang, R.Z. and Wang, Z.Y. 1994. Investigation report on the fauna of Qinghai and Gansu Provinces. Science Press, Beijing (in Chinese).

Zhang, R.Z. 1994. Geographic diversification of biota in the continent of China. *Chinese Biodiversity* 2 (supplement):43–46 (in Chinese).

Zheng, S. 1994. *Rare and endangered animals in northwestern China.* Forestry Publishing House, Beijing (in Chinese).

Zheng, S., Yu, Y., Han, Y., and Wu, J. 1989. Studies of the ungulate community at Yanchiwan Nature Reserve. *Acta Theriologica Sinica* 9:130–136 (in Chinese).

Chapter 34. India

A.R. Rahmani

Introduction

The Republic of India, with an area of 3,287,263km^2, is the seventh largest country in the world. India lies between 8^{0}4'N and 37^{0}6'N, and between 68^{0}7'E and 97^{0}25'E, and occupies a dominant position in the Indomalayan biogeographical region (Fig. 34.1). It is connected to the Palaearctic in the north and the Ethiopian region in the west. The combination of India's position, the great contrasts in its physical characters, and variations in climate has resulted in a rich biodiversity, represented by many biogeographical regions and many unique biota of its own. Mean annual rainfall varies from as little as 50mm in the extreme northwest parts of the Thar Desert to >10,000mm in Chirapunjee in northeastern India. A large part of India lies in the subtropical zone, though, as a whole, India experiences a typical, tropical monsoon climate (Negi 1993). The Himalayan mountain chain in the north forces the southwest monsoon clouds to bring rain to most parts of the country and prevents the cold winds of central Asia from reaching India.

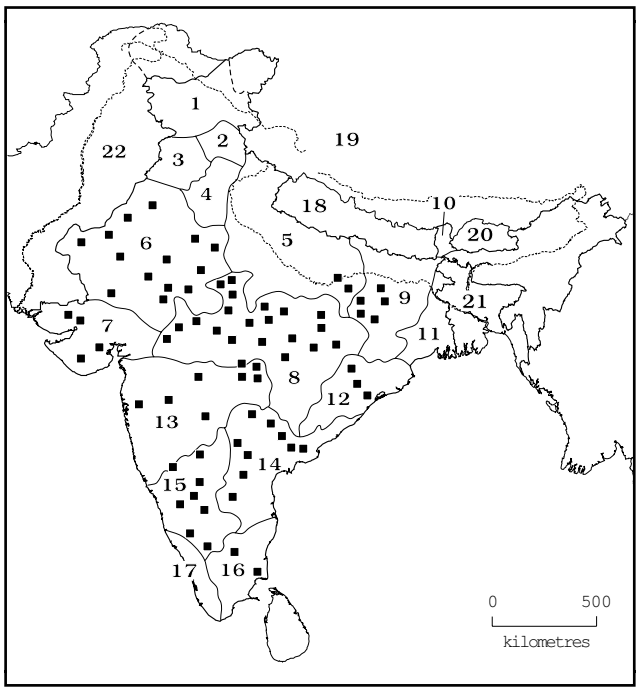


Fig. 34.1. India. Protected areas containing antelopes (solid squares) and States: 1. Jammu and Kashmir; 2. Himachal Pradesh; 3. Punjab; 4. Haryana; 5. Uttar Pradesh; 6. Rajasthan; 7. Gujarat; 8. Madhya Pradesh; 9. Bihar; 10. Sikkim; 11. West Bengal; 12. Orissa; 13. Maharashtra; 14. Andhra Pradesh; 15. Karnataka; 16. Tamil Nadu; 17. Kerala; 18. Nepal; 19. China; 20. Bhutan; 21. Bangladesh; 22. Pakistan.

The human population reached one billion in the first part of 2000 and population density now exceeds 273 per km^2, with >74% of the population in rural areas. The population growth rate in 1990–1995 was 1.9%. The literacy rate is 52%, with female literacy only 39%. India is divided into 25 states and six union territories. The Indian Constitution recognises 18 major languages and 700 dialects. More than 40% of the land is under cultivation. Nearly 83.5% profess the Hindu faith, 10.7% are Muslim, 2.4% Sikh, 1.8% Christian, 0.7% Buddhist, and the remaining percentage of other faiths. All these figures have an important influence on the flora and fauna.

India has a long history of hunting and conservation of wildlife. Wildlife is a part of culture, religion, mythology, folklore, languages, and medicine. King Ashok (273–232 BC) prohibited the killing of certain species such as elephant (*Elephas maximus*). The great Mughal emperors, who ruled India for 300 years from the 15th to the 17th centuries, passionately hunted animals and left a rich assemblage of stories and paintings. The British also loved hunting and made many rules to conserve animals for future hunting purposes. Before India's independence in 1947, the country had nearly 600 semi-independent states. The rulers of these states had their own hunting areas and later some of the most famous national parks and sanctuaries were established on these former hunting reserves.

In the Hindu religion, followed by the majority of Indians, animal life is considered sacred and, hence, the vast majority of people are vegetarian. Some animals such as antelopes are able to survive in highly populated areas. However, due to the sheer number of people, poverty, and the changing economic situation, the future for India's wildlife is not very bright.

Current status of antelopes

India is home to nearly 350 species of mammals (Prater 1980). These include six species of antelopes (Table 34.1): nilgai (*Boselaphus tragocamelus*), four-horned antelope (*Tetracerus quadricornis*), blackbuck (*Antilope cervicapra*), Indian gazelle or chinkara (*Gazella bennettii*), Tibetan gazelle (*Procapra picticaudata*), and Tibetan antelope or Chiru (*Pantholops hodgsonii*). Nilgai is found mainly in northern and central India, and numbers have increased to pest proportions in many rural areas (Singh 1995). Not much is known about the status of four-horned antelope, because very little research has been carried out on this species. Nevertheless, it appears secure in many pro-

Table 34.1 Current status of antelopes in India.

Species	Status[1]	GPS[2]
Nilgai (*Boselaphus tragocamelus*)	Satisfactory	>90%
Four-horned Antelope (*Tetracerus quadricornis*)	Vulnerable	>95%
Blackbuck (*Antilope cervicapra*)	Vulnerable	>99%
Chinkara (*Gazella bennettii*)	Satisfactory	>98%
Tibetan Gazelle (*Procapra picticaudata*)	Endangered	<0.1%
Tibetan Antelope (*Pantholops hodgsonii*)	Endangered	0.3% (seasonal)

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

tected areas of central India. Wild populations of blackbuck are found in 13 states, and although numbers have drastically declined during the last 100 years, its overall distribution is unchanged. Indian gazelle or chinkara has a more restricted distribution in India, because it prefers more arid biotypes. It is found in nine states and is quite secure in many areas (Rahmani 1990b). The remaining two species are restricted within Indian limits to high plateau areas bordering Tibet. Tibetan antelope is a seasonal visitor in small numbers to eastern Ladakh. Tibetan gazelle is facing extinction in India: perhaps fewer than 50 survive in eastern Ladakh according to the Department of Wildlife Protection in Ladakh, and up to 100 occur irregularly in the border area of northeastern Sikkim (Ganguli-Lachungpa 1997).

Antelopes mainly live in open plains and grasslands, which are the first to come under the plough. In open areas, they are also easy to hunt. Moreover, India has a huge livestock population of nearly 420 million head, which exerts tremendous grazing pressure (Rahmani *et al.* 1996). In the early 1950s and 1960s, there was a huge decline in the number of antelopes because the wildlife conservation laws were not very strict, and because four-wheel-drive vehicles had become easily available at the end of the World War II. Vast herds of blackbuck were exterminated and their grassland habitat was converted into crop fields. The nilgai, or blue bull, also suffered, but it had the benefit of being related by name to the sacred cow (*nilgai* = blue cow), so it was not hunted by Hindus. The Indian gazelle was also hunted, but as it lives in broken, uneven country, it did not face the same hunting pressure from motorised poachers as did the blackbuck (Roberts 1977; Rahmani 1990b). Four-horned antelope is a denizen of forests, so it also survives in most of its range, albeit in reduced numbers. Tibetan antelope and Tibetan gazelle were formerly relatively safe in the high altitude zones near the Tibetan border, due to their inaccessibility, the inhospitable climate, and the benign attitude of Buddhists towards wildlife. However, increased hunting in recent decades has reduced the numbers of both species. Tibetan antelope is under tremendous poaching pressure for its valuable underfur (*shahtoosh*). Very small numbers of Tibetan antelopes occur in India and a recent survey found no evidence of poaching in India (Talwar and Chundawat 1996), despite the difficulties of law enforcement in regions near the border with China. However, large quantities of *shahtoosh* are smuggled into India from China, where the Tibetan antelope population is much higher. Dharchula on the India-Nepal border is a major trading post where *shahtoosh* is smuggled to India. In Delhi, it is sold to Kashmiris who weave it in Srinagar, the capital of Jammu and Kashmir State. Some *shahtoosh* is also smuggled through Leh in Ladakh. These shawls are sold, mainly abroad, for high prices. In New Delhi, even the government emporium sells these shawls, notwithstanding the Wildlife (Protection) Act, which clearly prohibits trade in protected species and their products. However, Jammu and Kashmir has a separate Wildlife Act, under which trade is legal. A recent report reveals the extent of the worldwide illegal trade, which is very well organised (Wright and Kumar 1997). The report also shows that *shahtoosh* is the principal item of barter for bones and other parts of the tiger (*Panthera tigris*), which means that eliminating trade in one product without the other will be very difficult.

Conservation measures taken

Although India had hunting laws dating from the British period, they were not strictly followed after independence. Once the states and principalities merged with the Indian Union and the influence of former rulers declined, people started to enjoy the freedom of a democratic system and there was a breakdown of the local laws previously enforced by former state rulers in their domain. In 1947, India was partitioned to establish Pakistan. Massive displacement due to migration of people from Pakistan also placed a tremendous pressure on the newly emerged country to open up vast areas for settlement and agriculture. Forests were extensively cut down and grasslands were given to cultivators. The upheaval of the emerging democracy resulted in a neglect of wildlife. However, by the late 1960s, when the situation became critical for many species, the Indian Government started drafting new laws to protect wildlife. In 1972, the Wildlife (Protection) Act was passed by

Parliament. This act categorised wild animals, and later plants, into five groups depending upon the level of threat. Blackbuck, chinkara, four-horned antelope, Tibetan gazelle, and Tibetan antelope were placed in Schedule I and their hunting was totally banned. However, in the state of Jammu and Kashmir, Tibetan antelope is listed only on Schedule II, which allows trade. It is in Srinagar in Kashmir that the *shahtoosh* is woven into the finished product, so this represents a significant loophole in the legal protection of the species. Nilgai is the only antelope species listed in Schedule III, because it is quite common in certain areas and has to be controlled; the government has recently authorised the shooting of nilgai in areas where they have reached pest proportions to minimise crop damage (Singh 1995).

The first national park was established in 1935, and when India became independent in 1947, there were some very well-protected areas which were former hunting reserves. In the 1950s and 1960s, more reserves were established, but a proper protected area network was established following the Wildlife (Protection) Act of 1972. At present, India has 500 national parks and sanctuaries, and a few more are proposed (Rodgers and Panwar 1988). Special sanctuaries have been established for the protection of blackbuck, e.g., Velavadar National Park in Gujarat State, Ranebennur Blackbuck Sanctuary in Karnataka, and Taal Chhaper Blackbuck Sanctuary in Rajasthan (Rahmani 1991). Antelopes occur in more than 75 protected areas (Table 34.2). In addition, there are many rural areas where villagers do not allow any type of hunting. In Rajasthan State, there is a community of Hindus called Vishnoi who consider chinkara and blackbuck to be sacred, so very high densities of these antelopes are found around Vishnoi settlements (Rahmani 1990a; 1990b; 1991; 1994).

Until 1970–71, hunting licences were issued in many states, but now all types of hunting and shooting are illegal in India, except in certain tribal areas where traditional hunting is allowed. Enforcement is generally lax in non-protected areas, but fairly strict in national parks and moderate to good in sanctuaries. There is no legal hunting club or group in India.

Conservation measures proposed

A large number of wildlife sanctuaries have been proposed in Ladakh, chiefly as part of the Snow Leopard Recovery Programme. Two of these, Changtang (300,000ha) and Rupshu (100,000–300,000ha), will hopefully encompass the remaining population of the Tibetan gazelle. The proposed Daultberg-Depsang Sanctuary (50,000–100,000ha) in the Changchenmo Valley should include a small seasonal population of Tibetan antelope (Fox *et al.* 1991). A number of measures to combat the illegal trade in *shahtoosh* are necessary. These should include more rigorous controls at border crossings to prevent smuggling; checks at points along transportation routes within India; enforcement of the law forbidding sale of the finished product; and a campaign to publicise the illegal origin of *shahtoosh.* It is important that this problem is tackled in conjunction with the illegal trade in tiger bones.

Further research is needed to fill in some gaps in the knowledge of India's antelopes. A full survey of chinkara distribution is needed, covering all the range states in India. Ecological and biological studies on the behaviour and ecology of this abundant and easily observed species would also be useful. A detailed ecological and biological study of four-horned antelope is also required to find out more about its habitat requirements. Ways of preventing crop damage by nilgai and non-violent control methods should be determined.

Until now in India, most conservation activity has been limited to *in situ* protection. The time has come for more active management, and blackbuck would be a good candidate for pilot projects on translocation, selective culling, and even so-called sport hunting. There are still many areas in India, especially Maharashtra, Gujarat, and Rajasthan, where blackbuck could be reintroduced after consultation with local farmers.

Species accounts

Nilgai (*Boselaphus tragocamelus*)

Distribution and population: Nilgai mainly occur in northern, western, and central India (Fig. 34.2). They are locally abundant in agricultural areas, in states such as Uttar Pradesh, Haryana, Rajasthan, and Gujarat, where they are not molested for religious reasons. They are common to abundant in many protected areas, although most of the population occurs outside protected areas. Nilgai are expanding their range in canal-irrigated parts of the Thar Desert (Rahmani 1994). A full census has not been carried out, but numbers could be more than 100,000. In the Gir Forest (140,000ha), nilgai density was 0.58 per km^2 in 1989 (Khan *et al.* 1996) and in agricultural areas of Haryana, density reached 5.67 per km^2 (Singh 1995).

Photo 34.1 Nilgai *(Boselaphus tragocamelus).* Randy Rieches.

Table 34.2 Protected Areas in India containing antelopes (listed by State).

Protected Area[1]	Size (ha)	Year Established	Species
Andhra Pradesh			
Eturnagaram	82,259	1953	*B. tragocamelus; T. quadricornis; G. bennettii*
Kawal	89,228	1965	*B. tragocamelus*
Kinnersani	63,540	1977	*B. tragocamelus; T. quadricornis*
Nagarjunasagar Srisailam	35,689	1978	*B. tragocamelus; T. quadricornis; A. cervicapra; G. bennettii*
Pakhal	86,205	1952	*B. tragocamelus; T. quadricornis*
Papikonda	59,068	1978	*B. tragocamelus; T. quadricornis*
Pranhita	13,603	1980	*B. tragocamelus; T. quadricornis; A. cervicapra; G. bennettii*
Siwaram	2,992	1978	*T. quadricornis*
Venkateshwara	50,700		*B. tragocamelus*
Bihar			
Gautam Budha	25,948	1976	*A. cervicapra; G. bennettii*
Hazaribagh	18,625	1976	*B. tragocamelus; T. quadricornis; G. bennettii*
Kaimur	134,222	1978	*T. quadricornis; G. bennettii*
Koderma	17,795	1985	*B. tragocamelus; T. quadricornis*
Palamau	76,700	1976	*B. tragocamelus; T. quadricornis*
Gujarat			
Gir NP	25,871	1975	*B. tragocamelus; T. quadricornis; G. bennettii*
Velavadar NP	3,408	1976	*B. tragocamelus; A. cervicapra*
Narayan Sarovar	76,579	1981	*G. bennettii*
Udanti	24,759	1983	*B. tragocamelus; T. quadricornis?*
Wild Ass	495,370	1973	*B. tragocamelus; A. cervicapra; G. bennettii*
Karnataka			
Bandipur NP	87,420	1974	*T. quadricornis*
Nagarhole NP	64,339	1975	*T. quadricornis*
Mookambika	24,700	1974	*T. quadricornis?*
Ranebennur	11,900	1974	*A. cervicapra*
Sharavathi	43,123	1974	*T. quadricornis*
Shettihalli	39,560	1974	*T. quadricornis*
Tungabhadra	22,422		*T. quadricornis*
Madhya Pradesh			
Bandhavgarh NP	44,884	1968	*B. tragocamelus; T. quadricornis; G. bennettii*
Indravati NP	125,837	1978	*T. quadricornis*
Kanger Ghati NP	20,000	1982	*B. tragocamelus; T. quadricornis?*
Kanha NP	94,000	1955	*T. quadricornis; A. cervicapra*
Madhav NP	15,615	1959	*B. tragocamelus; T. quadricornis; G. bennettii*
Panna NP	542,666	1981	*T. quadricornis; G. bennettii*
Pench NP	29,286	1977	*T. quadricornis; G. bennettii?*
Satpura NP	52,437	1981	*B. tragocamelus; T. quadricornis*
Bagdara	47,890	1978	*B. tragocamelus; T. quadricornis; A. cervicapra; G. bennettii*
Karera Great Indian Bustard	20,221	1981	*A. cervicapra; G. bennettii*
Kheoni	12,270	1982	*T. quadricornis*
Noradehi	118,696	1975	*T. quadricornis*
Pachmarhi	46,086	1977	*B. tragocamelus; T. quadricornis; A. cervicapra*
Palpur Kuno	34,468	1981	*B. tragocamelus; T. quadricornis; A. cervicapra; G. bennettii*
Panpatha	24,584	1983	*B. tragocamelus; T. quadricornis*
Pench	11,847	1977	*B. tragocamelus; T. quadricornis*
Ratapani	68,879	1976	*B. tragocamelus; T. quadricornis*
Sanjay (Dubri)	36,459	1975	*B. tragocamelus; T. quadricornis*
Singhori	28,791	1976	*B. tragocamelus; T. quadricornis*

Table 34.2 Protected Areas in India containing antelopes (listed by State). (Cont.)

Protected Area[1]	Size (ha)	Year Established	Species
Maharashtra			
Nawegaon NP	13,388	1975	*B. tragocamelus; T. quadricornis*
Pench NP	25,726	1975	*T. quadricornis*
Sanjay Gandhi NP	8,696	1983	*T. quadricornis*
Tadoba NP	11,655	1955	*B. tragocamelus; T. quadricornis; G. bennettii?*
Dandeli	572,907	1975	*B. tragocamelus; T. quadricornis*
Great Indian Bustard	849,644	1979	*A. cervicapra; G. bennettii*
Melghat	159,733	1985	*B. tragocamelus; T. quadricornis; G. bennettii*
Nagzira	15,281	1969	*B. tragocamelus; T. quadricornis*
Tansa	30,481	1970	*T. quadricornis*
Orissa			
Kotagarh	39,950	1981	*B. tragocamelus; T. quadricornis*
Satkosia Gorge	79,552	1976	*B. tragocamelus; T. quadricornis*
Rajasthan			
Desert NP	316,200	1981	*B. tragocamelus; G. bennettii*
Keoladeo NP	2,873	1981	*B. tragocamelus; A. cervicapra*
Ranthambore NP	39,200	1980	*B. tragocamelus; T. quadricornis; G. bennettii*
Sariska NP	27,380	1982	*B. tragocamelus; T. quadricornis; G. bennettii*
Darrah	26,583	1955	*B. tragocamelus; T. quadricornis; G. bennettii*
Guda-Vishnoian	42,500		*B. tragocamelus; A. cervicapra; G. bennettii*
Jaisammand	5,200	1956	*B. tragocamelus; T. quadricornis; G. bennettii*
Kumbhalgarh	57,826	1971	*B. tragocamelus; T. quadricornis; G. bennettii*
Mount Abu	28,84	1960	*B. tragocamelus; G. bennettii*
National Chambal	28,000	1983	*B. tragocamelus; A. cervicapra; G. bennettii*
Phulwari	51,141	1983	*T. quadricornis*
Sitamata	42,294	1979	*B. tragocamelus; T. quadricornis; G. bennettii*
Tal Chappar	710	1962	*A. cervicapra; G. bennettii*
Todgarh Raoli	49,527	1983	*B. tragocamelus; T. quadricornis*
Tamil Nadu			
Point Calimere	1,726	1967	*A. cervicapra*
Uttar Pradesh			
Chandraprabha	7,800	1957	*B. tragocamelus; G. bennettii*
Kaimur	50,075	1982	*B. tragocamelus; A. cervicapra; G. bennettii*
Proposed			
Daultbeg-Depsang	30,000		*P. hodgsonii (seasonal)*
Changtang	100,000		*P. picticaudata?*
Rupshu	300,000		*P. picticaudata?*

[1]*All sanctuaries except NP = national park*

Habitat, food and reproduction: Nilgai are very adaptable, and occur in arid, sandy areas and dry deciduous forests, but they avoid extreme deserts and dense forests. Nilgai browse and graze, feeding on the leaves of *Zizyphus* and other trees (Prater 1980). Calves are born throughout the year and twins are common. They are sedentary, and are usually seen in groups of four to 10, though large assemblages of 30 animals are sometimes found in good feeding areas, generally crop fields (Qureshi 1992; Singh 1995).

Status within the country: Satisfactory. Numerous, and a pest in some agricultural areas. Protected by law but hunting is allowed when crop damage becomes excessive.

Conservation measures taken: Nilgai are considered sacred by Hindus, so traditionally they are not killed, but instead are driven away from crop fields. However, numbers have increased since implementation of the Wildlife (Protection) Act of 1972 due to stiff penalties for poaching. The population has reached pest proportions in several places and the government amended the law in 1996 to allow shooting of nilgai. Healthy populations survive in many protected areas (Table 34.2), e.g., Gir National Park (115,342ha) in Gujarat; Ranthambore National Park (39,200ha), Sariska National Park (27,380ha), and Kumbhalgarh Sanctuary (57,826ha) in Rajasthan; and Pench National Park (29,286ha) in Madhya

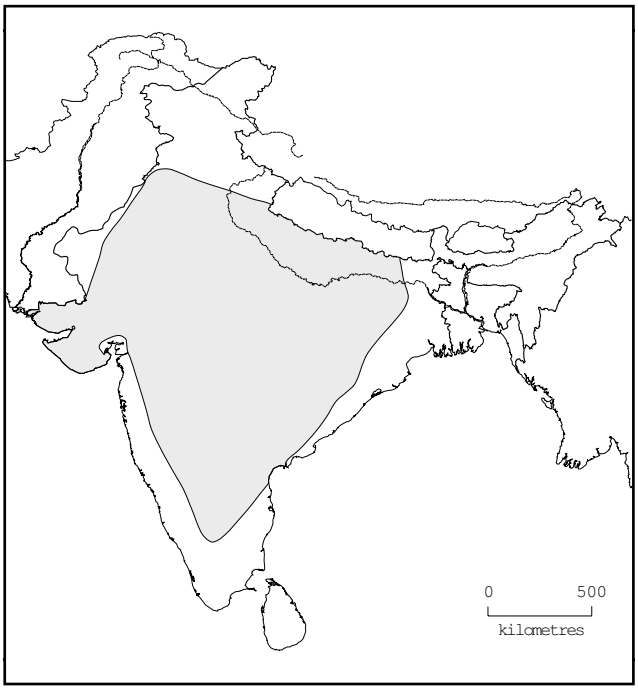
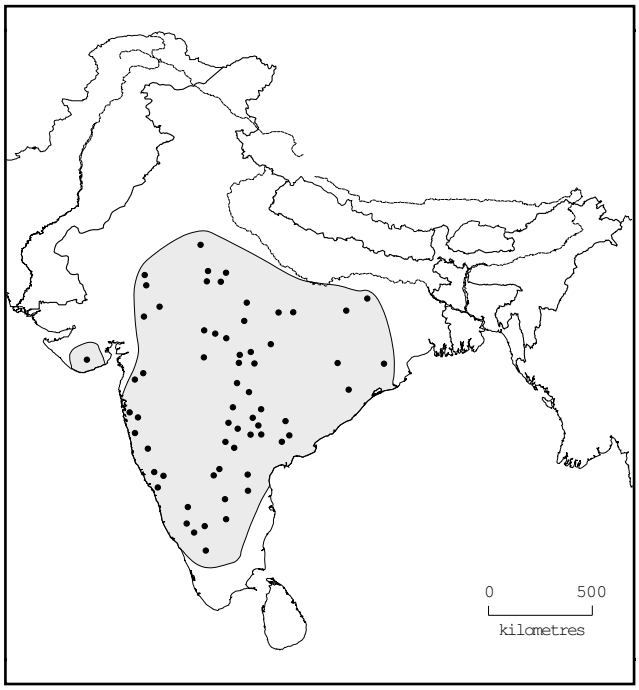


Fig. 34.2 General distribution of nilgai *(Boselaphus tragocamelus)* in India (shaded).



34.3 General distribution of four-horned antelope *(Tetracerus quadricornis)* in India (shaded) and sites of known occurrence (solid circles).

Pradesh. Global status is Lower Risk/conservation dependent (IUCN 1996).

Conservation measures proposed: Work should be started to determine ways of preventing crop damage and non-violent control methods. Other than this, no conservation measures are required, as the species is abundant and increasing.

Four-horned Antelope or Chousingha (*Tetracerus quadricornis*)

Distribution and population: The species has a very wide, but scattered distribution from the Himalayan foothills to peninsular India (Fig. 34.3). On the basis of a questionnaire survey, Rice (1991) recorded it at 83 sites in 10 states. In Gir Forest of Gujarat, population density was 0.22 per km^2 in 1970 (Berwick 1974) and 0.42 per km^2 in 1989 (Khan *et al.* 1995).

Habitat, food and reproduction: This is the least studied of all the antelopes of the Indian plains. No proper survey or any detailed study of its biology has been carried out, except for some studies by Berwick (1974) and a recent questionnaire survey by Rice (1991). Four-horned antelopes are found in well-wooded and well-watered, undulating or hilly country (Prater 1980). They browse and graze, and are never far from water. They are sedentary and solitary. Not much is known about the mating period. Young are perhaps born during the rains. Twins are not uncommon.

Status within the country: Vulnerable. Four-horned antelopes have been affected by deforestation and degradation of habitat, but it is not in immediate danger of extinction, although some populations may be too small and isolated to be viable in the long term.

Conservation measures taken: It is included in Schedule I of the Indian Wildlife (Protection) Act and is totally protected. Apparently common in many protected areas (Table 34.2), but census data are available only from three (Rice 1991). Numbers reported were 1,063 in Gir National Park and Sanctuary (141,200ha); 478 in Panna National Park

Photo 34.2 Four-horned Antelope *(Tetracerus quadricornis).* Nowak, Walker's Mammals of the World, p.1419. © N. Das.

(54,300ha); and 94 in Pench National Park (11,800ha). Global status is Vulnerable (IUCN 1996).

Conservation measures proposed: This species will benefit from more effective control on poaching and overgrazing by livestock in reserve forests and sanctuaries. A detailed ecological and biological study is required to find out more about its habitat requirements.

Blackbuck (*Antilope cervicapra*)

Distribution and population: Blackbuck occur in 13 states in northern, northwestern, central, and peninsular India (Fig. 34.4). Largest numbers are found in the states of Rajasthan, Punjab, Madhya Pradesh, Maharashtra, and Gujarat. In the late 1970s, Ranjitsinh (1982) estimated the total population in India to be between 22,000 and 24,000, which by the 1980s had increased to between 29,000 and 38,000, distributed at 93 known sites (Rahmani 1991). At present, its population could be >50,000. The development of Indira Gandhi Nahar (Canal) Project in the western Thar Desert is creating many new areas of blackbuck habitat by providing year-round forage and surface water, and some of these areas have already been occupied by blackbuck (Rahmani 1989, 1984; Rahmani and Sankaran 1991).

Habitat, food and reproduction: Blackbuck are found in flat, open areas, mainly grasslands (Ranjitsinh 1982). They require water daily, which restricts distribution to areas where surface water is available for the greater part of the year. It is primarily a grazer. Blackbuck live in herds of up to 300, generally in single-sex groups, but mixed herds of females, immature males, and one or two adult males are not uncommon. Blackbuck are, in general, sedentary, but in summer they may move long distances in search of water and forage. The calving season varies from area to area, but is generally after the monsoon.

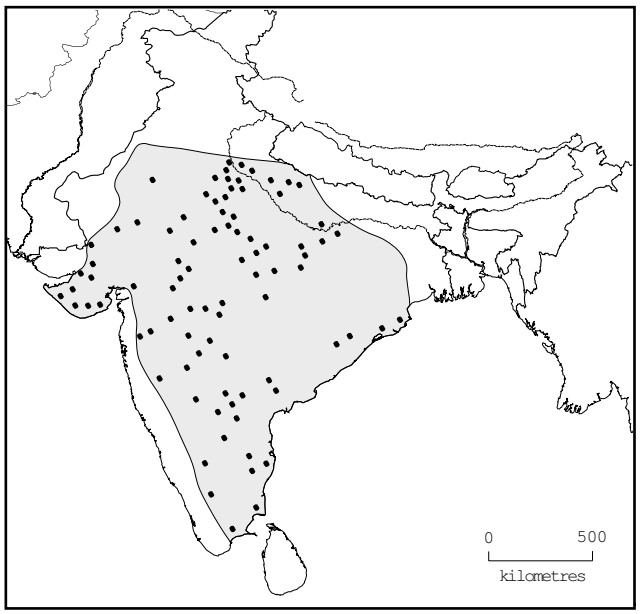


Fig.34.4 General distribution of blackbuck *(Antilope cervicapra)* in India (shaded) and sites of known occurrence (solid circles).

Photo 34.3 Blackbuck *(Antilope cervicapra).*
R.P. Fontaine/Mammal Slide Library, American Soc. Mammalogists.

Status within the country: Vulnerable. Blackbuck have disappeared from many areas, but they are reasonably secure and increasing in many protected areas and areas dominated by Vishnoi communities in Rajasthan and Haryana. The government's decision in 1996 to allow shooting of nilgai as an agricultural pest has led to an increase in poaching of blackbuck in some places, where both species share the same habitat.

Conservation measures taken: Blackbuck occur in many national parks and sanctuaries (Table 34.2). Notable protected areas for blackbuck are Velavadar National Park (3,000ha) in Gujarat, Point Calimere Wildlife Sanctuary (2,600ha) in Tamil Nadu, Ranebennur Wildlife Sanctuary (12,500ha) in Karnataka, Great Indian Bustard Wildlife Sanctuary in Maharashtra (800,000ha), and Guda-Vishnonian (42,500ha) and Taal Chhaper Blackbuck Sanctuary (700ha) in Rajasthan. Hunting of blackbuck is totally prohibited under the Wildlife (Protection) Act. Global status is Vulnerable (IUCN 1996).

Conservation measures proposed: With proper protection, blackbuck populations can quickly recover from low levels. In some areas, the population has increased so much that the blackbuck has become a menace to crops. For example, in Rollapadu Wildlife Sanctuary in Andhra Pradesh State,

blackbuck numbers increased from 17 in 1984 to 350 in 1995. Selective culling and even so-called sport hunting may eventually become appropriate. More areas of potential habitat created by the Indira Gandhi Canal in Rajasthan could be populated by translocations and introductions.

Indian Gazelle or Chinkara (*Gazella bennettii*)

Distribution and population: The chinkara still occurs in its former range in nine states of India (Fig. 34.5; Rahmani 1990a; 1990b; 1994). It is estimated that a minimum of 80,000 chinkara are found in the Thar Desert alone, and the total population in India is certainly more than 100,000. In some Vishnoi areas in the Thar Desert of western Rajasthan, population density reaches 31.6 per km^2 (Rahmani 1994). Based on 176 censuses covering 5,196km^2, the overall density in the Thar Desert in 1993–94 was 0.88 per km^2.

Habitat, food and reproduction: Chinkara are found in sandy areas and broken, uneven country, and avoid flat and steep terrain. Unlike blackbuck, chinkara are facultative drinkers so they can live in extremely arid areas, receiving 50–100mm annual rainfall. They are primarily browsers, but frequently graze on new shoots of grasses, especially during the monsoon. Chinkara can eat leaves of the highly toxic *Calotropis procera*. They are sedentary and live in groups of one to three, though sometimes larger herds are seen (Rahmani 1990a). The main calving period in the Thar is during the monsoon, but the season may vary in other areas.

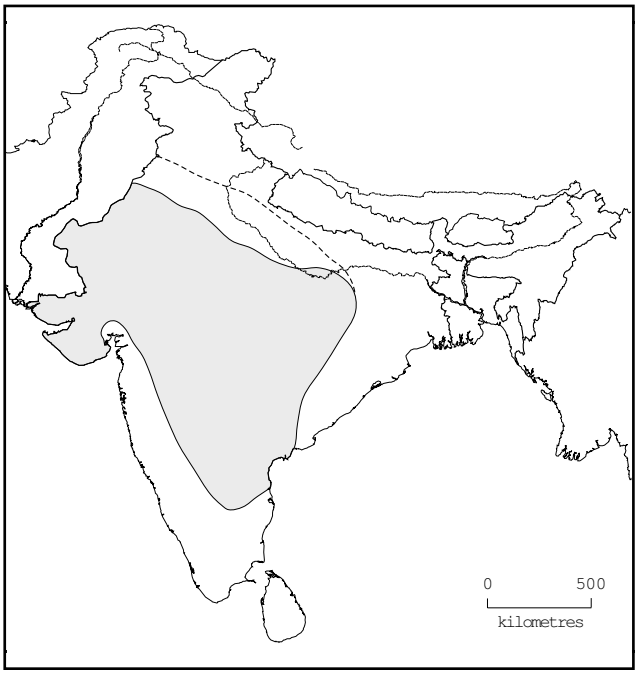


Fig. 34.5 General distribution of chinkara *(Gazella bennettii)* in India (shaded) and former distribution (broken line).

Status within the country: Satisfactory. Abundant around Vishnoi villages in Rajasthan and Haryana States (Rahmani 1994). The natural population fluctuates in cycles but no detailed study has been carried out on this aspect of its biology.

Conservation measures taken: Hunting and shooting are totally prohibited. Chinkara is the state animal of Rajasthan. Chinkara are found in more than 80 protected areas (Rahmani 1990b). The large Narayan Sarovar Chinkara Sanctuary (90,000ha) in Gujarat was recently partially denotified to enable mining for cement factories. Conservationists went to court against the denotification and finally won the case, but due to political exigencies and the money involved, work on the cement industries goes on uninterrupted. However, the number of chinkara in this sanctuary is small and denotification may not effect the overall chinkara population in the country. Global status is Lower Risk/conservation dependent (IUCN 1996).

Conservation measures proposed: The large Indira Gandhi Nahar (Canal) Project will have an impact on the chinkara population in the western Thar Desert and a full environmental impact assessment (EIA) is necessary (Rahmani 1994). A full survey of chinkara distribution and numbers in all the states where it occurs is needed, as well as ecological and biological studies of its behaviour.

Tibetan Gazelle (*Procapra picticaudata*)

Distribution and population: Tibetan gazelles inhabit two very small areas within Indian territorial limits, in southeastern Ladakh and northeastern Sikkim, both close to the border with China (Fig. 34.6). Fewer than 50 survive in southeastern Ladakh, in fragmented patches covering in total <1,000km^2 (Fox *et al.* 1991). In Sikkim, the Tibetan gazelle is a trans-border migrant roaming the Chho Lhamo Plateau on the border between India and China. A few usually remain on the Indian side of the border during

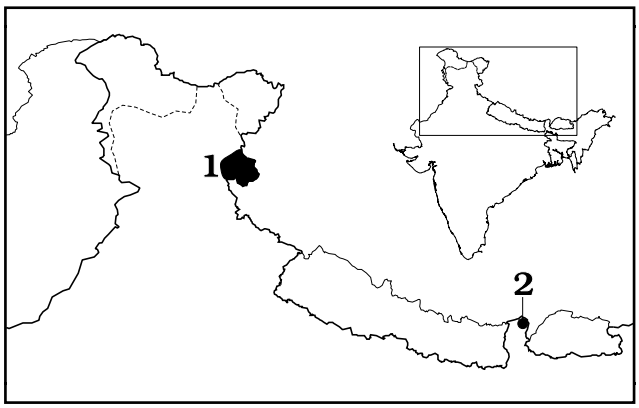


Fig. 34.6 Distribution of Tibetan gazelle *(Procapra picticaudata)* in India: 1. Former range in Ladakh; currently, very small numbers survive within this general area. 2. Seasonal occurrence in Sikkim.

winter, but they may not be seen regularly each year (Ganguli-Lachungpa 1997).

Habitat, food and reproduction: In Ladakh, Tibetan gazelles live in open rolling plains at altitudes of 4,700m and above. Their habitat has been subject to greatly increased sheep and goat herding in recent years, and there is also a large military presence (Fox *et al.* 1991). In Sikkim they inhabit high plains at elevations of *c.* 5,000m and they have been observed up to 5,447m (Ganguli-Lachungpa 1997).

Status within the country: Endangered. Extensively poached for its flesh and soft fur.

Conservation measures taken: Included in Schedule I of the Indian Wildlife (Protection) Act and specially protected by the Department of Wildlife Protection in Ladakh, but enforcement of the law is difficult in inaccessible areas. Global status is Lower Risk/near threatened (IUCN 1996).

Conservation measures proposed: Extensive conservation education of military officers who control most of the habitat of the Tibetan gazelle would help; in recent years, there has been a reduction in poaching by army personnel, but it has not been totally eliminated. Two proposed sanctuaries, Changtang (300,000ha) and Rupshu (100,000–300,000ha), will hopefully include the remaining population of the Tibetan gazelle in Ladakh (Fox *et al.* 1991). In Sikkim, a trans-border protected area should be established as a matter of urgency to protect the Tibetan gazelle population and other rare Tibetan Plateau species.

Tibetan Antelope or Chiru (*Pantholops hodgsonii*)

Distribution and population: Tibetan antelopes occur seasonally in two small areas of northeastern Ladakh, the Lingti Tsiang Plains of Daulat Baig Oldi region and the upper Changchenmo Valley (Fig. 34.7). Current range in Ladakh is estimated at approximately 2,500km^2 (Talwar and Chundawat 1996). They arrive within Indian limits around July and return to wintering grounds in Tibet by September; at most, 200–220 animals occur annually and this total is declining rapidly (Talwar and Chundawat 1996).

Habitat, food and reproduction: During the summer, Tibetan antelopes are found in high elevation plains (4,700m) in Ladakh, but they return to lower altitudes in winter. Not much is known about their ecology and behaviour in India. They live in small groups of three to five individuals, but sometimes herds >25 are found in good feeding grounds. They graze on grasses and sedges along the plains of the Changchenmo River Valley (Negi 1993). Single young are born during the summer.

Status within the country: Endangered. Tibetan antelope numbers have been drastically reduced due to an increase in poaching during the last 10 years. Earlier, the main reason was poaching by army personnel for meat and sport (Ranjitsinh 1981), but now it is extensively poached for its valuable wool. However, no recent evidence of poaching within Indian territory was found by Talwar and Chundawat (1996). Tibetan antelope horns are also used for traditional medicines as a substitute for saiga horns, which became unavailable after that species became extinct in China (Schaller *et al.* 1991).

Conservation measures taken: Listed in Schedule I of the Indian Wildlife (Protection) Act, 1972 (except in Jammu and Kashmir, where it is on Schedule II) and in Appendix I of CITES. The Department of Wildlife Protection of Ladakh gives special protection to this species, but patrolling a vast and difficult area is not easy with limited resources. Global status is Endangered.

Conservation measures proposed: Strict controls on poaching, the smuggling of wool, and on the sale of garments made from *shahtoosh* are urgently needed. The proposed Daultberg-Depsang Sanctuary in Ladakh would include a small seasonal population of Tibetan antelopes (Fox *et al.* 1991).

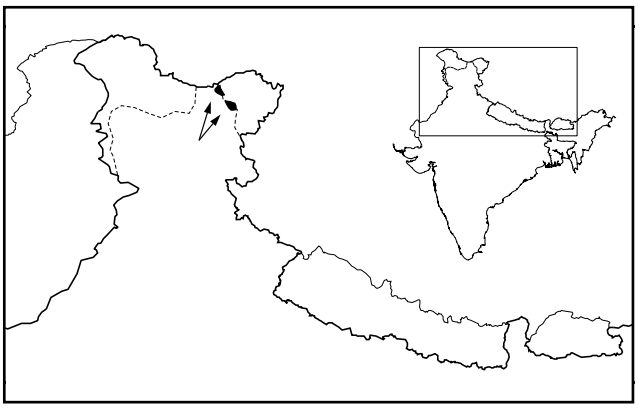


Fig. 34.7 Seasonal range of Tibetan antelope *(Pantholops hodgsonii)* in India (after Talwar and Chundawat 1996).

References

Berwick, S.H. 1974. The community of wild ruminants in the Gir Forest ecosystem, India. PhD thesis. Yale University, New Haven.

Fox, J.L., Nurbu, C., and Chundawat, R.S. 1991. The mountain ungulates of Ladakh, India. *Biological Conserv*ation 58:167–190.

Ganguli-Lachungpa, U. 1997. Tibetan gazelle *Procapra picticaudata* in Sikkim, India. *Journal of the Bombay Natural History Society* 94(3):557.

IUCN. 1996. *1996 IUCN Red List of threatened animals.* IUCN, Gland, Switzerland and Cambridge, UK.

Khan, J.A., Chellam, R., Rodgers, W.A., and Johnsingh, A.J.T. 1996. Ungulate densities and biomass in the tropical dry deciduous forests of Gir, Gujarat, India. *Journal of Tropical Ecology* 12:149–162.

Negi, S.S. 1993. *Biodiversity and its conservation in India*. Indus Publishing Company, New Delhi.

Prater, S.H. 1980. *The book of Indian animals*. Fourth edition. Bombay Natural History Society, Bombay.

Qureshi, M.Q. 1992. Population status and movement of Nilgai, *Boselaphus tragocamelus* (Pallas) around the village Gurshikaran near Aligarh University. MPhil dissertation, Aligarh Muslim University, Aligarh.

Rahmani, A.R. 1989. The uncertain future of the Desert National Park in Rajasthan, India. *Environmental Conservation* 16:237–244.

Rahmani, A.R. 1990a. Distribution, density, group size and conservation of the Indian gazelle or chinkara *Gazella bennetti* (Sykes 1831) in Rajasthan, India. *Biological Conservation* 51:177–189.

Rahmani, A.R. 1990b. Distribution of the Indian gazelle or chinkara *Gazella bennetti* (Sykes) in India. *Mammalia* 54:605–619.

Rahmani, A.R. 1991. Present distribution of the blackbuck *Antilope cervicapra* Linn. in India, with special emphasis on the lesser known populations. *Journal of the Bombay Natural History Society* 88:35–46.

Rahmani, A.R. 1994. *Wildlife situation in the Thar*. World Wide Fund for Nature, New Delhi.

Rahmani, A.R. and Sankaran, R. 1991. Blackbuck and chinkara in the Thar Desert: A changing scenario. *Journal of Arid Environments* 20:379–391.

Rahmani, A.R., Samant, J., Rao, Y.N., Manakadan, R., Natarajan, V., Kumar, A., Tiwari, J.K., Javed, S., and Kumar, S. 1996. A study of the ecology of the grasslands of the Indian plains with particular reference to their endangered fauna. Unpublished report. Bombay Natural History Society and Centre of Wildlife and Ornithology, Bombay.

Ranjitsinh, M.K. 1981. Himalayan fauna. Pp. 64–76 *in:* Lall, J.S. (Editor). *The Himalaya, aspects of change*. Oxford University Press, New Delhi.

Ranjitsinh, M.K. 1982. *The Indian blackbuck*. Natraj, Dehra Dun.

Rice, C. 1991. The status of four-horned antelope *Tetracerus quadricornis*. *Journal of the Bombay Natural History Society* 88:63–66.

Roberts, T.J. 1977. *The mammals of Pakistan*. Ernest Benn, London.

Rodgers, W.A. and Panwar, H.S. 1988. *Planning a wildlife protected area network in India*. Two vols. Wildlife Institute of India, Dehra Dun.

Schaller, G.B., Junrang, R., and Mingjiang, Q. 1991. Observations on the Tibetan antelope *(Pantholops hodgsoni)*. *Applied Animal Behaviour Science* 29:361–378.

Singh, R.V. 1995. Some studies on the ecology and behaviour of Nilgai (*Boselaphus tragocamelus* Pallas) with an assessment of damage to agricultural crops and development of strategy for damage control in south-western Haryana. PhD thesis. Aligarh Muslim University, Aligarh.

Sharma, B.D. 1994. *High altitude wildlife of India*. Oxford University Press, New Delhi.

Talwar, R. and Chundawat, R.S. 1996. A report on the survey of Tibetan antelope *Pantholops hodgsoni* in the Ladakh region of Jammu and Kashmir. Unpublished report. Wildlife Institute of India, Dehra Dun.

Wright, B. and Kumar A. 1997. *Fashioned for extinction.* Wildlife Protection Society of India, New Delhi.

Chapter 35. Nepal

T.K. Shrestha

Introduction

Nepal covers an area of 147,181km^2 and extends for about 800km along the southern slopes of the Himalaya, separating the arid Tibetan Plateau to the north from the fertile Gangetic Plain to the south (Fig. 35.1). More than 80% of the land area is covered by hills and mountains, which include Sagarmatha (Mount Everest) and a further seven of the 10 highest peaks in the world (IUCN 1993). There are four main ecological zones in Nepal, which lie parallel across the country on an east-west axis: Trans-Himalaya (a small, semi-arid montane zone north of the main Himalayan axis); Himalayan highlands; subtropical and temperate midlands; and subtropical lowlands or Terai (HMG Nepal/ IUCN 1988). Most of Nepal's antelopes occur in the Terai and parts of the adjacent foothills. The Terai represents a northern extension of the Gangetic Plain and is about 35km wide. About three decades ago, the vegetation consisted mainly of tropical deciduous forest containing *Shorea robusta*, *Dalbergia sissoo*, *Acacia catechu*, *Terminalia tomentosa*, *Bombax ceiba*, and other species. The lowlands have a subtropical monsoon climate; these conditions are moderated by increasing altitude. In general, precipitation is greater in the east than the west. Annual rainfall averages >3,500mm in the eastern parts of the Terai, but may be <500mm in the Trans-himalayan zone (Wegge and Oli 1997). The human population numbered more than 24,000,000 in 1999.

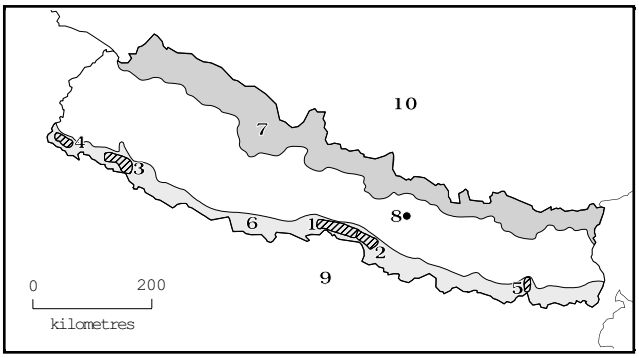


Fig. 35.1. Nepal. Protected areas containing antelopes: 1. Royal Chitwan NP (93,200ha); 2. Parsa WR (49,900ha); 3. Royal Bardia NP (96,500ha); 4. Royal Sukla Panta WR (15,500ha); 5. Koshi Tappu WR (17,500ha); (NP = national park; WR = wildlife reserve). Geographical features and localities mentioned in the text: 6. Terai; 7. Himalaya; 8. Kathmandu; 9. India. 10. China.

Current status of antelopes

Four antelope species occur, or have occurred, in Nepal (Table 35.1). All four are close to the geographical limits of their range. Tibetan antelope (*Pantholops hodgsonii*) formerly occurred in the extreme northwest of Nepal, but none has been seen there for some years and it is now apparently extinct in the country. However, large quantities of the valuable underfur of Tibetan antelope (*shahtoosh*) are smuggled across the long border with China into Nepal en route for India, and Kathmandu is believed to be one of the largest centres in the region for illegal wildlife trade (Wright and Kumar 1997). The other three species, blackbuck (*Antilope cervicapra*), nilgai (*Boselaphus tragocamelus*), and four-horned antelope (*Tetracerus quadricornis*) are endemic to the Indian Subcontinent and occur in the lowland Terai zone along the Indian border. Only nilgai are relatively common in Nepal, occurring widely in forest and scrub areas. Nilgai are regarded by Hindus as a kind of wild cow and are therefore given some protection by religious feelings, despite the serious damage they do to crops. Nevertheless, some nilgai are killed for meat and skins. Four-horned antelopes are rare and their distribution in Nepal is poorly known. Blackbuck were once abundant in the country, but their preference for open habitats made them highly vulnerable to shooting and they survive in only two localities. Attempts at reintroduction have so far failed. The growth in the human population of Nepal has been

Table 35.1 Current status of antelopes in Nepal.

Species	Status[1]	GPS[2]
Nilgai (*Boselaphus tragocamelus*)	Satisfactory	<10%
Four-horned Antelope (*Tetracerus quadricornis*)	Vulnerable	<5%
Blackbuck (*Antilope cervicapra*)	Endangered	c.0.25%
Tibetan Antelope (*Pantholops hodgsonii*)	Extinct	-

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

considerable. The success of malaria eradication programmes has led to increased settlement of the Terai and replacement of large areas of forest by agricultural land. Human interference through burning, domestic cattle grazing, clearing of the forest, and hunting has greatly increased pressure on wildlife.

Conservation measures taken

Early wildlife legislation comprised the Wildlife Conservation Act of 1958 and the Hunting Rules of 1967, under which six royal hunting reserves were established in 1969. A national conservation programme was begun by the government of Nepal in 1971. The National Parks and Wildlife Conservation Act was passed in March 1973. This act provides for establishment and administration of protected areas of all kinds and conservation of animals, birds, and their habitats. Four-horned antelope, blackbuck, and Tibetan antelope are protected on Schedule I of this act. The 1973 act was amended in 1989 to allow the establishment of conservation areas, which provide a more flexible system of management through the inclusion of human participation.

A National Conservation Strategy (NCS) for Nepal was completed in 1987 (HMG Nepal/IUCN 1988). The National Council for the Conservation of Natural and Cultural Resources is responsible for its implementation and for drawing up policy guidelines (IUCN 1993). The government of Switzerland, US Agency for International Development (USAID), and IUCN assist with implementation of the National Conservation Strategy. The main agency responsible for wildlife conservation is the Department of National Parks and Wildlife Conservation within the Ministry of Forests and Soil Conservation, but wildlife guards are provided by the Royal Nepalese Army (IUCN 1993).

Protected areas now cover about 9% of the land area and further protected areas are in the process of establishment (Wegge and Oli 1997). Categories of protected area are national park, controlled nature reserve, wildlife reserve, hunting reserve, and conservation area. Conservation areas are designed to include rural development programmes and are divided into different land-use zones. The major protected areas of significance for antelope conservation are the Royal Chitwan National Park (93,200ha) and adjoining Parsa Wildlife Reserve (49,900ha), Royal Bardia National Park (96,800ha), Koshi Tappu Wildlife Reserve (17,500ha), and Royal Sukla Phanta Wildlife Reserve (15,500ha). Royal Bardia is the largest and least-disturbed protected area in the Terai (Upreti 1989).

Several NGOs are concerned with wildlife conservation in Nepal. The King Mahendra Trust for Nature Conservation aims to conserve and manage natural resources to improve the quality of life of the human population (IUCN 1993). The Nepal Nature Conservation Society encourages local interest in nature conservation. IUCN has a project office in Kathmandu. WWF-US also provides financial and technical help for management of protected areas (Wegge and Oli 1997).

Conservation measures proposed

The most pressing problem facing wildlife conservation in Nepal is over-exploitation of natural resources by a rapidly growing human population, and the demand for land and for forest resources has an impact in and around protected areas (Upreti 1985; IUCN 1993). Resolution of conflicts between the management of protected areas and needs of local people is vital. A long-term programme for antelope conservation in Nepal should also include enforcement of existing laws and regulations to reduce poaching of antelopes, and the education of people living in the vicinity of protected areas about their scientific and religious value. Much more stringent controls on the illegal trade in *shahtoosh* are required at border crossings and in Kathmandu. Tibetan antelope has legal protection, but enforcement of the existing law is essential. It is important to conduct surveys to determine the current status of four-horned antelope and nilgai.

Species accounts

Nilgai (*Boselaphus tragocamelus*)

Distribution and population: Nilgai are widely distributed in the Terai (Fig. 35.2). There has been a considerable decrease in numbers over the last 60 years, mainly because the available habitat has been reduced through conversion to agricultural use, the extension of jute plantations, and the replacement of endemic forest trees by exotic species, mainly *Eucalyptus.* Hunting for meat and hide has also contributed to the population decline, and animals are occasionally killed by farmers when raiding crops. Nilgai are still common in protected areas, but no overall population estimate is available. There were 50–60 nilgai in the Royal Sukla Phanta Wildlife Reserve in 1988 (IUCN 1993).

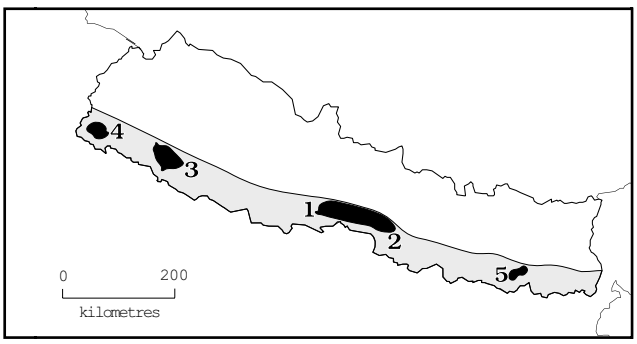


Fig. 35.2 General distribution of nilgai *(Bose1aphus tragocamelus)* in NepaI (shaded) and protected areas where it is known to occur (see Fig. 35.1).

Habitat, food and reproduction: Nilgai inhabit agricultural areas, where they cause considerable damage to crops, and the scrubby foothills of the Siwalik Hills in scrub jungle and dense riverine vegetation. They prefer areas close to water especially in the dry season. Nilgai are grazers and browsers and eat a wide variety of plants. Breeding may occur throughout the year, but February–March and October–November are the optimum times. Generally a single calf is born.

Status within the country: Satisfactory.

Conservation measures taken: Nilgai occur in the Royal Chitwan and Royal Bardia National Parks and Royal Sukla Phanta, Koshi Tappu, and Parsa Wildlife Reserves. Hindus consider the nilgai to be a wild cow, and so the animal is protected to some extent by religious sentiment. It was not included in the Department of National Parks and Wildlife's list of protected animals. Global status is Lower Risk/ conservation dependent (IUCN 1996).

Conservation measures proposed: The most important measure needed is the prevention of poaching of nilgai for meat. It would also be desirable to reduce the amount of damage caused to farmers' crops by fencing fields or by trenching. Encouraging growth of trees and shrubs, such as *Acacia catechu*, *Dalbergia sisso*, *Capparis dioica,* and *Zizyphus zujuba,* in selected areas of the forest will provide a source of preferred food items away from village fields. In particularly sensitive areas, it may be desirable to sow plants, such as wheat, beans, and mustard, within the forest to provide additional forage for nilgai.

Four-horned Antelope or Chousingha (*Tetracerus quadricornis*)

Distribution and population: Four-horned antelopes are found in parts of the Terai (Fig. 35.3), including the southern slopes of the Churia Hills (IUCN 1993). In Jhapa District of eastern Nepal they were common two decades ago, but are now rare. Numbers are low, but no population estimate for Nepal is available.

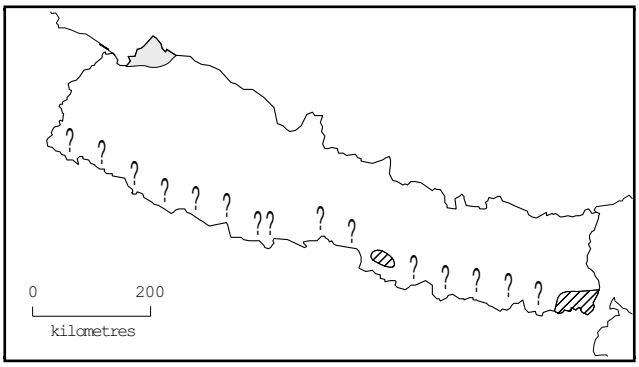


Fig. 35.3 Known distribution (hatched) and possible distribution (?) of four-horned antelope *(Tetracerus quadricornis)* in Nepal, and former distribution of Tibetan antelope *(Pantholops hodgsonii)* (shaded).

Habitat, food and reproduction: Four-horned antelopes live in undulating or hilly country covered by tall grass and open forest. They are seldom found far from water. Breeding occurs in spring, generally after the first rains.

Status within the country: Endangered.

Conservation measures taken: The species is included in the Department of National Parks and Wildlife's list of protected animals. Some four-horned antelopes occur in the Parsa Wildlife Reserve (49,900ha) situated on the southern slopes of the Churia Hills (IUCN 1993) and established in 1984. Global status is Vulnerable (IUCN 1996).

Conservation measures proposed: In order to control poaching, the number of forest guards should be increased and local villagers recruited to assist them. Existing areas of prime habitat should be protected from further human encroachment. Riverine grasslands that contain good forage species, such as *Saccharum* and *Cynodon*, are key ranges for four horned antelope. This good quality grassland should be maintained where necessary by regulated annual burning or cutting. Illegal grass cutting and cattle grazing in protected areas should be stopped by enforcing existing regulations, and overgrazing should be avoided. A long-term, conservation awareness programme should also be developed. Since the current distribution is so poorly known, all areas of potential habitat should be surveyed to assess the current status.

Blackbuck (*Antilope cervicapra*)

Distribution and population: Blackbuck were formerly abundant in the lowlands, but now only two populations remain in Nepal (Fig. 35.4). One is at Panditpur, Bardia District (but outside the Royal Bardia National Park) and totals about 200 animals within an area of 84ha (IUCN 1993). The other is a small, isolated population in the Banke District of western Nepal, about 37km southeast of Nepalgunj, between the Rapti River and the Churia Range near the villages of Jamuni and Bhaghawanpur. Blackbuck

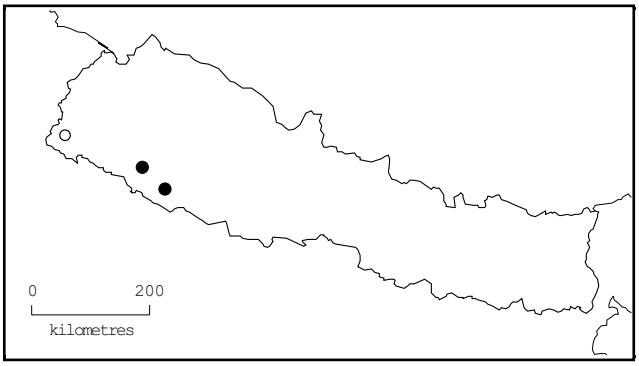


Fig. 35.4 Localities where blackbuck *(Antilope cervicapra)* currently occurs in Nepal (solid circles) and former range in Sukla Panta (open circle).

no longer occur within their previous range in Royal Sukla Phanta Wildlife Reserve.

Habitat, food and reproduction: Blackbuck prefer open grasslands and dry deciduous forest areas. They are now often forced to use wastelands, margins of agricultural land, and cultivated areas.

Status within the country: Endangered.

Conservation measures taken: Fully protected by law. About 30 are kept in the Jawalkhel Zoo in Kathmandu and are breeding well. Nine animals were introduced to the Royal Bardia National Park in 1980 and a further three animals were subsequently added to the original stock (Upreti 1989), but none have survived. To revive the declining population, four males and 22 females were translocated from Jawlakhel Zoo to Royal Bardia National Park in 1992. These animals were released directly into the wild from captive conditions in the zoo and did not thrive. Global status is Vulnerable (IUCN 1996).

Conservation measures proposed: No protected area in Nepal holds a sufficiently large population. The Baghaura area of Royal Bardia National Park has been identified as a suitable site for reintroduction, but before future releases take place, blackbuck should be acclimatised near the release site. If reintroduced blackbuck are to survive in Bardia, additional conservation measures must be taken. These include protecting fawns from predation by village dogs and stray dogs, fencing farmers' crops to prevent conflict, improving existing water sources, and managing the grasslands in the area for the benefit of blackbuck. People living in the area should also be made aware of the intrinsic religious and scientific value of the blackbuck.

Tibetan Antelope or Chiru (*Pantholops hodgsonii*)

Distribution and population: Tibetan antelopes formerly occurred in the extreme northwest of Nepal (Schaller 1977). The only locality where they were recorded was the Kameng Valley (Fig. 35.3), which they reached via a pass from Tibet (Shrestha 1997). There are no recent records of this animal in Nepal.

Status within the country: Extinct.

Conservation measures taken: Protected by law. Global status is Endangered.

Conservation measures proposed: Nepal is an important centre for the illegal trade in the underfur of Tibetan antelope (*shahtoosh*). Action to curb this trade should be greatly intensified. Efforts should be made to prevent *shahtoosh* reaching Nepal by increasing vigilance at border crossings from Tibet. Further checks and controls are needed in Kathmandu and along transport routes into India, at airports and land border crossings.

References

HMG Nepal/IUCN. 1988. *Building on success. The national conservation strategy for Nepal*. HMG National Planning Commission/NCS for Nepal Secretariat, Kathmandu.

IUCN. 1993. *Nature reserves of the Himalaya and central Asia.* IUCN, Gland, Switzerland and Cambridge UK.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Schaller, G.B. 1977. *Mountain monarchs*. University of Chicago Press, Chicago.

Shrestha, T.K. 1997. *Mammals of Nepal*. Bimala Shrestha, Kathmandu.

Upreti, B.N. 1985. The park-people interface in Nepal: Problems and new directions. Pp. 19–24 *in:* McNeely, J.A., Thorsell, J.W., and Chalise, S.R. (Editors). *People and protected areas in the Hindu Kush-Himalaya*. King Mahendra Trust for Nature Conservation/International Centre for Integrated Mountain Development, Kathmandu.

Upreti, B.N. 1989. Royal Bardia National Park. Unpublished report. Department of National Parks and Wildlife Conservation, Kathmandu.

Wegge, P. and Oli, M. 1997. Nepal. Pp. 231–239 *in:* Shackleton, D.M. (Editor). *Wild sheep and goats and their relatives. Status survey and action plan for Caprinae*. IUCN, Gland, Switzerland and Cambridge, UK.

Wright, B. and Kumar A. 1997. *Fashioned for extinction.* Wildlife Protection Society of India, New Delhi.

Chapter 36. Bangladesh

M.A.R. Khan

Introduction

Bangladesh has an area of 144,054km^2 and lies between 20^{0}34' and 26^{0}38'N and between 88^{0}01' and 92^{0}40'E at the head of the Bay of Bengal. It is surrounded by India to the west, north, and northeast, and is bordered by Myanmar to the east (Fig. 36.1). The human population is over 114,700,000. Most of the country (80%) consists of a low-lying alluvial plain crossed by the Ganges, Brahmaputra, and Meghna Rivers. The Chittagong Hills and other ranges lie in the east and southeast. Remaining forest cover is only about 6.9% of the land and most of this occurs in upland areas (IUCN 1990). The original forest cover of the plains has been replaced by cultivation and the only substantial area of forest there consists of the mangrove forests of the Sundarbans on the western border. Tropical evergreen and semi-evergreen forests are found in the eastern hills and there is a small area of moist deciduous sal (*Shorea robusta*) forest on the northern border. Bangladesh has a typical monsoon climate with high temperatures, high humidity, and heavy rainfall during the summer months; about half the plains are subject to annual flooding (IUCN 1990; Akonda 1997).

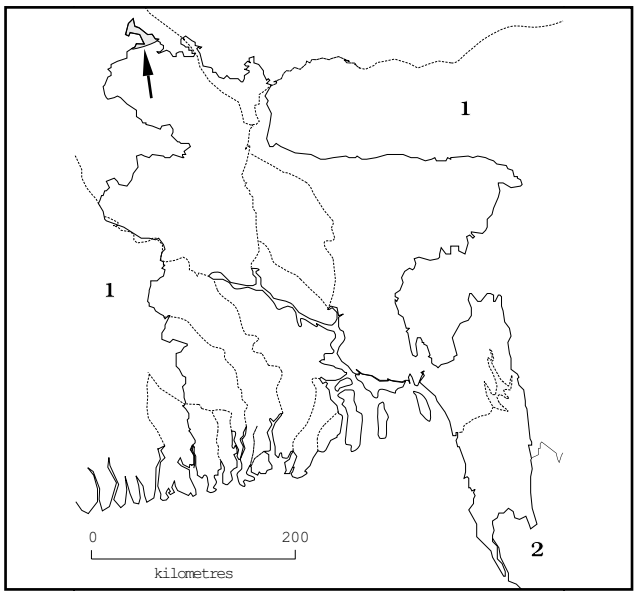


Fig. 36.1 Former distribution of nilgai *(Boselaphus tragocamelus)* in Bangladesh (shaded). 1. India; 2. Myanmar.

Current status of antelopes

Nilgai (*Boselaphus tragocamelus*) and blackbuck (*Antilope cervicapra*) are the only species of antelopes recorded in Bangladesh (Khan 1982; 1985), but both are now extinct in the country (Table 36.1). There appears to be no place in Bangladesh where antelopes could be reintroduced, since most of the potential habitat has been destroyed, and there is virtually no fallow land in Bangladesh that is devoid of human settlements. There are no antelopes in the country's zoos.

Conservation measures taken

Bangladesh has completed the first phase of a national conservation strategy to integrate conservation and national development objectives, but there is no national wildlife conservation policy (IUCN 1990). The Bangladesh Wildlife (Preservation) Order 1973, later amended in 1974 provides the basis for establishment of protected areas (national parks, wildlife sanctuaries, game reserves, and private game reserves). The only reserve lying within the general area formerly occupied by antelopes is Ramsagar National Park, which consists of a lake covering 52ha. Responsibility for conservation of wildlife rests with the Forest Directorate within the Ministry of Environment and Forests. However, there are no separate funds for wildlife within the Forest Directorate's budget (IUCN 1990; 1992). The Wildlife Society of Bangladesh is the principal NGO concerned with wildlife conservation. The Society for Conservation of Nature and the Environment is mainly concerned with environmental pollution (IUCN 1990).

Species accounts

Nilgai (*Boselaphus tragocamelus*)

Distribution and population: Nilgai formerly lived in the Tetulia-Banglabandha area (Fig. 36.1). Several elderly villagers have reported seeing very small numbers of nilgai

Table 36.1 Current status of antelopes in Bangladesh.

Species	Status[1]
Nilgai (*Boselaphus tragocamelus*)	Extinct
Blackbuck (*Antilope cervicapra*)	Extinct[2]

[1] *See Chapter 1 for definition of status categories*
[2] *Assuming the species formerly occurred within the country*

there in the 1940s, and a very few were reported to have been present around 1950 near Dinajpur (M.A. Choudhry *pers. comm.*). There have been no confirmed sightings since then and field surveys at these two sites and in neighbouring areas in December 1979, December 1981, and May 1988 failed to find any sign of the existence of this species.

Status within the country: Extinct.

Blackbuck (*Antilope cervicapra*)

Distribution and population: Details of the occurrence of blackbuck in Bangladesh are unclear. Nineteenth century reports mentioned its presence in "Lower Bengal." It is a matter of conjecture as to which parts of the present-day Bangladesh and the Indian state of West Bengal the term "Lower Bengal" referred. There have been no published records of blackbuck in Bangladesh during this century. Field surveys in northern Bangladesh in December 1979, December 1981, and May 1988, and in adjacent areas of Indian West Bengal failed to find any sign of blackbuck.

Status within the country: Extinct.

References

Akonda, A.W. 1997. Bangladesh. Pp. 264–266 *in:* Shackleton, D.M. (Editor). *Wild sheep and goats and their relatives. Status survey and conservation action plan for Caprinae*. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN. 1990. *IUCN directory of South Asian protected areas*. IUCN, Gland.

IUCN. 1992. *Protected areas of the world: A review of national systems. Vol. 1: Indomalaya, Oceania, Australia, and Antarctica.* IUCN, Gland, Switzerland and Cambridge, UK.

Khan, M.A.R. 1982. *Wildlife of Bangladesh – a checklist*. Dhaka University, Dhaka.

Khan, M.A.R. 1985. *Mammals of Bangladesh*. Nazma Khan, Dhaka.

Chapter 37. Lao PDR

R.J. Timmins

Introduction

The Lao Peoples' Democratic Republic (hereafter referred to as Laos) covers an area of 236,000km^2 in the centre of the Indochinese Peninsula and is bordered by Thailand, Vietnam, Cambodia, China, and Myanmar (Fig. 37.1). Its population is estimated at 5.4 million, a low density by regional standards, but the population growth rate is one of the highest in the world, at 2.4% per year (National Statistical Centre 1995). The majority of the population lives in small rural villages.

Laos can be divided into three main physiographic regions: northern highlands, Annamite Mountains, and the Mekong Plain (Salter 1993). The northern highlands range predominantly from 500m to 1,500m in altitude, and they have experienced the most extensive habitat disturbance in the country. The Annamite Mountains (known in Laos as Sayphou Louang) extend along the Vietnamese border to the northern highlands. Their rugged terrain, ranging from 200m to 2500m, is primarily covered in evergreen forests. To the west of the Annamite Mountains lies the Mekong Plain, which lies mostly below 200m. This plain has a pronounced seven-month dry season, lasting from October to May. The northern highlands are cooler at all seasons and experience the fewest seasonal fluctuations. The Annamites are also less seasonal, with small areas that experience rains through the winter. Further details of the status of habitats, principal human threats to wildlife and the wildlife surveys that have taken place in Laos up to the end of 1996 can be found in Thewlis *et al.* (1998). The current status of wildlife in Laos was summarised in a recent report (Duckworth *et al.* 1999).

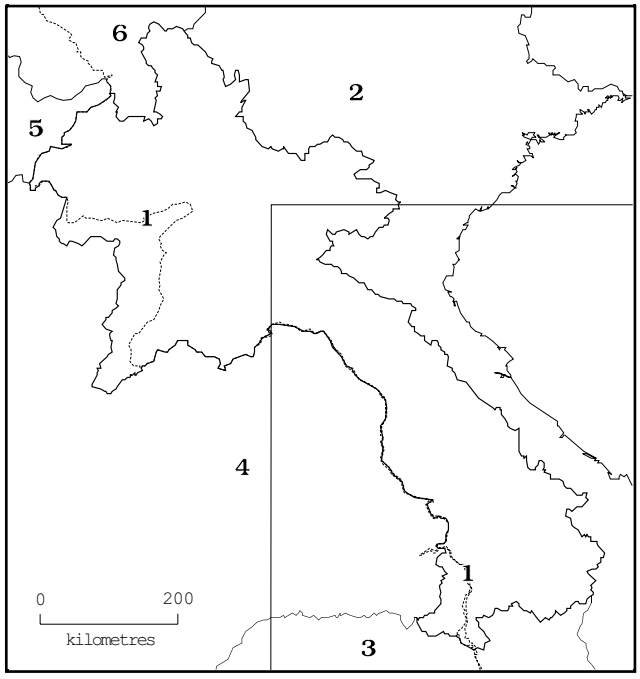


Fig. 37.1 Laos. Inset shows the area covered in Fig. 37.2. 1. River Mekong; 2. Vietnam; 3. Cambodia; 4.Thailand; 5. Myanmar; 6. China.

Current status of antelopes

The only species known to occur in Laos is the saola (*Pseudoryx nghetinhensis*), first discovered in Laos in 1993 (Salter 1993) (Table 37.1). Distribution is limited to the forested Annamite Mountains along the border with Vietnam. Distribution is not fully known and consists at present of fragmented populations in and around the Nakai-Nam Theun National Biodiversity Conservation Area (NBCA), a proposed extension area to the north, and other adjacent parts of the Nam Gnouang Catchment farther to the west. There is an old record and a recent report from an area of the Lao-Vietnamese border farther to the south, and a single report from the southern Lao Annamites. Surveys of a further 17 protected areas and one other forest area between October 1992 and June 1998 found no evidence of the species. In January 1996, a single adult female was captured by Hmong villagers from the Nam Gnouang area to the north of Nakai-Nam Theun NBCA and placed in a small private menagerie in the provincial town of Ban Lak (20) (Lak Xao). This animal survived for 17 days in captivity, allowing some observations to be made (Etter and Ruggeri 1996; Robichaud 1998). Few field data have been gathered on the biology of this species in Laos, although

Table 37.1 Current status of antelopes in Laos.

Species	Status[1]	GPS[2]
Saola (*Pseudoryx nghetinhensis*)	Endangered	?50%

[1] *See Chapter 1 for definition of status categories*
[2] *Global population share*

there is a substantial amount of anecdotal information from local people. (Note: many villages in Laos are called 'Ban Lak' and care should be taken not to confuse Ban Lak (20) with other localities, such as Ban Lak (52), which is a centre of wildlife trade [Duckworth 1997]).

Another newly discovered species of bovid (*Pseudonovibos spiralis*) has been reported from northeastern Cambodia and adjacent parts of Vietnam (Peter and Feiler 1994; Desai and Lic Vuthy 1996; Weiler *et al.* 1998). These areas lie close to the border with Laos and there is old evidence in the form of a detailed description for the possible presence of the species in the extreme southeast of Laos (Robichaud 1998b), but no recent records have come to light. Local people questioned on the northern edge of Xe Sap Proposed NBCA, the Dakchung Plateau, and Dong Amphan NBCA apparently did not recognise the species (G.B. Schaller *pers. comm.* 1995; Davidson *et al.* 1997; W.G. Robichaud *pers. comm.* 1998; Showler *et al.* 1998). The negative responses from hunters indicate the species is extinct in Laos if it ever occurred there (Duckworth *et al.* 1999).

The greatest single threat to the saola is from hunting. Laos has a predominantly rural population that traditionally hunts wildlife; this is especially so of the Hmong minorities of northern Laos. In addition, there is evidence that hunting activities have increased in response to a new demand from the novelty and status value of saola trophies and captive animals. Snaring and hunting by trans-border poachers in eastern Laos is probably a similarly severe threat to the species (W.G. Robichaud *in litt.*).

Conservation measures taken

The government agency responsible for wildlife conservation in Laos is the Centre for Protected Areas and Watershed Management (CPAWM) of the Department of Forestry, which is in the Ministry of Agriculture and Forestry. CPAWM has technical assistance from IUCN and has been funded partly through the Lao-Swedish Forestry Co-operation Programme. At present, saola are not legally protected, although the government of Laos is currently drafting new legislation for wildlife in which they will be given protected species status, which will make it illegal to kill or capture saola without government approval (Chantaviphone Inthavong *pers. comm.* 1996). Laos has agreed, in principle, to join the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The conservation ethic within Laos is very young. A national protected area system has only been created within the last eight years (Berkmüller *et al.* 1995a; 1995b). Several national biodiversity conservation areas (NBCA) have been established and a number of others have been proposed (PNBCA). Because there is no precedent for protected area management in Laos, the approach to conserving protected areas is experimental. Management plans have only been drafted for a small number of areas, and skilled human resources and, in some cases, funding are severely limited. Considerably more needs to be done before conservation of large animal species within these NBCAs becomes effective. The Wildlife Conservation Society (WCS) is working with CPAWM on baseline inventory surveys of the country's protected area system and is developing a programme of training for protected area staff. A number of other international donors are funding and providing assistance with surveys, personnel training, and/or management activities in several NBCAs. Saola are known to occur in Nakai-Nam Theun NBCA (371,000ha) and the proposed northern extension to it (64,500ha). Management of the NBCA is being implemented through IUCN-Laos (IUCN 1997). Saola may also occur in Nam Chouan PNBCA (161,000ha) and Xe Sap NBCA (133,500ha). The species could also occur in Dong Amphan NBCA (197,500ha), though field surveys have so far failed to find it. Dong Amphan NBCA has no funding from external donors, but the WWF Indochina Programme plans a three-year project from January 1999 to develop protected area staff capacity in Attapu Province with a socio-economic focus (R.J. Tizard *pers. comm.* 1998). Xe Sap NBCA is one of four areas selected for protected area development by the Forest Management and Conservation Programme, a joint, five-year venture between the Lao Government and World Bank's Global Environmental Facility. Personnel and infrastructure are already established (B. Jeffries *pers. comm.* 1998). Partial implementation of an Action Plan for saola in Laos has begun (Robichaud 1997) and an extensive revision is due in 1999.

Conservation measures proposed

The most urgently needed conservation measure is a public awareness and education programme targeted at the saola in areas near its habitat. This needs to be coupled with effectively implemented legislation. Patrols against trans-border poachers and their snares along Laos's eastern border are also urgently needed. Habitat loss due to forest clearance for subsistence agriculture is a longer-term threat.

Species account

Saola (*Pseudoryx nghetinhensis)*

Distribution and population: Saola occur in the forests of the Annamite Mountains along the Lao-Vietnam border (Fig. 37.2). Distribution is not known precisely and most information comes from searches for trophies and first-hand accounts in rural villages. The first distributional data were gathered in east-central Laos, in the Nakai-Nam Theun NBCA and its proposed northern extension between January and April 1994 (Timmins and Evans 1994; Schaller

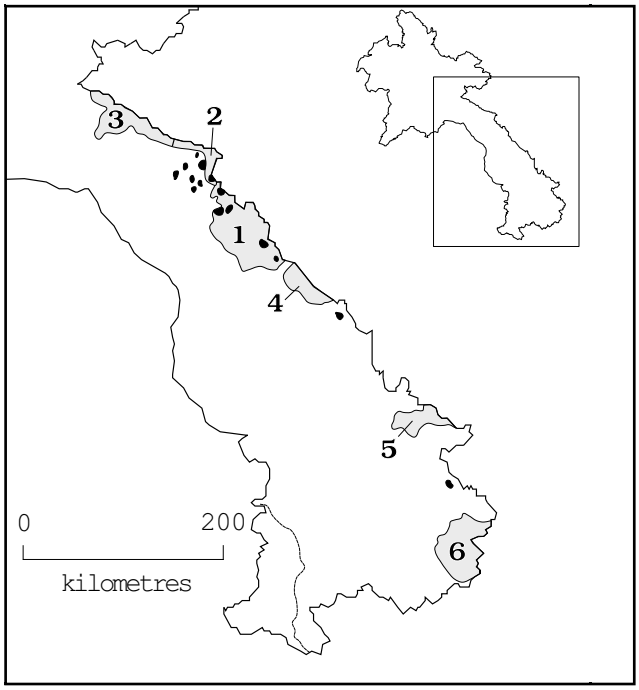


Fig. 37.2 Current distribution of saola *(Pseudoryx nghetinhensis)* in Laos (black) and protected areas mentioned in the text: 1. Nakai-Nam Theun National Biodiversity Conservation Area (NBCA) (371,000ha); 2. Proposed northern extension (64,500ha); 3. Nam Chuan proposed NBCA (161,000ha); 4. Hin Namno NBCA (82,000ha); 5. Xe Sap NBCA (161,000ha); 6. Dong Amphan NBCA (197,500ha).

and Rabinowitz 1995). A concentration of records in the Nam Noy/Pheo Headwaters was omitted by Schaller and Rabinowitz (1995). Further evidence for saola in Nakai-Nam Theun NBCA, the proposed northern extension, and in adjacent western parts of the Nam Gnouang Catchment came from four field surveys and other sources between December 1994 and October 1997 (Khamkhoun Khounboline 1995; Schaller 1995; Pheng Phaengstintham 1996; W.B. Robichaud *pers. comm.* 1996; Tizard 1996; Robichaud 1997; Pheng Phaengstintham *pers. comm.* 1996; J. Tobias *pers. comm.* 1998). About 18 reports and a small number of trophy horns come from the headwaters of the Nam Kata, Nam Noy/Nam Pheo, and the Nam Xot Rivers in Nakai-Nam Theun NBCA, but most recent evidence and reports (including more than five sets of trophy horns and two live animals) come from the Nam Gnouang Catchment (including the proposed northern extension), in an area between the lines $18^0$20'N, $104^0$50'E and the international border. There are probably four or more disjunct populations within this area, which is the only area from which reports suggest that animals are still regularly seen and killed. The forest in the proposed northern extension along the border is 600m to 1,800m in altitude and appears to experience a cooler and wetter climate than areas further to the south (Timmins and Evans 1994). The forest within five kilometres of the border is considerably wetter than any other forest surveyed within Laos in the winter months. Surveys in late 1997 and 1998 have extended this area of known occupancy further west and north into the southern catchment of the Nam Chouan and Nam Mouan Rivers (to the area approximately between $18^0$30'N, $104^0$33'E and $18^0$46'N, $104^0$27'E) (Robichaud 1998c). However, as in the Nam Gnouang Catchment, habitat and, presumably, saola populations are fragmented. There is further more recent evidence (reports and a small number of trophies) for presence to the west of the Nam Xan in an area centred on *c.*$18^0$51'N, $103^0$41'E (W.G.Robichaud *pers. comm.* 1998); the intervening area between the Nam Xan and the Nam Chouan has not been visited. The Nakai-Nam Theun NBCA is also mountainous (600m–2,200m), but it experiences a drier, warmer climate than the northern extension area, especially in the winter months. In contrast, localised areas, in particular the Nam Noy/Pheo Headwaters, appear to experience a wetter climate (Timmins and Evans 1994). Forest in the proposed northern extension along the international border is still intact and contiguous with similar forest in Vietnam, but it becomes progressively more fragmented southwestwards in Laos. Western parts of the Nam Gnouang Catchment are probably drier than the eastern headwaters in the proposed extension. In border areas north of $18^0$40'N, a survey in Nam Xam NBCA obtained no reports of saola (W.G. Robichaud *in litt.*).

Further south, no reports have come from the limestone area of Hin Namno NBCA along the Lao-Vietnamese border between $17^0$40'N, $105^0$45'E and $17^0$15'N, $106^0$10'E, despite fairly extensive questioning in villages (Timmins and Khamkhoun Khounboline 1996). However, there is a report of an animal captured several decades ago from southeast of Hin Namno NBCA, at $17^0$05'N, $106^0$15'E (Timmins and Evans 1994; Schaller and Rabinowitz 1995), and a more recent report of saola from the same area along the Lao-Vietnamese border, from non-calcareous mountains (Walston, unpublished data). Large gaps remain in survey work along the Annamites south of $170^0$15'N.

The only evidence for the species in the southern Lao Annamites is a single report from the Dakchung Plateau, *c.*$15^0$30'N, $107^0$20'E (Schaller 1995). All other local people questioned on the Dakchung Plateau, the northern edge of Xe Sap NBCA, and Dong Amphan NBCA did not recognise the saola (Schaller 1995; Timmins and Chantavi Vongkhamheng 1996; Davidson *et al.* 1997; W.G. Robichaud *pers. comm.* 1998; Showler *et al.* 1998). Although evidence for saola was not always directly sought, no evidence of the species was found during surveys of a further 17 NBCAs and PNBCAs, and one other forest area between October 1992 and August 1996. For details of these surveys, see Duckworth (1997) and Thewlis *et al.* (1998). There have been no reports or evidence of saola west of a line running southeast from $18^0$50'N, $104^0$15'E to $18^0$15'N, $104^0$55' E, and then to $17^0$40'N, $105^0$30'E.

The Lao population of saola is, at a guess, probably between 70 and 700 individuals, with an estimated 50 to 500

in the Nakai-Nam Theun NBCA. Twenty to 150 individuals are estimated in the Nam Gnouang Catchment and proposed extension to the north of Nakai-Nam Theun NBCA; estimates for other areas are far more speculative. The species is almost certainly declining in all areas.

Habitat, food and reproduction: The saola appears to inhabit evergreen forests of the Annamites, where slopes are often steep, but rarely precipitous. The Nam Gnouang Catchment to the north of Nakai-Nam Theun NBCA also has large tracts of scrub and various stages of secondary growth; first-hand reports suggest that the species prefers little-disturbed forest, but it is occasionally found in secondary habitat types. Schaller and Rabinowitz (1995) suggested that saola might inhabit karst, but no evidence for this has been found in surveys of four areas of karst, including those along the international border south of Nakai-Nam Theun NBCA (see e.g., Timmins and Khamkhoun Khounboline 1996). Local reports suggest that the species is either solitary or occurs sometimes in pairs, and that it is quiet and elusive. Hunters who track saola with dogs report a very distinctive defensive behaviour: apparently they run down into the nearest stream valley and stand rigidly with their hindquarters up against the stream bank, their heads down, and horns directed forward (W.G.Robichaud *pers. comm.* 1998; R.J. Timmins unpublished data). The captive female in Ban Lak (20) showed a very similar posture when encountering dogs, despite showing no apparent concern of people at an equivalent proximity (N.L. Ruggeri *pers. comm.* 1996; Robichaud 1998). Such behaviour probably developed in response to predation by Asian wild dog (*Cuon alpinus*) which hunts in packs, but it does not necessarily indicate this species to be the principal predator as suggested by Robichaud (1997). Both tiger (*Panthera tigris*) and leopard (*P. pardus*) are potentially equally important predators. The very large and highly specialised preorbital glands of the saola may be used for scent marking, as the captive female was observed marking specific rocks within her enclosure (Robichaud 1998a; R.J. Timmins unpublished data). Her long, mobile tongue and apparent food preferences suggest a browsing diet. The captive female showed an apparent preference for a plant identified as *Schismatoglottis* sp. of the family Araceae (P. Boyce, Kew Herbarium, *pers. comm.* to W.G. Robichaud); local Hmong villagers also report this herb to be a favoured food of wild saola (Pheng Phaengstintham 1996; Robichaud 1997; 1998a). The captive female was pregnant in January with a hairless foetus weighing *c.*1kg.

Status within the country: Endangered. Habitat clearance is rapidly progressing to the north of Nakai-Nam Theun NBCA, aided by migration of Hmong people into the area from northern Laos. Most large mammals have declined severely throughout Laos because of high hunting pressure. Every indication suggests that the same is true of saola. The saola has already gained a novelty value and trade in trophies appears to be on the rise. Two saola were captured by local people in the Nam Gnouang Catchment area and sent to Ban Lak (20) in January 1996 (Robichaud 1998a; 1998d; J.Tobias *pers. comm.* 1998; R.J.Timmins unpublished data). Several others have reportedly died during or shortly after capture. Between late 1995 and late 1997, a quasi-autonomous Lao development group, BKPK, based in Ban Lak (20) was interested in maintaining captive saola and reportedly paid $1,000 for some of the animals. No captive animals have lived for any length of time. Further problems arise from road construction, which contributes to habitat fragmentation and facilitates hunting and human encroachment. The proposed construction of a road up the Nam Chat River represents a major threat, as it may run through the proposed northern extension to Nakai-Nam Theun NBCA (Robichaud 1997), increasing exposure of the saola population to human threats and further fragmenting the populations.

Conservation measures taken: Part of the main saola population inhabits the proposed extension to the Nakai-Nam Theun NBCA, an area which is under severe pressure from hunting and habitat loss both at local and commercial levels. Current data suggest that the Nakai-Nam Theun NBCA, where habitat loss is considerably less of a threat, holds a smaller population, yet hunting pressure is presumed to be as high as elsewhere. The species is expected to occur in Nam Chouan PNBCA, while potential protected areas where the species might occur in the south include Xe Sap NBCA and Dong Amphan NBCA. The northern extension to Nakai-Nam Theun NBCA has been formally proposed for NBCA status (Berkmüller *et al.* 1995b). The remaining areas of the Nam Gnouang Catchment, which are inappropriate for NBCA status because of high levels of habitat fragmentation and human population density, have been proposed as a special zone for saola conservation (Tizard 1996; Robichaud 1997). IUCN has drafted an interim environmental and social Action Plan for the Nakai Nam Theun Conservation Area, which includes the NBCA and the northern extension (IUCN 1997). Interim management of Nakai-Nam Theun NBCA is being implemented by IUCN-Laos and funded by the Japanese Government. It is anticipated that basic protected area infrastructure and personnel will be on site by the year 2000. IUCN (1997) proposed that management of the conservation area be funded by revenue from the Nam Theun Electricity Consortium's (NTEC) Nam Theun 2 Hydropower Project, but many uncertainties still surround the long-term management of the Conservation Area. Management of the Nam Chouan PNBCA is currently under the auspices of CPAWM (C. Marsh *pers. comm.* 1998), but even basic field surveys have yet to be undertaken. A poster and t-shirt highlighting the threatened nature of saola were developed by WCS and CPAWM in 1996. These have been distributed to government officials and villagers in Annamite areas, but no further conservation action specific to saola has been taken within the areas where they occur. In 1997, the saola was

featured on a Lao postage stamp. Global status is Endangered (IUCN 1996).

Partial implementation has begun of a detailed Action Plan for saola in Laos (Robichaud 1997), which forms part of the IUCN environmental and social Action Plan for the Nakai-Nam Theun Conservation Area; an extensive revision is due to be published in 1999. It seems unlikely, however, that all recommendations of the Action Plan can be met without the projected funding through NTEC. The plan makes a number of recommendations, including: institute awareness programmes for villagers to publicise the rarity and limited distribution of saola; hold training workshops for government officials and law enforcement agencies; begin anti-poaching patrols in known saola habitat; prohibit logging in NBCAs; control shifting cultivation in the most sensitive areas; establish a Saola Management Area in the Nam Gnouang Catchment area; survey other areas of potential habitat (such as Nam Chouan PNBCA, southeastern and northeastern Xiangkhouang Province, all headwaters in Nakai-Nam Theun NBCA, southern Houaphan Province, and along the Vietnamese border); establish a suitable monitoring methodology; carry out ecological studies on saola; ensure a full environmental impact assessment is carried out on any proposed new roads in known or probable saola habitat; and maintain bilateral co-operation on saola conservation between Lao PDR and Vietnam.

Conservation measures proposed: Saola should be designated a Category 1 protected species under wildlife protection laws in Laos, and stiff penalties instituted for any violation, including live capture and possession of horns. The recommendations of the saola Action Plan (Robichaud 1997) should be implemented in full.

References

Berkmüller, K., Evans, T.D., Timmins, R.J., and Vene Vongphet. 1995a. Recent advances in nature conservation in the Lao PDR. *Oryx* 29:253–260.

Berkmüller, K., Sangthong Southammakhot, and Vene Vongphet. 1995b. *Protected area system planning and management in Lao PDR: Status report to mid-1995.* Unpublished report. Forest Resources Conservation sub-Programme, Lao-Swedish Forestry Co-operation Programme, Vientiane.

Davidson, P., Robichaud, W.G., Tizard, R.J., Chanthavi Vongkhamheng, and Wolstencroft, J. 1997. *A wildlife and habitat survey of Dong Amphan NBCA and Phou Kathong Proposed NBCA, Attapu Province, Lao PDR.* CPAWM/WCS, Vientiane.

Desai, A. and Lic Vuthy 1996. *Status and distribution of large mammals in eastern Cambodia: Results of the first foot surveys in Mondulkiri and Rattanakiri Provinces*. IUCN/FFI/WWF Large Mammal Conservation Project, Phnom Penh.

Duckworth, J.W. 1997. Small carnivores in Laos: A status review with notes on ecology, behaviour and conservation. *Small Carnivore Conservation* 16:1–24.

Duckworth, J.W., Salter, R.E., and Khounboline, K. (compilers) 1999. *Wildlife in Lao PDR: 1999 status report.* IUCN/Wildlife Conservation Society/Centre for Protected areas and Watershed Management, Vientiane.

Etter, M. and Ruggeri, N. 1996. First adult saola sighted. *Wildlife Conservation* 99(2):9.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN. 1997. Environmental and social action plan for Nakai Nam Theun Catchment and Corridor areas,Management strategy, vol. 1. Unpublished report. IUCN, Vientiane.

Khamkhoun Khounboline. 1995. *A wildlife survey of Xe Kong and Bolikomxai provinces.* Unpublished report. Center for Protected Areas and Watershed Management, Vientiane.

National Statistical Centre. 1995. *Lao census 1995*, *preliminary report 2 (results on the province and district level)*. Unpublished report. Committee for Planning and Co-operation, Government of the Lao PDR, Vientiane.

Pheng Phaengstintham. 1996. *A botanical survey of saola habitat in the Nam Gnouang Catchment area.* Unpublished report. Wildlife Conservation Society, Vientiane.

Robichaud, W. 1997. *Saola conservation action plan for Lao PDR*. Unpublished report. Wildlife Conservation Society, Vientiane.

Robichaud, W.G. 1998a. Physical and behavioral description of a captive saola, *Pseudoryx nghetinhensis*. *Journal of Mammalogy* 79:394–405.

Robichaud, W.G. 1998b. WCS trip report: Dakchung Plateau, Xekong Province, and lowlands near Attapu; 9–21 December 1997. Unpublished report. Wildlife Conservation Society, Vientiane.

Robichaud, W.G. 1998c. WCS trip report: Bolikhamxay saola survey, 15–24 January 1998. Unpublished report. Wildlife Conservation Society, Vientiane.

Robichaud, W.G. 1998d. Nakai-Nam Theun saola conservation: Interim report after the first fieldwork, 22 May to 15 June 1998. Revised. Unpublished report to IUCN. Wildlife Conservation Society, Vientiane.

Salter, R.E. 1993. *Wildlife in Lao PDR. A status report*. IUCN Vientiane.

Schaller, G.B. 1995. *A wildlife survey in the Annamite Mountains of Laos.* Unpublished report. Wildlife Conservation Society, New York.

Schaller, G.B. and Rabinowitz, A. 1995. The saola or spindlehorn bovid *Pseudoryx nghetinhensis* in Laos. *Oryx* 29:107–114.

Showler, D.A., Davidson, P., Chanthavi Vongkhamheng, and Khounme Salivong 1998. *A wildlife and habitat survey of the southern border of Xe Sap NBCA and the Dakchung Plateau, Xe Kong Province, Lao PDR*. CPAWM/WCS, Vientiane.

Thewlis, R.M., Timmins, R.J., Evans, T.D., and Duckworth, J.W. 1998. The conservation status of birds in Laos: A review of key species. *Bird Conservation International* 8 (Supplement): 1–159.

Tizard, R.J. 1996. *A preliminary wildlife and habitat survey of the proposed northern extension to the Nakai-Nam Theun National Biodiversity Conservation Area and the adjacent Nam Gnouang area, Bolikhamsai Province, Lao PDR.* Unpublished report. Wildlife Conservation Society, Vientiane.

Timmins, R.J. and Chantavi Vongkhamkheng. 1996. *A preliminary wildlife and habitat survey of Xe Sap National Biodiversity Conservation Area, and mountains to the south, Salavan and Xe Kong Provinces, Lao PDR*. Unpublished report. Wildlife Conservation Society, Vientiane.

Timmins, R.J. and Evans, T.D. 1994. A *wildlife and habitat survey of Nam Theun National Biodiversity Conservation Area, draft.* Unpublished report. Forest Resources Conservation sub-Programme, Lao-Swedish Forestry Co-operation Programme, and the Wildlife Conservation Society, Vientiane.

Timmins, R.J. and Khamkhoun Khounboline 1996. *A preliminary wildlife and habitat survey of Hin Namno National Biodiversity Conservation Area, Khammouan Province, Lao PDR*. Unpublished report. Wildlife Conservation Society, Vientiane.

Walston, J. (ed.) In prep. *A wildlife and habitat survey of Hin Namno NBCA and surrounding areas*. WWF Indochina Programme, Hanoi.

Weiler, H., Heng Kimchhay, Ouk Kimsan, Kry Masphal, Sin Polin, and Uch Seiha 1998. *The distribution of tiger, leopard, elephant and wild cattle (gaur, banteng, buffalo, khting vor and kouprey) in Cambodia. Interim report, July 1998*. Wildlife Protection Office, Phnom Penh.

Chapter 38. Vietnam

D.P. Mallon and J. Eames

Introduction

Vietnam extends for more than 1,600km from north to south along the eastern side of Indochina and occupies an area of 329,565km^2 (including a number of offshore islands). In addition to the long coastline along the South China Sea, Vietnam shares land borders with China to the north, and Laos and Cambodia to the west (Fig. 38.1). The human population exceeds 77,000,000 (1999). Two significant topographic features are the Song Hong (Red River) Delta in the north, and the Mekong Delta in the south. Between these two deltas runs a narrow coastal plain, and inland there are several ranges of forested mountains. In the north of the country lies a more extensive area of highlands, which includes the country's highest peak (3,143m).

There are wide differences in climate between northern, central, and southern Vietnam. Annual precipitation is about 1,800–2,000mm. Evergreen and semi-deciduous forests, including dipterocarp forests, once covered much of the country, but the area of forest has declined significantly. Forest types were classified by MacKinnon and MacKinnon (1986). The country's now limited natural resources are under pressure from the large rural population. This has been augmented by government 'trans-migration' programmes that have resettled tens of thousands of people in forested rural areas. The economy and environment suffered greatly from years of war, which ended in 1979, and later from an economic embargo. Use of chemical defoliants during the war was particularly damaging, especially Agent Orange, whose effects still persist. However, forest loss has accelerated since the end of the war and forests are still being depleted by logging and agricultural expansion. Very high levels of illegal wildlife trade also affect many species.

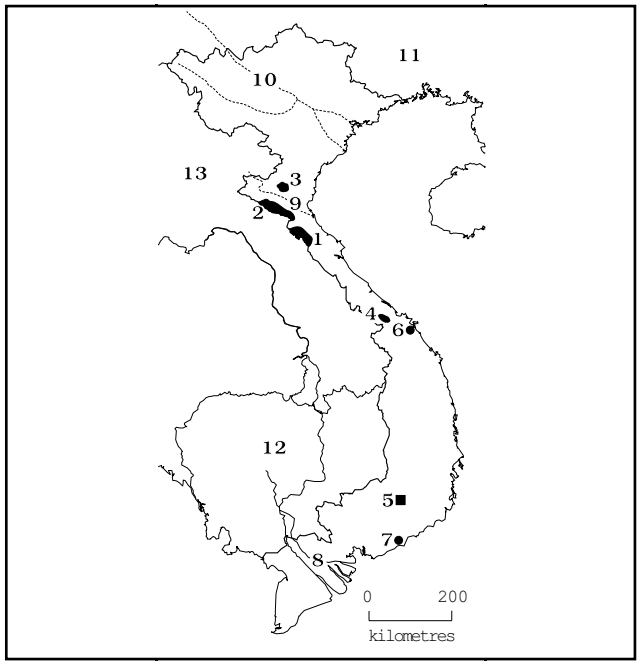


Fig. 38.1 Vietnam. Protected areas containing or formerly containing antelopes: 1. Vu Quang Nature Reserve (55,000ha); 2. Pu Mat NR (93,000ha + 83,000ha buffer); 3. Bu Hong NR (5,000ha); 4. Bach Ma National Park (22,030ha). Other protected areas and localities mentioned in the text: 5. Yok Don NP (58,200ha); 6. Da Nang; 7. Soui Kiet; 8. River Mekong; 9. Son Ca River; 10. Song Hong (Red River); 11. China 12. Cambodia 13. Laos.

Current status of antelopes

The two species recorded in Vietnam are both new to science, and their taxonomic position and phylogenetic relationships within the Bovidae have not been fully determined (Table 38.1). The saola (*Pseudoryx nghetinhensis*) was discovered during 1992 in Vu Quang Nature Reserve of north-central Vietnam by a joint team from the Forest Inventory and Planning Institute (FIPI) of the Ministry of Agriculture and Rural Development (MARD) and the World Wide Fund for Nature (WWF) (Dung *et al.* 1993; 1994; Tuoc *et al.* 1994). Subsequent surveys have revealed its presence in a number of other localities, and live specimens have been captured and photographed. The known area of distribution in Vietnam is

Table 38.1 Current status of antelopes in Vietnam.

Species	Status[1]	GPS[2]
Saola (*Pseudoryx nghetinhensis*)	Endangered	?50%
Linh-duong or Khting Vohr (*Pseudonovibos spiralis*)	Indeterminate	?

[1] *See Chapter 1 for definition of status categories*
[2] *Global population share*

restricted to the forested mountains of the Annamite Range along the border with Laos. These rugged mountains, known in Vietnamese as the Truong Son Range, contain the only remaining extensive area of pristine forest in northern Vietnam and have proved to be of great significance for mammalian biodiversity. In addition to the saola, other recent finds in the Annamite Range of Vietnam and Laos include: two species of deer, *Megamuntiacus vuquangensis* and a small new species of muntjac *Muntiacus truongsonensis* (Schaller 1995; Schaller and Vrba 1996; Timmins *et al.* 1998), and the rediscovery, after more than 100 years, of the Indochinese warty pig (*Sus bucculentus*) (Groves *et al.* 1997).

Pseudoryx has generally been classified in the subfamily Bovinae, where it has been variously considered a member of the Boselaphini, close to the Bovini, or in a new tribe within the Bovinae (Dung *et al.* 1993; Schaller and Rabinowitz 1995). However, Thomas (1994) reports that on morphological grounds, saola appears to have links with the Caprinae and may represent a primitive sister group.

The second, recently described species of bovid, *Pseudonovibos spiralis*, is more enigmatic. It was named on the basis of horns purchased in southern Vietnam, which were said to have originated in Dak Lac and Kon Tum Provinces (Peter and Feiler 1994a; 1994b). Horns of this species have subsequently also been obtained in Cambodia (Dioli 1995; 1997). However, no additional specimen material (skeleton or skin) has been found, no live individual has been sighted, and no field signs are known. The incidence of mounted horns in shops and markets has increased recently, but examination shows that many of these are clearly fakes. It has been surmised that the distribution of *Pseudonovibos* in Vietnam lies in dry deciduous forests of the border area with Cambodia following information on the origin of the specimens (Peter and Feiler 1994a; 1994b), but no local reports from these areas have been forthcoming despite recent surveys. Furthermore, this habitat is accessible by jeep, by elephant, and on foot; it has been extensively traversed by scientists, and by local, trophy, and commercial hunters who have all failed to find any sign of the species. The taxonomic position and phylogenetic relationships of *Pseudonovibos* are more uncertain than those of *Pseudoryx*. Peter and Feiler (1994a) considered that the horns most resembled those of Mongolian gazelle (*Procapra gutturosa*), but an early specimen was originally confused with kouprey (*Bos sauveli*) (Hoffmann 1986), so *Pseudonovibos* may well be closer to the wild cattle (*Bos* spp.) or anoas (*Bubalus* spp.). DNA analysis has not been carried out because suitable material is unavailable.

Conservation measures taken

A National Conservation Strategy, drawn up in co-operation with IUCN, was approved by the Council of Ministers in 1991 (Duc 1997). This has been superseded by a National Biodiversity Action Plan inaugurated by the government of Vietnam and funded by the United Nations Development Programme (UNDP). The two agencies responsible for biodiversity conservation in Vietnam are the Forest Protection Department (FPD) in the Ministry of Agriculture and Rural Development and the National Environment Agency in the Ministry of Science, Technology and the Environment. The FPD administers the protected areas system, while the National Environment Agency is responsible for co-ordinating implementation of the Biodiversity Action Plan. The Forest Inventory and Planning Institute (FIPI), also in the Ministry of Agriculture and Rural Development, has responsibility for monitoring forest status and producing management plans for protected areas. Officials of FIPI work closely with those of the FPD. Both ministries are based in Hanoi and have representation at provincial and district levels. Several international donors, including the European Union, Netherlands, Denmark, Sweden, Germany, World Bank, and the Asian Development Bank, contribute to ecosystem conservation in Vietnam.

Categories of protected area in Vietnam are: national park, nature reserve, and historical and cultural site. The area of Vu Quang Nature Reserve was increased to 55,000ha immediately following discovery of the saola, and several measures were taken to increase protection of the site. In Vu Quang, an integrated conservation and community development project has been designed and implemented by WWF and Ha Tinh Provincial Forest Department. Pu Mat Nature Reserve (93,000ha, plus a proposed 83,000ha buffer zone) has been established in an area of saola habitat. Saola may also still occur in Bach Ma National Park (22,030ha, plus a 21,300ha buffer zone and located at $16^{0}05'–15'$N, $107^{0}43'–53'$E). In Pu Mat Nature Reserve, the European Community is implementing a social forestry and nature conservation project in collaboration with the Nghe An Province People's Committee and FPD. As part of this project, Fauna and Flora International (FFI) has designed and is implementing a biodiversity survey and monitoring programme for the reserve that includes studies on saola and its habitat.

Conservation measures proposed

The government of Vietnam plans to double the size of the protected area system to 2,000,000ha. Field surveys should be conducted to establish the area of distribution and current status of both species. FFI is designing a research strategy for saola in Pu Mat Nature Reserve to be implemented in early 1999. FFI is also planning field studies in Pu Huong Provincial Nature Reserve in 1999.

Species accounts

Saola (*Pseudoryx nghetinhensis*)

Distribution and population: Distribution is restricted to forested mountains of the Annamite Range along the border with Laos (Fig. 38.2). Surveys have resulted in confirmed records of saola from more than 20 localities in the forested mountains of Ha Tinh and Nghe An Provinces. These localities lie between 104º5'E, 19º25'N and 105º50'E, 18º05'N and represent a total range of about 4,000km^2 (Dung *et al.* 1994). To the north of this area, hunting trophies and specimens were reported from the Pu Huong area of Nghe An Province, north of the Song Ca River, by Kemp *et al.* (1997), but surveys in the Thong Thu and Hanh Dien forests of Nghe An Province failed to find any sign of the species (Dawson 1995). Further south, saola have a scattered distribution in low densities in northern and northwestern parts of Quang Nam Province, between about 16^{0}10'N, 107^{0}55'E and 15^{0}50'N, 107^{0}20'E (Tien and Truyen 1996), and the A Luoi-Nam Dong area of Thua Thien Hue Province (Dang Huy Huynh *et al.* 1997). Other areas of potentially suitable habitat exist, and the area of distribution may be extended as surveys are completed. Ear pendants featuring a saola-like animal have been found throughout Vietnam and these may indicate a more extensive former range (Reinecke 1996). Numbers are difficult to estimate because of the saola's secretive habits and dense forest habitat. Dung *et al.* (1994) estimated the Vietnam population of saola at several hundred based on the frequency of specimens obtained during the short time since the first one was collected. Most hunting records originate in the southern part of the Vu Quang Reserve; the forest in this area is the least disturbed, as it lies farthest from villages (Dawson 1995).

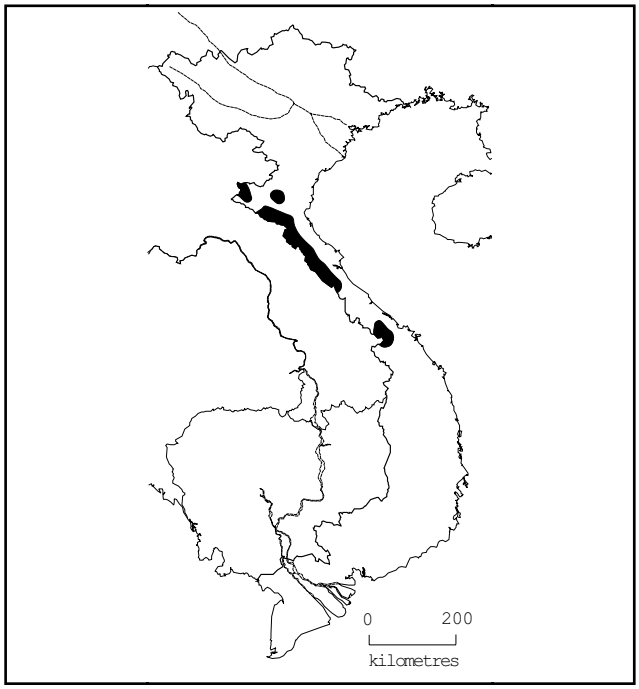


Fig. 38.2 Known distribution of saola *(Pseudoryx nghetinhensis)* in Vietnam.

Habitat, food and reproduction: Information is rudimentary and comes from hunting records, interviews with villagers, and observations on captive animals. Habitat consists of wet, evergreen montane forests. Saola appear to use all forest levels at different seasons, including lowland secondary forest along rivers at elevations of 200m. They keep to higher slopes in summer and descend to lower levels in winter when the upper streams are dry (Dung *et al.* 1994). Saola inhabit the southern and western parts of Vu Quang Nature Reserve in undulating, forested terrain with steep slopes, deep valleys, and a large number rocky outcrops (Dawson 1995). Saola are primarily browsers, but they also take some grasses and herbs. They occur in groups of two to three and rarely six to seven. Males are apparently solitary and range widely; they reportedly swim across streams up to 30m wide (Tien and Truyen 1996). Young are born February–March (Dung *et al.* 1994). Robichaud (1998) summarised current knowledge of behaviour and ecology of saola.

Status within the country: Endangered. Saola are still hunted by indigenous people, and the notoriety following their scientific discovery has apparently increased attempts to capture specimens.

Conservation measures taken: The saola is protected by law and enforcement has become more effective within reserves. It occurs in Vu Quang Nature Reserve, Pu Mat Nature Reserve (93,400ha, plus a proposed 83,000ha buffer), and Pu Huong Provincial Nature Reserve. It may still occur in Bach Ma National Park (22,030ha, plus a proposed 21,300ha buffer), where hunters' trophies were seen in 1990 (Kemp *et al.* 1997). Immediately after the discovery of the saola, the area of Vu Quang Reserve was increased to 55,000ha, with an additional buffer zone of 15,000ha. Logging in Vu Quang has been banned and international finance for its management has been obtained. The Dutch Government, working in co-operation with the Ministry of Agriculture and Rural Development and WWF, has initiated a project to protect and develop this area as a national park. Pu Mat Nature Reserve lies to the north of Vu Quang and occupies an extensive tract of forest along the border with Laos. The United Nations Development Programme (UNDP) has initiated a project promoting a trans-border reserve in Vietnam and Laos as part of their wider initiative for Lao PDR, Cambodia, and Vietnam. Global status is Endangered (IUCN 1996).

Conservation measures proposed: A nature reserve has been proposed for the Pu Huong area, which may help to protect a small population of saola (Kemp *et al.* 1997). Rigorous enforcement of the ban on hunting and capture of live specimens is essential. Alongside this, a publicity campaign should be carried out to inform local villagers of the rarity and value of the saola, and of the need to cease hunting

and attempts at live capture. It is also important to maintain corridors of suitable habitat between the scattered populations through appropriate forest planning and logging controls.

Additional remarks: Pseudoryx is known as saola (= spindle-horn) in Nghe An Province. In Ha Tinh it is called *son duong* (= mountain goat). Farther south in Quang Nam Province, local names include *xoong xoor* (after a species of fern it is reputed to eat) and *nai cha noc* (= straight-horned deer) (Dung *et al.* 1994; Tien and Truyen 1996).

Linh-duong or Khting Vohr (*Pseudonovibos spiralis)*

Distribution and population: Records of this species in Vietnam are based on specimens of horns (Figure 38.3). Eight horns from six animals were described by Peter and Feiler (1994a; 1994b). All these were purchased, one in Dak Lac Province, the others in markets in Ho Chi Minh City, and all were said to have originated from localities in Dak Lac and Kon Tum Provinces near the border with north-eastern Cambodia. A speculative distribution based on these records was mapped by Peter and Feiler (1994a; 1994b). The Biology Institute in Da Lat also possesses horns that are believed to have come from Lam Dong Province (Anh *et al.* 1996). Two additional specimens, consisting of frontlets, were obtained in 1929 at Soui Kiet near the town of Phan Thiet, about 125km east of Ho Chi Minh City. This locality is near the coast and lies about 175km southeast of the Cambodian border, the supposed origin of the recent records. These two specimens were originally identified as kouprey (*Bos sauveli*), but have been re-identified as *Pseudonovibos* (Hoffmann 1986; Peter and Feiler 1994b; Dioli 1997). During a recent survey of several areas of Dak Lac Province, including Yok Don National Park, local people failed to recognise photographs of the horns of *Pseudonovibos* (Canh *et al.* 1997). No information is available on the current status in Vietnam, or even if any survive.

Habitat, food and reproduction: Habitat in the border area with Cambodia consists of dry deciduous forest, which is very different from the semi-arid habitats of the coast where the specimens were obtained in 1929.

Status within the country: Indeterminate.

Conservation measures taken: No specific measures have been taken. Global status is Endangered (IUCN 1996).

Conservation measures proposed: It is important to establish the exact status of this taxon, firstly by comparing specimens in the Museum of Natural History, University of Kansas with other specimens, using DNA analysis if suitable material can be obtained. Carefully planned interviews should be conducted with villagers from the various ethnic groups living in areas where authenticated specimens were obtained. Finally, intensive field surveys should be carried out in order to establish the current range and status in Vietnam. If any survive, immediate protection from poaching should be ensured.

Additional remarks: According to Peter and Feiler (1994b) *Pseudonovibos* is known as 'linh duong' (= mountain goat). However, the usual name in border areas with Cambodia, where most reports originate, is 'khting vor' (J. Walston *in litt.* 1998); it was referred to as 'bo xoang' by Huynh *et al.* (1997).

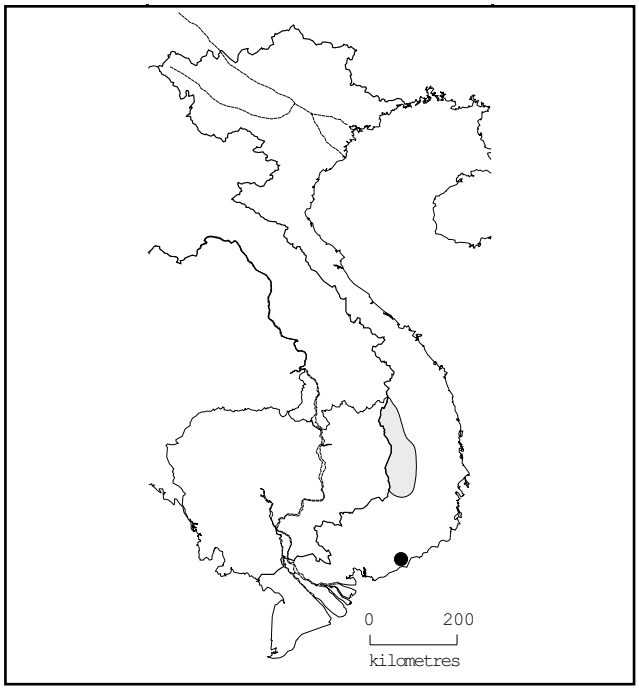


Fig. 38.3 Possible distribution of linh-duong *(Pseudonovibos spiralis)* in Vietnam (shaded) according to Peter and Feiler (1994b) and site of the 1929 record (solid circle).

Acknowledgements

We gratefully acknowledge the help of William Duckworth and Joe Walston in preparation of this report.

References

Anh, P.T., Nguyen D.K., and Nguyen, T.T.L. 1996. [List of mammals in the collection of the Biology Institute in Da Lat]. *Tap Chi Sinh Hoc* [Journal of Biology, Hanoi] 18(1):16–22 (in Vietnamese).

Canh, L.X., Anh, P.T., Duckworth, J.W. Thanh, V.N., and Vuthy, L. 1997. *Survey of large mammals in Daklak Province*. WWF-Vietnam, IGBR, IUCN Cambodia and WPO Cambodia, Hanoi.

Dawson, S. 1995. Saola (*Pseudoryx nghetinhensis*) studies in Nghe An and Ha Tinh Provinces, Vietnam. Consultancy report, Worldwide Fund for Nature - Indochina Programme, National Wildlife Federation, and World Conservation Union.

Dioli, M. 1995. A clarification about the morphology of the horns of the female kouprey. A new unknown bovid species from Cambodia. *Mammalia* 59:663–667.

Dioli, M. 1997. Notes on the morphology of the horns of a new artiodactyl mammal from Cambodia: *Pseudonovibos spiralis*. *Journal of Zoology* 241:527–531.

Duc, H.D. 1997. Vietnam. Pp. 291–294 *in:* Shackleton, D.M. (Editor). *Wild sheep and goats and their relatives. Status survey and conservation action plan for Caprinae*. IUCN, Gland, Switzerland and Cambridge, UK.

Dung, V.V., Giao, P.M., Chinh, N.N., Tuoc, D., Arctander, P., and MacKinnon, J. 1993. A new species of living bovid from Vietnam. *Nature* 363:443–445.

Dung, V.V., Giao, P.M., Chinh, N.N., Tuoc, D., and MacKinnon, J. 1994. Discovery and conservation of the Vu Quang ox in Vietnam. *Oryx* 28:16–21.

Groves, C.P., Schaller, G.B., Amato, G., and Khounboline, K. 1997. Rediscovery of the wild pig *Sus bucculentus*. *Nature* 386: 335.

Hoffmann, R.S. 1986. A new locality record for the kouprey from Viet-Nam, and an archaeological record from China. *Mammalia* 50:391–395.

Huynh, D.H., Anh, P.T., Khien, H.M., Canh, L.X., Thang, T.V., and Phuong, D.H. 1997. Supplementary data about the distribution area of saola *Pseudoryx nghetinhensis* in Vietnam. *Tap Chi SINH HOC* 19(1):16–19 (in Vietnamese, English translation by Nguyen Bich Ha, FFI Indochina Programme).

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Kemp, N., Dilger, M., Burgess, N., and Dung, C.V. 1997. The saola *Pseudoryx nghetinhensis* in Vietnam – new information on distribution and habitat preferences, and conservation needs. *Oryx* 31:37–44.

MacKinnon, J. and MacKinnon, K. 1986. *Review of the protected areas system in the Indo-Malayan realm*. IUCN, Gland, Switzerland and Cambridge UK.

Peter, W.P. and Feiler, A. 1994a. Hörner von einer unbekannten Bovidenart aus Vietnam (Mammalia: Ruminantia). *Faunistische Abhandlungen, Staatliches Museum für Tierkunde, Dresden* 19:247–253.

Peter, W.P. and Feiler, A. 1994b. Eine neue Bovidenart aus Vietnam und Cambodia (Mammalia: Ruminantia). *Zoologische Abhandlungen Staatliches Museum für Tierkunde Dresden.* 48:169–176.

Reinecke, A. 1996. Ohrringe mit Tierkopfenden in Südostasien. *Beiträge zur Allgemeinen und Vergleichenden Archäologie* 16:5–51.

Schaller, G.B. 1995. An unfamiliar "bark." *Wildlife Conservation* 98(3):8.

Schaller, G.B. and Rabinowitz, A. 1995. The saola or spindlehorn bovid *Pseudoryx nghetinhensis* in Laos. *Oryx* 29:107–114.

Schaller, G.B. and Vrba, E.S. 1996. Description of the giant muntjac (*Megamuntiacus vuquangensis*) in Laos. *Journal of Mammalogy* 77:675–683.

Thomas, H. 1994. Anatomie crânienne et relations phylogénétiques du nouveau bovidé (*Pseudoryx nghetinhensis*) découvert dans la cordillère annamitique au Vietnam. *Mammalia* 58:453–481.

Tien, N.M. and Truyen, T. 1996. Results of preliminary survey on the saola, *Pseudoryx nghetinhensis* in Quang Nam - Da Nang Province. Provincial Forest Protection Department of Quang Nam - Da Nang.

Timmins, R.J., Evans, T.D., Khamkhoun Khounboline, and Chainoi Sisomphone. 1998. Status and conservation of the giant muntjac *Megamuntiacus vuquangensis*, and notes on other muntjac species in Laos. *Oryx* 32:59–67.

Tuoc, D., Dung, V.V., Dawson, S., Arctander, P., and MacKinnon, J. 1994. [Introduction of a new mammal species in Vietnam]. *Science and Technology News,* Forest Inventory and Planning Institute (Hanoi)*,* March: 4–13 (in Vietnamese).

Chapter 39. Cambodia

H. Weiler and D. Ashwell

Introduction

Cambodia is situated in western Indochina and occupies an area of 181,000 km^2. It shares land borders with Vietnam, Lao PDR, and Thailand and has a short coastline on the Gulf of Thailand (Fig. 39.1). The human population is approximately 11,500,000 (1999).

More than 75% of the country consists of a low-lying central plain that is dominated by the Mekong River and Tonle Sap Lake. The Cardamom, Elephant, and associated ranges in southwestern Cambodia are the most extensive mountains in the country and, in general, exceed 1,000m in elevation. An outlier to these ranges, Phnom Aural (1,813m), is Cambodia's highest point. The smaller Dangrek Range and the Virachey Mountains form much of Cambodia's northern border with Thailand and Laos. The northeast and east are occupied by the Bokeo (Ratanakiri) and Chhlong (Mondulkiri) Plateaux. The latter is part of the larger Mnong Plateau in southern Vietnam and is contiguous with the Di Linh Highlands and Darlac Plateau of Vietnam.

Cambodia has a tropical monsoon climate with marked dry and wet seasons. The southwest monsoon brings heavy rain from May to October. Natural and semi-natural landscapes (mostly forests) occupy about 60% of Cambodia (Ashwell 1997). The economy and human population have been devastated by years of war and civil conflict, which have had unknown effects on the environment and wildlife. However, large areas of natural habitat remain, as the large majority of Cambodian villages are situated within only 20% of the landscape. Indeed, Cambodia contains the largest extent of lowland forest in mainland Southeast Asia (Ashwell 1997).

While there was a considerable amount of game hunting during the 1960s, research on Cambodia's wildlife prior to the 1970s was limited to largely *ad hoc* investigations on birds and Wharton's (1957) major study of the kouprey (*Bos sauveli*). The current status of much of the country's fauna is not well known, though gradual improvements in the security situation since 1993 have led to increased survey efforts. These mainly consist of collaborative efforts, particularly between the Ministry of Environment, the Wildlife Protection Office (WPO), IUCN and its partner organisations, WWF, UNESCO, Fauna and Flora International (FFI), and Wetlands International (WI), and also include a wide array of development projects and individual initiatives.

In recent years, a number of short-term field surveys have focused on large mammals (Olivier and Woodward 1994;

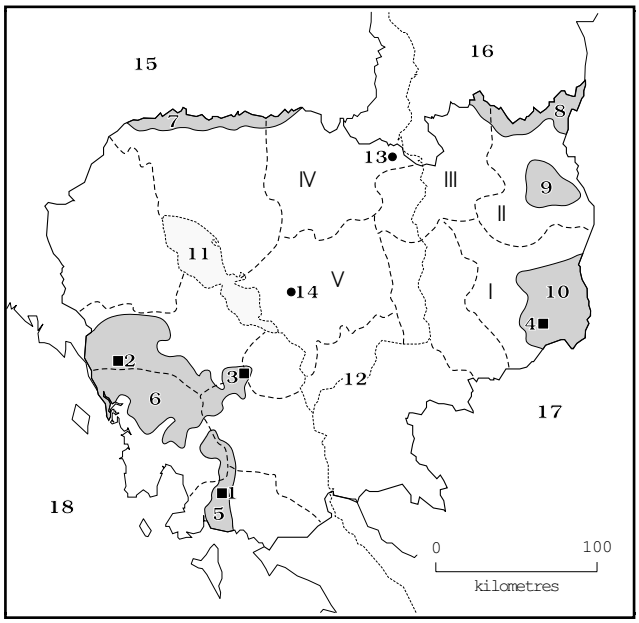


Fig. 39.1 Cambodia. Provinces: I) Mondulkiri; II) Ratanakiri; III) Stung Treng; IV) Preah Vihear; V) Kampong Thom. Protected areas that may contain antelopes: 1. Bokor National Park (142,700ha); 2. Phnom Samkos Wildlife Sanctuary (333,600ha); 3. Phnom Aural WS (257,800ha); 4. Nam Lyr WS (54,000ha). Geographical features and localities mentioned in the text: 5. Elephant Mountains; 6. Cardamom Mountains; 7. Dangrek Mountains; 8. Virachey Mountains; 9. Bokeo Plateau. 10. Chhlong Plateau; 11.Tonle Sap Lake; 12. River Mekong; 13. Kampong Sralau;14. Phnom Chi; 15. Thailand; 16. Laos; 17. Vietnam; 18. Gulf of Thailand.

Table 39.1 Current status of antelope species in Cambodia.

Species	Status[1]	GPS[2]
Khting Vohr (*Pseudonovibos spiralis*)	Endangered	?

[1]*See Chapter 1 for definition of status categories*
[2]*Global population share*

Desai and Lic 1996; Timmins and Men 1998; Weiler 1998a; 1998b). Several other initiatives to collect information have also taken place (Martin and Phipps 1996; Ashwell 1997; Duckworth and Hedges 1998; Weiler *et al.* 1998). The information collected generally supports the contention that Cambodia still contains a range of medium-sized and larger mammals, and that many of these are widely distributed, though not necessarily abundant. Many species are currently threatened by recent habitat destruction resulting from widespread logging and largely uncontrolled trade (Martin and Phipps 1996). Larger animals tend to be restricted to areas more than 10–20km from villages (Ashwell 1997; Weiler *et al.*1998).

Current status of antelopes

The only species of antelope reported from Cambodia is the *khting vohr* (*Pseudonovibos spiralis*), a new bovid named on the basis of horns obtained in Vietnam (Peter and Feiler 1994a, 1994b) (Table 39.1). Horns from this species were originally collected at Soui Kiet in southern Vietnam during 1929, but were not described until 1986 when they were considered to be those of a female kouprey (*Bos sauveli*) (Hoffman 1986). This material has now been re-assessed (Dioli 1995).

All existing specimens of *P. spiralis* consist of horns, with or without frontlets. As horns are commonly fabricated, the authenticity of some records is in doubt. However, their description by four separate authors (Hoffman 1986; Peter and Feiler 1994a, 1994b; Dioli 1995, 1997; Desai and Lic 1996) appears adequate to establish at least the prior existence of this species. Still, no corpse, specimen material, or body part, other than horns, has ever been observed by biologists, and field signs are unknown.

The taxonomic status, and systematic and phylogenetic relationships of *P. spiralis* within the Bovidae have yet to be established, although Peter and Feiler (1994a) considered that its horns most resembled those of the Mongolian gazelle (*Procapra gutturosa*). The reported distribution of *P. spiralis* so far covers parts of Cambodia and southern Vietnam. Its apparent absence from both Thailand and Laos suggests that its origin is more likely to be in the south, rather than the north of the Indochinese Peninsula. Reported localities are clearly distinct from those of the other recently discovered bovid in Indochina, *Pseudoryx nghetinhensis,* and they are very remote from those of *Procapra gutturosa*, which is endemic to steppes of Mongolia and northeast China. The possibility of divergence from *Bos, Bubalis,* or other stock cannot be ruled out in the absence of material suitable for DNA testing.

The physical characteristics of *P. spiralis* also remain unclear. Descriptions by hunters vary, and serve to emphasise the enigmatic nature of this reportedly heavy-bodied species. It is usually described as an agile, buffalo-like animal, uniformly black or grey in colour. Some hunters in Mondulkiri report that it is able to browse upon small trees by standing erect on its hind legs. In Preah Vihear, hunters describe it as agile, a leaper and a jumper (Weiler *et al.* 1998). This contrasts with descriptions of an estimated body weight of 200–300 kg and a height at withers of 1.1–1.2m (Dioli 1997), i.e., a heavy-bodied animal, rather than agile or deer-like. This latter description also suggests an animal somewhat resembling the anoa (*Bubalus* sp.)

There is a considerable amount of folklore pertaining to this species. *P. spiralis* is known in the Khmer language as *khting vohr*, "wild cow with lianas," (referring to the winding horns) or *khting si puoh*, "wild cow that eats snakes" (Dioli 1997). When used alone, the name *khting* refers to gaur (*Bos gaurus*). The term "khting vohr" is associated with an animal horn that is widely believed to have beneficial medicinal properties in the treatment of snakebites and stings of poisonous animals (Dioli 1997; Weiler *et al.* 1998). Some Cambodians contend that this species can eat snakes and that the bones of snakes may be observed in the faeces. However, the association with vines and snakes is more likely to be derived from a general resemblance to the spiral nature of the horns. A similar belief is reportedly associated with the spiral horns of the markhor (*Capra falconeri*) by some people in India (Dioli 1997). Indeed, the use of analogy to describe Cambodia's plants and animals is commonplace and is frequently used in the naming of medicinal plants (Martin 1971, 1974, 1986).

WPO interviewers report that some local hunters use additional names (Weiler *et al.* 1998). In Preah Vihear, a Khmer term meaning "leaf-eating gaur" is used. Near Phnom Chi, in Kampong Thom Province, *khting pus* is used, which loosely translated means "cobra gaur" or is understood to mean "cobra-eating gaur". Also the term *khting preng* "oily" is used for specimens with an oily coat. No other information is available about these names, but WPO interviewers state that the interview process and use of an artist's rendition of a khting vohr show that all names refer to the same animal.

Conservation measures taken

Various laws regarding hunting and wildlife trade exist, but little attempt has been made to enforce them. In early 1999, a complete ban on hunting and wildlife trade was announced along with a ban on logging. There are indications that the relevant agencies are beginning to develop a programme to enforce these initiatives.

Wildlife protection is the responsibility of the Wildlife Protection Office (WPO) within the Forestry and Wildlife Department, which is itself in the Ministry of Agriculture, Forestry and Fisheries (Sarun 1997). However, the Ministry of Environment has overall responsibility for the development and management of protected areas. Institutional responsibilities for wildlife management, therefore, require further clarification and enhancement.

Articles 58 and 59 of the Constitution, and the 1996 Environmental Framework Law provide an additional basis for the development of legal protection. Cambodia has also acceded to the Convention on Biological Diversity, World Heritage Convention, Ramsar Convention, and the CITES Convention. The CITES Secretariat visited Cambodia in April 1999 to help Cambodia develop a programme for full compliance with CITES requirements.

The Parc d'Angkor (declared in 1925) is regarded as the first national park in mainland Southeast Asia. Wildlife reserves covering more than two million hectares were designated by the 1950s, but this system collapsed with the onslaught of political instability and war in the 1970s. Attempts to re-establish this protected area system during the 1980s were ineffective and practical conservation was non-existent within the country for many years.

A revised national system of protected areas was designated by Royal Decree in 1993 and ratified by the Environmental Framework Legislation in 1996. This system incorporates more than three million hectares within 23 protected areas belonging to four management categories: national park, protected landscape, wildlife sanctuary, and multiple-use area. The system incorporates a broad array of vegetation types. However, management capabilities have been established in a limited number of reserves. The old Parc d'Angkor has been re-established as the basis for the Angkor World Heritage Site, and portions of the Tonle Sap Multiple-Use Reserve have been designated as a Biosphere Reserve. The Ministry of Environment has also established management activities at Ream, Bokor, Kirirom, and Virachey National Parks, as well as at Boeng Per Wildlife Sanctuary.

IUCN has also initiated the first cycle of national biodiversity planning through the production of a national biodiversity prospectus (Ashwell 1997), which provides a profile of Cambodia's biological diversity and its organisation into seven biodiversity management regions. This prospectus also outlines elements of a national biodiversity strategy and Action Plan, including: (1) regional planning for critical and fragile habitats, areas, sites, and species; (2) development of a national protected area systems plan; (3) systematic review of protected areas within the context of the biodiversity management regions; (4) institutional support; (5) information and understanding; and (6) awareness, education, and training.

Species account

Khting Vohr (*Pseudonovibos spiralis*)

Distribution and population: Nearly all Cambodian specimens pertain to horns obtained from wildlife markets in Phnom Penh (Dioli 1995; 1997) or from other intermediaries (Peter and Feiler 1994b; Desai and Lic 1996) and have, therefore, been items of trade. Until recently, the original specimen collected from Soui Kiet in Vietnam during 1929 was the only specimen with a clear locality. The set of horns photographed in 1996 in Senmonorom, capital of Mondulkiri Province, were obtained by the owner in Ko Nhek District in 1987 (Desai and Lic 1996). However, Lic Vuthy (*pers. comm.* 1998) states that the horns he saw in Mondulkiri in 1996 came originally from the Cardamom Mountains. The recent collection of a portion of a horn from an animal shot near Kampong Sralau in Preah Vihear Province between 1960 and 1965 appears to be the only Cambodian report supported by a specimen from a specific locality. Most Cambodian specimens are reported to have been obtained in remote forested areas of northeastern Cambodia, and initial reports from local hunters and villagers claim that the animal is present in Cambodia's northeastern provinces of Mondulkiri, Rattanakiri, and Stung Treng (Peter and Feiler 1994b; Desai and Lic 1996; Dioli 1995, 1997). Few details are available, but Dioli (1997) named three specific areas in his discussion of the northeast: Phnom Aural, Phnom Chreau, and Phnom Yang Kwe. However, Phnom Aural is the highest point in Cambodia and is situated in Kampong Speu Province in southwestern Cambodia. Phnom Chreau is located in the Cardamom Range in Koh Kong Province, also in the southwest. There is a Phnom Yang Ke in Mondulkiri, near the Vietnam border, which is probably the Phnom Yang Kwe referred to by Dioli (1997).

More recently, additional information has come to light from a nation-wide survey of hunters undertaken by Cambodia's Wildlife Protection Office (Weiler *et al.* 1998). This information suggests a broader distribution in areas west of the Mekong River, particularly in the southwestern mountains and in association with isolated hills and evergreen forests on Cambodia's northern plains. These reports also include areas east of the Mekong in Mondulkiri, along the Vietnam border, though not in the northeastern provinces of Ratanakiri and Stung Treng (Fig. 39.2). This systematic interview survey was conducted in all 13 provinces in Cambodia that contain large mammal habitat. A total of 150 pre-screened, experienced hunters were asked about the status of 35 mammals and birds. Each hunter was shown an artist's rendition of a khting vohr, clearly showing the unique horns. The hunters were asked if the animal was present and, if so, whether in low, medium, or high numbers. Twenty-seven out of 150 hunters reported the presence of khting vohr. Twenty-three reported low numbers; two hunters in the Elephant Mountains and two in the Cardamom Mountains reported medium numbers. One hunter showed WPO interviewer Sin Polin a khting vohr horn and cut off a piece for him. The hunter shot the animal between 1960 and 1965, seven to eight kilometres from Kampong Sralau, between the Lao border and Ba Tho Mountain in Preah Vihear Province. This is the only Cambodian specimen with a specific field location as referred to above. Two other hunters also described shooting khting vohr on isolated hills (*phnom*) in northern Preah

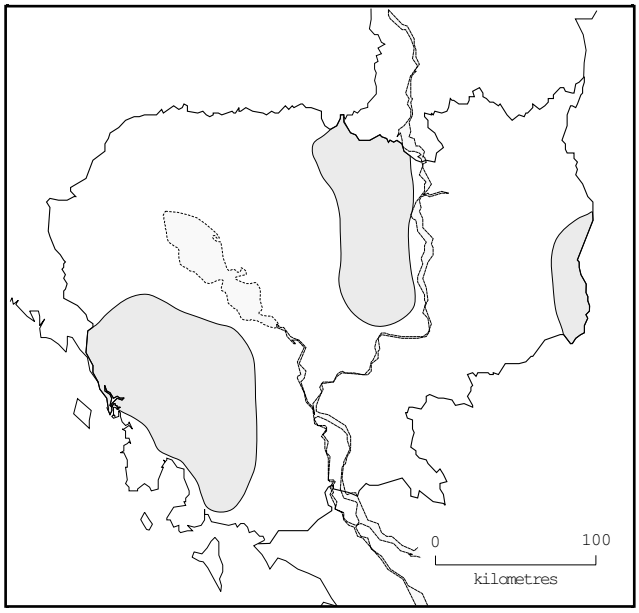


Fig. 39.2 General areas where khting vohr *(Pseudonovibos spiralis)* has been reported in Cambodia (shaded).

Vihear Province. Five hunters reported khting vohr in Kampong Thom Province, particularly from Phnom Chi, where several were shot during the 1960s.

Contrary to the earlier postulation that this animal was found in Ratanakiri, Stung Treng, and Mondulkiri Provinces in the northeast, no hunters from Stung Treng or Ratanakiri reported the presence of this animal. Only three Mondulkiri hunters reported its presence, all in areas near the Vietnam border. In areas west of the Mekong, 16 hunters reported khting vohr from the evergreen montane forests of the Elephant Mountains, Cardamom (Kravanh) Mountains, and the Phnom Aural complex. This contiguous region includes portions of Battambang, Pursat, Koh Kong, Kampot, and Kampong Speu Provinces. At a workshop in Koh Kong in April 1999, *krasna* (sandalwood) collectors and militia personnel reported to WPO that khting vohr still inhabit the Cardamom Range. No sightings have been reported in recent years from the Vietnam border area or the northern plains of Preah Vihear and Kampong Thom, suggesting that the animal may now only be found in the southwestern mountains of Cambodia. No details of current status or numbers are available. Most specific reports refer to encounters during the 1960s. *P. spiralis* is clearly rare and may even be extinct. It is highly improbable that this species occurs in one or more populations exceeding 50 individuals.

Habitat, food and reproduction: Speculation that the khting vohr is associated with the dry, deciduous, dipterocarp forest ecosystem, described by Wharton (1957, 1968) as one of the great grazing systems of the world, does not appear to be well supported. The apparent absence of *P. spiralis* from these areas in the 1960s, when large mammals were more abundant than today, is implied by the work of Wharton (1957, 1968), Pfeffer and Ou Kim-San (1967), Pfeffer (1969), and by the absence of this species from the substantial hunting and research record from this forest type. The range extensions suggested by Weiler *et al.* (1998) imply a closer association with evergreen and semi-evergreen forest types (*sensu* Legris and Blasco 1971, 1972) than previously proposed. These forest types are extensive in Cambodia's southwest mountains, portions of the northern plains, including Kampong Thom and Preah Vihear Provinces, parts of Mondulkiri, as well as on isolated hills located within areas of dry, dipterocarp and mixed deciduous forest. The species may once have been widespread within Cambodia, where the expansion of deciduous forest at the expense of evergreen formations has been attributed to the incidence of fire over recent centuries (see Wharton 1968; Legris and Blasco 1971, 1972; Dy Phon 1981). The expansion of open forests has been particularly pronounced in the north and northeast (Legris and Blasco 1971).

There is no substantial or reliable information concerning the diet of this species. It is likely that the conjecture that such a heavy-bodied animal habitually stands erect in order to browse, as some antelopes do, appears contradictory and reflects inaccurate information. However, the name "leaf-eating gaur" used by hunters in Preah Vihear indicates that the khting vohr may be a browser. Nothing is reported of the social organisation or breeding biology of this species, other than the report that it lives in small family groups (Dioli 1997).

Status within the country: Endangered. Despite the enigmas surrounding this species, it is certain that it existed in the past and it may still exist in small numbers. However, it is certainly close to extinction, if not already extinct. The horns are attributed with a high value for medicinal purposes. Recent degradation of Cambodia's forests and extensive hunting with automatic weapons further threaten large mammal species, and the end of the war has resulted in substantial migration and resettlement of both villagers and refugees in forest areas and the construction of new roads. It is highly improbable that the population of this species exceeds 2,500 mature individuals and is most likely below 250. A continuing decline in numbers is inferred, and the population structure appears to be severely fragmented, with no subpopulation estimated to contain more than 50 mature individuals. Therefore, the current global designation of Endangered (IUCN 1996) should be retained or upgraded to Critically Endangered.

Conservation measures taken: No specific conservation measures have been taken. Unconfirmed reports indicate the presence of khting vohr in Bokor National Park (142,700ha) in the Elephant Mountains, Phnom Aural Wildlife Sanctuary (257,800ha), the vicinity of Phnom Samkos Wildlife Sanctuary (333,600ha) in the Cardamom Mountains, and the Nam Lyr Wildlife Sanctuary (54,000ha) in Mondulkiri. As of April 1999, all hunting and catching of

animals is prohibited in Cambodia. All firearms are outlawed and civilian firearms are to be handed in by July 1999.

Conservation measures proposed: Field surveys to assess current status, distribution, population size, and habitat requirements should be undertaken to enable an Action Plan for the conservation of khting vohr to be drawn up. Similar surveys are also required for other large mammal species such as tiger (*Panthera tigris*), elephant (*Elephas maximus*), and wild cattle (*Bos* spp). Efforts to clarify the status of the khting vohr should be integrated with these activities if separate funding is not available. There is also a need for systematic surveys of small mammals, which are more useful for training Cambodia's under-skilled wildlife managers, as they yield more data. Efforts to clarify the status of the khting vohr should also be integrated with these activities. Field surveys specifically for khting vohr should concentrate first on the mountain complex in southwestern Cambodia. Camera trapping is the technique most likely to produce useful evidence of the presence and appearance of this elusive animal. Once a suitable specimen is obtained, DNA analysis should be undertaken to determine its taxonomic affinities.

References

Ashwell, D.A. 1997. *Cambodia: A national biodiversity prospectus. A contribution to the implementation of the Convention on Biological Diversity with particular reference to Cambodia's terrestrial ecosystems*. IUCN Cambodia, Phnom Penh.

Desai, A. and Lic Vuthy 1996. *Status and distribution of large mammals in eastern Cambodia: Results of the first foot surveys in Mondulkiri and Ratanakiri provinces*. IUCN/FFI/WWF Large Mammal Conservation Project, Phnom Penh.

Dioli, M. 1995. A clarification about the morphology of the horns of the female kouprey. A new unknown bovid species from Cambodia. *Mammalia* 59:663–667.

Dioli, M. 1997. Notes on the morphology of a new artiodactyl mammal from Cambodia: *Pseudonovibos spiralis*. *Journal of Zoology* 241:527–531.

Duckworth, J.W. and Hedges, S. 1998. Tracking tigers: A review of the status of tiger, Asian elephant, gaur and banteng in Vietnam, Lao, Cambodia, and Yunnan (China) with recommendations for future conservation action. WWF Indochina Programme, Hanoi.

Dy Phon, P. 1981. Contribution à l'étude de la végétation du Cambodge. Ph.D thesis, Université de Paris-Sud, Centre d'Orsay, Paris.

Hoffmann, R.S. 1986. A new locality record for the kouprey from Viet-Nam, and an archaeological record from China. *Mammalia* 50:391–395.

IUCN. 1996. *1996 IUCN Red List of threatened animals*. IUCN, Gland, Switzerland and Cambridge, UK.

Legris, P. and Blasco, F. 1971. Carte internationale du tapis végétal et des conditions écologiques au Cambodge, 1/1,000,000. *Travaux de la Section Scientifique et Technique de l'Institut Français à Pondichéry.*

Legris, P. and Blasco, F. 1972. La Végétation Naturelle. *In:* Notice de la Carte du Cambodge (Carte Internationale du Tapis Vegétal et des Conditions Ecologiques au Cambodge, 1/1,000,000). *Travaux de la Section Scientifique et Technique de l' Institut Français à Pondichéry. Hors série* 11:1–238.

Martin, M.A. 1971. *Introduction à l'éthnobotanique du Cambodge*. Éditions du Centre National de la Recherche Scientifique, Paris.

Martin, M.A. 1974. Essai d'ethnophytogéographie khmère. *J. Agric. Trop. Bot. Appl.* 23 (7–9): 219–238.

Martin, M.A. 1986. Les savoirs naturalistes populaires dans l'ouest cambodgien. *Seksa Khmer*, 8–9, 1985–1986.

Martin, E.B. and Phipps, M. 1996. A review of wild animal trade in Cambodia. *Traffic Bulletin* 16 No. 2.

Olivier, R. and Woodward, M. 1994. Aerial surveys for kouprey in Cambodia, March 1994. IUCN Species Survival Commission, Gland, Switzerland and Cambridge UK.

Peter, W.P. and Feiler, A. 1994a. Hörner von einer unbekannten Bovidenart aus Vietnam (Mammalia: Ruminantia). *Faunistische Abhandlungen, Staatliches Museum für Tierkunde, Dresden* 19:247–253.

Peter, W.P. and Feiler, A. 1994b. Eine neue Bovidenart aus Vietnam und Cambodia (Mammalia: Ruminantia). *Zoologische Abhandlungen Staatliches Museum für Tierkunde Dresden* 48:169–176.

Pfeffer, P. and Ou Kim-San. 1967. Le kouprey, Bos (Bibos) Sauveli Urbain, l937; discussion systématique et statut actuel, hypothèse sur l'origine du zebu (Bos Indicus), *Mammalia* 31:521–536

Pfeffer, P. 1969. Considérations sur l'écologie des forêts claires du Cambodge Oriental, *La Terre et la Vie* 1:3–24.

Sarun, C.1997. Cambodia. Pp. 266–267 *in:* Shackleton, D.M. (Editor). *Wild sheep and goats and their relatives. Status survey and conservation action plan for Caprinae*. IUCN, Gland, Switzerland and Cambridge, UK.

Timmins, R.J. and Men, S. 1998. A wildlife survey of the Tonle San and Tonle Srepok River Basins in

northeastern Cambodia. Flora and Fauna International, Indochina Programme (Hanoi) and the Wildlife Protection Office (Phnom Penh).

Weiler, H. 1998a. Virochey National Park Expedition 17 February–25 February 1998. Phnom Penh: Kouprey Reconnaissance Project, Wildlife Protection Office.

Weiler, H. 1998b. A wildlife reconnaissance of the Phnom Voeene Area: Stung Treng and Ratanakiri boundary. Phnom Penh: Kouprey Reconnaissance Project, Wildlife Protection Office.

Weiler, H., Heng Kimchhay, Ouk Kimsan, Kry Musphal, Sin Polin, and Uch Seiha. 1998. The distribution of tiger, leopard, elephant and wild cattle (gaur, banteng, buffalo, khting vohr and kouprey in Cambodia. Interim Report: July 1998. Wildlife Protection Office, and Cat Action Treasury.

Wharton, C.H. 1957. An ecological study of the kouprey *Novibos sauvelli* (Urbain). *Monograph of the Institute of Science and Technology, Manila.* 5:1–111.

Wharton, C.H. 1968. Man, fire and wild cattle in north Cambodia. *Proceedings of the Annual Tall Timbers Fire Ecology Conference* 8:107–167.

SECTION 3

Status Summary and Regional Action Plan

Chapter 40. Regional Status of Antelopes in North Africa, the Middle East, and Asia, and Identification of Conservation Priorities

D.P. Mallon and S.C. Kingswood

40.1 Introduction

The individual country accounts (Section 2) have summarised what is known about the status of antelopes in each country in the region and outlined conservation priorities. This chapter reviews the status of antelopes in a regional context and identifies key species and subspecies that are currently threatened. Since the region covered by Part 4 encompasses a great diversity of ecosystems with disparate antelope communities, the status of antelopes is summarised by six sub-regions based on their biogeographical characteristics.

Table 40.1 summarises current global status of antelope species that occur or have occurred in North Africa, the

Table 40.1 Current status of antelopes in North Africa, the Middle East, and Asia.

Species	Number of countries[1]	Status[2]	Population[3]	Estimated % in PA[4]	CITES[5]
Gazella arabica	– (1?)	EX	–	–	–
Gazella bilkis	– (1)	EX	–	–	–
Gazella rufina	– (1)	EX	–	–	–
Gazella saudiya	– (3+2?)	EW	–	–	–
Oryx dammah	– (5)	EW	–	–	I
Alcelaphus buselaphus	– (5)	RE (LR/cd)	–	–	–
Addax nasomaculatus	– (5)	CR A1c	–	–	I
Procapra przewalskii	1	CR A1c , C1	<150	<10%	–
Pseudonovibos spiralis	2	EN C2a	?	?	–
Oryx leucoryx	3R (4)	EN D1	*c.*800	100%	I
Pseudoryx nghetinhensis	2	EN C2a	500–1,500	>75%	I
Pantholops hodgsonii	2 (1)	EN A2d	<75,000	<25%?	I
Gazella cuvieri	3	EN C2a	1,500–2,500	40–70%	III
Gazella leptoceros	4	EN C1+2a	?	<50%?	III
Gazella dama	2 (1+1?)	EN A1c, C1	<150 (regional)	30%	I
Saiga tatarica	5 (2)	EN A1a	154,000–170,000	<25%?	II
Antilope cervicapra	2 (2)	VU A1c	*c.*50,000	>50%	III
Gazella dorcas	7	VU A1c	<10,000? (regional)	<25%?	III
Tetracerus quadricornis	2	VU C2a	Several thousand	>50%	III
Boselaphus tragocamelus	3 (1)	LR/cd	*c.*100,000	<50%	–
Gazella bennettii	4	LR/cd	*c.*100,000	>50%	–
Gazella gazella	8–9 (1–2)	LR/cd	25,000–28,000	<50%	–
Gazella subgutturosa	20 (3)	LR/nt	120,000–140,000	<30–35%	–
Procapra picticaudata	2	LR/nt	*c.*100,000?	*c.*25%	–
Procapra gutturosa	3 (1)	LR/nt	1,000,000–2,000,000	<10%	–

[1]Number of countries in the region where the species occurs. Figure in brackets shows the number of countries in the region where the species is now extinct. R = reintroduced. [2] Status according to IUCN 2000 Red List. EX = Extinct; EW = Extinct in the Wild; RE = Regionally Extinct; CR = Critically Endangered; EN = Endangered; VU = Vulnerable; LR = Lower Risk; cd = conservation dependent; nt = near threatened. [3] Population estimates are derived from country reports. For non-endemic species, figure refers to regional population as indicated. [4] PA = protected areas. Figures are estimated from data in country reports. [5] CITES Appendix listing. I = trade prohibited except under exceptional non-commercial circumstances; II = trade permitted when the scientific authority in the exporting country determines it is not detrimental to the survival of the species; III = species identified by a signatory country as subject to regulation within its jurisdiction to restrict exploitation.

Middle East, and Asia, the number of countries of occurrence, an estimate of population size, and the approximate proportion occurring inside protected areas. Global status follows the 2000 IUCN Red List except for saiga, which had been reclassified as Vulnerable following a recent decline amounting to 30% due to illegal hunting. An even more alarming decline amounting to 75–85% has occurred over the last two to three years and a classification of Endangered would now be appropriate. Population estimates in Table 40.1 are derived from information in relevant country reports in Section 2. These estimates do not include introduced or feral antelope populations in countries outside the region, which in two cases are substantial. In Texas, feral nilgai were estimated to number 37,000 (Shurter 1997a) and blackbuck >35,000 (Shurter 1997b); there were also at least 8,600 feral blackbuck in Argentina in 1985 (Jackson 1985). Before making direct comparisons between individual countries, it is worth noting that these population figures vary widely in accuracy and reliability, and are based on surveys conducted at different times and using different methodologies.

Most species included here are endemic to the region, so there is no difference between regional and global status. Only six North African species are not endemic to the region. One of these, scimitar-horned oryx, is Extinct in the Wild and common hartebeest is Regionally Extinct (though the species remains widespread south of the Sahara). Addax occur only as sporadic visitors to the margins of the region from the south and there is no resident population within the region at present. Dama gazelle also has a precarious status in the region, with only two small populations in Western Sahara and Algeria. The global status of the other two non-endemic species, slender-horned gazelle and dorcas gazelle, is considered to be equally applicable to North Africa, so they are provisionally regarded as regionally Endangered and regionally Vulnerable pending completion by IUCN of the proposed regional Red List criteria.

Five species listed in Table 40.1 are already Extinct or Extinct in the Wild and another is Extinct in the region. Of the 19 antelope species that still occur, two are classified as Critically Endangered, eight as Endangered, and three as Vulnerable. Thus, 13 species in the region (68.4%) are threatened, compared with *c.*17.5% of antelopes in sub-Saharan Africa and *c.*25% of all mammals (East *et al.* 1996; IUCN 1996; Steiner and Bayon 1997).

Table 40.2 summarises the current status of the subspecies listed in Chapter 2, all of which are endemic to the region. Many other subspecies have been named, some of which have captive populations that are managed separately (Section 40.6, below). Research currently being undertaken should confirm the validity (or otherwise) of these and clarify other areas of taxonomic uncertainty referred to in Chapter 2.

Virtually all antelope species in the region are declining and populations everywhere are increasingly fragmented and isolated, and some of these may have already crossed the extinction threshold. Furthermore, the time-lag between habitat destruction and the disappearance of populations or entire species ('extinction debt') means that some future extinctions may already be inevitable (Tilman *et al.* 1994). The threat to intraspecific variation is considerable and goes well beyond the named forms listed above. Enormous num-

Table 40.2 Current status of certain antelope subspecies in North Africa, the Middle East, and Asia.

Species	Number of countries[1]	Status[2]	Population[3]	Estimated % in PA[4]
Alcelaphus buselaphus buselaphus	– (5)	EX	–	–
Gazella dama mhorr	1?	CR C1	<100	–
Gazella gazella muscatensis	1	CR C2a	?	–
Gazella gazella acaciae	1	CR A1c, C2b	12	100%
Gazella dorcas massaesyla	1?	EN	?	?
Saiga tatarica mongolica	1	EN C1	1,600–3,000	>95%
Gazella gazella farasani	1	VU D1	*c.*500	100%
Gazella subgutturosa marica	7 (1+1?)	VU C2a	>2,000	>75%
Gazella subgutturosa hillieriana	2	LR/nt	>60,000	<10%
Gazella subgutturosa subgutturosa	12 (1)	LR/nt	40,000–60,000	20–30%
Gazella gazella gazella	7?	LR/cd	>10,000	>50%
Gazella gazella cora	4	LR/cd	*c.*15.000	<50%

[1]Number of countries in the region where the subspecies occurs. Figure in brackets shows the number of countries in the region where the species is now extinct. [2] Status according to IUCN (2000) or recent revisions. EX = Extinct; EW = Extinct in the Wild; CR = Critically Endangered; EN = Endangered; VU = Vulnerable; LR = Lower Risk; cd = conservation dependent; nt = near threatened. [3] Population estimates are derived from country reports. [4] PA = protected areas. Figures are estimated from data in country reports.

bers of local antelope populations have already disappeared, and this factor has undoubtedly reduced genetic variation and caused the loss of unique characteristics in all or most species, even those that are not currently threatened. Indeed, many genetically distinct populations of mammals are probably more threatened than the full species (Hughes *et al.* 1997). A possible solution might be to base future conservation efforts on a system of classification that identifies evolutionarily significant units (for example, see Moritz 1994; Dimmick *et al.* 1999), if the practical problems in identifying these can be overcome.

40.2 Key species and subspecies requiring greater conservation action

Conservation action is needed most urgently for the most highly threatened taxa. In the longer term, antelopes classified as Vulnerable require increased conservation action to improve their status, while it is important that antelopes whose current status is satisfactory continue to receive sufficient attention to maintain their status. The highest priority of all should be given to highly threatened taxa that are still declining and that have no viable captive populations, i.e., those whose complete extinction is a real possibility. On this basis, the most urgent regional priority is Przewalski's gazelle whose surviving population is <150 and still declining; very few occur in a protected area and there is no captive population. Priority antelopes in the region are listed in Table 40.3. These comprise nine species and two subspecies whose status is Critically Endangered or Endangered, and one species (scimitar-horned oryx) that is Extinct in the Wild, but whose planned reintroduction into the region is at an advanced stage. According to the latest information available at the end of 2000, saiga should also be added to this list.

The suggested order of priority used in the Antelope Action Plan is:

1. Species confined to the region (North Africa, the Middle East, and Asia).
2. Highly distinctive subspecies confined to the region.
3. Species which occur widely outside the region, but with internationally significant populations within the region.
4. Species which occur marginally within the region.

These priorities can be further refined by considering population trends, status of captive populations, effectiveness of conservation programmes in range states, protected area coverage, and taxonomic uniqueness.

40.3 Sub-regional summaries

40.3.1 North Africa

North Africa once had the most diverse antelope fauna within the region covered by Part 4 of the Antelope Survey. The scarcely known red gazelle disappeared long ago and is remembered only from three museum specimens. Hunting has been the principal factor in the virtual or total elimination from the region of the three larger species (addax, hartebeest, and scimitar-horned oryx), and for causing severe declines in all species of gazelles. The endemic bubal hartebeest (*A. b. buselaphus*) is Extinct. The only other antelope endemic to North Africa is Cuvier's gazelle, which survives in a series of small populations in highland areas of Morocco, Algeria, and Tunisia. Most of its areas of occurrence in Algeria and Tunisia are formally protected, but in Morocco it is mainly distributed outside protected areas. Conservation measures have been successful in Tunisia, where numbers are reported to be expanding, but the current situation in Algeria is unknown. Slender-horned gazelle has a wide distribution across North Africa and the Sahel, but details of its range in the region are poorly known and there are no estimates of numbers. This species is not known to occur in any protected area in Egypt and Libya, which together constitute more than half its North African range. Dama gazelle retains a precarious presence in North Africa, with two very small populations in Algeria and southern Morocco. Dorcas gazelle is the most widely distributed species, but numbers are much lower and populations far more fragmented than a few decades ago. On the positive side, the threat from hunting has partly diminished with the withdrawal of oil exploration and production facilities from some desert areas, and habitats across much of the Sahara have not been degraded through over-exploitation, so reintroduction remains a feasible option for antelope conservation. In Tunisia, current plans envisage the reintroduction of all former antelope species beginning with the release of captive-bred scimitar-horned oryx into two national parks. These plans represent an important step towards restoration of the former antelope fauna in a part of its former range. However, re-establishment of antelope communities over wider areas of North Africa will be impossible without strict protection for animals dispersing from reintroduction sites.

40.3.2 Arabian Peninsula

Hunting has been primarily responsible for an extensive decline in numbers and range of all species of antelopes in the Arabian Peninsula. The Arabian gazelle is known from a single museum specimen supposedly obtained in the Farasan Islands, although the gazelles which occur there now belong to a different species. Queen of Sheba's gazelle, not seen for 50 years, is also considered to be Extinct. Saudi gazelle also became Extinct in the Wild relatively recently; some specimens may survive in captivity, but these animals could consist of hybrids (Kumamoto *et al.* 1995; Rebholz and Harley 1997). Wild populations of Arabian oryx were extirpated by the early 1970s, but free-living populations have been re-established in Oman, Saudi Arabia, and Israel. Other gazelle species have been reduced to a small fraction

Table 40.3 Priority antelopes in North Africa, the Middle East, and Asia.

Species	Distribution/dispersal	Population trend	Threats	Conservation Programmes
Species endemic to the region				
Przewalski's gazelle *Procapra przewalskii*	Very small area around Qinghai Lake in W. China	<150 in three subpopulations. Declining	Habitat destruction; illegal hunting	<10% in PA. Protected area proposed. No captive population
Arabian oryx *Oryx leucoryx*	Four reintroduced populations widely dispersed on Arabian Peninsula	Oman – severe reduction; Saudi Arabia and Israel – increasing	Illegal live capture in Oman; hunting/capture of dispersing animals elsewhere.	100% in PAs. Further reintroductions planned for Saudi Arabia and Jordan
Saola *Pseudoryx nghetinhensis*	Small pockets along Lao-Vietnam border	Declining	Habitat destruction; illegal hunting/live capture	Est. >75% in PA. Active programmes in both countries. No captive population
Cuvier's gazelle *Gazella cuvieri*	Small pockets in mountains of NW Africa	Tunisia – increasing; Algeria – ?; Morocco – stable?	Illegal hunting; habitat destruction	Tunisia (*c.* 25% of total population) – effective protection; Algeria – unknown; Morocco – varied.
Tibetan antelope *Pantholops hodgsonii*	Tibetan Plateau; eradicated from many areas and now mainly in remote areas	Continuing decline over last 10–20 years, exacerbated by severe winter 1998-99	Illegal hunting for international trade in its wool	New PAs contain large populations, but effective protection is crucial. Intensified international campaign against illegal trade needed. No captive population.
Saiga *Saiga tatarica*	Steppes of southern Russia and Kazahstan to Mongolia	Population decline of 75–85% 1998-2000	Illegal hunting for horns and meat	Moritorium on legal harvest in Russia and Kazakhstan. Further action at planning stage
Khting Vohr *Pseudonovibos spiralis*	Reported from Cambodia (three areas) and Vietnam (two areas)	Unknown; presumed declining or extinct	Hunting; habitat destruction?	Field surveys underway to locate surviving populations, if any.
Subspecies endemic to the region				
Arava gazelle *Gazella gazella acaciae*	6km^2 area of the Arava Valley	Declining; only 12 remain	Hunting; habitat changes	Survivors in a PA; planned transfer to captive breeding at Hai-Bar NR
Mongolian saiga *Saiga tatarica mongolica*	Two areas of W. Mongolia	Fluctuates; long-term decline halted	Illegal hunting; grazing competition	Both areas of distribution now PA, but little practical protection at present. No captive population.
Species not endemic to the region, but with internationally significant populations in the region				
Slender-horned gazelle *Gazella leptoceros*	Scattered over Sahara	Unknown; presumed declining	Hunting	Not known to occur in any PA in Egypt or Libya
Scimitar-horned oryx *Oryx dammah*	Formerly occurred across North Africa. Now Extinct in the Wild	-	-	Good captive populations. Reintroduction planned for Tunisia (Sidi Toui NP)
Species which occur marginally within the region				
Addax *Addax nasomaculatus*	Formerly occurred across North Africa	Regionally Extinct (except vagrants from the south)	Hunting	Reintroduction planned in Tunisia
Dama gazelle *Gazella dama*	Two remnant populations, one in Western Sahara and one in S. Algeria	Declining	Hunting	Reintroduction planned in Tunisia. Algerian population is in Hoggar NP. PA proposed for Western Sahara population

of their former numbers. Dorcas gazelle occurs in Israel and in small numbers in Jordan. Mountain gazelle and Arabian sand gazelle are distributed more widely, but unevenly, across the Peninsula. Reintroductions of both gazelle species have taken place in Saudi Arabia, and the establishment of large protected areas in Saudi Arabia is essential to the success of these projects. The designation of two very large non-hunting areas in Saudi Arabia is potentially a key development in the future conservation of antelopes on the Arabian Peninsula, though whether their value is realised depends heavily on the level of protection they are given. The United Arab Emirates have no federal legislation for wildlife conservation and few protected areas have been established, but efforts are being made to develop a national network of protected areas. A protected area for gazelles is under establishment in Bahrain. Yemen has no legislation to protect antelopes or protected areas. In the north of the Peninsula, Jordan has recently strengthened its protected areas system and instituted conservation programmes for antelopes that envisage reintroduction of Arabian oryx using stock from the captive-breeding herd at Shaumari Reserve. Israel has an extensive protected area system. Its population of dorcas gazelle is currently secure and numbers of mountain gazelle have increased to the extent that it is culled as an agricultural pest. Antelopes are extinct in Kuwait and possibly in Lebanon. Few protected areas in Syria and Iraq contain antelopes and, although scattered populations are known to exist in both countries, the status of antelopes has not been fully determined. There are many successful captive-breeding projects in the area, but the situation has been complicated by illegal imports and unauthorised releases.

40.3.3 Southwest Asia

Apart from a small population of mountain gazelles on Farur Island, Iran, which was probably introduced, the only species of antelopes occurring in Southwest Asia are goitered gazelle and chinkara. Both species have undergone extensive declines in distribution and numbers. In Iran, gazelle populations are far smaller now than a few years ago, and most of the surviving antelopes occur within an extensive network of protected areas situated throughout the country. However, the current situation seems fairly stable and numbers of gazelles are increasing in some protected areas. It is virtually impossible to assess the current situation in Afghanistan, but antelope populations were severely depleted even before 1979 when the current series of armed conflicts began. It has to be assumed that any surviving gazelles are subject to uncontrolled hunting and have no protection. In Pakistan, hunting of antelopes has also had a detrimental effect, even within protected areas. As a consequence, goitered gazelles could be close to extinction in Pakistan, if not already Extinct there, and chinkara has a very fragmented distribution, now confined mainly to areas with restricted access for vehicles. Some existing protected areas would be large enough to protect viable populations of antelopes if stricter protection measures were applied. In Turkey, goitered gazelles have been reduced to a tenth of the numbers present 30 years ago, and the remaining population exists outside any protected area. A captive-breeding project has been successful and could provide stock for reintroduction. The Turkish population occurs in the extreme southeast of the country on the edge of the Syrian Desert, and it is probably more appropriate to consider it in the context of the Arabian Peninsula. In Transcaucasia, the range of goitered gazelles has declined drastically during the last 60 years, and over 90% of the remaining population is now concentrated in Azerbaijan's Shirvan Nature Reserve and adjacent Bandovan Sanctuary. This reserve is the key to future expansion of the population in Azerbaijan and possible recolonisation of former range in Georgia.

40.3.4 Russia and Central Asia

The situation for antelopes in these countries has deteriorated enormously since the dissolution of the former USSR into its constituent republics. Associated political and economic changes led to sudden restrictions in funding, which adversely affected all aspects of wildlife conservation. The extensive former system of protected areas was generally adequate to conserve antelope populations, despite some illegal hunting. Now, many reserves are completely unprotected and the effectiveness of others has been reduced. Law enforcement has generally become weaker, illegal hunting has increased markedly, and licences for trophy hunting have sometimes been issued despite existing laws. In Russia, a huge increase in poaching during the last decade, combined with changes in grazing patterns and land use have seriously affected the saiga. These factors have reduced saiga numbers, driven the remaining population into areas of inferior habitat, and adversely affected social structure and reproduction. The situation is becoming critical with the remaining population estimated to number only 25–30,000 of which only about 10% are males. Almost the entire Russian saiga population now occurs outside protected areas. There has also been a resurgence in poaching in Kazakhstan, but the effects had been less severe until the last two to three years, when a reduction in numbers of around 30% was reported. This decline has accelerated resulting in a decline of around 80%. Immediate, rigorous protection is needed to assure their long-term future. The large seasonal ranges of saiga are partially protected by nature reserves in Kazakhstan.

Goitered gazelles have undergone a massive decline in range and numbers throughout Central Asia during the last 50 years. Kazakhstan retains the largest population and also has a good network of protected areas. In Turkmenistan, numbers have declined to a small percentage of their earlier levels, but key populations survive in Badkhyz Nature

Reserve and in the unprotected Karabil Uplands in the south of the country, with smaller numbers scattered elsewhere. The situation is most acute in Uzbekistan, where goitered gazelle range has decreased to the same extent as in the rest of Central Asia, but where they are hardly represented within the existing protected area system. Kyrgyzstan and Tajikistan are predominantly mountainous and contain only small areas of suitable habitat for antelopes; both countries have lost, or almost lost, their small populations of goitered gazelles. Some grounds for optimism lie in frequent reports from this sub-region that this species can coexist with livestock, and moderate levels of economic activity and disturbance, provided that direct persecution is eliminated, and also in the existence of several well-established captive-breeding programmes.

40.3.5 China and Mongolia

Three species, Tibetan antelope, Tibetan gazelle, and Przewalski's gazelle, are either wholly or virtually endemic to China. A fourth species, Mongolian gazelle, is confined to China and Mongolia, except for occasional seasonal movements into eastern Russia. The nominate form of saiga has become extinct in both countries, but a small population of Mongolian saiga (*S. t. mongolica*) survives in western Mongolia. Goitered gazelles were once widely distributed in both countries, but they have declined markedly in China. If recent population estimates are correct, Mongolia contains the largest population of goitered gazelle anywhere and also has very substantial numbers of Mongolian gazelle, although only a small proportion of each species occurs within protected areas. Mongolia's human population density is extremely low, a factor that has helped to prevent hunting, a widespread activity in the country, from having a major impact on antelope populations. Nevertheless, poaching has increased sharply during the last decade. The only threatened antelope, Mongolian saiga, has recently had its remaining range designated as nature reserves, but at present these exist mainly on paper.

Hunting and habitat destruction have severely reduced antelope populations over much of northern and western China. Saiga is Extinct and Przewalski's gazelle is on the verge of extinction. Goitered gazelle and Mongolian gazelle have also suffered large population declines. The inexorable increase in human population growth, expansion of agriculture, and road building have steadily encroached on more remote areas. The northern part of the Tibetan Plateau, Chang Tang, has been spared extensive exploitation until recently, but new roads have altered this situation, while an upsurge in illegal hunting and trade is having a serious effect on Tibetan antelope. Outside protected areas and, in some cases, within them, hunting is widespread and controls are ineffective. However, some very large nature reserves have been established on the Tibetan Plateau, in particular Qiantang Nature Reserve. These reserves are large enough to conserve extensive areas of the Tibetan Plateau ecosystem and viable populations of the endemic ungulate community, including Tibetan antelope and Tibetan gazelle, provided they are given sufficient protection on the ground.

40.3.6 Indian Subcontinent

Four antelope species are widely distributed: nilgai, four-horned antelope and blackbuck, which are endemic to the Indian Subcontinent, and chinkara, which also occurs in Pakistan, Afghanistan, and Iran. While numbers of all four species have fallen compared to former levels, reasonable numbers survive in India; two species are classified as Vulnerable and two are not considered threatened. This is despite a human population that has now reached one billion, including a large rural component that makes intensive use of natural resources. India's relatively secure populations of antelopes result, in large part, from an extensive network of protected areas of varying sizes, categories, and management status, and from a relatively low level of hunting. Chinkara remains secure in its stronghold in western India, protected either inside reserves or outside them by local people. Four-horned antelope and blackbuck are mainly found within reserves, but nilgai retains extensive populations outside protected areas. Four-horned antelope is possibly the most threatened species in the subregion because its solitary existence at low densities may make it more vulnerable to the effects of habitat fragmentation from the continuing clearance of forest and scrub. However, this species is poorly known, so its status is difficult to assess with confidence. Both nilgai and blackbuck are able to survive in mixed agricultural areas, and the conversion of scrub and forest to grassland and cropland may even have benefited blackbuck. The Indira Gandhi Canal Project is creating new habitat for antelopes in western India, compensating, to a small extent, for the loss of habitat elsewhere. In addition, extremely small populations of Tibetan antelope and Tibetan gazelle occur in northern India in areas adjacent to the Chinese border.

Around the margins of the Subcontinent, a decline in antelope numbers is more pronounced. Antelopes have disappeared from Bangladesh, probably forever. In Nepal, growing human population pressure in the lowlands has greatly reduced the amount of available habitat and, together with hunting, has almost wiped out blackbuck. Four-horned antelope is rare and only nilgai remains relatively common. Few protected areas in Nepal contain antelopes. Blackbuck has also been extirpated in eastern Pakistan and nilgai retains only a tenuous presence on the eastern border of the country.

40.3.7 Southeast Asia

The discovery of saola (*P. nghetinhensis*) and other new species in montane forests along the Lao-Vietnam border

Table 40.4 Protected Areas containing antelopes or of potential significance for antelopes in North Africa, the Middle East, and Asia.

Protected Area[1]	Area (ha)	Date established	Species occurring
NORTH AFRICA			
Morocco			
El Kheng	4,000	?	*G. dorcas* (10–15)
M'Sabih Talâa	1,987	1952	*G. dorcas*
Outat el Haj Royal HR	10,000	?	*G. cuvieri* (*c.*15)
Souss-Massa NP	33,800	1991	*G. cuvieri* (reintroduction failed); (captive: *O. dammah*, *A. nasomaculatus*, *G. dorcas*)
*c.*80 hunting reserves	600,000–10,000,000		*G. dorcas* (occasional)
Algeria			
Belezma NP	26,500	1985	*G. cuvieri* (20?)
Hoggar NP	4,500,000	1987	*G. dorcas* (many); *G. dama* (few); *A. nasomaculatus* (rare vagrants)
Saharan Atlas NP	200,000	1979	*G. cuvieri* (100)
Tassili NP	1,140,000	1972	*G. dorcas* (many); *G. leptoceros*
Theniet el Had NP	3,610	1983	Potential reintroduction site for *G. cuvieri*
Mergueb NR	32,500	1985	*G. cuvieri* (50)
Djebel Senalba NSF	20,000	?	*G. cuvieri* (unknown number)
Tunisia			
Bou Hedma NP	16,448	1980	*G. dorcas*; (Captive: *A. nasomaculatus*; *O. dammah*; G. dama)
Boukornine NP	1,939	1987	(Suitable for reintroduction of *G. cuvieri*)
Djebel Chambi NP	6,723	1980	*G. cuvieri* (*c.*200); *G. dorcas*
Djebil NP	150,000	1997	*G. dorcas*; *G. leptoceros*
Sidi Toui NP	6,135	1997	*G. dorcas*; (*O. dammah* – reintroduction planned)
Libya			
El Kouf NP	35,000	1979	*G. dorcas* (15 released)
Nefhusa NR	20,000	1978	(*G. dorcas* may occur)
New Hisha NR	100,000	1978	*G. dorcas* (*c.*150)
Tripoli NR	700	1978	Captive - *A. nasomaculatus*; *O. dammah*
Zellaf NR	100,000	1978	(*G. leptoceros* may occur)
Egypt			
Gabal Elba/Bir Abraq PA	480,000	1986	*G. dorcas* (largest population in Egypt)
Nabaq PA	?	?	*G. dorcas* (v. few)
Wadi El Alaqi BR	27,500	?	*G. dorcas*
Wadi El Raiyan PA	20,000	?	*G. dorcas* (v. few); (*G. leptoceros* – extinct)
MIDDLE EAST			
Saudi Arabia			
Al-Khunfah	3,422,500	1987	*G. gazella* (small numbers); *G.s. marica* (150); *O. leucoryx* (reintroduction planned)
Farasan Islands	60,000	1989	*G. gazella farasani* (>1,000)
Harrat al-Harrah	1,377,500	1987	*G.s. marica* (>1,000); *G. gazella*?
Ibex Reserve	236,900	1988	*G. gazella* (200 –reintroduced)
Mahazat as-Sayd	224,400	1988	*O. leucoryx* (>300- reintroduced); *G.s. marica* (reintroduced)
Majami al-Hadb	340,000	1993	(*G. gazella* – reintroduction planned)

Table 40.4 Protected Areas containing antelopes or of potential significance for Antelopes in North Africa, the Middle East, and Asia (cont.).

Protected Area[1]	Area (ha)	Date established	Species occurring
Uruq Bani Ma'arid	550,000	1994	*O. leucoryx* (>100-reintroduced); *G.s. marica* (reintroduced); *G. gazella* (73-reintroduced)
Non-hunting Zones			
Rub al-Khali	64,000,000	1994	*G.s. marica*?
Northern	10,087,500	1988	*G.s. marica*?
Yemen	–	–	–
Oman			
Arabian Oryx Sanctuary	2,700,000	1994	*O. leucoryx; G. gazella*; *G.s. marica*
Wadi Sareen Tahr Reserve	80,000	1975	*G. gazella*
Proposed			
As Saleel	?	–	*G. gazella*
Jebel Samhan NP	346,000	–	*G. gazella*
United Arab Emirates	–	–	–
Bahrain			
Proposed			
Bahrain Island (southern part)			*G.s. marica*
Qatar	–	–	–
Kuwait			
Jal Az-Zor NP	33,300	1990	(Possible reintroduction site for *Oryx leucoryx* and *G.s.marica*)
Proposed			
Al Batin	91,000	–	(Possible reintroduction site for *G.s. marica*)
Umm Niga	24,600	–	
Iraq	–	–	–
Syria			
Choula GPA	22,000	?	*G. gazella*?
Jabal Shuah	?	?	*G. gazella*?
Proposed PA			
Buhayrat al-Khatuniyah	80,000		*G.s. marica*
Euphrates Valley	*c.*42,000		*G.s. marica*
Jabal Abdul Aziz	45,000		*G.s. marica*
Jabal al-Bilas	40,000		*G.s. marica*
Ras al-Ayn	100,000		*G.s. marica*
Sabkhat al-Jabbul	*c.*15,000		*G.s. marica*
Tadmur and Sabkhat Muh	45,000		*G.s. marica*
Lebanon			
Barouk Mountain	2,700	?	*G. gazella*?
Mashgarah NP	3,500	1988	(*G. gazella* – extinct)
Jordan			
Dana WR	23,000	1989	(*G. gazella* – extinct)

Table 40.4 Protected Areas containing antelopes or of potential significance for antelopes in North Africa, the Middle East, and Asia (cont.).

Protected Area[1]	Area (ha)	Date established	Species occurring
Shaumari WR	2,200	1975	*O. leucoryx* (captive –225); *G.s. marica* (captive – 14)
Wadi Mujib WR	21,200	1985	(*G. gazella* – extinct)
Wadi Rum WR	55,000	1965	Proposed reintroduction site for *O. leucoryx*
Proposed			
Bayer	44,000		Proposed reintroduction site for *O. leucoryx*
Burqu	95,000		*G. subgutturosa*. Proposed reintroduction site for *O. leucoryx*
Jabal Mas'udi	46,000		*G. dorcas*
Wadi Rajil	86,000		Proposed reintroduction site for *O. leucoryx*
Israel			
En Gedi	1,435	1971	*G. gazella*
Hai Bar	3,200	1970	(*Oryx dammah* –captive)
Hanahalim Hagdolim	24,800	1986	*G. dorcas*
Har Hanegev	104,900	1989	*G. dorcas*
Mezukai Hazinim	55,600	1989	*G. dorcas*
Mezukai Herev	2,290	?	*G. gazella*
Masiv Elat	39,900	1986	*G. dorcas*
Ya'ar Yehudia	6,200	1984	*G. gazella*
Turkey	–	–	–
Iran (see country report for protected areas where antelopes recently became extinct)			
National Parks			
Bamou	47,440	1962	*G. subgutturosa* (390)
Golestan	91,895	1957	*G. subgutturosa* (220)
Kavir (NP and Preserved Area)	420,000 +450,000	1964 1976	*G. subgutturosa* (60); *G. bennettii* (100)
Kola Ghazi	50,000	1964	*G. subgutturosa* (1,130)
Sorkeh Hesar	9,380	1982	*G. subgutturosa* (20)
Wildlife Refuges			
Ghamishloo	37,000	1971	*G. subgutturosa* (1,010)
Khabr-va-Rouchoon	169,200	1971	*G. bennettii* (200)
Khosh Yeilagh	154,400	1963	*G. subgutturosa* (15)
Miandasht	52,000	1974	*G. subgutturosa* (250); *G. bennettii*?
Mooteh	163,250	1964	*G. subgutturosa* (2,170)
Touran	565,000	1973	*G. subgutturosa* (180); *G. bennettii* (30)
Preserved Areas			
Bahram-e-Gour	385,000	1973	(*G. subgutturosa* –extinct); *G. bennettii* (60)
Bidouieh	94,275	1997	*G. subgutturosa* (750)
Farur Island	2,620	1987	*G. gazella* (360)
Gandu	382,430	1971	*G. bennettii* (6)
Hamoun	193,500	1967	(*G. subgutturosa* –extinct) ; *G. bennettii* (unknown number)
Hormud	151,284	1976	*G. bennettii* (50)
Kalmand-va-Bahadoran	17,500	1991	*G. subgutturosa* (1,500); *G. bennettii* (20)
Mond	46,700	1976	*G. subgutturosa* (250)
Nayband	195,000	1978	*G. bennettii* (15)
Parvar	59,840	1962	*G. subgutturosa* (migrants)

Table 40.4 Protected Areas containing antelopes or of potential significance for antelopes in North Africa, the Middle East, and Asia (cont.).

Protected Area[1]	Area (ha)	Date established	Species occurring
Salook	16,000	1973	*G. subgutturosa* (1,100)
Afghanistan	–	–	–
Pakistan			
Kala Chitta GR	132,611	1983	*G. bennettii*
Kalabagh GR	1,550	1966	*G. bennettii*
Kirthar NP	308,733	1974	*G. bennettii*
Lal Suhanra NP	87,426	1972	*G. bennettii*; (*A. cervicapra* – captive)
Takkar WS	43,513	1968	*G. bennettii*
Azerbaijan			
Shirvan NR	25,800	1969	*G. subgutturosa* (3000–4500)
Bandovan S	30,000	1961	
Gerchay S	15,000	1961	*G. subgutturosa*
Georgia			
Vashlovani NR	8,034	1935	(*G. subgutturosa* –extinct; potential reintroduction site)
Kazakhstan			
Altyn–Emel NP	250,000	1991	*G. subgutturosa* (5,000–10,000);
Almaty NR	73,342	1964	*G. subgutturosa* (few);
Andasai NR	1,000,000	1966	*S. tatarica* (winter)
Barsakelmes NR	30,000	1939	*G. subgutturosa* (introduced); *S. tatarica* (introduced)
Kurgantube NR	237,000	1958	*S. tatarica* (summer)
Naurzum NR	87,694	1934	*S. tatarica* (summer)
Ustyurt NR	227,000	1984	*G. subgutturosa*; *S. tatarica* (winter)
Aktau-Buzachinsk WS	182,000	1982	*G. subgutturosa*
Turgai WS	343,000	1967	*S. tatarica* (summer)
Uzbekistan			
Kyzyl Kum NR	5,721	1971	*G. subgutturosa* (few)
Dengizkul WS	8,620	1973	*G. subgutturosa* (few)
Tudakul WS	30,000	1960	*G. subgutturosa* (few)
Kyrgyzstan			
Issyk Kul WS	16,668	1976	(*G. subgutturosa* –extinct)
Tajikistan			
Tigerbulk NR	50,000	1938	*G. subgutturosa* (few)
Karatau WS	14,100	1972	(*G. subgutturosa* –extinct)
Turkmenistan			
Amudarinskiy NR	50,500	1982	*G. subgutturosa* (few)
Badkhyz NR	88,640	1941	*G. subgutturosa* (*c.*2,000)
Kaplankyr NR	282,800	1979	*G. subgutturosa* (few hundred)
Repetek NR	34,600	1928	*G. subgutturosa* (few)
Ogurchinsk WS	<4,500	1982	*G. subgutturosa* (*c.*400)
Sarykamysh WS	551,066	1980	*S. tatarica* (winter – occasional)
Meana-Chaachinsk HR	60,000	1976	*G. subgutturosa* (few)

Table 40.4 Protected Areas containing antelopes or of potential significance for antelopes in North Africa, the Middle East, and Asia (cont.).

Protected Area[1]	Area (ha)	Date established	Species occurring
Russia			
Cherniye Zemli BR	93,800	1990	*S. tatarica*
Mongolia			
Dornod Mongoliin Tal NP	570,400	1992	*P. gutturosa* (few)
Great Gobi NP	5,311,700	1975	*G. subgutturosa*
Mongol-Daguur NP	103,000	1992	*P. gutturosa* (few)
Gurvan Saikhan Gobi NCP	2,170,000	1965	*G. subgutturosa*
Mankhan NR	30,000	1993	*G. subgutturosa*; *S.t. mongolica*
Sharga NR	286,900	1993	*G. subgutturosa*; *S.t. mongolica* (>90% of the total population
Proposed			
Kherlen-Menen NR			*P. gutturosa*
China			
A Er Jin Shan (Arjin Shan)	4,512,000	1985	*P. picticaudata*; *P. hodgsonii*
Bird Island	53,550	1975	*P. przewalskii* (v. few)
Boghdad Mountain	217,000	1990	*G. subgutturosa*
Ganhaizi	300	1982	*G. subgutturosa*
Kalamaili Mountain	1,700,000	1982	*G. subgutturosa*
Kokoxili	60,000	1996	*P. hodgsonii*
Ludansuolin	28,000	?	*G. subgutturosa*
Qiantang	24,712,000	1993	*P. picticaudata*; *P. hodgsonii*
Qomolangma	3,500,000	1989	*P. picticaudata*
Yanchiwan	424,800	1982	*G. subgutturosa*
India (listed by State; Sanctuaries except where indicated NP)			
Andhra Pradesh			
Eturnagaram	82,259	1953	*B. tragocamelus; T. quadricornis; G. bennettii*
Kawal	89,228	1965	*B. tragocamelus*
Kinnersani	63,540	1977	*B. tragocamelus*; *T. quadricornis*
Nagarjunasagar Srisailam	35,689	1978	*B. tragocamelus*; *T. quadricornis*; *A. cervicapra*; *G. bennettii*
Pakhal	86,205	1952	*B. tragocamelus*; *T. quadricornis*
Papikonda	59,068	1978	*B. tragocamelus*; *T. quadricornis*
Pranhita	13,603	1980	*B. tragocamelus*; *T. quadricornis; A. cervicapra; G. bennettii*
Siwaram	2,992	1978	*T. quadricornis*
Venkateshwara	50,700	?	*B. tragocamelus*
Bihar			
Gautam Budha	25,948	1976	*A. cervicapra; G. bennettii*
Hazaribagh	18,625	1976	*B. tragocamelus*; *T. quadricornis*; *G. bennettii*
Kaimur	134,222	1978	*T. quadricornis*; *G. bennettii*
Koderma	17,795	1985	*B. tragocamelus*; *T. quadricornis*
Palamau	76,700	1976	*B. tragocamelus*; *T. quadricornis*
Gujarat			
Gir NP	25,871	1975	*B. tragocamelus*; *T. quadricornis*; *G. bennettii*
Velavadar NP	3,408	1976	*B. tragocamelus; A. cervicapra*

Table 40.4 Protected Areas containing antelopes or of potential significance for antelopes in North Africa, the Middle East, and Asia (cont.).

Protected Area[1]	Area (ha)	Date established	Species occurring
Narayan Sarovar	76,579	1981	*G. bennettii*
Udanti	24,759	1983	*B. tragocamelus*; *T. quadricornis?*
Wild Ass	495,370	1973	*B. tragocamelus*; *A. cervicapra*; *G. bennettii*
Karnataka			
Bandipur NP	87,420	1974	*T. quadricornis*
Nagarhole NP	64,339	1975	*T. quadricornis*
Mookambika	24,700	1974	*T. quadricornis?*
Ranebennur	11,900	1974	*A. cervicapra*
Sharavathi	43,123	1974	*T. quadricornis*
Shettihalli	39,560	1974	*T. quadricornis*
Tungabhadra	22,422	?	*T. quadricornis*
Madhya Pradesh			
Bandhavgarh NP	44,884	1968	*B. tragocamelus*; *T. quadricornis; G. bennettii*
Indravati NP	125,837	1978	*T. quadricornis*
Kanger Ghati NP	20,000	1982	*B. tragocamelus*; *T. quadricornis*?
Kanha NP	94,000	1955	*B. tragocamelus; T. quadricornis*; *A. cervicapra*
Madhav NP	15,615	1959	*B. tragocamelus*; *T. quadricornis*; *G. bennettii*
Panna NP	542,666	1981	*T. quadricornis*; *G. bennettii*
Pench NP	29,286	1977	*T. quadricornis*; *G. bennettii*?
Satpura NP	52,437	1981	*B. tragocamelus; T. quadricornis*
Bagdara	47,890	1978	*B. tragocamelus*; *T. quadricornis*; *A. cervicapra*; *G. bennettii*
Karera Great Indian Bustard	20,221	1981	*A. cervicapra*; *G. bennettii*
Kheoni	12,270	1982	*T. quadricornis*
Noradehi	118,696	1975	*T. quadricornis*
Pachmarhi	46,086	1977	*B. tragocamelus*; *T. quadricornis*; *A. cervicapra*
Palpur Kuno	34,468	1981	*B. tragocamelus*; *T. quadricornis; A. cervicapra; G. bennettii*
Panpatha	24,584	1983	*B. tragocamelus*; *T. quadricornis*
Pench	11,847	1977	*B. tragocamelus*; *T. quadricornis*
Ratapani	68,879	1976	*B. tragocamelus*; *T. quadricornis*
Sanjay (Dubri)	36,459	1975	*B. tragocamelus*; *T. quadricornis*
Singhori	28,791	1976	*B. tragocamelus*; *T. quadricornis*
Maharashtra			
Nawegaon NP	13,388	1975	*B. tragocamelus*; *T. quadricornis*
Pench NP	25,726	1975	*T. quadricornis*
Sanjay Gandhi NP	8,696	1983	*T. quadricornis*
Tadoba NP	11,655	1955	*B. tragocamelus*; *T. quadricornis*; *G. bennettii?*
Dandeli	572,907	1975	*B. tragocamelus; T. quadricornis*
Great Indian Bustard	849,644	1979	*A. cervicapra; G. bennettii*
Melghat	159,733	1985	*B. tragocamelus*; *T. quadricornis*; *G. bennettii*
Nagzira	15,281	1969	*B. tragocamelus*; *T. quadricornis*
Tansa	30,481	1970	*T. quadricornis*
Orissa			
Kotagarh	39,950	1981	*B. tragocamelus*; *T. quadricornis*
Satkosia Gorge	79,552	1976	*B. tragocamelus*; *T. quadricornis*

Table 40.4 Protected Areas containing antelopes or of potential significance for antelopes in North Africa, the Middle East, and Asia (cont.).

Protected Area[1]	Area (ha)	Date established	Species occurring
Rajasthan			
Desert NP	316,200	1981	*B. tragocamelus*; *G. bennettii*
Keoladeo NP	2,873	1981	*B. tragocamelus*; *A. cervicapra*
Ranthambore NP	39,200	1980	*B. tragocamelus*; *G. bennettii*
Sariska NP	27,380	1982	*B. tragocamelus*; *T. quadricornis*; *G. bennettii*
Darrah	26,583	1955	*B. tragocamelus; T. quadricornis; G. bennettii*
Guda-Vishnoian	42,500	?	*B. tragocamelus*; *A.. cervicapra*; *G. bennettii*
Jaisammand	5,200	1956	*B. tragocamelus; T. quadricornis; G. bennettii*
Kumbhalgarh	57,826	1971	*B. tragocamelus*; *T. quadricornis*; *G. bennettii*
Mount Abu	28,84	1960	*B. tragocamelus*; *G. bennettii*
National Chambal	28,000	1983	*B. tragocamelus*; *A. cervicapra*; *G. bennettii*
Phulwari	51,141	1983	*T. quadricornis*
Sitamata	42,294	1979	*B. tragocamelus*; *T. quadricornis*; *G. bennettii*
Tal Chappar	710	1962	*A. cervicapra*; *G. bennettii*
Todgarh Raoli	49,527	1983	*B. tragocamelus*; *T. quadricornis*
Tamil Nadu			
Point Calimere	1,726	1967	*A. cervicapra*
Uttar Pradesh			
Chandraprabha	7,800	1957	*B. tragocamelus*; *G. bennettii*
Kaimur	50,075	1982	*B. tragocamelus*; *A. cervicapra*; *G. bennettii*
Proposed			
Daultbeg-Depsang	30,000		*P. hodgsonii* (seasonal)
Changtang	100,000		*P. picticaudata*?
Rupshu	300,000		*P. picticaudata*?
Nepal			
Royal Chitwan NP	93,200	1973	*B. tragocamelus*
Royal Bardia NP	98,800	1988	*B. tragocamelus* (*A. cervicapra* – reintroduction failed)
Kosi Tappu WR	17,500	1976	*B. tragocamelus*
Parsa WR	49,900	1984	*B. tragocamelus*; *T. quadricornis*
Royal Sukla Panta WR	15,500	1976	*B. tragocamelus* (50–60); (*A. cervicapra* – extinct)
Bangladesh	–	–	–
Laos			
Nakai-Nam Theun NBCA	371,000	1993	*Pseudoryx nghetinhensis*
Proposed			
Northern extension to Nakai-Nam Theun	64,500		*Pseudoryx nghetinhensis*
Nam Chouan	161,000		*Pseudoryx nghetinhensis*?
Vietnam			
Bach Ma NP	22,030	1986	*Pseudoryx nghetinhensis?*
Pu Hong NR	5,000	1986	*Pseudoryx nghetinhensis*
Pu Mat NR	93,000+ 83,000 buffer	?	*Pseudoryx nghetinhensis*
Vu Quang NR	55,900	1986	*Pseudoryx nghetinhensis*

Table 40.4 Protected Areas containing antelopes or of potential significance for antelopes in North Africa, the Middle East, and Asia (cont.).

Protected Area[1]	Area (ha)	Date established	Species occurring
Cambodia			
Bokor NP	142,700	1993	*Pseudonovibos spiralis*?
Nam Lyr WS	54,000	1993	*Pseudonovibos spiralis?*
Phnom Aural WS	257,800	1993	*Pseudonovibos spiralis?*
Phnom Samkos WS	333,600	1994	*Pseudonovibos spiralis*?

[1] BR = biosphere reserve; GR = game reserve; HR = hunting reserve; NBCA = national biodiversity conservation area; NCP = nature conservation park; NP = national park; NSF = national state forest; WS = wildlife sanctuary.

has stimulated intensive conservation efforts. Most known populations of saola are in designated or proposed protected areas and populations elsewhere are the object of active conservation programmes. Khting vohr (*Pseudonovibos spiralis*) is an enigmatic species whose precise identity, distribution, and conservation status are still undetermined.

40.4 Status of antelopes within protected areas

All the reintroduced populations of Arabian oryx occur within protected areas. Only five other antelope species have more than half their populations protected within reserves. Thus, two-thirds of the remaining species have less than 50% of their numbers in protected areas and this figure drops to <10% in the case of the Critically Endangered Przewalski's gazelle (Table 40.1). Table 40.4 lists protected areas that contain antelopes in each of the region's 37 countries, the antelope species they contain, and an estimate of numbers, where available. Definite or accurate information on numbers and status of antelopes in individual proected areas is often lacking. Protected area coverage in the region is very uneven. Several countries have no protected areas of any kind, no functioning protected areas, or a protected area system at an early stage of development. In other countries, antelopes are poorly represented within the existing protected areas system. Management and protection of individual reserves differs widely, from nonexistent to excellent. The effectiveness of protected areas is also influenced by links to other protected areas or to outlying antelope populations. Some protected areas are of international importance to antelope conservation because they contain threatened species or large populations. However, this does not imply that other protected areas are unimportant, since conservation of adaptive variation requires the survival of each antelope species in as wide a range of its natural habitats as possible. Furthermore, the occurrence of antelopes within a protected area usually provides the potential for appropriate management to increase the population.

Continued evolution of antelopes by natural selection may be possible only in the largest protected areas that preserve the full spectrum of competing herbivores and natural predators (Frankel and Soulé 1981). However, the presence of large carnivores is not automatically guaranteed by reserve size alone, since predators may have been eliminated by hunters or livestock owners. Few large protected areas (>20,000km^2) that contain antelopes have been established in the region, and these are concentrated in a small number of countries. China has the vast Qiantang (at least 247,120km^2), Arjin Shan (45,000km^2), Kokoxili (45,000km^2), and Qomolangma (35,000km^2) Nature Reserves. These four areas protect significant tracts of the Tibetan Plateau ecosystem and large populations of two endemic antelopes, Tibetan gazelle, and Tibetan antelope. In Mongolia, Great Gobi National Park (53,000km^2) and Gurvan Saikhan Gobi National Conservation Park (21,700km^2) are inhabited by goitered gazelle, though this species is not currently regarded as threatened. On the Arabian Peninsula, Al-Khunfah Protected Area (34,225km^2) in Saudi Arabia and the Arabian Oryx Sanctuary (27,000km^2) in Oman contain reintroduced populations of Arabian oryx. In Algeria, Tassili (11,400km^2) and Hoggar (45,000km^2) National Parks contain important populations of dorcas gazelle, slender-horned gazelle, and dama gazelle. The importance of size is illustrated by the estimate that 500 breeding animals constitute the minimum viable population that is capable of maintaining genetic diversity (Soulé 1986). On this basis, Green *et al.* (1991) calculated that protected areas should cover 67,000km^2 for Arabian oryx and 50,000km^2 for scimitar-horned oryx.

Outside the formal protected areas system, a few populations of antelopes are given *de facto* protection due to special circumstances. For example, Vishnoi communities in northwestern India protect blackbuck and chinkara through religious belief and local custom. Others are protected by the remoteness of their habitats, although the significance of this factor has decreased as new roads open up such areas. In some places, sparse human population density and moderate levels of resource use allow antelopes to coexist alongside people and economic activities.

Table 40.5 Antelopes occurring (or once occurring) in North Africa, the Middle East, and Asia, reported numbers in captivity, and recommendations for captive management. Unless otherwise noted, population data are from the conservation assessment and management plan (CAMP) for antelopes (Sausman and Correll 1994) and studbooks (see references); recommendations are from Sausman and Correll (1994). In the "CAMP" column, numbers in parentheses are from Olney *et al*. (1998).

Species	CAMP	Studbook	Recommendation
Boselaphus tragocamelus	618	–	No
Tetracerus quadricornis	52 (68)	–	Level 2
Oryx dammah	1,195	1,081 (NA)	Level 1
Oryx leucoryx	890	1,600 (I)	Level 1
Addax nasomaculatus	701	862 (I)	Level 1
Alcelaphus buselaphus	162	–	No
Antilope cervicapra	1,344	–	Level 3
Gazella dorcas	306	108 5 (I)	Pending
Gazella saudiya	_75	–	Level 1
Gazella bennettii	_30 [1]	–	No
Gazella gazella	252 [2]	51 (UK)	–
Gazella bilkis	4?	–	Level 1
Gazella cuvieri	155	127 (I)	Level 1
Gazella subgutturosa	>2,960 [3]	66 6 (NA)	–
Gazella leptoceros	151	189 (I)	Level 1
Gazella dama	608	381 7 (NA)	Level 1
Procapra picticaudata	–	–	No
Procapra przewalskii	–	–	Pending
Procapra gutturosa	–	–	No
Pantholops hodgsonii	–	–	Level 3
Saiga tatarica	35 (218)	–	–
Pseudoryx nghetinhensis	–	–	–
Pseudonovibos spiralis	–	–	–

Subspecies	CAMP	Studbook	Recommendation
Gazella dorcas massaesyla	1 (41)	–	Pending
Gazella dorcas osiris	40 (65)	108 (I)	Pending
Gazella gazella acaciae	?	–	Level 1
Gazella gazella cora	_100	–	Level 2
Gazella gazella farasani	–	–	Pending
Gazella gazella gazella	113	–	Level 3
Gazella gazella muscatensis	–	–	Level 1
Gazella subgutturosa hillieriana	–	–	No
Gazella subgutturosa marica	>1,500[2]	23 (NA)	Level 1
Gazella subgutturosa subgutturosa	1,462 [4]	43 (NA)	Level 3

*1: F. Rietkerk (*in litt.*); 2: see Chapter 8; 3: see Chapters 8, 20, and 27; 4: see Chapters 20 and 27; 5:* Gazella dorcas osiris*; 6:* Gazella subgutturosa marica *and* Gazella subgutturosa subgutturosa*; 7:* Gazella dama mhorr *and* Gazella dama ruficollis*; I = International; NA = North America; UK = United Kingdom.*

40.5 Antelopes for which more information is required

Accurate and up-to-date information is a prerequisite for effective conservation action. The country reports make clear that such information is lacking on status, distribution, and population trends for antelopes in many countries and in individual protected areas. The latest available population figures often date from at least several years ago and estimates may be based on small samples or even partly on guesswork. Reliable population figures based on large samples and verified over several years are unavailable for most of the species addressed in Part 4 of the Antelope Survey. Knowledge of the biology and ecology of many species in the region is also seriously inadequate. For example, slender-horned gazelle has not been the subject of a detailed field study. Apart from the broad parameters of its habitat preferences, very little is known about its biology in the wild, although some information is available from captive animals. Even some common species, such as nilgai, have not been studied in detail.

40.6 Captive-breeding

Among antelopes whose survival in the wild is threatened, viable captive populations serve to provide insurance against extinction and provide breeding stock for re-establishment of natural populations. In North Africa and the Middle East, for example, various reintroduction projects have involved captive-born scimitar-horned oryx, Arabian oryx, addax, mountain gazelles, goitered gazelles, and dama gazelles. Approximately 16 of the region's antelope species are represented in captivity (Table 40.5). Many of these species occur in sufficient numbers to be considered viable populations, and for at least addax, Arabian oryx, and scimitar-horned oryx, numbers in captivity probably exceed numbers in the wild. Species that are either Extinct in the Wild or threatened (i.e., classified as Critically Endangered, Endangered, or Vulnerable) in North Africa, the Middle East, and Asia, and that have captive populations of at least 100 individuals are: scimitar-horned oryx, Arabian oryx, addax, blackbuck, Cuvier's gazelle, slender-horned gazelle, and dama gazelle. Among antelopes threatened at the subspecies level, the Arabian sand gazelle has a captive population that numbers more than 1,500.

As referred to in Table 40.5, captive populations of hartebeest represent specimens from sub-Saharan Africa, where the only natural populations of this species still occur. No specimens of Queen of Sheba's gazelle are known to exist in captivity (or in the wild), only an anecdotal report of a few animals in a German zoo (Sausman and Correll 1994). The taxonomic status of existing captive populations of Saudi gazelle should be regarded as uncertain, as they may consist of *G. bennettii* x *G. saudiya* hybrids (Kumamoto *et al.* 1995; Rebholz and Harley 1997).

Eleven taxa (six species and five subspecies) of the region's antelopes are being managed in captivity with the help of studbooks (Table 40.5). Species studbooks provide pedigree and demographic data that aid in the preservation of diversity found in limited gene pools and in the avoidance of potentially deleterious effects of inbreeding. International studbooks list all known captive individuals of particular taxa, whereas regional studbooks include only those held in a particular geographic region.

Since the 1980s, zoos have placed strong emphasis on co-ordinated management of their collections. Certain taxa, especially those threatened in the wild and/or having a viable captive population, have been designated for more intensive co-ordinated management through regional programmes. In 1996, these programmes included: the American Zoo and Aquarium Association's Species Survival Plans for scimitar-horned oryx, Arabian oryx, and addax; the Australasian Species Management Programmes for scimitar-horned oryx and addax; the Central Zoo Authority of India's programmes for Indian gazelle and four-horned antelope; the European Endangered Species Programmes for scimitar-horned oryx, Arabian oryx, addax, and dama gazelle; and the United Kingdom's Joint Management of Species Programme for mountain gazelle (Swengel *et al.* 1996; F. Rietkerk *in litt.*). These groups are co-ordinated by the International Union of Directors of Zoological Gardens, also known as The World Zoo Organization. The Conservation Breeding Specialist Group (CBSG), formerly the Captive-Breeding Specialist Group, of IUCN's Species Survival Commission plays an important role in setting priorities for captive management, collating and disseminating information globally, and in strengthening links between captive-breeding and field conservation (C. Lees *in litt.*).

The CBSG-Antelope Working Group, in conjunction with the Antelope Specialist Group, and the antelope taxon advisory groups of the American Zoo and Aquarium Association and the European Endangered Species Programmes, have jointly produced the *Antelope conservation assessment and management plan and global captive action recommendations* (Sausman and Correll 1994) to enhance the integration of captive-breeding and field conservation efforts. The recommendations for captive populations of antelopes (see Table 40.5) are defined as follows:

Level 1. A captive population is recommended as a component of a conservation programme. This programme has a tentative goal of developing and managing a population sufficient to preserve 90% of the genetic diversity of a population for 100 years. The programme should be further defined with a species/subspecies management plan encompassing the wild and captive populations and implemented immediately with available stock in captivity. If the current stock is insufficient to meet programme goals, a manage-

ment plan should be developed to specify the need for additional founder stock. If no stock is present in captivity, the programme should be developed collaboratively with appropriate wildlife agencies, Species Survival Commission specialist groups, and co-operative institutions.

Level 2. Similar to Level 1, except a species/subspecies management plan would include periodic reinforcement of the captive population with new genetic material from the wild. The amount of genetic exchange needed should be defined in terms of the programme goals, a population model, and management plan. It is anticipated that periodic supplementation with new genetic material will allow management of a smaller captive population.

Level 3. A captive population exists or is recommended for research, public education, or conservation purposes. Research includes husbandry/ management, population genetic, and taxonomic investigations. Depending on research results, Level 3 populations may be upgraded to Level 1 or 2. Level 3 is also recommended for taxa that should be phased out of captivity because they are either: (a) safe in the wild, and space would best be served for other taxa; or (b) the origins of the captive population are questionable and the population should therefore be replaced. In these cases, a Level 3 recommendation provides for the phase-out to be a managed process.

No. A captive programme is not currently recommended as a demographic or genetic contribution to the conservation of the species/subspecies. Taxa already held in captivity may be included in this category. These taxa should be evaluated either for management toward a decrease in numbers or for complete elimination from captive programmes. The strategy should be to accommodate as many species/subspecies of higher conservation priority as is possible.

Pending. A decision on a captive programme will depend on additional data, either from a population and habitat viability assessment workshop, survey, or compilation of existing information.

Acknowledgements

We thank S. Christie, T. Correll, M. Gimenez Dixon, A. Kumamoto, C. Lees, F. Rietkerk, K. Sausman, and H. Shoda for the information they provided and their suggestions to improve the text.

References

Ancín, T.A. 1993. Gazella dorcas neglecta [*Gazella dorcas osiris*] *international studbook (1991). (Updated list 31.12.1992)*. Departmento de Ecología y Medio Ambiente, Instituto de Estudios Almerienses de la Diputación de Almería, Almería.

Carter, S. 1995. *Goitered gazelle North American regional studbook. Third edition*. Detroit Zoological Institute, Detroit.

Correll, T. 1994. *Addax,* Addax nasomaculatus*. International studbook, 1 January 1993 through 31 December 1994.* The Living Desert, Palm Desert.

Dolan, J.M. and Sausman, K. 1993. *Arabian oryx* (Oryx leucoryx). *International studbook, 31 December 1992*. Zoological Society of San Diego, San Diego.

East, R. 1999. *African antelope database 1998*. IUCN/SSC Antelope Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.

East, R., Mallon, D.P., and Kingswood, S.C. 1996. Evaluation of antelopes using IUCN Red List categories. *Antelope Survey Update* 2:57–72.

Hill, C. 1995. *British Isles regional studbook for the Arabian gazelle,* Gazella gazella*. Studbook number 1* [updated 13 September 1996]. Dudley and West Midlands Zoological Society, Dudley.

Hughes, J.B. Daily, G.C., and Erhlich, P.R. 1997. Population diversity: Its extent and extinction. *Science* 278: 689–692.

IUCN. 1996. *1996 IUCN Red List of threatened animals.* IUCN, Gland, Switzerland and Cambridge, UK.

Jackson, J. 1985. La distribución de la población de antilopa cervicapra en la Argentina. *IDIA* 429–432:95–98.

Kingswood, S.C. 1997. *Slender-horned gazelle* (Gazella leptoceros). *International studbook, 1996. Number 10*. Center for Reproduction of Endangered Species, Zoological Society of San Diego, San Diego.

Kumamoto, A.T., Kingswood, S.C., Rebholz, W.E.R., and Houck, M.L. 1995. The chromosomes of *Gazella bennetti* and *Gazella saudiya*. *Zeitschrift für Säugetierkunde* 60:159–169.

McNeely, J.A. 1988. *Economics and biological diversity: Using economic incentives to conserve biological*

resources. IUCN, Gland, Switzerland and Cambridge, UK.

Moritz, C. 1994. Defining 'evolutionarily significant units' for conservation. *Trends in Ecology and Evolution* 9:373–375.

Olney, P.J.S., Fisken, F.A., and Davolls, L.J. (Editors). 1998. *International zoo yearbook,* Vol. 36. The Zoological Society of London, London.

Quilez, J.E. 1992. *Edmi gazelle* [*Gazella cuvieri*]. *International studbook (1990). (Updated list 1992)*. Departmento de Ecología y Medio Ambiente, Instituto de Estudios Almerienses de la Diputación de Almería, Almería.

Rebholz, W.E.R. and Harley, E.H. 1997. Cytochrome *b* sequences from the endangered Saudi gazelle (*Gazella saudiya*) suggest hybridization with chinkara (*Gazella bennetti*). *Conservation Biology* 11:251–255.

Rost, A.F. 1994. *Scimitar-horned oryx North American regional studbook*. Jacksonville Zoological Gardens, Jacksonville.

Sausman, K.A. 1994. *Cuvier's gazelle,* Gazella cuvieri. *North American regional studbook, 31 December 1994*. The Living Desert, Palm Desert.

Sausman, K.A. 1994. *Mhorr gazelle,* Gazella dama mhorr. *North American regional studbook, 31 December 1994*. The Living Desert, Palm Desert.

Sausman, K. and Correll, T. (Editors). 1994. *Antelope conservation assessment and management plan and global captive action recommendations. Draft 4*. IUCN/SSC Captive-Breeding Specialist Group, Apple Valley, Minnesota.

Shurter, S. (Editor). 1997a. *1997 regional action plan. Draft 2*. Antelope Taxon Advisory Group, American Zoo and Aquarium Association, Bethesda.

Shurter, S. 1997b. Antelope TAG 1997 mid-year meeting minutes. *Gnusletter* 16(1):15–17.

Steiner, A. and Bayon, R. 1997. World conservation congress breaks the silence of Rio. *Species* 28: 26–29.

Swengel, F.B., Hill, T.J., and Sullivan, E.J. (Editors). 1996. *1996 global zoo directory*. IUCN/SSC Conservation Breeding Specialist Group, Apple Valley, Minnesota.

Thuesen, L. 1995. *Addra gazelle,* Gazella dama ruficollis, *North American regional studbook. Second edition*. The Living Desert, Palm Desert.

Tilman, D., May, R.M., Lehman, C.L., and Nowack, M.A, 1994. Habitat destruction and the extinction debt. *Nature* 371:65–66.

Chapter 41. Regional Action Plan for Antelope Conservation

D.P. Mallon and S.C. Kingswood

41.1 Introduction

The goal of antelope conservation in the region stated in Chapter 1 is (a) to ensure the long-term survival of all antelope species by maintaining as many viable populations as possible of each species, in as wide a range of habitats as is practical, and (b) to restore recent antelope communities where feasible. It is axiomatic that Action Plans themselves do not conserve biodiversity, only action does, and implementation is the key to achievement of this goal. Antelopes are an integral component of most of the region's ecosystems and they feature widely in art and literature throughout the region. The country reports in Section 2 made recommendations for action and the most highly threatened antelope species in the region were identified in Chapter 40; action to conserve these taxa is summarised below. However, the goal of antelope conservation cannot be achieved in isolation and action taken must be part of an overall strategy to conserve biological diversity, which itself is fully integrated with human development needs. This overall strategy will be primarily focused on the conservation of ecosystems, that contain a full range of interacting organisms and dynamic ecological processes.

The involvement of local people in conservation programmes is crucial to their success. Their participation at the planning stage reduces potential conflicts between the needs of the local population and wildlife and enables traditional ways of managing natural resources to be included in management plans. At a practical level, material benefits of wildlife conservation programmes must be channelled back to local communities wherever possible. It is particularly important that if traditional access to a natural resource is restricted, then adequate compensation must be paid or an alternative provided.

Photo 41.1 Tibetan antelope poacher's camp. George Schaller.

The major direct threats facing antelopes are hunting, habitat destruction, and population fragmentation. Underlying all of these is the issue of funding: action cannot be implemented without adequate human and financial resources. The need to consider the economic value of natural resources when drawing up development programmes has been discussed by McNeely (1988), Pearce and Moran (1994), and others, while Costanza *et al.* (1997) attempted to make a financial estimate of the replacement value of the world's ecosystems. Unfortunately, these ideas have yet to be acted on by governments and under-funding remains a fundamental problem facing the conservation of all biodiversity, not only antelopes. It is, therefore, essential that IUCN should work with other conservation organisations to persuade ministers and officials responsible for policy formulation to commit the financial and human resources necessary to achieve national conservation objectives. There seems little doubt that an international contribution to the costs of programmes to conserve antelopes in many countries will be essential to ensure their effectiveness.

41.2 Hunting

Overhunting has been primarily or wholly responsible for the extinction of several species of antelopes in the region and the depletion of most others. Illegal or uncontrolled hunting was cited as a factor in antelope population declines in every country report in Section 2. In fact, the effects of over-hunting on antelopes have been so great that the immediate imposition of stringent controls on poaching and close regulation of legal hunting would have an immediate and positive impact on antelopes throughout the region. These two measures would be sufficient on their own to stabilise, and ultimately reverse, many local declines in regional antelope populations.

Legislation to protect antelopes exists in most, though not all, of the region's range states, but laws are often inadequate or incomplete. A major factor in some countries is a lack of political will to enforce existing laws, though the difficulty in policing the sparsely inhabited and often remote terrain covering much of the region should not be underestimated. Although a few countries have had some

success in controlling poaching, it remains a serious and widespread threat. There is an immediate need to undertake three interlinked measures: full enforcement of existing laws, a review of current legislation, and subsequent enactment of new or stronger laws where necessary. It is vital that the legal framework is supported by effective protection in the field in the form of properly equipped rangers who have the resources to make frequent vehicle patrols, and training for law enforcement agencies.

Antelopes can provide a valuable renewable resource, and responsibly managed sustainable hunting schemes in appropriate circumstances could provide food for local people and even generate cash and support for antelope conservation. The potential earnings from the sale of trophy hunting licenses to foreign hunters could also be considered as a source of revenue where appropriate.

41.3 International trade

Three of the region's antelope species are hunted on a commercial scale: Mongolian gazelle (*Procapra gutturosa*), Tibetan antelope (*Pantholops hodgsonii*), and saiga (*Saiga tatarica*). Exploitation of all three species has intensified during the last 10-15 years with severe detrimental effects in particular on Tibetan antelope and the saiga population in Russia.

Mongolian gazelles are harvested in large numbers, mainly for their meat, but numbers in Mongolia remain high and the species is not threatened at present, though stricter control of poaching is needed to maintain the long–term viability of the resource. The products of Tibetan antelope and saiga are traded internationally and their high value encourages poaching. The horns of male saiga are a valued item in traditional Chinese and Korean medicine and uncontrolled hunting had brought the species close to extinction by the early years of this century. Protection measures allowed the population to recover to a level that supported a substantial legal harvest for several decades. The huge increase in illegal hunting since 1989 has caused a dramatic fall in numbers. As a result, the commercial harvest in Russia has been suspended and this ban on hunting should be maintained until the Russian saiga population has recovered. The core population in Kazakhstan remained sufficiently numerous to allow a reduced harvest to continue until more recently, but numbers there have decreased enormously. Mongolian saiga (*S. t. mongolica*), a distinctive, endangered subspecies endemic to a small area of western Mongolia, needs complete protection and must be excluded from any kind of harvest. CITES carried out a Significant Trade Review of saiga in 1999 and is considering appropriate action.

Tibetan antelopes are shot and trapped illegally on the Tibetan Plateau for their underfur, which provides an extremely fine quality fibre known as *shahtoosh*. This is smuggled into India, directly or via Nepal, and transported to Srinagar in the Kashmir Valley and to Japan, where it is woven into shawls which are later sold as luxury items in Asia and the West. A sharp increase in the rate of poaching over the last 10-20 years has caused a large decline in numbers and local extinctions. If unchecked, commercial poaching on this scale has the potential to systematically exterminate the species. Tibetan antelope has been listed on Appendix I of CITES since 1975 and is now classified as Endangered. In China, Tibetan antelope is a Category I protected species which prohibits hunting and trade. Penalties for offenders are high: up to 13 years in jail and confiscation of vehicles used for poaching. In India, except for the State of Jammu and Kashmir, Tibetan antelope is listed on Schedule I of the Wildlife (Protection) Act, which bans hunting and trade. In Jammu and Kashmir, it is on Schedule II, which bans hunting but allows trade. The main processing centre for *shahtoosh* is Srinagar in Kashmir, so this exception is significant. However, in June 2000, the State Parliament recommended that the trade should be prohibited. Ratification and enforcement of this decision would represent a significant step in the protection of Tibetan antelopes. A report by Wright and Kumar (1997) revealed that poaching of Tibetan antelopes is much more extensive than previously realised, that *shahtoosh* is bartered for tiger bones and other illegal wildlife products, and that this barter trade is so closely linked that it will be difficult to eradicate one without the other. An international effort is needed to tackle this complex problem involving all relevant national authorities, IUCN, TRAFFIC, WWF, and other NGOs. A recent updated summary of the trade has been published by TRAFFIC (Anon. 1999). Increased awareness of the Tibetan antelope's plight has led to successful prosecutions in China, India, the USA, Europe, and Hong Kong during the last two to three years. An international workshop on the Conservation of and Control of Trade in Tibetan antelope was held at Xining, China in October 1999, resulting in the Xining Declaration and a series of resolutions for action.

41.4 General options for antelope conservation

41.4.1 National government action

Individual countries have a decisive role in the conservation of biological diversity because laws, administrative structures, and budgets all operate primarily at the national level and because implementation of international agreements most often depends on measures taken nationally by signatory countries. Action by national governments needed to conserve antelopes comprises: (1) protective legislation; (2) a national conservation strategy or biodiversity action plan; (3) an administrative infrastructure to manage wildlife and natural resources effectively; and (4) a comprehensive protected areas system. All of these must be backed by adequate financial and human resources. The country reports made clear where deficiencies in these areas exist and

action to rectify them should be urgent national priorities for all the countries concerned. Legislation to protect antelopes should consist of a complete ban on hunting threatened taxa and full controls on legal hunting. These controls include licensing of weapons, closed seasons, fixed quotas, and deterrent penalties for offenders.

Governments need a centralised department or agency responsible for wildlife conservation and management of protected areas that is directly responsible to an appropriate minister. These departments or agencies should have their role clearly defined in relation to other departments concerned with the environment and natural resources, such as agriculture, forestry, and water. IUCN should assist governments, wherever necessary, to develop appropriate administrative structures and to formulate national conservation strategies or biodiversity action plans. These plans need clear objectives and attainable targets in order to be effective. It is also vital that biodiversity action plans are fully integrated at the policy-making level with overall plans for economic development in order to minimise conflicts between conservation and economic development.

41.4.2 Regional co-operation

Although national action has a primary role, intergovernmental co-operation is equally important where ecosystems containing antelope populations cross international borders. Initiatives can operate bilaterally or regionally and may involve formal agreements or practical co-operation between agencies, NGOs, or research institutions. Current examples within the region range from a broad programme to restore six species of antelopes to the Sahara and Sahel, drawn up by the Convention on the Conservation of Migratory Species of Wild Animals (CMS), and a protocol by China and Mongolia covering the protection of Mongolian gazelles that migrate across their common border. In addition, Saudi Arabia's National Commission for Wildlife Conservation and Development has issued draft proposals on trans-border ungulate conservation in the Arabian Peninsula (Ostrowski *et al.* 1998). Other localities where trans-border co-operation would benefit existing antelope populations include the Ustyurt Plateau between Kazakhstan, Uzbekistan, and Turkmenistan (for goitered gazelle *G. subgutturosa* and saiga *S. tatarica*); the Great Eastern Erg between Tunisia and Algeria (for slender-horned gazelle *G. leptoceros*); and the mountains along the Lao-Vietnam border (for saola *Pseudoryx nghetinhensis*). Many other possibilities for trans-border co-operation exist within the region, although disputed borders and other political factors may hinder co-operation in certain cases.

41.4.3 Protected areas

Protected areas are essential to conserve representative samples of the full range of ecosystems that include, or recently included, antelopes. Chapter 40 reviewed protected area coverage for antelopes in the region and completion of the regional protected area system for antelopes is a very high priority. The country reports in Section 2 contain recommendations for new protected areas and for extensions to existing reserves. Implementation of these recommendations, with the highest importance given to the priority taxa listed in Table 40.3, would achieve this aim and ensure the protection of a representative sample of ecosystems and the geographical range of each antelope species. Strict nature reserves will be necessary to protect some areas of outstanding international importance for the conservation of antelopes, but creation of large (>20,000km^2) reserves of this type, in which all economic use is prohibited, is unrealistic in many countries in the region. In such cases, other categories of protected area that allow a greater degree of resource use are needed. Protected areas of all types should be components of a comprehensive protected area system that has been evaluated at the ecosystem level, and preferably also correlated regionally (e.g., Green *et al.* 1991).

To be effective, protected areas need clear objectives, and professional management and rigorous protection on the ground in order to attain them. These factors should be improved or strengthened in the region's protected areas wherever necessary. The importance of large size for protected areas was emphasised in Chapter 40. Where it is impossible to establish protected areas of a size deemed sufficient to protect viable populations, efforts should be made to designate clusters of smaller areas linked by corridors or buffers to allow genetic interchange between subpopulations. Particular care is needed in designing protected areas for species that occur at low densities in dispersed populations, and for migratory species that exhibit wide variations in their seasonal ranges.

41.4.4 Antelopes outside protected areas

The task of safeguarding the substantial populations of antelopes that occur outside protected areas will become more difficult as the human population continues to grow, along with demand for land for agriculture and economic development. In this situation, compromises between the needs of wildlife and human resource use are inevitable, so it is even more essential to gain the support of local people by engaging them in the planning and execution of conservation schemes for antelopes. In addition to the use of buffers around reserves, zoning, and multiple land-use strategies, fragmentation can be reduced by clustering development into small areas and minimising road building. This again underlines the importance of carrying out conservation efforts at the ecosystem or landscape level. At a local level, techniques such as the use of community game guards and concentrated protection for antelopes at rutting and calving times are already practised in parts of the region. Flexible and innovative antelope management programmes may

have to be devised to manage specific situations and, in some circumstances, the physical transfer of antelopes from one area to another may be necessary. Several country reports provide examples of antelopes coexisting with high levels of livestock grazing and other forms of economic activity, if they are not directly persecuted and if their habitat has not been completely destroyed. The ability to adapt to modified environments shown by some species of antelopes also provides some cause for optimism.

41.4.5 Reintroduction and translocation

Extinctions at local and regional levels have left many parts of the region with impoverished antelope communities. Many of these are unlikely to be restored through natural recolonisation because potential source populations either no longer exist or are themselves seriously depleted. In these circumstances, reintroduction of captive-bred stock or translocation of wild antelopes represents the only practical way of re-establishing free-ranging populations. This is obviously the case with species that have become Extinct in the Wild. Releases or transfers from source populations may be appropriate in other circumstances, such as augmenting small remnant populations, especially where these have been isolated by human-made barriers, or aiding recolonisation of former habitats, provided the potential effects of outbreeding depression are identified and managed.

There are many financial and practical constraints on reintroductions. Initial success can be achieved by intensive protection of relatively small protected areas and release sites. A far greater challenge is posed during the subsequent phase of reintroduction projects as animals disperse and need protection as they attempt to establish wider-ranging populations. It is usually preferable to concentrate efforts on *in situ* measures to conserve existing wild populations. The use of studbooks and the existence of co-operative programmes between zoos maximise genetic variation among captive antelope populations, and the development of molecular genetic techniques has made it possible to determine the taxonomic status of individual animals for release. Many collections, especially in the Middle East, could preserve a valuable source of local genetic material, but it is essential to screen the animals in them. Gazelles have long been traded across the Arabian Sea, especially chinkara from India and Pakistan to the Gulf states. As a consequence, many collections may well have been mixed for so long as to render the animals in them of little value for release into the wild.

Several successful reintroduction projects have taken place within the region, the most prominent being the restoration of Arabian oryx populations in three countries in the Middle East. Mountain gazelles and Arabian sand gazelles have also been reintroduced into protected areas in Saudi Arabia. Smaller-scale introductions and transfers of gazelles in countries of the fomer USSR and onto many islands in the Gulf further demonstrate the feasibility of such projects. However, success should not be taken for granted as the recent setback to the Arabian oryx reintroduction in Oman demonstrates. Some projects have failed completely; for example, attempted reintroductions of goitered gazelle in Georgia, Cuvier's gazelle in Morocco, and blackbuck in Nepal and Pakistan, demonstrating the need for careful pre-release planning and long-term protection.

A successful translocation took place in 1988-90 with the transfer of wild-caught Mongolian gazelles from their core area in eastern Mongolia to augment an isolated population in the west of the country; this population has since expanded in number and is now thriving. An example of an inappropriate translocation occurred in 1985-89 when 54 Mongolian saiga were transferred to an area formerly inhabited by the nominate subspecies (Lushchekina *et al.* 1999).

Some unofficial introductions within the region have also been of dubious conservation value, as they are poorly documented and use non-local stock. Releases of this kind confuse the status of wild antelopes and have the potential to dilute indigenous gene pools. It is obviously important to use the most appropriate stock nearest genetically to the extinct taxon and where a taxon is extinct, the nearest available form should be considered. Unauthorised introductions of antelopes should be strongly discouraged and releases of non-indigenous taxa banned completely. The recommendations on captive-breeding of antelopes made in Chapter 40 should be followed and the *IUCN Policy Statement on Captive-Breeding* should also be consulted. Caution should be exercised before attempting captive-breeding of threatened taxa that have proved difficult to maintain in captivity, such as Mongolian saiga (*Saiga tatarica mongolica*) and saola (*Pseudoryx nghetinhensis*). All reintroductions or releases should follow IUCN's *Reintroduction Guidelines* (IUCN/SSC/RSG 1995) and the *IUCN Position Statement on Translocation of Living Organisms* (available on the IUCN website (http://www.iucn.org/themes/ssc/pubs/policy/htm).

41.4.6 Surveys of antelopes and research

A clear first priority is to carry out field surveys to determine the distribution, numbers, and status of antelope species in the region where these are currently unknown in order to provide the fundamental basis for management planning. Secondly, research is needed on the ecology of most species, including habitat use, diet, reproduction, and dispersal. Thirdly, given the importance of public involvement in antelope conservation programmes and the need for integrated rural development, sociological research on public attitudes to wildlife and the environment should be seen as equally valuable (Eltringham 1984). To be most effective, all available information should be incorporated into an antelope data bank linked to SSC's Species Information System. It is particularly important that relevant information and analyses are made available to conservationists and

wildlife managers in range states. Training in survey, census, and monitoring techniques should also be provided for rangers and protected area managers where necessary.

41.4.7 Education and awareness

The Convention on Biodiversity envisaged that education programmes would be an integral part of biodiversity action planning. Education is a key element in gaining wider public acceptance of the need for improved status of antelopes and an appreciation of wildlife conservation objectives. Conservation and future expansion of antelope populations will increasingly depend on an accommodation between the needs of wildlife and local people. Therefore, education programmes will be required to inform people of the need for sustainable use of natural resources and to explain the rationale for practical measures, such as restrictions on hunting. Antelopes feature widely in art and literature throughout the region, so education programmes should seek to exploit their aesthetic and cultural appeal. These programmes should be integrated into the formal education system and also include wider publicity and awareness campaigns. It is equally important to aim campaigns at government officials and ministers to persuade them to take into account the needs of antelopes in planning and development issues, and to allocate the human and financial resources necessary for conservation. It is also necessary to lobby against government policies that have negative effects on antelopes or that damage the environment; for example, water improvements having short-term benefits at the expense of long-term desertification, and agricultural subsidies or land development grants that degrade and ultimately destroy natural habitats.

41.4.8 Tourism

Wildlife tourism in the region is much less developed than in eastern and southern Africa, mainly because of the relative lack of numbers and variety of large mammal species. Nonetheless, a number of countries run successful programmes and where the opportunities for ecotourism exist, they should be explored as a source of revenue for protected area authorities, and for local people through provision of goods and services, such as accommodation, transport, and guides.

41.4.9 Role of the Antelope Specialist Group

In its role as a scientific advisory group, the Antelope Specialist Group (ASG) should continue to monitor the status of antelopes, highlight problems of antelope conservation, recommend practical solutions, and monitor the success of attempts to integrate wildlife conservation with rural development. Another important task is to promote implementation of the Antelope Action Plan and liaise with other IUCN specialist groups and local NGOs, especially IUCN members, in integrating the recommendations of all IUCN Action Plans relevant to the regions covered here. ASG should also actively seek more members among nationals of countries where antelopes occur, and who are actively involved in research on antelopes and the management of natural resources.

41.5 Key antelope species and subspecies

41.5.1 Przewalski's Gazelle (*Procapra przewalskii*)

This is the most highly threatened antelope species in the region and, if current trends continue, its complete extinction is likely within a few years. Numbers (currently <150) are still declining and separated into three subpopulations with little or no contact between them. One of these is already on the verge of extinction. The main problem is agricultural encroachment and, in particular, the fencing-off of pastures, which prevents access to feeding grounds. High priority must be given to the establishment of a protected area for the largest surviving population in the Hudong-Ketu area, with a habitat corridor to the Yuanzhe population. This should include management of livestock grazing, with compensation for livestock owners. Although poaching may not currently be a serious problem, complete protection should be provided, given the small numbers of gazelles remaining. The proposal in the China country report to investigate the threat of wolf predation by scat analysis and, if necessary, to control wolf density in Hudong-Ketu should be investigated.

A systematic survey of the former distribution in Gansu and in the Ordos region of Inner Mongolia should be carried out to identify whether any remnant populations exist. At the same time, suitable sites for translocation in areas of former range should be identified and serious consideration given to the transfer of animals to establish a new population. Establishment of a captive-breeding population is another measure that deserves careful consideration. Finally, molecular genetic analysis should be carried out to determine its precise relationship to Tibetan gazelle (*P. picticaudata*).

41.5.2 Saola (*Pseudoryx nghetinhensis*)

Accurate population figures are not available, but speculative estimates are 70-700 in Laos and a few hundred in Vietnam, giving a global maximum of <1500 and, perhaps, far fewer. These occur in small, isolated pockets of suitable habitat in a fragmented landscape. In both Laos and Vietnam, considerable effort has been expended on ecosystem and biodiversity conservation in the mountains along their common border, and much of this will benefit saola either directly or indirectly. Saola seems to be a conservative species with specific habitat requirements that

render its situation more precarious as logging and road building threaten to isolate subpopulations completely. It is important to maintain corridors between subpopulations, wherever possible, through appropriate forest management, and to prevent new roads and other development from encroaching on established protected areas and key habitats. The impact of illegal hunting has not been eradicated, so anti-poaching patrols in all areas of known habitat should be intensified and deterrent penalties for illegal killing, capture, and possession of horns imposed. Existing publicity and awareness campaigns on the saola should be continued and extended. The few animals that have been captured by hunters did not survive long in captivity, so the risk inherent in establishing a captive population must be calculated carefully. Protected areas for saola could be enhanced by (a) increasing funding for management of existing protected areas; (b) implementing the proposed extension of Nakai-NamTheun National Biodiversity Conservation Area and establishing a management area for saola in the Nam Gnouang Catchment in Laos; and (c) establishing the proposed Bu Hong Reserve in Vietnam. Bilateral co-operation between Laos and Vietnam on management of cross-border populations should be a high priority. Further measures comprise surveys of all remaining areas of potential habitat and field research into the ecology of the species. Detailed proposals in the saola Action Plan for Laos should be followed.

41.5.3 Arabian Oryx (*Oryx leucoryx*)

The size and professional management of the captive population, which is spread between many centres, guarantees the future survival of the species, at least in captivity. There are, at present, four reintroduced populations; two in Saudi Arabia and one each in Israel and Oman. After initial success, the Oman population has declined due to illegal live capture and the project has effectively had to be restarted. The Saudi populations are increasing and plans to extend the reintroduction programme are underway. Reintroductions have been proposed into protected areas in Jordan and into a fenced reserve in southern Qatar; these should be implemented as soon as satisfactory levels of management and protection are provided. Reintroduction programmes for the United Arab Emirates, Syria, Iraq, and Kuwait are at preliminary or planning stages and these should be expedited as soon as possible. The two huge non-hunting areas in Saudi Arabia are of obvious potential importance, but the best hope for wider establishment of a free-ranging population in the Arabian Peninsula may lie in a properly managed trophy hunting programme. Whether such a programme could be policed adequately depends on the political will in individual countries. Education programmes to change people's attitudes and persuade them of the need to preserve oryx should be developed alongside the imposition of stringent protection from poaching.

41.5.4 Cuvier's Gazelle (*Gazella cuvieri*)

Surviving populations are scattered in pockets across the mountains of northwest Africa. In Tunisia, wild populations are increasing and expanding. Djebel Chambi National Park is of outstanding importance because it holds the largest population of this species in Tunisia and is the key to recolonisation of the Dorsale Range. It also lies adjacent to the easternmost population in Algeria, in the Nementch Massif. All measures to promote the continued recovery of the Tunisian population should be followed by ensuring strict protection in all reserves of the Dorsale Range, by intensifying protection measures in areas of former habitat, and by releasing captive-bred animals into Boukornine National Park. In Morocco and Algeria, stringent protection from hunting should be enforced for all known populations. The following new protected areas for the species have been proposed in northern Western Sahara, from the lower Drâa Valley to the Aydar; in Morocco (i) near Anezi, (ii) in the Aït Erkha-Tazeroualt region; and (iii) an extension of the temporary Tafingoult Reserve and upgrading to permanent status; and in Algeria, between El Abiod Cheikh and Taghit. Establishing these would safeguard the most important populations in these countries and help to reduce their isolation. Reintroduction of captive animals is planned for Belezma (where there is an existing population of unknown number) and Teniet el Had National Parks in Algeria, and for a fenced reserve adjacent to Toubkal National Park in Morocco.

41.5.5 Tibetan Antelope or Chiru (*Pantholops hodgsonii*)

Numbers are still relatively high (<75,000), but are declining steeply due to organised poaching. Action needs to be taken under three broad headings: (1) protecting the wild population, (2) preventing smuggling of raw material, and (3) eliminating demand for the finished product in consumer countries.

41.5.5.1 Protecting the wild population.
Provide rigorous protection from poaching, especially in Qiantang, Arjin Shan, and Kokoxili Nature Reserves by establishing teams of wardens equipped to make vehicle or animal-borne patrols. Ensure additional protection from poaching at rutting and calving periods throughout the range. Ensure that all offenders are prosecuted. Review the level of patrolling regularly and increase as required. Provide adequate human and financial resources for effective management of Qiantang, Arjin Shan, and Kokoxili Nature Reserves. Monitor the price of *shahtoosh* and match significant increases by raised penalties, so that they exceed the profits of illegal trade.

41.5.5.2 Preventing smuggling.
Increase patrols and take other action to restrict transport of the raw fibre from its source to Lhasa and other provincial centres. Take additional action along smuggling routes into India and Nepal, concentrating on known border crossings and key points, such as Delhi, Leh (in Ladakh), and Kathmandu. Maximise co-operation between national authorities, customs, and law enforcement agencies of China, India, and Nepal, together with TRAFFIC, the Wildlife Protection Society of India, and other NGOs concerned with the illegal trade in wildlife. Continue to urge the Jammu and Kashmir State Government to extend full protection to Tibetan antelope. Destroy confiscated *shahtoosh* to prevent it reaching the market, instead of allowing it to be resold.

41.5.5.3 Reducing demand for the finished product
Increase police and customs action in all signatory countries to CITES, and train customs and law enforcement officers to recognise contraband items. Initiate high-profile campaigns in the West, Hong Kong, and Japan to publicise the origin from an endangered species. Take similar action at tourist outlets in Delhi and Kathmandu. Carry out research into reliable diagnostic tests for *shahtoosh,* so that suspect items can be rapidly identified. Promote use of substitute fibres, such as high-quality pashmina and shahmina, to replace *shahtoosh*.

41.5.6 Khting Vohr (*Pseudonovibos spiralis*)

Research to establish the taxonomic relations, identity, and current status of this species, presuming any survive, is a priority. No recent records have come from Vietnam and the focus of current efforts is in Cambodia, where systematic field surveys of large mammals are being conducted.

41.5.7 Saiga (*Saiga tatarica*)

The nominate subspecies has experienced a decline of 75-85% in the last few years which must be checked if the species is to survive. Rigorous protection from poachers is needed all year round in Russia and Kazakhstan and in winter in Uzbekistan to conserve the remaining populations. Saiga have high fecundity and have shown once during the 20th century that they have the capacity to increase very rapidly in number once they are protected from hunting, but drastic action is needed immediately. Crossings for migrating animals could be constructed over rivers, irrigation canals, pipelines, railways, and roads and protection is needed where migration routes cross the Chu, Zhilanshik, Turgai, and Ul'koiak Rivers. Seasonal nature sanctuaries (*zakazniks*) would benefit these antelopes on their rutting and calving grounds, and an agreement between Uzbekistan, Turkmenistan, and Kazakhstan would facilitate trans-border conservation measures on the Ustyurt Plateau.

41.5.8 Arava Gazelle (*Gazella gazella acaciae*)

This subspecies has been reduced to a tiny remnant. The best hope for its survival appears to lie in a captive-breeding programme in Hai-Bar Reserve, coupled with research into the reasons for its decline. Animals can then be reintroduced into the wild when conditions are appropriate.

41.5.9 Mongolian Saiga (*Saiga tatarica mongolica*)

The surviving population occurs in and around Sharga and Mankhan Nature Reserves. These reserves exist largely on paper and the first priority is to provide vehicle-equipped protection teams to defend saiga against the depredations of poachers. Secondly, a comprehensive management plan for the Sharga Reserve, where most (>90%) of the surviving population is found, should be drawn up with the involvement of local herdsmen. Reductions in grazing levels should be negotiated, where necessary, and compensated adequately. Restrictions on off-road driving need to be agreed with the local authorities to prevent establishment of new tracks and to reduce disturbance. The population should be monitored on an annual basis. Given the concentration of numbers in Sharga, identification of a suitable site for translocation within the former range in the Great Lakes Basin, such as the Huisiin Gobi, would be advantageous.

41.5.10 Slender-horned Gazelle (*Gazella leptoceros*)

No population estimates are available for any of the four countries in the region where it occurs, so assessing the status of any surviving populations is a priority. This should be carried out by means of land and air surveys of suitable habitat, concentrating on the Eastern Great Erg, Western Great Erg, and Erg Iguidi of Algeria; Zellaf National Park and sand seas of Libya; and the Western Desert of Egypt. Existing populations in Djebil National Park, Tunisia, and the area west of Siwa in Egypt need immediate protection by teams of wardens. Controls on hunting across its range in Algeria, Tunisia, Libya, and Egypt should be intensified. Areas where slender-horned gazelles may still survive, and which should be considered for protection, include the Grand Erg Oriental, the acacia-steppe south of Tindouf, and parts of the Erg Iguidi in Algeria; portions of the Western Desert in Egypt; and areas of eastern, southeastern, and southwestern Libya. Trans-border management of populations in the Eastern Great Erg (Algeria-Tunisia) and Siwa area of the Western Desert (Egypt-Libya) should be encouraged.

41.5.11 Scimitar-horned Oryx (*Oryx dammah*)

Plans to release captive-bred animals into Sidi Toui and Djebil National Parks in Tunisia are underway and early completion of this project is desirable. Long-term planning for protection of animals dispersing away from the reintroduction site will ultimately be needed.

41.5.12 Addax (*Addax nasomaculatus*)

Presence in the region is sporadic and limited to occasional seasonal vagrants to the Hoggar region of Algeria. As addax numbers south of the Sahara continue to dwindle, such occurrences are likely to become even more infrequent. Reintroduction of captive-bred animals seems, at present, to be the only way a population can be re-established in the region. Reintroduction has been proposed in Tunisia, where Djebil National Park provides a large area of suitable habitat.

41.5.13 Dama Gazelle (G*azella dama*)

The regional population (*c.*150) represents only a small proportion of the global population and consists of two small remnants, one in the far south of Algeria, in Hoggar National Park and the other in the Adrar Souttouf, Western Sahara. Establishment of a protected area in the Adrar Souttouf as recommended in the country report would be a valuable step in preserving its presence within the region. Both populations need protection from hunting. Release of captive-bred animals to augment the remnant population in Hoggar National Park should be considered. The proposed release of captive-bred animals into protected areas in Tunisia should also be implemented.

41.6 Regional action

41.6.1 Morocco and Western Sahara

Revise wildlife legislation and concentrate administration of wildlife conservation and protected area management in a single authority. Tighten controls on legal hunting and institute regular patrolling of areas inhabited by threatened species (Cuvier's gazelle *Gazella cuvieri* and dama gazelle *G. dama*). Set up a protected area or management programme for dorcas gazelle *G. dorcas* in Jbel Grouz and Jbel Maiz (near Figuig). Upgrade the management and status of existing protected areas to include complete bans on hunting, restrictions on livestock grazing, and patrols by wardens. Involve local people in management planning and negotiate acceptable levels of resource use. Evaluate the feasibility of releasing captive-bred animals to augment declining natural populations, as well as those that have been reintroduced, once conditions are satisfactory.

41.6.2 Algeria

Maintain current stringent controls on hunting. Extend the current protected area system to cover the following important areas for antelopes: the western part of the Hauts Plateaux (for dorcas gazelle) and other areas listed under key species above (Cuvier's gazelle, slender-horned gazelle, and dama gazelle). Assess current distribution and status of slender-horned gazelle by land and aerial surveys in areas of suitable habitat, especially the Eastern Great Erg, Western Great Erg, and Erg Iguidi. Promote trans-border co-operation for this species between Algeria and Tunisia in the Eastern Great Erg.

41.6.3 Tunisia

Maintain stringent controls on hunting. Expedite increased protection and management of Djebil and Sidi Toui National Parks in preparation for release of captive-bred antelopes and implement proposed reintroductions of scimitar-horned oryx. Maintain the captive-breeding programme and implement planned reintroduction of dama gazelle. Provide all necessary financial and administrative support for the proposed reintroduction of addax. Protect the existing population of slender-horned gazelle in Djebil National Park with a team of wardens. Promote trans-border co-operation between Algeria and Tunisia in the Eastern Great Erg.

41.6.4 Libya

Provide institutional support to the Wildlife Technical Committee and other agencies responsible for wildlife conservation at both the governmental and non-governmental level. Maintain strict regulation of hunting and enforce the ban on illegal hunting. Implement planned expansion of the protected area system into the centre and south of the country. Encourage co-operative management of the slender-horned gazelle population in the Siwa area of the Western Desert, between Libya and Egypt. Assess current distribution and status of slender-horned gazelle by land and aerial surveys, with priority given to Zellaf National Park and all sand dune areas. Carry out a national survey of dorcas gazelle to determine its current status.

41.6.5 Egypt

Support efforts by the Egyptian Environmental Affairs Agency to enforce hunting laws and prevent commercial exploitation of antelopes. Enhance protection of existing gazelle populations with increased patrols by teams of rangers. Maintain pressure on the government to ban organised, foreign hunting parties. Increase levels of protection within existing protected areas and ensure they are

effectively managed. Establish new protected areas; priorities are the area west of Siwa for slender-horned gazelle and the northern part of the Qattara Depression for dorcas gazelle. Assess the feasibility of reintroducing mountain gazelle into protected areas in Sinai. Enhance remnant populations of other species by releases of captive-bred animals once adequate protection can be guaranteed. Encourage trans-border co-operation between Libya and Egypt in the Siwa area of the Western Desert.

41.6.6 Saudi Arabia

Maintain the current conservation efforts in NCWCD protected areas and continue the existing programme of releases and reintroductions of Arabian oryx, mountain gazelle, and Arabian sand gazelle. Devise flexible management programmes for antelopes occurring outside the protected area system. Intensify patrols in the Northern and Rub al–Khali Non-Hunting Areas. Enforce the ban on illegal hunting. Establish the taxonomic status of Saudi gazelle through molecular genetic analyses, and subsequently identify animals in captivity for release into the wild.

41.6.7 Yemen

As an immediate priority, develop the necessary administrative structures for wildlife conservation and protected area management, and enact appropriate legislation. Carry out a full national survey to establish the current status of antelopes. Provide immediate protection for any surviving antelope populations and draw up management plans for their long-term conservation. Establish protected areas for antelopes in parts of the Tihamah Plain on the Red Sea coast, the Western Highlands, margins of the Rub al-Khali, and the northeastern desert.

41.6.8 Oman

Implement the proposed As Saleel and Jebel Samhan National Parks. Continue captive-breeding of Arabian oryx at Jaaluni, monitor the remaining wild population, and intensify anti-poaching efforts on the Jiddat al-Harasis. Renew releases into the Arabian Oryx Sanctuary once the problem of illegal capture has been fully addressed. Continue wardening of all key areas for gazelles.

41.6.9 United Arab Emirates

Enact federal legislation covering establishment of protected areas and implement recommendations for protected areas. Important localities for antelopes are the desert south of Liwa, Jebel Ali sands, and the northern mountains. Carry out a national survey of antelopes to assess their current status in the country. Maintain controls on illegal hunting. Analyse the genetics of captive antelope populations to establish their taxonomic status and value for reintroduction and prohibit releases of non-indigenous species. Formulate a programme for reintroduction of Arabian oryx, identify suitable sites for releases, and provide the necessary protection and management.

41.6.10 Bahrain

Establish the proposed protected area in the south of the main island of Bahrain. Reinforce recent legislation with effective protection from hunting. Determine the taxonomic status of captive antelopes to establish their value for reintroduction. Manage captive herds on a scientific basis to maximise their value for reintroductions.

41.6.11 Qatar

Maintain current captive-breeding programmes for oryx and gazelles and manage these herds scientifically. Determine the taxonomic status of captive animals to establish their value for reintroduction. Maintain the managed population of Arabian oryx and proceed with the proposed release into a fenced reserve in the south of the country.

41.6.12 Kuwait

Develop the proposed system of protected areas and ensure that these are fenced to eliminate livestock grazing, and protected by wardens to control poaching. Draw up a reintroduction programme for Arabian oryx and Arabian sand gazelle in Jal Az-Zor National Park and other protected areas, and implement this when levels of protection and management are satisfactory.

41.6.13 Iraq

Develop the necessary administrative infrastructure for wildlife conservation and protected area management and provide appropriate legislation. Establish a national system of protected areas; important localities for antelopes are the areas around Rutba, Mahzam, and Thartar Lake. Conduct a national survey to assess current status of antelopes. Establish the taxonomic status of captive populations of goitered gazelle populations in the country (i.e., *G. s. subgutturosa*, *G. s. marica*, and intergrades) and keep animals of different origins separately in breeding centres. In the longer term, reintroduce Arabian oryx when a suitable site has been identified.

41.6.14 Syria

Review the protected area system and increase expenditure on it, implement proposed additions, and ensure that protection and management are effective. Carry out a national survey to determine the current status of antelopes. Develop the managed facility for Arabian oryx at At Talila Reserve. Develop reintroduction programmes for Arabian oryx and goitered gazelle, and possibly mountain gazelle, if protected areas of sufficient size can be established and effective management guaranteed.

41.6.15 Lebanon

Conduct field surveys in the south of the country to confirm the recent occurrence of mountain gazelle and take steps to protect the area. Establish a reserve within the former distribution of the species and reintroduce gazelles when protection and management are satisfactory.

41.6.16 Jordan

Increase protection by rangers in and around existing protected areas. Provide mobile protection teams for dorcas gazelle populations in Wadi Araba. Control hunting of mountain gazelles in the Jordan Valley. Implement proposals for new reserves at Burqu, Wadi Rajil, Bayer, Jabal Mas'udi, and Abu Rukbah. Continue to develop co-operative programmes with local people in and around protected areas. Implement RSCN's proposals for reintroductions of Arabian oryx and Arabian sand gazelle into suitable sites once satisfactory levels of management and protection can be assured. Control unofficial imports of gazelles from Iraq and elsewhere, especially those involving the nominate form of *G. subgutturosa* or intermediates between it and *G. s. marica*.

41.6.17 Israel

Continue the reintroduction programme for Arabian oryx. Continue and develop the management strategy for mountain gazelle to allow coexistence with agriculture, and take steps to overcome the effects of habitat and population fragmentation. Continue liaison with armed forces on conservation in military areas particularly for dorcas gazelle. Carry out captive-breeding of Arava gazelle in Hai-Bar Reserve, research reasons for their decline, and reintroduce into the wild when appropriate.

41.6.18 Turkey

Protect the surviving population of goitered gazelle on the southeastern border with a team of wardens, and augment it with animals from the captive-breeding centre at Ceylanpinar State Farm. Establish a protected area for gazelles in this area. Draw up a long-term plan to restore gazelles into suitable areas of former range.

41.6.19 Iran

Maintain strict protection in protected areas and strengthen controls on hunting outside protected areas. Investigate the taxonomic status of the population of goitered gazelle west of the Zagros Mountains, and that of mountain gazelle on Farur Island.

41.6.20 Afghanistan

Rebuild the administrative infrastructure responsible for wildlife conservation and the protected areas system. Carry out a national survey to assess the status of surviving antelope populations and formulate management plans accordingly.

41.6.21 Pakistan

Impose stringent controls on illegal hunting in protected areas by increasing the numbers of wardens and improving their equipment. Strengthen provincial wildlife departments to enable them to tackle the problems of poaching and overgrazing. Involve local people in co-operative management schemes in and around protected areas. Maintain pressure on the federal and provincial governments to ban organised hunting parties from abroad. Continue the captive-breeding programme for blackbuck and reintroduce the species to areas of former habitat. Consider releases of goitered gazelle into the Chagai Desert when a satisfactory level of protection can be assured.

41.6.22 Azerbaijan

Enforce the ban on hunting more strictly. Strengthen protection and management in Shirvan Nature Reserve to build up numbers of goitered gazelles in Shirvan/Bandovan reserves to carrying capacity. Establish a captive-breeding centre for goitered gazelle, using animals from Shirvan, to provide stock for reintroduction to areas of former range. and to replenish the dwindling population in Bozdag. Priorities for reintroduction are the areas around Mingechevir Reservoir in the north. This area is close to the Georgian border and could eventually become the source for recolonisation of the adjacent Shirak steppes in southeastern Georgia. Designate a new protected area in the Ajinour steppes. Investigate the taxonomic status of this isolated population through genetic research.

41.6.23 Georgia

Conduct captive-breeding of goitered gazelle, preferably using stock from Shirvan in Azerbaijan, and reintroduce the species to Vashlovani Nature Reserve when effective protection and management can be assured.

41.6.24 Kazakhstan

Strictly enforce control of illegal hunting of saiga and goitered gazelle. Increase funding for the hunting inspectorate and improve transport and other equipment so that it can operate effectively. Increase powers of the inspectorate to equal those of the police and increase the penalties for poaching. Continue the current moratorium on the official saiga harvest. When numbers have recovered regulate this strictly using annual quotas based on annual surveys and analyses of trends and population structure. Strengthen customs checks and ensure adequate certification for legally obtained saiga horn. Implement the detailed proposals for extensions to the protected area system for saiga and goitered gazelle and give temporary reserve status to saiga rutting and calving areas. Take practical measures along saiga migration routes (e.g., construction of bridges over canals, rivers, and railway lines) and create water points at crucial locations.

41.6.25 Uzbekistan

Implement strict protection from poaching for known populations of goitered gazelle and protect wintering saiga from exploitation. Establish current status of goitered gazelle through a full national survey. Designate new protected areas for this species in southern Ustyurt and the Sam and Magaikum sands. Maintain the captive-breeding programme at Bukhara Ecocentre and draw up a plan for restoration of the goitered gazelle population to suitable parts of its former range.

41.6.26 Kyrgyzstan

Survey areas of former distribution of goitered gazelle in the northeast and southeast to locate any surviving populations. Consider reintroduction of gazelles if habitat conditions remain suitable and if a satisfactory level of protection can be provided.

41.6.27 Tajikistan

Implement ranger patrols in areas with remaining populations of goitered gazelle, beginning in Tigerbulk Reserve. Expand the area of Karatau Wildlife Sanctuary and upgrade it to the status of nature reserve. Establish a captive-breeding centre in northern Tajikistan to provide stock for releases to reinforce remnant populations or to re-establish goitered gazelles in protected areas.

41.6.28 Turkmenistan

Strictly enforce current legal controls on hunting. Establish mobile protection teams in Badkhyz, Karabil, Kaplankyr, and northwest Turkmenistan, where the largest remaining populations of goitered gazelle currently occur. Kaplankyr and northwest Turkmenistan also provide seasonal protection for saiga in years when wintering animals reach the north of the country. Ensure the most effective management and protection of all protected areas, especially Badkhyz Nature Reserve, a key site for goitered gazelle in central Asia, and Kaplankyr Nature Reserve. Assist the natural expansion of goitered gazelle populations by providing artificial water points in desert areas, beginning in central Badkhyz. Continue captive-breeding programmes and augment natural recolonisation by releases of captive-bred animals. Plan a phased restoration of gazelles into as many suitable areas of former distribution as is practicable.

41.6.29 Russia

Maintain the ban on hunting saiga until the population has been restored to a stable condition. When this is achieved, manage the harvest on a strictly sustainable basis, with annual quotas calculated on the basis of detailed population monitoring. Establish a protected area in the Kalmyk steppes for the remaining saiga. Campaign to prevent desertification or other forms of habitat destruction. Research co-operative grazing schemes involving domestic livestock or use revenue from exports of saiga horn to compensate herdsmen whose stock are excluded from protected areas. In the longer term, establish a reserve for Mongolian gazelle in Transbaikalia and evaluate the possibility of reintroductions from Mongolia.

41.6.30 Mongolia

Intensify measures against illegal hunting of all species of antelopes. Carry out conservation measures for Mongolian saiga listed above. Evaluate the feasibility of reintroducing the nominate form of saiga into Sector B (Dzungarian Gobi) of the Great Gobi National Park. Monitor population trends of goitered gazelle, and review conservation measures accordingly.

Carry out a detailed aerial and ground census of Mongolian gazelle to confirm the current population size. Continue scientific management of the annual harvest, based on population/age structure, sex ratios, and trends. Enforce strict control of poaching, especially during the rut and calving. Ensure the harvest is allocated equitably between state industry and local needs. Confirm the proposed

extensions to Dornod-Mongol National Park to protect Mongolian gazelle calving areas and movement corridors. Gazette the proposed Kherlen-Menen reserve and establish further protected areas at key locations, such as the Matad area. Carry out a phased programme of translocations from the core population to suitable areas of former range in western and central Mongolia (natural recolonisation is prevented by the heavily fenced Ulaanbaatar-Beijing railway line). Ratify and implement the agreement with China on management of the trans-border population, and increase co-operation on the ground for management of migratory herds.

41.6.31 China

Carry out conservation measures for Przewalski's gazelle listed above. Carry out all measures to control the illegal trade in *shahtoosh* and to protect Tibetan antelope listed above. Provide rigorous protection from poaching for all species of antelopes. Provide adequate human and financial resources for effective management of all protected areas containing antelopes, especially Qiantang, Arjin Shan, Kokoxili, and Qomolangma Nature Reserves.

Increase protection of Mongolian gazelle populations by strictly enforcing hunting laws through increased patrols and prosecution of offenders. Ensure co-operation of state and provincial hunting inspectors and law enforcement officers to further reduce illegal hunting. Establish hunting on a sustainable basis through annual quotas based on detailed surveys and the involvement of provincial hunting authorities. Establish the two recommended reserves for Mongolian gazelle in Inner Mongolia at Xinbaragyouqi and Dongwuxi to protect the largest remaining populations. Formalise co-operation between Chinese and Mongolian authorities on conservation of the population that migrates across their common border.

Increase the frequency of anti-poaching patrols throughout the range of goitered gazelle, especially in Tsaidam, Tarim Basin, and western Inner Mongolia. Survey the isolated population in the Tarim Basin to establish its status and take protection measures accordingly. Monitor the population of Tibetan gazelle on a regular basis and review conservation measures accordingly. Pursue attempts at captive-breeding saiga, identify a site for future reintroduction, and draw up a plan for stringent protection.

41.6.32 India

Maintain efforts to control the illegal trade in *shahtoosh*. Implement the proposed Changtang and Rupshu Wildlife Sanctuaries in Ladakh to protect the remnant Indian populations of Tibetan antelope and Tibetan gazelle. Maintain or establish links, where possible, between fragmented populations of antelopes. Research the ecology of four-horned antelope, in particular its habitat requirements and feeding preferences, to assist management of protected areas. Carry out a full survey of chinkara to determine its current status. Carry out pilot projects on translocation of blackbuck to areas of former range, and evaluate the potential of a sport-hunting programme. Investigate means of preventing crop damage by nilgai, including control using non-violent methods.

41.6.33 Nepal

Greatly increase controls on the *shahtoosh* trade by increasing checks at border crossings and passes from Tibet, especially in western Nepal. Carry out additional inspections and checks in Kathmandu, ban the sale of finished products in tourist shops there, and publicise the illegal nature of the product. Strengthen enforcement of laws on poaching. Carry out a national survey of all antelopes to establish their current status. Involve local people in management of protected areas to gain their support. Ensure sympathetic management of protected areas for four-horned antelope. Continue attempts to reintroduce blackbuck into suitable sites.

41.6.34 Laos

Make saola a Category I protected species and impose deterrent penalties for illegal killing, capture, and possession of horns. Intensify anti-poaching patrols in areas of known habitat. Increase funding for protected area management. Formalise the proposed extension of Nakai-NamTheun National Biodiversity Conservation Area and establish a management area for saola in Nam Gnouang Catchment. Carry out other conservation measures for this species listed above.

41.6.35 Vietnam

Ensure stringent enforcement of the ban on hunting and live capture of saola, especially in Vu Quang Nature Reserve and other key areas. Implement the proposed protected area at Bu Hong. Carry out other conservation measures for this species listed in section 41.2.3. Continue research on the status of khting vohr (*Pseudonovibos spiralis*).

41.6.36 Cambodia

Continue field surveys to assess the current distribution and status of khting vohr and draw up a conservation plan accordingly.

References

Anonymous. 1999. *Trade in wild-caught animal specimens. A review of selected species.* Draft report to the CITES Animals Committee prepared by WCMC, IUCN/SSC Trade specialist Group and TRAFFIC International.

Costanza, R., d'Arge, R., de Groot, R., Farber. S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R.V., Paruelo, J., Raskin, R.G., Sutton, P., and van den belt, M. 1997. The value of the world's ecosystem services and natural capital. *Nature* 387:253-260.

Eltringham, S.K. 1984. *Wildlife resources and economic development.* Wiley, Chichester and New York.

Frankel, O.H. and Soulé, M.E. 1981. *Conservation and evolution.* Cambridge University Press, Cambridge.

Green, M.J.B., Drucker, G.R.F., and Day. S.I. 1991. Current status of protected areas and threatened mammal species in the Sahara-Gobian region. Pp. 5-69 *in:* McNeely, J.A. and Neronov, V.M. (Editors). *Mammals in the Palaearctic desert: Status and trends in the Sahara-Gobian region.* Russian Academy of Sciences and Russian Committee for the UNESCO Programme on Man and the Biosphere, Moscow.

Hughes, J.B., Daily, G.C., and Erhlich, P.R. 1997. Population diversity: Its extent and extinction. *Science* 278: 689-692.

IUCN/SSC/RSG. 1995. *Reintroduction guidelines. As approved by the 41st meeting of IUCN council.* IUCN, Gland, Switzerland and Cambridge UK.

Lushchekina, A.A., Dulamtseren, S., Amgalan, L., and Neronov, V.M. 1999. The status and prospects for conservation of the Mongolian saiga *Saiga tatarica mongolica. Oryx* 33:21-30.

McNeely, J.A. 1988. *Economics and biological diversity: Using economic incentives to conserve biological resources.* IUCN, Gland, Switzerland and Cambridge, UK.

Pearce, D. and Moran, D. 1994. *The economic value of biodiversity.* Earthscan Publications Ltd, London.

Soulé, M.E. (Ed.). 1986. *Viable populations for conservation.* Cambridge University Press, Cambridge.

Steiner, A. and Bayon, R. 1997. World conservation congress breaks the silence of Rio. *Species* 28: 26-29.

TRAFFIC. 1999. *Fashion statement spells death for Tibetan antelope.* TRAFFIC India and TRAFFIC East Asia.

APPENDICES

Appendix 1. Antelope Inventory Report Form

1. *Species/Subspecies/Population*
2. *Country*
3. *Date*
4. *Reporter*
   Name:
   Address:
5. *Distribution* (to save words include a distribution map)
6. *Population*
   Estimated numbers in the wild; if counts or samples have been made, summarise data
   Are numbers increasing, decreasing, or stable?
7. *Field Studies*
   Has the species/subspecies/population been studied in the country in question?
   If yes, by whom; please cite publications or reports under #13, References
8. *Habitat, food and Reproduction*
   (a) Brief description of habitat and food preferences.
   (b) Any data on average group size and dispersion pattern.
   (c) Movements – e.g., migratory/nomadic, wet season dispersion, dry season aggregation, or sedentary.
   (d) Reproduction – e.g., times of calving, mating (including peaks if any).
9. *Status*
   Is the status of the animal:
   (a) presently satisfactory?
   (b) threatened? If so, why? (e.g., habitat destruction, over-exploitation, hybridisation, natural disasters, competition for food, or other causes)
10. *Conservation measures taken*
    Legal measures (e.g., international conventions, national laws)
    To what extent are laws enforced?
    Protected areas – does it occur in national parks, reserves, etc.? If so, please name.
    Does it also occur outside protected areas?
    Have any specific conservation/management plans been proposed or implemented?
11. *Conservation measures proposed*
    What is required to conserve the population(s) in question?
12. *Additional remarks*
13. *References*
    Published papers, unpublished reports, manuscripts, written (*in litt.*) or verbal communication (*pers. comm.*)

Appendix 2. Status of Antelopes in North Africa, the Middle East, and Asia

This section summarises the status of antelopes in North Africa, the Middle East, and Asia. Antelopes are grouped according to species and highly distinct subspecies that are largely or entirely confined to the region; species and highly distinct subspecies which are represented by internationally significant populations within the region, but which also occur in sub-Saharan Africa; and species and highly distinct subspecies that occur only marginally within the region.

Within each of these groupings, antelopes are classified further into those which are extinct (including regionally extinct) or under immediate threat (i.e., currently in danger of extinction throughout the region, or likely to become in danger of extinction in the near future if the causal factors continue to operate), and those which are potentially at risk (i.e., antelopes which have a very restricted distribution and/or inadequate representation in conservation areas, but whose survival within the region is not under immediate threat). Currently, all antelopes in the region are at risk. The IUCN Red List classifications presented here are those used in Chapter 40 and follow those in the *2000 IUCN Red List of Threatened Animals* (except for saiga) and the *African Antelope Database 1998*.

Endemic and near-endemic antelopes extinct or under immediate threat

Four-horned Antelope (*Tetracerus quadricornis*)
The four-horned antelope inhabits mesic grasslands and woodlands from peninsular India to the Himalayan foothills of Nepal. This species was common in Nepal about 20 years ago, but it is now rare and is assessed as Endangered by the Antelope Survey. It is apparently common in many protected areas of central India, but its status in that country is Vulnerable because some populations may be too small and isolated to be viable. The species is globally classified as Vulnerable, and its total population is estimated to number several thousand individuals. Four-horned antelopes seem to occur at relatively low densities, perhaps <0.5 individuals/km^2. Populations are believed to have declined because of habitat degradation from cattle grazing, deforestation, grass cutting, and because of illegal hunting. Although it is legally protected throughout its range, more effective control of poaching is needed. The species will also benefit from increased levels of habitat management and protection, such as the regulation of livestock grazing, grass cutting, and the use of prescribed annual burning. Detailed surveys are required to accurately determine its distribution, status, and habitat requirements as a basis for specific conservation measures. Level 2 management is recommended for the captive population, which numbers at least 68 individuals worldwide.

Arabian Oryx (*Oryx leucoryx*)
Arabian oryx once inhabited deserts throughout the Arabian Peninsula as far north as Mesopotamia, but overhunting eventually eliminated this antelope throughout its range. Extermination of Arabian oryx reportedly occurred as follows: Iraq (1914), Israel (before 1920), Jordan (1930s), Yemen (*c.*1962), and Saudi Arabia and United Arab Emirates (late 1960s or early 1970s). The last known wild herd was killed by a hunting party in Oman during 1972. The species was also reported, but not confirmed, from Egypt, Kuwait, and Syria. As wild populations of Arabian oryx were being hunted into extinction during the 1960s and 1970s, zoos were producing a sizeable captive population. The Arabian oryx studbook indicates that now there are at least 1,600 individuals in captivity. In the Middle East, there are large captive herds in Qatar and at Hai-Bar Nature Reserve, Israel (*c.* 80 animals), Shaumari Wildlife Reserve, Jordan (225), and at Saudi Arabia's National Wildlife Research Center (>260). Level 1 management is recommended for the captive population that is providing stock for reintroduction projects. Free-ranging populations have been re-established by the release of captive-born oryx in the eastern Negev Desert (26) of Israel, the 224,000ha Mahazat as-Sayd Protected Area (>300) and Uruq Bani Ma'arid Protected Area (>130) in Saudi Arabia, and on the Jiddat-al-Harasis in Oman. The population in Oman reached *c.* 450 animals in early 1996, but it has since been reduced by poaching to <70. The Endangered classification on the IUCN Red List is based on a wild population estimated to number <250 mature individuals. Reintroduction of this antelope is either underway, planned, or proposed in other areas of the Middle East, including eastern Jordan, Al-Batin in Kuwait, the Al-Khunfah Protected Area in Saudi Arabia, and the At Talila Reserve in Syria. As exemplified by the White Oryx Project on the Jiddat-al-Harasis, conservation of Arabian oryx will certainly depend on population monitoring and protection from illegal hunting; however, the species will also benefit from protection of its habitat and the establishment of a balance between the species and the domestic livestock that it competes with for forage.

Bubal Hartebeest (*Alcelaphus buselaphus buselaphus*)
Alcelaphus b. buselaphus once occurred north of the Sahara from Morocco to Egypt in habitats ranging from mountain steppes and coastal belts to oases and oasis-like depressions. Populations in Algeria and Tunisia were apparently extirpated about the turn of this century, primarily as a result of over-hunting, and the last known animals were sighted in Morocco during the 1930s. Thus, *A. buselaphus* is Regionally Extinct. Reintroduction of hartebeest has been proposed in Algeria, Egypt, and Tunisia, including

Bou-Hedma, Sidi Toui, and Chambi National Parks. Under the assumption that *A. b. major* is the most similar taxon to the extinct *A. b. buselaphus*, it has been suggested that hartebeest from West Africa be used as reintroduction stock. Common hartebeest (*A. buselaphus*) is IUCN red-listed as Lower Risk/conservation dependent. There are an estimated 162 common hartebeests in captivity, which probably represent taxa from sub-Saharan Africa; however, a captive programme at the species level is not currently recommended.

Blackbuck (*Antilope cervicapra*)

This antelope is common in portions of northwestern, central, and peninsular India, and many populations within protected areas are relatively secure and increasing. However, the blackbuck has disappeared from many areas of India, much of Nepal, and from Pakistan. Its former occurrence in Bangladesh is uncertain, but it does not occur there now. The Antelope Survey's status assessments are as follows: Vulnerable in India, Endangered in Nepal, and Extinct in Pakistan and Bangladesh. Globally, its status is Vulnerable, derived from estimates that the total population has declined by 20% over the last 10 years. Blackbuck populations are threatened by illegal hunting, the high rise in human populations, which has led to disturbance and destruction of their desert, grassland, and woodland habitats, and, in some areas (e.g., Nepal), by predation from feral dogs. In India, numbers have drastically declined during this century, but the blackbuck's overall distribution there has not changed. The current population of blackbuck in India may exceed 50,000 (up from an estimated 22,000–24,000 during the late 1970s), and the largest numbers are found in the states of Rajasthan, Punjab, Madhaya Pradesh, Maharashtra, and Gujarat. Blackbuck occur in a large number of protected areas in India, including Velavadar National Park and Point Calimere, Ranebennur, and Great Indian Bustard Wildlife Sanctuaries. In Nepal, only two small populations remain. Prior to the 1950s, blackbuck occurred in Pakistan along the border with India, and vagrants may still occur in the deserts of southeastern Pakistan. There are captive populations in Lal Suhanra and Kirthar National Parks and at 13 breeding centres in Punjab, which are being managed as stock for reintroduction projects. Reintroduction of blackbuck is also being considered in Nepal (Royal Sukla Phanta Wildlife Reserve) and various protected areas in India. As a result of human overpopulation, however, there is virtually no fallow land in Bangladesh where antelopes could be reintroduced. In some areas of India, increases in blackbuck populations have resulted in crop depredation; as a result, selective culling, sport hunting and translocation have been considered as management tools. Presently, the hunting of blackbuck is prohibited in India, Nepal, and Pakistan, but poaching needs to be controlled in some areas. Recovery plans should also include habitat improvement and management, as well as conservation education programs that involve the local people. The blackbuck has been introduced to Argentina and the United States (Texas); these feral populations may exceed 8,600 and 35,000, respectively. The captive population of blackbuck probably exceeds 1,300 individuals; Level 3 management is recommended.

Saudi Gazelle (*Gazella saudiya*)

Gravel plains and sand deserts of the Arabian Peninsula are former haunts of this antelope, but now the Antelope Survey considers it Extinct in the Wild. Most historical records of *G. saudiya* are from an area east of the Asir and Hejaz Mountains in western Saudi Arabia and northern Yemen, but it is also reported from Kuwait. Insofar as a record from Jordan refers to a specimen found in excavations of an ancient human settlement, there is no evidence that the species occurred naturally there. Because of the age-old practice in Arabia of keeping gazelles as pets and trading them over long distances, it may be impossible to determine natural limits of the historical distribution of Saudi gazelle. Reports of the species are unconfirmed for Iraq and Syria. Although a population of gazelles (>100) on As Siniyyah Island in the Arabian Gulf is purported to represent *G. saudiya*, the taxonomic status of these animals is uncertain since mixed groups of different species and subspecies of gazelles from the mainland have been released on some islands of the United Arab Emirates. The best hope for conservation of the Saudi gazelle may lie with the captive population, which currently numbers at least 75 individuals. Most of these are at Al-Areen Wildlife Park in Bahrain and Al Ain Zoo and Aquarium in the United Arab Emirates, but there are also captive herds in Qatar and Saudi Arabia. Like the gazelles on As Siniyyah Island, however, the taxonomic status of the captive population is uncertain, and many specimens may actually be *G. bennettii*/*G. saudiya* hybrids. Museum specimens of known *G. saudiya* are being genetically profiled to enable the identification of captive specimens of this taxon. It is proposed that these captive animals then be used to form a breeding population and managed at Level 1 to provide stock for reintroduction into suitable protected areas.

Arava Gazelle (*Gazella gazella acaciae*)

Restricted to *Acacia* thickets in the Arava Rift Valley of southern Israel, this rare antelope is believed to represent a relict population of the mountain gazelle. Its numbers have been drastically reduced by poaching, from hundreds during the 1950s to only 12 individuals occupying a range of 6km^2 in 1996. *G. g. acaciae* is assessed as Critically Endangered, based on a population numbering <250 mature individuals (with all individuals in a single subpopulation) believed to have declined at least 80% over the last 10 years and predicted to decline further. *G. g. acaciae* has been protected from hunting since the 1960s, but now its population growth may be hindered by inbreeding, increasing aridity of its habitat, and wolf predation. The entire population has now been moved into captivity at the nearby Hai-Bar Nature Reserve in order to increase its numbers rapidly, and the captive population is recommended for Level 1 management.

Farasan Island Gazelle (*Gazella gazella farasani*)
Gazella g. farasani is endemic to the Farasan Archipelago in the Red Sea. A recent aerial survey indicates a population of >1,000 on Kebir Island, which is the largest of the Farasans. This represents the largest population of mountain gazelle in Saudi Arabia. Although its IUCN Red List classification of Vulnerable is based on a population once estimated to number <1,000 mature individuals, the population of this insular gazelle is nevertheless characterised by an acute restriction in the number of locations (three islands), and is thus threatened by human activities or stochastic events whose impact is increased by human activities. Kebir Island is designated as a protected area; however, a decision is pending on whether or not a captive-breeding programme should be implemented for this taxon.

Muscat Gazelle (*Gazella gazella muscatensis*)
Gazella g. muscatensis was apparently confined to the Batinah coastal plain of Oman, northwest of Muscat. The Batinah population of mountain gazelle has declined during the past few decades, probably because of development, competition from domestic livestock, and illegal hunting, and it may no longer occur there. Nonetheless, *G. g. muscatensis* is classified on the IUCN Red List as Critically Endangered on the basis of a population estimated to number <250 mature individuals and projected to decline due to severe fragmentation.

Queen of Sheba's Gazelle (*Gazella bilkis*)
The taxonomy of *G. bilkis* is based on five specimens collected during 1951 in the mountains near Ta'izz, Yemen. At that time, it was apparently common on *Euphorbia*-covered slopes, but gazelles have not been seen in the area for several decades, and a 1992 survey failed to locate any or detect signs of their presence. Heavy hunting pressure throughout Yemen has caused population declines among all species of antelopes. The IUCN Red List classifies the Queen of Sheba's gazelle as Extinct. Level 1 management of a captive population is recommended; however, a captive population does not exist at this time.

Arabian Gazelle (*Gazella arabica*)
This enigmatic antelope is known only from one male specimen in the Berlin Museum, apparently collected in 1825 and attributed to the Farasan Archipelago in the Red Sea. However, there is some doubt as to whether the specimen in fact originated from the Farasans. Skull characteristics distinguish this specimen from all other known specimens of gazelles, including the taxon that now occurs on the Farasans, which is named *G. gazella farasani*. *G. arabica* is considered Extinct by the Antelope Survey, and its former distribution and population status may never be known.

Cuvier's Gazelle (*Gazella cuvieri*)
Endemic to the hills and plateaus of the Atlas Mountains, the historic range of Cuvier's gazelle includes steppes, matorrals, and open forests throughout much of Morocco and northern portions of Algeria and Tunisia. Overhunting and the increase of farming, herding, and wood cutting have led to reduced and fragmented populations. The current population probably exceeds 1,500 gazelles; there are an estimated 500–1,500 in Morocco, 560 in Algeria and <500 in Tunisia. Cuvier's gazelle is IUCN red-listed as Endangered, a classification based on (a) an estimated population of <2,500 mature individuals and (b) a predicted population decline due to fragmentation (i.e., no subpopulations are believed to contain >250 mature individuals). This species is considered by the Antelope Survey to be Endangered in Algeria and Tunisia, and Vulnerable in Morocco. The status of Cuvier's gazelle has slightly improved in recent years following stricter enforcement of hunting laws and the establishment of reserves; for example, there has been no significant decline in Algeria since 1971. In Algeria, some level of protection is provided in Saharan Atlas National Park (100 animals), Mergueb State Nature Reserve (50), and Djebel Senalba National State Forest (30), and smaller numbers of this antelope occur in hunting reserves at Djebel Sahari, Djebel Achch, Djebel Nadour, and Djebel Aissa. Moroccan populations having partial protection occur in Outat el Haj Hunting Reserve (15) and Tafingoult (60), and a fairly large population inhabits the northern fringe of Western Sahara, an area considered to be a hunting reserve. More than 300 Cuvier's gazelles occur in the Djebel Chambi and Djebel Kechem el Kelb Massifs of Tunisia, and protected areas there include Chambi National Park and Kechem el Kelb Reserve. Other populations proposed for protection include: the Drâa-Aydar (few hundred animals), Aït Erkha- Tazeroualt (20), Anezi (20), and those of the eastern and western High Atlas in Morocco; the Tell Atlas (235), eastern mountains (135), and the region between El Abiod Sidi Cheikh and Taghit in Algeria; and the Siliana region of Tunisia.

Red Gazelle (*Gazella rufina*)
Gazella rufina is known only from three museum specimens that were obtained from markets in northern Algeria during the late 1800s. Although its former distribution is not exactly known, the red gazelle was possibly endemic to a small area in northwestern Africa, including Algeria's lower Chelif Valley and forests along the Algerian-Moroccan border. Extinction of the red gazelle may have been caused by a combination of human persecution and habitat contraction following the most recent advance of the Sahara.

Arabian Sand Gazelle (*Gazella subgutturosa marica*)
An inhabitant of desert plains, sand dunes, grasslands, and cultivated areas, *G. s. marica* occurs throughout the Arabian Peninsula as far north as Mesopotamia, where it intergrades with *G. s. subgutturosa*. As with other antelopes in the region, populations of this gazelle have either declined or vanished largely as a result of the drastic increase in motorised hunting, particularly during the years following World War II. Habitat degradation and competition with domestic livestock have also been factors in its decline. *G. s. marica* is

now extinct in Kuwait and possibly Yemen, though its status in Yemen is regarded by the Antelope Survey as Endangered should it still survive there. Populations are considered Endangered also in Jordan and Oman, Vulnerable in Iraq and Saudi Arabia, and Indeterminate in Syria. They are Insufficiently Known in United Arab Emirates. Only in Bahrain is *G. s. marica* classified as not threatened by the Antelope Survey, where it numbers >250 and *c.* 230, respectively, on the islands of Bahrain and Hawar. More than 1,500 goitered gazelles occur on Bahrain's Umm-Nasan Island, but many of these are probably hybrids between *G. s. marica* and *G. s. subgutturosa*, which were introduced there some time ago. The only other population estimates of *G. s. marica* are from Iraq (1,000 animals) and Saudi Arabia (>1,000); in addition, about 100 animals were sighted during a 1998 survey in southern Syria. Its IUCN Red List classification is Vulnerable, derived from a population estimate of <10,000 mature individuals and a predicted decline due to population fragmentation (i.e., no subpopulations are believed to contain >1,000 mature individuals). Conservation efforts for *G. s. marica* should involve (a) surveys to identify remnant populations, (b) measures to protect natural populations and their habitats, and (c) Level 1 management of the captive population to insure its viability and taxonomic purity, and to provide stock for reintroduction projects. Wild populations receive some degree of protection at the following reserves: Harrat al-Harrah (>1,000) and Al-Khunfah (150) in Saudi Arabia, Al Areen Wildlife Park (40–50) in Bahrain, and the Jiddat-al-Harasis and Barr Al Hikman in Oman. Areas inhabited by *G. s. marica* that have been proposed for protection include the southern portion of Bahrain, Burqu in Jordan, and Rutba, Mahzam, and Tharthar Lake in Iraq. Reintroduction projects have been initiated with the transfer of captive-bred animals to the At Talila Reserve (30) in Syria and protected areas in Saudi Arabia, including Mahazat as-Sayd, Uruq Bani Ma'arid (204), Hafar Al Batin (55), and Al Kharj (20). Pending their protection, locations proposed as reintroduction sites for *G. s. marica* include Al-Batin in Kuwait and Rakka in Syria. There are captive groups at Qassim (>1,200) and King Khalid Wildlife Research Center (306) in Saudi Arabia, Shaumari Wildlife Reserve in Jordan, and possibly various places within Iraq. Many private collections of *G. s. marica* in the United Arab Emirates are maintained on islands in the Arabian Gulf; Sir Bani Yas and Abu Al Abyadh islands together may hold as many as 5,000 individuals.

Przewalski's Gazelle (*Procapra przewalskii*)

Poaching, exclusion from feeding areas by fences, habitat loss affected by an increase in human population, agriculture, and desertification have eliminated Przewalski's gazelle from Gansu and the eastern portion of its former range in north-central China. This species once inhabited steppes, open valleys, and alpine grasslands of the Ordos, Eastern Tibetan, and Western Yellow Soil plateaux. Its distribution is now restricted to the Qinghai Lake area, where three small populations survive on the eastern and northwestern shores; they totalled about 350 in 1986 and >150 in 1998. *P. przewalskii* is red-listed as Critically Endangered. Legal protection is afforded by its designation as a Category I threatened species and by the presence of a small, albeit declining, population (19 in 1994, 7 in 1998) in Bird Island Nature Reserve. However, there is no protected area specially designed for the conservation of Przewalski's gazelle and law enforcement is difficult in remote areas where the gazelles live. There are no Przewalski's gazelles known to be held in captivity, but a decision is pending on whether or not a captive programme should be implemented.

Tibetan Antelope (*Pantholops hodgsonii*)

Endemic to the high, rolling plains and broad, montane valleys of the Qinghai-Tibetan Plateau, this antelope occurs largely in southwestern China, though it occurs seasonally in two small areas (*c.* 2,500km^2) of northeastern Ladakh, India, and there is a historical record from extreme northwestern Nepal. The Antelope Survey classifies the species as Vulnerable in China, Endangered in India, and probably Extinct in Nepal. The Tibetan antelope is classified as Endangered on the IUCN Red List, based on an estimate that its population has declined at least 20% over the last 10 years. Population decline is the result of shrinking habitat and poaching, especially for their underfur (*shahtoosh*), which has a high market value. The total population may have numbered 100,000 within the past decade, but a more recent estimate indicates that <75,000 remain. Reported densities in China vary from 0.1/km^2 in the western plateau to 17/km^2 in the central Kun Lun Mountains. India's summer population may be as high as 220, but this total is rapidly declining. There are no known Tibetan antelopes in captivity, yet Level 3 management of a captive population is recommended. Tibetan antelope occur in A Er Jin Shan (Xinjiang), Qiantang, and Kokoxili (northern Tibet) Nature Reserves, as well as one area that has been proposed for protection, Daultberg-Depsang in Ladakh. Although the Tibetan antelope is legally protected throughout its range, strict controls on poaching and the *shahtoosh* trade are important to safeguard the species. Effective management and wardening of protected areas will ameliorate population declines, and efforts to improve the rural economy in areas of key habitat will further benefit this threatened antelope.

Saola (*Pseudoryx nghetinhensis*)

This recently discovered bovid is threatened by hunting activities (including the trade of trophies and live specimens) and clearing of its habitat for subsistence agriculture. It apparently prefers moist, montane forests in east-central Laos and adjoining Ha Tinh, Nghe An, Quang Nam, and Thua Thien Hue provinces of Vietnam. The population of saola in Laos is guessed to be 70–700, with an estimated 50–500 in Nakai-Nam Theun National Biodiversity

Conservation Area (NBCA) and 20–150 just beyond this area's northern boundary. At least four disjunct populations are thought to occur within Nakai-Nam Theun NBCA and the area just to the north. This site has been proposed for inclusion within the conservation area as the forest is still intact there and contiguous with similar forest in Vietnam. *P. nghetinhensis* may also occur in Dong Amphan NBCA and in the proposed national biodiversity conservation areas of Nam Chouan and Xe Sap. Reports of saola also come from the area of Hin Namno NBCA along the Lao-Vietnamese border, but they are believed to be declining throughout their range in Laos. There may be another several hundred animals in Vietnam, with the highest densities occurring in the Vu Quang Nature Reserve. The forest in Vu Quang is more remote and thus less disturbed. It also occurs in Vietnam's Pu Mat Nature Reserve, Pu Huong Provincial Nature Reserve, and possibly in Bach Ma National Park. *P. nghetinhensis* is classified on the IUCN Red List as Endangered, derived from population estimates of <2,500 mature individuals (with no subpopulations containing >250 mature individuals) and predicted declines of at least 20% within five years. Specimens taken into captivity reportedly have not survived for more than a few days or weeks. Protection of sufficient undisturbed forest habitat to support viable populations is essential to ensure its long-term survival. It is legally protected in Vietnam and enforcement there has become more effective within reserves. Logging has been banned in the Vu Quang Reserve and financial support to manage the reserve has been obtained. The Lao Government is drafting new legislation for wildlife, which will give the saola legal protection from hunting and trade, and the United Nations is promoting a transborder reserve to protect contiguous portions of its habitat in both Laos and Vietnam. A public awareness and education program will also aid conservation efforts by informing local inhabitants of the importance of this endangered species.

Khting Vohr (*Pseudonovibos spiralis*)

Pseudonovibos spiralis is known only from the horns and, in some cases, frontlets from about a dozen specimens collected in Cambodia and Vietnam. Based on scant information obtained to date, the khting vohr occurs in the central highlands of Vietnam and in forested areas of Cambodia, including the southwestern mountains, isolated hills on the northern plains, and some lowland areas in the northeast. Local inhabitants indicate that populations in Vietnam have declined and that hunting pressure there has forced the species to seek refuge in Cambodia. It is reported to be rare and may even be extinct; the Antelope Survey has assessed this newly discovered bovid as Endangered. The Endangered status of this species on the IUCN Red List is based on a population estimated to number <2,500 mature individuals and predicted to decline due to population fragmentation (i.e., no subpopulations are believed to contain >250 mature individuals). Detailed surveys are obviously required to determine the khting vohr's distribution, status, and habitat requirements as a basis for recommending specific conservation measures. Protection from poaching and habitat disturbance (e.g., logging), including the establishment of protected areas, will be necessary to safeguard this species.

Saiga (*Saiga tatarica*)

The saiga is currently found from the steppes and semi-deserts northwest of the Caspian Sea, east to the Shargyn Gobi in western Mongolia. *S. t. mongolica* is endemic to Mongolia, while the nominate form *S. t. tatarica* occupies the remaining range of the species. Historical distribution of this antelope included Europe, but it has been extinct in Ukraine since at least the mid-1800s. It became extinct in China sometime during the 1960s or 1970s, and *S. t. tatarica* was extirpated in Mongolia about 40 years ago. The two major populations are in Kazakhstan and Russia, where the most recent surveys put their numbers at 154,000–170,000 and 25,000–30,000, respectively. Population fluctuations are often drastic because of severe winter conditions (*dzhut*), diseases (particularly pasteurellosis), and forage shortages. Variable numbers from Kazakhstan winter in Uzbekistan and Turkmenistan, and populations in all three countries are now considered to be Vulnerable or Endangered. Saiga populations have declined in Russia from an estimated 600,000–800,000 during the late 1950s. The species has also declined in Mongolia, and recent estimates for the only surviving populations of *S. t. mongolica* (in Shargyn Gobi and Mankhan) indicated that they numbered 1,600–3,000 and 35, respectively. The Antelope Survey thus considers the saiga Endangered in Russia and in Mongolia. Saiga is globally listed as Endangered and this status now applies to both subspecies. Saiga are threatened by poaching and habitat degradation, especially overgrazing by domestic livestock. In Kazakhstan, where their numbers are greatest, they are in need of protection because of population declines brought on by an increase in illegal hunting, primarily for their horns used in traditional Chinese medicine. They have long been hunted for their meat, hide, and horns, and in Kazakhstan, annual harvest from licensed hunting has been 62,000–112,000 during recent years. Areas affording at least some protection include: Turgai Nature Sanctuary and Andasai, Kurgantube, Naurzum, Ustyurt, and Barsakelmes Nature Reserves in Kazakhstan; Kaplankyr Nature Reserve in Turkmenistan; Chernye Zemli Biosphere Reserve in Russia; and Sharga and Mankhan Nature Reserves in Mongolia. Additional sites have been proposed for protection in Kazakhstan, such as a western extension of Andasai Nature Reserve. Reintroduction of captive-bred stock is proposed to restore saiga populations in China and Mongolia; there is a captive herd at the Wildlife Conservation Breeding Center in China's Gansu province. The captive population is reported to number 218 individuals, of which most if not all are *S. t. tatarica*. Level 3

management is recommended for *S. t. tatarica*, but the decision is pending on a captive program for *S. t. mongolica*.

Endemic and near-endemic antelopes potentially at risk

Nilgai (*Boselaphus tragocamelus*)

This large antelope is locally common to abundant in the Indian states of Uttar Pradesh, Haryana, Rajasthan, and Gujarat, and in Nepal along the foothills of the Mahabharat Range and Siwalik Hills; in some areas, it is considered an agricultural pest. The Antelope Survey's status assessment is Satisfactory for the nilgai in both countries. Nonetheless, its numbers have declined considerably in Nepal and also in Pakistan since the early 1900s as a result of habitat degradation, primarily from agricultural activities, and hunting. The small, remnant populations of nilgai in the Pakistani states of Punjab, Sind, and Azad Kashmir are Endangered, and the species is Extinct in Bangladesh; its extinction there is likely due to human overpopulation. On the IUCN Red List nilgai is classified as Lower Risk/ conservation dependent. Nilgai occur in many of India's protected areas, and in Nepal's Royal Chitwan and Royal Bardia National Parks and Royal Sukla Phanta and Koshi Tappu Wildlife Reserves. India's population of nilgai possibly exceeds 100,000, but the only estimates reported from Nepal and Pakistan are 50–60 in the Royal Sukla Phanta Wildlife Reserve during 1988 and three herds totalling 45–60 in the Punjab during 1990. Breeding centres in the Punjab also maintain captive populations. Worldwide, there are >600 nilgai in captivity and another 37,000 feral nilgai are established on Texas ranches, but captive-breeding is not currently recommended as a demographic or genetic contribution to the conservation of the species. However, as long as its scrub and forest habitats are being cleared for cultivation and other human needs, conservation of the nilgai will depend on protecting and managing an adequate network of parks and reserves. Conservation efforts should also include controls on poaching in areas where its populations have been reduced to small remnants.

Chinkara (*Gazella bennettii*)

Ranging across central and southern Iran, southwestern Afghanistan, much of Pakistan and into central India, the chinkara is adapted to arid country, including sand deserts, stony plains, and hilly terrain. India is the stronghold for the species, with a population estimated to exceed 100,000; at least 80,000 are found in the Thar Desert alone. Population density in the Thar averages 0.88/km^2, but it is abundant around some Vishnoi Hindu communities in Rajasthan and Haryana, where antelopes are considered sacred, and densities there are as high as 31.6/km^2. An estimated 400 chinkara occur in Iran, but there are no population figures for Afghanistan and Pakistan. The Antelope Survey thus classifies its status as Satisfactory in India, but elsewhere the species is threatened, being assessed as Endangered in Pakistan, Vulnerable in Iran, and Indeterminate in Afghanistan. Globally, the species is considered Lower Risk/conservation dependent. Threats to the chinkara include poaching, overgrazing, agriculture, construction, mining, and military activities. In Iran and Pakistan, they have been drastically reduced in number, and the once abundant populations along the Pakistani-Indian border have been nearly exterminated by military troops in the region. Due to civil war, information on the current status of antelopes in Afghanistan is scant and difficult to obtain; yet, because of the conflict, proliferation of arms and ineffectiveness of the central government, it is likely that environmental damage throughout the country is enormous and that wildlife poaching continues unchecked. In addition, India's growing human population and economic development put the future of its wildlife in question. Iran exemplifies how populations of gazelles can recover from severe declines through improved implementation of conservation programmes; most of the country's remaining gazelle populations occur in protected areas, where their numbers are reportedly increasing. Iran's known populations of chinkara occur in Kavir National Park, Touran and Khabr-va-Rouchoon Wildlife Refuges, and Hormud, Bahram-e-Gour and Nayband Protected Areas. They also occur in Pakistan's Lal Suhanra and Kirthar National Parks, Kala Chitta and Kalabagh Game Reserves, and Takkar Wildlife Sanctuary, and in more than 80 protected areas in India. The captive population numbers at least 30 individuals, but a global captive programme is not currently recommended. Conservation measures that have been proposed for chinkara include: comprehensive surveys of its distribution and numbers; development and implementation of effective management programmes, particularly a trans-frontier effort involving Afghanistan, Iran, and Pakistan; improved protection from illegal hunting inside and outside reserves; and further research into the behaviour, ecology, population dynamics, and taxonomy of the species.

Mountain Gazelle (*Gazella gazella*)

The mountain gazelle inhabits foothills, mountains, and plains of the Middle East, where its distribution closely follows that of *Acacia*. It is the most abundant antelope over most of its range, and the largest populations occur in Oman (*c.* 13,000 animals) and Israel (10,000). The Antelope Survey thus rates the mountain gazelle's status as Satisfactory in both countries, but it is less common elsewhere and is considered Insufficiently Known in Jordan, Syria, and United Arab Emirates, Indeterminate in Yemen, Vulnerable in Saudi Arabia, and Extinct in Egypt and possibly in Lebanon. There are about 300 mountain gazelles on Iran's Farur Island, but the origin of these animals is uncertain as Iran is well outside the known range of the species. *G. gazella*, including *G. g. cora* and *G. g. gazella*, is globally classified as Lower Risk/conservation dependent. Overhunting is the primary cause of its decline and extirpation in certain areas, and the species will require focused conservation efforts to prevent it from becoming threatened.

Populations of mountain gazelles that occur in nature reserves or that receive some degree of protection include those of the following areas: Farur Island in Iran; several protected areas in Israel, including Ya'ar Yehudia, Mezukai Herev, and En Gedi Nature Reserves; the Jiddat-al-Harasis (*c.* 10,000), coastal plain north of Sur (*c.* 1,000), near Al Kamil in the Ja'alan (1,000), Wadi Sareen Tahr Reserve (1,000), and various other locations in Oman; the Al-Khunfah Protected Area and possibly Harrat al-Harrah Protected Area of northern Saudi Arabia; and possibly the Choula Game Protection Area and Jabal Shuah Forest Reserve in Syria. Populations that are not protected occur in several areas, including: the Rift Valley of Jordan; the southwestern mountains and on the Tihamah coastal plain of Saudi Arabia; several areas in the United Arab Emirates; and in northern and southern Yemen. There are captive populations of mountain gazelles at the Breeding Centre for Omani Mammals in Oman and at King Khalid Wildlife Research Center (252) in Saudi Arabia; a captive-breeding programme is planned for Sana'a University in Yemen. Captive programme recommendations for *G. g. cora* and *G. g. gazella*, respectively, are Level 2 and Level 3. Captive animals in Oman have been released to re-populate the plains and foothills of Wadi Sareen Tahr Reserve. In Saudi Arabia, captive-born stock has been released into the Ibex Reserve (84), Uruq Bani Ma'arid Protected Area (73), and a fenced portion of the Jebel al-Rar Military Base (20). During 1995, the Ibex Reserve population was estimated to number about 200 gazelles. Release of the species is also planned for Majami al-Hadb Protected Area in Saudi Arabia and, pending establishment of a managed system of protected areas, reintroduction projects are proposed for northeastern Egypt (i.e., northern Sinai), southern Lebanon, and southwestern Syria. Conservation programmes for the mountain gazelle should also include field surveys to accurately determine the current size of its distribution and population; survey data should then be used to strengthen the network of protected and management areas for the species. Continued genetic studies of the captive and wild populations would further clarify the taxonomy of *G. gazella* at the subspecies level.

Goitered Gazelle (*Gazella subgutturosa*)

Distribution of the goitered gazelle is the largest of any antelope, ranging from deserts of the Arabian Peninsula and the mountain valleys of Transcaucasia to the steppes of central Asia. Overhunting and habitat loss have drastically reduced its numbers during the last few decades, for example: 200,000 to <10,000 during the mid-1930s to late-1970s in Kazakhstan; 13,000 to 4,000 during 1989–1999 in Azerbaijan; 8,000–10,000 to 5,000 during the 1970s and early 1980s in Uzbekistan; 3,000 to 300 during 1968–1978 in Turkey; and 200 to 70–80 during 1986–1996 in Tajikistan. Other recent population estimates include: about 60,000 in Mongolia; 30,000–50,000 in Kazakhstan; >7,060 in Iran; 4,000–5,600 in Turkmenistan; 500 in Iraq (excluding *G. s. marica*); 300 in Turkey; and 50 in Kyrgyzstan. The species is now Extinct in Armenia and possibly in Kyrgyzstan and Pakistan, although it is classified as Endangered in those two countries by the Antelope Survey. It is also considered Endangered in Azerbaijan, Georgia, Tajikistan, Turkey, and Uzbekistan; Vulnerable in China, Iran, Iraq, Kazakhstan, Mongolia, and Turkmenistan; and Indeterminate in Afghanistan and Syria. Continued population decline and fragmentation pose potential threats to the goitered gazelle in many areas, and on the IUCN Red List it is classified as Lower Risk/near threatened. Populations with some protection occur in the following areas: Shirvan Nature Reserve (>4,000 animals) in Azerbaijan; Boghdad Mountain Biosphere Reserve, Ludansuosulin Reserve, and Kalamaili and Ganhaizi Nature Reserves in China; at least 15 nature reserves in Iran, including Mooteh Wildlife Refuge (1,200), Kalmand-va-Bahadoran (1,200) and Salook (1,100) Protected Areas, and Kolah Ghazi National Park (>1,000); Altyn-Emel National Park (5,000–10,000), Ustyurt Nature Reserve, Aktau-Buzachinsk Wildlife Sanctuary, and a number of other reserves in Kazakhstan; Great Gobi National Park (2,000), Gurban Saikhan Nature Conservation Park, and Sharga and Mankhan Nature Reserves in Mongolia; Tigerbulk Nature Reserve in Tajikistan; Ogurchinsk Nature Sanctuary (400) and Badkhyz (*c.* 2,000), Kaplankyr, Repetek, Amudarinskiy, and Kopet Dag Nature Reserves in Turkmenistan; and Kyzylkum Nature Reserve, and Tudakul and Dengizkul Nature Sanctuaries in Uzbekistan. There are captive populations at Ceylanpinar (812) in Turkey, Bukhara (650) in Uzbekistan, Khanewal in Pakistan, and at Tadmur, Deir Ez Zoor, and Salamiyah in Syria; the status of various captive populations in Iraq is unknown. Captive-breeding has been proposed as a conservation measure for goitered gazelles in Georgia, Pakistan, Tajikistan, and those in Iran living west of the Zagros Mountains. Level 3 management is recommended for *G. s. subgutturosa*, but a captive programme is not currently recommended for *G. s. hillieriana*. Protection has been suggested for the following sites that reportedly have natural populations of goitered gazelles: the Tarim and Qaidam Basins in China; the Buzachi Peninsula, Taukum and Kyzyl Kum Deserts, Muyunkum, Besbulak, and Zhabaushkan in Kazakhstan; the Issyk Kul Basin in Kyrgyzstan; the Euphrates Valley, Buhayrat al-Khatuniyah, Jabal Abdul Aziz, Jabal al-Bilas, Ras al-Ayn, Sabkhat al-Jabbul, and Tadmur/Sabkhat Muh in Syria; and the Sam and Magaikum Sands, and Kyzyl Kum in Uzbekistan. Reintroductions have been proposed for Vashlovani Nature Reserve in Georgia, the northern Great Lakes Basin in Mongolia, Karatau Nature Sanctuary in Tajikistan, and southeastern Turkey. Small, isolated populations might require translocations from larger populations to prevent their disappearance. Field surveys are still needed to accurately determine the current status of goitered gazelles

in several countries, particularly Afghanistan, China, Kyrgyzstan, Syria, and Uzbekistan. The success of these conservation measures nevertheless will require increased control of poaching.

Tibetan Gazelle (*Procapra picticaudata*)
Tibetan gazelle is listed as Lower Risk/near threatened in the IUCN Red List and population estimates suggest the species has experienced a decline in numbers from 186,000 in 1989 to *c.* 100,000 during the late 1990s. Accuracy of these estimates is unknown, however, due to inaccessibility of the habitat. The country classifications for this antelope, which is endemic to the Qinghai-Tibetan Plateau, are Satisfactory in China and Endangered in India, where a very small proportion of the total population occurs. Tibetan gazelle is hunted for its meat, hide, and fur, and overhunting is causing its disappearance from large areas. Until the mid-1980s, about 8,000 skins were collected each year in Sichuan alone. It is now legally protected in both China and India, although poaching still occurs. Additional threats to the species include agricultural encroachment and growing numbers of domestic livestock that are reducing the quality and size of the open steppes and mountain grasslands that it requires. Protected populations occur in A Er Jin Shan Nature Reserve of Xinjiang, Yanchiwan Reserve in Gansu, and Qiantang and Qomolangma Nature Reserves of Tibet. The Qiantang population is estimated to number 16,000–19,000. Two sanctuaries, Changtang and Rupshu, have been proposed to protect the estimated <50 Tibetan gazelles that occur in Ladakh, India. A few gazelles roam the Chho Lhamo Plateau on the border between China and India. A trans-border protected area is suggested to protect this population and other rare wildlife of the Tibetan Plateau. Along with establishment of these proposed protected areas, anti-poaching measures throughout its range are recommended to further safeguard the species. In India, for example, conservation education of military officers, who control most of the land inhabited by Tibetan gazelles in Ladakh and Sikkim, may help to reduce poaching there by army personnel. Detailed surveys are required to accurately determine its distribution, status, and ecological requirements as a basis for identifying specific conservation measures. There are probably no Tibetan gazelles in captivity, but captive-breeding is not currently recommended as a demographic or genetic contribution to the conservation of the species.

Mongolian Gazelle (*Procapra gutturosa*)
Inhabiting the Mongolian steppes and adjacent plains of China and Russia, the Mongolian gazelle is the most abundant antelope in Asia, but current size of the population is debatable. Recent aerial surveys in Mongolia have produced widely divergent estimates, 400,000 in 1989 and 2,000,000 in 1994; thus, the latter figure requires verification by another survey taken at the same time of year. An isolated population (>3,500 gazelles) lives on the Khomin Tal steppe of western Mongolia, and a few scattered herds survive in central and southern Mongolia, but the core population inhabits the eastern part of the country. About 170,000 gazelles from this population winter in northeastern China, where another 80,000–85,000 permanently reside. The Chinese population may have numbered 2,000,000 as recently as the 1970s. There is no permanent population of Mongolian gazelle in Russia, but migrants from the core population in Mongolia occur sporadically in Transbaikalia. This species is extinct in eastern Kazakhstan, where the last records are from the early 1900s in the Ili Basin and Irtysh Valley. The Antelope Survey classifies Mongolian gazelle as Endangered in Russia, Vulnerable in China, and Satisfactory in Mongolia; it is classified globally as Lower Risk/near threatened. The primary threat to the Mongolian gazelle is illegal hunting, but disease, severe winter weather, and habitat degradation by domestic livestock have significantly reduced either gazelle numbers or suitable rangeland (e.g., its range in China and Mongolia is approximately 25% of what it was a few decades ago). Hundreds of thousands are harvested annually for their meat, and although the official harvest is now substantially lower than what it was during the 1970s and 1980s, poaching is largely uncontrolled; thus, annual take remains excessively high. Conservation of this gazelle obviously depends on the control of poaching, managed hunting, and sustainable harvest; these efforts will also require public education. Mongolian gazelles receive some degree of protection in Mongolia's Dornod-Mongol and Mongol-Daguur National Parks, though these areas are peripheral to the core population. The proposed Xinbaragyouqi Mongolian Gazelle and Kherlen-Menen Nature Reserves in China and Mongolia, respectively, would protect important areas; a Kherlen- Menen Nature Reserve could form the basis of a protected area on the China-Mongolia border. A protected area has also been proposed for Dongwuqi County in China, where there is a large population. Joint protection and management agreements between China, Mongolia, and Russia, as well as monitoring and research of Mongolian gazelle populations are also important for conservation of the species. A captive programme is not recommended at this time.

Non-endemic antelopes extinct or under immediate threat within the region

Scimitar-horned Oryx (*Oryx dammah*)
The range of *O. dammah* in North Africa once covered semideserts and steppes north of the Sahara from Morocco to Egypt, but overhunting and habitat loss, especially from increasing numbers of domestic livestock, have resulted in its probable extinction in the wild. Oryx were extirpated in Tunisia about 1910 and possibly during the same time-period in Morocco. The last reports of live oryx in North Africa date from 1975 (Egypt) and 1987 (Algeria). There is no definite evidence of its survival in the wild according to the *African Antelope Database 1998*. Thus, the IUCN Red

List status of *O. dammah* has been changed from Critically Endangered to Extinct in the Wild. Fortunately, captive-breeding has produced a sizeable zoo and ranch population. The number reported in captivity is about 1,200 individuals, while an estimated 2,145 scimitar-horned oryx occur on Texas ranches; a certain number of these oryx probably have been counted in both ranch and captive populations. Herds have been established in fenced enclosures at Bou-Hedma (Tunisia) and Souss-Massa (Morocco) National Parks, and the Tripoli Reserve (Libya). Reintroduction of the species has been proposed for all of the North African countries, and specific sites include the lower Drâa Valley, Aydar and Adrar Souttouf areas of Morocco, and Djebil and Sidi Toui National Parks in Tunisia. Although oryx are legally protected throughout North Africa, poaching must be strictly controlled if they are to be re-established in their former range. Likewise, protection of their habitat will require effective management of livestock grazing. Level 1 management is recommended for the captive population.

Addax (*Addax nasomaculatus*)

Addax once occurred throughout the deserts and sub-deserts of North Africa from the Atlantic to the Nile. As with other species of antelopes in the region, populations of addax have declined as a result of uncontrolled hunting and habitat degradation by domestic livestock. It was probably extirpated in Tunisia during the 1930s, and the last definite animals in Libya and Algeria were killed in 1966 and 1970, respectively. Remnant populations may still survive to the south of the region in remote desert areas of Chad, Niger, and Mali. A few addax from these populations may occasionally move north into Libya and Algeria, such as during years of good rainfall (e.g., 1994–1995). However, there is no recent evidence for the species in North Africa and the Antelope Survey considers addax to be Regionally Extinct. The *African Antelope Database 1998* notes that the IUCN Red List status of addax has been revised from Endangered to Critically Endangered, and that its wild population may not exceed a few hundred individuals. On a more positive note, however, captive-breeding has produced a world population that currently numbers >860, including herds that have been established in fenced enclosures at Bou-Hedma (Tunisia) and Souss-Massa (Morocco) National Parks and the Tripoli Reserve (Libya). Level 1 management is recommended for the captive population. Reintroduction of the species has been proposed for several areas in North Africa, and specific sites include Adrar Souttouf in Morocco's planned Dakhla National Park and Tunisia's Djebil and Sidi Toui National Parks. In Algeria, effective protection of Hoggar and Tassili National Parks will help to safeguard addax that may move north from populations in Niger and Mali. Establishment of a sand dune national park in Algeria, situated across the border from Djebil National Park, would provide protection for addax dispersing from planned reintroductions in Tunisia. Measures should also be considered to protect El Uweinat in Egypt and portions of southern and western Libya, areas also likely to be visited by dispersing addax. Hunting and livestock grazing must be more effectively controlled if addax are to be re-established in North Africa.

Slender-horned Gazelle (*Gazella leptoceros*)

An inhabitant of the great sand deserts of the Sahara, little is known of the biology and status of this rare antelope, but its numbers are believed to have decreased greatly as a result of over-hunting. In Egypt, for example, the species has been relentlessly sought by trophy hunters because of its rarity, and a small population in Wadi El Raiyan was exterminated by hunters subsequent to its discovery in the late 1980s, just prior to declaration of that area as protected. Thus, slender-horned gazelle is classified by the Antelope Survey as Endangered throughout its range in North Africa, including Egypt and Libya, but its status is Insufficiently Known in Algeria and Tunisia. Its IUCN Red List status is derived from a population estimated to number <2,500 mature individuals (with no subpopulations containing >250 mature individuals) and predicted to decline at least 20% within five years. In spite of these estimates, not enough population information is available, and field surveys should be conducted in order to assess its current distribution and status more rigorously. Although all species of gazelles are legally protected from hunting throughout their range in North Africa, laws are not enforced in many areas and strict prohibition of poaching will be necessary to actually protect these threatened antelopes. In Algeria, the slender-horned gazelle has benefited from a reduction of geological surveys and oil exploration, which also has reduced the frequency of motorised hunting parties in the desert interior. Its preference for sand dunes and areas of fine-grained sand has offered it some protection from pursuit by hunters in Libya. The only protected areas in the region where this species now occurs are Tassili and Djebil National Parks in Algeria and Tunisia, respectively. The few remaining individuals in Egypt are scattered over a very large area and their relocation into a secure reserve would improve the survival chances of the species in that country. A captive-breeding programme has been suggested for Djebil and Sidi Toui National Parks in Tunisia. The entire captive population of slender-horned gazelles currently numbers about 189 individuals; Level 1 management is recommended.

Dama Gazelle (*Gazella dama*)

Largest of the gazelles, *G. dama* was once common and widespread in arid and semi-arid regions of the Sahara (e.g., open scrub, steppes, gravel plains, and sand deserts), but like other North African antelopes, it has suffered from uncontrolled hunting and overgrazing by domestic livestock. Dama gazelle is IUCN red-listed as Endangered because its population, estimated to number <2,500 mature individuals, is believed to have declined at least 50% over the last 10 years and is predicted to decline at least another 20% within five years. Throughout the region, the Antelope

Survey also considers the species Endangered, as it is in Algeria and Morocco, but it is Extinct in Libya and Tunisia. A remnant population may survive in Algeria's Hoggar National Park, and there are probably <100 animals in Morocco, where they may still occur in the Adrar Souttouff and Oued Drâa Valley. Captive-breeding herds have been established at the Rmila Enclosure and Souss-Massa National Park in Morocco, and Bou-Hedma National Park in Tunisia, but jackal (*Canis aureus*) predation is a problem for the Bou-Hedma herd. Releases of captive animals in Djebil and Sidi Toui National Parks are under consideration in Tunisia. Worldwide, Level 1 management is recommended for captive populations of *G. d. mhorr* and *G. d. ruficollis*, which are reported to number 174 and 348, respectively. Surveys should be conducted in Morocco's Aydar and the region to the east, and in Libya's southern frontier to determine if dama gazelles still survive in those areas. Nature reserves to protect remnant populations have been proposed for the Erg Iguidi and the *Acacia*-steppe south of Tindouf in Algeria, and the Adrar Souttouf in Morocco. Strict protection from illegal hunting will be necessary to safeguard existing populations (e.g., Hoggar National Park) and those which may result from future releases.

Widespread antelopes potentially at risk within the region

Dorcas Gazelle (*Gazella dorcas*)

This small gazelle, the only antelope which occurs in both Africa and Asia, is also the most common antelope throughout much of its range. Nonetheless, overhunting is drastically reducing its numbers over large areas and, within the region, the Antelope Survey assesses populations of dorcas gazelle as either Endangered (Jordan and Libya), Vulnerable (Algeria, Egypt, Morocco, and Tunisia), or Rare (Israel). The *African Antelope Database 1998* (East 1999) indicates that populations of the species south of the region have also declined. Accordingly, the IUCN Red List status of dorcas gazelle has been changed from Lower Risk/near threatened to Vulnerable on the basis of a population reduction of at least 20% during the past 10 years. Although the size of the region's total population is unknown, it may be in the low tens of thousands. Estimates of dorcas gazelle populations in North Africa and the Middle East are as follows: 1,000–2,000 in Egypt; >2,000 in Israel; 180–200 in Jordan; and 200–600 in Morocco, plus several hundred in Western Sahara. Totals have not been estimated for the central North African countries, but there are 120–150 in Bou-Hedma National Park (Tunisia), about 150 in New Hisha Nature Reserve (Libya), and large numbers in Hoggar and Tassili National Parks (Algeria). Other protected areas with populations of dorcas gazelles include: the M'Sabih Talâa and El Kheng reserves in Morocco; Djebil and Sidi Toui National Parks in Tunisia; El-Kouf National Park in Libya; and Mezukai Hazinim, Har Hanegev, Hanahalim Hagdolim, and Masiv Elat Nature Reserves in Israel. The El-Kouf National Park herd is the result of an introduction of 15 gazelles from Sudan. There are probably >300 dorcas gazelles in captivity worldwide, including 108 *G. d. osiris* and 41 *G. d. massaesyla*. Not included in the world total are >240 captive animals in Morocco, most of which are kept at Temara National Zoo, the Royal Farms of Bouznika and Douyiet and the Royal Reserves of Rmila and Souss. A decision is pending on whether or not a captive programme should be implemented for dorcas gazelle or any of its subspecies; nevertheless, conservation measures have been proposed to increase safeguards for threatened wild populations. Areas with existing populations that have been identified for protection include: Adrar Souttouf, the lower Drâa-Aydar, Jbel Grouz, Tafilalt, and the Atlantic plains in Morocco; the western Hauts Plateaux in Algeria; and Jabal Mas'udi and west of the existing Dana Wildlife Reserve in Jordan. In many areas, surveys are needed either to assess the current population status of dorcas gazelles or to identify former range that is suitable for releases of captive-bred animals. Reintroductions are under consideration for the following sites: Chekhar, Outat el Haj, and Tamelelt Hunting Reserves in Morocco; Nefhusa Protected Area in Libya; and the proposed Gharandal Reserve in Jordan. Reversal of its population decline will also require effective protection from poaching, presently the dorcas gazelle's greatest threat, and from habitat loss and feral dog predation, which is a particular problem for gazelles kept in small, fenced reserves.

Appendix 3
IUCN/SSC Action Plans for the Conservation of Biological Diversity

Action Plan for African Primate Conservation: 1986–1990. Compiled by J.F. Oates and the IUCN/SSC Primate Specialist Group, 1986, 41pp. (Out of print.)

Action Plan for Asian Primate Conservation: 1987–1991. Compiled by A.A. Eudey and the IUCN/SSC Primate Specialist Group, 1987, 65pp. (Out of print.)

Antelopes. Global Survey and Regional Action Plans. Part 1. East and Northeast Africa. Compiled by R. East and the IUCN/SSC Antelope Specialist Group, 1988, 96pp. (Out of print.)

Dolphins, Porpoises and Whales. An Action Plan for the Conservation of Biological Diversity: 1988–1992. Second Edition. Compiled by W.F. Perrin and the IUCN/SSC Cetacean Specialist Group, 1989, 27pp. (Out of print).

The Kouprey. An Action Plan for its Conservation. Compiled by J.R. MacKinnon, S.N. Stuart and the IUCN/SSC Asian Wild Cattle Specialist Group, 1988, 19pp. (Out of print.)

Weasels, Civets, Mongooses and their Relatives. An Action Plan for the Conservation of Mustelids and Viverrids. Compiled by A. Schreiber, R. Wirth, M. Riffel, H. van Rompaey and the IUCN/SSC Mustelid and Viverrid Specialist Group, 1989, 99pp. (Out of Print.)

Antelopes. Global Survey and Regional Action Plans. Part 2. Southern and South-central Africa. Compiled by R. East and the IUCN/SSC Antelope Specialist Group, 1989, 96pp. (Out of print.)

Asian Rhinos. An Action Plan for their Conservation. Compiled by Mohd Khan bin Momin Khan and the IUCN/SSC Asian Rhino Specialist Group, 1989, 23pp. (Out of print.)

Tortoises and Freshwater Turtles. An Action Plan for their Conservation. Compiled by the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, 1989, 47pp.

African Elephants and Rhinos. Status Survey and Conservation Action Plan. Compiled by D.H.M. Cumming, R.F. du Toit, S.N. Stuart and the IUCN/SSC African Elephant and Rhino Specialist Group, 1990, 73pp. (Out of print.)

Foxes, Wolves, Jackals, and Dogs. An Action Plan for the Conservation of Canids. Compiled by J.R. Ginsberg, D.W. Macdonald, and the IUCN/SSC Canid and Wolf Specialist Groups, 1990, 116pp.

The Asian Elephant. An Action Plan for its Conservation. Compiled by C. Santiapillai, pp. Jackson, and the IUCN/SSC Asian Elephant Specialist Group, 1990, 79pp.

Antelopes. Global Survey and Regional Action Plans. Part 3. West and Central Africa. Compiled by R. East and the IUCN/SSC Antelope Specialist Group, 1990, 171pp.

Otters. An Action Plan for their Conservation. Compiled by pp. Foster-Turley, S.Macdonald, C. Mason and the IUCN/SSC Otter Specialist Group, 1990, 126pp.

Rabbits, Hares and Pikas. Status Survey and Conservation Action Plan. Compiled by J.A. Chapman, J.E.C. Flux, and the IUCN/SSC Lagomorph Specialist Group, 1990, 168pp.

African Insectivora and Elephant-Shrews. An Action Plan for their Conservation. Compiled by M.E. Nicoll, G.B. Rathbun and the IUCN/SSC Insectivore, Tree-Shrew and Elephant-Shrew Specialist Group, 1990, 53pp.

Swallowtail Butterflies. An Action Plan for their Conservation. Compiled by T.R. New, N.M. Collins and the IUCN/SSC Lepidoptera Specialist Group, 1991, 36pp.

Crocodiles. An Action Plan for their Conservation. Compiled by J. Thorbjarnarson, H. Messel, F.W. King, J.pp. Ross and the IUCN/SSC Crocodile Specialist Group, 1992, 136pp.

South American Camelids. An Action Plan for their Conservation. Compiled by H. Torres and the IUCN/SSC South American Camelid Specialist Group, 1992, 58pp.

Australasian Marsupials and Monotremes. An Action Plan for their Conservation. Compiled by M. Kennedy and the IUCN/SSC Australasian Marsupial and Monotreme Specialist Group, 1992, 103pp.

Lemurs of Madagascar. An Action Plan for their Conservation: 1993–1999. Compiled by R.A. Mittermeier, W.R. Konstant, M.E. Nicoll, O. Langrand and the IUCN/SSC Primate Specialist Group, 1992, 58pp. (Out of print.)

Zebras, Asses and Horses. An Action Plan for the Conservation of Wild Equids. Compiled by pp. Duncan and the IUCN/SSC Equid Specialist Group, 1992, 36pp.

Old World Fruit Bats. An Action Plan for their Conservation. Compiled by S. Mickleburgh, A.M. Hutson, pp.A. Racey and the IUCN/SSC Chiroptera Specialist Group, 1992, 252pp. (Out of print.)

Seals, Fur Seals, Sea Lions, and Walrus. Status Survey and Conservation Action Plan. Peter Reijnders, Sophie Brasseur, Jaap van der Toorn, Peter van der Wolf, Ian Boyd, John Harwood, David Lavigne, Lloyd Lowry, and the IUCN/SSC Seal Specialist Group, 1993, 88pp.

Pigs, Peccaries, and Hippos. Status Survey and Conservation Action Plan. Edited by William L.R. Oliver and the IUCN/SSC Pigs and Peccaries Specialist Group and the IUCN/SSC Hippo Specialist Group, 1993, 202pp.

The Red Panda, Olingos, Coatis, Raccoons, and their Relatives. Status Survey and Conservation Action Plan for Procyonids and Ailurids. (In English and Spanish) Compiled by Angela R. Glatston and the IUCN/SSC Mustelid, Viverrid, and Procyonid Specialist Group, 1994, 103pp.

Dolphins, Porpoises, and Whales. 1994–1998 Action Plan for the Conservation of Cetaceans. Compiled by Randall R. Reeves and Stephen Leatherwood together with the IUCN/SSC Cetacean Specialist Group, 1994, 91pp.

Megapodes. An Action Plan for their Conservation 1995–1999. Compiled by René W.R.J. Dekker, Philip J.K.McGowan and the WPA/Birdlife/SSC Megapode Specialist Group, 1995, 41pp.

Partridges, Quails, Francolins, Snowcocks and Guineafowl. Status survey and Conservation Action Plan 1995–1999. Compiled by Philip J.K. McGowan, Simon D. Dowell, John pp. Carroll and Nicholas J.A.Aebischer and the WPA/BirdLife/SSC Partridge, Quail and Francolin Specialist Group, 1995, 102pp.

Pheasants: Status Survey and Conservation Action Plan 1995–1999. Compiled by Philip J.K. McGowan and Peter J. Garson on behalf of the WPA/BirdLife/SSC Pheasant Specialist Group, 1995, 116pp.

Wild Cats: Status Survey and Conservation Action Plan. Compiled and edited by Kristin Nowell and Peter Jackson and the IUCN/SSC Cat Specialist Group, 1996, 406pp.

Eurasian Insectivores and Tree Shrews: Status Survey and Conservation Action Plan. Compiled by David Stone and the IUCN/SSC Insectivore, Tree Shrew and Elephant-Shrew Specialist Group, 1996, 108pp.

African Primates: Status Survey and Conservation Action Plan (Revised edition). Compiled by John F. Oates and the IUCN/SSC Primate Specialist Group, 1996, 80pp.

The Cranes: Status Survey and Conservation Action Plan. Compiled by Curt D. Meine and George W. Archibald and the IUCN/SSC Crane Specialist Group, 1996, 401pp.

Orchids: Status Survey and Conservation Action Plan. Edited by Eric Hágsater and Vinciane Dumont, compiled by Alec Pridgeon and the IUCN/SSC Orchid Specialist Group, 1996, 153pp.

Palms: Their Conservation and Sustained Utilization. Status Survey and Conservation Action Plan. Edited by Dennis Johnson and the IUCN/SSC Palm Specialist Group, 1996, 116pp.

Conservation of Mediterranean Island Plants. 1. Strategy for Action. Compiled by O. Delanoë, B. de Montmollin, L. Olivier and the IUCN/SSC Mediterranean Islands Plant Specialist Group, 1996, 106pp.

Asian Rhinos: Status Survey and Conservation Action Plan (Second edition). Edited by Thomas J. Foose and Nico van Strien and the IUCN/SSC Asian Rhino Specialist Group, 1997, 112pp.

Wild Sheep and Goats and their relatives: Status Survey and Conservation Action Plan. Edited by David M. Shackleton and the IUCN/SSC Caprinae Specialist Group, 1997, 390pp.

The Ethiopian Wolf: Status Survey and Conservation Action Plan. Compiled and edited by Claudio Sillero-Zubiri and David Macdonald and the IUCN/SSC Canid Specialist Group, 1997, 123pp.

Cactus and Succulent Plants. Status Survey and Conservation Action Plan. Compiled by Sara Oldfield and the IUCN/SSC Cactus and Succulent Specialist Group, 1997, x + 212pp.

Dragonflies. Status Survey and Conservation Action Plan. Compiled by Norman W. Moore and the IUCN/SSC Odonata Specialist Group, 1997, v + 28pp.

The African Wild Dog. Status Survey and Conservation Action Plan. Compiled and edited by Rosie Woodroffe, Joshua Ginsberg and David Macdonald and the IUCN/SSC Canid Specialist Group, 1997, 166pp.

Tapirs: Status Survey and Conservation Action Plan. Compiled and edited by Daniel M. Brooks, Richard E. Bodmer and Sharon Matola and the IUCN/SSC Tapir Specialist Group, 1997, viii + 164pp.

Grebes: Status Survey and Conservation Action Plan. Compiled by Colin O'Donnel and Jon Fjeldså and the IUCN/SSC Grebe Specialist Group, 1997, vii + 59pp.

Crocodiles: Status Survey and Conservation Action Plan, 2nd Edition. Edited by J. Perran Ross and the IUCN/SSC Crocodile Specialist Group, 1998, viii + 96pp.

Hyaenas: Status Survey and Conservation Action Plan. Compiled by Gus Mills and Heribert Hofer and the IUCN/SSC Hyaena Specialist Group, 1998, vi + 154pp.

North American Rodents: Status Survey and Conservation Action Plan. Compiled and edited by David J. Hafner, Eric Yensen, Gordon L. Kirkland Jr., and the IUCN/SSC Rodent Specialist Group, 1998, x + 171pp.

Deer: Status Survey and Conservation Action Plan. Compiled by C. Wemmer and the IUCN/SSC Deer Specialist Group, 1998, vi + 106pp.

Bears: Status Survey and Conservation Action Plan. Compiled by C. Servheen, H. Herrero and B. Peyton and the IUCN/SSC Bear and Polar Bear Specialist groups, 1998, x + 306pp.

Conifers: Status Survey and Conservation Action Plan. Compiled by A. Farjon and C.N. Page and the IUCN/SSC Conifer Specialist Group, 1999, ix + 121pp.

African Rhino: Status Survey and Conservation Action Plan. Compiled by R. Emslie and M. Brooks and the IUCN/SSC African Rhino Specialist Group, 1999, ix + 92pp.

Curassows, Guans and Chachalacas: Status Survey and Conservation Action Plan 2000–2004. Compiled by D.M. Brooks and S. D. Strahl and the IUCN/SSC Cracid Specialist Group, 2000, viii + 182pp.

Megapodes: Status Survey and Conservation Action Plan 2000–2004. Edited by René W.R.J. Dekker, Richard A. Fuller and Gillian C. Baker on behalf of WPA/BirdLife/SSC Megapode Specialist Group, 2000, vii + 39pp.

Parrots. Status Survey and Conservation Action Plan 2000-2004. Edited by Noel Snyder, Philip McGowan, James Gilardi, and Alejandro Grajal, 2000, x + 180pp.

West Indian Iguanas. Status Survey and Conservation Action Plan. Compiled by Allison Alberts. IUCN/SSC West Indian Iguana Specialist Group, 2000, vi + 111pp.

Grouse. Status Survey and Conservation Action Plan 2000–2004. Compiled by Ilse Storch. WPA/BirdLife/SSC Grouse Specialist Group, 2000, x + 112pp.

Pheasants. Status Survey and Conservation Plan 2000-2004. Edited by Richard A. Fuller and Peter J. Garson on behalf of the WPA/BirdLife/SSC Pheasant Specialist Group, 2000, viii +69pp.

Mosses, Liverworts, and Hornworts. Status Survey and Conservation Action Plan for Bryophytes. Compiled by Tomas Hallingbäck and Nick Hodgetts. IUCN/SSC Bryophyte Specialist Group, 2000, x + 106pp.

Partridges, Quails, Francolins, Snowcocks, Guineafowl, and Turkeys. Status Survey and Conservation Action Plan 2000-2004. Edited by Richard A. Fuller, John P. Carroll, and Philip J.K. McGowan on behalf of the WPA/BirdLife/SSC Partridge, Quail, and Francolin Specialist Group, 2000, vii + 63pp.

Microchiropteran Bats: Global Status Survey and Conservation Action Plan. Compiled by A.M. Hutson, S.P. Mickleburgh and P.A Racey. IUCN/SSC Chiroptera Specialist Group, 2001, x + 258 pp.

Other IUCN/SSC Publications

IUCN Red Lists of Threatened Animals and Plants

Red Lists are lists of all animal or plant species and subspecies that have been assessed according to the IUCN Red List Categories and Criteria. For each species, the category of threat and relevant criteria are shown, together with the range of states in which the species occurs.

IUCN Policies and Guidelines

Policies and Guidelines are short, A5 size booklets offering scientifically-based conservation principles and guidelines to aid decision-making at both the global and national level.

Monographs (arranged by topic)

- CITES
- Crocodiles
- Educational Booklets on Mammals
- Marine Turtles
- Plants
- Trade
- Others

Occasional Papers Series

Occasional Papers include overviews on the conservation status of species and proceedings of meetings.

A more detailed list of IUCN/SSC publications is available from the SSC Office, Rue Mauverney 28, CH-1196 Gland, Switzerland.
Tel: +41 22 999 0150, Fax: +41 22 999 0015,
E-mail: mcl@hq.iucn.org

Executive Summary

The Antelope Specialist Group (ASG) established the Global Antelope Survey to determine the distribution and status of the world's antelope species and to identify conservation priorities. The first three parts covered the countries of sub-Saharan Africa. This final part covers North Africa, the Middle East, and Asia. This region contains 37 countries in which antelopes occur or recently occurred, and the individual country accounts form the major part of this report. Less than one quarter of the world's antelope species are found within this region, in habitats varying from subtropical forests to cold desert plateaux. Herds numbering in the tens of thousands formerly occurred across the steppes and semideserts of Eurasia and India, but these have nearly all been reduced to fractions of their earlier size, and antelope populations are fragmented across the region. Five species currently have populations exceeding 100,000, while several others are highly threatened. Several species have disappeared altogether from the region during recent decades, and the principal challenge facing antelope conservation in the 21st century is to ensure that other species whose status is currently precarious do not follow them into extinction.

Threats facing antelopes in the region include hunting, loss of habitat, population fragmentation, inadequate protected area coverage, poorly developed administrative structures, under-resourcing of conservation programmes, and lack of enforcement of existing legislation. In addition, details of distribution and status of many taxa are unclear, and little is known of the ecology of several species. Hunting remains the most significant threat, frequently leading to a mass slaughter, which has extirpated populations and even whole species across the region during the second half of this century. Protected area coverage in some countries is excellent, but is poor or non-existent in others and the present system does not adequately protect all antelope species. An important step towards long-term conservation of the region's antelopes would be to implement the detailed recommendations for extensions to the protected area system made in each country report.

Rising human population growth and economic development constantly increase pressure on land and natural resources. There is a consequent need for integrated rural development and community-based conservation projects, which have the full participation of local people at both the planning and execution stages. These should ensure that the material benefits of conservation programmes are made available to local people. A determined effort will have to be made through education programmes to persuade people of the need for conservation of antelopes.

Successful captive-breeding schemes exist for many species and reintroductions of antelopes into their former ranges have begun to reverse the declining trend, but many more such projects are needed. Actions to conserve antelope populations are listed in each country report and summarised in the Regional Action Plan. Above all, these measures need full financial support and considerable political will to implement them.

ISBN: 2-8317-0594-0

This Action Plan is available from:
IUCN Publications Services Unit
219c Huntingdon Road, Cambridge, CB3 0DL, United Kingdom
Tel: +44 1223 277894. Fax: +44 1223 277175
E-mail: info@books.iucn.org
WWW: http://www.iucn.org/bookstore

Price: £20.00 or **$30.00** + postage & packing
(20% overseas surface, 30% Europe air, 40% overseas air)

A catalogue of IUCN publications is also available.