

The Newsletter of the IUCN/SSC Mollusc Specialist Group  
Species Survival Commission • IUCN - The World Conservation Union

# TENTACLE



## Editorial

The international Convention on Biological Diversity so hotly debated at the 'Earth Summit' in Rio in 1992 has now been ratified by more than 60 states, and the list is still growing. Because it explicitly refers to the species level of biological diversity, the convention should be of direct concern to us in the Species Survival Commission. As the biotechnology and bioengineering aspects of the convention appear to attract much attention from governments in both the developed and developing world, we may worry whether the rest of the convention will really have an impact on species and habitat losses occurring worldwide. As Mike Hadfield puts it in this issue of the newsletter, the conservation of species of invertebrates seems so remotely concerned by the higher politics of conservation!

Biological control by *Euglandina* has been a recognized agricultural failure and ecological disaster, but the lesson has not been learnt. The latest trend in Pacific Island biological control is the use of the flatworm *Platydemus manokwari*. As for its predecessor *Euglandina rosea* 20 years ago, well intentioned agriculture experts are recommending its introduction to Pacific islands to "eat out" the Giant African snail pest *Achatina fulica*. Like its predecessor *Euglandina*, *Platydemus* is not species-specific and eats all sorts of snails in sight, including the native endemic land snails of the Pacific islands.

The islands of the Pacific encapsulate the problems faced by land snails worldwide: narrow-range endemism, loss of habitat, competition with alien species. We therefore more than welcome the *Partula* Propagation Group, with its name now changed to Pacific Island Land Snail Group, as a member of our Mollusc Specialist Group. *Partula* species from Moorea and *Achatinella* from Hawaii are certainly the two best known examples of land snail extinctions outside malacological circles. Members of the former *Partula* Propagation Group are breeding species in captivity that are now extinct in the wild. Although captive breeding can hardly be considered as the key to all land snail conservation, the Group has actually saved from extinction the gene pool of two dozen species. The new name Pacific Island Land Snail Group more appropriately reflects the range of the group's work. One of their future tasks will be assistance with the

Pacific section of the MSG Action Plan. An application has been presented to the Sir Peter Scott Memorial Trust for funds to help with the preparation of this Action Plan for Land and Freshwater Molluscs. The application is currently being reviewed by IUCN. If funding is approved, we hope to have a substantial draft ready for the 12th International Malacological Congress in September 1995 in Vigo (Spain).

We are very grateful to Shell International who have taken on production of the newsletter. This will save the MSG much time and money and, as a result, we hope to be able to produce two issues a year. Robert Cowie, of the Bishop Museum in Honolulu, has kindly agreed to take on the editorship. So it looks as if the MSG has a regular means of communication, as well as a vehicle for raising public awareness about mollusc conservation. The next issue will be in the autumn. Please send in your contributions, preferably on diskette to: Dr Robert Cowie, Department of Natural Sciences, Bishop Museum, 1525, Bernice St., P.O. Box 19000A, Honolulu, Hawaii 96817-0916. Tel. 808-848-4118, Fax 808-841-8968.

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The MSG will be re-appointed in June this year for the next IUCN tri-ennium (1994-1996). Current members of the group are listed on the back page. As described in previous issues, membership is by invitations and carries certain obligations. However, we welcome contributions and interest from all malacologists and those concerned about mollusc conservation.

We now have a sub-group, the Pacific Island Land Snail Group. This has evolved out of the Partula Propagation Group, which has been very successful in its efforts on behalf of threatened Partulidae, and is now expanding to take on other species groups in the region. The new name more appropriately reflects the range of the group's work, and one of their future tasks will be assistance with the Pacific section of the MSG Action Plan for Terrestrial and Freshwater Molluscs. This has got off to a slow start, but we will shortly have funding for a part-time assistant for this project. We will keep all those who are interested informed.

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## IUCN AND MOLLUSC SPECIALIST GROUP NEWS

The new IUCN threat categories and criteria were mentioned briefly in *Tentacle* 3. These have still to be approved, and are undergoing final modifications. The 1994 IUCN Red List (see below) uses the old list, but it is expected that the new categories will be introduced over the next couple of years. We will print the new categories in *Tentacle* once these have been finalised.

### Proceedings of the Alan Solem Symposium on the diversity and conservation of the Mollusca

This symposium took place in the course of the 1992 International Malacological Congress and involved a number of members of the MSG. The proceedings are nearing completion, most diskettes having been translated into texts conforming to certain uniform standards. This is a very labour-intensive job (particularly the references and tables!), requiring extensive correspondence between myself and Theo Kemperman (now at the Zwolle natural history museum). Papers will shortly be returned to the authors for their approval, after which the camera-ready copy will be delivered to the printers. The book should be published before the end of the year. We have received

two grants which will ensure that the book is published at a very reasonable price for congress participants and Unitas Malacologica members, and for a reasonable price for non-members and the public at large. Please be patient and bear with us.

A.C. van Bruggen, Rijksmuseum van Natuurlijke Historie, Leiden

### Proceedings of 1986 Edinburgh symposium on threatened molluscs

These will be published this year by IUCN, with 'A framework for mollusc conservation', an outline action plan compiled by Alison Kay.

## 1994 IUCN RED LIST

The 1994 IUCN Red List of Threatened Animals was published at the beginning of this year in time for the IUCN General Assembly. We are very grateful to the many people who contributed their time, in some cases, substantial, to providing information to up-date the mollusc section. The following is a very rough summary of the current list; please check the Red List itself before quoting any of the figures given below. It can be obtained from IUCN Publications Services Unit, 219c Huntingdon Rd, Cambridge CB3 0DL, UK, Fax (44) 223-277175, price £15 (\$30); postage and packing add 15% (UK), 20% surface mail abroad, 30% airmail Europe, 40% airmail elsewhere. Members of IUCN receive a 30% discount.

Tables 1 and 2 compare the 1990 and 1994 listings of extinct and threatened molluscs respectively. The number of listed extinct species has increased from 56 in 1990 to 284 in 1994 (a five-fold increase); and threatened species have increased from 409 in 1990 to 1319 in 1994 (a three-fold increase). Although there will have been increased threats and pressure on molluscs over this period, the main reason for these changes is that a great deal more information has become available.

For several countries and states, such as Australia, USA, Hawaii, and a number of European countries, we now have fairly good overviews. Several Australian malacologists, co-ordinated by Winston Ponder, collated available information for their country, and revealed a large number of species with small ranges at risk. North American figures have not changed greatly, but the Red List is now more representative of the Candidate list for the US Federal Register, having been checked by Arthur Bogan and Barry Roth. The Hawaiian list is also fairly complete, including a large number of species on the database maintained by The Nature Conservancy. Numerous malacologists helped to review the European species listed and there have been several changes. For example, it has long been recognised that only a few of the Madeiran threatened species have been listed, and this has now been rectified.

Many more Pacific islands species are now on the list.

including large numbers from Guam (unfortunately absorbed into 'other' species in Table 2), the Federated States of Micronesia and Palau, identified by Barry Smith, and particularly threatened by the introduced flatworm (see below). It was also decided to list the species from the Cook Islands and French Polynesia that Solem considered to be at risk in his monographs, even though we do not have information on their current status. A number of Mascarene Island species are now also listed, thanks to the work of Owen Griffiths and Collette Stevanovitch. Many other colleagues assisted in the review, and we regret that we do not have the space to list them all.

Revision of the IUCN Red List is an on-going activity; for example, the Partulidae listed in the 1994 edition have already been revised. However, these new figures provide us with some ammunition for convincing conservation organisations, decision-makers and the public that molluscs need urgent attention if an important element of biodiversity is not to be lost.

**Table 1.**  
Comparison of 1990 and 1994 listings of extinct species

Region	1990	1994
French Polynesia	7	76
Hawaiian Islands	26	61
USA	21	40
Japan (Bonin Islands)		24
St Helena		22
Mascarenes		21
Cook Islands		14
Madeiran Islands		13
Europe		8
Other	2	5
<b>Total</b>	<b>56</b>	<b>284</b>

## THE CRISIS IN INVERTEBRATE CONSERVATION

Symposium held at the Annual Meeting of the American Society of Zoologists and the Canadian Society of Zoologists 27-30 December, 1992, Vancouver, British Columbia

We are reprinting here, with permission, the introduction by Mike Hadfield of the proceedings of the symposium,

**Table 2.**  
Comparison of 1990 and 1994 threatened species listings

Region	1990	1994
<b>Terrestrial</b>		
Achatinellidae	Hawaii	24 65
Bulimulidae	Galapagos	31 29
Partulidae	Pacific	9 24
Other land snails	Australia	1 175
	Europe	26 95
	Madeiran Islands	16 63
	N. America	51 53
	FSM	52
	Japan (Bonin Is)	38
	Canary Islands	21 30
	Palau	51
	Reunion	15
	New Zealand	11 12
Other	6 113	
<b>Sub-total</b>	<b>196</b>	<b>815</b>
<b>Freshwater</b>		
Unionidae	N. America	74 100
	Europe	5 7
Hydrobiidae	N. America	44 95
	Europe	30 95
	Australia	3 93
	Mexico	12 12
	Other	3 6
Pleuroceridae	N. America	13 50
	Other	16 32
<b>Subtotal</b>	<b>200</b>	<b>490</b>
<b>Marine</b>		<b>13 14</b>
<b>Total</b>	<b>409</b>	<b>1319</b>

published in *Amer. Zool.* 33: 497-630. Titles of the papers that specifically refer to molluscs are listed on the back page.

### Introduction to the Symposium

Michael G. Hadfield

Invertebrates - found in some 30 animal phyla - make up more than 95% of animal species. More than 99.9% of animal individuals are invertebrates, and some equally overwhelming percentage of animal biomass. Invertebrates are critical links in virtually every major food-chain type, and there are major ecosystems dominated by invertebrates. Invertebrate species are critical links in virtually every major food-chain type, and there are major ecosystems dominated by invertebrates. Invertebrate species are disappearing in great numbers from nearly all habitats, and entire

invertebrate biotas have probably already vanished from the earth. Because the world appears to be almost completely ignoring this mass extinction, we find a crisis in invertebrate extinction to exist within the generally recognized problem of declining biodiversity. What evidence is there that the passing of large numbers of invertebrate species is occurring without notice? In the last two years we have watched hours of television news coverage of the Exxon Valdez oil spill in Alaska and the crude-oil coated shores of the Gulf of Suez caused by the rupture of petroleum lines during the 1991 Gulf War. The newscasts featured oil-coated birds and suffering otters and talked of losses to fisheries, but rarely hinted at the devastation that had to be occurring among coastal invertebrates - sea urchins, mussels, snails, barnacles and the like - a resource on which all the rest depended. *Newsweek Magazine* on 22 June 1992, devoted a lengthy cover story to "The rape of the Ocean". In eight pages, the only invertebrates mentioned, and these were in the breadth of a sentence, were edible clams and oysters, despite the available evidence that entire invertebrate faunas have been destroyed in coastal estuaries throughout the world, that ocean drift nets lay waste to vast numbers of oceanic squid, and that over-harvesting is already becoming a problem for many new invertebrate fisheries.

The scientific literature offers no reassurance that the rapid disappearance of invertebrates is drawing adequate attention. A search of titles in major conservation journals for the three years preceding mid-1992 revealed that less than 10% of articles in either *Biological Conservation* or *Conservation Biology* addressed issues of invertebrate conservation, and in *Oryx*, the journal of the Fauna and Flora Preservation Society, there was not a single article on invertebrates among the 42 titles in the 1989 and 1990 volumes. All of the invertebrate studies that were published in the aforementioned conservation journals were devoted to insects.

Even obtaining funding for conservation-biological research on invertebrates has been fraught with difficulty because of the popularly held idea that generalizations learned from such research must lead to the preservation of birds, mammals and orchids. Unless they have altered their program in recent years, the World Wildlife Fund U.S.A. does not even have a program under which they can support work on invertebrates!

Recognition of the occurrence and growth of the crisis in invertebrate extinction precipitated this symposium. The intent was to expose conservation problems across as many invertebrate types and habitats as possible. This has been achieved. The accompanying papers treat animals in five of the largest invertebrate phyla, and also consider the habitats occupied by most other invertebrate phyla. They show that the threats are real, and arise from a multiplicity of causes including total habitat destruction, pollution, introduced species, and overharvesting. From the open oceans to the mountains,

in marine, fresh-water and aerial habitats, large invertebrate taxa have already vanished, and many more are seriously endangered. It is hoped that the publication of these papers will serve to awaken both the scientific and political communities to the dimensions of the crisis and the serious consequences that will fall if invertebrate extinctions do not soon receive the attention devoted to pandas, condors, rhinoceroses and a few plants.

We are grateful for the sponsorship of this symposium by the Divisions of Invertebrate Zoology and Ecology of the American Society of Zoologists. Critical support for participant travel to the symposium and its publication was provided by a grant from the National Science Foundation (DEB-9202626).

## LAND SNAILS OF THE GULF OF GUINEA ISLANDS

The four volcanic islands of Bioko, Príncipe, São Tomé and Annobon in the Gulf of Guinea have unique endemic snail faunas that are now coming under threat from changing land use associated with the privatisation of cocoa and coffee plantations and the development of small-scale farming.

Bioko, which, with Annobon, forms part of Equatorial Guinea, is the largest of the four islands and the nearest to the African mainland (32 km). During the last ice age when the sea level was 100 metres lower than at present, this island was connected to the continent. As a result its snail fauna has the lowest rate of endemism of the four islands (see Table), with only one endemic monospecific sub-genus (van Bruggen 1982). The other three islands are true oceanic islands and show far higher rates of endemism.

Only Príncipe and São Tomé (forming the Democratic Republic of São Tomé e Príncipe) have endemic taxa above the species level. Príncipe has one endemic genus, *Columna*, represented by three species as well as the type species of the genus *Bocageia* (*B. lotophaga*, otherwise only found on São Tomé, Mt Ruwenzori and the Comoros islands. São Tomé has the most unusual fauna with four monospecific genera, a further endemic genus, *Pyrgina*, with two species and the monospecific family *Thyrophorellidae* (Girard 1895, Merton 1993). This latter is unique in the world of gastropods in that it possesses an operculate flap, a hinged part of the shell that closes when the animal retracts. São Tomé and Príncipe are also home to the endemic giant snail, *Archachatina bicarinata*, which has long been an important food item on the islands. Annobon, the smallest (17 km<sup>2</sup>) and most isolated of the islands (340 km from the continent), has sixteen species of which nine are endemic.

São Tomé e Príncipe is currently following a Structural Adjustment Program in which land privatisation is an important component. This is leading to the most radical

changes in land use since the introduction of coffee and cocoa in the 19th century. At that time it appears that many species managed to adapt to plantation agriculture as both crops were grown under shade trees. Current changes in land use have led to the development of small farming, typical crops being cabbage, potato, carrots and pineapple. Although there is a clear need for the country to reduce its dependence on expensive food imports, such farming has resulted in the clearing of both primary and secondary forest and a reduction in suitable snail habitat. Attempts are also being made to rejuvenate the coffee sector using varieties that do not require shade trees.

Recent introductions to at least three of the islands may also pose a threat to the endemic fauna. On São Tomé *Archachatina marginata*, introduced since the first gastropod collecting at the beginning of the 20th century, is now far more common than the endemic *A. bicarinata*, which appears to be on the decline.

The islands have now come to the attention of conservationists due to the high degree of endemism across a number of taxonomic groups (birds, plants, bats etc.). The protection of large areas of primary lowland and montane forest is now planned. In both countries the European Union-funded ECOFAC project is involved in the delimitation of protected zones, the rational use of forest resources and conservation education. Until now the islands' snail faunas have been somewhat neglected and work on the ecology and distribution of the endemic snails is urgently needed to ensure that important habitats receive adequate protection and to monitor the effects of land use changes. Four species have been included in the new Red List including *A. bicarinata* and *Thyrophorella thomensis*. Distribution and monitoring work on these species is of particular importance. Very little systematic work has occurred since the faunas were first described at the end of the 19th and beginning of the 20th centuries. A revision of the fauna using modern techniques is therefore required.

The following is a selection of key publications on Gulf of Guinea land snails and conservation issues:

Bruggen, A.C. van (1982) A revision of the African operculate land snail genus *Matzaniella* (Gastropoda Prosobranchia: Matzaniidae), with the description of six new taxa. *Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen* C 85:179-204.

Fa, J.E. (1992) Conservation in Equatorial Guinea. *Oryx* 26(2):87-94.

German, L. (1912) Mollusques terrestres et fluviatiles recueillis par M. L. Fea pendant son voyage à la Guinée portugaise et à l'île du Prince. *Annali del Museo Civico di Storia Naturale Giacomo Doro* Ser. 3 5(45):335-399.

Girard, A.A. (1893) Revision de la faune malacologique des St. Thomé et du Prince. *Jornal de Sciencias mathematicas, physicas e naturaes* Ser. 2 3:28-42, 95-114.

Girard, A.A. (1894) Mollusques terrestres et fluviatiles de l'île d'Anno-Born (Golté de Guiné). *Jornal de Sciencias mathematicas, physicas e naturaes* Ser. 2 3:198-208.

Girard, A.A. (1895) Sur le *Thyrophorella thomensis*. *Greeff - Gastropode*

terrestre muni d'un faux opercule à charnière. *Jornal de Sciencias mathematicas, physicas e naturaes* Ser. 2 4:28-32.

Jones, P.J. Burlinson, J.P. and Tye, A. (1991) *Conservação dos ecossistemas florestais na República Democrática de São Tomé e Príncipe*. IUCN.

Jones, P. J. & A. Tye (1988). A survey of the avifauna of São Tomé e Príncipe. International Council for Bird Preservation (ICBP) Study Report No. 24, 64 pp.

Merton, C. (1993) Shell shock - the snail with style. *BBC Wildlife* November.

Ortiz de Zárate López, A. (1951) Contribuciones al conocimiento de la fauna malacológica terrestre de la isla de Fernando Poo. I. Trochaxonites. *Boletín de la Real Sociedad Española de Historia Natural Sección Biológica* 49:101-121.

Ortiz de Zárate, A. and Alvarez, J. (1960) Resultados de la expedición Peris-Alvarez a las islas de Annobón (Guinea Española). I. Los Gastrópodos Terrestres. *Boletín de la Real Sociedad Española de Historia Natural Sección Biológica* 58:87-103.

Ortiz de Zárate López, A. and Ortiz de Zárate Rocandio, A. (1956) Contribuciones al conocimiento de la fauna malacológica terrestre de la isla de Fernando Poo. II. Familia Streptaxidae. *Boletín de la Real Sociedad Española de Historia Natural Sección Biológica* 53:75-140

Ortiz de Zárate López, A. and Ortiz de Zárate Rocandio, A. (1959) Descripción de los moluscos terrestres de la isla de Fernando Poo. Familia Achatinidae. Madrid: Instituto de Estudios Africanos.

**Table 1.**  
Species numbers and rates of endemism in the Gulf of Guinea islands

Island	Total species	Single to Gulf of endemics		Endemic endemics		Total %
		No.	%	No.	%	
Bioko	>99	50	50	2	2.0	52
Príncipe	32	19	59.4	6	18.8	78.2
São Tomé	39	25	64.1	5	12.8	76.9
Annobon	16	9	56.3	3	18.8	75.1

Angus Gascoigne, Sao Tome e Principe

## PARTULID PAGE

### Report on International Partula Workshop London Zoo, 11-13 February 1993

This year's annual meeting of the Partula Propagation Group took the form of a three-day workshop during which a review of the entire Partulidae family (Eua - four species; *Samoana* - 23 species; *Partula* - over 100 species) was carried out. The aim was to produce a Global Animal Species Plan (GASP) i.e. a review of the taxon both in the wild and in captivity with recommendations for conservation action. It was felt important that the whole group should be looked at, as it is now certain that many more species need to be

included in the breeding programme if extinctions are to be kept to a minimum.

The 30 or so workshop participants included geneticists, scientists working on *Partula* and *Achatinella* (species of which are being bred in Hawaii), members of IUCN's Captive Breeding Specialist Group (CBSG) and Mollusc Specialist Group, and representatives of the zoos taking part in the *Partula* propagation programme and of a number of interested institutions. Three working groups were set up to tackle the key issues.

### 1. Wild Species Review

Using a system developed by the CBSG, each taxon was assessed across a range of criteria to determine its status and distribution, threats and required conservation action. The quality of the data on which these assessments were made was also recorded (e.g. scientific study, extrapolation, anecdotal). The 1994 IUCN Red List lists 24 partulids as threatened and 48 as extinct in the wild. Despite the knowledge gaps and lack of recent field data for many species, sufficient information was available to make major amendments to this list. Using the new IUCN categories and criteria (see Tentacle 3) 40 species are considered to be extinct, 31 Critical, 5 Endangered and a further 45 are of serious concern but lack sufficient information to be assigned a category.

As well as predatory snails, there is a major new threat to partulids: the New Guinea flatworm *Platydemus manokwari* which is rapidly being introduced throughout the Pacific (see below - news items to come from Lu Eldredge). A statement of concern was produced regarding the continued predator threat and resultant species loss. On a more positive note, it is possible that *Euglandina* has not arrived on the Marquesas Islands. This group of islands has seven endemic partulids, second only to the radiation of the now virtually extinct Society Island partulids. There may yet be time to study the Marquesan species in the wild, as well as to establish captive breeding populations.

### 2. Captive populations analysis

A total of 24 *Partula* species are now being bred in captivity, in a programme involving some 14 collections. The results of the wild species reviewed indicated that a further 53 species need to be brought into the captive breeding programme, assuming that wild populations still exist from which collections can be made. The working group reviewed current husbandry methods, diets, and other aspects of the breeding programme and how these relate to numbers of species and individuals being reared. The target adult population for each species, including those still to be added to the programme, has been put at 300 adults, and the means by which these could be held by the various institutions involved were resolved.

### 3. Genetic Studies

The 24 species in the breeding programme come from

over 100 different populations (separate valleys and/or collecting sites), which makes their management very difficult. However, without some indication of the genetic significance of each population, amalgamations cannot be carried out. Genetic profiles of each population will be prepared using molecular genetic techniques, by scientists at the Institute of Zoology (Zoological Society of London - ZSL) and the universities of Oxford and Nottingham. This will provide the basis for a molecular phylogeny for the whole family from species down to population level and will permit objective judgements to be made about amalgamating populations. Some of the necessary genetic analysis will be carried out through the database 'CERCI' maintained at ZSL which holds detailed demographic records of all captive *Partula* species.

A number of other issues were discussed during the workshop, such as re-introduction plans, predator control methods (see below), and the recent establishment of a colony of captive-bred *Partula* onto Polynesian plants at Kew Gardens.

The full workshop report will shortly be available; copies may be obtained from Paul Pearce-Kelly, Invertebrate Conservation Centre, Zoological Society of London, Regents Park, London NW1 4RY, UK. Fax 071-722-4427.

Many thanks to Sarah Anderson and Paul Pearce-Kelly for their contributions.

### Status of Partulidae in the Society Islands

The French Polynesian Partulidae are the best known victims of introductions of the carnivorous snail *Euglandina rosea*. This species was introduced to Tahiti and Moorea in the 1970s and unofficial introductions were made in the 1980s to Bora-Bora, Raiatea and Tahaa. Partulidae have been described from all these islands, as well as from Huahine, which is at present the only island in the Society Islands free from *E. rosea*. It is highly probable that *E. rosea* will reach Huahine in the near future, either by deliberate introduction or by accidental transport. Partulids do not co-exist with *E. rosea*, and invasion of partulid habitat by this predator leads to prey extinction within a few weeks. This has resulted in the extinction of partulids from most of Tahiti, Moorea, Bora-Bora and Raiatea. Tahaa has not been surveyed but is presumed to be in the same situation.

There appears to be a relationship between *E. rosea* presence and altitude, and invasion does not seem to occur where temperatures fall below 10°C. This may mean that Partulidae will persist on the higher parts of these islands. Calculations of altitude-temperature relationships predict that *E. rosea*-free habitat might just possibly exist on the higher parts of Tahiti, Moorea and possibly Raiatea.

The status of *Partula* in the Society Islands is shown in Table 1. Four *Samoaana* species have also been affected by *E. rosea*: *S. diaphana* and *S. solitaria* are extinct on Moorea; *S. connectens* is endangered on

Huahine, and *S. attenuata* is Critical, occurring on several islands but probably only persisting at high altitudes.

**Table 1. Status of *Partula* in the Society Islands (Ex = extinct, Ex? = possibly extinct, C = Critical, E = Endangered).**

	Ex	Ex?	C	E	Total
Tahiti	0	6	1	0	7
Moorea	7	0	0	0	7
Bora-Bora	1	0	0	0	1
Raiatea	26	0	7	0	33
Tahaa	0	6	0	0	6
Huahine	0	0	0	3	3
<b>Total</b>	<b>34</b>	<b>12</b>	<b>8</b>	<b>3</b>	<b>57</b>

In addition to the Partulidae, two other species are threatened by *E. rosea*: *Trochomorpha trochiformis* (possibly not a single species but a species group) and the euconulid *Diastole conula*. Both were found on more than one island and survived at high altitude on Raiatea in 1992. *D. conula* is considered Critical as it has not been recorded from Huahine, the only island without *E. rosea*. *T. trochiformis* occurs on Huahine and thus is Endangered. Neither are included in the captive breeding programme at present. Current information, therefore, indicates that *E. rosea* in the Society Islands has caused the probable extinction of 50 species in the wild (of which only 8 are represented in captive colonies), with a further 15 becoming endangered, 10 critically so.

Numerous other endodontids, euconulids and charopids have not been seen in the Society Islands in recent years. The cause of this apparent decline is not known as it seems to apply equally to *E. rosea* free areas as to known areas of invasion. The need for further survey work is clear.

Justin Gerlach, Wadham College, Oxford, UK.

### A toxic bait for *Euglandina rosea*

An apple snail, *Pomacea* sp., is being used to make a toxic bait for *Euglandina rosea* in Hawaii. Several *Pomacea* species have been introduced to Hawaii, where they have become major pests in commercial taro ponds. Their rate of reproduction is prodigious, and it is possible to collect hundreds from a single pond very rapidly. It is likely that we have used more than one

species in preparing our *Euglandina* bait. The snails can be frozen (in their shells) for later use.

The shells are removed (apple snail shells are easily broken) and the snails are ground to a uniform soup in a blender. To this is added, by per cent weight of the apple-snail puree, 2% metaaldehyde (a standard molluscicide used in garden slug and snail baits) and 5% propionic acid (a common food preservative, added to prevent putrefaction of the pellets when rewetted). The additives are mixed thoroughly with the snail puree, and the mixture is measured into small plastic tubes (diameter about 0.75 cm) in 1 ml quantities. These are then lyophilized to form dry pellets which can be easily removed from the containers and stored in a freezer.

The *Pomacea* flesh provides an attractant for predatory snails. In the laboratory, hungry *E. rosea* will eat bait pellets placed on a moist filter-paper disc and die within 24 hours. Not all trials led to death, and this probably varies with the nutritional state of the snail as well as the condition of the pellet. Even with propionic acid, pellets begin to grow mold in 3-4 days.

In the field, bait is being applied only very locally around trees where we are attempting to establish new colonies of endangered species with snails propagated in the laboratory. These are at relatively remote forest sites. Several bait pellets are placed in a small mound on the ground and covered with small platform-covers, constructed by driving 4-inch nails through each corner of one-foot squares of quarter-inch plywood. The cover is about 1 inch above the ground, and should provide shady places attractive to *E. rosea* (they seek darkness during the day), and protect the bait from most birds and mammals other than small rodents - if rats are killed by the bait, this would be a welcome side effect in Hawaii. The effectiveness of this method is currently being tested.

### Cautionary notes:

1. Hawaii is fortunate perhaps in having no native predatory snails, so there is little worry that other endemic snails would be killed. In other areas, this bait or method of baiting may be unacceptable, if native predatory snails are likely to be killed. Snails that are not normally predators may also be attracted by the bait, particularly 'generalist' ground-dwellers. Laboratory tests showed that *Bradybaena similis*, which eats a broad spectrum of decaying plant and animal materials, was killed by the bait.

2. The toxic effects of metaaldehyde are not limited to molluscs. In laboratory tests, endemic Hawaiian *Drosophila* spp were found to eat the bait and die. However, if given a choice of bait or almost any form of rotting plant material, they never touch the bait and survive for long periods in its presence. Anyone planning to use the bait in the field should make certain that they will not affect native arthropods.

3. Metaaldehyde is about the most common source of



poisoning in cats and dogs, although the literature suggests that it is rarely lethal. However, care should be taken to keep bait away from them.

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### Introductions and transfers of the triclad flatworm *Platydemus manokwari*

*Platydemus manokwari*, described by Beauchamp in 1963 from the Dutch New Guinea agricultural research station at Manokwari, is a known predator of the giant African snail, *Achatina fulica*. As a supposedly effective gastropod predator, this flatworm has been intentionally and unofficially transported as a biological control agent and now poses a serious threat to native gastropod fauna.

The flatworm appeared in large numbers on Guam in 1978 and had spread throughout most of the island by 1980, where it is a serious threat to the endemic Mariana Island Partulidae, as well as ground-dwelling endemics. It has been observed preying on both juvenile and adult partulids at heights above one metre in trees; and in captivity *P. manokwari* will feed on both *Partula* and *Pythia* specimens. The flatworm was established on Saipan by 1981, was reported from Tinian in late 1984, Rota in late 1988 and Aguijan in late 1992. It was reported from Koror, Palau in 1991 and observed at Ulong in 1992. Specimens have also been found in leaf litter in the cloud forest on Pohnpei in 1993 at elevations above 675 metres.

Its impact on snail populations elsewhere is less well documented but there is cause for concern. In late 1981 and early 1982, 150 specimens were intentionally taken to Bugsuk Island (off Negros), south of Palawan, in the Philippines for giant African snail control; after 20 months control was considered effective. In 1985, two specimens were found in a garden in Manila.

Specimens collected from Bugsuk Island and Saipan were transported to the Maldives in mid-1985 where they were released at several sites and successfully spread. Some 200 specimens were taken to Bugsuk to Yokohama in 1984; their status is unknown. A considerable number of specimens were found in southern Okinawa Island in the fall of 1990 and were later observed at several other sites. It has been reported feeding on some 17 snail species here. Outside the western Pacific insular areas, *P. manokwari* was thought to be well established in 1987 in northern Queensland between Townsville and Cairns, exclusively in man-modified areas. In late 1992, specimens were first collected on Oahu, and subsequently individuals have been collected at other sites.

Information about the distribution and biology of *P. manokwari* is being collated for a fuller report on the spread of this species. If you can help, please contact:

L.G. Eldredge.

Pacific Science Association, P.O. Box 17801, Honolulu, Hawaii 96817 [Internet: psa@bishop.bishop.hawaii.org] or B.D. Smith, Marine Laboratory, University of Guam, UOG Station, Mangilao, Guam 96923 [Internet: bdsmith@uog9.uog.edu].

## MARINE MATTERS

A proposal is being drafted in Australia to list the Giant Triton *Charonia tritonis* on Appendix II of CITES, the Convention on International Trade in Endangered Species of Fauna and Flora. The proposal specifies the listing of both *Charonia tritonis tritonis*, the Indo-Pacific subspecies and *Charonia tritonis variegata*, the Caribbean subspecies. Voting takes place at the Ninth Conference of the Parties in Fort Lauderdale, Florida, USA in November 1994. If accepted, this listing would mean that international trade in specimens of the Giant Triton between Parties to CITES will only be permitted if appropriate export permits have been issued by the country of origin (in some cases, import permits may also be required).

Despite the popularity of this species in the shell trade, there is remarkably little available data about the Giant Triton. If anyone who has not contributed to the proposal has information, particularly on the quantities of shells traded, please contact, as soon as possible:

Glenn Sant,

TRAFFIC Oceania, P.O. Box R594, Royal Exchange, Sydney N.S.W. 2000, Australia.  
Fax 02-247-4579; Phone 02-247-8133.

## INVERTEBRATE HABITAT MANAGEMENT

Kirby, P. 1992. *Habitat Management for Invertebrates: a practical handbook*. Royal Society for the Protection of Birds, U.K. 150 pp.

Produced jointly by the RSPB and the JNCC (Joint Nature Conservation Committee) in Britain, this must be one of the first, if not the first, habitat management manual specifically for invertebrates. As such, it deserves wide publicity, and is of value well beyond the confines of country for which it was designed. It starts by describing the special features of invertebrates that affect their management: their varied biology, the fact that they occur in habitats that are often neglected because they are of no interest to other species; and their need for varied and structured vegetation. The author emphasises that invertebrates are often more sensitive to habitat changes than plants or vertebrates, and points out that small reserves are not sufficient - large areas must be protected if large numbers of invertebrate species are to survive in the long-term.

The management section covers five habitat types:



woodland, grassland, lowland heaths, freshwater wetlands, and coastlands. Uplands were omitted because of the paucity of information, but it is pointed out that many of the general principles described for other habitats will apply. For each habitat, the invertebrate fauna and its characteristics are described and then highly practical advice is given on its management in a very clear lay-out, with helpful illustrations.

The handbook is available from: RSPB, The Lodge, Sandy, Bedfordshire SG19 2DL, UK.

## RECENT ARTICLES AND PUBLICATIONS OF RELEVANCE TO MOLLUSC CONSERVATION

Altaba, C.R. 1992. Les nàïades (Mollusca: Bivalvia: Unionoïda) Paisos Catalans. *Bulleti de la Institució Catalana d'Història Natural dels 60* (Zoologia, 9): 23-44.

Altaba, C.R. 1993. Pla d'Estudi i Recuperació de les Nàïades (*Unio elongatulus aleroni*) del Parc Natural de la Zona Volcànica de la Garrotxa. MINUARIMA, Estudis Ambientals S.L., Campins, Balearic Islands.

Bogan, A.E. 1993. Freshwater bivalve extinctions (Mollusca: Unionoïda): a search for causes. *Amer. Zool.* 33: 599-609.

Brook, F.J. and Laurensen, C.M. 1992. Ecology and morphological variation in *Placostylus bollonsi* (Gastropoda: Bulimulidae) at Three Kings Islands, New Zealand. *Rec. Auckland Inst. Mus.* 29: 135-166.

Carlton, J.T. 1993. Neoeextinctions of marine invertebrates. *Amer. Zool.* 33: 499-509.

Cooper, J.E. and Knowler, C. 1992. Investigations into causes of death of endangered molluscs (*Partula* species). *The Veterinary Record* 10: 342-344.

Cowie, R.H. 1992. Evolution and extinction of Partulidae, endemic Pacific island land snails. *Phil. Trans. R. Soc. Lond. B* 335: 167-191.

Hadfield, M.G., Miller, S.E. and Carwile, A.H. 1993. The decimation of Hawaiian tree snails by alien predators. *Amer. Zool.* 33: 610-622.

Hopper, D.R. and Smith, B.D. 1992. Status of tree snails (Gastropoda: Partulidae) on Guam, with a resurvey of sites studied by H.E. Crampton in 1920. *Pac. Sci.* 46(1): 77-85.

Jameson, G.S. 1993. Marine invertebrate conservation: evaluation of fisheries over-exploitation concerns. *Amer. Zool.* 33: 551-567.

New, T.R. 1993. Angels on a pin: dimensions of the crisis in invertebrate conservation. *Amer. Zool.* 33: 623-630.

Suchanek, T.H. 1993. Oil impacts on marine invertebrate populations and communities. *Amer. Zool.* 33: 510-523.

Zuganov, V.V., Zotin, A.A., Nezlin, L.P., Tretjakov, V.A. 1994. Freshwater Pearl Mussels and their Relationships with Salmonid Fish. Available from Dr V.V. Zuganov, Institute of Developmental Biology of Russian Academy of Science, Varilov Str. 26, Moscow 117808, Russia. Fax 7095 907 91 22. Price US\$30.

### SSC Mollusc Specialist Group (until June 1994)

*Pacific Island Land Snail Group*

c/o Quentin Bloxham, Jersey Wildlife Preservation

Trust, Les Augres Manor, Trinity Jersey JE3 5BF, Channel Islands. Fax 0534 865161.

Arthur Bogan, Freshwater Molluscan Research, 36 Venus Way, Sewell, NJ 08080, USA. Tel. 609-582-9113, Fax 215-299-1130.

Dolf van Bruggen, c/o Rijksmuseum van Natuurlijke Historie, P.O. Box 9517, 2300 RA Leiden, Netherlands. Tel. 31-71-143844, Fax 31-71-274900.

Guy Coppois, Laboratoire de Zoologie Systematique et d'Ecologie Animale, Université Libre de Bruxelles, 50 Av F D Roosevelt, 1050 Bruxelles, Belgium. Tel 32-2-6502260, Fax 32-2-6502231.

Robert Cowie, Dept of Natural Sciences, Bishop Museum, 1525, Bernice St., P.O. Box 19000A, Honolulu, Hawaii 96817-0916. Tel. 808-848-4118, Fax 808-841-8968.

Ken Emberton, Dept Malacology, Academy of Natural Sciences, 1900 Benjamin Franklin Parkway, Philadelphia PA 19103-1195, USA.

Jackie van Goethem, Institut royal des Sciences naturelles de Belgique, Rue Vautier 29, B-1040, Bruxelles, Belgium.

Victor Goryachev, Laboratory of Global Climate Change, VNIIPRODA, Vilar, Moscow 113628, Russia. Fax 423-23-22.

Michael Hadfield, Kewalo Marine Laboratory, University of Hawaii, 41 Ahui St, Honolulu, Hawaii 96813. Tel. 808-5397319; Fax 808-5994817.

Alison Kay, Dept Zoology, University of Hawaii, 2538, The Mall, Honolulu, Hawaii 96822.

Maria Christina Mansur, Museu de Ciencias Naturais, Rua Dr Salvador Franca 1427, 90690000 Porto Alegre RS, Brazil. Fax (512) 36-1778.

Brian Morton, Dept Zoology, University of Hong Kong, Hong Kong. Tel. 852-5-8592847, Fax 852-5-479907.

Beata Pokryszko, Museum of Natural History, Wrocław University, Sienkiewicza 21, PL-50-335 Wrocław, Poland. Tel. 48-71-225041, Fax 48-71-402800.

Winston Ponder, Australian Museum, 6-8 College St, Sydney NSW 2000, Australia. Tel 61-2-3398120, Fax 61-2-3604350.

Theo Ripken, c/o National Natuurhistorisches, Museum Afda, Mollusca, Postbus 9517, 2300 RA Leiden, Netherlands.

Mary Seddon, Zoology Dept, National Museum of Wales, Cardiff CF1 3NP. Tel. 44-222-397951, Fax 44-222-239009.

Greg Sherley, Science Directorate, Department of Conservation, Box 10-420, Wellington, New Zealand. Tel (04)-4710-726; Fax (04) 4711-082.

Fred Thompson, Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611-2035. Tel. 1-904-3921721, Fax 1-904-3928783.

Henrik Walden, Kyrkvagen 1C, 435 35 Molnlycke. Tel. 46-31-885102.

Sue Wells, Coral Cay Conservation, University College of Belize, University Drive, West Landover, P.O. Box 990, Belize City, Belize. Phone/fax: (501)-2-32787, e-mail: coral@ucb.edu.bz

Fred Woodward, Art Gallery and Museum, Kelvingrove, Glasgow G3 8AG, UK. Tel. 44-41-357-3929, Fax 44-41-357-4537.