

# Ecology and biology of a Seychelles island *Borbo gemella* (Lepidoptera: Hesperinae) metapopulation

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## INTRODUCTION

*Borbo gemella* (Mabille) is widespread throughout Africa (ACKERY, *et al.* 1995). Within Seychelles, it has been recorded from the islands of Mahé (BERGER 1962; FLETCHER 1910; FRYER 1912; JOANNIS 1894; LEGRAND 1965), Silhouette (Berger 1962; Fryer 1912; GERLACH, *et al.* 1997); Praslin (BERGER 1962; Fletcher 1910; Fryer 1912; JOANNIS 1894), Aride (Aride Island Research Group 1999), Coetivy (LEGRAND 1965), Alphonse (FLETCHER 1910; HOLLAND 1895); Platte (HOLLAND 1895) and Aldabra (LEGRAND 1965). Only recently has *B. gemella* being recorded from Cousine Island (LAWRENCE, *in prep.*).

Although many observations on this species have been made from Continental individuals, very little information, except for distributional records, have been made on an island population of this species. In response, this article will focus on the following aspects of the ecology and biology of *B. gemella* on Cousine Island, Seychelles: 1) biotope selection; 2) influence of rainfall on abundance and phenology; 3) activity times; 4) nectar sources and larval food plant selection.

## Site

Cousine is a small granitic island situated 4° 20' 41" S and 55° 38' 44" E (Fig. 1a). It is just over 1km long, 400m at its widest point and 27ha in area (BOURQUIN 1997). The highest point on Cousine is approximately 70m a.m.s.l.. The Seychelles islands experience a humid, tropical climate as defined by TRICART (1972), in that mean monthly temperatures are generally above 20°C and annual rainfall exceeds 700-800mm. Although the climate is seasonal, the summer NW monsoon (i.e. December to March) brings a higher rainfall than the winter SE trade winds (i.e. May to October). The transition months of April and November generally experience high rainfall (WALSH 1984). Relative humidity varies little throughout the year averaging 77% (IYER & FRANCIS 1941).

Topographically, Cousine consists of two hills separated by a saddle, and a coastal flat on the northern and eastern sides of the island (Fig. 1b). The vegetation of the hilly region consists mostly of undisturbed forest dominated by *Euphorbia pyrifolia* Lam., *Ficus reflexa* Thunb., *F. lutea* Val., *Pisonia grandis* R.Br. and *Pandanus balfouri* Mart. trees. *Ipomoea pescaprae* (L.) R.Br. herblands, mowed grass areas (dominated by *Cynodon dactylon* (L.) Pers. and *Stenotaphrum dimidiatum* (L.) Brongn.), and a secondary herbland/woodland dominate the coastal flat.

Over the last several years the coastal area has undergone an extensive rehabilitation programme (HITCHINS 1999). Large areas of *Ipomoea pescaprae* (L.) R.Br. and various alien and/or invasive species, such as *Stachytarpheta jamaicensis* (L.) Vahl, *Amaranthus dubius* Mart. Ex Thell, *Achyranthes aspera* L., *Datura metel* L., *Carica papaya* L. and *Asystasia* sp. are being removed or kept under control. Although it is unclear what the original vegetation of the coastal flat was, remnants of *P. grandis* forest on the northern section of the coastal flat indicate that forest used to occupy the coastal flat (BOURQUIN 1997). As a result, large numbers of indigenous trees have been planted in this area.

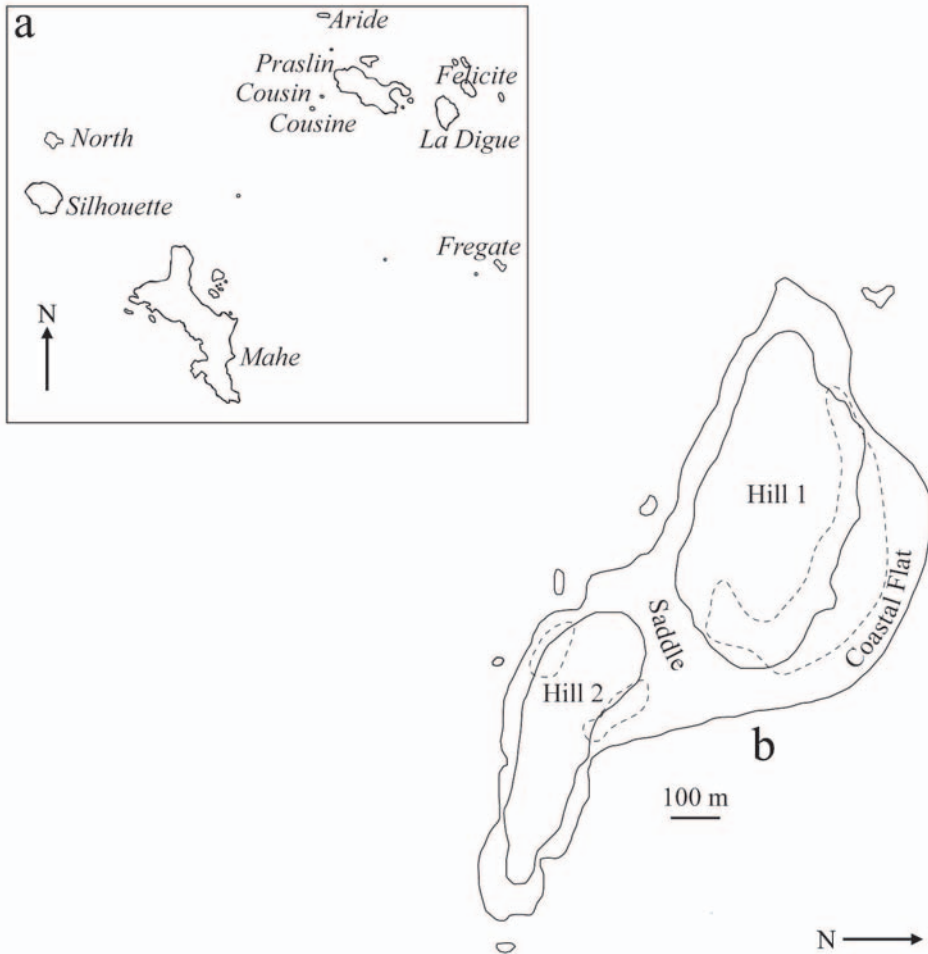


Fig. 1 (a) The main central group of granitic islands of Seychelles, showing the position of the study island, Cousine. (b) General meso-distribution of *Borbo gemella* on Cousine, Seychelles. Areas in which the butterflies occurred are enclosed by dashed lines

## METHODS

On Cousine, data were collected between 5 June 2002 and 3 May 2003, between 06h00 and 18h00. The location on the island of all individuals seen was recorded. Also, the time each individual was first seen was noted. Four time periods were quantified, each three hours long, between 06h00 and 18h00.

The biotope in which each individual was sighted was recorded. Three biotopes, each differing in vegetation heterogeneity and complexity were defined: 1) forest biotope: areas densely covered with trees taller than  $\pm 5\text{m}$ ; 2) open biotope: areas dominated by grasses and/or herbs, due to the habitat rehabilitation programme on the coastal flat, young trees (less than 5m in height) sparsely covered portions of this area; 3) forest edge biotope: an ecotone area consisting of the forest and open biotopes.

The food source of all feeding individuals was noted. Also, all oviposition observations were recorded. All botanical names and authorities follow ROBERTSON (1989). As *B. gemella* was not commonly encountered, abundance was measured as the total number of individuals seen per month. Daily rainfall was measured using a standard rain gauge.

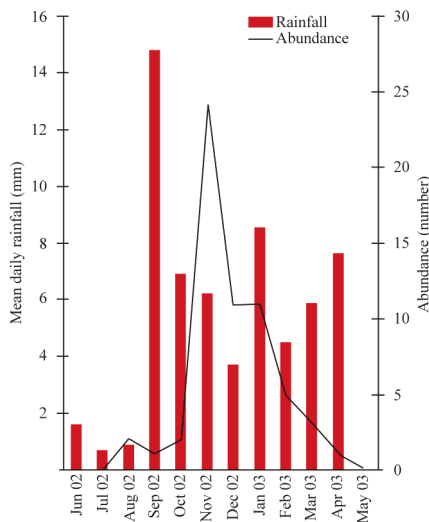


Fig. 2 *Borbo gemella* abundance and mean daily rainfall per month (mm) between June 2002 and April 2003. No butterfly or rainfall data were collected during May 2003

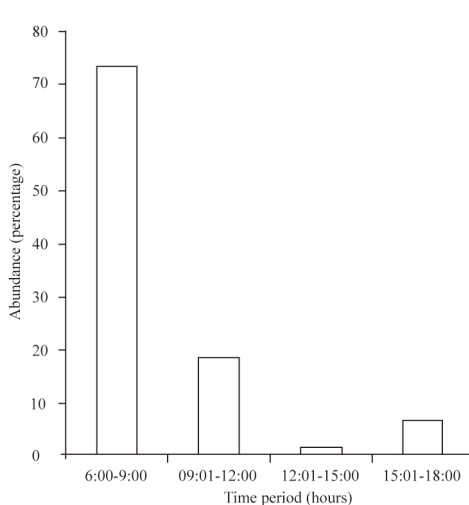


Fig. 3 The percentage abundance of *Borbo gemella* observations per three-hour time period between 06h00 and 18h00

## RESULTS

A total of 60 butterfly observations were made on Cousine. Most butterfly observations (i.e. 76.7%) were made in the 'forest edge biotope'. Few butterflies were seen in the 'open biotope' (i.e. 10.0%) and the 'forest biotope' (i.e. 13.3%). The general meso-distribution of *B. gemella* on Cousine is shown in Fig. 1b.

On Cousine, butterflies were encountered during all months of the study period, except June and July (Fig. 2). However, no data were collected for May. Seventy-six per-

cent of all observations were made between November and January, with the most observations made during November (i.e. 24 observations). Adults were generally seen during the wetter months (i.e. NW monsoon) with very few observed during the drier months (i.e. SE trade winds) (Fig. 2). Individuals were most frequently seen during the early morning (i.e. between 06h00 and 09h00), with 73.3% of all observations made during this time of day (Fig. 3). Butterflies were rarely seen during other times of the day.

Eleven feeding observations were made. The following flower nectar sources were used: *Asystasia* sp. (one observation); *Catharanthus roseus* (L.) G.Don (three observations), and *Turnera ulmifolia* L. (seven observations). All feeding observations were made on the coastal flat area.

Three oviposition observations were made between 6 January 2003 and 17 January 2003. In all cases, a single egg was laid towards the end of the upper surface of young *S. dimidiatum* grass swards. All oviposition observations were made on the coastal flat area.

#### DISCUSSION

Vegetation type clearly affects the meso-distribution of *B. gemella* on Cousine, with butterflies preferring the forest edge biotope. *B. gemella*, nevertheless, displays a high degree of ecological tolerance, with individuals encountered in both the forest and open coastal flat areas. Interestingly, numerous individuals were seen in disturbed vegetation around Grande Anse, Praslin ( $\pm 10$  m a.m.s.l.) on the 19 October 2002. This wide ecological tolerance is also found in the continental African individuals, as it has been recorded from savannah, bushveld and rainforest habitats (HENNING, *et al.* 1997).

On Cousine, the main flight period (i.e. November to January) coincides with the wetter months of the year. The only months in which it was not recorded were June and July. Although no data were collected for May, it most likely would be scarce during this month, particularly as May is generally a dry month. In southern Africa this species has been recorded throughout the year, with March and April being when it is most frequently encountered (HENNING *et al.* 1997).

Short visits to Beau Vallon, Mahe ( $\pm 200$  m a.m.s.l.) on the 3 June 2002, and to Plaine Hollandaise, Praslin ( $\pm 150$  m a.m.s.l.) on the 29 August 2002 showed that *B. gemella* was relatively abundant on these larger islands. Interestingly, *B. gemella* was scarce on Cousine during this period. Possibly the greater rainfall on the larger, higher islands compared to the smaller low-lying islands (WALSH 1984) allowed the adults to be present during the lower rainfall period of the SE tradewinds. Adults were most active during the early morning period between 06h00 and 09h00. This period was the coolest part of the day. It is well known, particularly in tropical areas, that butterfly activity is suppressed by high temperatures (OWEN 1971). Many of the individuals observed in the early morning were seen perching with the hind wings fully expanded, and the forewings held half-open, possibly to aid thermoregulation (CLENCH 1966).

The flowers of three plant species were used as nectar feeding sources for *B. gemella*. As these nectar species were absent from, or rarely encountered in the forested areas, all the feeding observations were confined to the coastal flat area. Clearly, *T. ulmifolia* was the preferred nectar source. Several individuals were also observed feeding from the flowers of *T. ulmifolia* on Praslin at Plaine Hollandaise (29 August 2002). As *T. ulmifolia* and *C. roseus* are considered non-indigenous to Seychelles (J. GERLACH, *pers. comm.*), it appears as though *B. gemella* prefers exotic plants for nectar sources. Whether

*Asystasia* sp. is native or not will depend on its final identification (Gerlach 1996).

Larvae of *B. gemella* have been recorded on many species of Poaceae (e.g. *Ehrharta* sp., *Triticum* sp., *Saccharum* sp. and *Zea* sp.) (LARSEN, 1996). Although the indigenous *S. dimidiatum* was the only Seychelles record for *B. gemella* at present, it is quite likely that it would also use other Poaceae species on Cousine. As *S. dimidiatum* is restricted to several patches on the coastal flat, all oviposition observations were obviously confined to these areas. Eggs are laid towards the end of the grass sward. Common practice on Cousine has been to cut most grass areas on the coastal flat. This could reduce the number of suitable breeding areas on Cousine. Whether or not this has a large impact on this species on Cousine is not known. However, leaving patches of *S. dimidiatum* uncut, especially near the forest edge could possibly benefit this species.

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