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Chapter 3

A Rapid Survey of Butterflies in Ajenjua Bepo and Mamang River Forest Reserves, Eastern Region of Ghana

Marek Bakowski and Ernestina Doku-Marfo

SUMMARY

During 11 days of field work (25 August – 4 September 2006) in the Ajenjua Bepo and Mamang River forest reserves, 1800 specimens of butterflies and moths (Lepidoptera), representing 486 species in 18 families, were collected. The survey focused primarily on diurnal butterflies of the superfamilies Papilionoidea and Hesperoidea, with 187 recorded species (128 at Ajenjua Bepo and 116 at Mamang River). Twelve species are of particular conservation interest and are discussed in detail; a clearwing moth *Metasphesia xanthopyga* Aurivillius 1905 (Sesiidae) represents both the first record of this species for Ghana, and the first male specimen ever collected.

INTRODUCTION

The order Lepidoptera is one of the most species-rich groups of insects, with the estimated number of species close to 146,000. Based on the different modes of activity, the Lepidoptera are traditionally divided into diurnal butterflies and nocturnal moths. This division does not truly reflect the phylogenetic relationships within the group as many “moths” show a diurnal activity pattern, while some butterflies show limited nocturnal activity. However, butterflies include only the superfamilies Papilionoidea and Hesperioidea, while moths include a large number of superfamilies, such as Pyraloidea, Nepticuloidea, Hepialoidea, Lasiocampoidea, Noctuoidea, and many others.

Because of the ease of collecting and identification, and close ties of individual lepidopteran species to host plants and their habitats, butterflies have often been used in biomonitoring and as habitat change indicators. These attributes makes them a good candidate for use in Rapid Assessment Program (RAP) surveys.

The butterflies of West Africa, especially in Ghana, are well studied (Emmel and Larsen 1997; Kühne 1999, 2001; Larsen 2005a, 2005b). The most current list of known Ghanaian butterflies, including the Volta region, includes 915 species (Larsen 2005a). Yet the knowledge of other groups of the Lepidoptera in this region is not nearly as good. Many species of moths, especially those classified as “microlepidoptera” still await comprehensive studies, or even the initial scientific description.

METHODS AND STUDY SITES

During the survey the following collecting methods were employed:

Collecting on a transect line

At both sites of the current survey, transects were selected within the forest, along trails, on the edges of the forest, and at selected locations in cocoa and plantain plantations. Most specimens were physically collected with hand-held nets, except in a few cases when easily recognizable members of the family Papilionidae were identified in flight. Collecting was done daily in the

morning, between the hours of 9:00 and 12:00, and additional collecting was done daily between the hours of 14:00 and 17:00.

Fruit bait traps

Traps were baited mainly with pieces of rotten watermelon, though pineapple was used on a few occasions. This method yielded a number of species of the Nymphalidae, which are otherwise rather difficult to catch using the net alone (especially members of the subfamilies Satyrinae and Nymphalinae, and the genus *Charaxes*). Four baited traps were set, two located deep within the forest, and two on the forest edge or within the plantations. Traps were baited with fruits every 24 hours. Additionally, butterflies were collected at night through a search for roosting or sleeping individuals.

Nocturnal collecting at a mercury vapor light

To collect nocturnal Lepidoptera a mercury vapor (MV) lamp (160 Watt) was used against a reflective, white sheet (for the first few nights a high-powered halogen lamp was used). Collecting was done nightly between the hours 20:00 and 23:00, regardless of the weather conditions, and often during the rain. The light source was usually located at the camp site within the forest, although at the Mamang River Forest Reserve night light collecting was also done on the fringes of the forest, close to a plantain plantation.

Pheromone traps

Two pheromone traps (uni-traps) were set at the edge of the forest at both sites. The traps contained wide spectrum pheromones specific to the family Sesiidae. The pheromones used were produced by IPO-DLO, Wageningen, Netherlands.

The main collecting site within the Ajenjua Bepo Forest Reserve was located at N 06° 22' 2.3", W 01° 01' 58.6", at the elevation of 300 m. Sampling was conducted there during the period of 24 -30 August 2006. The surroundings of the site contained a relatively undisturbed forest as well as plantain and cocoa plantations.

The second major collecting site was located within the Mamang River Forest Reserve at N 06° 15' 0.2", W 01° 02' 25.7", at the elevation of approximately 130 m. Sampling was conducted there between August 31st and September 4th, 2006. The dominant habitat was a relatively undisturbed deciduous forest, bordering on cocoa and plantain plantations. Collecting was done both within the forest and along its edge.

RESULTS

Of the two major sampled localities the Ajenjua Bepo Forest Reserve showed a higher species count, most likely the result of higher fragmentation of the habitat and a stronger edge effect than within the Mamang River Forest Reserve. The difference was particularly strong with regards to the numbers of species of nocturnal Lepidoptera. This may be attrib-

uted to different collecting methods used at both sites as well as different weather conditions during sampling.

We recorded 187 species of butterflies in 87 genera and 5 families (Appendix 3) and 99 species of 13 families of moths (Table 3.1). The majority of butterflies were collected using hand-held nets along transect lines (90% of identified species), while baited traps yielded only about 10% of species. Interestingly, these traps were highly effective in collecting members of the genus *Charaxes* (especially at the second site), but did not catch any individuals of highly abundant species of the genus *Euphaedra*. This may be partially explained by high "competition" from the fruits available to insects at the plantain plantations, or discarded fruits around the camp sites, which attracted high numbers of butterflies of the latter genus.

Pheromone traps turned out to be ineffective. It is unclear why these traps did not result in more effective collection of specimens, but perhaps the activity of Sesiidae in West Africa is more seasonal than anticipated, and their absence reflects the fact that most species of the family are in their larval stages during the months of August and September. Only one specimen of Sesiidae was collected, a male of *Metasphesia xanthopyga* Aurivillius 1905; this specimen represents both the first record of this species for Ghana, but also the first male specimen ever collected. Previously this species has been recorded only from Senegal (Gaede 1929). The collected individual was found on the outside of a bait trap placed on the border of Mamang River reserve.

Most specimens of non-butterfly Lepidoptera were collected using the MV light. This method was highly effective for strong flying species and for species inhabiting treetops, such as members of the families Sphingidae, Arctiidae, Noctuidae, Limacodidae, and several others. Rainy conditions did not significantly influence the abundance and activity of moths, especially the Macrolepidoptera. However, bright moon and cloudless sky had an adverse effect on collecting results.

A greater number of moth species were collected within the Ajenjua Bepo reserve (Table 3.1). This was most likely related to more favorable weather conditions at this site compared to weather at Mamang River site. The latter site yielded high numbers of specimens only during the last night of collecting (Aug. 29/30), following a storm. A critical factor influencing the effectiveness of collecting using the MV lights is the power and positioning of the light source. At Ajenjua Bepo the light was situated at the edge of the forest and thus its ability to attract moths was significant. At Mamang River the lamp was initially situated within dense forest, and thus its ability to attract insects from a wide area was reduced. Later the light source was placed at a more exposed site at the edge of the forest, but its effectiveness was reduced by heavy rains and the full moon. A disadvantage of collecting using the MV light is that this method can be applied to only one plot per night.

The MV collecting at both sites resulted in recording high numbers of species of Arctiidae, Noctuidae, and

Geometridae, but surprisingly few representatives of Tortricidae, Oecophoridae, and Tineidae (Table 3.1)

A group as heterogeneous in terms of their biology as the Lepidoptera requires a wide range of sampling methods, not all of which could be conducted during this survey. For this reason, most of our sampling effort concentrated on estimating the diversity of easily collected and observed diurnal Lepidoptera. At Ajenjua Bepo we recorded 128 species of butterflies, whereas the Mamang River we recorded 116. Of those, 36 and 35 species, respectively, are classified by Larsen (2005b) as members of MEF group (species centered on moist evergreen and semi-deciduous forests) (Appendix 3). Additionally, 20 and 14 species, respectively, are classified as WEF (species typical of wet evergreen forest) (Table 3.2). Larsen also introduced a system of ranking butterfly species according to their rarity, based on the percentage of positive records of a species in relation to the number of visitations to a site (full description of the ranking system in Appendix 3). Most of the species of butterflies recorded during the present survey had a ranking of 1-3 (very common to not rare). However, a few species recorded had a high ranking status, indicating their rarity. For example, the following species were ranked as 4 (rare): *Citrinophila erastus erastus*,

Liptena evanescens, *Liptena xanthostola coomassiensis*, *Cacyreus audeoudi*, *Charaxes petersi*, *Euriphene incerta incerta*, *Euphaedra inanim*, *Euphaedra eupalus*, *Pseudathyma falcata*, *Acraea orestia orestia* and *Gretna cylinda*. One species, *Pardaleodes xanthopeplus* was ranked as 5 (very rare). A full list of recorded taxa is given in Appendix 3, and below we comment only on particularly interesting butterfly species (distribution information according to Larsen 2005a.)

Citrinophila erastus erastus Hewitson 1866

Recorded in Mamang River. This species seems to be very scarce in West Africa, rarely encountered in Ghana, and has been recorded only from the Oban Hills and the Korup and Bia National Parks.

Liptena evanescens Kirby 1887

Recorded in Ajenjua Bepo. The Pink Liptena is known from eastern Côte d'Ivoire, Ghana, southern Nigeria and the Cross River loop. The habitat of this rare butterfly is forest in good condition.

Liptena xanthostola coomassiensis Hawker – Smith 1933

Recorded in Mamang River. This is a rare forest butterfly species. The subspecies *L. x. coomassiensis* is found from Sierra Leone to Ghana.

Table 3.1. The moth families of Lepidoptera recorded at the Ajenjua Bepo and Mamang forest reserves, SE Ghana.

Family	Ajenjua Bepo Spp. No.	Mamang River Spp. No.	Total Species	Total Individuals
Sesiidae		1	1	1
Arctiidae	29	13	42	170
Sphingidae	9	6	10	50
Lymantridae	11	7	19	50
Limacodidae	10	7	17	70
Noctuidae	81	62	110	350
Geometridae	45	30	60	150
Saturnidae	1		1	1
Pyalidae	22	9	30	100
Thyrididae	3	2	4	12
Tineidae		1	1	1
Tortricidae	1	2	2	3
Oecophoridae		2	2	2
Total	212	142	299	960

Table 3.2. Numbers of species of butterflies recorded in Ajenjua Bepo and Mamang River forest reserves according to their habitat preferences (habitat abbreviations explained in Appendix 3).

	MEF	WEF	ALF	DRF	UBQ	GUI	SPE	SUD	Total
Ajenjua Bepo	36	20	52	8	8	3	1	1	129
Mamang River	35	14	55	7	4	1	0	0	116

Cacyreus audeoudi Stempffer 1936

Recorded in Ajenjua Bepo. Compared to the two other species of *Cacyreus*, this species shows much stronger preference for forest habitats. Kühne (1999) recorded this species in Ghana from the vicinity of Sunyani (African Butterflies Research Institute collection) in the Atewa Range.

Charaxes petersi van Someren 1969

Recorded in Mamang River. A rare butterfly, recorded from Konongo and Tano Ofin in Ghana. It is an inhabitant of rain forest in good condition. The species is endemic to the area west of the Dahomey Gap, from Sierra Leone to the Volta Region.

Euriphene incerta incerta Aurivillius 1912

Recorded in Mamang River. This species, distinctly rare west of the Dahomey Gap and in western Nigeria, is found in wetter forests in good condition where it can be found alongside other species of *Euriphene* e.g., *E. barombina* and *E. tadema*. Recorded in Ghana from Ankasa and Kakum.

Euphaedra inanum Butler 1873

Recorded in Ajenjua Bepo. This species is known from Guinea-Bissau, Guinea, Sierra Leone, Côte d'Ivoire and Ghana (type locality – Ashanti). Though widespread in all types of forest, in Ghana it is distinctly scarce.

Euphaedra eupalus Fabricius 1781

One of the western wet zone endemics, which crosses into the Volta Region without reaching Nigeria, this species is found only in forest in good condition, and is much scarcer than *E. harpalyce*. At Owabi in Ghana, *E. eupalus* was trapped 24 times compared to 36 *E. harpalyce*, an unusually high ratio, seemingly a result of special local conditions. During our survey we collected six specimens of each species and recorded the species at both sites.

Pseudathyma falcata Jackson 1969

Recorded in Ajenjua Bepo. This is a western endemic, having been found only between Côte d'Ivoire and western Nigeria. In Ghana recorded as scarce in Kakum and Kibi.

Acraea orestia orestia Hewitson 1874

Recorded in Mamang River. The species is scarce west of Dahomey Gap. There are few Ghanaian records, mostly from the Atewa Range, but also from Winneba and near Kumasi. Recorded also from Kintampo Falls, near Ankasa, and Krokosua Hills.

Pardaleodes xanthopeplus Holland 1892

Recorded in Mamang River. A Ghana sub-region endemic, this species is very scarce, but it may be overlooked in the field because of its similarity to the common *P. tibulus*. In Ghana, individuals have been recorded from Kukurantumi, Tarkwa, Konongo and the Atewa Range. It does not occur outside forests in good condition.

Gretna cylinda Hewitson 1877

Recorded in Mamang River. This species usually occurs in open habitats. In West Africa recorded from Liberia to Nigeria. In Ghana recorded from Kakum and Boabeng-Fiema.

CONSERVATION RECOMMENDATIONS

The results of our surveys indicate a similar, rich Lepidopteran fauna in both forest reserves. Both include a high proportion of forest species of the categories MEF and WEF. Ajenjua Bepo is distinctly more heterogeneous in terms of its vegetation coverage than Mamang River, with a higher number of open and edge habitats. This results in a higher number of heliophilous (sun-loving) species of butterflies, but lower numbers of species associated with undisturbed forests. The Mamang River reserve is significantly more homogenous, with denser, less disturbed forest coverage than Ajenjua Bepo, and thus a better candidate for any conservation activity. A longer and more detailed survey of both reserves will undoubtedly help in understanding the distribution and habitat preferences of the Lepidoptera found at both sites. Combined with the rapid, negative changes in the natural habitats of West Africa, the basic, faunistic and taxonomic study of moths should become one of the priorities of biological explorations of the region.

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