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avives@eresmas.net

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Sáfián, Sz.

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# Observation of hill-topping behaviour by the Giant African Swallowtail - *Papilio antimachus* Drury, 1782 and other recent records from Liberia (West Africa) (Lepidoptera: Papilionidae)

Sz. Sáfíán

## Abstract

Hill-topping, as a mate location strategy of the Giant African Swallowtail *Papilio antimachus* Drury, 1782 was observed in Liberia's Nimba Mountains (Nimba County) and Putu Range (Grand Gedeh County) and is presented in detail. Other recent observations are also included, since *P. antimachus* is considered extremely rare in West Africa and is included in the IUCN's red list, as "DD - data deficient". The observations and the new distribution data provide relevant information for further understanding of the ecology and for more effective conservation of the habitats of Africa's largest butterfly.

KEY WORDS: Lepidoptera, Papilionidae, *Papilio antimachus*, animal behaviour, mate location, IUCN, red list.

## Observaciones sobre el comportamiento "hill-topping" de la Mariposa Gigante Africana - *Papilio antimachus* Drury, 1782 y otros recientes registros de Liberia (África Occidental) (Lepidoptera: Papilionidae)

## Resumen

Se presenta en detalle el "hill-topping", como estrategia de localización de pareja de la Mariposa Gigante Africana *Papilio antimachus* Drury, 1782 que fue observada en las Montañas Nimba (Nimba County) y Putu Range (Grand Gedeh County) en Liberia. Se incluyen otras recientes observaciones, ya que *P. antimachus* es extremadamente rara en África Occidental y está incluida en la lista roja de la UICN, como "DD - datos deficientes". Las observaciones y los nuevos datos de distribución suministran la información relevante para un conocimiento adicional de la ecología de la especie y una conservación más eficiente de sus hábitats.

PALABRAS CLAVE: Lepidoptera, Papilionidae, *Papilio antimachus*, comportamiento animal, ubicación, UICN, lista roja.

## Introduction

Hill-topping is a well known mate location strategy for many butterfly species, as it is for other insect groups (SHIELDS, 1967). During hill-topping male specimens assemble on (or near) the highest available point within their habitat range and display a territorial behaviour; fighting other males and chasing away every passing object identified as a potential competitor, apart from receptive females. Hill-topping is widespread among Afrotropical butterflies. Many genera are avid hill-toppers including *Graphium*, *Deudorix*, *Aphnaeus*, *Charaxes*, *Acraea* and even *Coeliades* (HENNING, 1988, JIGGINS, 2002, LARSEN, 1996, 2005, PRINGLE *et al.*, 1994, WOODHALL, 1989, and personal observations). Interestingly, this phenomenon is mostly recorded in savannah areas, probably because in tropical

forests there are fewer localities where open hilltops surrounded by forest are available and visited by lepidopterists. One of the most famous forest localities for hill-topping in Africa is Kere Hill (or Epitola Hill) in Minziro Forest, western Tanzania, where literally all known *Epitola* s. l. (Lycaenidae) and hundreds of other butterflies were collected in just a 30x30 metres open hilltop (CONGDON & COLLINS, 1998). Although quite a few species in the family Papilionidae have been recorded as hill-toppers from Europe (*Papilio machaon*, *Iphiclidides podalirius*), North America (*Papilio cresphontes*, *P. troilus*, *Battus philenor*, etc.) and from Africa (*Papilio rex*, *Graphium leonidas*, *G. angolanus*) (PRINGLE *et al.*, 1994, TURNER, 1990 and personal observations), this behaviour was not previously mentioned in literature for the magnificent Giant African Swallowtail (*Papilio antimachus*).

### The species and the study sites

With its size, unique wing shape and colouration, the Giant African Swallowtail is among the most popular butterflies worldwide. Its rarity and elusiveness make it even more interesting for butterfly enthusiasts and collectors. The species is also of conservation concern; it has “DD - data deficient” status in IUCN’s red list (GIMENEZ DIXON, 1996). Although the species is widely distributed in the Guineo-Congolian forest zone from Uganda to Sierra Leone, this occurrence is in fact very patchy, especially in West Africa, where it is extremely rare, with only a few recent records from just two localities in Ghana: Atewa Range and Bobiri Butterfly Sanctuary (LARSEN *et al.*, 2007). The species was described from Sierra Leone and a number of specimens from more than 100 years ago are available in museum collections, but there have been no reports of the species from the country recently. Even in Central Africa *P. antimachus* is local, and only males are regularly encountered when they descend from the canopy level to a known mud-puddling spot along rivers or streams. The larval foodplant of the species is unknown. It was suggested that that it might be a creeper in the family Piperaceae by HANCOCK (1988) on phylogenetic grounds or Asclepiadaceae (now Apocynaceae) as cardiac glycosides were isolated from the larva by ROTHCHILD & REICHSTEIN (LARSEN, 2005, WILLIAMS, 2007).

*P. antimachus* was reported from Liberia on a few occasions by FOX *et al.* (1965). All specimens in their work were observed in Nimba County, as were the most recent observations by Ben Phalan, Ron Demey (pers. comm.) and by the author.

#### NIMBA MOUNTAINS (LIBERIA)

The Liberian part of the Nimba Mountains (including the main ridgeline of Mt. Nimba - East Nimba Nature Reserve and four individual mountains in Western Nimba) is situated in northern Liberia near the triple border with Guinea and Ivory Coast (the major part of the Mt. Nimba chain continues in Guinea, while a smaller area is in the Ivory Coast). The peaks of the main ridgeline of Mt. Nimba reach over 1300 metres (1700 m in Guinea), while the highest peaks in Western Nimba reach just over 1000 metres. The original vegetation on the summits of Mt. Nimba was upland forest according to COLSTON & CURRY-LINDAHL (1986), but the forest was seriously depleted by mining activities in the 1960-70s. It is now covered mainly by secondary grassland savannah with small pockets of sub-montane secondary forests. The forest on the higher slopes also has upland affinities, while lowland rainforest covers the area east and west of the ridgeline. The lowlands west of Mt. Nimba are largely degraded, but good quality lowland forest is still found west of the highest mountains of Western Nimba (Mt. Tokadeh, Mt. Gangra and Mt. Beeton) to the Guinean border. The four individual mountains in Western Nimba were covered by upland forest to the summits, although the majority of the forest has disappeared from Mt. Tokadeh, Mt. Yuelliton and Mt. Gangra due to mining, timber extraction and farming activities. Mt. Beeton is still largely forested, although the summit of the mountain was seriously affected by recent farming activities. During a butterfly survey in February and March 2012 all summits were visited to record hill-topping activities of butterflies.

## PUTU RANGE

The other area, where hill-topping of *P. antimachus* was observed is the Putu Range in Eastern Liberia (Grand Gedeh County). This relatively low range, with its highest summit reaching over 700 metres, is surrounded by lowland areas and is entirely forested. Sapo National Park, the largest protected area in Liberia (BIRDLIFE INTERNATIONAL, 2012), is situated just south-west of the range. Putu comprises two parallel ridges (Mt. Jideh and Mt. Ghi) with summits of about 750 m and 550 m respectively. The ridges stretch from south-west to north-east, the length of Jideh is about 12 km. A much lower ridgeline (Mt. Dotroh west of Ghi) could still be considered part of the range, since it is geologically and ecologically similar to the higher ridges of Putu, such as Mt. Montröh, which is a separate lower peak northwest of Jideh. The vegetation in Putu is rainforest, which was encountered only low intensity disturbance for centuries from farming, firewood collecting and charcoal-burning. Some areas of forest can still be considered as primary forest, although disturbance has accelerated in the recent years due to mining activities. A detailed butterfly survey by the author proved that the area has an exquisitely high richness of butterflies, including special upland or sub-montane butterfly fauna on the hilltops of Mt. Jideh (SÁFIÁN, unpublished). Due to road construction for mining exploration a track was cleared on the narrow ridgeline on Mt. Jideh, creating an open gap in the forest. This gap was used by many hill-topping forest species to descend almost to ground level, when tree-tops were probably occupied by displaying males. In December 2010 over 180 species of butterfly were recorded from two sub-summits on the ridge of Mt. Jideh in a single day. The mountain tops in the Putu Range were surveyed in December 2010, January 2011 and April 2011.

**Observations of hill-topping**

The first sightings of *P. antimachus* on hilltops were reported by Ben Phalan, an ornithologist, who visited the Nimba Mountains in Liberia in 2010 and 2011 to carry out bird surveys in the East Nimba Nature Reserve and in Nimba West. He reported the species from two different localities, both of which were later confirmed as regular hill-topping areas for *P. antimachus*.

The first specimen of *P. antimachus* with obvious hill-topping behaviour was seen on the ridgeline of Mt. Jideh in the Putu Range in April 2011 (for detailed account of records, see the summary below). It was observed exactly on the same sub-summit, where over 300 species of butterfly were recorded during two surveys in December 2010-January 2011 and April 2011, including a few that were later recognised as undescribed species and other rarities. The specimen was a worn male, gliding above the higher canopy level, at about 25-30 metres from the ground. The butterfly flew in irregular large circles, also settled a few times on the crown of the trees and it never descended below 25 metres. Sometimes it disappeared from sight behind the canopy of the trees and on one occasion it seemed to have moved from its spot, as the butterfly reappeared a hundred metres from the spot. It turned out that this was actually a different specimen, a female *P. antimachus*, gliding in the open air above 30+ metres from the hilltop. She did not notice the male and flew away unnoticed by him. The male butterfly later returned to its spot where it continued active hill- and tree-topping from about 12.00 to 14.00.

The following day at about 08.30 in the morning, *P. antimachus* was observed on the hilltop of Mt. Montröh. A fresh-looking male specimen was circling above 30 metres from the ground, when a female appeared, which was quickly approached by the male, being chased to settle on the top of a giant tree, where both of them disappeared. This action probably ended up in successful mating as they did not reappear in the air. No further specimens were observed on Mt. Montröh on that day and the following one. The courtship (and the probable mating) had happened over 40 metres above the ground.

Ten days later at about 12.00 the first worn male was sighted again exactly at the same displaying spot on Mt. Jideh ridge. It stayed at the spot for hours, along with another two males, which were discovered a couple of hundred metres away from the first male's display area. It seemed that the butterflies maintained well-defined territories, as they never entered in each other's display area. Each male stayed inside an approximately 100 metre-radius circle on the narrow ridgeline, and during their display never descended to the lower slopes on the hillside. The butterflies regularly settled on the crown of tall trees for a short time,

but stayed mostly in the open air above the canopy. They did not notice smaller flying insects but a large female *Charaxes castor* (Cramer, 1775) was observed being chased by one of the males for a while. The not much larger swifts, which circled at high speed above the hilltop, were also regularly chased by the largest male, but the butterfly was not attacked by the swifts.

In the Nimba Mountains in February and March 2012 very similar behaviour was observed (for detailed account of records, see the summary below). The author followed the information received from Ben Phalan to find suitable hilltops for *P. antimachus*. The first specimens were observed on the top of Mt. Gangra, where a female appeared at about 11.00 near the top, far above the open canopy. It glided along the short ridgeline of the mountain and disappeared. The first male appeared around noon and stayed only for half an hour around the highest point of Mt. Gangra; its behaviour was a typical display flight, with regular settling, and keeping a well-defined territory. After its disappearance *P. antimachus* was sighted twice on the same day, but due to visibility problems on the partly forested hilltop, their behaviour could not be recorded. Three weeks later, two more males were observed hill-topping; they did not overlap since the first appeared at about 11.00 and left before the second appeared after noon. *P. antimachus* was also found hill-topping in the East Nimba Nature Reserve at the telecommunication mast, on a hilltop, where the sub-montane forest stretched straight up to the summit. The male was observed at about 14.00 in the afternoon, circling just above the canopy, regularly settling on the tree top. It is worth noting, that Ban Phalan observed *P. antimachus* hill-topping on a nearby summit (over 1300 metres), where no trees were actually present.

The most spectacular hill-topping activity was that observed on the summit of Mount Beeton in the Nimba West, as the species has never been recorded in such number from a single locality. The first two males were observed near the hilltop at about 9.30, while a further twelve individuals were sighted during a single day on and around the top of Mt. Beeton from 10.00 to 16.00. The summit was quite recently cleared for farming and it was not too difficult to cut a few lookout points from the bush, which covers the summit. Practically every single large tree, left untouched by the farmers hosted a male *P. antimachus*; they regularly patrolled around their territory. Several male individuals could easily be identified from their wing-damage, so counting the specimens was not too complicated since they rarely left their "master tree". That hill-topping is definitely a successful mate location strategy was well demonstrated, since a single passing female was seen to be chased by three different males! During hill-topping none of the males descended to lower vegetation, although some specimens (pushed down by more dominant males from the taller trees) chose younger trees to settle on. The males also regularly chased foraging swallows and swifts, which was a magnificent sight.

### Summary of recent records in Liberia

*P. antimachus* was always rare in West Africa, especially west of the Dahomey Gap. Mostly old records are found even in recent comprehensive literature (e.g. LARSEN, 2005). It is therefore no surprise that the species received Data Deficient status as a result of its assessment by IUCN (GIMENEZ DIXON, 1996). Fairly recent West African data came from Ghana's Volta Region, where Father Theodore Maessen recorded it regularly near Amedzofe village in the 1970s (Larsen, pers. comm.), but nearly all forest have been cleared around Amedzofe and the remaining patches are all severely degraded, and *P. antimachus* was not re-recorded since Maessen's observations. Apart from these, there are about five males collected in the Atewa Range and two were observed mud-puddling in Bobiri Butterfly Sanctuary (also in Ghana) between 2000 and 2007. All records compiled below were from between January 2009 and March 2012 in eastern and northern Liberia. The data will be entered into and shared online through the African Butterfly DataBase ([www.abdb-africa.org](http://www.abdb-africa.org)) with free access.

29-I-2009. 1 specimen (sex not identified) was observed by Ron Demey. Locality: Geipa, East Nimba Nature Reserve, Nimba County, Liberia. Coordinates: 07° 26' 51.2" N, 08° 31' 09.1" W. Elevation: 480 m.

The specimen was flying high in an open area (village) surrounded by lowland forest at about 16.00 (Demey, pers. comm.).

7-IV-2010. 1 male specimen was observed by Ben Phalan and Alan Lewis. Locality:

Telecommunication mast (1), Mount Nimba, East Nimba Nature Reserve, Liberia. Coordinates: 7° 31' 11.93" N, 8° 31' 5.02" W. Elevation: 1390 m.

The specimen was "flying around in fine, sunny weather at the summit of the highest point on the Liberian side of Mt Nimba, where there is a communication mast. The local time was 10.40. It flew mostly at around 1-3 m above ground level, above open grassy habitat, sometimes landing to rest on bracken fronds, with wings held closed over its body". (Phalan, pers. comm.).

17-IV-2010. 1 male specimen was observed by Ben Phalan. Locality: Mount Gangra, West Nimba, Liberia. Coordinates: 7° 32' 33.61" N, 8° 38' 5.24" W. Elevation: 940 m.

The specimen was "flying determinedly uphill towards top of Mt Gangra from good forest lower down at 8.50 in the morning" (Phalan, pers. comm.).

19-XII-2010. 1 male specimen observed by Szabolcs Sáfián. Locality: Dhan (road to Tappita), Nimba County, Liberia. Coordinates: 6° 38' 42.33" N, 8° 47' 38.70" W. Elevation: 248 m.

The specimen was mud-puddling on the wet road in open habitat at about 14.00.

09-IV-2011. 1 male and 1 female specimen was observed by Szabolcs Sáfián and Martin Strausz. Locality: Mt. Jideh Ridge, Putu Range, Grand Gedeh County, Liberia. Coordinates: 5° 38' 57.98" N, 8° 10' 48.46" W. Elevation: 658 m.

The male specimen was hill-topping from 12.00-14.00 often settled on a tree-top, the female was seen floating above the ridge at about 12.00.

10-IV-2011. 1 male and 1 female specimen was observed by Szabolcs Sáfián and Martin Strausz. Locality: Mt. Montroh, Putu Range, Grand Gedeh County, Liberia. Coordinates: 5° 41' 56.46" N, 8° 7' 50.78" W. Elevation: 419 m.

The male was hill-topping at 08.30 in the morning, it approached the appearing female and they disappeared on a tree-top at about 09.00.

21-IV-2011. 3 males were observed by Szabolcs Sáfián and Martin Strausz. Locality: Mt. Jideh Ridge, Putu Range, Grand Gedeh County, Liberia. Coordinates: 5° 38' 57.980" N, 8° 10' 48.464" W. Elevation: 685 m.

All specimens were hill-topping males keeping well-defined territories on a sub-summit on Mount Jideh ridge within a few hundred metres between 12.00 and 14.00.

24-X-2011. 1 male specimen observed by Ben Phalan and Françoise Dowsett-Lemaire. Locality: Mt Nimba, East Nimba Nature Reserve, Liberia. Coordinates: 7° 31' 19.99" N, 8° 30' 52.02" W. Elevation: 1345 m.

"One individual flew over at treetop height at 10.55 local time". (Phalan, pers. comm.).

25-X-2011. 1 male specimen observed by Ben Phalan and Françoise Dowsett-Lemaire. Locality: Mt Nimba, East Nimba Nature Reserve, Liberia. Coordinates: 7° 31' 3.90" N, 8° 31' 3.36" W. Elevation: 1318 m.

"One individual flew over at 12.00 local time. It was flying (floating) at a height of up to 50 m above a grassy ridge, which dropped into the forested Yiti Valley" (Phalan, pers. comm.).

11-II-2012. 1 male and 1 female specimen were observed by Szabolcs Sáfián and Martin Strausz. Locality: Mt. Gangra, Nimba Mountains, Nimba County, Liberia. Coordinates: 7° 32' 44.95" N, 8° 38' 10.14" W. Elevation: 1000 m.

The female specimen was gliding above the summit at about 11.00, while the male appeared at 12.00.

13-II-2012. 1 male specimen observed by Szabolcs Sáfián. Locality: Swamp near Gbapa, Nimba Mountains, Nimba County, Liberia. Coordinates: 7° 28' 41.74" N, 8° 38' 46.39" W. Elevation: 483 m.

The male specimen descended to a muddy spot at about 14.00, but it did not stay near ground level, as the weather was rather cloudy.

29-II-2012. 1 male specimen observed by Szabolcs Sáfián and Klaas-Douwe Dijkstra. Locality: Telecommunication mast (2), Mount Nimba, East Nimba Nature Reserve, Liberia. Coordinates: 7° 30' 52.97" N, 8° 31' 41.40" W. Elevation: 1347 m.

The specimen was hill-topping above the canopy of submontane forest at about 14.00.

01-III-2012. 1 female observed by Szabolcs Sáfián. Locality: Mount Tokadeh, Nimba Mountains, Nimba County, Liberia. Coordinates: 7° 28' 14.63" N, 8° 39' 59.11" W. Elevation: 720 m.

A single female was passing over the ridge, high up in the canopy of the emergent trees.

06-III-2012. 13 males, 1 female specimens observed by Szabolcs Sáfián. Locality: Mount Beeton, Nimba Mountains, Nimba County, Liberia. Coordinates: 7° 31' 51.38" N, 8° 39' 23.08" W. Elevation: 1008 m.

Males congregated on the hilltop of Mt. Beeton, they often perched on the top of emergent trees, involved in occasional fighting and chasing the passing single female.

### Summary and conclusions

Hill-topping behaviour of the rainforest-dwelling *Papilio antimachus* is documented in some detail for the first time. It is possible that the species developed hill-topping as a mate location strategy, because the population density of *P. antimachus* is usually very low and without an assemblage of individuals from a larger area, the probability of successful mating might be very low. In most cases only a few specimens were present in any single locality (hilltop), and each mountain hosted several hundred hectares of forest on the slopes surrounded by several thousand hectares of lowland forest. Although we have no information on the flying ability of *P. antimachus*, seeing specimens flying strongly against wind on the mountain tops makes it quite likely that the observed hill-topping specimens actually fly kilometres to locate a mate, and that they do not necessarily breed in close vicinity of the hilltops. This information might prove significant for the conservation of the species, since *P. antimachus* might not be able to survive in small fragments of forest habitat, but would need a larger forest area to host a healthy population. As the species is listed in the IUCN's redlist as Data Deficient, the data provided in this paper should prove useful for the continued re-assessment of the species.

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Sz. S.  
 Institute of Silviculture and Forest Protection  
 University of West Hungary  
 Bajcsy-Zsilinszky u. 4  
 H-9400 Sopron  
 HUNGRIA / HUNGARY  
 E-mail: safian@bcghana.org

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