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Description of previously unknown females of three *Euriphene* Boisduval, 1847 species and the unknown male of *Bebearia inepta* Hecq, 2001 from Western Africa, with notes on their taxonomy, bionomy and distribution (Lepidoptera: Nymphalidae, Limenitidinae)

Sz. Sáfián, S. C. Collins, C. Belcastro, O. Brattström & R. Tropek

Abstract

During extensive field research of fruit-feeding Lepidoptera in various West African forests, we have collected a rich material of several rare or poorly known species. Among them we identified four species, where only one of the sexes was described. Here, we describe unknown females of *Euriphene lomaensis* Belcastro, 1986, *E. taigola* Sáfián & Warren-Gash, 2009 and *E. bernaudi* Hecq, 1994 with reference to the latter species' taxonomic position (stat. rev.). We also describe the male of *Bebearia inepta* Hecq, 2001. We report observations on their habitats and behaviour and review their known distribution.

KEY WORDS: Lepidoptera, Nymphalidae, Limenitidinae, tropical rainforest, Cameroon, Liberia, Nigeria, West Africa.

Descripción de las hembras de tres especies, antes desconocidas, de *Euriphene* Boisduval, 1847 y del macho desconocido de *Bebearia inepta* Hecq, 2001 de África Occidental, con notas sobre su bionomía y distribución (Lepidoptera: Nymphalidae, Limenitidinae)

Resumen

Durante una extensa investigación de campo sobre los Lepidoptera que se alimentan de fruta en varios bosques húmedos tropicales de África occidental, hemos recogido un rico material de especies raras o escasamente conocidas. Entre otras, identificamos cuatro especies, donde solamente uno de los sexos estaba descrito. Aquí, describimos las desconocidas hembras de *Euriphene lomaensis* Belcastro, 1986, *E. taigola* Sáfián & Warren-Gash, 2009 y *E. bernaudi* Hecq, 1994 con referencia a la posición taxonómica de la última especie (estatus revisado). También describimos el macho de *Bebearia inepta* Hecq, 2001. También informamos sobre las observaciones de su hábitat y comportamiento y revisamos su distribución conocida.

PALABRAS CLAVE: Lepidoptera, Nymphalidae, Limenitidinae, bosque húmedo tropical, Camerún, Liberia, Nigeria, África Occidental.

Introduction

In recent years, research on fruit-feeding Lepidoptera (mainly Charaxinae, Satyrinae and Limenitidinae) has been intensified in tropical areas, including western Africa. One of the main reasons for this was the publication of Torben Larsen's comprehensive work on the West African Lepidoptera

(LARSEN, 2005), which is now used as a foundation for both taxonomic and ecological research in the region. The second and third authors were involved in various research projects in West African forests since 1974, while the other authors between 2006 and 2018, during which an extensive material of fruit-feeding butterflies (particularly Limenitidinae, Adoliadini) was collected in Western Cameroon, Ghana, Guinea, Ivory Coast, Liberia and Sierra Leone.

In the material collected during these research projects, previously unknown sexes of a few recently described species in the genera *Euriphene* and *Bebearia* were recognised: females of *Euriphene lomaensis* Belcastro, 1986, *E. taigola* Sáfián & Warren-Gash, 2009, and *E. bernaudi* Hecq, 1994, and males of *Bebearia inepta* Hecq, 2001. This paper aims to present morphological descriptions and illustrations of the previously unknown sexes. It also provides further information on the habitats, distribution and biogeography of these poorly known species.

Methods

Euriphene taigola, *E. lomaensis* and *Bebearia inepta* were observed and collected on various field expeditions in Sierra Leone during over ten field trips to the Gola Forests between 1989 and 2017 by Claudio Belcastro, specimens were also collected in Sierra Leone and Liberia between 2010 and 2017 by Szabolcs Sáfián, Robert Tropek, Oskar Brattström; a few specimens collected in Diecké Forest, Guinea, by C. Belcastro and local collectors were also examined. Female specimens of *E. bernaudi* were first collected by the African Butterfly Research Institute, (ABRI) collectors in 2010 and 2011 and during an expedition organized by Marianne Espeland, Robert Tropek and Szabolcs Sáfián in the Cameroon Highlands in April 2013.

For comparison of the newly described sexes and their respective relatives, we consulted the Rhopalocera collection of the African Butterfly Institute, Nairobi, Kenya (ABRI) and the research reference collections of Claudio Belcastro, Szabolcs Sáfián and Oskar Brattström. In the descriptions we followed the English numbering of wing venation, as described in MILLER (1970). Sáfián's research reference collection is now deposited at the African Natural History Research Trust's (ANHRT) Museum in Leominster, UK.

Descriptions

Euriphene lomaensis Belcastro, 1986

The species was described from a male holotype collected in the Loma Mountains, Sierra Leone, (BELCASTRO, 1986) and was originally believed to be endemic to the area, until another male was found in the Tai National Park, western Ivory Coast (LARSEN, 2005). Recently, further males and the first female of the species were obtained in the lowland forests of the Gola Rainforest National Park, Sierra Leone (BELCASTRO & LARSEN, 2006). Oskar Brattström found the first specimens for Liberia in the Sapo National Park, including the second female. Another female was found in the Sapo National Park by Robert Tropek and Szabolcs Sáfián and subsequently, the species was also recorded (both males and females) from the Liberian side of the Nimba Mountains on various occasions, where it seems to be generally more common. No specimens have been found outside the Liberian sub-region so far. The species were found both in lowland and upland and even sub-montane forest within its range, but it appeared only in primary or old grown secondary forest with closed canopy. Males were observed expressing display behaviour on hilltops in the Nimba Mountain, possibly because abundance of the populations is generally low. On some occasions both males and females were captured in fruit-baited net-traps set close to the ground.

Description of female: Illustrated specimen data: SIERRA LEONE, Gola North, Lalehun 1-V-2013, leg. Belcastro, (Fig. 1 A, B); Liberia, Sapo National Park, Putu Jawodee 26-XI-09-XII-2009, leg. Oskar Brattström (Fig. 1 C, D).

Forewing: 31-33 mm, wingspan: 54-57 mm (between the specimens illustrated). The female is of "*Catuna*-type" with unusually falcate forewing outer margin and acute apex. The ground colour is

brown with creamy yellow pattern. The pale-yellow lines and spotting on the forewing are inconspicuous looking rather shades of the pattern itself. The central transverse band on the forewing is also very weakly marked and narrow (much more conspicuous on the underside) but the four whitish spots in the apex are visible. The hindwing upper side has a prominent creamy transverse band, broadening significantly from the abdominal fold towards the apex (4 mm in space 1b and 11 mm in space 6). The underside is similar in both colour and pattern to the upper side but is generally lighter, the pattern is more conspicuous, and the hindwing's creamy-yellow area and the forewing's sub-apical area are sparsely speckled with dark brown scales. There is a prominent pale yellowish spot in the hindwing base and another more irregular pale-yellow area centred on the base of the hindwing cell.

The female of *E. lomaensis* is not easily recognizable in the wild, being very similar to the female of *E. coerulea*. It was considered quite different by T. Larsen, because the presumably closely related Central African *E. karschi* has a very different, typical '*Euriphene*-type' female with uniformly reddish-brown ground colour, black apical area with a prominent white subapical band and four white spots in the forewing apex. However, despite its similarity to the female of *E. coerulea* (1 E, F), the falcate outer margin of the forewing with a rather acute apex, the hindwing underside with the pale yellowish basal spot and the pale creamy yellow outer half, speckled with brown scales are convincing features to pair it up with the male *E. lomaensis*. Other *Euriphene* species related to *E. lomaensis* (e. g., *E. obsoleta*) have very similar wing shape and underside pattern.

Other material examined: GUINEA: 1 ♀, Guinea, Fôret Classée de Diecké, VI-2012 (leg. local collector, coll. C. Belcastro); LIBERIA: 1 ♀, Grand Gedeh County, Sapo NP, Gamboh trail, 15-20-XI-2012 (leg. R. Tropek and Sz. Sáfian, coll. Sz. Sáfian); 1 ♀, Grand Gedeh County, Putu Jawodee, buffer zone to Sapo National Park, 26-XI-8-XII-2009 (leg. O. Brattström, coll. ABRI) (Fig. 1 C, D); SIERRA LEONE: 2 ♀♀, Gola Forests (South and North), 11-12-V-2011 (leg. and coll. C. Belcastro);

Euriphene taigola Sáfian & Warren-Gash, 2009

The first (male) specimens of this recently described species were found in the Tai National Park, western Ivory Coast, by Haydon Warren-Gash, who was hesitant to describe it until more morphologically identical males were collected in the Gola Rainforest National Park, Sierra Leone (LARSEN *et al.*, 2009). The species was believed to be rare and local, but extensive field studies in the Gola Forests in Sierra Leone and Liberia and other forest areas in Liberia revealed that *E. taigola* is not necessarily rare, but its distribution is probably centred in Liberia's generally under-recorded lowland forests. There, it is relatively widespread and could be occasionally common. The species is associated with hyper-wet and wet forests in good conditions, none were found in the submontane forests of Nimba Mountains, Liberia, while specimens were recorded from the lowland zone at the foothills of the Liberian Nimba and in the lowland forest of Diecké in Guinea near the Nimba Mountains. Males were observed displaying on hilltops and both sexes were found in fruit-baited traps.

Description of female: Illustrated specimen data: SIERRA LEONE, Gola North, Lalehun forest trail. 5-V-2014 (leg. and coll. C. Belcastro) (Fig. 2A, B).

Forewing: 29 mm, wingspan: 52.5 mm. The upper side is of typical '*Euriphene*-type' with blackish brown ground colour in the outer half of the forewing, warmer brown in the inner half of the forewing and the hindwing and with a prominent whitish sub-apical band on the forewing. The band is unbroken, it tapers down strongly towards the costa from vein 4 at the end of the discoidal cell, where its outer edge is also strongly serrated. The spot in space between veins 3 and 4 is at least twice as large as those above it. The crescent shaped spot between veins 2 and 3 is partially conjoined. There are four small white subapical dots in the spaces between veins 4 and 9. On the hindwing upper side there is a row of sub-marginal crescent-shaped dark brown lunules and another one with conical spots towards the centre, with lighter spots in-between. A fine dark median line is also visible, and the margin is also sparsely covered with darker scales. The underside ground colour is warm hazel brown with the prominent sub-apical band on the forewing and the four white dots of the upper side, a white dusted black centre spot on the hindwing and prominent whitish pattern and scaling. The white scaling is particularly visible in centre area of the hindwing, where a quadrangular area is well edged by a white

band that runs from the inner margin through the blackish central spot, where it turns in right angle upwards to the costa. Apart from this central quadrangle, there are also whitish spots overlaid in the discoidal cell and a larger whitish area in the tornus. The post-median row of lunules and the spots of the upper side also appear as whitish spots. Further white pattern appears in the forewing discoidal cell and a prominent whitish spot at the tornus, adjacent to the end of the white sub-apical band. Many West African *Euriphene* females are similar in appearance, however, the female of *E. taigola* could easily be separated from all but that of *E. aridatha feronia* via the white-barred quadrangle on the hindwing underside which is characteristic only of *E. taigola* and *E. aridatha feronia* in West Africa. The separation of *E. taigola* from *E. aridatha feronia* is particularly difficult for inexperienced eyes, but the white sub-apical band tapers down towards the costa in *E. taigola* (Fig. 2 A, B), while it is generally of even width in *E. aridatha feronia* (Fig. 2 C, D).

Other material examined: GUINEA, 1 ♀, Fôret Classée de Diecké, VI-2012 (leg. local collector, coll. C. Belcastro); LIBERIA, 1 ♀, Nimba Mountains, Western Range, Vanyenpah, Gba Community Forest, 20-27-II-2012 (leg. Sz. Sáfian and M. Strausz, coll. ANHRT); 8 ♀♀, Gola Forests (South and North), various dates in 2013-2015 (leg. and coll. C. Belcastro); SIERRA LEONE, 1 ♀, Gola North, Lalehun, (1-IV-XII-2008 (leg. Sz. Sáfian, G. Csontos and R. Vorgas; coll. ANHRT).

Euriphene bernaudi Hecq, 1994, **stat. n.**

The butterfly was described as a subspecies of *E. simplex* (Staudinger, 1891) by HECQ (1994) but was already treated as a distinct species by HECQ (2002) and subsequently also by LARSEN (2005). Despite the obvious morphological and ecological differences between *E. simplex* and its sub-species, *E. bernaudi* was not formally raised to species level, as pointed out by WILLIAMS (2017), which here we correct. The male of *E. simplex* is morphologically very distant from *E. bernaudi*, since it is one of the few species, where the blue colour completely overlays the usual *Euriphene* pattern, whereas on males of *E. bernaudi* the pattern is clearly visible. *E. bernaudi* is also significantly larger in size (the species is one of the largest *Euriphene*) based on the series examined in the ABRI collection and the real-size illustration of the holotype in HECQ (2002). *E. simplex* is a widely distributed lowland species of the Upper Guinean forest zone, whereas *E. bernaudi* is a Gulf of Guinea Highlands endemic orophilous specialist, which does not commonly occur below 1500 m asl. (LARSEN, 2005). For these differences the two cannot be treated conspecific (**stat. n.**).

The male was first collected on the Obudu Plateau, Eastern Nigeria, by St. Leger in 1965 and then on a few occasions by several collectors (LARSEN, 2005; Robert Warren, pers. comm.), and later in its type locality in the Rumpi Hills, Cameroon, by D. Bernaud (HECQ, 1994). Quite a few specimens, including females, were found recently on Mount Kupe in Cameroon by ABRI collectors in 2010-2011, and by Szabolcs Sáfian, Robert Tropek and Marianne Espeland in 2013.

Description of female: Illustrated specimen data: CAMEROON, South-Western Province, Mount Kupe (Koupé), 2010-2011 (leg. and coll. ABRI) (Fig. 3A, B).

Forewing: 40.5 mm, wingspan 73.5 mm, significantly larger than the majority of species in the genus, even compared to its morphologically closest relatives (*E. jacksoni*, *E. hecqi*) (Fig 3. A, B). It is of the typical '*Euriphene*-type', with dark apical area on the forewing and a white sub-apical band, although the ground colour is reddish-brown instead of hazel or light chocolate brown. The apex of the forewing is black and not brown, which is also not rare in *Euriphene* females. The sub-apical white band is not continuous but formed by three rectangular white spots separated only by the veins, the centre one between veins 3 and 4 is prominent and rather oval with a dentation on its inner edge. The white spot between veins 2 and 3 is of crescent shape with a smaller lunule on the inner edge. There are also two minute white dots in the apical area between veins 4 and 6 and two slightly larger apical spots along the costa. The hindwing is almost completely reddish brown, apart from a darker margin, which broadens from the apex (3.5 mm) to the tornus (7 mm). The darker margin is separated from the rest of the wing by a row of blackish lunular and triangular spots, and there is another much more faints row of spots towards the post-median. The width of the spots varies among the examined specimens. The underside is warm hazel-brown with a whitish flush in the sub-apical area and along the costa of the

forewing and in the median and post-median on the hindwing. The forewing sub-apical white spots (band) are clearly visible also on the underside. There is an ochreous-brown more or less triangular area from the base along the cell well into the spaces between 2 and 3 which widens towards the inner margin. The hindwing underside is warm hazel-brown with the above-mentioned whitish flush, which is well separated from the sub-basal area by a slightly irregular median line, which turns toward the base with a right angle when reaching vein 2. There is an oval black ring edged with a whitish flush in the cell, the faint whitish flush actually forms here a band (or the hint of a band), which also turns to the base at the base of vein 2. The white flush or scaling is strongest along the median line and in the post-median, where a row of faint whitish spots is visible in the spaces. The shade of the sub-marginal crescent-shaped spots from the upper side is also visible as a zig-zagging line. The dorsal side of the body is dark brown, while the ventral side is covered with long dirty-white hairs. The antennae are black on the dorsal side, while dark brown below.

The female of *E. bernaudi* differs from its morphologically closest relatives *E. jacksoni* and *E. hecqi* by its larger size (wingspans are 74 mm, 64.5 mm and 58.5 mm respectively in the examined material), also by the spotting in the sub-apical area: The central oval spot is much more prominent in *E. bernaudi* than in the other two species. The costal section of the linear white band, formed by the three conjoined rectangular spots between veins 5 and 9 almost touches the prominent central spot on the corner in *E. bernaudi*, while it is separated by a broader black area in *E. jacksoni* and *E. hecqui*. The lunular spot of the band between veins 2 and 3, is also much closer to the central white spot in *E. bernaudi* than in the other two species.

Other material examined: CAMEROON, 12 ♀♀, South-Western Province, Mount Kupe (Koupé), 2010- (leg. and coll. ABRI); 1 ♀, South-Western Province, Mount Kupe (Koupé), IV-2013 (leg. Sz. Sáfíán, R. Tropek and M. Espeland, coll. Sz. Sáfíán).

Bebearia inepta Hecq, 2001

B. inepta was originally described from a female holotype, collected by M. Auberger in the Danané area, western Ivory Coast, in 1975 (HECQ, 2001). Another three females were subsequently collected from Danané and the Taï National Park, Ivory Coast, confirming its specific status (LARSEN, 2005), but the male remained unknown. The first specimen caught in Sierra Leone was another female in the corridor area between the Gola Rainforest National Park and the Liberian border (the Moro River), while the first male was found on the Liberian side of the river (now Gola Forest National Park) just a couple of days later in January. In Liberia, further males were collected near Camp Alpha, Gola National Forest, in February 2011, and on Mount Swa, Nimba County, in November-December 2012, while several specimens of both sexes are in the collection of Belcastro, collected over a long period of time in the Gola Forests and other locations in western Ivory Coast and Guinea.

It is another Liberian sub-region endemic species (ranging between the Taï National Park, Ivory Coast, and the Gola Rainforest National Park, Sierra Leone), which is usually rare in lowland rainforests and old secondary growths in good condition throughout its range. Similar to all other Adoliadini, both males and females were recorded feeding on fallen fruits, while males were observed hill-topping on forested hilltops in the Putu Range, Grand Gedeh County and on Mount Swa, Nimba County, Liberia, approximately 4-6 metres above the ground at 14:30-15:30 in the afternoon.

Description of male: Illustrated specimen data: LIBERIA, Nimba County, Mount Swa, 29-XI-3-XII-2012 (leg. Sz. Sáfíán and R. Tropek, coll. ABRI) (Fig. 4 A, B).

Forewing: 28 mm, wingspan 47 mm. The forewing is strongly falcate, like in other morphologically close species (e. g. *B. demetra* and *B. warrengashi*) with which *B. inepta* flies in full sympatry. The hindwing is not rounded but rather conical, with a rounded tip at the anal angle. The ground colour of the upper side is dark brown and rusty-brown, with the usual dark blackish-brown *Bebearia* pattern (figure-of-eight in the forewing cell, spotting and cross-bands) but with an unusual golden-olive greenish sheen on both wings, which somewhat fades over time and dead specimens could partially lose their greenish colour. The rusty-brown colour is most visible in the forewing tornus and the anal angle of the hindwing on the specimen illustrated, but individual variation occurs, and the

ground colour could also turn more greyish with no rusty colour present. The shade of the brown on *B. inepta* is similar to that of *B. laetitia*, but on the latter, this brown colour appears slightly darker and is distributed all over the wings, filling up the space between the *Bebearia* pattern, and the forewing outer margin is also much less falcate. The golden-greenish sheen is also missing from *B. laetitia* (Fig. 4 C, D). The greyish forms are more similar to lighter specimens of male *B. demetra* (Fig. 4 E, F), however *B. demetra* specimens always have the apical white spot right on the tip of the apex, whereas it is always displaced inwards in *B. inepta* (also in females, as described in LARSEN (2005)). The underside, similarly to that of *B. demetra*, is shiny green, when fresh, with white spots in the forewing cell, another one between the cell and the apex along the costa and in the apex. There is a single white spot on the hindwing in space 7 on the costa.

The main distinguishing feature on the underside is the white spot in the forewing apex, which is, similarly in the female (see description in LARSEN, 2005), not centred on the apex, but slightly displaced towards the centre (the white spot is sometimes visible, but rather inconspicuous on the upper side of some specimens). All other closely related species have a prominent white spot exactly on the apex, except *B. laetitia*, which has a brownish underside and the displaced white apical spot is minute in most cases.

Other material examined: LIBERIA, 1 ♂, Gola National Forest, Money Camp, 20-I-2011 (leg. Sz. Sáfian, coll. ABRI); SIERRA LEONE, 1 ♂, Gola Forest, Gola South, Nemahugoima, 15-XII-2013 (leg. and coll. C. Belcastro).

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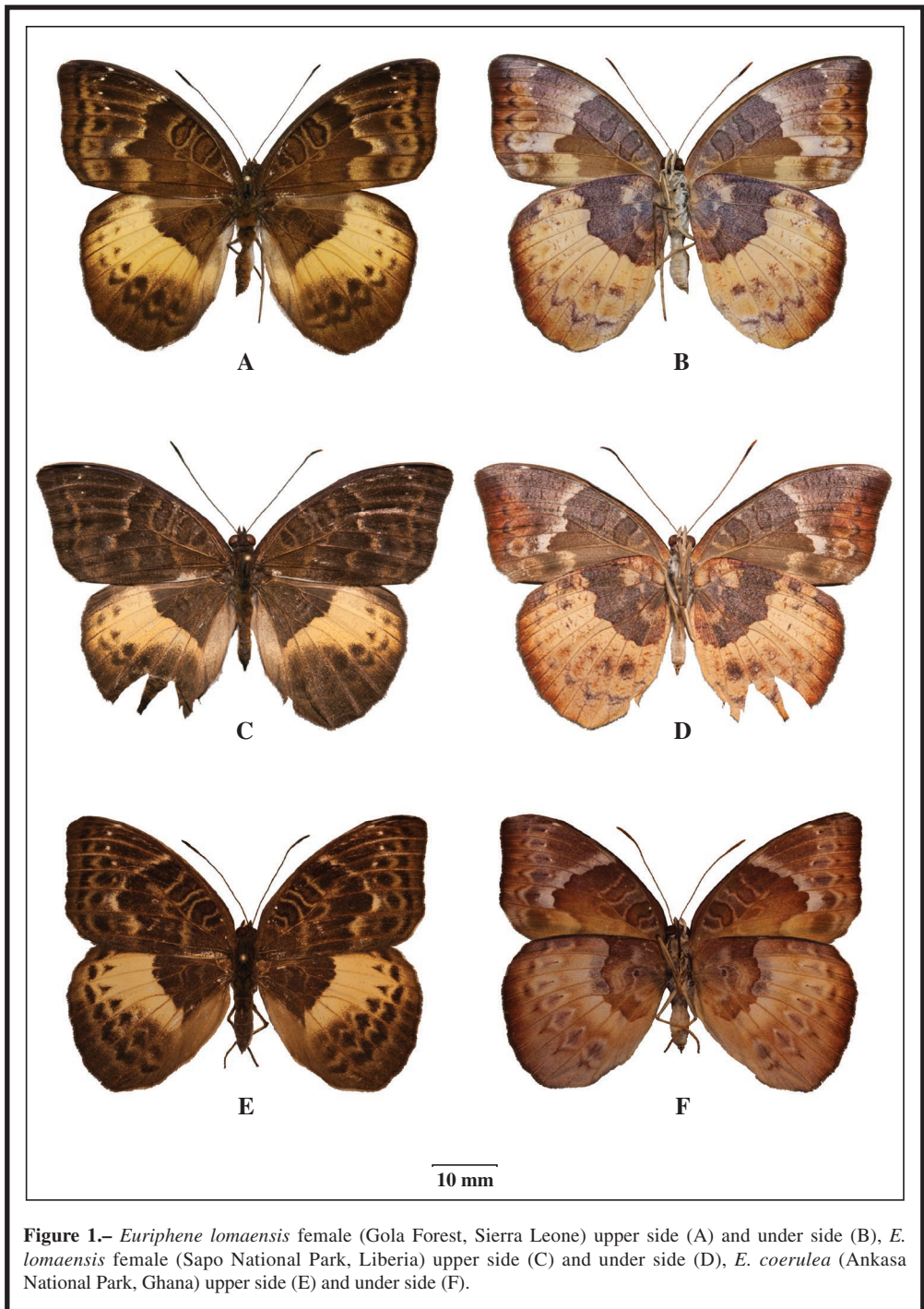
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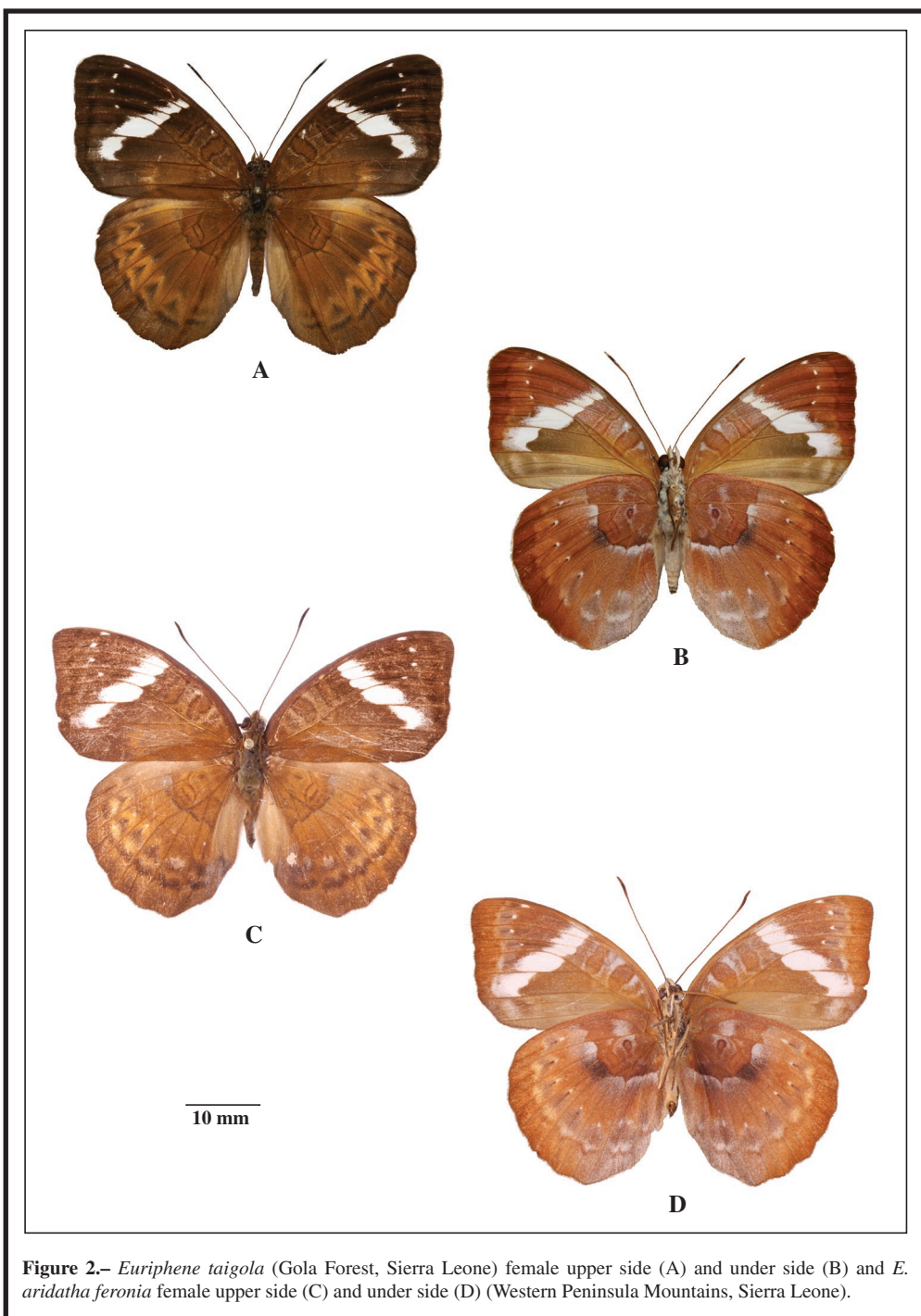


Figure 2.– *Euriphene taigola* (Gola Forest, Sierra Leone) female upper side (A) and under side (B) and *E. aridatha feronia* female upper side (C) and under side (D) (Western Peninsula Mountains, Sierra Leone).

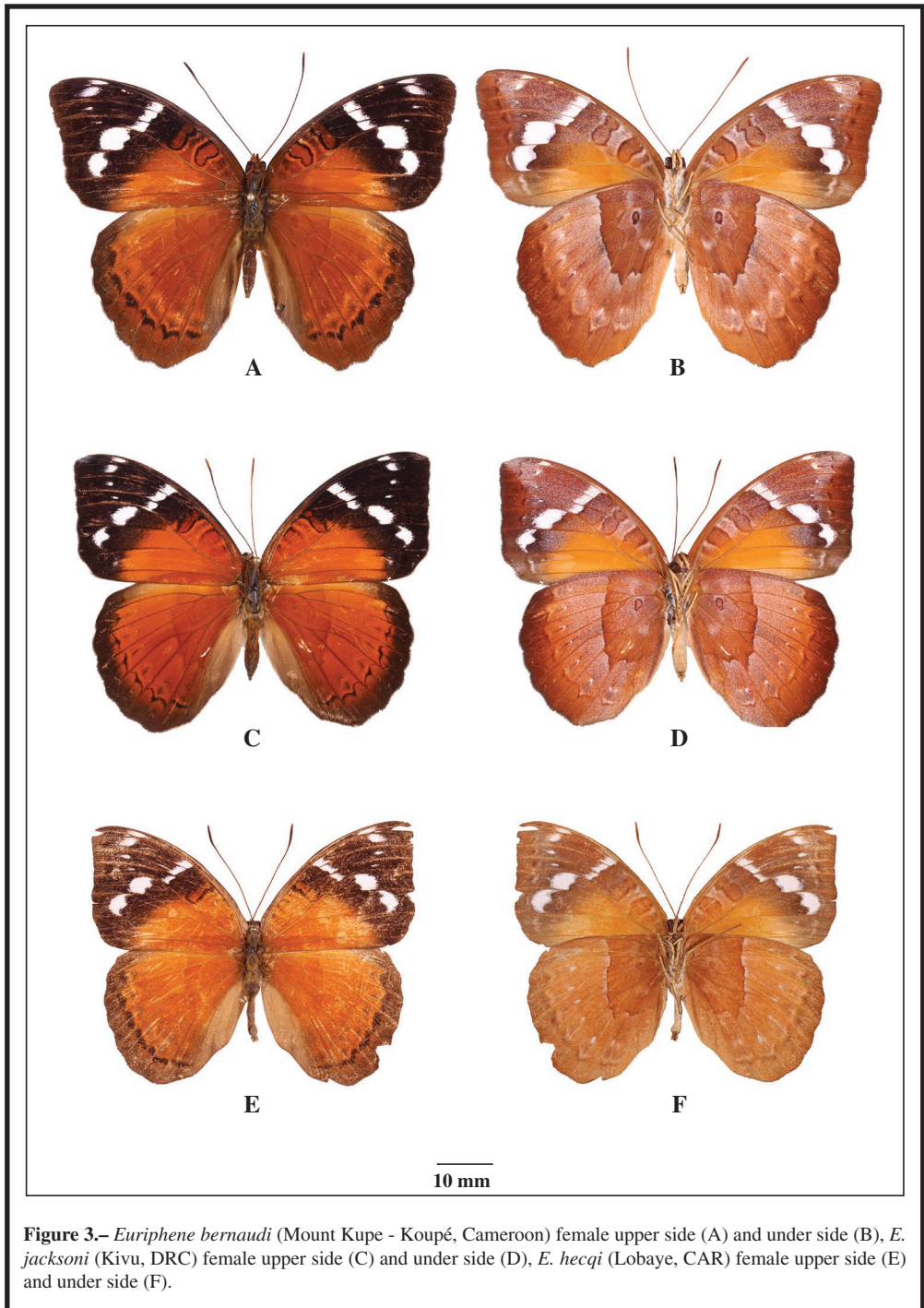




Figure 4.– *Bebearia inepta* (Mount Swa, Liberia) male upper side (A) and under side (B), *B. laetitia* (Cape Three Points, Ghana) male upper side (C) and under side (D), *B. demetra* (light form Guma Valley, Sierra Leone) male upper side (E) and under side (F).