



A new *Iridana* Aurivillius, 1920 and a new *Teratoneura* Dudgeon, 1909 (Lepidoptera: Lycaenidae) from tropical Africa

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Abstract: A new species of *Iridana* Aurivillius, 1920 has been discovered in 2009 and is described as *I. kollariki* sp. nov. in relation to *I. perdita* (Kirby, 1890). It was bred from larva and pupa in the Bunso Arboretum, Ghana and was subsequently found also in Liberia. Descriptions of larva and pupa are given, as well as notes on the species' development and myrmecophilous relationship. A remarkable species in the previously monotypic genus *Teratoneura* Dudgeon, 1909 is also described in comparison with *Teratoneura isabellae* Dudgeon, 1909. Although it was recognised for a while, the lack of accessibility of the few specimens in collections and a taxonomic misunderstanding of *T. isabellae* and *T. isabellae congoensis* Stempffer, 1954 in relation to the new species, prevented its description. The confusion was partly caused by the misidentification and illustration of the undescribed species in two relevant works.

Key words: *Iridana kollariki* sp. nov., *Teratoneura zambiae* sp. nov., Epitolini, myrmecophily.

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INTRODUCTION

A new *Iridana* Aurivillius, 1920 species has been discovered in recent years in the Guineo-Congolian forest zone. It was bred from larvae and pupae found on tree bark near a *Crematogaster* ant nest in Ghana, and was subsequently recorded also in Liberia. The species seems to be close to the Central African *I. perdita* (Kirby, 1890), but females of the two species differ significantly and consistently. A species of *Teratoneura* Dudgeon, 1909 from northern Zambia has, for a while, been recognised to be different from *T. isabellae* Dudgeon, 1909 (Heath *et al.* 2002), but due to previous misunderstanding of the species and the lack of access to collection specimens prevented its description. This confusion was caused mainly by the illustration of a male of the undescribed species as *T. isabellae* in 'The Catalogue' (Ackery *et al.* 1995), following the illustration of a female as an aberration of *T. isabellae* in Berger (1981), and possibly the confusion of the undescribed species with *T. isabellae congoensis* Stempffer, 1954. Examination of the male in the collection of the African Butterfly Research Institute, Nairobi, the illustrated male (Ackery *et al.* 1995), and a matching female from the same locality

found in the Natural History Museum, London confirmed its specific status. The new species is being described below in comparison with *T. isabellae isabellae* and *T. isabellae congoensis*.

MATERIALS AND METHODS

The female holotype of *I. perdita* was viewed and photographed in the NHM collection as well as 103 males and 34 females from Cameroon and the Central African Republic in the ABRI and MRAC collections. The holotype of *T. isabellae congoensis* was photographed in the MRAC collection. Furthermore, 84 males and 54 females of *T. isabellae* (including several specimens belonging to spp. *congoensis*) were viewed in the ABRI and SZS collections for comparison. Specimens in the comparative material were collected in Tanzania, Uganda, Democratic Republic of Congo, Central African Republic, Cameroon, Nigeria, Ghana and Ivory Coast.

The specimens illustrated were photographed with a Canon 40D digital SLR camera, equipped with Microsat MT-160, 75 W portable studio flashes and softboxes. The illustrations were processed and edited in Adobe Photoshop Elements 7 freeware software.

Abbreviations: The following abbreviations are used for the various collections of the specimens involved:

ABRI = African Butterfly Research Institute, Nairobi;
MRAC = Royal Museum for Central Africa, Tervuren;
NHM = Natural History Museum, London; SZS = Szabolcs Sáfian's scientific reference collection.

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RESULTS

GENUS *IRIDANA* AURIVILLIUS, 1920

(Lycaenidae: Lipteninae: Epitolini)

Iridana kollariki Sáfián sp. nov.

(Figs 1A, 1D, 1G & 1J)

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Type locality: Bunso Arboretum, Eastern Region, Ghana. (6°16'4.93"N, 0°27'38.52"W).**Type material:** Holotype ♀: 22–28.x.2009 (ex-larva); Ghana, Bunso Arboretum, Eastern Region; leg.: Sáfián, Sz. Deposited in ABRI collection. Paratypes: Ghana: 3♂♂, 3♀♀: 20–28.x.2009 (ex-larva); Bunso Arboretum, Eastern Region; leg.: Sáfián, Sz. 1♀: 10.iii.2009 (ex-pupa); Bunso Arboretum, Eastern Region; leg.: Sáfián, Sz., Horváth Á. 1♂: x.2009;

Bunso Arboretum, Eastern Region; leg.: ABRI. Liberia: 3♂♂: 6–10.ii.2011; Camp Alpha, Gola National Forest; leg.: Sáfián, Sz. Deposited in the ABRI and SZS collections.

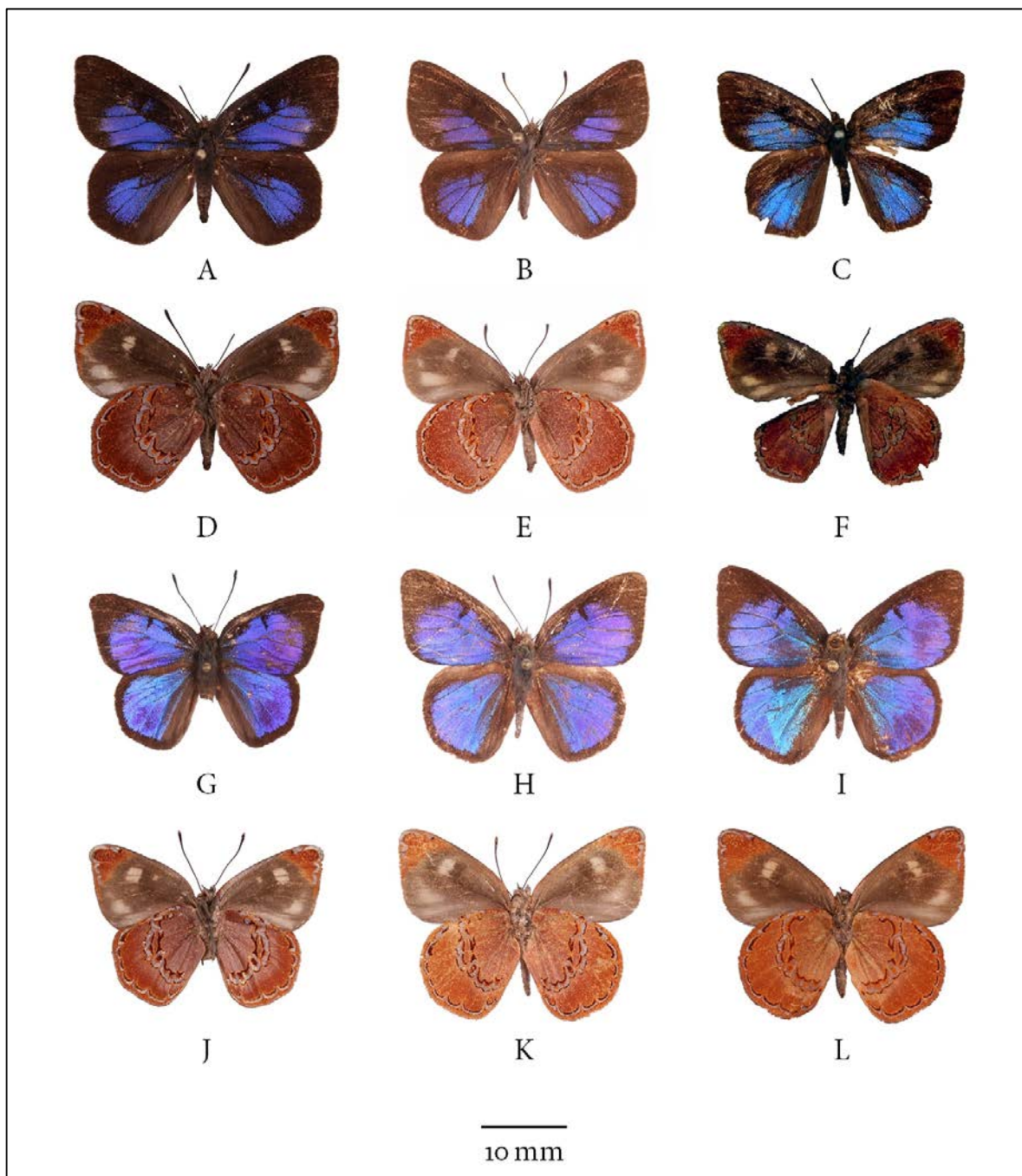
Description: Female (holotype) (Figs 1A, 1D): Forewing length 17 mm, wingspan 31 mm. Body length 12.5 mm. Upperside ground colour black, with large dark blue-coloured patches on both wings. Blue area on forewing covers most of spaces 1a and 1b; more reduced in spaces 2 and 3; and just extends into space 4 – there forming only a blue spot. Separate, rather prominent blue spot present also in the discoidal cell. Blue area covers only one-third of hindwing, almost exclusively in the discoidal area. Patch rounded from margin, getting narrower towards base. Underside hindwing shiny rust-red, with the usual *Iridana* pattern

Figure 1 – *Iridana kollariki* sp. nov. female (holotype) **A** recto, **D** verso; *I. perdita* female (Ebogo, Cameroon) **B** recto, **E** verso; *I. perdita* female (holotype) **C** recto, **F** verso; *I. kollariki* sp. nov. male (paratype) **G** recto, **J** verso, *I. perdita* male (Maan, Southern Cameroon) **H** recto, **K** verso, *I. perdita* male (Ebogo, Cameroon) **I** recto, **L** verso.

(for the majority of species, the pattern is dominated by a central semi-circular band formed by small irregular lunules and a submarginal line of silvery coloured crescent-shaped lunules) of bluish-silvery-grey lunules bordered by black and fiery red lines in *I. kollariki*. Forewing also has rusty apical patch and the usual silvery lunules along the margin, while mostly blackish in the centre, with a more or less quadrate-shaped light greyish spot in space 4-5 at end of cell. Ternal area also has whitish-grey spots in spaces 1a and 1b (these lighter spots are also featured in most other *Iridana* species).

Male (Figs 1G, 1J): Forewing length 16 mm. Wingspan 27.5 mm. Body length: 12 mm (abdomen of the illustrated specimen was later removed for genitalia dissection). Shape of the wings typically *Iridana*-like, with slightly concave outer forewing margin. Upperside ground colour black with beautiful iridescent cobalt blue patches. Blue scales cover almost the entire space 1a from base to tornus, while black margin from space 1b widens prominently from under 1 mm to 7 mm, with outer edge of blue area almost evenly rounded. Blue scaling just penetrates space 6. Blue area broken at the closing of the discoidal cell with prominent black tooth. Roughly two-thirds of cell covered by blue scales. Blue area narrows towards base, along vein 4. Hindwing upperside has same coloured blue patch covering much of wing, rounded along outer margin but almost straight from sub-base to anal angle along vein 1b. Black margin broader than 1 mm. Underside matches the female holotype.

Male genitalia: As in nearly all other *Iridana*, compact, circular in shape, with reduced features (gen. prep. SAFI00019 attached to holotype in coll. ABRI).

Diagnosis: The female holotype of *I. kollariki*, especially on the underside, is most similar to *I. perditia* but the two can easily be separated, since *I. perditia*

females (including the holotype and 32 females examined in the ABRI collection) lack any blue in the discoidal cell and in space 4, while prominent blue spots are present in all female specimens in the type series of *I. kollariki*. The males are rather more difficult to separate, but the outer edge of the forewing blue patch is evenly rounded in *I. kollariki*, while in *I. perditia*, the tip of the blue patch is broken inward between veins 4-6, best viewed from an oblique angle (Fig. 2). This small difference shows consistent pattern throughout the distribution of *I. perditia* and in both the Ghanaian and Liberian specimens of *I. kollariki* ruling out individual variation, which is usually slight in *Iridana*. The male genitalia did not show any differences from those of *I. perditia*, which is not surprising, as they were not found diagnostic at species level. The male genitalia of *I. perditia* were illustrated by Stempffer (1964).

Pre-imaginal stages: The length of the fully-grown larva is 18–21 mm. The larva is moth-like and hairy. The body is silvery-grey, with darker grey dorsal and sub-dorsal lines. The head is shiny black, small, only 2 mm in the last instar. The first two thoracic segments (T1, T2) and the last two abdominal segments (A9, A10) are black. The setae are clustered all over the body; a single cluster contains shorter reddish-brown hairs (usually shorter than 1–2 mm) and also longer silvery-grey setae (4–8 mm). The reddish hairs form a ring around the neck and on the anal plate, where they are almost the same length as the grey ones (otherwise the reddish short hairs can easily be taken as evenly distributed reddish spots on the body). The longer hairs are especially long on the back and on the anal plate (Fig. 3). The pupa is the usual bold brown *Iridana* type, with brownish-grey hairs on the dorsal side. The pupae

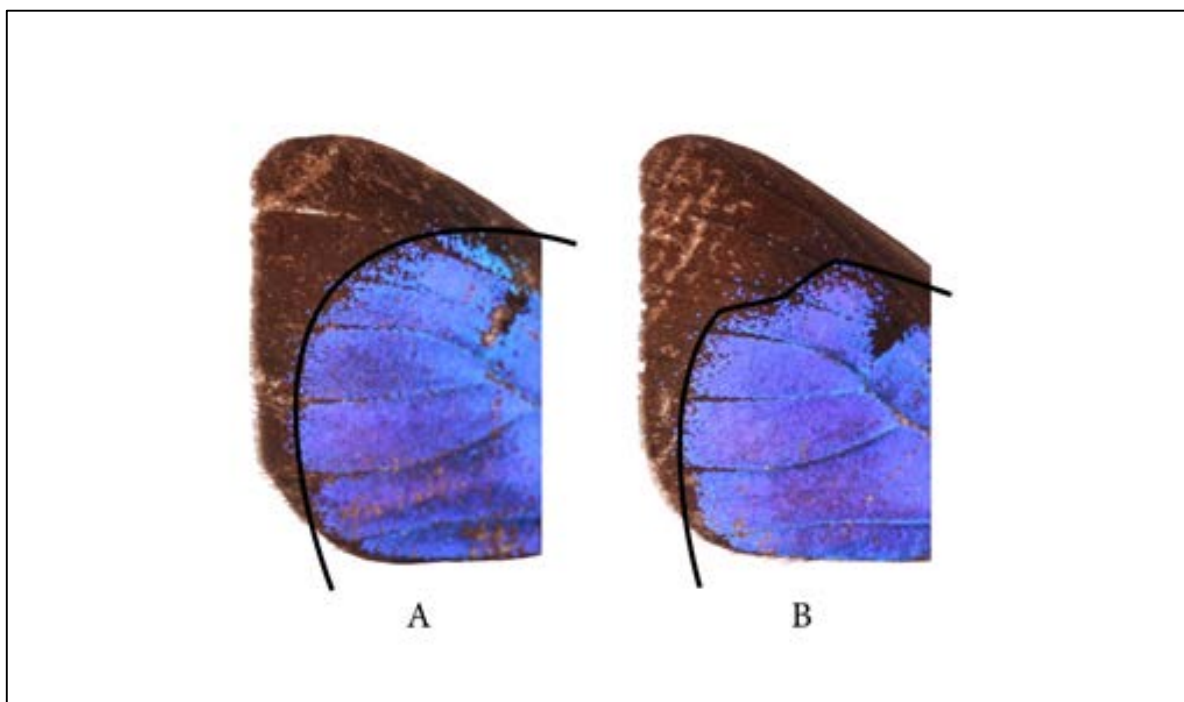


Figure 2 – Small, but consistent difference between the males of *I. kollariki* and *I. perditia* is the outer edge of the blue patch on the forewing, which is evenly rounded in *I. kollariki* (left), while is broken inward in *I. perditia* (right).



Figure 3 – Larva of *I. kollariki* surrounded by *Crematogaster* workers during feeding (left) and resting in the “larval chamber” (right).

of the *Iridana* do not seem to be distinguished by macro-morphological features.

Discussion: *I. kollariki* is known only from the type locality and the Gola National Forest in western Liberia. The forest of Bunso Arboretum was once part of the continuous rainforest belt, which covered southern Ghana west of the River Volta, but it is now only a 16.5 hectares forest fragment, preserved by the establishment of the arboretum in 1905. The majority of the habitat is lowland moist semi-deciduous forest in slightly disturbed condition, surrounded by designed parkland, and extensively managed cacao plantations. The parkland hosts many old trees (mostly indigenous species) in a rather open structure, making them more visible for visiting tourists and more accessible for research studies. This seems to be important, since preliminary studies on Eitolini species revealed that more open woodlands with forest climate allow the establishment of colonies of various *Crematogaster* ant species lower on the tree-bark (Sáfián & Larsen 2009, Sáfián unpublished), which is the case also in Bunso Arboretum. Pre-imaginal stages of *I. kollariki* were found only on the bark of a middle-aged Ivory Coast Almond - *Terminalia ivoriensis* Chev. tree and on an introduced King Palm - *Archontophoenix alexandrae* (F.Muell.) H.Wendl. & Drude. Both stood in the more open parkland and hosted *Crematogaster* ant nests. In Liberia, males of *I. kollariki* were found displaying along *Crematogaster* infested tree-trunks on a hilltop at 14h00. The habitat was a disturbed hyperwet lowland forest, where large ant-trees supported a rich Lipteninae community.

I. perdita seems to be among the commonest *Iridana* species in the Congolian forest zone with over 130 specimens placed in the ABRI collection in Nairobi. These records are centred in Cameroon, only a single record is known from Nigeria’s Cross River State (Rhoko Conservation Area, in coll.: Robert David Warren, det.: Szabolcs Sáfián) and none were found further west. The River Cross actually serves as the eastern boundary of distribution of various Central

African butterfly species (e.g. *Liptena despecta*, *Obania subvariegata*, *Neurellipes mahota*, *Euriphene goniogramma*, *E. atrovirens* and *Bebearia octogramma* just to mention a few) (Larsen 2005, Libert 2010).

I. kollariki is the western vicariant of the Central African *I. perdita*, which occurs between Ghana, west of the Dahomey Gap and Liberia, probably without overlap with the latter, due to discontinuity of suitable habitats in western Nigeria, Benin, Togo and Ghana’s Volta Region. It is probably rare and much localised in Ghana’s remaining wet lowland forests, otherwise it should have been collected during the extensive research by Larsen or one of his predecessors (Larsen 2005). It might be more widely distributed in Liberia’s extensive lowland forests, which are generally wetter than those in the Ghana sub-region, but Liberia’s butterfly fauna still awaits in depth study.

Notes on larval development and myrmecophily:

Some information on the larvae of *Iridana* and their ant-associated development is available, mostly from old literature. Farqharson (1921) was among the first to breed *Iridana* (= *Iridopsis*) *incredibilis* (Staudinger, 1891) in Nigeria, while Jackson (1937) found and successfully bred *I. incredibilis* and *I. marina* Talbot, 1935 in Uganda. Larva and pupa of *I. nigeriana* Stempffer, 1964 were also found in the Aburi Botanical Gardens in Ghana by Larsen (2005). It is well known that *Iridana* larvae live in proximity to *Crematogaster* ants, but the nature of their myrmecophilous relationship is still quite unclear. The females of *I. kollariki* lay their eggs singly on the tree bark, in close proximity to *Crematogaster* ants. The young larvae spin a light web to cover their “larval chamber” in cracks or furrows in the bark. They leave their first chamber after their second moult and then spin a new one on the bark, usually in a depression, very close to the ant nest or an ant run. The second chamber is large enough to host the larva until pupation (Fig. 3). They also pupate in the chamber. The larvae actively eat and move from dusk till dawn, and they return to their chamber to rest from the morning till late afternoon,

except on cloudy days, when they sometimes become active even during the day. They most probably feed on living tissue of algae and lichens growing on the tree bark, like other Lipteninae, but larvae were not dissected for identification of their food. The larval period is estimated to be more than one month (from the speed of development), which is slower than in other Eptolini (Sáfián unpublished). The pupal stage lasts for ten days. *I. kollariki* seems to have an obligate association with its *Crematogaster* ant hosts. The females lay their eggs only on trees where the ants are present and the larvae and pupae can be found only in close proximity to a *Crematogaster* nest or an ant run. The larvae have several thousand interactions with ant workers every day without being recognised as prey, and therefore some sort of communication between them is quite probable. Possibly, imagines also stay close to the ant-trees where they developed, and these local colonies could build up a meta-population in rainforest areas. The nature of the myrmecophily of *I. kollariki* seems to be very similar to that of *Cerautola*, another genus in the subfamily Lipteninae, where the ant hosts receive no benefit from the larvae, but they are well protected from predation (Sáfián & Larsen 2009). This association was described as 'loose-obligate myrmecophily' by Sáfián (2011), although the relationship between Lipteninae and their ant hosts is not yet fully understood.

Etymology: The specific name of this new *Iridana* was derived from the surname of the author's late grandfather János Kollárik, who encouraged his interest in nature since a young age and whose bookshelf was full of books about Africa, frequently borrowed by the author as a child, and deepening his desire to travel on the African continent.

GENUS *TERATONEURA* DUDGEON, 1909

(Lycaenidae: Lipteninae: Eptolini)

Teratoneura zambiae Sáfián & Collins sp. nov.

(Figs 4A, 4D, 4G, & 4J)

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Type locality: Fiwale, Ndola, Zambia. (13°12'12.48"S, 28°42'43.01"E).

Type material: Holotype: ♂: 28.xi.1978 Zambia, Fiwale, Ndola. leg.: Heath, A. Deposited in the ABRI collection. Paratypes: 1♂, 1♀, Zambia, Fiwale, Ndola. 26. xi. 1978. leg.: Heath, A. Deposited in the NHM collection.

Description: Male (holotype) (Figs 4A, 4D): Forewing length 18.5 mm, wingspan 34.5 mm. Body length 13 mm. Forewing shape unique, with narrow and acute apex and rectangular outer margin, angled at the end of space 5, leaving an almost straight section between angle and apex. Between vein 4 and tornus margin turns strongly inward, with another almost straight, but very slightly concave section. At tornus, margin curves slightly into the inner margin. Hindwing also has unique angled shape, turning inwards at apex, at vein 5 and also at tornus, but margin itself gently curving and turns do not form real angles. Costa concave, ground colour bright orange. Apex dark brown (almost blackish); brown area stretches down along outer margin, ending at vein 3. Costa also brown, covering

two-thirds of discoidal cell but narrows down to 1 mm between tips of veins 11 and 12. Hindwing almost completely covered with orange, apart from a dark brown edge between apex and tornus, fading out along inner margin and being slightly broader at apex and costa. Rather intensive orange scaling in dark brown area along costa and at the tornus. Underside dominated by dark chocolate brown colour, apart from median and lower basal area of the paler orange forewing. Discoidal cell almost black with minor orange scaling. Hindwing underside with greyish cross-band between costa and inner margin, forming small fork at end of discoidal cell. Spaces 1a and 1b also covered by pale greyish scales. Small, square-shaped yellowish spot between inner third of costa and vein 9 and another one on vein 9, which touches costal spot with one of its corners. Body dark brown dorsally; abdomen covered by pale grey scales ventrally. Legs brown, antennae also brown at the base, turning into black at clubs, but tip of clubs orange.

Female (Figs 4G, 4J) Forewing length 18 mm, wingspan ca. 34 mm (no exact measurement possible due to a missing left forewing). Body length 13 mm. Only slight dimorphism between the sexes in *T. zambiae*. Only known female has its discoidal cell covered almost entirely with dark brown (blackish) scales; orange scaling reaches forewing costa. Brown (blackish) hindwing margin twice as broad as in the male.

Diagnosis: *T. zambiae* differs significantly and consistently from *T. isabellae* in the following features:

1. The ground colour of both sexes of *T. zambiae* is bright orange and never red or dark orange as in the male and the female, respectively, of *T. isabellae*.
2. Although some females of *T. isabellae* appear to be orange rather than red, they always have a much more reduced orange area on the forewing, sometimes with a separate orange spot at the end of the cell. The orange is always much more extensive in both sexes of *T. zambiae*, covering spaces 1a and 1b almost entirely and extending near the costa as a broad orange band.
3. There is orange scaling in the discoidal cell of *T. zambiae*, while *T. isabellae* females show no orange colouration in the cell.
4. On the hindwing upperside, *T. isabellae* lacks any orange scaling along the costa, leaving a dark prominent brown edge. *T. zambiae* has very visible orange scaling along the costa.
5. The shape of the forewings of the two species is very different and highly diagnostic. The forewing shape of *T. isabellae* is very elongated, turning outward very sharply at vein 4, and leaving a concave outer edge from the tornus to vein 3. The outer edge of *T. zambiae* is angled only moderately at vein 4 and the wing shape is rectangular, rather than elongate.
6. The hindwing shape appears to be strongly rectangular in *T. isabellae*, with almost right angle turns at the apex and the tornus, while obtusely angled at the tip of vein 5. In *T. zambiae*, the hindwing is also angled at the apex, but it is more curved than angled at the turn of the tornus and gently curved at the tip of vein 5.

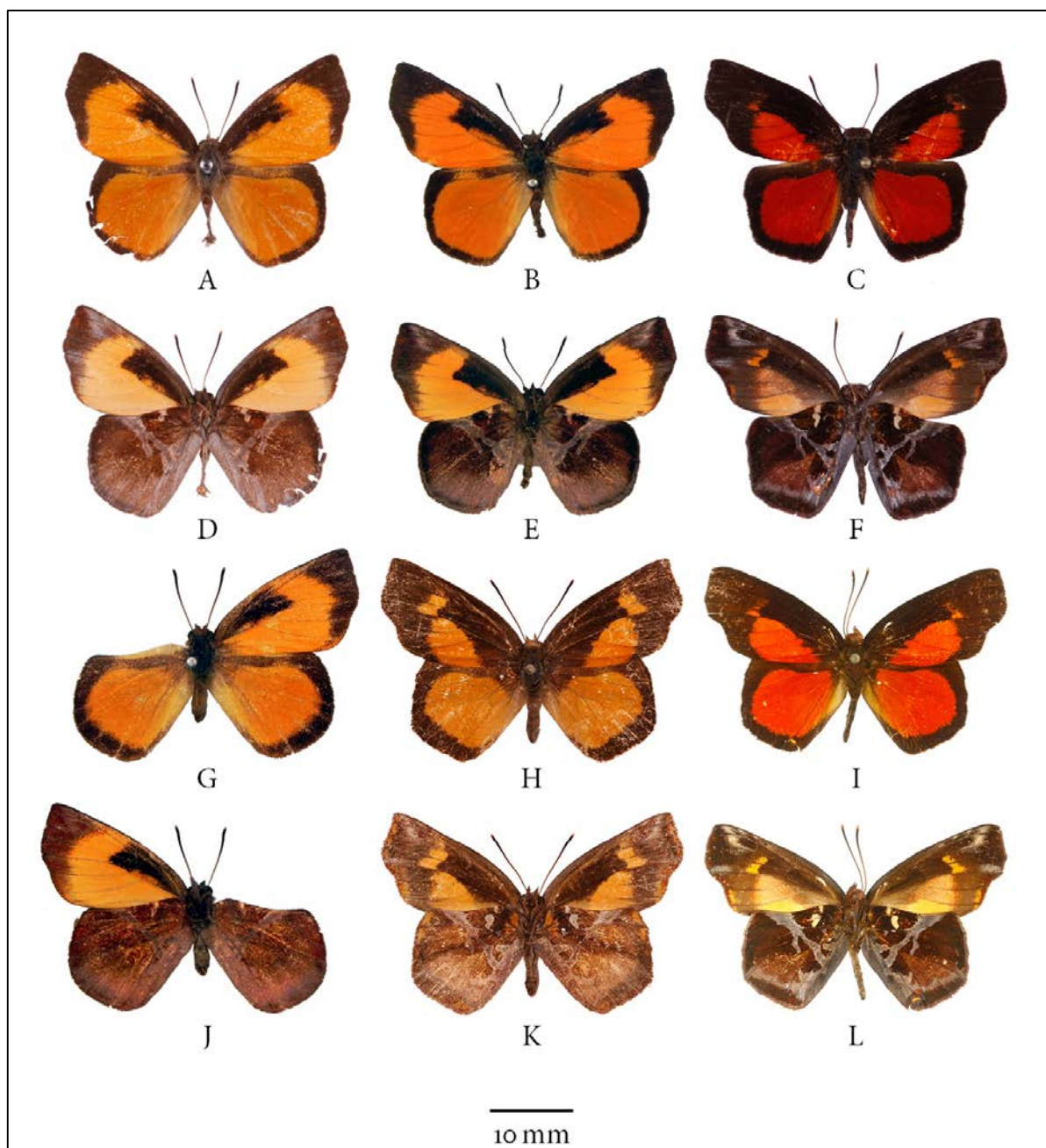


Figure 4 – *Teratoneura zambiae* sp. nov. male (holotype) **A** recto, **D** verso, *T. zambiae* sp. nov. male (paratype) **B** recto, **E** verso, *T. isabellae congoensis* male (Ebogo, Cameroon) **C** recto, **F** verso, *T. zambiae* sp. nov. female (paratype)(left forewing detached) **G** recto, **J** verso, *T. isabellae isabellae* female (Bunso Arboretum, Ghana) **H** recto, **K** verso, *T. isabellae congoensis* male (holotype) **I** recto, **L** verso.

7. *T. isabellae* has two silvery grey cross-bands on the hindwing underside, one between the costa and the inner margin, another one linking the tornus to the angle at the tip of vein 5, particularly visible on the males. The hindwing underside of both sexes of *T. zambiae* has only a single silvery band, which stretches from the costa to the inner margin across the discoidal cell (Fig 4).

All three specimens of *T. zambiae* known to exist have been viewed and are illustrated on Fig. 4 (A, D, B, E, G, J). They all have the diagnostic features described above, differing so significantly from *T. isabellae* and *T. isabellae congoensis* (Fig. 4 C, F, H, K, I, L) that there is no doubt about the specific status of *T. zambiae*. An additional, identical female was illustrated by Berger (1981) as an aberration of *T. isabellae*; the

origin of the specimen could not be traced, possibly southern Democratic Republic of Congo (DRC). Another specimen (possibly the one illustrated by Berger) was also viewed in the MRAC collection by Sáfián in 2012, but the specimen was no longer found during the compilation of data for this paper.

Discussion: *T. zambiae* has a unique biogeographical and ecological position and the species is known only from dense woodlands in northern Zambia on the southern edge of the transition zone from the Congolese rainforests to the Southern African savannah zone (the specimen illustrated in Berger (1981) is most probably from Katanga, DRC, but the original specimen was not found). It is an exceptional occurrence for any Epitolini, since most species are only found in

rainforests of the Equatorial forest belt. However, *T. zambiae* is not the only Eritolini occurring in northern Zambia, since *Iridana euprepes* (Druce, 1905) and *Cerautola fisheri* Libert & Collins, 1999 are also inhabitants of similar woodland habitats (Heath *et al.* 2002) and are known to be endemic to this biogeographical sub-region that includes also southern Katanga (formerly known as Shaba) region of the DRC.

Etymology: As *T. zambiae* is known only from unique dense woodlands in Northern Zambia the authors found it appropriate to name the species after its country of origin.

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