

## A new species of *Leptomyrina* Butler, 1898 (Lepidoptera: Lycaenidae) from Mts Mecula, Namuli, Inago, Nallume and Mabu in Northern Mozambique

urn:lsid:zoobank.org:pub:BD9304A2-682E-415F-AB9E-1D751B0221D4

Published online: 3 December 2019

Julian Bayliss<sup>1,2</sup>, Oskar Brattström<sup>1,3,4</sup>, Ivan Bampton(†)<sup>1</sup> and Steve Collins<sup>1</sup>

<sup>1</sup>African Butterfly Research Institute, P.O. Box 14308, 0800 Nairobi, Kenya. E-mail: [jlbayliss@yahoo.co.uk](mailto:jlbayliss@yahoo.co.uk);

[oskar.brattstrom@gmail.com](mailto:oskar.brattstrom@gmail.com); [collinsabri@gmail.com](mailto:collinsabri@gmail.com)

<sup>2</sup>Department of Biological and Medical Sciences, Oxford Brookes University, Oxford, OX3 0BP, United Kingdom.

<sup>3</sup>School of Life Sciences, University of Glasgow, Glasgow G12 8QQ, United Kingdom.

<sup>4</sup>Department of Zoology, University of Cambridge, Cambridge CB2 3EJ, United Kingdom.

Copyright © Lepidopterists' Society of Africa

**Abstract:** This paper describes a new species of *Leptomyrina* from five mountains in northern Mozambique – Mts Mecula, Namuli, Inago, Nallume and Mabu. Specimens were collected over the course of several years between 2007 and 2019 through a series of biodiversity surveys of the mountains of northern Mozambique. This species differs from others in the group based on the rounded and tail-less shape of the hindwing, and the dusting of powder blue scales on the upper side of the males. The genitalia also show significant differences to others in the group. It is found towards the summits of these mountains at elevations generally over 1000m and feeds on Crassulaceae.

**Key words:** *Leptomyrina*, *Gonatomyrina*, *congoni*, Black-eyes, Mecula, Namuli, Mabu, Inago, Nallume, Mozambique.

**Citation:** Bayliss, J., Brattström, O., Bampton, I. & Collins S.C. 2019. A new species of *Leptomyrina* Butler, 1898 (Lepidoptera: Lycaenidae) from Mts Mecula, Namuli, Inago, Nallume and Mabu in Northern Mozambique. *Metamorphosis* 30: 19–24.

## INTRODUCTION

The genus *Leptomyrina* belongs to the Family Lycaenidae Leach, 1815; Subfamily Theclinae Swainson, 1831; Tribe Hypolycaenini Swinhoe, 1910. The other genera in the Tribe Hypolycaenini in the Afrotropical Region are *Hypolycaena* and *Hemiolaus*. The genus *Leptomyrina* Butler, 1898, commonly known as the Black-eyes, is an Afrotropical genus containing nine previously described species (d'Abrera, 2009; Williams, 2019).

Of the nine species described to date, five have hindwing tails. These are *L. phidias* (Fabricius, 1793); *L. hirundo* (Wallengren, 1857); *L. makala* Bethune-Baker, 1908; *L. sudanica* Stempffer, 1964; and *L. boschi* Strand, 1911. The remaining four species do not have hindwing tails. Three of these have sharply attenuated hindwings. They are *L. handmani* (Gifford, 1965); *L. gorgias* (Stoll, 1790); and *L. henningi* (Dickson, 1976). The fourth, *L. lara* (Linnaeus, 1764), is a small, bronze species with a rounded hindwing, and with no hindwing tail although the males have a small protrusion at tornus of hindwing. It is confined to southern Africa, as far north as Lesotho.

Several of these species are already known from Mozambique. *L. hirundo* is known from Kenya, Tanzania, Malawi, Zambia, Mozambique and South Africa.

*L. gorgias* is known from all the above plus Uganda, Somalia and Swaziland.

*L. hirundo* was caught on Mts Namuli and Mabu in northern Mozambique in addition to the new species described in this paper (Congdon *et al.*, 2010), and *L. gorgias sobrina* was also collected on Mts Njesi and Inago (Fig. 1). *L. handmani* has not so far been caught in Mozambique although it is found on Mt Mulanje in southern Malawi on the Mozambique border. It would therefore be expected to occur on the Mozambique side of Mulanje (Mlanje), and perhaps on Mt Chiperoni in northern Mozambique, which is only 60km from Mt Mulanje (Fig. 1).

The new species described in this paper most closely resembles *L. lara*. It was collected from the high-altitude mountains of northern Mozambique through a series of scientific expeditions to survey the biodiversity of these sites (Fig. 1). Between 2007 and 2009 these expeditions, funded by the Darwin Initiative (UK), were organised through the Royal Botanic Gardens Kew, in collaboration with the Instituto de Investigação Agrária de Moçambique, the Mulanje Mountain Conservation Trust (Malawi), BirdLife International, and the Forest Research Institute of Malawi. From 2010 to 2019 the African Butterfly Research Institute (ABRI) based in Nairobi coordinated the survey of butterflies from these mountains. To date the biological surveys of these mountains in northern Mozambique have resulted in the discovery of the largest continuous tract of medium altitude rainforest in southern Africa (Bayliss *et al.*, 2014) and more than 30 new species were discovered (Branch &

Received: 8 October 2019

Published: 4 December 2019

Copyright: This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License. To view a copy of this license, send a letter to Creative Commons, Second Street, Suite 300, San Francisco, California, 94105, USA, or visit: <http://creativecommons.org/licenses/by-nc-nd/3.0/>

Bayliss, 2009; Branch & Tolley, 2010; Staude *et al.*, 2011; Daniels & Bayliss, 2012; Taylor *et al.*, 2012; Daniels *et al.*, 2014; Branch *et al.*, 2014; Conradie *et al.*, 2018; Branch *et al.*, 2019), which included 4 new species and 4 new sub-species of butterfly (Congdon & Bampton, 2009; Congdon *et al.*, 2010; Congdon & Bayliss, 2012; Van Velzen *et al.*, 2016; Bayliss *et al.*, 2016; Bayliss *et al.*, 2018).



**Figure 1** – Map showing study area between Malawi and Mozambique, and location of Mts Mecula, Namuli, Inago, Nallume and Mabu in relation to neighbouring mountains above 1 500 m.

## MATERIAL AND METHODS

### Specimen acquisition

Nearly all specimens of the new species of *Leptomyrina* were collected opportunistically with a range of butterfly hand nets on several visits to Mt Mecula (12°4'39"S 37°37'49"E), Mt Namuli (15°21'37.29"S 37°03'30.91"E), Mt Mabu (16°17'56"S 36°23'44"E), Mt Inago (15°02'42"S 37°23'46"E) and Mt Nallume (15°03'32.97"S 38°32'45.78"E) between 2007 and 2019 by members of ABRI.

### Analysis and terminology

In the description of the new subspecies the wing venation terminology follows Larsen, 2005: 54 (Figs 19a & b).

### Comparative material examined

All specimens collected, examined, and presented in this manuscript are deposited in ABRI. A larger series of *L. congdoni* were also examined at ABRI collectively from the four mountains and these data also used in elements of the species description. These were compared to other species of *Leptomyrina* that are currently deposited at ABRI, in particular a sizeable collection of *L. lara*.

### Genitalia

The abdominal tips of both specimens were dissected to study the genitalia characters. The tissues were placed in glass vials containing about 500 µl 10% KOH solution heated to just below boiling point. After eight minutes the

samples were transferred to a 70% ethanol solution and cleaned under a stereomicroscope using a pair of micro forceps (Dumont #55). Images were acquired using a Leica DFC495 digital camera coupled to a Leica M125 stereomicroscope. To improve the depth of field for the images we used focus-stacking software provided with the microscope (Leica Application Software (LAS) Ver. 3.8.0). Images were later cleaned up in Adobe Photoshop CC, only neutralising the background and lining each structure up in comparable orientations. The genitalia were photographed whilst submerged in 70% ethanol and the angle can be slightly different between pictures, but all structural differences described in the text were verified by manually cross-comparing samples under the microscope from various angles. The genitalia structure of *L. lara* was drawn in detail by Stempffer (1967) and we compared this with our two dissections.

### Abbreviations

ABRI – African Butterfly Research Institute, Nairobi, Kenya.

## DESCRIPTION OF NEW SPECIES

### Genus *Leptomyrina* Butler, 1898

*Proceedings of the Zoological Society of London* **1898**: 405 (395–444).

Type-species: *Hesperia phidias* Fabricius, by original designation.

*Gonatomyrina* Aurivillius, 1924. In: Seitz, 1908–25. *Die Gross-Schmetterlinge der Erde*, Stuttgart (2) **13** *Die Afrikanischen Tagfalter*: 423 (614 pp.).

Type-species: *Papilio lara* Linnaeus, by monotypy.

D'Abrera (2009: 768) synonymises *Gonatomyrina* with *Leptomyrina* **syn. nov.**

*Leptomyrina congdoni* Bayliss, Brattström, Bampton, and Collins sp.nov.

urn:lsid:zoobank.org:pub:BD9304A2-682E-415F-AB9E-1D751B0221D4

**Holotype**: male: Mt Namuli MOZAMBIQUE ABRI 2018 4651 20–30.xi.2008 JB.IB.TCEC.MH. Figs 2a & 2b.

**Paratypes**: MOZAMBIQUE

Paratype1 – Namuli ♀ same data as Holotype (Figs 3a & 3b)

Paratype 2 – Mecula ♂ Mecula JB/SC/TCEC/MH vi.2012 ♂ Bred (Figs 2c & 2d)

Paratype 3 – Mecula ♀ Mecula TCEC/MH 20.vi.2012 ♀ Bred (Figs 3c & 3d)

Paratype 4 – Mabu ♂ Mt Mabu x.2008 TCEC/IB/MH (Figs 2e & 2f)

Paratype 5 – Inago ♂ Mt Inago 27–29.iv.2008 JB (Figs 2g & 2h)

Paratype 6 – Inago ♀ Mt Inago 30.v.2009 IB Bred (Figs 3e & 3f)

### Description of facies

#### Male holotype:

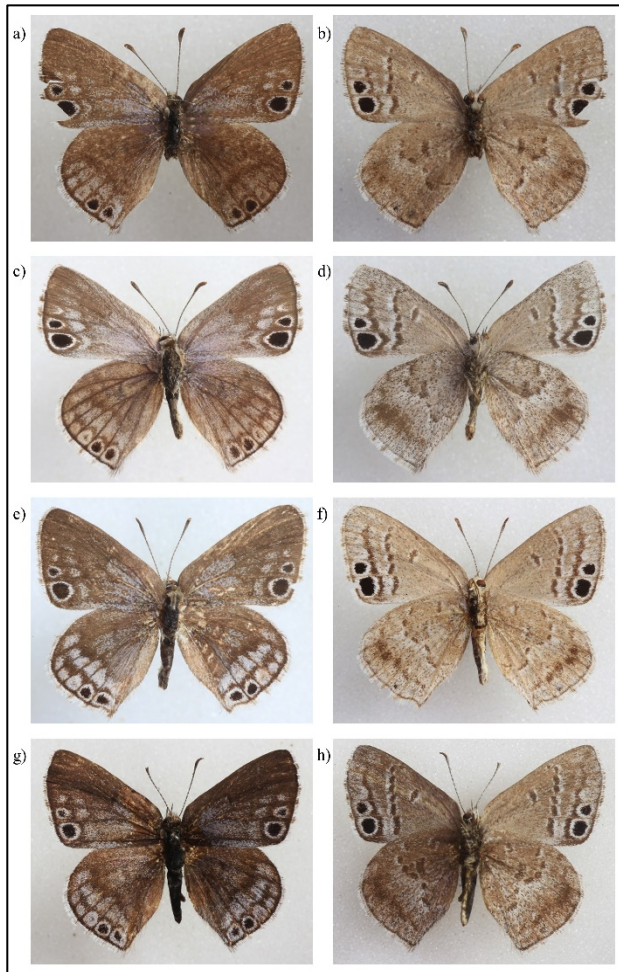
Wingspan. Figs 2a & 2b = 19 mm.

Upper side. Forewing ground colour dark brown, more or less heavily overlaid with powder blue scaling (Fig. 2a). Two sub-marginal black eyespots, ringed with whitish



scales. Hindwing rounded and lacking a tail although there is a very slight protrusion at tornus of hindwing. Ground colour dark brown, overlaid with powder blue scaling. Two black sub-marginal eye-spots, ringed with whitish scales. These are continued as a row of whitish sub-marginal spots, and with a second row basally.

**Underside.** Forewing ground colour blueish grey (Fig. 2b). Two eyespots ringed white. Two post discal lines of dark spots, edged white. A white edged dark comma at cell end. Hindwing ground colour paler greyish white, darker basally. A line of indistinct dark spots post-discally, and an irregular line of more defined spots discally, these being subtended with white scaling. A dark comma at cell end.



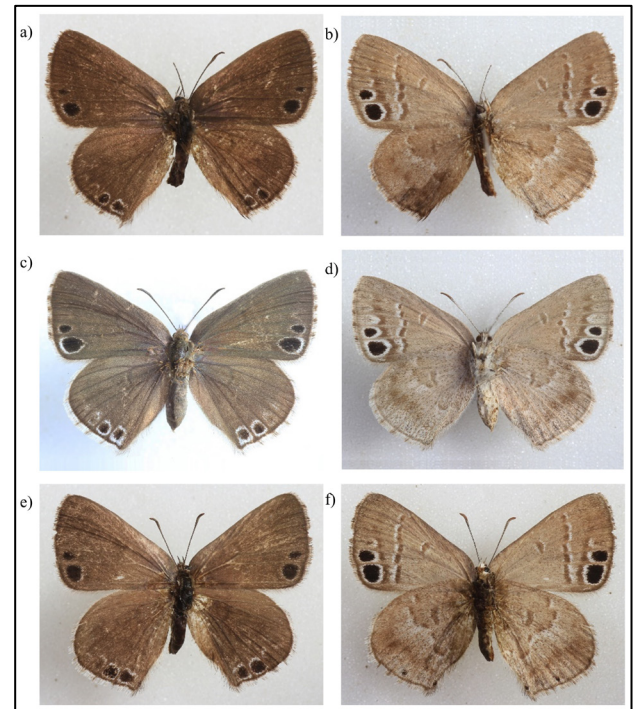
**Figure 2** – a) Namuli Male upper side; b) Namuli male underside; c) Mecula male upper side; d) Mecula male underside; e) Mabu male upper side; f) Mabu male underside; g) Inago male upper side; h) Inago male underside. Wingspan. Figs 2a & 2b = 19 mm; Figs 2c & 2d = 20 mm; Figs 2e & 2f = 19 mm. Figs 2g & 2h = 22 mm. Average = 20 mm.

#### Female paratype 1:

**Wingspan.** Figs 3a & 3b = 23 mm.

**Upper side.** Forewing ground colour brown grey and dull blue (Fig. 3a). Hindwing ground colour brown greyish blue. Forewing and hindwing with two eyespots, narrowly edged white. Forewing cilia white with black at nerve ends, hindwing cilia white. Female upper side darker than males.

**Underside.** Forewing ground colour blueish grey, much lighter than upper side (Fig. 3b). Two eyespots ringed white. One post-discal line of dark spots, edged white. A white edged dark comma at cell end. Hindwing ground colour same as forewing – blueish grey, much lighter than upper side. A line of indistinct dark spots discally, these being subtended with white scaling. A dark comma at cell end finely surrounded with white scaling. A small submarginal black spot in cell 2.



**Figure 3** – a) Namuli female upper side; b) Namuli female underside; c) Mecula female upper side; d) Mecula female underside; e) Inago female upper side; f) Inago female underside. Note: Mabu female is missing from this series as it has not yet been collected from this site. Wingspan. Figs 3a & 3b = 23 mm. Figs 3c & 3d = 26 mm. Figure 3e & 3f = 25 mm. Average (= 24.67) = 25 mm.

There is some variation between populations from the different mountains. The eye spots of both sexes from Mecula are oval rather than rounded. The extent of the upper side blue scaling in males appears to vary considerably, although some of this may be due to wear. The upper sides of fresh females have a blue tinge (Fig. 3c) not present in older material. Very recently (November 2019) a single female specimen (Fig. 4) was caught from a fifth mountain, Mt Nallume (Fig. 1). This specimen has a suggestion of a third eye-spot on the forewing underside (Fig. 4a) and hindwing upper side (Fig. 4b), although absent from the hindwing underside (Fig. 4c).

#### Genitalia

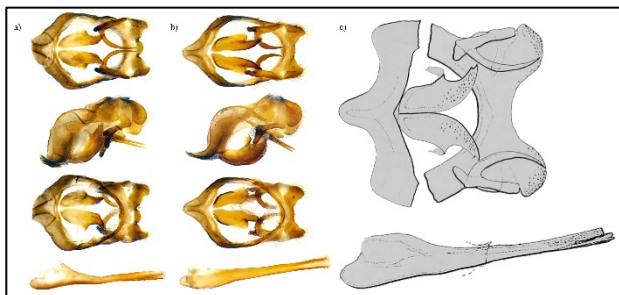
Genitalia were compared between *Leptomyrina congdoni* sp nov. ABRI-4654. Date: 30.xi.2008 from Mt. Namuli in northern Mozambique (Fig. 5a) and *L. handmani* ABRI-4655. Date: 02.x.1988 from Mt. Mulanje in southern Malawi (Fig. 5b). *L. handmani* is a species which is geographically close to *L. congdoni* and occupying a

similar niche and altitude – Mts Namuli and Mulanje are approximately 150 km directly apart.



**Figure 4** – a) Field photograph of Nallume female upper side; b) Field photograph of Nallume female underside; c) Field photograph of Nallume female underside.

Figs 5a & 5b show (from top of each column) the ventral, lateral, and dorsal views of the main genitalia structures with lower panel showing the aedeagus from a lateral view. Each column shows one species: (a) *L. congdoni* sp. nov. and (b) *L. handmani*. Figure 5c (modified from Stempffer, 1967) shows the main genitalia structures from the ventral side and the aedeagus from a lateral view of *L. lara*. The main difference setting *L. congdoni* sp. nov. apart is the prominent protrusion in the middle line of the uncus that is missing in *L. lara*, and much reduced in *L. handmani*. The lower edge of the valve is also more evenly rounded in the latter two species, while it has a pronounced angle at about two thirds of its length in *L. congdoni* sp. nov. The saccus also appears to be less drawn out in *L. congdoni* sp. nov., but this could be due to the preparation of the specimen.



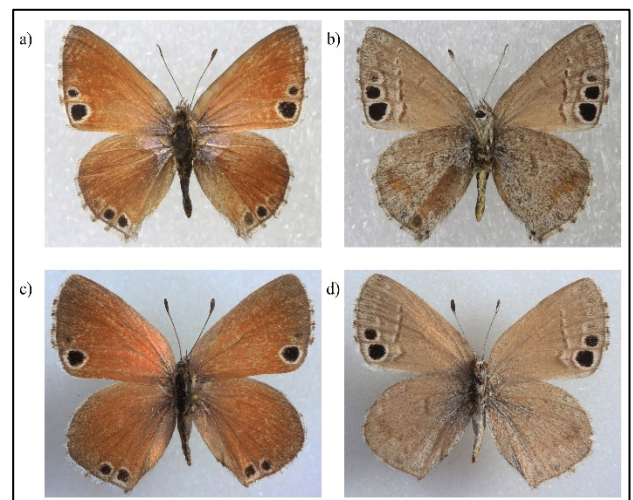
**Figure 5** – a) *Leptomyrina congdoni* sp. nov. (ABRI-4654. Date: 30.xi.2008 from Mt. Namuli). b) *Leptomyrina handmani* (ABRI-4655. Date: 02.x.1988 from Mt. Mulanje). c) *Leptomyrina lara* (modified from Stempffer, 1967).

### Diagnosis

The present species resembles *L. lara* in size and shape. On average the male *L. congdoni* (Figs 2a–2h), has a wingspan of 20 mm and the female (Figs 3a–3f) a wingspan of 25 mm based on the specimens examined in this study. When these measurements are compared to that of *L. lara*, with the specimens examined in this study, the male of *L. lara* (Figs 6a & 6b) has a wingspan of 19 mm and the female (Figs 6c & 6d) has a wingspan of 26 mm. Thus there is little difference in the wingspan between these two species.

*L. congdoni* differs from *L. lara* in the male upper side ground colour, which is pale brown in *lara*, dark brown in *congdoni* and more or less heavily overlaid with blueish scales. In *congdoni* the blue scaling is widely spread over

the wing surface and is a powder blue. In *lara* it is basal, and is a shiny blue. Also, in the reduced protrusion at tornus of hindwing. It differs from *L. handmani* in the hindwing shape, which is attenuated in *handmani* and rounded in *congdoni* (the male has a reduced projection at the hindwing tornus). The female upper side of *congdoni* differs from *lara* in being dark brown with a blue wash in fresh specimens. *L. congdoni* is also smaller than the other species. The undersides of both sexes differ from other species (except *L. phidias*) in being dark greyish brown – much less rufous than other species. The genitalia of *congdoni* were found to be significantly different from *lara* and *handmani*, which are two of the closest related species, and also quite different from *phidias* when compared. As all other species of *Leptomyrina* are far removed from *congdoni* it is assumed that the genitalia of the other species in the group are also significantly different from *congdoni*.



**Figure 6** – a) *L. lara* male upper side; b) *L. lara* male underside; c) *L. lara* female upper side; d) *L. lara* female underside. Wingspan. Figs 6a & 6b = 19 mm. Figs 6c & 6d = 26 mm.

### Differential diagnosis

Based on the male morphology:

- 1 With tails – *L. phidias*, *L. hirundo*, *L. makala*, *L. boschi*, *L. sudanica*
- 2 Without tails – *L. handmani*, *L. henningi*, *L. gorgias*, *L. lara*, *L. congdoni* sp. nov.
- 3 No tails, but attenuated hindwings – *L. handmani*, *L. henningi*, *L. gorgias*
- 4 No tails, rounded hindwings – *L. lara*, *L. congdoni*
- 5 No tails, rounded hindwings, dark underside and bronzy brown upper side, shiny blue basally – *L. lara*
- 6 No tails, rounded hindwings, paler underside and dark brown upper side with blue scaling towards the margin – *L. congdoni*

### Etymology

*Leptomyrina congdoni* is named after Colin Congdon for his dedication to supporting the field work in discovering this species on the various expeditions in northern Mozambique (Congdon & Bampton, 2009; Timberlake *et al.*, 2009; Bayliss *et al.*, 2010; Congdon *et al.*, 2010;



Congdon & Bayliss, 2012; Bayliss *et al.*, 2014). Colin has also been a life-long supporter of the African Butterfly Research Institute (ABRI), a great friend and companion to work with both on and off the field consequently providing much joy and laughter as well as a lifetime of anecdotes – Quis custodiet ipsos custodes!

## DISCUSSION

### Distribution

The new species of *Leptomyrina* described in this paper is confined to the high altitudes of a series of mountains in northern Mozambique (Fig. 1). At this stage it is only known from five of these mountains, but it is probably also found on other mountains in the area assuming the foodplant (Crassulaceae) is also present. As *L. congdoni* is currently only found in Mozambique it therefore represents a new endemic species for the Mozambique butterfly list. The species which it most closely resembles is *L. lara*, which is a southern African species. It is reasonable to suppose, therefore, that *congdoni* has affinities with ancestry from southern Africa.

### Habitats and Behaviour

The species resides in the upland habitats of high-altitude mountains generally above 1000 m (and rising to 2400 m in the case of Mt Namuli). The adults were ovipositing on a species of Crassulaceae, as with the other closely related species in this group such as *L. lara* (Stempffer, 1967) and *L. gorgias* (Clark & Dickson, 1971). The species of Crassulaceae commonly encountered on Mt. Namuli are *Crassula sarcocaulis*, *Crassula setulosa*, and *Crassula schimperi* subsp. *transvaalensis* var. *denticulata* (Timberlake *et al.*, 2009). *L. congdoni* was found to feed on one of these species, but unfortunately no voucher specimens were kept of the host plant.

## ACKNOWLEDGEMENTS

The authors thank the Museu de História Natural, Maputo for providing collecting permission. Thanks also to the British Government funded Darwin Initiative project ‘Monitoring and Managing Biodiversity Loss on South-East Africa’s Montane Ecosystems’ (Award 15/036) through which some of the collecting permission was also granted. This collaborative project, led by the Royal Botanic Gardens, Kew, also included BirdLife International, the Instituto de Investigação Agrária de Moçambique, the Mulanje Mountain Conservation Trust, Malawi, the Forest Research Institute of Malawi, and the African Butterfly Research Institute (ABRI) based in Nairobi, Kenya. Support was also provided by the Transglobe Expedition Trust (TET). All the specimens were collected by members of the African Butterfly Research Institute (ABRI).

## LITERATURE CITED

BAYLISS, J., CONGDON, T.C.E. & COLLINS, S.C. 2018. A new subspecies of *Papilio* (*Princeps*) *pelodurus* Butler, 1896 (Lepidoptera: Papilionidae:

Papilioninae) from several mountains in northern Mozambique. *Metamorphosis* **29**: 132–136.

BAYLISS, J.L., COLLINS, S.C. & CONGDON, T.C.E. 2016. A new species of *Iolaus* Hübner subgenus *Epamera* Druce (Lepidoptera: Lycaenidae: Theclinae) from Mts Namuli and Mabu, Northern Mozambique. *Metamorphosis* **27**: 21–28.

BAYLISS, J., MONTEIRO, J., FISHPOOL, L., CONGDON, C.G.C., BAMPTON, I., BRUESSOW, C., MATIMELE, H., BANZE, A. & TIMBERLAKE, J. 2010. *Biodiversity and conservation of Mount Inago, Mozambique*. Report for Darwin Initiative Award 15/036. Royal Botanic Gardens, Kew. 32 pp.

BAYLISS, J., TIMBERLAKE, J., BRANCH, W., BRUESSOW C., COLLINS, S., CONGDON, C., DA SOUSA, C., HERRMANN, E., DOWSETT, R.J., DOWSETT-LEMAIRE, F., FISHPOOL, L.D.C., HARRIS, T., GEORGIADIS, S., LIGGITT, B., MONADJEM, A., PATEL, I.H., RIBEIRO, D., SPOTTISWOODE, C.N., TAYLOR, P., WILLCOCK, S. & SMITH, P. 2014. The discovery, biodiversity, and conservation of Mabu forest – the largest mid-altitude rainforest in southern Africa. *Oryx* **48**(2): 177–185.

BETHUNE-BAKER, G.T. 1908. Descriptions of new species of butterflies of the division Rhopalocera from Africa and from New Guinea. *Proceedings of the Zoological Society of London* **1908**: 110–126.

BRANCH, W. & BAYLISS, J.L. 2009. A new species of tree viper *Atheris* (Serpentes: Viperidae) from Northern Mozambique. *Zootaxa* **2113**: 41–54.

BRANCH, W.R., BAYLISS, J. & TOLLEY, K.A. 2014. Pygmy chameleons of the *Rhampholeon platyceps* complex (Squamata: Chamaeleonidae): Description of four new species from isolated ‘sky islands’ of northern Mozambique. *Zootaxa* **3814**(1): 001–036. <http://dx.doi.org/10.11646/zootaxa.3814.1.1>.

BRANCH, W.R., BAYLISS, J., BITTENCOURT-SILVA, G., CONRADIE, W., ENGELBRECHT, H. M., LOADER, S. P., MENEGON, M., NANVONAMUQUITXO, C. & TOLLEY, K.A. 2019. A new species of tree snake (*Dipsadoboa*, Serpentes: Colubridae) from ‘sky island’ forests in northern Mozambique, with notes on other members of the *Dipsadoboa werneri* group. *Zootaxa* **4646**(3): 541–563.

BRANCH, W.R. & TOLLEY, K.A. 2010. A new species of chameleon (Sauria: Chamaeleonidae: *Nadzikambia*) from Mount Mabu, central Mozambique. *African Journal of Herpetology* **59**(2): 157–172.

BUTLER, A.G. 1898. Genus *Leptomyrina*. *Proceedings of the Zoological Society of London* **1898**: 405 (395–444).

CLARK, G.C. & DICKSON, C.G.C. 1971. *Life Histories of the South African Lycaenid Butterflies*. Pub. Purnell. p133.

CONGDON, T.C.E. & BAYLISS, J. 2012. Butterflies of Mt Mecula and Mt Yao, Niassa Province, Northern Mozambique. *Metamorphosis* **23**: 26–34.

CONGDON, C., COLLINS, S. & BAYLISS, J. 2010. Butterflies of south east Africa’s mountains (Mozambique and Malawi). *Metamorphosis* **21**(2): 45–107.

- CONGDON, T.C.E. & BAMPTON, I. 2009. Musings from Mount Mabu. *Metamorphosis* **20**(2): 67–71.
- CONRADIE, W., BITTENCOURT-SILVA, G., FAROOQ, H., LOADER, S. P., MENEGON, M. & TOLLEY, K.A. 2018. New species of Mongrel Frogs (Pyxicephalidae: *Nothophryne*) for northern Mozambique inselbergs. *African Journal of Herpetology* **67**: 61–85.
- D'ABRERA, B.L. 2009. *Butterflies of the Afrotropical Region – Part III: Lycaenidae, Riodinidae*. New and revised edition. Hill House Publishers Melbourne and London: i–xxvi, 768–769.
- DANIELS, S. & BAYLISS J. 2012. Unexplored refugia of biodiversity: Mountainous regions in Mozambique and Malawi yield two novel freshwater crab species (Potamonautidae: *Potamonantes*). *Zoological Journal of the Linnean Society* **164**: 498–509.
- DANIELS, S., PHIRI E. & BAYLISS, J. 2014. Renewed sampling of inland aquatic habitats in southern Africa yield two novel freshwater crab species (Decapoda: Potamonautidae: *Potamonantes*). *Zoological Journal of the Linnean Society* **171**: 356–369.
- DICKSON, C.G.C. 1976. Six new southern African butterflies. *Entomologist's Record and Journal of Variation* **88**(11): 273–280, **88**(12): 307–314.
- GIFFORD, D. 1965. *The Butterflies of Malawi*. The Society of Malawi.
- LARSEN, T. 2005. *The Butterflies of West Africa*. Apollo Books. Fig. 19, p. 54.
- STAUDE H., BAYLISS, J. & SIHVONEN P. 2011. The Mulanje Tiger Moth Prout, 1922, new status, a critically endangered species from Malawi (Lepidoptera: Geometridae: Diptychinae). *Metamorphosis* **22**(2): 49–64.
- STEMPFER, H. 1964. Contribution a l'étude des Lycaenidae d'Afrique tropicale et équatoriale. *Bulletin de la l'Institut Française d'Afrique Noire* (A) **26**: 1226–1287.
- STEMPFER, H. 1967. *Leptomyrina* (*Gonatomyrina*) *lara lara*. *Bulletin of the British Museum (Natural History – Entomology)* Suppl. **10**: 170.
- STRAND, E. 1911. Neue Grossschmetterlinge aus Abyssinien. *Entomologische Rundschau* **28**: 137–141.
- TAYLOR P., STOFFBERG, S., MONADJEM, A., SCHOEMAN, M.C., BAYLISS, J. & COTTERILL, F.P.D. 2012. Four new bat species (*Rhinolophus hildebrandtii* complex) reflect PlioPleistocene divergence of dwarfs and giants across an Afrotropical Archipelago. *PLoS ONE* **7**(9): e41744. doi:10.1371/journal.pone.0041744.
- TIMBERLAKE, J.R., DOWSETT-LEMAIRE, F., BAYLISS, J., ALVES, T., BAENA, S., BENTO, C. *et al.* 2009. *Mt Namuli, Mozambique: Biodiversity and Conservation*. Report for Darwin Initiative Award 15/036. Royal Botanic Gardens, Kew, UK.
- VAN VELZEN, R., COLLINS, S.C., BRATTSTRÖM, O. & CONGDON, T.C.E. 2016. Description of a new species of *Cymothoe* Hübner, 1819 from northern Mozambique (Lepidoptera: Nymphalidae: Limenitidinae) *Metamorphosis* **27**: 34–41.
- WILLIAMS, M.C. 2019. *Afrotropical Butterflies*. <http://www.metamorphosis.org.za/>