METAMORPHOSIS
LEPIDOPTERISTS' SOCIETY OF AFRICA
Volume 29: 132–136
ISSN 1018–6490 (PRINT)
ISSN 2307–5031 (ONLINE)

A new subspecies of *Papilio (Princeps) pelodurus* Butler, 1896 (Lepidoptera: Papilionidae: Papilioninae) from several mountains in northern Mozambique

urn:lsid:zoobank.org:pub:F0181BE3-1D16-4A7A-A877-9247BDFCEABD
DOI: https://dx.doi.org/10.4314/met.v29i2.7
Published online: 19 December 2018

Julian L. Bayliss[1,2], T. Colin E. Congdon[1] and Steve C. Collins[1]
[1] African Butterfly Research Institute, P O Box 14308, 0800 Nairobi, Kenya. E-mail: collins abri@gmail.com
[2] Department of Biological and Medical Sciences, Oxford Brookes University, Oxford, OX3 0BP, United Kingdom. E-mail: jlbayliss@yahoo.co.uk

Abstract: A new subspecies of *Papilio pelodurus* Butler, 1896 is described that was collected from two mountains in Zambezia Province, northern Mozambique, over the course of several years, between 2007 and 2012. The specimens collected show distinct differences from the nominotypical species from Malawi and provide sufficient morphological evidence to merit the description of a new subspecies. The specimens collected are also the first records of this species from Mozambique and therefore add another species to the country list.

Key words: Lepidoptera, Papilionidae, *Papilio pelodurus*, Mabu, Namuli, Inago, Zomba, Mulanje, Mozambique, Malawi, new subspecies.

Citation: Bayliss, J.L., 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.

INTRODUCTION

Papilio pelodurus is a member of the *hesperus* species-group whose larvae are known or (in the case of *horribilis*) presumed to feed on Lauraceae. The members of the clade are *Papilio hesperus* Westwood, 1843; *Papilio euphranor* Trimen, 1868; *Papilio horribilis* Butler, 1874; and *Papilio pelodurus* Butler, 1896. It is a wet forest species which was first described by Butler in 1896 from the Zomba mountains in southern Malawi, and thereafter found to range between Tanzania, Malawi, Zambia, and, more recently, Mozambique (Congdon & Bampton, 2009; Congdon *et al*., 2010; Williams, 2018). Throughout the highland forest of Malawi, the species is generally represented by *Papilio pelodurus pelodurus*, however, it is replaced by *Papilio pelodurus vesper* Le Cerf, 1924, from eastern and southern Tanzania, north-eastern Zambia, and northern Malawi, between altitudes of 300 to 2000 m (Kielland, 1990).

This study is part of a prolonged biodiversity assessment of a selection of mountains that rise above 1500 metres in Zambezia Province, northern Mozambique (Fig. 1). Six mountains in total were visited between 2007 and 2012 during which time a series of biodiversity surveys were undertaken. This resulted in the discovery of more than 20 new species (Branch & 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), which included new species and new subspecies of butterfly (Congdon & Bampton, 2009; Congdon *et al*., 2010; Bayliss *et al*., 2014; Bayliss *et al*., 2016; Van Velzen *et al*., 2016), and most significantly the discovery of the largest continuous tract of medium altitude rainforest in southern Africa (Bayliss *et al*., 2014). One of these discoveries was the new subspecies of *Papilio pelodurus*. It was first collected in November 2007 by J. Bayliss from Mt Namuli (Timberlake *et al*., 2009; Congdon *et al*., 2010), and subsequently from Mt Mabu in 2009, 2010, and 2012 (Congdon & Bampton, 2009; Congdon *et al*., 2010; Bayliss *et al*., 2014).

Received: 14 October 2018
Published: 19 December 2018

MATERIALS AND METHODS

Abbreviations

ABRI – African Butterfly Research Institute, Nairobi, Kenya.
JBC – Julian Bayliss Private collection, Wales, UK.

Specimen acquisition

All specimens of the new subspecies of *P. pelodurus* were collected opportunistically with a range of butterfly hand nets on several visits to Mt Namuli (15°23′S 37°02′E) and Mt Mabu (16°17′S 36°24′E) between 2007 and 2012 by members of ABRI.

Morphological studies

This study focused on the morphological analysis of the wing patterns (notably the forewing postdiscal band) of a series of specimens from two mountains in

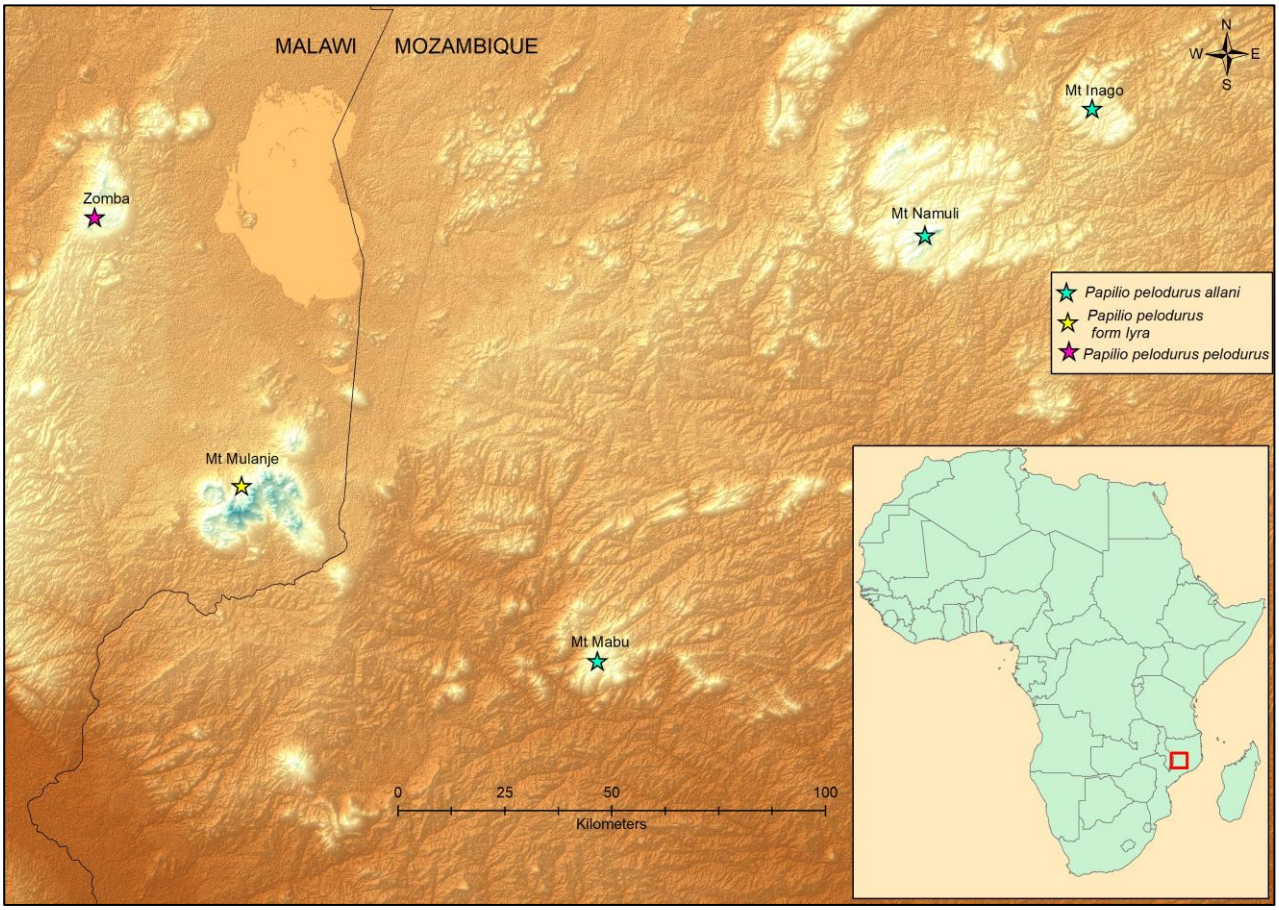

Figure 1 – Map depicting localities for *Papilio pelodurus* subspecies populations in northern Mozambique and Malawi.

northern Mozambique, and the comparison of this material with known specimens from Malawi and Tanzania.

Analysis and terminology

In the description of the new subspecies the wing venation terminology follows Larsen, 2005: 54 (Fig. 19).

Comparative material examined

All specimens collected, examined, and presented in this manuscript are deposited in ABRI or JBC.

Papilio pelodurus pelodurus

♂ Mulanje Crater, 1000m, Malawi. ix.1983. ABRI: 2018–4676; ♂ Mulanje, Malawi. 20.iii.1960. ABRI: 2018–4677; ♂ Mulanje, Malawi. 02.iii.1960. ABRI: 2018–4678; ♂ Mulanje Crater, Malawi. x.1978. ABRI: 2018–4679; ♂ Mulanje Crater, Malawi. xii.1979. ABRI: 2018–4680; ♂ Ruo Gorge, Mt Mulanje 15°58.3′S 35°39.3′E, Mulanje, Malawi. 28.x–8.xi.2004, R. Murphy.

Papilio pelodurus vesper

2♂ 1♀ Ambangulu, Usambara, 3500m, Tanzania. iii.1993. ABRI: 2018–4671, 4672, 4674; as above but ♂ iv.1992. ABRI: 2018–4673; ♀ Magamba Forest, Usambara Mnts, 1250m, Tanzania. iv.1973. ABRI: 2018–4675; ♀ Mugesse, FR, 9°39′S 33°32′E, 1830m, Misuku Hills, Malawi. 11–12.xii.2016. R. Murphy.

Papilio pelodurus ssp. nov.

5♂ Mt Namuli, NE Mozambique. 20-30.xi.2008. ABRI: 2018: 4660–4663 & 4667; 2♂ Mt Namuli, Malama Valley, 1200m. NE Mozambique. 26.xi.2007. ABRI: 2018–4665 & 4666; ♂ Mt Mabu, c. 1000m, NE Mozambique. 28.x.2008. ABRI: 2018–4664; as above but 2♂ 1♀ 1–5.xi.2010. ABRI: 2018–4668, 4669, 4670; ♂ ♀ Mt Mabu, NE Mozambique, c. 1000m, 28.x.2008. ABRI: 2016–00554 & 00555; 4♂ Mt Mabu 16°17′10″S 36°24′01″E), NE Mozambique. 1-13.xi.2010. JBC: MabPel01, 103, 104, 105; as above but ♀, JBC: MabPel02.

DESCRIPTION OF NEW SUBSPECIES

Genus *Papilio* Linnaeus, 1758
Systema Naturae 1, Regnum Animale, 10th edition: 458 (824 pp.). Holmiae.
Type-species*: Papilio machaon* Linnaeus, by subsequent designation (Latreille, 1810).

Species *Papilio pelodurus* Butler, A.G. 1896 (Fig. 2). On a small collection of butterflies made by Consul Alfred Sharpe at Zomba, British Central Africa. *Proceedings of the Zoological Society of London* **1895**: 720-721.

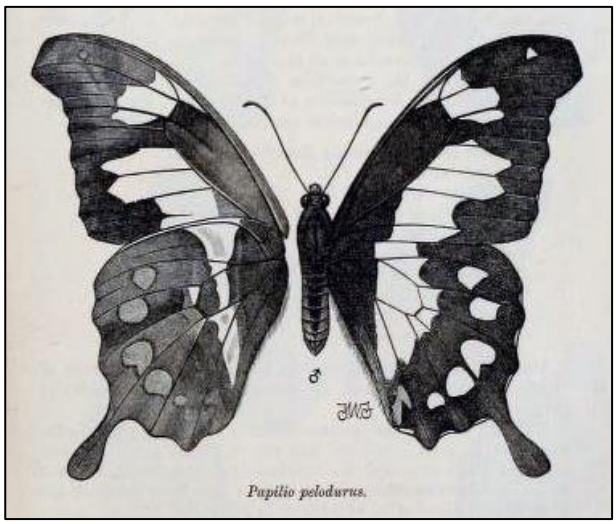

Figure 2 – *Papilio pelodurus pelodurus* (male) from Zomba mountain, according to Butler's original description (1896), showing the break in the forewing postdiscal band at space 4.

***Papilio pelodurus allani* ssp. nov.** (Figs 3A, 3B)
urn:lsid:zoobank.org:act:1080A84C-46AD-4280-A1C7-FB0456729D60

Holotype
♂ Mt Namuli, Malama Valley, 1200m, 15°23′S 37°02′E, NE Mozambique. 26.xi.2007. ABRI: 2018–4666.

Paratypes
♂ Mt Namuli, NE Mozambique. 20-30.xi.2008. ABRI: 2018–4663; ♀ Mt Mabu, NE Mozambique, c. 1000m. 1–5.xi.2010. ABRI: 2018–4670; ♂ Mt Mabu, NE Mozambique, c. 1000m. 28.x.2008. ABRI: 2016– 00554; ♀ Mt Mabu, NE Mozambique, c. 1000m. 1–5.xi.2010. ABRI: 2016–00555; 2♂ Mt Mabu 16°17′10″S 36°24′01″E, NE Mozambique. 1–13.xi.2010, J. Bayliss – MabPel01 & 103; ♀ as above but J. Bayliss MabPel02.

Description of facies

The facies of *P. pelodurus allani* ssp. nov. (Figs 3A, 3B) are generally similar to *P. pelodurus pelodurus* (Figs 3C, 3D), with the exception that the yellow forewing upper side postdiscal band does not have a gap, and most specimens are also missing the orange tornal spot on the hindwing. To a certain degree this condition is also evident in the material from Mt Mulanje on the Malawi border (form *lyra*), but it not as pronounced (Figs 3E, 3F).

Diagnosis

Papilio pelodurus allani ssp. nov. differs from the nominate subspecies, *P. pelodurus pelodurus*, in respect to the occurrence of continuous yellow markings in the forewing postdiscal band on the upper side of both males and females. This contrasts with the material from the type locality of *P. pelodurus pelodurus* on Mt Zomba in Malawi, which shows a distinct break in the forewing band (highlighted by a red box) and this 'space 4' (Larsen, 2005) is not yellow but brownish black as in the rest of the wing (Figs 3C, 3D). In addition, the orange tornal spot on the hindwing anal angle is variable in *P. pelodurus allani* ssp. nov., from well-developed to missing

The only other described subspecies is *P. pelodurus vesper* Le Cerf, 1924, found from eastern and southern Tanzania, north-eastern Zambia, and northern Malawi between altitudes of 300 and 2000 m (Kielland, 1990). This subspecies (Le Cerf, 1924) shows an even greater break in the forewing postdiscal band (Figs 3G, 3H).

The evidence in Fig. 3 shows that *P. pelodurus allani* ssp. nov. is actually more closely aligned with *P. pelodurus*

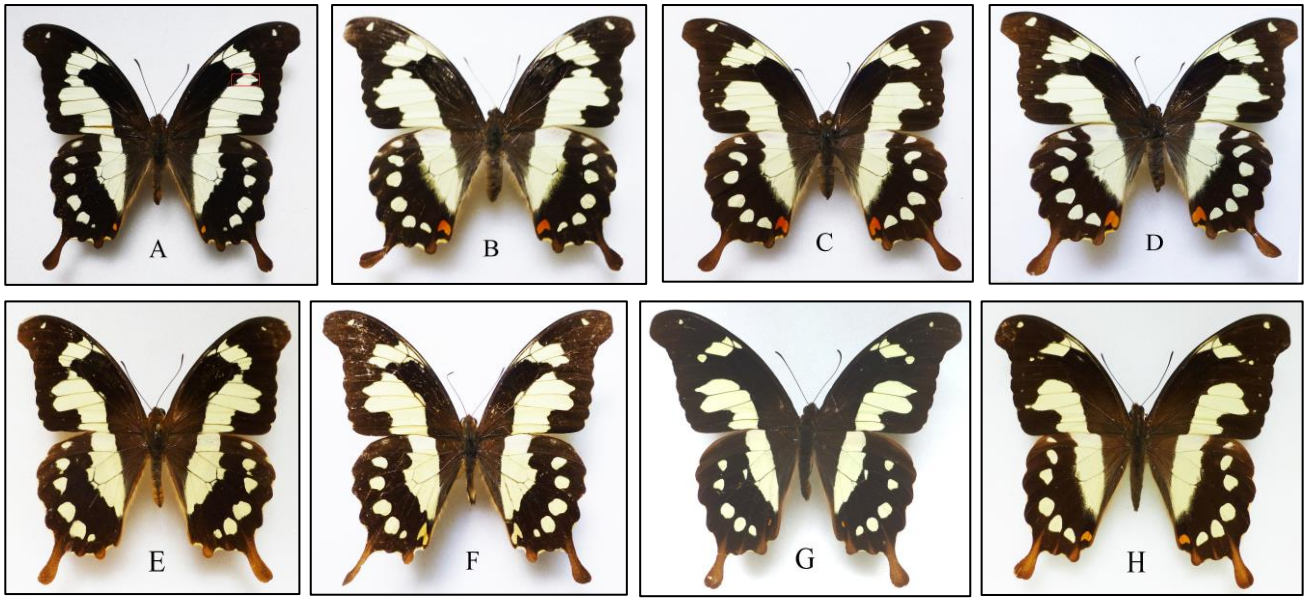

Figure 3 – *Papilio pelodurus* subspecies upper sides: A – *P. pelodurus allani* ssp. nov. ♂ Mt Namuli, Mozambique; B – *P. pelodurus allani* ssp. nov. ♀ Mt Mabu, Mozambique; C – *P. p. pelodurus* ♂ Mt Zomba, Malawi; D – *P. p. pelodurus* ♀ Mt Zomba, Malawi; E – *P. p. pelodurus* form *lyra* ♂ Mt Mulanje, Malawi; F – *P. p. pelodurus* form *lyra* ♀ Mt Mulanje, Malawi; G – *P. p. vesper* ♂ Usambara, Tanzania; H – *P. p. vesper* ♀ Usambara, Tanzania. All images photographed by T.C.E. Congdon.

pelodurus form *lyra* than it is to the other two subspecies.

Etymology

The new subspecies has been named after Allan Bayliss, whose participation and assistance on the Mt Namuli expedition in 2008 resulted in the collection of the new subspecies, and inspired in his son an appreciation and love of the natural world.

DISCUSSION

Distribution

Papilio pelodurus allani ssp. n. was collected on Mt Namuli and Mt Mabu in northern Mozambique (Fig. 1), and it was also observed flying at Mt Inago in 2010 (Bayliss *et al*., 2010). These records represented the first account of this species from Mozambique (Congdon & Bampton, 2009; Congdon *et al*., 2010; Bayliss *et al*., 2014). It is quite likely that this species also occurs on other mountains in northern Mozambique (such as Mt Chiperone) and await capture, although which subspecies they will belong to remains to be seen. These mountain sites in Mozambique are 150 km (Mt Mabu) and 180 km (Mt Namuli) from Zomba Mountain in Malawi, from where this species was first described; and 75 km (Mt Mabu) and 150 km (Mt Namuli), respectively, from its closest known site to these Mozambique mountains, which is Mt Mulanje in southern Malawi (Fig. 1). From the current evidence Mt Mulanje appears to be the boundary between the occurrence of *Papilio pelodurus pelodurus* and *Papilio pelodurus allani*, although further research is required before this can be verified.

Habitats and Behaviour

The larvae of this butterfly feed on *Cryptocarya liebertiana* (Kielland, 1990) and *Ocotea usambarensis* (Congdon, pers. obs.), both of which belong to the Lauraceae. Consequently, the first three larval instars are aposematic as the laurels are full of alkaloids. It was seen flying at canopy level in the Manho and Khara forests on Mt Namuli, and mud puddling along the banks of the Rio Malema. At Mt Mabu it was caught flying along the riverine courses within the forest.

ACKNOWLEDGEMENTS

The authors thank the British Government funded Darwin Initiative project ‘Monitoring and Managing Biodiversity Loss on South-East Africa’s Montane Ecosystems’ (Award 15/036) through which the collecting permission was 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, and the Forest Research Institute of Malawi. All the specimens were collected by members of the African Butterfly Research Institute (ABRI) based in Nairobi, Kenya. We would also like to thank Teresa Di Micco de Santo for assisting in the organisation of the material examined. Thanks also to Ray Murphy for the loan of several specimens.

LITERATURE CITED

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.

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., & 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. 1896. On a small collection of butterflies made by Consul Alfred Sharpe at Zomba, British Central Africa. *Proceedings of the Zoological Society of London* **1895**: 720-721.

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.

DANIELS, S. & BAYLISS J. 2012. Unexplored refugia of biodiversity: Mountainous regions in Mozambique and Malawi yield two novel freshwater crab species (Potamonautidae: *Potamonautes*). *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: *Potamonautes*). *Zoological Journal of the Linnean Society* **171**: 356–369.

KIELLAND, J. 1990. *Butterflies of Tanzania*. Hill House, Melbourne & London. 363 pp.

LARSEN, T. 2005. *The Butterflies of West Africa*. Apollo Books. Fig. 19, p. 54.

LE CERF, F.D. 1924. *Papilio pelodurus vesper. Bull. Hill. Mus. 1* **3**: 383, pl. 3, f. 25

STAUDE H., BAYLISS, J., & SIHVONEN P. 2011. The Mulanje Tiger Moth Prout, 1922, new status, a critically endangered species from Malaŵi (Lepidoptera: Geometridae: Diptychinae). *Metamorphosis* **22(2)**: 49–64.

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 Afromontane 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. 2018. Afrotropical Butterflies. http://www.metamorphosis.org.za/?p=articles&s=atb