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A new species of *Cryptopacha* Prozorov & Zolotuhin, 2012 (Lasiocampidae: Lasiocampinae) from West Africa

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Abstract. A new species of *Cryptopacha* is described from West Africa: *C. smithi* sp. n. The habitus and genitalia are illustrated and a comparison made with its closest congener, *C. porphyria* (Holland, 1893). These two taxa are separated by the Dahomey Gap and their distribution is discussed in relation to this barrier to speciation.

Key words. Lappet moths, Dahomey Gap, biogeography, taxonomy.

INTRODUCTION

The lappet moth genus *Cryptopacha* Prozorov & Zolotuhin, 2012 was erected by Prozorov & Zolotuhin (2012) to include a single species, *Metanastria porphyria* Holland, 1893, described from Gabon and thought to be widely distributed in the lowland forests of Central and West Africa. *Cryptopacha porphyria* (Holland, 1893) is an unmistakable species with a characteristic forewing pattern of white and purplish-brown bands on a red-brown background. As part of recent DNA barcoding efforts by the African Natural History Research Trust (ANHRT), individuals from Central and West Africa were sampled and the results suggested two, genetically divergent populations existing either side of the Dahomey Gap. Morphological studies of genitalia corroborated the molecular results and a new species from West Africa is described herein.

MATERIAL AND METHODS

Primary label data have been transcribed verbatim with "//" denoting a different label and "/" denoting a line break. Genitalia were dissected, stained with Eosin red and mounted in Euparal on microscope slides applying standard methods of preparation (Lafontaine & Mikkola 1987). Photos of adults were taken using a Nikon D90 SLR camera equipped with a Nikkor AF Micro 60 mm lens. Genitalia were photographed using a Canon EOS 700D camera mounted on a Wild M3Z stereo microscope. All images were edited in Adobe Photoshop. Genitalia terminology follows Prozorov & Zolotuhin (2012).

DNA barcodes were obtained by removing tarsal segments from adult specimens before being submitted to the Canadian Centre for DNA Barcoding (CCDB, Biodiversity Institute of Ontario, University of Guelph). Sequences were obtained using Single Molecule Real-Time sequencing through the Sequel (PacBio) pipeline at CCDB (Hebert et al. 2018). The resulting sequences were aligned using MUSCLE in MEGA ver. X (Kumar et al. 2018) and genetic distances were calculated using Kimura's two-parameter model (Kimura 1980).

RESULTS

Taxonomy

Family Lasiocampidae Harris, 1841
Subfamily Lasiocampinae Harris, 1841
Genus *Cryptopacha* Prozorov & Zolotuhin, 2012

Cryptopacha smithi sp. n.
urn:lsid:zoobank.org:act:F06AA4E5-515A-412B-B33A-CC8B40B58618
Figs 1–5

Diagnosis

Cryptopacha smithi is very similar in appearance to *C. porphyria* but in the latter, the forewing markings are more heavily contrasting, the silvery-white bands (particularly the one beyond the submarginal band) are wider and better defined and placed at slightly more of an obtuse angle to the costal margin (Fig. 6). In the male genitalia of *C. porphyria*, the tegumen is wider, the socii

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are longer and the valves are more robust and shorter (the valve-socii ratio is almost 1:1). The phallus is larger and the pointed apical section longer in *C. porphyria* and the digitiform projections of sternite VIII are more robust, shorter and with greater serrations apically (Figs 7–9). As these two species are distributed allopatrically, there is unlikely to be any confusion in specimens with good provenance.

Etymology

It is with great pleasure that this new species is dedicated to Richard Smith, the director of the African Natural History Research Trust, for his continued support of and dedication to African entomology and in particular Lepidoptera systematics.

Material examined

Holotype
WEST AFRICA – Sierra Leone • ♂; "SIERRA LEONE 120m / Tiwai Island, Moa River / N07˚33′00″, W11˚21′09″ / 17–22.vi.2016 Light Trap / leg. Takano, Miles & Goff / ANHRT:2017.18 // ANHRTUK / 00029947 // Gen. slide No. / LG 5618 m# / prep. by Gy. M. Laszlo"; ANHRT.

Paratypes (38 ♂♂ 1 ♀)
WEST AFRICA – Guinea • 5 ♂♂; Massadou campsite, Forêt Classée de Ziama; 08˚20′36.25″ N, 09˚26′14.70″ W; alt. 541 m; 15–17.iii.2019; Sz. Sáfián and S. Koivogui leg.; Light Trap; ANHRT – **Ivory Coast** • 18 ♂♂; Tai National Park; 05˚50′00″ N, 07˚20′32.0″ W; alt. 174 m; 25.iii–17.iv.2017; A. Aristophanous, M. Aristophanous, M. Geiser and P. Moretto leg.; MV Light Trap; ANHRT • 6 ♂♂, 1 ♀; Tai National Park; 05˚49′59.8″ N, 07˚20′32″ W; alt. 174 m; 5–10.vii.2015; M. Aristophanous, P. Moretto and E. Ruzzier leg.; Light Trap; ANHRT – **Liberia** • 1 ♂; East Nimba Nature Reserve, Cellcom Road; 07˚31′2.18″ N, 08˚31′1.90″ W; alt. 1300 m; 31.iii–04.iv.2017; Sz. Sáfián and G. Simonics leg.; Light Trap; ANHRT • 3 ♂♂; Foya Proposed Protected Area; 07˚56′36″ N, 10˚16′36″ W; alt. 530 m; 10–19.xi.2017; M. Aristophanous, Sz. Sáfián, G. Simonics and L. Smith leg.; MV Light Trap; ANHRT • 2 ♂♂; Welezu camp, Wonegizi Nature Reserve; 08˚04′57.11″ N, 09˚34′47.86″ W; alt. 561 m; 19–27.iii.2019; Sz. Sáfián and S. Koivogui leg.; Light Trap (Blended Bulb); ANHRT • 1 ♂; Krahn-Bassa Reserve, Juboe River; 05˚39′04″ N, 08˚39′04″ W; alt. 140 m; 14–20.i.2018; M. Geiser, Sz. Sáfián and G. Simonics leg.; Light Trap (Blended Bulb); ANHRT – **Sierra Leone** • 1 ♂; same collection data as for holotype; ANHRT • 1 ♂; Kambama village on the banks of the Moa River; 07˚33′29″ N, 11˚21′51″ W; alt. 110 m; 22.vi.2016; H. Takano, W. Miles and R. Goff leg.; Light Trap; ANHRT.

Description

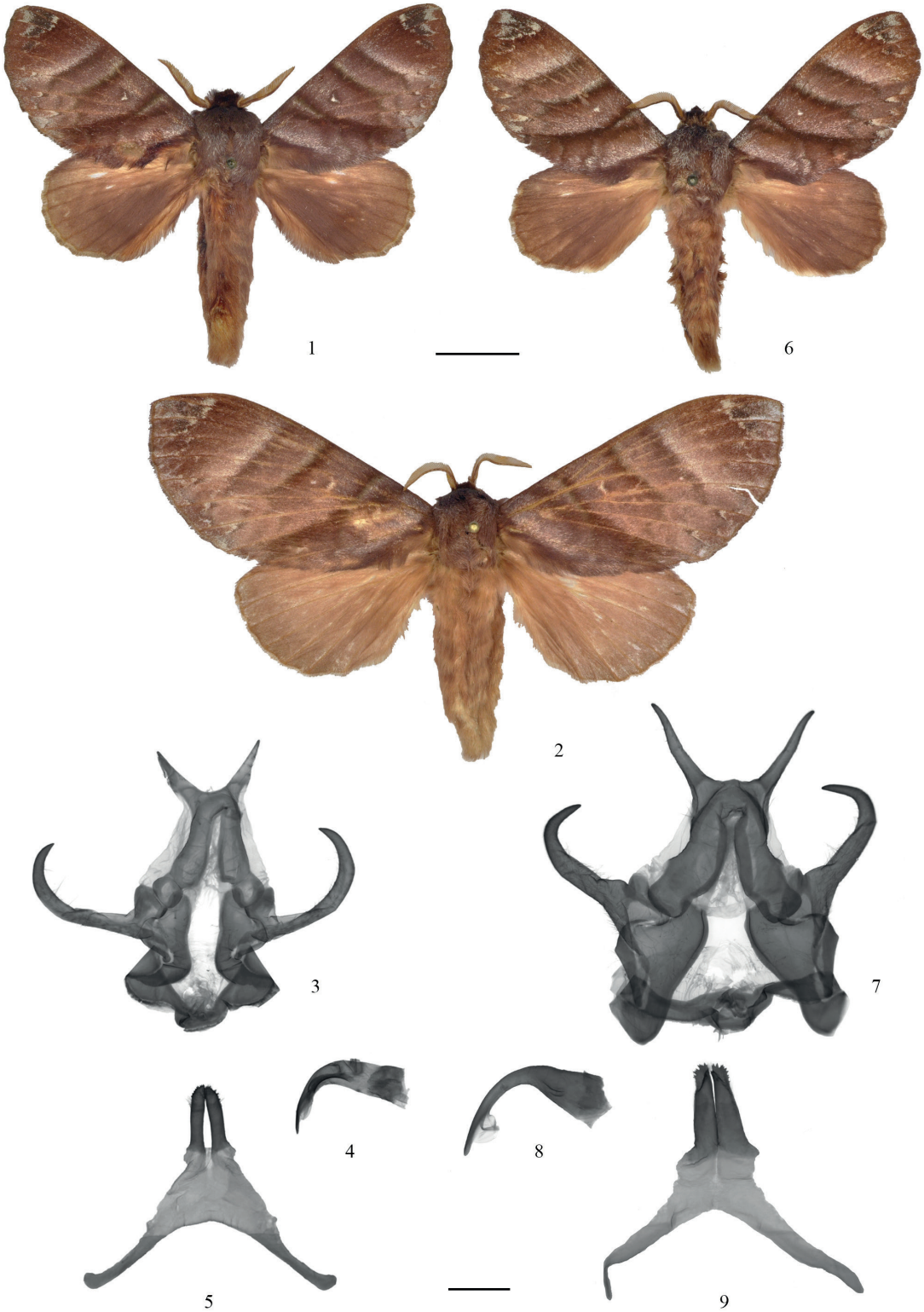
External morphology of adults (Figs 1–2)

Forewing length
Holotype: 26 mm; range: 24–26 mm; female: 36 mm.

Upperside
Ground colour of head, thorax and forewings purplish-brown mixed with densely scattered grey and white scales. Head with a low longitudinal crest. Antennae brown, bipectinate; rami lighter in colour. Patagia with slightly greyer scales posteriorly. Tegulae with transverse patch of white scales medially. Abdomen hirsute, covered in long red-brown hairs. Forewing rounded, outer margin gently sinuate. Basal two-thirds (up to the submarginal line) with silvery-mauve diffuse patches atop the ground colour separated by dark brown bands and silvery-white bands on their outer edge; basal band, straight; double antemedial bands which kink inwards towards dorsal margin at vein CuA2, posterior section slightly sinuate; transverse band filling the space between veins A1+A2 and CuA2, bisecting the antemedial bands just below CuA2 and extending to the outer margin. Discal spot white, well-developed. Postmedial and submarginal bands slightly arcuate anteriorly kinking sharply towards dorsal margin at vein M3, posterior sections beyond sinuate. Subterminal band zigzagged with dark brown and white markings at corners, originating at apical marking. Apical marking triangular, graphite-grey with silvery markings on inner and outer edges. Hindwing outer margin slightly sinuate; same ground colour as forewing, becoming paler towards the costa; anal fold pale. Fringe greyish-brown, darkened at the veins.

Underside
Ground colour of head, thorax, legs purplish-brown; labial palps brown. Forewing underside similar in colour to upperside but slightly paler; basal and antemedian bands absent; postmedial band well developed, submarginal band less so, both bands converging towards dorsal margin. Broad diffuse greyish-white band beyond submarginal band, well-defined towards costal margin. Yellowish scales along veins most clearly defined in the subterminal area. Hindwing ground colour similar to forewing but overlaid with creamy scales except for tornal region and postmedial, submarginal and subterminal bands. Terminal band indicated by yellowish-white lunules. Yellowish scales along veins most clearly defined in the subterminal area reaching as far as postmedial line.

Female
Ground colour of body and wing pattern on both upperside and underside similar to male but slightly paler.



Figs 1–9. *Cryptopacha smithi* sp. n. and *Cryptopacha porphyria* (Holland, 1893), ♂; Gabon, P.N. Ivindo [ANHRTUK00039000]; gen. slide No. LG 5616. **1**. *Cryptopacha smithi* sp. n. holotype, ♂, upperside. **2**. *Cryptopacha smithi* sp. n., paratype, ♀, upperside. **3**. *Cryptopacha smithi* sp. n., holotype, ♂, genital capsule; **4**. *idem*., phallus. **5**. *idem*., sternite VIII. **6**. *Cryptopacha porphyria* (Holland, 1893), upperside. 7. *idem*, genital capsule. **8**. *idem*, phallus. **9**. *idem*, sternite VIII. Scale bars: 1–2, 6 = 10 mm; 3–5, 7–9 = 1 mm.

Male genitalia (Figs 3–5)
Uncus and gnathos absent; tegumen bell-shaped, apically with a pair of robust conical socii, each basally as wide as the width of tegumen. Tuba analis membranous. Valve fully sclerotised, tubular, sickle-shaped, curved caudad, two and a half times longer than the socii. Vinculum sclerotised, curved dorsad. Saccus band-shaped. Anellus membranous. Phallus short, strongly curved medially, basally dilated, apically pointed. Sternite VIII with a pair of heavily-sclerotised digitiform posterior projections with serrations apically. Apodemes long, narrow and rounded at extremities.

DNA divergences
The new species has been assigned the COI-5P cluster number BOLD:AAZ9255. Interspecific pairwise distances between the new species and *C. porphyria* ranged from 6.2–6.4%.

Distribution
Cryptopacha smithi is a species of the Upper Guinean Forests distributed from Sierra Leone to Ivory Coast.

DISCUSSION

Cryptopacha smithi and its sister species *C. porphyria* are distributed allopatrically on either side of the Dahomey Gap, a 200 km wide belt of open vegetation separating the Upper and Lower Guinean Forest blocks. This region was once covered by closed-canopy forest during the mid-Holocene but rapid aridification following the Holocene Climatic Pejoration resulted in the domination of savannas in the Dahomey Gap (Demenou et al. 2018). Numerous studies have shown that the Dahomey Gap can be a significant barrier to gene flow for those species restricted to forest habitats (e.g., Dongmo et al. 2019), and further genetic and morphological studies of Lasiocampidae, as well as other Lepidopteran groups will undoubtedly reveal many more sibling taxa separated by this barrier.

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REFERENCES

Demenou BB, Doucet J-L, Hardy OJ (2018) History of the fragmentation of the African rain forest in the Dahomey Gap: insight from the demographic history of *Terminalia superba*. Heredity 120: 547–561

Dongmo J-B, DaCosta JM, Champlain D-L, Ngassam P, Sorenson MD (2019) Variable phylogeographic histories of five forest birds with populations in Upper and Lower Guinea: implications for taxonomy and evolutionary conservation. Ostrich: Journal of African Ornithology 90 (3): 257–270

Hebert PDN, Braukmann TWA, Prosser SWJ, Ratnasingham S, deWaard JR, Ivanova NV, Janzen DH, Hallwachs W, Naik S, Sones JE & Zakharov EV (2018) A Sequel to Sanger: amplicon sequencing that scales. BMC Genomics 19: 219. https://doi.org/10.1186/s12864-018-4611-3

Holland WJ (1893) Descriptions of new species and genera of West African Lepidoptera. Psyche 6 (201): 373–376, 393–400, 411–418, 431–434, 451–454, 469–476, 487–490, 513–520, 531–538, 549–552, 565–568

Kimura M (1980) A simple method for estimating evolutionary rate of base substitutions through comparative studies of nucleotide sequences. Journal of Molecular Evolution 16: 111–120

Kumar S, Stecher G, Li M, Knyaz C, Tamura K (2018) MEGA X: Molecular Evolutionary Genetics Analysis across computing platforms. Molecular Biology and Evolution 35: 1547–1549

Lafontaine JD, Mikkola K (1987) Las-och-nyckel systemen i de inre genitalierna av Noctuidae (Lepidoptera) som taksonomiska kaennetecken. [Lock-and-key systems in the inner genitalia of Noctuidae (Lepidoptera) as a taxonomic character.] Entomologiske Meddelelser 55: 161–167

Prozorov AV, Zolotuhin VV (2012) Seven new monotypic genera of African Lasiocampidae (Lepidoptera). Zoologicheskii Zhurnal 91 (8): 950–960