

# Setteleia, a New Genus for Four New Species from the Philippines (Insecta: Lepidoptera: Erebidae: Arctiinae)

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We describe a new Lithosiini genus *Setteleia* gen. nov. for four new species from the Philippines: *S. witti* sp. nov. (Mindanao Island), *S. carota* sp. nov. (northern Luzon Island), *S. lourensi* sp. nov. (eastern Luzon Island) and *S. bakunawa* sp. nov. (northern Luzon Island). The new genus belongs to the *Asura* Walker, 1854 / *Mitochondria* Hübner, [1819] generic complex and is related to the genera *Moorasura* Volynkin & Huang, 2019, *Sarbine* Volynkin, 2019, *Ammatho* Walker, 1855 and *Cyme* Felder, 1861 and also shares some genital characters with such genera as *Integrivalvia* Volynkin & Huang, 2019, *Fossia* Volynkin, Ivanova & Huang, 2019 and *Asuridia* Hampson, 1900, but is characterized by a number of autapomorphic features in both male and female genitalia.

**Key words:** Arctiinae, Lithosiini, New genus, New species, Asia.

## BACKGROUND

The *Asura* / *Mitochondria* generic complex is one of the most species-rich and taxonomically difficult groups in the tribe Lithosiini (family Erebidae, subfamily Arctiinae) (Holloway 2001; Volynkin et al. 2019). For a long time, many species in the group were assigned to the large and polyphyletic genera *Mitochondria* Hübner, *Lyclene* Moore, *Asura* Walker and *Barsine* Walker (Edwards 1996; Fang 2000; Holloway 2001; Černý and Pinratana 2009; Bucsek 2012 2014). Volynkin et al. (2019) revised the generic structure of the wide sense *Barsine* and *Asura*, erected 20 new genera and 10 subgenera and provided a checklist of the whole *Asura* / *Mitochondria* generic complex. The generic complex currently comprises 57 genera and 14 subgenera: *Barsine* Walker, *Cyme* Felder, *Ammatho* Walker (with subgenera *Thamoma* Volynkin, *Ammathella* Volynkin, *Composine* Volynkin, *Idopterum* Hampson, *Striatella* Volynkin et Huang, *Conicornuta* Volynkin, *Delineatia* Volynkin et Huang and *Rugosine* Volynkin), *Ovipennis*

Hampson (with subgenera *Barsipennis* Volynkin, *Nebulene* Volynkin et Černý and *Coccinigripennis* Volynkin et Huang), *Huangilene* Volynkin & Černý, *Barsochrista* N. Singh et Kirti, *Asuridia* Hampson, *Barsura* Volynkin, Dubatolov et Kishida (with a subgenus *Tenebrasura* Volynkin), *Nepita* Moore, *Esmasura* Volynkin et Huang, *Matsumursine* Volynkin et Huang, *Asura* Walker (with a subgenus *Eutane* Walker), *Floridasura* Volynkin, *Graptasura* Hampson, *Xanthetis* Hampson, *Disasuridia* Fang, *Quadrassura* Holloway, *Fossia* Volynkin, Ivanova et Huang, *Melanaema* Butler, *Wittasura* Volynkin, *Disparsine* Volynkin, *Moorasura* Volynkin et Huang, *Sarbine* Volynkin (with a subgenus *Processine* Volynkin), *Longarista* Volynkin, *Cernysura* Volynkin, *Rubrandia* Volynkin et Huang, *Indiania* Kirti, Joshi et N. Singh, *Integrivalvia* Volynkin et Huang, *Argentosine* Volynkin, *Pseudobarsine* N. Singh et Kirti, *Hampsonascia* Volynkin, *Barsilene* Volynkin et Huang, *Nanarsine* Volynkin, *Amphisine* Volynkin, *Karolia* Volynkin, *Niveutane* Volynkin, *Albarrania* Bolotov, Spitsyn et Kondakov, *Aberrasine*

Volynkin et Huang, *Arctelene* N. Singh, Kirti et Gill, *Parvuspina* N. Singh, Kirti et Datta, *Sesapa* Walker (with a subgenus *Nipponasura* Inoue), *Chrysasura* Hampson, *Trichocerosia* Hampson, *Chiretolpis* Watson, *Micronyctemera* de Vos et van Mastrigt, *Symmetroides* Meyrick, *Miltochrista* Hübner, *Cabarda* Walker, *Cabardites* Volynkin & Černý, *Gurna* Swinhoe, *Adites* Moore, *Pseudoadites* N. Singh et Kirti, *Afrasura* Durante, *Palaeugoa* Durante, *Tumicla* Wallengren and *Parafrasura* Durante. The genus *Barsaurea* Volynkin & Huang erected for two species and provisionally placed in the *Asura* / *Miltochrista* generic complex under the genus *Barsine* by Černý and Pinratana (2009) was subsequently transferred to ‘the *Eugoa* group of genera’ *sensu* Holloway (2001) by Volynkin et al. (2020).

During examination of extensive Lithosiini materials collected by the second author and our colleagues in the Philippines, we found a series of four peculiar unidentified species (Figs. 1, 3, 4A–B, 6A–C) that clearly belonging to the *Asura* / *Miltochrista* generic complex but which cannot be associated with any known genus. Below we describe these four species as new to science and erect a new genus for them. The new genus is related to the genera *Moorasura* (Figs. 2A–B, 4C–D, 7A), *Sarbine* (Figs. 2C–D, 5A, 6D), *Ammatho* (Figs. 2E, 5B, 6E) and *Cyme* (Figs. 2G, 5C, 7B) and also shares some genital characters with such genera as *Integrivalvia* (Figs. 2F, 5D, 6F), *Fossia* and *Asuridia* (illustrated by Volynkin et al. (2019)). However, it clearly differs from all these genera as well as other members of the *Asura* / *Miltochrista* generic complex by a number of autapomorphic features in both, male and female genitalia.

## MATERIALS AND METHODS

Abdomens of specimens were removed and macerated in hot 8% KOH solution. The genitalia were dissected, stained with eosin B and mounted in Euparal on glass slides using standard methods of preparation (Lafontaine and Mikkola 1987; Fibiger 1997). Photos of imagoes were taken using a Nikon D3100/AF-S camera equipped with Nikkor, 18–55 mm lens. Genital images were taken by the same camera attached to a microscope with an LM-scope adapter. Pictures were processed by Adobe Photoshop CC 2018® software. The pictures of specimens housed in NHMUK are available under Creative Commons License 4.0 (<https://creativecommons.org/licenses/by/4.0/>).

## RESULTS

### Genus *Setteleia* Volynkin et Černý, gen. nov.

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*Type species: Setteleia carota* Volynkin et Černý, sp. nov.

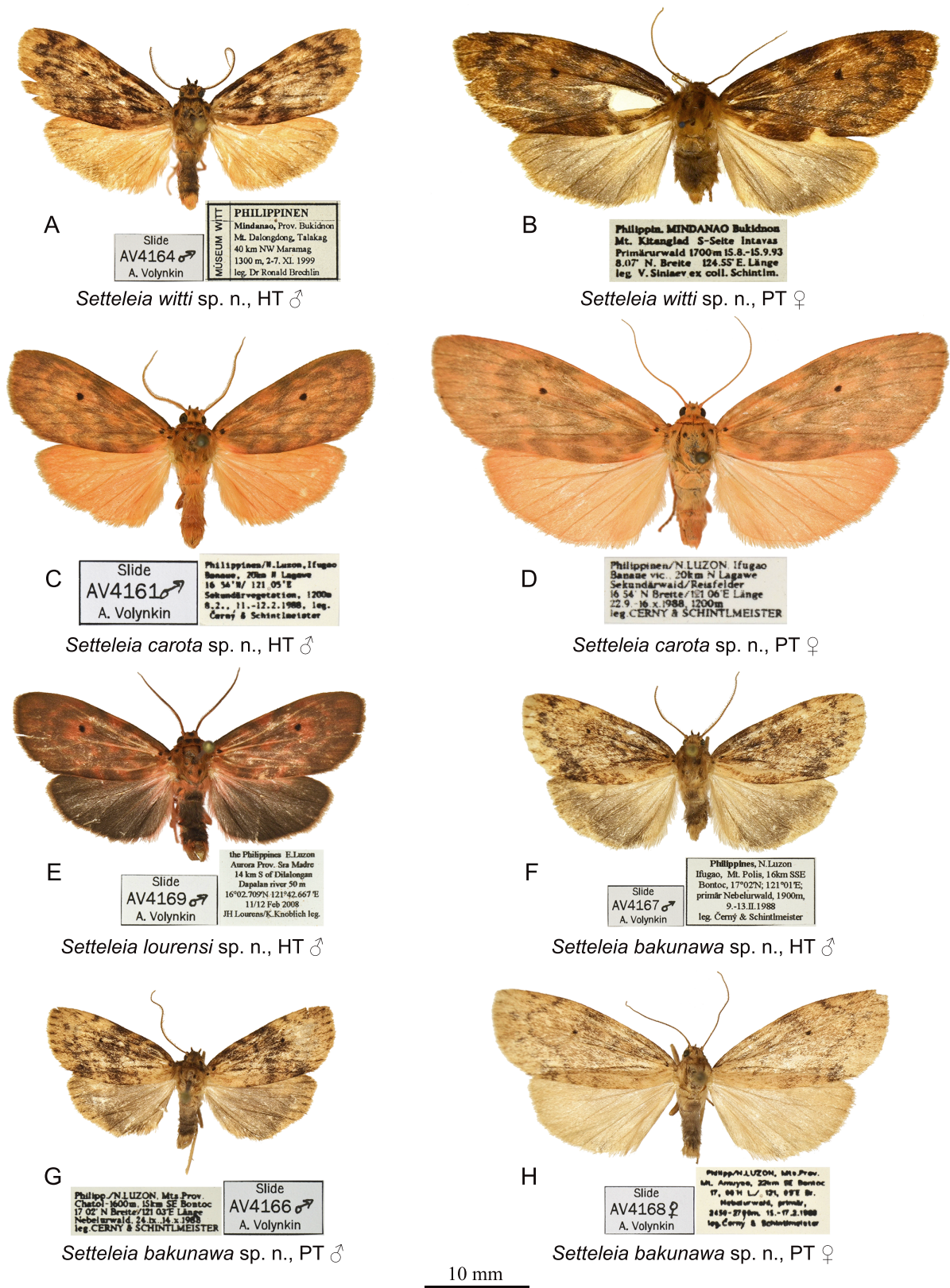
*Etymology:* The genus is named after Prof. Josef Settele (Helmholtz Centre for Environmental Research – UFZ, Halle, Germany), who was very helpful in organizing the second author’s researches in the Philippines and who is actively involved in science-policy processes for the conservation of Lepidoptera and biodiversity in the Philippines as well as globally. Gender is feminine.

*Diagnosis:* Members of the new genus (Fig. 1) remotely reminiscent some species of the genera *Cyme* (*C. quadrifasciata* (Rothschild)) (Fig. 2G) and *Asura* (*A. mimetica* Rothschild) (Fig. 2H) due to the shape of forewing transverse lines and the presence of a discal spot on forewing, but differ by their larger size and more diffuse and narrower transverse lines.

The male genitalia of *Setteleia* (Figs. 3, 4A–B) are characterized by the complex of the following characters: The uncus is strongly broadened distally (an autapomorphic character) (Figs. 3, 4A–B), whereas in other related genera the uncus is evenly narrow or broadened basally (e.g., in *Moorasura*, as shown in Figs. 4C–D) or medially (*Barsochrista* (illustrated by Volynkin and Ivanova 2017, p. 182, Figs. 7–9) and *Longarista* (illustrated by Volynkin 2019, p. 100, Figs. 16–19)), or is dorso-ventrally flattened (*Xanthetis* and *Disasuridia*) (illustrated by Volynkin et al. 2019, p. 47, Figs. 133, 134).

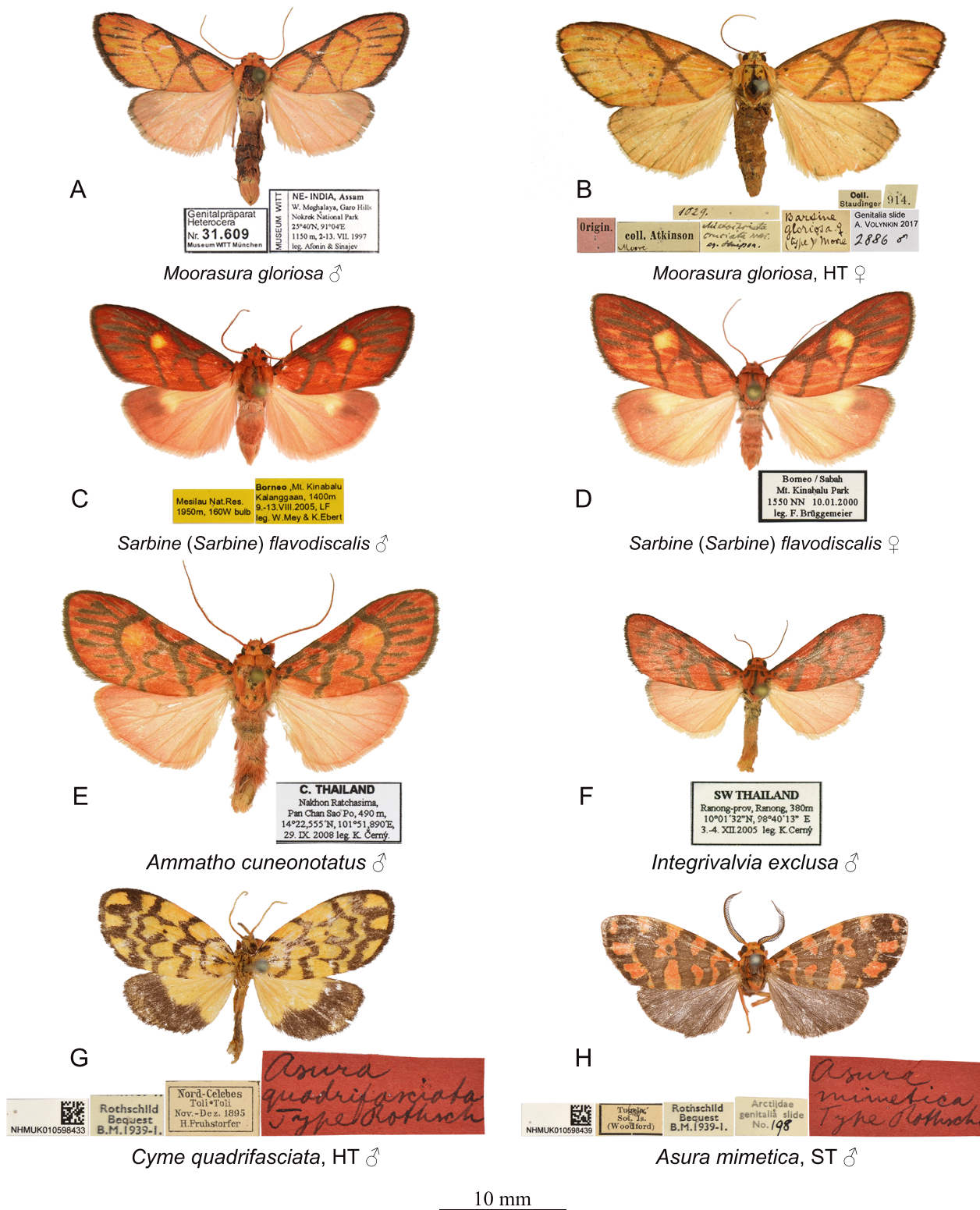
The medial costal process is elongate, narrow, slightly curved, apically pointed and directed dorsally (an autapomorphic character) (Figs. 3, 4A–B), whereas in other related genera (Figs. 4C–D, 5B–C) the medial costal process is directed ventrally or ventrally-distally. The genus *Sarbine* (Fig. 5A) also has the medial costal process directed more or less dorsally, but it is very short and tubercle-like. Another genus having a dorsally directed process of costa is *Albarrania* (illustrated by Volynkin et al. 2019, p. 53, fig. 157), but in the latter the process represents a straight and heavily sclerotized spur situated more distally than that of *Setteleia*.

The costa is broadened distally, reaching the tip of valva where forming a broad cucullus with a small ventral process (an autapomorphic character) (Figs. 3, 4A–B), whereas in other related genera the costa is narrowed distally and forms a distal process (e.g., in *Moorasura*, *Sarbine* and *Ammatho*) (Figs. 4C–D, 5A–B), or is not reaching the valva tip (e.g., in *Cyme*)



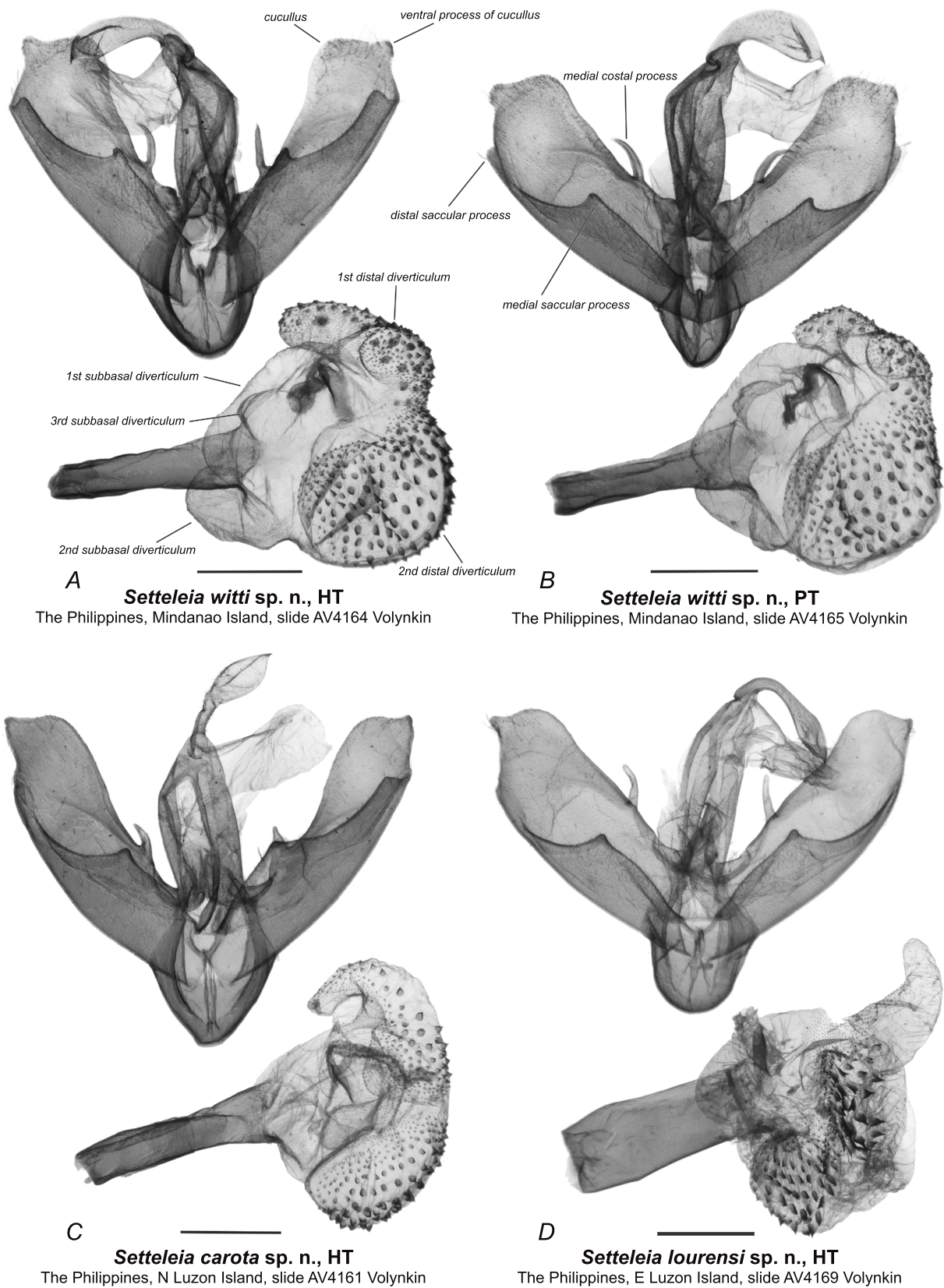
**Fig. 1.** *Setteleia* gen. nov. spp.: adults. A, *S. witti* sp. nov., holotype male (MWM/ZSM). B, *S. witti* sp. nov., paratype female (MWM/ZSM). C, *S. carota* sp. nov., holotype male (MWM/ZSM). D, *S. carota* sp. nov., paratype female (CKC). E, *S. lourensi* sp. nov., holotype male (MWM/ZSM). F, *S. bakunawa* sp. nov., holotype male (MWM/ZSM). G, *S. bakunawa* sp. nov., paratype male (CKC). H, *S. bakunawa* sp. nov., paratype female (CKC).



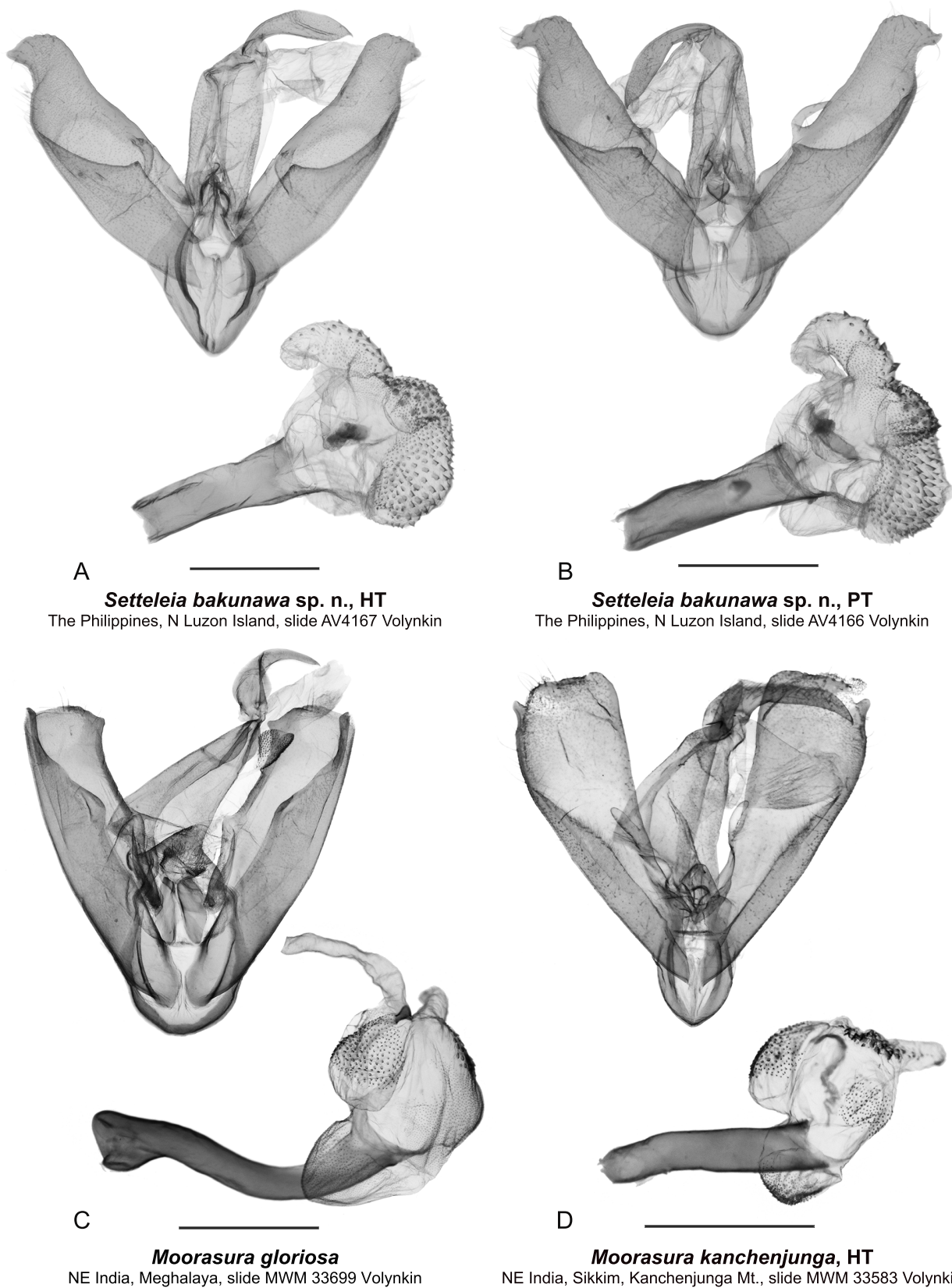


**Fig. 2.** Lithosiini spp.: adults (A–F – type species of genera). A, *Moorasura gloriosa*, male (MWM/ZSM). B, *Moorasura gloriosa*, holotype female (MFN). C, *Sarbine flavodiscalis*, male (MFN). D, *Sarbine flavodiscalis*, female (CKC). E, *Ammatho cuneonotatus*, male (CKC). F, *Integrivalvia exclusa*, male (CKC). G, *Cyme quadrifasciata*, holotype male (©The Trustees of NHMUK). H, *Asura mimetica*, syntype male (©The Trustees of NHMUK).





**Fig. 3.** *Setteleia* gen. nov. spp.: male genitalia. A, *S. witti* sp. nov., holotype (MWM/ZSM). B, *S. witti* sp. nov., paratype (CKC). C, *S. carota* sp. nov., holotype (MWM/ZSM). D, *S. lourensi* sp. nov., holotype (MWM/ZSM). Scale bars = 1 mm.



**Fig. 4.** Lithosiini spp.: male genitalia. A, *Setteleia bakunawa* sp. nov., holotype (MWM/ZSM). B, *S. bakunawa* sp. nov., paratype (CKC). C, *Moorasura gloriosa*, type species of *Moorasura* (MWM/ZSM). D, *M. kanchenjunga*, holotype (MWM/ZSM). Scale bars = 1 mm.

(Fig. 5C), or is narrow and lacking processes (e.g., in *Integrivalvia*) (Fig. 5D).

The sacculus is broadened basally and subbasally and bearing a small trigonal ventral process near the beginning of the strongly narrowed distal section (an autapomorphic character) (Figs. 3, 4A–B). The similar medial process of sacculus is present in some related genera such as *Moorasura* (Fig. 4C–D) and *Sarbine* (Fig. 5A), but in those genera the sacculus is conspicuously less broadened basally and subbasally.

The distal saccular process is represented by a very short, trigonal protrusion with a rounded tip (in *S. witti*, *S. carota* and *S. lourensi*) (Fig. 3) or is reduced (*S. bakunawa*) (Fig. 4A–B). Such a structure of the distal saccular process is also found in some species of *Moorasura* (Fig. 4C–D) and *Fossia* (illustrated by Volynkin et al. 2019, p. 48, fig. 136).

The distal membranous lobe of valva is absent (Figs. 3, 4A–B).

The aedeagus vesica has an elongate and curved diverticulum (called here as the 1st distal diverticulum) generally directed dorsally and covered with numerous small and very short cornuti and granulation (Figs. 3, 4A–B). The similar characteristic diverticulum is also known in the genus *Asuridia* only (illustrated by Volynkin et al. 2019, p. 44, fig. 120).

The female genitalia of *Setteleia* (Fig. 6A–C) are characterized by the complex of the following characters: The ostium bursae is narrower than the posterior section of ductus bursae, whereas in other related genera that is as broad as the ductus bursae (Fig. 6A–C).

The ductus bursae is relatively short, broad, dorso-ventrally flattened, moderately sclerotized, with slightly convex lateral margins (Fig. 6A–C), whereas in other related genera that is more elongate and has more or less parallel margins (Figs. 6D–F, 7A–B).

The posterior section of corpus bursae is moderately sclerotized and strongly rugose (Fig. 6A–C).

The anterior section of corpus bursae bears a large, elongate signum bursae with a narrow longitudinal groove (an autapomorphic character) (Fig. 6A–C), whereas in other related genera the signum bursae (if present) is round, elliptical or band-like and lacks a longitudinal groove (Figs. 6D–F, 7A–B).

The appendix bursae is elongate, curved anteriorly, its basal section is weakly sclerotized and rugose (Fig. 6A–C). Such a shape of the appendix bursae is known in the genus *Ammatho* s. str. (Fig. 6E), but in the latter the appendix bursae is not sclerotized and rugose basally. The genus *Integrivalvia* (Fig. 6F) also has an elongate appendix bursae, but it is evenly covered with numerous spinules and directed posteriorly.

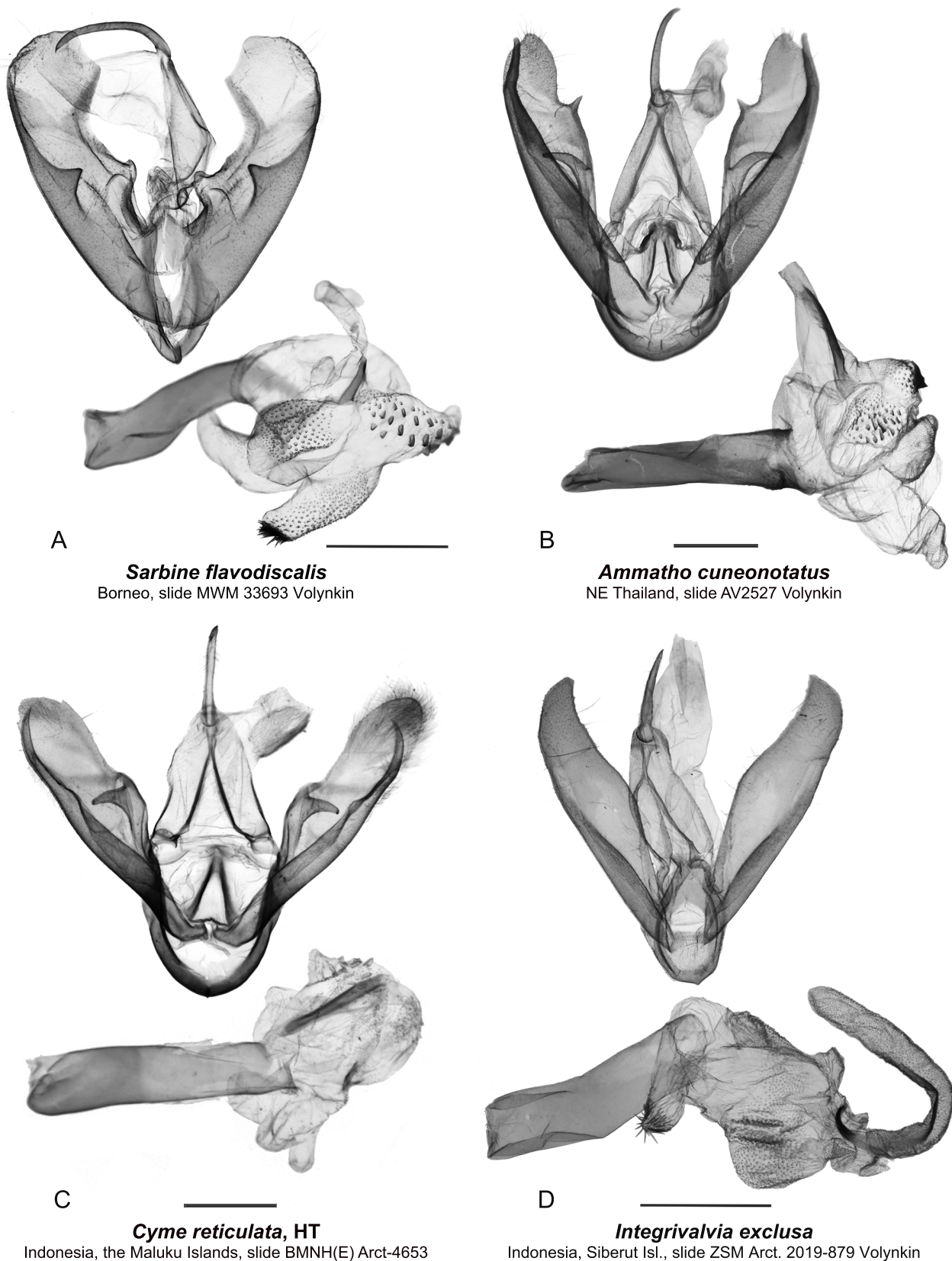
**Description:** External morphology of adults (Fig.

1). Medium-sized moths, forewing length 14–17 mm in males and 19–24 mm in females. Sexual dimorphism poorly expressed: female larger than male and has broader forewing with more elongate apex. Labial palps short, porrect. Male antenna strongly ciliate, female antenna filiform. Coloration from pale carrot orange or rusty reddish to brown. Head and thorax coloration same as that of forewing, abdomen paler. Forewing pattern consists of small black subbasal and discal dots and diffuse and wavy transverse lines fusing to each other on veins. Hindwing without pattern, in some species lightened subbasally and basally.

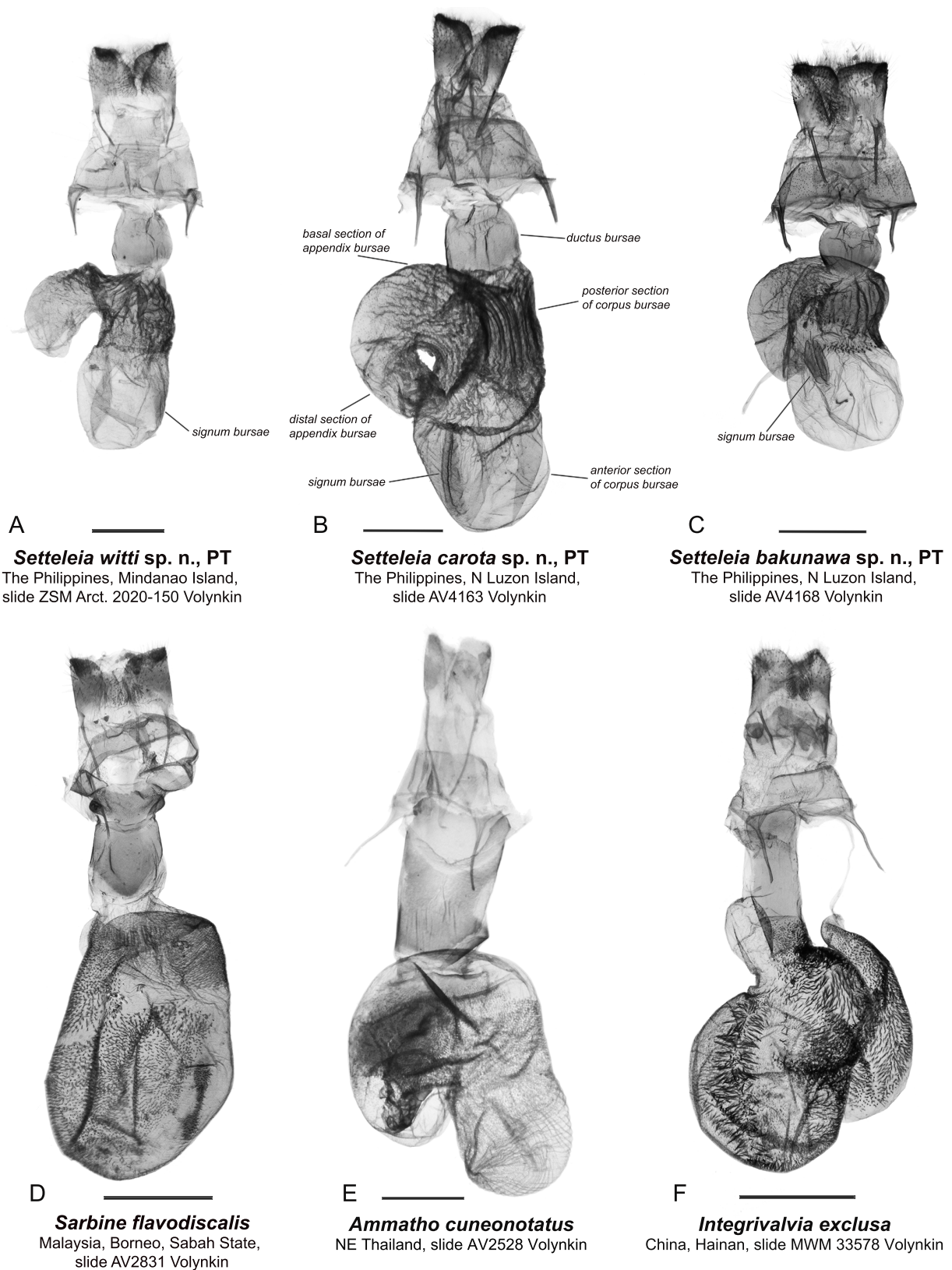
**Male genitalia** (Figs. 3, 4A–B): Uncus strongly broadened distally, with pointed thorn-like tip. Tuba analis moderately broad, membranous. Scaphium narrow, moderately sclerotized. Subscaphium absent. Tegumen relatively short and narrow. Juxta more or less trapezoidal, weakly sclerotized. Vinculum robust, U-like. Valva elongate and relatively narrow. Costa nearly straight, narrow basally and medially, strongly broadened distally and forms broad cucullus bearing short ventral process. Medial costal process narrow, slightly hook-like curved, apically pointed, directed ventrally. Sacculus broadened basally and subbasally and bears small trigonal ventral process near the beginning of the strongly narrowed distal section. Distal saccular process represents very short, trigonal protrusion with rounded tip, or reduced. Distal membranous lobe of valva absent. Aedeagus elongate, straight, relatively narrow, slightly broadened distally. Aedeagus vesica broad, with three membranous short but broad subbasal diverticula and two large distal diverticula bearing areas of numerous short but robust cornuti or granulation; 1st distal diverticulum elongate, curved and generally directed dorsally; 2nd distal diverticulum broad, more or less globular. Distal plate of vesica narrow, band-like, weakly sclerotized.

**Female genitalia** (Fig. 6A–C): Ovipositor short and broad. Papilla analis rectangular with rounded corners, weakly setose. Apophyses elongate and thin, of equal length, apophyses anteriores slightly broader than apophyses posteriores. Ostium bursae slightly narrower than ductus bursae, with membranous margins. Main part of ductus bursae relatively short and broad, moderately sclerotized, dorso-ventrally flattened, with slightly convex lateral margins; anterior end of ductus bursae membranous. Posterior section of corpus bursae relatively narrow, moderately sclerotized, strongly rugose, its anterior end with granulation or small dentation. Anterior section of corpus bursae broadened, more or less globular, membranous, with large signum situated latero-longitudinally and having narrow longitudinal groove subdividing it to two equal parts. Appendix bursae originates laterally from posterior





**Fig. 5.** Lithosiini spp.: male genitalia of type species of genera. A, *Sarbine flavodiscalis* (MWM/ZSM). B, *Ammatho cuneonotatus* (CKC). C, *Cyme reticulata*, holotype (©The Trustees of NHMUK). D, *Integrivalvia exclusa* (MWM/ZSM). Scale bars = 1 mm.



**Fig. 6.** Lithosiini spp.: female genitalia. B, D, E, F are type species of genera. A, *Setteleia witti* sp. nov., paratype (MWM/ZSM). B, *Setteleia carota* sp. nov., paratype (CKC). C, *Setteleia bakunawa* sp. nov., paratype (CKC). D, *Sarbine flavodiscalis* (CKC). E, *Ammatho cuneonotatus* (CKC). F, *Integrivalvia excluda* (MWM/ZSM). Scale bars = 1 mm.

section of corpus bursae, elongate, curved anteriorly, its basal section weakly sclerotized and rugose like the posterior section of corpus bursae; distal section membranous and may be weakly rugose.

**Distribution:** The genus is endemic to the Philippine archipelago. It is not found on the island of Palawan belonging biogeographically to the Sundaic Region.

**Species composition:** The new genus comprises four species, all of which are new to science and described below.

***Setteleia witti* Volynkin et Černý, sp. nov.**

(Figs. 1A–B, 3A–B, 6A)

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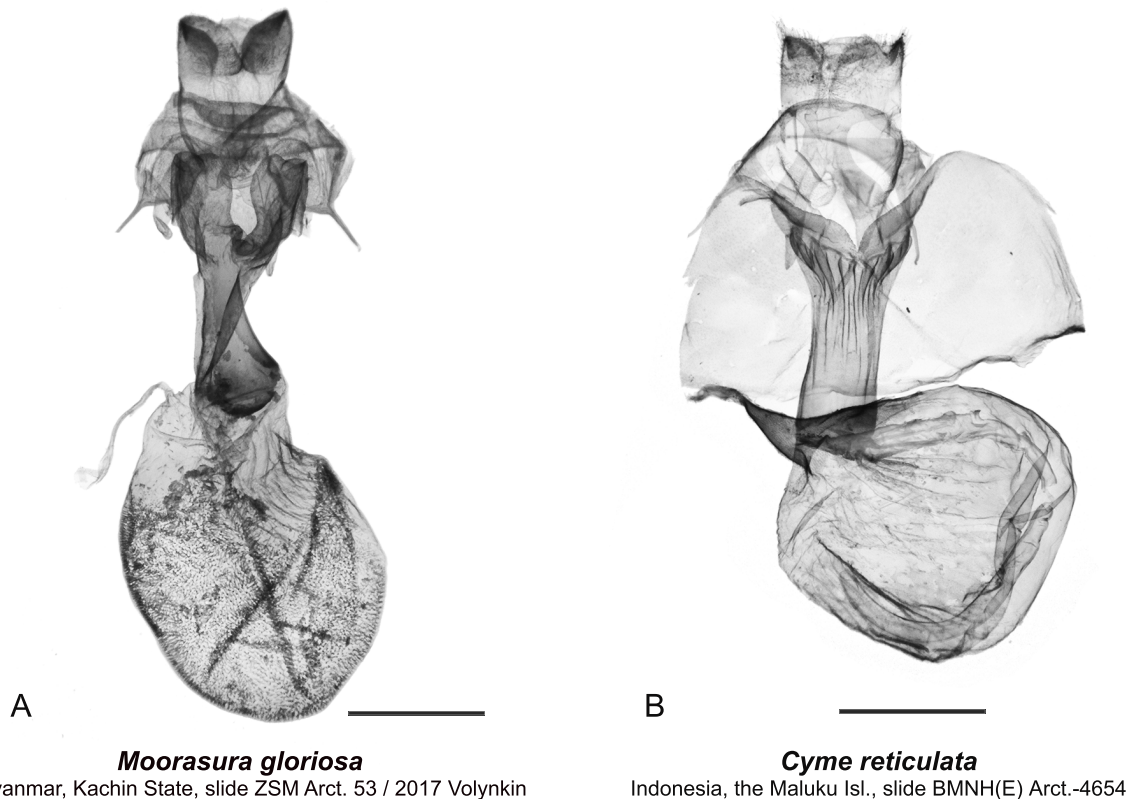
**Type material:** *Holotype*: male, “[the Philippines] Philippinen, Mindanao, Prov. Bukidnon, Mt. Dalongdong, Talakag, 40 km NW Maramag, 1300 m, 2–7.XI.1999, leg. Dr. Ronald Brechlin”, slide ZSM Arct. 2020-136 Volynkin (Coll. MWM/ZSM).

**Paratypes:** 2 males, the Philippines, Mindanao, Bukidnon prov., 60 km S Talakag, Dominorog, 1271 m, 23–24. III.2009, 7°56.144'N 124°38.5'E, leg. K. Černý

& J. Lourens (Coll. CKC); 2 males, the Philippines, Mindanao, Bukidnon, 40 km NW Maramag, Dalongdong, 800 m, Talakag, 7°53'N 123°54'E, edge of forest, 1.X–3.X.1988, leg. Černý & Schintlmeister, slide AV4165 Volynkin (Coll. CKC); 1 female, the Philippines, Mindanao, Bukidnon prov., Mt. Kitanglad, S side, Intavas, primary rainforest, 1700m, 15.VIII.–15. IX.[19]93, 8°07'N 124°55'E, leg. V. Sinyaev, ex coll. Schintl[m]eister], slide ZSM Arct. 2020-150 Volynkin (Coll. MWM/ZSM); 1 female, the same data, but 2200 m (Coll. MWM/ZSM).

**Etymology:** The species is dedicated to the memory of Dr Thomas J. Witt, a famous lepidopterist and a founder of the Museum Witt Munich having one of the largest collections of Heterocera in the world.

**Diagnosis:** *Setteleia witti* reminiscent externally *S. bakunawa* due to its brown coloration, but can be easily distinguished from the latter by its slightly larger size, more elongate forewing, darker body and wing coloration and more distinct transverse lines. The male genitalia of *S. witti* differ from those of other congeners by the uncus being broader basally and more strongly broadened distally, the cucullus being most broad in the genus, the most prominent distal saccular process, and the broadest aedeagus vesica having the largest and



**Fig. 7.** Lithosiini spp.: female genitalia of type species of genera. A, *Moorasura gloriosa* (MWM/ZSM) B, *Cyme reticulata* (©The Trustees of NHMUK).



well-developed 1st, 2nd and 3rd subbasal diverticula. The female genitalia of the new species differ from those of *S. carota* and *S. bakunawa* by their narrow ductus bursae, shorter sclerotized and rugose posterior section of corpus bursae, shorter and more weakly sclerotized signum bursae, and smaller appendix bursae with the shorter and more weakly sclerotized basal section.

**Description: External morphology of adults:** Forewing length 16.5–17 mm in males and 22–24 mm in females. Antennae and head dark brown, frons with black spot. Thorax dark brown; collar blackish, encircled with brown. Patagia with black spot medially. Abdomen dark brown, in male with pinkish suffusion basally and distally. Forewing ground color dark brown. Pattern consists of small black subbasal and discal dots and diffuse and irregularly wavy blackish brown transverse lines fusing to each other on veins. Cilia brown. Hindwing pale orange brown with intense dark brown suffusion medially and distally, darker in female. Cilia pale orange brown with admixture of dark brown scales.

**Male genitalia:** Uncus robust, strongly broadened medially and distally, with pointed thorn-like tip. Tuba analis moderately broad, membranous. Scaphium narrow, moderately sclerotized. Subscaphium absent. Tegumen relatively short and narrow. Juxta more or less trapezoidal, weakly sclerotized. Vinculum robust, U-like. Valva elongate and relatively narrow. Costa nearly straight, narrow basally and medially, strongly broadened distally and forms broad cucullus bearing short ventral process with round tip. Medial costal process narrow, slightly hook-like curved, apically pointed, directed ventrally. Saccus broadened basally and subbasally, bears small trigonal ventral process near the beginning of the strongly narrowed distal section. Distal saccular process short, broadly trigonal, with rounded tip. Aedeagus elongate, straight, relatively narrow, slightly broadened distally. Aedeagus vesica broad. 1st subbasal diverticulum extremely wide but short, membranous situated dorsally. 2nd subbasal diverticulum large, nearly globular, membranous, with weakly granulated lateral area basally, situated ventrally. 3rd subbasal diverticulum relatively small, globular, membranous, situated medially. 1st distal diverticulum elongate, broadened basally, with broad and round tip, covered with numerous small but robust cornuti and granulation. 2nd distal diverticulum broad, globular, covered with numerous small but robust cornuti and granulation. Distal plate of vesica narrow, band-like, weakly sclerotized.

**Female genitalia:** Ovipositor short and broad. Papilla analis rectangular with rounded corners, weakly setose. Apophyses elongate and thin, of equal length,

apophyses anteriores slightly broader than apophyses posteriores. Ostium bursae slightly narrower than ductus bursae, with membranous margins. Main part of ductus bursae relatively short and broad, moderately sclerotized, dorso-ventrally flattened, with slightly convex lateral margins; anterior end of ductus bursae membranous. Posterior section of corpus bursae relatively narrow, moderately sclerotized, strongly rugose, its anterior end with dense granulation. Anterior section of corpus bursae broadened, more or less globular, membranous, with elongate signum situated latero-longitudinally and having narrow longitudinal groove subdividing it to two equal parts. Appendix bursae originates laterally from posterior section of corpus bursae, elongate, curved anteriorly, its basal section weakly sclerotized and rugose like the posterior section of corpus bursae; distal section membranous.

**Distribution:** The new species is known from the island of Mindanao.

### ***Setteleia carota* Volynkin et Černý, sp. nov.**

(Figs. 1C–D, 3C, 6B)

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**Type material:** *Holotype*: male, “[the Philippines] Philippinen, N Luzon, Ifugao, Banawe, 20 km N Lagawe, 16°54'N 121°05'E, Secundärvegetation [secondary vegetation], 1200 m, 8.II, 11–12.II.1988, leg. Černý & Schintlmeister”, slide ZSM Arct. 2020-137 Volynkin (Coll. MWM/ZSM).

**Paratypes:** 6 males, 2 females, the same data as for the holotype, slides AV4162 (male) and AV4163 (female) Volynkin (Coll. CKC); 4 males, the same data (Coll. CAH); 2 males, the same data (Coll. MWM/ZSM); 13 males, 3 females, the same locality and collectors, but 22.IX–16.X.1988 (Coll. CKC); 3 males, 2 females, the same data (Coll. MWM/ZSM); 2 females, the same data (Coll. CAH).

**Etymology:** ‘Carota’ means ‘a carrot’ in Latin. The specific epithet refers to its pale carrot orange coloration.

**Diagnosis:** The new species is most similar externally to *S. witti* due to the similar forewing pattern, but differs clearly from *S. witti* as well as from other congeners by the pale carrot orange coloration. The male genital capsule of *S. carota* differs from that of *S. witti* by the uncus having the conspicuously narrower basal section and the narrower distal section, the shorter medial costal process, the narrower cucullus with the trigonal ventral process (that is broader and has a rounded tip in *S. witti*), and the shorter medial and distal saccular processes. The aedeagus vesica is conspicuously narrower than that of *S.*

*witti*, the subbasal diverticula are much smaller and less prominent; the 1st distal diverticulum is distally narrower, more elongate and bears smaller cornuti than that of *S. witti*; the 2nd distal diverticulum is narrower and bears smaller cornuti than that of *S. witti*. The female genitalia of *S. carota* differ clearly from those of *S. witti* by the thicker apophyses, conspicuously broader ductus bursae with less convex margins, the longer, more heavily sclerotized and more rugose posterior section of corpus bursae, the conspicuously longer and more heavily sclerotized signum bursae, and the much longer and broader appendix bursae with longer and more heavily sclerotized basal section. The differences from *S. lourensi* are listed in the Diagnosis of the latter species.

**Description: External morphology of adults:** Forewing length 17–17.5 mm in males and 25 mm in females. Antennae and head orange brown, frons with black spot. Thorax orange brown; collar orange brown with two black spots. Patagia with black spot anteriorly. Abdomen pale carrot orange. Forewing ground color pale carrot orange. Pattern consists of small black subbasal and discal dots and diffuse and irregularly wavy brown transverse lines fusing to each other on veins. Cilia carrot orange with strong admixture of brown. Hindwing pale carrot orange, slightly lighter than forewing. Cilia pale carrot orange.

**Male genitalia:** Uncus narrow basally and strongly arrowhead-like broadened distally, with pointed thorn-like tip. Tuba analis moderately broad, membranous. Scaphium narrow, moderately sclerotized. Subscaphium absent. Tegumen relatively short and narrow. Juxta more or less trapezoidal, weakly sclerotized. Vinculum robust, U-like. Valva elongate and relatively narrow. Costa nearly straight, narrow basally and medially, strongly broadened distally and forms broad cucullus bearing short ventral process with round tip. Medial costal process narrow, slightly hook-like curved, apically pointed, directed ventrally. Sacculus broadened basally and subbasally, bears small trigonal ventral process near the beginning of the strongly narrowed distal section. Distal saccular process very short, broadly trigonal, with blunt tip. Aedeagus elongate, straight, relatively narrow, slightly broadened distally. Aedeagus vesica relatively broad. 1st subbasal diverticulum wide but very short, membranous situated dorsally. 2nd subbasal diverticulum small, semiglobular, membranous, with weakly granulated lateral area, situated ventrally. 3rd subbasal diverticulum small, globular, membranous, situated medially. 1st distal diverticulum elongate, narrowed and curved distally, covered with numerous various sized small but robust cornuti and granulation. 2nd distal diverticulum broad, globular, covered with numerous various sized small but robust cornuti and

granulation. Distal plate of vesica narrow, band-like, weakly sclerotized.

**Female genitalia:** Ovipositor short and broad. Papilla analis rectangular with rounded corners, weakly setose. Apophyses elongate and thin, of equal length, apophyses anteriores thicker than apophyses posteriores. Ostium bursae slightly narrower than ductus bursae, with membranous margins. Main part of ductus bursae relatively broad, moderately sclerotized, dorso-ventrally flattened, with very slightly convex lateral margins; anterior end of ductus bursae membranous. Posterior section of corpus bursae relatively narrow, heavily sclerotized, strongly rugose, its anterior end with dense granulation. Anterior section of corpus bursae broadened, more or less globular, membranous, with large and heavily sclerotized elongate signum situated latero-longitudinally and having narrow longitudinal groove subdividing it to two equal parts. Appendix bursae originates laterally from posterior section of corpus bursae, long, anteriorly and hook-like curved, its basal section weakly sclerotized and strongly rugose; distal section weakly rugose and granulated.

**Distribution:** The new species is known from the northern part of the island of Luzon.

### ***Setteleia lourensi* Volynkin et Černý, sp. nov.**

(Figs. 1E, 3D)

urn:lsid:zoobank.org:act:EDD5964A-F3DB-4BCD-91C7-B0F4BFF85CE3

**Type material: Holotype:** male, “the Philippines, E. Luzon, Aurora Prov., Sra Madre, 14 km S of Dilalongan, Dapalan river, 50 m, 16°02.709'N 121°42.667'E, 11/12 Feb 2008, J.H. Lourens / K. Knoblich leg.”, slide ZSM Arct. 2020-138 Volynkin (Coll. MWM/ZSM).

**Etymology:** The species is named after Johannes H. Lourens, a famous researcher of the Lepidoptera fauna of the Philippines and a collector of the holotype.

**Diagnosis:** *Setteleia lourensi* is an unmistakable species clearly differing from its congeners by its blackish hindwing with a rusty red suffusion basally and along the costal margin, the rusty red forewing ground color and the blackish brown abdomen. The male genitalia of *S. lourensi* are similar to those of *S. carota*, but differ by the uncus being narrower distally, the longer medial costal process, the slightly broader cucullus, the smaller distal saccular process, the slightly broader aedeagus, the larger 1st subbasal diverticulum, the larger and more pointed cornuti on the 2nd and the base of the 1st distal diverticula, and the broader and weakly granulated distal elongate section of the 1st distal diverticulum (whereas in *S. carota* that is narrower and covered with small but robust various sized cornuti).

**Description: External morphology of adults:** Forewing length 16 mm in holotype male. Antennae and head rusty red, frons with black spot. Thorax rusty red; collar rusty red with two black spots. Patagia with black spot anteriorly. Abdomen blackish brown but pale rusty red basally and distally. Forewing ground color rusty red. Pattern consists of small black subbasal and discal dots and diffuse and irregularly wavy dark brown transverse lines fusing to each other on veins. Cilia dark brown with admixture of rusty red scales. Hindwing ground color blackish brown, rusty red at base and along the costal margin. Cilia pale rusty red with admixture of dark brown scales.

**Male genitalia:** Uncus narrow basally and medially and strongly arrowhead-like broadened distally, with pointed thorn-like tip. Tuba analis moderately broad, membranous. Scaphium narrow, moderately sclerotized. Subscaphium absent. Tegumen relatively short and narrow. Juxta more or less trapezoidal, weakly sclerotized. Vinculum robust, U-like. Valva elongate and relatively narrow. Costa nearly straight, narrow basally and medially, strongly broadened distally and forms broad cucullus bearing short ventral process with round tip. Medial costal process narrow, slightly hook-like curved, apically pointed, directed ventrally. Saccus broadened basally and subbasally, bears small trigonal ventral process near the beginning of the strongly narrowed distal section. Distal saccular process very small, broadly trigonal. Aedeagus elongate, straight, moderately broad, slightly broadened distally. Aedeagus vesica relatively broad. 1st subbasal diverticulum wide but short, membranous, situated dorsally. 2nd subbasal diverticulum small, semiglobular, membranous, situated ventrally. 3rd subbasal diverticulum very small, globular, membranous, situated medially. 1st distal diverticulum elongate, narrowed distally and rounded apically, its basal section covered with numerous small but robust cornuti with pointed tips and granulation, and distal section membranous and laterally bears area of weak granulation only. 2nd distal diverticulum broad, globular, covered with numerous short but robust cornuti with pointed tips. Distal plate of vesica narrow, band-like, weakly sclerotized.

Female unknown.

**Distribution:** The new species is known from the eastern part of the island of Luzon.

***Setteleia bakunawa* Volynkin et Černý, sp. nov.**

(Figs. 1F–H, 4A–B, 6C)

urn:lsid:zoobank.org:act:7A0926E0-0605-43A0-AA9D-DC7E6C8EB50A

**Type material:** *Holotype:* male, “[The] Philippines, N Luzon, Ifugao, Mt. Polis, 16 km SSE Bontoc,

17°02'N 121°01'E, primär Nebelurwald [primary cloud rainforest], 1900 m, 9–13.II.1988, leg. Černý & Schintlmeister”, slide ZSM Arct. 2020-139 Volynkin (Coll. MWM/ZSM).

**Paratypes:** 4 males, 4 females, the same data as for the holotype (Coll. CKC); 2 females, The Philippines, N Luzon, Mountain Prov., Mt. Amuyao, 22 km SE Bontoc, 17°00'N 121°09'E, primary cloud rainforest, 2450–2700 m, 15.II–16.II.1988, leg. Černý & Schintlmeister, slide AV4168 Volynkin (Coll. CKC); 2 females, the same data (Coll. MWM/ZSM); 3 males, 3 females, The Philippines, N Luzon, Mountain Prov., Chatol, 1600 m, 15 km SE Bontoc, 17°02'N 121°03'E, cloud rainforest, 24.IV., 14.X.1988, leg. Černý & Schintlmeister, slide AV4166 (male) Volynkin (Coll. CKC).

**Etymology:** In the Philippine traditional mythology, Bakunawa is a dragon trying to swallow the moon during a lunar eclipse.

**Diagnosis:** *Setteleia bakunawa* reminiscent externally *S. witti* due to its brown coloration, but can be easily distinguished by its slightly smaller size (it is the smallest species in the genus), less elongate forewing, paler body and wing coloration and more diffuse transverse lines. The male genitalia of the new species differ clearly from those of three other congeners by the narrower valva with the narrowest cucullus having the longest ventral process, the absence of a distal saccular process, the narrowest aedeagus vesica with the smallest cornuti on the 2nd and the base of the 1st distal diverticula, and the strongly elongate distal section of the 1st distal diverticulum. The female genitalia differ from those of *S. witti* and *S. carota* by the short main sclerotized section of ductus bursae with strongly convex lateral margins, the weakly rugose posterior section of the corpus bursae having two band-like transverse clusters of dentation anteriorly (absent in two other species), the short but well-sclerotized signum bursae (that is also short but weakly sclerotized in *S. witti* and that is much longer in *S. carota*), and the short appendix bursae with weakly rugose and granulated basal section (in *S. witti* that is also short but has the more strongly rugose and not granulated basal section; in *S. carota* that is much longer and its basal section is more heavily sclerotized, rugose and not granulated).

**Description: External morphology of adults:** Forewing length 13.5–16 mm in males and 19 mm in females. Antennae and head brown. Thorax brown, collar brown. Patagia with small black spot anteriorly. Abdomen pale brown. Forewing brown. Pattern consists of small black subbasal and discal dots and diffuse and irregularly wavy dark brown transverse lines fusing to each other on veins. In males strong brown suffusion in medial area also present. Subterminal area with



dark brown suffusion on veins. Cilia brown. Hindwing ground pale brown with intense blackish brown suffusion in medial and subterminal areas. Cilia pale brown.

**Male genitalia:** Uncus narrow basally and arrowhead-like broadened medially and distally, with pointed thorn-like tip. Tuba analis moderately broad, membranous. Scaphium narrow, moderately sclerotized. Subscaphium absent. Tegumen relatively short and narrow. Juxta more or less trapezoidal, weakly sclerotized. Vinculum robust, U-like. Valva elongate and relatively narrow, slightly narrowed distally. Costa nearly straight, narrow basally and medially, strongly broadened distally and forms broad cucullus bearing short ventral process with round tip. Medial costal process narrow, slightly hook-like curved, apically pointed, directed more or less ventrally. Sacculus broadened basally and subbasally, bears small trigonal ventral process near the beginning of the strongly narrowed distal section. Distal saccular process reduced. Aedeagus elongate, straight, moderately broad, slightly broadened distally. Aedeagus vesica relatively broad. 1st subbasal diverticulum wide but short, membranous situated dorsally. 2nd subbasal diverticulum small, globular, membranous, situated ventrally. 3rd subbasal diverticulum small, globular, membranous, situated medially. 1st distal diverticulum elongate, narrowed distally, with rounded tip, strongly hook-like curved, its basal section bears row of small but robust various-sized cornuti and broad area of granulation; distal section membranous. 2nd distal diverticulum broad, globular, covered with numerous small but robust cornuti with pointed tips. Distal plate of vesica narrow, band-like, weakly sclerotized.

**Female genitalia:** Ovipositor short and broad. Papilla analis rectangular with rounded corners, weakly setose. Apophyses elongate and thin, apophyses anteriores slightly shorter and thicker than apophyses posteriores. Ostium bursae slightly narrower than ductus bursae, with membranous margins. Main part of ductus bursae relatively broad, moderately sclerotized, dorso-ventrally flattened, with strongly convex lateral margins making it nearly round; anterior end of ductus bursae membranous. Posterior section of corpus bursae relatively narrow, moderately sclerotized, rugose, its anterior end with two transverse band-like clusters of numerous denticles. Anterior section of corpus bursae broadened, more or less globular, membranous, with elongate and heavily sclerotized elongate signum situated latero-longitudinally and having narrow longitudinal groove subdividing it to two equal parts. Appendix bursae originates laterally from posterior section of corpus bursae, long, anteriorly and hook-like curved, its basal section weakly sclerotized, rugose and

granulated; distal section thick-walled membranous.

**Distribution:** The new species is known from the northern part of the island of Luzon.

## DISCUSSION

*Setteleia* is the 58th valid genus of the *Asura* / *Miltochrista* generic complex. Although most species in the generic complex are already assigned with monophyletic genera, some species-groups, especially within the genus *Miltochrista* (provisionally considered by Volynkin et al. (2019) in a wide sense), still have an unclear generic placement. Their status, as well as the status of taxa currently considering as subgenera, needs to be revised using molecular analysis methods. Additionally, the taxonomy of many groups of this diverse complex remains poorly studied and many new taxa are yet to be discovered and described. This fully applies to the fauna of the Philippine archipelago.

## CONCLUSIONS

A new Lithosiini genus *Setteleia* gen. nov. is erected for four new species from the Philippines. The new genus is related to the genera *Moorasura*, *Sarbine*, *Ammatho* and *Cyme*, but differs from them by a number of autapomorphic features in both, male and female genitalia. Four new species are described under the new genus. Adults, male and female genitalia of *Setteleia* and related genera are illustrated.

## List of abbreviations

CKC, private collection of Karel Černý (Innsbruck, Austria).

HT, holotype.

MWM/ZSM, Museum Witt Munich / the Bavarian State Collection of Zoology (Museum Witt München / Zoologische Staatssammlung München, Munich, Germany).

NHMUK, Natural History Museum, London (formerly British Museum of Natural History, BMNH, London, United Kingdom).

PT, paratype.

MFN, Museum of Natural History, Berlin (Museum für Naturkunde, Berlin, Germany).

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**Authors' contributions:** KC performed the field work. AV dissected the specimens, took pictures of the specimens and genital preparations and made the illustrations in the Adobe Photoshop CC 2018® software. AV & KC designed the study, analysed the specimens and wrote the text.

**Competing interests:** The authors declare that they have no conflict of interests.

**Availability of data and materials:** Holotypes and a part of paratypes of the new species are housed in the Bavarian State Collection of Zoology (Munich, Germany) and are publicly available. Part of paratypes is housed in the collection of Karel Černý (Innsbruck, Austria), that later to be deposited in the Bavarian State Collection of Zoology, and are available by a request.

**Consent for publication:** Not applicable.

**Ethics approval consent to participate:** Not applicable.

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