

## A new *Thyatira* Ochsenheimer, 1816 (s.l.) species from New Guinea (Lepidoptera: Drepanidae, Thyatirinae)

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Suara Serangga Papua (SUGAPA digital) 13(2): 131-142.  
urn:lsid:zoobank.org:pub: CFFC9A0B-F6C7-4992-9651-0119D6BE6789

**Abstract:** A new species of *Thyatira* Ochsenheimer, 1816 (s.l.) is described, *T. papuana spec. nov.*, recently discovered in old museum material and new collected material from New Guinea. Adults and genitalia are figured and the status of the species in the genus *Thyatira* is discussed.

**Rangkuman:** Spesies baru dari genus *Thyatira* Ochsenheimer, 1816 (s.l.), yaitu *T. papuana spec. nov.*, dideskripsi disini. Spesies ini ditemukan di dalam koleksi lama museum dan di dalam hasil koleksi baru dari New Guinea. Gambar bentuk dewasa dan genitalia disajikan dan status spesies ini dalam genus *Thyatira* didiskusikan.

**Keywords:** *Horithyatira*, *Gaurena*, Indonesia, Papua, taxonomy

### Introduction

During an expedition in 2018 to Lake Habbema (Lorentz National Park, Papua, Indonesia), a peculiar thyatirine species was found above 3000 meter altitude. The external morphological characters of the otherwise rather uniform specimens are so confusing that even the generic placement of the species was dubious before the dissection of a male and a female specimen. The valval structure and the widely bipectinate antenna of the male demonstrate the close relationship of the newly found taxon with the similarly New Guinean *Thyatira delattini* (Werny, 1966) and their placement in the genus *Thyatira*, reflecting also the uncertain phylogeny and taxonomic situation of the genera *Thyatira*, *Horithyatira* Matsumura, 1933, *Gaurena* Walker, 1865 and *Habrana* Bethune-Baker, 1908.

The description of the new species and the taxonomic considerations on the composition of the aforementioned genera are presented below.

### Material and methods

The method of surveys was traditional taxonomic, based on expedition materials of state museums and private collections, electronic databases and a large set of digitalised microscopic slides.

The genital dissections were made by the technique published by Robinson (1976), with certain modifications (Fibiger, 1997). Potassium hydroxide (10% solution KOH) was used to macerate the full abdomen. The cleaned copulatory organs were dehydrated in 96% ethanol; the weakly sclerotized structures were stained with Chlorazol black and then mounted in Euparal as permanent slides.

The terminology of the genital structures follows László et al (2007).

### Abbreviations

Fwl – Forewing length (measured from wing base to apex)

KSP – Koleksie Serangga Papua (Papua Insects Collection), Waena, Papua, Indonesia (former collection of Henk van Mastrigt)

RMNH – Collection of Naturalis Biodiversity Center, Leiden, The Netherlands (former Rijksmuseum voor Natuurlijke Historie)

RMNH.INS. – Acronym for unique collection numbers of specimens and slides in RMNH

### Systematic part

#### ***Thyatira papuana* spec. nov.** (Figs 1–4, 17, 18)

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**Holotype:** RMNH.INS.1108704: ♂, Indonesia, Papua, Lorentz Reserve, Lake Habbema, 3457 m, at light, 4°08'S, 138°42'E, 30.ix-1.x.2018, Leg. Rob de Vos (PIF).

**Paratypes:** RMNH.INS.1108702, 1108705, KSP65146: 3 ♀♀, same as holotype; 3 ♂♂, 1 ♀, same locality and data, leg. & coll. Siep Sinnema [Hemrik, The Netherlands]; RMNH.INS.1283148: ♀, Centr. Ned. Nieuw Guinea [Central Dutch New Guinea], Puindalkamp [Scree Valley Camp], 22.ix.1938, Tox. [L.J. Toxopeus, during the 3<sup>rd</sup> Archbold Expedition].

**Diagnosis:** The new species is easily distinguishable from all related taxa belonging to the genera *Thyatira* Ochsenheimer, 1816, *Horithyatira*, *Habrona* and *Gaurena*. The external features of *T.* (s.l.) *papuana* display an unusual mixture of the typical characters of the above-mentioned three closely related genera of the *Thyatira* generic complex, while the male genitalia undoubtedly support its placement to *Thyatira* due to the presence of the generic synapomorphy of *Thyatira*, the well-developed ventral saccular process of the valva. The exclusively *Thyatira* (s.l.) external feature is the long pectinated male antenna: the presence of pectination in different manifestations is known only in the two New Guinean *Thyatira* (s.l.) species, and the pectination is longer and finer in *T.* (s.l.) *papuana* than in *T.* (s.l.) *delattini* (Werny, 1966). It is worth to note that the orbicular and reniform stigmata are missing from the species of *Thyatira* (s.str.) and appear, besides the new species, only in *T.* (s.l.) *florina* (Gaede, 1930) and *T.* (s.l.) *delattini* (Werny, 1966). The common external features of *T.* (s.l.) *papuana*, *Thyatira* (s.l.) and *Horithyatira* are 1) the orbicular stigma is larger than reniform stigma, 2) the presence of intense rosy-red to rosy-brown suffusion along tornal patch, outer side of postmedial line, lower part of basal area and often along anal vein, and 3) there is only one signum in the female bursa copulatrix. The shared feature of the new species with the members of *Gaurena* and *T.* (s.l.) *delattini* is the short and broad, apically more rounded forewings; with those of *Gaurena* and *Horithyatira ornata* is the intense whitish and golden-ochreous suffusion along postmedial line and in subcellular area;

and with most *Gaurena* species are 1) the long, narrow, more streak-like than patch-like apical light marking, and 2) the rather unicolorous dark hindwing.

The male clasping apparatus of *T.* (s.l.) *papuana* differs from that of *T.* (s.l.) *delattini* (and also of *T.* (s. str.) *dysimata* West, 1932 and *T.* (s. str.) *florina* (Gaede, 1930)) by its thicker and shorter uncus, proportionally shorter socii, broader and apically more pointed valvae with more obtuse ventral saccular process. The aedeagi of the two species differ mostly by the shape of the carinal hook which is distally curiously curved in the new species while it is regularly falcate in *T.* (s.l.) *delattini*.

The female genitalia of the two species cannot be compared as the female of *T.* (s.l.) *delattini* is yet unknown. The female genitalia of *T.* (s.l.) *papuana* are similar to those of *T.* (s. str.) *dysimata* and *T.* (s. str.) *florina* but have thinner sclerotised ductus bursae and remarkably weaker, less sclerotised and shorter signum bursae than in the other two relatives.

**Description:** Fwl. ♂ 18.2 mm, ♀ 19.3-19.8 mm. Sexes similar, the sexual dimorphism is expressed mostly in the structure of the antennae which are filiform (typically thyatirine) in the females while those are widely bipectinate in the males.

Head relatively small, eyes large, globular; palpi rather long, porrect, second segment thickly hairy with blackish hair-scales, third segment long, bar-shaped. Antenna of male widely and more or less symmetrically bipectinate in its basal two-thirds, lamellate in apical third, terminated in thin, acute tip. Collar broad, blackish mixed with greenish-white hair-scales; tegulae well-developed, thickly hairy, blackish-brown mixed strongly with olive-green and whitish-grey; metathoracic tuft large, white tipped. Abdomen paler, greyish-ochreous with dark fumous-grey lateral ridges; dorsal crest consisting of blackish-brown tufts on the first four segments. Forewing broadly triangular, with apex finely pointed, outer margin evenly arcuate. Ground colour dark chocolate-brown to blackish-brown with intense golden-ochreous and vivid brown irroration and a fine olive-green or olive-ochreous reflection which is more expressed in the UV-light (see Plate 1, Fig. 3). Forewing pattern very characteristic, consisting of prominent, often fasciate, silvery-white to golden ochreous crosslines and orbicular and reniform stigmata, the fiery-red patches along inner margin towards tornus and the similarly fiery-red definition of antemedial, medial and postmedial crosslines. Basal dash short and thick, white to ochreous; upper half of antemedial line broadly fasciate, oblique, more ochreous than white, lower half bent backwards, thinner and sinuous, more whitish. Median area variably intensely suffused with golden-ochreous, blurring often median fascia. Orbicular and reniform stigmata bright white to golden-ochreous, more or less rounded and finely outlined by blackish brown, orbicular always larger than reniform. Postmedial line complex, appearing as a broad fascia composed by fine dark lines followed by lighter patches forming a more or less continuous zone; outer part of postmedial line characteristically defined by a discontinuous and prominent fiery-red line. Praeterminal line rather diffuse, dark brown, subterminal line poorly visible, both defined by the strong, long oblique light streak at termen and the white and red patches of tornus. Terminal line fine, consisting of white and blackish brown arches. Inner half of cilia light golden-orange or pale orange-brown, outer half white; entire cilia chequered by black at veins.

Hindwing more or less unicolorous, greyish-brown with fine golden-ochreous sheen; transverse line poorly visible, slightly darker brown; terminal line darker brown; cilia long,

ochreous-brown basally, outer part more whitish; variably strongly chequered by blackish-brown.

**Male genitalia:** [RMNH.INS.1108704, fig. 17] Uncus rather short, slightly stouter than socii, apically finely arched, with rounded tip. Socii also relatively short and straight, apically finely clubbed and rounded. Tegumen short, normal; fultura superior weakly sclerotized; transtilla long, rather narrow; fultura inferior (juxta) also weakly sclerotized, narrowly bilobate. Vinculum short, rounded quadrangular. Valva relatively broad, basal two-thirds with parallel costal and ventral margins; sacculus very narrow, forming an elongate, sclerotized ribbon along more or less straight ventral margin, terminated in short, triangular, rather obtuse process. Aedeagus tubular, relatively short, carina with long, fine and distally recurved ventral hook. Vesica simple, without cornuti but with ventro-lateral sclerotised plate at base.

**Female genitalia:** [RMNH.INS.1108705, fig. 18] Ovipositor short, papillae anales broad and obtuse, covered densely with long setae, apophyses posteriores short. Eighth tergite very short, ribbon-like, with evenly biarcuate anterior and posterior margins and small, trapezoidal ventral medial plate; apophyses anteriores long, thin. Ostium bursae (antrum) shortly funnel-like, membranous with finely sclerotised margins; ductus bursae very short, tubular, sclerotized. Tubular distal part of corpus bursae long, membranous; dilated proximal part of corpus bursae relatively large, elliptical-globular; signum well-developed, relatively short and weakly sclerotised, streak-like, finely dentate.

**Distribution and bionomics:** Endemic to New Guinea. The species is known from the type locality (Indonesia, Papua, Lorentz National Park, near Lake Habbema) only and found at high altitudes above 3000 meter. The habitat is of the subalpine type, with wide plains of swampy and rocky grassland, dominated by tree ferns (*Dicksonia*), many endemic *Rhododendron* species, heather species and small terrestrial orchids. The weather can be very rough at this location, but the circumstances at time of collecting were favourable: no rain, no moon, but a strong wind and a clear sky which resulted in low temperatures which dropped as low as 4° Celsius. Nevertheless, moths came to light, including some other new Lepidoptera species (De Vos, 2020).

**Etymology.** The name of the new species refers to its homeland, the Papua Province of Indonesia in New Guinea.

### Discussion

The exploration of the Thyatirinae fauna of south-eastern Asia, especially the regions east from the Wallacean line, is still in an initial phase, even if a few species being characteristic for this region have been already found before the end of the World War I (see Bethune-Baker, 1908; Warren, 1915). These results are summarised in the first monographic works (Warren, 1912; Houlbert, 1921; Dalla Torre, 1921; Gaede, 1930; Seitz, 1933), but the first comprehensive work with remarkable additions to the richness of the fauna of this region was published by Werny in 1966. The subsequent works dealing with the Oriental Thyatirinae fauna (Inoue, 1982; Kobes, 1985; Holloway, 1998) followed the statements of Werny and only the studies of Yoshimoto between 1976-1996 (e.g. Yoshimoto, 1985) represent a milestone in the better understanding of the highly diverse eastern Palaearctic

and Oriental fauna of the subfamily, increasing considerably the species numbers and clarifying the generic constitution of the group.

The last monograph of Thyatirinae was published by László et al. (2007), surveying all genera and species known from Eurasia including the fauna of the Sundaland, the Wallacea and New Guinea. One of the major statements of the monograph is that only the tribe Thyatirini is found eastwards of the Greater Sunda Islands and only two genera, *Thyatira* and *Habrona* Bethune-Baker, 1908 are known to occur in New Guinea.

The morphological features of the newly discovered species and the closely related relatives mentioned above as "*Thyatira sensu lato*" suggest the re-consideration of the basic genera of Thyatirini called the "*Thyatira* generic complex". It is quite clear that the Wallacean and New Guinean taxa of *Thyatira* (s.l.), *Habrona* and *Horithyatira*, together with the generally Himalayan-Indo-Malayan *Gaurena*, display a rather stochastic mixture of the typical features of all four genera, preserving commonly a few ancient characters like the pectinated antenna of the males and the simultaneous presence of the linear and patchy forewing pattern. It is also worth to note that all these four genera include distinct phylogenetic lineages and the taxonomic (generic/subgeneric) interpretation of these lineages would depend strongly on the results of a future integrate taxonomic analysis of the entire generic complex. Last but not least, the further field studies may discover additional species belonging to these basic lineages which could influence the evaluation of the formerly stressed characters.

### Acknowledgements

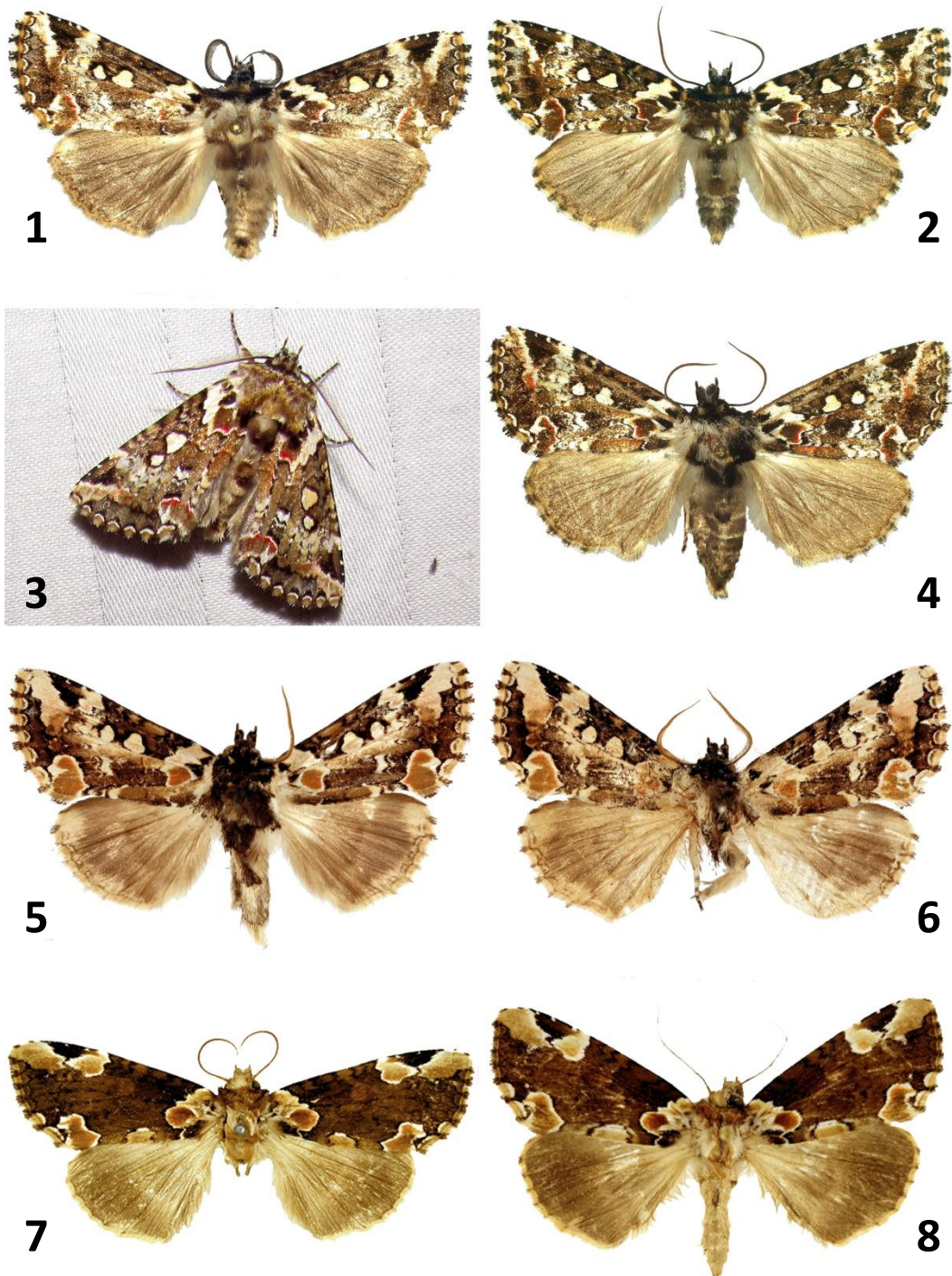
The authors express their thanks to all persons supported the former studies on the Thyatirinae. Our sincere thanks go to Martin R. Honey, Geoff Martin and Alberto Zilli (London, United Kingdom), Martin Lödl and Sabine Gaal-Haszler (Vienna, Austria), Wolfram Mey (Berlin, Germany), Alexej Y. Matov (St. Petersburg, Russia), Dieter Stüning and the late Clas Naumann (Bonn, Germany), Axel Hausmann, Ulf Buchsbaum and the late Thomas J. Witt (Munich, Germany), Peter Huemer and Gerhard Tarmann (Innsbruck, Austria), Bernard Landry (Geneva, Switzerland), Erik van Nieuwerkerken, (Leiden, The Netherlands), Hermann-Heinrich Hacker (Staffelstein, Germany), Bert Gustafsson and Tobias Malm (Stockholm, Sweden), Ole Karsholt (Copenhagen, Denmark), and the late Michael Fibiger (Sorø, Denmark).

Furthermore, we thank the expedition members with whom the discovery of the new species took place: Siep and Jannie Sinnema (Hemrik, The Netherlands), Piet J. Zumkehr (Midland, Terschelling, The Netherlands) and Renate Kramer (Den Haag, The Netherlands). We are thankful to Miss Evie Warikar and Mrs. Daawia Suhartawan who, as board of the Kelompok Entomology Papua and curators of the Koleksi Serangga Papua (Waena, Papua, Indonesia), helped us with permits, accommodation and translations and other logistics. Peter Jan de Vries (Ommen, The Netherlands) we thank for the translation of the "abstract" into Bahasa Indonesia (Rangkuman).

Last but not least we would like to thank the Uyttenboogaart-Eliassen Foundation (Dutch Entomological Society) for financing the expedition which led to the discovery of this and other new and interesting insect species in Papua.

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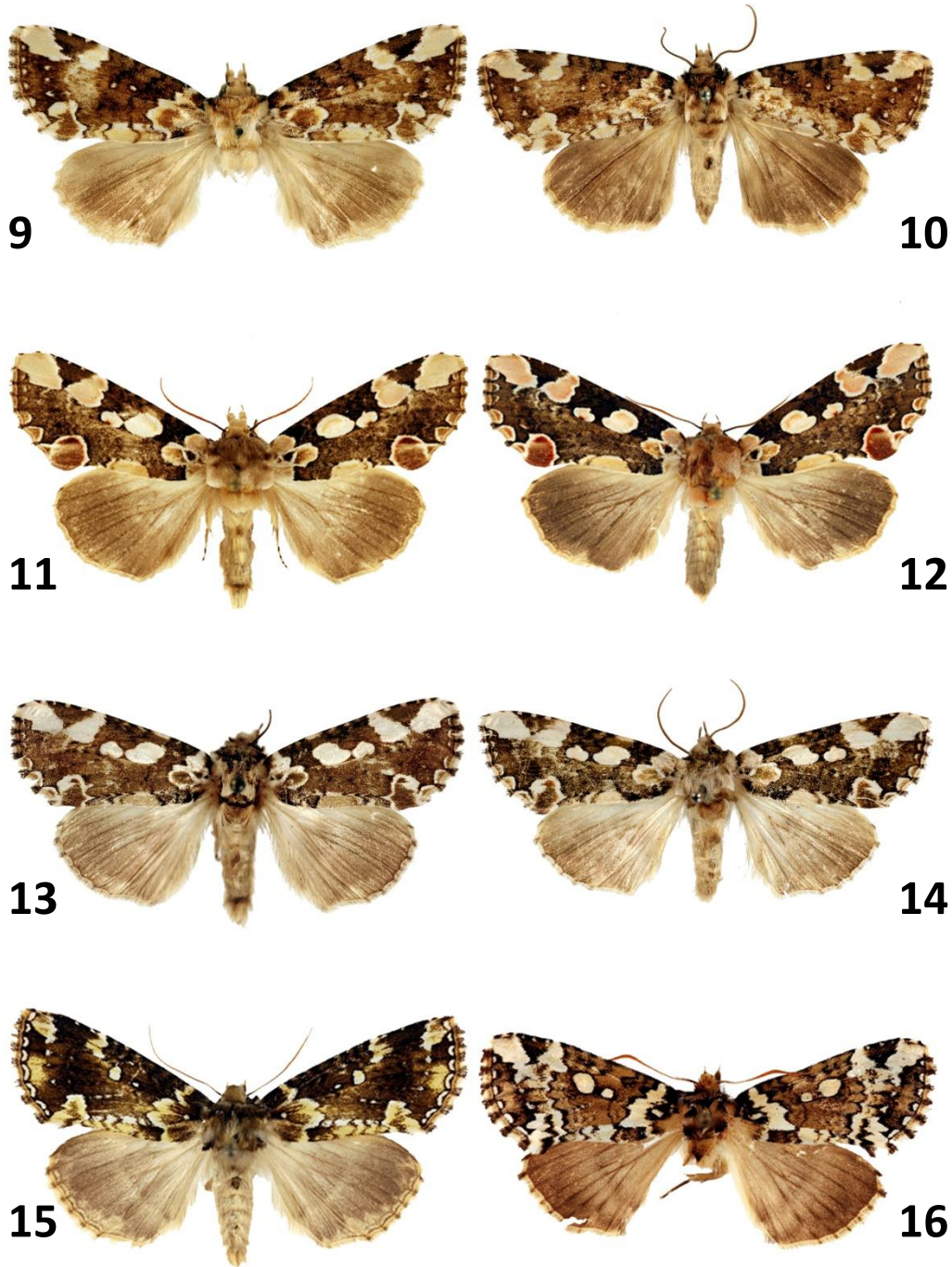
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**Figs 1-4.** *Thyatira* (s.l.) *papuana* **spec. nov.**, Lake Habbema, Papua, Indonesia: **1.** Holotype ♂ (coll. RMNH); **2.** Paratype ♀ (coll. RMNH); **3.** Paratype ♂ (photo and coll.: Siep Sinnema); **4.** Paratype ♀ (coll. RMNH).

**Figs 5-6.** *Thyatira* (s.l.) *delattini* (Werny, 1966), Papua New Guinea: **5.** Holotype ♂; **6.** Paratype ♂.

**Figs 7-8.** *Thyatira* (s.str.) *dysimata* West, 1932, The Philippines: **7.** Holotype ♂, Luzon; **8.** ♀, Mindanao.



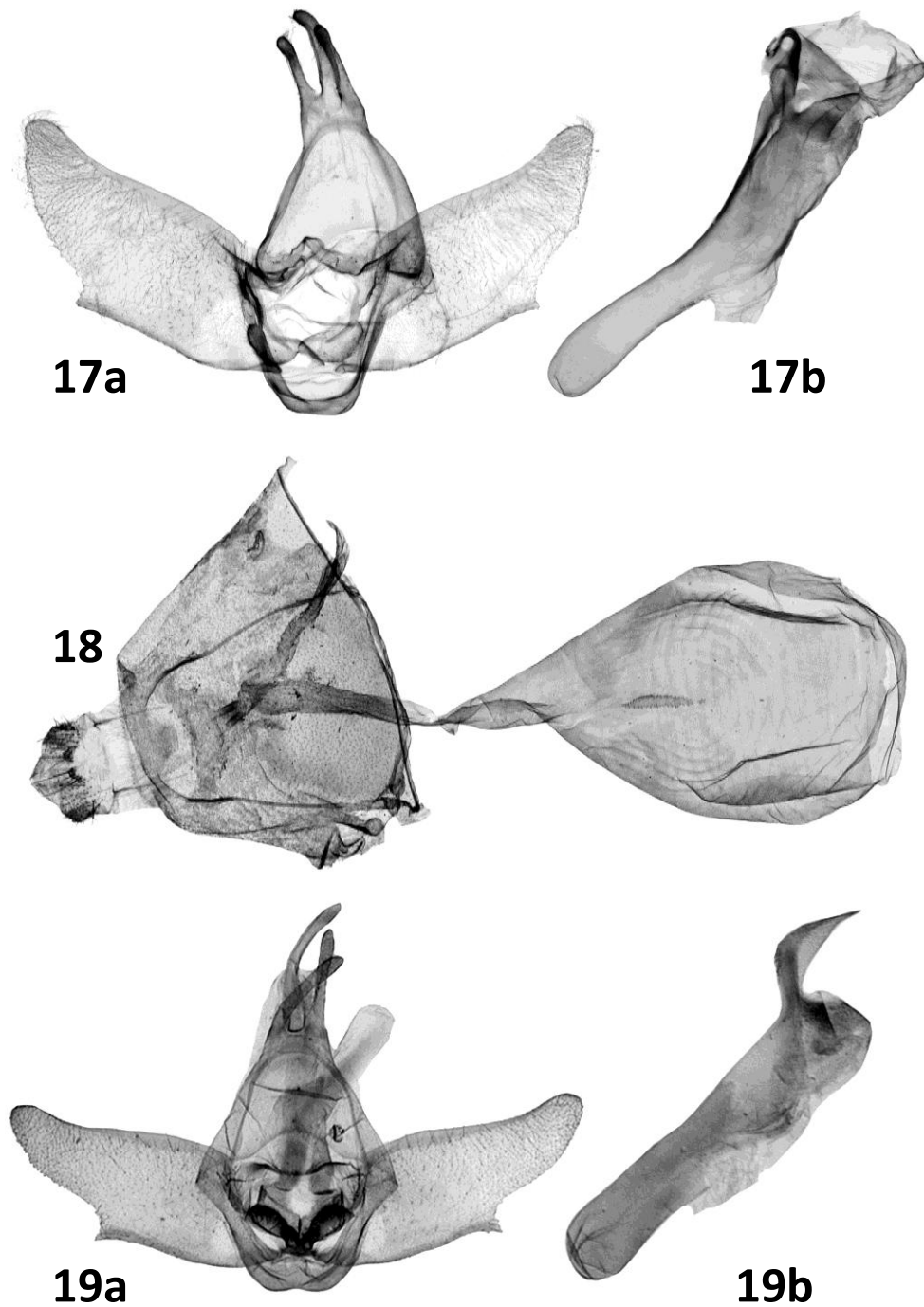
**Figs 9-10.** *Thyatira* (s.l.) *florina* (Gaede, 1930), Sulawesi, Indonesia: **9.** Holotype ♂; **10.** Paratype ♀.

**Figs 11-12.** *Horithyatira decorata* (Moore, 1881), Annapurna Himal, Nepal: **11.** ♂; **12.** ♀.

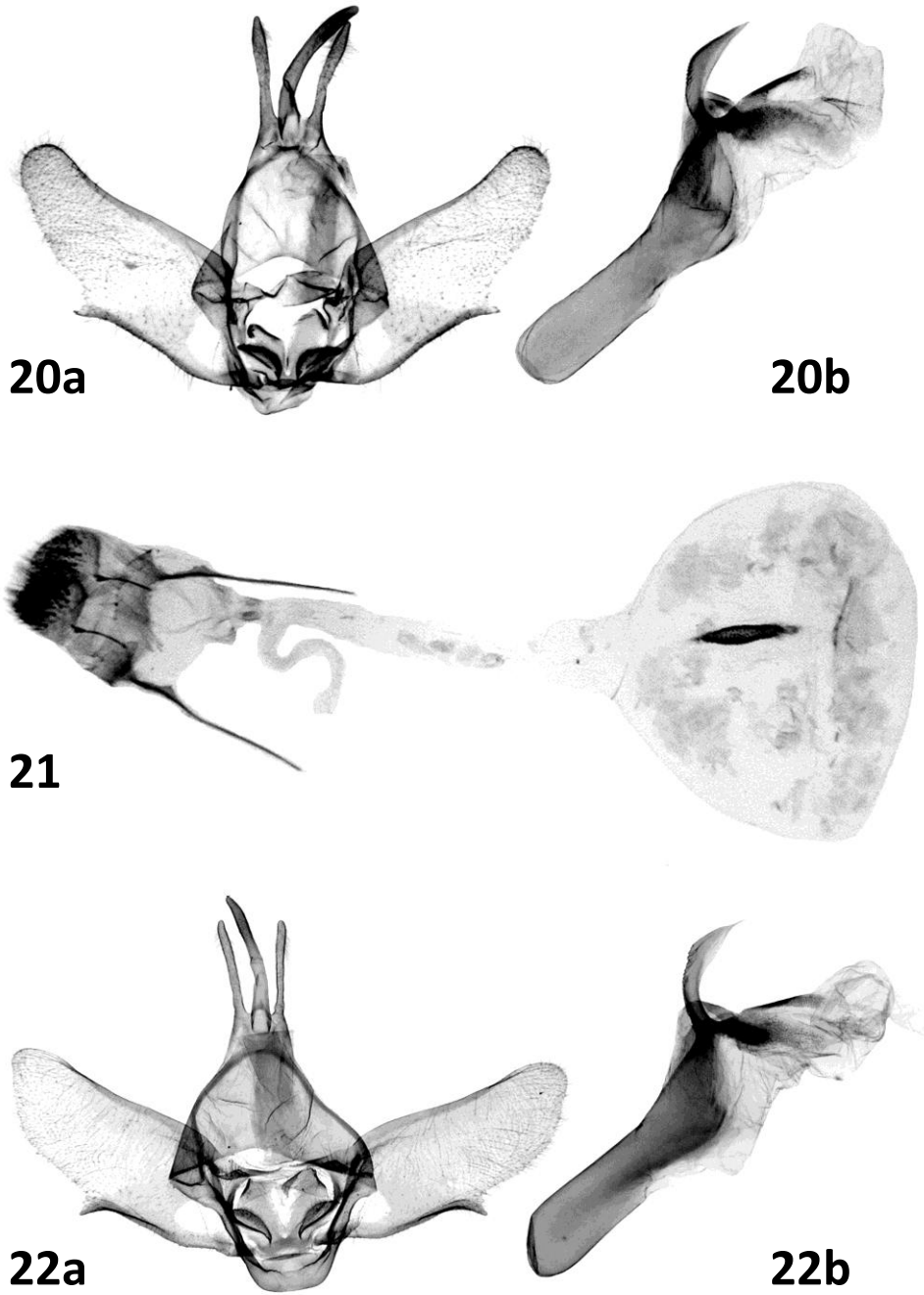
**Figs 13-14.** *Horithyatira javanica* (Werny, 1966), Java, Indonesia: **13.** Holotype ♂; **14.** Paratype ♀.

**Figs 15-16.** *Gaurena* species: **15.** *Gaurena florens* Walker, 1865, ♂, Ganesh Himal, Nepal; **16.** *Gaurena delattini* (Werny, 1966), paratype ♀, Yunnan, China.

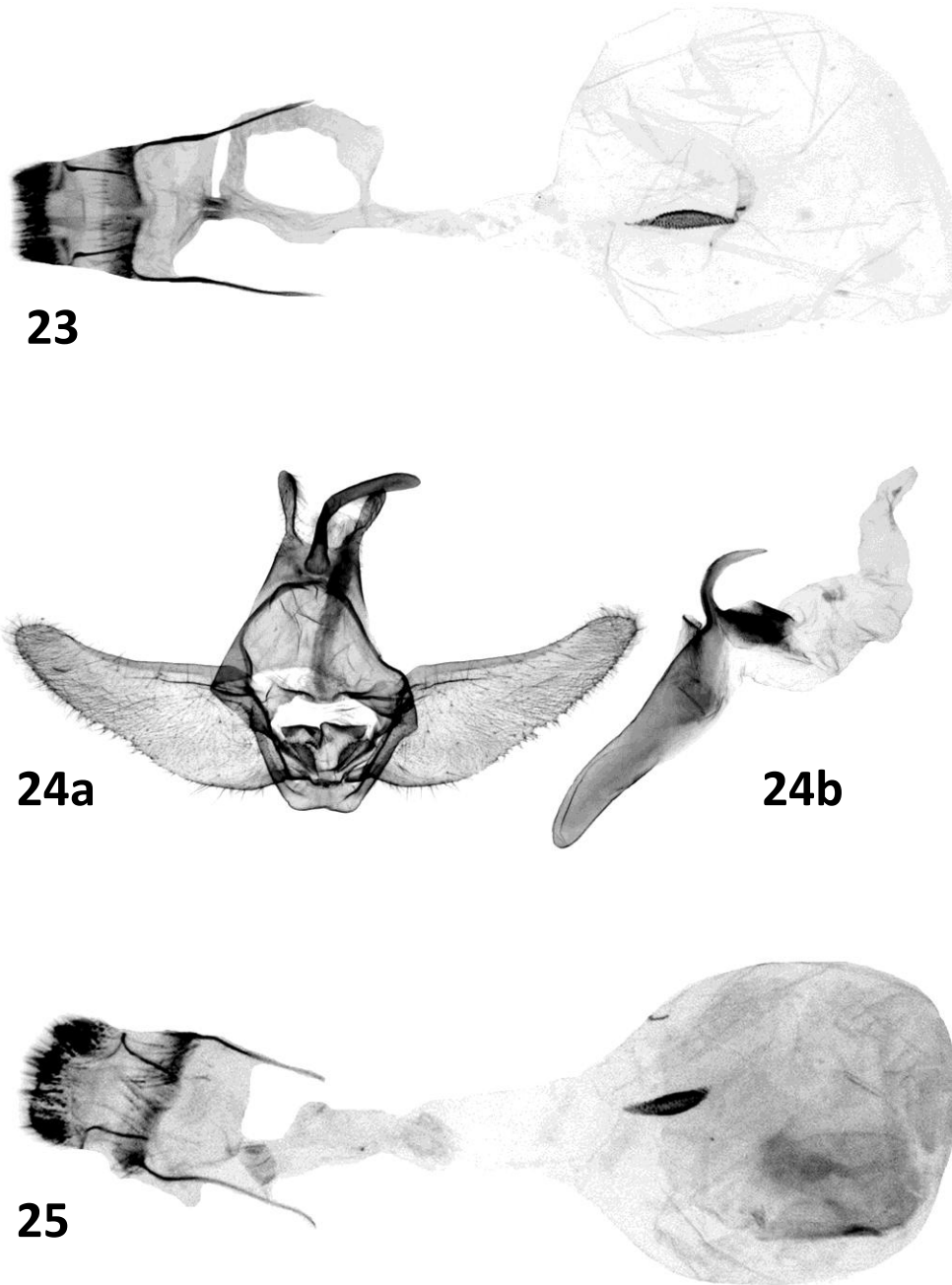




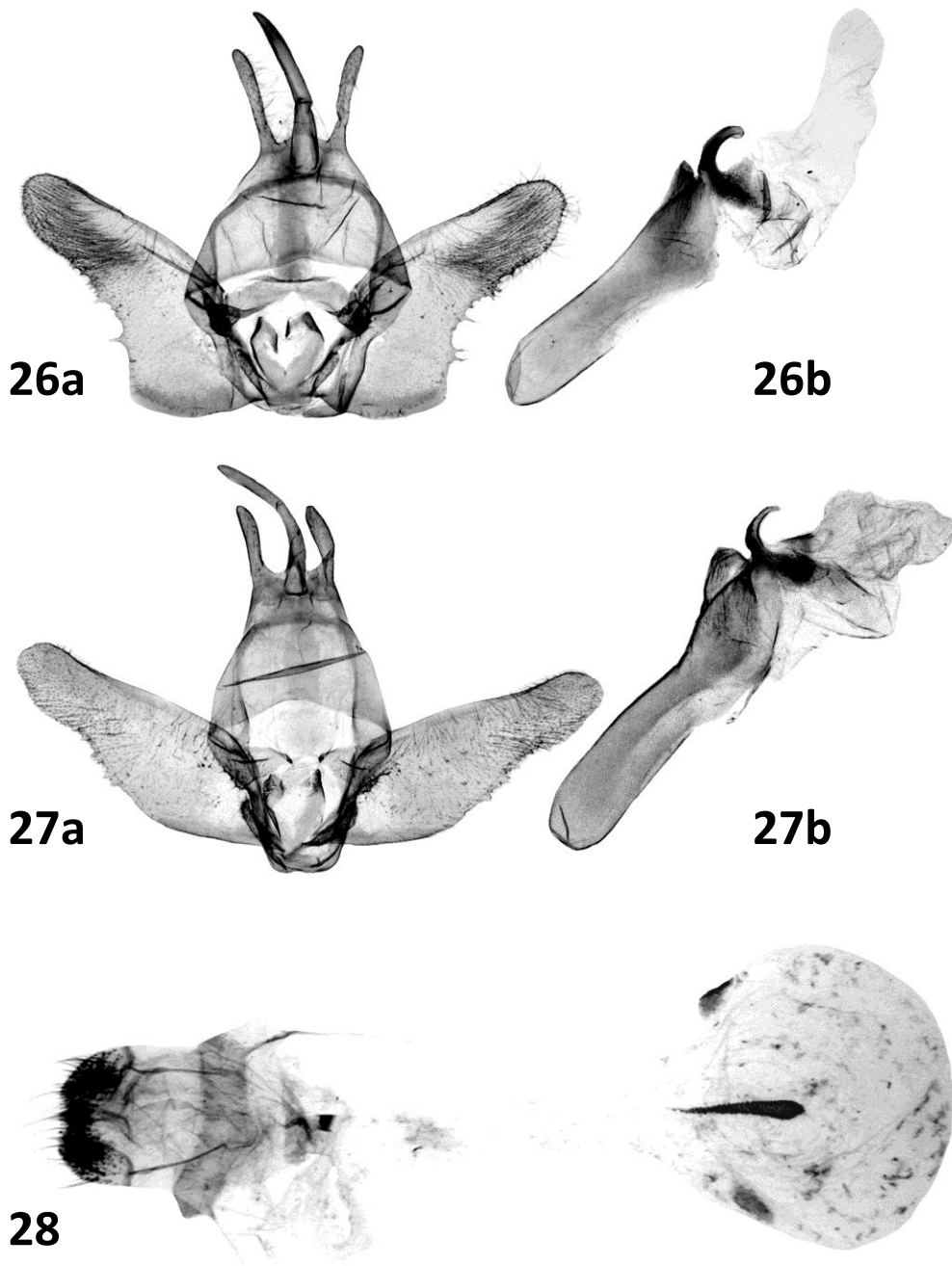
**Figs 17-19.** Genitalia of *Thyatira* (s.l.) species. **a.** armature, **b.** aedeagus: **17.** *Thyatira* (s.l.) *papuana* **spec. nov.**, holotype ♂, slide no. RMNH.INS.1108704; **18.** *T.* (s.l.) *papuana* **spec. nov.**, paratype ♀, slide no. RMNH.INS.1108705; **19.** *T.* (s.l.) *delattini* (Werny, 1966), paratype ♂, slide no. BMThyatiridae 153.



**Figs 20-22.** Genitalia of *Thyatira* species. **a.** armature, **b.** aedeagus: **20.** *Thyatira* (s.str.) *dysimata* West, 1932, ♂, slide no. LG760; **21.** *T.* (s.str.) *dysimata* West, 1930, ♀, slide no. LG761; **22.** *T.* (s.l.) *florina* (Gaede, 1930), ♂, slide no. LG1819.



**Figs 23-25.** Genitalia of *Thyatira* and *Horithyatira* species. **a.** armature, **b.** aedeagus: **23.** *Thyatira* (s.l.) *florin* (Gaede, 1930), ♀, slide no. LG1687; **24.** *Horithyatira decorata* (Moore, 1881), ♂, slide no. LG826; **25.** *H. decorata* (Moore, 1881), ♀, slide no. LG854.



**Figs 26-28.** Genitalia of *Gaurena* species. **a.** armature, **b.** aedeagus: **26.** *Gaurena florens* Walker, 1865, ♂, slide no. LG1276; **27.** *G. delattini* (Werny, 1966), ♂, slide no. LG1264; **28.** *G. delattini* (Werny, 1966), paratype ♀, slide no. Werny0731.