



## Two new species of the genus *Apsidophora* Diakonoff, 1973 (Lepidoptera: Tortricidae: Olethreutinae) from Thailand

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### Abstract

Two new species, *Apsidophora bala* **sp. nov.** and *Apsidophora chandrapatyae* **sp. nov.**, are described. Illustrations of adult and genitalia are provided. We also present a photograph of living specimen of *A. chandrapatyae* **sp. nov.** in natural resting posture. The two new taxa increase the number of described *Apsidophora* species to 3.

**Key words:** new species, Olethreutini, Thailand

### Introduction

The genus *Apsidophora*, belonging to the tribe Olethreutini, was proposed by Diakonoff in 1973 with *A. purpurobis* Diakonoff, 1973 as the type species. Diakonoff (1973) defined the genus by the following characters: conspicuously pattern of a large curve patch on apical half of forewing,  $R_2$  from beyond middle of cell and equidistant between  $R_1$  and  $R_3$ ,  $R_3$ – $R_5$  equidistant,  $CuA_2$  from 3/5 of discal cell,  $CuA_1$  from ventral angle of cell,  $M_3$  close to  $CuA_1$ ,  $R_5$  separate to termen. Sexual dimorphism was represented by modified anal margin to lanceolate projecting lobe in male hindwing, hooked and clavate uncus, semicircular socii, long and slender valva, cylindrical aedeagus in male genitalia, and reticulated subquadrate sterigma and two distinct unequal signa in female genitalia. Diakonoff (1973, 1983) recorded the distribution of *A. purpurobis* from New Guinea, Singapore, Sulawesi and Sumatra. Later this genus and species were recorded for the first time from Thailand (Kawabe, 1989). Gilligan *et al.* (2018) listed the single species, *A. purpurobis*, in the genus *Apsidophora*, worldwide. The two new species brings to 3 described species in the genus.

### Materials and methods

Specimens of the new species were collected in National Park and Wildlife Sanctuary of Thailand that were deposited in Kasetsart Kamphaeng Sean Insect Collection (KKIC), Nakhon Pathom, Thailand. Latitude, longitude and elevation were recorded with a GARMIN GPSMAP 76CS. Methods of genitalia and wings dissection and preparation were adapted from Common (1990). Adults were photographed with a Canon DSLR 5D Mark II camera and a 100 mm macro lens. Labial palpi were photographed with a Leica S8 APO stereomicroscope equipped with a Leica MC170 HD camera module. Leica DM750 connected with an ICC50 HD camera module was used for photographs of genitalia and wing venations, and examinations of genitalia. An Olympus SZ51 stereomicroscope was used for examinations and measurements of specimens. Forewing length was measured from the outer edge of the tegula at the wing base to the outermost edge of the fringe scales at the apex. The images were edited with Adobe Photoshop CC. The terminology for forewing pattern and genital structure follows Horak (1991, 2006).

## Key to the species of *Apsidophora* (adult male)

1	Hindwing with modified scales between $M_3$ and $CuA_2$ .....	2
-	Hindwing without modified scales between $M_3$ and $CuA_2$ .....	<i>bala</i>
2	Hindwing with pointed apex.....	<i>purpurobis</i>
-	Hindwing with rounded apex.....	<i>chandrapatyae</i>

### *Apsidophora bala* sp. nov.

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(Figs. 2–3, 5–6, 8–9, 14, 17, 19, 22–23)

**Type material.** Holotype: ♂. THAILAND: Narathiwat Prov., Hala-Bala W.S., 05°47'49"N 101°50'03"E, ca. 60 m, 23–29 Jan 2012, N. Pinkaew, np6676 (genitalia slide NP3004). Deposited in KKIC. Paratypes: 6♂, 3♀. THAILAND: Narathiwat Prov., Hala-Bala W.S., 05°47'49"N 101°50'03"E, ca. 60 m, 23–29 Jan 2012, N. Pinkaew, np6628 (♂, genitalia slide NP3006, wing slide), np6675 (♀, genitalia slide NP3007), np6712 (♂, genitalia slide NP3008), np6713 (♂, genitalia slide NP3005), np13713 (♂), np13714 (♀). Nakhon Si Thammarat Prov., Khao Nan N.P., 08°43'56"N 99°38'21"E, ca. 116 m, 7 Dec 2007, N. Pinkaew, np2539 (♂, genitalia slide NP3001); 08°47'00"N 99°47'46"E, ca. 125 m, 10 Nov 2007, N. Pinkaew, np2524 (♂, genitalia slide NP3003). All deposited in KKIC.



FIGURE 1. Living specimen of *Apsidophora chandrapatyae*, sp. nov. with natural resting posture.

**Diagnosis.** This species is most similar to *Apsidophora chandrapatyae*. The crescent mark on forewing of *A. bala* is wider than in *A. chandrapatyae*. Costal margin on hindwing slightly curves in *A. bala* but it is convex in *A. chandrapatyae*. Sex scales on male abdominal segment and modified scales between  $M_3$  and  $CuA_2$  are absent while they are present in *A. chandrapatyae*. Cucullus of *A. bala* is slightly narrow to apex and less curve but it is more parallel and evenly curve in *A. chandrapatyae*.

**Description.** *Head* (Figs. 5–6): Lower frons brownish white, upper frons light brown; vertex light brown mixed with brown; labial palpus porrect, first segment brownish white mixed with light brown, second segment enlarged, margin parallel, yellowish brown, with brown spot dorsobasally, apical 1/4 with transverse brown line, apical segment small, yellowish brown. Antenna light brown.

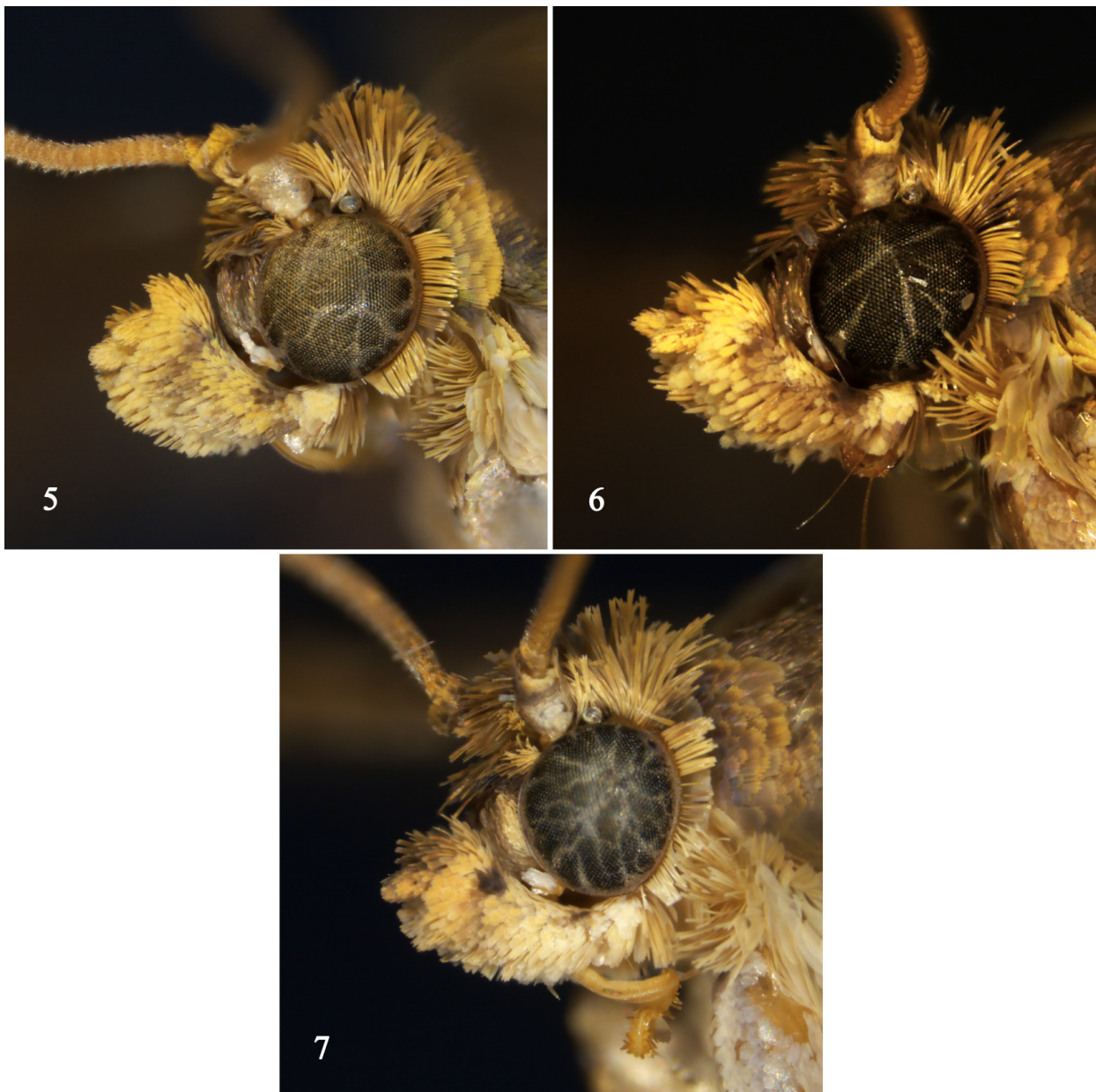
*Thorax*: Pronotal collar brown, slightly paler posteriorly; tegulae light brown, darker anteriorly, each scale yellowish brown at tip; mesonotum without posterior crest, light brown, each scale with yellowish brown at tip, anterior 1/5 with transverse brown band. Hind tibia with tuft of long, whitish hair pencils extend from base to near apex, above with tuft of shorter, greyish brown hair pencils extending from base to apical 3/5 (Fig. 17). Forewing rectangular, length 7.1–7.7 mm in males ( $n = 7$ ) (Figs. 2, 14), 6.8–8.4 mm in females ( $n = 3$ ) (Fig. 3), basal half of costa slightly curve, apical half more curve, costa with well developed strigulae, especially apical 2/3, yellowish white separated by dark brown, termen rather round, rounded apex, ground color yellowish brown mixed with diffuse, small, brown and dark brown spots, wing base with small subtriangular patch, dark brown, basal 1/3 with irregular dark brown patch extending from costa to between  $Sc$  and  $R_1$ , dorsum patch large, dark brown, extending



**FIGURES 2–4.** Wing pattern of *Apsidophora* spp. 2. *A. bala*, **sp. nov.** (holotype, male) 3. *A. bala*, **sp. nov.** (paratype, female np6675) 4. *A. chandrapatyae*, **sp. nov.** (holotype, male), scale bars = 2 mm.

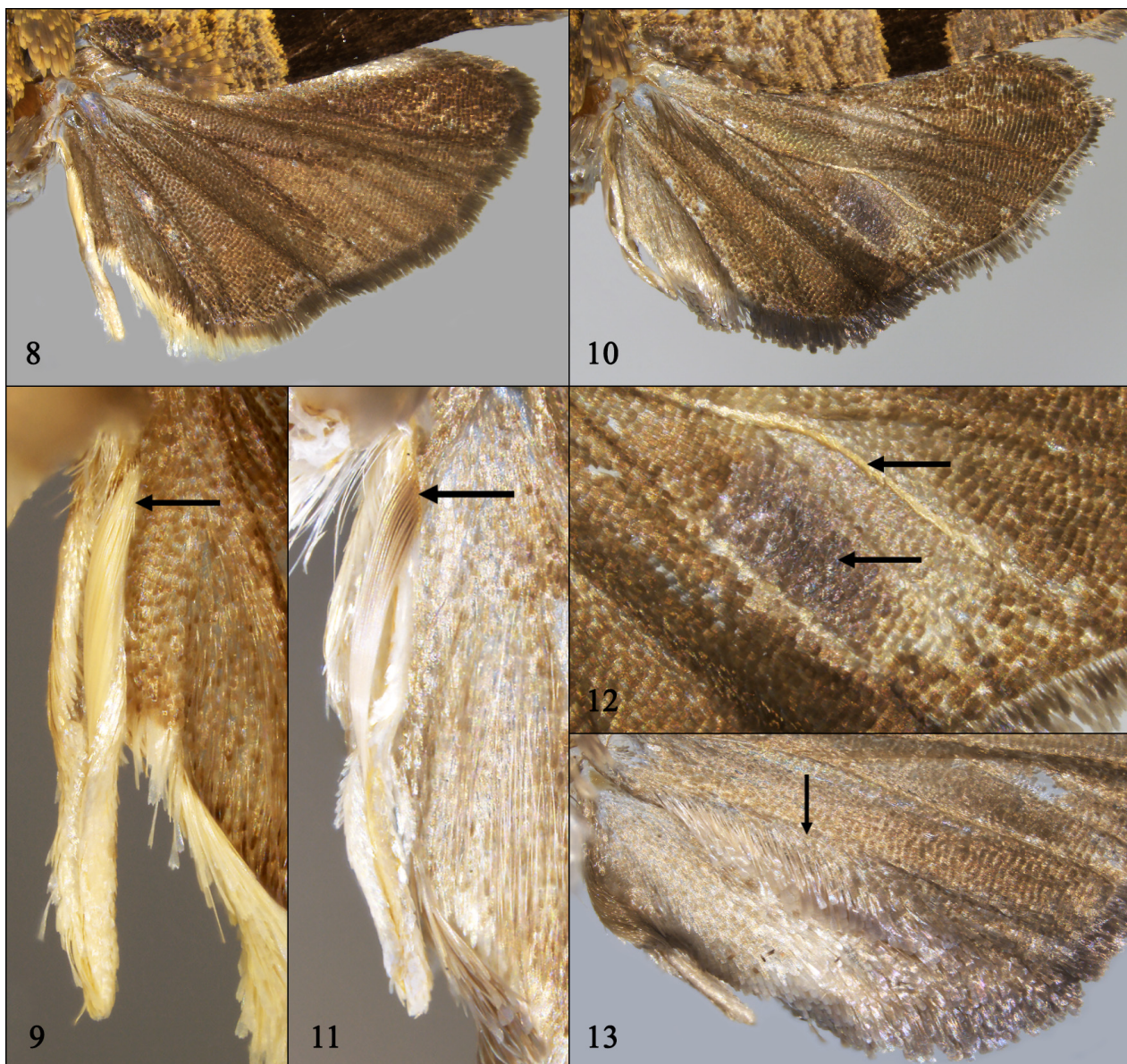


from middle of dorsum and strongly curved outwardly to termen, upper edged by yellowish white narrow line, upper margin extending gently curved from basal 1/3 of dorsum to termen between  $M_1$  and  $M_2$ , lower margin extending from apical 1/3 of dorsum to  $M_3$ , then extending downward to termen at  $CuA_2$ , tornus with a large oval dark grey patch, slightly paler to termen, with small irregular transverse strip medially, extending from  $M_3$  to tornus, light brown mixed with brown, nearly half of costa with slightly sinuate strip, gradually widened, extending obliquely to near termen between  $R_5$  and  $M_1$ , above with light brown narrow strip extending parallel to near termen between  $R_4$  and  $R_5$ , in near termen with a transverse dark brown strip extending from wing apex to between  $M_1$  and  $M_2$ , beyond with a narrow, transverse white strip on termen extending from below apex to between  $M_1$  and  $M_2$ , fringe scales light brown from wing apex to between  $M_1$  and  $M_2$ , then dark brown mixed with brown extending to tornus; underside brown except 1/3 above dorsum greyish white, termen with yellowish white between wing apex and  $M_1$  and  $M_2$ . Hindwing (Figs. 8, 14) subtriangular, brown, costal margin slightly curve, with modified thickened and rolled anal margin in male, forming long and slender rigid projecting lobe, with group of dense, yellowish white hair pencils originating from between near wing base and basal 1/3, then inserted to the groove beyond middle of lobe (Fig. 9) long as length of projecting lobe (Fig. 14), fringe scales brown except from  $CuP$  to projecting lobe in male, brown in females, slightly paler on anal margin; underside of hindwing light brown, slightly darker to costa.



**FIGURES 5–7.** Head of *Apsidophora* spp. 5. *A. bala*, **sp. nov.** (holotype, male) 6. *A. bala*, **sp. nov.** (paratype, female np13274) 7. *A. chandrapatyae*, **sp. nov.** (holotype, male).





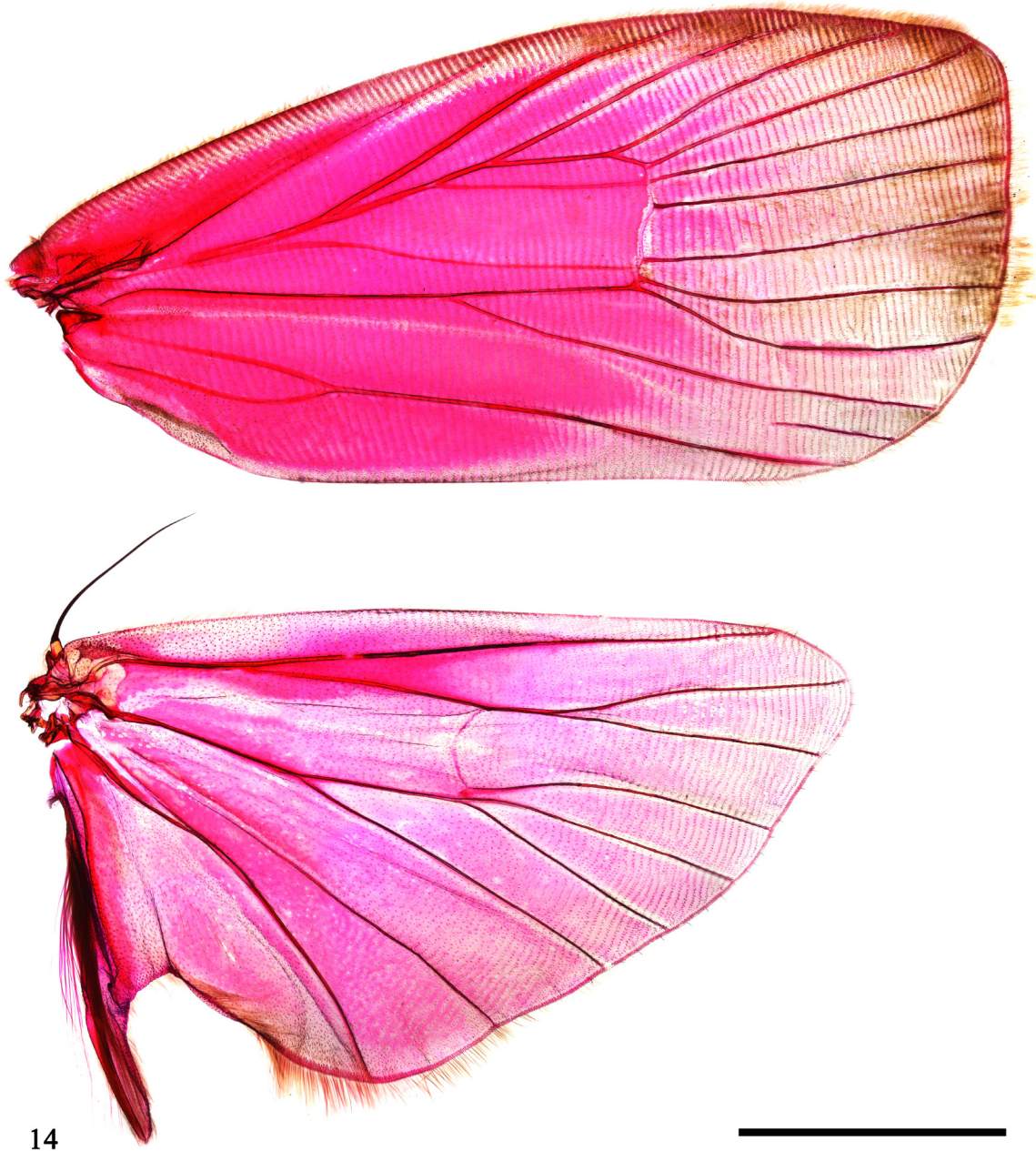
**FIGURES 8–13.** Male hindwing of *Apsidophora* spp. 8–9. *A. bala*, **sp. nov.** (holotype, male) 8. Hindwing 9. Projecting lobe 10–13. *A. chandrapatyae*, **sp. nov.** (holotype, male) 10. Hindwing 11. Projecting lobe 12. Two groups of sex scales on hindwing (upperside hindwing) 13. A row of long scales (underside hindwing).

*Abdomen:* Male genitalia (Fig. 19) with tegumen high, moderately widened, with dense scale sockets laterally; uncus long about 1/3 of tegumen length, truncated apex, posterior surface with dense setae, more dense near apex, posterobasal half without setae; socii moderately large, subtriangular lobe, densely setose; gnathos arising from basal 1/3 of tegumen length, forming moderately large membranous band, sclerotized at base; vinculum moderately sclerotized; juxta subpentagonal; caulis shot; anellus surrounding at basal 1/4 of phallus; phallus rather shot, slightly curve, wide at base and tapered to apex; cornuti absent; valva long and slender, sinuate, margins slightly narrow to rounded apex; sacculus with a small group of moderately dense setae basally, ventromedially with a moderately large group of dense setae, slightly narrow to ventrobasally of cucullus, with a small group of shot setae on basal opening margin medially; cucullus longer than sacculus, densely setose, ventral half with strongly spines except apical 1/4 of cucullus, with group of dense, moderately long spines dorsobasally.

Female genitalia (Figs. 22–23) with papillae anales densely setose; tergum VIII smooth, with dense scale sockets on subtriangular extension; sternum VII weakly sclerotized, with dense scale sockets, more dense along excavated posterior margin; sterigma forming moderately large, reticulated subquadrate plate, with vertical split-like ostium between two subtriangular, aciculate lobes, pointing outwardly (Fig. 23); colliculum moderately sclerotized, long



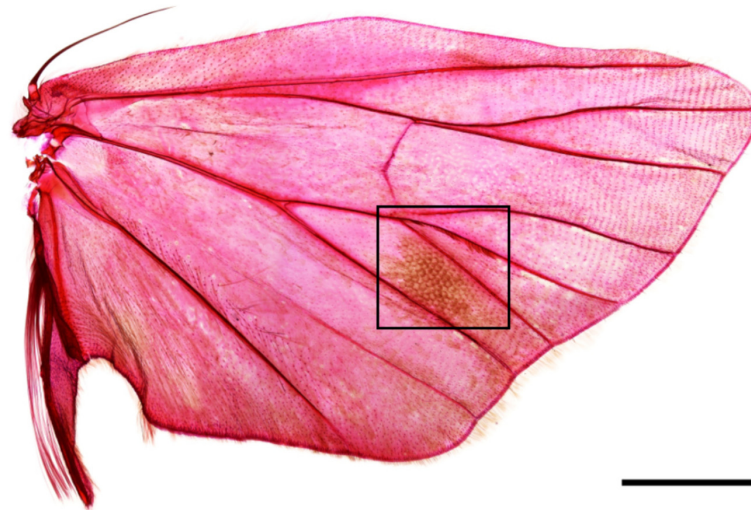
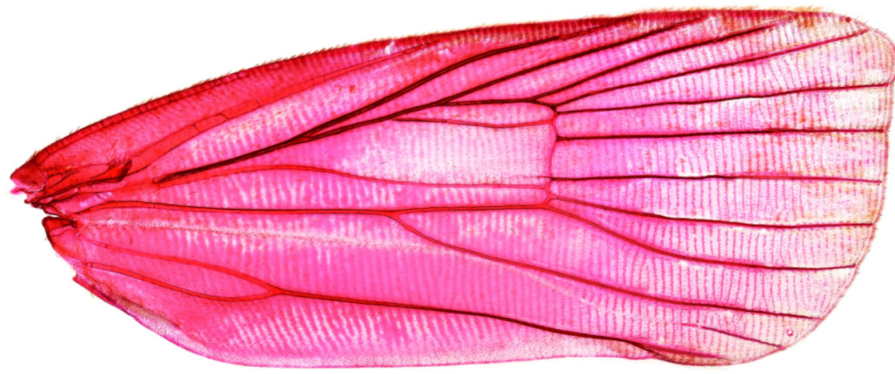
about 1/4 of ductus bursae length; ductus bursae rather narrow, margins parallel to ostium bursae; ductus seminalis arising from posterior 1/3 of ductus bursae; corpus bursae ovate, granulate throughout, signa unequal, large signum funnel-shaped, rounded apex, apex rather narrow, with widened hollow base, small signum subtriangular, rounded apex, subelliptical hollow base.



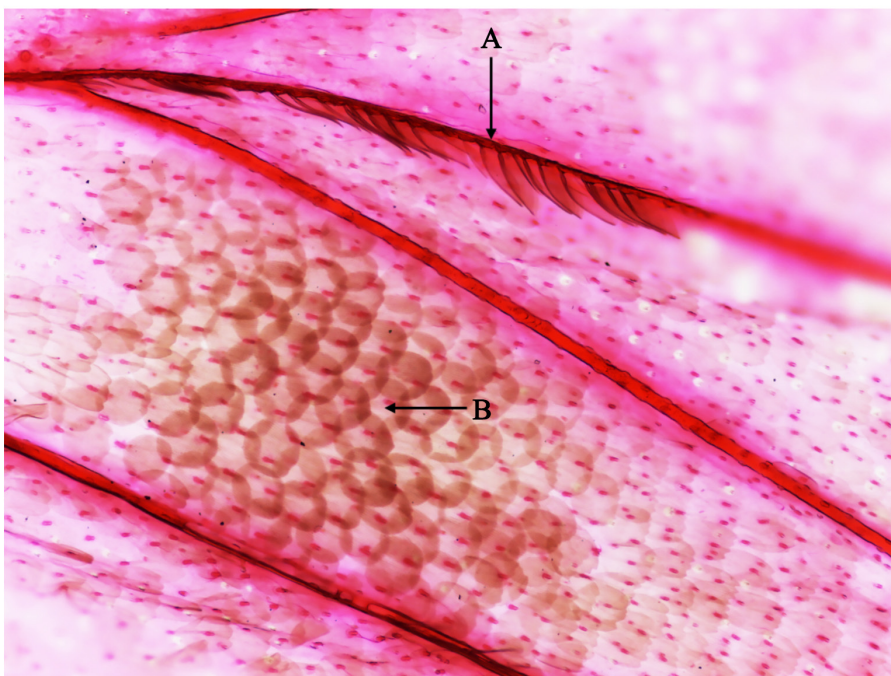
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**FIGURE 14.** Wing venation of *Apsidophora bala*, **sp. nov.** (paratype, male, np6628, right wing), scale bar = 2 mm.

**Etymology.** The specific epithet *bala* refers to Bala Wildlife Research Station (Hala-Bala Wildlife Sanctuary), the location of holotype.



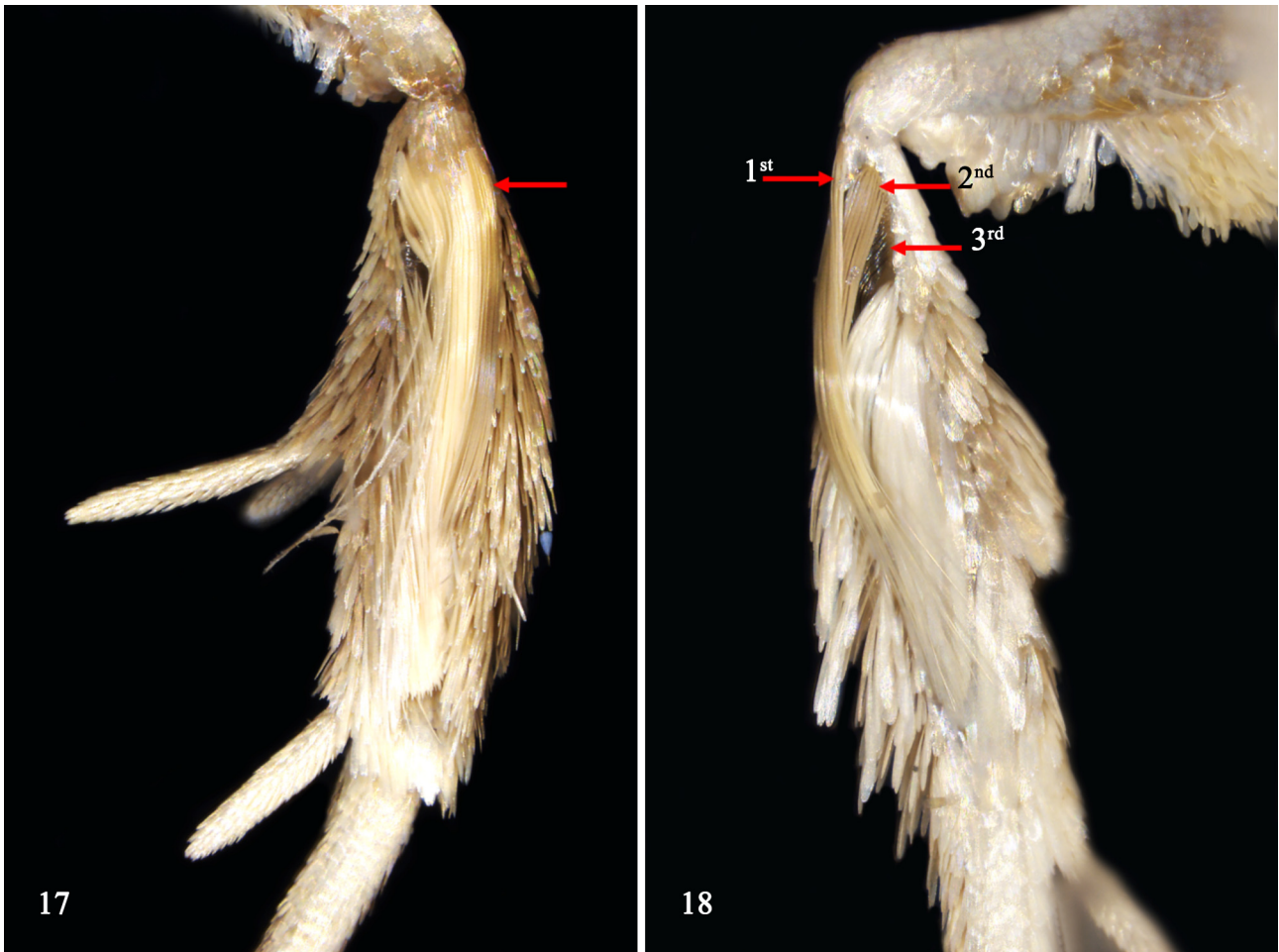
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**FIGURES 15–16.** Wing venation of *A. chandrapatyae*, **sp. nov.** (paratype, male, np11988) 15. Right wing with groups of sex scales in square mark 16. Sex scales on hindwing. (A = row of leaf-like scales on  $M_3$ , B = large patch of appressed rounded scales between  $CuA_1$  and  $CuA_2$ ), scale bar = 2 mm.





**FIGURES 17–18.** Hind tibial pencils of *Apsidophora* spp. 17. *A. bala*, **sp. nov.** (holotype, male) 18. *A. chandrapatyae*, **sp. nov.** (holotype, male).

***Apsidophora chandrapatyae* sp. nov.**

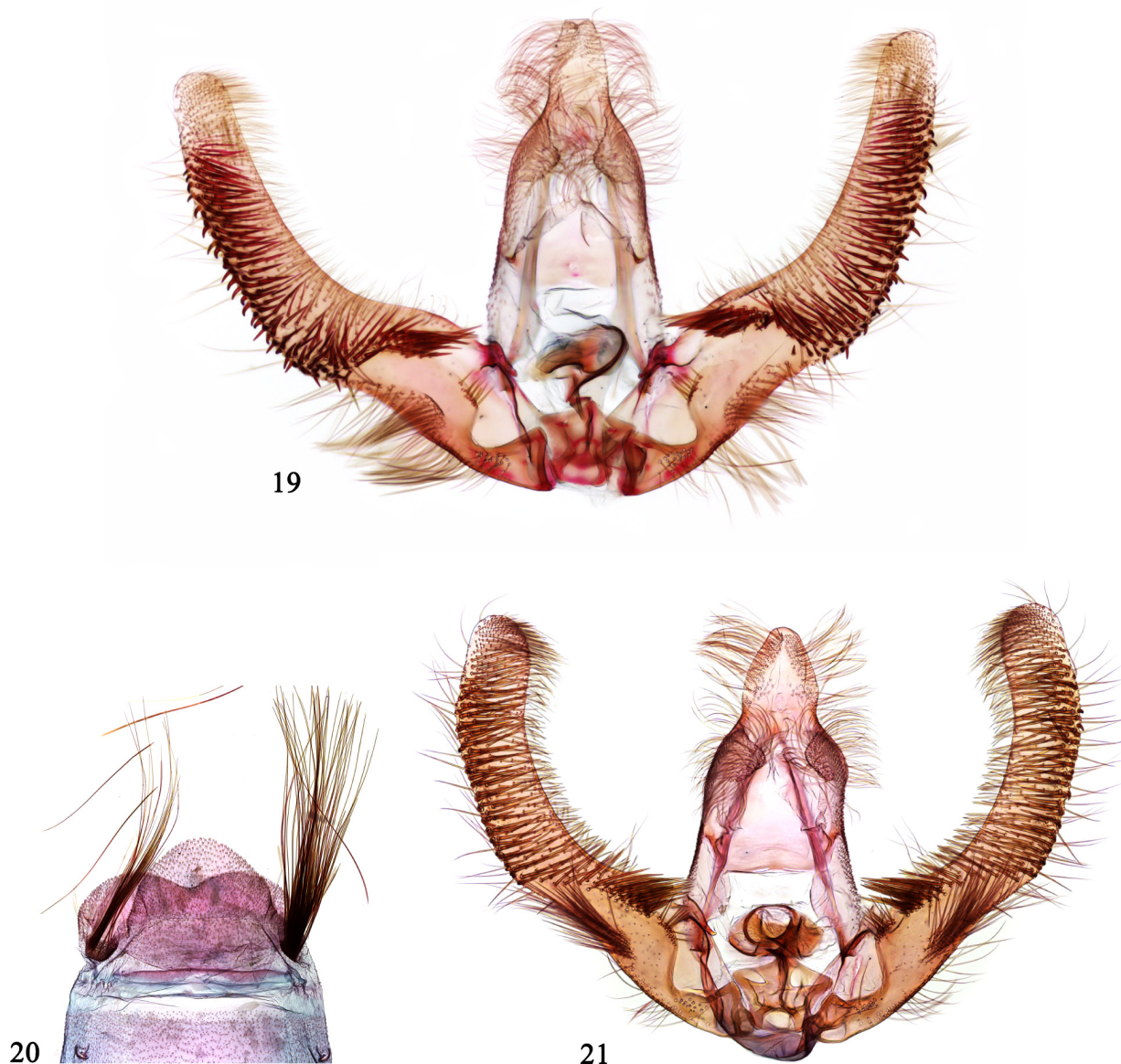
urn:lsid:zoobank.org:act:3C3BC8C6-B602-4F0C-81A0-68FEA4E3BD5C  
(Figs. 1, 4, 7, 10–13, 15–16, 18, 20–21)

*Apsidophora purpurobis*: Kawabe, 1989: 41, fig. 40 (adult). [Misidentification].

**Type material.** Holotype: ♂. THAILAND: Chaiyaphum Prov., Phu Khieo W.S. (Thung Kramang), 16°22′56″N 101°33′51″E ca. 875 m, 12 Jun 2018, N. Pinkaew, np12360 (genitalia slide NP3943). Deposited in KKIC. Paratype: 2♂. THAILAND: Chaiyaphum Prov., Phu Khieo W.S. (Pang Muong F.P.U.), 16°30′24″N 101°41′22″E, ca. 770 m, 15 Mar 2018, N. Pinkaew, np11988 (♂, wing slide). Chiang Mai Prov., Doi Suthep-Pui N.P. (Pha Dum N.P.), 18°45′33″N 98°53′28″E, ca. 1,412 m, 31 Mar 2014, N. Patibhakyothin, np6329 (♂, genitalia slide NP2233). All deposited in KKIC.

**Diagnosis.** This species is most similar to *Apsidophora bala* and the diagnosis characters are as described in *A. bala*.

**Description.** *Head* (Fig. 7): Lower frons yellowish white, upper frons light brown mixed with brown to dark brown ventrally, vertex light brown; labial palpus porrect, first segment yellowish white, second segment slightly enlarged to apex, light brown, slightly darker to apex, with a small dark brown spot dorsobasally and distinct blackish mark dorsoapical 1/3, apical segment small, light brown mixed with brown. Antenna brown.



**FIGURES 19–21.** Male genitalia and abdominal segments of *Apsidophora* spp. 19. Male genitalia of *A. bala*, **sp. nov.** (holotype) 20. Scale tufts on abdominal 8<sup>th</sup> in *A. chandrapatyae* 21. Male genitalia of *A. chantrapatyae*, **sp. nov.** (holotype).

*Thorax:* Pronotal collar, tegulae, and mesonotum light brown to brown, each scale yellowish brown at tip; inner side of hind tibia with three tufts of hair pencils, first tuft orange white extending from outer most of tibial base to posterior 1/4, second tuft light brown arising from lower point beyond first tuft extending to mid length of tibia, third tuft dark brown, beneath the second tuft, arising next to second tuft (Fig. 17). Forewing subrectangular, length 8.0–8.8 mm in males (n = 3) (Figs. 1, 4, 15), costal margin regularly curved, basal half with costal strigulae light brown alternate with black streaks, apical half with well developed costal strigulae, greyish white separated by blackish streaks, with confluence narrow orange brown strip extending obliquely from near middle of costa to termen at  $R_5$ , beneath with narrow oblique greyish line extending from near mid length of costa to near termen between  $M_1$  and  $M_2$ , wing apex with a dark brown spot, continued with narrow dark brown line extending downward to termen at  $M_2$ , termen rather straight, rounded apex, ground color greyish brown, basal half mixed with irregular transverse striae, light brown to brown, apical half of wing with large patch, dark brown, extending curve from dorsum to termen, upper edge of patch arising from mid length of dorsum, extending slightly curve to middle of chorda then strongly curve to termen between  $M_2$  and  $M_3$ , lower edge arising from about apical 1/3 of dorsum, extending sinuately curved to base of  $CuA_1$ , then extending irregularly to termen at  $CuA_2$ , tornus greyish brown with a small and



narrow crescent-shaped patch medially, dark brown; underside light brown with small white spots along costa and termen. Hindwing subtrapezoid (Figs. 10, 15), middle of costa gently curved, termen sinuate, dorsum rather straight from between CuP and 1A+2A to near 3A, ground color light brown, slightly paler to base, tornal area darker to brown, anal area between 1A+2A and anal margin whitish brown, anal margin folded and thickened with long and slender projecting lobe, basal 1/3 of 3A with a tuft of long hair pencils reaching to near the end of projecting lobe (wing slide) (Fig. 15) but apical half inserted to folded projecting lobe (pinned specimen) (Fig. 11), basal 2/3 of M<sub>3</sub> with row of dense, modified flattened scales, and with large elliptical patch of modified, rounded and appressed scales between CuA<sub>1</sub> and CuA<sub>2</sub> (Figs. 12, 16), fringe scales brown, slightly darker to dark brown between CuA<sub>2</sub> and 1A+2A, then greyish white from 1A+2A to projecting lobe; underside light brown, with large patch of long scales between CuP and 1A+2A extending from near wing base to near termen (Fig. 13).



22



23

**FIGURES 22–23.** Female genitalia of *Apsidophora bala*, **sp. nov.** (paratype NP3005). 22. Female genital capsule 23. Sterigma and ostium.



**Abdomen.** Abdominal segment VIII with groups of dense long setae anterolaterally, posterior margin of tergum VIII with large, rounded lobe differed from bilobe on posterior margin of sternum VIII (Fig. 20). Male genitalia (Fig. 21) with tegumen triangular, moderately high, with dense scale sockets laterally; uncus subtriangular, moderately rounded apex, slightly hook, with dense setae laterally; socii moderately large, subtriangular lobe, rounded apex, densely setose; gnathos arising from middle of tegumen, forming moderately large membranous band, sclerotized at base; vinculum moderately sclerotized; juxta subpentagonal; caulis shot; anellus cup-like; phallus rather shot, funnel-shaped, tapered to rounded apex; cornuti absent; valva long and slender, sinuate, rounded apex, dorsal and ventral margin rather parallel; sacculus with a small group of moderately dense, short setae basally, connected with row of shot setae along ventral margin reaching to moderately large group of long setae ventroapically, with a small group of shot setae on margin of basal opening medially; cucullus curve, margin parallel to rounded apex, densely setose, ventral half with strongly spines except apical 1/5, with group of dense, moderately long spines dorsobasally.

**Etymology.** This species is named to honor Prof. Angsumarn Chandrapatya, major advisor of corresponding author.

## Discussion

The two new described species share many morphological features with *Apsidophora purpureobis*. The crescent shape mark on forewing is distinct character of the genus *Apsidophora*. This mark strongly differs in each species. Forewing of *A. purpureobis* and *A. chandrapatya* has chorda extending from between  $R_1$  and  $R_2$  to below  $R_5$ , but in *A. bala* chorda is extending to base of  $R_5$ . In male hindwing of *A. purpureobis*,  $M_3$  and  $CuA_1$  connate as stalk basally, but are separated in *A. bala* and *A. chandrapatya*. *A. purpureobis* shows the difference of hindwing shape with pointed apex in male, but is less pointed in female in contrast to rounded apex in both sexes of *A. bala*. Adult males in all species shows sexual dimorphism by strongly modified anal margin of hindwing to distinct projecting lobe and long scale tufts. This character also was present in original description of *A. purpureobis* but it might have some error that did not apparent on Figure 649A in Diakonoff (1973). Modified sex scales on male hindwing are present between  $M_3$  and  $CuA_2$  in *A. purpureobis* and *A. chandrapatya* but absent in *A. bala*. Diakonoff (1983) presented the adult male figure of *A. purpureobis* for the first time (plate 8-fig. 34), but in our opinion this should not be *A. purpureobis* because the hindwing shape, hindwing apex and a patch of sex scale between  $M_3$  and  $CuA_2$  do not match with original description and illustrations (Diakonoff, 1973), so this should be another undescribed species. All male of *Apsidophora* species share character of hind tibial hair pencil. Diakonoff (1973) mentioned that female hindwing of *A. purpureobis* has  $M_3$  and  $CuA_1$  with short stalk, but those are separate in *A. bala*. Male abdominal coremata present (in *A. purpureobis* on segment VII, and in *A. chandrapatya*, on segment VIII) but absent in *A. bala*. Male genitalia of two new species are similar to *A. purpureobis* and share many morphological features. Female genitalia of all species share characters of distinct reticulated sterigma, aciculated vertical spilt-like ostium between two subtriangular lobes, long and narrow sclerotized colliculum, and two unequal signa. Sterigma differ in size and shape among the three species. In Thailand, the genus *Apsidophora* was reported for the first time by Kawabe (1989) with known species, *A. purpureobis* which adult figure (p. 70-fig. 40) was showed. We thought this species was misidentified because many diagnostic characters do not match with original descriptions and illustrations of *A. purpureobis* in Diakonoff (1973). From Kawabe's figure, characters of crescent mark on forewing, shape of hindwing including position of a large patch of sex scale on hindwing are present as same as in *A. chandrapatya*. So, this species should be corrected to *A. chandrapatya*.

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