



ELEVEN NEW SPECIES OF THE GENUS *INDONEMOURA* BAUMANN (PLECOPTERA: NEMOURIDAE) FROM THAILAND AND VIETNAM

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ABSTRACT

Eleven new species of *Indonemoura* Baumann are proposed from Thailand and Vietnam specimens and a tentative Thai record for *I. javanica* (Banks) is reported. New species include *I. angulata* sp. n., *I. auberti* sp. n., *I. bilobata* sp. n., *I. chantaramongkolae* sp. n., *I. clavata* sp. n., *I. forcipata* sp. n., *I. horvati* sp. n., *I. malickyi* sp. n., *I. reducta* sp. n., *I. rostrilobata* sp. n. and *I. tricantha* sp. n. A provisional regional key for male *Indonemoura* is presented, and a group of closely related species, including *I. clavata*, is recognized as the *I. fujianensis* complex.

Keywords: *Indonemoura*, Plecoptera, Nemouridae, Thailand, Vietnam, New species

INTRODUCTION

Indonemoura was proposed as a new genus by Baumann (1975) with *Protonemoura indica* Kimmins as the type. The genus, as originally proposed, was based on the "Indica Group" of Aubert (1967) and was placed as the sister group of *Mesonemoura* Baumann (Baumann 1975). Males of *Indonemoura* are typified by trilobed paraprocts, including a large, heavily sclerotized, often apically armed mesal lobe, and a long, slender epiproct, often enlarged near the apex (Baumann 1975).

The original 14 species placed by Baumann (1975) in *Indonemoura* were all known from Assam, except for two species, *I. jacobsoni* (Klapálek) and *I. javanica* (Banks) which occur in Indonesia and/or Malaysia. Several additional species, have been proposed from China (Li & Yang 2005; 2006; 2008a; 2008b; 2008c; Li et al. 2005; Wang & Du 2009; Wang et al. 2008; Yang & Yang 1991; Zhu et al. 2002), Japan (Shimizu 1994), Bhutan (Zwick 1977) and Nepal (Harper 1974; Sivec

1981; Zwick & Sivec 1980). An additional species, *I. loebli* Zwick, is known only from India (Zwick & Sivec 1980) and a few species described from Assam or Nepal now are also known from Bhutan, India or Tibet (Zwick 1977; Zwick & Sivec 1980; Li & Yang 2008b). *Indonemoura* currently includes 41 species (DeWalt et al. 2009) but no records for this genus are reported for Thailand, Vietnam or several other nations of southeast Asia where it might reasonably be expected to occur.

This study is based on material collected in Thailand primarily by Professor Dr. P. Chantaramongkol and members of the Chiang Mai University team, and by the senior author and a colleague from the Slovenian Museum of Natural History. These Thai collections were acquired as part of a National Science Foundation Grant awarded to Dr. G. Courtney of Iowa State University. Vietnamese specimens were provided primarily by Dr. H. Malicky, Dr. W. Mey and by the

Naturhistorisches Museum, Vienna. In total, the material studied includes one species tentatively placed as *I. javanica* and eleven species, all represented by male specimens, which we regard as new. Specimens are deposited in the Naturhistorisches Museum, Vienna (NMW), the Slovenian Museum of Natural History, Ljubljana (PMSL), the B.P. Stark collection, Mississippi College, Clinton (BPS) and the Zoologisches Museum der Humboldt-Universität, Berlin (ZMB). The following key will assist in identifying males of Vietnamese and Thai specimens of *Indonemoura*.

RESULTS AND DISCUSSION

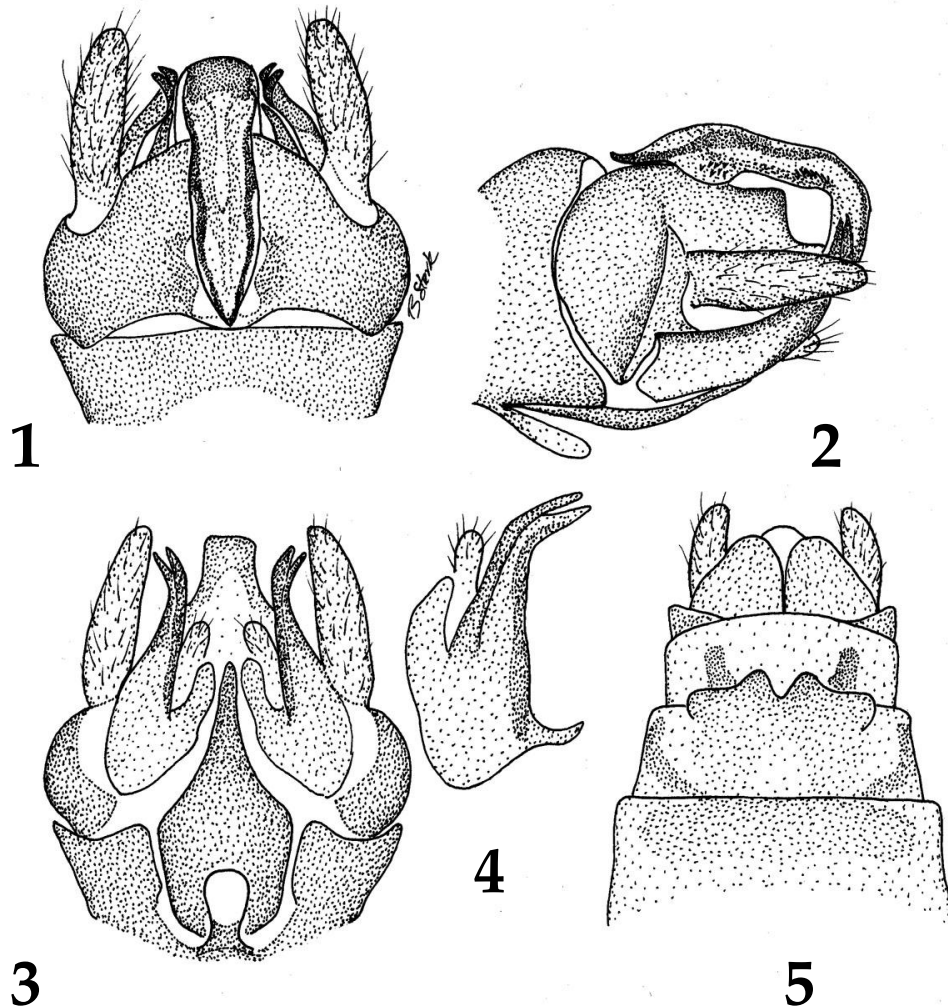
Provisional Key to Males of *Indonemoura* from Vietnam and Thailand

- | | | | | | |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| 1 | Tergum 10 bearing a pair of raised tubercles or spine-like processes beneath or along side of the epiproct (Figs. 2, 12) | 2 | 16) | 7 | |
| 1' | Tergum 10 without tubercles or spine-like processes beneath or along side of the epiproct (Fig. 17) | 6 | 6' | Tergum 9 without sensilla basiconica patch (Fig. 25) | 10 |
| 2 | Tergum 9 without sensilla basiconica patch (Fig. 6) | 3 | 7 | Epiproct thickness in lateral aspect subequal to length (Fig. 21) | 8 |
| 2' | Tergum 9 with sensilla basiconica patch (Fig. 11) | 4 | 7' | Epiproct slim in lateral aspect (Figs. 17, 39); mesal lobe of paraprocts slender (Fig. 41) | 9 |
| 3 | Dorsal aspect of epiproct abruptly widened subapically (Fig. 6); mesal paraproct lobe with an antler-like branching pattern in caudal aspect (Fig. 9) | <i>auberti</i> | 8 | Mesal lobe of paraprocts club shaped (Fig. 22); outer lobe of paraprocts bifurcate (Fig. 20) | <i>clavata</i> |
| 3' | Epiproct without dorsal subapical broad area (Fig. 1); mesal and outer paraproct lobes somewhat scissors-like (Figs. 3-4) | <i>angulata</i> | 8' | Mesal lobe of paraprocts without slender, club shaped apex; outer lobe of paraprocts terminating in three prominent spines (Figs. 51, 53) | <i>tricantha</i> |
| 4 | Outer lobe of paraprocts bearing a subapical, laterally directed spine (Fig. 11) | <i>bilobata</i> | 9 | Paraprocts with long, slender, sclerotized processes projecting freely from mesal and outer lobes (Fig. 41); lateral margins of epiproct almost parallel in dorsal aspect (Fig. 38); ventral margin of epiproct with a prominent subapical cluster of spines (Fig. 39) | <i>malickyi</i> |
| 4' | Outer lobe of paraprocts without subapical spine | 5 | 9' | Paraprocts with long, slender, sclerotized process projecting freely only from outer lobe (Fig. 19); lateral margins of epiproct convex in dorsal aspect (Fig. 16); ventral margin of epiproct without a cluster of spines (Fig. 17) | <i>chantaramongkolae</i> |
| 5 | Subapical area of mesal paraproct lobe abruptly narrowed (Fig. 49); ventral margin of epiproct with a sparse subapical group of teeth (Fig. 48) | <i>rostrilobata</i> | 10 | Apex of epiproct ends in an acute spine (Figs. 33-34); ventrolateral aspect of epiproct without row of prominent spines (Fig. 34) | <i>javanica</i> |
| 5' | Subapical area of mesal paraproct lobe gradually narrowed to tip (Fig. 31); ventral margin of epiproct with a cluster of small spines (Fig. 30) | <i>horvati</i> | 10' | Apex of epiproct blunt or slightly bifurcate (Fig. 25); ventrolateral aspect of epiproct with row of prominent spines (Figs. 26, 44) | 11 |
| 6 | Tergum 9 with a sensilla basiconica patch (Fig. | | 11 | Outer and mesal paraproct lobes cross, or nearly so (Figs. 27-28) | <i>forcipata</i> |
| | | | 11' | Outer paraproct lobe reduced, mesal lobe with a slender, projecting process (Fig. 45) | <i>reducta</i> |

Indonemoura angulata sp. n. (Figs. 1-5)

Material examined. Holotype ♂ and 1♂, 3♀ paratypes from Vietnam, Vinh Phu Province, Tam Dao, 800-1000 m, 19 May-13 June 1995, H. Malicky (PMSL).

Male. Forewing length 7 mm. Epiproct long with slight constriction near midlength, slightly wider subapically and narrowed to an acute point in dorsal aspect (Fig. 1); ventrolateral aspect wider subapically



Figs. 1-5. *Indonemoura angulata*. 1. Male terminalia, dorsal aspect. 2. Male terminalia, lateral aspect. 3. Male terminalia, ventral aspect. 4. Male paraprocts, caudal aspect. 5. Female terminalia, ventral aspect.

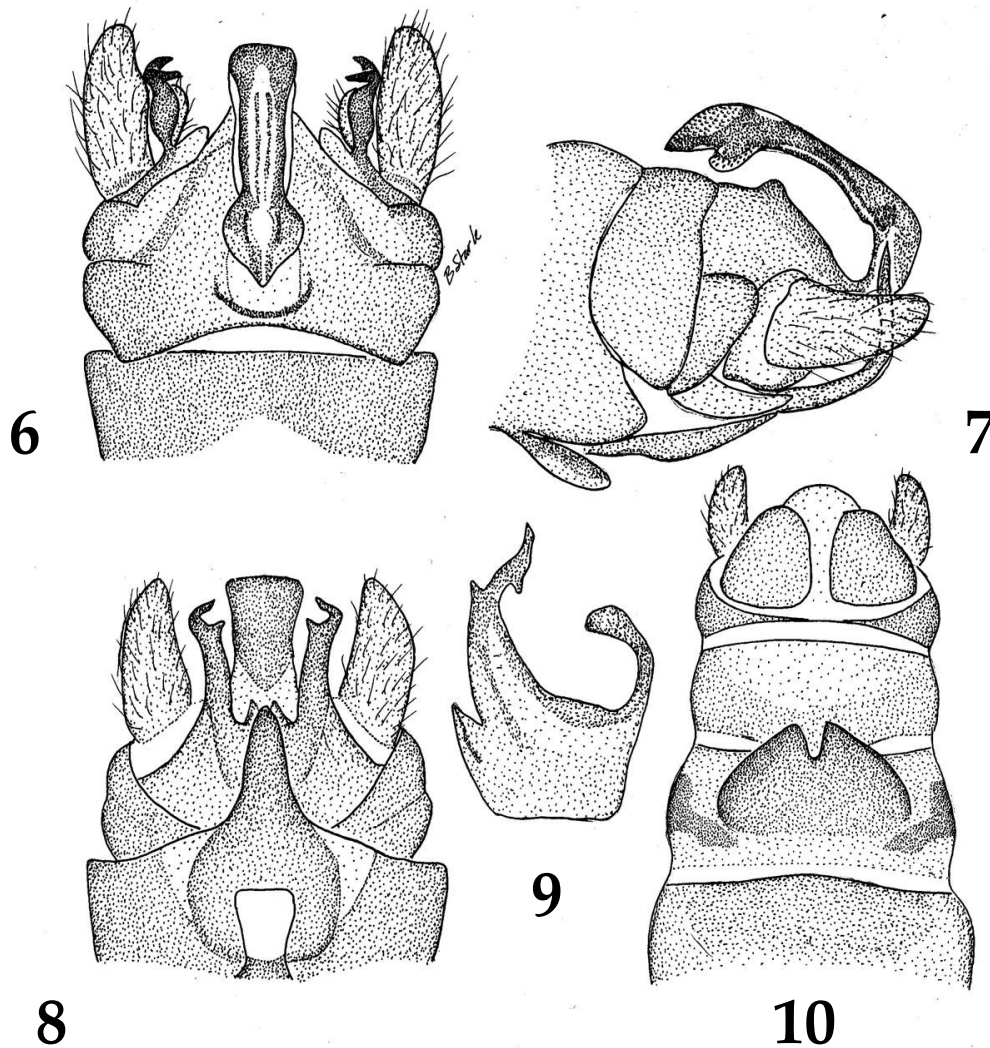
and bearing a few small spines (Fig. 2). Outer and mesal paraproct lobes slender, subequal in length and both bent sharply near apex (Figs. 3-4); inner lobe short and somewhat club shaped. Tergum 9 and 10 without conspicuous sensilla patches. Vesicle short and slightly widened subapically (Fig. 3); hypoproct slender, and tapering to a slightly rounded or acute apex.

Female. Forewing length 9.5 mm. Subgenital plate broadly notched on posterior margin (Fig. 5). Posterior margin of sternum 7 not projecting over base of sternum 8.

Larva. Unknown.

Etymology. The species name refers to the angular, subapical bend in the paraproct lobes.

Diagnosis. Five of the regional species share the presence of a pair of small tubercles located adjacent to the epiproct on tergum 10. This feature apparently does not occur on most other species of *Indonemoura*, or at least it is not shown in figures provided by colleagues, except for *I. trichotoma* Li & Yang (Li & Yang 2008c). The regional species included in this grouping, *I. angulata*, *I. auberti*, *I. bilobata*, *I. horvati* and *I. rostrilobata*, are distinguished in the key and *I. trichotoma* differs from these species in having a group of small spines on the hypoproct (Li & Yang 2008c); *I. angulata* is similar to *I. auberti* in lacking sensilla basiconica on tergum 9, but these species have very different paraprocts (compare Figs. 4 and 9) and epiprocts (compare Figs. 1 and 6).



Figs. 6-10. *Indonemoura auberti*. 6. Male terminalia, dorsal aspect. 7. Male terminalia, lateral aspect. 8. Male terminalia, ventral aspect. 9. Male paraprocts, caudal aspect. 10. Putative female, ventral aspect.

Indonemoura auberti sp. n.
(Figs. 6-10)

Material examined. Holotype ♂ from Thailand, Chiang Mai Province, Doi Inthanon National Park, Huai Sai Lueng, 1060 m, 98° 27' N, 18° 31' E, 7-8 May 2002, blacklight trap, Chiang Mai University team (PMSL). Paratypes: Type locality, 22 March-4 April 2002, Malaise trap, Chiang Mai University team, 1♂ (BPS). Type locality, 4 April-3 May 2003, 1♂, 1♀ (PMSL). Chiang Mai Province, Doi Inthanon National Park, Bang Khun Klang, 1200 m, 98° 32' N, 18° 32' E, 7-14 November 1989, 1♂ (PMSL). Same site,

17-26 July 1989, 3♂ (PMSL). Chiang Mai Province, Doi Inthanon National Park, Huai Kaew above Monthatarn, 800 m, 98° 55' N, 18° 49' E, 6 December 2002-4 January 2003, 1♂ (PMSL). Same site, 14 February-11 March 2003, 2♂, 1♀ (PMSL). Additional material: Type locality, 7-8 May 2002, blacklight trap, Chiang Mai University team, 1♀ (PMSL).

Adult habitus. General color brown to dark brown. Head and wings dark brown; pronotum paler, brown with obscure rugosities. Palpi pale, antennae uniformly dark brown. Legs pale brown, tarsi darker. **Male.** Forewing length 8 mm. Epiproct long, slender and expanded apically in dorsal and lateral aspect;

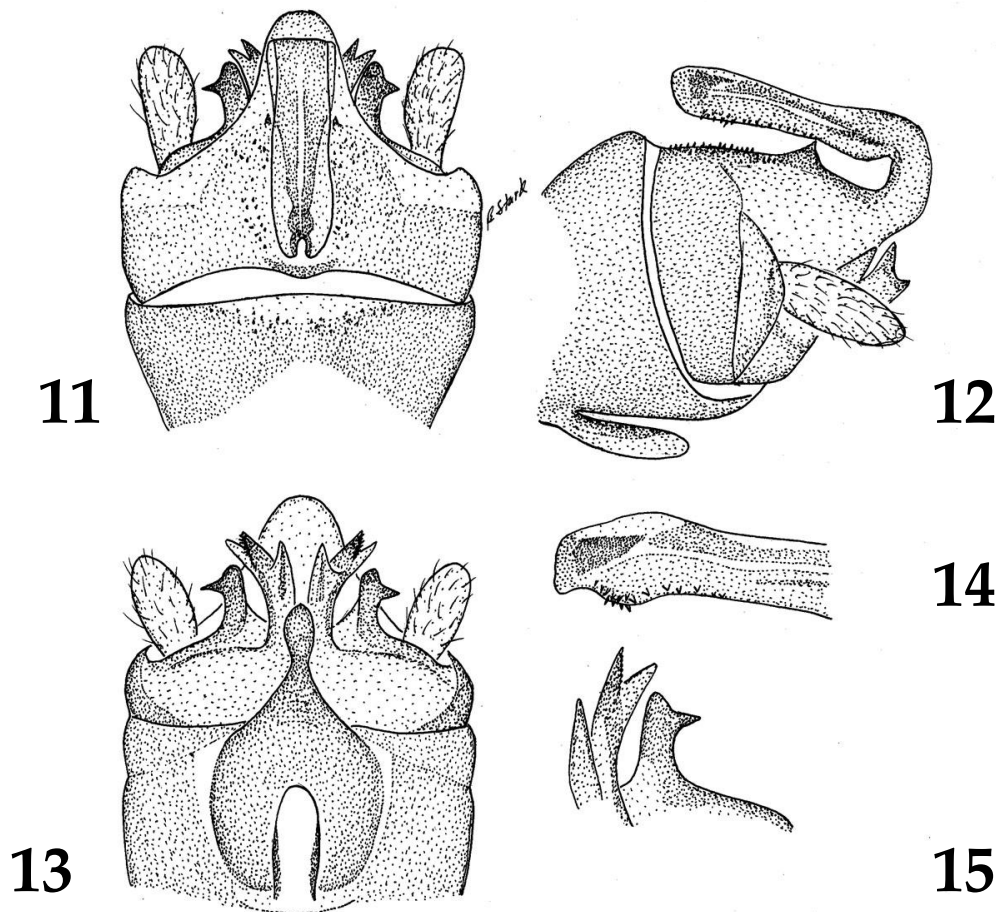
dorsal aspect of apex setaceous and bulbous, sclerotized tip divided (Fig. 6); ventral aspect of apex bears a small spiny, subapical lobe (Fig. 7). Tergum 10 bears a pair of low mesal knobs at midlength; tergum 9 without conspicuous setation or knobs. Mesal paraproct lobe sclerotized and bearing apical, inwardly directed spines in ventral aspect (Fig. 9); outer lobe curved inward and somewhat enlarged at the apex. Vesicle slightly longer than wide with

truncate apex (Fig. 8); hypoproct broadly triangular. **Putative female.** Forewing length 9 mm. Subgenital plate subtriangular in outline and bearing a narrow, median notch (Fig. 10). Plate strongly sclerotized, sternum 7 not projecting over base of sternum 8.

Larva. Unknown.

Etymology. The patronym honors Dr. Jacques Aubert for his pioneering work on Asian Nemouridae.

Diagnosis. See under *I. angulata*.



Figs. 11-15. *Indonemoura bilobata*. 11. Male terminalia, dorsal aspect. 12. Male terminalia, lateral aspect. 13. Male terminalia, ventral aspect. 14. Epiproct apex showing variation, lateral aspect. 15. Male paraprocts, caudal aspect.

Indonemoura bilobata sp. n.
(Figs. 11-15)

Material examined. Holotype ♂ from Thailand, Chiang Mai Province, Doi Inthanon National Park,

Bang Khun Klang, 1200 m, 98° 32' N, 18° 32' E, 7-14 November 1989, P. Chantaramongkol, H. Malicky (PMSL). Paratypes: Thailand: Chiang Mai Province, Doi Inthanon National Park, Huai Sai Lueng, 1060 m, 98° 27' N, 18° 31' E, 16 November-7 December 2002,

2♂ (PMSL). Same locality, 8 December 2002-14 January 2003, 1♂ (PMSL). Same locality, 3-4 April 2003, 1♂ (PMSL). Same locality, 4 April-3 May 2003, 1♂, 2♀ (PMSL). Chiang Mai Province, Doi Inthanon National Park, stream on right below check point, 1500 m, 11 April 1989, 1♂ (PMSL).

Adult habitus. General color brown to dark brown. Head dark brown, pronotum and wings brown; pronotum with obscure rugosities. Palpi and antennae brown. Legs pale brown with a wide, pale, median band on femora, and a pale basal femoral area; tibiae and tarsi uniformly brown.

Male. Forewing length 7 mm. Epiproct with lateral margins almost parallel in dorsal aspect; apex notched (Fig. 11); ventrolateral aspect with an irregular row of short spines for most of apical half of epiproct length, some specimens with a slightly bulging subapical lobe (Figs. 12, 14). Outer and mesal lobes of paraproct both relatively short and both

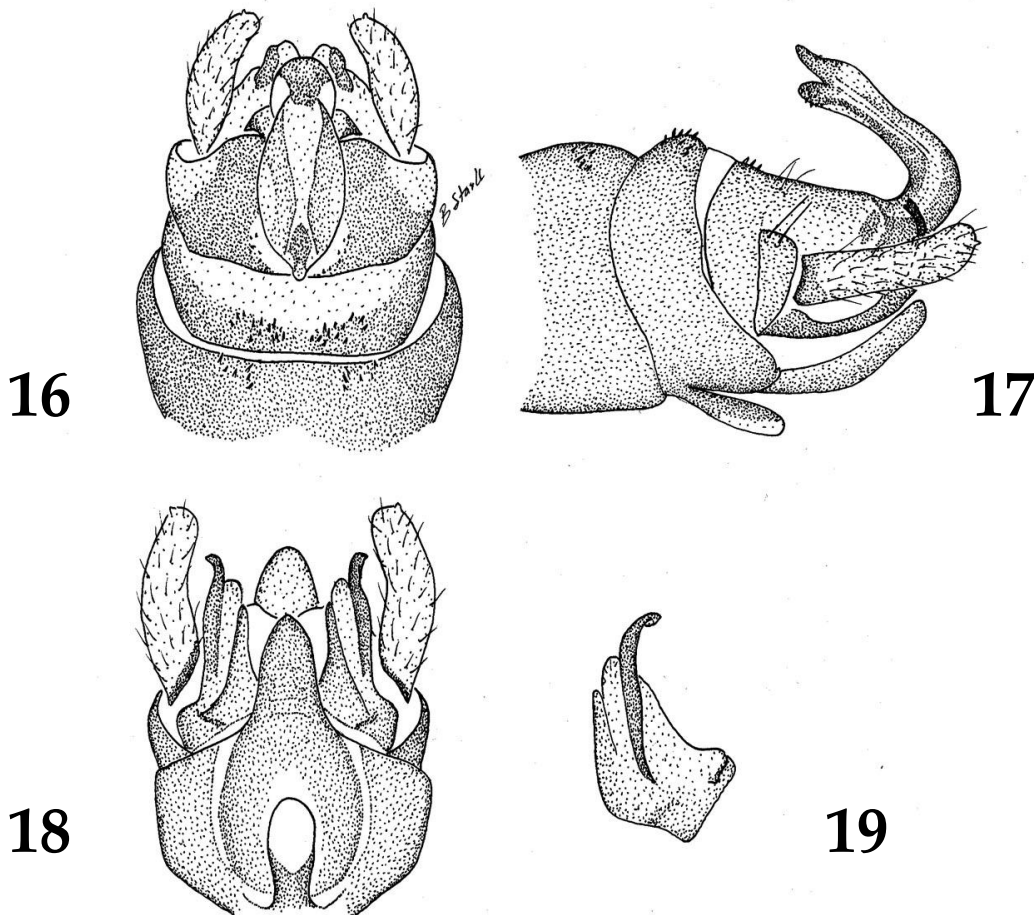
bilobed at apex in caudal aspect (Figs. 13, 15). Tergum 10 bearing a pair of midbasal spines adjacent to epiproct, and a group of sensilla scattered around epiproct; tergum 9 with a sparse, irregular linear cluster of sensilla basiconica along posterior margin. Vesicle longer than wide, margins parallel for most of length (Fig. 13); hypoproct with a subapical constriction.

Female. Unknown.

Larva. Unknown.

Etymology. The species name refers to the bilobed tips of the paraprocts.

Diagnosis. This species is discussed above under *I. angulata* but it keys to a group (including *I. horvati* and *I. rostrilobata*) in which sensilla basiconica are present on tergum 9. The outer lobes of the paraprocts of *I. bilobata* are forked near the tips (Fig. 15) whereas the other species in this cluster have unforked paraproct lobes.



Figs. 16-19. *Indonemoura chantaramongkolae*. 16. Male terminalia, dorsal aspect. 17. Male terminalia, lateral aspect. 18. Male terminalia, ventral aspect. 19. Male paraprocts, caudal aspect.

Indonemoura chantaramongkolae sp. n.
(Figs. 16-19)

Material examined. Holotype ♂ from Thailand, Chiang Mai Province, Doi Inthanon National Park, Namtok Monthatarn, 600 m, 98° 55' N, 18° 49' E, 25 September-12 October 2002, Malaise trap, Chiang Mai University team (PMSL). Paratypes: Thailand: Type locality, 13-14 February 2003, 1♂ (PMSL). Type locality, 16-17 November 2002, 1♂ (PMSL). Loei Province, Phu Hin Rongkla National Park, Huai Man Daeng Noi, 1600 m, 101° 03' N, 16° 57' E, 21 October 2002, I. Sivec, 1♂ (PMSL).

Adult habitus. General color brown to dark brown. Head, pronotum and wings dark brown; pronotum with obscure rugosities. Palpi and antennae brown, first two segments of antennae darker. Legs mostly dark brown but hind femora with pale band in distal third and fore and mid femora with pale dorsal area; all femora pale on proximal half of ventral surface;

tibiae and tarsi uniformly dark brown.

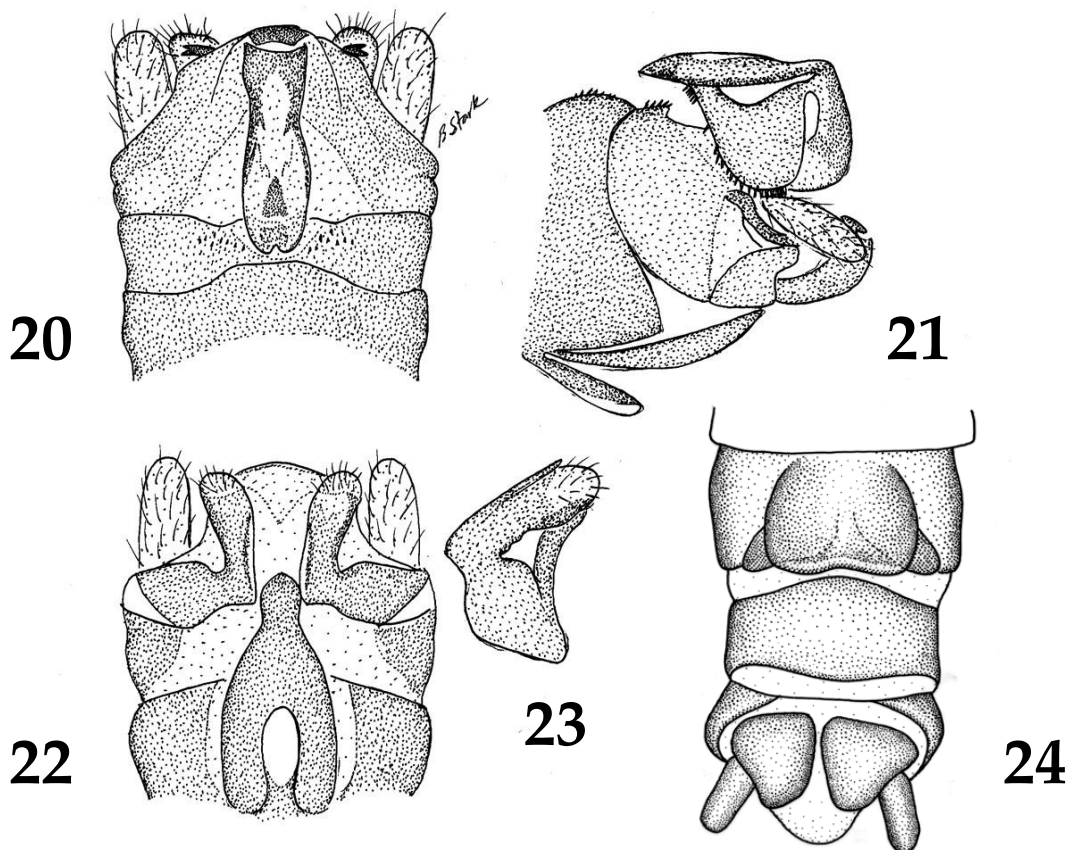
Male. Forewing length 7 mm. Epiproct long and broad, widest near midlength and bearing a broad mesal keel in dorsal aspect (Fig. 16); apex terminating in a small rounded projection; in ventrolateral aspect, ventral sclerite terminates in a subapical, rounded spinous structure (Fig. 17). Outer lobe of paraproct slender for much of length, strongly sclerotized and turned sharply outward to an acute apex (Figs. 18-19). Vesicle short, wide and slightly rounded (Fig. 18); hypoproct very broad and somewhat shield-shaped.

Female. Unknown.

Larva. Unknown.

Etymology. The matronym honors Professor Dr. P. Chantaramongkol in recognition of her leadership of the Chiang Mai University team during this project.

Diagnosis. The key above places this species near *I. malickyi* but the two are not apparently closely related. The single, long, slender and apically bent outer paraproct lobe of this species (Figs. 18-19) is distinctive.



Figs. 20-24. *Indonemoura clavata*. 20. Male terminalia, dorsal aspect. 21. Male terminalia, lateral aspect. 22. Male terminalia, ventral aspect. 23. Male paraprocts, caudal aspect. 24. Putative female terminalia, ventral aspect.

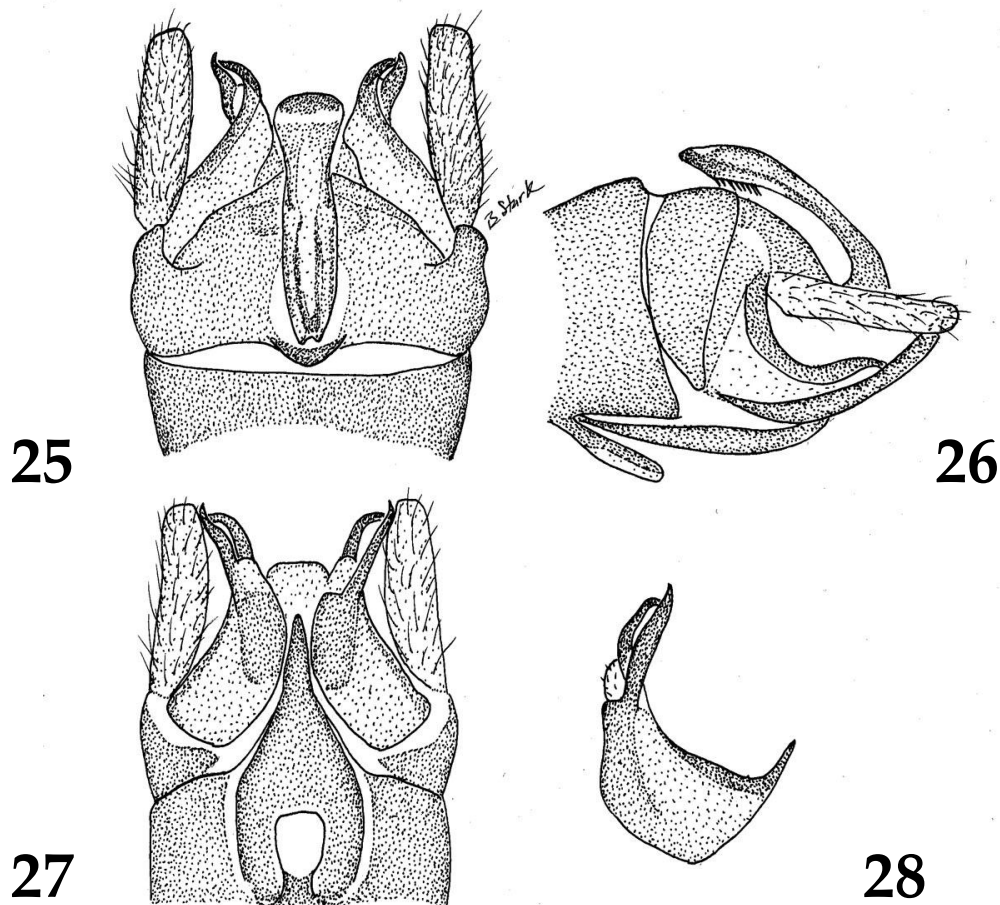
Indonemoura clavata sp. n.
(Figs. 20-24)

Material examined. Holotype ♂ from Vietnam, Vinh Phu Province, Tam Dao, 800-1000 m, 19 May-13 June 1995, H. Malicky (PMSL). Additional material: Vietnam: Type locality, 19 May-13 June 1995, H. Malicky, 15♀ (PMSL). Vinh Phu Province, Tam Dao, 23 March 1995, 1♀ (ZMB).

Adult habitus. General color dark brown. Head and wings dark brown; pronotum slightly paler with obscure rugosities. Legs, palpi and antennae uniformly dark brown.

Male. Forewing length 6.5 mm. Epiproct narrowed

near midlength and slightly expanded subapically, apex with a shallow notch in dorsal aspect (Fig. 20); ventrolateral aspect greatly expanded and armed along most of length with thick setal spines (Fig. 21). Mesal lobe of paraprocts sharply bent near base and club shaped; outer lobe slender, heavily sclerotized, appressed to mesal lobe near apex, bearing a subapical knob and a bifurcate tip; inner lobe needle-like (Figs. 22-23). Tergum 10 bearing a small median patch of sensilla; tergum 9 with a sparse patch of sensilla along posterior margin. Vesicle narrow, only slightly wider subapically (Fig. 22); hypoproct slightly constricted near midlength between apex and posterior margin of sternum 9.



Figs. 25-28. *Indonemoura forcipata*. 25. Male terminalia, dorsal aspect. 26. Male terminalia, lateral aspect. 27. Male terminalia, ventral aspect. 28. Male paraprocts, caudal aspect.

Putative female. Forewing length 8 mm. Subgenital plate scarcely produced beyond hind margin of sternum 8; posterior margin with a slight median emargination (Fig. 24). Oval paragenital plates distinct.

Larva. Unknown.

Etymology. The species name refers to the club shaped mesal paraproct lobe.

Diagnosis. The epiproct of this species is similar to that of several species including *I. auriformis* Li & Yang (Li & Yang 2008a), *I. baishanzuensis* Li & Yang, *I. fujianensis* Li & Yang, *I. guangdongensis* Li & Yang, *I. hubeiensis* Yang & Yang, *I. macrolamellata* (Wu) and *I. yangi* Li & Yang (Li & Yang 2006; 2008c) and *I. tricantha* (described below). We formally recognize these species, distinguished on the basis of paraproct structures, particularly those of the outer lobes, as members of the *Fujianensis* complex. Within the complex only *I. clavoata* has the mesal paraproct lobe club shaped and the outer lobe terminating in a pair of short, almost equally sized spines. Chinese members of the complex, except *I. auriformis*, are included in keys developed by Li & Yang (2006; 2008c). This new species and *I. tricantha*, the only regional members of the complex, are distinct from other Southeast Asian *Indonemoura* in having the ventral epiproct sclerite greatly produced into a wide, semicircular structure (Fig. 21), typical of all species in the *I. fujianensis* complex.

Indonemoura forcipata sp. n.

(Figs. 25-28)

Material examined. Holotype ♂ from Thailand, Chiang Mai Province, Huai Sai Lueng, 98° 27' N, 18° 31' E, 1060 m, 7-8 May 2002, blacklight trap, Chiang Mai University team (PMSL). Paratypes: Thailand: Type locality, 20 March 2002, 1♂, 2♀ (PMSL). Type locality, 3-22 March 2002, 2♂ (PMSL). Type locality, 22 March-4 April 2002, 1♂ (PMSL). Type locality, 3-4 April 2003, 1♂ (PMSL). Type locality, 6 April 1993, 1♂ (BPS). Type locality, 9 May-8 June 2002, 1♂ (PMSL). Type locality, 8 June-7 July 2002, 1♂ (PMSL). Chiang Mai Province, Doi Inthanon National Park, Bang Khun Klang, 1200 m, 98° 32' N, 18° 32' E, 10 April 1989, 1♂ (PMSL). Same site, 10-17 July 1989, 1♂ (PMSL). Same site, 7-14 November 1989, 2♀ (PMSL). Same site, 11-19 November 1988, 1♂ (PMSL). Chiang

Mai Province, Doi Inthanon National Park, W. Gastehaus, 1600 m, 98° 30' N, 18° 32' E, 25 February 1987, 3♂ (PMSL). Chiang Mai Province, Doi Suthep-Pui National Park, Huai Kaew above Monthatarn, 800 m, 98° 55' N, 18° 49' E, 6-26 May 2002, 1♂ (PMSL).

Adult habitus. General color brown to dark brown. Head, pronotum and wings dark brown; pronotum with obscure rugosities. Palpi and antennae uniformly brown. Legs dark brown with pale median band on femora; tibiae and tarsi uniformly dark brown.

Male. Forewing length 8 mm. Epiproct long, slender and slightly narrowed throughout length; apex with a shallow notch in dorsal aspect (Fig. 25); ventrolateral aspect with a prominent row of ca. 8-10 subapical setal spines (Fig. 26). Outer and mesal lobes of paraprocts subequal in length and forming a beak, or forceps-like structure; inner lobe reduced (Figs. 27-28). Tergum 9 unmodified and without conspicuous sensilla. Vesicle about as wide as long (Fig. 27); hypoproct very slender and gradually tapering to an acute apex.

Female. Unknown.

Larva. Unknown.

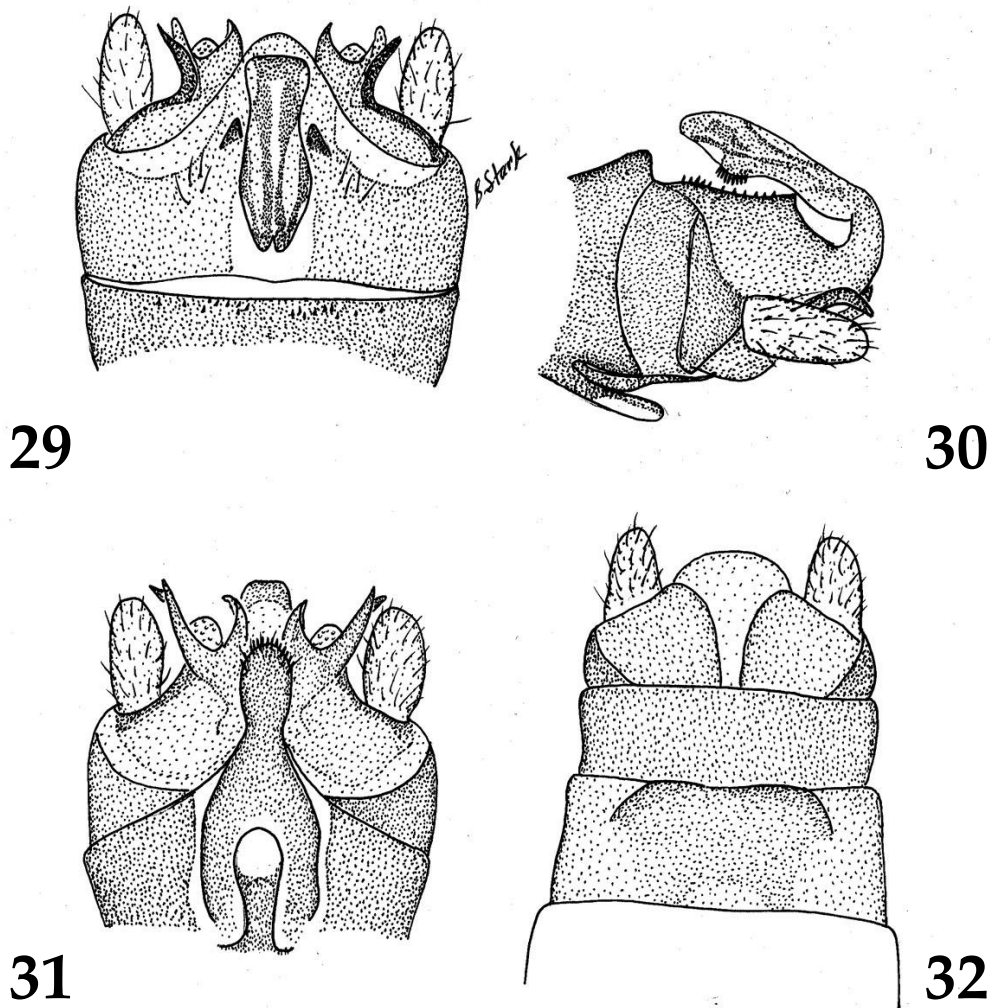
Etymology. The species name refers to the forceps-like form of the paraproct lobes.

Diagnosis. The epiproct and paraprocts of this species are generally similar to *I. bilateralia* Du & Wang and *I. trilogispina* Du & Wang (Wang & Du 2009). The epiproct of the new species differs from the epiproct of the other species in having a close set ventral row of ca. 8-10 thick spine-like setae set near the epiproct apex (Fig. 26), whereas the former species has ca. 5 of these structures and *I. trilogispina* also has ca. 5 in the corresponding position and an additional three grouped near the middle of the epiproct (Wang et al. 2006). The paraprocts for all three species have long, slender, heavily sclerotized elements but the individual shapes differ, and the major lobes for *I. forcipata* paraprocts lack apical furcations, unlike those for both related species.

Indonemoura horvati sp. n.

(Figs. 29-32)

Material examined. Holotype ♂ and 1♂, 3♀ paratypes from Thailand, Chiang Mai Province Doi



Figs. 29-32. *Indonemoura horvati*. 29. Male terminalia, dorsal aspect. 30. Male terminalia, lateral aspect. 31. Male terminalia, ventral aspect. 32. Putative female terminalia, ventral aspect.

Inthanon National Park, 2100 m, 6 April 1993, I. Sivec, B. Horvat (PMSL). Additional Paratypes: Thailand: Chiang Mai Province, Doi Inthanon National Park, 1640 m, 98° 27' N, 18° 31' E, 7 April 1993, 1♂ (PMSL). Chiang Mai Province, Doi Inthanon National Park, 2300 m, 98° 30' N, 18° 35' E, 10 April 1989, 1♂ (PMSL). Chiang Mai Province, Doi Inthanon National Park, CP3TF, LF, 1600 m, 98° 31' N, 18° 31' E, 25 March 1993, 10♂, 5♀ (PMSL), 4♂, 4♀ (BPS). Chiang Mai Province, Doi Inthanon National Park, WRC1, 2000 m, 98° 29' N, 18° 33' E, 10 April 1996, 2♂, 1♀ (PMSL).

Adult habitus. General color brown to dark brown. Head, pronotum and wings dark brown; pronotum

quadrate with obscure rugosities. Palpi and antennae uniformly brown. Legs pale brown with pale median band on femora; tibiae and tarsi uniformly brown.

Male. Forewing length 7.5 mm. Epiproct widest in apical third, and narrowed to bifid tip in dorsal aspect (Fig. 29); ventrolateral aspect with a spiny, subapical lobe (Fig. 30). Outer lobe of paraproct long slender, acute, and curved ventrad in lateral aspect; mesal lobe about as long as outer, slender and acute; inner lobe split basally into a pair of short, acute, overlapping projections (Fig. 31). Tergum 10 and 9 each with sparse patches of short sensilla. Vesicle long and little expanded near tip (Fig. 31); hypoproct apex bulb-shaped and bearing a cluster of setae.

Putative female. Forewing length 10 mm. Subgenital plate a short, wide truncate projection (Fig. 32). Sternum 7 not projecting over base of sternum 8.

Larva. Unknown.

Etymology. The patronym honors our colleague and friend B. Horvat, curator at the Slovenian Museum of Natural History, for his assistance in collecting the type series of this and other Asian specimens.

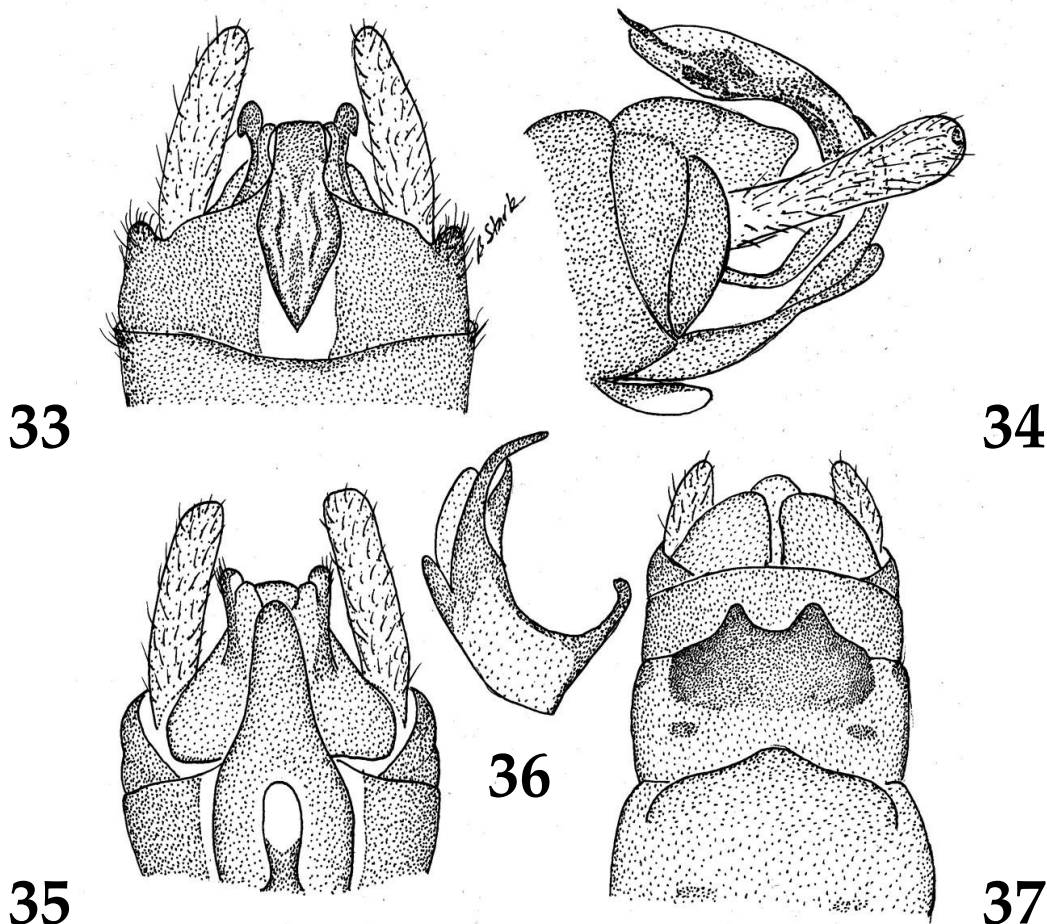
Diagnosis. See above under *I. bilobata*. This species is similar to *I. rostrilobata* in general epiproct and tergal setation features but paraprocts for the two species are quite distinct. The mesal paraproct lobes for *I. horvati* taper throughout their length to a fine point (Fig. 31) whereas those for *I. rostrilobata* are slightly

swollen subapically (Fig. 50).

Indonemoura c.f. *javanica* (Banks)
(Figs. 33-37)

Nemoura javanica Banks, 1920:323. Holotype ♂ (Museum of Comparative Zoology), Batavia, Java

Material examined. Thailand: Chiang Mai Province, Doi Inthanon National Park, Huai Sai Lueng, 1060 m, 98° 27' N, 18° 31' E, 8 December 2002-14 January 2003, 1♂ (PMSL). Same site, 22 March-4 April 2002, 2♂ (PMSL). Same site, 8 July-12 August 2002, 1♂, 2♀ (PMSL). Chiang Mai Province, Doi Inthanon National Park, Namtok Siripum, 1460 m, 98° 31' N,



Figs. 33-37. *Indonemoura* cf. *javanica*. 33. Male terminalia, dorsal aspect. 34. Male terminalia, lateral aspect. 35. Male terminalia, ventral aspect. 36. Male paraprocts, caudal aspect. 37. Putative female terminalia, ventral aspect.

18° 32' E, 16 October 2002, 1♂ (PMSL). Chiang Mai Monthatarn, 700m, 98° 55' N, 18° 49' E, 11-12 March 2003, 1♂, 1♀ (PMSL). Same site, 5-21 April, 2003, 2♂ (PMSL). Chiang Mai Province, Doi Suthep-Pui National Park, Huai Kaew above Monthatarn, 800 m, 98° 55' N, 18° 49' E, 14 February-11 March 2003, 4♂, 3♀ (PMSL). Loei Province, Phu Hin Rongkla National Park, Huai Man Daeng, tier 5, 1250 m, 101° 03' N, 16° 57' E, 11 March 2002, 1♂ (PMSL). Mae Hong Son Province, Namtok Maw Pang, 850 m, 97° 59' N, 19° 25' E, 16 October 2002, 1♀ (PMSL). Phayao Province, Doi Luang National Park, Namtok Champatong, 620 m, 99° 44' N, 19° 13' E, 17 March 2002, 1♀ (PMSL). Same site, 24 October 2002, 1♂ (PMSL). Khao Yai, 20 August 2000, 1♂ (PMSL). Same location, 28 October 2000, T. Tapoo, 1♀ (PMSL). Tung Yaw, 18 km NW Ba Pa Pael, 1200 m, 98° 39' N, 19° 08' E, 17 April 1989, 1♂ (PMSL).

Adult habitus. General color brown to dark brown. Head, pronotum and wings dark brown; pronotum with obscure rugosities. Palpi brown, antennae uniformly dark brown. Legs pale brown with pale median band and proximal ends on femora; tibiae uniformly pale brown, tarsi darker.

Male. Forewing length 8 mm. Epiproct widest near midlength in dorsal aspect and tapered to an acute apex (Fig. 33); ventrolateral aspect inflated subapically (Fig. 34). Mesal lobe of paraproct slender and curved outward in caudal aspect (Figs. 35-36); outer lobe slender, reaching beyond midlength of mesal lobe; inner lobe short, sclerotized and projecting beyond base. Tergum 9 and 10 without conspicuous sensilla patches. Vesicle widest subapically (Fig. 35); hypoproct only slightly narrowed beyond posterior margin of sternum 9.

Putative female. Forewing length 9 mm. Subgenital plate bearing a pair of projecting, parallel to slightly divergent lobes (Fig. 37).

Larva. Unknown.

Comments. Our identification of this male specimen as *I. javanica*, and its association with this female are both tentative.

Indonemoura malickyi sp. n.

(Fig. 38-41)

Material examined. Holotype ♂ and 1♂ paratype from Thailand, Chiang Mai Province, Doi Inthanon

National Park, CP3TF, LF, 1600 m, 98° 31' N, 18° 31' E, 25 March 1993, H. Malicky (PMSL). Additional Paratypes: Thailand: Chiang Mai Province, Doi Inthanon National Park, W. Gastehaus, 1600 m, 98° 30' N, 18° 32' E, 25 February 1987, 2♂ (PMSL).

Adult habitus. General color brown to dark brown. Head and wings dark brown; quadrate pronotum pale brown with obscure rugosities. Palpi brown, antennae uniformly dark brown. Legs pale brown but distal half of hind femora darker; tibiae uniformly pale brown, tarsi darker.

Male. Forewing length 9.5 mm. Epiproct long, broad and widest near apex; projecting tip divided in dorsal aspect (Fig. 38); ventrolateral aspect bearing a subapical spiny lobe (Fig. 39). Mesal lobe of paraproct long, slender and sclerotized, tip acute in lateral aspect but appearing blunt, or truncate caudally or dorsally (Figs. 40-41); outer lobe reaching beyond midlength of mesal lobe and terminating in a long, slender, acute point. Tergum 10 bearing a few short sensilla adjacent to epiproct tip; tergum nine with patches of sensilla clustered along posterior margin near midlength. Vesicle short and widest at apex (Fig. 40); hypoproct short, wide and bearing a few short, thick setae.

Female. Unknown.

Larva. Unknown.

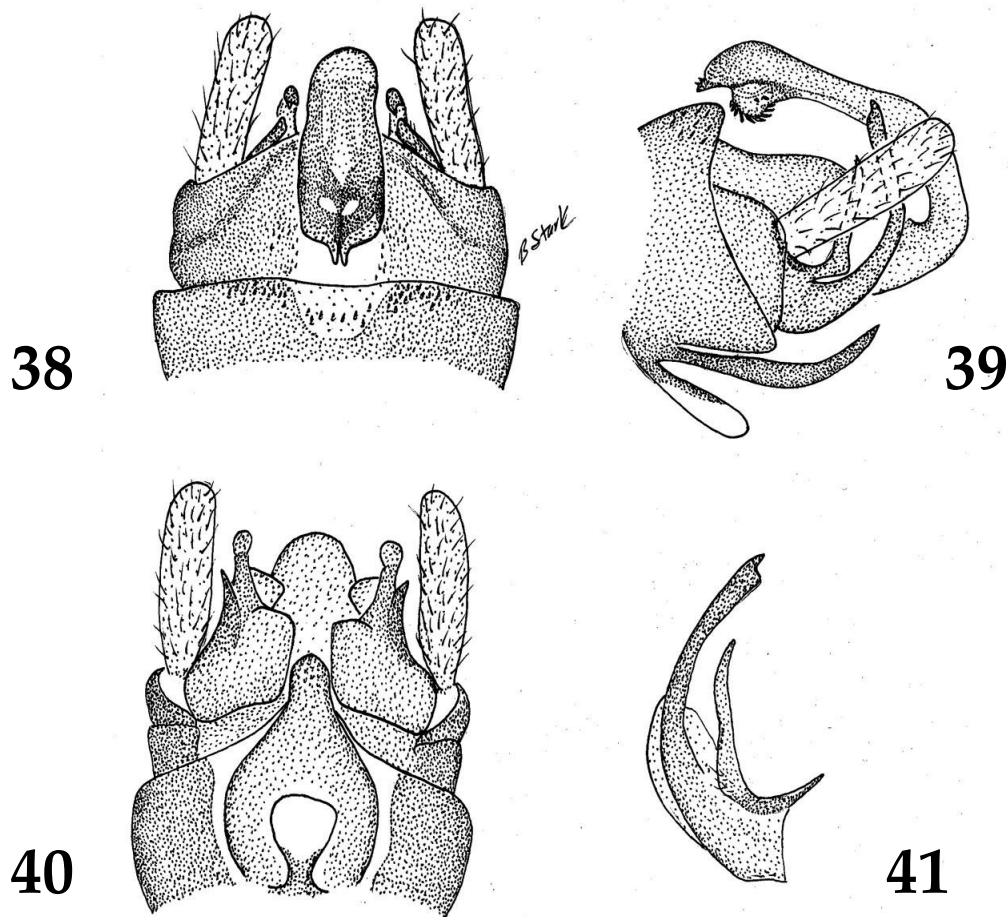
Etymology. The patronym honors Dr. H. Malicky for his numerous contributions of interesting specimens from southeast Asia.

Diagnosis. Several species share the prominent, spiny ventral epiproct lobe with this species (including *I. horvati* among regional congeners) and several also have long, heavily sclerotized paraproct lobes. This species lacks the small projections found on tergum 10 in *I. horvati* and related species, and the long, slightly bifurcate mesal paraproct lobe (Fig. 41) of *I. malickyi* appears to be distinctive.

Indonemoura reducta sp. n.

(Figs. 42-46)

Material examined. Holotype ♂ from Thailand, Chiang Mai Province, Doi Inthanon National Park, Huai Sai Lueng, 1060 m, 98°27' N, 18° 31' E, 7-8 May 2002, blacklight trap, Chiang Mai University team (PMSL). Paratypes: Thailand: Type locality, 3-22 March 2002, 1♂, 1♀ (PMSL). Type locality, 7-8 May



Figs. 38-41. *Indonemoura malickyi*. 38. Male terminalia, dorsal aspect. 39. Male terminalia, lateral aspect. 40. Male terminalia, ventral aspect. 41. Male paraprocts, caudal aspect.

2002, blacklight trap, Chiang Mai University team, 1♀ (PMSL). Chiang Mai Province, Doi Inthanon National Park, Bang Khun Klang, 1200 m, 98° 32' N, 18° 32' E, 6-13 August 1988, 1♂ (PMSL). Chiang Mai Province, Chiang Dao Wildlife Research Center, Chiang Dao, 520 m, 98° 55' N, 19° 21' E, 27 February 2003, 2♂, 1♀ (PMSL). Same site, 22 March 2003, 1♂, 1♀ (PMSL). Same site, 25 April 2003, 1♂, 1♀ (PMSL). Same site, 3-26 May 2002, 1♂ (PMSL). Same site, 22 July 2002, 1♂ (PMSL). Phayao Province, Doi Luang National Park, Namtok Champatong, 620 m, 99° 44' N, 19° 13' E, 24 October 2002, 1♂, 1♀ (PMSL). Phrae Province, Wieng Ko Sai National Park, Namtok Maekueang Luang, tier 1, 350 m, 99° 35' N, 17° 58' E,

22-23 March 2003, 1♂ (PMSL). Same site, 25-26 October 2002, 3♂ (BPS). Same site, 22-23 November 2002, 1♂, 1♀ (PMSL). Phrae Province, Wieng Ko Sai National Park, Namtok Maekueang Luang, tier 7, 430 m, 99° 35' N, 17° 58' E, 22-23 April 2003, 1♂ (PMSL). Huey Nam Ru, 1400 m, 98° 35' N, 19° 23' E, 18 April 1989, 1♂ (PMSL).

Adult habitus. General color brown to dark brown. Head, pronotum and wings dark brown; pronotum with obscure rugosities. Palpi brown, antennae uniformly dark brown. Femora dark brown with fore and mid femore pale in proximal half and hind femora with pale median band; tibiae uniformly brown except pale distally; tarsi dark brown.

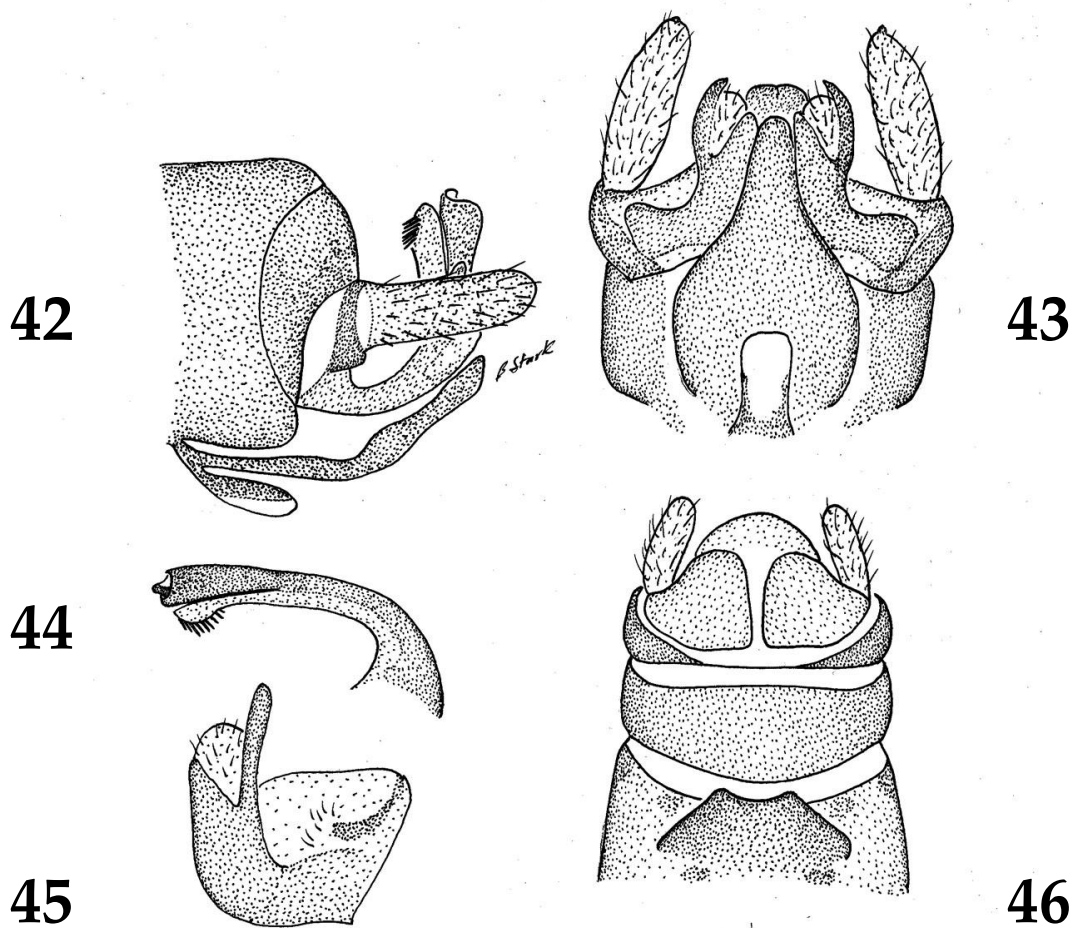
Male. Forewing length 7 mm. Epiproct upright, not recurved over tergum 10 in holotype (Fig. 42); ventrolateral aspect swollen subapically and bearing a small patch of setal spines near tip (Fig. 44). Mesal lobe of paraprocts slender (Fig. 45) and curved inward near tip in ventral aspect; outer lobe reduced, inner lobe triangular and projecting near mesal lobe apex. Terga 9 and 10 without conspicuous sensilla patches. Vesicle with almost parallel lateral margins (Fig. 43); hypoproct slightly narrowed beyond posterior margin of sternum 9 with a broadly rounded apex.

Putative female. Forewing length 8 mm. Subgenital plate hind margin truncate or slightly emarginate (Fig. 46).

Larva. Unknown.

Etymology. The species name refers to the reduced outer paraproct lobe.

Diagnosis. The upright, non-recurved epiproct of this species (Fig. 42) is not common among *Indonemoura* species, and might be anomalous, however the extreme reduction of the outer paraproct lobe (Fig. 45) is also unusual.



Figs. 42-46. *Indonemoura reducta*. 42. Male terminalia, lateral aspect. 43. Male terminalia, ventral aspect. 44. Male epiproct, lateral aspect. 45. Male paraprocts, caudal aspect. 46. Putative female terminalia, ventral aspect.

Indonemoura rostrilobata sp. n.
(Figs. 47-50)

Material examined. Holotype ♂ from Thailand, Loei Province, Phu Hin Rongkla National Park, Huai Man Daeng Noi, 1600 m, 101° 03' N, 16° 57' E, 21 October 2001 (PMSL). Paratype: Vietnam: Lao Cai Province, Sapa, Fan Si Pang Mountains, 25-30 March 1995, W. Mey, 1♂ (ZMB).

Adult habitus. General color brown to dark brown. Head, pronotum and wings dark brown; pronotum with obscure rugosities. Palpi pale, antennae uniformly brown. Legs brown with wide pale band on femora; tibiae uniformly brown, tarsi paler.

Male. Forewing length 6.5 mm (7.5 mm in Vietnam specimen). Epiproct slightly constricted in basal third and narrowed from apical third in dorsal aspect;

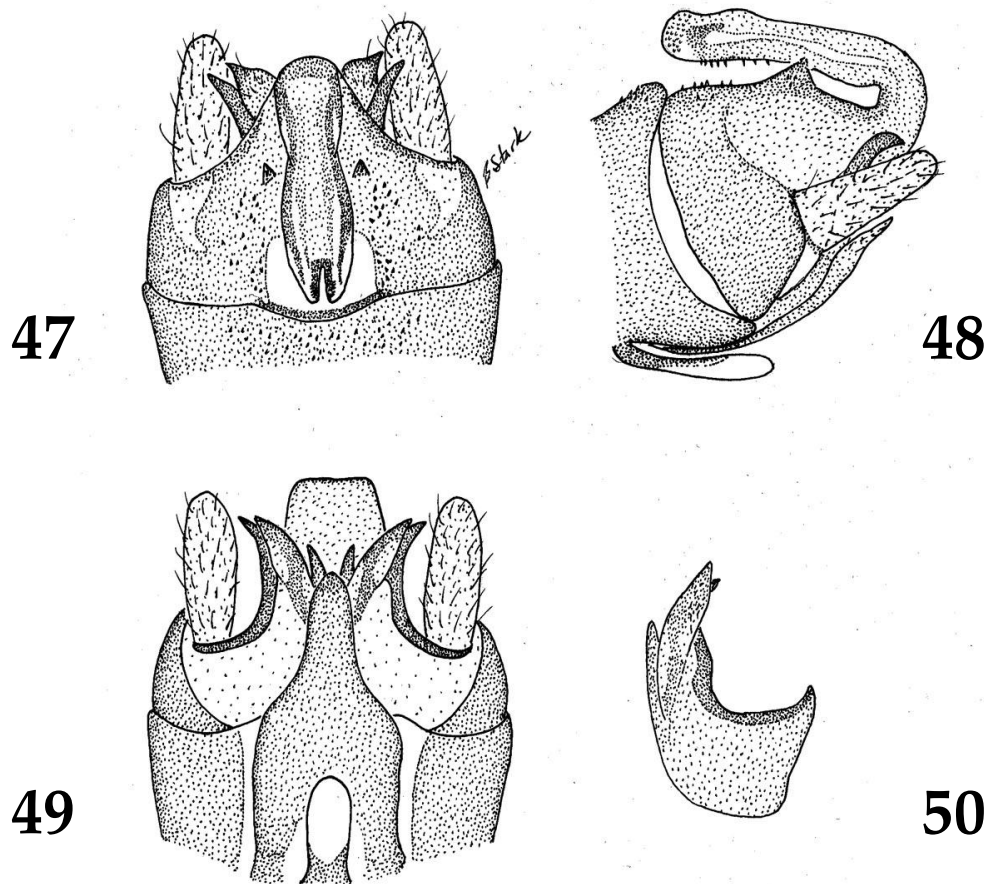
apex deeply notched (Fig. 47); ventrolateral aspect slightly inflated near apex and armed along much of apical half with small spines (Fig. 48). Outer and mesal lobes of paraprocts subequal in length; mesal lobe inflated subapically and beak-like at tips; inner lobes slender (Figs. 49-50). Tergum 10 bearing a pair of midbasal spines and scattered sensilla over surface; tergum 9 with an irregular linear sensilla patch along posterior margin. Vesicle slender with relatively parallel lateral margins (Fig. 49); hypoproct constricted beyond posterior margin of sternum 9 and broadly tapered to apex.

Female. Unknown.

Larva. Unknown.

Etymology. The species name refers to the beak-like form of the mesal paraproct lobe.

Diagnosis. See above under *I. horvati*.



Figs. 47-50. *Indonemoura rostrilobata*. 47. Male terminalia, dorsal aspect. 48. Male terminalia, lateral aspect. 49. Male terminalia, ventral aspect. 50. Male paraprocts, caudal aspect.

Indonemoura tricantha sp. n.
(Figs. 51-53)

Material examined. Holotype ♂ from Tonkin [Vietnam], Frustorfer (NMW).

Adult habitus. General color dark brown. Other details obscured due to specimen condition.

Male. Forewing length 7 mm. Epiproct constricted in basal third, broader in apical third and slightly notched at apex in dorsal aspect (Fig. 51-52); ventral sclerite in lateral aspect produced into a prominent, semicircular structure armed with numerous spines (Fig. 51). Outer lobes of paraprocts heavily sclerotized, terminating in three prominent spines

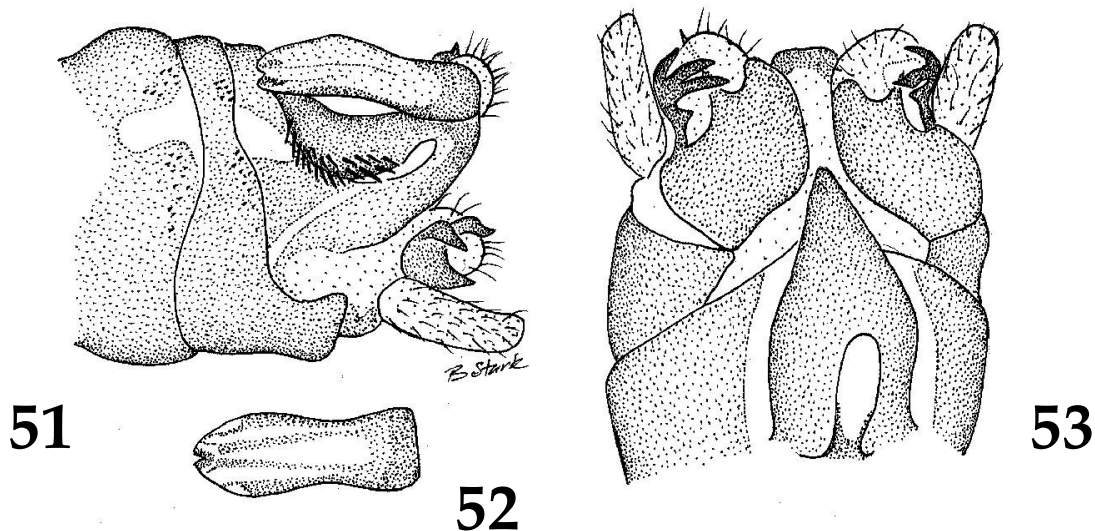
(Figs. 51, 53); mesal lobe sclerotized in basal half, and bearing a truncate apical point and a laterally directed acute point. Tergum 10 with a patch of small anterior spines and tergum 9 with midlateral patches of small spines on either side of median U-shaped membranous area. Vesicle narrow basally, larger in apical half and slightly narrowed near apex (Fig. 53); hypoproct short and triangular in outline.

Female. Unknown.

Larva. Unknown.

Etymology. The species name refers to three acute processes on the outer paraproct lobes.

Diagnosis. See above under *I. clavata*.



Figs. 51-53. *Indonemoura tricantha*. 51. Male terminalia, oblique lateral aspect. 52. Male epiproct, dorsal aspect. 53. Male terminalia, ventral aspect.

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