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**THE ALINGUUM GROUP,
A NEW SPECIES GROUP OF THE GENUS TRICHADENOTECNUM,
WITH DESCRIPTIONS OF TWO NEW SPECIES FROM THAILAND
(PSOCODEA: 'PSOCOPTERA': PSOCIDAE)**

By KAZUNORI YOSHIZAWA and CHARLES LIENHARD

Abstract

YOSHIZAWA, K. and LIENHARD, C. 2015. The *alinguum* group, a new species group of the genus *Trichadenotecnum*, with descriptions of two new species from Thailand (Psocodea: 'Psocoptera': Psocidae). *Ins. matsum. n. s.* 71: 179–188, 5 figs.

The *alinguum* species group is newly proposed in the genus *Trichadenotecnum* (Psocidae: Ptyctini), and diagnosis of the species group is provided. Four named species, *T. alinguum* Endang, Thornton & New, *T. laticornutum* Endang, Thornton & New, *T. sibolangitense* Endang & New, and *T. waykananense* Endang & New are assigned to this species group. Two new species of the *alinguum* group, *T. siamense* and *T. triceratum*, are described and *T. alinguum* is newly recorded from Thailand.

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INTRODUCTION

Yoshizawa et al. (2014) placed *Trichadenotecnum sibolangitense* Endang & New, 2005 in the *majus* group and recognized it as a close relative of *T. arciforme* Thornton, 1961, also a species of the *majus* group. Placement of *T. sibolangitense* in the *majus* group was mainly based on the complete absence of the hypandrial median tongue. The median tongue is a uniquely and widely observed male genital structure of *Trichadenotecnum*. However, it is consistently reduced or absent in the species of the *majus* group, which is recognized as one of the autapomorphies defining this group (Yoshizawa, 2001, 2004; Yoshizawa & Lienhard, 2004; Yoshizawa et al., 2007, 2014). The triangular shape of the hypandrium is also very similar in *T. sibolangitense* and *T. arciforme* (Yoshizawa et al., 2014).

Recent molecular phylogenetic analyses of the genus showed that *T. sibolangitense* and its relatives are only distantly related to the *majus* group (Yoshizawa et al., in press). The observed similarities in male genitalia between *T. sibolangitense* and the *majus* group (Yoshizawa et al., 2014) are now recovered as convergences. In contrast, several male and female genital apomorphies are uniquely shared by *T. alinguum* Endang, Thornton & New, 2002, *T. laticornutum* Endang, Thornton & New, 2002, *T. sibolangitense* and *T. waykananense* Endang & New, 2005 (Yoshizawa et al., 2014). In this paper, we propose the *alinguum* group, a new species group in the genus *Trichadenotecnum* containing these four species. Two new species from Thailand belonging to this species group are also described. Methods and terminologies follow Yoshizawa et al. (2014). Holotypes will be deposited in the Queen Sirikit Botanical Gardens, Thailand.

TAXONOMY

Genus *Trichadenotecnum* Enderlein

The *alinguum* group (new species group)
[= *majus* group I of Yoshizawa et al. (in press)]

Diagnosis. Forewing (Fig. 1) not extensively covered by tiny spots; submarginal spots in r cells well developed, sometimes fused to marginal cloud; spots in m cells less developed, obscure in cell m3. Male terminalia (Figs 2, 3, 5): 8th sternite lacking sclerotized portions. Clunial arm well developed, arising from ventral margin of clunium, pointed apically. Epiproct lobe bilobed anteriorly, weakly to strongly developed. Hypandrium asymmetrical, triangular in overall shape, with long distal projection directed rightward; anterior margin concave; lateral corners with broad sclerotization; median tongue absent. Phallosome rounded anteriorly, open posteriorly, with two short posterior projections. Female genitalia (Fig. 4): Subgenital plate posterolaterally with a pair of long processes. Ventral valve of gonapophyses (not illustrated in this paper: see e.g., Yoshizawa et al., 2014: fig. 19) rather short, with its tip reaching but not exceeding posterior margin of external valve; internal lobe of external valve narrow.

Remarks. Six species, including two new ones described below, are here classified in this species group. Some of them were previously assigned to the *majus* group but this placement was rejected by molecular phylogeny (Yoshizawa et al., in press). Species of this group are known from Thailand, Malaysia and Indonesia.



Fig. 1. Forewings of specimens of the *alinguum* group collected in Thailand. A. *Trichadenotecnum alinguum*. B. *T. siamense* (holotype). C. *T. triceratum* (holotype).

The *alinguum* group was placed as the sister of the *alexanderae* group by molecular phylogeny (Yoshizawa et al., in press). However, statistical supports for their close relationship were low and thus this placement is far from convincing. Placement of the *alinguum* group within *Trichadenotecnum s. str.* (*sensu* Thornton, 1961) is convincing morphologically and molecularly (Yoshizawa et al., in press).

Trichadenotecnum alinguum Endang, Thornton & New
(Figs 1A, 2)

Trichadenotecnum alinguum Endang, Thornton & New, 2002: 163 (from Indonesia, male: not assigned to any previously established species group); Yoshizawa, Lienhard & Idris, 2014: 488 (close affinity with *T. sibolangitense* mentioned).

Specimens examined. 1 male, THAILAND, Nakhon Ratchasima Khao Yai NP, Moist evergreen forest at Dong Suer Paan, 14°27.511N 101°22.408E, 760m, Malaise trap, 19–23. xii.2006, Pong Sandow leg. (T1311). (Tiger12).

Remarks. The specimen examined here is in good agreement with the original description of *T. alinguum*. The male terminal structures illustrated here (Fig. 2) look somewhat different from those in the original illustrations (Endang et al., 2002: figs 319–323) but, after dissecting and slide mounting, similar deformations as drawn in the original description were confirmed. This species was originally recorded from Indonesia (Endang et al., 2002) and is here recorded from Thailand for the first time.

Trichadenotecnum laticornutum Endang, Thornton & New

Trichadenotecnum laticornutum Endang, Thornton & New, 2002: 158 (from Indonesia, female: not assigned to any previously established species group); Yoshizawa, Lienhard & Idris, 2014: 488, 500 (close affinity with *T. sibolangitense* mentioned, assigned to the *majus* group).

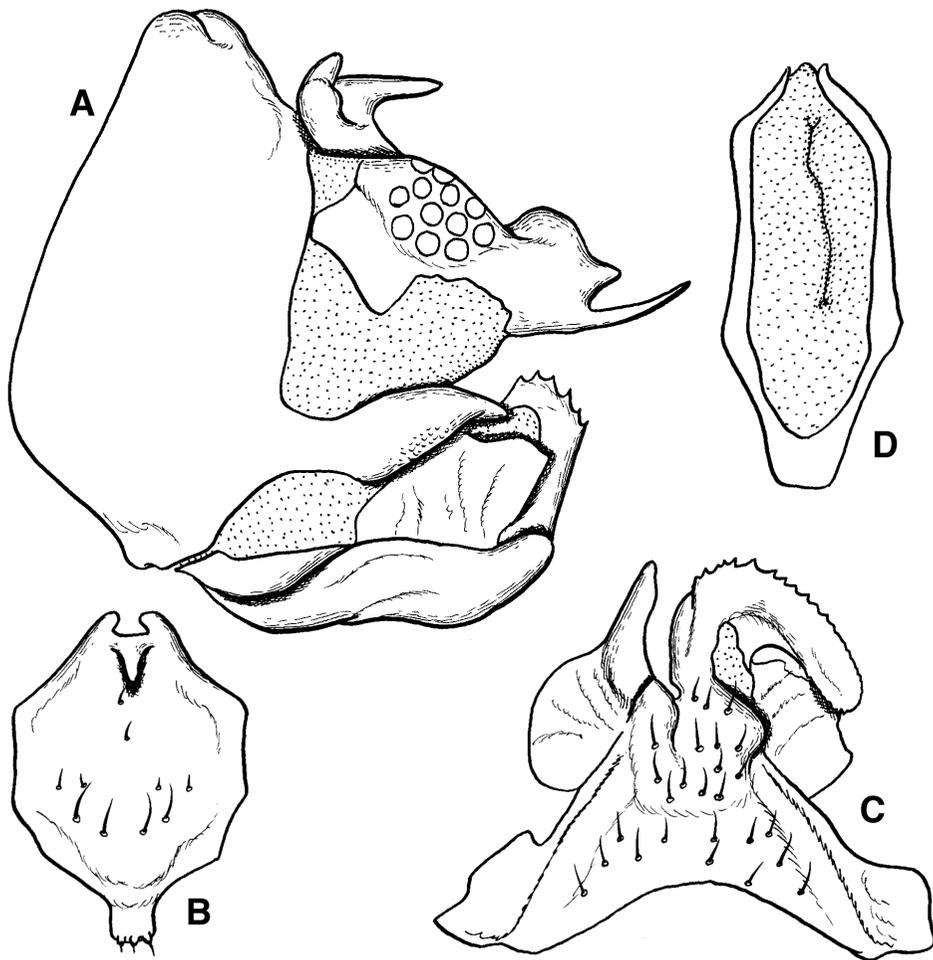


Fig. 2. Male terminal structures of *Trichadenotecnum alinguum*. A. Terminalia, lateral view. B. Epiproct, posterodorsal view. C. Hypandrium, ventral view. D. Phallosome, ventral view.

Remarks. Although this species is known only from females, characteristic forewing markings and the shapes of the female subgenital plate and external valve of gonapophyses clearly show that it belongs to the *alinguum* group. Females of *T. alinguum* have not yet been recorded, thus this species may correspond to the female of *T. alinguum*.

Trichadenotecnum sibolangitense Endang & New

Trichadenotecnum sibolangitense Endang & New, 2005: 27 (Indonesia, male: close affinity with *T. alinguum* mentioned); Yoshizawa, Lienhard & Idris, 2014: 487 (from Malaysia, first description of female, with genitalia of both sexes illustrated: assigned to the *majus* group); Yoshizawa, Yao & Lienhard, in press (DNA sequences).

Trichadenotecnum waykananense Endang & New

Trichadenotecnum waykananense Endang & New, 2005: 25 (from Indonesia, female: close affinity with *T. laticornutum* mentioned); Yoshizawa, Lienhard & Idris, 2014: 488, 500 (close affinity with *T. sibolangitense* mentioned, assigned to the *majus* group).

Remarks. This species is known only from females. The presence of a pair of long posterolateral projections on the subgenital plate strongly suggests its affinity with the species of the *alinguum* group (Yoshizawa et al., 2014). Forewing markings (less developed submarginal spots in r cells and distinct spots in m cells) and shapes of the gonapophyses (broad internal lobe of external valve) of *T. waykananense*, however, look somewhat distinctive from the other species of this group. Therefore, further examinations, such as male genitalia and DNA sequences, are needed to finally confirm its assignment to the *alinguum* group. Similar subgenital projections are also known in some species of the *spiniserrulum* group (Yoshizawa et al., 2007) but, within *Trichadenotecnum s. str.* (Thornton, 1961; Yoshizawa et al., in press), such structures are known only from the *alinguum* group.

Trichadenotecnum siamense n. sp.
(Figs 1B, 3, 4)

Description. Male. Head. White in ground color; vertical markings pale brown, each marking fused with neighbors; orbital markings faint; coronal suture white; epicranial suture narrowly bordered with pale brown band dorsally; frons with two pairs of small brown markings ventrally; eyes black, small (IO/D = 1.7); ocelli white, ocellar field black; gena white, medially with pale brown marking; postclypeus with rows of brown spots ventrally; anteclypeus pale. Antenna and mouthparts pale brown.

Thorax. Prothorax pale brown. Mesonotum mostly pale brown, anterior surface darker, medially with white field, marking on anterior lobe bilaterally divided by narrow white stripe. Metanotum white with faint markings. Meso- and metapleuron brown except for white membranous region; medially with darker longitudinal stripe.

Legs. Almost uniformly brown; ventral surface of all femora white medially.

Forewing (Fig. 1B). Spots in cell a1 well developed. Anterior spot of opposing spots in cell r small, posterior spot well developed, each separated. Basal band not continuous but distinct anteriorly, well developed posteriorly but pale in cell cu1. Median spots reduced, represented by marking along M stem vein and faint posteroproximal marking in discoidal cell. Distal band well developed. Spot on roof of cell m3 small but apparent. Submarginal spots well developed, especially in cell r5, small and faint in cell m3. Marginal cloud obscure except for vein ends and along M1. Hindwing hyaline.

Abdomen white with small brown irregular markings dorsally, brown ventrally.

Terminalia (Fig. 3). Clunial arm (Fig. 3A) long, basally broad and gradually narrowing to pointed tip, ventroapically rugose. Epiproct (Fig. 3A, B) with well developed, widely divergent pair of lobes, each with posterior swelling; anteromedially without projection but with small swelling; posteriorly with three papillae. Hypandrium (Fig. 3C) with distal projection serrated posteriorly and apically, broadly fused to sclerotization of right lateral corner at base; with very narrow and long sclerotization arising from left to distal projection. Phallosome (Fig. 3D) very weakly sclerotized

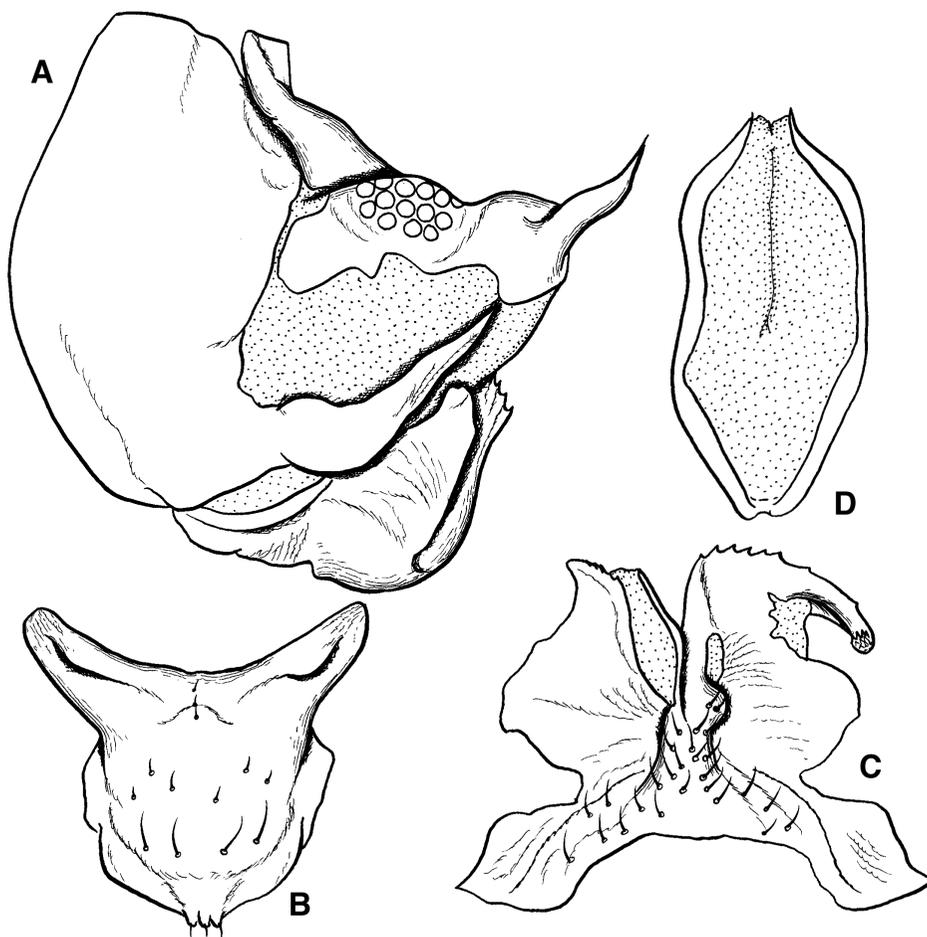


Fig. 3. Male terminal structures of *Trichadenotecnum siamense* (holotype). A. Terminalia, lateral view. B. Epiproct, posterodorsal view. C. Hypandrium, ventral view. D. Phallosome, ventral view.

anteriorly.

Length (in mm). Body (B) 1.5–1.7; forewing (FW) 2.3–2.8; hindwing (HW) 1.8–1.9. Female. Generally as for male. IO/D = 2.2.

Genitalia (Fig. 4). Subgenital plate (Fig. 4A) with pair of pointed processes posteriorly; egg guide short, shorter than basal width; body much broader than long, with broad membranous region anteriorly. Gonapophyses (Fig. 4B). Ventral valve lost during dissection; dorsal valve broad, with short distal process; external valve with membranous region anteriorly, posterior lobe well developed, internal lobe somewhat flattened. Spermapore plate weakly sclerotized and pigmented as in Fig. 4C.

Length. B 1.7–1.8; FW 2.6–2.7; HW 1.8–1.9.

Holotype. Male. THAILAND, Nan Doi Fhu Kha NP, Office 13, 19°12.488N 101°4.907E, 1375m, Malaise trap, 15–22.xii.2007, Charoen & Nikom leg. (T3275) (Tiger14). *Paratypes*. 1 male, THAILAND, Phetchabun Thung Salaeng Luang NP, Pine forest, Gang wang nam yen,

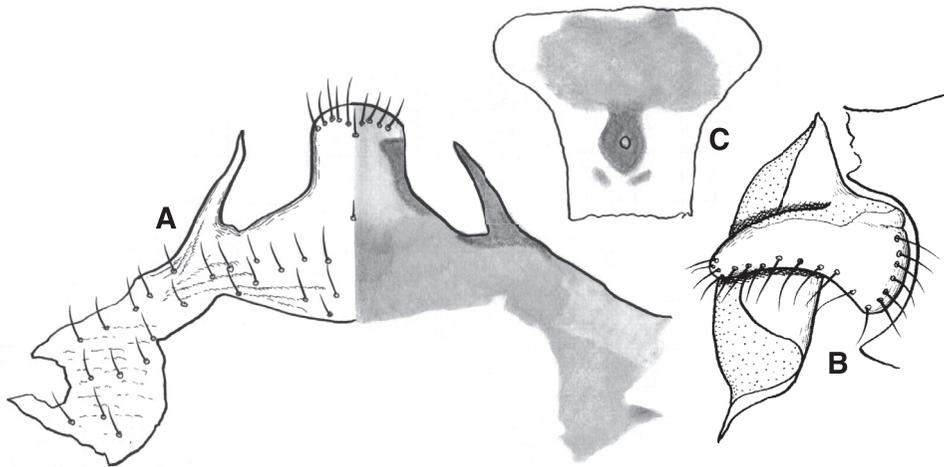


Fig. 4. Female genitalia of *Trichadenotecnum siamense*. A. Subgenital plate. B. Gonapophyses (ventral valve missing). C. Spermapore plate.

16°36.284N 100°53.128E, 749m, Malaise trap, 4–11.i.2007, Pongpitak and Sathit leg. (T1292); 1 male 2 females, THAILAND, Nan Doi Phu Kha NP Office 15, 19°12.133N 101°4.756E, 1310 m, Malaise trap, 15–22. xii. 2007, Charoen & Nikom leg. (T3283).

Etymology. The species epithet refers to Siam, the old name of Thailand.

Remarks. This species is similar to *T. sibolangitense* in the absence of the anteromedian conical process on the epiproct, but this may represent a plesiomorphic condition. Their hypandrial structures are clearly different. The weakly sclerotized condition of the anterior end of the phallosome is uniquely observed in *T. siamense* among the species of the *alinguum* group.

Trichadenotecnum triceratum n. sp.

(Figs 1C, 5)

Trichadenotecnum sp.Tiger11 (KY444): Yoshizawa, Yao & Lienhard, in press (DNA sequences).

Description. Male. Head. White in ground color; vertical markings pale brown, each marking fused with neighbors; orbital markings pale brown; dark brown spot between vertical and orbital markings; coronal suture white; epicranial suture narrowly bordered with pale brown band in lateral half; frons with faint brown markings medially and brown spot ventrolaterally; eyes black, small (IO/D = 1.8); ocelli white, ocellar field black; gena white, medially with pale brown band; postclypeus with rows of faint spots dorsally, spots fused and forming brown marking ventromedially; anteclypeus pale. Antenna and mouthparts pale brown.

Thorax. Prothorax pale brown. Mesonotum mostly white, with posterior part of lateral lobe with brown spot; anterior surface of median lobe pale brown, sutures brown. Metanotum white, anterior margin of metascutellum brown. Meso- and metapleuron brown except for white membranous region; medially with darker longitudinal stripe.

Legs. Almost uniformly brown; distal part of fore- and mid-femora white.

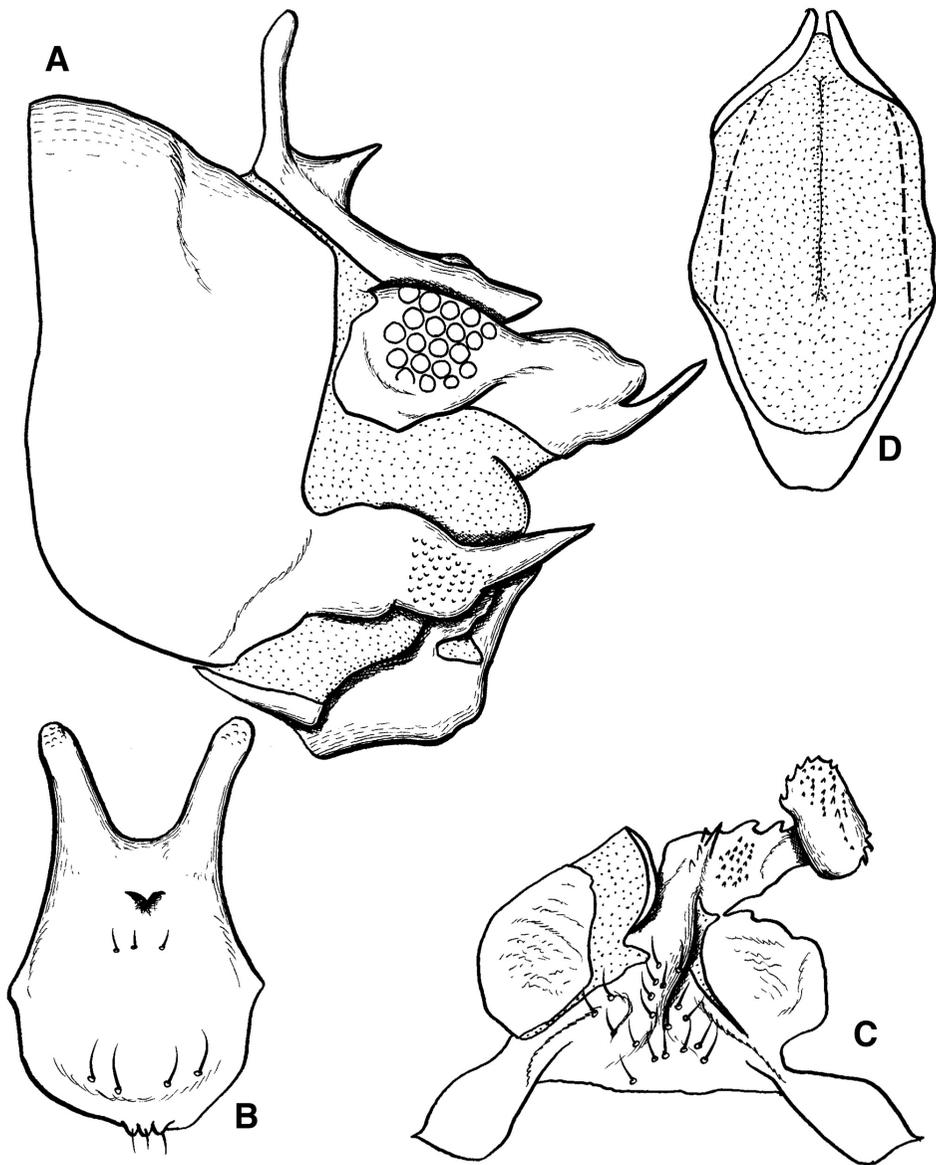


Fig. 5. Male terminal structures of *Trichadenotecnum triceratum* (holotype). A. Terminalia, lateral view. B. Epiproct, posterodorsal view. C. Hypandrium, ventral view. D. Phallosome, ventral view.

Forewing (Fig. 1C). Spots in cell a1 small, especially basal one faint. Opposing spots in cell r small, clearly separated. Basal band reduced anteriorly, only represented by marking around R-M fusion, well developed posteriorly but pale except anterior and posterior ends. Median spots reduced, represented by marking along M stem vein and faint marking posteroproximal of discoidal cell. Distal band well developed but pale. Spot on roof of cell m3 obscure. Submarginal spots well developed, especially in cell r5 expanding distally to marginal cloud, obscure in cell m3. Marginal cloud obscure except for vein ends and along M1. Hindwing hyaline.

Abdomen white with small brown irregular markings dorsally, brown ventrally.

Terminalia (Fig. 5). Clunial arm (Fig. 5A) long, broad in basal half, median surface with papillae, narrowing to pointed tip distally. Epiproct (Fig. 5A, B) with well developed pair of narrow lobes, each with papillae apically; anteromedially with well developed conical projection; posteriorly with three papillae. Hypandrium (Fig. 5C) with distal projection broadly serrated, medially covered with denticules, apically broadened and directed posteriorly, covered with denticules; with short sclerotization arising from left to distal projection. Phallosome (Fig. 5D) broadly sclerotized and closed basally.

Length. B 1.5–1.6; FW 2.2–2.9; HW 1.7–2.0.

Female unknown.

Holotype. Male. THAILAND, Phetchabun, Nam Nao NP, Pine forest/Sambon3, 16°42.41N 101°35.3E, 868m, Malaise trap, 2–9.x.2006, Leng Janteab leg. (T4986) (Tiger11, KY444). *Paratypes*. 1 male, THAILAND, Phetchabun, Nam Nao NP, Heliport, 16°43.113N 101°35.134E, 889m, Malaise trap, 8–15.i.2007, Leng Janteab leg. (T1443); 1 male, THAILAND, Phetchabun, Thung Salaeng Luang NP, Gang Wang Nam Yen, 16°34.36N 100°52.827E, 725m, Malaise trap, 29.i–4.ii.2007, Pongpitak & Sathit leg. (T1585).

Etymology. The species epithet (tri = three; cerato = horn) refers to the three long projections (one anteromedian process and a pair of narrow lobes) arising from the male epiproct (Fig. 5A, B).

Remarks. This species is considered as a close relative of *T. alinguum* due to the synapomorphic presence of the long anteromedian conical process on the epiproct, although the epiproct lobes are otherwise significantly different in these two species. A well developed and bilobed epiproct lobe is widely observed in the *alinguum* group, including *T. triceratum*. Therefore, the bilobed but very weakly developed condition of the epiproct lobe in *T. alinguum* (Fig. 2B) probably represents the derived condition.

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