

ORIGINAL ARTICLE

Eulophine parasitoids of the genus *Trichospilus* in Indonesia, with the description of two new species (Hymenoptera: Eulophidae)

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Two new species of the parasitoid wasp genus *Trichospilus* (Chalcidoidea: Eulophidae: Eulophinae) are described from Java and Sulawesi, Indonesia. A key to all species of *Trichospilus* worldwide is provided.

Key words: Chalcidoidea, identification key, Java, Sulawesi, *Trichospilus striatus* sp. nov., *Trichospilus politus* sp. nov.

INTRODUCTION

Trichospilus Ferrière, 1930, is a small genus in the eulophid tribe Eulophini, with six species so far recognized (Ferrière 1930; Cherian & Margabandhu 1942; Bouček 1976, 1988; Zhu *et al.* 2002). Members of the genus are gregarious pupal parasitoids mainly of lepidopteran caterpillars (Noyes 2003). Of the six species, three (*T. boops* Bouček, 1976; *T. ferrierei* Bouček, 1976; *T. vorax* Bouček, 1976) are known only from Africa, and *T. lutelineatus* (Liao *et al.* 1987) has been recorded only from Zhejiang, China (Noyes 2003). The remaining two species, *T. diatraeae* Cherian and Magabandhu, 1947, and *T. pupivorus* Ferrière, 1930, occur widely in tropical and subtropical areas throughout the world, but they seem to have been introduced into various parts of the world from tropical Asia as biological control agents (Dharmaraju 1963; Bouček 1976; Noyes 2003).

In the course of faunal and taxonomic study of eulophid parasitoids in Indonesia (Ubaidillah *et al.* 2000; Ubaidillah & Kojima 2002, 2006; Ubaidillah 2004), three species of *Trichospilus* have been recognized, two of which are described in the present paper. A key to all species of the genus is provided.

MATERIALS AND METHODS

Specimens studied were collected by sweep-netting and Malaise trapping. Terminology follows Bouček (1988) and Gibson (1997). Acronyms for the museums/institutions in which the specimens are deposited are as follows: ANIC, Australian National Insect Collection; CSIRO, Canberra, Australia; IUNH, Natural History Collection, Ibaraki University, Mito, Japan; MNHN, Museum National d'Histoire Naturelle, Paris, France; MZB, Museum Zoologicum Bogoriense, Bogor, Indonesia.

RESULTS AND DISCUSSION**Genus *Trichospilus* Ferrière**

Trichospilus Ferrière (1930): 358. Type species: *Trichospilus pupivora* Ferrière, 1930, by monotypy.

Diagnosis. Small (0.9–2.0 mm long); body predominantly yellow-orange or almost brown; head short; frontovertex convex, with sparse hairs; scrobes depressed, horseshoe-shaped; eye relatively large, oval; antennal torulus situated at or below the level of ventral margin of eye; antenna short, with scape short and slender, funicle consisting of two articles, and clava of three articles; pronotum large, with four long setae (paired dorsolateral setae and one laterally) along posterior margin; notaulus complete, reaching posterior margin of mesoscutum; median disk of mesoscutum with two pairs of setae; scutellum without sublateral groove, with two pairs of setae; propodeal median

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carina ending anteriorly in small lamina; plica present; metasoma semioval in dorsal view and flat dorsally, with petiole (=segment I) short and transverse.

***Trichospilus striatus* sp. nov.** (Figs 1–3,6,10)

Diagnosis. This species is characterized by the granulated sculpture on the vertex, pronotum and mesoscutum (Figs 1,6), the disk of scutellum with fine longitudinal striation on the entire surface (Figs 1,6), and the axilla finely striated.

Female. Body length 1.1–1.2 mm (holotype 1.15 mm). Forewing length 0.7–0.8 mm (holotype 0.7 mm).

Head and mesosoma brown; antennal scape and pedicel yellowish brown; anelli, funicle and clava pale yellow; legs brown, except fore and mid coxae pale yellow, and hind coxa dark brown. Metasomal terga brown, except for anterior margin of tergum I, lateral margins of terga III and IV, and median parts of terga V–VII, all dark brown (Fig. 1); sterna brown, but anterior and posterior margins of each sternum black; ovipositor sheath black.

Head in frontal view (Fig. 3) approximately 1.2-fold as wide as high, and approximately 1.1-fold as wide as mesoscutal width. Vertex finely granulated. Eyes with sparse, short setae; ocellular distance (=distance between posterior ocellus to inner eye margin) much shorter than distance between posterior ocellus and anterior ocellus; distance between posterior ocelli approximately 4.5-fold as long as ocellular distance. Scape, at rest, ending at the lower margin of anterior ocellus; pedicel 1.2-fold as long as first funicular article; first and second funicular articles equal in length; clava approximately three-fold as long as first funicular article (Figs 1,2). Scrobes finely granulated (Figs 1,3). Malar space approximately 0.3-fold as long as eye height; malar sulcus straight (Fig. 2).

Pronotum without transverse carina, finely granulated (Fig. 1). Median lobe of mesoscutum more coarsely granulated than vertex, with two pairs of thick black setae (Figs 1,6); lateral lobe finely granulated, with two thick setae; axilla finely striated. Entire surface of scutellar disk finely striated (Figs 1,6). Dorsellum smooth, broad, approximately 0.3-fold as long as scutellar disk. Propodeum 0.4-fold as long as scutellar disk, smooth, engraved with reticulation around propodeal spiracle; callus with five setae (Figs 1,6).

Lateral margins of metasomal terga and most of tergum VI with sparse hairs.

Hind coxa finely reticulate dorsally; first tarsomere of hind leg slightly shorter than second. Forewing 2.5-fold as long as broad (Figs 1,10); submarginal vein with

three dorsal setae; ratio of lengths of submarginal, marginal, stigmal and postmarginal veins 25:42:8:11; basal cell and speculum bare, remaining parts of forewing densely pubescent; area behind proximal part of marginal vein and most area behind stigmal vein with dark infuscation.

Male. Unknown.

Holotype. ♀ (MZB), labeled “Indonesia, South Sulawesi, Maros, Leang-leang, 04°59′N 119°40′E, 18.ix.2003, R. Ubaidillah & J. Kojima, sweep sample” and “♀ *Trichospilus striatus* Ubaidillah, sp. nov. Holotype.”

Paratypes. 2♀ (IUNH, MNHN), South Sulawesi: Bantimurung, secondary seasonal forest, 20 m, 31.vii–11.viii.2005, Dougeron, C. Villemant.

Distribution. Known only from South Sulawesi.

Host. Unknown.

Etymology. The specific name, *striatus*, is a Latin adjective for “striped,” referring to the distinct striation on the scutellar disk.

Remarks. *Trichospilus striatus* sp. nov. is very similar to *T. boops* Bouček (1976) from the Afrotropics, but it can be distinguished from the latter by having the scutellar disk with striation on its entire surface (Figs 1,4), the vertex and frons finely granulated, and the metasomal terga with three black spots on each lateral margin and one black spot on the last tergum.

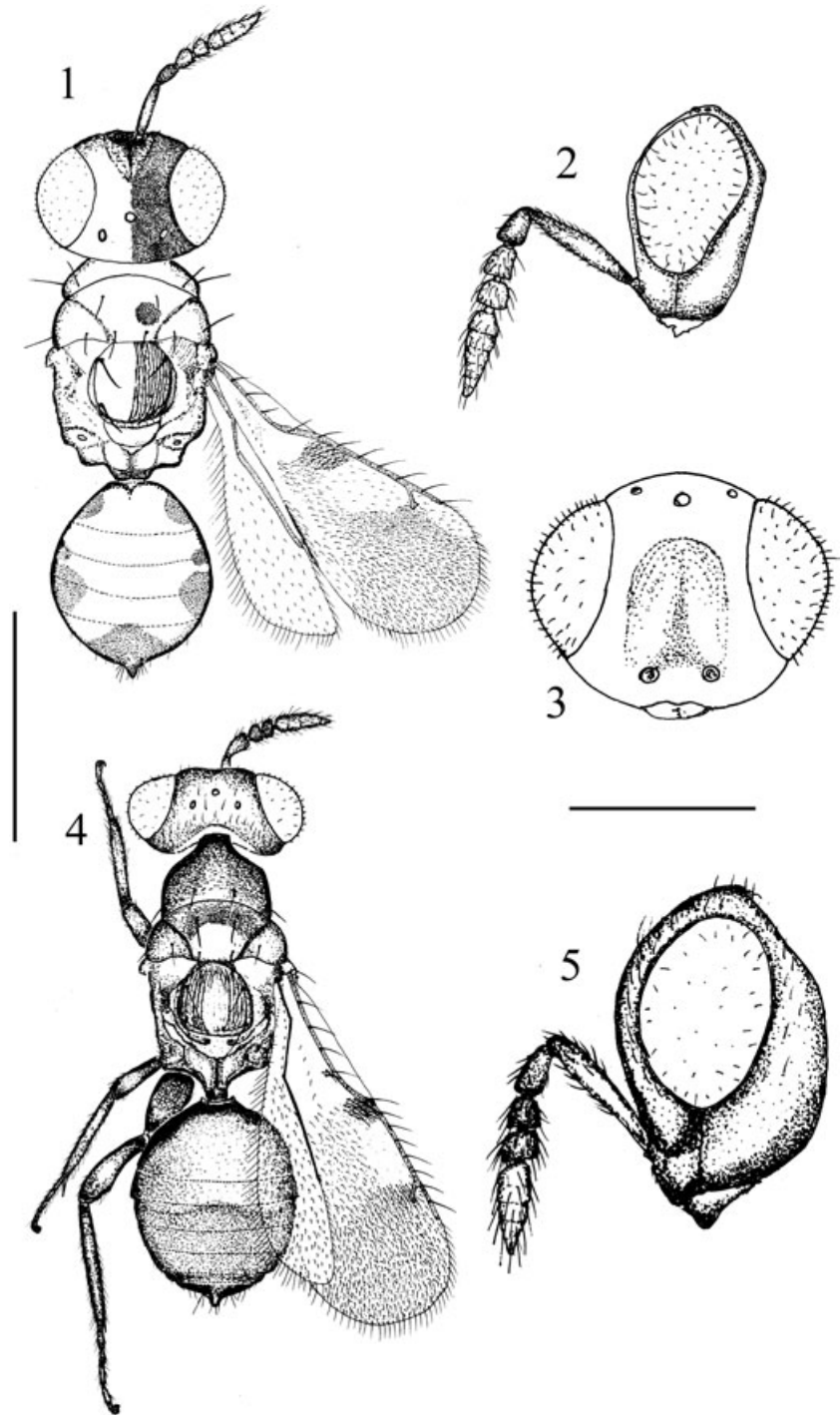
***Trichospilus politus* sp. nov.** (Figs 4–5,7,11)

Diagnosis. This species is characterized by having the mesoscutal median disk smooth and shiny in the posterior half (Fig. 7), the basal line of the forewing with three thick black hairs, and the area behind the proximal end of the marginal vein with dense dark hairs.

Female. Body length 0.9–1.1 mm (holotype, 1.1 mm). Forewing length 0.7–0.8 mm (holotype 0.8 mm).

Body light brown; scape yellowish brown, with apex dark brown; pedicel and funicle dark brown; clava yellowish brown, paler in apex; all legs yellowish brown. Metasomal terga dark brown, except for posterior parts of terga I and II light brown; sterna yellowish brown, but anterior and posterior margins of each sternum black; ovipositor sheath black.

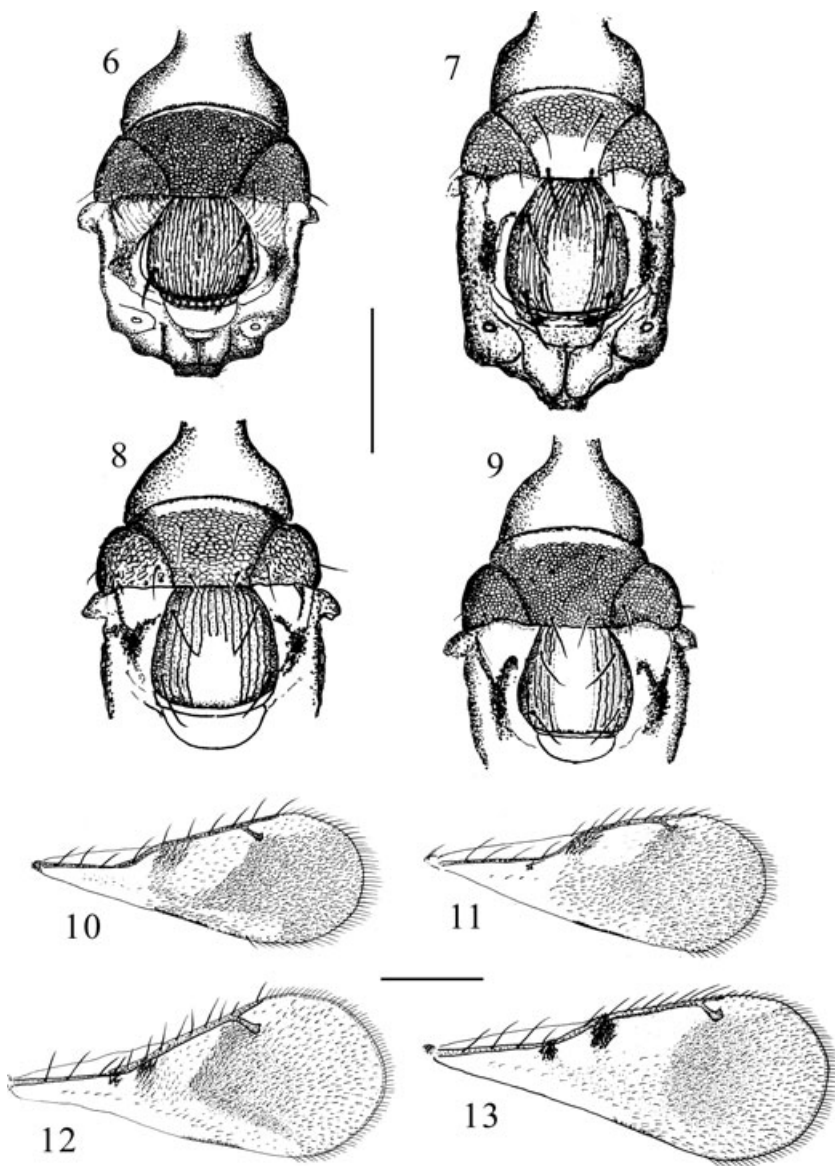
Head in frontal view wider than high, approximately 1.1-fold as wide as mesoscutal width. Vertex smooth (Fig. 4). Eye with sparse short setae (Figs 4,5); ocellular distance shorter than distance between posterior ocellus and anterior ocellus; distance between posterior ocelli approximately two-fold as long as ocellular distance. Scape, at rest, ending at the lower margin of anterior ocellus; pedicel 1.3-fold as long as first funicu-



Figures 1–5 Holotypes (female) of new *Trichospilus* species. 1–3 *T. striatus* sp. nov. (1 habitus in dorsal view; 2 head in lateral view; 3 head in frontal view); and 4,5 *T. politus* sp. nov. (4 habitus in dorsal view; 5 head in lateral view). Scale lines: 0.5 mm (1,4); 0.25 mm (2,3,5).

lar article; first funicular article slightly thinner than second article and approximately 0.9-fold as long as the second (Figs 4,5). Scrobe finely reticulate, distinctly wider than high. Malar space approximately 0.3-fold as

long as eye height, with elongated shallow groove running from lower margin of eye to lateral margin of antennal torulus; malar sulcus straight, without small fovea on eye margin (Fig. 5).



Figures 6–13 Characters of *Trichospilus* females. Mesosoma in dorsal view (6–9) and forewing (10–13) of *Trichospilus* species females. 6,10 *T. striatus* sp. nov., holotype (6 mesosoma in dorsal view; 10 forewing); 7,11 *T. politus* sp. nov., holotype (7 mesosoma in dorsal view; 11 forewing); 8,13 *T. pupivorus* Ferrière (8 mesosoma in dorsal view; 13 forewing); 9,12 *T. diatraeae* Cherian and Magabandhu (9 mesosoma in dorsal view; 12 forewing). Scale lines: 0.25 mm.

Pronotum without transverse carina, reticulately sculptured (Fig. 7). Mesoscutal median lobe finely reticulate in anterior half, smooth and shiny in posterior half; axilla smooth and shiny (Figs 4,7). Scutellar median disk finely striated, but posterior half to two thirds of median part smooth (Figs 4,7). Propodeum approximately 0.7-fold as long as scutellar disk, smooth, with reticulation around propodeal spiracle (Fig. 7).

Hind coxa finely reticulate dorsally; first tarsomere of hind leg slightly shorter than the second. Forewing 2.5-fold as long as broad; submarginal vein with four dorsal setae; ratio of lengths of submarginal, marginal, stigmal

and postmarginal veins 25:30:10:18; basal cell and speculum bare; basal line with three thick hairs; area behind proximal part of marginal vein clothed with dense hairs (Figs 4,11).

Male. Unknown.

Holotype. ♀ (MZB), labeled “Indonesia, West Java, Bandung, Cimidy, Gunung Patuha 07°09’59” S 107°24’39”, 13.x.2004. Coll. R. Ubaidillah” and “♀ *Trichospilus politus* Ubaidillah, sp. nov. Holotype.”

Paratype. 1♀ (MZB), Domoga Bone National Park, Torout, Sulawesi, vs 1985, J.S. Noyes.

Distribution. Known only from West Java and North Sulawesi.

Host. Unknown.

Etymology. The specific name, *politus*, is a Latin adjective for “polished,” referring to the mesoscutal median disk being polished or smooth in the posterior half.

Remarks. This species is very similar to *T. diatraeae* (six specimens from Pakistan and 17 specimens from India deposited in the ANIC and identified by J. LaSalle were examined); both have the vertex smooth, an infusate spot distal to the speculum of the forewing, and the area behind the proximal part of the marginal vein with dense hairs (Figs 11,12). However, they can be separated from each other by the condition of the mesoscutal median lobe, which is finely reticulated on its entire surface in *T. diatraeae* (Fig. 9), whereas it is smooth in the posterior half in *T. politus* (Fig. 7). Also, the metasomal terga of *T. politus* are brown, whereas they are marked with a longitudinal dark brown band in *T. diatraeae*.

***Trichospilus pupivorus* Ferrière (Figs 8,13)**

Trichospilus pupivora Ferrière (1930): 358, 359.

Trichospilus pupivorus Ferrière: Bouček (1988): 633, fig. 1098.

Diagnosis. This species can be easily distinguished from other *Trichospilus* species by the mesoscutal disk being finely reticulate, the forewing having two tufts of thick erect black hairs, one just behind the proximal end of the parastigma and the other behind the proximal end of the marginal vein (Fig. 13), and the metasoma being predominantly dark brown with a yellowish-brown spot on tergum I.

Specimens examined. Indonesia: 2♀ (MZB), Ciburayut, Gombong, Sukabumi, West Java, 18–14.vi.2004, M. Rofik, Malaise traps; 1♀ (MZB), Bogor Botanical Garden, Bogor, 8.v.2002. R. Ubaidillah; 1♀ (MNHN), Bantimurung, secondary seasonal forest, South Sulawesi, 20 m, 31.vii–11.viii.2005, Dougeron, C. Villemant.

Distribution. This species is South-East Asian in origin, but has been imported into other areas of the world. It has been recorded from Mauritania, Barbados, India, Sri Lanka, Burma, Malaysia, Indonesia and New Guinea (Noyes 2003).

Host. Noctuid and Pyralid moths (Noyes 2003).

Remarks. This species was described by Ferrière (1930) based on specimens from India, Sri Lanka, the Malay Peninsula and Java. Bouček (1976) designated the specimen from Coimbatore, India, as the lectotype. This

species is distinctive in *Trichospilus* in having two tufts of thick erect black hairs on the forewing.

Key to species of *Trichospilus* worldwide

The present key was produced based on that of Bouček (1976) with additions and modifications to include the two species described in the present paper. Although I have not seen any type specimens of *T. lutelineatus* (Liao *et al.* 1987), judging from the original description (Liao *et al.* 1987: 115–116), the species seems to be a synonym of *T. diatraeae*, thus *T. lutelineatus* is not included in the present key.

- 1 Vertex, pronotum, mesoscutum granulated (Fig. 1); entire surface of scutellar disk with longitudinal striae (Figs 1,6). Forewing mainly infusate distally (Figs 1,10), without any tuft of thick hairs, with basal line bare (Figs 1,10). Metasomal tergae III and IV black laterally, V and VI black medially (Fig. 1) *T. striatus* sp. nov.
- Vertex smooth and shiny; pronotum and mesoscutum reticulately sculptured; scutellar disk not entirely striated, with smooth median area (Figs 7–9). Forewing with or without tuft of thick hairs, or with infusate area on distal part; basal line with hairs. Metasomal black markings, if present, in different arrangement (Fig. 4) 2
- 2 Forewing with two distinct tufts of thick erect black hairs, one behind proximal end of parastigmal vein and the other behind proximal end of marginal vein (Fig. 13). Pronotum with fine transverse carina delimiting collar 3
- Forewing without distinct tufts of hairs, but mainly infusate distally (Figs 11,12). Pronotum without transverse carina 5
- 3 On forewing, area distal to level of proximal tuft of setae infusate and covered with dense hairs, but infuscation becoming weaker distally; speculum and area between distal tuft and stigmal vein transparent, the former without setae and the latter with sparse hairs (see Bouček 1976; fig. 3). Median smooth area of scutellar disk reduced, not reaching the anterior margin of scutellum (see Bouček 1976; fig. 4) *T. vorax* Bouček
- Forewing extensively bare and transparent in speculum and area between distal tuft and stigmal vein. Median smooth area of scutellar disk extending to anterior margin of scutellum 4
- 4 Mesoscutal median disk shiny, weakly sculptured at least anteriorly; pronotum without transverse carina. Body length approximately 1.5 mm *T. pupivorus* Ferrière

- Mesoscutal median disk dull, finely reticulated; pronotum with transverse carina (see Bouček 1976; fig. 1). Body length approximately 2.0 mm
 *T. ferrierei* Bouček
- 5 Mesoscutal median disk smooth and shiny in posterior half, reticulately sculptured in anterior half (Fig. 7). On forewing, basal line with three thick setae; area behind proximal end of marginal vein clothed with dense setae (Figs 4,11) *T. politus* sp. nov.
- Mesoscutal disk reticulately sculptured entirely. Basal line of forewing with two or more thick black setae 6
- 6 Infuscation on forewing extensive, broadly reaching anterior margin beyond stigmal vein and distal margin of the wing (see Bouček 1976; fig. 6). Eyes densely pilose even dorsally. Metasomal terga pale-yellow medially, infuscated on lateral and apical margins *T. boops* Bouček
- Infuscation on forewing much reduced, barely extending distally beyond level of stigmal vein (Fig. 12). Eyes dorsally less hairy. Metasomal terga infuscate medially, testaceous anterolaterally
 *T. diatraeae* Cherian and Magabandhu

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