

Three new brachypterous species of *Trimorus* Förster (Hymenoptera, Scelionidae) from Japan

Yoto Komeda¹, Toshiharu Mita², Kenzo Yamagishi³

1 Entomological Laboratory, Graduate School of Bioresource and Bioenvironmental Sciences, Kyushu University, Hakozaki 6-10-1, Fukuoka, 812-8581 Japan **2** Entomological Laboratory, Faculty of Agriculture, Kyushu University, Hakozaki 6-10-1, Fukuoka, 812-8581 Japan **3** Entomological Laboratory, Faculty of Agriculture, Meijo University, Shiogamaguchi, Nagoya, 468-8502 Japan

Corresponding author: Yoto Komeda (kome123k123@gmail.com)

Academic editor: P. Jansta | Received 16 January 2018 | Accepted 25 March 2018 | Published 30 April 2018

<http://zoobank.org/F446E760-99FE-499D-AF5E-BF298735A6C6>

Citation: Komeda Y, Mita T, Yamagishi K (2018) Three new brachypterous species of *Trimorus* Förster (Hymenoptera, Scelionidae) from Japan. Journal of Hymenoptera Research 63: 15–32. <https://doi.org/10.3897/jhr.63.23671>

Abstract

Three new brachypterous species of *Trimorus* Förster, *T. coriaceus* **sp. n.**, *T. granulatus* **sp. n.**, and *T. haniyasu* **sp. n.** were described from Japan. Keys to species of Eastern Palearctic brachypterous *Trimorus* and Japanese male of *Trimorus* are provided.

Keywords

Taxonomy, Teleasinae, East Asia

Introduction

The genus *Trimorus* Förster, 1856 is one of the largest genus in Scelionidae, comprising 389 species (Johnson 2018). Among Scelionidae, the brachypterous females are somewhat common, especially of spider egg parasitoids. Females of *Baeus* Haliday, 1833 are always apterous, although males have developed wings. In *Idris* Föester, 1856, females of some species have shortened wings, however, others species are macropterous. Wing polymorphisms are reported in some heteropterous egg parasitoids (e.g. Gryonini Szabó, 1966 and Telenomini Thomson, 1860 (Kononova and Kozlov 2001)). Brachyp-

teries in these genera are results of adaptation for their habitats; most of them live and search their host in soils or under litters. Also, among *Trimorus*, egg parasitoids of Carabidae (Masner 1975) and Staphylinidae (Staniec 2005) (Coleoptera), brachyptery is also known in 67 species (Kieffer 1926; Dodd 1930; Nixon 1936; Fouts 1948; Graham 1984; Buhl 1998; Kozlov and Kononova 2007: see also Suppl. material 1). Kieffer (1926) reported 34 brachypterous *Trimorus* (mainly *Hoplogryon* Ashmead at that time) from Europe, North America, and Africa. Dodd (1930) described five brachypterous species from Australia. Kononova and Kozlov (2001) recognized 11 brachypterous species from the Palearctic region mainly in Europe and the Russian Far East. However, no species are recorded from East Asia. In the present study, we describe three new brachypterous species from central Honshu Island and Kyushu Island, Japan.

Methods

Specimens examined in the present study have been deposited in collections of the Entomological Laboratory of Kyushu University, Fukuoka, Japan (ELKU) and Entomological Laboratory of Meijo University, Nagoya, Japan (ELMU). The following abbreviations were used for collecting methods: EmT – emergence trap, MT – Malaise trap, PT – pitfall trap, and YPT – yellow pan trap.

Photos were taken by Canon MP-E65mm micro lens mounted on Canon EOS 60D, combined by CombineZM, and processed in GIMP 2.8.14. SEM images were taken by Hitachi S-3000N.

Morphological terminology and measurements follow Masner (1980), Mikó et al. (2007, 2010), and Komeda et al. (2016). The description of surface sculpture follows Eady (1968) and Harris (1979). Abbreviations used for additional measurements are mainly as Mikó et al. (2010), and some additional abbreviations as : A2–6 – length of female antennomere 2–6, A5L – length of male antennomere 5, A5W – apical width of male antennomere 5, and ty – length of tyloid.

Taxonomy

Trimorus coriaceus sp. n.

<http://zoobank.org/A6761D41-4A05-486D-B221-46167ADCE361>

Figs 1; 4

Diagnosis. Female. Frons coriaceous. A2–4 same length. Mandible tridentate; teeth almost same length. Mesoscutum flat, densely punctate–imbricate. Mesoscutellum flat, imbricate. Postacetabulum imbricate–smooth. Fore and hind wings reaching posterior edge of T1. T1 with slightly developed horn; T3 coriaceous with dense setae.

Description. Female ($n = 3$): Length = 0.88–0.90 mm ($m = 0.89$).

Color (Fig. 1A, B). Body light brown; head and A3–12 dark brown.

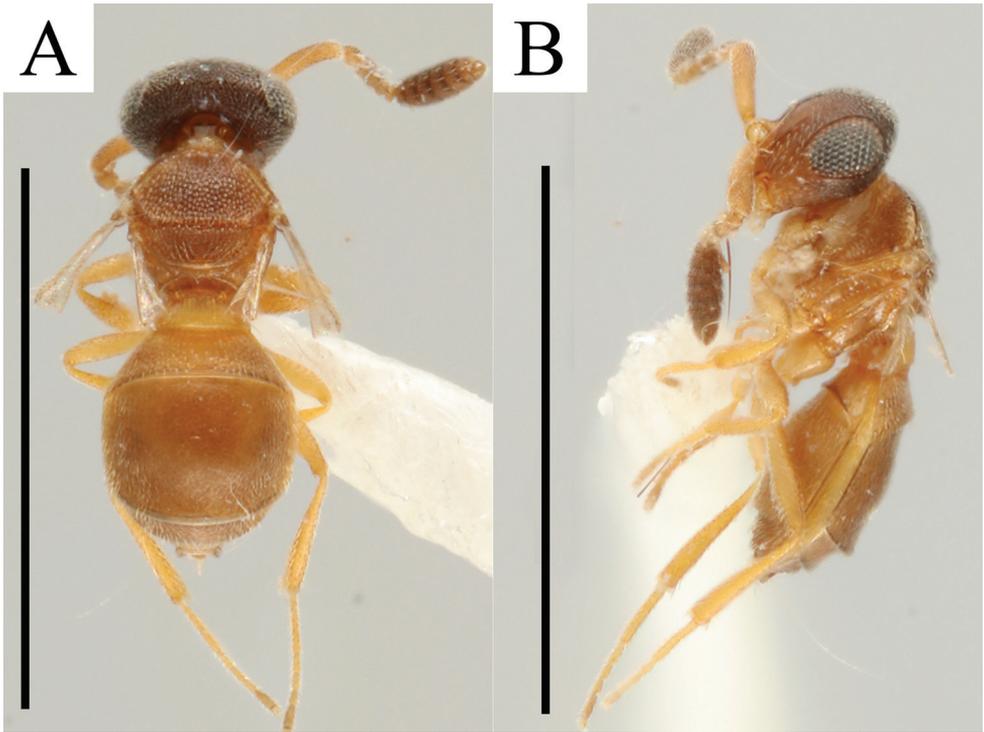


Figure 1. *Trimorus coriaceus* sp. n. **A** female, dorsal view **B** female, lateral view. Scale bars: 1 mm.

Head. FCI = 1.18–1.21 ($m = 1.19$); LCI = 1.50–1.62 ($m = 1.55$); DCI = 1.81–1.90 ($m = 1.84$) HW/IOS = 1.60–1.65 ($m = 1.62$); head about 1.3 times as wide as mesosoma (HW/TSL = 1.27–1.33, $m = 1.31$). Frons (Fig. 4A) coriaceous with dense setae; frontal patch absent; central keel incomplete; antennal scrobe small, smooth, without setae; interantennal process (Fig. 1B) rounded without setae. Vertex coriaceous with dense setae; POL as long as OOL (POL/OOL = 1.00–1.14, $m = 1.05$); OOL 1.5 times as long as LOL (OOL/LOL = 1.40–1.60, $m = 1.53$); hyperoccipital carina absent; vertex patch absent. Eyes with dense setae. Malar region costate; facial striae expanding to bottom of eye; orbital carina extending to top of eye. Gena coriaceous with dense setae; genal patch absent. A1 (Fig. 4B) about 5.7 times as long as radicle ($A1/r = 5.50$ – 5.75 , $m = 5.67$), about 11.3 times as long as A6 ($A1/A6 = 11.00$ – 11.50 , $m = 11.33$), as long as clava ($A1/cl = 1.00$ – 1.05 , $m = 1.03$); A2–4 same length, about 2 times as long as A6 ($A2/A6 = 2.00$; $A3/A6 = 2.00$; $A4/A6 = 1.50$ – 2.00 , $m = 1.83$); A5 as long as A6 ($A5/A6 = 1.00$). Mandible tridentate; all teeth of mandible almost same length.

Mesosoma. Pronotal suprahumeral sulcus foveolate; epomial carina incompletely present; cervical pronotal area imbricate with dense setae; lateral pronotal area rugulose–smooth. Mesoscutum (Fig. 4C) about 1.8 times as wide as long (TSL/ML = 1.67–1.76, $m = 1.73$), flat, densely punctate–imbricate, with dense setae; mesoscutal suprahumeral sulcus present; mesoscutal humeral sulcus present; antero–admedian

line absent; notauli absent. Mesoscutellum about 2.6 times as wide as long (SW/SL = 2.50–2.63, $m = 2.58$), flat, imbricate, with dense setae; scutoscutellar sulcus foveolate; axillular carina present; mesoscutellum without median spine; posterior scutellar sulcus foveolate. Femoral depression (Fig. 4D) smooth; mesopleural carina present; anterior rows of foveae of mesopleural carina present; posterior rows of foveae of mesopleural carina present dorsally; postacetabular sulcus foveolate; postacetabulum imbricate–smooth with dense setae; postacetabular patch absent; sternaulus foveolate; mesepimeral sulcus foveolate; speculum relatively wide, transversely sulcate; prespecular sulcus foveolate; transpleural sulcus foveolate. Metanotal trough foveolate; metascutellum smooth; metascutellar carina unclear; metanotal spine present, short, blunt. Metapleural sulcus foveolate; dorsal metapleural areas smooth; ventral metapleural areas smooth; paracoxal sulcus present; metapleural epicoxal sulcus present; metapleural epicoxal carina completely present; metapleural triangle smooth; prespiracular propodeal area narrow, modified to small teeth; lateral propodeal carina present; lateral propodeal area sulcate; metasomal depression sulcate; plica present posteriorly; posterior propodeal projection modified to shortly curved spine; plical area with dense setae. Legs (Fig. 1A, B) elongate. Fore wing (Fig. 1A, B) short, narrow, reaching posterior edge of T1. Hind wing short, narrow, reaching posterior edge of T1.

Metasoma. T1 about 0.7 times as long as T1+T2 length (T1W/T1+T2L = 0.59–0.87, $m = 0.70$), longitudinally costate; T1 horn slightly producing. T2 longitudinally costate anteriorly, coriaceous with dense setae posteriorly; basal depressions on T2 present; lateral patch of T2 absent; T3 (Fig. 4E) about 1.2 times as wide as long (T3W/T3L = 1.16–1.26, $m = 1.22$), about 1.3 times as wide as mesoscutum (T3W/TSL = 1.23–1.43, $m = 1.34$), coriaceous with dense setae; basal depressions on T3 absent; lateral patch of T3 absent; posterodorsal patch of T3 absent; apical setae on T3 absent. S3 (Fig. 4F) coriaceous with dense setae; basal depressions of S3 absent. T4 coriaceous with dense setae; median patch on T4 absent; lateral patch of T4 absent. T5 coriaceous with dense setae; lateral patch of T5 absent; T6 coriaceous with dense setae; lateral patch of T6 absent.

Male. Unknown.

Material examined. Holotype: Aichi pref.: Kita–Shitara dist., Shitara town, Uradani (Beech forest), alt. 900m, 18–24. VII. 1994, K. Yamagishi leg., 1♀ (EmT) [ELMU]. Paratypes: Same locality as the holotype, 9–17. IV. 1994, K. Yamagishi leg., 1♀ (YPT) [ELMU]; 25. IV–1. V. 1994, 1♀ (EmT) [ELMU]; 2–8. V. 1994, 3♀ (YPT) [ELMU]; 9–15. V. 1994, 1♀ (EmT) [ELMU]; 9–15. V. 1994, 1♀ (YPT) [ELMU]; 16–22. V. 1994, 1♀ (EmT) [ELMU]; 23–29. V. 1994, 9♀ (EmT) [ELMU]; 6–12. VI. 1994, 4♀ (YPT) [ELMU]; 13–19. VI. 1994, 23♀ (EmT) [ELMU]; 13–19. VI. 1994, 9♀ (YPT) [ELMU]; 20–26. VI. 1994, 8♀ (EmT) [ELKU]; 20–26. VI. 1994, 1♀ (MT) [ELMU]; 27. VI–3. VII. 1994, 7♀ (EmT) [ELKU]; 27. VI–3. VII. 1994, 2♀ (YPT) [ELMU]; 4–10. VII. 1994, 4♀ (EmT) [ELMU]; 11–17. VII. 1994, 2♀ (EmT) [ELMU]; 15–21. VIII. 1994, T. Kanbe leg., 1♀ (EmT) [ELMU]; 22–28. VIII. 1994, 2♀ (EmT) [ELMU]; 29. VIII–4. XI. 1994, K. Yamagishi leg., 3♀ (EmT) [ELKU]; 5–11. XI. 1994, 2♀ (EmT) [ELMU].

Distribution. Japan (Honshu: Aichi).

Etymology. The species name refers to the sculpture of frons and metasoma.

Remarks. Among eastern Palearctic *Trimorus* species, this species is similar to *T. amesis* Kozlov & Kononova, 2001 and *T. mirandus* Kozlov & Kononova, 2001 in having shortened wings that at most reach posterior margin of mesosoma. However, it differs from *T. amesis* in small body size (*T. coriaceus* about 0.9 mm, whereas *T. amesis* is about 1.4 mm), antennomere length ratio (A2, A3, A4 are same length, A4 is about 2 times longer than A5, A5 and A6 are same length in *T. coriaceus*; A2 and A3 are same length, A4 is about 0.8 times shorter than A3 and 3.4 times longer than A5, A5 and A6 are same length in *T. amesis*) and central keel (not reaching anterior ocellus in *T. coriaceus*; complete in *T. amesis*), and from *T. mirandus* in sculpture of frons, mesoscutellum, and T3 (frons is coriaceous (Fig. 4A), mesoscutellum is imbricate (Fig. 4C), and T3 is densely punctate–imbricate (Fig. 4E) in *T. coriaceus*; all of them are smooth in *T. mirandus*). In addition, this species differs from *T. granulatus* sp. n. in the shape of head (flat in *T. coriaceus* (Fig. 1A, B); globular in *T. granulatus* (Fig. 2A, B)) and sculpture of frons (coriaceous in *T. coriaceus* (Fig. 4A); granulate in *T. granulatus* (Fig. 5A)) and T3 (densely punctate–imbricate in *T. coriaceus* (Fig. 4E); shallowly punctate in *T. granulatus* (Fig. 5E)).

***Trimorus granulatus* sp. n.**

<http://zoobank.org/6694BCFA-36A2-4C18-A1D4-13E8381C50F7>

Figs 2; 5; 6

Diagnosis. Head globular. Frons granulate. Eyes small. Mandible subtridentate, with anterior and posterior large teeth and median small tooth. Mesoscutum and mesoscutellum flat, granulate. Postacetabulum granulate–smooth. In female, A2 and A3 longest among A2–6; fore and hind wings short, narrow, beyond anterior edge of metasoma; T1 without horn; T3 shallowly punctate with dense setae. In male, A5 about 2.3 times as long as wide, about 1.5 times as long as tyloid; fore and hind wings long, narrow, exceeding to apical metasoma; T3 weakly punctate–smooth.

Description. Female ($n = 3$): Length = 0.90–0.95 mm ($m = 0.93$).

Color (Fig. 2A, B). Body dark brown; A1–2, legs, T1 light brown.

Head globular. FCI = 1.13–1.16 ($m = 1.14$); LCI = 1.28–1.35 ($m = 1.32$); DCI = 1.48–1.52 ($m = 1.50$); HW/IOS = 1.33–1.40 ($m = 1.37$); head about 1.3 times as wide as mesosoma (HW/TSL = 1.24–1.32, $m = 1.29$). Frons (Fig. 5A) granulate with dense setae; frontal patch absent; central keel present ventrally; antennal scrobe small, smooth, without setae; interantennal process (Fig. 2B) rounded without setae. Vertex granulate with dense setae; POL as long as OOL (POL/OOL = 0.90–1.11, $m = 1.00$); OOL about 1.9 times as long as LOL (OOL/LOL = 1.80–2.00, $m = 1.87$); hyperocipital carina absent; vertex patch absent. Eyes small with dense setae. Malar region costate; facial striae expanding to bottom level of eye; orbital carina extending to top level of eye. Gena granulate with dense setae; genal patch absent. A1 (Fig. 5B) about

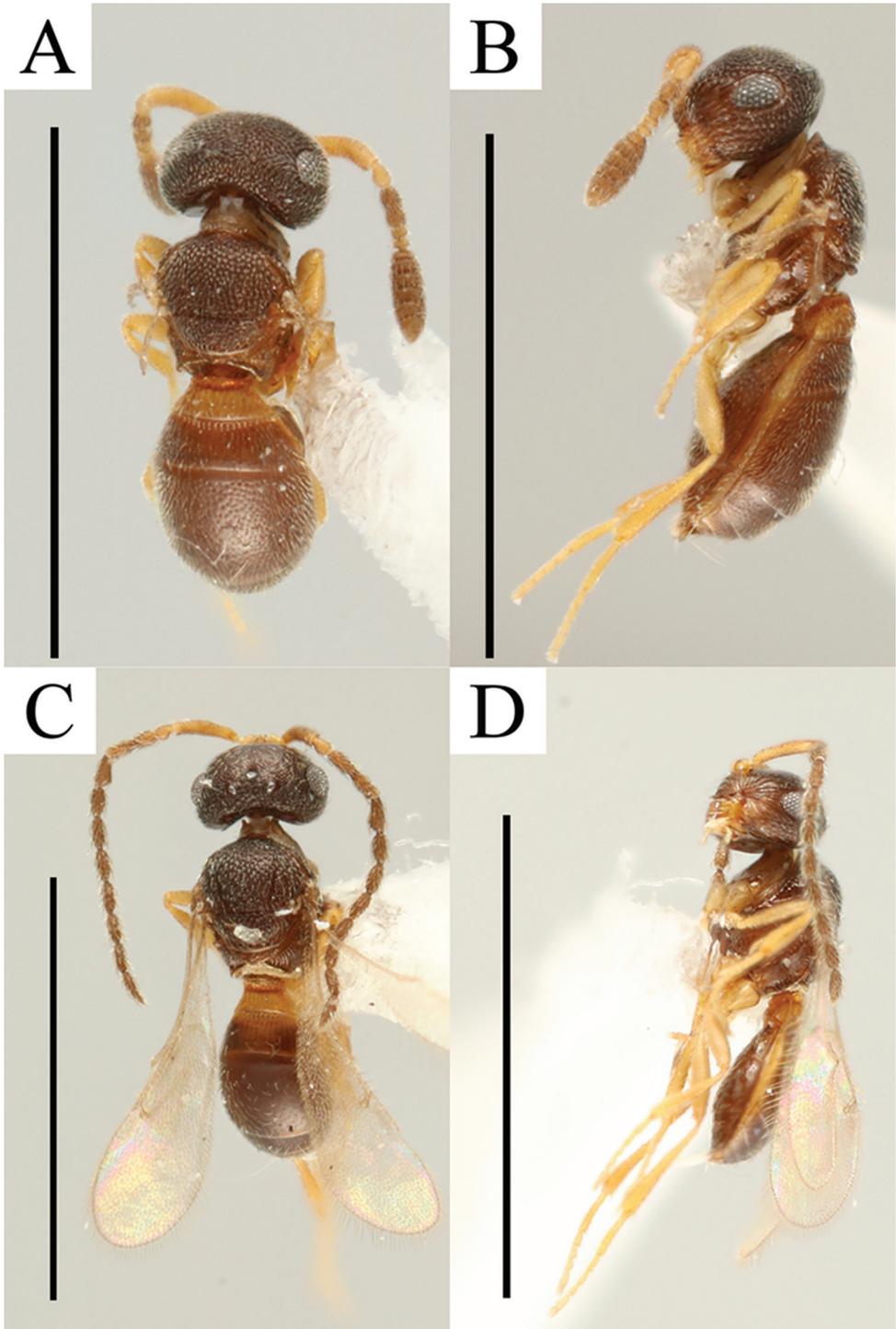


Figure 2. *Trimorus granulatus* sp. n. **A** female, dorsal view **B** female lateral view **C** male, dorsal view **D** male lateral view. Scale bars: 1 mm.

5.6 times as long as radicle ($A1/r = 5.50\text{--}5.75$, $m = 5.58$), about 22.3 times as long as $A6$ ($A1/A6 = 22.00\text{--}23.00$, $m = 22.33$), about as long as clava ($A1/cl = 1.05\text{--}1.10$, $m = 1.00$); $A2\text{--}3$ same length, 5 times as long as $A6$ ($A2/A6 = 5.00$; $A3/A6 = 5.00$); $A4$ about 3.3 times as long as $A6$ ($A4/A6 = 3.00\text{--}4.00$, $m = 3.33$); $A5$ as long as $A6$ ($A5/A6 = 1.00$). Mandible tridentate; anterior and posterior tooth same length, median tooth shorter.

Mesosoma. Pronotal suprahumeral sulcus sulcate–foveolate; epomial carina weakly present; cervical pronotal area granulate with dense setae; lateral pronotal area smooth. Mesoscutum (Fig. 5C) about 1.6 times as wide as long ($TSL/ML = 1.50\text{--}1.61$, $m = 1.56$), flat, granulate, with dense setae; mesoscutal suprahumeral sulcus weakly present; mesoscutal humeral sulcus weakly present; antero–admedian line absent; notauli weakly present, expanding to half level of mesoscutum; inter notaular area granulate with dense setae; lateral notaular area granulate with dense setae. Mesoscutellum about 2.4 times as wide as long ($SW/SL = 2.25\text{--}2.50$, $m = 2.36$), flat, granulate, with dense setae; scutoscutellar sulcus foveolate; axillular carina present; mesoscutellum without median spine; posterior scutellar sulcus foveolate. Femoral depression (Fig. 5D) smooth; mesopleural carina present; anterior rows of foveae of mesopleural carina present; posterior rows of foveae of mesopleural carina foveolate dorsally; postacetabular sulcus foveolate; postacetabulum granulate–smooth with dense setae; postacetabular patch absent; sternaulus absent; mesepimeral sulcus foveolate; speculum wide, transversely sulcate; prespecular sulcus foveolate; transpleural sulcus absent. Metanotal trough foveolate; metascutellum rugulose–foveolate; metascutellar carina unclear; metanotal spine weakly present, short, blunt. Metapleural sulcus present; dorsal metapleural areas smooth; ventral metapleural areas smooth; paracoxal sulcus foveolate; metapleural epicoxal sulcus present; metapleural epicoxal carina completely present; metapleural triangle smooth; prespiracular propodeal area narrow; lateral propodeal carina present; lateral propodeal area sulcate; metasomal depression sulcate; plica absent; posterior propodeal projection weakly present; plical area narrow, with dense setae. Legs (Fig. 2A, B) elongate. Fore wing (Fig. 2A, B) short, narrow, beyond anterior edge of metasoma. Hind wing short, narrow, beyond anterior edge of metasoma.

Metasoma. $T1$ about 0.6 times as long as $T1+T2$ length ($T1W/T1+T2L = 0.50\text{--}0.59$, $m = 0.55$), longitudinally costate. $T2$ longitudinally costate in anterior, shallowly punctate with dense setae in posterior; basal depressions on $T2$ present; lateral patch of $T2$ absent. $T3$ (Fig. 5E) about 1.2 times as wide as long ($T3W/T3L = 1.10\text{--}1.22$, $m = 1.16$), about 1.2 times as wide as mesoscutum ($T3W/TSL = 1.18\text{--}1.22$, $m = 1.20$), shallowly punctate with dense setae; basal depressions on $T3$ absent; lateral patch of $T3$ absent; posterodorsal patch of $T3$ absent; apical setae on $T3$ absent. $S3$ (Fig. 5F) shallowly punctate with dense setae. $T4$ shallowly punctate with dense setae; median patch on $T4$ absent; lateral patch of $T4$ absent. $T5$ shallowly punctate with dense setae; lateral patch of $T5$ absent. $T6$ shallowly punctate with dense setae; lateral patch of $T6$ absent.

Male ($n = 3$): Length = 0.93–1.00 mm ($m = 0.95$). FCI = 1.17–1.27 ($m = 1.22$); LCI = 1.32–1.36 ($m = 1.34$); DCI = 1.55–1.73 ($m = 1.64$); HW/IOS = 1.42–1.46 ($m = 1.45$); HW/TSL = 1.17–1.27 ($m = 1.24$). Central keel (Fig. 6A) present, incom-

plete dorsally; antennal scrobe larger than female, smooth, without setae. POL/OOL = 0.89–1.00 ($m=0.96$); OOL/LOL = 1.80–2.25 ($m = 2.10$). Eyes larger than female. Orbital carina extending to bottom level of eye. A1/r = 4.00–4.40 ($m = 4.20$); A5 (Fig. 6B) 2.3 times as long as wide (A5L/A5W = 2.25), about 1.5 times as long as tyloid (A5L/ty = 1.50). TSL/ML = 1.36–1.50 ($m = 1.44$). SW/SL = 2.00–2.20 ($m = 2.13$); notauli (Fig. 6C) present, expanding to 3/4 levels of mesoscutum. Mesoscutellum shallowly punctate–smooth with dense setae. Anterior rows of foveae of mesopleural carina (Fig. 6D) foveolate dorsally, smooth ventrally; postacetabulum granulate–smooth with sparse setae; speculum wide, smooth. Metapleural sulcus absent; paracoxal sulcus foveolate dorsally, absent ventrally; metapleural epicoxal sulcus absent; lateral propodeal area foveolate; metasomal depression foveolate; plica present in posterior; plical area with dense setae. Legs (Fig. 2C, D) elongate. Fore wing (Fig. 2C, D) long, narrow, exceeding to apical metasoma, as wide as mesoscutum (TSL/WW = 0.94–1.04, $m = 1.00$); marginal vein about 3.5 times as long as stigmal vein ($m/st = 3.33–3.67$, $m = 3.53$). Hind wing long, narrow, exceeding to apical metasoma, 1.5 times as wide as length of marginal cilia at widest point (HWW/HWS = 1.40–1.50, $m = 1.47$). T1W/T1+T2L = 0.60–0.63 ($m = 0.61$). T3W/T3L = 1.11–1.23 ($m = 1.18$); T3 (Fig. 6E) narrower (T3W/TSL = 1.03–1.07, $m = 1.04$), weakly punctate–smooth with sparse setae; posterodorsal patch of T3 present, rugulose. S3 (Fig. 6F) smooth with dense setae; S3 setae sparser than female. T4 smooth with dense setae; T4 setae sparser than female.

Material examined. Holotype: Fukuoka pref.: Fukuoka city, Mt. Tachibana, 2. X. 1993, H. Honda leg., 1♀ (YPT) [ELKU]. Paratypes: Same locality as the holotype, 2. X. 1993, H. Honda leg., 5♂ (YPT) [ELKU]; 16. X. 1993, 7♂2♀ (YPT) [ELKU]; 23. X. 1993, 5♂5♀ (YPT) [ELKU]; 30. X. 1993, 6♂1♀ (YPT) [ELKU]; 6. XI. 1993, 7♂2♀ (YPT) [ELKU]; 14. XI. 1993, 8♂6♀ (YPT) [ELKU]; 20. XI. 1993, 6♂6♀ (YPT) [ELKU]; 27. XI. 1993, 3♂2♀ (YPT) [ELKU].

Distribution. Japan (Kyushu: Fukuoka).

Etymology. The species name refers to the sculpture on frons and mesoscutum.

Remarks. Among eastern Palearctic *Trimorus* species, the female of this species is similar to *T. amesis* Kozlov & Kononova, 2001 and *T. mirandus* Kozlov & Kononova, 2001 in shortened wings at most reaching posterior margin of mesosoma. But it differs from *T. amesis* in small body size (*T. granulatus* about 0.9 mm; *T. amesis* about 1.4 mm) and sculpture of T3 (shallowly punctate in *T. granulatus*, coriaceous in *T. amesis*), and from *T. mirandus* in sculpture of frons, mesoscutellum and T3 (frons and mesoscutellum are granulate (Fig. 5A, C) and T3 is shallowly punctate (Fig. 5E) in *T. granulatus*; all of them are smooth in *T. mirandus*). In addition, this species differs from *T. coriaceus* sp. n. in the shape of head (globular in *T. granulatus* (Fig. 2A, B), flat in *T. coriaceus* (Fig. 1A, B)) and sculpture of frons (granulate in *T. granulatus* (Fig. 5A); coriaceous in *T. coriaceus* (Fig. 4A)) and T3 (shallowly punctate in *T. granulatus* (Fig. 5E); densely punctate–imbricate in *T. coriaceus* (Fig. 4E)). Male of *T. granulatus* is similar to *T. bisulcatus* Kieffer, 1908 in ratio of length and width of antennomeres. The new species differs from *T. bisulcatus* in body size (*T. granulatus* is about 1 mm; *T. bisulcatus* is about 1.7–2 mm) and body sculpture.

***Trimorus haniyasu* sp. n.**

<http://zoobank.org/52D8DD10-3F9E-41AE-B743-42EF34062BF6>

Figs 3; 7; 8

Diagnosis. Frons shallowly punctate. Mandible subtridentate, with anterior and posterior large teeth and median small tooth. Mesoscutum and mesoscutellum densely deeply punctate. Postacetabulum rugulose–densely deeply punctate. T3 deeply punctate. In female, A3 longest among A2–6; mesoscutum and mesoscutellum flat; fore and hind wings reaching apical margin of T3; T1 without horn. In male, A5 about twice as long as wide and about 1.8 times as long as tyloid; mesoscutum and mesoscutellum convex; fore wing far exceeding to apical mesosoma; hind wing exceeding to apical mesosoma.

Description. Female ($n = 2$): Length = 1.83–2.00 mm.

Color (Fig. 3A, B). Body mainly black–dark brown; A1–A6 and mandibles brown and legs excluding coxae yellow.

Head. FCI = 1.09–1.13; LCI = 1.62–1.74; DCI = 1.83–1.89; HW/IOS = 1.66–1.76; head about 1.2 times as wide as mesosoma (HW/TSL = 1.18–1.28). Frons (Fig. 7A) shallowly punctate with dense setae; frontal patch absent; central keel completely present; antennal scrobe smooth without setae; interantennal process (Fig. 3B) rounded with sparse setae. Vertex shallowly punctate with dense setae; POL as long as OOL (POL/OOL = 1.00); OOL about 1.6 times as long as LOL (OOL/LOL = 1.50–1.67); hyperoccipital carina absent; vertex patch present, rugulose. Eyes with sparse setae. Malar region costate; facial striae expanding to middle level of eye; orbital carina extending to top level of eye. Gena costate–punctate with dense setae; genal patch absent. A1 (Fig. 7B) about 6.3 times as long as radicle ($A1/r = 6.00–6.60$), about 10.5 times as long as A6 ($A1/A6 = 10.00–11.00$), about 1.9 times as long as clava ($A1/cl = 1.07–1.10$); A2 2.3 times as long as A6 ($A2/A6 = 2.33$); A3 longest among A2–6, about 2.7 times as long as A6 ($A3/A6 = 2.67$); A4 about 2.2 times as long as A6 ($A4/A6 = 2.00–2.33$); A5 as long as A6 ($A5/A6 = 1.00$). Mandible tridentate, with anterior and posterior large teeth and median small, tubercular tooth.

Mesosoma. Pronotal suprahumeral sulcus foveolate; epomial carina incompletely present; cervical pronotal area rugulose–densely deeply punctate without setae; lateral pronotal area smooth–rugose. Mesoscutum (Fig. 7C) about 1.7 times as wide as long (TSL/ML = 1.60–1.73) flat, densely deeply punctate, with dense setae; mesoscutal suprahumeral sulcus absent; mesoscutal humeral sulcus weakly present; antero–admedian line absent; notauli weakly present. Mesoscutellum about 2.2 times as wide as long (SW/SL = 2.14–2.33); flat, densely deeply punctate with dense setae; scutoscutellar sulcus foveolate; axillular carina present, with weakly tooth; mesoscutellum without median spine; posterior scutellar sulcus foveolate. Femoral depression (Fig. 7D) smooth in upper half, transversely costate in lower half; mesopleural carina present; anterior rows of foveae of mesopleural carina absent; posterior rows of foveae of mesopleural carina absent; postacetabular sulcus absent; postacetabulum rugulose–densely deeply punctate with dense setae; postacetabular patch absent; sternaulus absent; mesepimeral sulcus absent; speculum transversely costate; prespecular sulcus weakly foveo-

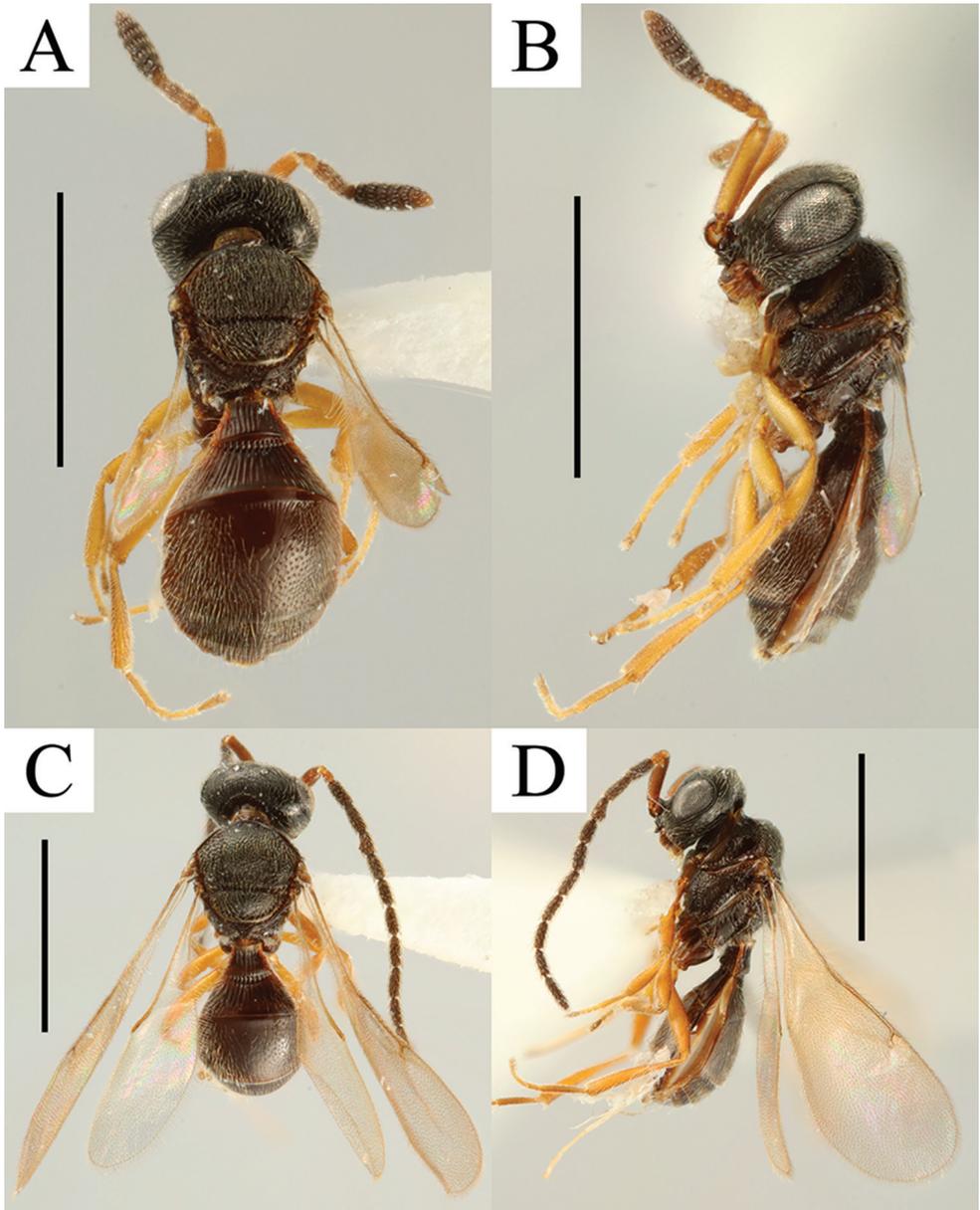


Figure 3. *Trimorus haniyasu* sp. n. **A** female, dorsal view **B** female lateral view **C** male, dorsal view **D** male lateral view. Scale bars: 1 mm.

late; transpleural sulcus absent. Metanotal trough foveolate; metascutellum densely deeply punctate; metascutellar carina present; metanotal spine present, short, blunt. Metapleural sulcus sulcate; dorsal metapleural areas smooth; ventral metapleural areas smooth; paracoxal sulcus present; metapleural epicoxal sulcus weakly present; metapleural epicoxal carina incomplete; metapleural triangle smooth; prespiracular propo-

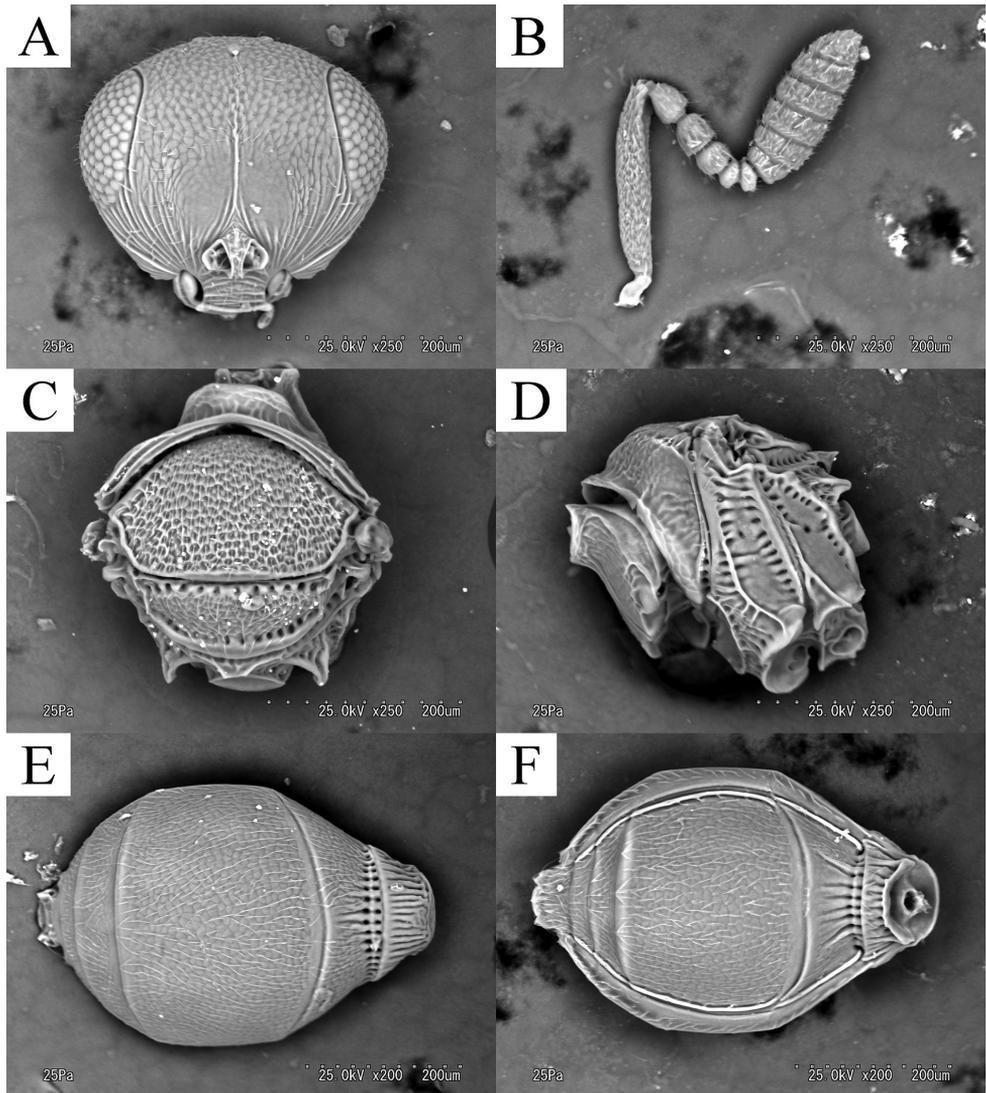


Figure 4. *Trimorus coriaceus* sp. n., female. **A** head, frontal view **B** Antennae **C** mesosoma, dorsal view **D** mesosoma, lateral view **E** metasoma, dorsal view **F** metasoma, ventral view.

deal area narrow, modified to small teeth; lateral propodeal carina present; lateral propodeal area densely deeply punctate; metasomal depression densely deeply punctate; plica present; posterior propodeal projection modified to shortly sharp spine; plical area narrow, densely deeply punctate with dense setae; legs (Fig. 3A, B) elongate. Fore wing (Fig. 3A, B) short, reaching posterior edge of T3, 2 times as wide as mesoscutum ($TSL/WW = 2.00-2.05$); marginal vein 5 times as long as stigmal vein ($m/st = 5.00$). Hind wing short, reaching posterior edge of T3, about 4.2 times as wide as length of marginal cilia at widest point ($HWW/HWS = 4.00-4.25$).

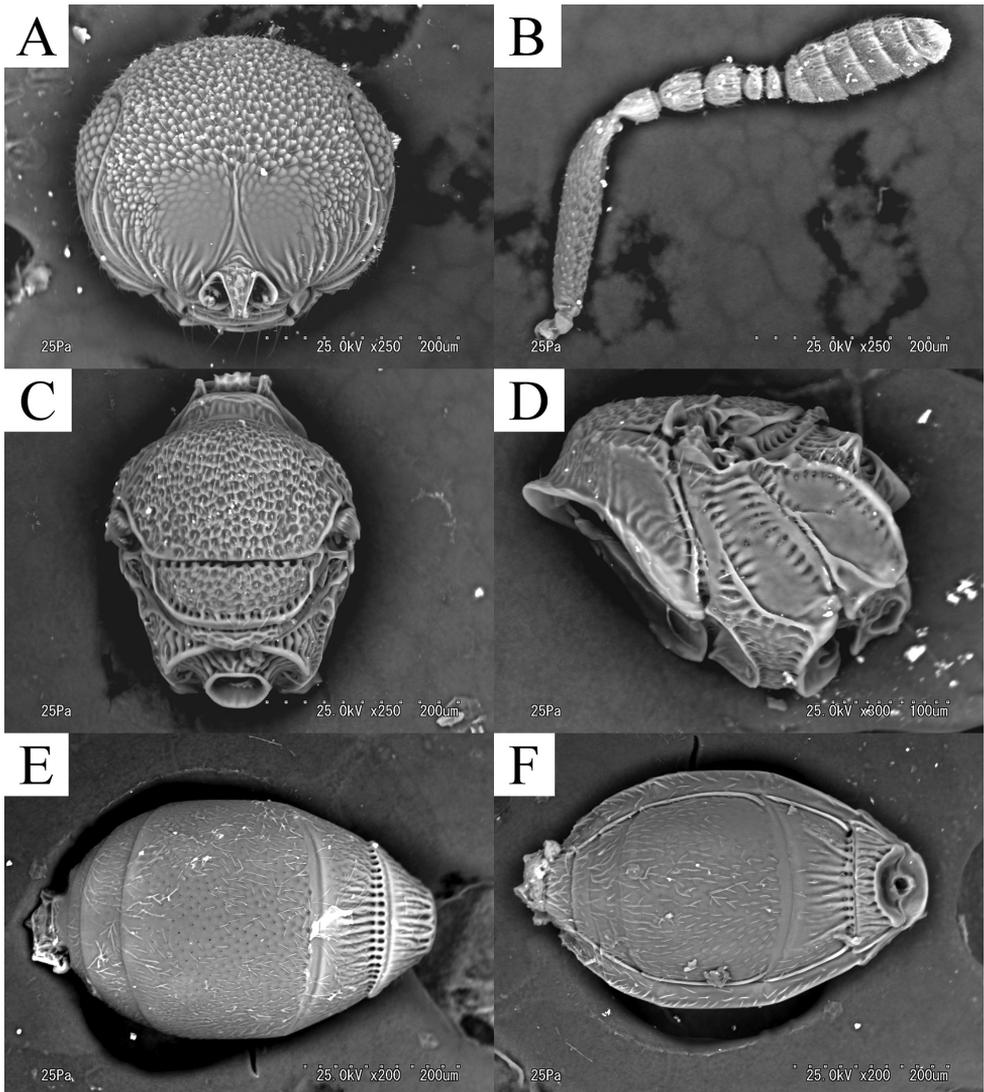


Figure 5. *Trimorus granulatus* sp. n., female. **A** head, frontal view **B** Antennae **C** mesosoma, dorsal view **D** mesosoma, lateral view **E** metasoma, dorsal view **F** metasoma, ventral view.

Metasoma. T1 about 0.6 times as long as T1+T2 length ($T1W/T1+T2L = 0.56-0.57$), longitudinally costate. T2 longitudinally costate; basal depressions on T2 present; lateral patch of T2 present, with dense setae. T3 (Fig. 7E) about 1.3 times as wide as long ($T3W/T3L = 1.26-1.33$), about 1.3 times as wide as mesoscutum ($T3W/TSL = 1.24-1.33$), deeply punctate with dense setae; T3 sculpture sparser medially; basal depressions on T3 absent; lateral patch of T3 absent; posterodorsal patch of T3 absent; apical setae on T3 absent. S3 (Fig. 7F) deeply punctate with dense setae; basal depressions on S3 absent. T4 punctate with dense setae; median patch on T4 absent; lateral patch of T4 absent. T5 punctate with dense

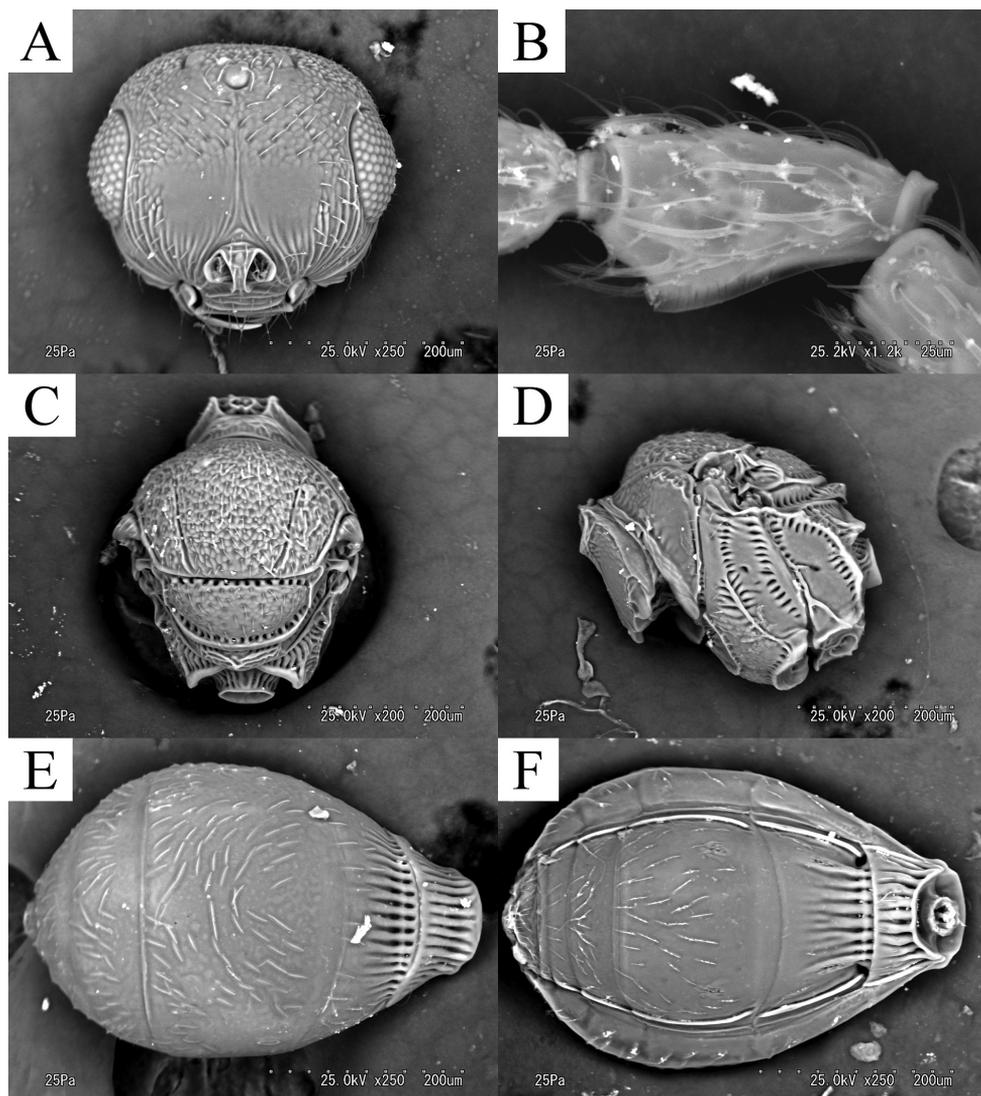


Figure 6. *Trimorus granulatus* sp. n., male. **A** head, frontal view **B** A5, lateral view **C** mesosoma, dorsal view **D** mesosoma, lateral view **E** metasoma, dorsal view **F** metasoma, ventral view.

setae; lateral patch of T5 absent. T6 smooth; lateral patch of T6 present, imbricate, with dense setae.

Male ($n = 3$): Length=1.88–1.98 mm ($m = 1.93$); A1–2 (Fig. 3C, D) brown. Head wider than female (FCI = 1.17–1.26, $m = 1.22$); LCI = 1.56–1.70 ($m = 1.62$); DCI = 1.96–2.00 ($m = 1.97$); HW/IOS = 1.55–1.64 ($m = 1.60$); HW/TSL = 1.16–1.23 ($m = 1.20$). Frons (Fig. 8A) punctate with dense setae: antennal scrobe smooth–costate without setae. Vertex costate–punctate with dense setae; OOL longer (POL/OOL = 0.91–1.00, $m = 0.94$; OOL/LOL = 2.00–2.75, $m = 2.32$); vertex patch absent. Ocelli more developed than female. Facial striae expanding to 3/4 of eye. Gena costate with dense setae. A1/r =

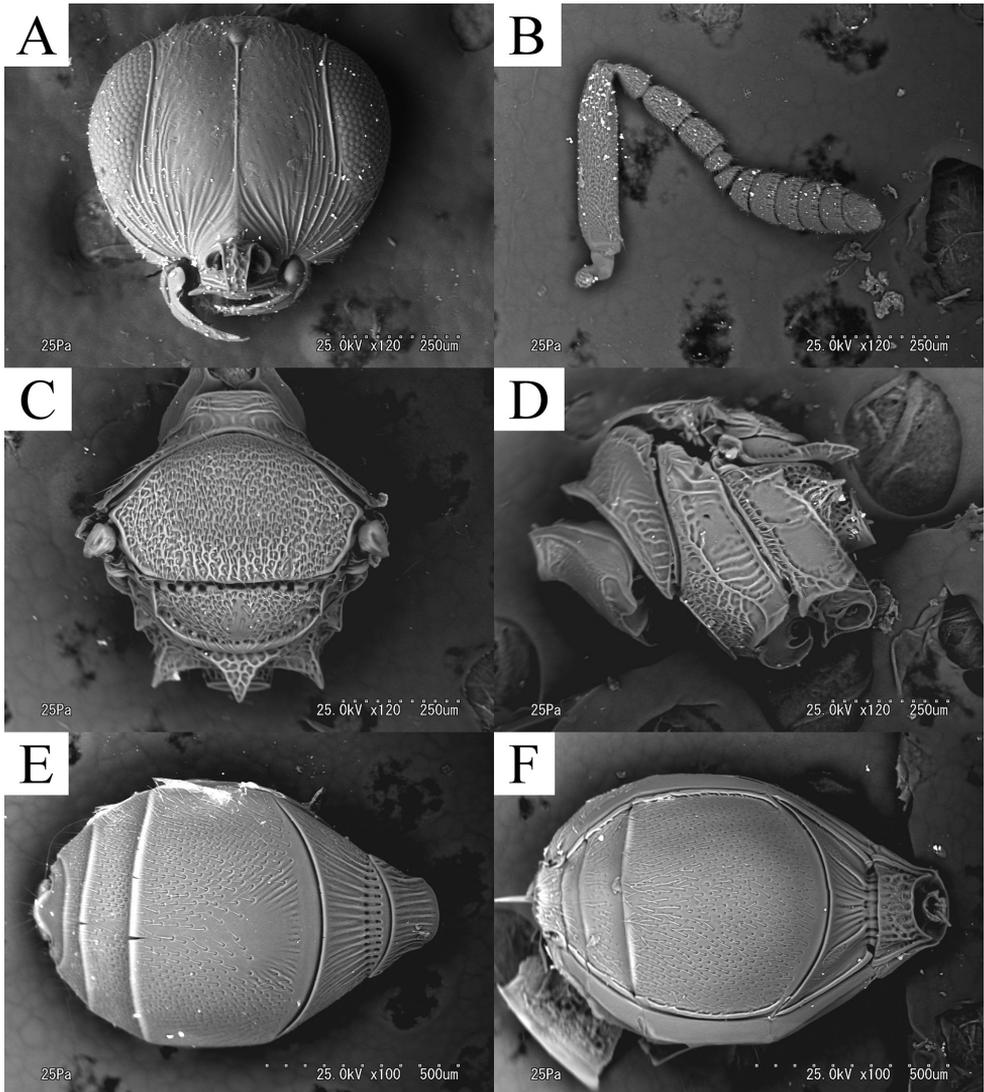


Figure 7. *Trimorus haniyasu* sp. n., female. **A** head, frontal view **B** Antennae **C** mesosoma, dorsal view **D** mesosoma, lateral view **E** metasoma, dorsal view **F** metasoma, ventral view.

4.50–5.00 ($m = 4.67$); A5 (Fig. 8B) about twice as long as wide ($A5L/A5W = 1.83–2.20$, $m = 2.01$); A5 about 1.9 times as long as tyloid ($A5L/ty = 1.83–2.00$, $m = 1.89$). Cervical pronotal area rugulose without setae. Mesoscutum (Fig. 8C) longer ($TSL/ML = 1.41–1.48$, $m = 1.44$), convex; notauli incompletely present. Mesoscutellum longer ($SW/SL = 2.00–2.14$, $m = 2.07$), convex, densely deeply punctate with dense setae. Paracoxal sulcus (Fig. 8D) sulcate–foveolate; metapleural epicoxal sulcus sulcate; metapleural epicoxal carina completely present; prespiracular propodeal area larger than female, modified to small teeth. Fore wing (Figs 3C, D) long, far exceeding to apical mesosoma, wider than mesoscutum ($TSL/WW = 0.71–0.73$, $m = 0.72$); marginal vein about 4.2 times as long

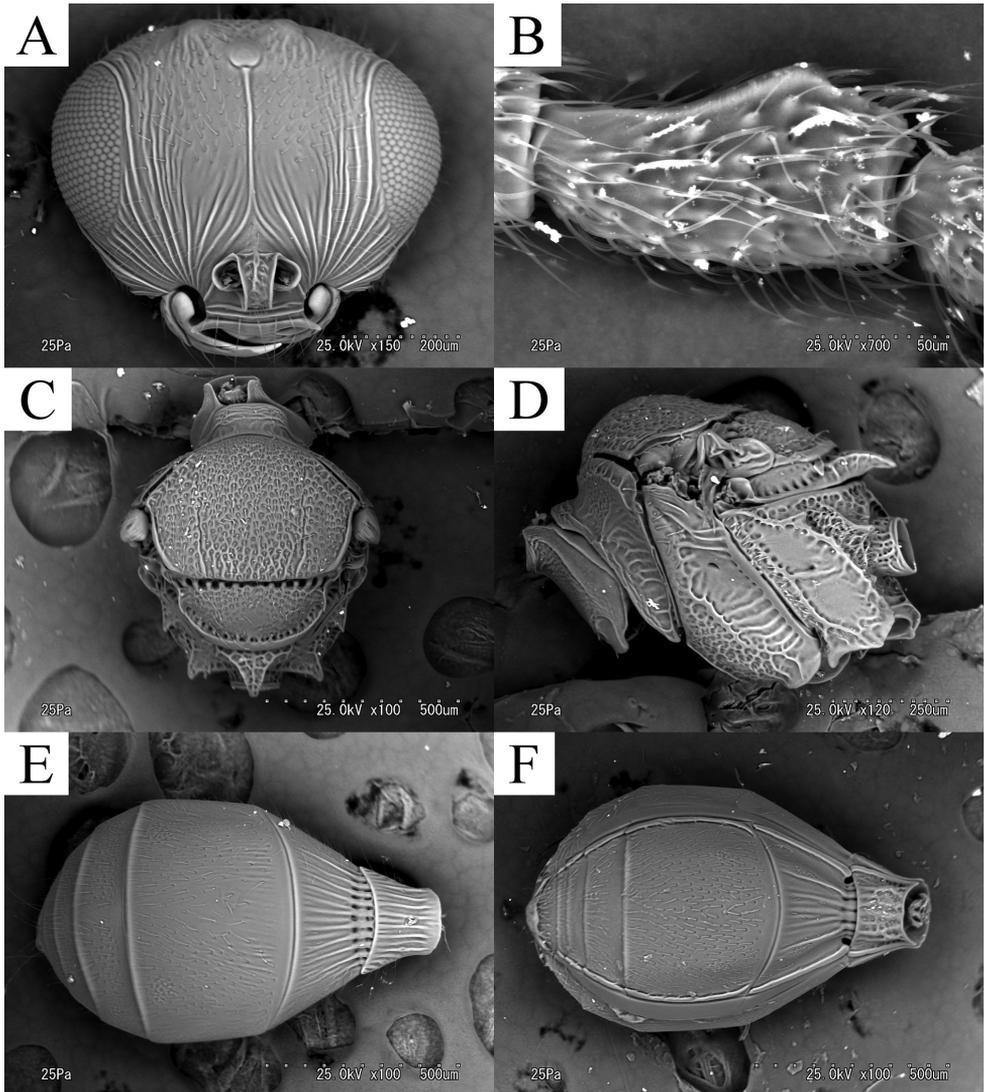


Figure 8. *Trimorus haniyasu* sp. n., male. **A** head, frontal view **B** A5, lateral view **C** mesosoma, dorsal view **D** mesosoma, lateral view **E** metasoma, dorsal view **F** metasoma, ventral view.

as stigmal vein ($m/st = 4.00-4.44$, $m = 4.19$). Hind wing long, exceeding to apical mesosoma, about 6.4 times as wide as length of marginal cilia at widest point ($HW/W/HWS = 6.20-6.60$, $m = 6.40$). $T1W/T1+T2L = 0.44-0.45$ ($m = 0.45$); T2 longitudinally costate with dense setae laterally; lateral patch of T2 present, imbricate. $T3W/T3L = 1.31-1.36$ ($m = 1.33$); T3 narrower ($T3W/T3L = 1.07-1.09$, $m = 1.08$); sculpture of T3 (Fig. 8E) sparser than female; posterodorsal patch of T3 present, imbricate. S3 (Fig. 8F) deeply punctate with dense setae. Lateral patch of T4 present, imbricate.

Material examined. Holotype: Aichi pref.: Kita-Shitara dist., Shitara town, Uradani (Beech forest), alt. 900m, 13–19. VI. 1994, K. Yamagishi leg., 1♀ (YPT)

[ELMU]. Paratypes: Same locality as the holotype, 16–22. V. 1994, K. Yamagishi leg., 1♂ (EmT) [ELMU]; 6–12. VI. 1994, 2♂ (YPT) [ELKU]; 6–12. VI. 1994, 1♂ (MT) [ELMU]; 13–19. VI. 1994, 1♀ (YPT) [ELKU]; 10–16. X. 1994, 1♂ (PT) [ELMU].

Distribution. Japan (Honshu: Aichi).

Etymology. The species named after Haniyasu, a Japanese god of the soil.

Remarks. Among eastern Palearctic *Trimorus* species, the female of this species is similar to *T. mirificus* Kozlov & Kononova, 2000 and *T. angulator* Kozlov & Kononova, 2000 in shortened wings that reach T3. However, it differs from both species in sculpture of frons (shallowly punctate in *T. haniyasu*; along to central keel smooth and other part costate in *T. mirificus*; dorsally reticulate, ventrally smooth *T. angulator*), mesoscutum (densely and deeply punctate in *T. haniyasu*; reticulate in *T. mirificus* and *T. angulator*) and T3 (deeply punctate in *T. haniyasu*; costate and granulate in *T. mirificus*; reticulate in *T. angulator*). In male, antennomeres about twice as long as wide in *T. haniyasu*, but about 5 times as long as wide in *T. mirificus*.

Key to species of brachypterous female of the Eastern Palearctic *Trimorus*

(“Brachypterous” means shortened wing reaching or not beyond posterior margin of T3 in this key.)

- 1 Body length more than 1.7 mm; wings reaching T3 2
- Body length less than 1.4 mm; wings shorter, at most reaching posterior margin of mesosoma 4
- 2 Frons (Fig. 7A) shallowly punctate; mesoscutum (Fig. 7C) densely and deeply punctate; T3 (Fig. 7E) deeply punctate ***T. haniyasu* sp. n.**
- Sculptures of frons and T3 different from above; mesoscutum reticulate 3
- 3 T1 horn present; frons and T3 strigate
..... ***T. mirificus* Kozlov & Kononova, 2000**
- T1 horn absent; frons and T3 reticulate
..... ***T. angulator* Kozlov & Kononova, 2000**
- 4 Central keel completely present, reaching anterior ocellus
..... ***T. amesis* Kozlov & Kononova, 2000**
- Central keel incomplete, not reaching anterior ocellus 5
- 5 Frons, mesoscutellum, and T3 smooth; mesoscutellum wide: SW/SL about 3.3; T3 wider: T3W/T3L about 1.5 ***T. mirandus* Kozlov & Kononova, 2000**
- Frons, mesoscutellum and T3 sculptured; mesoscutellum not so wide: SW/SL less than 2.6; T3W/T3L about 1.2 6
- 6 Head (Fig. 1B) flat: LCI about 1.5, DCI about 1.8; eyes large; frons (Fig. 4A) and T3 (Fig. 4E) coriaceous; mesoscutum (Fig. 4C) densely punctate–imbricate; T1 horn weakly present ***T. coriaceus* sp. n.**
- Head (Fig. 2B) globular: LCI about 1.3, DCI less than 1.5; eyes small; frons (Fig. 5A) and mesoscutum (Fig. 5C) granulate; T3 (Fig. 5E) shallowly punctate; T1 horn absent ***T. granulatus* sp. n.**

Key to males of species of Japanese *Trimorus*

(Male of *T. butus* Kononova & Kozlov, 2001, *T. calvus* Miyazaki, 1979, *T. coriaceus*, *T. fulviclavatus* Miyazaki, 1979, *T. nasutus* Kononova & Kozlov, 2001, *T. nipponensis* Masner & Muesebeck, 1968, *T. striatissimus* Miyazaki, 1979 and *T. viktori* Kononova, 2001 are unknown.)

- 1 Mandible tridentate, with almost same length teeth (body mainly black-dark brown; notaulus present, expanding to half level of mesoscutum; T3 weakly coriaceous)..... ***T. nigrigaster* Miyazaki, 1979**
- Mandible subtridentate, with anterior and posterior large teeth and median small tooth (or bump)..... **2**
- 2 Antennomeres elongated: A5L more than 3.5 times as long as A5W..... ***T. laticlypeatus* Miyazaki, 1979**
- Antennomeres shortened: A5L less than 2.5 times as long as A5W **3**
- 3 Body length less than 1 mm. (frons (Fig. 6A) and mesoscutum (Fig. 4C) granulate; postacetabulum (Fig. 6D) granulate–smooth) ***T. granulatus* sp. n.**
- Body length greater than 1.8 mm. (frons (Fig. 8A) punctate; mesoscutum (Fig. 8C) deeply punctate with densely locates punctures; postacetabulum (Fig. 8D) rugulose–deeply punctate with densely locates punctures)..... ***T. haniyasu* sp. n.**

Acknowledgements

We express our cordial thanks to Dr. T. Hirowatari and members of the Entomological Laboratory, Kyushu University for their invaluable advice during this study. The authors wish to thank two anonymous reviewers for comments on earlier version of this paper. Our thanks are also due to Mr. H. Honda for the collection of many specimens. This is a contribution from the Entomological Laboratory, Kyushu University, Fukuoka (Ser. 7, No. 61).

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March 2018]

Supplementary material I

Checklist of brachypterous *Trimorus*

Authors: Yoto Komeda, Toshiharu Mita, Kenzo Yamagishi

Data type: species data

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