

A New Species of the Bee Genus *Eucera* Scopoli, 1770 (Hymenoptera: Apidae) from Japan

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A New Species of the Bee Genus *Eucera* Scopoli, 1770 (Hymenoptera: Apidae) from Japan

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Abstract. Under the new classification a new species of the genus *Eucera* Scopoli, 1770, *Eucera* (*Tetralonia*) *yoshihiro*i is described from Japan. Key to the Japanese species of *Eucera* (*Tetralonia*) is presented.

Key words: Taxonomy, *Tetralonia*, *Tetraloniella*.

Introduction

According to Michener (2000, 2007), the genus *Tetraloniella* Ashmead, 1899 belongs to the tribe Eucerini of solitary bees which consists of euceriform, rather hairy, the metasoma often having pale hair bands, and males usually having long antennae, often reaching well beyond the base of the metasoma. The bees of *Tetraloniella* are characteristic in relatively small size, forewing with three submarginal cells, the 6th sternum of male with the two converging carinae each simple and straight, clypeus protuberant for less than the width of an eye as seen in lateral view. This genus includes more than 140 species in the Holarctic and Ethiopian regions.

The Japanese species of *Tetraloniella* has been hitherto known by only one species, *T. mitsukurii* (Cockerell, 1911) belonging to the subgenus *Tetraloniella* s. str. However, Dr. Yoshihiro Hirashima, Emeritus Professor, Kyushu University, had suggested in a private communication that another species belonging to this genus might inhabit Japan. His information was based on a specimen of the female which was collected by himself in Fukuoka, Japan in 1960. That is the starting point for this study. This time I examined the corresponding specimen in detail. The result is that it appears to be a member of the *T. ruficornis* species group which is known from Europe and contains 6 species (Tkalců 1979, treated as the genus *Tetralonia* Spinola, 1839), but is different from those known species. After careful examination, I have concluded that this is new to science.

In a recent paper on phylogeny, new generic-level classification, and historical biogeography of the genus *Eucera* complex, Dorchin *et al.* (2018) proposed a new theory as the result of molecular, morphological, and combined phylogenetic analyses. In this theory, *Tetraloniella* is synonymized with *Tetralonia* which is reduced to a subgeneric rank within *Eucera* Scopoli, 1770. Therefore, this new classification is adopted here for the Japanese species: *Eucera* (*Tetralonia*) *mitsukurii* (Cockerell, 1911), *Eucera* (*Tetralonia*) *yoshihiro*i Ikudome **sp. nov.**

Materials and methods

Examined specimens are 208 individuals in total. I use the following abbreviations for collectors and the institutes: GS – Ge Sumei, HX – H-l Xu, IO – I. Ohtsuka, KO – K. Ogata, KY – K. Yamagishi, MI – M. Inoue, MN – M. Nishihara, MS – M. Shiozaki, OT – O. Tadauchi, SI – S. Ikudome, SM – S. Miyamoto, ST – S. Taniguchi, SY – Sk. Yamane, TE – T. Endo, TH – T. Hirao, TK – T. Kawarabata, YH – Y. Hirashima, YM – Y. Maeta; ELKU – Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan, PCSI – Private Collection of Shuichi Ikudome, Kagoshima, Japan.

Male terminalia were dissected and cleared for examination by soaking in 10% KOH for 10–15 minutes. After the observations, these dissected parts of the bodies were rinsed carefully with water, put on paper with glue, and pinned with the body of the specimens.

For the examination of specimens, a

stereoscopic microscope Leica Z16APO was used. Photographs were taken with a system consisting of a microscope, a Nikon DXM1200F digital camera, and the Mitani Corporation Application Suite Version 3.1 Composite images were made using the software Dynamic Eye.

For morphological concepts and terminology, I generally follow Michener (2007). The abbreviations used in the text are as follows: HL – head length, HW – head width, F – flagellum (e.g. F1 = 1st antennal flagellar segment), T – tergum (e.g. T1 = 1st metasomal tergum), S – sternum (e.g. S1 = 1st metasomal sternum).

Records of flowers visited by a species are based on specimen label data. The scientific names of flowering plants visited by bees are cited by Yonekura & Kajita (2003).

Holotype and most paratypes are deposited in the collection of ELKU. The rest of the paratypes are housed in the author's private collection (PCSI).

The genus *Eucera* Scopoli

Eucera Scopoli, 1770: 8. Type species: *Apis longicornis* Linnaeus, 1758.

According to Michener (2000, 2007), *Eucera* includes most of the Palearctic Eucerini that forewing has two submarginal cells and also includes many holarctic species with three submarginal cells as in the subgenus *Synhalonia* Patton, 1879. On the other hand, the genera *Tetralonia* and *Tetraloniella* also have three submarginal cells in the forewing.

In a recent paper, Dorchin *et al.* (2018) proposed a new theory as the result of molecular, morphological, and combined phylogenetic analyses. Namely, *Tetraloniella* is synonymized with *Tetralonia* which is reduced to a subgeneric rank within *Eucera*.

For many years, especially in the last century, the name *Tetralonia* had been used for almost all Eucerini with three submarginal cells as the present Japanese *Tetraloniella*.

Species and subspecies included in Japan

E. (Eucera) sociabilis Smith, 1873

E. (Eucera) spurcatipes Pérez, 1905

E. (Synhalonia) chinensis nigricaudata
(Yasumatsu & Hirashima, 1965)

E. (Synhalonia) nipponensis (Pérez, 1905)

E. (Synhalonia) okinawae okinawae (Friese, 1910)

E. (Synhalonia) okinawae sakishimana
(Yasumatsu & Hirashima, 1965)

E. (Tetralonia) mitsukurii (Cockerell, 1911)

E. (Tetralonia) yoshihiroii Ikudome **sp. nov.**

* “key to species and subspecies of the genera *Eucera* and *Tetraloniella* (= the subgenus *Tetralonia* of the genus *Eucera*) of Japan” is provided by Watanabe & Nagase (2022 in Japanese).

Description of new taxon

Eucera (Tetralonia) yoshihiroii Ikudome **sp. nov.**

[Japanese name: Oukan–higenaga–hanabachi]
(Figs A–H)

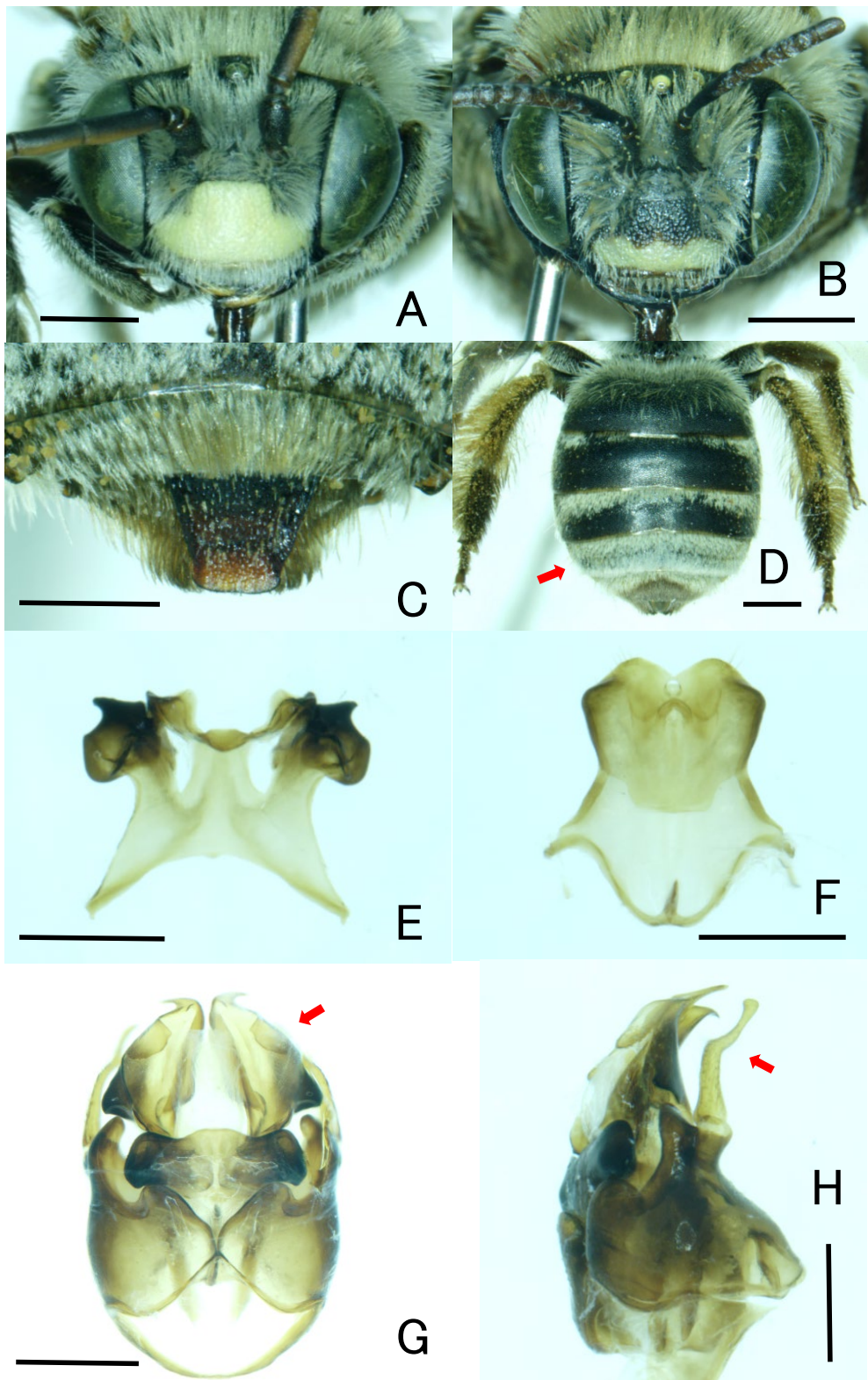
ZooBank taxon LSID:

zoobank.org:act:2A543AD6-D599-489D-ACD2-F4E756B0421C

Diagnosis. This new species is easily separated from the other Japanese species by having clypeus with a transverse yellow band on the lower portion of the female, and appears to be a member of *Tetralonia ruficornis* species group from Europe. According to Tkalců (1979), that species group includes 6 species, *T. fulvescens* Giraud, 1863 (large species = body length 11–12 mm), *T. julliani* (Pérez, 1879) (with small lobe in the middle of penis valves), *T. alticincta* (Lepelletier, 1841), *T. iberica* Dusmet, 1926, *T. inulae* Tkalců, 1979 and *T. ruficornis* (Fabricius, 1804). The latter 4 species are characterized by having the apical portion of T4 not only more or less with the space not covered with plumose hairs but also without a distinct fringe of dense appressed hairs in the female. This new species especially resembles *T. ruficornis* s. str., but is distinguished from it by the following characteristics: in the male genitalia with gonostylus more strongly bent in the middle, and with penis valves more broadened (like wings) along the inner margin; in the female visible all space (posterior portion) of T4 covered with appressed plumose hairs, and with a distinct fringe of dense appressed hairs.

Type locality. Hakoishi (printed as “Hakoish” on all labels) Coast, Kumihama, Kyoto, Japan.

Type series. Holotype: ♂, 4. IX. 2002, Fl–vis col. M. Inoue leg. (ELKU). Paratypes: 1♀, same data as holotype (ELKU); 1♂, same data as holotype (PCSI); 1♂, 2♀♀, 4. IX. 2002, Fl–vis col. MN leg. (ELKU); 1♀, idem, (PCSI); 5♂♂, 5♀♀, 5. IX. 2002, Fl–vis col. TE leg. (ELKU);



FIGURES A–H. *Eucera (Tetralonia) yoshihiroii*, **sp. nov.** A, face of male; B, face of female; C, pygidial plate of male; D, dorsal metasoma of female; E, ventral 7th sternum of male; F, ventral 8th sternum of male; G, dorsal genitalia of male; H, lateral genitalia of male. Scale: A, B, D = 1 mm, C, E–H, 0.5 mm.

3♂♂, 3♀♀, idem, (PCSI); 2♂, 1♀, 5. IX. 2002, Fl-vis col. MN leg. (ELKU); 1♂, 1♀, 5. IX. 2002, Fl-vis col. MI leg. (ELKU); 2♂♂, 2♀♀, 6. IX. 2002, Fl-vis col. MN leg. (ELKU); 2♂♂, 2♀♀, idem, (PCSI); 2♂♂, 2♀♀, 6. IX. 2002, Fl-vis col. TE leg. (ELKU); 4♂♂, 6. IX. 2002, Fl-vis col. MI leg. (ELKU); 3♀♀, 20. IX. 2002, Fl-vis col. MS leg. (ELKU); 1♂, 1♀, idem, (PCSI); 1♂, 2♀♀, 21. IX. 2002, Fl-vis col. MI leg. (ELKU); 1♀, 21. IX. 2002, Fl-vis col. MS leg. (ELKU); 1♀, 22. IX. 2002, Fl-vis col. MI leg. (ELKU).

Other specimens examined. [Japan] Central Honshu: 1♂, same locality as type series, 5. IX. 2002, Fl-vis col. AE leg.; 2♂♂, idem, MI leg.; 3♂♂, idem, MN leg.; 2♂♂, 1♀, idem, 6. IX. 2002, MI leg.; 4♂♂, 1♀, idem, TE leg.; 1♀, idem, MN leg.; 3♀♀, 20. IX. 2002, idem, MI leg.; 4♀♀, idem, TE leg.; 1♀, 21. IX. 2002, idem, MS leg.; 1♀, idem, TE leg.; 6♀♀, idem, MI leg.; 3♀♀, 22. IX. 2002, idem, MI leg.; 4♀♀, idem, MS leg.; 1♀, idem, 25. VIII. 1959, SM leg.; 1♀, Sasayama, Kyoto, 20. VIII. 1953, ST leg.; 4♀♀, idem, 21. VIII. 1953, ST leg.; 1♂, idem, 25. VIII. 1959, SM leg.; 1♂, idem, 28. VIII. 1958, SM leg.; 2♂♂, idem, 29. VIII. 1957, SM leg.; 1♂, idem, 23. VIII. 1954, ST leg. **Kyushu:** 1♀, Kashii, Fukuoka, 9. IX. 1960, YH leg.; 1♀, Kashii, Fukuoka, 16. IX. 1959, YM leg.; 1♀, Suguchi, Yatsushiro City, Kumamoto Pref., 25. IX. 2004, IO leg.; 1♀, Shimobunda, Kamoto-machi, Kumamoto Pref.; 14. X. 1995, IO leg. 1♂, Kurae, Matsushimamachi, Amakusa Is., Kumamoto Pref., 1. X. 1989, IO leg.; 1♀, Uchinokawachi, Matsushimamachi, Amakusa Is., Kumamoto Pref., 7. X. 1989, IO leg.; 1♀, Miyajidake, Amakusa Is., Kumamoto Pref., 6. XI. 1961, YH & TK leg. **Tanegashima Is.:** 5♀♀, Mihama-cho, Nishinoomote-shi, Kagoshima Pref., 4. X. 1996, KO leg.; 3♀♀, Naga-hama, Kagoshima Pref., 11. X. 1999, SY leg. **[Korea] Mainland:** 1♀, Enjōmen, Mozangun, Kankyōhoku-dō, 15. IX. 1989, TH leg. **Cheju Is.:** 5♀♀, Pijarim, Pukcheju-gun, 15. IX. 1998, OT leg.; 3♀♀, 400–600 m, Myeong-do-am, 15. IX. 1998, OT leg.; 12♀♀, Songdang-ri, Pukcheju-gun, 16. IX. 1998, OT leg.; 4♀♀, Pyoson-ri, Namjeju-gun, 16. IX. 1998, OT leg. **[China]** 1♂, 1♀, Chinese Academy of Sciences, Beijing, 31. VIII. 1964, GS leg.; 1♀, Hangzhou Ct., Zhejiang Pv., 12. IX. 1995, HX leg.; 1♂, 3♀♀, Xiuning, Huangshan Ct., Anhui Pv., 23–24. IX. 1995, KY leg.; 26♂♂, 41♀♀, idem, 23–25. IX. 1995, SI leg.

Description of male (Figs A, C, E–H). Body length. 7–8 mm. (n = 26).

Coloration. Black except for the followings: clypeus and labrum entirely yellow as in Fig. A; apical one-third of the outer side of mandibles often yellow like glistening; underside of flagella yellowish brown; compound eyes brown; ocelli bright brown; tegulae brown; wings slightly brownish subhyaline, veins and stigma pale brown; marginal zone of T1 to T5 yellowish bright brown; distitarsi and tarsal claws brown.

Structure. HL : HW = 8 : 11; inner margin of eyes slightly converging below; clypeus protuberant, about half of maximum width of a compound eye as seen in lateral view; clypeus with moderately dense, distinct punctures and its diameter three times as long as interspace of two punctures around median portion; malar space extremely short; a blade of galea less than the length of a compound eye; maxillary palpus six-segmented; antennae reaching T1; F3 slightly more than two thirds as long as F2; fore wings each with three submarginal cells; mesoscutum, scutellum and mesepisternum with punctures moderately strong, adjacent each other; T1 with dense punctures, stronger anteriorly, smaller posteriorly; T2 to T5 with more or less distinct punctures; T7 with pygidial plate truncate as in Fig. C; S6 with two converging carinae, each simple and straight; S7 with a pair of lobus like dustpan in shape at the apex and with a median lobe like boomerang in shape at the apex as in Fig. E; S8 with a pair of lobus like a cap at the apex as in Fig. F; genitalia with slender gonostylus elbowed, more strongly bent in the middle than in any species of *T. ruficornis* species group as in Fig. H, and with a middle lobe of penis valves broadened along inner margins in the middle as in Fig. G.

Pilosity. Head with slightly yellowish white hairs moderately long, dense; thorax with pale yellowish hairs moderately long, dense; basal two-thirds of T1 with slightly yellowish white hairs moderately long, dense; T2 to T4 with a transverse band of appressed plumose whitish hairs; that of T5 covered marginal zone, too; T6 and T7 covered with simple short hairs colored brownish; S1 to S5 each with more or less fimbria, those of T2 and T3 dense, broadened in especial; hairs on legs simple, moderately long, slightly yellowish white.

Description of female (Figs B & D). Body

length, 8.5–9.5 mm. (n = 28).

Coloration. Black except for the followings: clypeus with a yellow band like a crown in shape in the lower portion as in Fig. B; apical half of outer side of mandibles yellow like glistening; underside of F2 to F10 reddish brown; compound eyes brown; ocelli bright brown; tegulae brown; wings slightly brownish subhyaline, veins and stigma brown; apical margin of T1 to T3 yellowish bright brown; distitarsi and tarsal claws brown.

Structure. HL : HW = 7 : 11; inner margin of eyes slightly converging below; clypeus protuberant, about half of maximum width of a compound eye as seen in lateral view; punctures on clypeus stronger than in the male; antennae short as usual, F1 to F10 slightly more than as long as compound eye; T6 with pygidial plate not truncate but tapering.

Pilosity. Head with slightly yellowish white hairs moderately long, dense; thorax with pale yellowish hairs moderately long, dense; usually visible part of T4 covered with appressed plumose whitish hairs, its apical portion with a fringe of whitish dense hairs as in Fig. D; medio-apical portion of T5 and T6 covered with simple short hairs colored brownish; apical portion of S2 to S6 with comparatively long hairs colored whitish; hind legs with scopa slightly yellowish white, but the inner part of tarsi with brown hairs.

Variation. In the female upper zigzag margin of a transverse yellow band of the lower portion of clypeus various: its zigzag margin with usually one acute peak in the middle of the band, sometimes a pair or rarely two pairs of weak, not acute peaks on both sides of the center peak; the height of center peak transformed up and down, usually highest among them.

Flight period. Male: late August to early October, Female: late August to early November.

Flower records. Asteraceae: *Aster arenarius* (Kitam.) Nemoto, *Aster yomena* (Kitam.) Honda, *Inula britannica* Linnaeus, *Melanthera robusta* (Makino) K. Ohashi et H. Ohashi. Lamiaceae: *Vitex negundo* Linnaeus.

Distribution. Japan (Central Honshu, Kyushu, Tanegashima Is.), Korea (mainland, Cheju Is.) and China (Beijing, Anhui Pv., Zhejiang Pv.).

Etymology. The specific name is dedicated to Dr. Yoshihiro Hirashima, Emeritus Professor of Entomology, Kyushu University, who is the first person to notice this species.

Remarks. A species treated as *Tetralonia*

ruficornis in China (Wu 2000) appears to be the same species as this new species as a result of examining a pair of specimens from China that were given to me as *T. ruficornis* by Prof., Dr. Wu Yanru. On the habits of visiting flowers, *E. mitsukurii* is generally known to visit the flowers of the plant family Fabaceae mainly (Ikudome 1978, 2005; Iwata 2003; Kakutani *et al.* 1990; Maeta *et al.* 2003; Negoro 2012; Yamane & Ikudome 2008), on the other hand, this new species seems to be fascinated by those of Asteraceae mostly. It is very interesting whether the distribution pattern of these two species is sympatric or not and whether there is habitat segregation connected with the food source between both species. There is no alternative but to wait for future research and development.

Key to the Japanese species of *Eucera* (*Tetralonia*)

Male

1. Antennae reaching well beyond T2; upper margin of yellow mark on clypeus arched; basal one-third or half portion of the outer side of mandibles with a yellow mark; long hairs on medio-apical portion of S2 to S5 distinctly dense; pygidial plate of T7 broadened laterally..... *E. (T.) mitsukurii*
— Antennae long but not reaching beyond T2; upper margin of yellow mark on clypeus distinguishably horizontal; basal portion of mandibles without such mark; long hairs on medio-apical portion of S2 to S5 distinctly sparse; pygidial plate of T7 slender
..... *E. (T.) yoshihiroii* **sp. nov.**

Female

1. Clypeus black, without any yellow mark; hairs on T5 fuscous as a whole
..... *E. (T.) mitsukurii*
— Clypeus with a transverse yellow band like a crown in shape on the lower portion; hairs on T5 broadly yellowish white but distinctly brown on the medio-apical triangular area..
..... *E. (T.) yoshihiroii* **sp. nov.**

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