

Taxonomic Notes on the bifasciata Species Group of the Genus *Nomada* (Hymenoptera : Apidae) in Japan

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Taxonomic Notes on the *bifasciata* Species Group of the Genus *Nomada* (Hymenoptera: Apidae) in Japan*

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Abstract. The *bifasciata* species group of the genus *Nomada* (Hymenoptera: Apidae) in Japan is revised. Two species are recognized. *Nomada yasha* Tsuneki of the *ruficornis* species group is newly synonymized with *Nomada ginran* Tsuneki of the *bifasciata* species group. Supplementary descriptions and illustrations of male terminalia for two species are given.

Keywords: taxonomy, Hymenoptera, Apidae, *Nomada*, *bifasciata* species group, synonymy.

Introduction

The genus *Nomada* Scopoli (Hymenoptera: Apidae) contains at least 800 species in the world. They are all cleptoparasitic bees mainly on *Andrena* (Hymenoptera: Andrenidae). Alexander (1994) analyzed the relationship of the presumable monophyletic lineages within *Nomada* based on a large number of species from the world, and proposed 16 species groups. Although Alexander & Schwarz (1994) classified all Japanese species (78 species) into six species groups, the taxonomic groupings for some species were determined based only on the original descriptions. However, the descriptions of some Japanese species are necessary to be revised because of the following reasons; they provided no information about character states of male terminalia, to which Alexander (1994) attached importance in his cladistic analysis; they

were based either on male or on female; they were based on a few specimens in spite of morphological variations within species of *Nomada*.

According to Alexander & Schwarz (1994), the *bifasciata* species group of *Nomada* in Japan contains two species, *Nomada comparata* Cockerell and *N. ginran* Tsuneki. Because these species were not fully described in their original descriptions (Cockerell, 1911; Tsuneki, 1973), we describe, in this paper, some of their important characters that were not described previously. In addition, we noted during the course of this study that *N. yasha* Tsuneki should be synonymized with *N. ginran*.

Materials and Methods

The morphological terminology used in the descriptions generally followed Alexander (1994) and Michener (2000). Respective terms are abbreviated as follows: HW=head width (distance between the outer margins of compound eyes); MsW=mesosomal width (distance between the outer rims of the tegulae); MtW=metasomal width (width in maximal metasomal tergum); UID=upper interocular distance; IOD=interocellar distance; CD=clypeocellar distance (distance from apicomedian margin of clypeus to apical margin of median ocellus); LID=lower interocular distance; OCD=ocelloccipital distance; LOD=lateral ocellar diameter; UMW=upper malar space width (the shortest distance from anterior base of mandible to margin of compound eye); LMW=lower margin space width (the shortest distance from lower portion of base of mandibles to margin of compound eye).

The specimens examined in this study were borrowed from the following institutions and personal collections, which are referred to in the text by the following abbreviations; ELKU: Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan; MNHAH: Museum of Nature and Human Activities, Hyogo, Japan; NIAES: National Institute of Agro-Environmental Sciences, Tsukuba, Japan; NSMT: National Science Museum, Tokyo, Japan.

The *bifasciata* species group Alexander

Nomada bifasciata species group Alexander, 1994, Univ. Kansas Sci. Bull. 55: 228.

The *bifasciata* species group contains 15 species in the Palearctic Region (Alexander & Schwarz, 1994). It is distinguished by the broad, flat, bladelike, apically curved, imbricate setae on hind tibia in female, the subgenital brush composed of setae long, dense, plumose, horizontally directed, forming apical fringe on the 6th metasomal sterna, the tuft of long, erect setae on trochanter and the depression with recumbent

setae on femur in male, the gonostylus with apical half flattened and curved strongly mesad, and the apically plumose or sinuate vestiture divided into basal and two apical tufts on gonostylus.

Key to the Japanese species of the *bifasciata* species group

Female

- 1 Pubescence on propodeum outside propodeal triangle erect to suberect, sparse (surface of propodeum observable. Fig. 1-E); apical hind tibial setae two, broad, flat, and bladelike (fig. 1-G); bright yellow spots on scutellum and metasoma; body large, usually about or more than 10 mm *comparata* Cockerell
- Pubescence on propodeum outside propodeal triangle appressed, dense (surface of dorsal face of propodeum unobservable. Fig. 3-E); apical hind tibial setae two, short, spinelike (Fig. 3-G); no bright yellow spot on scutellum and metasoma; body smaller, usually less than 10 mm *ginran* Tsuneki

Male

- 1 Flocculus strongly appressed backward and shines brilliantly under a certain direction of light (Figs. 2-C, D); two bright yellow spots on scutellum
.....*comparata* Cockerell
- Flocculus long, sinuate, not shines (Figs. 4-C, D); reddish yellow spot on scutellum
..... *ginran* Tsuneki

Nomada comparata Cockerell

(Japanese name: Ushizuno-kimadara-hanabachi)

(Figs. 1 A-H; 2 A-I)

Nomada maculifrons var. *comparata* Cockerell, 1911, Proc. U.S. Nat. Mus., 39: 644-645 [female, Japan].

Nomada comparata: Yasumatsu & Hirashima, 1952, Kontyû, 19: 81-84; Tsuneki, 1973, Etizenia, 66: 56-58 [redescription]; Alexander & Schwarz, 1994, Univ. Kansas Sci. Bull., 55: 255.

Supplementary description.

Female.

Body length 8.5-13.0 mm. HW:MsW:MtW 1.0:1.0-1.1:1.0-1.1; HW:UID:IOD 1.0:0.6:0.10-0.15; CD:UID:LID 1.0:0.9-1.2:0.9; OCD/LOD 1.4-1.8; area enclosed by three ocelli and preoccipital ridge not raised; scape roughly cylindrical, about as wide as flagella; area between antennal socket and compound eye flat; UMW 0.15-0.18 mm;

LMW 0.05 mm; labrum 1.6 times as wide as long; preoccipital ridge distinctly carinate, gradually higher apically; base of proboscis broadly rounded (Fig. 2-E). Pronotum with lateral ridge rounded, indistinct; collar not incised dorso-medially, weakly or moderately angulate along crest of lateral curve; mesopleuron above scrobal groove conically projected. Propodeal spiracles lie flush against evenly rounded lateral surface of propodeum, with ridge above; propodeal triangle as in Fig. 1-E. Procoxa without spine and lateral carina; distal setae of hind tibia as in Fig. 1-G. Pygidial plate as in Fig. 2-A.

Male.

Body length 7.0-12.0 mm. HW:MsW:MtW 1.0:0.75-1.0:0.7-0.9; HW:UID:IOD 1.0:0.4-0.5:0.16; CD:UID:LID 1.0:0.6-0.9:1.8; OCD/LOD 1.7-2.0; UMW 0.15-0.18 mm; LMW 0.05-0.06 mm. Propodeal triangle, distal setae of hind tibia, and pygidial plate as in Fig. 1-E, H, and 2-B, respectively. Other characters similar to female except as follows: scape swollen in the middle, wider than flagella; labrum 1.6-1.7 times as wide as long; anterior articulation of mandible with moderate flange; hind femur as in Fig. 2-C, D; subgenital brush composed of fringe of long, straight, laterally directed setae on apico-lateral margin of S6, and much sparser vestiture of sub-erect setae on other portion of S6; 7th metasomal sternum as in Fig. 2-I; 8th as in Fig. 2-G, H.

Male genitalia: Gonostylus (Fig. 2-F) roughly cylindrical, vestiture long, moderately plumose, dense on apical and middle-lateral portion, otherwise much sparser; basoventral lobe bearing basoventral setae tuft shorter than on apical gonostylus; shelf on inner base and sclerotized patch on mesal face absent. Penis valve with apex thin; pubescence sparse; ventral hock, inner ridge, basoventral swelling, outer lateral ridge absent; gonobase ring-shaped in ventral view, projecting moderately beyond base of gonocoxite in lateral view. Gonocoxites with distinct dorsal invagination, inner dorsal lobe triangular in ventral view.

Distribution. Japan (Hokkaido, Honshu, Shikoku, Kyushu).

Specimens examined. We have examined a total of 90 females and 69 males from the following localities; Hokkaido, Aomori, Iwate, Ibaraki, Tochigi, Saitama, Chiba, Tokyo, Kanagawa, Niigata, Ishikawa, Fukui, Yamanashi, Nagano, Gifu, Shizuoka, Aichi, Kyoto, Osaka, Wakayama, Hiroshima, Ehime, Fukuoka, and Kumamoto Prefs. Some of them are cited as follows: HONSHU: Iwate Pref.: 1 female, Kuriyagawa, Morioka, 16. v. 1964 (Y. Maeta, ELKU). Ibaraki Pref.: 1 male, Muramatsu, Naka-gun, 22. iv. 1934 (T. Tani, NSMT). Nagano Pref.: 1 female and 1 male, 21. v. 1931 (ELKU). Gifu Pref.: 1 male, Hatahoko, Mt. Norikura, 8. v. 1976 (O. Tadauchi, ELKU), Wakayama Pref.: 1 female and 4 males, Koya, 27. iv. 1976 (O. Tadauchi, ELKU). SHIKOKU: Ehime Pref.: 3 males, Sugitake, Matsuyama, 19. iv. 1953 (T. Mohri, ELKU).

Floral association. *Brassica napus* L. (Cruciferae), *Brassica* sp. (Cruciferae).

Remarks. The female of this species can be easily distinguished from the Japanese congeners by having a unique state in apical hind tibial setae, which are robust, strongly flattened and overlapping each other. The male has a prominent characteristic in having the long, appressed, flocculus on the basal hind femur below. The similar state also occurs in males of other species such as *Nomada ginran* Tsuneki and *N. sheppardana*

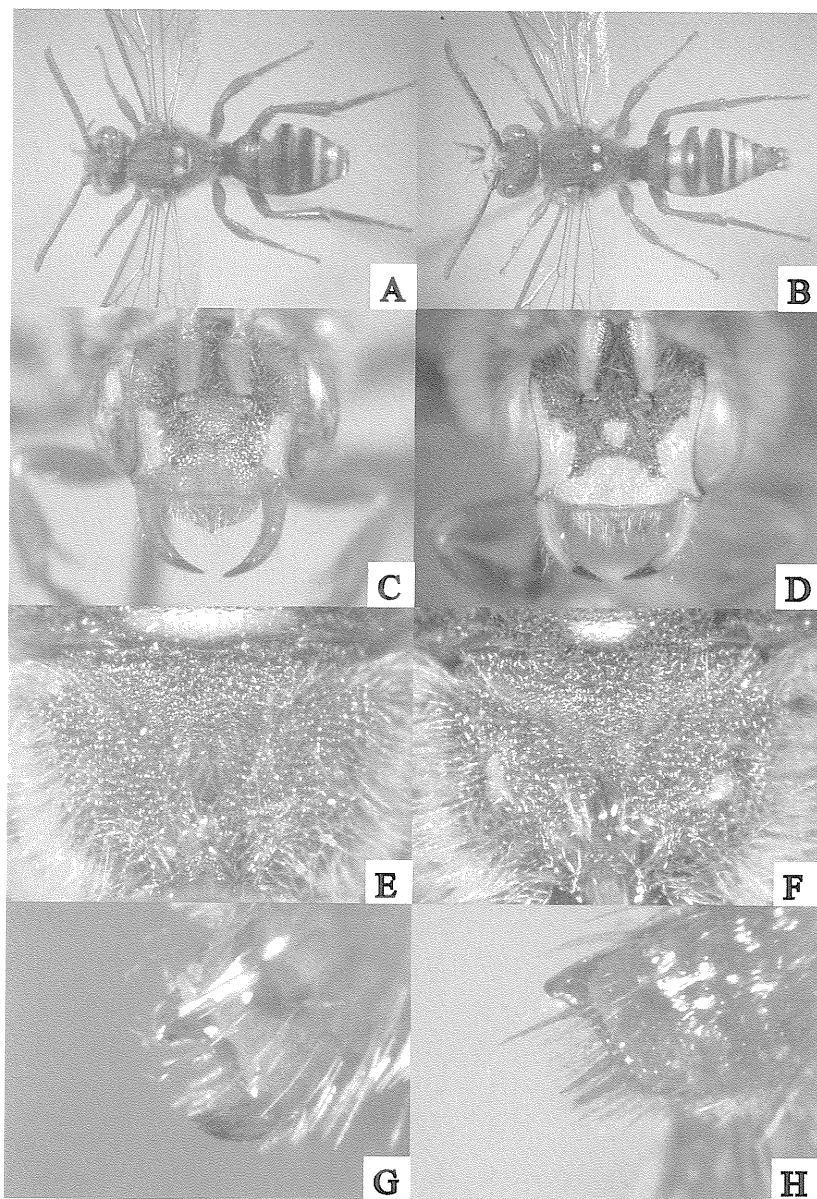


Fig. 1. *Nomada comparata* Cockerell (1). A, C, E, G, female; B, D, F, H, male. A-B, dorsal view; C-D, face; E-F, propodeal triangle; G-H, distal setae of hind tibia.

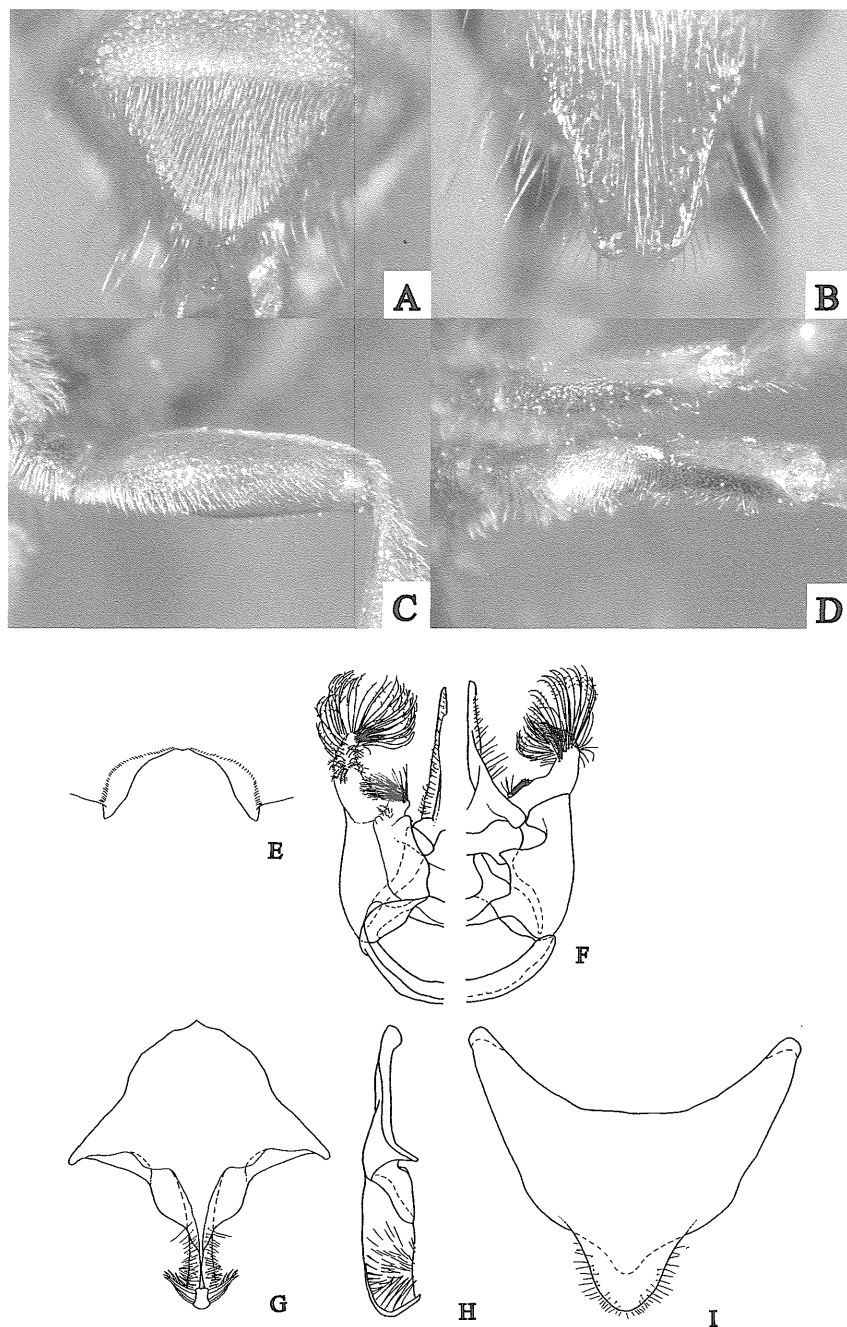


Fig. 2. *Nomada comparata* Cockerell (2). A, E, female; B-D, F-I, male. A-B, pygidial plate; C, hind femur, front view; D, same, beneath; E, base of proboscis; F, capsule (left, dorsal view; right, ventral view); G, 8th metasomal sternum, ventral view; H, same, lateral view; I, 7th sternum, ventral view.

okubira Tsuneki, but the flocculus of *N. comparata* is much more strongly appressed backward and shines brilliantly under a certain direction of light.

***Nomada ginran* Tsuneki**

(Japanese name: Ginran-kimadara-hanabachi)

(Figs. 3 A-H; 4 A-I)

Nomada ginran Tsuneki, 1973, Etizenia, 66: 85-87 [female & male, Japan]; Alexander & Schwarz, 1994, Univ. Kansas Sci. Bull., 55: 256; Ikudome, 1999, in: Ident. Guide Aculeata Nansei Is., Jap.: 653-654.

Nomada yasha Tsuneki, 1986, Spec. Pub. Jap. Hym. Assoc., 32: 36-37 [male, Japan]; Alexander & Schwarz, 1994, Univ. Kansas Sci. Bull., 55: 253. **syn. nov.**

Supplementary Description.

Female.

Body length 6.5-9.0 mm. HW:MsW:MtW 1.0:9.5-1.05:0.9; HW:UID:IOD 1.0:0.55-0.60:0.15; CD:UID:LID 1.0:0.85-0.95:0.65-0.7; OCD/LOD 1.2; area enclosed by three ocelli and preoccipital ridge not raised; scape roughly cylindrical, about as wide as flagella; paraocular ridge weakly raised; area between antennal socket and compound eye flat; UMW 0.1 mm; LMW 0-0.01 mm; labrum 1.4 times as wide as long; preoccipital ridge rounded; base of proboscoidal fossa broadly rounded, hypostomal carina high (Fig. 4-E). Pronotum with lateral ridge indistinct; collar slightly incised dorso-medially, weakly angulate along crest of lateral curve; mesopleuron above scrobal groove somewhat convex; propodeal spiracle without ridge above; propodeal triangle as in Fig. 3-E. Procoxa without spine and lateral carina; distal setae of hind tibia as in Fig. 3-G. Pygidial plate as in Fig. 4-A.

Male.

Body length 5.5-9.0 mm. HW:MsW:MtW 1.0:0.7-0.9:0.8-0.9; HW:UID:IOD 1.0:0.6:0.17; CD:UID:LID 1.0:0.8-0.9:0.7; OCD/LOD 1.4-1.6; UMW 0.1 mm; LMW 0.01 mm. Propodeal triangle, distal setae of hind tibia, and pygidial plate as in Fig. 3-F, H, and 4-B, respectively. Other characters similar to female except as follows: scape swollen in the middle, wider than flagella; labrum 1.7 times as wide as long; anterior articulation of mandibles with flange more prominent than in *N. comparata*; hind femur as in Fig. 4-C, D; subgenital brush erect, evenly dense, not divided into apico-laterad marginal, and much sparser vestiture of sub-erect setae on other portion of S6; 7th metasomal sternum as in Fig. 4-I; 8th as in Fig. 4-G, H.

Male genitalia: Gonostylus (Fig. 4-F) short, strongly curved ventrally, vestiture long,

plumose, dense on apical and middle-lateral portion, otherwise much sparser; basoventral setae tuft short; shelf on inner base, basoventral lobe, and sclerotized patch on mesal face absent. Penis valve with apex bluntly pointed; pubescence fine and sparser; ventral hock, inner ridge, basoventral swelling and outer lateral ridge absent;

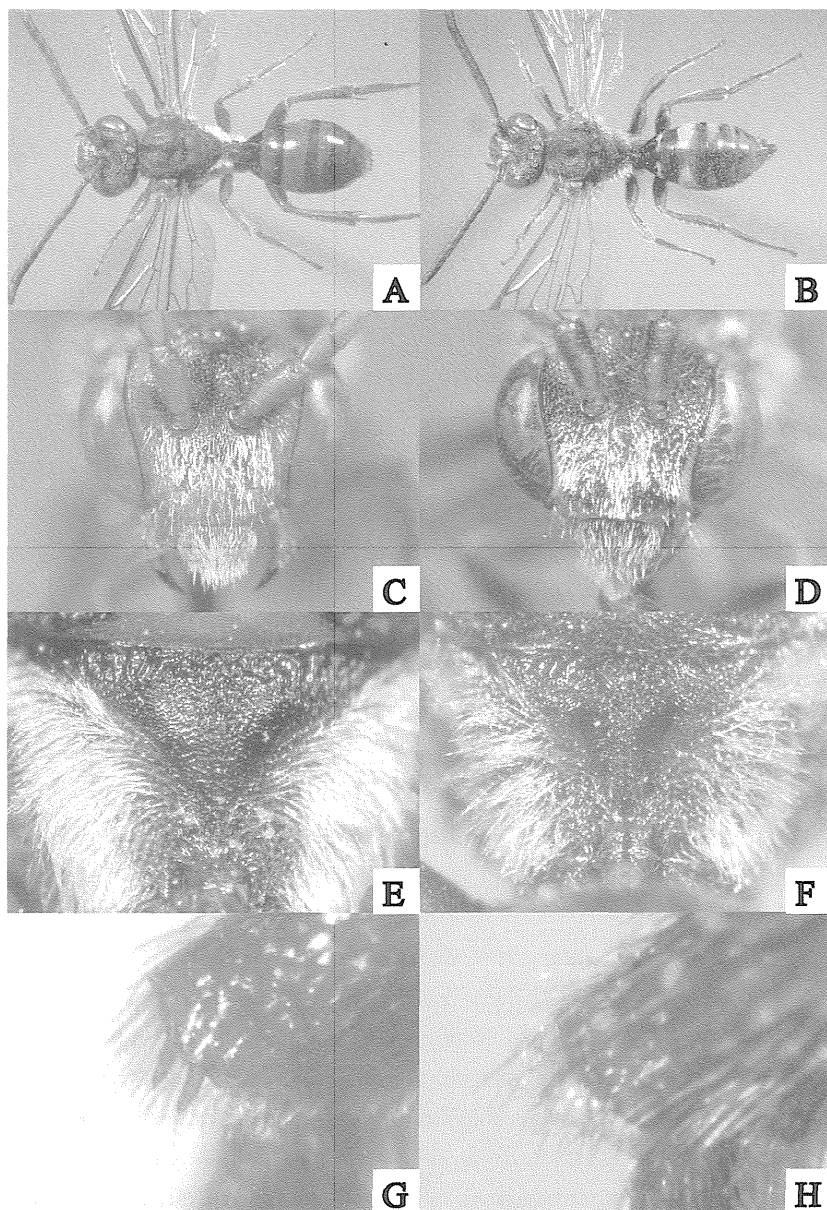


Fig. 3. *Nomada ginran* Tsuneki (1). A, C, E, G, female; B, D, F, H, male. A-B, dorsal view; C-D, face; E-F, propodeal triangle; G-H, distal setae of hind tibia.

Gonobase ring-shaped in ventral view, projecting moderately beyond base of gonocoxite in lateral view. Gonocoxites with dorsal invagination distinct, inner dorsal lobe distinct, rounded at apex.

Distribution. Japan (Hokkaido, Honshu, Shikoku, Kyushu).

Specimens examined. Holotype: female, Fukui Pref., 10. v. 1972 (K. Tsuneki, MNHAH). Other materials: We have examined 354 females and 243 males from the following localities; Aomori, Iwate, Fukushima, Saitama, Tokyo, Kanagawa, Chiba, Niigata, Ishikawa, Fukui, Yamanashi, Osaka, Wakayama, Hyogo, Hiroshima, Tottori, Kochi, Ehime, Fukuoka, Kumamoto, and Miyazaki Prefs. Some of them are cited as follows: HONSHU: Iwate Pref.: 1 female, Ooshida, 6. vi. 1971 (T. Chiba, NIAES). Fukushima Pref.: 18 females, Nakayama, Kôriyama, 23. v. 1975 (O. Tadauchi, ELKU). Wakayama Pref.: 1 male, Koya, 27. iv. 1976 (O. Tadauchi, ELKU). Hyogo Pref.: 1 male, Tamba, Sasayama, 11. iv. 1955 (S. Taniguchi, ELKU). Tottori Pref.: 1 male, Mt. Nagi, Tochimoto, 26. iv. 1976 (O. Tadauchi, ELKU). SHIKOKU: Kochi Pref.: 1 female, 20. iv. 1935 (K. Ôkubo, ELKU). Ehime Pref.: 1 female, Matsuyama, 2. iv. 1950 (M. Miyatake, ELKU). KYUSHU: Kumamoto Pref.: 1 male, 1. v. 1949 (Y. Hirashima, ELKU). Miyazaki Pref.: 1 male, Miyakonojô, 5. iv. 1949 (Y. Hirashima, ELKU).

Floral association. Salicaceae gen. et sp., *Brassica* sp. (Cruciferae), *Acer buergerianum* Miq. (Aceraceae), Ericaceae gen. et sp., *Taraxacum* sp. (Compositae).

Remarks. The female of this species is similar to that of *Nomada aswensis* Tsuneki in having the developed vestiture (reaching the base of segment) on propodeum composed of dense, plumose, appressed setae, but differs from it in having the weaker excavation of basal hind femur below (much wider and deeper excavation in *N. aswensis*) and only two short seta on hind apical tibia (four longer seta in *N. aswensis*). The male is similar in general appearance to that of *Nomada nipponica* Yasumatsu et Hirashima, but can be distinguished from it by the denser and more strongly sinuate flocculus on hind femur below. *Nomada yasha* Tsuneki was described based on three male specimens from Fukui Pref., Japan (Tsuneki, 1986) and since then no additional specimen has been recorded. Tsuneki (1986) mentioned in the original description that this species was quite similar to *N. ginran*, but differed from it by the morphological character states of hind femur, pronotum, scutellum, and pygidial plate and the flying season in early autumn (*N. ginran* flies in spring-summer). However, examination of the holotype of *N. yasha* and a large number of additional specimens of *N. ginran* revealed that the differences in the morphological characters are obscure due to individual variations in *N. ginran*. In addition, Mrs. C. Nozaka (2003, personal communication) informed us that the true collecting dates of type specimens were not in September (Tsuneki, 1986), but in April and May. Therefore, we concluded *N. yasha* should be synonymized with *N. ginran*.

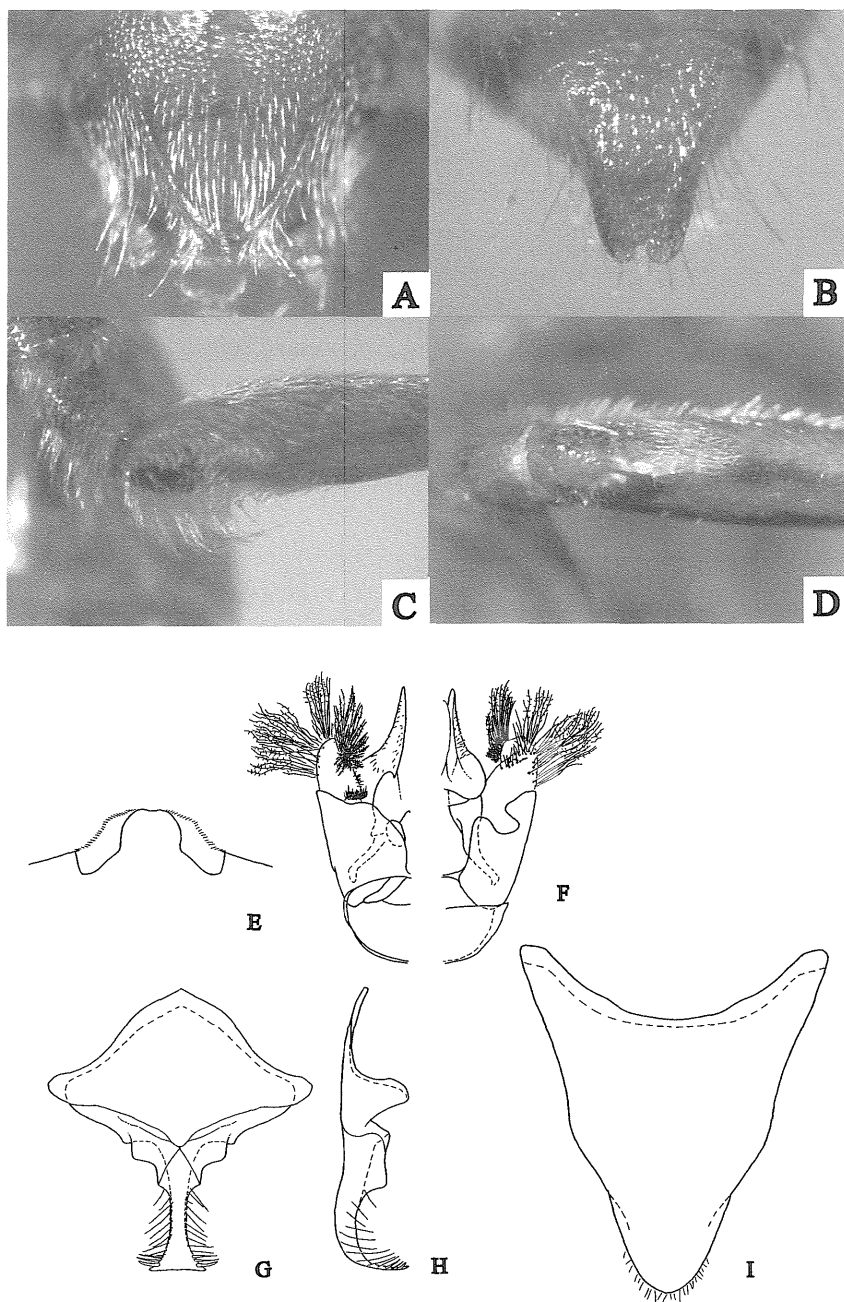


Fig. 4. *Nomada ginran* Tsuneki (2). A, E, female; B-D, F-I, male. A-B, pygidial plate; C, hind femur, front view; D, same, beneath; E, base of proboscis; F, capsule (left, dorsal view; right, ventral view); G, 8th metasomal sternum, ventral view; H, same, lateral view; I, 7th sternum, ventral view.

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