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REVISION OF THE JAPANESE SPECIES OF *NESOPROSOPIS*,
WITH DESCRIPTIONS OF TWO NEW SPECIES
(HYMENOPTERA, COLLETIDAE, *HYLAEUS*)*

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Synopsis *Nesoprosopis* which is a subgenus of *Hylaeus* and is famous for its adaptive radiation in the Hawaiian Islands is reported from Japan for the first time. Seven species of *Nesoprosopis* are recognized there and they are divided into 2 species-groups and 5 species-subgroups. Two new taxa, *Hylaeus nippon* sp. n. and *Hylaeus noomen* sp. n. are described. European species *Hylaeus pectoralis* is newly reported from Japan. *Hylaeus gnathylaeoides* Bridwell is synonymized with *Hylaeus floralis* (Smith). Faunistic and zoogeographical aspects are discussed.

Nesoprosopis is one of the subgenera of the world-wide genus *Hylaeus* (= *Prosopis*). It was proposed by R. C. L. Perkins in 1899 as an endemic genus of bees to the Hawaiian Islands including 52 species. Since then it has been reported outside the Hawaiian Islands from Europe and China. However, the Chinese species was later transferred to *Nesylaeus*, another subgenus of *Hylaeus* restricted to tropical Asia in its distribution.

This paper reports the Japanese species of *Nesoprosopis* which is

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not recorded previously from this country. In Japan, it includes 7 species, 2 of which are new species and 1 of which is the European species *Hylaeus pectoralis* Förster newly found in Japan.

The 7 Japanese species are divided into 2 species-groups and 5 species-subgroups. This treatment, however, is very temporal because the bulk of the species of *Nesoprosopis* are not yet studied in such a way.

For my present study, I was able to examine some valuable specimens, in addition to our collection in Kyushu University, collected by a number of entomologists whose names are appeared in the collecting data of the specimens. Especially I owe to Mr. T. Tano (Fukui City), Dr. R. Ishikawa (Tokyo Metropolitan Univ.) and Mr. Y. Haneda (Ohno City) for interesting specimens. I would like to thank these entomologists for their kind assistance.

Nesoprosopis Perkins, 1899

Nesoprosopis Perkins, 1899, Fauna Hawaiiensis, 1 (1) : 75.

Type-species : *Prosopis facilis* Smith, 1879 (By designation of Popov, 1939).

Nesoprosopis is now understood as a subgenus of *Hylaeus*. It is recognized by the character of the 8th sternum of the male. The apical portion of it is always produced into an extremely long process which rises suberect, on the ventral side, from the body of the sternum. In its simplest form the process is a curved slender rod, but more usually it is expanded dorso-ventrally, bifurcated at the apex and fringed with long hairs.

The extreme apex of the process is always exposed beyond the 6th sternum in life in the Hawaiian species (according to Perkins) but it is not exposed in some Japanese species.

The 6th sternum is more or less compressed or carinate longitudinally on its apical portion and the apical margin of the sternum is emarginate in the middle, on which a part of the process of the 8th sternum is resting.

Perkins reported in 1911 that the European species *Prosopis kriebaumeri* Förster (now known as *Hylaeus pectoralis* or *Prosopis pectoralis*) belongs to *Nesoprosopis*. He also described one species of *Nesoprosopis*, *chinensis*, from China (Macao and West River as far as Kwei-yuen). Because of the structure of the male genitalia (the aedeagus

has the stipes greatly elongate and attenuate as in *Nothylaeus* of Africa), Bridwell (1919) placed *chinensis* in the subgenus *Nesylaeus* Bridwell, 1919 of the genus *Hylaeus*.

So far as is known, *Nesylaeus* is found in China and the Philippines (Los Baños). I have seen, however, some species of *Nesylaeus* from other parts of tropical Asia.

I have also seen a number of species of *Nesoprosopis* from various parts of tropical Asia. This paper, however, only concerns with the Japanese species.

In addition to the character of the male 8th sternum, Bridwell (1919) gives considerable importance to the structure of the supraclypeal area and its extension above between the antennae. In *Nesoprosopis*, according to him, this area is convex between the antennae and narrowed, rounding down at the sides to the rest of the surface without angles, ridges or carinae; it is also not narrowed in the middle nor expanded and elevated at its summit, but is sub-triangular in form, and with a fine shallow channel leading from near its summit near to the anterior ocellus.

In some Japanese species such as *globula* and *nippon* the supraclypeal area is not as described by Bridwell but it is highly elevated, constricted, dilated and sharply edged, and also sharply defined from the rest of the lower portion of the frons.

It is also conspicuous to the Japanese species of *Nesoprosopis* that the 1st tergum is polished and impunctate.

The Japanese species of *Nesoprosopis* may be divided into 2 species-groups in regard to the structure of the male 8th sternum. Each species-group may further be divided into the species-subgroups temporarily. These are separable by the following key.

Key to species-groups, species-subgroups and species of Japanese *Nesoprosopis*

1. Apical process of male 8th sternum filiform or very slender rod-like, simple at apex, not fringed with long curled hairs
..... Species-group of *Hylaeus pectoralis*.....2
- Apical process of male 8th sternum robust (dorso-ventrally expanded), bifid at apex, fringed with long curled hairs
..... Species-group of *Hylaeus floralis*.....3

2. Mesopleuron very strongly punctured and coarsely sculptured even in female; upper portion of supraclypeal area not highly elevated (although well defined from neighbouring areas); face of male broadly yellow; apical portions of 2nd to 4th sterna of male each with a compact fringe of white hairs (Species-subgroup of *Hylaeus pectoralis*) *Hylaeus pectoralis* Förster
- Mesopleuron very strongly punctured and coarsely sculptured in male only (rather coarsely sculptured but punctures small in female) ; upper portion of supraclypeal area highly elevated, dilated laterally and sharply defined from the rest of lower frons; yellow marks on face of male not well developed (clypeus not entirely yellow, lateral face marks not extending above beyond antennal sockets, and supraclypeal area black); sterna of male without hair band (Species-subgroup of *Hylaeus nippon*) *Hylaeus nippon* sp. n.
3. Preoccipital carina distinctly keeled; mesoscutum very finely and very closely punctured, jet black, dull, with very short fuscous hairs ; collar of pronotum low, median portion scarcely convex; clypeus (except for unusual yellow spot) and supraclypeal area of male black; apical margins of 4 basal terga with fringes of snow-white or glistening white hairs distinct in female (especially on lateral portions of 1st tergum) (Species-subgroup of *Hylaeus insularum*) *Hylaeus insularum* Yasumatsu et Hirashima
- Preoccipital carina sharp but not keeled; collar of pronotum convex in outline when seen in front; yellow markings on face of male well developed 4
4. Clypeus of female black; propodeal enclosure broadly and strongly wrinkled, wrinkles distinct (although weakened) even on vertical apical portion ; mesopleuron coarsely sculptured ; mesoscutum with whitish hairs predominant Species-subgroup of *Hylaeus matsumurai* 5
- Clypeus of female broadly yellow or at least with median yellow stripe; propodeal enclosure wrinkled only at basal portion (vertical apical portion broadly free of wrinkles); mesopleuron either smooth or roughened ; mesoscutum with brownish hairs predominant Species-subgroup of *Hylaeus floralis* 6
5. Paraocular keel distinct, especially in male; collar of pronotum hardly thickened and rounded (only lateral portions slightly thickened in female only), clothed with white tomenta behind; mesoscutum weakly shining, very densely punctured (punctures fine especially on anterior portion)..... *Hylaeus matsumurai* Bridwell
- Paraocular keel not distinct ; collar of pronotum thickened, convex and rounded especially on lateral portions, broadly yellow; mesoscutum dull, densely punctured (punctures coarser than in *matsumurai*); face of male very broadly ivory *Hylaeus noomen* sp. n.

6. Supraclypeal area only slightly constricted in middle as seen in front, upper portion distinctly elevated and sharply defined from neighbouring areas but not abruptly reducing its height toward above ; mesopleuron reticulate-punctured in female, strongly punctured in male ; malar space short but distinct; 2nd flagellar segment much broader than long, only slightly longer than 1st which is ring-like; clypeus of female with yellow median stripe*Hylaeus floralis* (Smith)
- Supraclypeal area distinctly constricted in middle as seen in front, upper portion highly elevated and distinctly dilated laterally with sharp edges (more evident in female); malar space very short; mesopleuron smooth (although microscopically reticulate) with well separated small punctures ; 2nd flagellar segment distinctly longer than ring-like 1st segment; clypeus of female often largely yellow*Hylaeus globula* (Vachal)

A. Species-group of *Hylaeus pectoralis* Förster

Eighth sternum of male with apical process filiform or very slender rod-like, with simple apex, without dense fringe of long curled hairs. Two species.

This species-group is further divided into two species-subgroups.

A-1. Species-subgroup of *Hylaeus pectoralis* Förster

Mesopleuron very strongly punctured even in female; supraclypeal area of female almost triangular as seen in front, upper portion not highly elevated, slightly dilated laterally, distinctly defined from the rest of lower frons ; supraclypeal area of male much longer than broad, upper portion small triangular, not strongly elevated; lower portion of frons broadly impunctate above antennal sockets ; this area especially distinct and shining in male ; collar of pronotum thin, transversely almost carinate (more or less similar to that of *matsumurai*), sparsely fringed with white tomenta behind; mesoscutum with hairs white; yellow markings on face of male well developed. One species.

(1) *Hylaeus* (*Nesoprosopis*) *pectoralis* Förster

Nesoprosopis kriechebaumeri : Perkins, 1911, Trans. Ent. Soc. Lond., 1911: 719.

This is the first record of this species outside Europe. In Japan, this species is only found in Hokkaido so far. Horonobe in Teshio Province is the only known locality there. Only four male specimens are available for the present study. Identification of the Japanese specimens was made in comparison with the European material at the Museum

Leiden in 1967. There is a delicate difference between the Japanese and European specimens, especially in the proportion of the male antennal segments, but I think these are conspecific.

Characteristic of this species is the mesopleuron which is very strongly punctured in both sexes. The collar of pronotum is also distinctive in being not thickened and rounded, but thin and transversely almost carinate, although it is well convex in outline as seen in front. Another important character of this species is that apical margins of the male 2nd to 4th sterna are fringed with compact, downy, white hairs.

Male: Length about or less than 7 mm.

Black, with following maculations or portions yellow : clypeus except for apical margin and lateral sutures (median portions of sutures longitudinally slightly enlarged), supraclypeal area, large lateral face marks which are often extending above beyond antennal sockets, anterior stripes of scapes sometimes absent, apical halves of tubercles, marks on tegulae, and rich markings on tibiae and tarsi (anterior faces of fore tibiae, basal marks of mid tibiae, basal halves of hind tibiae, and basitarsi of all legs except for each apex) ; apices of basitarsi and small segments of tarsi of all legs pale yellowish brown; tegulae brownish or pale brownish subtransparent ; wings slightly dusky with veins and stigma brownish.

Head more or less thick as seen in profile (thickest in all the Japanese species of *Nesoprosopis*); inner margins of eyes converging below but not very strongly so; face broadly nearly flat; supraclypeal area much longer than broad, upper portion small triangular, slightly convex; frons broadly nearly flat, with large impunctate and shining spaces lateral to frontal line above antennal sockets ; malar space distinct, not long; vertex broad, posterior portion near occiput, unlike other species, not strongly slanting ;scape distinctly dilated (with posterior faces excavated), slightly less than one and one-half times as long as broad; flagellum more or less short, with two basal segments broader than long respectively, 3rd approximately as long as broad.

Collar of pronotum entirely black, thin, transversely carinate, clothed with white fringe of hairs behind but this is not conspicuous ;mesoscutum feebly shining, microscopically reticulate, rather densely punctured, punctures small (or occasionally rather coarse) and interspaces flat; scutellum nearly flat, with punctures much stronger than those on mesoscutum; propodeal enclosure transversely or irregularly strongly carinate, rest of propodeum coarsely sculptured; mesopleuron very coarsely

sculptured with large, round, deep and dense punctures, interspaces of punctures linear.

First tergum polished and distinctly shining; 2nd and following terga shining with an indication of aciculate punctures ; apical margins of 2nd to 4th sterna each with a compact fringe of downy, whitish hairs; medio-apical portion of 6th sternum longitudinally elevated and apical margin of the same sternum emarginate in middle ; apical process of 8th sternum very slender, rod-like, with fine and sparse hairs at apex which is exposed or not exposed beyond apex of 6th sternum.

Hairs on head and thorax more or less long, whitish; abdomen more or less hairy but hairs short ; hairs on apical segments (terga and sterna) fuscous; hairs on apical margins of three or four basal terga obscurely appearing fringe-like in some light.

The following description of the female is based on the European specimens.



Fig. 1. Frontal view of the head of *Hylaeus pectoralis*, female (European material).

Female : Length about 7.5 mm.

Black, with following maculations or portions yellow: large lateral face marks which are not reaching bases of mandibles below and not beyond upper margins of antennal sockets above, tubercles, spots on tegulae, basal marks of fore and mid tibiae, and about basal halves of hind tibiae.

Outline of head round as seen in front; head thick with genal areas well developed (thickest among the Japanese *Nesoprosopis* as in the

case of the male) ; face broadly convex, but outline of clypeus not distinctly arched when head is seen from side ; supraclypeal area moderately convex, well separated from the rest of lower frons, almost triangular as seen in front, upper portion indistinctly dilated laterally, not abruptly reducing its height toward above, with a median sulcus (which is an extension of the frontal line) distinct ; apical margin of clypeus somewhat broadly constricted and slightly reflected ; clypeus microscopically reticulate, distinctly wrinkled-punctured ; supraclypeal area somewhat longitudinally lineolate ; lower portion of frons somewhat broadly impunctate just above each antennal socket; malar space narrow, widened posteriorly.

Collar of pronotum similar to that of *matsumurai* (thin, transversely almost carinate, lateral portions only slightly thickened, fringed with short, white, not specially dense tomenta behind); mesoscutum microscopically reticulate, nearly dull, rather densely punctured (punctures sparser and stronger than in female of *nippon*), covered with short white hairs ; scutellum nearly flat, coarsely and strongly punctured; propodeal enclosure strongly and irregularly wrinkled as in *nippon*, wrinkles on apical portion (vertical) weakened but well noticeable, rest of propodeum coarsely sculptured (more coarsely so than in *nippon*); mesopleuron very coarsely sculptured with strong, round punctures (only slightly less coarsely sculptured than in male and in male of *matsumurai*).

Abdomen with 1st tergum polished and impunctate as in male ; hairs on apical margins of 2nd to 4th or to 5th terga glistening white and fringe-like in some light; hairs on apical portion of abdomen fuscous.

Specimens examined from Japan: 2 males, Horonobe, Teshio Prov., Hokkaido, July 23, 1953 (R. Ishikawa) ; 1 male, the same locality, July 23-24, 1956 (R. Ishikawa).

Distribution : Europe and Japan (Hokkaido).

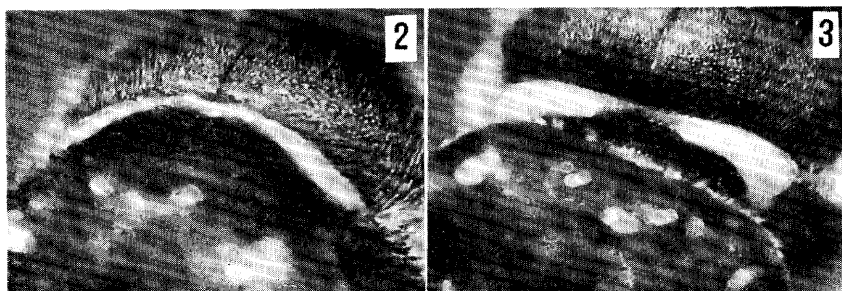
A-Z. Species-subgroup of *Hylaeus nippon* sp. n.

Mesopleuron very strongly punctured in male only (although coarsely sculptured in female) ; supraclypeal area highly elevating, slightly constricted in middle as seen in front, upper portion dilated laterally, abruptly reducing its height toward above; collar of pronotum strongly convex, median portion distinctly retreating toward mesoscutum because anterior face of pronotum slantingly cut off; frons without shining impunctate space ; yellow markings on face of male not well developed

(clypeus not entirely yellow, lateral face marks rather small and supra-clypeal area black) ; mesoscutum dull, very densely punctured, covered with fuscous hairs; male sterna without fringe of hairs. One species.

(2) *Hylaeus* (*Nesoprosopis*) *nippon* sp. n.

Characteristic of the new species is the structure of the pronotum, the anterior face of which is broadly clearly cut off slantingly, therefore the median portion of the collar of pronotum is retreating toward the mesoscutum; the collar of pronotum is highly convex and very thin in the middle where it is slightly concave. This structure of the pronotum is more pronounced in the female than in the male. Another important characters of this species are that the supraclypeal area is highly elevating and the upper portion of it is abrupt and sharply defined from the frons, and that the mesoscutum is jet black, dull, very densely punctured, clothed with very short, nearly appressed fuscous hairs (hairs slightly longer and downy in the male).



Figs. 2 and 3. Frontal view of the collar of pronotum. 2: *Hylaeus nippon*, female. 3: *Hylaeus insularum*, female.

Female : Length about 7.5 mm.

Black, with following maculations or portions yellow : large lateral face marks not beyond antennal sockets above, transverse band (sometimes linear) on lateral portions of collar of pronotum, apical halves of tubercles, spots on tegulae occasionally absent, small basal marks on fore and mid tibiae, and less than basal halves of hind tibiae; sometimes clypeus with a yellow spot subapically ; flagellum beneath brownish ; tegulae brown ; wings slightly darkened with veins and stigma brown.

Outline of head in front view slightly receding below; malar space distinct (slightly longer than in *pectoralis*); when head is seen from side, clypeus distinctly arched in outline; clypeus minutely reticulate

or longitudinally lineolate, weakly wrinkled-punctured (less wrinkled-punctured than in *pectoralis*, especially on upper portion) ; supraclypeal area highly elevated, upper portion dilated laterally, abrupt, clearly defined from the rest of lower frons; frons slightly convex, extremely densely punctured ; posterior portion of vertex strongly slanting.

Pronotum as described before ; collar of pronotum slightly thickened and rounded on lateral portions ; mesoscutum jet black, dull, minutely reticulate, very densely punctured, punctures small with interspaces almost linear, covered with short, appressed, fuscous hairs; scutellum flat, distinctly more coarsely punctured than in mesoscutum ; propodeum less strongly sculptured than in *pectoralis* except for enclosure which is very strongly, irregularly carinate, but wrinkles on apical portion (vertical) almost obsolete ; mesopleuron dull, coarsely sculptured but punctures not strong, much weaker than in *pectoralis*.

Abdomen strongly tapering toward apex as usual for the species of *Hylaeus*; 1st tergum polished, highly shining; 2nd and following terga shining with aciculate punctures ; hairs on apical margins of 2nd to 4th terga glistening white and obscurely fringe-like in some light; hairs on apical portion of abdomen fuscous.

Male: Length about or less than 6.5 mm.

Black, with following maculations or portions pale yellow : large lateral face marks sometimes somewhat reduced, mark on clypeus variable in size, anterior stripes of scapes sometimes absent, linear band on lateral portions of collar of pronotum often absent, apices or apical halves of tubercles, spots on tegulae often absent, anterior stripes on fore tibiae, basal small marks on mid tibiae, less than basal halves of hind tibiae,

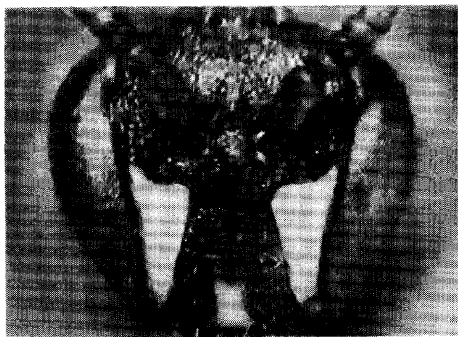


Fig. 4. Frontal view of the head of *Hylaeus nippon*, male.

and hind basitarsi except for apices (fore and mid basitarsi sometimes also pale yellow in variable extent) ; flagellum beneath reddish brown.

Head receding below as seen in front; inner margins of eyes distinctly converging below ; clypeus less convex than in female; supraclypeal area highly elevated, upper portion narrower than in female but sharply defined from neighbouring area as in female; lower portion of frons only narrowly impunctate along upper lateral margins of supraclypeal area ; malar space distinct, about as long as 1st flagellar segment; scape short, hardly dilated (distinctly narrower than in *pectoralis*); 1st and 2nd flagellar segments much broader than long respectively; 3rd approximately as long as broad.

Collar of pronotum very thin, transversely carinate, clothed with fringe-like dull white (sometimes slightly brownish) hairs behind ; unlike female, collar of pronotum not concave in middle; mesoscutum and scutellum as described for female ; propodeal enclosure shining, transversely very strongly carinate or sometimes irregularly so ; mesopleuron very coarsely sculptured with strong, round punctures, with interspaces often well marked, flat, nearly dull.

First tergum polished and highly shining as in female; 2nd and following terga also shining, with an indication of sparse aciculate-punctures ; median longitudinal elevation of 6th sternum not distinct, apical margin of 6th sternum only slightly emarginate in middle ; apical process of 8th sternum usually not exposed, similar in shape to that of *pectoralis*. Genitalia more or less elongate ; stipes broad and rounded at apex, fringed with long hairs on outer margins; apex of stipes slightly produced beyond apices of sagittae.

Hairs on head, thorax and abdomen fuscous except for those on genal areas, mesopleuron and propodeum paler; hairs on legs brownish to whitish.

Type material : Holotype female (Type No. 2062, Kyushu Univ.), 6 paratopotype females and 2 paratopotype males, Sumo, Tsushima, Oct. 8, 1959 (Y. Hirashima). Other paratypes from Tsushima: 2 females and 3 males, on *Fagopyrus vulgare*, Oct. 5, 1959 (Y. Hirashima); 6 females, some are collected on *Mentha arvensis* var. *piperascens*, Tsutsu, Oct. 7, 1959 (Y. Hirashima); 8 females and 7 males, Azamo-Taterayama, Sept. 27, 1959 (Hidaka, Morimoto, Kamiya & Kawarabata); 4 females, Sumo, Oct. 9, 1959 (Y. Maeta). Paratypes from Hokkaido: 3 females and 10 males, Kawakami, near Honbetsu, Tokachi Prov., July 7-27, 1953 (Y. Hirashima) ; 1 female and 2 males, Antaroma-Aizankei, Ishikari Prov.,

Jul. 14, 1952 (T. Shirozu). Paratypes from Honshu: 3 males, Mt. Hino, Fukui Pref., May 8, 1960 (T. Tano) ; 3 males, Kameyama, Fukui Pref., May 22, 1960 (T. Tano). Paratypes from Kyushu: 1 female, Kashii, Fukuoka City, on the flowers of *Castanea crenata*, June 6, 1960 (Y. Hirashima); 1 male, Inunakiyama, on *Picris hieracioides* var. *japonica*, June 2, 1960 (Y. Hirashima).

Specimens examined other than the type material: 36 specimens from Hokkaido, Honshu, Kyushu, Tsushima, collected by T. Shirozu, M. Takahashi, S. Nakao, Y. Hirashima, Y. Ohmori, S. Taniguchi, R. Ishikawa, J. Minamikawa, T. Tano, T. Ono, Esaki and Hirashima, and T. Kifune.

Type depository : Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka 812, Japan.

Distribution : Japan (Hokkaido, Honshu, Kyushu, Tsushima).

B. Species-group of *Hylaeus floralis* Smith

Apical process of 8th sternum of male robust (expanded dorso-ventrally), bifid at apex, fringed with long curled hairs, and apical portion of the process often exposed beyond tip of 6th sternum. Five species.

This species-group may be divided into three species-subgroups.

B-1. Species-subgroup of *Hylaeus insularum* Yasumatsu et Hirashima

Preoccipital carina distinctly keeled ; supraclypeal area large triangular as seen in front, not sharply edged laterally, upper portion gently merging into frons; collar of pronotum with dorsal margin transverse and low as seen in front, lateral portions thickened, rounded and convex; mesoscutum very finely and exceedingly densely punctured with fuscous hairs; clypeus and supraclypeal area of male black ; glistening white fringes of hairs on apical portions of terga distinct; size of *pectoralis* and *nippon*. One species.

(3) *Hylaeus* (Nesoprosopis) *insularum* Yasumatsu et Hirashima

Hylaeus insularum Yasumatsu et Hirashima, 1965, Kontyû, 33 (2): 247, female and male.

The most interesting feature of this species is that the preoccipital carina is sharp and distinctly keeled in both sexes. This species is further characterized as follows :

Female : Face strongly convex anteriorly, so that clypeus distinctly arched in outline when head is seen from side ; supraclypeal area well convex, broad below, narrowing above and gently merging into frons,

not distinctly defined from the latter; mesoscutum very finely and very densely punctured, jet black, dull, covered with very short fuscous hairs; collar of pronotum not distinctly convex but rather transverse in middle, lateral portions (pale yellow in colour) well convex, rounded; fringes of hairs on apical portions of terga distinct, especially on 1st tergum laterally.

Male: Clypeus (except for unusual yellow spot) and supraclypeal area black; paraocular carina distinct (about as strong as or only slightly weaker than in the male of *matsumurai*) ; upper portion of clypeus broadly flat ; mesoscutum as in female ; propodeal enclosure transversely very strongly carinate ; scape black, slightly dilated; flagellum long, 2nd flagellar segment a little broader than long, 3rd a little longer than broad (rarely about as long as broad).

For further information see the original description.

Specimens examined from new localities: 43 females and 19 males, Hachijo-jima, May 26-June 5, 1964 (Hirashima and Shiga). 1 female, Ashizuri-misaki, Kochi Pref., Shikoku, Oct. 12, 1962 (Y. Haneda).

Distribution : Nansei Islands (Iriomote, Ishigaki, Okinawa, Okinoerabu, Tokuno-shima, Amami-Oshima, Yakushima), Kyushu (Satano-misaki), Koshiki-jima (Kagoshima Pref.), Okino-shima (Fukuoka Pref.), Shikoku (Ashizuri-misaki), Hachi jo- jima.

B-2. Species-subgroup of *Hylaeus matsumurai* Bridwell

Large species (size of the preceding species-subgroup) ; preoccipital carina sharp but not keeled; clypeus usually black in female; upper portion of supraclypeal area of female not dilated laterally and not abruptly reducing its height toward above; propodeal enclosure strongly wrinkled or carinate, wrinkles usually distinct (although weakened) even on vertical apical portion; mesopleuron coarsely (in female) or very coarsely (in male) sculptured; mesoscutum either dull or weakly shining, with white hairs predominant. Two species.

(4) *Hylaeus* (*Nesoprosopis*) *matsumurai* Bridwell

Hylaeus matsumurai Bridwell, 1919, Proc. Hawaii. Ent. Soc., 4 (1): 153, female.

Characteristics of this species are the presence of the paraocular keel which is weak in the female (although distinct in comparison with other species) and very strong in the male, the collar of pronotum which is thin, often entirely black and clothed with a white fringe of short hairs on posterior margin, the mesoscutum which is shining

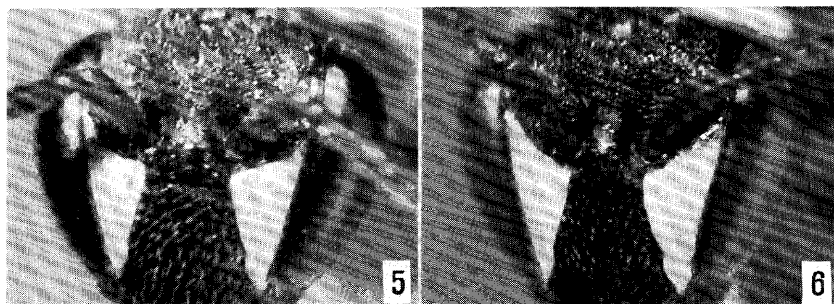
(although weakly so) and clothed with whitish hairs, and the propodeal enclosure which is very strongly wrinkled or carinate, and wrinkles distinct even at the apical (vertical) portion.

Female: Size of the female of *insularum*.

Black, with following maculations or portions yellow or pale yellow: large lateral face marks, a pair of evanescent marks on collar of pronotum sometimes absent, tubercles, anterior marks on tegulae, and basal marks on all tibiae (marks on mid tibiae small).

Clypeus well convex, minutely reticulate, more or less coarsely wrinkled-punctured especially on lower portion ; supraclypeal area well convex, rather large and triangular as seen in front, upper portion gently reducing its height toward above with a distinct median sulcus; posterior portion of vertex strongly slanting; malar space somewhat long, about as long as 1st flagellar segment; paraocular keel well noticeable.

Collar of pronotum well convex in outline as seen in front, median portion very thin, lateral portions only slightly thickened, not roundly convex ; collar of pronotum clothed with a fringe of white tomenta behind ; mesoscutum shining (although weakly so), microscopically reticulate, very densely and finely punctured, clothed with whitish hairs; scutellum flat, much more coarsely punctured than in mesoscutum; propodeal enclosure well convex, very strongly and coarsely wrinkled or carinate even to the apical (vertical) portion (although wrinkles weakened apically); rest of propodeum also coarsely sculptured ; mesopleuron coarsely sculptured with indication of very dense, round, strong punctures with linear interspaces. Abdomen tapering posteriorly as



Figs. 5 and 6. Frontal view of the female head. 5: *Hylaeus matsumurai*.
6: *Hylaeus noomen*.

usual, polished and highly shining, with sparse glistening hairs appearing fringe-like on apical margins of intermediate terga in some light; hairs on apex of abdomen fuscous.

Male: Size of the male of *insularum*.

Black, with following maculations or portions yellow or pale yellow : clypeus, supraclypeal area, large lateral face marks which often extend above beyond antennal sockets, anterior stripes of scapes, tubercles, anterior marks on tegulae and rich markings on legs (fore tibiae except behind, basal marks on mid tibiae, basal halves of hind tibiae, and basitarsi of all legs except for apices) ; small segments of tarsi yellowish brown ; flagellum beneath reddish brown.

Inner eye margins distinctly converging below, with paraocular keel strong; clypeus weakly convex or rather flat; supraclypeal area also weakly convex, lower portion broadly flat, upper portion short triangular in outline as seen in front, more or less abruptly reducing its height toward above ; malar space slightly longer than 1st flagellar segment, scape distinctly dilated; flagellum with two basal segments much broader than long respectively, 3rd about as long as broad.

Collar of pronotum thin and less developed than in female, clothed with a fringe of white tomenta behind like female ; mesoscutum like female but punctures becoming slightly more larger posteriorly than in female ; propodeal enclosure shining, transversely very strongly carinate; rest of propodeum slightly more coarsely sculptured than in female ; mesopleuron coarsely sculptured with very strong, dense punctures which are considerably larger than those in female.

First tergum polished and highly shining; 2nd and following terga hairy with aciculate punctures; 6th sternum convex, apical margin emarginate in middle, from which apex of 8th sternum is exposed; apical lobe of 8th sternum richly decorated with long curled hairs, apex distinctly bifid.

Specimens examined : Many specimens from Kyushu and Tsushima and a few from Honshu and Shikoku, respectively, were collected by Y. Hirashima, T. Esaki, H. Hori, T. Hidaka, K. Morimoto, H. Kamiya, T. Kawarabata, K. Yasumatsu, Y. Yamamoto, K. Sato, J. Sonan, K. Iwata and T. Tano.

Distribution : Japan (Honshu, Shikoku, Kyushu, Tsushima).

(5) *Hylaeus (Nesoprosopis) noomen* sp. n.

The female of this new species shows a close resemblance to that of

H. matsumurai Bridwell, and is only distinguishable decidedly by the combination of the following characters : paraocular carina not at all distinct ; supraclypeal area slightly smaller (narrower) with upper portion slightly constricted ; lateral portions of pronotum thickened, rounded and convex, and colored in yellow ; and mesoscutum dull, slightly more coarsely punctured (although punctures small). Recognition of the male of this species is rather easy because of the large ivory marks on the face, to which the specific name, noomen, a Japanese word meaning a mask used in the no-play, is related.

Female : Size of the female of *matsumurai*.

Black, with following maculations or portions yellow or ivory yellow: large lateral face marks, interrupted band on collar of pronotum, tubercles, anterior marks on tegulae, anterior stripes on fore tibiae, basal marks on mid tibiae and basal halves of hind tibiae; flagellum beneath and small segments of tarsi dark reddish brown.

Clypeus slightly more distinctly wrinkled-punctured than in *matsumurai*; supraclypeal area well convex, upper portion narrow, slightly constricted, gently reducing its height toward above; malar space a little longer than in *matsumurai*.

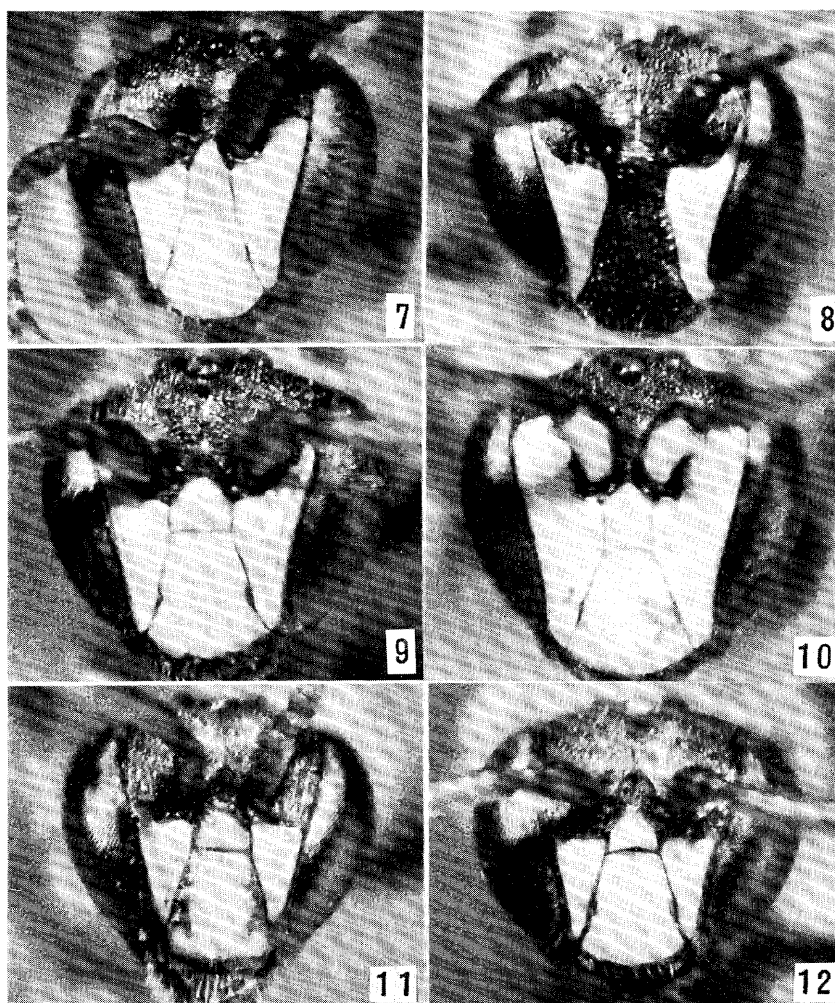
Unlike *matsumurai*, collar of pronotum well developed, with lateral portions thickened, convex and rounded; mesoscutum dull or nearly so, densely reticulate, very densely punctured, punctures slightly coarser than in *matsumurai* especially on anterior portion, and interspaces slightly more irregular than in *matsumurai*; propodeal enclosure and mesopleuron almost as in *matsumurai*.

Abdomen similar to *matsumurai* but, in the holotype of this species, white hair fringes on apical portions of terga distinct nearly as in *insularum*, and hairs on 5th segment (tergum and sternum) fuscous (hairs on the same segment primarily white in *matsumurai*).

Male : Size of the male of *matsumurai*.

Black, with following markings or portions pale yellow or ivory: stripes on mandibles sometimes obscure, clypeus, supraclypeal area, paraocular areas except for upper portions only, anterior faces of scapes, interrupted band on collar of pronotum, tubercles, anterior halves of tegulae, and rich marks on tibiae and tarsi.

Face broad, largely flat; paraocular carina not distinct ; frons largely flat, with longitudinal, impunctate, shining spaces lateral to frontal line



Figs. 7-12. Frontal view of the male head.

- | | |
|--------------------------------|-------------------------------|
| 7: <i>Hylaeus pectoralis</i> . | 8: <i>Hylaeus insularum</i> . |
| 9: <i>Hylaeus matsumurai</i> . | 10: <i>Hylaeus noomen</i> . |
| 11: <i>Hylaeus floralis</i> . | 12: <i>Hylaeus globula</i> . |

above antennal sockets ; malar space long, longer than 1st flagellar segment ; scape distinctly dilated as in *matsumurai*; flagellum more or less long, two basal segments broader than long, 3rd about as long as

broad.

Thorax almost as in female but punctures on mesoscutum slightly stronger.

First tergum highly shining, with an indication of microscopical fine punctures on lateral portions ; 2nd and following terga hairy with aciculate punctures ; apical fringes of short white hairs on basal four terga distinct in fresh specimens; medio-apical portion of 6th sternum longitudinally distinctly elevated, apical margin notched in middle; 8th sternum similar in shape to that of *matsumurai*, and bifid apical portion frequently exposed beyond apex of 6th sternum.

Type material : Holotype female (Type No. 2063, Kyushu Univ.), 7 paratopotype females and 2 paratopotype males, Terai, Ishikawa Pref., July 14, 1967 (T. Tano); 4 paratype males, Hachijo Is. in the Pacific, Tokyo Pref., June 4-5, 1964 (Hirashima & Shiga) ; 6 paratype males, Imuta, Koshiki-jima, Kagoshima Pref., Aug. 23-25, 1960 (K. Morimoto); 1 paratype male, Nukabira, Tokachi Prov., Hokkaido, Aug. 10, 1965 (Y. Hirashima).

Type depository : Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka 812, Japan.

Distribution : Japan (Hokkaido, Honshu, Hachijo Is., Koshiki-jima).

B-3. Species-subgroup of *Hylaeus floralis* (Smith)

More or less small species ; preoccipital carina sharp but not keeled; propodeal enclosure wrinkled on basal portion only (vertical apical portion free of wrinkles); supraclypeal area well convex, constricted or nearly so in middle as seen in front, upper portion with lateral edges distinct, sharply defined from the rest of lower frons; mesopleuron either coarsely sculptured (*floralis*) or weakly punctured (*globula*); malar space short to very short; face of female with rich yellow markings even on median portion of clypeus ; occasionally supraclypeal area and axillae of female also yellow ; mesoscutum very densely and finely punctured with brownish hairs predominant. Two species.

(6) *Hylaeus* (Nesoprosopis) *floralis* (Smith)

Prosopis floralis Smith, 1873, Trans. Ent.Soc.Lond., 1873: 199, female and **male**.
Hylaeus gnathylaeoides Bridwell, 1919, Proc. Hawaii. Ent. Soc., 4(1): 152, female and male. New Synonymy.

This species and the following one, *Hylaeus globula*, are very closely

allied and may be easily confused unless the character of the mesopleuron is carefully observed. In this species, the mesopleuron is rather coarsely sculptured with very close punctures (although small) on the densely reticulate surface in the female, and coarsely sculptured with strong punctures in the male. In *globula* the mesopleuron is rather smooth, weakly shining, with small punctures in both sexes. Supraclypeal area is also delicately different. In the females, it is constricted in the middle and the upper portion distinctly dilated laterally with sharp edges in *globula*, but it is only slightly constricted, if ever, in the middle and the upper portion is not very abrupt in *floralis*.

The female of this species may further be recognizable by its more or less small size, more or less rich yellow markings on face, pronotum, tubercles, tegulae and legs, finely and densely punctured mesoscutum, and pale brownish subtransparent apical margins of the intermediate terga.

In the male of this species, the colored portions of paraocular areas are slightly concave longitudinally and the paraocular carinae are more or less distinct.

Hylaesus gnathylaeoides Bridwell, 1919, is a synonym of this species. It is very probable that the male of ***gnathylaeoides*** described by Bridwell belongs to the different species.

Female : Length about 6 mm.

Black, with following portions or maculations yellow: large lateral face marks, large mark on clypeus variable in shape (often a reverse T-shaped, sometimes the transverse bar of T reduced or disappeared, or rarely clypeus nearly entirely yellow, or yellow mark reduced to a subapical spot), mark on supraclypeal area often absent, interrupted band on collar of pronotum, tubercles, anterior mark of tegulae, fore tibiae in front except for apices, basal marks on mid tibiae, and about basal halves of hind tibiae ; apical margin of clypeus sometimes piceous or more paler (ferruginous) ; flagellum beneath brownish or more paler (yellowish brown) except for basal segments; apical margins of terga, especially those on intermediate ones, often brownish subtransparent.

Head well convex in front when seen from side; supraclypeal area well convex, distinctly defined from neighbouring areas, upper portion slightly dilated laterally, more or less strongly reducing its height toward above ; malar space short but distinct.

Collar of pronotum with lateral portions slightly thickened, convex and rounded ; mesoscutum microscopically reticulate, almost dull or very weakly shining, very densely and finely punctured, clothed with short brownish hairs mixed with white ones; scutellum nearly flat, more strongly punctured than in mesoscutum; propodeal enclosure with irregular wrinkles (primarily longitudinal) confined to basal portion only; mesopleuron more or less coarsely sculptured as a result of close and small punctuation and reticulation.

Abdomen shining; 1st tergum polished; 2nd and following terga with microscopical fine aciculate punctures ; hairs on latero-apical portions of 1st tergum fringe-like in some light; hairs on two apical segments primarily fuscous.

Male: Length about 5.5 mm.

Black, with following maculations or portions pale yellow : large lateral face marks, clypeus except for lateral stripes, lower half of supraclypeal area, anterior stripes of scapes, linear marks on lateral portions of collar of pronotum often absent, apical halves or apices of tubercles, spot on tegulae often absent, fore tibiae except behind, basal portions of mid and hind tibiae, and all basitarsi except for apices; small segments of tarsi in addition to apices of basitarsi yellowish brown; flagellum beneath yellowish brown or dark reddish brown.

Head receding below ; inner margins of eyes distinctly converging below ; clypeus broadly flat ; supraclypeal area well elevated, distinctly defined from neighbouring areas, upper portion narrow, only slightly dilated laterally; malar space short but distinctly indicated ;scape only slightly dilated or nearly normal, short, shorter than three basal segments of flagellum taken together; flagellum short ; 1st and 2nd flagellar segments ring-like, 3rd slightly broader than long.

Collar of pronotum not well developed, thin ; mesoscutum like female ; punctures on scutellum much coarser than those on mesoscutum (this is more pronounced than in female) ; propodeal enclosure weakly shining, basal portion primarily longitudinally, irregularly wrinkled ; mesopleuron strongly and densely punctured, punctures larger and much more distinct than in female.

Abdomen shining, 1st tergum polished as in female; median portion of 6th sternum longitudinally elevated in middle, apical margin emarginate in middle ; apical lobe of 8th sternum slender but expanded dorso-ventrally, fringed with long curled hairs, apical fringe distinctly

bifid.

Specimens examined : More than 50 specimens from Hokkaido, Honshu, and Kyushu were collected by T. Shirozu, S. Ueda, K. Kurosawa, R. Ishikawa, K. Sato, K. Morimoto, T. Saigusa, K. Yasumatsu, S. Ide, J. Minamikawa, Y. Haneda, T. Tano and Y. Hirashima.

Distribution : Japan (Hokkaido, Honshu, Kyushu).

(7) *Hylaeus (Nesoprosopis) globula* (Vachal)

Prosopis globula Vachal, 1903, Bull. Mus. d'Hist. Nat., 1903: 132, female and male.

Characteristic of this species is the mesopleuron which is not coarsely sculptured in both sexes (punctures small, well separated from each other, interspaces of punctures flat, weakly shining and only microscopically reticulate). The supraclypeal area is also distinctive in being constricted in the middle as seen in front and the upper portion is highly elevated, dilated laterally and sharply defined from the neighbouring areas.

This species is a close relative of the sympatric *Hylaeus floralis* and is only separable from the latter by the combination of characters stated in the key.

Specimens examined : More than 100 specimens from Hokkaido, Honshu, Shikoku, Kyushu and Tsushima were collected by T. Shirozu, R. Ishikawa, S. Nakao, K. Ogata, H. Yamamoto, K. Morimoto, I. Togashi, Y. Maeta, Y. Haneda, T. Tano, S. Kimoto, S. Taniguchi, Y. Murakami and Y. Hirashima.

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

Faunistic and zoogeographic aspect

Up to present, 11 species of *Hylaeus* have been described from Japan. In my collection of the Japanese bees at Kyushu University I can pick up 15 species of the genus in all. Seven species of them belong to *Nesoprosopis*, as I reported in this paper. Thus, it is very certain that *Nesoprosopis* is an important component of the genus *Hylaeus* of Japan.

This becomes more obvious when the European fauna is took into consideration, For example, Richards (1937) enumerated 12 species of *Hylaeus* for the British fauna. In the light of present knowlege, the British species are divided into at least 9 subgenera. Stoeckert (1954)

listed 29 species of **Hylaeus**, which are divided into 11 subgenera, for the German fauna. Although *Nesoprosopis* is found in Europe as far west as England, it is represented by a single species **Hylaeus pectoralis**.

It is an interesting discovery to report **Hylaeus pectoralis** from Japan. This species is now known to occur in the Palaearctic Region from Japan to England, but its detailed distribution in that region is unknown. In Japan, as is often observed in other species of the Palaearctic or Eurosiberian element, this species is restricted to Hokkaido only.

Six other species of *Nesoprosopis* of Japan, which belong to the Asiatic element in a broad sense, are known from Japan only at present, but I do not think all of them are endemic to Japan.

Hylaeus nippon is known from Hokkaido, Honshu, Kyushu and Tsushima, but is very probable that it also occurs in Shikoku. It is also expected to be found from Korea and China. **Hylaeus floralis** and **Hylaeus globula** are thought to show a pattern of distribution similar to **Hylaeus nippon**.

Hylaeus matsumurai has not been found from Hokkaido. It is probable that this species belongs to the Oriental or Tropico-asiatic element. In fact, I have seen a male specimen from Hong Kong which is similar to **matsumurai**.

Distribution of **Hylaeus noomen** is puzzling. It is found from Hokkaido and Honshu and two remote islets such as Hachijo-jima and Koshiki-jima. Further detailed study on its distribution is expected.

Hylaeus insularum is very interesting in that it is found only in some warmer parts of south-western Japan. As its specific name implies, it occurs predominantly in the Nansei Islands from Iriomote to Yakushima. It reaches to the southernmost point of Kyushu (Satano-misaki) and also to the southernmost point of Shikoku (Ashizuri-misaki), which is a new record for this species. This is also newly found from Hachijo-jima. To the west of Kyushu, it reaches to Koshiki-jima of Kagoshima Prefecture and Okinoshima of Fukuoka Prefecture. Undoubtedly the distribution of this species is dependent on an ocean current. This pattern of distribution is also seen in some other insects which are thought to be the Oriental or Tropico-asiatic element. It is suspected that **Hylaeus insularum** might also be found in Formosa or in some part of Chinese continent.

In summary, *Nesoprosopis* is essentially an Asiatic element, although the bulk of the species are now known from the Hawaiian Islands. It is also an important component of Japanese *Hylaeus*.

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