

SYSTEMATIC STUDIES ON PROCTOTRUPOID AND
CHALCIDOID PARASITES OF GALL MIDGES INJURIOUS
TO PINUS AND CRYPTOMERIA IN JAPAN AND KOREA
(HYMENOPTERA)

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**SYSTEMATIC STUDIES ON PROCTOTRUPOID AND CHALCIDOID
PARASITES OF GALL MIDGES INJURIOUS TO PINUS
AND CRYPTOMERIA IN JAPAN AND KOREA
(HYMENOPTERA)***

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Abstract

Seven species of Hymenopterous wasps parasitic to three species of gall midges injurious to *Pinus* and *Cryptomeria* are discussed, five of which are described as new. New species are *Inostemma matsutama* and *Platygaster matsutama* parasitic to *Thecodiplosis japonensis*, *Platygaster sugitama* and *Gastrancistus sugitama* parasitic to *Contarinia inouyei*, and *Synopeas zaitama* parasitic to *Resseliella odai*. *Isostasius seoulis* KO is transferred to *Inostemma*.

Scanning microscopic photographs of all parasites discussed are provided in order to facilitate the precise identification of these tiny but economically important species. Biological notes of these Hymenopterous parasites are also given.

This paper deals with Hymenopterous parasites associated with three important species of gall midges injurious to *Pinus* and *Cryptomeria* in Japan and Korea.

The pine needle gall midge or matsuba-no-tamabae, *Thecodiplosis japonensis* Uchida et Inouye, is one of the most serious pests of pines, *Pinus densiflora* and *Pinus thunbergii* in Japan and Korea. In Japan, outbreaks of this gall midge were observed on Tsushima (Nagasaki Prefecture) from 1939 to 1970, on Okinoshima (Shimane Prefecture) from 1940 to 1960, in Ishikawa Prefecture from 1959 to 1965 and in Hiroshima Prefecture from 1963 to 1974. Local damages to the pine trees are still observed at present in Kyushu and in some

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areas of Toyama, Niigata, Yamagata and Akita Prefectures faced to the Japan Sea. A number of papers have been published in relation to the control of this pest. Yasumatsu (1961), Miura (1962), Yamada (1963), Kato (1964), Matsueda (1966), Kuranaga, Yoshida and Morimoto (1972, 1973, 1976) and Kuranaga (1974a, b) are some of those who worked on the biological control of the pine needle gall midge.

In Korea, the outbreak of the pine needle gall midge is so extensive that the control of this pest has become one of the most serious social problems because of the importance of the pine tree (chiefly *Pinus densiflora* in this case) in forestry and conservation. Its outbreak has been observed for the last 20 years, which was originated in the Moppo area, a south-western part of Korea. Since then, a great deal of effort has been paid for its control. J. H. Ko (1963, 1965, 1966, 1971) is working on the biological control of this pest extensively.

For the natural control agency of the pine needle gall midge, three species of Hymenopterous parasites and two species of them have been recorded in Japan and Korea, respectively. These wasps are studied comprehensively in this paper for the first time. As shown in the systematic section below, these are recognized as three species, *Inostemma seoulis* (Ko), *Inostemma matsutama* sp. n. and *Platygaster matsutama* sp. n. Of these, *Inostemma seoulis* and *Platygaster matsutama* are widespread in Japan and Korea, but *Inostemma matsutama* is found only in a limited area of Kyushu so far.

In addition to the pine trees, the Japanese cedar or sugi, *Cryptomeria japonica*, is also one of the most important forest trees in Japan. This species grows only in Japan and China. In Japan, two species of gall midges are known to be injurious to sugi. They are the sugi needle gall midge or sugi-tamabae, *Contarinia inouyei* Mani, which attacks sugi needles as is suggested by its common name, and the sugi pitch midge or sugizai-no-tamabae, *Resseliella odai* (Inouye), which bores into the trunk of the sugi tree. The former pest occurs throughout Japan while the latter is restricted to southern part of Kyushu, most destructive in Miyazaki, Kagoshima, Kumamoto and Oita Prefectures. Hymenopterous parasitoids are also involved in the control of the two sugi gall midges. *Tetrastichus sugitamabae* Yasumatsu et Yoshii is said to be the most important parasite of this gall midge. We describe two more species of Hymenopterous parasites of this pest which have been detected chiefly by entomologists at the Kyushu Branch of the Forestry and Forest Products Research Institute, Kumamoto.

Another gall midge injurious to the *Cryptomeria*, the sugi pitch midge or sugizai-no-tamabae, *Resseliella odai* (Inouye), which was transferred from *Thomasiniana* is a local pest of sugi founded in southern part of Kyushu as stated before, although it is quite destructive. In 1976, a wasp parasitic to this gall midge was discovered at Ebino, Mt. Kirishima, by Mr. T. Sanui of Miyazaki

Forest Experiment Station. This species is also treated in this paper.

Scanning microscopic photographs of all the parasites discussed in this paper are provided in order to facilitate the precise identification of these tiny but economically important species. Thus, the present paper provides the latest biological as well as detailed morphological informations of all the Hymenopterous parasites known to us of the three gall midges injurious to the pine and sugi trees in Japan and Korea.

It is also noted herewith that the identity of Japanese and Korean material of *Thecodiplosis japonensis* was confirmed by Dr. Yukawa of Kagoshima University (personal communication).

Acknowledgement: We are grateful to Mr. Kenzo Yamagishi of Kyushu University for his valuable discussions on the systematics of the Hymenopterous parasites involved and for literature. We are also grateful to Dr. Katsura Morimoto of Kyushu University for his useful discussions on the biology of *Inostemma* and *Platygaster* and informations on the biological control of matsuba-no-tamabae. Mr. Je Ho Ko of the Forest Experiment Station, Seoul, Korea, kindly invited Hirashima to Korea in 1977 in order to promote the biological control of matsuba-no-tamabae and provided him with a series of valuable specimens of *Inostemma* and *Platygaster*. We are grateful to him. Thanks are also due to Mr. Zentaro Kuranaga of the Kyushu Branch, Forestry and Forest Products Research Institute, Kumamoto and Mr. Takayoshi Sanui of Miyazaki Forest Experiment Station, Miyazaki for their kind cooperation in providing us with valuable material. We are also thankful to Dr. J. Yukawa of Kagoshima University for identification of matsuba-no-tamabae.

I. WASPS PARASITIC TO *Thecodiplosis japonensis*,
OR MATSUBA-NO-TAMABAE

Proctotrupoidea : Platygasteridae

(1) *Inostemma seoulis* (Ko), **comb. n.** (Figs. 1-7)

Japanese name : マツタマヤドリクロコバチ

Isostasius seoulis Ko, 1965, Res. Rep. Office Rural Devel., Suwon, 8 (2) : 91.

Although this species was originally described under the genus *Isostasius*, morphological characters clearly show that this species belongs to *Inostemma*. *Inostemma seoulis* is one of few interesting *Inostemma* species which do not have a prolonged horn on the tergite I.

Recent studies prove that *Inostemma* and *Isostasius* are separated as follows (Yamagishi, personal communication) :

Inostemma
Scutellum trapezoidal, angulate
postero-laterally.
Parapsidal furrows present.
Lateral ocelli close to compound eyes.

Isostasius
Scutellum rounded and semicircular
posteriorly.
Parapsidal furrows absent.
Lateral ocelli rather apart from compound eyes.

Tergite I more or less long, at least slightly swollen dorsally.
Tergite II not very long, about half as long as abdomen.

Tergite I short, not convex dorsally.
Tergite II very large, at least two-thirds as long as abdomen.

Redescription of female

Length : 1.28-1.72 mm.

Color: Body black ; antenna dark brown, apical half of scape yellow ; legs yellowish brown except coxae which are black; femora darker.

Head : Transverse in front view; height in front view: length in top view: width, 0.33 : 0.22 : 0.4; face slightly convex in front ; eye moderate, height : width, 0.2 : 0.185; lateral ocelli nearly circular ; POL (distance between post ocelli) : LOL (distance between front and post ocelli) : OOL (distance between post ocellus and compound eye), 0.11 : 0.06 : 0.035; mandible bidentate ; maxillary palpus 2-segmented. Antenna inserted just above clypeus, 10-segmented; length : width of each antennal segment, I 0.271 : 0.074, II 0.069 : 0.035, III 0.067 : 0.033, IV 0.052 : 0.033, V 0.039 : 0.03, VI 0.03 : 0.03, VII 0.041 : 0.043, VIII 0.056 : 0.054, IX 0.054 : 0.052, X 0.08 : 0.043; club 4-segmented but not distinct.

Thorax: Ratio of length: height: width across tegulae as 0.51 : 0.35 : 0.38; mesonotum with notauli complete, broader posteriorly; median lobe of mesonotum rounded apically, with three to four longitudinal striae on apical 1/4; scutellar foveae with scale-like waxy structure ; scutellum with postero-lateral corners angulate (Fig. 5), posterior margin broadly rounded ; frenal groove deep and wide; mesopleuron with broad impressed area in middle; metapleuron pubescent. Forewing with a subcostal vein which is almost straight and knob-like at distal end, reaching 1/3 the length of forewing; length: width of forewing, 0.94 : 0.4 ; length : width of hindwing, 0.86 : 0.17. Tarsi 5-segmented.

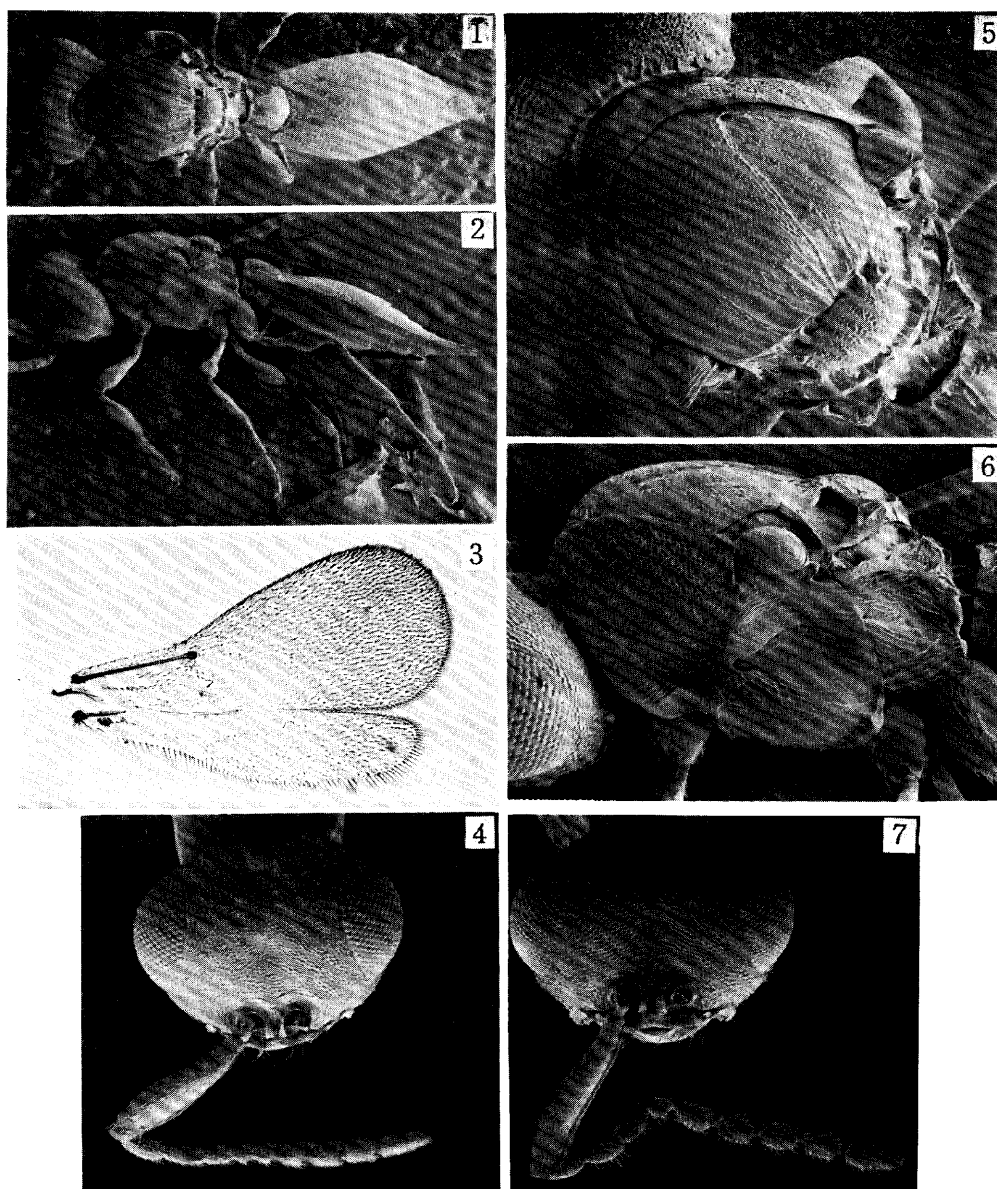
Abdomen: Ratio of length and width of each tergite, I 0.13 : 0.15, II 0.38 : 0.36, III 0.05 : 0.31, IV 0.06 : 0.27, V 0.06 : 0.21, VI 0.12 : 0.16; tergite I slightly swollen dorsally (Figs. 1 and 2) ; tergite VI triangular and pointed apically.

Redescription of male

Length : 1.25 – 1.65 mm.

Similar to female except for antenna and abdomen. Length: width of antennal segments, I 0.252 : 0.054, II 0.054 : 0.039, III 0.061 : 0.033, IV 0.078 : 0.033, V 0.037 : 0.030, VI 0.054 : 0.039, VII 0.061 : 0.064, VIII 0.056 : 0.041, IX 0.054 : 0.039, X 0.093 : 0.035. Length : width of abdominal tergites, I 0.15 : 0.14, II 0.37 : 0.33, III 0.06 : 0.32, IV 0.05 : 0.27, V 0.04 : 0.23, VI 0.035 : 0.2, VII 0.03 : 0.13. Tergite VII rounded apically.

SPECIMENS EXAMINED: A long series of male and female specimens bred from the larvae of *Thecodiplosis japonensis* collected in Japan and Korea.



Figs. 1-7. *Inostemma seoulis* (Ko) . 1: Dorsal view of the female. 2: Lateral view of the female. 3: Wings. 4: Head and antenna (the left one is omitted) of the female. 5: Dorsal view of the female thorax. 6: Lateral view of the female thorax. 7: Head and antenna (the left one is omitted) of the male.

DISTRIBUTION: Korea and Japan (Kyushu, Honshu, Hokkaido). This species was originally described based on the material taken in Korea and Japan.

BIOLOGY: The life history of this wasp was studied by Ko (1966). The following note was derived from him. This species has one generation a year which is synchronized with its host. The adult wasp emerges from mid-June to mid-July with the peak of emergence in late-June. More adult emerges in the afternoon than in the morning. The sex ratio was 0.27 in the field. The longevity of male adult was 2 days and that of female 4 days. The number of eggs found in one female ovary was 462 on an average. The adult wasps deposit their eggs mostly in the newly hatched host larvae. Although a number of wasp's larvae are found living in one host larva, only one adult wasp emerges. This parasite overwinters in the 1st instar larval stage within the host larva in the soil.

Our observation of the life cycle of this species in Kyushu is very close to that described by Ko.

(2) ***Inostemma matsutama*, new species** (Figs. 8-14)

Japanese name : マツタマヤドリク ロコブコバチ

Female

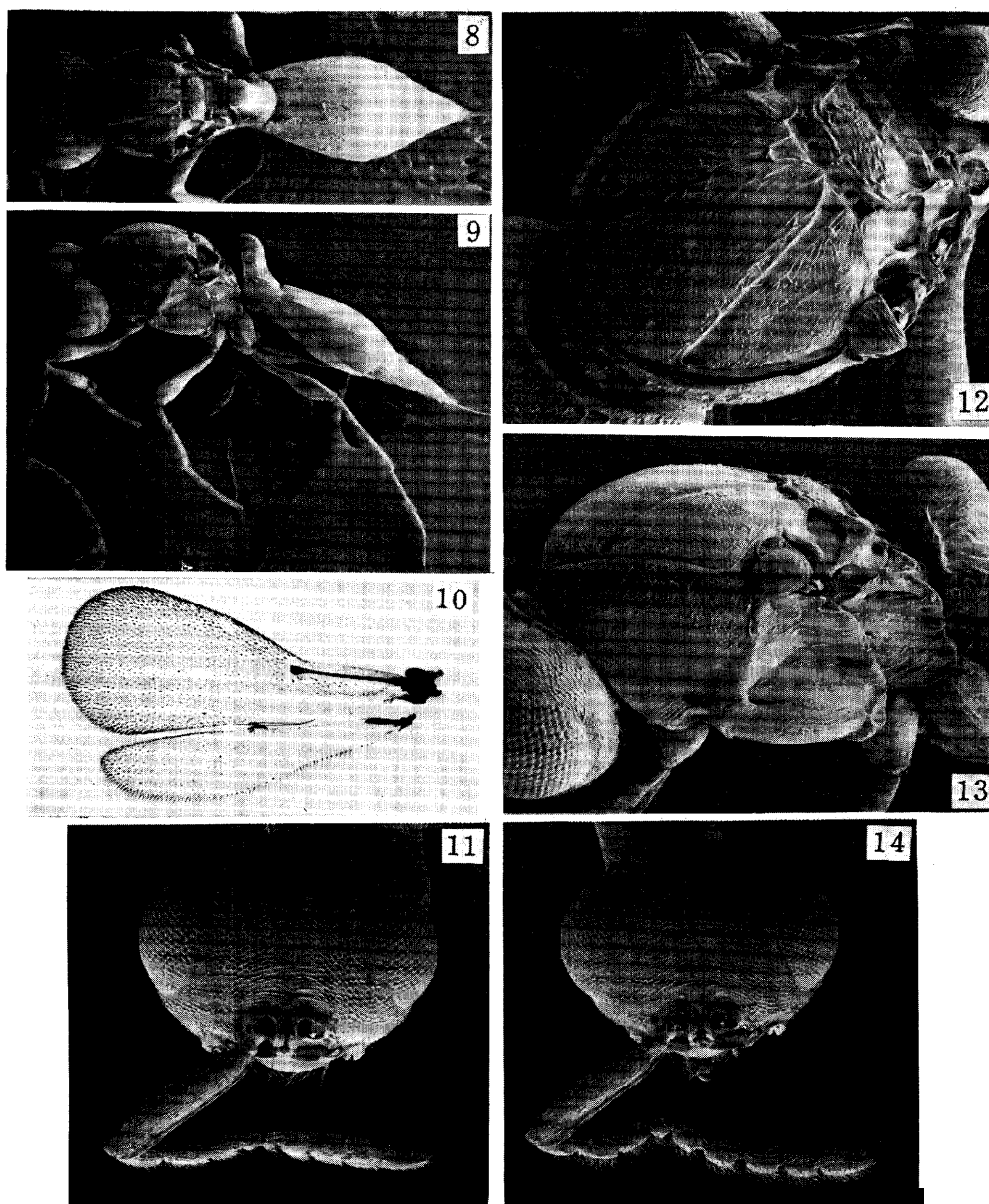
Length : 1.5–1.9 mm.

Color: Body black; antenna dark brown, with both ends of scape yellowish; legs yellowish brown except coxae which are blackish; femora darker.

Head: Transverse in front view; height in front view : length in top view : width, 0.33 : 0.25 : 0.46; face slightly convex in front; eye moderate, height : width, 0.21 : 0.18; lateral ocelli rather crescent; POL: LOL : OOL, 0.14 : 0.075 : 0.029; mandible bidentate; maxillary palpi very short, 2-segmented. Antenna inserted just above clypeus, 10-segmented, length : width of each segment, I 0.26 : 0.05, II 0.082 : 0.028, III 0.076 : 0.024, IV 0.054 : 0.028, V 0.032 : 0.022, VI 0.03 : 0.03, VII 0.04 : 0.04, VIII 0.05 : 0.044, IX 0.048 : 0.042, X 0.07 : 0.04; club 4-segmented but not distinct.

Thorax: Ratio of length : height : width across tegulae, 0.47 : 0.41 : 0.64; mesonotum with notauli complete, broader posteriorly; median lobe of mesonotum pointed posteriorly and with a fine stria; scutellar foveae with scale-like waxy structure; scutellum with anterior and posterior margins more angled than in *Inostemma seoulis*; frenal groove deep and wide; mesopleuron with a broad impressed area in middle; metapleuron pubescent. Forewing with a subcostal vein which is almost straight and knob-like at distal end, reaching 1/3 the length of forewing; length : width of forewing, 1.1 : 0.45; length : width of hindwing, 0.92 : 0.2. Tarsi 5-segmented.

Abdomen: Ratio of length : width of each tergite, I 0.13 : 0.2, II 0.43 : 0.43, III 0.05 : 0.4, IV 0.06 : 0.34, V 0.06 : 0.25, VI 0.19 : 0.19; tergite I with a



Figs. 8-14. *Inostemma matsutama*, new species. 8: Dorsal view of the female. 9: Lateral view of the female. 10: Wings. 11: Head and antenna (the left one is omitted) of the female. 12: Dorsal view of the female thorax. 13: Lateral view of the female thorax. 14: Head and antenna (the left one is omitted) of the male.

short horn-like process (Figs. 8 and 9), which is not seen in *Inostemma seoulis*; anterior length : width of the process, 0.12 : 0.13; tergite VI triangular, pointed apically.

Male

Length : 1.4 – 1.7 mm.

Similar to female except antenna and abdomen. Ratio of length to width of each antennal segment, I 0.26 : 0.058, II 0.05 : 0.035, III 0.073 : 0.035, IV 0.065 : 0.038, V 0.045 : 0.033, VI 0.063 : **0.033**, VII 0.035 : 0.11. Unlike female, tergite I without process. Tergite VII rounded apically.

TYPE MATERIAL: Holotype female (Type No. 2161, Kyushu Univ.), 1 paratopotype female and 4 paratopotype males, emerged on 2. VIII. 1976 (reared at 15°C), from *T. japonensis*, Tatsudayama, Kumamoto City, Kyushu (Z. Kuranaga); 3 paratopotype females, 13. VII. 1976 (Z. Kuranaga); 2 paratype females, Ashikita, Kumamoto Pref., Kyushu, 27. VI. 1975 (Z. Kuranaga); 4 paratype females and 3 paratype males, 4. VII. 1975, 4 paratype females and 4 paratype males, 8. VII. 1975, 4 paratype males, 2. VII. 1975, and 1 paratype male, 27. VI. 1975, same locality as above, all were collected by Z. Kuranaga.

DISTRIBUTION : Japan (Kyushu).

DIAGNOSIS: The female of the new species differs markedly from that of *Inostemma seoulis* in having the horn, which is not very long, however, on the tergite I. Males of both species, however, are very similar because, unlike the females, the male of *Inostemma matsutama* does not have such a horn on the tergite I. They are separable by the median lobe of mesonotum which is provided on the apical 1/4 with a fine stria only in *matsutama* but with three to four striae in *seoulis*.

BIOLOGY: The life cycle of this species is very similar to that of *Inostemma seoulis*. The female of this wasp also oviposits on the 1st instar larva of the host.

(3) *Platygaster matsutama*, new species (Figs. 15-21)

Japanese name: マツタマヤドリハラビロコバチ

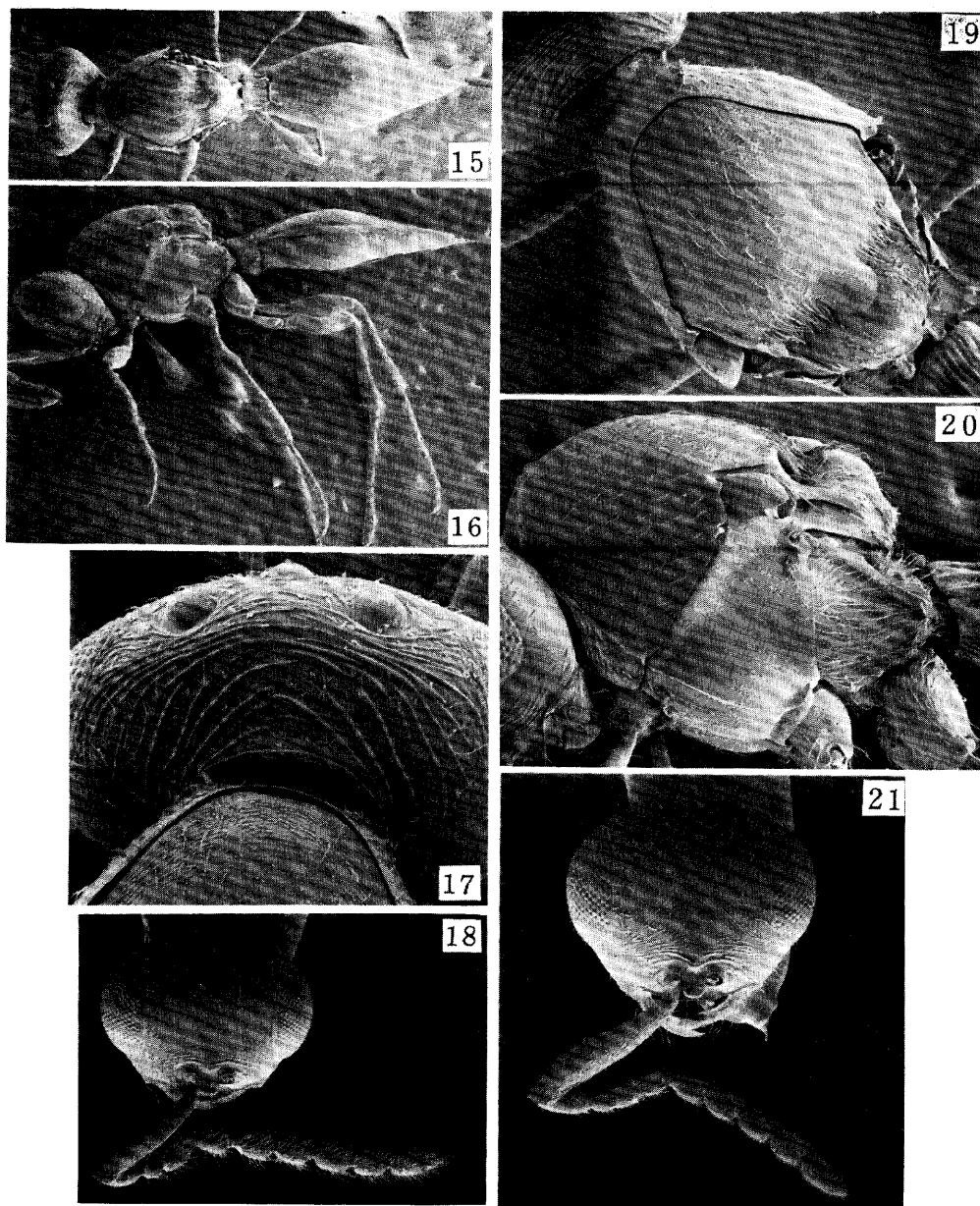
Female

Length : 1.2 – 1.75 mm.

Color: Body black, shining; antenna reddish brown; legs reddish brown to yellowish brown except coxae which are darker.

Head: Transverse in front view; length in top view : height in front view : width, 0.22 : 0.35 : 0.43; POL : LOL : OOL, 0.13 : 0.038 : 0.045. Antenna 10-segmented, length : width of each segment, I 0.308 : 0.072, II 0.08 : 0.035, **III 0.026 : 0.028**, IV 0.059 : 0.039, V 0.056 : 0.033, VI 0.069 : 0.041, VII 0.074 : 0.046, VIII 0.056 : **0.048**, IX 0.056 : **0.046**, X 0.095 : 0.043.

Thorax: Stout, length : height : width across tegulae, 0.55 : 0.43 : 0.37; pro-



Figs. 15-21. *Platygaster matsutama*, new species. 15: Dorsal view of the female. 16: Lateral view of the female. 17: Occiput of the male. 18: Head and antenna (the left one is omitted) of the male. 19: Dorsal view of the female thorax. 20: Lateral view of the female thorax. 21: Head and antenna (the left one is omitted) of the female.

notum distinctly truncate ; notauli indicated on posterior 1/2 of mesonotum, absent anteriorly; median lobe projecting posteriorly, broadly covering the depressed base of scutellum; scutellar foveae deep, filled with scale-like pubescence ; mesopleuron weakly impressed medially; metapleuron pubescent. Wings veinless; length : width of forewing, 1.07 : 0.45, length : width of hind wing, 0.95 : 0.2. Tarsi 5-segmented.

Abdomen: Margined at sides ; length : width of each tergite, I 0.12 : 0.17, II 0.4 : 0.32, III 0.04 : 0.29, IV 0.05 : 0.24, V 0.06 : 0.19, VI 0.12 : 0.14.

Male

Length : 1.0 – 1.5 mm.

Similar to female except antenna and abdomen. Length : width of antennal segments, I 0.23 : 0.04, II 0.061 : 0.037, III 0.043 : 0.035, IV 0.074 : 0.05, V 0.072 : 0.037, VI 0.072 : 0.039, VII 0.065 : 0.039, VIII 0.065 : 0.039, IX 0.065 : 0.039, X 0.109 : 0.039; hairs of flagellum longer than in female, almost as long as width of the segment of origin (Figs. 18 and 21). Length : width of abdominal tergite, I 0.11 : 0.15, II 0.35 : 0.28, III 0.03 : 0.26, IV 0.03 : 0.23, V 0.03 : 0.19, VI 0.02 : 0.14, VII 0.02 : 0.09.

TYPE MATERIAL: Holotype female (Type No. 2162, Kyushu Univ.) and 15 paratopotype females and 16 paratopotype males, Tatsudayama, Kumamoto City, Kyushu, 23. V. 1973 (Z. Kuranaga) ; 4 paratopotype females and 4 paratopotype males, 20. V. 1973 (Z. Kuranaga) ; 2 paratype females and 2 paratype males, Kamikamo, Kyoto Pref., Honshu, 18. V. 1976 (K. Sone) ; 2 paratype females and 2 paratype males, Yuza, Yamagata Pref., Honshu, V. 1976 (Z. Kuranaga); 5 paratype females and 5 paratype males, Seochun, Choong-Chungnam, Korea, 19. V. 1977 (Y. Hirashima).

DISTRIBUTION: Japan (Kyushu, Honshu) and Korea.

DIAGNOSIS: This species is very close to *Platygaster sugitama* which is described below, and is only separable from it by the occiput being more striated than in the latter (Figs. 17 and 24).

BIOLOGY: This is a gregarious endoparasite of the gall midge indicated above. About four adult wasps of this species can emerge from one host larva, although frequently about seven wasp larvae are seen living together in one host larva. One female wasp contains about 1,000 mature eggs in her abdomen. It oviposits in the egg of the host. The life cycle of this species is also similar to that of *Inostemma seoulis* and *Inostemma matsutama*.

II. WASPS PARASITIC TO *Contarinia inouyei* Mani,
OR SU GI-TAMABAE

Proctotrupoidea : Platygasteridae

(1) *Platygaster sugitama*, new species (Figs. 22-28)

Japanese name: スギタマヤドリハラビロコバチ

Female

Length : 1.05 ~ 1.55 mm.

Color: Body black, shining; antenna brown; legs reddish brown; coxae reddish brown to black; basal four tarsal segments yellowish.

Head: Length in top view: height in front view : width, 0.21 : 0.31 : 0.4; mandible bidentate; POL : LOL : OOL, 0.12 : 0.047 : 0.06; occiput distinctly less striate than in *Platygaster matsutama* (Figs. 17 and 24). Antenna 10-segmented, length : width of each segment, I 0.273 : 0.054, II 0.087 : 0.033, III 0.041 : 0.024, IV 0.054 : 0.03, V 0.063 : 0.03, VI 0.072 : 0.035, VII 0.074 : 0.041, VIII 0.076 : 0.041, IX 0.074 : 0.041, x 0.109 : 0.041.

Thorax: Stout, length : height : width across tegulae, 0.49 : 0.41 : 0.35; pronotum truncate; notauli indicated on posterior 1/2 of mesonotum; median lobe projecting posteriorly, covering a part of the depressed base of scutellum; median lobe on scutellar foveae variable in width, sometimes much narrower than in *Platygaster matsutama*; scutellum convex, without hairs in middle as in *Platygaster matsutama*; mesopleuron without hairs, weakly depressed; metapleuron pubescent. Wings veinless; length : width of forewing, 1.1 : 0.47, length : width of hindwing, 0.94 : 0.19. Tarsi 5-segmented.

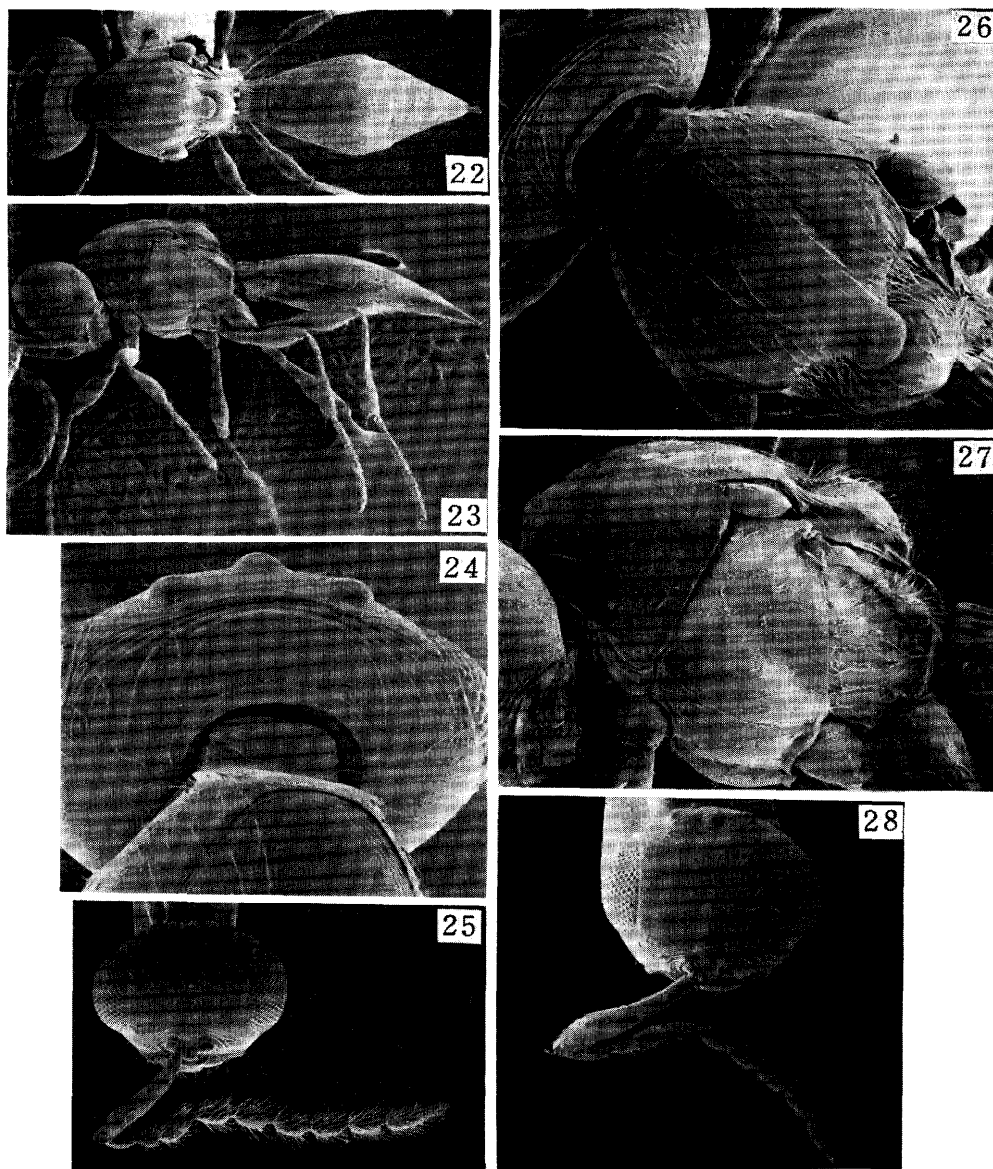
Abdomen: Margined at sides; length : width of each tergite, I 0.09 : 0.11, II 0.37 : 0.3, III 0.05 : 0.28, IV 0.06 : 0.25, V 0.07 : 0.2, VI 0.1 : 0.14; tergite VI triangular, pointed apically.

Male

Length : 1.0 ~ 1.3 mm.

Similar to female except antenna and abdomen. Length : width of each antennal segment, I 0.23 : 0.04, II 0.06 : 0.037, III 0.043 : 0.035, IV 0.074 : 0.05, V 0.072 : 0.037, VI 0.072 : 0.039, VII 0.065 : 0.039, VIII 0.065 : 0.039, IX 0.065 : 0.039, X 0.109 : 0.039; hairs of flagellum longer than female, almost as long as the width of the segment of origin (Figs. 25 and 28). Length : width of abdominal tergites, I 0.11 : 0.15, II 0.35 : 0.28, III 0.03 : 0.26, IV 0.03 : 0.23, V 0.03 : 0.19, VI 0.02 : 0.14, VII 0.02 : 0.19.

TYPE MATERIAL: Holotype female (Type No. 2163, Kyushu Univ.) and 9 paratopotype females, Tatsudayama, Kumamoto City, Kyushu, 22. IV. 1976 (N. Yoshida); 13 paratopotype females, 19. IV. 1976 (N. Yoshida); 7 paratopotype females, 21. IV. 1976 (N. Yoshida); 3 paratype females, Kikuchi, Kumamoto



Figs. 22-28. *Platygaster sugitama*, new species. **22:** Dorsal view of the female. **23:** Lateral view of the female. **24:** Occiput of the male. **25:** Head and antenna (the left one is omitted) of the male. **26:** Dorsal view of the female thorax. **27:** Lateral view of the female thorax. **28:** Head and antenna (the left one is omitted) of the female.

Pref., Kyushu, 18. IV. 1976 (N. Yoshida) ; 5 paratype males, 19. IV, 1973, 5 paratype males, 17. IV. 1976, 8 paratype males, 18. IV. 1976, and 2 paratype males, 19. IV. 1976, same locality as above, all were collected by N. Yoshida.

DISTRIBUTION: Japan (Kyushu).

DIAGNOSIS: As stated in the text, the present new species is very close to *Platygaster matsutama*, and is only separable from the latter in having the occiput distinctly less striated in both sexes.

BIOLOGY: This is a gregarious endoparasite of the gall midge stated above. About four adult wasps can emerge from one host larva. Adult wasps appear about one month earlier than *Platygaster matsutama* does. The life span of the adult wasp is very short, at most two or three days, often a day. A female wasp contains about 900 mature eggs in her abdomen, and oviposits in the egg of the host. The full-grown larvae of the host, which are in the third instar larval stage, drop to the ground in October in Kyushu and overwinter in the soil. They pupate in the soil in April, and the adults appear soon after. The larvae of the wasp also pupate in March and April.

Chalcidoidea : Pteromalidae

(2) ***Gastrancistus sugitama*, new species** (Figs. 29-35)

Japanese name : スギタマヤドリコガネコバチ

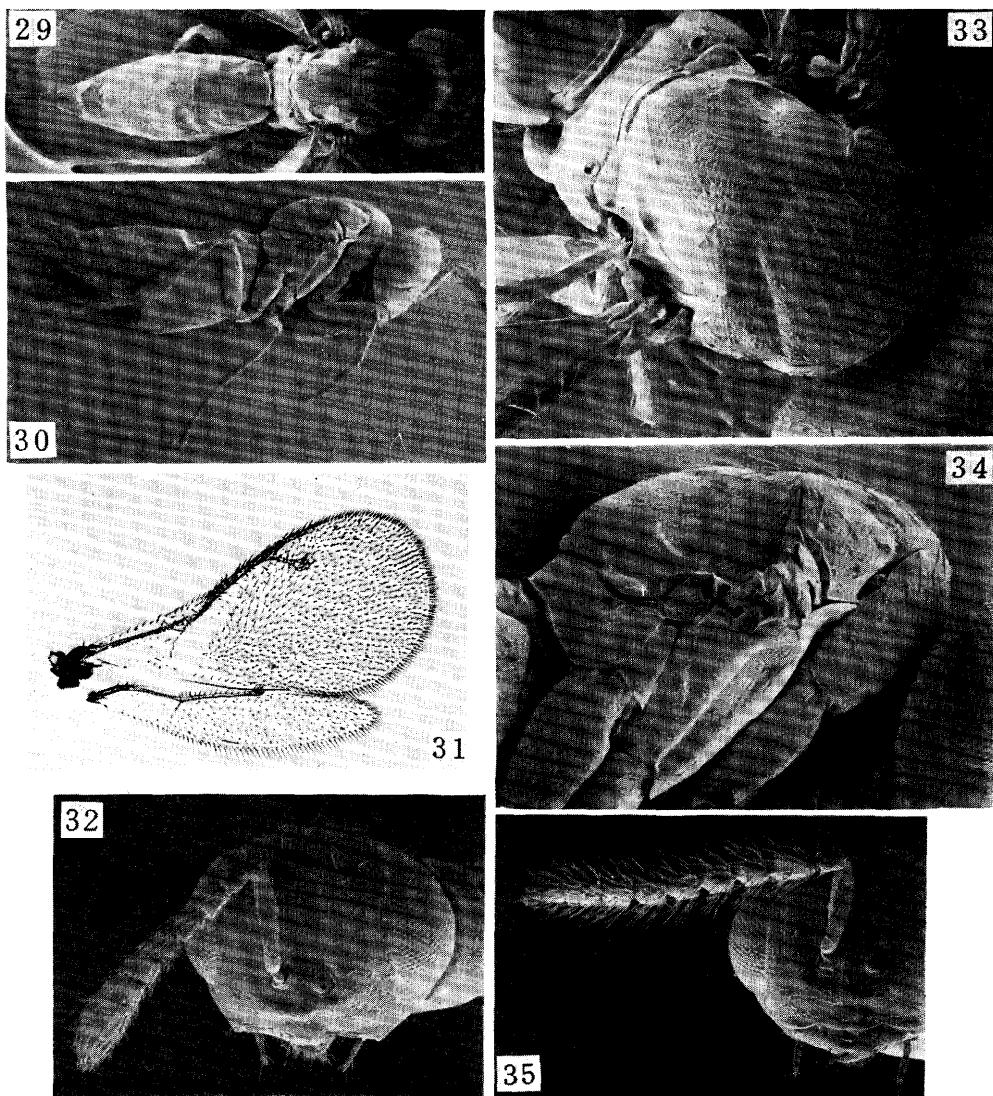
Female

Length : 1.5 – 1.9 mm.

Color: Distinctly metallic, golden green or frequently more coppery; mandible yellow; antennae yellow or slightly brownish except scape; legs yellow, coxae brownish ; hind femora broadly brownish medially; mid and fore femora sometimes brownish medially.

Head: Ratio of height in front view : length in top view : width, 0.35 : 0.22 : 0.48; genae short ; anterior margin of clypeus curved forward and slightly truncate medially; lower edge of antennal toruli slightly lower than level of ventral edge of eyes, separated 1.5 times as long as own diameter from clypeus ; inner orbits of eye diverging only slightly ventrad; mandible with four teeth, the uppermost tooth slightly smaller than others. Antenna 12-segmented; formula 11253; combined length of pedicellus and flagellum at most equal to breadth of head; scape shorter than eye, not reaching median ocellus; anelli 2-segmented, discoid, the basal one very minute ; first and second segments of funicle longer than broad; length : width of antennal segments, I 0.187 : 0.037, II 0.059 : 0.041, III 0.003 : 0.022, IV 0.005 : 0.022, V 0.052 : 0.039, VI 0.05 : 0.039, VII 0.052 : 0.043, VIII 0.064 : 0.054, IX 0.05 : 0.054, X 0.044 : 0.059, XI 0.044 : 0.056, XII 0.036 : 0.043.

Thorax: Pronotal collar broadly rounded in front ; mesoscutum reticulate,



Figs. 29-35. *Gastrancistus sugitama*, new species. 29: Dorsal view of the female. 30: Lateral view of the female. 31: Wings. 32: Head and antenna (the left one is omitted) of the female. 33: Dorsal view of the female thorax. 34: Lateral view of the female thorax. 35: Head and antenna (the left one is omitted) of the male.

with sparse bristles ; notauli complete, almost straight ; scutellum slightly shorter than mesoscutum, longer than broad, sculptured like mesoscutum and with 3 pairs of bristles; frenum marked off by a fine grooved line; scutello-axillar sutures meet mesoscutum a little mesad of hind ends of notauli; axillae sculptured like scutellum ; dosellum smooth, shorter than frenum; propodeum strongly transverse, about $1/5$ as long as scutellum, weakly reticulate, without median carina; spiracles circular, separated from metanotum by nearly own diameter; callus with five to six bristles; metapleuron narrowing dorsally; mesepimeron elongate, weakly reticulate and marked off from mesepisternum; upper triangular area of mesepisternum wholly smooth, lower area reticulate. Legs not stout; hind coxae about 2.5 times as long as broad, reticulate, dorsal surface without hairs; spur of mid tibia about half as long as first tarsal segment ;tarsi 5-segmented. Forewing slightly more than twice as long as broad ;costal cell broad (length : breadth, about 9 :1), its lower surface sparsely hairy, its upper surface with a row of several hairs in distal third; upper surface of basal cell with several hairs in distal end; speculum opened below, extending as a bare strip to marginal vein; radial cell hairy, as dense as disc ; marginal vein 1.4 times as long as postmarginal vein and 1.9 times as long as stigma vein; stigma moderate in size, oval, with a distinct uncus.

Abdomen : Elongated obovate ; abdomen strongly compressed laterally and very thin as seen from above in ordinarily dried specimens; abdomen 1.7 times as long as thorax; petiol very short but visible dorsally, 0.5 times as long as propodeum; basal foveae not distinct; ovipositor sheath projecting, as long as the last tergite; hypopygium extending half way along the abdomen, without mucro.

Male

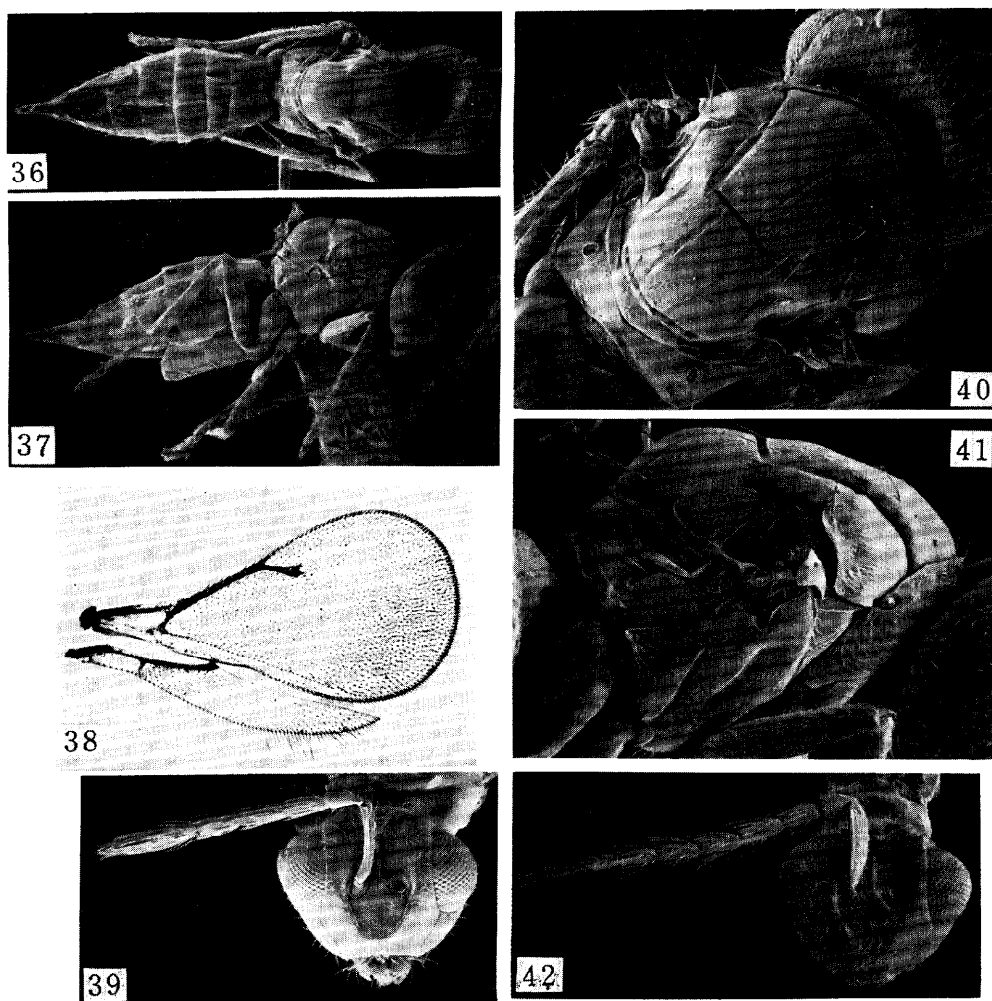
Length :1.1 – 1.7 mm.

Differs from the female in antennae and abdomen. Antennal formula 11262; antenna yellow, pedicellus blackish basally; length : width of antennal segments, I 0.167 : 0.041, II 0.054 : 0.043, III 0.003 : 0.022, IV 0.005 : 0.022, V 0.065 : 0.046, VI 0.061 : 0.052, VII 0.054 : 0.052, VIII 0.054 : 0.052, IX 0.054 : 0.052, X 0.059 : 0.052, XI 0.054 : 0.052, XII 0.065 : 0.043. Abdomen elongated ovate ; slightly longer than thorax; basal tergite with distinct Y-shaped fovea.

TYPE MATERIAL: Holotype female (Type No. 2164, Kyushu Univ.) and 19 paratopotype females and 20 paratopotype males, Tatsudayama, Kumamoto City, 2. V. 1975 (N. Yoshida) ; 8 paratopotype females and 8 paratopotype males, 10. V. 1975 (N. Yoshida) ; 11 paratopotype females and 7 paratopotype males, 17. V. 1979 (N. Yoshida).

A long series of female and male specimens other than the type material is also examined.

DISTRIBUTION : Japan (Kyushu only).



Figs. 36-42. *Tetrastichus sugitamabae* Yasumatsu et Yoshii. 36: Dorsal view of the female. 37: Lateral view of the female. 38: Wings. 39: Head and antenna (the left one is omitted) of the female. 40: Dorsal view of the female thorax. 41: Lateral view of the female thorax. 42: Head and antenna (the left one is omitted) of the male.

DIAGNOSIS: The antennal formula of this species is unique and the proportion of each antennal segment easily separates this new species from the congeneric species.

BIOLOGY: This new species is a solitary endoparasite of the midge shown above. Only one larva lives in one host larva. The female wasp apparently does not oviposit in the eggs of the host which were already oviposited by *Platygaster* or *Tetrastichus*. Adult wasps fly in May. The life span of them is about 40 days. A female wasp has about 200 eggs in her abdomen. Apparently the first instar larva of the host is chosen for oviposition. The wasp overwinters in the larval stage in the host larva in the soil and pupate toward April.

Chalcidoidea : Eulophidae

(3) ***Tetrastichus sugitamabae*** Yasumatsu et Yoshii (Figs. 36-42)

Japanese name: スギタマヤドリヒメコバチ

Tetrastichus sugitamabae Yasumatsu et Yoshii, 1959, Bull. Fac. Agr., Kyushu Univ., 17 (2): 168, female and male. Type locality: Nobeoka, Kyushu

Biology of this parasite was studied by Yoshii (1959). The adult wasps of *Tetrastichus sugitamabae* emerge from the host larva all year round, but most frequently in October and early November (57 %); the sex ratio being 65 females and 35 males. The life span of a male reared in a test tube with honey was 89 days (from March 26 to June 22). More observations were made by Kobayashi (1966) who concluded that this parasite is synovigenic and the egg is anhydronic.

Although this species was originally found in Kyushu, it occurs throughout Japan except Hokkaido.

III. WASP PARASITIC TO *Resseliella odai* (INOUE),
OR SUGIZAI-NO-TAMABAE

Proctotrupoidea : Platygasteridae

(1) ***Synopeas zaitama***, new species (Figs. 43-49)

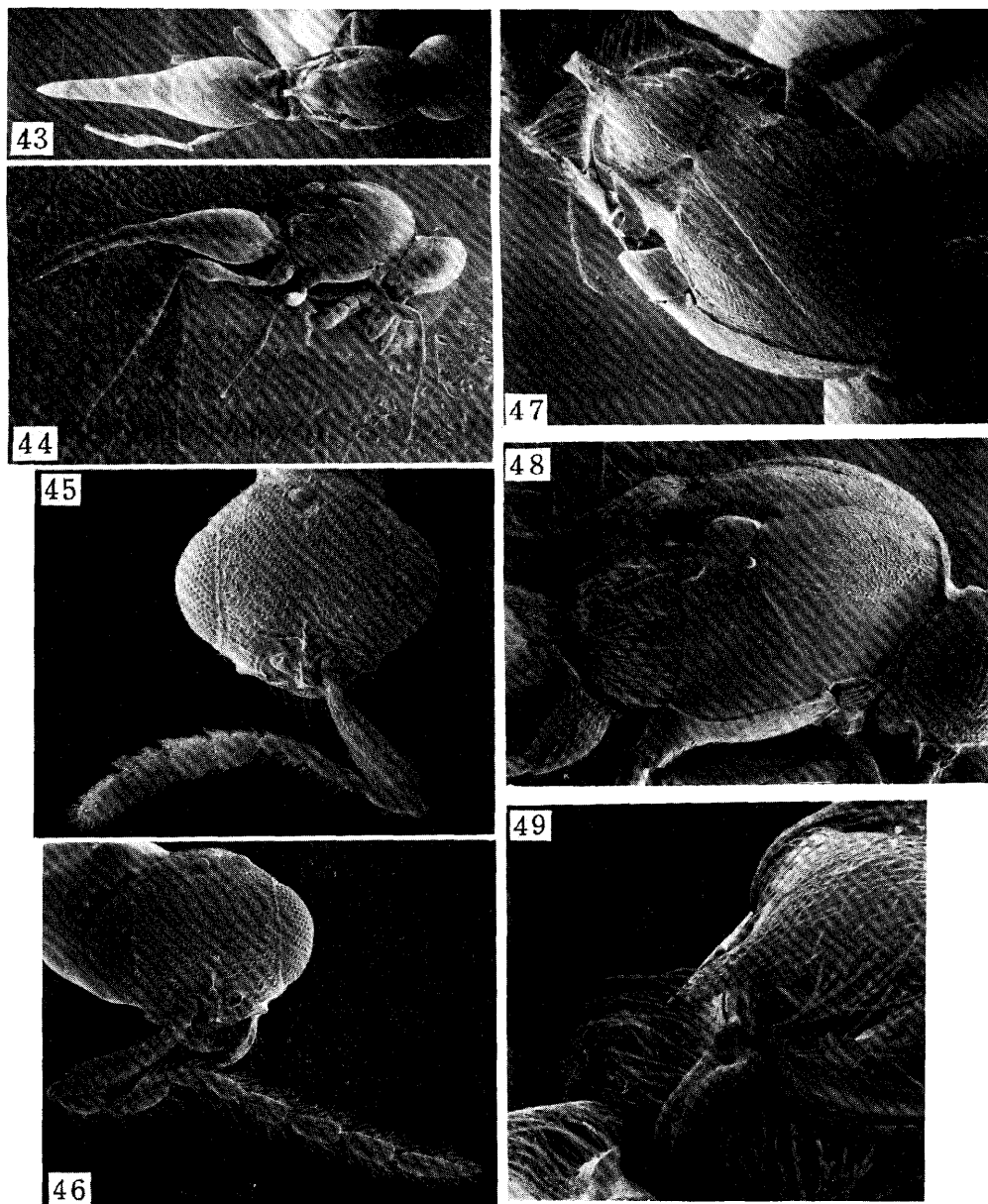
Japanese name: ザイタマヤドリハラビロコバチ

Female

Length: 1.35–2.30 mm.

Color: Body black; antenna reddish brown with club darker; legs reddish brown except coxae nearly black and femora often darkened.

Head: Transverse in front view; length in top view : height in front view: width, 0.23 : 0.355 : 0.435; head distinctly reticulate, not shining. Eyes oval, height : width, 0.2 : 0.16; POL: LOL : OOL, 0.15 : 0.07 : 0.06. Antenna 10-segmented, length : width of each segment, I 0.315 : 0.08, II 0.087 : 0.037, III



Figs. 43-49. *Synopeas zaitama*, new species. 43: Dorsal view of the female. 44: Lateral view of the female. 45: Head and antenna (the right one is omitted) of the female. 46: Head and antenna (the left one is omitted) of the male. 47: Dorsal view of the male thorax. 48: Lateral view of the male thorax. 49: Posterior part of the male thorax, an oblique-dorsal view.

0.046 : 0.028, IV 0.078 : 0.024, V 0.056 : 0.028, VI 0.043 : 0.03, VII 0.085 : 0.069, VIII 0.078 : 0.069, IX 0.078 : 0.069, X 0.106 : 0.056.

Thorax: Ratio of length : width : height, 0.6 : 0.38 : 0.46; collar of pronotum truncate, about half as wide as thorax; notauli indicated on posterior 3/4 of mesonotum; median lobe of mesonotum projecting posteriorly and slightly covering depressed base of scutellum; scutellum convex, with a posteriorly projecting horn (Fig. 47); propodeum with long hairs (Fig. 49); mesopleuron bare, partly weakly depressed; metapleuron covered with long hairs; thorax reticulate dorsally, only weakly shining; meso- and metapleura polished and strongly shining. Wings veinless; length : width of forewing, 1.46 : 0.58; length : width of hind wing, 1.25 : 0.23.

Abdomen: Tergite I transverse, covered with dense white hairs; tergites IV and V elongate; length : width of each tergite, I 0.04 : 0.14, II 0.46 : 0.32, III 0.13 : 0.22, IV 0.16 : 0.15, V 0.25 : 0.11, VI 0.21 : 0.08; abdomen shining, especially so on tergite II which is polished, the following tergites finely sculptured except apical margins.

Male

Length : 1.23 - 1.62 mm.

Similar to female except antenna and abdomen. Length : width of antennal segments, I 0.31 : 0.073, II 0.082 : 0.046, III 0.042 : 0.033, IV 0.01 : 0.061, V 0.061 : 0.04, VI 0.09 : 0.04, VII 0.096 : 0.047, VIII 0.101 : 0.045, IX 0.1 : 0.045, X 0.138 : 0.038. Abdomen not elongate; length : width of abdominal tergites, I 0.04 : 0.12, II 0.38 : 0.28, III 0.04 : 0.22, IV 0.06 : 0.18, V 0.06 : 0.15, VI 0.06 : 0.1.

TYPE MATERIAL: Holotype female (Type No. 2165, Kyushu Univ.) and 19 paratopotype females and 2 paratopotype males, Ebino, Miyazaki Pref., Kyushu, 29. V. 1979 (T. Sanui); 5 paratopotype females, V-VI. 1977 (T. Sanui); 3 paratopotype females, 24. V. 1978 (T. Sanui).

DISTRIBUTION: Japan (Ebino, Miyazaki Prefecture, Kyushu only).

DIAGNOSIS: The proportions of the antennal segments and abdominal tergites are characteristic to this species which separate this from the congeneric species.

BIOLOGY: This new species is the only wasp parasitic to *Resseliella odai* (Inouye). The adult wasps appear twice a year while the host passes a generation a year. This is probably a solitary endoparasite (Sanui, 1978). The distribution of this species is very limited, known only from Ebino, Miyazaki Prefecture, Kyushu so far. So far as we know, the male of this species is very few in number.

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APPENDIX

1. The fourth species of gall midge injurious to the conifers in Japan is the Japanese pine bud gall midge or matsu-no-shintome-tamabae, *Contarinia matsusintome* Haraguti et Monzen which attacks the pine trees. This species, however, is a minor pest. Yasumatsu (1961) recorded two Hymenopterous parasites, *Tetrastichus* sp., which was said to be slightly larger than *Tetrastichus sugitamabae* Yasumatsu et Yoshii, and *Brachyinoctemna* sp. No further information is available on these Hymenopterous species.
2. *Inostemma* sp. parasitic to sugi-tamabae which was recorded by Kobayashi (1964) was not discovered in the course of the present study. Thus, the occurrence of this parasite is not confirmed.
3. "X kobachi" of Yoshii (1959) is described as *Gastrancistus sugitama* in this paper.
4. What was recorded as "*Platygaster* sp. parasitic to sugi-tamabae and matsu-ba-no-tamabae" in Japanese literatures is recognized as a mixture of two species, which are described as *Platygaster sugitama* and *Platygaster matsutama* in this paper. As a matter of fact, these two species are very similar to each other.
5. In pine forests of Japan and Korea, another species of *Inostemma* sp., which has a very long projection on the tergite I, has been collected by sweeping together with *Inostemma seoulis*. We are not certain, however, whether this species is also parasitic to matsuba-no-tamabae or not.
6. Another species of *Platygaster* living in pine forests, a few specimens of which have been taken in Japan and Korea, is suspicious of its parasitic habit to matsuba-no-tamabae. This species is known by the tergites IV and V being distinctly elongate.