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APHIDIIDAE OF JAPAN*

(HYMENOPTERA)

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Introduction

The family Aphidiidae is a small group of the superfamily Ichneumonoidea. More than 300 species have been known to occur in the world. From the standpoint of host associations this group is an especially interesting one: insofar as their habits are known the species of Aphidiidae appear to be restricted to solitary internal parasites of plant-lice, Aphididae. The full-grown larva of most genera spins a cocoon inside the empty skin of the victim whereas that of *Praon* makes a peculiar tent-like cocoon beneath the victim. It should be noted that the empty skin of victim, mummy, shows characteristic coloration in accordance with the species.

The Aphidiidae are most important natural enemies of aphids. A successful example of biological control against aphid pests by use of aphidiid parasites is seen in California: the spotted alfalfa aphid, *Therioaphis trifolii* (Monell), has been successfully controlled by the introduction of the two aphidiid parasites, *Praon palitans* Muesebeck and *Trioxys utilis* Muesebeck, from the Near East in 1955.

So far as my investigation goes 42 species of this family have been recorded from Japan by W. H. Ashmead (1906), H. T. Viereck (1911), C. Watanabe (1939-1941 b), K. Yasumatsu (1951), C. Watanabe & H. Takada (1964-1967), and H. Takada (1965-1966 b). Since 1961 I have made a taxonomic study on this family and this paper is the first attempt to classify the species of Japan in proper systematic order. In the present investigation are given 74 species, of which 17 are new to science and 15 new to Japan. Moreover, one new genus is described herein. The terminology adopted herein is explained by the figures in plates. All the host aphids were identified by Dr. V. F. Eastop and Mr. M. Miyazaki. Unless otherwise stated the specimens were collected by myself. All the types of the new species described herein are deposited in the collection of the Entomological Institute, Hokkaido University.

Before going further I wish to express my sincere thanks to Prof. C. Watanabe of Hokkaido University for his continuous direction in the course of the study and for his kindness in reading through this manuscript. I am indebted to Dr. M. Mackauer of Simon Fraser University, Canada, and Dr. P. Starý of the Czechoslovak Academy of Science for their gift of the literature, and to Dr. V. F. Eastop of the British Museum (N. H.) and Mr. M. Miyazaki of Hokkaido University for their kindness in identifying aphids. Many thanks are also due to Dr. K. Kamijo of the Hokkaido Forest Experi-

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Classification

Family **Aphidiidae**

Although this family is treated by authors as a subfamily of the Braconidae I am much inclined to the opinion that it might be in taxonomy placed between the Braconidae and Ichneumonidae as a distinct family. It differs from the Braconidae in having the real articulation between the 2nd and 3rd abdominal segments, and from the Ichneumonidae in having only one recurrent vein of the fore wing. Moreover, so far as their habits are known the species of this family are restricted to solitary internal parasites of Aphididae.

In Japan 17 genera have been known to occur, being distinguishable by the following key:—

Key to the genera

1. Fore wing with 1st abscissa of cubitus distinct, separating cubital and discoidal cells. . . . 2
- Fore wing with 1st abscissa of cubitus completely effaced. 5
2. Fore wing with 1st and 2nd intercubiti distinct. 3
- Fore wing with 1st and 2nd intercubiti completely effaced. 4
3. Antenna with 10 or 11 segments in both sexes. Ovipositor straight; ovipositor sheath slender, narrowed towards apex. Propodeum carinated. Empty skin of victim becoming black or dark brown. 1. *Ephedrus* Haliday
- Antenna with 17 to 20 segments in female and 18 to 23 segments in male. Ovipositor strongly curved downwards; ovipositor sheath trapezoid, broadened towards apex. Propodeum completely carinated. 2. *Toxares* Haliday
4. Ovipositor sheath sparsely hairy. Pupation occurring outside the host body, making a cocoon under the empty skin of victim. Antenna with 14 to 23 segments in female and 16 to 26 segments in male. Notaulix distinct on the whole length. Propodeum not carinated. Ovipositor straight. 3. *Praon* Haliday
- Ovipositor sheath densely hairy. Pupation occurring inside the host body. Antenna with 13 to 22 segments in female and 17 to 20 segments in male. Notaulix distinct on the whole length. Propodeum carinated or not. Ovipositor straight. (In *A. nipponicum*, sp. nov., fore wing with cubitus and recurrent vein entirely effaced). 4. *Areopraon* Mackauer
5. Fore wing with radius developed only as a point just below stigma. Legs unusually strong and long. Eye small. Antenna with 15 or 16 segments in female and 16 to 18 segments in male. Propodeum not carinated. Ovipositor straight. Parasites of root aphids. 9. *Paralipsis* Foerster
- Fore wing with radius well developed, at least longer than breadth of stigma. Legs of normal form. 6
6. Fore wing with 2nd and 3rd abscissae of cubitus, 2nd intercubitus and recurrent vein distinct at least in part. 7
- Fore wing with 2nd and 3rd abscissae of cubitus, 2nd intercubitus and recurrent vein entirely effaced. 14
7. Fourth and following abdominal segments of female tubiform and telescopic. Antenna with 24 segments in female and 28 segments in male. Propodeum carinated, the posterior surface being strongly excavated medially. Ovipositor curved downwards; ovipositor sheath small.

- Pupation occurring inside the host body (The skin of aphids mummified by the aphidiid is sometimes nibbled by attendant ants and the true cocoon remains like a shiny ball). 8. *Protaphidius* Ashmead
- Fourth and following abdominal segments of female neither tubiform nor telescopic. 8
8. Fore wing with recurrent vein partly effaced and discocubital cell open below. 9
- Fore wing with recurrent vein wholly distinct and discocubital cell completely closed. 10
9. Ovipositor almost straight. Fore wing with metacarp about 1/2 as long as stigma. Propodeum carinated. Antenna with 12 to 16 segments in female and 14 to 18 segments in male. Ovipositor sheath membranous at apex. 12. *Lysaphidus* Smith
- Ovipositor curved downwards. Fore wing with metacarp much more than 1/2 as long as stigma. Propodeum not carinated (except for *L. japonicus* Ashmead). Antenna with 11 to 14 segments in female and 14 to 17 segments in male. Ovipositor sheath chitinized at apex (except for *japonicus*). 13. *Lysiphlebus* Foerster
10. Ovipositor curved downwards; ovipositor sheath chitinized at apex, curved downwards. 11
- Ovipositor straight or curved upwards; ovipositor sheath membranous at apex, straight or curved upwards. 12
11. Propodeum weakly excavated medially on posterior surface. Fore wing with radius oblique to stigma. Ovipositor sheath acute at apex. Antenna with 12 to 14 segments in female and 15 to 18 segments in male. Propodeum carinated. 14. *Amonoctonus*, gen. nov.
- Propodeum not excavated on posterior surface. Fore wing with radius perpendicular to stigma. Ovipositor sheath obtuse at apex. Antenna with 13 to 16 segments in female and 15 to 17 segments in male. Propodeum carinated. 15. *Monoctonus* Haliday
12. Propodeum not carinated, weakly excavated medially on posterior surface. Head and thorax reticulated. Antenna with 20 or 21 segments in female and 21 to 23 segments in male. Ovipositor curved upwards. Wing hyaline or obfuscate; stigma broad. 5. *Xenostigmus* Smith
- Propodeum carinated. Head and thorax smooth, not reticulated. 13
13. Propodeum excavated medially on posterior surface, the post-median longitudinal carina being effaced (except for *P. salignae*). Antenna with 16 to 29 segments in female and 19 to 32 segments in male. Parasites of aphids of Lachninae. 6. *Pauesia* Quilis
- Propodeum not excavated on posterior surface, the post-median longitudinal carina being distinct. Antenna with 12 to 21 segments in female and 15 to 22 segments in male. Parasites of various kinds of aphid excluding Lachninae. 10. *Aphidius* Nees
14. Abdomen with anal prong in female. Antenna with 11 or 12 segments in female and 13 segments in male. Propodeum carinated. Ovipositor strongly curved downwards. 17. *Trioxyis* Haliday
- Abdomen without anal prong in female. 15
15. Ovipositor sheath densely hairy. 3. *Areopraon* Mackauer (see 4)
- Ovipositor sheath sparsely hairy. 16
16. Propodeum not carinated. 13. *Lysiphlebus* Foerster (see 9)
- Propodeum carinated. 17
17. Fore wing with radius much longer than stigma and metacarp as long as stigma. Ovipositor sheath slender. Antenna with 12 segments in female and 13 segments in male. Ovipositor curved downwards. 16. *Lipolexis* Foerster
- Fore wing with radius shorter than stigma and metacarp much shorter than stigma. Ovipositor sheath stout. 18
18. Propodeum excavated medially on posterior surface. Ovipositor curved downwards. Antenna with 15 or 16 segments in female and 16 to 18 segments in male. Ovipositor sheath membranous at apex. 7. *Diaeretus* Foerster
- Propodeum not excavated on posterior surface. Ovipositor straight. Antenna with 13 to 15 segments in female and 15 to 18 segments in male. Ovipositor sheath membranous at apex. 11. *Diaeretiella* Starý

1. Genus *Ephedrus* Haliday

Ephedrus Haliday, Ent. Mag. 1: 485, 1833. [Type-species: *Bracon plagiator* Nees, 1811].

Only three species, *E. nacheri* Quilis, *E. persicae* Froggatt and *E. plagiator* (Nees), have been known to occur in Japan. On this occasion are added to the fauna five other species, of which three are new to science. Parasitized aphids are found one by one on the leaves or twigs of host plants, the empty skin becoming black or dark brown.

Key to the species (♀♀)

1. Petiole (fig. 70) about as long as broad at spiracle. Fore wing (fig. 191) with 2nd abscissa of radius 2 times as long as 1st intercubitus. 8. *E. brevis* Stelfox
- Petiole much longer than breadth at spiracle. Fore wing with 2nd abscissa of radius much less than 2 times as long as 1st intercubitus. 2
2. Fore wing (fig. 198) with 2nd abscissa of radius distinctly shorter than 1st intercubitus, 2: 3. Petiole (fig. 65) 1.4-1.6 times as long as broad at spiracle. Notaulix distinct and deep on anterior 3/4. 7. *E. persicae* Froggatt
- Fore wing with 2nd abscissa of radius longer or as long as 1st intercubitus. Petiole 2 times or more as long as broad at spiracle. Notaulix distinct and deep only on anterior 1/4 at most. 3
3. Fore wing with stigma very narrow, 7 times as long as broad. Eye with dense pubescences. 4
- Fore wing with stigma broader, 4-5 times as long as broad. Eye with no pubescence. . . . 5
4. Antenna (fig. 38) with 1st flagellar segment long, 1.5 times as long as the 2nd and 6 times as long as broad at base. Petiole (fig. 69) 2 times as long as broad at spiracle. Ovipositor sheath (fig. 114) slender. Front leg (fig. 241) with tibia 2 times as long as 1st tarsus. Mesoscutum moderately hairy all over. Abdomen dark brown entirely. 5. *E. lacertosus* (Haliday)
- Antenna (fig. 39) with 1st flagellar segment shorter, 1.2 times as long as the 2nd and 4 times as long as broad at base. Petiole (fig. 67) 2.6 times as long as broad at spiracle. Ovipositor sheath (fig. 113) slender. Front leg (fig. 242) with tibia 2.8-2.9 times as long as 1st tarsus. Mesoscutum sparsely hairy entirely (except for lateral lobe hairless). Abdomen dirty yellow apically. 6. *E. trichosiphoniellae*, sp. nov.
5. Antenna (fig. 34) becoming sharply stouter towards apex; 1st flagellar segment 4 times as long as broad at base and the 7th 1.3 times so. Mesoscutum scatteringly hairy. Temple (fig. 2) in dorsal view parallel just behind eye. 2. *E. salicicola*, sp. nov.
- Antenna becoming gradually stouter towards apex; 1st flagellar segment 4 times as long as broad at base and the 7th 1.8-3.0 times so. Mesoscutum more densely hairy. Temple (fig. 1) in dorsal view converging weakly just behind eye. 6
6. Petiole (fig. 68) 2.6 times as long as broad at spiracle. Ovipositor sheath (fig. 115) very slender. Fore wing (fig. 196) with 2nd abscissa of radius about as long as 1st intercubitus. 3. *E. plagiator* (Nees)
- Petiole (figs. 63 & 66) 2.0-2.3 times as long as broad at spiracle. Ovipositor sheath (figs. 111 & 112) less slender. Fore wing (figs. 192 & 195) with 2nd abscissa of radius 1.1-1.3 times as long as 1st intercubitus. 7
7. Antenna (fig. 33) with 1st flagellar segment a little longer than the 2nd, 5: 4, entirely yellow. Propodeum (fig. 51) with pentagonal areola sharply narrowed posteriorly. 1. *E. cavariellae*, sp. nov.
- Antenna (fig. 36) with 1st flagellar segment about as long as the 2nd, yellowish only at base. Propodeum (fig. 52) with pentagonal areola less sharply narrowed posteriorly. 4. *E. nacheri* Quilis

1. *Ephedrus cavariellae*, sp. nov.

In general facies this and the following three species are closely allied.

♀. Temple (fig. 1) in dorsal view a little longer than eye, 5:4, converging weakly just behind eye; face $1/2$ as broad as head, 2.0 times as broad as long; clypeus 2.0 times as broad as long. Eye without pubescence. Antenna (fig. 33) becoming gradually stouter towards apex; 1st flagellar segment longer than the 2nd, 5:4, a little more than 4 times as long as broad at base and usually with no sensorium (in a few specimens with 1 or 2), the 7th 1.8 times as long as broad, and the 8th and 9th distinctly separated from each other. Mesoscutum sparsely hairy entirely (except for lateral lobe hairless); notaulix obscure and shallow on the whole length. Propodeum (fig. 51) with pentagonal areola which narrows rather sharply posteriorly. Petiole (fig. 63) 2 times or a little more as long as broad at spiracle, with a longitudinal carina on each lateral side of apical $2/3$. Genitalia (fig. 152) with ovipositor sheath (fig. 111) rather stout. Fore wing (fig. 192) with stigma 4-5 times as long as broad and 2nd abscissa of radius 1.2-1.3 times as long as 1st intercubitus. Front leg (fig. 237) with tibia 2.7-2.9 times as long as 1st tarsus, which is 2.7-2.8 times as long as the 2nd or 1.4-1.5 times of the 5th.

Dark brown to black. Maxillary palpus, pedicel, 1st flagellar segment, and the 2nd basally (rarely the 3rd basally) dirty yellow. Legs generally dirty yellow; coxae and femora of middle and hind legs dark brown above.

Length: Body 1.8-2.1 mm., antenna 1.0-1.2 mm.

♂. Length: Body 1.6-1.8 mm., antenna 1.2-1.4 mm.

Holotype, ♀ (29-v-63), & paratypes, 27♀♀ & 27♂♂: Sapporo, reared from *Cavariella* sp. on *Salix* sp.

Host: *Cavariella* sp. on *Salix* sp.

This species is distinct from *E. plagiator* (Nees) in the structure of the petiole and propodeum, in the form of the ovipositor sheath, in the wing venation and in the relative length of the front leg, and from *E. nacheri* Quilis in having the comparatively longer first flagellar segment and the narrower propodeal pentagonal areola. Furthermore, this species closely resembles the European species, *E. minor* Stelfox, but it may be clearly differentiated from *minor* in having the 10th and 11th antennal segments which are distinctly separated from each other (in *minor* they are not separated, forming a club), and the propodeal pentagonal areola which narrows more sharply posteriorly. Also, the ovipositor sheath is stouter than that of *minor* (after Starý, 1958, fig. 59).

2. *Ephedrus salicicola*, sp. nov.

In the structure of the propodeum, petiole, female genitalia and fore wing, as well as in the host relationship this species is closest to the preceding species, *E. cavariellae* but is much smaller. It differs from *cavariellae* by the following characters:—

♀. Temple (fig. 2) in dorsal view parallel just behind eye. Antenna (fig. 34) becoming more sharply stouter towards apex; 1st flagellar segment 4 times as long as broad at base, with no sensorium and the 7th 1.3 times as long as broad. Mesoscutum scatteringly hairy only along notaulix and on lateral side. Propodeum (fig. 49), petiole (fig. 64), genitalia (figs. 116 & 153) and fore wing (fig. 193) as in figures. Front tibia (fig. 238) 2.9-3.1 times as long as the 1st tarsus which is 2.2-2.5 times as long as the

2nd; middle tibia 4.1–4.3 times as long as the 1st tarsus (in *cavariellae* 3.8–3.9 times); hind tibia 2.3–2.4 times of the 1st tarsus (in *cavariellae* 2.1–2.2 times).

Black all over. In some specimens maxillary palpus, pedicel apically and 1st flagellar segment basally somewhat yellowish. Legs generally brown, with coxae and femora dark brown.

Length: Body 1.6–1.8 mm., antenna 0.8–0.9 mm.

♂. Length: Body 1.4 mm., antenna 0.9 mm.

Holotype, ♀ (27–viii–64), & paratypes, 5♀♀ & 3♂♂: Sapporo, reared from *Cavariella salicicola* on *Salix vulpina*. Paratype: 1♀, Taisetsu-zan, Hokkaido (K. Kamijo).

Host: *Cavariella salicicola* (Matsumura).

This species differs from *E. plagiator* (Nees) and *E. nacheri* Quilis by the antenna becoming sharply stouter towards apex, without a sensorium on the first flagellar segment. Moreover, from *E. minor* Stelfox it may be distinguished by the same differences between *cavariellae* and *minor* as given in the preceding page.

3. *Ephedrus plagiator* (Nees)

Bracon plagiator Nees, Mag. Ges. Nat. Fr. Berlin 5: 17, 1811.

Ephedrus plagiator: Stelfox, Proc. R. Irish Acad. (B) 46: 134, 1941.

Ephedrus (*Ephedrus*) *plagiator*: Starý, Acta Faun. Ent. Mus. Nat. Pragae 3: 76, 1958; *ibid.*, Opusc. Ent. 27: 94, 1962.

Ephedrus japonicus Ashmead, Proc. U.S. Nat. Mus. 30: 187, 1906.

Ephedrus japonicus: Watanabe, Ins. Mats. 15: 136, 1941 (partim).

Having examined the specimens reported by Watanabe (1941 b) under the name of *E. japonicus* Ashmead, I have found that they should be referred to two different species, *E. plagiator* (Nees) and *E. nacheri* Quilis, as mentioned below.

♀. Temple in dorsal view as long as eye, almost parallel or converging weakly just behind eye; face a little less than 1/2 as broad as head, 1.8 times as broad as long; clypeus a little less than 2 times as broad as long. Eye without pubescence. Antenna (fig. 35) becoming gradually stouter towards apex; 1st flagellar segment 1.1–1.3 times as long as the 2nd, 4 times as long as broad at base and with a few sensoria, the 7th 2 times as long as broad, and the 8th and 9th distinctly separated from each other. Mesoscutum sparsely hairy; notaulix distinct and deep on anterior 1/4, becoming shallower posteriorly. Propodeum (fig. 50) as in figure. Petiole (fig. 68) 2.6 times as long as broad at spiracle, with a distinct longitudinal carina on each side. Genitalia (fig. 154) with ovipositor sheath (fig. 115) very slender. Fore wing (fig. 196) with stigma 4–5 times as long as broad and 1st abscissa of radius about as long as 1st intercubitus. Front leg (fig. 239) with tibia 2.7–2.8 times as long as 1st tarsus, which is 2.2–2.5 times as long as the 2nd or 1.9–2.0 times of the 5th.

Dark brown to black. Clypeus, mouthparts and petiole very slightly yellowish; pedicel apically and 1st flagellar segment basally yellowish brown. Legs dirty yellow, with coxae dark brown.

Length: Body 2.0–2.9 mm., antenna 1.1–1.7 mm.

♂. Length: Body 1.7–2.5 mm., antenna 1.2–1.4 mm.

Habitat: Sapporo & Shizuoka (after Watanabe, 1941 b); Kyôto (after Watanabe & Takada, 1967). A lot of specimens were collected at the following localities for the first time:—Sôunkyo, Yukomambetsu & Shimamatsu (K. Kusigemati), Aizankei & Bibai

(K. Kamijo), & Nukabira & Zenibako, Hokkaido; Sendai; Nara; Ōsaka; Sasayama (T. Naito) & Takarazuka, Hyōgo-ken; Tottori; Wakamiya, Kōchi-ken; Fukuoka, & Hiko-san (M. Miyazaki), Fukuoka-ken; Iki, Nagasaki-ken; Miyazaki; Kagoshima & Takakumayama, Kagoshima-ken.

Host: *Amphicercidus japonicus* (Hori) (Sapporo)*; *Aphis craccivora* Koch (Sapporo)*; *A. spiraeicola* Patch (Sapporo)*; *Aulacorthum magnoliae* (Essig & Kuwana) (Sapporo)*; *A. muradachi* (Shinji) (Hiko-san, on *Lindera sericea*); *Macrosiphum avenae akebiae* Shinji (Shizuoka)*; *Melanaphis bambusae* (Fullaway) (Zenibako & Nara, on Rosaceous species); *Myzus persicae* (Sulzer) (after Watanabe & Takada, 1967); *Prociphilus* sp. (Sapporo, on *Syringa emodi*); *Rhopalosiphoninus deutzifoliae* Shinji (Kyōto & Wakamiya, on *Deutzia crenata*); *Toxoptera aurantii* (Fonscolombe) (Fukuoka, on *Citrus* sp.); *T. odinae* (Van der Goot) (Ōsaka & Miyazaki, on *Pittosporum tobira*) (in Japan).

Furthermore, this insect is reared from various kinds of aphids in other countries (see Gahan, 1926 & Starý, 1958 & 1962 a).

Distribution: Japan; Formosa; Europe.

4. *Ephedrus nacheri* Quilis

Ephedrus nacheri Quilis, Eos 10: 17, 1934.

Ephedrus (*Ephedrus*) *nacheri*: Starý, Acta Faun. Ent. Mus. Nat. Pragae 3: 74, 1958; *ibid.*, Opusc. Ent. 27: 93, 1962.

Ephedrus japonicus: Watanabe, Ins. Mats. 15: 136, 1941 (partim).

In general facies this species is extremely similar to *E. plagiator* (Nees), the differences between them being as follows:—

♀. Antenna (fig. 36) with 1st flagellar segment almost as long as the 2nd. Propodeum (fig. 52) in most specimens with 2 oblique carinae joining together at or just behind anterior margin. Petiole (fig. 66) 2.0–2.3 times as long as broad at spiracle. Genitalia (fig. 155) with ovipositor sheath (fig. 112) less slender. Fore wing (fig. 195) with 1st abscissa of radius 1.1–1.3 times as long as 1st intercubitus and 2nd cubital cell slenderer. Front leg (fig. 240) as in figure. In some specimens 2nd flagellar segment yellowish brown basally.

Length: Body 1.8–2.9 mm., antenna 1.0–1.4 mm.

♂. Length: Body 1.4–2.1 mm., antenna 1.0–1.3 mm.

Habitat: Sapporo (after Watanabe, 1941 b). Many examples were collected at the following localities for the first time:—Teshio, Aizankei & Apoi-dake (K. Kamijo), Rumoi (G. Kuno), Noppo (M. Suwa), & Tomakomai, Hokkaido; Sendai; Niigata (E. Kawase); Utsunomiya, Tochigi-ken (M. Miyazaki); Hatano & Aburatsubo, Kanagawa-ken; Kyōto; Nara; Dazaifu & Hiko-san (M. Miyazaki), & Fukuoka, Fukuoka-ken; Iki, Nagasaki-ken; Kumamoto, & Yatsushiro (M. Miyazaki), Kumamoto-ken; Takachihokyo, Miyakonojo & Nobeoka, Miyazaki-ken (M. Miyazaki); Kagoshima.

Host: *Amphicercidus japonicus* (Hori) (Sapporo)*; *Aphis craccivora* Koch (Sapporo)*; *A. spiraeicola* Patch (Sendai, on *Spiraea thunbergii*, & Kagoshima, on *Prunus serotina*); *Cavariella salicicola* (Matsumura) (Fukuoka, on *Salix* sp.); *Coloradoa artemisiae artemisicola* Takahashi (Fukuoka, on *Artemisia* sp.); *C. kiku* (Hori) (Utsunomiya, on *Prunus salicina*); *Hyalopterus pruni* (Geoffroy) (Sapporo)*; *Hyperomyzus lactucae* (Linné) (Fukuoka & Kumamoto, on *Sonchus oleraceus*); *Macrosiphum avenae akebiae*

* These specimens were reported by Watanabe (1941 b) under the name of *Ephedrus japonicus*.

Shinji (Niigata, on wheat); *M. ibarae* Matsumura (Sapporo & Fukuoka, on *Rosa* spp.); *Myzus persicae* (Sulzer) (after Watanabe & Takada, 1967); *Pleotrichophorus glandulosus* (Kaltenbach) (Fukuoka, on *Artemisia* sp.); *Prociphilus konoii* Hori (Sapporo)*; *Rhopalosiphoninus deutzifoliae* Shinji (Kyôto, on *Deutzia crenata*); *Rhopalosiphum padi* (Linné) (Sapporo, on *Zea mays*); *Sappaphis mume* (Hori) (Sapporo)*; *Trichosiphonaphis lonicerae* (Uye) (Kagoshima, on *Lonicera japonica*) (in Japan).

In Europe *Cryptosiphum artemisiae* Buckton and *Hayhurstia atriplicis* (Linné) have been recorded as its hosts (after Starý, 1962 a).

Distribution: Japan; Europe.

The specimens examined agree well with Starý's redescription (1962 a) of *nacheri*.

5. *Ephedrus lacertosus* (Haliday)

Aphidius (*Ephedrus*) *lacertosus* Haliday, Ent. Mag. 1: 486, 1833.

Ephedrus lacertosus: Stelfox, Proc. R. Irish Acad. (B) 46: 136, 1941.

Ephedrus (*Ephedrus*) *lacertosus*: Starý, Acta Faun. Ent. Mus. Nat. Pragae 3: 70, 1958.

This species is new to Japan.

♀. Temple in dorsal view a little longer than eye, 5:4, almost parallel just behind eye, thence converging gradually posteriorly; face a little less than 1/2 as broad as head, 1.5 times as broad as long; clypeus 1.5 times as broad as long. Eye with dense pubescences. Antenna (fig. 38) becoming gradually stouter towards apex; 1st flagellar segment long, 1.5 times as long as the 2nd, 6 times as long as broad at base and with a few sensoria, the 7th 3 times as long as broad, and the 8th and 9th distinctly separated from each other. Mesoscutum moderately hairy all over; notaulix distinct and deep only on anterior 1/4, thence tending to disappear posteriorly. Propodeum (fig. 53) as in figure. Petiole (fig. 69) 2.0 times as long as broad at spiracle and without any distinct carina. Genitalia (fig. 158) with ovipositor sheath (fig. 114) slender. Fore wing (fig. 197) with stigma very narrow, 7 times as long as broad and 2nd abscissa of radius as long as 1st intercubitus. Front leg (fig. 241) with tibia 2 times as long as 1st tarsus, which is comparatively long, 2.4-2.5 times as long as the 2nd or 2.5-2.8 times of the 5th.

Black. Clypeus brown. Antenna dark brown; pedicel and 1st flagellar segment basally brown. Abdomen dark brown, 2nd and following segments being a little paler than petiole. Legs dirty yellow, with tarsi brown.

Length: Body 2.2-3.1 mm., antenna 1.4-1.8 mm.

♂. Length: Body 1.7-2.3 mm., antenna 1.2-1.7 mm.

Specimens examined: 23♀♀ & 45♂♂, caught at the following localities:—Taisetsuzan (K. Kamijo), Aizankei, Yukomambetsu & Eniwa-dake (K. Kusigemati), Tenninkyo (S. Suzuki), Uryû (I. Miyagi), Soranuma-dake, & Sapporo, Hokkaido; Chôkai-zan, Yamagata-ken (K. Kusigemati); Amagi-san, Shizuoka-ken (K. Kamijo); Nachi, Wakayama-ken; Sandankyo, Hiroshima-ken (M. Miyazaki); Kirishima-yama (K. Kusigemati) & Takakumayama, Kagoshima-ken.

Host: Unknown (in Japan).

According to Starý (1958) various kinds of aphids are recorded as hosts of this parasite in other countries.

Distribution: Japan; China; India; Europe.

Specimens examined agree very well with Stelfox's and Starý's descriptions of

lacertosus except for the stouter petiole.

6. *Ephedrus trichosiphoniellae*, sp. nov.

This new species is most closely related to *E. lacertosus* (Haliday), from which it may be easily distinguished by the antenna, the ovipositor sheath, the front leg, etc. as follows:—

♀. Temple in dorsal view as long as eye, almost parallel just behind eye, thence converging less strongly posteriorly. Antenna (fig. 39) with 1st flagellar segment shorter, 1.2 times as long as the 2nd and 4 times as long as broad at base. Mesoscutum sparsely hairy all over (except for lateral lobe hairless). Propodeum (fig. 55) with pentagonal areola narrower. Petiole (fig. 67) slenderer, 2.6 times as long as broad at spiracle. Genitalia (fig. 157) with ovipositor sheath (fig. 113) slenderer. Fore wing (fig. 194) as in figure. Front leg (fig. 242) with tibia 2.8–2.9 times as long as 1st tarsus, which is comparatively shorter, 2.2–2.3 times as long as the 2nd or 1.8 times of the 5th.

Generally paler in color, dark brown to black. Palpus yellowish brown; clypeus and mandible somewhat yellowish. Antenna dark brown, distinctly paler than head; scape, pedicel, 1st flagellar segment and sometimes the 2nd basally dirty yellow. Abdomen dirty yellow apically; ovipositor sheath darkened towards apex. Legs yellow.

Length: Body 1.6–1.7 mm., antenna 0.9–1.0 mm.

♂. Length: Body 1.3–1.4 mm., antenna 1.0–1.1 mm.

Holotype, ♀ (7-vi-65), & paratypes, 3♀♀ & 8♂♂: Hiko-san, Fukuoka-ken, reared from *Trichosiphoniella momonis* on *Prunus* sp. Paratypes: 1♂, Sapporo, reared from *T. momonis* on *Prunus maximowiczii*; 3♀♀, Nikkō, Tochigi-ken (H. Higuchi), reared from *Eumyzus impatiensae* Shinji on *Impatiens noli-tangere*; 2♀♀ & 7♂♂, caught at the following localities:—Kyōto; Sasayama, Hyōgo-ken (T. Naito).

Host: *Eumyzus impatiensae* (Shinji); *Trichosiphoniella momonis* (Matsumura).

7. *Ephedrus persicae* Froggatt

Ephedrus persicae Froggatt, Agr. Gaz. Sydney 15: 611, 1904.

Ephedrus persicae: Mackauer, Z. Ang. Ent. 52: 343, 1963.

Ephedrus (*Ephedrus*) *pulchellus*: Stary, Acta Faun. Ent. Mus. Nat. Pragae 3: 79, 1958; *ibid.*, Opusc. Ent. 27: 95, 1962.

Ephedrus interstitialis Watanabe, Ins. Mats. 15: 139, 1941.

This species is characterized by the fore wing with the second abscissa of radius which is distinctly shorter than the first intercubitus, by the distinct notaulix, by the broad petiole and by the comparatively long first tarsus of the front leg.

♀. Temple in dorsal view a little longer than eye, 5:4, parallel or very slightly diverging just behind eye; face 1/2 as broad as head, 2 times as broad as long; clypeus 2 times as broad as long. Eye without pubescence. Antenna (fig. 37) with 1st flagellar segment 1.4 times as long as the 2nd, 5 times as long as broad at base and with a few sensoria, and the 7th 2 times as long as broad; in most specimens the 8th and 9th not distinctly separated from each other, forming a club. Mesoscutum moderately hairy evenly on anterior surface and becoming sparser posteriorly; notaulix distinct and deep on anterior 3/4, thereafter almost effaced. Propodeum (fig. 54) as in figure. Petiole (fig. 65) 1.4–1.6 times as long as broad at spiracle, with 2 or 3 longitudinal carinae on apical 3/4. Genitalia (fig. 156) with ovipositor sheath (fig. 117) rather stout. Fore wing (fig. 198) with stigma 5–6 times as long as broad and 2nd abscissa of radius

distinctly shorter than 1st intercubitus, 2:3. Front leg (fig. 243) with tibia 2.0–2.3 times as long as 1st tarsus, which is 2.4–2.7 times as long as the 2nd or 2.3–2.4 times of the 5th.

Black. Clypeus and mouthparts somewhat lightened. Antenna dark brown; 1st flagellar segment basally and frequently pedicel slightly yellowish. Abdomen dark brown; in some specimens 1st and 2nd sutures yellowish. Legs yellowish brown to brown, usually with coxae dark brown basally.

Length: Body 1.4–2.3 mm., antenna 0.7–1.2 mm.

♂. Unknown.

Habitat: Sapporo (after Watanabe, 1941 b); Kyôto, Kôchi & Kagoshima (after Watanabe & Takada, 1967); Fukuoka (after Yasumatsu & Moritsu, 1947). A lot of specimens were collected at the following localities for the first time:—Kumamoto; Takakuma-yama, Kagoshima-ken; Imasato, Amami-ôshima.

Host: *Capitophorus elaeagni* (Del Guercio) (Kyôto, on *Elaeagnus umbellata*); *C. hippophaes* (Walker) (Kyôto, on *Elaeagnus umbellata*); *Macrosiphum avenae akebiae* Shinji (Kyôto, on *Stauntonia hexaphylla*); *Myzus mumecola* (Matsumura) (after Watanabe, 1941 b); *M. persicae* (Sulzer) (after Watanabe & Takada, 1967); *M. varians* Davidson (after Yasumatsu & Moritsu, 1947); *Rhopalosiphoninus deutzifoliae* Shinji (Kyôto, on *Deutzia crenata*); *Trichosiphonaphis lonicerae* (Uye) (Kyôto, on *Lonicera japonica*); *Trichosiphoniella momonis* (Matsumura) (after Watanabe, 1941 b) (in Japan).

In other countries many species of aphids are recorded as its hosts (see Starý, 1958 & 1962 a, & Mackauer, 1963).

Distribution: Cosmopolitan.

It is noticeable that no male specimen has been discovered in Japan.

Having examined the type-series of *E. interstitialis* Watanabe, I have come to the conclusion that *interstitialis* should be suppressed as a synonym of *persicae* as Mackauer (1963) already pointed out.

8. *Ephedrus brevis* Stelfox

Ephedrus brevis Stelfox, Proc. R. Irish Acad. (B) 46: 140, 1941.

Ephedrus (*Ephedrus*) *brevis*: Starý, Acta Faun. Ent. Mus. Nat. Pragae 3: 67, 1958.

This is the most aberrant species of *Ephedrus* occurring in Japan. It differs sharply from any other species in the broad petiole and in the slender second cubital cell. The present information is the first record of this species in Japan.

♀. Temple in dorsal view as long as eye, slightly diverging just behind eye; face slightly less than 1/2 as broad as head, 2.5 times as broad as long; clypeus 2.3 times as broad as long. Eye without pubescence; ocellus small. Antenna (fig. 40) becoming sharply stouter towards apex; 1st flagellar segment 1.3 times as long as the 2nd, a little longer than 4 times as long as broad at base and with no sensorium, the 7th 1.4 times as long as broad, and the 8th and 9th not distinctly separated from each other, forming a club. Mesoscutum moderately hairy only along notaulix and on lateral side; notaulix distinct and deep only on perpendicular part. Propodeum (fig. 48) as in figure. Abdomen less lanceolate; petiole (fig. 70) broad, a little longer than breadth at spiracle and without any distinct longitudinal carina. Fore wing (fig. 191) with stigma 4 times as long as broad and 2nd abscissa of radius about 2 times as long as 1st intercubitus. Front leg (fig. 244) with tibia 2.8 times as long as 1st tarsus, which is 2.3 times as

long as the 2nd or 1.8 times of the 5th.

Black. Clypeus, mouthparts, pedicel and 1st flagellar segment basally yellowish brown; 2nd tergite with obscure yellowish band apically. Legs generally yellowish brown, with coxae dark brown.

Length: Body 2.4 mm., antenna 1.1 mm.

♂. Unknown.

Specimens examined: 1♀, Kumamoto, caught on leaf of *Quercus serrata*.

Host: Unknown.

Distribution: Japan; Europe.

2. Genus *Toxares* Haliday

Trionyx Haliday, Ent. Mag. 1: 487, 1833 (nec Geoffroy, 1809). [Type-species: *Trionyx deltiger* Haliday, 1833].

Toxares Haliday, Introd. Mod. Class. Ins. 2, Synopsis: 65, 1840. [Type-species: *Trionyx deltiger* Haliday, 1833].

This genus is distributed in the Palearctic region and represented by the two species, *T. deltiger* (Haliday) from Europe and *T. shigai* Takada from Japan.

1. *Toxares shigai* Takada (figs. 151 & 199)

Toxares shigai Takada, Ins. Mats. 28: 17, 1965.

Habitat: Kikuchi, Kumamoto-ken (after Takada, 1965 a). 1♀ & 12♂♂, caught at the following localities for the first time:—Sapporo (K. Kamijo), Bibai & Nopporo, Hokkaido; Daisen, Tottori-ken (M. Miyazaki); Ôtaki-zan, Tokushima-ken (T. Naito); Matsuyama, Ehime-ken; Hiko-san, Fukuoka-ken.

In the present specimens the antennae have 18 segments (1♀) and 19 to 21 segments [19 (2♂♂), 20 (7), 21 (2)].

Host: Unknown.

Distribution: Japan.

3. Genus *Areopraon* Mackauer

Areopraon Mackauer, Beitr. Ent. 9: 849, 1959. [Type-species: *Praon lepelleyi* Waterston, 1926].

This genus has been represented by three species, *A. lepelleyi* (Waterston) and *A. pilosum* Mackauer from Europe, and *A. antiquum* Mackauer from West Pakistan. In the course of the present investigation have been found in Japan two other species, which are new to science. This genus is to be placed closest to *Praon* Haliday as shown in the present key. It should be noted that the species of *Areopraon* spin cocoons not beneath the empty skin of victims as in *Praon* but inside the host body.

Key to the species (♂♂)

1. Fore wing (fig. 207) with 1st abscissa of cubitus faint and recurrent vein distinct. Ocellus rather large (distance between posterior ocelli 2.5 times as long as minor axis of ocellus). Malar space as long as basal breadth of mandible. Temple (fig. 21) in dorsal view as long as eye, converging very slightly behind eye. Abdomen with 2nd and following segments not compressed. Head sparsely hairy. 1. *A. kurohimense*, sp. nov.
- Fore wing (fig. 208) with 1st abscissa of radius and recurrent vein entirely effaced. Ocellus

small (distance between posterior ocelli 6 times as long as minor axis of ocellus). Malar space much shorter than basal breadth of mandible, 1:2. Temple (fig. 22) in dorsal view longer than eye, 3:2, converging weakly behind eye. Abdomen with 2nd and following segments compressed. Head densely hairy. 2. *A. nipponicum*, sp. nov.

1. *Areopraon kurohimense*, sp. nov.

♂. Head sparsely hairy; temple (fig. 21) in dorsal view as long as eye, converging very slightly behind eye; face (fig. 3) 1/2 as broad as head, 1.6 times as broad as long; clypeus 1.6 times as broad as long; malar space as long as basal breadth of mandible. Eye not pubescent; ocellus rather large (distance between posterior ocelli 2.5 times as long as minor axis of ocellus). Antenna with 18 or 19 segments [18 (1♂), 19 (2)], densely clothed with short hairs; flagellar segments narrowed towards apex, the 1st being as long as the 2nd, 2 times as long as broad at base. Mesoscutum falling almost vertically into pronotum, moderately hairy (except for lateral lobe); notaulix distinct and deep on the whole length; mesopleuron scarcely hairy; propodeum not carinated, with dense short hairs. Petiole (fig. 82) almost quadrate, a little longer than breadth at spiracle, 7:6, with dense short hairs; 2nd and following abdominal segments not compressed, moderately hairy. Fore wing (fig. 207) with stigma 2.9 times as long as broad, much longer than metacarp; radius about 2 times as long as breadth of stigma; 1st abscissa of cubitus faint; recurrent vein distinct.

Dark brown; mouthparts and 1st flagellar segment basally somewhat yellowish; petiole and 2nd tergite brown. Legs dirty yellow, slightly darker above; hind coxa dark brown.

Length: Body 1.4–1.9 mm., antenna 1.7–2.0 mm.

♀. Unknown.

Holotype, ♂ (7-vi-59), & paratypes, 2♂♂: Kurohime, Nagano-ken (K. Kamijo).

Host: Unknown.

2. *Areopraon nipponicum*, sp. nov.

♀. Body including antenna entirely clothed with dense short hairs; temple (fig. 22) in dorsal view longer than eye, 3:2, diverging weakly just behind eye; face (fig. 4) 1/2.7 as broad as head, 1.3 times as broad as long; clypeus 2 times as broad as long; malar space much shorter than basal breadth of mandible, 1:2. Eye densely pubescent; ocellus small (distance between posterior ocelli 6 times as long as minor axis of ocellus). Antenna with 14 segments (1♀); 1st flagellar segment distinctly longer than the 2nd, 3:2 and 4 times as long as broad at base; 2nd and following segments (except for the last) almost equal in shape, 2.5 times as long as broad. Mesoscutum falling almost vertically into pronotum; notaulix distinct and deep on the whole length. Propodeum not carinated. Petiole (fig. 83) almost quadrate, a little longer than breadth at spiracle, 7:6; 2nd and following abdominal segments compressed. Ovipositor sheath slender, densely hairy. Fore wing (fig. 208) with stigma 3 times as long as broad, much longer than metacarp; radius 1.8 times as long as breadth of stigma; 1st abscissa of cubitus and recurrent vein entirely effaced; 2nd abscissa of cubitus very faint.

Dark brown; clypeus and mandible very slightly lightened; maxillary palpus yellowish brown. Legs brown, darker above, with trochanters and tibiae at base somewhat lightened.

Length: Body 2.0 mm., antenna 1.1 mm.

♂. Differs from the female in the following points:—

Eye smaller, not pubescent; face $1\frac{1}{2}$ as broad as head, 1.4 times as broad as long. Antenna with 17 or 18 segments [17 (♂), 18 (♀)]; 1st flagellar segment almost as long as the 2nd. Lateral lobe of mesoscutum, and mesopleuron less hairy.

Length: Body 1.5 mm., antenna 1.4 mm.

Holotype, ♀ (28-v-63), & paratypes, 2♂♂: Nopporo, Hokkaido.

Host: Unknown.

In conclusion, these two new species are easily distinguished from any other species of *Areopraon* ever known by the following key:—

1. Propodeum carinated. Petiole rather slender, sparsely hairy. 2
- Propodeum not carinated. Petiole quadrate, densely hairy. 3
2. Antenna with 13 or 14 segments in female. Europe. *A. lepelleyi* (Waterston)
- Antenna with 22 segments in female. Europe. *A. pilosum* Mackauer
3. Fore wing with recurrent vein distinct. Eye bare in male. Japan.
- *A. kurohimense*, sp. nov.
- Fore wing with recurrent vein faint or entirely effaced. 4
4. Antenna with 19 or 20 segments in male. Eye shortly pubescent in male. Head and abdomen (except for petiole) sparsely hairy. Fore wing with 1st abscissa of cubitus indistinct. West Pakistan. *A. antiquum* Mackauer
- Antenna with 17 or 18 segments in male. Eye bare in male. Head and abdomen densely hairy. Fore wing with 1st abscissa of cubitus entirely effaced. Japan.
- *A. nipponicum*, sp. nov.

4. Genus *Praon* Haliday

Praon Haliday, Ent. Mag. 1: 483, 1833. [Type-species: *Bracon exsoletus* Nees, 1811].

The species of this genus are widely distributed over the world. It is the well-known fact that they make whitish tent-like cocoons beneath the empty skin of aphids. The two species, *P. volucre* (Haliday) and *P. dorsale* (Haliday), have hitherto been known to occur in Japan. In the following pages are given five other species, of which four are new to science.

Key to the species (♀♀)

1. Fore wing (fig. 202) with radius 4 times as long as breadth of stigma and metacarp about as long as stigma. Eye pubescent. Antenna with 20 to 23 segments. Thorax entirely black. 7. *P. taisetsuzanum*, sp. nov.
- Fore wing with radius 2-3 times as long as breadth of stigma and metacarp distinctly shorter than stigma. Eye bare. 2
2. Fore wing (fig. 203) with radius 2 times as long as breadth of stigma and metacarp $\frac{1}{2}$ as long as stigma. Ovipositor sheath (fig. 122) rather stout, with 2 conical bristles apically. Antenna with 18 to 20 segments. Thorax bicolor, dark brown and dirty yellow.
- 3. *P. flavinode* (Haliday)
- Fore wing with radius about 3 times as long as breadth of stigma and metacarp more than $\frac{1}{2}$ as long as stigma. Ovipositor sheath slenderer, with 2 nail-form bristles apically. 3
3. Mesoscutum hairless on lateral lobe. Fore wing with recurrent vein decolored or entirely effaced. 4
- Mesoscutum hairy entirely. Fore wing with recurrent vein distinct. 5
4. Antenna with 15 or 16 segments. Ovipositor sheath (fig. 119) rather stout. Thorax almost unicolor, dark brown. 1. *P. rhopalosiphum*, sp. nov.

- Antenna with 18 or 19 segments. Ovipositor sheath (fig. 118) slender. Thorax bicolor, dark brown and dirty yellow. 2. *P. yomenae*, sp. nov.
- 5. Face 1/2.5-1/2.7 as broad as head, 1.0-1.1 times as broad as long. Mesoscutum falling gently into pronotum. Fore wing with stigma 3.9-4.4 times as long as broad. Antenna with 16 to 18 segments. Thorax dark brown almost entirely. 6. *P. capitophori*, sp. nov.
- Face 1/2.3-1/2.5 as broad as head, 1.1-1.3 times as broad as long. Mesoscutum falling almost vertically into pronotum. Fore wing with stigma 3.4-3.8 times as long as broad. 6
- 6. Petiole (figs. 79 & 80) with about 30 hairs laterally. Ovipositor sheath (fig. 120). Antenna with 17 to 20 segments. Thorax dark brown almost entirely. 4. *P. volucre* (Haliday)
- Petiole (figs. 73 & 76) generally stouter, with less number of hairs. Ovipositor sheath (fig. 123) slenderer. Antenna with 19 to 22 segments. Thorax lighter in color. 5. *P. dorsale* (Haliday)

1. *Praon rhopalosiphum*, sp. nov.

This is essentially characterized in having the gently arched mesoscutum with the hairless lateral lobe, and the fore wing with the stigma narrow and the recurrent vein entirely effaced or decolored.

♀. Eye bare; ocellus oval; distance between posterior ocelli 3 times as long as minor axis of ocellus. Antenna with 15 or 16 segments [15 (1♀), 16 (1)]. Mesoscutum falling gently into pronotum, the lateral lobe and posterior area being hairless. Petiole (fig. 78) peculiar in shape, longer than breadth at spiracle, 5:4, with a few hairs. Genitalia (fig. 159) with ovipositor sheath (fig. 119) rather stout, the apical 2 bristles being nail-form and comparatively long. Fore wing (fig. 200) with stigma narrow, 4.4 times as long as broad; metacarp distinctly shorter than stigma; radius 3 times as long as breadth of stigma; 1st abscissa of cubitus faint entirely; recurrent vein effaced.

Head dark brown; clypeus, mouthparts and 3 basal segments of antenna yellow. Thorax unicolor, dark brown, pronotum being somewhat yellowish at most. Abdomen dark brown, a little paler than thorax; petiole and 2nd tergite at base yellowish brown. Legs dirty yellow.

Length: Body 1.4 mm., antenna 1.2 mm.

♂. Differs from the female in the following points:—

Antenna with 16 to 18 segments [16 (1♂), 17 (4), 18 (6)]. Darker in color.

Length: Body 1.0-1.4 mm., antenna 1.2-1.4 mm.

Holotype, ♀ (3-viii-64): Sapporo, reared from *Rhopalosiphum* sp. near *padi* on a species of Poaceae. Paratypes, 2♀♀ & 12♂♂: Sapporo.

Host: *Rhopalosiphum* sp. near *padi* (Linné).

Parasitized aphids are found one by one on the leaves of host plants.

On account of the number of antennal segments, the wing venation and the coloration this species comes near *P. abjectum* (Haliday) and *P. necans* Mackauer of Europe, and *P. nymphaeae* Subba Rao et al. of India but it differs from those species in the shape of the petiole and the density of hairs thereon.

2. *Praon yomenae*, sp. nov.

This species closely resembles the preceding species, *P. rhopalosiphum*, from which it differs in the number of antennal segments, the structure of the ovipositor sheath, the coloration, etc. as follows:—

♀. Antenna with 18 or 19 segments [18 (1♀), 19 (1)]. Petiole (figs. 71 & 72) slenderer. Genitalia (fig. 160) with ovipositor sheath (fig. 118) slenderer. Fore wing

(fig. 201) with recurrent vein decolored or entirely effaced.

Face and gena yellowish. Thorax bicolor, the dorsal surface being dark brown and the rest dirty yellow.

Length: Body 1.7–2.1 mm., antenna 1.4–1.6 mm.

♂. Unknown.

Holotype, ♀ (23–v–65), & paratype, 1♀: Yuwan-dake, Amami-ōshima, reared from *Macrosiphoniella yomenae* on *Kalimeris yomena*.

Host: *Macrosiphoniella yomenae* (Shinji).

Parasitized aphids are found one by one on the leaves of host plants.

In the shape of the petiole, the form of the ovipositor sheath, the number of antennal segments, the coloration and the host relationship this species is closely related to the European species, *P. absinthii* Bignell. Judging from Mackauer's description (1959) of *absinthii*, however, the present new species is readily differentiated from that species by the following points:—(1) The mesoscutum is rather sparsely hairy with the hairless lateral lobe, whereas in *absinthii* densely hairy. (2) The propodeum is entirely smooth, whereas in *absinthii* weakly granular.

3. *Praon flavinode* (Haliday)

Aphidius (*Praon*) *flavinodis* Haliday, Ent. Mag. 1: 485, 1833.

Praon flavinode: Mackauer, Beitr. Ent. 9: 833, 1959.

This species is new to Japan. It is characterized by the mesoscutum with the hairless lateral lobe, the short metacarp and radius of the fore wing, the rather stout ovipositor sheath with the conical bristles apically, the bicolor thorax, etc. as follows:—

♀. Eye bare; distance between posterior ocelli 2.5 times as long as minor axis of ocellus. Antenna with 18 to 20 segments [18 (4♀), 19 (10), 20 (3)]. Mesoscutum falling vertically into pronotum, the lateral lobes being hairless. Petiole (figs. 75 & 77) variable in shape but generally rather quadrate, with a few hairs. Genitalia (fig. 161) with ovipositor sheath (fig. 122) rather stout, the apical 2 bristles being conical. Fore wing (fig. 203) with stigma a little more than 3 times as long as broad; metacarp short, 1/2 as long as stigma; radius 2 times as long as breadth of stigma; 1st abscissa of cubitus decolored partly; recurrent vein distinct.

Head dark brown; face, clypeus, mouthparts, gena and 3 or 4 basal segments of antenna dirty yellow. Thorax bicolor, the dorsal surface being dark brown and the rest dirty yellow; rarely thorax entirely yellowish. Abdomen dark brown; petiole, 2nd tergite at base and apical sternites yellowish; in a few specimens abdomen entirely dirty yellow. Legs yellow.

Length: Body 1.7–2.6 mm., antenna 1.6–2.3 mm.

♂. Antenna with 20 to 22 segments [20 (7♂♂), 21 (9), 22 (3)]. Thorax unicolor, dark brown.

Length: Body 1.4–2.0 mm., antenna 1.5–2.4 mm.

Specimens examined: 14♀♀ & 19♂♂, Bibai (K. Kamijo) & Sapporo, Hokkaido, reared from *Euceraphis punctipennis* on *Betula* spp.; 1♀ Tomakomai, Hokkaido, reared from an aphid (Callaphidinae) on *Alnus* sp.; 2♀♀, Usui-tōge, Nagano-ken.

Host: *Euceraphis punctipennis* (Zetterstedt); an aphid (Callaphidinae) on *Alnus* sp.

In Europe several aphids including *Euceraphis punctipennis* are known as hosts of this parasite (see Mackauer, 1959).

Distribution: Japan; Europe.

Parasitized aphids are attached one by one on the leaves of host plants.

The present specimens agree well enough with Mackauer's redescription (1959) of *flavinode*.

4. *Praon volucre* (Haliday)

Aphidius (*Praon*) *volucris* Haliday, Ent. Mag. 1: 484, 1833.

Praon volucre: Mackauer, Beitr. Ent. 9: 842, 1959.

Praon volucre: Watanabe & Takada, Ins. Mats. 27: 8, 1964.

This species is essentially characterized by the following points:—

♀. Face 1/2.3–1/2.5 as broad as head, 1.1–1.3 times as broad as long. Eye bare; distance between posterior ocelli 1.5–2.0 times as long as minor axis of ocellus. Antenna with 17 to 20 segments [17 (3♀), 18 (65), 19 (159), 20 (40)]. Mesoscutum falling vertically into pronotum, densely hairy almost all over. Petiole (figs. 79 & 80) very variable in shape, with about 30 hairs laterally. Genitalia (fig. 162) with ovipositor sheath (fig. 120) rather slender, with 2 nail-form bristles at apex. Fore wing (fig. 206) with stigma 3.4–3.8 times as long as broad; metacarp distinctly shorter than stigma; radius about 3 times as long as breadth of stigma; 1st abscissa of cubitus decolored partly; recurrent vein distinct.

Dark brown; clypeus, mouthparts, gena and 3 basal segments of antenna dirty yellow; face yellowish brown; prothorax slightly yellowish. Abdomen brown, a little paler than thorax; petiole yellow on both extremes; basal tergites and apical sternites obscurely yellowish. Legs dirty yellow.

Length: Body 2.1–2.8 mm., antenna 1.8–2.3 mm.

♂. Antenna with 20 to 23 segments [20 (41♂), 21 (129), 22 (87), 23 (14)]. Darker in color than the female.

Length: Body 1.7–2.3 mm., antenna 1.6–2.5 mm.

Habitat: Sapporo & Kyôto (after Watanabe & Takada, 1964 a); Fukuoka (after Watanabe & Takada, 1967). A lot of specimens were collected at the following localities for the first time:— Nukabira, Soranuma-dake, & Chitose (K. Kusigemati), Hokkaido; Hatano, Kanagawa-ken; Usui-tôge, Nagano-ken; Takarazuka, Hyôgo-ken; Kure, Hiroshima-ken; Matsuyama, Ehime-ken; Hiko-san, Fukuoka-ken; Iki & Tsushima, Nagasaki-ken; Kumamoto; Kagoshima & Takakuma-yama, Kagoshima-ken.

Host: *Amphorophora rubiphaga* Takahashi (Nukabira & Sapporo, on *Rubus* sp.); *Aulacorthum magnoliae* (Essig & Kuwana) (after Watanabe & Takada, 1964 a); *A. solani* (Kaltenbach) (Sapporo, on *Cornus* sp.); *A. syringae* Takahashi (Sapporo, on *Syringa vulgaris*, *S. emodi* & *S. reticulata*); *Macrosiphum avenae akebiae* Shinji (Kyôto & Takarazuka, on *Stauntonia hexaphylla*); *M. ibarae* Matsumura (Sapporo, Kyôto, Takarazuka, Fukuoka & Kumamoto, on *Rosa* spp.); *Myzus persicae* (Sulzer) (after Watanabe & Takada, 1967); *Unisitobion sorbi* (Matsumura) (Sapporo, on *Sorbaria sorbifolia* var. *stellipila*).

Furthermore, various kinds of aphids are recorded as its hosts in other countries (see Mackauer, 1959).

Distribution: Holarctic region.

Parasitized aphids are attached one by one on the leaves of host plants.

5. *Praon dorsale* (Haliday)

Aphidius (*Praon*) *dorsalis* Haliday, Ent. Mag. 1: 484, 1833.

Praon dorsale: Mackauer, Beitr. Ent. 9: 825, 1959.

Praon dorsale: Watanabe & Takada, Ins. Mats. 27: 9, 1964.

This species is closely allied to the preceding species, *P. volucre* (Haliday), from which it differs in the following points:—

♀. Antenna with 19 to 22 segments [19 (3♀), 20 (27), 21 (8), 22 (3)]. Mesoscutum falling a little more gently into pronotum. Petiole (figs. 73 & 76) variable in shape but generally stouter, with less number of hairs. Genitalia (fig. 163) with ovipositor sheath (fig. 123) slenderer. Fore wing (fig. 205) with recurrent vein sometimes decolored.

Thorax generally lighter in color, with dorsal surface dark brown and the rest yellowish, but sometimes almost entirely light reddish brown or dark brown.

Length: Body 2.3–2.9 mm., antenna 2.0–2.7 mm.

♂. Antenna with 21 to 24 segments [21 (3♂), 22 (12), 23 (21), 24 (4)].

Length: Body 1.7–2.5 mm., antenna 1.9–3.0 mm.

Habitat: Sapporo (after Watanabe & Takada, 1964a). Five female and 3 male specimens were collected at Nopporo (M. Suwa) and Toikambetsu (K. Kusigemati), Hokkaido, for the first time.

Host: *Acyrtosiphon pisum* (Harris) (Nopporo, on *Trifolium repens*); *Dactynotus gobonis* (Matsumura) (Sapporo, on *Arctium lappa*); *D. picridis* (Fabricius) (Toikambetsu); *Indomegoura indica* (Van der Goot) (after Watanabe & Takada, 1964a).

In Europe aphids of *Dactynotus* and its allied genera are known as hosts.

Distribution: Japan; Europe.

Parasitized aphids are found one by one or in a group on the leaves and stems of host plants.

6. *Praon capitophori*, sp. nov.

The new species is closely related to *P. volucre* (Haliday), from which it differs clearly in the following features:—

♀. Face narrower, 1/2.5–1/2.7 as broad as head, 1.0–1.1 times as broad as long. Distance between posterior ocelli 3 times as long as minor axis of ocellus. Antenna with 16 to 18 segments [16 (6♀), 17 (20), 18 (8)]. Mesoscutum falling gently into pronotum. Petiole (fig. 81) slenderer, with less number of hairs. Genitalia (fig. 165) with ovipositor sheath (fig. 121). Fore wing (fig. 204) with stigma 3.9–4.4 times as long as broad. Face and gena dark brown.

Length: Body 1.5–1.7 mm., antenna 1.1–1.3 mm.

♂. Antenna with 17 to 20 segments [17 (3♂), 18 (10), 19 (10), 20 (12)].

Length: Body 1.2–1.5 mm., antenna 1.3–1.5 mm.

Holotype, ♀ (7–iv–64), & paratypes, 29♀ & 29♂: Kumamoto, reared from *Capitophorus* sp. on *Elaeagnus umbellata*. Paratypes, 7♀ & 6♂: Sapporo & Fukuoka, reared from *Capitophorus* sp. on *Elaeagnus umbellata*.

Host: *Capitophorus* sp. on *Elaeagnus umbellata*.

Parasitized aphids are found one by one on the leaves of host plants.

7. *Praon taisetsuzanum*, sp. nov.

The new species is easily distinguished by the large size, the length of metacarp and radius of the fore wing, the number of antennal segments, the shape of the petiole, etc. as follows:—

♀. Eye sparsely pubescent; distance between posterior ocelli 1.5 times as long as minor axis of ocellus. Antenna with 20 to 23 segments [20 (2♀♀), 22 (5), 23 (2)]. Mesoscutum falling vertically into pronotum, densely hairy all over. Petiole (fig. 74) peculiar in shape, longer than breadth at spiracle, 3:2, with several hairs. Genitalia (fig. 164) with ovipositor sheath (fig. 124) rather slender, with 2 nail-form bristles at apex. Fore wing (fig. 202) with stigma 4 times as long as broad; metacarp long, almost as long as stigma; radius 4 times as long as breadth of stigma; 1st abscissa of cubitus decolored partly; recurrent vein distinct.

Dark brown to black; clypeus, mouthparts, scape, pedicel, 1st flagellar segment in whole and the 2nd at base dirty yellow; face somewhat lightened. Legs yellow.

Length: Body 2.5–3.3 mm., antenna 2.1–3.0 mm.

♂. Antenna with 24 to 26 segments [24 (1♂), 25 (3), 26 (1)].

Length: Body 2.3–2.4 mm., antenna 2.7–2.8 mm.

Holotype, ♀ (3–viii–66): Aizankei, Hokkaido (K. Kusigemati). Paratypes, 8♀♀ & 4♂♂: Aizankei & Taisetsu-zan (K. Kusigemati & K. Kamijo), Tenninkyô (S. Suzuki), & Poroshiri-dake (T. Kocha), Hokkaido.

Host: Unknown.

It should be noted that all the specimens examined were caught in mountain districts of Hokkaido (500–2,000 meters above the sea-level).

Judging from Smith's redescription (1944) of *alaskense* this aberrant species appears to be extremely like *P. alaskense* Ashmead, which was originally described from a single male specimen collected at St. Paul's Island, Alaska. In the present state of my knowledge, however, it is very difficult to state the true relationship between them.

5. Genus *Xenostigmus* Smith

Xenostigmus Smith, Ohio State Univ. Contr., Zool. Ent. 6: 36, 1944. [Type-species: *Aphidius bifasciatus* Ashmead, 1891].

This genus is monobasic, represented only by the North American species, *X. bifasciatus* (Ashmead). In the course of the present investigation another species has been found in Japan.

1. *Xenostigmus* sp.

♂. Head entirely reticulated, clothed moderately with short hairs; temple (fig. 5) in dorsal view much shorter than eye, 3:7, converging strongly behind eye; face (fig. 20) 1/1.8 as broad as head, 2.5 times as broad as long; clypeus 2 times as broad as long; malar space 2.5 times as long as basal breadth of mandible. Ocellus oval; distance between posterior ocelli 5 times as long as minor axis of ocellus. Antenna with 23 segments (1♂); flagellar segments with adpressed dense short hairs, 1.5 times as long as broad at base. Thorax reticulated, scarcely hairy. Mesoscutum weakly prominent anteriorly, covering pronotum in lateral view; notaulix completely effaced. Propodeum not carinated, smooth and shining, the posterior surface being excavated medially.

Abdomen scarcely reticulated, rather smooth; petiole (fig. 85) a little more than 2 times as long as broad at spiracle, almost parallel-sided and very flat as seen laterally. Fore wing (fig. 211) with stigma triangular, 2.3 times as long as broad and longer than metacarp, 3:2; 1st abscissa of radius a little longer than the 2nd, much shorter than breadth of stigma, 3:5.

Dark brown; face, clypeus, mouthparts, pronotum, tegula, petiole on basal 1/4, and 1st and 2nd sutures of abdomen yellowish. Wing hyaline, without brown cloud. Front leg dirty yellow; middle and hind legs brown, with coxae darker, and trochanters, tibiae basally and tarsi basally yellowish.

Length: Body 2.5 mm., antenna 1.9 mm.

♀. Unknown.

Specimens examined: 1♂, Kôbe, reared from *Cinara* sp. on *Pinus densiflora*.

Host: *Cinara* sp. on *Pinus densiflora*.

A parasitized aphid is found on the needles of host plants, the empty skin becoming pale brown.

The present species is closely related to *bifasciatus*, agreeing well with Smith's description (1944) of that species, apart from the longer metacarp of the fore wing and the antenna with 23 segments. This species is, however, not named at this time, since further abundant material are necessary in order to give a scientific name.

6. Genus *Pauesia* Quilis

Pauesia Quilis, Eos 7: 67, 1931. [Type-species: (*Pauesia albuferensis* Quilis, 1931)=*Aphidius unilachni* Gahan, 1926].

In 1965 Watanabe and Takada gave thirteen species of *Pauesia* occurring in Japan. In this paper one new species is added to the fauna of Japan. It is known that the species of this genus are parasitic on aphids belonging to the Lachninae.

Key to the species (♀♀)

1. Antenna with 27 to 29 segments. 2
- Antenna with less number of segments. 3
2. Petiole about 3 times as long as broad at spiracle, dilated strongly towards apex on apical 1/2. Clypeus 3 times as broad as long; face 1/2 as broad as head, 1.5 times as broad as long. Mesoscutum with sparse hairs. Ovipositor sheath stout. Face entirely black. Legs yellow to yellowish brown. Empty skin of victim dark brown. 1. *P. kono* (Watanabe)
- Petiole distinctly more than 3 times as long as broad at spiracle, dilated moderately towards apex on apical 1/2. Clypeus 2 times as broad as long; face a little more than 1/2 as broad as head, 2 times as broad as long. Mesoscutum with dense hairs. Ovipositor sheath less stout. Face somewhat yellowish. Legs darker in color. Empty skin of victim black. 2. *P. nopporensis* Watanabe & Takada
3. Fore wing with stigma distinctly shorter than metacarp. Antenna with 22 to 25 segments. 5. *P. inouyei* Watanabe
- Fore wing with stigma as long as or longer than metacarp. 4
4. Notaulix very distinct and deep (except for posterior end effaced). Antenna with 21 or 22 segments. 9. *P. momicola* Watanabe & Takada
- Notaulix obsolete (except for anterior 1/3 distinct and deep). 5
5. Face very narrow, 1/2.7 as broad as head and 1.5 times as broad as long. Antenna with 19 to 22 segments. Apical segment of antenna brown and the preceding 3 or 4 whitish brown. 6. *P. infulata* (Haliday)

- Face broad, about 1/2 as broad as head and more than 1.5 times as broad as long. 6
- 6. Propodeum shallowly excavated medially on posterior surface and completely areolated. Antenna with 19 to 21 segments. 13. *P. salignae* (Watanabe)
- Propodeum strongly excavated medially on posterior surface and incompletely areolated, the post-median longitudinal carinae being effaced. 7
- 7. Ovipositor sheath very long and slender, weakly curved upwards. Temple in dorsal view 2/3 as long as eye, rather parallel behind eye. Antenna with 16 to 18 segments; 1st flagellar segment slightly shorter than the 2nd. 14. *P. unilachni* (Gahan)
- Ovipositor sheath short and stout, almost straight. Temple in dorsal view less than 1/2 as long as eye, converging moderately behind eye. Antenna with 1st flagellar segment as long as or longer than the 2nd. 8
- 8. Fore wing with stigma broad, triangular, less than 2.5 times as long as broad. Ovipositor sheath very stout, almost quadrate. 9
- Fore wing with stigma narrow, about 3 times as long as broad. Ovipositor sheath slenderer. 10
- 9. Petiole rather slender, 4 times as long as broad at spiracle. Temple in dorsal view 2/3 as long as eye. Mesoscutum entirely black. Fore wing with stigma as long as metacarp. Antenna with 20 to 23 segments. 3. *P. pini* (Haliday)
- Petiole stouter, 3 times as long as broad at spiracle. Temple in dorsal view shorter, 1/3 as long as eye. Mesoscutum yellowish along notaulix and on lateral side. Fore wing with stigma 1.3-1.5 times as long as metacarp. Antenna with 21 or 22 segments. 4. *P. abietis* (Marshall)
- 10. Ovipositor sheath stout, obtuse at apex. Propodeum narrowly excavated on posterior surface. Antenna with 18 to 20 segments. 11
- Ovipositor sheath slenderer, acute at apex. Propodeum broadly excavated on posterior surface. 12
- 11. Petiole a little more than 2.5 times as long as broad at spiracle. Fore wing with stigma about 2.5 times as long as broad, about as long as metacarp; 1st abscissa of radius distinctly less than 1.5 times as long as the 2nd, which is longer than 2nd intercubitus. Mesoscutum entirely dark brown. Empty skin of victim black. 8. *P. jezoensis* (Watanabe)
- Petiole slenderer, about 3 times as long as broad at spiracle. Fore wing with stigma conspicuously more than 3 times as long as broad, a little longer than metacarp; 1st abscissa of radius distinctly more than 1.5 times as long as the 2nd, which is shorter than 2nd intercubitus. Mesoscutum yellowish along notaulix and on lateral side. Empty skin of victim brown. 7. *P. soranumensis* Watanabe & Takada
- 12. Temple in dorsal view 1/2 as long as eye. Ovipositor sheath almost straight. Antenna with 21 to 23 segments. 12. *P. japonica* (Ashmead)
- Temple in dorsal view shorter, 1/3 as long as eye. Ovipositor sheath weakly curved upwards. Antenna with 20 or 21 segments. 13
- 13. Petiole 3 times as long as broad at spiracle. Fore wing (fig. 210) with metacarp as long as stigma; 1st abscissa of radius a little longer than breadth of stigma. Ovipositor sheath (fig. 127) as in figure. Body almost entirely dark brown. 10. *P. laricis* (Haliday)
- Petiole 4 times as long as broad at spiracle. Fore wing (fig. 209) with metacarp 3/4 as long as stigma; 1st abscissa of radius as long as breadth of stigma. Ovipositor sheath (fig. 126) slenderer. Body bicolor, yellowish brown and dark brown. 11. *P. akamatsucola*, sp. nov.

1. ***Pauesia konoï*** (Watanabe)

Aphidius kônoi Watanabe, Ins. Mats. 15: 106, 1941.

Pauesia konoï: Watanabe & Takada, Ins. Mats. 27: 11, 1964 & 28: 3, 1965.

Habitat: Sapporo (after Watanabe, 1941), & Yuni & Naganuma (after Watanabe &

Takada, 1964), Hokkaido; Kyôto (1♀ & 3♂♂); Ishizuchi-yama, Ehime-ken (1♀, A. Nakanishi).

Host: *Cinara longipennis* (Matsumura) (after Watanabe, 1941).

Distribution: Japan.

2. ***Pauesia nopporensis*** Watanabe & Takada

Pauesia nopporensis Watanabe & Takada, Ins. Mats. 28: 4, 1965.

Habitat: Nopporo, Hokkaido (after Watanabe & Takada, 1965).

Host: *Cinara longipennis* (Matsumura) (after Watanabe & Takada, 1965).

Distribution: Japan.

3. ***Pauesia pini*** (Haliday)

Aphidius pini Haliday, Ent. Mag. 2: 96, 1834.

Aphidius pini: Watanabe, Ins. Mats. 15: 54, 1940.

Paraphidius pini: Starý, Acta Faun. Ent. Mus. Nat. Pragae 6: 23, 1960.

Pauesia pini: Watanabe & Takada, Ins. Mats. 28: 5, 1965.

Aphidius lachnivorius Ashmead, Proc. U.S. Nat. Mus. 30: 189, 1906; Watanabe, Ins. Mats. 21: 2, 1957.

Habitat: Sapporo (after Watanabe, 1940), Yamabe, Nopporo & Naganuma (after Watanabe & Takada, 1965), & Kuriyama (1♀, K. Kamijo), Hokkaido,

Host: *Cinara laricicola* (Matsumura) (in Japan, after Watanabe, 1940); *Cinaria laricis* (Walker) (in Japan, after Watanabe & Takada, 1965); *Cinara cembrae* (Cholodkovsky), *Cinaria taeniata* (Koch), *Cinaropsis cistata* (Buckton), *C. pruinosa* (Hartig) & *Cupressobium juniperi* (de Geer) (in Europe, after Starý, 1960 a).

Distribution: Japan; Europe.

4. ***Pauesia abietis*** (Marshall)

Aphidius abietis Marshall, Spec. Hym. Eur. 5: 565, 1896.

Paraphidius abietis: Starý, Acta Faun. Ent. Mus. Nat. Pragae 6: 8, 1960.

Aphidius pini: Watanabe, Ins. Mats. 15: 110, 1941.

Pauesia abietis: Watanabe & Takada, Ins. Mats. 28: 5, 1965.

Habitat: Sapporo & Kyôto (after Watanabe & Takada, 1965).

Host: *Cinara pineti* (Koch) (in Japan, after Watanabe & Takada, 1965); *Cinaria laricis* (Walker) & *Cinaropsis pilicornis* (Hartig) (in Europe, after Starý, 1960 a).

Distribution: Japan; Europe.

5. ***Pauesia inouyei*** (Watanabe)

Aphidius inouyei Watanabe, Ins. Mats. 15: 106, 1941.

Pauesia inouyei: Watanabe & Takada, Ins. Mats. 28: 7, 1965.

Habitat: Sapporo (after Watanabe, 1941), Eniwa (after Watanabe & Takada, 1965), Sôunkyo (1♀, A. Yamaguchi), Aizankei (1♀, K. Kusigemati) & Nopporo (2♀♀), Hokkaido.

Host: *Cinara todocola* (Inouye) (after Watanabe, 1941).

Distribution: Japan.

6. ***Pauesia infulata*** (Haliday)

Aphidius infulatus Haliday, Ent. Mag. 2: 96, 1834.

Paraphidius infulatus: Starý, Acta Faun. Ent. Mus. Nat. Pragae 6: 14, 1960.

Pauesia infulata: Watanabe & Takada, Ins. Mats. 28: 7, 1965.

Habitat: Yuni (after Watanabe & Takada, 1965) & Soranuma-dake (1♀), Hokkaido.
 Host: *Cinara* sp. on *Picea abies* (in Japan, after Watanabe & Takada, 1965);
Buchneria pectinatae (Noerdl.) (in Europe, after Starý, 1966); *Cupressobium juniperi* (de Geer) & *Laricaria kochiana* (Boerner) (in Europe, after Starý, 1960 a).
 Distribution: Japan; Europe.

7. ***Pauesia soranumensis*** Watanabe & Takada

Aphidius jezoensis Watanabe, Ins. Mats. 15: 108, 1941 (partim).

Pauesia soranumensis Watanabe & Takada, Ins. Mats. 28: 9, 1965.

Habitat: Sapporo & Soranuma-dake, Hokkaido (after Watanabe & Takada, 1965).

Host: *Cinara pinicola* (Kaltenbach) & *Lachniella costata* (Zetterstedt) (after Watanabe & Takada, 1965).

Distribution: Japan.

8. ***Pauesia jezoensis*** (Watanabe)

Aphidius jezoensis Watanabe, Ins. Mats. 15: 108, 1941.

Pauesia jezoensis: Mackauer, Beitr. Ent. 12: 641, 1962.

Pauesia jezoensis: Watanabe & Takada, Ins. Mats. 28: 10, 1965.

Habitat: Sapporo (after Watanabe, 1941) & Nopporo (after Watanabe & Takada, 1965), Hokkaido.

Host: *Cinara pinicola* (Kaltenbach) (in Japan, after Watanabe, 1941); *Lachniella costata* (Zetterstedt) (in Europe, after Mackauer, 1962).

Distribution: Japan; Europe.

9. ***Pauesia momicola*** Watanabe & Takada

Pauesia momicola Watanabe & Takada, Ins. Mats. 28: 11, 1965.

Habitat: Tomakomai, Hokkaido (3♀ & 6♂♂, A. Yamaguchi & M. Takai); Sendai, Kyôto & Nara (after Watanabe & Takada, 1965).

Host: *Cinara todocola* (Inouye) (Tomakomai, on *Abies sachalinensis*).

Distribution: Japan.

10. ***Pauesia laricis*** (Haliday) (figs. 127 & 210)

Aphidius laricis Haliday, Ent. Mag. 2: 97, 1834.

Aphidius laricis: Watanabe, Ins. Mats. 15: 53, 1940.

Paraphidius laricis: Starý, Acta Faun. Ent. Mus. Nat. Pragae 6: 17, 1960.

Pauesia laricis: Watanabe & Takada, Ins. Mats. 28: 12, 1965.

Habitat: Sapporo (after Watanabe, 1940).

Host: *Cinara laricicola* (Matsumura) (in Japan, after Watanabe, 1940); *Cinaria nuda* (Mordvilko) & *Laricaria cochiana* (Boerner) (in Europe, after Starý, 1960 a).

Distribution: Japan; Europe.

11. ***Pauesia akamatsucola***, sp. nov.

♀. Temple in dorsal view $1/3$ as long as eye, converging strongly behind eye; face a little more than $1/2$ as broad as head, about 2 times as broad as long; clypeus 2 times as broad as long; malar space 1.7 times as long as basal breadth of mandible. Ocellus oval; distance between posterior ocelli a little more than 3.5 times as long as minor axis of ocellus. Antenna with 21 segments (1♀), becoming slightly stouter towards

apex; 1st flagellar segment 1.5 times as long as broad at base, almost equal in length to the 2nd. Mesoscutum falling vertically into pronotum, with sparse hairs along notaulix and longitudinal median line, and on lateral side; notaulix distinct and deep only on anterior 1/3. Propodeum smooth (except for lateral surface weakly rugose), incompletely areolated, with post-median longitudinal carina effaced, the posterior surface being broadly excavated medially. Petiole (fig. 86) 4 times as long as broad at spiracle. Genitalia with ovipositor sheath (fig. 126) slender, weakly curved upwards and narrowed towards apex. Fore wing (fig. 209) with stigma 3 times as long as broad, 1.3 times as long as metacarp; 1st abscissa of radius about as long as breadth of stigma.

Dark brown. Face, clypeus, mouthparts, gena, mesoscutum along notaulix and on lateral side, mesoscutellum on disc, tegula, pronotum, mesopleuron (except for lower part), and 2nd and 3rd tergites laterally yellowish brown. Legs yellowish brown to dark brown.

Length: Body 2.8–3.2 mm., antenna 2.1 mm.

♂. Differs from the female in the following points:—

Antenna with 23 segments (1♂). Petiole 3 times as long as broad at spiracle. Thorax and abdomen dark brown almost entirely.

Length: Body 2.6 mm., antenna 2.3 mm.

Holotype, ♀ (14-iv-65), & paratype, 1♀: Kyôto. Paratypes, 1♂: Sendai; 1♀ & 1♂: Hirakata, Ôsaka-fu. All the specimens are reared from *Cinara pineti* on *Pinus densiflora*.

Host: *Cinara pineti* (Koch).

Parasitized aphids are found one by one on the needles of host plants, the empty skin becoming pale brown.

In general facies this species closely resembles *P. laricis* (Haliday), from which it may be differentiated by the slenderer petiole, by the wing venation, by the bicolor body, etc. as given in the above-mentioned key.

12. *Pauesia japonica* (Ashmead)

Aphidius japonicus Ashmead, Proc. U.S. Nat. Mus. 20: 189, 1906.

Aphidius japonicus: Watanabe, Ins. Mats. 13: 83, 1939 & 21: 2, 1957.

Pauesia japonica: Watanabe & Takada, Ins. Mats. 28: 12, 1965.

Habitat: Sapporo (after Watanabe & Takada, 1965); Gifu (after Ashmead, 1906); Kyôto (after Watanabe, 1939).

Host: *Lachnus tropicalis* (Van der Goot) (after Watanabe, 1939).

Distribution: Japan.

13. *Pauesia salignae* (Watanabe)

Aphidius salignae Watanabe, Ins. Mats. 13: 81, 1939 & 21: 2, 1957.

Pauesia salignae: Watanabe & Takada, Ins. Mats. 28: 13, 1965.

Habitat: Sapporo (after Watanabe, 1939) & Soranuma-dake (after Watanabe & Takada, 1965), Hokkaido; Fukuoka (after Yasumatsu et al., 1946). A lot of specimens were collected at the following localities for the first time:—Toikambetsu, Hokkaido (K. Kusigemati); Sadoga-shima, Niigata-ken (H. Abe); Hamada, Shimane-ken (A. Machida); Hiko-san, Fukuoka-ken (K. Kamijo); Kagoshima (S. Fukamachi) & Chiran (K. Kusigemati), Kagoshima-ken.

Host: *Tuberolachnus salignus* (Gmelin) (after Watanabe, 1939).

Distribution: Japan.

14. ***Pauesia unilachni*** (Gahan)

Aphidius unilachni Gahan, Proc. U.S. Nat. Mus. 70: 1, 1926.

Pauesia unilachni: Mackauer, Beitr. Ent. 12: 640, 1962.

Pauesia unilachni: Watanabe & Takada, Ins. Mats. 28: 14, 1965.

Pauesia albuferensis Quilis, Eos 7: 69, 1931.

Paraphidius praevisus: Starý, Acta Faun. Ent. Mus. Nat. Pragae 6: 27, 1960.

Habitat: Kyôto (after Watanabe & Takada, 1965); Takamatsu, Kagawa-ken (1♀).

Host: *Schizolachnus* sp. on *Pinus densiflora* (in Japan, after Watanabe & Takada, 1965); *S. pineti* (Fabricius) (in Europe, after Starý, 1960a); *S. obscurus* Boerner (in Europe, after Mackauer, 1962).

Distribution: Japan; Formosa; Europe.

7. Genus ***Diaeretus*** Foerster

Diaeretus Foerster, Verh. Naturh. Ver. Rheinl. 19: 249, 1862. [Type-species: *Aphidius leucopterus* Haliday, 1834].

Only a single species, *D. leucopterus* (Haliday), has been known in the Palearctic region. On this occasion I give Japan as a new locality of this species.

1. ***Diaeretus leucopterus*** (Haliday)

Aphidius leucopterus Haliday, Ent. Mag. 2: 103, 1834.

Diaeretus leucopterus: Starý, Acta Soc. Ent. Cechosl. 57: 240, 1960.

This species is new to Japan. On the basis of the present specimens a brief redescription may be given below:—

♀. Head and thorax scarcely hairy; temple in dorsal view shorter than eye, 3:5, converging weakly behind eye; face $1/2$ as broad as head, about 2 times as broad as long; clypeus 2.6 times as broad as long. Ocellus oval; distance between posterior ocelli 3 times as long as minor axis of ocellus. Antenna with 15 or 16 segments [15 (12♀♀), 16 (15)]; 1st flagellar segment almost as long as the 2nd and 3 times as long as broad at base, and the 12th 2 times as long as broad. Mesoscutum falling vertically into pronotum; notaulix effaced entirely. Propodeum (fig. 56) smooth and shining, shallowly and broadly excavated medially on posterior surface, the post-median longitudinal carinae being completely effaced. Petiole (fig. 84) smooth and shining, 3 times as long as broad at spiracle. Genitalia (fig. 166) with ovipositor sheath (fig. 125) stout, attached downwards and scarcely hairy, the apical area being membranous. Fore wing (fig. 212) with stigma 2.8 times as long as broad, about 2 times as long as metacarp; radius a little longer than breadth of stigma.

Dark brown to black. Mouthparts and apical part of 2nd tergite yellowish brown. Antenna very slightly paler than head. Legs yellowish brown to dark brown.

Length: Body 1.9–2.3 mm., antenna 1.1–1.3 mm.

♂. Differs from the female as follows:—

Antenna with 16 to 18 segments [16 (2♂♂), 17 (19), 18 (1)]; flagellar segments stouter. Legs darker in color.

Length: Body 1.8–2.1 mm., antenna 1.4–1.7 mm.

Specimens examined: 31♀♀ & 27♂♂, Sapporo, Kyôto, Nara, Tottori, Fukuoka & Sasebo, Nagasaki-ken, reared from *Eulachnus thunbergii* on *Pinus thunbergii*.

Host: *Eulachnus thunbergii* Wilson (in Japan); *E. agilis* (Kaltenbach) (in Europe, after Starý, 1966).

Distribution: Palearctic region.

Parasitized aphids are found one by one on the needles of pines, the empty skin becoming brown.

8. Genus *Protaphidius* Ashmead

Coelonotus Foerster, Verh. Naturh. Ver. Preuss. Rheinl. 19: 248, 1862 (nec Peters, 1855). [Type-species: (*Coelonotus rufus* Foerster, 1862)=*Aphidius wissmannii* Ratzeburg, 1848].

Protaphidius Ashmead, Canad. Ent. 32: 368, 1900. [Type-species: *Coelonotus rufus* Foerster, 1862].

The following species is a single representative of this genus.

1. *Protaphidius wissmannii* (Ratzeburg)

Aphidius wissmannii Ratzeburg, Ichn. D. Forst. 2: 59, 1848.

Protaphidius wissmannii: Starý, Acta Faun. Ent. Mus. Nat. Pragae 3: 91, 1958; *ibid.*, Ins. Mats. 22: 88, 1959.

Coelonotus rufus Foerster, Verh. Naturh. Ver. Preuss. Rheinl. 19: 248, 1862.

Aclitus nawaii Ashmead, Proc. U. S. Nat. Mus. 30: 188, 1906.

Aphidius nawaii: Watanabe, Ins. Mats. 21: 2, 1957.

Habitat: Gifu (after Ashmead, 1906).

Host: *Stomaphis yanonis* Takahashi (in Japan, after Watanabe, 1957); *Pterocomma salicis* (Linné) & *Stomaphis quercus* (Linné) (in Europe, after Starý, 1958).

Distribution: Japan; Europe.

I have not yet seen any specimen of this species.

9. Genus *Paralipsis* Foerster

Paralipsis Foerster, Verh. Naturh. Ver. Preuss. Rheinl. 19: 248, 1862. [Type-species: *Aphidius enervis* Nees, 1834].

This is a peculiar genus, being represented by two species, *P. enervis* (Nees) from Europe and *P. eikoe* (Yasumatsu) from Japan. The species of this genus are known as parasites of root aphids, which are mostly associated with ants.

1. *Paralipsis eikoe* (Yasumatsu)

Myrmecobosca eikoe Yasumatsu, Rev. Franc. Ent. 18: 172, 1951.

Paralipsis eikoe: Starý, Acta Faun. Ent. Mus. Nat. Pragae 3: 89, 1958; Yasumatsu, Kontyû 28: 57, 1960.

Habitat: Hiko-san, Fukuoka-ken (after Yasumatsu, 1951).

Host: Unknown.

Distribution: Japan.

This species was originally described from a single female which was caught from the nest of *Lasius niger* in the tree-trunk of an old Japanese cedar tree, *Cryptomeria japonica* (after Yasumatsu, 1951).

10. Genus *Aphidius* Nees

Aphidius Nees, Nova Acta Acad. Caes. Leop. Carol. 9: 302, 1818. [Type-species: *Aphidius avenae* Haliday, 1834] (It. Opinion Nr. 284).

Euaphidius Mackauer, Beitr. Ent. 11: 110, 1961. [Type-species: (*Aphidius pterocommae* Ashmead, 1889)=*Aphidius cingulatus* Ruthe, 1859].

This is the largest and commonest genus of this family. So far as I am aware, however, only three species of this genus have been known to occur in Japan. In the present paper are added to the fauna of Japan nine other species, of which three are new to science.

Key to the species (♀♀)

1. Antenna with 12 to 14 segments. 2
- Antenna with 15 or more segments. 3
2. Temple (fig. 6) in dorsal view shorter than eye, 1:2, converging moderately behind eye; face (fig. 25) 1/2.7 as broad as head, 1.5 times as broad as long. Flagellar segments (fig. 41) becoming strongly stouter towards apex, the 1st being 2.5 times as long as broad at base and the 10th as long as broad. Mesoscutum weakly prominent anteriorly, covering pronotum in lateral view. Ovipositor sheath (fig. 129) almost quadrate. Parasite of *Periphyllus* species. 1. *A. areolatus* Ashmead
- Temple (fig. 7) in dorsal view as long as eye, converging very slightly behind eye; face (fig. 27) 1/2.4 as broad as head, 1.7 times as broad as long. Flagellar segments thickened weakly towards apex, the 1st being 3 times as long as broad at base and the 10th 2 times so. Mesoscutum falling vertically into pronotum, not covering the latter in lateral view. Ovipositor sheath (fig. 130) less quadrate. Parasite of *Cavariella* species. 2. *A. salicis* Haliday
3. Face (fig. 26) 1/1.9 as broad as head, 2 times as broad as long; malar space 2 times as long as basal breadth of mandible. Flagellar segments (fig. 42) clothed with adpressed short hairs as well as elcted long one. Antenna with 18 to 20 segments. Parasite of *Pterocomma* species. 3. *A. cingulatus* Ruthe
- Face narrower, 1/2.1-1/2.6 as broad as head, 1.2-1.7 times as broad as long; malar space much less than 2 times as long as basal breadth of mandible. Flagellar segments clothed with nearly elcted short hairs. 4
4. Petiole (fig. 96) slender, 4 times as long as broad at spiracle. Face (fig. 32) narrow, 1/2.6 as broad as head and 1.2 times as broad as long. Antenna with 18 to 21 segments. Parasite of *Macrosiphoniella grandicauda*. 11. *A. longipetiolus*, sp. nov.
- Petiole stouter, 2.7-3.5 times as long as broad at spiracle. Face broader, 1/2.1-1/2.5 as broad as head and 1.4-1.7 times as broad as long. 5
5. Ovipositor sheath slender (figs. 137, 138 & 140). 6
- Ovipositor sheath stout (figs. 132-136). 8
6. Petiole (fig. 95) stout, 2.7 times as long as broad at spiracle and rather strongly dilated behind spiracular tubercle. Antenna with 17 or 18 segments. Parasite of *Dactynotus* species. 12. *A. funebris* Mackauer
- Petiole slender, 3 times as long as broad at spiracle and almost parallel-sided. Parasite of *Macrosiphoniella* species. 7
7. Ovipositor sheath (fig. 137) slender. Temple (fig. 17) in dorsal view parallel or diverging slightly just behind eye. Head dirty yellow. Antenna with 16 or 17 segments. 9. *A. absinthii* Marshall
- Ovipositor sheath (fig. 138) slenderer. Temple (fig. 15) in dorsal view converging weakly just behind eye. Head dark brown. Antenna with 15 to 17 segments. 10. *A. macrosiphoniellae*, sp. nov.
8. Temple (fig. 12) in dorsal view almost straight and almost as long as eye. Head clothed sparsely with rather long hairs. Propodeum (fig. 47) with pentagonal areola very small. Antenna with 18 or 19 segments. Parasite of *Amphorophora* species. 8. *A. lonicerae* Marshall
- Temple (figs. 9-11 & 14) in dorsal view swollen and distinctly shorter than eye. Head clothed less densely with short hairs. Propodeum with pentagonal areola larger. 9

9. Fore wing (figs. 218 & 219) with metacarp as long as stigma and 1st abscissa of radius as long as the 2nd. Mesoscutum falling gently into pronotum. Thorax bicolor (dorsal surface dark brown, the rest dirty yellow) or entirely dirty yellow. 10
- Fore wing (figs. 214 & 217) with metacarp distinctly shorter than stigma and 1st abscissa of radius distinctly longer than the 2nd. Mesoscutum falling vertically into pronotum. Thorax unicolor, dark brown (at most pronotum and mesopleuron somewhat yellowish). 11
10. Temple (fig. 14) in dorsal view shorter than eye, 3:4, converging weakly behind eye; face (fig. 28) 1/2.5 as broad as head, 1.4 times as broad as long. Petiole (fig. 94) 3.6 times as long as broad at spiracle. Antenna with 15 to 18 segments. Empty skin of victim pale brown. Polyphagous species. 6. *A. gifuensis* Ashmead
- Temple (fig. 11) in dorsal view shorter than eye, 2:3, converging more strongly behind eye; face (fig. 29) broader, 1/2.2 as broad as head and 1.7 times as broad as long. Petiole (fig. 98) stouter, 3.0 times as long as broad at spiracle. Antenna with 17 or 18 segments. Empty skin of victim dark brown. Parasite of *Aulacorthum* species. 7. *A. amamioshimensis*, sp. nov.
11. Petiole (fig. 91) 3 times as long as broad at spiracle, with lateral margin weakly bowed convexly behind spiracular tubercle. Fore wing (fig. 214) with stigma 3.8 times as long as broad, longer than metacarp, 4:3. Antenna with 17 to 19 segments. Face dark brown. Petiole dirty yellow. Parasite of *Acyrtosiphon* species. 4. *A. ervi* Haliday
- Petiole (fig. 89) 3.5 times as long as broad at spiracle, gradually dilated behind spiracular tubercle. Fore wing (fig. 217) with stigma 3.3 times as long as broad, longer than metacarp, 3:2. Antenna with 15 to 17 segments. Face dirty yellow. Petiole generally dark brown. Parasite of *Macrosiphum* species. 5. *A. avenae* Haliday

1. *Aphidius areolatus* Ashmead

Aphidius areolatus Ashmead, Proc. U. S. Nat. Mus. 30: 189, 1906; Watanabe, Ins. Mats. 21: 2, 1957.

♀. Head sparsely hairy; temple (fig. 6) in dorsal view shorter than eye, 1:2, converging moderately behind eye; face (fig. 25) 1/2.7 as broad as head, 1.5 times as broad as long; clypeus a little less than 2 times as broad as long; malar space almost as long as basal breadth of mandible. Antenna (fig. 41) with 13 or 14 segments [13 (68♀♀), 14 (12)]; flagellar segments densely clothed with adpressed short hairs and becoming strongly stouter towards apex, the 1st being 2.5 times as long as broad at base and almost equal in length to the 2nd, and the 10th as long as broad. Mesoscutum weakly prominent anteriorly, covering pronotum in lateral view and sparsely hairy along notaulix and on lateral sides. Propodeum with pentagonal areola rather narrow. Petiole (fig. 87) 3 times as long as broad at spiracle. Genitalia (fig. 167) with ovipositor sheath (fig. 129) almost quadrate. Fore wing (fig. 213) with stigma 3.5 times as long as broad, longer than metacarp, 5:3; 1st abscissa of radius 1.4 times as long as the 2nd, 1.7 times as long as breadth of stigma.

Black. Mouthparts dirty yellow; petiole, 2nd tergite apically and apical sternites somewhat lightened. Legs yellowish brown to brown.

Length: Body 2.6-3.0 mm., antenna 1.3-1.6 mm.

♂. Differs from the female in the following characters:—

Eye smaller; face 1/2.1 as broad as head. Antenna with 18 to 20 segments [18 (4♂♂), 19 (25), 20 (49)]. Generally darker in color.

Length: Body 2.0-2.6 mm., antenna 2.0-2.3 mm.

Habitat: Many specimens were collected at the following localities:—Sapporo, Naganuma, Yuni, Bibai & Apoi-dake, Hokkaido; Kyôto; Takachihokyô, Miyazaki-ken

(M. Miyazaki).

Host: *Periphyllus californiensis* (Shinji) (Naganuma, Yuni, Sapporo & Kyôto, on *Acer* spp.).

Distribution: Japan.

Parasitized aphids are found one by one on the leaves of host plants, the empty skin becoming brown.

This species is distinct by the short antenna, the large eye, the almost quadrate ovipositor sheath and the black body. Judging from the original description (1961 b) of *setiger* this species seems to show a certain affinity with *A. setiger* (Mackauer) from Europe, a parasite of *Periphyllus aceris*.

2. *Aphidius salicis* Haliday

Aphidius salicis Haliday, Ent. Mag. 2: 102, 1834.

Aphidius salicis: Marshall, Trans. Ent. Soc. London 1899: 60, 1899.

This species is new to Japan.

♀. Head scatteringly hairy; temple (fig. 7) in dorsal view as long as eye, converging very slightly behind eye; face (fig. 27) $1/2.4$ as broad as head, 1.7 times as broad as long; clypeus a little less than 2 times as broad as long; malar space almost as long as basal breadth of mandible. Antenna (fig. 42) with 12 to 14 segments [12 (2♀♀), 13 (102), 14 (2)]; flagellar segments densely clothed with adpressed short hairs and becoming weakly stouter towards apex, the 1st being 3 times as long as broad at base and as long as or shorter than the 2nd, and the 10th 2 times as long as broad. Mesoscutum falling vertically into pronotum, not covering the latter in lateral view and scarcely hairy. Propodeum with pentagonal areola narrow. Petiole (fig. 88) 2.5 times as long as broad at spiracle. Genitalia (fig. 169) with ovipositor sheath (fig. 130) as in figure. Fore wing (fig. 215) with stigma 4 times as long as broad, much longer than metacarp, 2:1; 1st abscissa of radius 1.4 times as long as the 2nd, about 1.5 times as long as breadth of stigma.

Dark brown. Mouthparts, anellus, propodeum posteriorly, petiole and 2nd tergite on basal triangular patch yellowish brown; in some specimens propodeum entirely and petiole basally dark brown. Legs dirty yellow to dark brown.

Length: Body 1.6–2.2 mm., antenna 1.0–1.6 mm.

♂. Differs from the female as follows:—

Face $1/2.1$ as broad as head. Antenna with 15 to 17 segments [15 (5♂♂), 16 (61), 17 (7)].

Length: Body 1.4–2.3 mm., antenna 1.1–1.8 mm.

Specimens examined: 64♀♀ & 46♂♂, reared from *Cavariella salicicola* on *Salix* spp. at the following localities:—Naganuma & Sapporo, Hokkaido; Kyôto; Tottori; Kôchi; Kumamoto; Yatsushiro, Kumamoto-ken & Miyazaki (M. Miyazaki); Kagoshima; Koniya, Amami-ôshima. 55♀♀ & 32♂♂, reared from *Cavariella araliae* on *Tetrapanax papyriferus* at the following localities:—Fukuoka; Kagoshima; Nishinakama, Amami-ôshima.

Host: *Cavariella araliae* Takahashi; *C. salicicola* (Matsumura) (in Japan).

In Europe several aphids of *Cavariella* and its allied genera are recorded as hosts of this parasite.

Distribution: Japan; Europe.

Aphids parasitized by this aphidiid are attached one by one on the leaves and stems

of willows, the empty skin becoming pale brown to brown.

This as well as *A. areolatus* Ashmead is an isolated species characterized by the small number of the antennal segments. The former is distinguishable from the latter by the longer temple, the broader face, the slenderer flagellar segments, etc. as given in the key.

3. *Aphidius cingulatus* Ruthe

Aphidius cingulatus Ruthe, Stett. Ent. Ztg. 20: 315, 1859.

Aphidius cingulatus: Starý, Ent. Tidskr. 82: 214, 1961.

Aphidius pterocommae: Smith, Ohio State Univ. Contr., Zool. Ent. 6: 68, 1944.

This species is new to Japan.

♀. Head sparsely hairy; temple (fig. 8) in dorsal view shorter than eye, 4:7, converging moderately behind eye; face (fig. 26) 1/1.9 as broad as head, 2 times as broad as long; clypeus a little less than 2 times as broad as long; malar space 2 times as long as basal breadth of mandible. Antenna (fig. 43) with 18 to 20 segments [18 (12♀), 19 (48), 20 (3)]; flagellar segments clothed with dense adpressed short hairs as well as sparse elected long ones and becoming weakly stouter towards apex, the 1st being 2.5 times as long as broad at base and almost equal in length to the 2nd, and the 10th 2 times as long as broad. Mesoscutum falling vertically into pronotum, not covering the latter in lateral view and scatteringly hairy. Propodeum with pentagonal areola rather narrow. Petiole (fig. 90) 3 times as long as broad at spiracle. Genitalia (fig. 168) with ovipositor sheath (fig. 131) as in figure. Fore wing (fig. 216) with stigma 3.5 times as long as broad, longer than metacarp, 5:3; 1st abscissa of radius 1.4 times as long as the 2nd, 1.5 times as long as breadth of stigma.

Dark brown. Face, clypeus, mouthparts, scape, 1st flagellar segment at extreme base, pronotum, mesoscutum along notaulix and on lateral side, and mesopleuron (except for lower extreme) dirty yellow. Abdomen brown; petiole entirely yellowish brown to brown; tergites yellowish basally. Legs dirty yellow.

Length: Body 2.2–2.8 mm., antenna 1.6–2.0 mm.

♂. Differs from the female as follows:—

Antenna with 20 to 22 segments [20 (5♂), 21 (10), 22 (2)].

Length: Body 1.9–2.4 mm., antenna 1.9–2.3 mm.

Specimens examined: 65♀♀ & 19♂♂, Yamabe (K. Kamijo) & Sapporo, Hokkaido, reared from *Pterocomma* sp. on *Salix* spp.

Host: *Pterocomma* sp. on *Salix* spp.

According to the literature the hosts of this parasite are strictly restricted to aphids of the genus *Pterocomma*.

Distribution: Holarctic region.

Parasitized aphids are found in a group on the twigs and boughs of willows, the empty skin becoming brown to dark brown.

On account of the broad face and the antenna with elected hairs the present species is very distinctive from any other species occurring in Japan. Judging from Starý's redescription (1961b) of *cingulatus* based on the European form, the Japanese form is different from the European in the following points:—(1) The mesoscutum is falling vertically into the pronotum, not covering the latter in lateral view. (2) The face, mesopleuron and petiole are yellowish in most female specimens, not "brown black".

4. *Aphidius ervi* Haliday

Aphidius ervi Haliday, Ent. Mag. 2: 100, 1834.

Aphidius ervi: Marshall, Trans. Ent. Soc. London 1899: 47, 1899.

Aphidius ervi ervi: Mackauer & Finlayson, Canad. Ent. 99: 1061, 1967.

This species is new to Japan.

♀. Head scatteringly hairy; temple (fig. 9) in dorsal view slightly shorter than eye, 4:5, converging weakly behind eye; face $1/2.4$ as broad as head, 1.4 times as broad as long; clypeus about 1.5 times as broad as long; malar space a little longer than basal breadth of mandible. Antenna with 17 to 19 segments [17 (2♀), 18 (43), 19 (9)]; flagellar segments densely clothed with nearly adpressed short hairs and becoming weakly stouter towards apex, the 1st being 3.3 times as long as broad at base and as long as or slightly shorter than the 2nd, and the 10th 2 times as long as broad. Mesonotum falling almost vertically into pronotum, with scattered hairs along notaulix and on lateral side. Propodeum with pentagonal areola comparatively narrow. Petiole (fig. 91) 3 times as long as broad at spiracle, the lateral margin being weakly bowed convexly behind spiracular tubercle. Genitalia (fig. 170) with ovipositor sheath (fig. 133) stout. Fore wing (fig. 214) with stigma 3.8 times as long as broad, longer than metacarp, 4:3; 1st abscissa of radius 1.4 times as long as the 2nd, 1.7 times as long as breadth of stigma.

Dark brown. Clypeus, mouthparts, scape ventrally, 1st flagellar segment at extreme base and petiole dirty yellow; pronotum, and 2nd tergite on basal triangular patch and extreme apex obscurely yellowish brown; in a few specimens propodeum lightened posteriorly. Legs dirty yellow.

Length: Body 2.7–3.4 mm., antenna 2.0–2.3 mm.

♂. Differs from the female as follows:—

Eye smaller; face $1/2.0$ as broad as head. Antenna with 19 to 22 segments [19 (1♂), 20 (12), 21 (10), 22 (1)]; flagellar segments stouter, clothed with more adpressed hairs. Generally darker in color.

Length: Body 2.4–2.7 mm., antenna 2.3–2.5 mm.

Specimens examined: 57♀♀ & 26♂♂, reared from *Acyrtosiphon pisum* at the following localities:—Sapporo, on *Medicago sativa* & Nopporo (M. Suwa), on *Trifolium repens*, Hokkaido; Morioka, Iwate-ken (T. Oku).

Host: *Acyrtosiphon pisum* (Harris).

In other countries this insect is known as a principal parasite of *Acyrtosiphon* species.

Distribution: Palearctic region; Nearctic region (introduced).

Parasitized aphids are found rather in a group on the leaves and stems of host plants, the empty skin becoming pale brown.

The present specimens agree well with Mackauer and Finlayson's redescription (1967) of *ervi*, except for the paler color of the petiole and the smaller number of the antennal segments.

5. *Aphidius avenae* Haliday

Aphidius avenae Haliday, Ent. Mag. 2: 99, 1834.

Aphidius avenae: Marshall, Trans. Ent. Soc. London 1899: 46, 1899.

Aphidius granarius: Watanabe, Ins. Mats. 15: 168, 1941.

This species closely resembles the preceding, *A. ervi* Haliday, from which it differs

in the wing venation, the number of the antennal segments, the shape of the petiole, etc. as follows:—

♀. Temple (fig. 10) in dorsal view shorter than eye, 3:4, nearly parallel just behind eye; face (fig. 30) as in figure. Antenna with 15 to 17 segments [15 (2♀♀), 16 (73), 17 (6)]; flagellar segments stouter, the 1st being a little less than 3 times as long as broad at base and the 10th 2 times so. Petiole (fig. 89) slenderer, 3.5 times as long as broad at spiracle and gradually dilated behind spiracular tubercle. Genitalia (fig. 171) with ovipositor sheath (fig. 132) very slightly slenderer. Fore wing (fig. 217) with stigma broader, 3.3 times as long as broad, much longer than metacarp, 3:2; 1st abscissa of radius 1.4 times as long as breadth of stigma. Face yellowish brown. Petiole dark brown almost entirely. Legs darker.

Length: Body 1.8–2.9 mm., antenna 1.4–1.8 mm.

♂. Antenna with 18 to 21 segments [18 (19♂♂), 19 (62), 20 (12), 21 (2)].

Length: Body 1.8–2.3 mm., antenna 1.7–2.2 mm.

Habitat: Sapporo (after Watanabe, 1941 a); Hiko-san, Fukuoka-ken (after Yasumatsu et al., 1947). A lot of specimens were collected at the following localities for the first time:—Sōunkyo (S. Suzuki), Yukomambetsu & Mashike (K. Kusigemati), Asahikawa (H. Inoue), & Nopporo (M. Suwa), Hokkaido; Hatano, Kanagawa-ken; Kyōto; Sasayama, Hyōgo-ken (T. Naito); Wakamiya, Kōchi-ken; Matsuyama, Ehime-ken; Ōmura, Fukuoka-ken (M. Miyazaki); Hirado (M. Miyazaki), Iki & Tsushima, Nagasaki-ken; Kumamoto; Takachihokyo, Miyazaki-ken (M. Miyazaki); Kagoshima & Takakuma-yama, Kagoshima-ken.

Host: *Macrosiphum avenae akebiae* Shinji (after Watanabe, 1941 a); *M. ibarae* Matsumura (Sapporo & Fukuoka, on *Rosa* spp.).

In Europe this aphidiid is known as a parasite of *Sitobion* species.

Distribution: Japan; China; Europe.

Parasitized aphids are found one by one on the leaves or ears of host plants, the empty skin becoming brown.

6. *Aphidius gifuensis* Ashmead

Aphidius gifuensis Ashmead, Proc. U. S. Nat. Mus. 30: 188, 1906; Watanabe, Ins. Mats. 21: 2, 1957.

♀. Head with scattered hairs; temple (fig. 14) in dorsal view shorter than eye, 3:4, converging weakly behind eye; face (fig. 28) 1/2.5 as broad as head, 1.4 times as broad as long; clypeus about 1.6 times as broad as long; malar space as long as basal breadth of mandible. Antenna with 15 to 18 segments [15 (2♀♀), 16 (17), 17 (160), 18 (46)]; flagellar segments moderately clothed with nearly elected short hairs and becoming weakly stouter towards apex, the 1st being 3 times as long as broad at base and equal in length to the 2nd, and the 10th 2 times as long as broad. Mesoscutum falling gently into pronotum, not covering the latter in lateral view, and scatteringly hairy along notaulix and on lateral side. Propodeum with pentagonal areola very variable in shape but usually rather broad. Abdomen scatteringly hairy; petiole (fig. 94) 3.6 times as long as broad at spiracle, slightly dilated behind spiracular tubercle. Genitalia (fig. 174) with ovipositor sheath (fig. 134) stout. Fore wing (fig. 218) with stigma 4 times as long as broad, about as long as metacarp; 1st abscissa of radius almost as long as the 2nd, 2 times as long as breadth of stigma.

Very variable in color. Head dark brown; clypeus and mouthparts yellow; face yellowish brown. Antenna concolorous with head but a little paler; scape, pedicel and 1st flagellar segment on basal half dirty yellow; in a few specimens 2nd and 3rd flagellar segments at base yellowish. Thorax usually bicolor, the dorsal surface being dark brown and the rest dirty yellow; in a few specimens thorax entirely dirty yellow. Abdomen brown; petiole, 2nd tergite on median longitudinal and apical transverse patches, 2nd to 5th sutures, and apical sternites dirty yellow. Legs yellow.

Length: Body 1.8–2.7 mm., antenna 1.5–2.0 mm.

♂. Differs from the female in the following points:—

Eye smaller; face $1/2.0$ as broad as head. Antenna with 18 to 21 segments [18 (14♂♂), 19 (67), 20 (32), 21 (4)]. Generally darker in color.

Length: Body 1.6–2.0 mm., antenna 1.7–2.1 mm.

Habitat: Gifu (after Ashmead, 1906); Sapporo, Tōkyō, Kyōto, Matsuyama, Kōchi, Fukuoka, Kumamoto, Kagoshima & Amami-ōshima (after Watanabe & Takada, 1967). A lot of specimens were collected at the following localities for the first time:—Asahikawa (H. Inoue) & Soranuma-dake, Hokkaido; Morioka, Iwate-ken (T. Oku); Utsunomiya, Tochigi-ken (M. Miyazaki); Hatano, Kanagawa-ken; Sasayama, Hyōgo-ken (T. Naito); Wakamiya, Kōchi-ken; Hiko-san, Fukuoka-ken; Iki, Nagasaki-ken; Takachihokyo & Miyakonojō, Miyazaki-ken (M. Miyazaki); Yaku-shima, Kagoshima-ken.

Host: *Aphis glycines* Matsumura (Sapporo, on *Glycine max*); *A. gossypii* Glover (Kyōto); *Aulacorthum solani* (Kaltenbach) (Sapporo, on *Solanum tuberosum* & *Cornus* sp., Morioka, & Utsunomiya, on *Boehmeria nippononivea*); *Macrosiphum ibarae* Matsumura (Wakamiya & Fukuoka, on *Rosa* spp.); *Myzus persicae* (Sulzer) (after Watanabe & Takada, 1967).

Distribution: Japan; Hawaii.

Parasitized aphids are found one by one on the leaves and stems of host plants, the empty skin becoming pale brown.

7. *Aphidius amamioshimensis*, sp. nov.

In general structure this species most closely resembles *A. gifuensis* Ashmead, from which it differs clearly in the narrower temple, the broader face, the stouter petiole, the dark brown mummy, etc. as follows:—

♀. Temple (fig. 11) in dorsal view shorter than eye, 2:3, converging more strongly behind eye; face (fig. 29) broader, $1/2.2$ as broad as head and 1.7 times as broad as long; malar space a little longer than basal breadth of mandible. Antenna with 17 or 18 segments [17 (2♀♀), 18 (1)]. Petiole (fig. 98) stouter, 3 times as long as broad at spiracle. Genitalia (fig. 173) with ovipositor sheath (fig. 135) slightly stouter. Fore wing (fig. 219) with stigma a little longer than metacarp. Thorax entirely dirty yellow.

Length: Body 1.9–2.7 mm., antenna 1.7–1.9 mm.

♂. Antenna with 18 or 19 segments [18 (1♂), 19 (1)].

Length: Body 1.6–2.1 mm., antenna 1.6–2.0 mm.

Holotype, ♀ (30–iv–65), & paratypes, 2♀♀ & 1♂: Uragami, Amami-ōshima (M. Miyazaki). Paratypes, 1♀ & 2♂♂: Naze, Amami-ōshima. All the specimens are reared from *Aulacorthum nipponicum* on *Paederia scandens*.

Parasitized aphids are attached in a group on the leaves and stems of host plants, the empty skin becoming dark brown.

8. *Aphidius lonicerae* Marshall

Aphidius lonicerae Marshall, Spec. Hym. Eur. 5: 572, 1896.

Aphidius silvaticus Starý, Bull. Ent. Pologne 32: 114, 1962.

This species is new to Japan.

♀. Head clothed with sparse and rather long hairs; temple (fig. 12) in dorsal view slightly shorter than eye, 5:6, converging rather straight behind eye; face 1/2.4 as broad as head, 1.4 times as broad as long; clypeus about 1.6 times as broad as long; malar space as long as basal breadth of mandible. Antenna with 18 or 19 segments [18 (3♀), 19 (8)]; flagellar segments moderately clothed with nearly elected short hairs and becoming weakly stouter towards apex, the 1st being 3 times as long as broad at base and a little shorter or as long as the 2nd, and the 10th 2 times as long as broad. Mesoscutum falling vertically into pronotum, not covering the latter in lateral view, and scatteringly hairy along notaulix and on lateral side. Propodeum (fig. 47) with pentagonal areola very small. Abdomen sparsely hairy; petiole (fig. 97) a little more than 3 times as long as broad at spiracle, parallel-sided. Genitalia (fig. 172) with ovipositor sheath (fig. 136) as in figure. Fore wing (fig. 223) with stigma more than 4 times as long as broad, much longer than metacarp, 4:3; 1st abscissa of radius a little longer than the 2nd, 2 times as long as breadth of stigma.

Dark brown. Face, clypeus, mouthparts, gena and 2nd suture of abdomen dirty yellow; pronotum, mesopleuron in part and apical segments of abdomen (except for ovipositor sheath) somewhat yellowish. Antenna concolorous with head; scape, pedicel and 1st flagellar segment at extreme base dirty yellow ventrally. Legs dirty yellow. In 3 specimens from Sapporo and Nukabira the above-mentioned yellowish parts much paler than in those from Taisetsu-zan.

Length: Body 3.2–3.9 mm., antenna 2.5–3.0 mm.

♂. Unknown.

Specimens examined: 3♀, Nukabira & Sapporo, Hokkaido, reared from *Amphorophora rubiphaga* on *Rubus* spp.; 8♀, Taisetsu-zan, Hokkaido (K. Kusigemati).

Host: *Amphorophora rubiphaga* Takahashi.

Furthermore, in Europe many species of aphids belonging to the Dactynotinae are known as its hosts (see Starý, 1962 & 1966).

Distribution: Japan; Europe.

Parasitized aphids are found one by one on the leaves and stems of host plants, the empty skin becoming pale brown.

In general structure, especially the wing venation, this species is closely related to the preceding two species, *A. gifuensis* Ashmead and *A. amamioshimensis*, sp. nov., but it differs from those in the larger size of the body, the denser and longer hairs on the head and abdomen, the longer temple and the slenderer ovipositor sheath. The specimens examined agree well with Starý's original description of *A. silvaticus* (= *A. lonicerae*), from which it differs slightly in the following points:—(1) The shape of the ovipositor sheath. (2) The relative length of the metacarp to the stigma of the fore wing.

9. *Aphidius absinthii* Marshall

Aphidius absinthii Marshall, Spec. Hym. Eur. 5: 605, 1896.

Aphidius absinthii: Starý, Ent. Tidskr. 82: 218, 1962.

This and the following three species may be referred to the same species-group, being parasitic on aphids of *Macrosiphoniella* or *Dactynotus*. The present information is the first record of this species in Japan.

♀. Head scatteringly hairy; temple (fig. 17) in dorsal view a little shorter than eye, 4:5, parallel or diverging slightly just behind eye; face (fig. 31) $1/2.3$ as broad as head, 1.4 times as broad as long; clypeus 2 times as broad as long; malar space a little longer than basal breadth of mandible. Antenna with 16 or 17 segments [16 (40♀♀), 17 (7)]; flagellar segments moderately clothed with nearly elected short hairs, becoming weakly stouter towards apex, the 1st being 3 times as long as broad at base and equal in length to the 2nd, and the 10th 2.5 times as long as broad. Mesoscutum falling rather vertically into pronotum, scatteringly hairy along notaulix and on lateral side. Propodeum with pentagonal areola very narrow. Petiole (fig. 92) 3 times as long as broad at spiracle, almost parallel-sided. Genitalia (fig. 175) with ovipositor sheath (fig. 137) slender. Fore wing (fig. 220) with stigma 3.7 times as long as broad, longer than metacarp, 3:2; 1st abscissa of radius 1.3 times as long as the 2nd, 1.5 times as long as breadth of stigma.

Dirty yellow but very variable in shade of color. Eye, ocellus and ocellar triangle, pedicel dorsally, all flagellar segments (except for the 1st at base), lateral lobe of mesoscutum, mesoscutellum (except for disc), metanotum, propodeum, 2nd and 3rd tergites on lateral parts, and ovipositor sheath dark brown. Legs dirty yellow.

Length: Body 1.9–2.4 mm., antenna 1.3–1.8 mm.

♂. Differs from the female in the following characters:—

Eye smaller; face $1/2.0$ as broad as head. Antenna with 18 to 20 segments [18 (9♂♂), 19 (11), 20 (2)]; flagellar segments stouter, clothed with rather adpressed hairs.

Dark brown. Face, clypeus, mouthparts, gena, pronotum, mesopleuron (except for lower part), petiole, 2nd tergite on median longitudinal patch and apical part, and the 3rd on basal part yellowish. Legs brown to dark brown, with trochanters and tibiae at base yellowish.

Length: Body 1.6–2.3 mm., antenna 1.7–2.1 mm.

Specimens examined: 6♀♀ & 2♂♂, Omogokei, Ehime-ken, reared from *Macrosiphoniella pseudoartemisiae* on *Artemisia* sp. 5♀♀, Wakamiya, Kōchi-ken, & Dazaifu, Fukuoka-ken (M. Miyazaki), reared from *Macrosiphoniella yomenae* on *Kalimeris yomena*. 30♀♀ & 13♂♂, Iya-Kyōjō, Tokushima-ken & Yaku-shima, Kagoshima-ken, reared from *Macrosiphoniella yomogifoliae* on *Artemisia* spp. 15♀♀ & 7♂♂, caught at the following localities:—Bibai, Hokkaido; Hatano, Kanagawa-ken; Sasayama, Hyōgo-ken (T. Naito); Matsuyama, Ehime-ken; Wakamiya, Kōchi-ken; Takachihokyō, Miyazaki-ken (M. Miyazaki); Kagoshima (K. Kusigemati).

Host: *Macrosiphoniella pseudoartemisiae* Shinji; *M. yomenae* (Shinji); *M. yomogifoliae* (Shinji).

This species is known as a parasite of *Macrosiphoniella* in Europe.

Distribution: Japan; Europe.

Aphids parasitized by this species are found rather in a group on the leaves of host plants, the empty skin becoming brown.

The specimens examined agree well with Stary's description and figures (1961 b) of this species except for variation in color.

10. *Aphidius macrosiphoniellae*, sp. nov.

The present species most closely resembles *A. absinthii* Marshall, the differences between them being subtle and difficult to appreciate as follows:—

♀. Temple (fig. 15) in dorsal view converging weakly just behind eye; face slightly broader, $1\frac{1}{2}$ as broad as head and 1.5 times as broad as long. Antenna with 15 to 17 segments [15 (5♀♀), 16 (33), 17 (1)]. Petiole (fig. 93) as in figure. Genitalia (fig. 176) with ovipositor sheath (fig. 138) slenderer. Fore wing (fig. 224) as in figure. Head dark brown; face, clypeus, mouthparts and gena yellowish.

Length: Body 1.9–2.3 mm., antenna 1.5–1.6 mm.

♂. Antenna with 17 or 18 segments [17 (7♂♂), 18 (7)].

Length: Body 1.6–1.8 mm., antenna 1.4–1.7 mm.

Holotype, ♀ (22–iv–65), & paratypes, 42♀♀ & 22♂♂: Iya-Kyôjô, Tokushima-ken, reared from *Macrosiphoniella sanborni* on *Artemisia* sp. Paratypes, 1♀ & 1♂: Yakushima, Kagoshima-ken, reared from *Macrosiphoniella hikosanensis* on *Artemisia* sp.; 2♀♀: Kyôto, & Kagoshima (K. Kusigemati), reared from *Macrosiphoniella sanborni* on *Artemisia* spp.; 1♀: Dazaifu, Fukuoka-ken (M. Miyazaki), reared from *Macrosiphoniella yomenae* on *Kalimeris yomena*; 2♀♀: Omogokei, Ehime-ken, & Nagasakibana, Kagoshima-ken (M. Miyazaki).

Host: *Macrosiphoniella hikosanensis* Moritsu; *M. sanborni* (Gillette); *M. yomenae* (Shinji).

Parasitized aphids are found rather in a group on the leaves of host plants, the empty skin becoming brown to dark brown.

11. *Aphidius longipetiolus*, sp. nov.

This species is readily differentiated from both *A. absinthii* Marshall and *A. macrosiphoniellae*, sp. nov. by the larger number of the antennal segments, the stouter ovipositor sheath, the narrower face, etc. as follows:—

♀. Temple (fig. 16) in dorsal view, shorter than eye, 3:4, converging very slightly just behind eye; face (fig. 32) narrower, $1\frac{1}{2}$ as broad as head and 1.2 times as broad as long. Antenna with 18 to 21 segments [18 (1♀), 19 (9), 20 (5), 21 (1)]; flagellar segments slenderer, the 1st being 4 times as long as broad at base and the 10th 3 times so. Petiole (fig. 96) slenderer, almost 4 times as long as broad at spiracle. Genitalia (fig. 177) with ovipositor sheath (fig. 139) much stouter. Fore wing (fig. 221) with stigma slightly narrower.

Head dark brown; frons on anterior triangular lobe, face, clypeus, mouthparts and gena yellow.

Length: Body 2.4–3.4 mm., antenna 2.1–2.8 mm.

♂. Face $1\frac{1}{2}$ as broad as head, 2 times as broad as long. Antenna with 20 to 22 segments [20 (1♂), 21 (3), 22 (4)]. Generally darker in color than the female.

Length: Body 1.9–2.4 mm., antenna 1.9–2.8 mm.

Holotype, ♀ (24–v–66), & paratypes, 9♀♀ & 7♂♂: Hatano, Kanagawa-ken, reared from *Macrosiphoniella grandicauda* on *Artemisia* sp. Paratypes, 2♀♀ & 2♂♂: Nagasakibana, Kagoshima-ken (M. Miyazaki), reared from *Macrosiphoniella grandicauda* on *Artemisia* sp.; 7♀♀: Shizuoka (K. Kamijo); Wakamiya, Kôchi-ken; Hiko-san, Fukuoka-ken; Kumamoto; Kagoshima; Uragami, Amami-ôshima.

Host: *Macrosiphoniella grandicauda* Takahashi & Moritsu.

Parasitized aphids are found one by one on the leaves of host plants, the empty skin becoming brown (except for head and prothorax whitish).

12. *Aphidius funebris* Mackauer

Aphidius funebris Mackauer, Boll. Lab. Ent. Agr. "F. Silvestri", Portici 19: 279, 1961.

Aphidius funebris: Starý, Bull. Ent. Pologne 32: 119, 1962.

This species is new to Japan, being differentiated from *A. absinthii* Marshall by the following characters:—

♀. Temple (fig. 13) in dorsal view shorter than eye, 3:4, converging moderately behind eye; face 1/2.1 as broad as head, 1.6 times as long. Antenna with 17 or 18 segments [17 (3♀), 18 (1)]; 1st flagellar segment 3.3 times as long as broad at base and the 10th 2.0 times so. Propodeum with ante-median longitudinal and oblique carinae effaced in most specimens; pentagonal areola broader. Petiole (fig. 95) 2.7 times as long as broad at spiracle, more strongly dilated behind spiracular tubercle. Genitalia (fig. 178) with ovipositor sheath (fig. 140) slightly curved upwards. Fore wing (fig. 222) as in figure.

Head dark brown; face, clypeus and mouthparts yellowish brown.

Length: Body 2.4–2.7 mm., antenna 1.7–1.9 mm.

♂. Unknown.

Specimens examined: 7♀♀, Sapporo (C. Watanabe), reared from *Dactynotus solidaginis* on *Solidago virga-aurea asiatica*.

Host: *Dactynotus solidaginis* (Fabricius).

In Europe this insect is known as a parasite of *Dactynotus* species.

Distribution: Japan; Europe; North Africa.

Parasitized aphids are found one by one on the leaves of host plants, the empty skin becoming brown.

This species is distinct from the preceding three by the structure of the petiole and by the shape of the ovipositor sheath. The present specimens agree well with the above-listed descriptions of this species.

11. Genus *Diaeretiella* Starý

Diaeretiella Starý, Acta Soc. Ent. Cechosl. 57: 242, 1960. [Type-species: *Aphidius rapae* M'Intosh, 1855].

1. *Diaeretiella rapae* (M'Intosh) (figs. 59, 99, 128, 179 & 225)

Aphidius rapae M'Intosh, Book of the Garden 2: 194, 1855.

Diaeretiella rapae: Starý, Acta Ent. Mus. Nat. Pragae 34: 384, 1961; Mackauer, Beitr. Ent. 14: 53, 1964.

Diaeretus nipponensis Viereck, Proc. U. S. Nat. Mus. 40: 182, 1911.

This is one of the commonest species, being distributed over the world. The specimens examined agree completely with the redescription of *rapae* given by Starý (1961). In the present specimens the number of antennal segments is 13 to 15 [13 (86♀), 14 (63), 15 (3)] and 15 to 17 [15 (8♂), 16 (63), 17 (15)].

Habitat: Sapporo, Tôkyô, Kôchi & Ômuta, Fukuoka-ken (after Watanabe & Takada, 1967). A lot of specimens were collected at the following localities for the first time:—Hatano, Kanagawa-ken; Kanaya, Shizuoka-ken (J. Minamikawa); Takara-

zuka, Hyôgo-ken; Tsurugi-san, Tokushima-ken (T. Naito); Wakamiya, Kôchi-ken; Matsuyama, Ehime-ken; Hiko-san (K. Kamiyo & M. Miyazaki) & Dazaifu (M. Miyazaki), Fukuoka-ken; Miyakonojô & Takachihokuyô, Miyazaki-ken (M. Miyazaki); Kagoshima.

Host: *Aphis* sp. (Kyôto, on *Caspicum annuum*); *Brevicoryne brassicae* (Linne) (after Viereck, 1911); *Cavariella salicicola* (Matsumura) (Yatsushiro, on *Salix eriocarpa*); *Myzus persicae* (Sulzer) (after Watanabe & Takada, 1967) (in Japan).

Furthermore, various kinds of aphids are recorded as hosts of this parasite in other regions (see Starý, 1961).

Distribution: Cosmopolitan.

Parasitized aphids are found one by one or in a group on the leaves and stalks of host plants, the empty skin becoming pale brown.

12. Genus *Lysaphidus* Smith

Lysaphidus Smith, Ohio State Univ. Contr., Zool. Ent. 6: 72, 1944. [Type-species: *Lysaphidus adelocarinus* Smith, 1944].

Key to the species (♀♀)

1. Antenna with 15 or 16 segments; 1st flagellar segment more than 3 times as long as broad at base. Thorax dark brown; pronotum yellowish brown anteriorly. Legs yellow to yellowish brown. 1. *L. pleotrichophori* Takada
- Antenna with 12 or 13 segments; 1st flagellar segment less than 3 times as long as broad at base. Thorax dark brown entirely. Legs brown to dark brown. 2
- 2 Fore wing with 1st abscissa of radius as long as breadth of stigma. Face 1.5 times as broad as long; clypeus 1.8 times as broad as long. Petiole a little less than 3 times as long as broad at spiracle, flat as seen laterally. 2. *L. matsuyamensis* Takada
- Fore wing with 1st abscissa of radius 1.5 times as long as breadth of stigma. Face 2 times as broad as long; clypeus 1.5 times as broad as long. Petiole 3 times as long as broad at spiracle, weakly convex as seen laterally. 3. *L. callipterinellae* Takada
1. *Lysaphidus pleotrichophori* Takada
Lysaphidus pleotrichophori Takada, Ins. Mats. 28: 127, 1966.
Habitat: Kure, Hiroshima-ken & Matsuyama, Ehime-ken (after Takada, 1966 b); Shôdo-shima, Kagawa-ken (2♀♀ & 1♂, M. Miyazaki).
Host: *Pleotrichophorus glandulosus* (Kaltenbach) (after Takada, 1966 b).
Distribution: Japan.
2. *Lysaphidus matsuyamensis* Takada
Lysaphidus matsuyamensis Takada, Ins. Mats. 28: 128, 1966.
Habitat: Matsuyama, Ehime-ken & Hiko-san, Fukuoka-ken (after Takada, 1966 b).
Host: *Coloradoa artemisiae artemisicola* Takahashi (after Takada, 1966 b).
Distribution: Japan.
3. *Lysaphidus callipterinellae* Takada
Lysaphidus callipterinellae Takada, Ins. Mats. 28: 129, 1966.
Habitat: Sapporo (after Takada, 1966 b).
Host: *Callipterinella callipterus* (Hartig) (after Takada, 1966 b).
Distribution: Japan.

13. Genus *Lysiphlebus* Foerster

Lysiphlebus Foerster, Verh. Naturh. Ver. Preuss. Rheinl. 19: 248, 250, 1862. [Type-species:

Bracon dissolutus Nees, 1811].

The species of this genus are widely distributed in the Holarctic region but from Japan only a single species, *L. japonicus* Ashmead, has been recorded. In the course of the present study, two other species have been found from Japan.

Key to the species (♀♀)

1. Propodeum (figs. 57 & 58) carinated at least on posterior surface. Ovipositor sheath (figs. 141 & 142) membranous at apex. Fore wing (fig. 226) with 2nd intercubitus and part of cubitus distinct. Antenna (fig. 44) with only adpressed short hairs; 1st flagellar segment with linear sensoria. Both hind femur and tibia (fig. 245) with adpressed hairs. Petiole (figs. 102 & 103) about 3 times as long as broad at spiracle. 1. *L. japonicus* Ashmead
- Propodeum not carinated. Ovipositor sheath chitinized at apex. 2
2. Fore wing (fig. 228) with 2nd intercubitus and cubitus entirely effaced. Antenna (fig. 46) with adpressed short hairs as well as elected long ones; 1st flagellar segment with linear sensoria. Both hind femur and tibia (fig. 247) with nearly elected hairs above. Petiole (fig. 100) 2.5 times as long as broad at spiracle, weakly broadened towards apex. Temple (fig. 19) in dorsal view much shorter than eye, 1:2, converging behind eye. Head with sparse long hairs. Mesoscutum scatteringly hairy. 2. *L. salicaphis* (Fitch)
- Fore wing (fig. 227) with 2nd intercubitus and part of cubitus distinct. Antenna (fig. 45) with only adpressed short hairs; 1st flagellar segment without a linear sensorium. Hind femur (fig. 246) with elected hairs above and the tibia with adpressed ones. Petiole (fig. 101) 2 times as long as broad at spiracle, strongly broadened towards apex. Temple (fig. 18) in dorsal view as long as eye, almost parallel behind eye. Head with very scattering short hairs. Mesoscutum scarcely hairy. 3. *L. ambiguus* (Haliday)

1. *Lysiphlebus japonicus* Ashmead

Lysiphlebus japonicus Ashmead, Proc. U. S. Nat. Mus. 30: 190, 1906; Watanabe, Ins. Mats. 21: 3, 1957.

On the basis of the present specimens a redescription of this species may be given below:—

♀. Head scatteringly hairy; temple in dorsal view shorter than eye, 1:2-3, converging moderately or weakly behind eye; face about 1/2 as broad as head, about 2 times as broad as long; clypeus about 2 times as broad as long; malar space about 2 times as long as basal breadth of mandible. Distance between posterior ocelli about 3 times as long as minor axis of ocellus. Antenna (fig. 44) with 12 to 14 segments [12 (2♀♀), 13 (309), 14 (88)]; flagellar segments clothed with adpressed short hairs, gradually thickened towards apex, the 1st being almost equal in length to the 2nd, 2.5 times as long as broad at base and with linear sensoria, and the 9th 1.5-1.8 times as long as broad. Mesoscutum falling vertically into pronotum, with scattering hairs along notaulix, which is distinct and deep only on perpendicular part. Propodeum (figs. 57 & 58) very shallowly and broadly excavated medially on posterior surface, and completely areolated, the ante-median longitudinal and oblique carinae being faint or completely effaced. Petiole (figs. 102 & 103) about 3 times as long as broad at spiracle, weakly rugose. Genitalia (fig. 181) with ovipositor sheath (figs. 141 & 142) rather stout, membranous at apex. Fore wing (fig. 226) with stigma 3 times as long as broad, almost as long as metacarp; 1st abscissa of radius a little longer than breadth of stigma; in some specimens 2nd intercubitus and part of cubitus decolored; marginal hairs much longer than ones on surface, 3:1. Hind femur and tibia (fig. 245) with adpressed hairs.

Variable in color. Dark brown; mouthparts, petiole and 2nd tergite basally dirty yellow; scape, pedicel ventrally, pronotum, propodeum and 3rd tergite on extreme base yellowish brown. In some specimens face, clypeus and thorax wholly (except for meso- and metanota) yellowish. Legs dirty yellow.

Length: Body 1.1–2.1 mm., antenna 0.8–1.5 mm.

♂. Generally darker in color than the female. Antenna with 14 to 17 segments [14 (3♂♂), 15 (75), 16 (163), 17 (4)].

Length: Body 1.0–1.8 mm., antenna 1.0–1.9 mm.

Habitat: Gifu (after Ashmead, 1906); Kagoshima (after Watanabe & Takada, 1967). A lot of specimens were collected at the following localities for the first time:—Tomakomai, Hokkaido; Utsunomiya, Tochigi-ken (M. Miyazaki); Kanaya, Shizuoka-ken (J. Minamikawa); Kyôto; Wakamiya, Kôchi-ken; Iki, Nagasaki-ken; Takachihokyô & Miyazaki (M. Miyazaki), & Aoshima, Miyazaki-ken; Takakuma-yama & Yaku-shima, Kagoshima-ken; Akagina (M. Miyazaki), Uragami, Yamma, Yuwan & Kanetsu, Amami-ôshima; Shikaura & Isen, Tokuno-shima.

Host: *Aphis craccivora* Koch (Kanaya, on *Vicia faba*); *Aphis fukii* Shinji (Miyazaki, on *Petasites japonicus*); *A. gossypii* Glover (after Watanabe, 1957); *A. ichigo* Shinji (Tomakomai, on *Rubus wrightii*); *A. kurosawai* Takahashi (Yaku-shima, on *Artemisia* sp.); *A. spiraeicola* Patch (Kyôto, on *Cestrum nocturnum* & *Lantana camara* in the greenhouse, Takachihokyô, on *Deutzia crenata*, & Yamma & Isen, on *Viburnum suspensum*); *Longiunguis japonicus* (Takahashi) (Wakamiya, on *Miscanthus* sp.); *Melanaphis bambusae* (Fullaway) (Kyôto & Iki, on Bambusaceous species); *Myzus persicae* (Sulzer) (after Watanabe & Takada, 1967); *Toxoptera aurantii* (Fonscolombe) (Miyazaki, on *Eurya japonica*, Takachihokyô, on *Pieris japonica*, Takakuma-yama, on *Camellia* sp., Uragami, on *Murraya paniculata* & *Ficus erecta*, & Shikaura, on *Ficus pumila*); *T. ficicola* (Takahashi) (Akagina, on *Turpinia ternata*); *T. odinae* (Van der Goot) (Sapporo, on *Aralia elata*, Utsunomiya, Kagoshima & Yaku-shima, on *Rhus* spp., Aoshima, on *Pittosporum tobira*, & Yuwan, on *Bidens pilosa minor*).

In Formosa *Toxoptera aurantii* is recorded as a host of this species (after Gahan, 1926).

Distribution: Japan; Formosa.

Parasitized aphids are round in shape, being found in a group on the leaves and twigs of host plants, the empty skin becoming pale to dark brown with reddish tint.

Judging from the key to the genera of Aphidiidae given by Starý (1965, p. 222) this species seems to be referred to the genus *Lysiphlebia* Starý & Schlinger (nom. nud.).

2. *Lysiphlebus salicaphis* (Fitch)

Trioxys salicaphis Fitch, N. Y. State Agr. Soc. Trans. 14: 841, 1855.

Diaeretus salicaphis: Smith, Ohio State Univ. Contr., Zool. Ent. 6: 102, 1944.

Lysiphlebus laticephalus: Starý, Acta Faun. Ent. Mus. Nat. Pragae 10: 210, 1965.

This species is new to Japan, characterized in the following points:—

♀. Head sparsely clothed with long hairs. Eye moderate in size; temple (fig. 19) in dorsal view much shorter than eye, 1:2, converging behind eye; face 1/2 as broad as head, 2 times as broad as long; clypeus slightly more than 2 times as broad as long; malar space 2 times as long as basal breadth of mandible. Distance between posterior ocelli 5 times as long as minor axis of ocellus. Antenna (fig. 46) with 12 to 14 segments

[12 (32♀♀), 13 (26), 14 (2)]; flagellar segments gradually thickened towards apex, with adpressed short hairs as well as elected long ones which are almost as long as basal breadth of segment, the 1st being slightly longer than the 2nd, 5:4, 2.5 times as long as broad at base and with linear sensoria, and the 9th 1.5 times as long as broad. Mesoscutum falling almost vertically into pronotum, with scattering long hairs along notaulix and on lateral side; notaulix distinct only on anterior 1/5. Propodeum without a carina, shallowly excavated medially on posterior surface. Petiole (fig. 100) smooth and shining, 2.5 times as long as broad at spiracle and weakly broadened towards apex. Genitalia (fig. 180) with ovipositor sheath (fig. 144) less slender, chitinized at apex. Fore wing (fig. 228) with stigma 3 times as long as broad, distinctly longer than metacarp, about 7:5; radius more than 2 times as long as breadth of stigma; 2nd intercubitus and cubitus entirely effaced; marginal hairs much longer than ones on surface, 5:2. Hind femur and tibia (fig. 247) with nearly elected hairs above.

Dark brown. Mouthparts and petiole yellowish; antenna a little paler than head. Legs yellowish brown to dark brown. Specimens from Kagoshima generally paler than those from Kyôto in color.

Length: Body 1.2–1.8 mm., antenna 0.8–1.1 mm.

♂. Antenna with 14 or 15 segments [14 (4♂♂), 15 (11)].

Length: Body 1.0–1.2 mm., antenna 0.9–1.3 mm.

Specimens examined: 61♀♀ & 15♂♂, Kyôto, & Kagoshima (K. Kusigemati & M. Miyazaki), reared from *Chaitophorus niger* on *Salix* spp.

Host: *Chaitophorus niger* Mordvilko (in Japan).

According to the literature this species is known also in other regions to associate closely with aphids belonging to the genus *Chaitophorus* as hosts.

Distribution: Holarctic region.

Parasitized aphids are found rather in a group on the leaves, twigs and trunks of host plants, the empty skin becoming brown to dark brown.

Specimens examined agree very well with the above-listed descriptions of this species.

3. *Lysiphlebus ambiguus* (Haliday)

Aphidius (*Aphidius*) *ambiguus* Haliday, Ent. Mag. 2: 104, 1834.

Lysiphlebus (*Lysiphlebus*) *ambiguus*: Mackauer, Beitr. Ent. 10: 595, 1960.

This species is new to Japan. On account of the following features the specimens examined may be identified with this species.

♀. Head very scatteringly clothed with short hairs. Eye rather small; temple (fig. 18) in dorsal view as long as eye, almost parallel behind eye; face 1/1.8 as broad as head, 2 times as broad as long; clypeus 2 times as broad as long; malar space 2.3 times as long as basal breadth of mandible. Ocellus small, distance between posterior ocelli being 7 times as long as minor axis of ocellus. Antenna (fig. 45) with 11 to 13 segments [11 (1♀), 12 (118), 13 (47)]; each flagellar segment (except for the last long) almost equal in shape, 2.5 times as long as broad at base, with adpressed short hairs, the 1st being without a linear sensorium. Mesoscutum falling almost vertically into pronotum, scarcely hairy; notaulix distinct only on perpendicular part. Propodeum without a carina, shallowly excavated medially on posterior surface. Petiole (fig. 101) smooth and shining, less than 2 times as long as broad at spiracle and strongly broadened towards

apex. Genitalia (fig. 182) with ovipositor sheath (fig. 143) rather sharply narrowed towards apex, chitinized at apex. Fore wing (fig. 227) with stigma about 3 times as long as broad, a little shorter than metacarp; 1st abscissa of radius 1.5 times as long as breadth of stigma, distinctly shorter than the 2nd; marginal hairs much longer than ones on surface, 3:1. Hind femur (fig. 246) with elected hairs above and the tibia with adpressed ones.

Brown to dark brown. Mouthparts and petiole yellowish brown to dirty yellow. Legs yellowish brown to dark brown.

Length: Body 1.3–1.9 mm., antenna 0.9–1.3 mm.

♂. Unknown.

Specimens examined: 168 ♀♀, Nopporo (C. Watanabe), Yukomambetsu (H. Higuchi), Soranuma-dake, Jōzankei & Sapporo, Hokkaido, reared from *Aphis farinosa yanagicola* on *Salix* spp.

Host: *Aphis farinosa yanagicola* Matsumura (in Japan).

Aphis farinosa as well as other aphids is listed as a host of this parasite in Europe (after Mackauer, 1960 a).

Distribution: Japan; Europe.

Aphids parasitized by this species are attached in a group mainly to the twigs of host plants, the empty skin becoming dark brown.

The present specimens agree well enough with Mackauer's description (1960) of this species.

14. Genus *Amonoctonus*, gen. nov.

Type-species: *Monoctonus watanabei* Takada, 1965.

The new genus is erected for the reception of *Monoctonus watanabei* Takada, a parasite of *Mansakia shirakabae*.

Head transverse; maxillary palpus with 4 segments; labial palpus with 2 segments. Antenna rather short. Notaulix distinct only on anterior area. Propodeum carinated, the posterior surface being weakly excavated medially. Abdomen lanceolate; petiole elongate. Genitalia of female with ovipositor curved downwards and ovipositor sheath slender, acute apically and curved downwards. Fore wing with stigma moderate in breadth; radius oblique to stigma and not reaching wing margin; cubital and discoidal cells confluent, forming a closed discocubital cell.

In general facies this genus is closely allied to *Monoctonus*, from which it may be readily differentiated by the radius of the fore wing not perpendicular to the stigma, the acute ovipositor sheath and the propodeum excavated posteriorly. In the structure of the propodeum the genus also resembles *Pauesia*, which differs from the former by the ovipositor and ovipositor sheath straight or curved upwards.

1. *Amonoctonus watanabei* (Takada) (figs. 183 & 229)

Monoctonus watanabei Takada, Kontyû 33: 223, 1965.

Habitat: Sapporo (after Takada, 1965) & Bibai (5♀♀ & 7♂♂, K. Kamijo), Hokkaido.

Host: *Mansakia shirakabae* (Monzen) (after Takada, 1965).

Distribution: Japan.

15. Genus *Monoctonus* Haliday

Monoctonus Haliday, Ent. Mag. 1: 261, 487, 1833. [Type-species: *Aphidius* (*Monoctonus*) *caricis* Haliday, 1833].

In Japan are known the following two species, of which one is new to Japan.

Key to the species (♀♀)

1. Fore wing with stigma 6 times as long as broad; 1st abscissa of radius a little shorter than the 2nd, 2:3. Petiole 2.6 times as long as broad at spiracle. Ovipositor sheath broadened in middle. Antenna with 15 segments. 1. *M. nervosus* (Haliday)
- Fore wing with stigma 4 times as long as broad; 1st abscissa of radius much shorter than the 2nd, 1:2. Petiole a little less than 2 times as long as broad at spiracle. Ovipositor sheath slender, not broadened in middle. Antenna with 13 or 14 segments. 2. *M. longiradius* Takada

1. *Monoctonus nervosus* (Haliday)

Aphidius (*Monoctonus*) *nervosus* Haliday, Ent. Mag. 1: 488, 1833.

Monoctonus (*Monoctonus*) *nervosus*: Starý, Acta Soc. Ent. Cechosl. 56: 248, 1959.

On the basis of the present specimens a redescription of this species, which is new to Japan, may be given as follows:—

♀. Smooth and shining, and scatteringly hairy. Temple in dorsal view a little longer than eye, 4:3, diverging very slightly just behind eye; face 1/2.5–1/2.8 as broad as head, 1.0–1.3 times as broad as long; clypeus 2.3 times as broad as long; malar space about as long as basal breadth of mandible. Distance between posterior ocelli 2.5 times as long as minor axis of ocellus. Antenna with 15 segments (2♀♀); 1st flagellar segment 4 times as long as broad at base and slightly longer than the 2nd, and the 8th 2.2 times as long as broad. Mesoscutum falling rather gently into pronotum; notaulix distinct only on anterior 1/3. Propodeum smooth and shining entirely, completely areolated. Petiole (fig. 104) 2.6 times as long as broad at spiracle, very feebly rugose, with a strong longitudinal ruga on each side behind spiracle. Genitalia (fig. 185) with ovipositor sheath (fig. 146) as in figure. Fore wing (fig. 230) with stigma 6 times as long as broad, 2.4 times as long as metacarp; 1st abscissa of radius almost perpendicular to stigma, a little longer than breadth of stigma and distinctly shorter than the 2nd, 2:3.

Dark brown. Mouthparts yellowish brown; clypeus somewhat lightened. Antenna dark brown, paler than head; scape, pedicel and 1st flagellar segment at basal 1/2 yellowish brown. Abdomen dark brown, a little paler than thorax; petiole apically, and apical segments including ovipositor sheath yellowish brown. Legs dirty yellow.

Length: Body 1.8 mm., antenna 1.3 mm.

♂. Antenna with 17 segments (1♂). Generally darker in color than the female.

Length: Body 1.3 mm., antenna 1.5 mm.

Specimens examined: 2♀♀ & 1♂, Aizankei, Hokkaido (K. Kamijo & K. Kusigemati).

Host: Unknown (in Japan).

In Europe this species is known to be parasitic on *Impatiens balsamines* (Kaltenbach) (after Starý, 1966).

Distribution: Japan; Europe.

The specimens examined agree well with Starý's description (1959 a) of *nervosus*

except that the face, prothorax and propodeum are dark brown, not yellow nor of lighter color.

2. *Monoctonus longiradius* Takada (fig. 184)

Monoctonus longiradius Takada, Kontyû 34: 154, 1966.

Habitat: Sapporo (after Takada, 1966 a).

Host: Unknown.

Distribution: Japan.

16. Genus *Lipolexis* Foerster

Lipolexis Foerster, Verh. Nat. Ver. Preuss. Rheinl. 19: 249, 1862. [Type-species: *Lipolexis gracilis* Foerster, 1862].

This genus is represented by three species: *L. gracilis* Foerster from Europe, *L. oregrae* (Gahan) from Philippine and *L. scutellaris* Mackauer from Hongkong. In this paper is given Japan as a locality of *L. gracilis* for the first time.

1. *Lipolexis gracilis* Foerster

Lipolexis gracilis Foerster, Verh. Nat. Ver. Preuss. Rheinl. 19: 249, 1862.

Lipolexis gracilis: Stary, Acta Soc. Ent. Cechosl. 56: 94, 1959.

This species is new to Japan. On the basis of the present specimens a brief redescription may be given below:—

♀. Head sparsely to moderately hairy; temple in dorsal view shorter than eye, 1:2, converging weakly behind eye; face 1/2.4 as broad as head, 1.3 times as broad as long; clypeus 2.5 times as broad as long; malar space as long as basal breadth of mandible. Eye sparsely pubescent; distance between posterior ocelli 2 times as long as minor axis of ocellus. Antenna with 12 segments (7♀♀); flagellar segments clothed with dense short hairs, the 1st being 5 times as long as broad at base and longer than the 2nd, 5:4, and the others almost equal in shape, 4 times as long as broad. Mesoscutum falling vertically or gently into pronotum, scatteringly hairy along notaulix and on lateral side; notaulix distinct only on perpendicular part. Propodeum completely areolated, weakly rugose, the 2 oblique carinae joining together at or just behind the anterior margin. Petiole (figs. 105 & 106) a little more than 3 times as long as broad at spiracle, moderately rugose and with a longitudinal carina, which bifurcates just before spiracle and diverges therefrom towards the apical margin. In most specimens 2nd and following abdominal segments compressed. Genitalia (fig. 186) with ovipositor sheath (fig. 147) long, weakly curved downwards. Fore wing (fig. 231) with stigma 2.6 times as long as broad, about as long as metacarp; radius long, reaching almost wing margin.

Dark brown. Clypeus and mouthparts yellowish; pronotum slightly yellowish. Antenna dark brown, lighter than head, the first 3 segments being dirty yellow ventrally. Abdomen brown; petiole and genitalia dirty yellow. Legs dirty yellow. In 2 female specimens collected from Sapporo (reared from *Rhopalosiphum padi*) thorax yellow entirely (except for mesonotum dark brown). In the specimens from Kagoshima (2♀♀) generally paler in color.

Length: Body 1.5–2.2 mm., antenna 1.2–1.6 mm.

♂. Face broader than the female, 1/2.2 as broad as head. Antenna with 13 segments (13♂♂).

Length: Body 1.2–1.7 mm., antenna 1.0–1.6 mm.

Specimens examined: 2♀♀ & 1♂, Sapporo, reared from *Rhopalosiphum padi* on *Zea mays*. 10♀♀ & 16♂♂, caught at the following localities:—Asahikawa (S. Suzuki), Hiroshima (M. Suwa), Bibai & Apoi-dake (K. Kamijo), Soranuma-dake, Tomakomai, & Sapporo, Hokkaido; Hatano, Kanagawa-ken; Hiko-san, Fukuoka-ken; Iki, Nagasaki-ken; Kagoshima (K. Kusigemati) & Takakuma-yama (K. Kamijo), Kagoshima-ken; Nishinakama, Amami-ōshima (K. Kamijo).

Host: *Rhopalosiphum padi* (Linné) (in Japan).

Furthermore, this species is known to be parasitic on various kinds of aphids in Europe (see Starý, 1966).

Distribution: Japan; Europe.

Aphids parasitized by the species are attached to the leaves and ears of host plants, the empty skin becoming dark brown.

17. Genus *Trioxys* Haliday

Trioxys Haliday, Ent. mag. 1: 261, 488, 1833. [Type-species: *Aphidius cirsii* Curtis, 1831].

In my previous paper (1966) eleven species of *Trioxys* are confirmed to occur in Japan. In addition, four new species are described in this paper. On the basis of the shape of the petiole this genus may be divided into two groups.

Key to the species (♀♀)

1. Petiole with only 1st lateral tubercle (=spiracular tubercle) on each side. (Group I) 2
- Petiole with both 1st and 2nd lateral tubercles on each side. (Group II) 11
2. Anal prong (fig. 148 A) bearing 5 comb-like rigid long hairs on dorsal surface apically. Propodeum without a carina. 1. *T. kamijoi*, sp. nov.
- Anal prong not bearing comb-like rigid hairs apically. Propodeum with carinae at least on posterior surface. 3
3. Antenna short, 1/2 as long as body; flagellar segments stout, the 1st being 3 times as long as broad at base and the 8th 2 times so. Maxillary palpus distinctly shorter than greatest distance between both mandibles. Petiole dilated weakly from 1st lateral tubercle to apex. 2. *T. brevipalpus* Takada
- Antenna longer, much more than 1/2 as long as body; flagellar segments slenderer, the 1st being 4 times or more as long as broad at base and the 8th at least 2.5 times so. Maxillary palpus distinctly longer than greatest distance between both mandibles. Petiole almost parallel-sided or contracted from 1st lateral tubercle to apex. 4
4. Eye moderate in size; face 1/2.5–1/2.7 as broad as head, distinctly broader than length, 5:4. 5
- Eye large; face 1/3.3–1/3.7 as broad as head, narrower than length, 5:6. 8
5. Propodeum with 2 oblique carinae joining together at or just behind anterior margin; ante-median longitudinal carina completely absent or much shorter than oblique one. Ovipositor sheath rather stout. 5. *T. eucraphis* Takada
- Propodeum with ante-median longitudinal carina distinctly longer than oblique one. Ovipositor sheath slenderer. 6
6. Anal prong long, gradually curved upwards, with 7 rigid short hairs on dorsal surface. 6. *T. machilaphidis*, sp. nov.
- Anal prong shorter, straight at least at basal 3/4, with 5 or 6 rigid long hairs on dorsal surface. 7
7. Fore wing with stigma 2.7 times as long as broad. Petiole 2.5 times as long as broad at spiracle. Mesoscutum falling vertically into pronotum. Propodeum completely and distinctly areolated. 3. *T. shivaphis* Takada

- Fore wing with stigma narrower, 3.5 times as long as broad. Petiole 2 times as long as broad at spiracle. Mesoscutum falling gently into pronotum. Propodeum with ante-median longitudinal carina and anterior parts of oblique ones indistinct. 4. *T. auctus* (Haliday)
- 8. Anal prong straight on the whole length. Antenna with 12 segments. Propodeum with ante-median longitudinal and oblique carinae faint. 9
- Anal prong gradually curved upwards. Antenna with 11 segments. Propodeum completely and distinctly areolated. 10
- 9. Ovipositor sheath stout, with lower edge sharply concave. Petiole 2 times as long as broad at spiracle, which is situated just before middle. 7. *T. japonicus* Takada
- Ovipositor sheath slender, with lower edge bluntly concave. Petiole 1.6 times as long as broad at spiracle, which is situated at basal 1/3. 8. *T. hokkaidensis*, sp. nov.
- 10. Anal prong with 5 rigid long hairs on dorsal surface. Ovipositor sheath rather slender, sparsely hairy. Body generally dark brown. 9. *T. artistigma* Takada
- Anal prong with 8 rigid long hairs on dorsal surface. Ovipositor sheath long and broad, more densely hairy. Body generally dirty yellow. 10. *T. myzocallis*, sp. nov.
- 11. Petiole with distance between 1st and 2nd lateral tubercles distinctly shorter than that between 2nd tubercle and apical margin. 12
- Petiole with distance between 1st and 2nd lateral tubercles as long as or longer than that between 2nd tubercle and apical margin. 13
- 12. Fore wing with radius about as long as stigma. Flagellar segments slightly thickened towards apex, the 1st being 3.5 times as long as broad at base, the 8th a little more than 3 times so and the last 5 times so. Clypeus 2.0 times as broad as long; face 1.3 times as broad as long. Distance between posterior ocelli 2.5 times as long as minor axis of ocellus. Thorax reddish brown; anterior and lower parts of pronotum, and propodeum yellowish. Legs dirty yellow. 11. *T. glycines* Takada
- Fore wing with radius distinctly shorter than stigma. Flagellar segments more sharply thickened towards apex, the 1st being 3 times as long as broad at base, the 8th less than 2 times so and the last 3 times so. Clypeus longer in height, 1.7 times as broad as long; face shorter in height, 2.0 times as broad as long. Distance between posterior ocelli, 3.5 times as long as minor axis of ocellus. Thorax entirely dark brown. Legs brown. 12. *T. capitophori* Takada
- 13. Petiole with distance between 1st and 2nd lateral tubercles as long as that between 2nd tubercle and apical margin. Anal prong with 7 rigid long hairs on dorsal surface. Vertex and gena feebly rugose posteriorly. Body generally yellowish brown. 13. *T. centaureae* (Haliday)
- Petiole with distance between 1st and 2nd lateral tubercles distinctly longer than that between 2nd tubercle and apical margin. Anal prong at most with only 4 rigid long hairs on dorsal surface. Vertex and gena entirely smooth. Body generally dark brown. 14
- 14. Ovipositor sheath rather slender, narrowed towards apex; anal prong slender. Mesoscutum falling vertically into pronotum, not covering the latter in lateral view. Temple in dorsal view a little shorter than eye. 14. *T. toxopterae* Takada
- Genitalia of peculiar form, with ovipositor sheath semicircular and anal prong broader. Mesoscutum strongly prominent anteriorly, covering pronotum in lateral view. Temple in dorsal view as long as eye. 15. *T. confucius* (Mackauer)

Group I

This group is characterized by the petiole with only 1st lateral tubercle on each side. The following 10 species fall in this group.

1. *Trioxys kamijoi*, sp. nov.

♀. Temple in dorsal view shorter than eye, 2:3, converging very slightly behind

eye; face (fig. 23) $1/2.7$ as broad as head, a little broader than length; clypeus 1.5 times as broad as long. Distance between posterior ocelli 3 times as long as minor axis of ocellus. Antenna with 11 segments (1♀); 1st flagellar segment 4 times as long as broad at base, slightly longer than the 2nd, 9:7, the 2nd and following segments (except for the last long) being almost equal in length but weakly broadened towards apex. Mesoscutum falling vertically into pronotum, scatteringly hairy. Propodeum without a distinct carina. Petiole (fig. 109) 2.3 times as long as broad at spiracle, which is situated just before middle. Genitalia (fig. 187) with anal prong (fig. 148 A) of peculiar form, bearing 5 comb-like rigid long hairs on dorsal surface apically; ovipositor sheath (fig. 148 B) slender, with a long hair on inner edge just before middle, about 10 short ones apically and a very short bristle on inner edge at apex. Fore wing (fig. 233) with stigma 3 times as long as broad; radius a little longer than stigma.

Dark brown. Mouthparts yellow; clypeus somewhat yellowish. Antenna a little paler than head; first 4 segments yellow. Abdomen brown; petiole, ovipositor sheath and anal prong dirty yellow; 2nd tergite obscurely yellowish on longitudinal median lobe. Legs dirty yellow.

Length: Body 1.3 mm., antenna 1.1 mm.

♂. Unknown.

Holotype, ♀ (23-vi-59): Tomakomai, Hokkaido (K. Kamijo).

Host: Unknown.

On account of the peculiar anal prong with 5 comb-like rigid long hairs on the dorsal surface apically, this species is similar to the three European, *T. compressicornis* Ruthe, *T. affinis* Mackauer and *T. hortorum* Starý. However, the new species is clearly distinctive from those three species in the following characters:—(1) The propodeum without a carina whereas in *compressicornis* on the posterior half and in *affinis* and *hortorum* entirely the propodeum is carinated. (2) The antenna of female with 11 segments (the last segment is about twice as long as the preceding but not divided) whereas in the other three species the antenna is with 12 segments. (3) The ovipositor sheath sharply broadened towards base whereas in the other three species the ovipositor sheath is less sharply broadened towards base.

2. *Trioxys brevipalpus* Takada

Trioxys brevipalpus Takada, Ins. Mats. 29: 25, 1966.

Habitat: Sapporo & Tomakomai, Hokkaido (after Takada, 1966).

Host: *Trichosiphoniella momonis* (Matsumura) (after Takada, 1966).

Distribution: Japan.

3. *Trioxys shivaphis* Takada

Trioxys shivaphis Takada, Ins. Mats. 29: 26, 1966.

Habitat: Kyôto & Kumamoto (after Takada, 1966).

Host: *Shivaphis celti* Das (after Takada, 1966).

Distribution: Japan.

4. *Trioxys auctus* (Haliday)

Aphidius (*Trioxys*) *auctus* Haliday, Ent. Mag. 1: 489, 1833.

Trioxys (*Trioxys*) *auctus*: Mackauer, Beitr. Ent. 9: 154, 1959.

Trioxys auctus: Takada, Ins. Mats. 29: 28, 1966.

Habitat: Niigata (after Takada, 1966); Sapporo (3♀♀, K. Kusigemati).

Host: *Rhopalosiphum padi* (Linné) (in Japan, after Takada, 1966); *Aphis evonymi* Fabricius, *A. frangulae* Kaltenbach & *A. gossypii* Glover (in Europe, after Mackauer, 1959 a).

Distribution: Japan; China; Europe.

5. ***Trioxyx euceraphis*** Takada

Trioxyx euceraphis Takada, Ins. Mats. 29: 28, 1966.

Habitat: Sapporo (after Takada, 1966).

Host: *Euceraphis punctipennis* (Zetterstedt) (after Takada, 1966).

Distribution: Japan.

6. ***Trioxyx machilaphidis***, sp. nov.

♀. Temple in dorsal view shorter than eye, 2:3, converging moderately behind eye; face 1/2.5 as broad as head, 1.3 times as broad as long; clypeus 2 times as broad as long. Distance between posterior ocelli 2 times as long as minor axis of ocellus. Antenna with 11 segments (1♀); each flagellar segments (except for the last long) almost equal in shape, 4 times as long as broad at base. Mesoscutum falling vertically into pronotum. Propodeum (fig. 61) completely and distinctly areolated. Petiole (fig. 108) slender, 3 times as long as broad at spiracle, which is situated just before middle. Genitalia (fig. 189) with anal prong (fig. 145 A) long, gradually curved upwards, with 7 rigid short hairs on dorsal surface and a medium-sized bristle at apex; ovipositor sheath (fig. 145 B) rather stout, moderately hairy. Fore wing (fig. 235) with stigma 3.2 times as long as broad; radius much longer than stigma.

Dark brown. Clypeus, mouthparts, propleuron and propodeum dirty yellow; face, meso- and metapleura somewhat yellowish. Antenna paler than head; first 3 segments yellow. Abdomen brown; petiole, 2nd tergite on longitudinal median lobe, and apical segments including anal prong and ovipositor sheath yellow. Legs dirty yellow.

Length: Body 1.7 mm., antenna 1.3 mm.

♂. Differs from the female in the following features:—

Eye smaller; face 1/2.2 as broad as head, about 2 times as broad as long. Antenna with 13 segments (1♂); each flagellar segment almost 3 times as long as broad at base. Generally darker in color.

Length: Body 1.5 mm., antenna 1.3 mm.

Holotype, ♀ (5-iii-64), & paratype, 1♂: Kagoshima, reared from *Machilaphis machili* on *Machilus thunbergii*.

Host: *Machilaphis machili* (Takahashi).

Aphids parasitized by the species are found rather in a group on the leaves of host plants, the empty skin becoming dark brown.

This species comes near *T. artistigma* Takada in the structure of the female genitalia but has denser hairs thereon than the latter. Further, in *machilaphidis* the face is 1/2.5 as broad as head whereas in *artistigma* much narrower, 1/3.5 so.

7. ***Trioxyx japonicus*** Takada

Trioxyx japonicus Takada, Ins. Mats. 29: 30, 1966.

Habitat: Sapporo (after Takada, 1966) & Hippu (1♀, A. Nakanishi), Hokkaido.

Host: Unknown.

Distribution: Japan.

8. *Trioxys hokkaidensis*, sp. nov.

♀. Temple in dorsal view shorter than eye, 2:3, parallel behind eye; face (fig. 24) 1/3.5–1/3.7 as broad as head, narrower than length; clypeus 1.5 times as broad as long. Distance between posterior ocelli 3 times as long as minor axis of ocellus. Antenna with 12 segments (2♀♀), becoming weakly stouter towards apex, 1st flagellar segment being 4 times as long as broad at base and a little longer than the 2nd, 8:7, the 9th 2.5 times as long as broad, and the 10th long, 4.5 times so. Mesoscutum falling vertically into pronotum. Propodeum (fig. 60) incompletely areolated, the ante-median longitudinal and oblique carinae being entirely effaced. Petiole (fig. 107) 1.6 times as long as broad at spiracle, which is situated at basal 1/3. Genitalia (fig. 188) with anal prong (fig. 149 A) straight on the whole length, with 5 rigid long hairs on dorsal surface and 2 short bristles at apex; ovipositor sheath (fig. 149 B) rather slender, sparsely hairy. Fore wing (fig. 234) with stigma 3 times as long as broad; radius as long as or shorter than stigma.

Dark brown. Lower surface of face, clypeus, mouthparts, gena, anterior part of pronotum, propleuron and lower surface of mesopleuron yellowish brown. Antenna dark brown, a little paler than head; first 4 segments yellow. Abdomen brown; petiole dirty yellow; 2nd tergite obscurely on longitudinal median lobe, and apical segments including anal prong and ovipositor sheath yellowish brown. Legs yellow.

Length: Body 1.4–1.6 mm., antenna 1.1–1.2 mm.

♂. Unknown.

Holotype, ♀ (17–viii–65), & paratypes, 2♀♀: Hiroshima, Hokkaido (M. Suwa).

Host: Unknown.

This species is characterized by the narrow face, the incompletely areolated propodeum, the straight anal prong, the rather slender ovipositor sheath and the petiole with a spiracular tubercle at the basal third. Judging from the original description (1960) of *humuri* and the figure of the female genitalia of *humuri* given by Starý (1966, fig. 79) the new species appears to be close to *T. humuri* Mackauer.

9. *Trioxys artistigma* Takada

Trioxys artistigma Takada, Ins. Mats. 29: 29, 1966.

Habitat: Kyôto (after Takada, 1966); Miyakonojô, Miyazaki-ken (1♀, M. Miyazaki).

Host: Unknown.

Distribution: Japan.

10. *Trioxys myzocallis*, sp. nov.

♀. Temple in dorsal view much shorter than eye, 1:2, converging weakly behind eye; face 1/3.3–1/3.7 as broad as head, a little narrower than length; clypeus 1.5 times as broad as long. Distance between posterior ocelli 3 times as long as minor axis of ocellus. Antenna with 11 segments (2♀♀); 1st flagellar segment 5 times as long as broad at base and very slightly longer than the 2nd, 13:12, and the 2nd and following segments (except for the last long) almost equal in shape, 4 times as long as broad. Mesoscutum falling vertically into pronotum. Propodeum (fig. 62) completely and dis-

tinctly areolated. Petiole (fig. 110) 3 times as long as broad at spiracle, which is situated just before middle. Genitalia (fig. 190) with anal prong (fig. 150 A) gradually curved upwards, with 8 rigid long hairs on dorsal surface and 2 ones at apex; ovipositor sheath (fig. 150 B) long and broad, moderately hairy. Fore wing (fig. 232) with stigma 3 times as long as broad; radius as long as or longer than stigma.

Dirty yellow. Dark brown parts: ocellus and the neighboring area, eye, 4th and following antennal segments, mesoscutum, and 2nd to 4th tergites laterally. Mesoscutellum yellowish brown on disc.

Length: Body 2.2 mm., antenna 1.6 mm."

♂. Differs from the female in the following features:—

Eye smaller; proportion of dorsal length of temple to eye more, 2:3; face $1\frac{1}{2}$ as broad as head, 1.5 times as broad as long. Antenna with 13 segments (3♂♂); each flagellar segment almost 3 times as long as broad at base.

Dark brown. Clypeus, mouthparts, petiole, and 2nd and 3rd tergites on longitudinal median surfaces yellowish. Antenna a little paler than head; scape and pedicel yellowish. Legs yellow.

Length: Body 1.8–2.1 mm., antenna 1.5–1.7 mm.

Holotype, ♀ (17–v–66), & paratypes, 1♀ & 2♂♂: Kyôto. Paratype, 1♂: Kagoshima. All the specimens are reared from *Myzocallis pilosus* on *Quercus* sp.

Host: *Myzocallis pilosus* Takahashi.

Parasitized aphids are found one by one on the leaves of host plants, the empty skin becoming whitish brown or brown.

This species is extremely aberrant, being sharply characterized by the broad and long ovipositor sheath, the anal prong with 8 rigid long hairs dorsally, the narrow face and the light coloration.

Group II

This group is characterized by the petiole with both 1st and 2nd lateral tubercles on each side. The following 5 species belong to this group.

11. *Trioxys glycines* Takada

Trioxys glycines Takada, Ins. Mats. 29: 30, 1966.

Habitat: Sapporo (after Takada, 1966).

Host: *Aphis glycines* Matsumura (after Takada, 1966).

Distribution: Japan.

12. *Trioxys capitophori* Takada

Trioxys capitophori Takada, Ins. Mats. 29: 32, 1966.

Habitat: Sapporo (after Takada, 1966); Seppiko-yama, Hyôgo-ken (1♀ & 1♂, M. Miyazaki).

Host: *Capitophorus hippophaes* (Walker) (after Takada, 1966).

Distribution: Japan.

13. *Trioxys centaureae* (Haliday)

Aphidius (*Trioxys*) *centaureae* Haliday, Ent. Mag. 1: 490, 1833.

Trioxys (*Trioxys*) *centaureae*: Mackauer, Beitr. Ent. 9: 157, 1959.

Trioxys centaureae: Takada, Ins. Mats. 29: 32, 1966.

Habitat: Kyôto, Kôchi, Fukuoka, Tsu-shima & Kagoshima (after Takada, 1966).

Host: *Macrosiphum ibarae* Matsumura (in Japan, after Takada, 1966).

In Europe various kinds of aphids are recorded as hosts of this species (see Mackauer, 1959 a & Starý, 1966).

Distribution: Japan; Europe.

14. ***Trioxys toxopterae*** Takada

Trioxys toxopterae Takada, Ins. Mats. 29: 33, 1966.

Habitat: Hatsuno & Taken, Amami-ôshima (after Takada, 1966).

Host: *Toxoptera aurantii* (Fonscolombe) (after Takada, 1966).

Distribution: Japan.

15. ***Trioxys confucius*** (Mackauer)

Binodoxys confucius Mackauer, Entomophaga 7: 37, 1962.

Trioxys confucius: Takada, Ins. Mats. 29: 34, 1966.

Habitat: Shinokawa, Amami-ôshima (after Takada, 1966); Kyôto (1♀).

The present specimen from Kyôto differs from those from Amami-ôshima in the following characters:—

♀. Face narrower, 1/2.5 as broad as head. Scape longer, 2 times as long as pedicel; hairs on flagellar segments shorter and denser. Fore wing (fig. 236) with a brown small cloud just below stigma. Petiole slenderer, 4 times as long as broad at spiracle. Head and thorax pale reddish brown.

Host: An aphid on citrus (in Hongkong, after Mackauer, 1962 a).

Distribution: Japan; Hongkong.

Host list

Lachninae

<i>Cinara laricicola</i> (Matsumura)	<i>Pauesia laricis</i> (Haliday)
"	<i>Pauesia pini</i> (Haliday)
<i>Cinara longipennis</i> (Matsumura)	<i>Pauesia konoi</i> (Watanabe)
"	<i>Pauesia nopporensis</i> Watanabe & Takada
<i>Cinara pineti</i> (Koch)	<i>Pauesia abietis</i> (Marshall)
* "	<i>Pauesia akamatsucola</i> , sp. nov.
<i>Cinara pinicola</i> (Kaltenbach)	<i>Pauesia soranumensis</i> Watanabe & Takada
"	<i>Pauesia jezoensis</i> (Watanabe)
<i>Cinara todocola</i> (Inouye)	<i>Pauesia inouyei</i> (Watanabe)
* "	<i>Pauesia momicola</i> Watanabe & Takada
<i>Cinara</i> sp.	<i>Pauesia infulata</i> (Haliday)
* <i>Cinara</i> sp.	<i>Xenostigmus</i> sp.
<i>Cinaria laricis</i> (Walker)	<i>Pauesia pini</i> (Haliday)
* <i>Eulachnus thunbergii</i> Wilson	<i>Diaeretus leucopterus</i> (Haliday)
<i>Lachniella costata</i> (Zetterstedt)	<i>Pauesia soranumensis</i> Watanabe & Takada

* This host-parasite relationship is confirmed in Japan by the present investigation for the first time.

<i>Lachniella costata</i> (Zetterstedt)	<i>Pauesia jezoensis</i> (Watanabe)
<i>Lachnus tropicalis</i> (Van der Goot)	<i>Pauesia japonica</i> (Ashmead)
<i>Schizolachnus</i> sp.	<i>Pauesia unilachni</i> (Gahan)
<i>Stomaphis yanonis</i> Takahashi	<i>Protaphidius wissmannii</i> (Ratzeburg)
<i>Tuberolachnus salignus</i> (Gmelin)	<i>Pauesia salignae</i> (Watanabe)

Chaitophorinae

* <i>Chaitophorus niger</i> Mordvilko	<i>Lysiphlebus salicaphis</i> (Fitch)
* <i>Periphyllus californiensis</i> (Shinji)	<i>Aphidius areolatus</i> Ashmead

Callaphidinae

<i>Callipterinella callipterus</i> (Hartig)	<i>Lysaphidus callipterinellae</i> Takada
* <i>Euceraaphis punctipennis</i> (Zetterstedt)	<i>Praon flavinode</i> (Haliday)
"	<i>Trioxys euceraaphis</i> Takada
* <i>Machilaphis machili</i> (Takahashi)	<i>Trioxys machilaphidis</i> , sp. nov.
* <i>Myzocallis pilosus</i> Takahashi	<i>Trioxys myzocallis</i> , sp. nov.
<i>Shivaphis celti</i> Das	<i>Trioxys shivaphis</i> Takada

Aphidinae

* <i>Acyrtosiphon pisum</i> (Harris)	<i>Aphidius ervi</i> Haliday
* "	<i>Praon dorsale</i> (Haliday)
* <i>Amphicercidus japonicus</i> (Hori)	<i>Ephedrus nacheri</i> Quilis
"	<i>Ephedrus plagiator</i> (Nees)
* <i>Amphorophora rubiphaga</i> Takahashi	<i>Aphidius lonicerae</i> Marshall
* "	<i>Praon volucre</i> (Haliday)
* <i>Aphis craccivora</i> Koch	<i>Ephedrus nacheri</i> Quilis
"	<i>Ephedrus plagiator</i> (Nees)
* "	<i>Lysiphlebus japonicus</i> Ashmead
* <i>Aphis farinosa yanagicola</i> Matsumura	<i>Lysiphlebus ambiguus</i> (Haliday)
* <i>Aphis fukii</i> Shinji	<i>Lysiphlebus japonicus</i> Ashmead
* <i>Aphis glycines</i> Matsumura	<i>Aphidius gifuensis</i> Ashmead
"	<i>Trioxys glycines</i> Takada
* <i>Aphis gossypii</i> Glover	<i>Aphidius gifuensis</i> Ashmead
"	<i>Lysiphlebus japonicus</i> Ashmead
* <i>Aphis ichigo</i> Shinji	<i>Lysiphlebus japonicus</i> Ashmead
* <i>Aphis kurosawai</i> Takahashi	<i>Lysiphlebus japonicus</i> Ashmead
* <i>Aphis spiraeicola</i> Patch	<i>Ephedrus nacheri</i> Quilis
"	<i>Ephedrus plagiator</i> (Nees)
* "	<i>Lysiphlebus japonicus</i> Ashmead
* <i>Aphis</i> sp.	<i>Diaeretiella rapae</i> (M'Intosh)
<i>Aulacorthum magnoliae</i> (Essig & Kuwana)	<i>Ephedrus plagiator</i> (Nees)
"	<i>Praon volucre</i> (Haliday)
* <i>Aulacorthum muradachi</i> (Shinji)	<i>Ephedrus plagiator</i> (Nees)
* <i>Aulacorthum nipponicum</i> (Essig & Kuwana)	<i>Aphidius amamioshimensis</i> , sp. nov.
* <i>Aulacorthum solani</i> (Kaltenbach)	<i>Aphidius gifuensis</i> Ashmead
* "	<i>Praon volucre</i> (Haliday)
* <i>Aulacorthum syringae</i> Takahashi	<i>Praon volucre</i> (Haliday)
* <i>Brevicoryne brassicae</i> (Linné)	<i>Diaeretiella rapae</i> (M'Intosh)
* <i>Capitophorus elaeagni</i> (Del Guercio)	<i>Ephedrus persicae</i> Froggatt
* <i>Capitophorus hippophaes</i> (Walker)	<i>Ephedrus persicae</i> Froggatt
"	<i>Trioxys capitophori</i> Takada
* <i>Capitophorus</i> sp.	<i>Praon capitophori</i> , sp. nov.
* <i>Cavariella araliae</i> Takahashi	<i>Aphidius salicis</i> Haliday
* <i>Cavariella salicicola</i> (Matsumura)	<i>Aphidius salicis</i> Haliday

* <i>Cavariella salicicola</i> (Matsumura)	<i>Diaeretiella rapae</i> (M'Intosh)
* " "	<i>Ephedrus nacheri</i> Quilis
* " "	<i>Ephedrus salicicola</i> , sp. nov.
* <i>Cavariella</i> sp.	<i>Ephedrus cavariellae</i> , sp. nov.
* <i>Coloradoa artemisiae artemisicola</i> Takahashi	<i>Ephedrus nacheri</i> Quilis
" "	<i>Lysaphidus matsuyamensis</i> Takada
* <i>Coloradoa kiku</i> (Hori)	<i>Ephedrus nacheri</i> Quilis
* <i>Dactynotus gobonis</i> (Matsumura)	<i>Praon dorsale</i> (Haliday)
* <i>Dactynotus picridis</i> (Fabricius)	<i>Praon dorsale</i> (Haliday)
* <i>Dactynotus solidaginis</i> (Fabricius)	<i>Aphidius funebris</i> Mackauer
* <i>Eumyzus impatiensae</i> (Shinji)	<i>Ephedrus trichosiphoniellae</i> , sp. nov.
* <i>Hyalopterus pruni</i> (Geoffroy)	<i>Ephedrus nacheri</i> Quilis
* <i>Hyperomyzus lactucae</i> (Linné)	<i>Ephedrus nacheri</i> Quilis
<i>Indomegoura indica</i> (Van der Goot)	<i>Praon dorsale</i> (Haliday)
* <i>Longiunguis japonicus</i> (Takahashi)	<i>Lysiphlebus japonicus</i> Ashmead
* <i>Macrosiphoniella grandicauda</i> Takahashi & Moritsu	<i>Aphidius longipetiolus</i> , sp. nov.
* <i>Macrosiphoniella hikosanensis</i> Moritsu	<i>Aphidius macrosiphoniellae</i> , sp. nov.
* <i>Macrosiphoniella pseudoartemisiae</i> Shinji	<i>Aphidius absinthii</i> Marshall
* <i>Macrosiphoniella sanborni</i> (Gillette)	<i>Aphidius macrosiphoniellae</i> , sp. nov.
* <i>Macrosiphoniella yomenae</i> (Shinji)	<i>Aphidius absinthii</i> Marshall
* " "	<i>Aphidius macrosiphoniellae</i> , sp. nov.
* " "	<i>Praon yomenae</i> , sp. nov.
* <i>Macrosiphoniella yomogifoliae</i> (Shinji)	<i>Aphidius absinthii</i> Marshall
<i>Macrosiphum avenae akebiae</i> Shinji	<i>Aphidius avenae</i> Haliday
* " "	<i>Ephedrus nacheri</i> Quilis
* " "	<i>Ephedrus persicae</i> Froggatt
" "	<i>Ephedrus plagiator</i> (Nees)
* " "	<i>Praon volucre</i> (Haliday)
* <i>Macrosiphum ibarae</i> Matsumura	<i>Aphidius avenae</i> Haliday
* " "	<i>Aphidius gifuensis</i> Ashmead
* " "	<i>Ephedrus nacheri</i> Quilis
" "	<i>Ephedrus plagiator</i> (Nees)
* " "	<i>Praon volucre</i> (Haliday)
" "	<i>Trioxys centaureae</i> (Haliday)
* <i>Melanaphis bambusae</i> (Fullaway)	<i>Ephedrus plagiator</i> (Nees)
* " "	<i>Lysiphlebus japonicus</i> Ashmead
<i>Myzus mumecola</i> (Matsumura)	<i>Ephedrus persicae</i> Froggatt
<i>Myzus persicae</i> (Sulzer)	<i>Aphidius gifuensis</i> Ashmead
" "	<i>Diaeretiella rapae</i> (M'Intosh)
" "	<i>Ephedrus nacheri</i> Quilis
" "	<i>Ephedrus persicae</i> Froggatt
" "	<i>Ephedrus plagiator</i> (Nees)
" "	<i>Lysiphlebus japonicus</i> Ashmead
" "	<i>Praon volucre</i> (Haliday)
<i>Myzus varians</i> Davidson	<i>Ephedrus persicae</i> Froggatt
* <i>Pleotrichophorus glandulosus</i> (Kaltenbach)	<i>Ephedrus nacheri</i> Quilis
" "	<i>Lysaphidus pleotrichophori</i> Takada
* <i>Pterocomma</i> sp.	<i>Aphidius cingulatus</i> Ruthe
* <i>Rhopalosiphoninus deutzifoliae</i> Shinji	<i>Ephedrus nacheri</i> Quilis
* " "	<i>Ephedrus persicae</i> Froggatt
* " "	<i>Ephedrus plagiator</i> (Nees)
* <i>Rhopalosiphum padi</i> (Linné)	<i>Ephedrus nacheri</i> Quilis

* <i>Rhopalosiphum padi</i> (Linné)	<i>Lipolexis gracilis</i> Foerster
"	<i>Trioxys auctus</i> (Haliday)
* <i>Rhopalosiphum</i> sp. near <i>padi</i> (Linné)	<i>Praon rhopalosiphum</i> , sp. nov.
* <i>Sappaphis mume</i> (Hori)	<i>Ephedrus nacheri</i> Quilis
* <i>Toxoptera aurantii</i> (Fonscolombe)	<i>Ephedrus plagiator</i> (Nees)
* "	<i>Lysiphlebus japonicus</i> Ashmead
"	<i>Trioxys toxopterae</i> Takada
* <i>Toxoptera ficicola</i> (Takahashi)	<i>Lysiphlebus japonicus</i> Ashmead
* <i>Toxoptera odinae</i> (Van der Goot)	<i>Ephedrus plagiator</i> (Nees)
* "	<i>Lysiphlebus japonicus</i> Ashmead
* <i>Trichosiphonaphis lonicerae</i> (Uye)	<i>Ephedrus nacheri</i> Quilis
* "	<i>Ephedrus persicae</i> Froggatt
<i>Trichosiphoniella momonis</i> (Matsumura)	<i>Ephedrus persicae</i> Froggatt
"	<i>Ephedrus trichosiphoniellae</i> , sp. nov.
"	<i>Trioxys brevipalpus</i> Takada
* <i>Unisitobion sorbi</i> (Matsumura)	<i>Praon volucre</i> (Haliday)

Thelaxinae

<i>Mansakia shirakabae</i> (Monzen)	<i>Amonoctonus watanabei</i> (Takada)
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Eriosomatinae

* <i>Prociphilus konoi</i> Hori	<i>Ephedrus nacheri</i> Quilis
<i>Prociphilus</i> sp.	<i>Ephedrus plagiator</i> (Nees)

Literature

- Ashmead, W. H. 1906. Descriptions of new Hymenoptera from Japan. Proc. U. S. Nat. Mus. 30: 169-201.
- Dalla Torre, C. G. 1898. Catalogus Hymenopterorum huiusque descriptorum systematicus et synonymicus. IV. Braconidae.
- Eastop, V. F. 1966. The mouthparts of some common genera of Aphidiinae (Hymenoptera: Braconidae). Proc. R. Ent. Soc. London (A) 41: 42-44.
- Fahringier, J. 1937. Die Parasiten der Baumläuse (Lachnini) aus der Gruppe der Aphidiinae Foerster, Festschr. 60 Geb. E. Strand, Riga 3: 240-245.
- Gahan, A. B. 1911. Aphidiinae of North America. Bull. Agric. Exp. Sta. Maryland 152: 147-200.
- . 1926. Some Braconid and Chalcid flies from Formosa, parasitic on Aphids. Proc. U. S. Nat. Mus. 70: 1-7.
- Mackauer, M. 1959. Die europäischen Arten der Gattungen *Praon* und *Arcopraon* (Hym.: Braconidae, Aphidiinae). Eine monographische Revision. Beitr. Ent. 9: 810-865.
- . 1959a. Die mittel-, west- und nord-europäischen Arten der Gattung *Trioxys* Haliday. Beitr. Ent. 9: 144-179.
- . 1959b. *Trioxys similis* n. sp. (Hym.: Braconidae, Aphidiinae), eine neue Blattlaus-Schlupfwespe aus Frankreich. Nebst einigen biocönologischen und nomenklatorischen Bemerkungen. Entomophaga 4: 303-309.
- . 1960. Zur Systematik der Gattung *Trioxys* Haliday. Beitr. Ent. 10: 137-160.
- . 1960a. Die europäischen Arten der Gattung *Lysiphlebus* Foerster. Beitr. Ent. 10: 582-623.
- . 1960b. *Trioxys (Trioxys) vandenboschi* n. sp., ein neuer Blattlaus-parasit aus dem Iran (Hymenoptera: Braconidae, Aphidiinae). Senck. Biol. 41: 359-362.
- . 1960c. Ein weiterer Vertreter der Untergattung *Betuloxys* Mackauer. Mitt. Dtsch. Ent. Ges. 19: 96-98.

- 1961. Die Gattungen der Familie Aphidiidae und ihre verwandtschaftliche Zuordnung (Hymenoptera: Ichneumonoidea). Beitr. Ent. 11: 792-803.
- 1961a. Die Typen der Unterfamilie Aphidiinae des Britischen Museums London (Hymenoptera: Braconidae). Beitr. Ent. 11: 96-154.
- 1961b. Neue europäische Blattlaus-Schlupfwespen. Boll. Lab. Ent. Agr. "F. Silvestri", Portici 19: 270-290.
- 1962. Blattlaus-Schlupfwespen der sammlung F. P. Müller, Rostock (Hymenoptera: Ichneumonoidea; Aphidiidae). Beitr. Ent. 12: 631-661.
- 1962a. Drei neue Blattlaus-Parasiten aus Hongkong (Hymenoptera: Aphidiidae). Entomophaga 7: 37-45.
- 1962b. Spezifische Parasiten der *Acyrtosiphon-Macrosiphum*-Gruppe und Grundfragen der Wirtsbindung der Blattlaus-Schlupfwespen. Z. Ang. Ent. 50: 125-131.
- 1963. Bemerkungen zur Systematik, Verbreitung und Wirtsbindung des *Ephedrus persicae*-Komplexes (Hymenoptera: Aphidiidae). Z. Ang. Ent. 52: 343-354.
- 1964. Comments on the authorship, generic position, and synonymy of *Diaeretiella rapae* (M'Intosh) (Hymenoptera: Aphidiidae). Beitr. Ent. 14: 53-58.
- 1965. Notes on and Additions to the *Trioxy*s and *Binodoxys* species (Hymenoptera: Aphidiidae) of North America. Canad. Ent. 97: 225-231.
- Mackauer, M. & T. Finlayson 1967. The Hymenopterous Parasites (Hymenoptera: Aphidiidae et Aphelinidae) of the Pea Aphid in Eastern North America. Canad. Ent. 99: 1051-1082.
- Marshall, T. A. 1896. Les Braconides. In E. André, Spécies des Hyménoptères d'Europe et d'Algérie. 5 bis, Paris.
- 1899. A monograph of the British Braconidae. Trans. Ent. Soc. London 1899: 11-73.
- Muesebeck, C. F. W., K. V. Krombein, H. K. Townes & others. 1951. Hymenoptera of America North of Mexico. Synoptic Catalog. U.S. Dept. Agric. Monogr. 2.
- Narayanan, E. S., B. R. Subba Rao, A. K. Sharma & P. Starý 1962. Revision of "A Catalogue of the known Species of the World belonging to the Subfamily Aphidiinae" (Hymenoptera: Braconidae). Beitr. Ent. 12: 662-720.
- Smith, C. F. 1944. The Aphidiinae of North America. Ohio State Univ. Contr., Zool. Ent. 6: 1-154.
- Starý, P. 1958. A taxonomic revision of some Aphidiine genera with remarks on the subfamily Aphidiinae. Acta Faun. Ent. Mus. Nat. Pragae 3: 53-96.
- 1959. Redescription of the Aphidiine genus *Lipolexis* Foerster 1862. Acta Soc. Ent. Cechosl. 56: 93-96.
- 1959a. A revision of the European species of the genus *Monoctonus* Haliday. Acta Soc. Ent. Cechosl. 56: 237-250.
- 1959b. Synonymical and other notes on *Protaphidius wissmannii* (Ratzeburg) (Hymenoptera, Braconidae: Aphidiinae). Ins. Mats. 22: 88-91.
- 1960. A new British species of the genus *Trioxy*s Haliday (Hym., Braconidae). Ent. Month. Mag. 96: 22-23.
- 1960a. A taxonomic revision of the European species of the genus *Paraphidius* Starý (Hym., Brac.). Acta Faun. Ent. Mus. Nat. Pragae 6: 5-44.
- 1960b. The aphidiid genus *Lysaphidus* Smith C. F. in Europe (Hym., Aphidiidae). Bull. Ent. Pologne 30: 357-366.
- 1960c. The generic classification of the family Aphidiidae. Acta Soc. Ent. Cechosl. 57: 238-252.
- 1960d. Two new species of *Trioxy*s Haliday from central Europe (Hymenoptera, Aphidiidae). Acta Soc. Ent. Cechosl. 57: 365-368.
- 1960e. Une nouvelle espèce du genre *Trioxy*s Haliday de la région de la Pannonie. Bull. Soc. Ent. Mulhouse 1960: 93-96.

- . 1961. A revision of the genus *Diaeretiella* Starý (Hymenoptera: Aphidiidae). Acta Ent. Mus. Nat. Pragae 34: 383-397.
- . 1961a. Faunistic Survey of Czechoslovak species of the genera *Lysiphlebus* Foerster and *Trioxys* Haliday (Hymenoptera: Aphidiidae). Acta Faun. Ent. Mus. Nat. Pragae 7: 131-149.
- . 1961b. Notes on European species of the genus *Aphidius* Nees. Ent. Tidskr. 82: 213-221.
- . 1961c. Notes on the parasites of the root aphids (Hymenoptera, Aphidiidae). Acta Soc. Ent. Cechosl. 58: 228-240.
- . 1961d. Some synonymical notes on the Aphidiidae (Hymenoptera). Acta Ent. Mus. Nat. Pragae 34: 21-25.
- . 1961e. Taxonomic notes on the genus *Lysiphlebus* Foerster (Hymenoptera, Aphidiidae). Bull. Ent. Pologne 31: 97-103.
- . 1961f. Two new species of *Praon* Haliday from Czechoslovakia (Hym., Aphidiidae). Acta Soc. Ent. Cechosl. 58: 340-343.
- . 1962. New aphid parasites of the genus *Aphidius* Nees from Europe. Bull. Ent. Pologne 32: 109-122.
- . 1962a. Notes on the European species of the *Ephedrus* Haliday (Hymenoptera: Aphidiidae). Opusc. Ent. 27: 87-98.
- . 1963. A study on the relationship of the Lachnidae, Chaitophoridae, Thelaxidae, Eriosomatidae, Adelgidae, Phylloxeridae and their Aphidiid parasites in (Central) Europe (Homoptera: Aphidoidea; Hymenoptera: Aphidiidae). Beitr. Ent. 13: 894-901.
- . 1963a. A study on the relationship of the Myzinae and their Aphidiid parasites in (Central) Europe. (Homoptera: Aphidoidea, Myzinae; Hymenoptera: Aphidiidae). Boll. Lab. Ent. Agr. "F. Silvestri", Portici 21: 199-216.
- . 1965. Aphidiid parasites of aphids in the USSR (Hymenoptera: Aphidiidae). Acta Faun. Ent. Mus. Nat. Pragae 10: 187-227.
- . 1965-66. The Aphidiidae of Italy. Boll. Ent. Bologna 28: 65-139.
- . 1966. Aphid parasites of Czechoslovakia: 1-242.
- . 1966a. Aphid parasites (Hym., Aphidiidae) and their relationship to aphid attending ants, with respect to biological control. Ins. Soc. Paris 13: 185-202.
- Stelfox, A. W. 1941. A list of the Irish species of *Toxares* and *Ephedrus* (Hym., Aphidiidae) with descriptions of these, which include three species new to science. Proc. R. Irish Acad. Dublin 46 (B): 125-142.
- Subba Rao, B. R., P. Sarup & A. K. Sharma 1963. A new species of the genus *Praon* Haliday, 1833. Beitr. Ent. 13: 189-191.
- Szépligeti, G. V. 1904. Hymenoptera. Fam. Braconidae. In Wytsman, P., Genera Insectorum, Bruxelles 22 & 23: 1-253.
- Takada, H. 1965. A new species of the genus *Monoctonus* Haliday from Japan (Hymenoptera, Aphidiidae). Kontyû 33: 223-225.
- . 1965a. A new species of the genus *Toxares* Haliday from Japan (Hymenoptera: Aphidiidae). Ins. Mats. 28: 18.
- . 1966. A preliminary revision of species of *Trioxys* Haliday occurring in Japan, with description of eight new species (Hymenoptera: Aphidiidae). Ins. Mats. 29: 23-36.
- . 1966a. Description of a new species of *Monoctonus* (Hymenoptera, Aphidiidae). Kontyû 34: 154-157.
- . 1966b. Three new species of the genus *Lysaphidus* Smith from Japan (Hymenoptera, Aphidiidae). Ins. Mats. 28: 127-130.
- Thomson, C. G. 1895. LII. Bidrag till Braconidernas kännedom. Opusc. Ent. 20: 2141-2339.
- Viereck, H. T. 1911. Descriptions of six new genera and thirty-one new species of Ichneumonflies. Proc. U.S. Nat. Mus. 40: 170-196.
- Watanabe, C. 1939. A new species of genus *Aphidius* Nees and redescription of *Aphidius*

- japonicus* Ashmead (Taxonomic notes on Aphidiidae of Japan, I). Ins. Mats. 13: 81-84.
- 1940. On two species of *Aphidius* bred from *Cinara laricicolus* (Mats.) (Taxonomic notes on Aphidiidae of Japan, II). Ins. Mats. 15: 53-56.
- 1941. Descriptions of three new species of *Aphidius* parasitic on some aphids of coniferous trees (Taxonomic notes on Aphidiidae of Japan, III). Ins. Mats. 15: 106-111.
- 1941a. On two Aphidiid parasites of the grain aphids, *Macrosiphum granarium* (Kirby). Ins. Mats. 15: 167-170.
- 1941b. On two species of genus *Ephedrus* Haliday (Taxonomic notes on Aphidiidae of Japan, IV). Ins. Mats. 15: 136-140.
- 1957. Notes on Ashmead's Japanese Braconidae (Hymenoptera). Ins. Mats. 21: 1-5.
- Watanabe, C. & H. Takada 1964. A note on *Pauesia konoi* (Watanabe) (Hymenoptera: Aphidiidae). Ins. Mats. 27: 11.
- 1964a. Occurrence of two species of the genus *Praon* Haliday in Japan (Hymenoptera: Aphidiidae). Ins. Mats. 27: 8-11.
- 1965. A revision of the genus *Pauesia* Quilis in Japan, with three new species (Hymenoptera: Aphidiidae). Ins. Mats. 28: 1-17.
- 1967. Aphidiid parasites of the green peach aphid, *Myzus persicae* (Sulzer), in Japan (Hymenoptera, Aphidiidae). Mushi 40: 83-87.
- Yasumatsu, K. 1947. Two hymenopterous parasites of the grain Aphis *Macrosiphum granarium* (Kirby) in Hikosan, Kyushu (in Japanese). Mushi 17: 113-114.
- 1951. Sur un remarquable Aphidiide du Japon. Rev. France Ent. Paris 18: 171-174.
- 1960. The identity of *Paralipsis enervis* (Nees) and *P. eikoe* (Yasumatsu). Kontyû 28: 57.
- Yasumatsu, K., T. Ishihara & M. Moritsu 1946. Five hymenopterous parasites of *Tuberolachnus saligna* Gmelin (Aphididae) from Japan (in Japanese). Mushi 17: 9-12.
- Yasumatsu, K. & M. Moritsu 1947. Two hymenopterous parasites of *Myzus varians* Davidson (in Japanese). Mushi 17: 89-90.

Addendum

In the course of correcting the proofs of the present paper I have had the opportunity to read Starý and Schlinger's publication, "A revision of the Far East Asian Aphidiidae (Hymenoptera)" (in Schimitschek, Series Entomologica 3: viii+204, Den Haag, 1967). Having read their publication I have found that their taxonomic conclusions in regards to several species occurring in Japan differ from my present conclusions as follows:—

***Bioxys japonicus* Starý & Schlinger, 1967 (p. 32)**

The genus *Bioxys* is proposed by Starý and Schlinger (1967) for *Bioxys japonicus* which appears to be the same species as *Trioxys machilaphidis* Takada, 1968. Furthermore, I am much inclined to the opinion that the genus *Bioxys* is not a full genus but merely a subgenus of the genus *Trioxys*.

***Praon glabrum* Starý & Schlinger, 1967 (p. 99)**

Praon glabrum seems to be the same species as *Praon flavinode* (Haliday, 1833).

***Praon orientale* Starý & Schlinger, 1967 (p. 100)**

This species seems to be identical with *Praon volucre* (Haliday, 1833).

***Trioxys (Binodoxys) orientalis* Starý & Schlinger, 1967 (p. 115)**

This species seems to be identical with *Trioxys centaureae* (Haliday, 1833).

***Trioxys (Trioxys) luteolus* Starý & Schlinger, 1967 (p. 126)**

It is quite possible that *Trioxys luteolus* might be suppressed as a synonym of *Trioxys shivaphis* Takada, 1966.

In conclusion, further discussions about the above-mentioned problems in details will be given in another paper.

Explanation of plates

Plate VII. Head in dorsal view. Fig. 1, *Ephedrus cavariellae*, ♀ (a, length of eye; b, length of temple; c, distance between posterior ocelli; d, minor axis of ocellus); 2, *E. salicicola*, ♀; 3, *Areopraon kurohimense*, ♂; 4, *A. nipponicum*, ♀; 5, *Xenostigmus* sp., ♂; 6, *Aphidius areolatus*, ♀; 7, *A. salicis*, ♀; 8, *A. cingulatus*, ♀; 9, *A. ervi*, ♀; 10, *A. avenae*, ♀; 11, *A. amamioshimensis*, ♀; 12, *A. loniceræ*, ♀; 13, *A. funebris*, ♀; 14, *A. gifuensis*, ♀; 15, *A. macrosiphoniellae*, ♀; 16, *A. longipetiolus*, ♀; 17, *A. absinthii*, ♀.

Plate VIII. Head in dorsal view (figs. 18 & 19) and in frontal view (figs. 20-32). Fig. 18, *Lysiphlebus ambiguus*, ♀; 19, *L. salicaphis*, ♀; 20, *Xenostigmus* sp., ♂ (a, breadth of head; b, breadth of face; c, length of face; d, breadth of clypeus; e, length of clypeus; f, malar space; g, basal breadth of mandible); 21, *Areopraon kurohimense*, ♂; 22, *A. nipponicum*, ♀; 23, *Trioxys kamijoi*, ♀; 24, *T. hokkaidensis*, ♀; 25, *Aphidius areolatus*, ♀; 26, *A. cingulatus*, ♀; 27, *A. salicis*, ♀; 28, *A. gifuensis*, ♀; 29, *A. amamioshimensis*, ♀; 30, *A. avenae*, ♀; 31, *A. absinthii*, ♀; 32, *A. longipetiolus*, ♀.

Plate IX. Antenna of female. Fig. 33, *Ephedrus cavariellae*; 34, *E. salicicola*; 35, *E. plagiator*; 36, *E. nacheri*; 37, *E. persicae*; 38, *E. lacertosus*; 39, *E. trichosiphoniellae*; 40, *E. brevis*; 41, *Aphidius areolatus*; 42, *A. salicis*; 43, *A. cingulatus* (7th and following segments); 44, *Lysiphlebus japonicus*; 45, *L. ambiguus*; 46, *L. salicaphis*.

Plate X. Propodeum of female. Fig. 47, *Aphidius loniceræ* (AM, ante-median longitudinal carina; O, oblique carina; PM, post-median longitudinal carina; T, transverse carina; L, lateral longitudinal carina); 48, *E. brevis*; 49, *E. salicicola*; 50, *E. plagiator*; 51, *E. cavariellae*; 52, *E. nacheri*; 53, *E. lacertosus*; 54, *E. persicae*; 55, *E. trichosiphoniellae*; 56, *Diaeretus leucopterus*; 57 & 58, *Lysiphlebus japonicus*; 59, *Diaeretiella rapae*; 60, *Trioxys hokkaidensis*; 61, *T. machilaphidis*; 62, *T. myzocallis*.

Plate XI. Petiole of female. Fig. 63, *Ephedrus cavariellae*; 64, *E. salicicola*; 65, *E. persicae*; 66, *E. nacheri*; 67, *E. trichosiphoniellae*; 68, *E. plagiator*; 69, *E. lacertosus*; 70, *E. brevis*; 71 & 72, *Praon yomenae*; 73 & 76, *P. dorsale*; 74, *P. taisetsuzanum*; 75 & 77, *P. flavinode*; 78, *P. rhopalosiphum*.

Plate XII. Petiole. Figs. 79 & 80, *Praon volucre*, ♀; 81, *P. capitophori*, ♀; 82, *Areopraon kurohimense*, ♂; 83, *A. nipponicum*, ♀; 84, *Diaeretus leucopterus*, ♀; 85, *Xenostigmus* sp., ♂; 86, *Pauesia akamatsucola*, ♀; 87, *Aphidius areolatus*, ♀; 88, *A. salicis*, ♀; 89, *A. avenae*, ♀.

Plate XIII. Petiole of female. Fig. 90, *Aphidius cingulatus*; 91, *A. ervi*; 92, *A. absinthii*; 93, *A. macrosiphoniellae*; 94, *A. gifuensis*; 95, *A. funebris*; 96, *A. longipetiolus*; 97, *A. loniceræ*; 98, *A. amamioshimensis*; 99, *Diaeretiella rapae*; 100, *Lysiphlebus salicaphis*; 101, *L. ambiguus*.

Plate XIV. Petiole of female (figs. 102-110) and ovipositor sheath (figs. 111-119). Figs. 102 & 103, *Lysiphlebus japonicus*; 104, *Monoctonus nervosus*; 105 & 106, *Lipolexis gracilis*; 107, *Trioxys hokkaidensis*; 108, *T. machilaphidis*; 109, *T. kamijoi*; 110, *T. myzocallis*; 111, *Ephedrus cavariellae*; 112, *E. nacheri*; 113, *E. trichosiphoniellae*; 114, *E. lacertosus*; 115, *E. plagiator*;

116, *E. salicicola*; 117, *E. persicae*; 118, *Praon yomenae*; 119, *P. rhopalosiphum*.

Plate XV. Ovipositor sheath. Fig. 120, *Praon volucre*; 121, *P. capitophori*; 122, *P. flavinode*; 123, *P. dorsale*; 124, *P. taisetsuzanum*; 125, *Diaeretus leucopterus*; 126, *Pauesia akamatsucola*; 127, *P. laricis*; 128, *Diaeretiella rapae*; 129, *Aphidius areolatus*; 130, *A. salicis*; 131, *A. cingulatus*; 132, *A. avenae*; 133, *A. ervi*; 134, *A. gifuensis*; 135, *A. amamioshimensis*; 136, *A. lonicerae*; 137, *A. absinthii*; 138, *A. macrosiphoniellae*; 139, *A. longipetiolus*; 140, *A. funebris*.

Plate XVI. Ovipositor sheath (figs. 141–144, 145 B, 146, 147 & 148 B–150 B) and anal prong (figs. 145 A & 148 A–150 A). Figs. 141 & 142, *Lysiphlebus japonicus*; 143, *L. ambiguus*; 144, *L. salicaphis*; 145, *Trioxys machilaphidis*; 146, *Monoctonus nervosus*; 147, *Lipolexis gracilis*; 148, *Trioxys kamijoi*; 149, *T. hokkaidensis*; 150, *T. myzocallis*.

Plate XVII. Female genitalia. Fig. 151, *Toxares shigai*; 152, *Ephedrus cavariellae*; 153, *E. salicicola*; 154, *E. plagiator*; 155, *E. nacheri*; 156, *E. persicae*; 157, *E. trichosiphoniellae*; 158, *E. lacertosus*.

Plate XVIII. Female genitalia. Fig. 159, *Praon rhopalosiphum*; 160, *P. yomenae*; 161, *P. flavinode*; 162, *P. volucre*; 163, *P. dorsale*; 164, *P. taisetsuzanum*; 165, *P. capitophori*; 166, *Diaeretus leucopterus*.

Plate XIX. Female genitalia. Fig. 167, *Aphidius areolatus*; 168, *A. cingulatus*; 169, *A. salicis*; 170, *A. ervi*; 171, *A. avenae*; 172, *A. lonicerae*; 173, *A. amamioshimensis*; 174, *A. gifuensis*.

Plate XX. Female genitalia. Fig. 175, *Aphidius absinthii*; 176, *A. macrosiphoniellae*; 177, *A. longipetiolus*; 178, *A. funebris*; 179, *Diaeretiella rapae*; 180, *Lysiphlebus salicaphis*; 181, *L. japonicus*; 182, *L. ambiguus*.

Plate XXI. Female genitalia. Fig. 183, *Amonoctonus watanabei*; 184, *Monoctonus longiradius*; 185, *M. nervosus*; 186, *Lipolexis gracilis*; 187, *Trioxys kamijoi*; 188, *T. hokkaidensis*; 189, *T. machilaphidis*; 190, *T. myzocallis*.

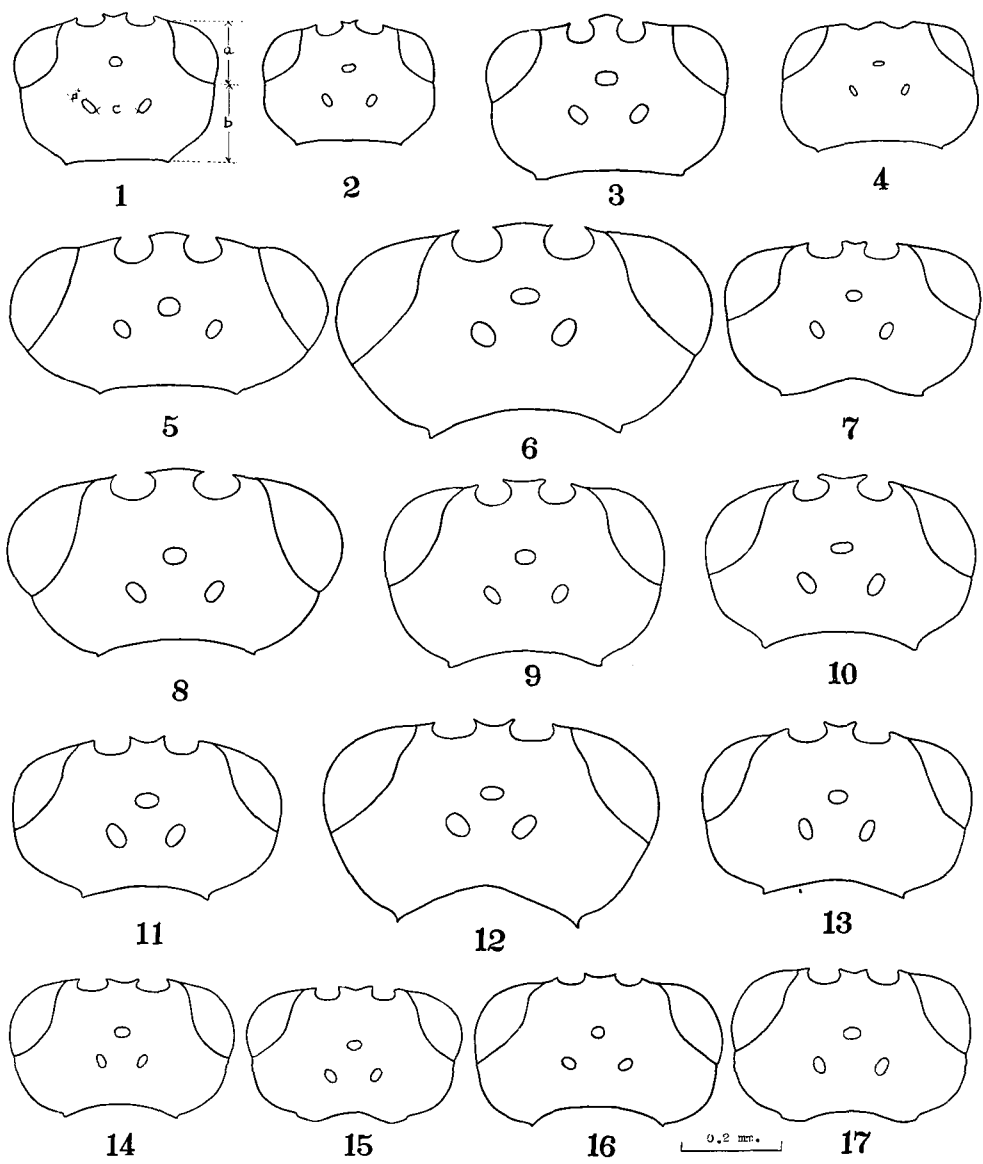
Plate XXII. Fore wing of female. Fig. 191, *Ephedrus brevis* (AN, anal vein; B, basal vein; C, cubitus; CO, costa; IC, intercubitus; M, median; MC, metacarp; N, nervulus; P, parallel vein; R, radius; RC, recurrent vein; SC, subcosta; ST, stigma); 192, *E. cavariellae*; 193, *E. salicicola*; 194, *E. trichosiphoniellae*; 195, *E. nacheri*; 196, *E. plagiator*; 197, *E. lacertosus*; 198, *E. persicae*; 199, *Toxares shigai*; 200, *Praon rhopalosiphum*; 201, *P. yomenae*.

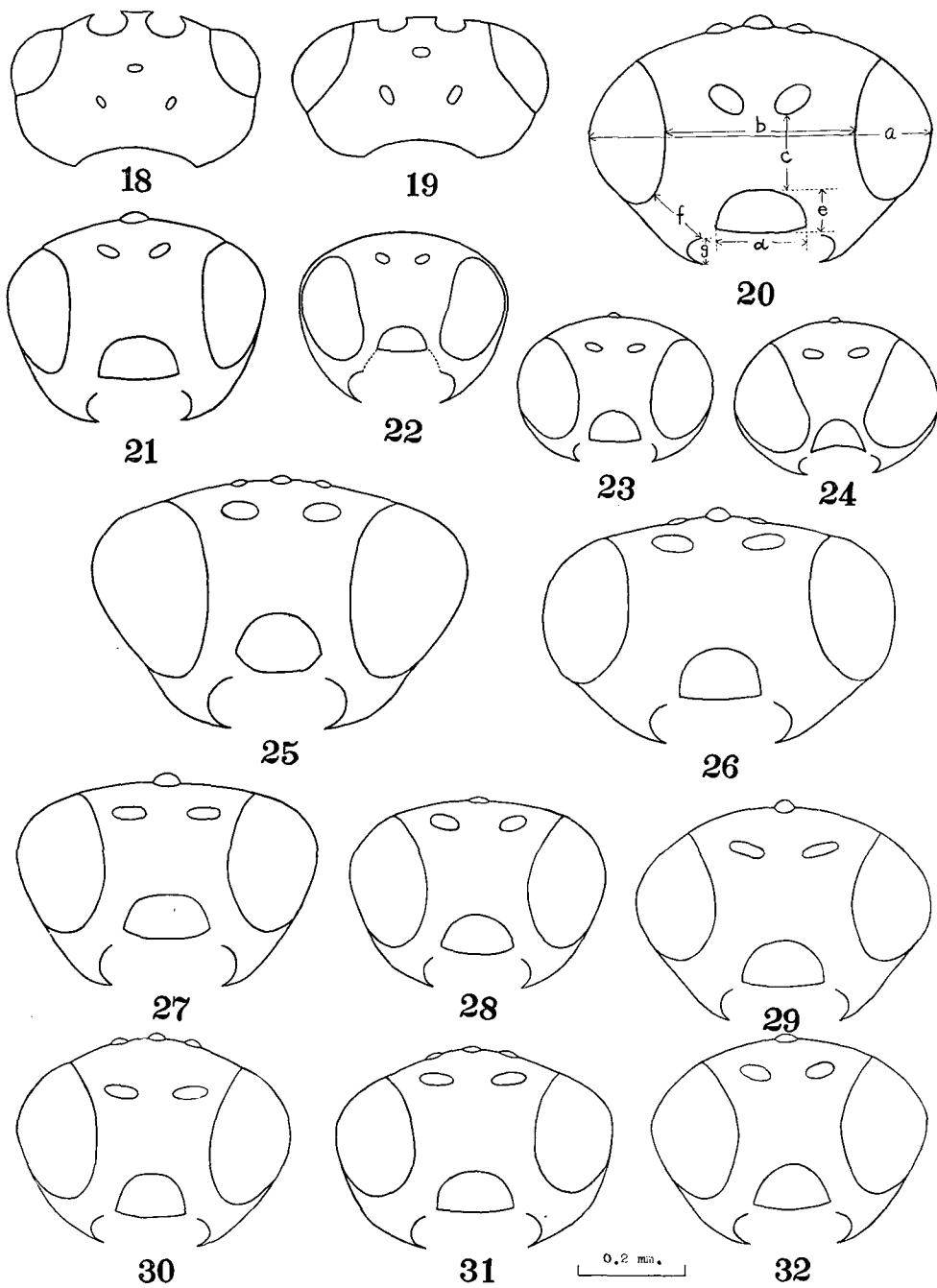
Plate XXIII. Fore wing. Fig. 202, *Praon taisetsuzanum*, ♀; 203, *P. flavinode*, ♀; 204, *P. capitophori*, ♀; 205, *P. dorsale*, ♀; 206, *P. volucre*, ♀; 207, *Areopraon kurohimense*, ♂; 208, *A. nipponicum*, ♀; 209, *Pauesia akamatsucola*, ♀; 210, *P. laricis*, ♀; 211, *Xenostigmus* sp., ♂; 212, *Diaeretus leucopterus*, ♀.

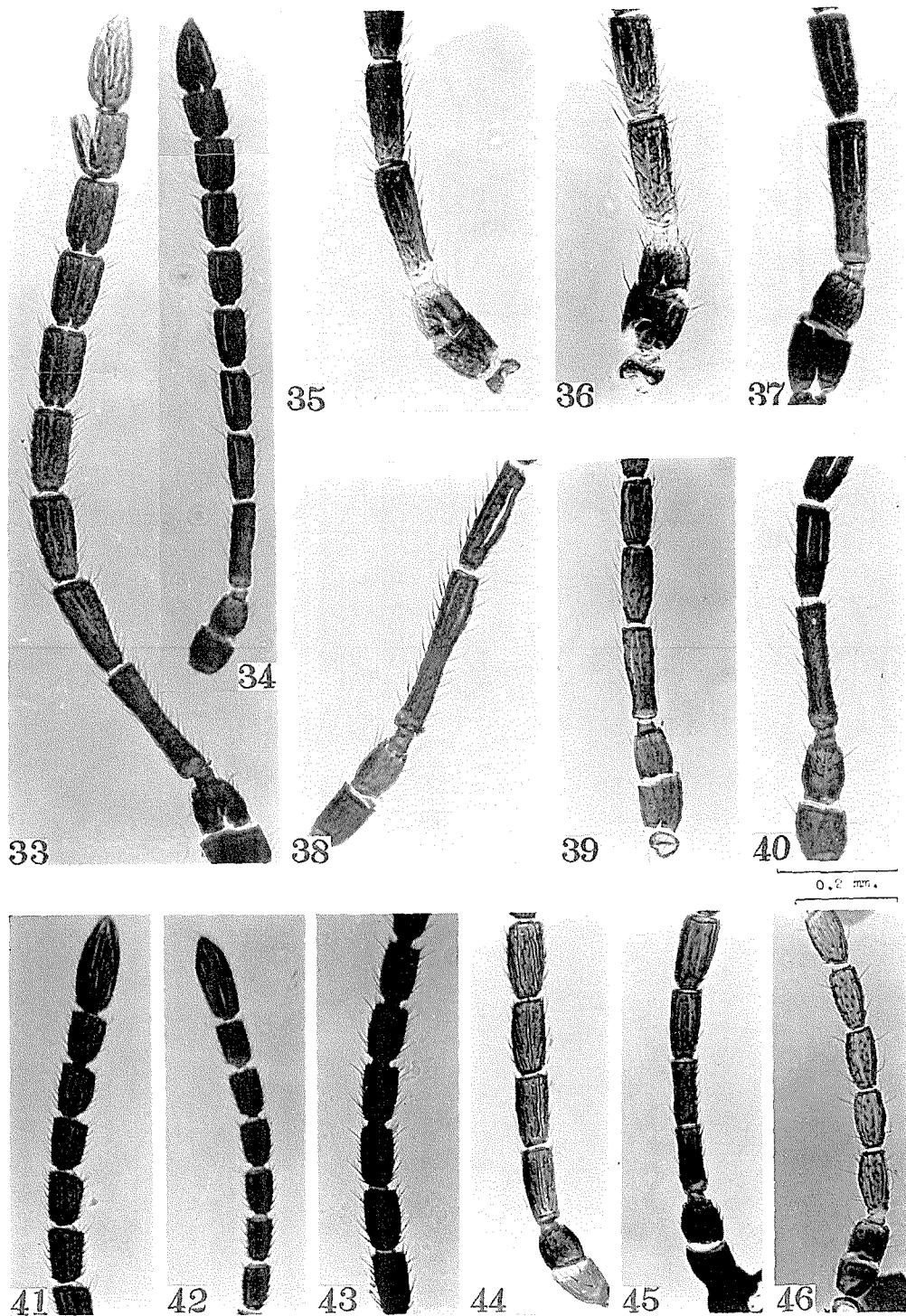
Plate XXIV. Fore wing of female. Fig. 213, *Aphidius areolatus*; 214, *A. ervi*; 215, *A. salicis*; 216, *A. cingulatus*; 217, *A. avenae*; 218, *A. gifuensis*; 219, *A. amamioshimensis*; 220, *A. absinthii*; 221, *A. longipetiolus*; 222, *A. funebris*; 223, *A. lonicerae*; 224, *A. macrosiphoniellae*.

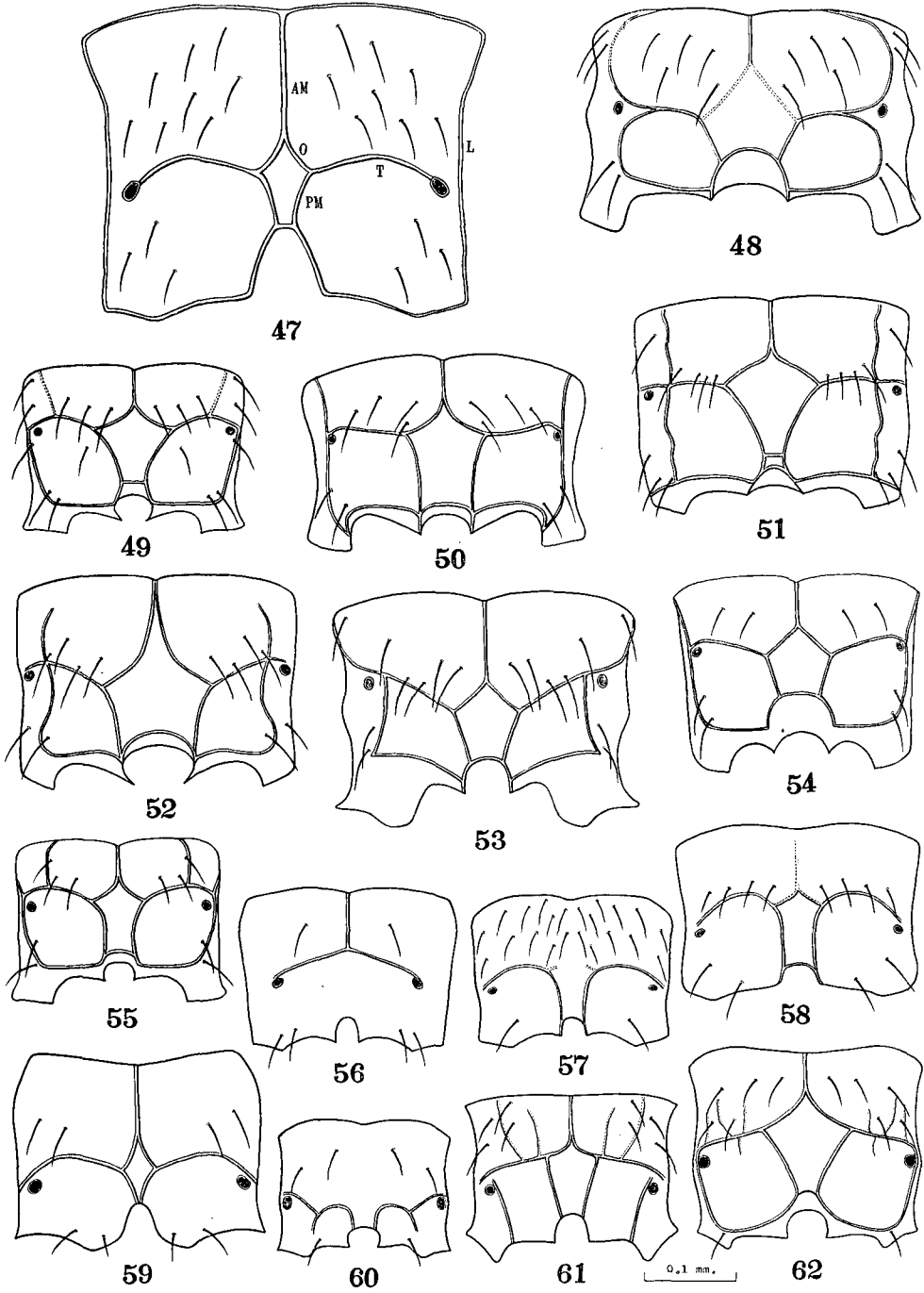
Plate XV. Fore wing of female. Fig. 225, *Diaeretiella rapae*; 226, *Lysiphlebus japonicus*; 227, *L. ambiguus*; 228, *L. salicaphis*; 229, *Amonoctonus watanabei*; 230, *Monoctonus nervosus*; 231, *Lipolexis gracilis*; 232, *Trioxys myzocallis*; 233, *T. kamijoi*; 234, *T. hokkaidensis*; 235, *T. machilaphidis*; 236, *T. confucius*.

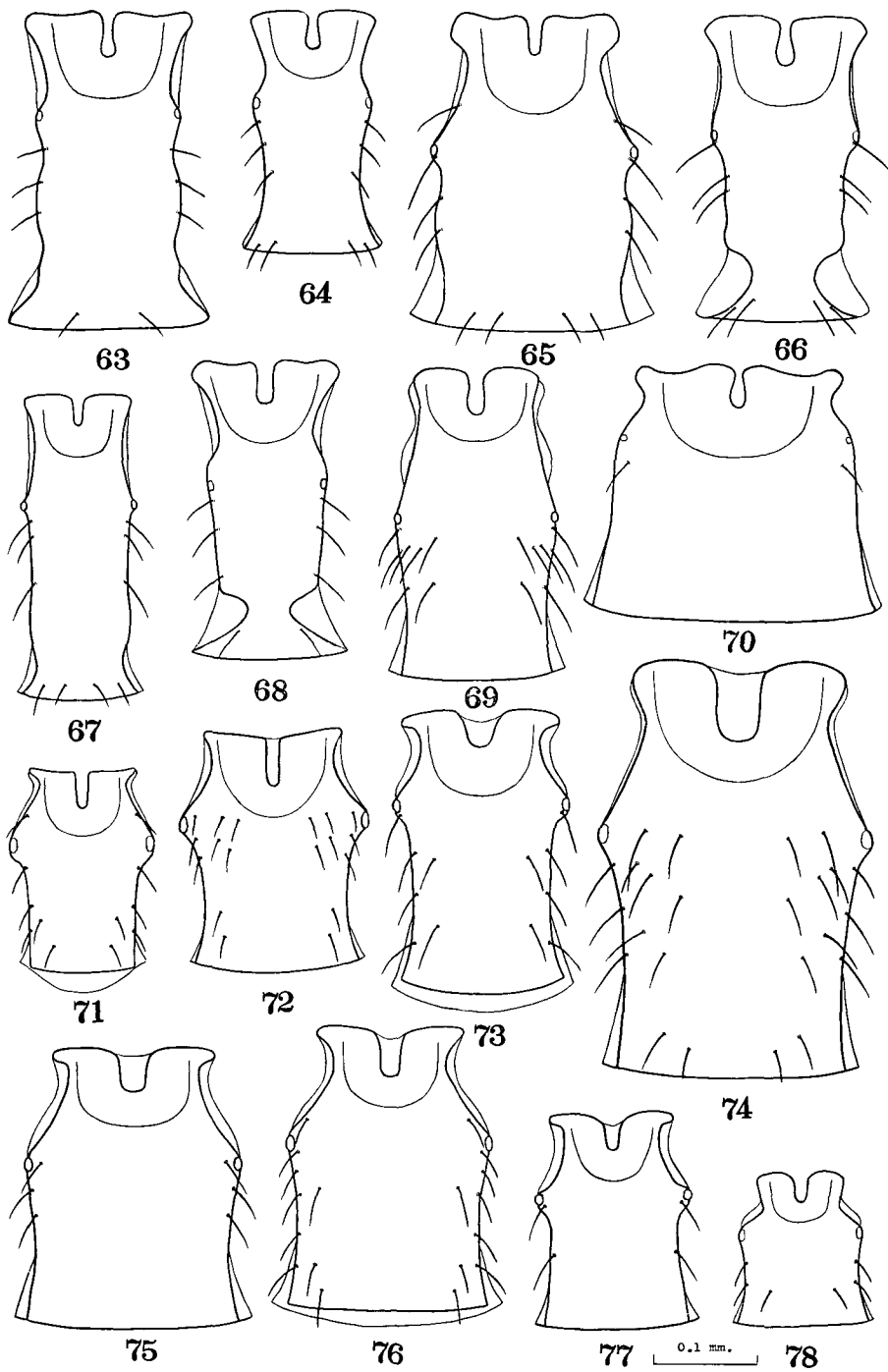
Plate XVI. Front leg. (figs. 237–244) and hind leg (figs. 245–247) of female. Fig. 237, *Ephedrus cavariellae*; 238, *E. salicicola*; 239, *E. plagiator*; 240, *E. nacheri*; 241, *E. lacertosus*; 242, *E. trichosiphoniellae*; 243, *E. persicae*; 244, *E. brevis*; 245, *Lysiphlebus japonicus*; 246, *L. ambiguus*; 247, *L. salicaphis*.

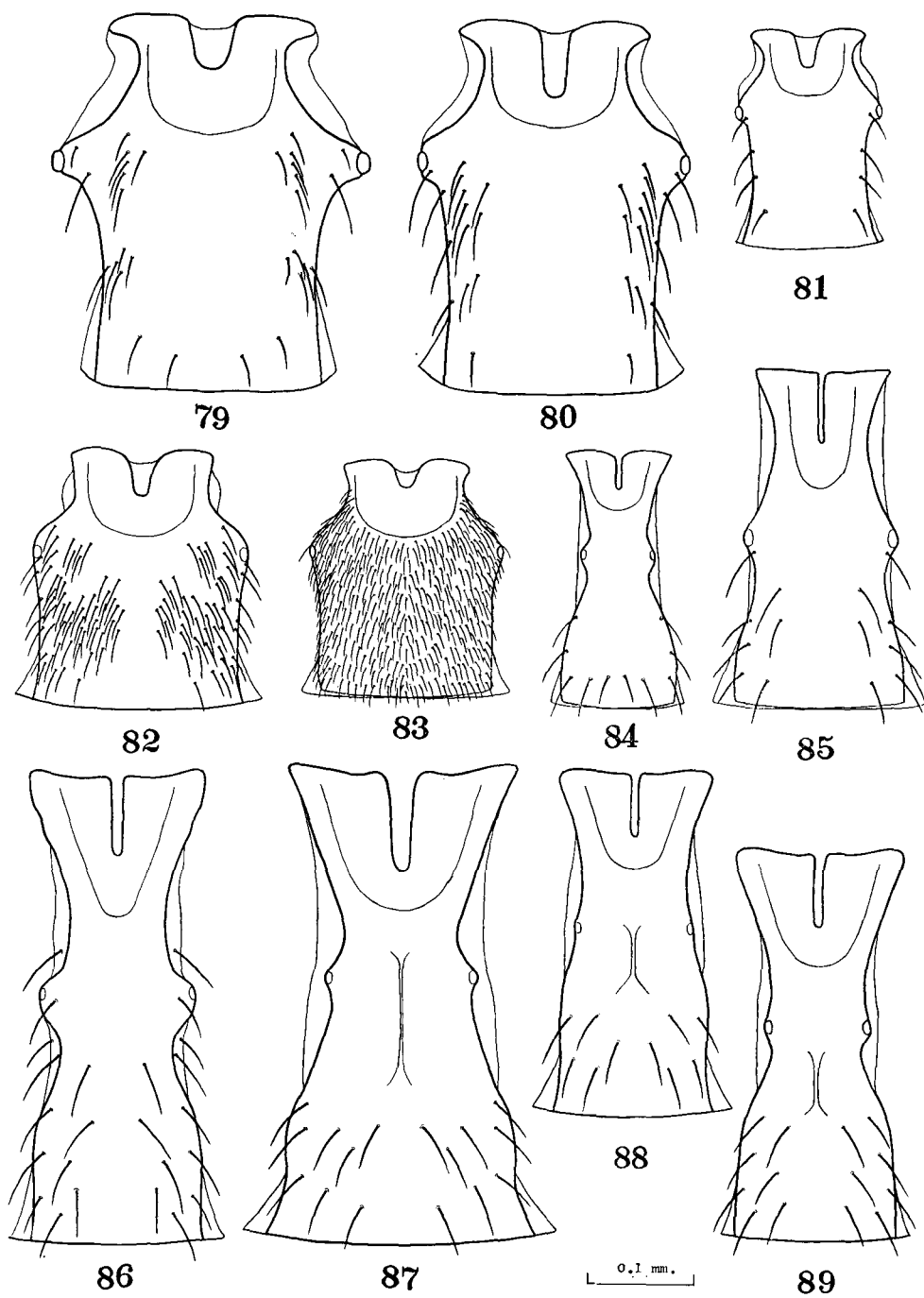


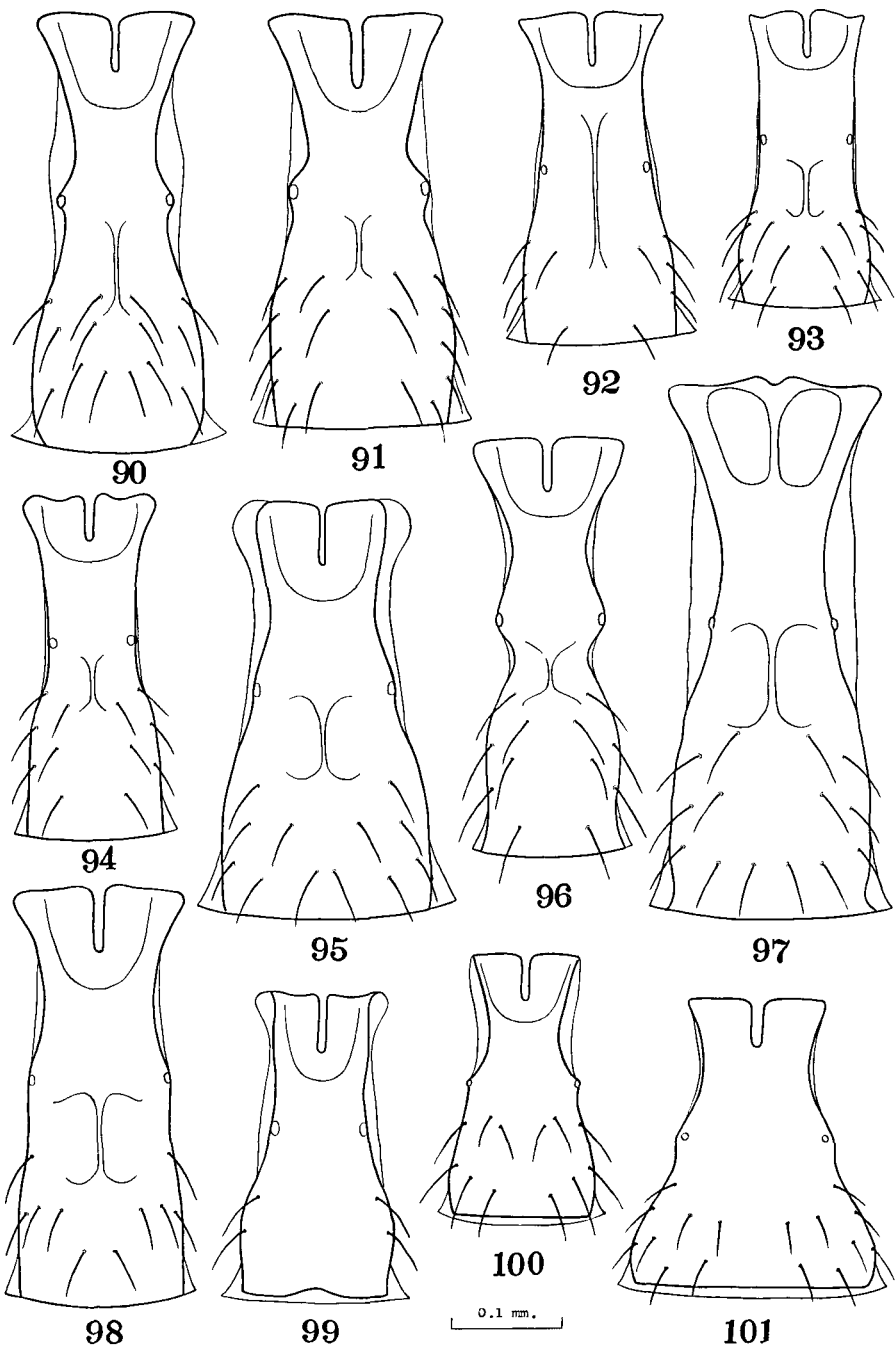


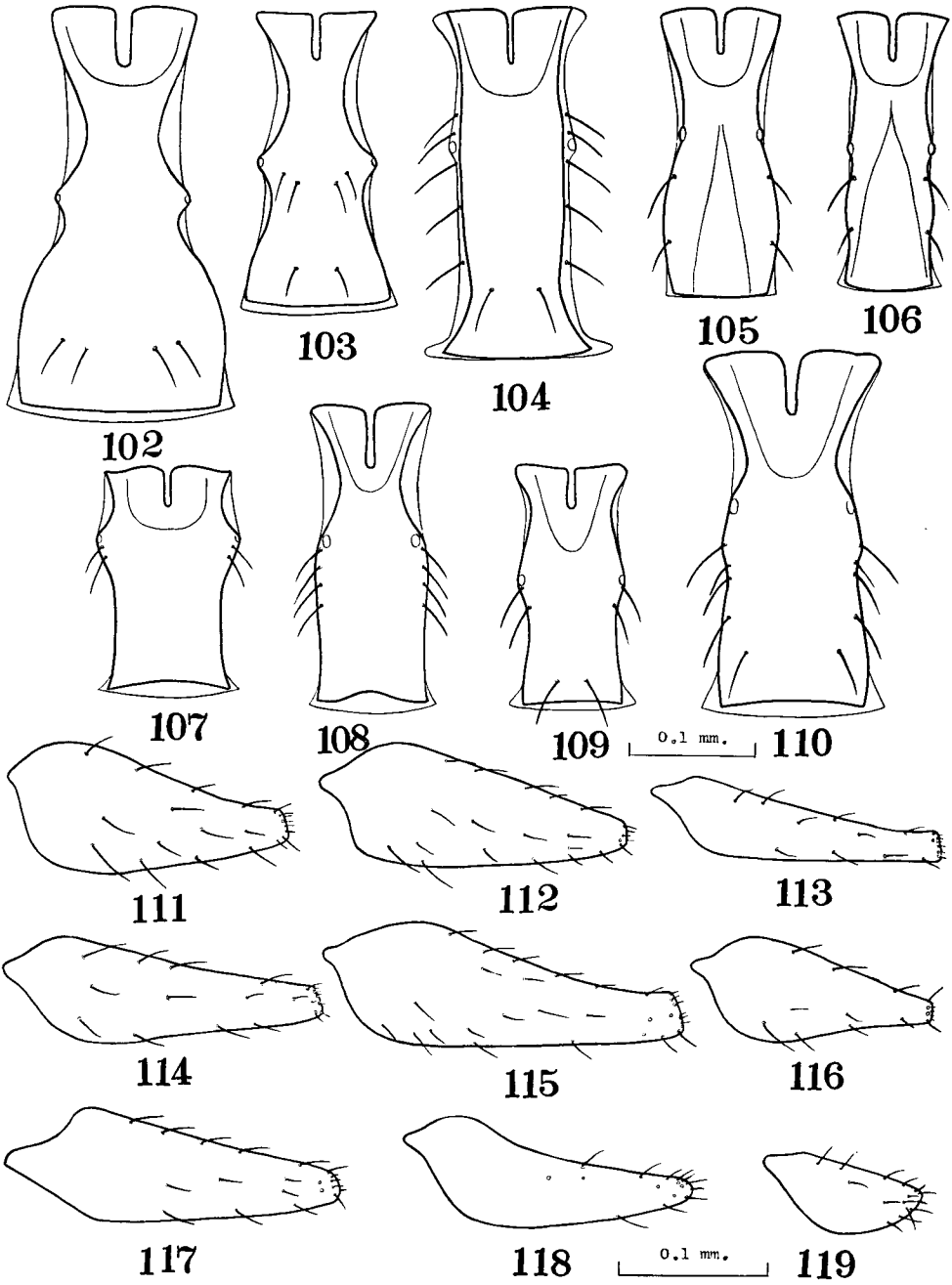


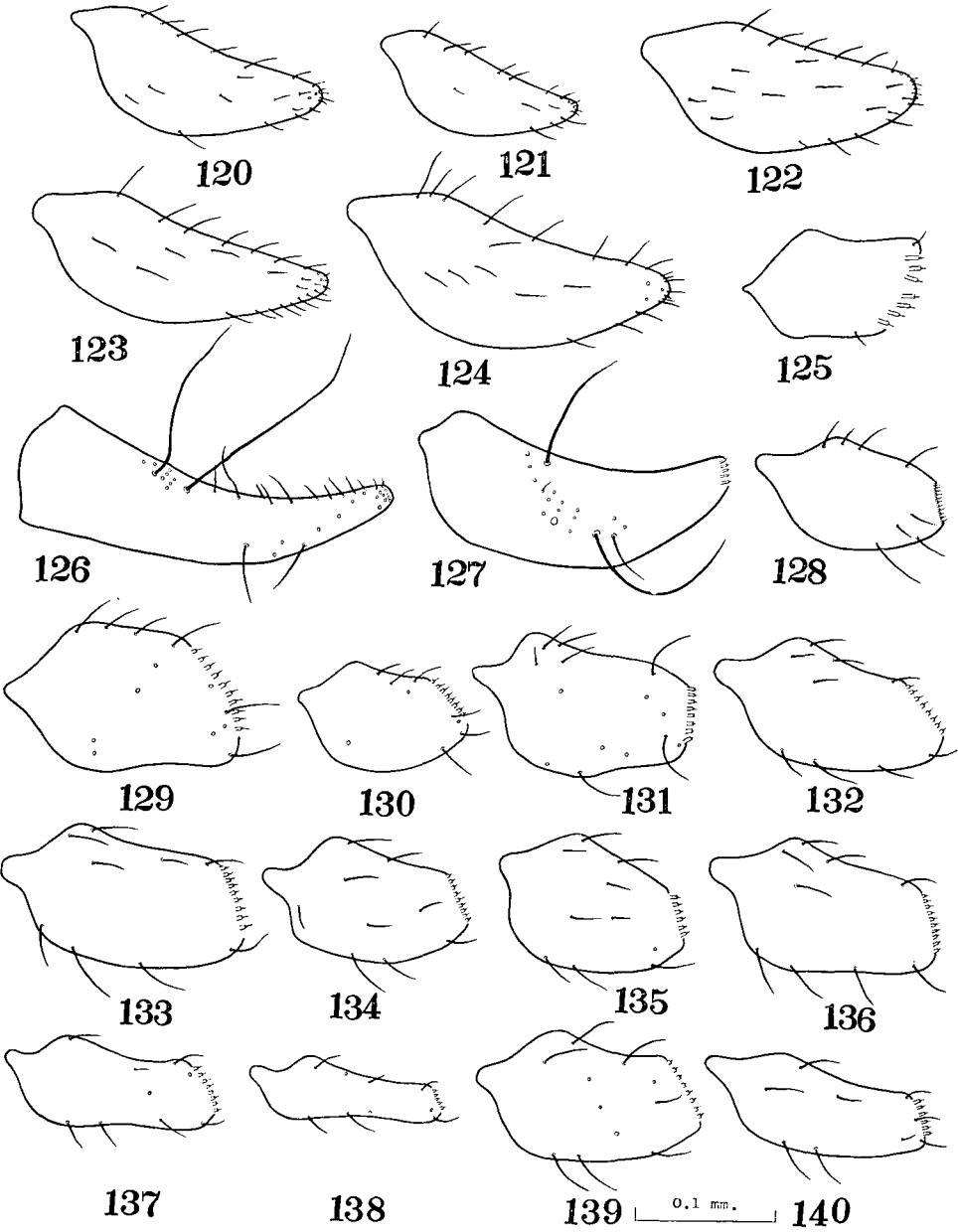


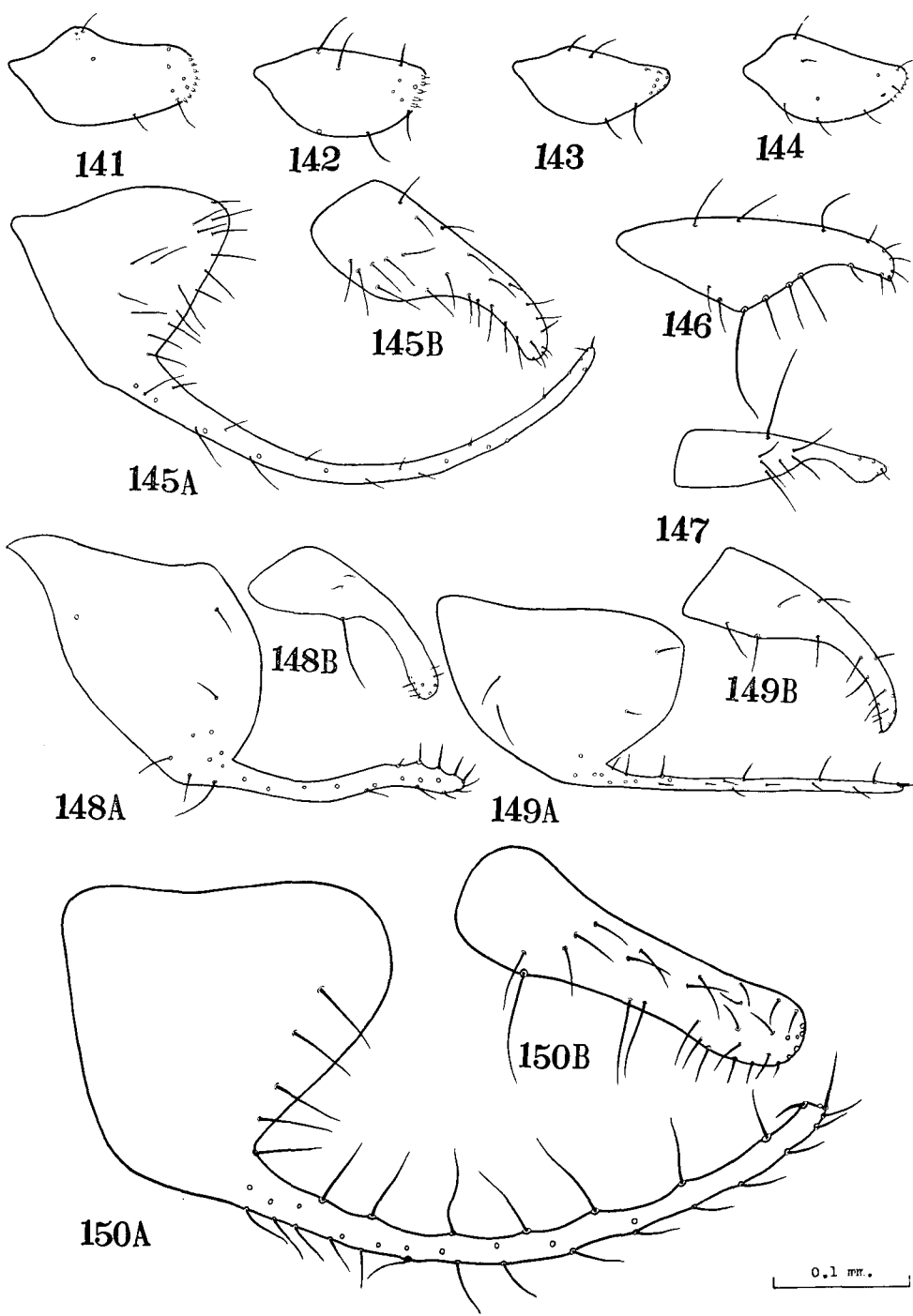


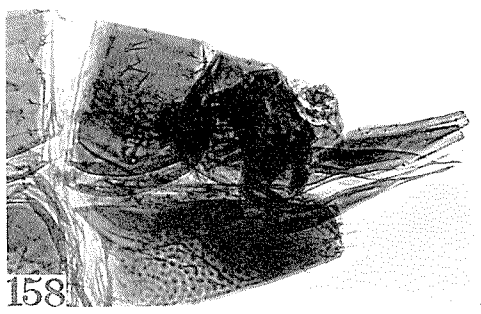
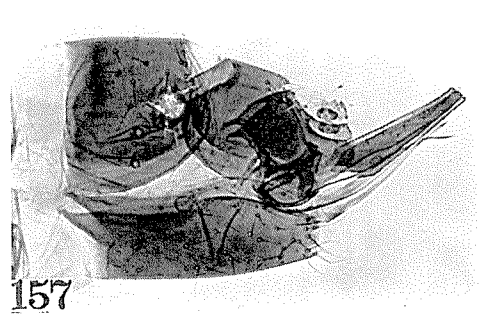
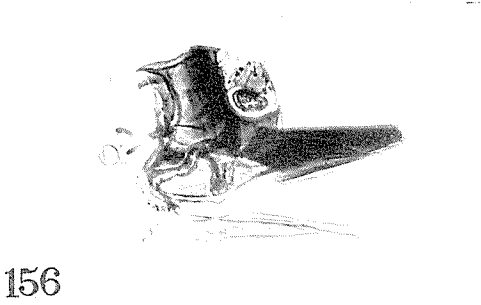
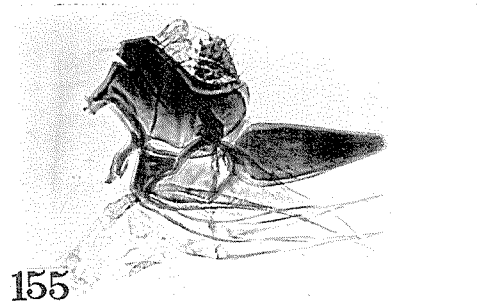
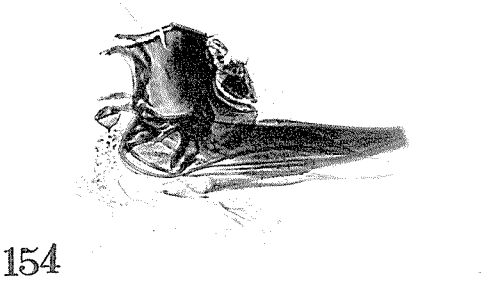
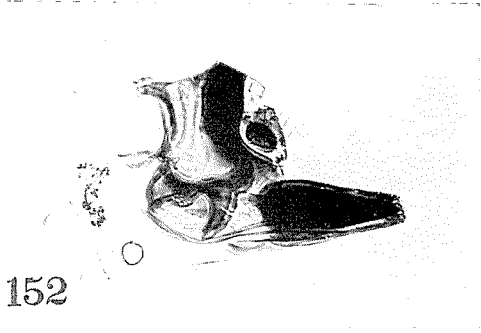
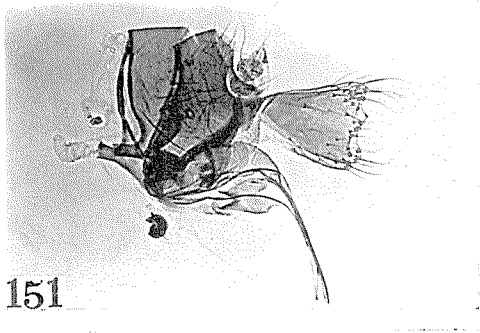




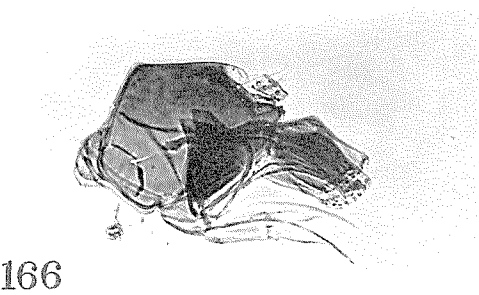
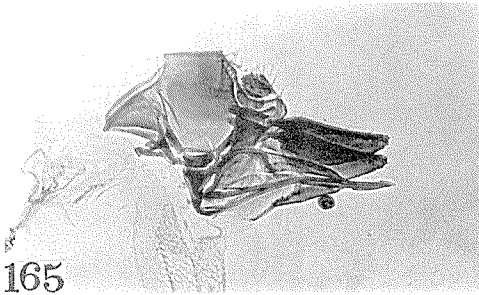
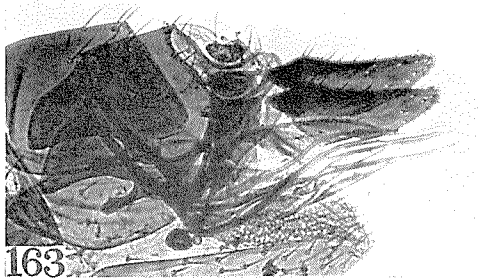
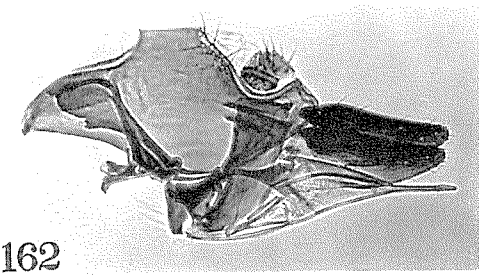
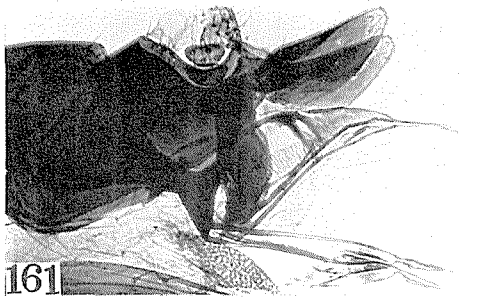
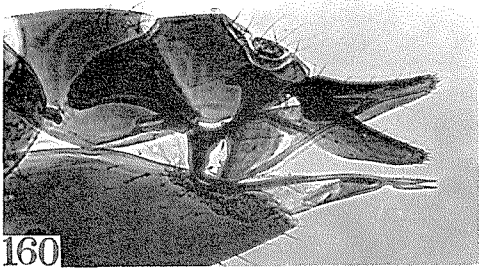




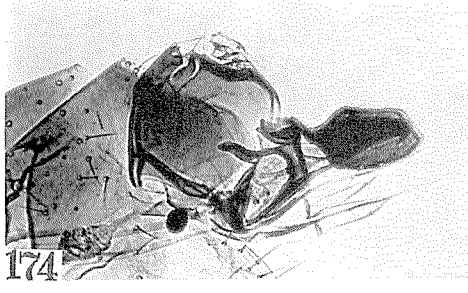
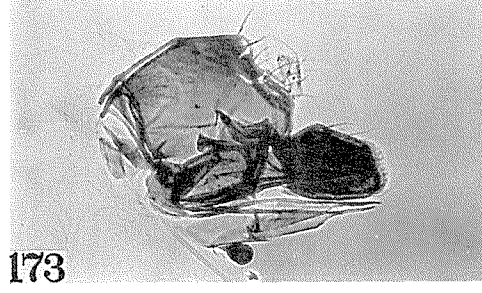
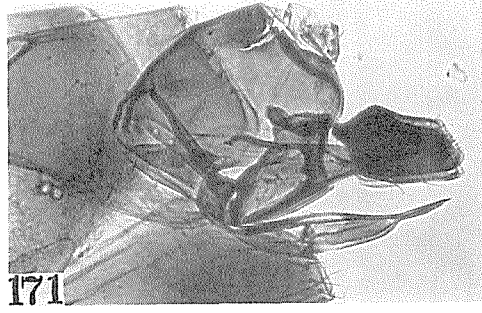
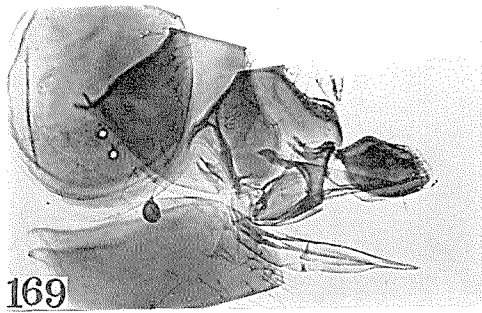
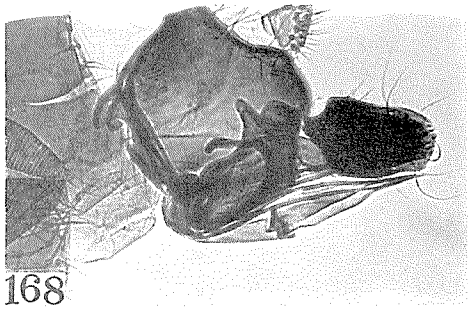
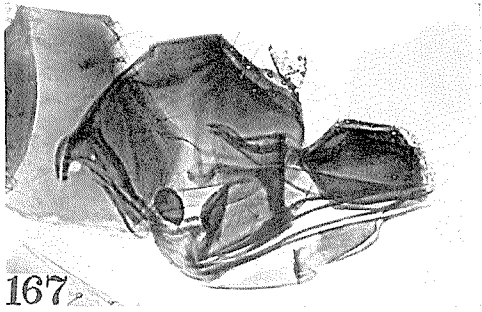




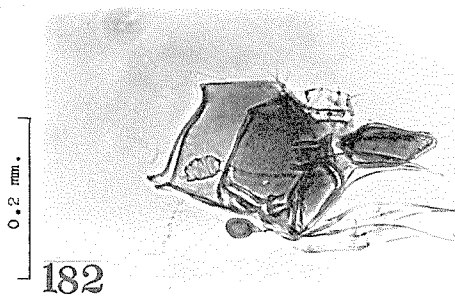
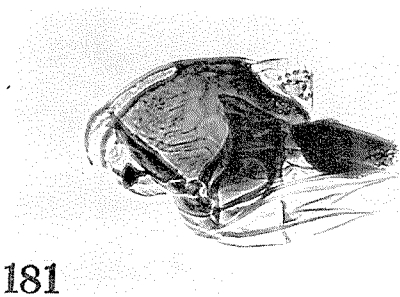
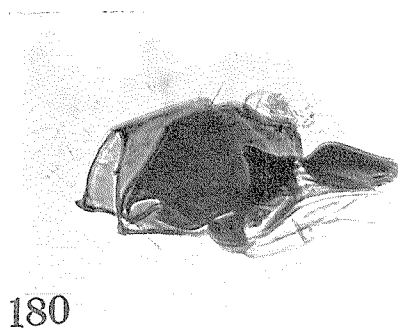
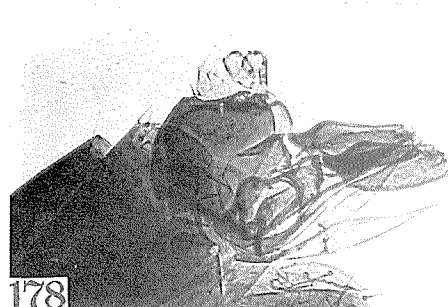
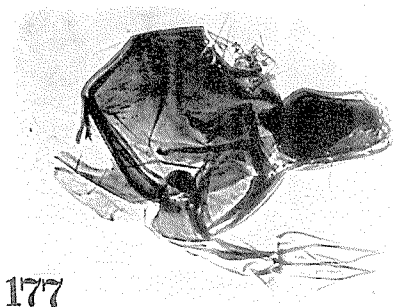
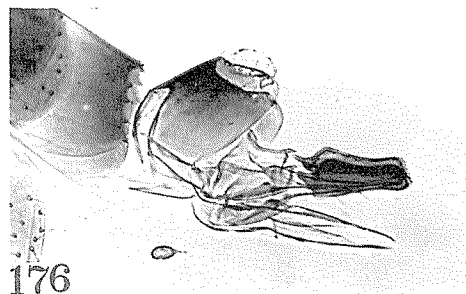
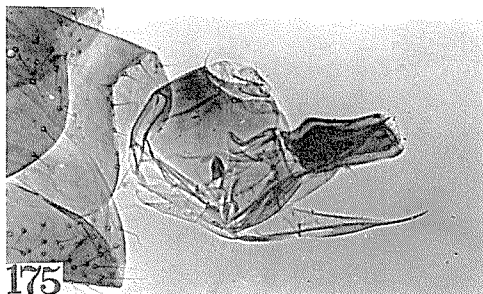
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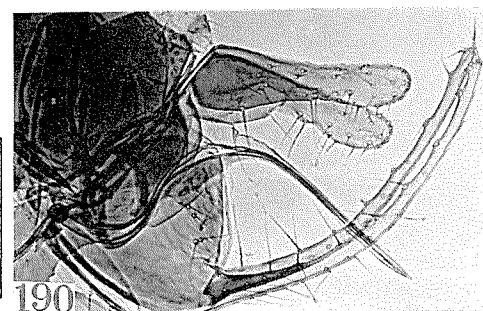
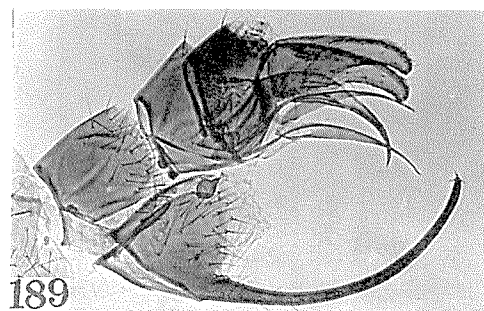
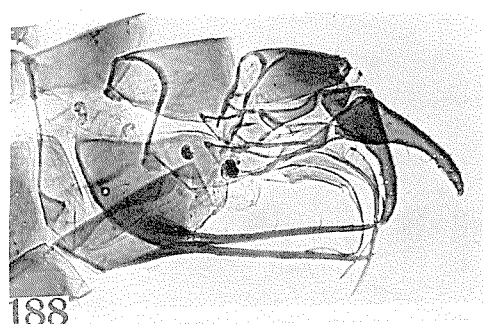
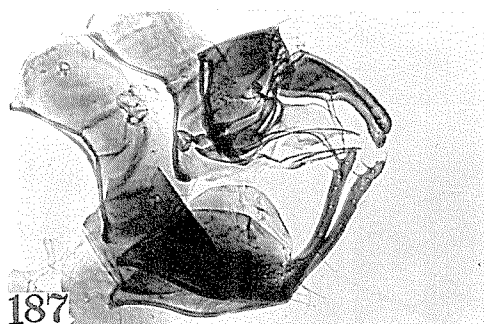
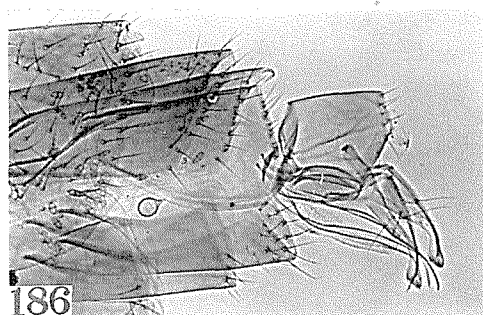
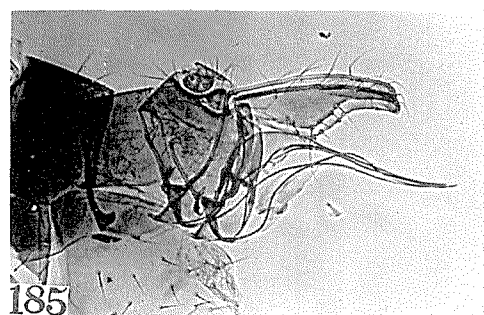
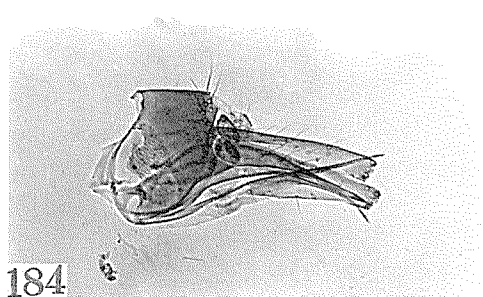
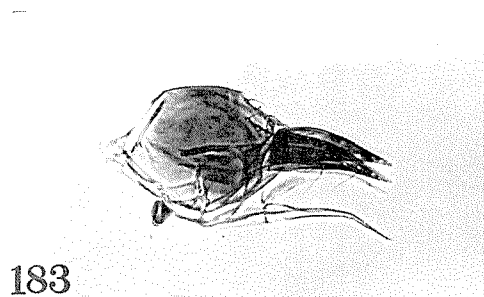


0.2 mm.

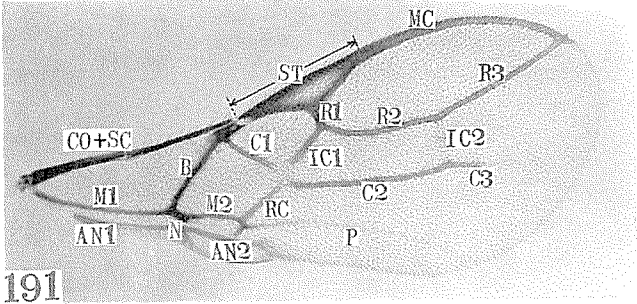


0.2 mm.

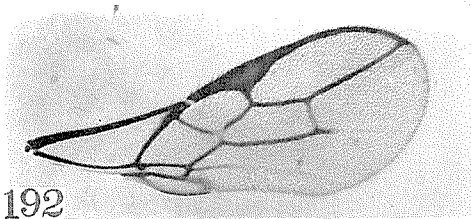




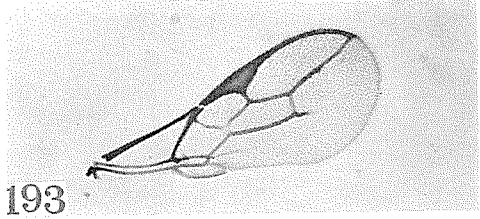
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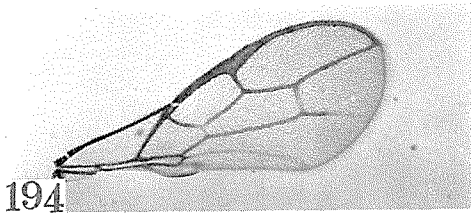
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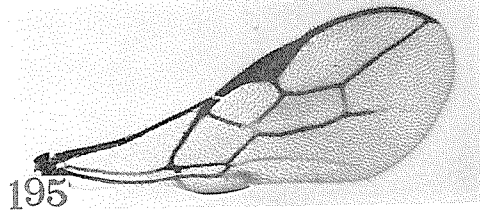
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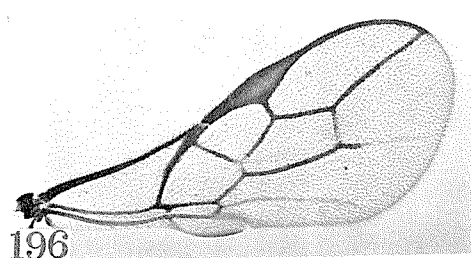
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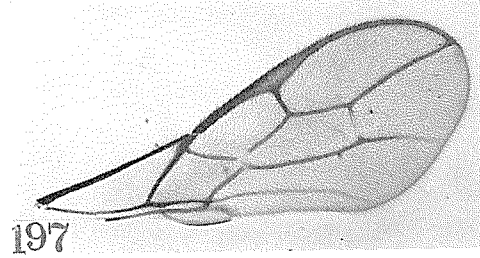
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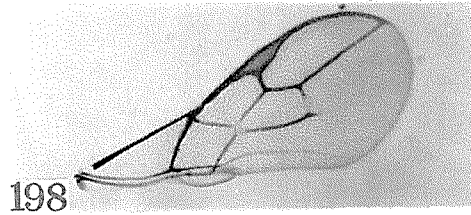
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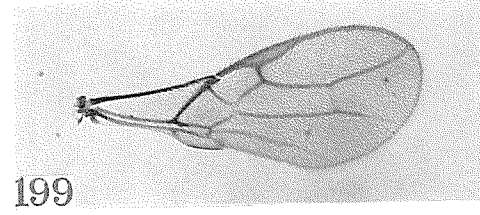
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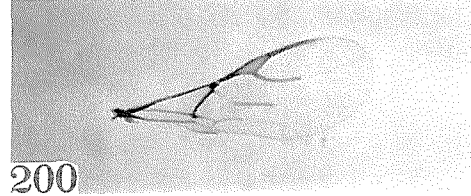
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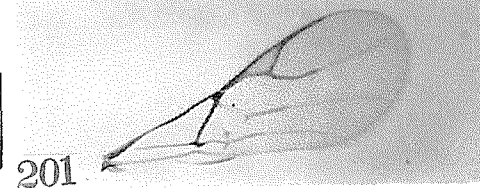
198



199

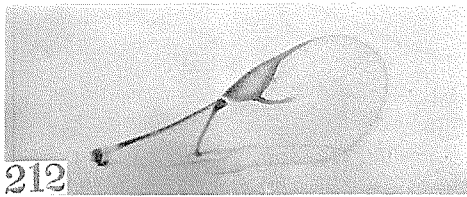
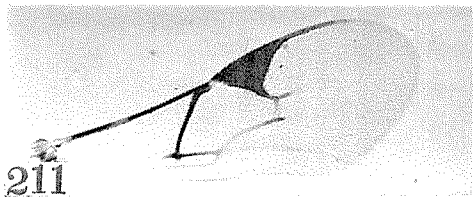
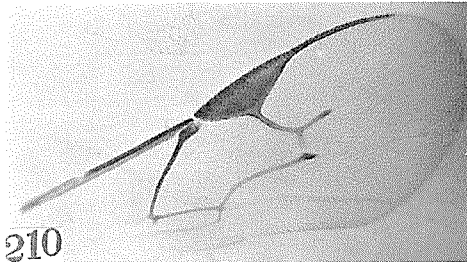
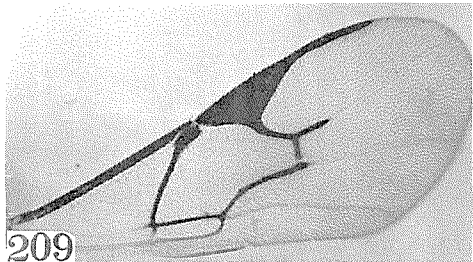
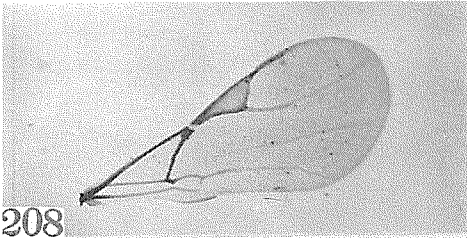
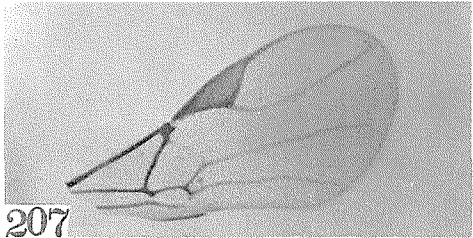
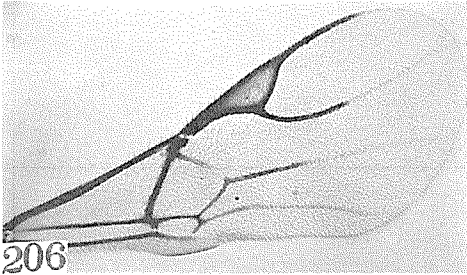
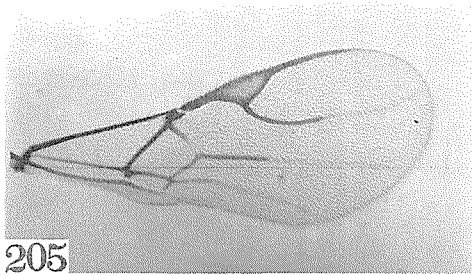
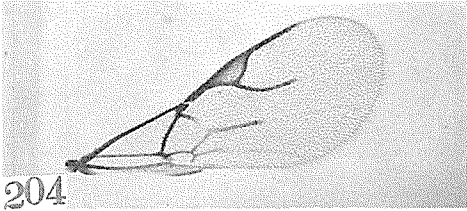
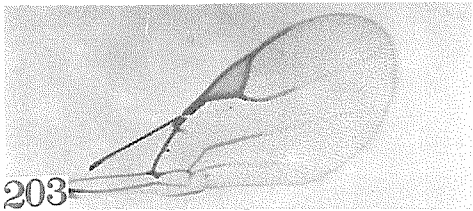
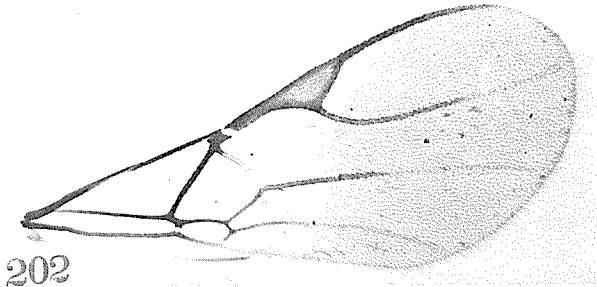


200

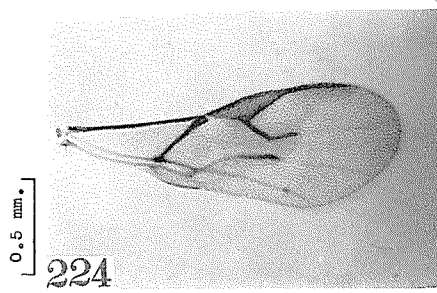
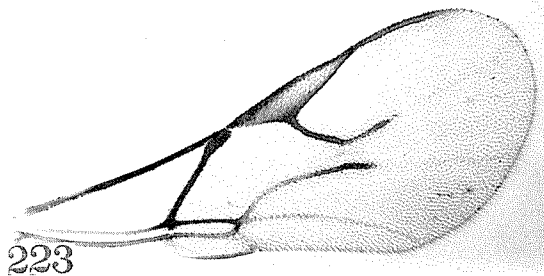
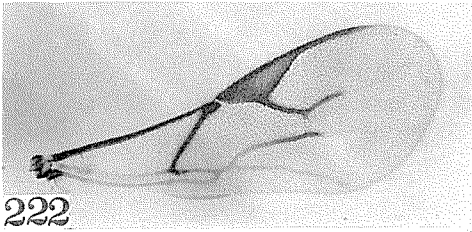
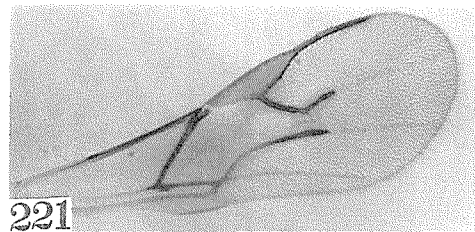
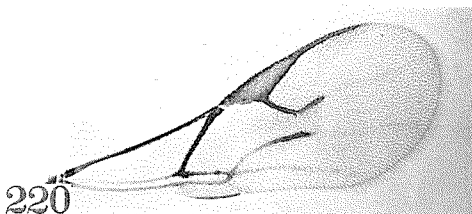
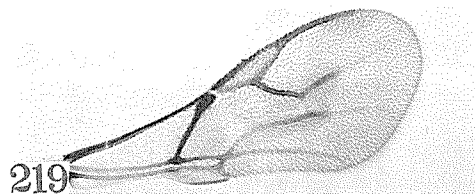
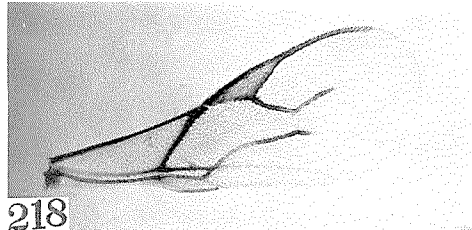
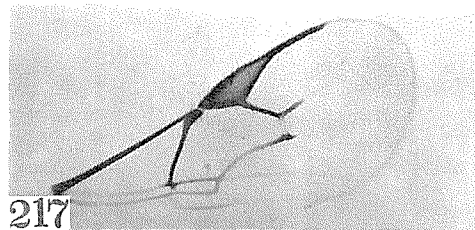
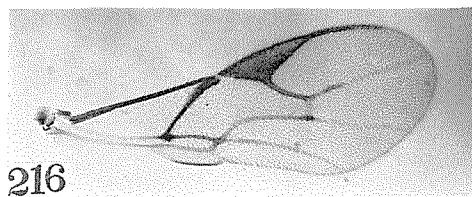
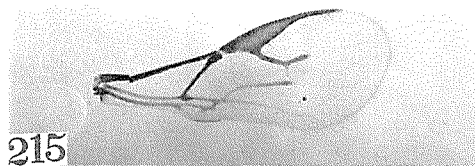
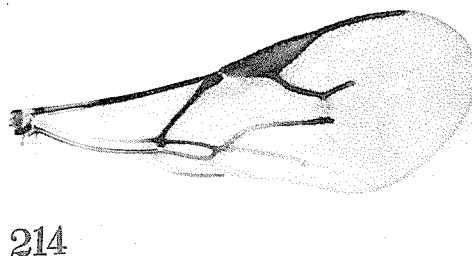
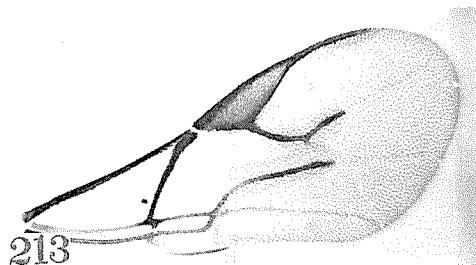


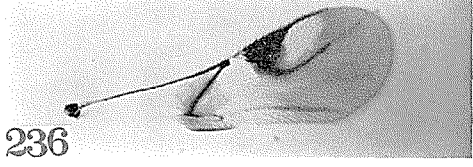
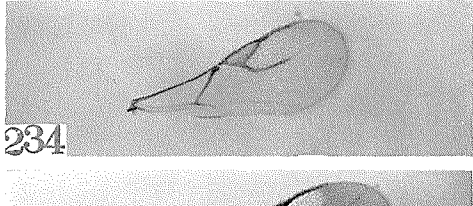
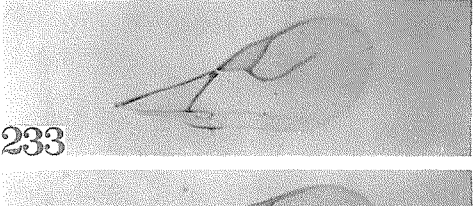
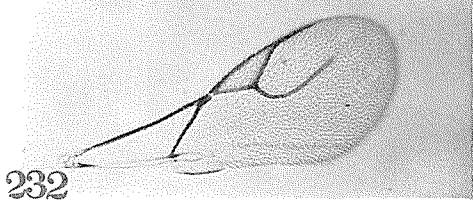
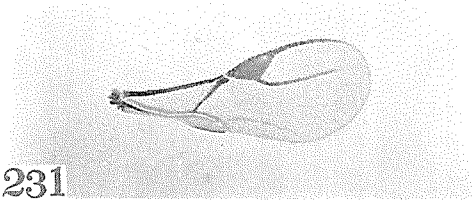
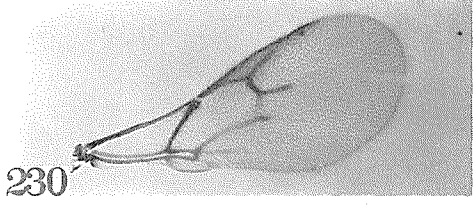
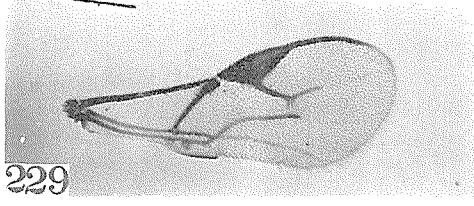
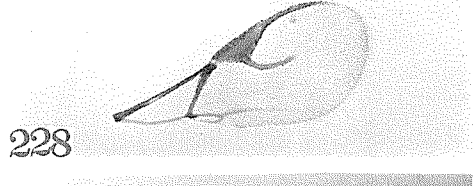
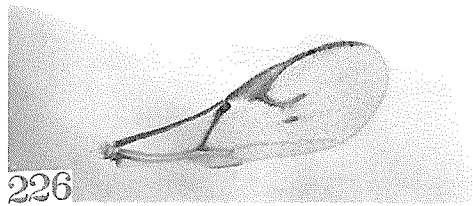
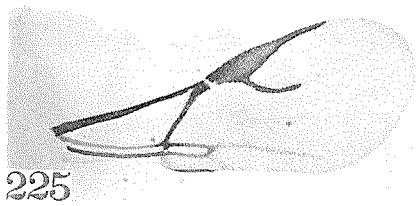
201

0.5 mm.



0.5 mm.





0.5 mm.

