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# A TAXONOMIC STUDY OF THE SUBFAMILY CALLIPTERINAE IN JAPAN (HOMOPTERA : APHIDIDAE)

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## Introduction

The Callipterinae, a relatively small and rather primitive subfamily of the family Aphididae, are widely distributed over the world, including more than 450 species. This subfamily, characterized by the knobbed or semi-circular cauda and the often bilobed anal plate, is represented by more than 70 species in Japan and they are mainly eastern Palaearctic with some Oriental species. The aphids of this group live mostly in monophagous holocycle. Moreover, so far as their habits are known most of the species pass their lives on the foliages, young shoots and branches of broad-leaved trees, some others occurring on conifers, bamboos and sedges and a few, such as *Therioaphis trifolii* (Monell), attack pasturage (Leguminosae).

From the economic standpoint, the Aphididae are one of the most important groups of insects in agriculture, because sometimes they cause serious damages to their host plants by sucking sap and, moreover, in transmitting plant viruses. In this subfamily about 25 species have been known to be virus vectors, of which one, *Therioaphis maculata* (Buckton), is well known as a vector of the clover vein mosaic virus.

Insofar as the present investigation goes, more than 60 species of this subfamily have been recorded from Japan by Matsumura (1917, 1919), Essig & Kuwana (1918), Shinji (1917-1944), Takahashi (1919-1961), Moritsu (1953), Higuchi (1968, 1969), etc. Up to the present time, however, no general taxonomic work has been published except for the "Monograph of Japanese Aphids" given by Shinji (1941). Since 1965 I have carried on a taxonomic study of this subfamily and this paper is the first attempt to review and arrange the species of Japan according to the recent taxonomic knowledge. In this paper will be given 83 species, of which 9 are new to science and 7 new to Japan. Furthermore, 2 new genera are described herein. All the types of the new species described in this paper are deposited in the collection of the Entomological Institute, Hokkaido University.

Before preceding further, I wish to express my sincere thanks to Prof. C. Watanabe of the Hokkaido University for his continuous kind guidance and encouragement during the course of the present study. I am especially obliged to Dr. D. Hille Ris Lambers of Bennekom, Netherlands, Dr. V. F. Eastop of the British Museum, England, and Dr. F. W. Quednau of the Forest Research Laboratory, Canada, for the valuable specimens for comparison and for their helpful suggestions. Many thanks are also

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### Classification

#### Family **Aphididae**

#### Subfamily **Callipterinae**

This subfamily is represented in Japan by thirty-seven genera, which may be placed in the following 8 genus-groups:—

*Myzocallis* group (= *Callaphidini* of Börner, 1952)

*Chromocallis*, *Mesocallis*, *Myzocallis*, *Neochromaphis*, *Paratinocallis* (gen. nov.), *Recticallis*, *Sappocallis*, *Shivaphis*, *Takecallis*, *Tiliaphis*, *Tinocallis*, and *Tuberculatus*

*Symydobius* group (= *Phyllaphidini* of Börner, 1952)

*Betacallis*, *Betulaphis*, *Boernerina*, *Calaphis*, *Callipterinella*, *Clethrobius*, *Eucерaphis*, *Hannabura*, *Monaphis*, *Neobetulaphis*, *Neocalaphis* and *Symydobius*

*Diphyllaphis* group

*Diphyllaphis*, *Machilaphis*, and *Phyllaphis*

*Saltusaphis* group (= *Saltusaphidini* of Börner, 1952)

*Subsaltusaphis* and *Thripsaphis*

*Yamatocallis* group (= *Drepanosiphini* of Börner, 1952)

*Yamatocallis*

*Chaitophorus* group (= *Chaitophorini* of Eastop, 1966)

*Chaitophorus* and *Periphyllus*

*Trichaitophorus* group

*Trichaitophorus* and *Yamatochaitophorus* (gen. nov.)

*Neophyllaphis* group (= *Neophyllaphidini* of Eastop, 1966)

*Neophyllaphis*

Isolated genera

*Dasyaphis* and *Parachaitophorus*

#### ***Myzocallis* group**

This is the largest group of this subfamily, being characterized by the combination of the following characters:—Apterae viviparae not produced except for *Mesocallis* and *Shivaphis*. Alatae mostly bearing only inconspicuous body setae. Processus terminalis 0.1–2.0 times as long as base of 6th antennal segment. Ultimate rostral segment with 2–16 secondary setae. Apical tibial setae differing from other tibial setae. First tarsal segment with 5–7 ventral setae and a pair of dorsal setae. Empodial setae flattened. Eighth abdominal segment with 2–20 setae. Rudimentary gonapophyses 1

or 2 in number. Wax plates mostly absent.

This group differs from the *Symydobius* group by the absence of pleural abdominal setae in the embryonic stage. In the embryo examined the shape of dorsal setae is capitate except for *Shivaphis* and the spinal setae are not arranged in parallel rows except for *Myzocallis*, *Shivaphis*, *Takecallis*, and *Tuberculatus*. There is no remarkable difference between *Recticallis* and *Pterocallis* in the embryonic stage. *Shivaphis* is represented by only a single species, *Shivaphis celti* Das, which is widely distributed in the Oriental region. It has been referred to the *Symydobius* group by most authors. Examining the present material, however, I have been convinced that the genus should be placed in this group.

### 1. Genus *Chromocallis* Takahashi

References. Takahashi 1961 b: 253.

Type-species. *Chromaphis nirecola* Shinji, 1933.

This genus is closest to *Callaphis* Walker of Europe, but it is differentiated from the latter by the longer processus terminalis, by the abdomen without pigmented sclerites, and by the smaller primary sensoria. It is represented by only a single species occurring in Japan.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 41, H, the setae being long, capitate; spinal setae variable in length, not arranged in parallel rows; pleural setae absent. Cornicle visible.

Host plants: Ulmaceae.

Distribution: Eastern Asia.

#### 1. *Chromocallis nirecola* (Shinji)

References. Shinji 1933 d: 210 [*Chromaphis*]; ibid. 1941: 339 [*Chromaphis*]; Takahashi 1961 b: 253.

Only the alate viviparous female of the species has hitherto been described. On the basis of the present specimens a brief description of the alate male is given as follows:—

Alate male: Body smaller, about 1.69 mm. including cauda. Antennae about 0.8 as long as body; 3rd segment with 20 or 21 secondary sensoria, 4th with 3 or 4, 5th with 5–7, and 6th with 2–4; length of 3rd–6th segments in proportion 32.5:16.5:15.5:11+7. Ultimate rostral segment about 0.75 as long as 2nd segment of hind tarsus. Abdomen with black patches on each segment, but the patches on 3rd–6th segments being very small. Dorsal setae shorter than in alate viviparous female, measurements of maximal setae in mm. as follows:—head: 0.019, antenna (3rd seg.): 0.015, abdomen (6th seg.): 0.030, leg (hind tibia): 0.078.

Alate viviparous female: Measurements of 10 specimens in mm. Body 2.84 (2.44–3.12); antennal segments (1st–6th): 0.07 (0.06–0.08), 0.06 (0.06–0.07), 0.54 (0.46–0.60), 0.27 (0.21–0.29), 0.25 (0.18–0.29), 0.16 (0.12–0.19)+0.08 (0.06–0.10); ultimate rostral segment 0.12 (0.11–0.12); hind femur 0.73 (0.68–0.82); hind tibia 1.80 (1.65–1.95); 2nd segment of hind tarsus 0.15 (0.14–0.16); longest seta on head 0.036 (0.027–0.042), that on 3rd antennal segment 0.027 (0.019–0.038), that on 6th abdominal segment 0.031 (0.023–0.039), that on hind tibia 0.152 (0.130–0.169).

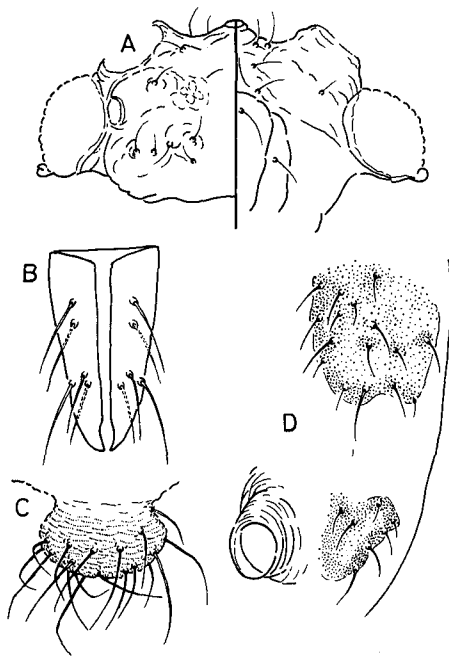


Fig. 1. *Chromocallis nirecola* Shinji. Alate viviparous female:—A, head; B, ultimate rostral segment; C, cauda; D, cornicle and marginal sclerite.

*Mesocallis* Matsumura was erected with *Myzocallis sawashibae* Mats., 1917, as the type-species, but has since been neglected, as its few species known have been placed in *Myzocallis*, *Nippochaitophorus*, *Tinocallis*, etc. In general appearance this genus is very similar to *Tinocallis* Matsumura, but it differs from the latter by the absence of finger-like tubercles on body.

Embryo: Dorsal abdominal chaetotaxy as shown in Figs. 41, A & B, the setae being long, capitate; spinal setae variable in length, not arranged in parallel rows; pleural setae absent. Cornicle visible.

Host plants: Betulaceae.

Distribution: Eastern Asia.

#### Key to the Japanese species of *Mesocallis*

Alate viviparous female

1. Head with vertex pigmented. Third antennal segment wholly pigmented. Ultimate rostral segment 1.2-1.4 times as long as 2nd segment of hind tarsus, with 6-12 secondary setae. Each abdominal segment with 2-5 dorsal setae excluding marginal ones. . . . . 1. *pieleae* Matsumura
- Head with vertex not pigmented. Third antennal segment not pigmented except at apex.

Specimens examined\*: Many alate viviparous females, Sapporo, Hokkaidô, 13-vi-1967, ex *Ulmus davidiana* var. *japonica*; Ônuma, Hokkaidô, 18-vi-1967, ex *Ulmus davidiana* var. *japonica* f. *suberosa*. 1 alate male, Sapporo, Hokkaidô, 28-ix-1967, ex *Ulmus davidiana* var. *japonica*.

Host plants: *Ulmus campestris* var. *major* (Rehd.) (after Shinji, 1941), *Ulmus davidiana* var. *japonica* (Rehd.), *Ulmus davidiana* var. *japonica* f. *suberosa* Nakai.

Distribution: Japan (Hokkaidô; Honshû).

#### 2. Genus *Mesocallis* Matsumura

References. Matsumura 1919: 103; ibid. 1919: 104 [*Neocallis*]; Takahashi 1961 b: 247 [*Nippochaitophorus*].

Synonyms. *Neocallis* Matsumura, 1919 [type-species: (*Neocallis carpinicola* Matsumura, 1919) = *Mesocallis sawashibae* (Matsumura, 1917)]. **Syn. nov.** *Nippochaitophorus* Takahashi, 1961 [type-species: (*Nippochaitophorus moriokaensis* Takahashi, 1961) = *Mesocallis sawashibae* (Matsumura, 1917)]. **Syn. nov.**

Type-species. *Myzocallis sawashibae* Matsumura, 1917.

\* The specimens are collected by the author unless otherwise stated.

Ultimate rostral segment at most as long as 2nd segment of hind tarsus, with 2-4 secondary setae. Each abdominal segment with only 2 dorsal setae excluding marginal ones. . . . .  
 . . . . . 2. *sawashibae* (Matsumura)

1. ***Mesocallis pteleae*** Matsumura

References. Matsumura 1919: 103; Shinji 1935a: 284 [*Agrioaphis hashibamii*]; ibid. 1941: 1148 [*Myzocallis colyricola*]; Tao 1963: 57 [*Myzocallis hashibamii*].

Synonyms. *Agrioaphis hashibamii* Shinji, 1935. **Syn. nov.** *Myzocallis colyricola* Shinji, 1941. **Syn. nov.**

Alate viviparous female: Body pale yellow in life. In mounted specimens, head pale; vertex fuscous. Antennae fuscous; 4th on basal half and 5th on basal half pale. Abdomen pale. Cornicle and cauda pale. Fore legs: tibiae and tarsi fuscous; middle legs: tibiae at apex and tarsi fuscous; hind legs: femora at apex, tibiae and tarsi fuscous. Wings (fig. 2, F): anal vein bordered with brown. Body about 1.6 mm. in length. Head (fig. 2, A) smooth, without tubercles on dorsum; cephalic setae inconspicuous, the longest seta 0.2-0.6 as long as middle breadth of 3rd antennal segment. Antennae short, 0.62 as long as body; 3rd segment (fig. 2, C) imbricated, with 7-14 (mostly 12) secondary sensoria; processus terminalis 0.79-1.0 as long as base of 6th antennal segment; length of 3rd-6th segments in proportion 21:13:12:6+6. Antennal setae short, at most 1/4 as long as middle breadth of 3rd antennal segment; 3rd segment with 5-8 setae. Clypeus with a pair of anterior setae; mandibular lamina with a seta. Rostrum not reaching middle coxae; ultimate segment (fig. 2, D) slender, 1.23-1.38 (mostly 1.27) times as long as 2nd segment of hind tarsus, with 6-12 setae besides apical ones. Pronotum and mesonotum without spinal tubercles; prothoracic setae about equal to cephalic setae in length. Legs: tibiae with spinules on distal 6/7; 1st tarsal segment (fig. 2, E) with 5 setae ventrally and 2 dorsally. Abdomen sometimes with small tubercles on anterior segments, but without finger-like tubercles. Dorsal abdominal chaetotaxy as shown in Fig. 2, B; 2nd-5th segments with 2-6 setae (spinal and pleural), of which the longest one is 0.4-0.8 as long as middle breadth of 3rd antennal segment; marginal seta of 6th segment not attached to the base of cornicle; anterior segments with marginal tubercles, the tubercles on 3rd and 4th segments being much larger than the rest, but much smaller than cornicles. Cornicles 0.5-0.8 as long as 2nd segment of hind tarsus, at most 4/5 as long as base of 6th antennal segment, without flange. Cauda knobbed and anal plate bilobed, both bearing only elongate setae with pointed apices.

Specimens examined: Some alate viviparous females (syntypes), Sapporo, Hokkaidô, 23-vi-1917, ex *Betula* sp., S. Matsumura leg. Many alate viviparous females

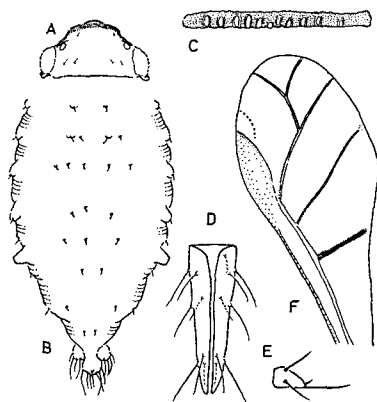


Fig. 2. *Mesocallis pteleae* Matsumura. Alate viviparous female:—A head; B, abdomen; C, 3rd antennal segment; D, ultimate rostral segment; E, 1st segment of hind tarsus (lateral view); F, fore wing.

taken at the following localities in Honshû: Oirase, Aomori-ken, 21-vi-1967, ex *Corylus sieboldiana*; Morioka, Iwate-ken, 4-viii-1960, ex *Corylus* sp., R. Takahashi leg.; Sendai, Miyagi-ken, 27-vi-1967, ex *Corylus sieboldiana* var. *mandshurica*; Tôkyô, 3-viii-1957, ex *Carpinus* sp., R. Takahashi leg.; Hirayu, Gifu-ken, 12-viii-1959, ex *Alnus matsumurae*, R. Takahashi leg.; Ôsaka, 29-vi-1959, ex *Alnus* sp., R. Takahashi leg.

Host plants: *Alnus matsumurae* Callier, *Carpinus* sp., *Corylus heterophylla* var. *thunbergii* Blume (after Shinji, 1935), *Corylus sieboldiana* Blume, *Corylus sieboldiana* var. *mandshurica* (Maxim.). Matsumura (1919) gives *Ptelea trifoliata* as host plant. This may not be a true host of this aphid. In China *Alnus cremstogyne* and *Betula* sp. have been recorded as hosts (after Tao, 1963).

Distribution: Japan (Hokkaidô; Honshû); China.

Having read the original description of *Agrioaphis hashibamii* Shinji, I have been convinced that it should be suppressed as a synonym of *Mesocallis pteleae* Matsumura.

## 2. *Mesocallis sawashibae* (Matsumura)

References. Matsumura 1917: 374 [*Myzocallis*]; ibid. 1919: 103.

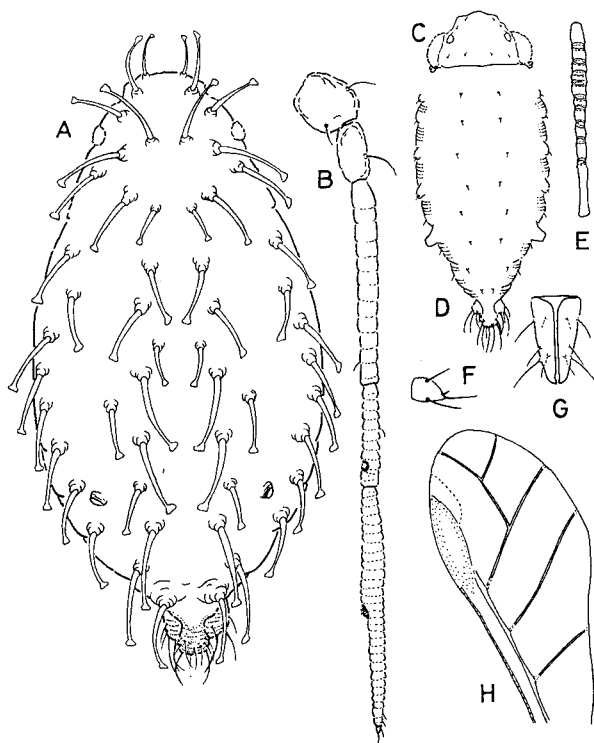
Synonyms. *Neocallis carpinicola* Matsumura, 1919. **Syn. nov.** *Nippochaitophorus moriokaensis* Takahashi, 1961. **Syn. nov.**

Alate viviparous female: Head, thorax and abdomen pale yellow. Antennae pale yellow; 3rd-5th segments at apex fuscous. Legs pale dirty. Body about 1.5 mm. in length. Head (fig. 3, C) smooth, without tubercles on dorsum; cephalic setae short, the longest seta 0.43-0.75 as long as middle breadth of 3rd antennal segment. Antennae short, 0.63 as long as body; 3rd segment (fig. 3, E) not imbricated, with 7-9 (mostly 8) secondary sensoria; processus terminalis 1.0-1.2 times as long as base of 6th antennal segment; length of 3rd-6th segments in proportion 20:14:11:6+6. Antennal setae at most 3/4 as long as middle breadth of 3rd antennal segment; 3rd segment with 3-5 setae. Clypeus with a pair of anterior setae; mandibular lamina with a seta. Rostrum reaching a little past fore coxae; ultimate segment (fig. 3, G) 0.8-0.9 as long as 2nd segment of hind tarsus, with 2-4 setae besides apical ones. Prothoracic setae as long as or a little shorter than cephalic setae. Legs: tibiae with spinules on distal 2/5-3/4; 1st segment of all tarsi with 5 setae ventrally and 2 setae dorsally. Abdomen (fig. 3, D) not having finger-like tubercles; 2nd-4th segments with marginal tubercles. Dorsal abdominal setae inconspicuous; the marginal seta of 6th not attached to the base of cornicle. Cornicles 0.5-0.6 as long as 2nd segment of hind tarsus, at most 6/11 as long as base of 6th antennal segment, without flange. Cauda knobbed and anal plate bilobed, both bearing only elongate setae with pointed apices.

Oviparous female: Body about 12.5 mm., with many long capitate setae. Head with 8 dorsal setae which are 7 or 8 times as long as middle breadth of 3rd antennal segment. Antennae 5- or 6-segmented, about 0.42 as long as body; length of 3rd-5th segments in proportion 16.2:7:7.5+5. Antennal setae short, at most 1/2 as long as middle breadth of 3rd antennal segment. Ultimate rostral segment 0.7-0.9 as long as 2nd segment of hind tarsus, with a pair of secondary setae. Abdomen: 1st-6th segments with 4 long, capitate setae including marginal ones; the longest seta on 6th segment 8-11 times as long as middle breadth of 3rd antennal segment. Hind tibiae bearing about 20 pseudosensoria.

Apterous viviparous female: Measurements of 5 specimens (syntypes of *Nippochaitophorus moriokaensis* Tak.) in mm. Body 0.83 (0.79–0.84); antennal segments (1st–5th): 0.03 (–), 0.03 (–), 0.11 (0.11–0.13), 0.05 (0.05–0.06), 0.07 (–)+0.06 (0.06–0.07); ultimate rostral segment 0.05 (0.05–0.06); hind femur 0.15 (0.14–0.17); hind tibia 0.25 (0.23–0.25); 2nd segment of hind tarsus 0.07 (–); longest seta on head 0.072 (0.057–0.075), that on 3rd antennal segment 0.005 (–), that on 6th abdominal segment 0.0136 (0.0129–0.0152), that on hind tibia 0.023 (0.023–0.026).

Specimens examined: 5 alate viviparous females, Sapporo, Hokkaidô, 18–x–1915, ex *Carpinus cordata*, S. Matsumura leg.; Morioka, Iwate-ken, 24–vi–1967, ex *Carpinus*



**Fig. 3.** *Mesocallis sawashibae* (Matsumura). Apterous viviparous female:— A, outline of the aphid; B, antennae. Alate viviparous female:— C, head; D, abdomen; E, 3rd antennal segment; F, 1st segment of hind tarsus (lateral view); G, ultimate rostral segment; H, fore wing.

*cordata*. Some apterous viviparous females, Morioka, Iwate-ken, 4–viii–1960, R. Takahashi leg. (syntypes of *Nippochaitophorus moriokaensis* Tak.). Some oviparous females, Sapporo, Hokkaidô, 18–x–1915, ex *Carpinus cordata*, S. Matsumura leg.; 9–x–1916, ex *Carpinus cordata*, S. Matsumura leg. (syntypes of *Neocallis carpinicola* Mats.).

Host plants: *Carpinus cordata* Blume. Takahashi (1961) gives *Acer* sp. as a host plant of *Nippochaitophorus moriokaensis*, but this plant seems not to be a true host of this aphid.

Distribution: Japan (Hokkaidô; Honshû).



Having compared a syntype of *Neocallis carpinicola* Mats. with the present species, I have come to the conclusion that they should be treated as a single species. *Nippochaitophorus moriokaensis* Tak., described from a few apterae taken at Morioka, may be rightly identified with *sawashibae*. As far as I am aware, the aptera of *sawashibae* is unknown, while in *N. moriokaensis* only the aptera has hitherto been described. Therefore, I could not examine the same morphs of these species, but in comparison with the oviparous female of *sawashibae* the aptera of *moriokaensis* resembles the former in main points, e.g. the shape and arrangement of dorsal setae; the shape of antenna and the number of antennal segment; the shape of primary sensoria; the number of secondary setae of ultimate rostral segment; the shape of apical tibial setae, etc.

### 3. Genus *Myzocallis* Passerini

References. Passerini 1860: 28; Swain 1919: 21 (part); Baker 1920: 29 (part); Theobald 1927: 331 (part); Palmer 1952: 70 (part); Börner 1952: 61; Cottier 1953: 109 (part); Boudreaux et Tissot, 1962: 122; Eastop 1966: 512 (part); Richards 1965: 29; *ibid.* 1968b: 4.

Synonyms. *Agrioaphis* Walker, 1870 [type-species: *Aphis myricae* Kaltenbach, 1843]; *Nippocallis* Matsumura, 1917 [type-species: *Nippocallis kuricola* Matsumura, 1917].

Type-species. *Aphis coryli* Goeze, 1778.

This is the largest and commonest genus of this subfamily, but in Japan are known to occur only three species, of which one is described here as a new species.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 41, L, the setae being capitate; spinal setae arranged in parallel rows; pleural setae absent. Cornicle visible.

Host plants: Fagaceae, Betulaceae, Asclepiadaceae and Myricaceae.

Distribution: Holarctic and Australian regions.

#### Key to the Japanese species of *Myzocallis*

Alate viviparous female

1. Dorsal setae long, at least twice as long as middle breadth of 3rd antennal segment. Processus terminalis about as long as base of 6th antennal segment. Marginal sclerites on anterior abdominal segment bearing 5-8 setae. Fore wing with veins bordered dusky. On *Castanea* spp. . . . . 1. *kuricola* (Matsumura)
- Dorsal setae short, at most as long as middle breadth of 3rd antennal segment. Processus terminalis short, 0.2-0.4 as long as base of 6th antennal segment. Marginal sclerites on anterior abdominal segment bearing 2 or 3 setae. Fore wing without bordering veins as above. On *Corylus* spp. . . . . 2. *montana*, sp. nov.

#### 1. *Myzocallis kuricola* (Matsumura)

References. Matsumura 1917: 365 [*Nippocallis*]; Essig et Kuwana 1918: 92; Takahashi 1923: 124; Okamoto et Takahashi 1926: 143; Shinji 1927: 20 [*Callipterus*]; Hori 1929: 152; Shinji 1941: 316; Tao 1963: 64 [*Nippocallis*]; Paik 1965: 51 [*Nippocallis*]; Richards 1968b: 37.

So far as I am aware, the oviparous female of the species has not hitherto been described. On this occasion a brief description of the oviparous female is given as follows:—

Oviparous female: Differs from the alate viviparous female:—Body larger, about 2.02 mm. in length. Antennae 0.50 as long as body; length of 3rd-6th segments in

proportion 23 : 12.5 : 11 : 7 + 6.5. Ultimate rostral segment about 0.97 as long as 2nd segment of hind tarsus. Hind tibiae with 60 or more pseudosensoria along whole length.

**Table 1.** Chaetotactic data for *Myzocallis kuricola* (Matsumura).  
Measurements of maximal setae in micra :

	alate vivip. female	alate male	oviparous female
head	98-129 av. 114	106	106-144 av. 125
antenna (3rd seg.)	61- 83 av. 71	64	106-114 av. 110
abdomen (6th seg.)	121-136 av. 126	106	136-152 av. 144
leg (hind tibia)	53- 61 av. 55	68	83- 91 av. 87

Examined specimens: May alate viviparous females, Sendai, Miyagi-ken, 27-vi-1967, ex *Castanea crenata*; Kinugawa, Tochigi-ken, 13-vii-1967, ex *Castanea crenata*. 1 alate male, Ōsaka, 14-xi-1954, ex *Castanea crenata*, R. Takahashi leg. 2 oviparous females, Ōsaka, 14-xi-1954, ex *Castanea crenata*, R. Takahashi leg.

Host plants: *Castanea crenata* Sieb. & Zucc., *Quercus acutissima* Carruth. (after Essig et Kuwana, 1918).

Distribution: Japan (Honshū; Shikoku; Kyūshū); Formosa; China; Korea.

This species is easily distinguished from any other congeneric species by the veins of fore wing bordered dusky, by the longer dorsal setae, and by the host relationship.

## 2. *Myzocallis montana*, sp. nov.

Alate viviparous female: Head, thorax and abdomen pale yellow. Antennae pale; 3rd-5th segments at apex brown. Legs yellow; tibiae at apex and tarsi brown. Cornicle and cauda yellow. Body about 1.15 mm. in length. Head smooth; vertex convex; cephalic setae short, pointed, 0.8-0.9 as long as middle breadth of 3rd antennal segment. Antennae spiculosely imbricated, 0.47-0.56 as long as body; 3rd segment with 2 or 3 circular or oval secondary sensoria; 6th with primary sensorium surrounded by setae; 1 or 2 of accessory sensoria apart from primary one; processus terminalis 0.21-0.43 as long as base of 6th antennal segment; length of 3rd-6th segments in proportion 12 : 8 : 7.5 : 7 + 2.5. Antennal setae very short, at most 1/2 as long as middle breadth of 3rd antennal segment. Clypeus with a pair of anterior setae; mandibular lamina with a seta. Rostrum extending to midway between fore and middle coxae; ultimate segment 0.78-0.85 as long as 2nd segment of hind tarsus, with 2 secondary setae. Legs: tibiae with spinules on distal 3/5-4/5; longest tibial seta 2.2-2.9 times as long as middle breadth of 3rd antennal segment; 1st tarsal segment bearing 5 ventral setae and 2 dorsal setae. Abdomen (fig. 4, B) smooth; anterior segments with marginal sclerites bearing 2 pointed setae; 6th segment with 2 setae between cornicles, the longest seta being 0.72-0.94 as long as middle breadth of 3rd antennal segment; 8th segment with 3 setae. Cornicles short, at most 1/2 as long as 2nd segment of hind tarsus. Cauda knobbed, bearing 10-12 setae. Anal plate

bilobed.

Specimens examined: Some alate viviparous females (syntypes), Mt. Yatsugatake, Yamanashi-ken, 31-vii-1967, ex *Corylus sieboldiana*.

Host plants: *Corylus sieboldiana* Blume.

Distribution: Japan (Honshû).

This species is an aberrant member of the genus. It differs from any other congeneric species in having short processus terminalis (fig. 4, C).

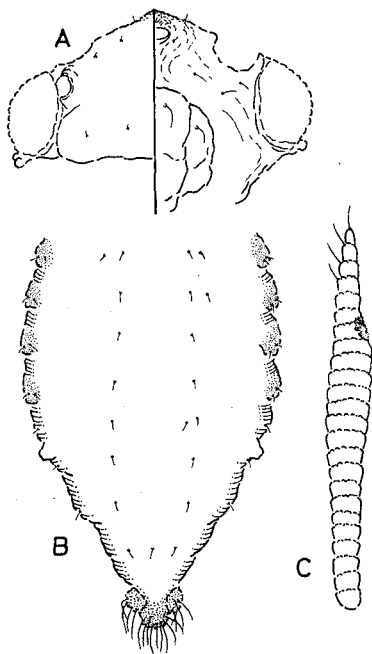


Fig. 4. *Myzocallis montana*, sp. nov. Alate viviparous female:—A, head; B, abdomen; C, 6th antennal segment.

#### Species of *Myzocallis* not included in the key

##### 3. *Myzocallis coryli* (Goeze)

References. Goeze 1778: 31 [*Aphis*]; Shinji 1941: 309; Richards 1968b: 21.

Synonyms. *Aphis avellanae* Blanchard, 1840.

Host plants: *Carpinus cordata* Blume and *Corylus sieboldiana* Blume (after Shinji, 1941).

Distribution: Japan (after Shinji, 1941); Europe, North America, Australia and New Zealand (after Richards, 1968).

As I have seen no representatives of this species, it is excluded from the key. According to Richards' description (1968, p. 21–22) this species may be distinguished from other congeneric species in Japan by the combination of the following characters:— (1) Processus terminalis at least twice as long as base of 6th antennal segment. (2) Ultimate rostral segment with 9–14 secondary setae. (3) Cephalic setae at most as long as basal breadth of 3rd antennal segment. (4) Each abdominal segment with 2 median or spinal clusters consisting of 3–5 setae.

##### 4. Genus *Neochromaphis* Takahashi

References. Takahashi 1921a: 24; *ibid.* 1961c: 12.

Type-species. (*Neochromaphis carpini* Takahashi, 1921) = *Chromaphis carpinicola* Takahashi, 1921.

This genus is Asiatic, being closely related to *Chromaphis* Walker, 1870, of Europe and North America, but it may be distinguished from the latter by the setal pattern of the embryo (figs. 41, I & J) and by the wing with large dark markings (fig. 5, C). In Japan two species have been known to occur.

Embryo: Dorsal abdominal chaetotaxy as shown in Figs. 41, I & J, the setae being long, blunt or faintly capitate; spinal setae variable in length, not arranged in parallel rows; pleural setae absent. Cornicle visible.

Host plants: Betulaceae.

Distribution: Eastern Asia.

## Key to the Japanese species of *Neochromaphis*

Alate viviparous female

1. Antennal setae 0.5–1.2 times as long as middle breadth of 3rd antennal segment. Third antennal segment (fig. 5, D) with 7 or 8 secondary sensoria. Mandibular lamina with 2 or 3 setae. Ultimate segment of rostrum 1.2–1.3 times as long as 2nd segment of hind tarsus. Abdomen with developed marginal tubercles on 2nd–5th segments; 8th segment with 7 or 8 setae. . . . . 1. *carpinicola* (Takahashi)
- Antennal setae 1.3–2.3 times as long as middle breadth of 3rd antennal segment. Third antennal segment (fig. 5, E) with 9–14 secondary sensoria. Mandibular lamina with 3–5 setae. Ultimate segment of rostrum 1.4–1.6 times as long as 2nd segment of hind tarsus. Abdomen with small marginal tubercles on 2nd and 3rd segments (sometimes also on 4th); 8th segment with 10–13 setae. . . . . 2. *coryli* Takahashi

### 1. *Neochromaphis carpinicola* (Takahashi)

References. Takahashi 1921a: 21 [*Chromaphis*]; *ibid.* 1921a: 24 [*carpini*]; *ibid.* 1961c: 13.

Synonyms. *Neochromaphis carpini* Takahashi, 1921.

Alate viviparous female: Measurements of 5 specimens in mm. Body 1.85 (1.70–1.95); antennal segments (1st–6th): 0.05 (–), 0.06 (0.05–0.06); 0.35 (0.34–0.35); 0.22 (0.18–0.23); 0.20 (0.19–0.21); 0.11 (0.11–0.12)+0.02 (0.01–0.02); ultimate rostral segment 0.11 (0.10–0.11); hind femur 0.27 (0.27–0.29); hind tibia 0.66 (0.65–0.68); 2nd segment of hind tarsus 0.09 (–); longest seta on head 0.055 (0.045–0.065), that on 3rd antennal segment 0.015 (0.011–0.023), that on 6th abdominal segment 0.027 (0.023–0.030), that on hind tibia 0.028 (0.027–0.030).

Specimens examined: 8 alate viviparous females, Tôkyô, 19–v–1949, 25–vii–1958, 28–vii–1959, ex *Carpinus* sp., R. Takahashi leg.

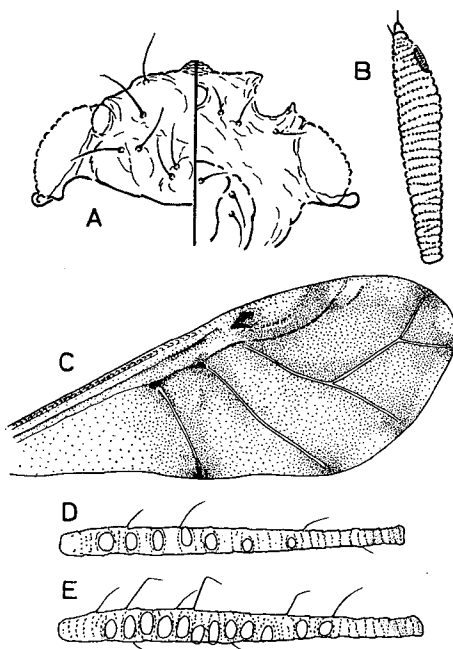
Host plants: *Carpinus japonica* Blume (after Takahashi, 1921), *Carpinus tschonoskii* Maxim. (after Takahashi, 1921), *Carpinus* sp.

Distribution: Japan (Honshû).

### 2. *Neochromaphis coryli* Takahashi

References. Shinji 1941: 336 [*Chromaphis carpinicola*]; Takahashi 1961c: 12; Paik 1965: 45 [*Chromaphis carpinicola*].

Alate viviparous female: Measurements of 10 specimens in mm. Body 1.84 (1.58–2.21); antennal segments (1st–6th): 0.06 (0.05–0.06), 0.06 (0.05–0.06), 0.35 (0.29–0.38), 0.17, (0.14–0.18), 0.17 (0.14–0.20), 0.11 (0.10–0.13)+0.03 (0.02–0.03); ultimate rostral segment 0.14 (0.11–0.15); hind femur 0.36 (0.30–0.40); hind tibia 0.72 (0.63–0.79); 2nd segment of hind tarsus 0.10 (0.09–0.11); longest seta on head 0.068 (0.053–0.076), that on 3rd an-



**Fig. 5.** *Neochromaphis carpinicola* (Takahashi) (A–D) and *N. coryli* Takahashi (E). Alate viviparous female:— A, head; B, 6th antennal segment; C, fore wing; D & E, 3rd antennal segment.

tenal segment 0.049 (0.038–0.053), that on 6th abdominal segment 0.057 (0.045–0.061), that on hind tibia 0.061 (0.061–0.068).

Specimens examined: Many alate viviparous females (including syntypes of *coryli* Tak.), Morioka, Iwate-ken, 4–viii–1960, ex *Corylus sieboldiana*, R. Takahashi leg.

Host plants: *Corylus sieboldiana* Blume, *Carpinus laxiflora* (Sieb. & Zucc.) (after Shinji, 1941). In Korea *Corylus heterophylla* has been recorded as host (after Paik, 1965).

Distribution: Japan (Honshû); Korea.

The aphid mentioned under the name *Chromaphis carpinicola* by Paik (1965) seems to be referred to the present species.

#### 5. Genus *Paratinocallis*, gen. nov.

Type-species. *Paratinocallis corylicola*, sp. nov.

The new genus may be defined as follows:—

Abdomen without clusters of spinal setae; spinal setae not arranged in parallel rows and pleural setae absent; marginal setae on anterior segment 2 or 3 in number. First segment of all tarsi with 5 setae. Apical tibial setae strongly differentiated from other tibial setae. Head, thorax, and abdomen without finger-like tubercles. Wings normal. Apterae unknown.

The new genus resembles *Tinocallis* Matsumura in the arrangement of spinal abdominal setae and *Myzocallis* Passerini in the number of marginal setae, but it differs from *Tinocallis* by the absence of finger-like tubercles on body and from *Myzocallis* by the arrangement of spinal abdominal setae. The genus is represented by a single species.

Embryo: Dorsal setae long, capitate; spinal setae variable in length, not arranged in parallel rows; pleural setae absent; marginal setae single. Cornicle visible.

Host plants: Betulaceae.

Distribution: Eastern Asia.

#### 1. *Paratinocallis corylicola*, sp. nov.

Alate viviparous female: Body pale yellow in life. In mounted specimens, head, thorax, and abdomen pale. Antennae pale; 5th and 6th segments pale brown. Legs pale; tibiae at apex and tarsi pale brown. Cornicle and cauda pale. Body about 1.45 mm. in length. Head (fig. 6 A) smooth, with front somewhat roughened, without tubercles; cephalic setae very short, the longest seta 0.4–0.5 as long as middle breadth of 3rd antennal segment. Antennae about 0.7 as long as body; 3rd segment (fig. 6, C) faintly imbricated, with 7–9 secondary sensoria; 4th and following segments more distinctly imbricated; processus terminalis 0.94–1.14 times as long as base of 6th segment; length of 3rd–6th segments in proportion 26 : 17 : 13 : 7.4+7.6. Antennal setae short, at most 1/2 as long as middle breadth of 3rd antennal segment; 3rd segment with 2 or 3 setae. Rostrum extending to midway between fore and middle coxae; ultimate segment (fig. 6, D) slender, about 0.9 as long as 2nd segment of hind tarsus, with 4–5 setae besides apical ones. Thorax without tubercles. Legs: tibiae with spinules on distal 1/2–3/5; 1st tarsal segment with 5 setae. Abdomen: anterior segments with small marginal tubercles bearing 2 or 3 setae. Dorsal abdominal

chaetotaxy as shown in Fig. 6, B; its arrangement of the spinal setae is similar to that of *Tinocallis* Mats. Cornicle truncate, 0.6-0.7 as long as 2nd segment of hind tarsus, at most 5/7 as long as base of 6th antennal segment. Cauda knobbed and anal plate bilobed, both bearing only elongate setae with pointed apices.

Specimens examined: 3 alate viviparous females and 2 alatoid nymphs (syntypes), Sapporo, Hokkaidô, 22-viii-1970, ex *Corylus sieboldiana*, M. Miyazaki leg.

Host plants: *Corylus sieboldiana* Blume.

Distribution: Japan (Hokkaidô).

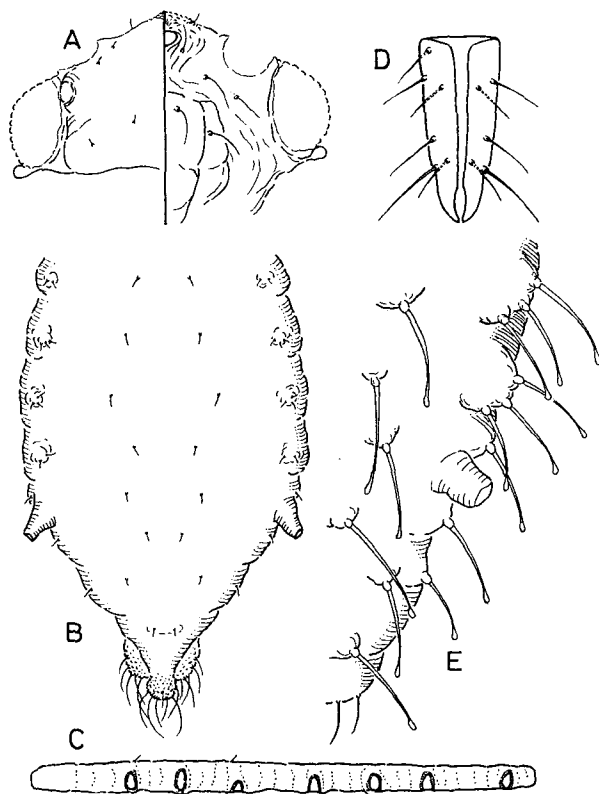


Fig. 6. *Paratinocallis corylicola*, sp. nov. Alate viviparous female:—A, head; B, abdomen; C, 3rd antennal segment; D, ultimate rostral segment. Alatoid nymph:—E, right side of abdomen.

#### 6. Genus *Recticallis* Matsumura

References. Matsumura 1919: 105; Takahashi 1965: 56; Hille Ris Lambers 1965: 194.

Type-species: *Recticallis alnijaponicae* Matsumura, 1919.

On account of the resemblance of the embryonic chaetotaxy this genus appears to be very closely related to *Pterocallis* Passerini of Europe. It is, however, distinguished from the latter by the presence of well-developed unpaired tubercles in the adult.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 41, K, the setae being long, capitate; spinal setae variable in length, not arranged in parallel rows; pleural setae absent. Cornicle visible.

Host plants: Betulaceae.

Distribution: Eastern Asia.

#### Key to the Japanese species of *Recticallis*

Alate viviparous female

1. Pronotal median tubercle short, 1.3–2.1 times as long as middle breadth of 3rd antennal segment. Third antennal segment colourless except for apical part. Fore wing without patch between veins (fig. 7, C). Body about 1.9 mm. . . . . 1. *alnijaponicae* Matsumura
- Pronotal median tubercle long, 2.1–3.8 times as long as middle breadth of 3rd antennal segment. Third antennal segment dark at middle part. Fore wing with dark patch between veins (fig. 7, D). Body about 1.7 mm. . . . . 2. *nigrostriata* (Shinji)

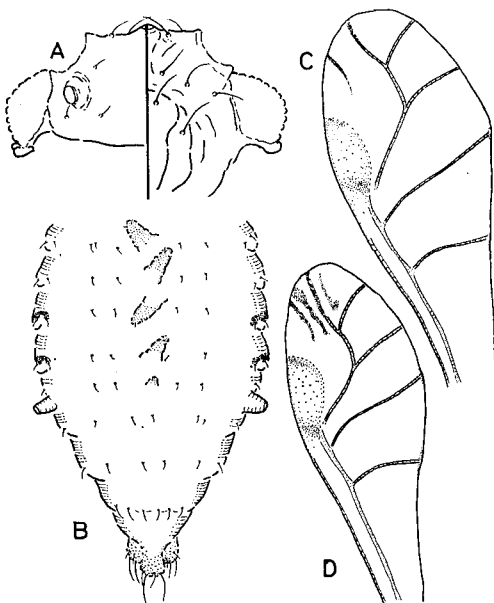


Fig. 7. *Recticallis alnijaponicae* Matsumura (A–C) and *R. nigrostriata* (Shinji) (D). Alate viviparous female:—A, head; B, abdomen; C & D, fore wing.

#### 1. *Recticallis alnijaponicae* Matsumura

References. Matsumura 1919: 106; Shinji, 1935a: 282 [*Agrioaphis moriokae*]; ibid. 1941: 364 [*Tuberculoides alnifoliae*]; ibid. 1941: 1147 [*Myzocallis moriokae*]; Takahashi 1965: 57.

Synonyms. *Agrioaphis moriokae* Shinji, 1935; *Tuberculoides alnifoliae* Shinji, 1941.

Alate viviparous female: Measurements of 10 specimens in mm. Body 1.19 (1.47–2.12); antennal segments (1st–6th): 0.06 (0.05–0.06), 0.06 (0.05–0.06), 0.48 (0.40–0.55), 0.32 (0.25–0.36), 0.28 (0.24–0.32), 0.14 (0.12–0.15)+0.11 (0.09–0.12); ultimate rostral segment 0.09 (0.08–0.09); hind femur 0.42 (0.35–0.47); hind tibia 0.78 (0.65–0.86); 2nd segment of hind tarsus 0.10 (0.09–0.11); longest seta on head 0.023 (0.015–0.030), that on 3rd antennal segment 0.009 (0.008–0.011), that on 6th abdominal segment 0.016 (0.014–0.018), that on hind tibiae 0.023 (0.020–0.025).

Specimens examined: Many alate viviparous females taken at the following

localities: Hokkaidō—Sapporo, 1–viii–1960, ex *Alnus japonica*, R. Takahashi leg.; Sôunkyô, 17–vii–1968, ex *Alnus hirsuta*. Honshû—Kaigake, Niigata-ken, 2–vii–1967, ex *Alnus hirsuta*; Ôsaka, 3–v–1959, ex *Alnus* sp., R. Takahashi leg.

Host plants: *Alnus firma* Sieb. & Zucc. (after Shinji, 1941), *Alnus hirsuta* Turcz., *Alnus hirsuta* var. *sibirica* (Fischer) (after Shinji, 1924), *Alnus japonica* (Thunb.).

Distribution: Japan (Hokkaidô; Honshû).

This species is very closely related to *Recticallis pseudoalni* (Takahashi) from Formosa, but it differs from the latter by the number of secondary sensoria and by

the pigmentation of 3rd antennal segment.

## 2. *Recticallis nigrostriata* (Shinji)

References. Shinji 1941: 383 [*Tuberculoides*]; Paik 1965: 40 [*Tuberculoides*]; Takahashi 1965: 57.

Alate viviparous female: Measurements of 10 specimens in mm. Body 1.68 (1.41–2.03); antennal segments (1st–6th): 0.05 (0.05–0.06), 0.06 (0.05–0.07), 0.44 (0.34–0.51), 0.29 (0.23–0.39), 0.24 (0.20–0.33), 0.12 (0.09–0.14)+0.11 (0.09–0.14); ultimate rostral segment 0.08 (0.08–0.09); hind femur 0.35 (0.27–0.42); hind tibia 0.65 (0.52–0.82); 2nd segment of hind tarsus 0.09 (0.08–0.10); longest seta on head 0.020 (0.015–0.023), that on 3rd antennal segment 0.008 (–), that on 6th abdominal segment 0.016 (0.015–0.017), that on hind tibia 0.023 (0.020–0.027).

Specimens examined: Many alate viviparous females, Utsunomiya, Tochigi-ken, 4-ix-1967, ex *Alnus japonica*; Mt. Tanzawa, Kanagawa-ken, 9-viii-1961, ex *Alnus* sp., R. Takahashi leg.; Asakawa, Tōkyō Distr., 24-vii-1959, ex *Alnus* sp., R. Takahashi leg.; Hirao, Ōsaka, 3-xi-1960, ex *Alnus japonica*, R. Takahashi leg.; Sōja, Okayama-ken, 18-viii-1967, ex *Alnus hirsuta* var. *sibirica*; Mt. Daisen, Tottori-ken, 21-viii-1967, ex *Alnus* sp.

Host plants: *Alnus firma* Sieb. & Zucc. (after Shinji, 1941), *Alnus hirsuta* var. *sibirica* (Fischer), *Alnus japonica* (Thunb.).

Distribution: Japan (Honshū); Korea.

## 7. Genus *Sappocallis* Matsumura

References. Matsumura 1919: 107; Shinji 1941: 127.

Synonyms. *Telocallis* Shinji, 1922 [type-species: *Telocallis alnifoliae* Shinji, 1922].

Type-species. *Sappocallis ulmicola* Matsumura, 1919.

In most respects *Sappocallis* resembles *Tinocallis* Matsumura, being distinguishable from the latter only by the media of the forewing being once-branched. This genus is represented by a single species occurring in Japan.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 41, D, the setae being long, capitate; spinal setae on abdominal segments III, V, and VII show a considerably greater mutual distance than the other spinal setae; pleural setae absent. Cornicle visible.

Host plants: Ulmaceae.

Distribution: Eastern Asia.

### 1. *Sappocallis ulmicola* Matsumura

References. Matsumura 1919: 108; Shinji 1941: 347; Tao 1963: 63.

Alate viviparous female: Measurements of 10 specimens in mm. Body 1.55 (1.44–1.62); antennal segments (1st–6th): 0.05 (–), 0.05 (0.04–0.05), 0.39 (0.35–0.42), 0.21 (0.17–0.23), 0.20 (0.18–0.23), 0.11 (0.11–0.12)+0.11 (0.08–0.12); ultimate rostral segment 0.10 (0.09–0.11); hind femur 0.37 (0.35–0.39); hind tibia 0.65 (0.61–0.71); 2nd segment of hind tarsus 0.09 (0.07–0.09); longest seta on head 0.011 (0.011–0.015), that on 3rd antennal segment 0.004 (–), that on 6th abdominal segment 0.011 (0.010–0.015), that on hind tibia 0.027 (0.023–0.031).

Specimens examined: Many alatae taken at the following localities: Hokkaidō—



Sapporo, 13-vi-1967, ex *Ulmus davidiana* var. *japonica*; Ônuma, 16-vi-1967, ex *Ulmus davidiana* var. *japonica* f. *suberosa*; Jôzankei, 4-ix-1969, ex *Ulmus* sp. Honshû—Nikkô, Tochigi-ken, 23-vii-1967, ex *Ulmus davidiana* var. *japonica* f. *suberosa*; Tsumagoi, Gumma-ken, 30-vii-1961, ex *Ulmus* sp., R. Takahashi leg.; Tokusawa, Naganoken, 25-vii-1967, ex *Ulmus davidiana* var. *japonica*. 1 alate male, Sapporo, Hokkaidô, 28-ix-1967, ex *Ulmus davidiana* var. *japonica*.

Host plants: *Ulmus davidiana* var. *japonica* (Rehd.), and *Ulmus davidiana* var. *japonica* f. *suberosa* Nakai.

Distribution: Japan (Hokkaidô; Honshû; Kyûshû); Formosa.

## 8. Genus *Shivaphis* Das

References. Das 1918: 245; Baker 1920: 24; Shinji 1941: 120.

Type-species. *Shivaphis celti* Das, 1918.

This genus is evidently Oriental, being represented by only a single species.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 41, P, the setae being very short, pointed; pleural setae absent; spinal setae about equal to marginal ones in length. Cornicle visible.

Host plants: Ulmaceae.

Distribution: Oriental region.

### 1. *Shivaphis celti* Das

References. Das 1918: 246; Essig & Kuwana 1918: 95 [*Chromaphis celticolens*]; Takahashi 1919b: 195 [*Phyllaphis celticolens*]; ibid. 1921b: 74; ibid. 1923: 130 [*celticolens*] & 131; ibid. 1924: 66; Shinji 1927: 10; ibid. 1941: 299; Kanakaraj David 1958: 172; Tao 1963: 38; Paik 1965: 33.

Synonyms. *Chromaphis celticolens* Essig & Kuwana.

Alate viviparous female: Measurements of 6 specimens in mm. Body 1.93 (1.80–2.28); antennal segments (1st–6th): 0.07 (0.06–0.08), 0.07 (0.07–0.08), 0.53 (0.50–0.56), 0.27 (0.26–0.29), 0.26 (0.25–0.27), 0.20 (0.20–0.21)+0.04 (0.03–0.05); ultimate rostral segment 0.10 (0.09–0.11); hind femur 0.67 (0.62–0.82); hind tibia 1.02 (0.92–1.20); 2nd segment of hind tarsus 0.13 (0.11–0.15); longest seta on head 0.033 (0.023–0.046), that on 3rd antennal segment 0.012 (0.006–0.015), that on 6th abdominal segment 0.040 (0.034–0.054), that on hind tibia 0.042 (0.030–0.049).

Apterous viviparous female: Measurements of 5 specimens in mm. Body 2.46 (2.31–2.58); antennal segments (1st–6th): 0.07 (0.07–0.08), 0.07 (–), 0.42 (0.41–0.43), 0.19 (0.18–0.19), 0.20 (0.20–0.21), 0.16 (0.15–0.17)+0.03 (–); ultimate rostral segment 0.10 (0.09–0.10); hind femur 0.58 (0.56–0.59); hind tibia 0.86 (0.80–0.91); 2nd segment of hind tarsus 0.15 (0.14–0.15); longest seta on head 0.038 (–), that on 3rd antennal segment 0.014 (0.011–0.015), that on 6th abdominal segment 0.040 (0.036–0.054), that on hind tibia 0.040 (0.034–0.052).

Specimens examined: Many alate viviparous females, Tôkyô, 23-vii-1960, ex *Celtis* sp., R. Takahashi leg.; Hôya Tôkyô, 12-v-1969, ex *Celtis sinensis* var. *japonica*, H. Takizawa leg.; Utsunomiya, Tochigi-ken, 20-v-1966, ex *Celtis sinensis* var. *japonica*; Nagano, Ôsaka, 3-v-1959, ex *Celtis sinensis*, R. Takahashi leg.; Kôchi, Kôchi-ken, 15-v-1966, ex *Celtis sinensis* var. *japonica*. Some apterous viviparous females, Hôya, Tôkyô, 12-v-1969, H. Takizawa leg.; Kôchi, Kôchi-ken, 15-v-1966.

Host plants: *Celtis sinensis* var. *japonica* (Planch.). In India *Celtis tetrandra* var. *hamiltonii* has been recorded as its host (after Kanakaraj David, 1958).

Distribution: Japan (Honshû; Shikoku; Kyûshû); Korea; Formosa; China; India; Ceylon.

This species is distinct by the body covered with wax dust and by the host relationship.

#### 9. Genus *Takecallis* Matsumura

References. Matsumura 1917: 373; Cottier 1953: 87; Hille Ris Lambers 1965: 202; Eastop 1966: 519; Higuchi 1968: 25.

Type-species. (*Takecallis bambusae* Matsumura, 1917) = *Takecallis arundicolens* (Clarke, 1903).

So far as my previous revision (1968) is concerned, this genus is represented by four species, of which the origins are apparently considered to be Oriental.

Embryo: Dorsal abdominal chaetotaxy as shown in Figs. 41, M & N, the setae being long, capitate; spinal setae arranged in parallel rows; pleural setae absent. Cornicle visible.

Host plants: Bambusaceae.

Distribution: Holarctic, Oriental and Australian regions.

#### Key to the Japanese species of *Takecallis*

Alate viviparous female

1. Antennae longer than body. Cornicle with a seta. Secondary sensoria arranged on black area of 3rd antennal segment. White or yellowish in life. . . . . 2
- Antennae shorter than body. Cornicle without setae. Secondary sensoria arranged on pale or dusky area of 3rd antennal segment. Green in life. . . . . 3
2. Abdomen with a pair of elongate, dark patches on each segment. Third antennal segment wholly dusky and cauda pale or dusky. . . . . 2. *arundinariae* (Essig)
- Abdomen without dark patches as above. Third antennal segment at least partially pale and cauda black. . . . . 1. *arundicolens* (Clarke)
3. Secondary sensoria arranged on basal 1/2 of 3rd antennal segment. Anterior abdominal segments bearing at least 4 dorsal setae excluding marginal ones. . . 3. *sasae* (Matsumura)
- Secondary sensoria arranged on basal 1/3 of 3rd antennal segment. Each abdominal segment bearing 2 dorsal setae excluding marginal ones. . . . . 4. *taiwanus* (Takahashi)

#### 1. *Takecallis arundicolens* (Clarke)

References. Clarke 1903: 249 [*Callipterus*]; Matsumura 1917: 373 [*bambusae*]; Swain 1919: 22 [*Myzocallis*]; Takahashi 1926: 159 [*Myzocallis*]; Theobald 1927: 341 [*Myzocallis*]; Shinji 1941: 306 [*Myzocallis*]; Hille Ris Lambers 1947: 658; Börner 1952: 60; Tao 1963: 59; *ibid*, 1964a: 220; Stroyan 1964: 34; Paik 1965: 49; Hille Ris Lambers 1965: 202; Eastop 1966: 520; Higuchi 1968: 25.

Synonyms. *Takecallis bambusae* Matsumura, 1917.

Host plants: *Phyllostachys* sp., *Sasa nipponica* (Makino), *Sasa palmata* (Bean), and *Sasa senanensis* (Franch. & Sav.).

Distribution: Japan; Korea; Formosa; Europe; North America.

#### 2. *Takecallis arundinariae* (Essig)

References. Essig 1917: 302 [*Myzocallis*]; Takahashi 1921 b: 73 [*Myzocallis bambucifoliae* (sic)];

Swain 1919: 24 [*Myzocallis*]; Takahashi 1926: 159 [*Myzocallis*]; *ibid.* 1931: 84 [*Agrioaphis bambusifoliae*]; Börner 1952: 60; Tao 1963: 59; *ibid.* 1964 a: 220; Stroyan 1964: 34; Hille Ris Lambers 1965: 202; Takahashi 1965: 58; Paik 1965: 49 [*Takecallis sasacola*]; Eastop 1966: 520; Higuchi 1968: 27.

Synonyms. *Myzocallis bambusifoliae* Takahashi, 1921.

Host plants: Bamboo (in Japan after Takahashi, 1926); *Arundinaria graminea*, *A. japonica*, *Phyllostachys dulcis*, *P. castillonis* and *P. viridiglaucescens* (in England after Stroyan, 1964).

Distribution: Japan; Korea; Formosa; Europe; North America.

### 3. *Takecallis sasae* (Matsumura)

References. Matsumura 1917: 372 [*Myzocallis*]; Takahashi 1926: 160 [*Myzocallis*]; Shinji 1935: 285 [*Agrioaphis sasacola*]; *ibid.* 1941: 322 [*Myzocallis*], 1150 [*Myzocallis sasacola*]; Hille Ris Lambers 1965: 202; Takahashi 1965: 58 (partim); Higuchi 1968: 29.

Synonyms. *Agrioaphis sasacola* Shinji, 1935.

Host plants: *Phyllostachys* sp., *Sasa nipponica* (Makino), *Bambusa* sp. (after Takahashi, 1926), and *Sasa senanensis* (Franch. & Sav.) (after Matsumura, 1917).

Distribution: Japan (Hokkaidô; Honshû).

### 4. *Takecallis taiwanus* (Takahashi)

References. Takahashi 1925: 46 [*Myzocallis sasae*]; *ibid.* 1926: 160 [*Myzocallis*]; Theobald 1927: 343 [*Myzocallis arundinariae*]; Takahashi 1931: 84 [*Agrioaphis*]; Tissot 1932: 11 [*Therioaphis tectae*]; Cottier 1953: 87 [*arundinariae*]; Tao 1963: 60; *ibid.* 1964 a: 220 [*sasae*]; Stroyan 1964: 34; Hille Ris Lambers 1965: 202; Eastop 1966: 520; Higuchi 1968: 30.

Synonyms. *Therioaphis tectae* Tissot, 1932.

Host plants: *Sasa* sp. (in Japan after Higuchi, 1968); *Arundinaria anceps*, *A. gigantea*, *Phyllostachys dulcis*, *P. nigra* and *P. castukkinis* (in England after Stroyan, 1964).

Distribution: Japan; Formosa; New Zealand; Europe; North America.

Having examined the paratype of *Therioaphis tectae* Tissot, 1932, from Florida (14-iv-1930) I have come to the conclusion that *tectae* should be suppressed as a synonym of *taiwanus* as Hille Ris Lambers (1965) already pointed out.

## 10. Genus *Tiliaphis* Takahashi

References. Takahashi 1961 b: 251.

Type-species. *Therioaphis shinae* Shinji, 1924.

In most respects this genus appears to be extremely like *Eucallipterus* Schouteden, 1906, which occurs on various plants of *Tilia* L. in Europe and North America, but in Asia *Tiliaphis* is most easily recognized by the distinctive body colour and by the host relationship. It is too early to discuss the relationship between *Tiliaphis* and *Eucallipterus* exactly, since further examinations of Asiatic species are necessary.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 41. G, the setae being long, capitate; spinal setae variable in length, not arranged in parallel rows; pleural setae absent. Cornicle visible.

Host plants: Tiliaceae.

Distribution: Eastern Asia.

**Key to the Japanese species of *Tiliaphis***

Alate viviparous female

1. Abdomen (fig. 8, B) with a pair of brown patches on each segment. Third antennal segment (fig. 8, D) about 2.6 times as long as base of 6th antennal segment, with 8-11 (mostly 9) secondary sensoria on basal 1/3. Sixth antennal segment with processus terminalis 0.9-1.2 times as long as base of the segment. Ultimate rostral segment 1.3-1.5 times as long as 2nd segment of hind tarsus. Body about 2.0 mm. in length. . . . . 2. *shinji*, sp. nov.
- Abdomen without brown patches as above. Third antennal segment (fig. 8, E) about 1.9 times as long as base of 6th antennal segment, with 10-17 (mostly 14) secondary sensoria on basal 2/3. Sixth antennal segment with processus terminalis 1.2-1.4 times as long as base of the segment. Ultimate rostral segment 1.0-1.1 times as long as 2nd segment of hind tarsus. Body about 1.7 mm. in length. . . . . 1. *shinae* (Shinji)

1. ***Tiliaphis shinae*** (Shinji)

References. Shinji 1924: 346 [*Therioaphis*]; ibid. 1933c: 165 [*Therioaphis japonica*]; ibid. 1941: 353 [*Therioaphis japonica*]; Takahashi 1961b: 251; Paik 1965: 47 [*Therioaphis japonica*].

Synonyms. *Therioaphis japonica* Shinji, 1933. **Syn. nov.**

Only the alate viviparous female of the species has hitherto been described. On the basis of the present specimens brief descriptions of the male and oviparous female are given as follows:—

Alate male: Much like the alate viviparous female, differing in the following aspects:—Body smaller, about 1.5 mm. in length. Head and abdomen with dorsal setae shorter than in apterae. Antennae about 0.9 as long as body; 3rd segment with 19-22 secondary sensoria along whole length, 4th with 5 or 6, 5th with 4 or 5, and 6th with 2 or 3; length of 3rd-6th segments in proportion 28 : 16 : 16 : 11.5+16. Cornicles smaller.

Oviparous female: Differs from the alate viviparous female as follows:—Body larger and not slender, about 1.8 mm. in length. Head, thorax, and abdomen with dorsal setae longer than in apterae, all the setae being capitate. Hind tibiae with 70 or more pseudosensoria along whole length. Cornicles large, about 1.6 times as long as 2nd segment of hind tarsus, about 1.5 times as long as ultimate rostral segment.

**Table 2.** Chaetotactic data for *Tiliaphis shinae* (Shinji).  
Measurements of maximal setae in micra:

Morph	Head	Abdomen (6th seg.)
Alate viviparous female	46-62 av. 53	53- 62 av. 56
Alate male	19	32
Oviparous female	57-95 av. 76	99-114 av. 106

Specimens examined: Some alate viviparous females, Misumai, Hokkaidô, 24-vi-1968, ex *Tilia maximowicziana*; Iwamizawa, Hokkaidô, 7-vii-1968, ex *Tilia* sp.; Morioka, Iwate-ken, 4-viii-1960, ex *Tilia japonica*, R. Takahashi leg. 1 alate male

and some oviparous females, Misumai, Hokkaidô, 2-x-1967, ex *Tilia maximowicziana*.

Host plants: *Tilia japonica* (Miq.), *Tilia maximowicziana* Shirasawa, *Tilia miqueliana* Maxim. (after Shinji, 1933). In Korea *Tilia insularis*, *T. amurensis* var. *borbigera*, and *T. amurensis* var. *glabrata* have been recorded as hosts (after Paik, 1965).

Distribution: Japan (Hokkaidô; Honshû); Korea.

Having read the original description of *Therioaphis japonica* Shinji, 1933, I have been convinced that this should be suppressed as a synonym of *shinae*.

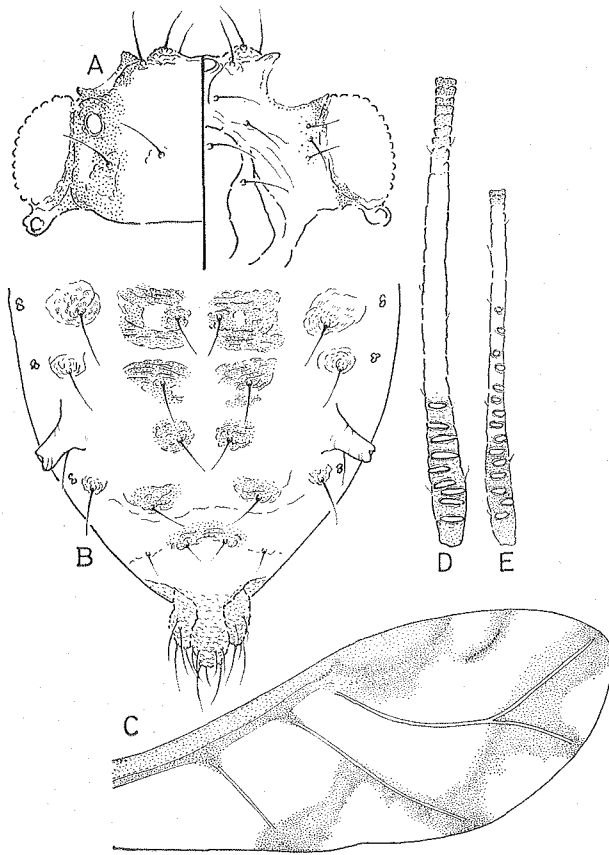


Fig. 8. *Tiliaphis shinjii*, sp. nov. (A-D) and *T. shinae* (Shinji) (E). Alate viviparous female:—A, head; B, abdomen, C, fore wing; D & E, 3rd antennal segment.

## 2. *Tiliaphis shinjii*, sp. nov.

References. Shinji 1933c: 162 [*Therioaphis shinae*]; ibid. 1941: 355 [*Therioaphis shinae*].

*Therioaphis shinae* Shinji (1933 & 1941) is different from *shinae* Shinji, 1924, but seems to be identical with the present new species.

Alate viviparous female: Body colour in life unknown. In mounted specimens

head (fig. 8, A) and thorax with a brown stripe on either side. Antennae: 1st-2nd segments, 3rd segment on basal 1/3, and 3rd-5th segments at apex brown. Legs pale; tarsi brown. Abdomen (fig. 8, B) with two rows of brown patches.<sup>†</sup> Body about 2.0 mm. in length. Antennal tubercles not well developed. Antennae very slender, as long as body; 1st segment much convex on inner side; 3rd segment (fig. 8, D) about 2.6 times as long as base of 6th antennal segment, with 8-11 transversely elongate sensoria on basal 1/3; one or 2 accessory sensoria a little isolated from primary one; processus terminalis as long as base of 6th antennal segment; length of 3rd-6th segments in proportion 39:24:24:15+16. Clypeus with a pair of anterior setae; mandibular lamina with a seta about equal to cephalic setae. Rostrum short, not reaching middle coxae; ultimate segment about 1.4 times as long as 2nd segment of hind tarsus, with 2-4 secondary setae besides primary ones. Pronotum with 1 anterior spinal seta, 1 posterior spinal seta, and 0 or 1 posterior marginal seta on either side, all prothoracic setae long, about equal to posterior cephalic setae. Legs: fore coxae much enlarged; femora with some short setae; tibiae with spinules on apical 1/3 or more; 1st segment of all tarsi with 5 setae ventrally and 2 setae dorsally. Abdomen with a pair of brown patches on each segment and small blunt marginal tubercles on anterior segments. Dorsal abdominal chaetotaxy and pigmentation as shown in Fig. 8, B. Cornicles smooth, long, a little longer than 2nd segment of hind tarsus, expanded at base, without flange. Cauda with about 12 long setae. Anal plate deeply bilobed. Genital plate with about 6 setae along hind margin. Wing (fig. 8, C): media with a branch; radial sector normal (not short). Measurements of maximal setae in micra as follows:—head 51 (45-62), antenna (3rd seg.) 13 (12-15), abdomen (6th seg.) 58 (46-68), leg (hind tibia) 32 (28-39).

Specimens examined: Some alate viviparous females (syntypes), Sugadaira, Nagano-ken, 29-vii-1961, ex *Tilia* sp., R. Takahashi leg.

Host plants: *Tilia japonica* (Miq.) (after Shinji, 1933), *Tilia* sp.

Distribution: Japan (Honshû).

## 11. Genus *Tinocallis* Matsumura

References. Matsumura 1919: 100; Richards 1965: 98; ibid. 1967: 537; Eastop 1966: 522.

Synonyms. *Melanocallis* Oestlund, 1922 [type-species: *Callipterus caryaefoliae* Davis, 1910]; *Sarucallis* Shinji, 1922 [type-species: (*Sarucallis lythrae* Shinji, 1922) = *Tinocallis kahawaluokalani* (Kirkaldy)]; *Lutaphis* Shinji, 1924 [type-species: (*Lutaphis nirecola* Shinji, 1924) = *Tinocallis zelkowae* (Takahashi)]; *Tuberocallis* Nevsky, 1929 [type-species: *Tuberocallis saltans* Nevsky, 1929].

Type-species. *Tinocallis ulmiparvifoliae* Matsumura, 1919.

This genus is closely related to *Myzocallis* Passerini, but it differs from the latter by the arrangement of the dorsal abdominal setae. The spinal setae on the abdominal segments III, V and VII are displaced laterally both in the adult and in the embryo.

Embryo: Dorsal abdominal chaetotaxy as shown in Figs. 41, E & F, the setae being capitate; spinal setae on abdominal segments III, V and VII show a considerably greater mutual distance than the other spinal setae; pleural setae absent. Cornicle visible.

Host plants: Ulmaceae, Betulaceae, Sapindaceae and Lythraceae.

Distribution: Holarctic, Oriental, Neotropical and Australian regions.

### Key to the Japanese species of *Tinocallis*

Alate viviparous female

1. Mesonotum with spinal tubercles. . . . . 2
- Mesonotum without spinal tubercles. . . . . 6
2. Spinal tubercles on mesonotum shorter than 2nd antennal segment. . . . . 3
- Spinal tubercles on mesonotum as long as or longer than 2nd antennal segment. . . . . 4
3. Pronotum with 2 pairs of spinal tubercles. Third antennal segment (fig. 9, C) with 6-9 secondary sensoria. On *Sapindus* spp. . . . . 1. *insularis* (Takahashi)
- Pronotum with a pair of spinal tubercles which are sometimes obsolete. Third antennal segment (fig. 10, C) with 15-19 secondary sensoria. On *Corylus* spp. . . . . 3. *nikkoensis*, sp. nov.
4. Third antennal segment (fig. 11, C) with 10-13 secondary sensoria and 3 or 4 setae. Abdominal segments III-VII without spinal tubercles. Body small, at most 1.25 mm. On *Ulmus* spp. . . . . 4. *sapporoensis*, sp. nov.
- Third antennal segment with 16-24 secondary sensoria and 9-19 setae. Abdominal segments III-VII with small spinal tubercles. Body large, at least 1.76 mm. . . . . 5
5. Head with finger-like tubercles. Pronotum with 2 pairs of spinal tubercles. Ultimate rostral segment 0.75-0.85 as long as 2nd segment of hind tarsus, with 4 or 5 secondary setae. First tarsal segment with 5 or 6 setae ventrally. On *Ulmus* spp. . . . . 6. *ulmiparvifoliae* Matsumura
- Head (fig. 12, A) without finger-like tubercles. Pronotum with a pair of spinal tubercles. Ultimate rostral segment (fig. 12, D) 0.94-1.14 times as long as 2nd segment of hind tarsus, with 6-10 secondary setae. First tarsal segment (fig. 12, E) with 7 setae ventrally. On *Ulmus* spp. . . . . 5. *takachihoensis*, sp. nov.
6. Spinal tubercles on 2nd abdominal segment longer than 2nd antennal segment. Third antennal segment with 5-9 secondary sensoria. Cornicle brown. On *Lagerstroemia* spp. . . . . 2. *kahawaluokalani* (Kirkaldy)
- Spinal tubercles on 2nd abdominal segment shorter than 2nd antennal segment. Third antennal segment with 13-18 secondary sensoria. Cornicle pale. On *Zelkova* spp. . . . . 7. *zelkowae* (Takahashi)
1. *Tinocallis insularis* (Takahashi), comb. nov.

References. Takahashi 1927: 9 [*Myzocallis*]; ibid. 1931: 83 [*Myzocallis*]; Tao 1963: 67 [*Sarucallis*].

This species is new to Japan. On the basis of the specimens examined a redescription is given below:—

Alate viviparous female: Body colour in life unknown. In mounted specimens head and thorax pale. Antennae pale; 3rd-5th segments at apex and 6th segment at middle fuscous. Legs pale. Abdomen (fig. 9, B) with a pair of dusky spots on 3rd and following segments. Cornicles and cauda pale. Body about 1.48 mm. in length. Head (fig. 9, A) smooth, with very small tubercles which are sometimes obsolete; cephalic setae 0.5-0.75 as long as middle breadth of 3rd antennal segment. Antennae 0.74 as long as body; 3rd segment (fig. 9, C) faintly spiculose imbricated, with 6-9 (mostly 7) secondary sensoria on thickening part; processus terminalis 0.9-1.0 times as long as base of 6th antennal segment; length of 3rd-6th segments in proportion 24:14:13:8+7. Antennal setae at most 3/4 as long as middle breadth of 3rd antennal segment; 3rd segment with 3-5 setae. Clypeus with a pair of anterior setae;

mandibular lamina with a seta 3.4–5.8 times as long as cephalic setae. Rostrum not reaching middle coxae; ultimate segment (fig. 9, E) 0.8–1.0 times as long as 2nd segment of hind tarsus, with 8–10 setae including apical ones. Pronotum with 2 pairs of spinal tubercles, the tubercles being at most  $16\mu$  in length. Prothoracic setae 8 in number and about equal to cephalic ones in length. Mesonotum with a pair of small tubercles. Legs: tibiae with spinules on distal  $1/3$ – $1/2$ ; 1st tarsal segment with 5 setae ventrally and 2 setae dorsally. Abdomen with 1st and 2nd segments bearing a pair of large spinal tubercles; 3rd–7th segments sometimes with a pair of small spinal tubercles about equal to prothoracic spinal ones. Dorsal abdominal chaetotaxy and pigmentation as shown in Fig. 9, B. Marginal tubercles present on anterior segments, the tubercles situated in the marginal sclerites. Cornicles smooth, 0.3–0.4 as long as 2nd segment of hind tarsus, at most  $1/3$  as long as base of 6th antennal segment, without flange. Cauda knobbed and anal plate bilobed, both bearing only elongate setae with pointed apices.

Specimens examined: Some alate viviparous females taken at Tôkyô, 3–viii–1957, 22–vii–1959, ex *Sapindus* sp., R. Takahashi leg.

Host plants: *Sapindus* sp. In Formosa *Sapindus mukurossi* has been recorded as host (after Takahashi, 1927).

Distribution: Japan (Honshû); Formosa; China.

## 2. *Tinocallis kahawaluokalani* (Kirkaldy)

References. Kirkaldy 1907: 10 [*Myzocallis*]; Takahashi 1920: 118 [*Monellia lagerstroemiae*]; ibid. 1921b: 74 [*Callipterus*]; ibid. 1923: 44 [*Callipterus*]; Shinji 1922: 731 [*Sarucallis lythrae*]; ibid. 1941: 311 [*Myzocallis*]; Tao 1963: 68 [*Sarucallis*]; Paik 1965: 52 [*Sarucallis*]; Calilung 1967: 119 [*Sarucallis*]; Richards 1967: 540.

Synonyms. *Monellia lagerstroemiae* Takahashi, 1920; *Sarucallis lythrae* Shinji, 1922.

Alate viviparous female: Measurements of 10 specimens in mm. Body 1.35 (1.02–1.80); antennal segments (1st–6th): 0.05 (0.04–0.06), 0.05 (0.04–0.05), 0.30 (0.22–0.42), 0.21 (0.14–0.27), 0.19 (0.15–0.27), 0.12 (0.09–0.14)+0.11 (0.09–0.12); ultimate rostral segment 0.08 (0.07–0.09); hind femur 0.29 (0.23–0.39); hind tibia 0.50 (0.39–0.73); 2nd segment of hind tarsus 0.08 (0.06–0.09); cornicle 0.03 (0.03–0.05); longest seta on head 0.008 (0.008–0.011), that on 3rd antennal segment 0.004 (–), that on 6th abdominal segment 0.008 (0.004–0.011).

Specimens examined: Many alate viviparous females taken at the following localities: Honshû—Utsunomiya, Tochigi-ken, 17–viii–1967, ex *Lagerstroemia indica*; Tôkyô, 16–viii–1964, ex *Lagerstroemia indica*, M. Miyazaki leg.; Nagano, Ôsaka, 3–v–1959, ex *Lagerstroemia* sp., R. Takahashi leg. Shikoku—Kôchi, Kôchi-ken, 15–v–1966, ex *Lagerstroemia indica*; Ryûkyû—Naha, Okinawa, ex *Lagerstroemia* sp., K. Iha leg.

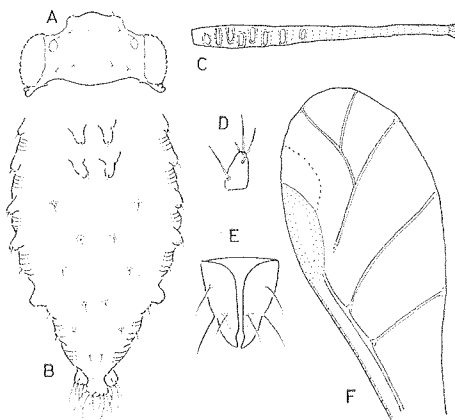


Fig. 9. *Tinocallis insularis* (Takahashi). Alate viviparous female:—A, head; B, abdomen; C, 3rd antennal segment; D, 1st segment of hind tarsus (lateral view); E, ultimate rostral segment; F, fore wing.



Host plants: *Lagerstroemia indica* L.

Distribution: Japan (Honshû; Shikoku; Kyûshû; Ryûkyû); Korea; Formosa; China; Philippines; Hawaii; North America.

This species is readily distinguished from any other Japanese species by its host relationship, by the distinctive colouration, and by the second abdominal segment with the largest abdominal tubercles.

3. *Tinocallis nikkoensis*, sp. nov.

Alate viviparous female: Head, thorax and abdomen pale yellow. Antennae and legs pale yellow or dirty yellow. Body about 1.47 mm. in length. Head (fig. 10, A) smooth, with front somewhat roughened, without tubercles on dorsum; cephalic setae short, the longest seta 0.40–0.68 as long as middle breadth of 3rd antennal segment.

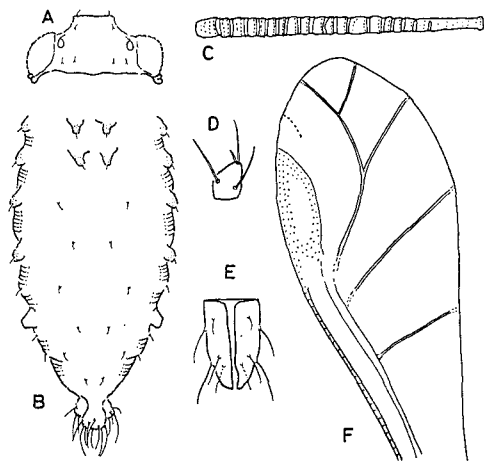


Fig. 10. *Tinocallis nikkoensis*, sp. nov. Alate viviparous female:—A, head; B, abdomen; C, 3rd antennal segment; D, 1st segment of hind tarsus (lateral view); E, ultimate rostral segment; F, fore wing.

Antennae about 0.70 as long as body; 3rd segment (fig. 10, C) spiculosely imbricated, with 15–19 (mostly 18) secondary sensoria; processus terminalis 0.82–1.33 times as long as base of 6th antennal segment; length of 3rd–6th segments in proportion 25 : 11 : 12 : 7+7. Antennal setae short, at most 1/2 as long as middle breadth of 3rd antennal segment; 3rd segment with 1–4 (mostly 3) setae. Clypeus with a pair of anterior setae; mandibular lamina with a seta 4.6–6.2 times as long as cephalic setae. Rostrum extending to midway between fore and middle coxae; ultimate segment (fig. 10, E) 0.63–0.84 as long as 2nd segment of hind tarsus, with 4 setae besides apical ones. Pronotum sometimes with a pair of spinal tubercles at most 1/4 as long as those on 1st abdominal segment; prothoracic setae subequal to cephalic setae in length. Mesonotum with a pair of spinal tubercles as large as marginal ones on 3rd abdominal segment. Legs: tibiae

with spinules on distal 1/4–1/3; 1st tarsal segment with 5 setae ventrally and 2 setae dorsally. Abdomen with 1st and 2nd segments bearing a pair of large spinal tubercles. Dorsal abdominal chaetotaxy as shown in Fig. 10, B; the marginal seta of 6th segment not attached to the base of cornicle. Cornicles 0.2–0.3 as long as 2nd segment of hind tarsus, at most 1/4 as long as base of 6th antennal segment. Cauda knobbed and anal plate bilobed, both bearing only elongate setae with pointed apices.

Specimens examined: Some alate viviparous females (syntypes) taken at the following localities in Honshû: Shirabutakayu, Yamagata-ken, 29-vi-1967, ex *Corylus sieboldiana*; Oku-kinu (Nikkô), Tochigi-ken, 11-, 12-vii-1967, ex *Corylus heterophylla*.

Host plants: *Corylus heterophylla* Fischer and *Corylus sieboldiana* Blume.

Distribution: Japan (Honshû).

In the number of secondary sensoria this species resembles *T. zelkowae* (Takahashi), but it differs from the latter in having a pair of large tubercles on mesonotum. The new species is distinct by the body colour, by the shape of tubercles, and by the host relationship.

4. *Tinocallis sapporoensis*, sp. nov.

Alate viviparous female: Body colour in life unknown. In mounted specimens head and thorax dark brown. Antennae pale; 1st segment dark brown. Abdomen with a pair of spots on each segment. Fore wings (fig. 11, F) hyaline. Body about 1.19 mm. in length. Head (fig. 11, A) without tubercles on dorsum; cephalic setae short, the longest seta 0.20–0.50 as long as middle breadth of 3rd antennal segment. Antennae about 0.75 as long as body; 3rd segment (fig. 11, C) around sensoria spiculously imbricated, with 10–12 secondary sensoria; processus terminalis 1.0–1.3 times as long as base of 6th antennal segment; length of 3rd–6th segments in proportion 21:11:10:6+7. Antennal setae at most 1/4 times as long as middle breadth of 3rd antennal segment; 3rd segment with 3 or 4 setae. Rostrum extending to midway between fore and middle coxae; ultimate segment (fig. 11, E) 0.7–1.0 times as long as 2nd segment of hind tarsus, with 4–6 setae besides apical ones. Pronotum with 2 pairs of spinal tubercles, the hind pair being slightly larger than the frontal one. Mesonotum with a pair of large spinal tubercles which are similar to those of *ulmiparvifoliae* Matsu-mura in shape. Metanotum without tubercles. Legs: tibiae with spinules on distal 3/13; 1st tarsal segment with 5 setae ventrally and 2 setae dorsally. Abdomen with 1st–2nd segments bearing a pair of spinal tubercles. Dorsal abdominal chaetotaxy as shown in Fig. 11, B. Anterior segments with marginal tubercles, of which those on 2nd and 3rd segments are especially large. Cornicles 0.33–0.40 as long as 2nd segment of hind tarsus, at most 4/11 as long as base of 6th antennal segment. Cauda knobbed and anal plate bilobed, both bearing only elongate setae with pointed apices.

Length of spinal tubercles on thorax and abdomen as follows:—

prothorax		mesothorax	abdomen	
ant.	post.		1st seg.	2nd seg.
8–11	15–23	68–83	46–57	47–64 ( $\mu$ )

Specimens examined: 3 alate viviparous females (syntypes), Sapporo, Hokkaidô, 31-vii-, 1-viii-1960, ex *Ulmus* sp., R. Takahashi leg.

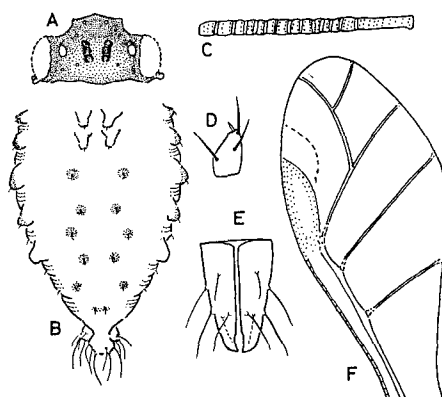


Fig. 11. *Tinocallis sapporoensis*, sp. nov. Alate viviparous female:—A, head; B, abdomen; C, 3rd antennal segment; D, 1st segment of hind tarsus (lateral view); E, ultimate rostral segment; F, fore wing.

Host plants: *Ulmus* sp.

Distribution: Japan (Hokkaidô).

This species is characterized by the following features:—(1) Fore wings hyaline. (2) Head and thorax black. (3) Head without tubercles. (4) Abdominal spinal tubercles present on 1st and 2nd segments. (5) Largest spinal tubercle situated on mesonotum.

5. *Tinocallis takachihoensis*, sp. nov.

Alate viviparous female: Head and thorax black. Eyes reddish brown. Antennae pale; 3rd–5th segments at apex black. Abdomen pale green. Legs—fore and middle legs: tibiae at apex and tarsi black; hind legs: femora at apex, tibiae at both ends and tarsi black. Body about 1.92 mm. in length. Head (fig. 12. A) faintly corrugated,

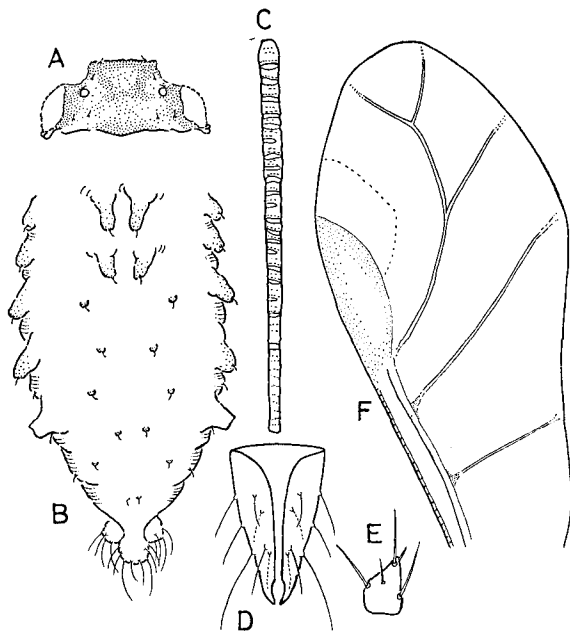


Fig. 12. *Tinocallis takachihoensis*, sp. nov. Alate viviparous female:—A, head; B, abdomen; C, 3rd antennal segment; D, ultimate rostral segment; E, 1st segment of hind tarsus (lateral view); F, fore wing.

without tubercles on dorsum; cephalic setae short, the longest seta 0.45–0.83 as long as middle breadth of 3rd antennal segment. Antennae 0.88 as long as body: 3rd segment (fig. 12, C) spiculose imbricated, with 19–24 (mostly 22) secondary sensoria; processus terminalis 0.92–1.2 times as long as base of 6th antennal segment; length of 3rd–6th segments in proportion 39 : 23 : 21 : 11 + 11. Antennal setae short, at most  $\frac{1}{2}$  as long as middle breadth of 3rd antennal segment; 3rd segment with 9–15 (mostly 14) setae. Clypeus with a pair of anterior setae; mandibular lamina with 1 or 2 setae 3.5–4.2 times as long as cephalic setae. Rostrum extending to midway between fore

and middle coxae; ultimate segment (fig. 12, D) 0.94–1.14 times as long as 2nd segment of hind tarsus, with 6–10 setae besides apical ones. Pronotum with a pair of posterior spinal tubercles; prothoracic setae blunt or faintly capitate, as long as or a little longer than cephalic setae. Mesonotum with a pair of large spinal tubercles which are similar to those of *ulmiparvifoliae* Matsumura in shape. Legs: tibiae with spinules on distal 1/6; 1st tarsal segment with 7 setae ventrally and 2 setae dorsally. Abdomen with each segment bearing a pair of spinal tubercles, of which those on 1st and 2nd segments are especially large, at least 2.5 times as large as the rest, while those of 5th and following segments are often small and inconspicuous. Dorsal abdominal chaetotaxy as shown in Fig. 12, B; the marginal seta of 6th segment attached to the base of cornicle. Cornicles a little constricted at middle, 0.4–0.6 as long as 2nd segment of hind tarsus, at most 2/5 as long as base of 6th antennal segment. Cauda knobbed and anal plate bilobed, both bearing only elongate setae with pointed apices.

Specimens examined: Some alate viviparous females (syntypes), Takachiho, Miyazaki-ken, 1-v-1965, ex *Ulmus* sp.

Host plants: *Ulmus* sp.

Distribution: Japan (Kyûshû).

This species is readily distinguished from any other related ones by the following characters: (1) Antennae about 0.9 as long as body. (2) Third antennal segment with 19–24 secondary sensoria and 9–15 setae. (3) Ultimate rostral segment with 6–10 secondary setae. (4) First tarsal segment with 7 ventral setae.

## 6. *Tinocallis ulmiparvifoliae* Matsumura

References. Matsumura 1919: 101; Takahashi 1929: 252 [*Myzocallis viridis*]; Tao 1963: 61; Eastop 1966: 522; Richards 1967: 548.

Synonyms. *Myzocallis viridis* Takahashi, 1929.

Alate viviparous female: Measurements of 8 specimens in mm. Body 2.01 (1.75–2.12); antennal segments (1st–6th): 0.07 (0.07–0.08), 0.05 (–), 0.53 (0.48–0.58), 0.26 (0.18–0.32), 0.27 (0.19–0.30), 0.17 (0.13–0.19)+0.13 (0.08–0.15); ultimate rostral segment 0.09 (0.08–0.09); hind femur 0.49 (0.44–0.53); hind tibia 0.88 (0.79–0.97); 2nd segment of hind tarsus 0.12 (0.10–0.12); cornicle 0.05 (0.05–0.06); longest seta on head 0.011 (0.008–0.015), that on 3rd antennal segment 0.004 (–), that on 6th abdominal segment 0.011 (0.008–0.015).

Specimens examined: Some alate viviparous females, Tôkyô, 27-vii-1955, 15-v-1959, ex *Ulmus* sp., R. Takahashi leg.

Host plants: *Ulmus parvifolia* Jacq. (after Matsumura, 1919), *Ulmus* sp. According to the literature the following plants are recorded as hosts:—*Ulmus chinensis* (in Australia, after Eastop, 1966), *Zelkova formosana* (in Formosa, after Tao, 1963).

Distribution: Japan (Honshû); Formosa; Australia.

This species is easily distinguished from any other congeneric ones by the presence of three pairs of elongate tubercles on the head.

## 7. *Tinocallis zelkowae* (Takahashi)

References. Takahashi 1919: 173 [*Myzocallis*]; Shinji 1924: 347 [*Lutaphis nirecola*]; ibid. 1941: 320 [*Myzocallis nirecola*]; Tao 1963: 69 [*Sarucallis*]; Paik 1965: 51 [*Sarucallis*]; Richards 1967: 550.

Synonyms. *Lutaphis nirecola* Shinji, 1924.

Alate viviparous female: Measurements of 10 specimens in mm. Body 1.62 (1.41–1.72); antennal segments (1st–6th): 0.05 (0.05–0.06), 0.05 (0.04–0.05), 0.36 (0.30–0.40), 0.20 (0.17–0.22), 0.19 (0.15–0.21), 0.12 (0.11–0.14)+0.08 (0.06–0.09); ultimate rostral segment 0.08 (–); hind femur 0.33 (0.29–0.41); hind tibia 0.53 (0.47–0.61); 2nd segment of hind tarsus 0.08 (0.07–0.09); cornicle 0.03 (–); longest seta on head 0.012 (0.008–0.015), that on 3rd antennal segment 0.004 (–), that on 6th abdominal segment 0.008 (0.008–0.011).

Specimens examined: Many alate viviparous females taken at the following localities: Honshû—Morioka, Iwate-ken, 24-vi-1967, ex *Zelkova serrata*; Utsunomiya, Tochigi-ken, 17-viii-1967, ex *Zelkova serrata*; Nikkô, Tochigi-ken, 21-vii-1967, ex *Zelkova serrata*; Tôkyô, 8-viii-1958, ex *Zelkova* sp., R. Takahashi leg.; Ôsaka, 31-v-1959, ex *Zelkova* sp., R. Takahashi leg. Shikoku—Sadamitsu, Tokushima-ken, 19-vii-1958, ex *Zelkova* sp., R. Takahashi leg.

Host plants: *Zelkova serrata* (Thunb.), *Ulmus davidiana* var. *japonica* (Rehd.) (after Shinji, 1924). According to the literature the following plants are recorded as hosts:—*Zelkova formosana* (in Formosa, after Tao, 1963); *Alnus japonica*, *Corylus sieboldiana*, *Robinia pseudoacacia* (in Korea, after Paik, 1965).

Distribution: Japan (Hokkaidô; Honshû; Kyûshû; Shikoku); Korea; Formosa.

This species is readily distinguished from any other congeneric ones by its coloration and by the absence of well developed dorsal tubercles as indicated in Figs. 12, A & B. Furthermore, *Tinocallis zelkova*e Dzhibladze, 1957, from Eurasia is a different species.



Fig. 13.

*Tinocallis zelkovaiae* (Takahashi). Alate viviparous female:—A, head; B, abdomen.

## 12. Genus *Tuberculatus* Mordwilko

References. Mordwilko 1894: 136; Richards 1965: 66; ibid. 1968a: 562; Higuchi 1969: 111.

Synonyms. *Acanthocallis* Matsumura, 1917 [type-species: *Acanthocallis quercicola* Matsumura, 1917]; *Arakawana* Matsumura, 1917 [type-species: *Arakawana stigmata* Matsumura, 1917].

Type-species. *Aphis quercea* Kaltenbach, 1843.

This genus is widely distributed in the Holarctic region, including about 20 species. In my previous paper (1969) 9 species are recognized in Japan.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 41, O, the setae being long, capitate; spinal setae arranged in parallel rows; pleural setae absent. Cornicle visible.

Host plants: Fagaceae.

Distribution: Holarctic region.

### Key to the Japanese species of *Tuberculatus*

Alate viviparous female

1. Pronotum without spinal tubercles. . . . . 2
- Pronotum with spinal tubercles. . . . . 4

2. Head with frontal and anterior discal setae capitate. Pronotum with 2 posterior spinal setae. Abdominal segments I-III with a pair of spinal tubercles which are not united on basal part, the tubercles on 3rd segment being sometimes much smaller than the rest. . . . 4. *kashiwae* (Matsumura)
- Head with frontal and anterior discal setae pointed. Pronotum with 4-16 posterior spinal setae. Abdominal segments I-III with a pair of spinal tubercles which are united and expanded on basal part, the tubercles on 3rd segment being much larger than the rest. . . 3
3. Stigma with a conspicuously pigmented crescent patch posteriorly. Eyes rather small. Frontal tubercles well developed. Frontal setae shorter than 1st and 2nd antennal segments taken together. Third antennal segment with about 6 secondary sensoria. Ventral abdominal setae longer than dorsal ones. Cornicles spiculose. . . . . 8. *stigmatus* (Matsumura)
- Stigma not marked as above. Eyes large. Frontal tubercles poorly developed. Frontal setae as long as 1st and 2nd antennal segments taken together. Third antennal segment with about 15 secondary sensoria. Ventral abdominal setae shorter than dorsal ones. Cornicles smooth. . . . . 5. *pilosus* (Takahashi)
4. Pronotum with a pair of spinal tubercles. . . . . 5
- Pronotum with 2 pairs of spinal tubercles. . . . . 6
5. Head with middle discal setae subequal to frontal setae in length and shape. Third antennal segment with setae as long as those of the 1st. Cornicles smooth. . . . . 7. *querciformosanus* (Takahashi)
- Head with middle discal setae shorter than frontal setae. Third antennal segment with setae shorter than those of the 1st. Cornicles spiculose on distal half. . . . . 9. *yokoyamai* (Takahashi)
6. Mesonotum without spinal tubercles. Sixth antennal segment with processus terminalis 1.7-1.9 times as long as base. Abdominal segments I-III with a pair of spinal tubercles. . . . 1. *capitatus* (Essig & Kuwana)
- Mesonotum with spinal tubercles. Sixth antennal segment with processus terminalis 0.8-1.6 times as long as base. All abdominal segments with a pair of spinal tubercles, of which those of 1st-3rd segments much larger than the rest. . . . . 7
7. Frontal setae conspicuously or slightly capitate, as long as 1st antennal segment, shorter than 2nd segment of hind tarsus. Hind femora with capitate setae. . . . 3. *japonicus* Higuchi
- Frontal setae pointed, longer than 1st antennal segment, as long as 2nd segment of hind tarsus. Hind femora with pointed setae. . . . . 8
8. Metanotum with spinal tubercles. Head with 5 or 6 posterior discal setae on either side. Third antennal segment with 16-20 setae. Pronotum with 4-6 anterior pleural setae on either side. Cells of forewing with many pointed setae. . . . . 6. *quercicola* (Matsumura)
- Metanotum without spinal tubercles. Head with 2 posterior discal setae on either side. Third antennal segment with 7-10 setae. Pronotum with 2 anterior pleural setae on either side. Cells of forewing without setae. . . . . 2. *fulviabdominalis* (Shinji)

1. ***Tuberculatus capitatus*** (Essig & Kuwana)

References. Essig & Kuwana 1918: 89 [*Myzocallis*]; Shinji 1941: 366 [*Tuberculoides*]; Tao 1963: 76 [*Tuberculoides*]; ibid. 1964a: 215 [*Tuberculoides*]; Paik 1965: 41 [*Tuberculoides*]; Moritsu 1953: 2; Richards 1968a: 566; Higuchi 1969: 112.

Host plants: *Quercus acutissima* Carruthers (after Essig & Kuwana, 1918), *Quercus dentata* Thunb. (after Shinji, 1941), *Quercus mongolica* var. *grosseserrata* Blume (after Shinji, 1941), *Quercus serrata* Thunb. (after Shinji, 1941), and *Quercus variabilis* Blume (after Moritsu, 1953).

Distribution: Japan (Honshû); Korea; Formosa; China.

2. ***Tuberculatus fulviabdominalis*** (Shinji)

References. Shinji 1941: 368 [*Tuberculoides*]; Paik 1965: 42 [*Tuberculoides quercicola*]; Higuchi 1969: 113.

Host plants: *Quercus dentata* Thunb., *Quercus mongolica* var. *grosseserrata* Blume, and *Quercus serrata* Thunb. (after Shinji, 1941).

Distribution: Japan (Honshû); Korea.

3. ***Tuberculatus japonicus*** Higuchi

References. Higuchi 1969: 114.

Host plants: *Quercus dentata* Thunb.

Distribution: Japan (Hokkaidô).

4. ***Tuberculatus kashiwae*** (Matsumura)

References. Matsumura 1917: 371 [*Myzocallis*]; ibid. 1919: 102 [*Myzocallis naracola*]; Higuchi 1969: 115.

Synonyms. *Myzocallis naracola* Matsumura, 1919. **Syn. nov.**

Host plants: *Quercus dentata* Thunb. (after Matsumura, 1917), *Quercus mongolica* var. *grosseserrata* Blume, and *Quercus serrata* Thunb.

Distribution: Japan (Hokkaidô; Honshû).

Having examined the slide (without date) identified by Dr. S. Matsumura as *naracola* Mats., I have come to the conclusion that *naracola* and *kashiwae* should be treated as one species. Judging from the literature the aphid stated by Shinji (1941) under the name *Tuberculoides naracola* seems to be another species.

5. ***Tuberculatus pilosus*** (Takahashi)

References. Takahashi 1929: 256 [*Myzocallis*]; Tao 1963: 78 [*Tuberculoides*]; ibid. 1964a: 216 [*Tuberculoides*]; Higuchi 1969: 116.

Host plants: *Quercus phillyraeoides* A. Gray.

Distribution: Japan (Honshû); Formosa.

6. ***Tuberculatus quercicola*** (Matsumura)

References. Matsumura 1917: 368 [*Acanthocallis*]; Essig & Kuwana 1918: 90 [*Myzocallis macrotuberculata*]; Matsumura 1919: 101 [*Ptychodes quercicola*]; Shinji 1941: 378 [*Tuberculoides macrotuberculata*]; Paik 1965: 41 [*Tuberculoides macrotuberculata*]; Richards 1968a: 584; Higuchi 1969: 117.

Synonyms. *Myzocallis macrotuberculata* Essig & Kuwana, 1918; *Ptychodes quercicola* Matsumura, 1919. **Syn. nov.**

Host plants: *Quercus acutissima* Carruthers (after Shinji, 1941), *Quercus dentata* Thunb., *Quercus mongolica* var. *grosseserrata* Blume (after Matsumura, 1917), and *Quercus serrata* Thunb.

Distribution: Japan (Hokkaidô; Honshû); Korea.

Having examined syntypes of *Ptychodes quercicola* Matsumura, 1919, described from oviparous females and alate males taken at Sapporo, I have come to the conclusion that it should be suppressed as a synonym of *quercicola* Mats., 1917.

7. ***Tuberculatus querciformosanus*** (Takahashi)

References. Takahashi 1921b: 72 [*Myzocallis*]; ibid. 1924: 713 [*Myzocallis*]; ibid. 1927: 19 [*Myzocallis*]; ibid. 1931: 82 [*Tuberculoides*]; Moritsu 1953: 8; Richards 1968a: 586; Higuchi 1969: 118.

Host plants: *Quercus dentata* Thunb.

Distribution: Japan (Hokkaidô; Honshû); Formosa.

8. ***Tuberculatus stigmatus*** (Matsumura)

References. Matsumura 1917: 375 [*Arakawana*]; Takahashi 1923: 64 [*Myzocallis quercicola*]; Okamoto & Takahashi 1926: 143 [*Myzocallis nigra*]; Shinji 1941: 386 [*Tuberculoides*]; Tao 1963: 80 [*Tuberculoides*]; ibid. 1964a: 216 [*Tuberculoides*]; Paik 1965: 39 [*Tuberculoides*]; Moritsu 1953: 4; Richards 1968a: 589; Higuchi 1969: 119.

Synonyms. *Myzocallis nigra* Okamoto & Takahashi, 1926.

Host plants: *Quercus dentata* Thunb. (after Moritsu, 1953), *Quercus mongolica* var. *grosseserrata* Blume, and *Quercus serrata* Thunb.

Distribution: Japan (Hokkaidô; Honshû); Korea; Formosa; China.

9. ***Tuberculatus yokoyamai*** (Takahashi)

References. Takahashi 1923: 63 [*Myzocallis*]; Moritsu 1953: 4 [*kashiwae*]; Richards 1968a: 593; Higuchi 1969: 120.

Host plants: *Quercus mongolica* var. *grosseserrata* Blume, and *Quercus serrata* Thunb.

Distribution: Japan (Hokkaidô; Honshû).

**Species of *Tuberculatus* not included in the key**

The following three oak aphids which were described as members of *Tuberculoides* v. d. Goot by Shinji might be referred to *Tuberculatus*. However, these species are excluded from the present key since I have seen no representatives.

10. ***Tuberculatus konaracola*** (Shinji)

References. Shinji 1941: 374 [*Tuberculoides*].

Host plants: *Quercus serrata* Thunb. (after Shinji, 1941).

Distribution: Japan (Honshû).

Judging from the original description, this species may be distinguished from other congeneric species by the following characters:—(1) Tubercles on 1st-2nd abdominal segments colourless, but those on 3rd black. (2) Cornicle black on distal half.

11. ***Tuberculatus kunugi*** (Shinji)

References. Shinji 1924: 346 [*Myzocallis*]; ibid. 1935b: 7 [*Tuberculoides*].

Host plants: *Quercus acutissima* Carruthers (after Shinji, 1924).

Distribution: Japan (Honshû).

According to the original description, this species is recognized by the following characters:—(1) Antenna longer than body; 3rd segment about as long as the 6th, with 4 setae and 2 small secondary sensoria; 4th segment about as long as the 5th, with 2 setae. (2) Each thoracic segment with a pair of finger-like tubercles. (3) Ab-



domen with 3 pairs of large finger-like tubercles. (4) Finger-like tubercles on abdomen, cornicles and cauda concolorous with body. (5) Cornicle about as long as tarsus in length.

## 12. *Tuberculatus naganoe* (Shinji)

References. Shinji 1941: 380 [*Tuberculoides*].

Host plants: *Quercus dentata* Thunb., *Quercus mongolica* var. *grosseserrata* Blume and *Quercus serrata* Thunb. (after Shinji, 1941).

Distribution: Japan (Honshû).

Judging from the original description, this species may be distinguished from any other species of *Tuberculatus* occurring in Japan by the following characters:—(1) All tibiae black and all spinal tubercles concolorous with body. (2) Abdomen with each segment bearing a pair of tubercles, the tubercles on 1st-3rd segments being larger than the rest. (3) Cornicle faintly pigmented at apex.

## *Symydobius* group

In most respects this group resembles the *Myzocallis* group, being distinguishable from the latter only by the presence of pleural abdominal setae in the embryonic stage. It may be distinct from the *Myzocallis* group and other groups by the combination of the following characters:—Apterae usually present. Head sometimes with a V-shaped suture. Processus terminalis 0.6-7.0 as long as base of 6th antennal segment. Ultimate rostral segment with 2-22 secondary setae. Apical tibial setae differing from other tibial setae. First tarsal segment usually without dorsal setae. Empodial setae flattened. Eighth abdominal segment with 6-28 setae. Rudimentary gonapophyses 1 or 2, rarely 3 in number. Wax plates sometimes present.

In the species of this group the embryo is characterized as follows:—Dorsal setae conspicuous except for *Betulaphis* and *Boernerina*; spinal and pleural setae arranged in parallel rows and capitate in shape except for *Callipterinella*, *Clethrobis*, *Eucera-aphis*, and *Symydobius*; marginal setae single in number except for *Clethrobis* and *Symydobius*. There is no remarkable difference between *Hannabura* and *Calaphis* in this stage.

## 13. Genus *Betacallis* Matsumura

References. Matsumura 1919: 110.

Type-species. *Betacallis alnicolens* Matsumura, 1919.

*Betacallis* is most easily recognized by the head with a broad dark band on the venter (fig. 14, A). This genus is probably Asiatic, being represented by two species.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 42, E, the setae being comparatively long, capitate; pleural setae present; marginal setae single. Cornicles visible.

Host plants: Betulaceae.

Distribution: Eastern Palaearctic region.

## Key to the Japanese species of *Betacallis*

Alate viviparous female

1. Abdomen without black band; 1st-7th segments with spinal setae about equal to those on 8th segment and longer than pleural setae. Cornicles pale at the base. On *Alnus* spp. . . . . 1. *alnicolens* Matsumura
- Abdomen with black bands on 4th and 5th segments; 1st-7th segments with spinal setae shorter than those on 8th segment and about to pleural setae. Cornicles not pale at the base. On *Betula* spp. . . . . 2. *odaiensis* Takahashi

1. ***Betacallis alnicolens*** Matsumura

References. Matsumura 1919: 110.

On the basis of the present specimens, a redescription of the alate viviparous female is given below:—

Alate viviparous female: Body pale green in life, about 3.5 mm. including cauda. Antennal tubercles well developed. Head (fig. 14, A) smooth, with 4 pairs of long, pointed setae on dorsum. Eyes not reaching antennae; median ocellus situated on a distinct triangular part. Antennae very slender, about 1.6 times as long as body; 3rd segment a little broadened on basal part, with about 23 transversely elongate secondary sensoria in a row on basal 4/7, these sensoria not surrounded by spinules; 4th faintly imbricated, with pale streaks; 5th more distinctly imbricated; 6th with processus terminalis about 1.8 times as long as base of the segment; primary sensorium of 6th much elongated longitudinally, large, about 2.5 times as long as middle breadth of 6th segment, surrounded by setae; accessory sensoria present near primary one. Clypeus with a pair of long anterior setae; mandibular lamina with 2 setae. Rostrum short, not reaching middle coxae; ultimate segment with 4 pairs of secondary setae. Prothoracic setae 10 in number, long, at least 3 times as long as middle breadth of 3rd antennal segment. Legs: femora long, narrowed towards base; tibiae with many spines on distal part, and with 4 large stout spine-like setae at tip; tarsi with 1st segment wanting dorsal setae, and with 5 ventral setae; 2nd segment of hind tarsus

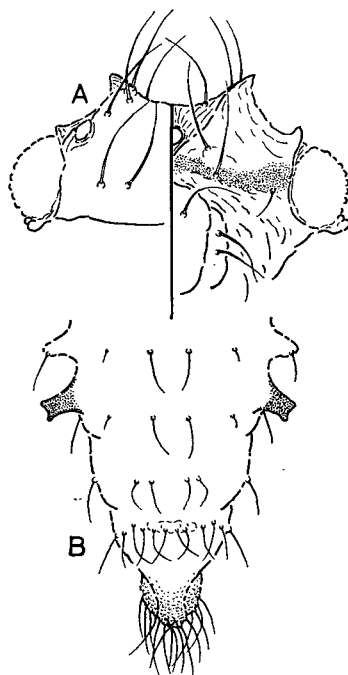


Fig. 14. *Betacallis alnicolens* Matsumura. Alate viviparous female:— A, head; B, abdomen.

slightly longer than ultimate segment of rostrum, much shorter than basal part of 6th antennal segment. Abdomen (fig. 14, B): 1st-7th segments with spinal setae about equal to those on 8th segment and longer than pleural setae; marginal tubercles well developed, the tubercles on 4th and 5th segments being especially large, but much smaller than cornicles. Cornicles pale at base, distinctly over twice as long as wide at middle, shorter than basal part of 6th antennal segment, tapered toward apex, corrugated, but not imbricated, and with flange moderately developed. Measurements of maximal setae in micra as follows:— head 151 (137-167), antenna (3rd seg.) 27 (23-30)

abdomen (6th seg.) 136 (128–151), leg (hind tibia) 189 (174–212).

Specimens examined: Many alate viviparous females taken at the following localities: Hokkaidô—Sapporo, 2-viii-1960, ex *Alnus* sp., R. Takahashi leg.; Mt. Daisetsu, 25-vii-1957, ex *Alnus* sp., S. Takagi leg. Honshû—Sukayu, Aomori-ken, 19-vi-1967, ex *Alnus* sp.; Sendai, Miyagi-ken, 27-vi-1967, ex *Alnus hirsuta* var. *sibirica*; Shirabutakayu, Yamagata-ken, 29-vi-1967, ex *Alnus hirsuta* var. *sibirica*; Oku-kinu, Tochigi-ken, 11-vii-1967, ex *Alnus hirsuta* var. *sibirica*; Nikkô, Tochigi-ken, 2-viii-1962, ex *Alnus hirsuta* var. *sibirica*, R. Takahashi leg.; Mt. Yatsugatake, Yamanashi-ken, 31-vii-1967, ex *Alnus* sp.; Karasawa, Nagano-ken, 25-vii-1967, ex *Alnus matsumurae*; Mt. Norikura, Nagano-ken, 11-viii-1961, ex *Alnus matsumurae*, R. Takahashi leg.; Mt. Daisen, Tottori-ken, 21-viii-1967, ex *Alnus* sp. Shikoku—Ichiûmura, Tokushima-ken, 20-viii-1958, ex *Alnus hirsuta*, R. Takahashi leg.

Host plants: *Alnus hirsuta* Turcz., *Alnus hirsuta* var. *sibirica* Fischer, *Alnus japonica* Thunb. (after Matsumura, 1919), *Alnus matsumurae* Callier.

Distribution: Japan (Hokkaidô; Honshû; Shikoku).

## 2. *Betacallis odaiensis* Takahashi

References. Takahashi 1961a: 6; Ghosh & Raychaudhuri 1968: 190; Ghosh, Basu & Raychaudhuri 1970: 67.

Alate viviparous female: Measurements of 10 specimens in mm. Body 2.81 (2.40–3.04); antennal segments (1st–6th): 0.12 (0.11–0.15), 0.07 (0.07–0.08), 1.30 (1.00–1.40), 0.95 (0.81–1.04), 0.80 (0.75–0.89), 0.31 (0.29–0.32)+0.67 (0.65–0.68); ultimate rostral segment 0.14 (0.12–0.16); hind femur 0.95 (0.77–1.09), hind tibia 1.99 (1.74–2.18); 2nd segment of hind tarsus 0.14 (0.12–0.16); longest seta on head 0.103 (0.090–0.129), that on 3rd antennal segment 0.020 (0.016–0.026), that on 6th abdominal segment 0.026 (0.023–0.032), that on hind tibia 0.145 (0.097–0.167).

Specimens examined: 1 alata (holotype) taken at Odaigahara, Nara-ken, 18-viii-1956, M. Sorin leg. Many alatae taken at the following localities: Shirabutakayu, Yamagata-ken, 29-vi-1967, ex *Betula ermanii*; Mikuni, Niigata-ken, 2-vii-1967, ex *Betula platyphylla* var. *japonica*; Oku-kinu, Tochigi-ken, 11-, 12-vii-1967, ex *Betula maximowicziana*.

Host plants: *Betula platyphylla* var. *japonica* (Miq.), *Betula ermanii* Cham., *Betula maximowicziana* Regel. In Sikkim *Castanospermum* sp. and a plant of Acanthaceae have been recorded as hosts (after Ghosh & Raychaudhuri, 1968).

Distribution: Japan (Honshû); Sikkim.

## 14. Genus *Betulaphis* Glendinning

References. Glendinning 1926: 96; Cottier 1953: 105.

Type-species. (*Betulaphis occidentalis* Glend., 1926) = *Betulaphis quadrituberculata* (Kaltenbach, 1843).

This genus is probably Holarctic, being represented by the following five species: *quadrituberculata* (Kalt.) from Europe, North America, and New Zealand, *arctosetis* Richards from Baffin Island and Northern Alaska, *viridis* Richards and *aureus* Richards from Canada, *pelei* H. R. L. from Greenland and *japonica* Tak. from Japan. All the species live on *Betula* spp.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 42, J; spinal and pleural setae very short and inconspicuous; marginal setae capitate and single. Cornicle visible.

Host plants: Betulaceae.

Distribution: Holarctic and Australian regions.

1. ***Betulaphis japonica*** Takahashi

References. Takahashi 1961a: 4.

Apterous viviparous female: Measurements of 10 specimens in mm. Body 1.36 (1.11–1.60); antennal segments (1st–6th); 0.06 (0.05–0.08), 0.04 (0.03–0.05), 0.27 (0.21–0.28), 0.16 (0.10–0.18), 0.13 (0.09–0.14), 0.10 (0.08–0.10)+0.10 (0.08–0.10); ultimate rostral segment 0.06 (0.05–0.06); hind femur 0.31 (0.23–0.36); hind tibia 0.50 (0.35–0.60); 2nd segment of hind tarsus 0.10 (0.08–0.12); longest seta on head 0.045 (0.032–0.065), that on 3rd antennal segment 0.010 (0.006–0.012), that on 6th abdominal segment 0.008 (0.003–0.012), that on hind tibia 0.036 (0.026–0.039).

Specimens examined: 3 apterous viviparous females and nymphs (syntypes) taken at Mt. Norikura, Nagano-ken, 11–viii-1959, ex *Betula* sp., R. Takahashi leg. Many apterous viviparous females taken at the following localities: Hokkaidô—Sapporo, 12–vi-1968, ex *Betula platyphylla* var. *japonica*; Ōnuma, 16–vi-1967, ex *Betula platyphylla* var. *japonica*. Honshû—Nikkô, Tochigi-ken, 10 –vii-1967, ex *Betula maximowicziana*; Karasawa, Nagano-ken, 26–vii-1967, ex *Betula* sp.

Host plants: *Betula maximowicziana* Regel, *Betula platyphylla* var. *japonica* (Miq.), *Betula* sp.

Distribution: Japan (Hokkaidô; Honshû).

Judging from the description, *Betulaphis aureus* Richards described from Canada is closest to this species. Furthermore, the species is very similar to *Betulaphis quadrituberculata* (Kalt.), but it differs from the latter by the following characters:— (1) Anterior abdominal segments with spinal setae short, at most 1/3 as long as marginal ones. (2) Hind tibia not more than 0.6 mm. in length.

15. Genus ***Boernerina*** Bramstedt

References. Bramstedt 1940: 11; Hille Ris Lambers 1962: 112.

Type-species. *Boernerina depressa* Bramstedt, 1940.

*Boernerina* Bramstedt is a small genus, of which the members are associated with *Alnus* spp. In Japan has been known to occur only a single species, which seems to be restricted to mountainous regions.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 42, I; spinal and pleural setae very short and inconspicuous; marginal setae single, capitate. Cornicle visible.

Host plants: Betulaceae.

Distribution: Holarctic region.

1. ***Boernerina alni*** Takahashi

References. Takahashi 1961a: 3; Hille Ris Lambers 1962: 118; Sorin 1970: 254.

As far as I am aware, the alate viviparous female of the species has hitherto been undescribed. On the basis of the present specimens a description is given as follows:—

Alate viviparous female: Body about 2.4 mm. in length. Head (fig. 15, A) faintly corrugated, with a pair of prominent tubercles near anterior margin, the tubercles being at least  $\frac{4}{5}$  as long as their width in the middle. Antennae about 0.8 as long as body; 3rd segment (fig. 15, C) imbricated but not spinulose, with about 12 short, pointed setae, and with 4-8 secondary sensoria on basal  $\frac{2}{5}$ ; primary sensoria with hairy fringe; 6th with processus terminalis about 0.7 as long as base of the segment. Clypeus faintly corrugated, with a pair of anterior setae; mandibular lamina with a seta. Rostrum short, not reaching middle coxae; ultimate segment about 0.9 as long as 2nd segment of hind tarsus, with 6 secondary setae besides primary ones. Pronotum with 8 pointed setae about equal to cephalic setae in length. Legs: femora narrowed towards base, with spinules on distal part, and with some pointed setae as

long as or a little shorter than tibial setae; tibiae with very stout, spine-like setae at apex; 1st segment of all tarsi with 6 or 7 setae ventrally and 2 setae dorsally; 2nd tarsal segment with conspicuous spinules on the imbrications. Abdomen (fig. 15, B) with a spino-pleural sclerotic bar on each segment, the bar being pigmented and broad. Dorsal abdominal setae arranged as in apterae, the spinal and pleural setae inconspicuous, and the marginal setae not capitate, about twice as long as spinal setae on abdomen; 8th segment with 8 setae. Cornicles short, with a weakly developed flange. Cauda knobbed, with about 12 pointed setae. Genital plate not defined distinctly. Waxglands on head, pronotum, and abdomen conspicuous in dark specimens, while invisible in pale ones. Measurements of maximal setae in micra as follows:—head 13.5 (7.5-15), antenna (3rd seg.) 10 (7.5-15), abdomen (6th seg.) 6 (4-10), leg (hind tibia) 35 (30-45).

Specimens examined: 1 aptera (holotype) taken at Mt. Norikura (altitude 3026 m), Gifu-ken, 12-viii-1959, ex *Alnus* sp., R. Takahashi leg.

Many apterous viviparous females taken at the following localities: Hokkaidô—Mt. Teine (altitude 1024 m), 5-ix-1963, M. Miyazaki leg.; Mt. Eniwa (altitude 1320 m), 1-vii-1966, ex *Alnus maximowiczii*, M. Miyazaki leg. Honshû—Oku-kinu (altitude about 1200 m), Tochigi-ken 11-vii-1967, ex *Alnus hirsuta*; Karasawa (altitude about 2000 m), Nagano-ken, 26-vii-, 27-viii-1967, ex *Alnus matsumurae*. Some alate viviparous females, Futamata (altitude about 1000 m), Hokkaidô, 24-vii-1968, ex *Alnus maximowiczii*; Karasawa, Nagano-ken, 26-vii-, 27-viii-1967, ex *Alnus matsumurae*.

Host plants: *Alnus alnobetula* var. *fruticosa* (after Sorin, 1970), *Alnus hirsuta* Turcz., *Alnus matsumurae* Callier, *Alnus maximowiczii* Callier.

Distribution: Japan (Hokkaidô; Honshû).

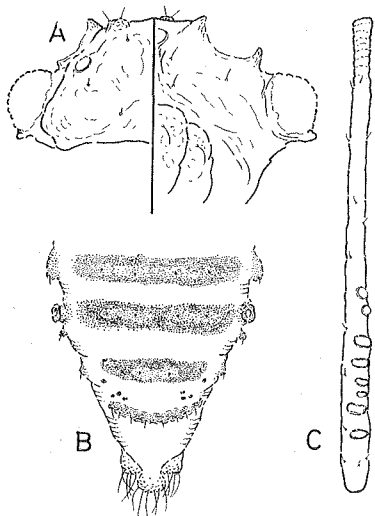


Fig. 15. *Boernerina alni* Takahashi. Alate viviparous female:—A, head; B, abdomen; C, 3rd antennal segment.

16. Genus *Calaphis* Walsh

References. Walsh 1862: 301; Baker 1920: 26; Palmer 1952: 63; Archibald 1958: 124.

Type-species. *Calaphis betululela* Walsh, 1862.

This is a well-known genus of the subfamily. So far as I am aware, however, no species of the genus has hitherto been known to occur in Japan. In the course of the present study is added to the fauna of Japan one species, *C. betulaecolens* (Fitch).

Embryo: Dorsal setae long, capitate; spinal setae single, arranged in parallel rows; pleural setae present; marginal setae single. Cornicle visible.

Host plants: Betulaceae.

Distribution: Holarctic region.

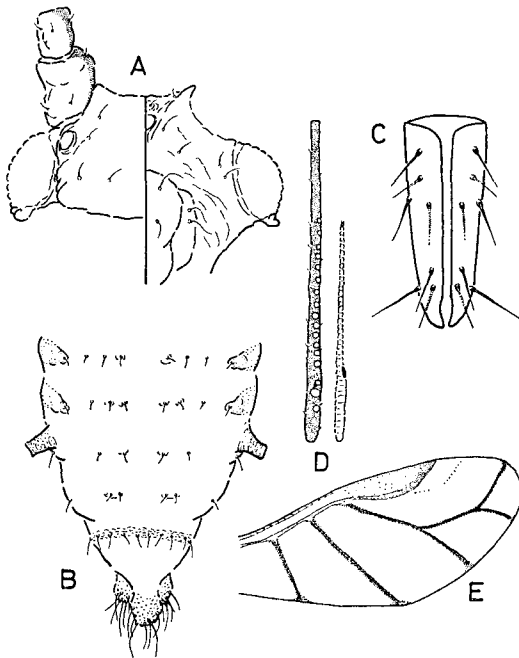


Fig. 16. *Calaphis betulaecolens* (Fitch). Alate viviparous female:—  
A, head; B, abdomen; C, ultimate rostral segment;  
D, 3rd and 6th antennal segments; E, fore wing.

1. *Calaphis betulaecolens* (Fitch)

References. Fitch 1851: 66 [*Aphis*]; Archibald 1958: 125.

Alate viviparous female: Head, thorax and abdomen yellowish green. Eyes red. Antennae: 1st and 2nd segments blackish brown at inner margin, 3rd and 4th segments on distal half blackish brown, 5th on distal 2/3 and 6th segment pale brown. Legs: femora at apex, tibiae and tarsi blackish brown. Fore wing (fig. 16, E) with veins bordered dusky. Body large, about 2.56 mm. in length. Antennal tubercles developed. Head (fig. 16, A) smooth; cephalic setae short, pointed, 0.5–0.7 as long as middle breadth of 3rd antennal segment; lateral ocellus as large as or a little larger

than secondary sensoria. Antennae long, 1.3–1.5 times as long as body; 3rd segment (fig. 16, D) with about 14–20 oval secondary sensoria on basal 7/10; 6th with primary sensorium surrounded by setae; one or 2 of accessory sensoria a little apart from primary one; processus terminalis 1.9–2.4 times as long as base of 6th antennal segment; length of 3rd–6th segments in proportion 77.5 : 52.5 : 42 : 18+36.5. Antennal setae blunt, short, 0.4–0.6 as long as middle breadth of 3rd antennal segment; 3rd segment with 21–38 setae, 4th with 10–15, and 5th with 6–9. Clypeus with a pair of anterior setae; mandibular lamina with 2 or 3 setae. Rostrum extending to midway between fore and middle coxae; ultimate segment 0.82–1.03 times as long as 2nd segment of hind tarsus, with 6–10 secondary setae. Legs: femora narrowed towards base, with spinules and setae sparsely; tibiae with spinules on distal 2/5, with many setae, of which the longest one is 1.3–1.6 times as long as middle breadth of 3rd antennal segment; 1st tarsal segment with 5 setae ventrally and 2 setae dorsally. Abdomen (fig. 16, B) smooth; 2nd–5th segments with 6–12 setae; 6th with 4 setae between cornicles, of which the longest one is 0.6–0.9 as long as middle breadth of 3rd antennal segment; 8th with 10 setae. Cornicles spiculously imbricated, somewhat tapered, 0.6–0.8 as long as 2nd segment of hind tarsus. Cauda bearing 6 or 7 setae. Anal plate weakly divided.

Specimens examined: Some alate viviparous females, Sapporo, Hokkaidô, 4–vii-1970, ex *Betula platyphylla* var. *japonica*; Mt. Yatsugatake, Yamanashi-ken, 31–vii-1967, ex *Betula ermanii*.

Host plants: *Betula ermanii* Cham. and *Betula platyphylla* var. *japonica* (Miq.).

Distribution: Japan (Hokkaidô; Honshû).

This species differs from *C. betullela* of North America, the type-species of *Calaphis*, by the following aspects:—(1) Abdomen without black transverse bands on dorsum. (2) Processus terminalis at most 2.4 times as long as base of 6th antennal segment. (3) Ultimate rostral segment with at least 6 secondary setae.

## 17. Genus *Callipterinella* van der Goot

References. van der Goot 1913: 118; *ibid.* 1915: 289.

Synonyms. *Procalaphis* Quednau, 1954 [type-species: *Aphis tuberculata* v. Heyden, 1837].

Type-species. (*Aphis betularia* Kalt., 1843) = *Aphis tuberculata* v. Heyden, 1837.

This genus is represented by two species: *C. tuberculata* (v. Heyden) from Europe and *C. calliptera* (Hartig) from Europe and North America. In this paper is given Japan as a locality of *C. calliptera* for the first time.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 42, C, the setae long, pointed; spinal setae a little longer than pleural ones, arranged in parallel rows; pleural setae present; marginal setae single. Cornicle visible.

Host plants: Betulaceae.

Distribution: Holarctic region.

### 1. *Callipterinella calliptera* (Hartig)

References. Hartig 1841: ? [*Aphis*]; Koch 1854: 7 [*Chaitophorus annulatus*]; van der Goot 1915: 290 [*annulata*]; Palmer 1952: 76 [*Neosymydobius annulatus*]; Börner 1952: 58 [*Calaphis*]; Szelegiewicz 1967: 55; *ibid.* 1968: 49.

Synonyms. *Chaitophorus annulatus* Koch, 1854.

This species is new to Japan. On the basis of the present material, a brief redescription is given below:—

Apterous viviparous female: Body about 1.7 mm. in length. Antennae 0.60–0.83 as long as body; 3rd segment with 2–7 (mostly 5) secondary sensoria; length of 3rd–6th segments in proportion 24 : 13 : 11 : 7+15.5. Ultimate rostral segment 0.9–1.1 times as long as 2nd segment of hind tarsus. Abdomen with black transverse band on each segment; marginal setae as long as or a little longer than spino-pleural setae. Measurements of maximal setae in micra as follows:—head 115 (86–144), antenna (3rd seg.) 18.3 (13.2–26.4), abdomen (6th seg.) 92.5 (76–167), leg (hind tibia) 88 (68–106).

Alate viviparous female: Body about 1.9 mm. in length. Antennae 0.68–0.84 as long as body; 3rd segment with 5–8 (mostly 7) secondary sensoria; length of 3rd–6th segments in proportion 31 : 19 : 14 : 7.5+16. Ultimate rostral segment 0.9–1.1 times as long as 2nd segment of hind tarsus. Abdomen with black bands as in apterae. Measurement of maximal setae in micra as follows:—head 98 (76–109), antenna (3rd seg.) 12 (7.6–15.2), abdomen (6th seg.) 65 (46–76), leg (hind tibia) 82 (76–90).

Specimen examined: Many apterous and alate viviparous females taken at the following localities: Hokkaidō—Sapporo, 29–vii–1969, ex *Betula platyphylla* var. *japonica*. Honshū—Morioka, Iwate-ken, 4–viii–1960, ex *Betula* sp., R. Takahashi leg.; Tsumagoi, Gumma-ken, 30–vii–1961, ex *Betula* sp., R. Takahashi leg.; Rokkō, Hyōgo-ken, 27–x–1956, ex *Betula* sp., R. Takahashi leg.

Host plants: *Betula platyphylla* var. *japonica* (Miq.), *Betula* sp. According to the literature the following plants are recorded as hosts:—*Betula carpatica*, *B. pubescens*, and *B. verrucosa* (in Poland, after Szelegiewicz, 1968), *Betula alba* and *B. papyrifera* (in U.S.A., after Palmer, 1952).

Distribution: Japan (Hokkaidō; Honshū); Europe; North America.

This species differs from *C. tuberculata* (v. Heyden) of Europe by the following aspects:—(1) Each abdominal segment with a black band. (2) Dorsal setae slender, not blunt in shape. (3) Antennal setae shorter, at most 4/5 as long as middle breadth of 3rd antennal segment.

## 18. Genus *Clethrobius* Mordwilko

References. Mordwilko 1928: 184.

Type-species. *Callipterus giganteus* Cholodkovsky, 1899.

This genus is represented by two species: *C. comes* (Walker, 1848) and *C. giganteus* (Chol., 1899), both of which occur in Europe. On this occasion I give Japan as a new locality of *C. comes* (Walker).

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 42, B, the setae being long, pointed; spinal setae double; pleural setae present; marginal setae triple; Cornicle visible.

Host plants: Betulaceae.

Distribution: Palaearctic region.

### 1. *Clethrobius comes* (Walker)

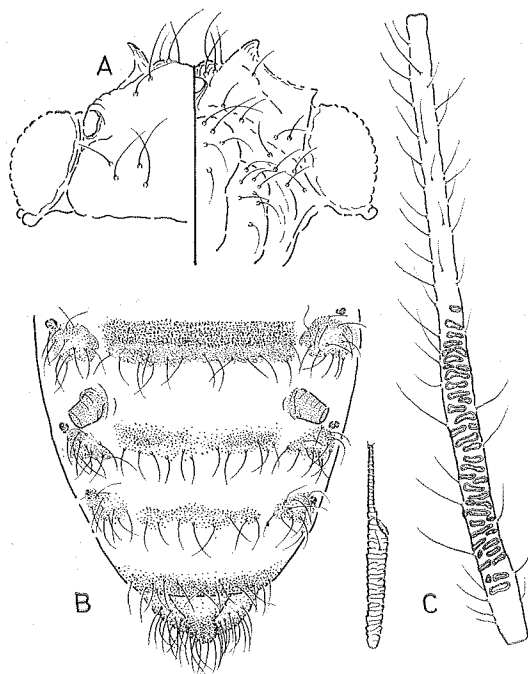
References. Walker 1848: 258 [*Aphis*]; Hille Ris Lambers 1947: 332; Börner 1952: 56 [*Beta-*



*callis*]; Szelegiewicz 1968: 48.

This species is new to Japan. On the basis of the specimens examined a redescription is given below:—

Alate viviparous female: Body dirty brown in life. Antennae black. Legs black; femora pale on basal half. Abdomen with black band on each segment. Cornicles and cauda black. Body large, about 4.4 mm. in length. Antennal tubercles developed. Head (fig. 17, A) with a V-shaped suture on ventrum; cephalic setae slender, hair-like, 1.6–2.9 (mostly 2.3) times as long as middle breadth of 3rd antennal segment; frontal setae 2, anterior setae 4, posterior setae 6–10 in number. Antennae strongly imbricated, about 0.74 as long as body; 3rd segment (fig. 17, C) with about 34–51 (mostly



**Fig. 17.** *Clethrobius comes* (Walker). Alate viviparous female:—

A, head; B, abdomen; C, 3rd and 6th antennal segments.

44) transversely elongate secondary sensoria; 6th with primary sensorium surrounded by setae; one or 2 accessory sensoria a little apart from primary one; processus terminalis about 0.6 as long as base of 6th antennal segment; length of 3rd–6th segments in proportion 86 : 47 : 40 : 16+10. Antennal setae slender, hair-like, numerous in number; 3rd with about 40–65 setae, of which the longest one is about 1.5–2.5 times as long as middle breadth of 3rd antennal segment; 6th with 1 seta. Clypeus with 4–6 pairs of anterior setae; mandibular lamina with about 8 setae. Rostrum extending to midway between fore and middle coxae; ultimate segment 0.67–0.81 as long as 2nd segment of hind tarsus, with 18–24 setae including apical ones. Legs: femora narrowed towards base, tibiae narrowed on distal 1/4, with stout, spine-like

setae at apex; 1st segment of all tarsi with 7 setae ventrally and 2 setae dorsally. Abdomen (fig. 17, B): each segment with a spino-pleural sclerotic bar which includes wax plate; 2nd-5th segments with 14-20 setae excluding marginal ones; 6th with 10-16 setae between cornicles; 1st-7th segments with marginal sclerites bearing 12-18 (mostly 15) setae; marginal tubercles on 3rd-5th segments more developed, low conical or semiglobular, and with 1 or 2 setae. Cornicles corrugated, not attached to marginal sclerites, about 0.36-0.58 as long as 2nd segment of hind tarsus. Cauda knobbed and anal plate not bilobed, both bearing only elongate setae with pointed apices. Genital plate defined distinctly, spiculose imbricated, with numerous setae in irregular rows.

Specimens examined: Many alate viviparous females taken at the following localities: Hokkaidô—Sapporo, 26-v-1967, ex *Betula platyphylla* var. *japonica*; Ônuma, 16-vi-1967, ex *Betula platyphylla* var. *japonica*. Honshû—Sukayu, Aomori-ken, 19-vi-1967, ex *Betula maximowicziana*; Suganuma, Gumma-ken, 22-vii-1967, ex *Betula ermanii*.

Host plants: *Betula ermanii* Cham., *Betula maximowicziana* Regel, and *Betula platyphylla* var. *japonica* (Miq.).

Distribution: Japan (Hokkaidô; Honshû); Europe.

This species may have been confused with *Symydobius kabae* (Matsumura) in Japan because of their similarity in pigmentation and because this species also feeds on *Betula* spp., but it differs from the latter by the number of setae on the 6th antennal segment and by the presence of wax-plates.

#### 19. Genus *Euceraphis* Walker

References. Walker 1870: 2001; van der Goot 1915: 329; Baker 1920: 28; Theobald 1927: 372; Shinji 1941: 126; Börner 1952: 57; Palmer 1952: 68; Eastop 1966: 508.

Synonyms. *Callipteroides* Mordwilko, 1909 [type-species: (*Aphis nigritarsis* Heyden, 1837) = *Euceraphis punctipennis* (Zett.)]; *Mimocallis* Matsumura, 1919 [type-species: (*Mimocallis betulijaponicae* Matsumura, 1919) = *Euceraphis punctipennis* (Zett.)].

Type-species. (*Aphis betulae*: Walker, 1870, nec Linné, 1758) = *Aphis punctipennis* Zetterstedt, 1828.

This genus is composed of several species occurring on *Betula* spp. and *Alnus* spp. in the World, and is represented in Japan by two species.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 42, D, the setae long, pointed; spinal setae single; pleural setae present; marginal setae single. Cornicle visible.

Host plants: Betulaceae.

Distribution: Holarctic and Australian regions.

##### 1. *Euceraphis punctipennis* (Zetterstedt)

References. Zetterstedt 1828: 559 [*Aphis*]; Heyden 1837: 299 [*Aphis nigritarsis*]; Koch 1855: 217 [*Callipterus betulae*]; Buckton 1881: 15 [*Callipterus betulae*]; Walker 1870: 2001 [*betulae*]; Mordwilko 1908: 377 [*Callipteroides nigritarsis*]; van der Goot 1915: 330 [*betulae*]; Matsumura 1919: 109 [*Mimocallis betulijaponicae*]; Theobald 1927: 373 [*betulae*]; Takahashi 1939: 126 [*betulae*]; Shinji 1941: 342 [*betulae*]; Palmer 1952: 68 [*betulae*]; Hille Ris Lambers 1952: 21; Börner 1952: 57; Archibald 1958: 128 [*betulae*]; Tao 1963: 75 [*betulae*]; Eastop 1966: 510; Szelegiewicz 1968: 48.

Synonyms. *Aphis nigritarsis* Heyden, 1837; *Callipterus betulae* Koch, 1881; *Mimocallis betulijaponicae* Matsumura, 1919.

Alate viviparous female: Measurement of 10 specimens in mm. Body 3.70 (3.48–4.12); antennal segments (1st–6th): 0.15 (0.15–0.18), 0.09 (0.08–0.09), 1.59 (1.44–1.73), 0.96 (0.89–1.26), 0.82 (0.74–1.00), 0.30 (0.27–0.33)+0.22 (0.19–0.26); ultimate rostral segment 0.15 (0.13–0.18); hind femur 1.51 (1.12–1.64); hind tibia 2.71 (1.82–3.14), 2nd segment of hind tarsus 0.19 (0.18–0.22); longest seta on head 0.038 (0.032–0.046), that on 3rd antennal segment 0.031 (0.025–0.039), that on 6th abdominal segment 0.053 (0.039–0.065), that on hind tibia 0.076 (0.065–0.083).

Specimens examined: Many alate viviparous females taken at the following localities: Hokkaidō—Sapporo, 8-vi-1967, 12-vi-1968, ex *Betula platyphylla* var. *japonica*; Obihiro, 17-vi-1965, ex *Betula platyphylla* var. *japonica*; Mt. Daisetsu, 25-vii-1957, ex *Betula* sp., S. Takagi leg.; Yukomanbetsu, 14-vii-1965, ex *Betula* sp. Honshū—Kai-gake, Niigata-ken, 2-vii-1967, ex *Betula platyphylla* var. *japonica*; Oku-kinu, Tochigi-ken, 11-vii-1967, ex *Betula maximowicziana*; Karasawa, Nagano-ken, 26-vii-, 27-viii-1967, ex *Betula ermanii*; Mt. Ikoma, Ōsaka, 20-v-1956, ex *Betula platyphylla* var. *japonica*, M. Sorin leg.

Host plants: *Betula ermanii* Cham., *Betula maximowicziana* Regel, *Betula platyphylla* var. *japonica* (Miq.), *Betula* sp. In Europe *Betula albosinensis*, *B. alnoides*, *B. andrewsi*, *B. ermanii*, *B. fontinalis*, *B. glandulosa*, *B. grossa*, *B. obscura*, *B. oycoviensis*, *B. papyrifera*, *B. pendula*, *B. platyphylla*, *B. pubescens*, *B. sandbergii*, *B. tristis*, *B. turkenstanica*, and *B. viscosa* have been recorded as hosts (after Eastop, 1966).

Distribution: Japan (Hokkaidō; Honshū); Formosa; Australia; Europe; North America; Greenland.

This is a well-known species in various parts of the World, feeding on *Betula* spp.

Judging from the literature *Mimocallis betulijaponicae* Matsumura, 1919, is a synonym of this species as Tao (1963) already pointed out.

### Species of *Eucерaphis* not included in the key

#### 2. *Eucерaphis ontakensis* Sorin

References. Sorin 1970: 252.

Host plants. *Alnus alnobetula* var. *fruticosa* and *Betula ermanii* (after Sorin, 1970).

Distribution. Japan (Honshū).

Judging from the literature this species resembles *E. punctipennis* (Zett.), but it differs from the latter by the distinct median longitudinal band on head.

#### 20. Genus *Hannabura* Matsumura

References. Matsumura 1917: 377.

Type-species. *Hannabura alnicola* Matsumura, 1917.

This Asiatic genus is closely related to *Kallistaphis* Kirkaldy, from which it differs only by the 1st tarsal segment with 5 ventral setae and without dorsal setae.

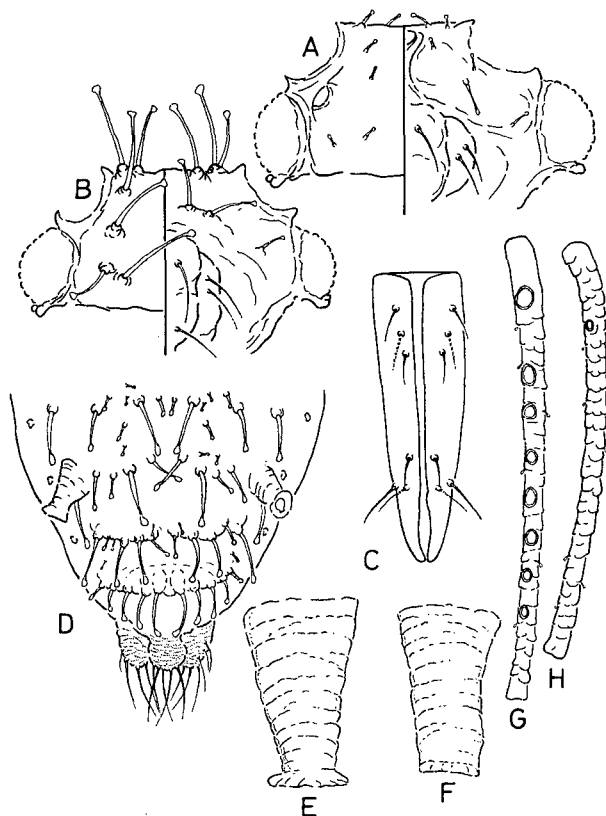
Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 42, F, the setae being capitate; spinal setae single, arranged in parallel rows; pleural setae present, shorter than spinal ones; marginal setae single. Cornicle visible.

Host plants: Betulaceae.  
Distribution: Eastern Asia.

1. *Hannabura alnicola* Matsumura

References. Matsumura 1917: 377; *ibid.* 1919: 107.

As far as I am aware, the oviparous female of the species has hitherto been undescribed. On the basis of the present specimens a brief description of oviparae and, on this occasion, redescrptions of alatae and apterae are given as follows:—



**Fig. 18.** *Hannabura alnicola* Matsumura. Alate viviparous female:—A, head; F, cornicle; G, 3rd antennal segment. Apterous viviparous female:—B, head; C, ultimate rostral segment; D, abdomen; E, cornicle; H, 3rd antennal segment.

Apterous viviparous female: Body about 1.6 mm. in length. Antennal tubercles poorly developed. Head (fig. 18, B): cephalic setae long, capitate, bases of setae slightly tuberculate. Antennae slender, as long as or a little longer than body; 1st segment somewhat projected on inner side, 1.7–3.0 (mostly 2.3) times as long as 2nd segment; 3rd segment (fig. 18, H) with 0–2 secondary sensoria; accessory sensoria not apart from primary one; processus terminalis long, 1.3–2.8 (mostly 2.4) times as long

as base of 6th segment; length of 3rd-6th segments in proportion 24.5 : 19 : 19 : 12+28. Antennal setae short, about 1/4 as long as middle breadth of 3rd antennal segment. Clypeus with a pair of anterior setae; mandibular lamina with 2 setae. Rostrum not surpassing middle coxae; ultimate segment (fig. 18, C) about 1.2 times as long as 2nd segment of hind tarsus, with 4-6 secondary setae besides primary ones. Pronotum with 1 anterior marginal seta, 1 posterior marginal seta, and 11-14 spinopleural setae on either side, all prothoracic setae capitate. Legs slender; fore coxae normal in shape; femora with short, capitate setae; tibiae with capitate or pointed setae, and without stout spine-like setae at apex; 1st tarsal segment with 5 ventral setae, no dorsal setae. Abdomen (fig. 18, D): dorsal setae variable in length; 6th with about 13 setae between cornicles; marginal abdominal setae single; marginal tubercles not developed. Wax plates absent. Cornicle 0.6-0.9 as long as 2nd segment of hind tarsus, tapered toward apex, corrugated, and with well developed flange. Cauda knobbed and bearing 8 setae. Anal plate bilobed but not deeply incised. Rudimentary gonapophyses usually represented by a single cluster.

Alate viviparous female: Differs from the apterous viviparous female as follows:—Body without small tubercles. Head, thorax and abdomen with dorsal setae shorter than in apterae. Third antennal segment (fig. 18, G) with 6-10 (mostly 8) round or oval secondary sensoria in a row along whole length; length of 3rd-6th antennal segments in proportion 23 : 19 : 18 : 11+31. Cornicle without well developed flange. Wing venation normal.

Oviparous female: Very much like apterous viviparous female. Body with numerous small tubercles and long, capitate setae as in apterae. Third antennal segment with 1 secondary sensorium. Ultimate rostral segment a little longer than in apterae. Hind tibiae with 21-34 pseudosensoria.

**Table 3.** Chaetotactic data for *Hannabura alnicola* Matsumura.  
Measurements of maximal setae in micra:

	apterous vivip. female	alate vivip. female	oviparous female
head	76- 95 av. 83	15-23 av. 20	91
antenna (3rd seg.)	8	4- 8 av. 6	8
abdomen (6th seg.)	83-114 av. 97	15-30 av. 20	99-106 av. 102
leg (hind tibia)	23- 38 av. 29	23-30 av. 25	23- 27 av. 25

Specimens examined: Many apterous viviparous females, Sōunkyō, Hokkaidō, 9-vii-1965, 17-vii-1968, ex *Alnus* sp.; Oirase, Aomori-ken, 21-vi-1967, ex *Alnus hirsuta* var. *sibirica*; Shirabutakayu, Yamagata-ken, 29-vi-1967, ex *Alnus* sp.; Tokusawa, Nagano-ken, 25-vii-1967, ex *Alnus hirsuta* var. *sibirica*. Some alate viviparous females, Oirase, Aomori-ken, 21-vi-1967, ex *Alnus hirsuta* var. *sibirica*; Tokusawa, Nagano-ken, 25-vii-1967, ex *Alnus hirsuta* var. *sibirica*. 2 oviparous females, Sapporo, Hokkaidō, 2-viii-1968, ex *Alnus* sp.; Sōunkyō, Hokkaidō, 17-vii-1968, ex *Alnus* sp.

Host plants: *Alnus hirsuta* var. *sibirica* (Fischer), *Alnus japonica* (Thunb.) (after

Matsumura, 1919), and *Alnus matsumurae* Callier (after Matsumura, 1917).

Distribution: Japan (Hokkaidō; Honshū).

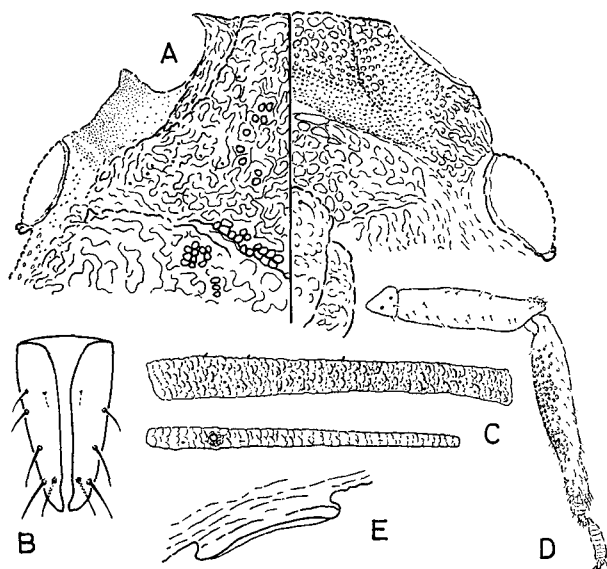
Judging from the literature the aphid stated by Shinji (1941) under the name *Calaphis alnicola* seems to be another species.

## 21. Genus *Monaphis* Walker

References. Walker 1870: 2001; van der Goot 1915: 340; Baker 1920: 32; Theobald 1927: 395; Börner 1952: 59.

Synonyms. *Bradyaphis* Mordwilko, 1894 [type-species: *Aphis antennata* Kalt., 1843].

Type-species. *Aphis antennata* Kaltenbach, 1843.



**Fig. 19.** *Monaphis antennata* (Kaltenbach). Oviparous female:—  
A, head; B, ultimate rostral segment; C, 3rd and 6th  
antennal segment; D, hind leg; E, cornicle.

This genus is represented by only a single species, *M. antennata* (Kaltenbach). On this occasion I give Japan as a new locality of this species.

Embryo: Unknown.

Host plants: Betulaceae.

Distribution: Palaearctic region.

### 1. *Monaphis antennata* (Kaltenbach)

References. Kaltenbach 1843: 115 [*Aphis*]; Walker 1870: 2001; Mordwilko 1894: 59 [*Bradyaphis*]; van der Goot 1915: 340; Theobald 1927: 395; Börner 1952: 59; Szelegiewicz 1968: 51.

This species is new to Japan. On the basis of the present material, a brief redescription is given below:—

Oviparous female: Body dark green in life, corrugated, covered with very small warts, about 3.16 mm. in length. Head (fig. 19, A) fused with prothorax, with a median longitudinal suture. Antennae very stout and about 0.85 as long as body; processus terminalis (fig. 19, C) long, 5.0–7.5 times as long as base of 6th antennal segment; length of 3rd–6th segments in proportion 43 : 30 : 32 : 9+46. Ultimate rostral segment (fig. 19, B) about 0.88 as long as 2nd segment of hind tarsus. Legs (fig. 19, D) stout, short; hind tibiae bearing at least 80 pseudosensoria. Abdomen with broad, black bands on 6th–8th segments. Cornicles very short (fig. 19, E).

Specimens examined: Some oviparous females, Sapporo, Hokkaidô, 18-x-1967, ex *Betula platyphylla* var. *japonica*; Nikkô, Tochigi-ken, 7-x-1967, ex *Betula maximowicziana*.

Host plants: *Betula maximowicziana* Regel and *Betula platyphylla* var. *japonica* (Miq.).

Distribution: Japan (Hokkaidô; Honshû); Europe.

This species is characterized in having stout antennae.

## 22. Genus *Neobetulaphis* Basu

References. Basu 1964: 226.

Type-species. *Neobetulaphis pusilla* Basu, 1964.

This peculiar genus is represented by a single species, *N. pusilla* Basu, described from Assam. In the course of the present study a second species has been found from Japan.

Embryo: Unknown.

Host plants: Betulaceae.

Distribution: Northern Oriental region.

### 1. *Neobetulaphis alba*, sp. nov.

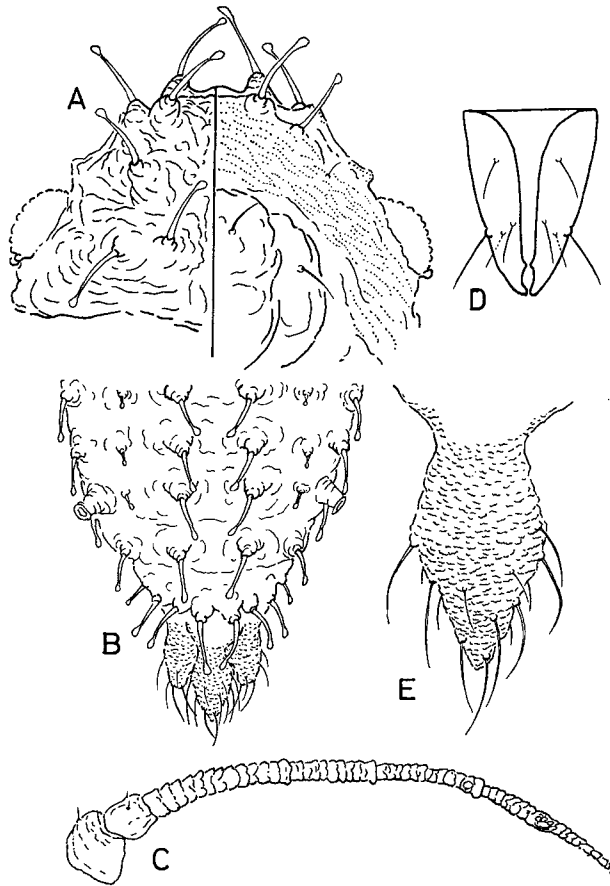
Apterous viviparous female: Body pale yellow in life, corrugated on dorsum, about 1.48 mm. in length, each dorsal seta placed on a small tubercle. Head (fig. 20, A) covered with spinules on ventrum. Antennae (fig. 20, C) strongly imbricated, about 0.45 as long as body, without secondary sensoria; accessory sensoria fused with the margin of primary one; processus terminalis as long as base of 6th antennal segment; length of 3rd–6th segments in proportion 11 : 7 : 8 : 6+6. Antennal setae very short, inconspicuous, at most 3/10 as long as middle breadth of 3rd antennal segment; 3rd segment with 3 setae. Clypeus with a pair of anterior setae; mandibular lamina with a seta. Rostrum just reaching to middle coxae; ultimate segment (fig. 20, D) about 1.1 times as long as 2nd segment of hind tarsus, with 2–4 secondary setae besides primary ones. Pronotum with 10 setae, of which 4 are marginal, the prothoracic setae subequal to cephalic setae in length and shape. Legs: tibiae thickening on distal 1/6, with spine-like setae at apex; 1st segment of all tarsi with 5 setae. Abdomen (fig. 20, B): 1st–6th segments with 2 spinal, 2 pleural and 2 marginal setae, the spinal and marginal setae longer than pleural ones; 7th with 4 setae; 8th with 8 setae. Cornicles corrugated, 0.67–1.0 as long as their width at the base, at most 0.7 as long as 2nd segment of hind tarsus, with well developed flange. Cauda (fig. 20, E) elongate, constricted near basal 1/3, with about 20 setae. Anal plate deeply bilobate. Measure-

ments of maximal setae in micra as follows:—head 72 (—), antenna (3rd seg.) 4.6 (3.8–6.1), abdomen (6th seg.) 62 (53–68), leg (hind tibia) 21 (19–23).

Specimens examined: Some apterous viviparous females (syntypes), Yumoto (Nikkō), Tochigi-ken, 10–viii–1967, ex *Betula platyphylla* var. *japonica*.

Host plants: *Betula platyphylla* var. *japonica* (Miq.).

Distribution: Japan (Honshū).



**Fig. 20.** *Neobetulaphis alba*, sp. nov. Apterous viviparous female:—A, head; B, abdomen; C, antenna; D, ultimate rostral segment; E, cauda.

This species is very closely related to *N. pusilla* Basu, but it differs from the latter by the following aspects:—(1) Third antennal segment at most twice as long as base of 6th antennal segment. (2) Processus terminalis at least 0.86 as long as base of 6th antennal segment. (3) Body at most 1.5 mm. in length. Judging from the literature the two species seem to differ only in the characters mentioned above. This may not be a fully reasonable basis for specific separation, but it seems better to regard them as distinct until the authentic material of *N. pusilla* from Assam is



available for further comparison.

### 23. Genus *Neocalaphis* Shinji

References. Shinji 1927: 28; Takahashi 1965: 54.

Type-species. *Calaphis magnoliae* Essig & Kuwana, 1918.

*Neocalaphis* Shinji differs from other related genera by the 6th antennal segment with very long processus terminalis. Its members associate with *Magnolia*, and are attended by ants. This genus is probably Asiatic, being represented by only two species from eastern Asia.

Embryo: Dorsal abdominal chaetotaxy as shown in Figs. 42, G & H, the setae being comparatively short, capitate; pleural setae present; marginal setae single. Cornicle visible.

Host plants: Magnoliaceae.

Distribution: Eastern Asia.

#### Key to the Japanese species of *Neocalaphis*

Alate viviparous female

1. Frontal setae short, about 0.5 as long as middle breadth of 3rd antennal segment. Third antennal segment dark near middle part, with 10-12 secondary sensoria. Ultimate segment of rostrum 0.8-0.9 as long as 2nd segment of hind tarsus. Eighth abdominal segment with 9 or 10 setae. Cauda with about 8 setae. Body small, about 1.9 mm. in length. . . . .  
. . . . . 1. *magnoliae* (Essig & Kuwana)
- Frontal setae long, about 2.4 times as long as middle breadth of 3rd antennal segment. Third antennal segment colourless except near apical part, with 9-19 secondary sensoria. Ultimate segment of rostrum 1.0-1.3 times as long as 2nd segment of hind tarsus. Eighth abdominal segment with 18-23 setae. Cauda with about 17 setae. Body large, about 2.9 mm. in length. . . . .  
. . . . . 2. *magnicolens* Takahashi

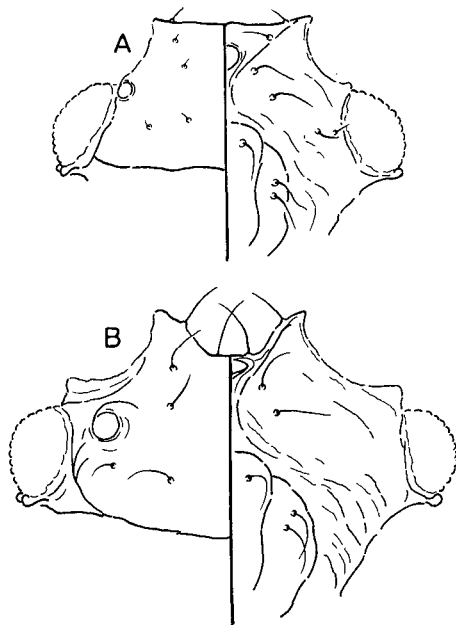


Fig. 21. *Neocalaphis magnoliae* (Essig & Kuwana) (A) and *N. magnicolens* (Takahashi) (B). Alate viviparous female:—A & B, head.

#### 1. *Neocalaphis magnoliae* (Essig & Kuwana)

References. Essig & Kuwana 1918: 85 [*Calaphis*]; Shinji 1923: 305 [*Euceraphis magnolifoliae*]; ibid. 1927: 28; ibid. 1941: 328 [*Calaphis*]; Paik 1965: 43 [*Calaphis*]; Takahashi 1965: 55.

Synonyms. *Euceraphis magnolifoliae* Shinji, 1923. **Syn. nov.**

Alate viviparous female: Measurements of 4 specimens in mm. Body 1.89 (1.76-1.97); antennal segments (1st-6th): 0.10 (0.09-0.11), 0.06 (0.05-0.06), 0.81 (0.77-0.88), 0.54 (0.49-0.64), 0.52 (0.49-0.59), 0.17 (0.17-0.18)+1.11 (—); ultimate rostral segment 0.08 (—); hind femur 0.55 (0.53-0.58); hind tibia 1.03 (0.95-1.07); 2nd segment of hind tarsus 0.09 (—); longest seta on head 0.016 (0.013-0.025), that on 3rd antennal segment 0.008

(--), that on 6th abdominal segment 0.019 (0.016–0.026), that on hind tibia 0.045 (0.039–0.049).

Specimens examined: 4 alate viviparous females, Tōkyō, 29–vii–1956, ex *Magnolia kobus*; Nara, Nara-ken, 23–viii–1957, ex *Magnolia* sp., R. Takahashi leg.

Host plants: *Magnolia kobus* Dc., *Magnolia liliflora* Desr. (after Shinji, 1923), and *Magnolia* sp.

Distribution: Japan (Honshū); Korea.

## 2. *Neocalaphis magnicolens* (Takahashi)

References. Takahashi 1921a: 27 [*Calaphis*]; ibid. 1923: 10 [*Calaphis*]; ibid. 1924: 109 [*Calaphis*]; Shinji 1941: 332 [*Calaphis*]; Takahashi 1965: 55.

Alate viviparous female: Measurements of 10 specimens in mm. Body 2.88 (2.36–3.30); antennal segments (1st–6th): 0.10 (0.08–0.12), 0.06 (0.05–0.08), 0.84 (0.58–0.98), 0.56 (0.41–0.68), 0.52 (0.38–0.59), 0.15 (0.12–0.18)+1.02 (0.83–1.27); ultimate rostral segment 0.16 (0.13–0.18); hind femur 0.75 (0.59–0.86); hind tibia 1.46 (1.23–1.65); 2nd segment of hind tarsus 0.13 (0.11–0.15); longest seta on head 0.063 (0.045–0.076), that on 3rd antennal segment 0.012 (0.008–0.016), that on 6th abdominal segment 0.039 (0.038–0.045), that on hind tibia 0.052 (0.038–0.064).

Specimens examined: Many alate viviparous females taken at the following localities: Hokkaidō—Sapporo, 28–ix–1967, ex *Magnolia obovata*; Ōnuma, 16–, 17–vi–, 8–ix–1967, ex *Magnolia obovata*; Shikotsuko, 30–viii–1969, ex *Magnolia obovata*; Kitami, 25–vii–1968, ex *Magnolia obovata*; Yamabe, 13–ix–1969, ex *Magnolia* sp. Honshū—Sukayu, Aomori-ken, 19–vi–1967, ex *Magnolia obovata*; Towada, Aomori-ken, 22–vi–1967, ex *Magnolia obovata*; Kaigake, Niigata-ken, 2–vii–1967, ex *Magnolia* sp.; Okukinu, Tochigi-ken, 12–vii–1967, ex *Magnolia obovata*; Mt. Daisen, Tottori-ken, 21–viii–1967, ex *Magnolia* sp.

Host plants: *Magnolia obovata* Thunb.

Distribution: Japan (Hokkaidō; Honshū).

## 24. Genus *Symydobius* Mordwilko

References. Mordwilko 1894: 58; Matsumura 1917: 369 [*Yezocallis*]; van der Goot 1919: 336; Baker 1920: 30; Theobald 1927: 376; Börner 1952: 56.

Synonyms. *Yezocallis* Matsumura, 1917 [type-species: *Yezocallis kabae* Matsumura, 1917].

Type-species. *Aphis oblongus* Heyden, 1837.

This genus is represented by three species: *S. oblongus* (Heyden, 1837) of Europe, *S. alniaria* (Matsumura, 1917) and *S. kabae* (Matsumura, 1917) of Asia. These species associate with *Alnus* and *Betula*, and are attended by ants.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 42, A, the setae being long, pointed; pleural setae present; marginal setae triple.

Host plants: Betulaceae.

Distribution: Palearctic region.

### Key to the Japanese species of *Symydobius*

Alate viviparous female

1. Body large, about 3.4 mm., without small tubercles on dorsum. Third antennal segment with

- about 60–70 secondary sensoria and about 70–90 setae. Processus terminalis about 0.8 as long as base of 6th antennal segment. On *Alnus* spp. . . . . 1. *alniaria* (Matsumura)
- Body smaller, about 3.0 mm., with small tubercles on dorsum. Third antennal segment with about 16–35 secondary sensoria and at most 50 setae. Processus terminalis about 0.6 as long as base of 6th antennal segment. On *Betula* spp. . . . . 2. *kabae* (Matsumura)
- Apterous viviparous female
1. Body about 3.1 mm., without small tubercles on dorsum. Third antennal segment with about 25–50 secondary sensoria. . . . . 1. *alniaria* (Matsumura)
- Body about 2.5 mm., with small tubercles on dorsum. Third antennal segment with about 16–30 secondary sensoria. . . . . 2. *kabae* (Matsumura)

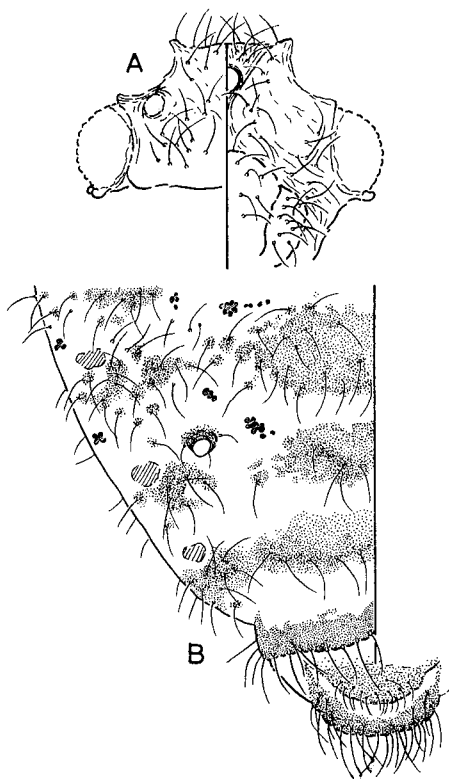


Fig. 22. *Symydobius alniaria* (Matsumura). Alate viviparous female:—A, head; B, abdomen.

1. *Symydobius alniaria* (Matsumura),  
comb. nov.

References. Matsumura 1917: 370 [*Yezocallis*];  
Essig & Kuwana 1918: 87 [*Eucraphis japonica*].

Synonyms. *Eucraphis japonica* Essig &  
Kuwana, 1918. **Syn. nov.**

On the basis of the specimens examined  
a redescription is given below:—

Alate viviparous female: Blackish brown  
in life. Body about 3.4 mm. including cauda.  
Antennal tubercles developed. Head (fig. 22,  
A): cephalic setae delicate, hair-like, numer-  
ous in number. Antennae imbricated, about  
0.8 as long as body; 3rd segment with about  
60–70 transversely elongate secondary sen-  
soria; 6th segment with primary sensorium  
surrounded by setae; accessory sensoria pre-  
sent near primary one; processus terminalis  
about 0.8 as long as base of 6th; length of  
3rd–6th segments in proportion 77 : 39 : 32 :  
14+11. Antennal setae numerous in number;  
3rd with about 70–90 setae; 6th with 11–13  
setae. Clypeus faintly corrugated, with about  
7 pairs of anterior setae; mandibular lamina  
with about 10 setae. Rostrum extending to  
midway between fore and middle coxae;  
ultimate segment about 0.8 as long as 2nd  
segment of hind tarsus, with about 8 pairs  
of secondary setae besides primary ones.

Prothoracic setae delicate, hair-like, very numerous in number. Legs: tibiae with  
numerous setae and with stout spine-like setae at apex; 1st segment of all tarsi with  
7 setae ventrally and 2 setae dorsally. Abdomen: 2nd–5th segments with 40–60 setae  
excluding marginal ones; 6th with 10–20 setae between cornicles; 1st–7th segments  
with marginal sclerites bearing 7–16 (mostly 13) setae. Cornicle rather short, about 1/3  
as long as 2nd segment of hind tarsus, corrugated, without flange. Cauda rounded.  
Anal plate not indented. Wing venation normal; stigma with about 10 setae along

posterior margin.

Apterous viviparous female: Differs from the alate viviparous female as follows:—Body smaller, about 3.1 mm. in length. Third antennal segment with about 25–50 secondary sensoria. Length of 3rd–6th antennal segments in proportion 73 : 34 : 29 : 14+11.

Specimens examined: An alate viviparous female (type of *Euceraphis japonica* Essig & Kuwana), Nikkô, Tochigi-ken, 11–vi–1913, ex *Alnus indica glauca* Ait., S. I. Kuwana leg. Many alate and apterous viviparous females, Kaigake, Niigata-ken, 2–vii–1967 ex *Alnus hirsuta*; Oku-kinu, Tochigi-ken, 12–vii–1967, ex *Alnus hirsuta* var. *sibirica*; Mt. Yatsugatake, Yamanashi-ken, 29–vii–1967, ex *Alnus hirsuta*.

Host plants: *Alnus hirsuta* Turcz., *Alnus hirsuta* var. *sibirica* (Fischer) (= *A. indica glauca* Ait.).

Distribution: Japan (Honshû).

Having examined the type of *Euceraphis japonica* E. & K., 1918, I have come to the conclusion that *E. japonica* should be suppressed as a synonym of *alniaria* (Mats., 1917).

This species is closely related to *Symydobius oblongus* (Heyden, 1837), from which it differs by the following aspects:—(1) Antennal setae long, about 1.0–2.5 times as long as middle breadth of 3rd antennal segment. (2) Third antennal segment with more numerous secondary sensoria, e. g. 60–70 in alatae, and 25–50 in apterae. (3) Fourth and 5th antennal segments not pale on the basal parts.

## 2. *Symydobius kabae* (Matsumura)

References. Matsumura 1917: 369 [*Yezocallis*]; Paik 1965: 45.

This species is closely related to the preceding one, from which it differs by the following aspects:—

Alate viviparous female: Body about 3.0 mm. in length. Antennae 0.9 as long as body; 3rd segment with 16–35 transversely elongate secondary sensoria and about 30–50 setae; processus terminalis about 0.6 as long as base of 6th antennal segment; length of 3rd–6th segments in proportion 65 : 34 : 30 : 14+8. Pronotum and abdomen with small tubercles. Marginal abdominal sclerites bearing about 15–20 setae.

Apterous viviparous female: Body smaller, about 2.5 mm. in length. Third antennal segment with about 16–30 secondary sensoria. Length of 3rd–6th antennal segments in proportion 68 : 33 : 29 : 14+9.

Specimens examined: Some alate viviparous females, Sapporo, Hokkaidô, 12–vi–1968, 10–vii–1970, ex *Betula platyphylla* var. *japonica*. 10 apterous viviparous females, Sapporo, Hokkaidô, 10–vii–1970; Mikuni, Niigata-ken, 2–vii–1967, ex *Betula platyphylla*



Fig. 23. *Symydobius kabae* (Matsumura). Alate viviparous female:—A, head. Apterous viviparous female:—B, abdomen.

var. *japonica*.

Host plants: *Betula maximowicziana* Regel (after Matsumura, 1917), *Betula platyphylla* var. *japonica* (Miq.).

Distribution: Japan (Hokkaidô; Honshû); Korea.

This species is easily distinguished from any other congeneric species in having small tubercles on the pronotum and abdomen. Judging from the literature the aphid stated by Shinji (1941) under the name *Symydobius kabae* seems to be another species.

### ***Diphyllaphis* group**

This group may have been separated together with the *Myzocallis* and *Symydobius* groups from the ancestral stock, because they have particular apical tibial setae. The most important character of this group is that the 2nd antennal segment is longer than the 1st. This group is characterized by the following features:—Second antennal segment longer than the 1st. Processus terminalis 0.1–0.5 as long as base of 6th antennal segment. Ultimate rostral segment with 2–4 secondary setae. Apical tibial setae slightly differing from other tibial setae. First tarsal segment with 2–5 ventral setae, and without dorsal setae. Empodial setae hair-like except for *Phyllaphis*. Eighth abdominal segment with 4–6 setae. Rudimentary gonapophyses 2 in number. Wax plate present.

The embryo of this group is similar to that of the *Neophyllaphis* group in the arrangement, shape, and number of the dorsal setae. This suggest that this group is the most primitive stock among the *Myzocallis*, *Symydobius* and *Diphyllaphis* groups. *Machilaphis* and *Phyllaphis* are much alike in the embryonic stage.

### 25. Genus ***Diphyllaphis*** Takahashi

References. Takahashi 1960: 12.

Synonyms. *Nymphaphis* Takahashi, 1960 [type-species: *Nymphaphis quercus* Takahashi, 1960].

Type-species. *Phloeomyzus konarae* Shinji, 1924.

*Diphyllaphis* Takahashi is very closely related to *Stegophylla* Oestlund of North America, but it differs from the latter by the minute cornicle not surrounded by setae. This genus is represented by four species, of which the following three species occur in Japan.

Embryo: Dorsal abdominal setae very short, inconspicuous; pleural setae present; marginal setae single.

Host plants: Fagaceae.

Distribution: Palaearctic region.

### **Key to the Japanese species of *Diphyllaphis***

Apterous viviparous female

1. Ultimate rostral segment (fig. 24, F) not stiletto-like in shape. Antennae 0.36–0.50 (average 0.45) as long as body. Cornicle (fig. 24, G) with pore much larger than diameter of wax-pore. Second tarsal segment with 2 setae on lower side besides apical ones. . . . . 3. *quercus* (Takahashi)
- Ultimate rostral segment (figs. 24, D & E) stiletto-like in shape. Antennae 0.26–0.36 as long as body. Cornicle (fig. 24, C) with pore about as wide as diameter of wax-pore. Second tarsal

- segment without setae on lower side besides apical ones. . . . . 2
2. Second antennal segment longer than 3rd segment. Sixth abdominal segment separated from 7th. Cauda with 3 or 4 setae. . . . . 1. *alba* Takahashi
- Second antennal segment shorter than 3rd segment. Sixth abdominal segment not separated from 7th. Cauda with 3 setae. . . . . 2. *konarae* (Shinji)

1. *Diphyllaphis alba* Takahashi

References. Takahashi 1960: 13.

Apterous viviparous female: Measurements of 10 specimens in mm. Body 1.26 (1.09–1.40); antennal segments (1st–6th): 0.04 (0.03–0.04), 0.06 (0.06–0.07), 0.05 (0.05–0.06), 0.04 (0.04–0.05), 0.06 (0.05–0.06), 0.09 (0.08–0.10)+0.03 (0.02–0.03); ultimate rostral segment 0.09 (0.09–0.10); hind femur 0.20 (0.17–0.22); hind tibia 0.25 (0.20–0.27); 2nd seg-

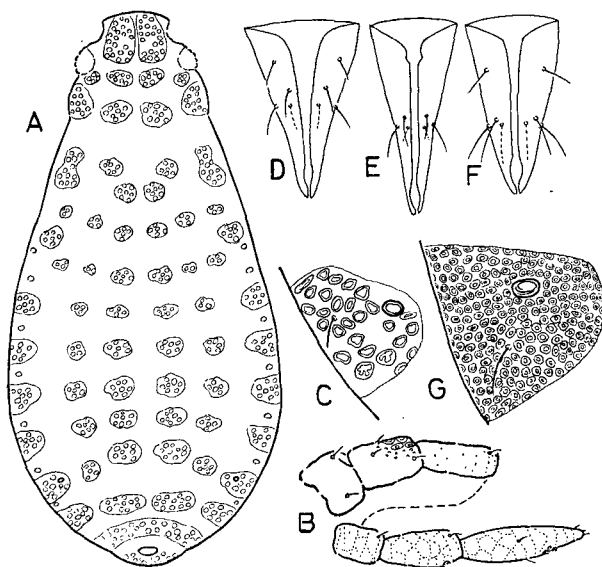


Fig. 24. *Diphyllaphis konarae* (Shinji) (A–D), *D. alba* Takahashi (E), and *D. quercus* (Takahashi) (F and G). Apterous viviparous female:—A, outline of the aphid; B, antenna; C & G, cornicle and wax-pores; D–F, ultimate rostral segment.

ment of hind tarsus 0.08 (—); longest seta on head 0.009 (0.008–0.011), that on 3rd antennal segment 0.004 (—), that on 6th abdominal segment 0.012 (0.010–0.013), that on hind tibia 0.012 (0.010–0.013).

Specimens examined: Some apterous females (syntypes), Ôsaka, ?-ix-1955, ex *Quercus phillyraeoides*, R. Takahashi leg. Many apterous viviparous females, Fukuoka, Fukuoka-ken, 22-x-1961, ex *Quercus phillyraeoides* var. *crispa*, R. Takahashi leg.

Host plants: *Quercus phillyraeoides* A. Gray, and *Quercus phillyraeoides* var. *crispa* Matsumura.

Distribution: Japan (Honshû; Kyûshû).

## 2. *Diphyllaphis konarae* (Shinji)

References. Shinji 1924: 369 [*Phloeomyzus*]; ibid. 1933a: 155 [*Phyllaphis*]; ibid. 1941: 295 [*Phyllaphis*]; ibid. 1944: 464 [*Phyllaphis*]; Takahashi 1960: 12.

Apterous viviparous female: Measurements of 10 specimens in mm. Body 1.37 (1.20–1.58); antennal segments (1st–6th): 0.04 (0.03–0.04), 0.07 (0.06–0.07), 0.08 (0.05–0.09), 0.05 (0.03–0.07), 0.07 (0.03–0.09), 0.10 (0.09–0.10)+0.03 (0.02–0.04); ultimate rostral segment 0.08 (0.07–0.09); hind femur 0.23 (0.20–0.26); hind tibia 0.29 (0.24–0.34); 2nd segment of hind tarsus 0.09 (0.08–0.10); longest seta on head 0.007 (0.005–0.011), that on 3rd antennal segment 0.008 (–), that on 6th abdominal segment 0.012 (0.010–0.013), that on hind tibia 0.022 (0.019–0.026).

Specimens examined: Many apterous females, Tôkyô, ?–x–1953, ex *Quercus serrata*, R. Takahashi leg.; Tondabayashi, Ôsaka, 30–x–1955, ex *Quercus serrata*, R. Takahashi leg.; Nagano, Ôsaka, 20–x–1957, ex *Quercus acutissima*, R. Takahashi leg.

Host plants: *Quercus acutissima* Carruthers, *Quercus dentata* Thunb. (after Shinji, 1944), *Quercus mongolica* var. *grosseserrata* (Blume) (after Shinji, 1935), and *Quercus serrata* Thunb.

Distribution: Japan (Honshû).

The aphid stated by Paik (1965) under the name *Phyllaphis konarae* is not the same as this species, differing by the area of wax-pores and by the shape of the ultimate rostral segment.

## 3. *Diphyllaphis quercus* (Takahashi)

References. Takahashi 1960: 14 [*Nymphaphis*]; Hille Ris Lambers 1966b: 616.

Apterous viviparous female: Measurements of 10 specimens in mm. Body 1.53 (1.49–1.75); antennal segments (1st–6th): 0.06 (0.05–0.07), 0.11 (0.09–0.11), 0.14 (0.11–0.15), 0.10 (0.08–0.11), 0.11 (0.09–0.14), 0.13 (0.11–0.14)+0.04 (0.04–0.05); ultimate rostral segment 0.09 (0.08–0.09); hind femur 0.30 (0.29–0.36); hind tibia 0.43 (0.38–0.47); 2nd segment of hind tarsus 0.12 (0.11–0.13); longest seta on head 0.015 (0.008–0.022), that on 3rd antennal segment 0.008 (0.006–0.011), that on 6th abdominal segment 0.032 (0.026–0.035), that on hind tibia 0.028 (0.020–0.029).

Specimens examined: Some apterous viviparous females (syntypes of *Nymphaphis quercus* Tak.), Tondabayashi, Ôsaka, 30–x–1955, ex *Quercus acutissima*, R. Takahashi leg. Many apterous viviparous females, Suibun, Ôsaka, 11–x–1959, ex *Quercus serrata*, R. Takahashi leg.

Host plants: *Quercus acutissima* Carruthers, *Quercus serrata* Thunb.

Distribution: Japan (Honshû).

## 26. Genus *Machilaphis* Takahashi

References. Takahashi 1960: 11.

Type-species. *Phyllaphis machili* Takahashi, 1928.

This genus is represented by only a single species.

Embryo: Dorsal abdominal setae very short, pointed; pleural setae present; marginal setae single.

Host plants: Lauraceae.

Distribution: Oriental region.

1. *Machilaphis machili* (Takahashi)

References. Takahashi 1928: 146 [*Phyllaphis*]; Shinji 1941: 296 [*Phyllaphis*]; Takahashi 1941: 14 [*Phyllaphis*]; ibid. 1960: 12.

Alate viviparous female: Measurements of 6 specimens in mm. Body 1.76 (1.56–1.97); antennal segments (1st–6th): 0.07 (0.07–0.08), 0.12 (0.11–0.13), 0.42 (0.36–0.45), 0.28 (0.24–0.32), 0.27 (0.27–0.29), 0.19 (0.18–0.20)+0.04 (0.03–0.05); ultimate rostral segment 0.10 (0.09–0.10); hind femur 0.53 (0.49–0.56); hind tibia 0.79 (0.73–0.86); 2nd segment of hind tarsus 0.15 (0.14–0.15); longest seta on head 0.019 (0.011–0.023), that on 3rd antennal segment 0.008 (0.005–0.010), that on 6th abdominal segment 0.022 (0.016–0.028), that on hind tibia 0.026 (0.023–0.032).

Apterous viviparous female: Measurements of 10 specimens in mm. Body 1.77 (1.64–1.92); antennal segments (1st–6th): 0.07 (0.06–0.07), 0.12 (0.11–0.12), 0.29 (0.25–0.35), 0.20 (0.18–0.22), 0.21 (0.19–0.24), 0.18 (0.16–0.18)+0.05 (0.04–0.05); ultimate rostral segment 0.10 (0.09–0.11); hind femur 0.44 (0.41–0.48); hind tibia 0.64 (0.58–0.71); 2nd segment of hind tarsus 0.14 (0.14–0.15); longest seta on head 0.015 (0.008–0.015), that on 3rd antennal segment 0.008 (0.005–0.010), that on 6th abdominal segment 0.026 (0.026–0.028), that on hind tibia 0.027 (0.023–0.032).

Specimens examined: Many apterous and alate viviparous females, Kasugayama, Nara-ken, 10–v–1959, ex *Machilus* sp., R. Takahashi leg

Host plants: *Machilus thunbergii* Sieb. & Zucc. (after Shinji, 1941), *Machilus* sp., *Neolitsea sericea* (Blume) (after Shinji, 1941). In Formosa *Machilus bournae* has been recorded as host (after Tao, 1963).

Distribution: Japan (Honshû); Formosa; China; Tai.

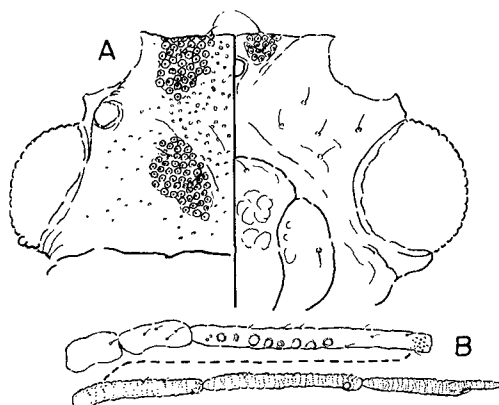


Fig. 25. *Machilaphis machili* (Takahashi).  
Alate viviparous female:—  
A, head; B, antenna.

27. Genus *Phyllaphis* Koch

References. Koch 1856: 248; van der Goot 1915: 342; Baker 1920: 24; Theobald 1927: 391; Shinji 1941: 119 (part); Börner 1952: 57; Cottier 1953: 90; Archibald 1958: 143; Eastop 1966: 517.

Type-species. *Aphis fagi* Linné, 1767.

This genus is represented by only a single species.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 42, K, the setae being very short, pointed; pleural setae present; marginal setae single.

Host plants: Fagaceae.

Distribution: Holarctic and Australian regions.

1. *Phyllaphis fagi* (Linné)

References. Linné 1767: 735 [*Aphis*]; van der Goot 1915: 343; Takahashi 1919b: 194 [*fagi*-



*foliae*]: Theobald 1927: 391; Monzen 1929: 44; Shinji 1933a: 153; Takahashi 1937: 91 [*fagifoliae*]; Shinji 1941: 290; ibid. 1944: 463; Börner 1952: 57; Cottier 1953: 90; Archibald 1958: 144; Eastop 1966: 518; Szelegiewicz 1968: 49.

Synonyms. *Phyllaphis fagifoliae* Takahashi, 1919. **Syn. nov.**

Alate viviparous female: Measurements of 10 specimens in mm. Body 2.72 (2.58–2.94); antennal segments (1st–6th): 0.11 (0.10–0.13), 0.14 (0.13–0.14), 0.68 (0.66–0.77), 0.44 (0.42–0.45), 0.39 (0.37–0.40), 0.27 (0.26–0.29)+0.05 (0.04–0.05); ultimate rostral segment 0.11 (0.10–0.11); hind femur 0.87 (0.85–0.92); hind tibia 1.47 (1.41–1.62); 2nd segment of hind tarsus 0.20 (0.19–0.22); longest seta on head 0.028 (0.024–0.032), that on 3rd antennal segment 0.019 (0.012–0.024), that on 6th abdominal segment 0.022 (0.020–0.039), that on hind tibia 0.036 (0.026–0.045).

Alate male: Measurements of 3 specimens in mm. Body 2.29 (2.02–2.50); antennal segments (1st–6th): 0.08 (0.08–0.09), 0.11 (0.09–0.11), 0.52 (0.51–0.56), 0.34 (0.32–0.36), 0.34 (0.31–0.38), 0.26 (0.24–0.28)+0.05 (0.05–0.06); ultimate rostral segment 0.10 (0.10–0.11); hind femur 0.66 (0.64–0.68); hind tibia 1.03 (1.01–1.07); 2nd segment of hind tarsus 0.18 (–); longest seta on head 0.017 (0.015–0.019), that on 3rd antennal segment 0.010 (0.008–0.011), that on 6th abdominal segment 0.012 (–), that on hind tibia 0.033 (0.020–0.038).

Oviparous female: Measurements of one specimen in mm. Body 3.28; antennal segments (1st–6th): 0.12, 0.15, 0.48, 0.29, 0.27, 0.21+0.05; ultimate rostral segment 0.11; hind femur 0.70; hind tibia 1.09; 2nd segment of hind tarsus 0.18; longest seta on head 0.038, that on 3rd antennal segment 0.020, that on 6th abdominal segment 0.038, that on hind tibia 0.032.

Specimens examined: Many alate viviparous females taken at the following localities: Hokkaidô—Sapporo, 8-vi-1967, ex *Fagus crenata*, 4-vi-1970, ex *Fagus crenata*; Ōnuma, 16-vi-1970, ex *Fagus crenata*. Honshû—Hirayu, Gifu-ken, 12-viii-1959, ex *Fagus* sp., R. Takahashi leg.; Mt. Kongô, Ōsaka, 17-v-1959, ex *Fagus* sp., M. Sorin leg. 3 males, Sapporo, 30-x-1966, 26-x-1967, ex *Fagus crenata*. Some oviparous females, Sapporo, Hokkaidô, 30-x-1966, 26-x-1967, ex *Fagus crenata*.

Host plants: *Fagus crenata* Blume, *Fagus japonica* Maxim. (after Monzen, 1929); *Fagus sylvatica* (in Europe after Theobald, 1927 & in Australia after Eastop, 1966).

Distribution: Japan (Hokkaidô; Honshû); Europe; North America; Australia; New Zealand.

### ***Saltusaphis* group**

On account of the same number of rudimentary gonapophyses, the presence of wax plates and the cornicles not reticulated the *Saltusaphis* group is closely related to the *Myzocallis* and *Symydobius* groups rather than to the *Chaitophorus* group. This group is easily recognized from any other related groups by the absence of the triommatidion and by its association with Cyperaceae. It may be characterized by the combination of the following aspects:—Processus terminalis 0.5–0.9 as long as base of 6th antennal segment. Ultimate rostral segment with 2 secondary setae. Apical tibial setae not differing from other tibial setae. First tarsal segment with 4 or 5 ventral setae, and without dorsal setae. Empodial setae flattened or hair-like. Eighth abdominal segment with 8–18 setae. Cornicle ring-like, not reticulated. Rudimentary gonapophyses 2 in number. Wax plates present or absent.

In the species of this group the embryo is characterized as follows:—Dorsal setae very short, never capitate, those of *Subsaltusaphis* being often fan-like; marginal setae often double or more in number.

## 28. Genus *Subsaltusaphis* Quednau

References. Quednau 1953: 224.

Type-species. *Saltusaphis intermedia* Hille Ris Lambers, 1939.

*Subsaltusaphis* Quednau is easily distinguished from any other related genera by the presence of the fan-like dorsal setae. It is widely distributed in the Holarctic region, but no species of this genus has hitherto been known to occur in Japan. In this paper one species is added to the fauna of Japan.

Embryo: Dorsal setae mostly fan-like in shape; pleural setae present; marginal setae double or more in number.

Host plants: Cyperaceae.

Distribution: Holarctic region.

### 1. *Subsaltusaphis saracola*, sp. nov.

Apterous viviparous female: Body yellow in life, narrow and elongated, without two longitudinal strips, about 1.9 mm. in length. Head covered dorsally with spinules and many short, fan-like setae, the bases of the cephalic setae being pigmented; frontal setae long, not fan-shaped; vertex produced prominently at the middle. Antennae spiculosely imbricated, about 0.68 as long as body. Antennal setae short, at most 0.4 as long as middle breadth of 3rd antennal segment; 3rd segment with 7–11 pointed setae. Rostrum short, a little surpassing fore coxae; ultimate segment 0.38–0.50 as long as 2nd segment of hind tarsus, with 6–8 setae including apical ones. Legs covered with many spinules; tibiae without spine-like setae at apex; 1st segment of all tarsi with 5 setae. Head, thorax and abdominal segments clearly separated by pigmented intersegmental sclerites. Abdomen covered with spinules and fan-like setae as in head, the bases of the setae pigmented; 6th segment without elongate marginal setae; 8th segment roughly semicircular; all the setae on the hind margin of 8th segment and 2 marginal setae on 7th segment (fig. 26, G) elongate and blunt at apices. Cornicle short, 0.20–0.33 as long as its width of the base, spiculosely imbricated, without flange. Cauda knobbed, with about 13 setae. Anal plate bilobed, with 4–6 setae.

Alate viviparous female: Body yellow in life. Antennae: 3rd segment at apex and 4th segment on distal half, 5th and 6th segments brown. Legs pale brown; femora and tibiae at apex, and tarsi wholly brown. Head with a distinct median ocellus. Antennae about 0.5 as long as body; 3rd segment (fig. 26, F) with 8–11 circular secondary sensoria. Dorsal abdominal setae fewer than those of apterae in number. Abdomen (fig. 26, E) with a large median pigmented sclerite and some small ones. Marginal sclerites distinct. Other characters as in apterae viviparae.

Specimens examined: Some alate and apterous viviparous females (syntypes), Sapporo, Hokkaidô, 26–vii–1968, ex *Carex* sp.

Host plants: *Carex* sp.

Distribution: Japan (Hokkaidô).

In general appearance this species is very similar to *picta* (Hille Ris Lambers) of Europe, but it differs from the latter by the absence of distinctive median and submedian spots on the thorax and abdomen. Furthermore, the new species may be allied to *Saltusaphis kienshuensis* Shinji from Manchuria, China, but it differs from the latter as follows:—Thorax without a black patch; femora not enlarged.

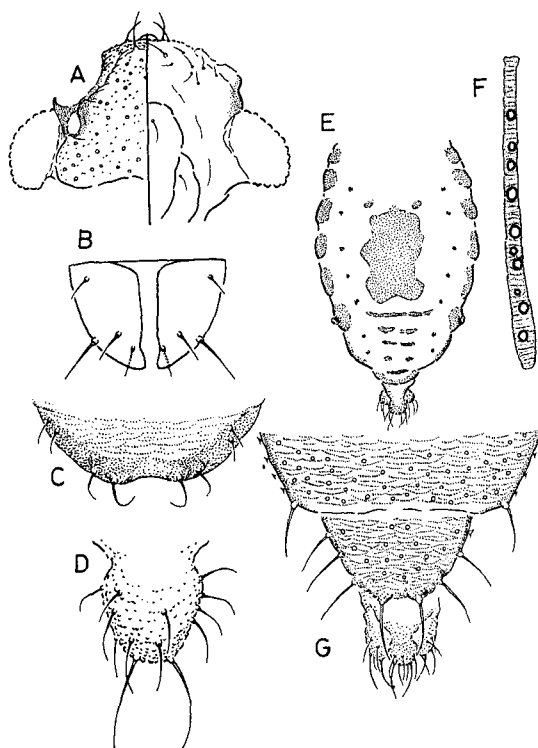


Fig. 26. *Subsaltusaphis saracola*, sp. nov. Alate viviparous female:—A, head; B, ultimate rostral segment; C, dorsal setae of 8th abdominal segment; D, cauda; E, abdomen; F, 3rd antennal segment. Apterous viviparous female:—G, apical abdominal segments.

## 29. Genus *Thripsaphis* Gillette

References. Gillette 1917: 193; Baker 1920: 30; Theobald 1929: 67; Gillette & Palmer 1931: 909; Palmer 1952: 82; Cottier 1953: 81; Eastop 1966: 520.

Type-species. *Brachycolus ballii* Gillette, 1909.

This is a well-known genus including the following six subgenera: *Allaphis* Mordwilko, *Synthripsaphis* Quednau, *Trichocallis* Börner, *Larvaphis* Ossiannilsson, *Peltaphis* Frison & Ross, and *Thripsaphis* Gillette. So far as I am aware, however, no species of the genus has hitherto been known to occur in Japan. In the course of the present study is added to the fauna of Japan one species, which belongs to the subgenus *Trichocallis*.

Embryo: Dorsal setae very short, not fan-like; marginal setae single.

Host plants: Cyperaceae.

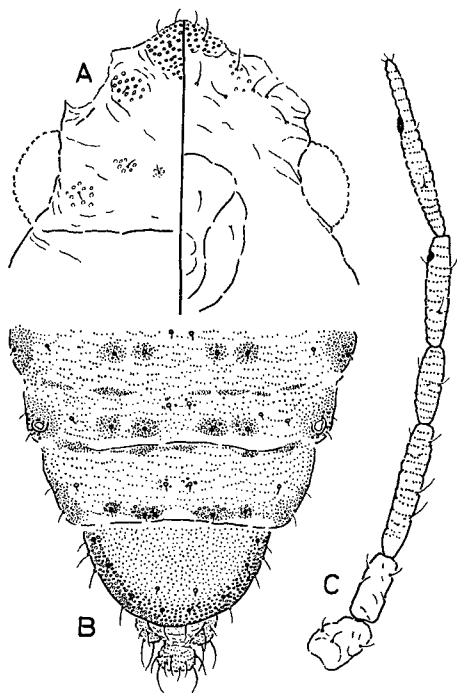
Distribution: Holarctic and Australian regions.

1. ***Thripsaphis (Trichocallis) ossiannilssoni*** Hille Ris Lambers

References. Hille Ris Lambers 1952a: 56; Quednau 1954: 39 [*Trichocallis*]; Szelegiewicz 1968: 60 [*Trichocallis*].

This species is new to Japan. On the basis of the specimens examined a redescription is given below:—

Apterous viviparous female: Body grayish brown in life. Antennae brown. Legs



**Fig. 27.** *Thripsaphis (Trichocallis) ossiannilssoni* Hille Ris Lambers. Apterous viviparous female:—A, head; B, abdomen; C, antenna.

grayish brown. Abdomen: anterior segments on the middle part pale, 8th segment brown. Body covered with wax dust, very narrow and elongated, about 1.85 mm. in length. Head (fig. 27, A) narrower than body; vertex convex, being rather strongly produced at the middle. Antenna (fig. 27, C) very short, about 0.3 as long as body. Antennal setae short, at most 0.4 as long as middle breadth of 3rd antennal segment; 3rd segment with 5 or 6 setae. Rostrum very short, a little surpassing fore coxae, 0.3–0.5 as long as 2nd segment of hind tarsus, with 8 setae including apical ones. Legs: femora with spinules sparsely; tibiae without stout, spine-like setae at apex; 1st tarsal segment bearing 5 ventral setae. Abdomen (fig. 27, B) sclerotic, with 3rd to 6th segments solidly fused together; 6th segment with 7–9 setae between cornicles;

setae on the hind margin of 8th segment and some of the setae on the marginal sclerites of 7th segment longer than other dorsal setae; 8th segment semicircular, without any particular structure on the hind margin. Cornicle a mere ring, situated in the marginal sclerite of 6th abdominal segment. Cauda knobbed, with 8 setae. Anal plate bilobed, with 5 setae. Wax-glands present around the spinal and pleural setae.

Specimens examined: 12 apterous viviparous females, Mt. Muine, Hokkaidô, 25-viii-1969, ex *Carex* sp.; Nishi-koma, Nagano-ken, Honshû, 29-viii-1970, ex *Carex* sp., M. Miyazaki leg.

Host plants: *Carex* sp.; *Carex fusca* (in Europe after Szelegiewicz, 1968).

Distribution: Japan (Hokkaidô; Honshû); Europe (Sweden; Poland). This inconspicuous aphid was originally described from Sweden, but seems to be probably much more widely distributed than is indicated by the published records. In Japan this species seems to be restricted to mountainous regions.

This species is very easily distinguished from any other related ones by the very short antennae and the shape and pigmentation of the 8th abdominal segment as Hille Ris Lambers (1952) pointed out. The Japanese form taken at Muine, Hokkaidô, somewhat differs from the European one by the hind femora slenderer ( $10.5 \times 3.3 \sim 11 \times 3.4$  in the European form;  $13 \times 3$  in the Japanese form).

### ***Yamatocallis* group**

This group has been placed in the *Myzocallis* or *Symydobius* group by previous authors. In the course of the present studies, however, I have been convinced that it should be placed near the *Chaitophorus* group on account of the reticulated cornicle and the host association. This group is characterized by the combination of the following characters:—Processus terminalis 1.5–2.8 times as long as base of 6th antennal segment. Secondary sensoria transversely elongated and with hairy fringe. Fore femora enlarged. Apical tibial setae not differing from other tibial setae. First tarsal segment with a pair of dorsal setae. Empodial setae flattened. Marginal sclerite with 1 long seta and some shorter setae. Eighth abdominal segment with 4 setae. Cauda elongated and cornicle long, reticulated at apex. Rudimentary gonapophyses 3 in number. Apterae not produced.

In this group the marginal setae of the embryo seem to be somewhat similar to those of *Periphyllus*, but they are not foliate.

### 30. Genus ***Yamatocallis*** Matsumura

References. Matsumura 1917: 366; Shinji 1923: 307 [*Chaitophoraphis*]; ibid. 1941: 133 [*Drepanaphis*]; Takahashi 1963: 160 [*Megalocallis*].

Synonyms. *Chaitophoraphis* Shinji, 1923 [type-species: (*Chaitophoraphis acerifloris* Shinji, 1923) = *Yamatocallis hirayamae* Matsumura]; *Megalocallis* Takahashi, 1963 [type-species: *Megalocallis takagii* Takahashi, 1963].

Type-species. *Yamatocallis hirayamae* Matsumura, 1917.

This Asiatic genus is very closely related to *Drepanaphis* del Guercio of North America, but it differs from the latter by the cornicle reticulated at apex. It appears to be an intermediate form between the *Myzocallis* and *Symydobius* groups and the

*Chaitophorus* group on account of the reticulated cornicle and the host association. In Japan three species of the genus have been known to occur.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 42, L, the spinal and pleural setae short, sometimes inconspicuous; marginal setae blunt, longer than spinal setae. Cornicle distinct.

Host plants: Aceraceae.

Distribution: Eastern Asia.

#### Key to the Japanese species of *Yamatocallis*

Alate viviparous female

1. Cornicle (fig. 28, D) black, smooth, not swollen, rather cylindrical, 3.6-5.0 times as long as the base, 4.0-4.4 times as long as 2nd segment of hind tarsus. Fourth antennal segment 1.0-

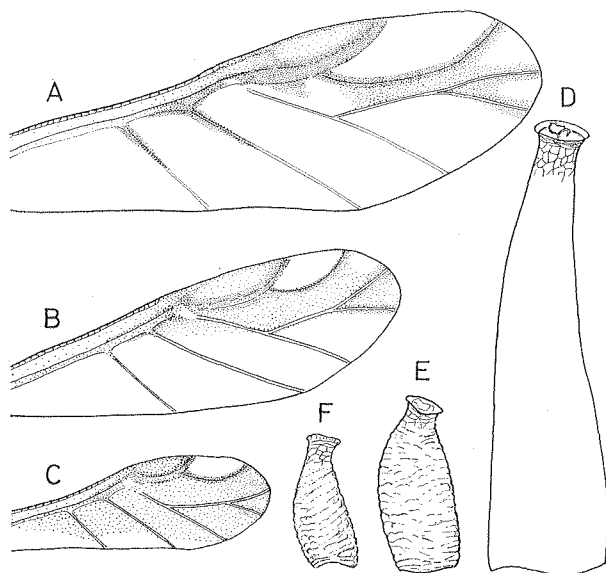


Fig. 28. *Yamatocallis hirayamae* Matsumura (B and E), *Y. takagii* (A and D), and *Y. tokyoensis* (Takahashi) (C and F). Alate viviparous female:—A-C, fore wing; D-F, cornicle.

- 1.2 times as long as 5th antennal segment. Body more than 4.5 mm. in length. . . . . 2. *takagii* (Takahashi)
- Cornicle (figs. 28, E & F) brown, corrugated, swollen, 2.3-4.0 times as long as the base, 1.8-2.5 times as long as 2nd segment of hind tarsus. Fourth antennal segment 0.8-1.0 as long as 5th antennal segment. Body at most 3.5 mm. in length. . . . . 2
2. Third antennal segment with 9-14 (mostly 11) secondary sensoria on basal 2/5. Processus terminalis 1.5-2.0 times as long as base of 6th antennal segment. Cornicle 1.8-2.0 times as long as 2nd segment of hind tarsus. Fore wing (fig. 28, C) infuscated except along the posterior margin. Body about 2.4 mm. in length. . . . . 3. *tokyoensis* (Takahashi)
- Third antennal segment with 12-20 (mostly 18) secondary sensoria on basal 3/10. Processus terminalis 2.3-2.8 times as long as base of 6th antennal segment. Cornicle 2.1-2.5 times as long as 2nd segment of hind tarsus. Fore wing (fig. 28, B) infuscated only on the anterior marginal area. Body about 3.1 mm. in length. . . . . 1. *hirayamae* Matsumura

1. *Yamatocallis hirayamae* Matsumura

References. Matsumura 1917: 367; Shinji 1923: 307 [*Chaitophoraphis acerifloris*]; ibid. 1933b: 158; ibid. 1941: 389 [*Drepanaphis*].

Alate viviparous female. Measurements of 10 specimens in mm. Body 3.04 (2.64–3.50); antennal segment (1st–6th): 0.16 (0.15–0.18), 0.08 (–), 1.09 (0.95–1.18), 0.89 (0.80–0.98), 0.80 (0.71–0.94), 0.25 (0.21–0.32)+0.67 (0.58–0.80); ultimate rostral segment 0.12 (0.11–0.14); hind femur 0.80 (0.65–0.92); hind tibia 1.62 (1.40–1.87); 2nd segment of hind tarsus 0.18 (0.17–0.20); longest seta on head 0.055 (0.045–0.061), that on 3rd antennal segment 0.014 (0.008–0.016), that on 6th abdominal segment 0.068 (0.063–0.075), that on hind tibia 0.034 (0.031–0.038).

Specimens examined: Many alate viviparous females taken at the following localities: Hokkaidô—Sapporo, 8–, 13–vi–1967, ex *Acer* sp., 2–vi–1969, ex *Acer mono*. Honshû—Niigata-ken, 9–vi–1956, K. Shibata leg. Kyûshû—Mt. Hikosan, 3–v–1962, M. Shiga leg.

Host plants: *Acer diabolicum* Blume (after Shinji, 1923), *Acer japonicum* Thunb. (after Shinji, 1923), *Acer mono* Maxim.

Distribution: Japan (Hokkaidô; Honshû; Kyûshû).

*Drepanaphis sauteri* Takahashi from Formosa is a member of this genus, and is very close to this species, but differs by the number of secondary sensoria.

2. *Yamatocallis takagii* (Takahashi)

References. Takahashi 1963: 161 [*Megalocallis*].

Alate viviparous female: Measurements of 5 specimens in mm. Body 4.58 (4.48–4.66); antennal segments (1st–6th): 0.23 (0.23–0.24), 0.11 (–), 1.79 (1.62–2.08), 1.53 (1.29–1.79), 1.53 (1.49–1.59), 0.56 (0.50–0.62)+1.31 (1.21–1.41); ultimate rostral segment 0.18 (0.17–0.18); hind femur 1.38 (1.36–1.44); hind tibia 2.76 (2.71–2.91); 2nd segment of hind tarsus 0.21 (0.20–0.23); longest seta on head 0.098 (0.098–0.151), that on 3rd antennal segment 0.023 (–), that on 6th abdominal segment 0.129 (0.114–0.136), that on hind tibia 0.064 (0.061–0.068).

Specimens examined: 2 alate viviparous females (syntypes of *Megalocallis takagii* Tak.), Sapporo, Hokkaidô, 8–vi–1961, ex *Acer* sp., S. Takagi leg. Some alate viviparous females, Sapporo, Hokkaidô, 28–ix–1967, ex *Acer* sp.

Host plants: *Acer* sp.

Distribution: Japan (Hokkaidô).

3. *Yamatocallis tokyoensis* (Takahashi), comb. nov.

References. Takahashi 1923: 66 [*Drepanaphis* (sic)]; Shinji 1933b: 159 [*moriokae*]; ibid. 1941: 394 [*Drepanaphis moriokae*].

Synonyms. *Yamatocallis moriokae*, 1933.

Alate viviparous female: Measurements of 10 specimens in mm. Body 2.42 (2.18–2.90); antennal segments (1st–6th): 0.14 (0.12–0.15), 0.07 (0.06–0.08), 0.81 (0.70–0.91), 0.75 (0.68–0.85), 0.76 (0.71–0.85), 0.31 (0.28–0.35)+0.57 (0.45–0.65); ultimate rostral segment 0.09 (0.09–0.10); hind femur 0.57 (0.48–0.61); hind tibia 1.18 (1.06–1.33); 2nd segment of hind tarsus 0.15 (0.14–0.17); longest seta on head 0.051 (0.038–0.064), that on 3rd antennal segment 0.008 (–), that on 6th abdominal segment 0.068 (0.053–0.076), that on hind tibia 0.027 (0.023–0.031).

Specimens examined: 15 alate viviparous females, Tōkyō, 19-v-1949, ex *Acer* sp., R. Takahashi leg.; Mt. Makiosan, Ōsaka, 16-vi-1957, ex *Acer* sp., M. Sorin leg.; Mt. Shigisan, Ōsaka, 21-v-1961, ex *Acer* sp., R. Takahashi leg.

Host plants: *Acer* sp.

Distribution: Japan (Honshū).

*Yamatocallis moriokae* Shinji, 1933 should be suppressed as a synonym of the present species.

### ***Chaitophorus* group**

This group seems to be not so closely related to the *Myzocallis* and *Symydobius* groups which, are regarded as direct descendants of the primitive stock of this sub-family on account of the reticulated cornicle, four rudimentary gonapophyses, the host association, etc. This group is recognized by the following characters:—Body and antennae of both apterae and alatae bearing numerous long setae. Secondary sensoria round or oval in shape and not ciliated. Processus terminalis 1.0–4.0 times as long as base of 6th antennal segment. Ultimate rostral segment with 2–10 secondary setae. Apical tibial setae not differing from other tibial setae. First tarsal segment with 5–7 ventral setae, and without dorsal setae. Marginal abdominal sclerites with 5–11 setae. Cornicle truncate and reticulated. Cauda crescent-shaped or knobbed and with 6–14 setae. Wax plates absent.

The embryonic chaetotaxy of this group is characterized as follows:—Dorsal abdominal setae arranged in parallel rows, not capitate in shape; spinal setae single; pleural setae invisible (absent ?) in *Periphyllus*; marginal setae single, often foliate in *Periphyllus*, while those of *Chaitophorus* long, pointed.

### 31. Genus ***Chaitophorus*** Koch

References. Koch 1854: 1; van der Goot 1915: 352; Baker 1920: 33; Theobald 1929: 8; Shinji 1941: 137; Palmer 1952: 90; Hille Ris Lambers 1960: 1.

Synonyms. *Tranaphis* Walker, 1870 [type-species: (*Aphis salicivora* Walker, 1848) = *Aphis capreae* Mosley, 1841]; *Arctaphis* Walker, 1870 [type-species: (*Aphis populi*: Walker, 1870) = *Aphis populeti* Panzer, 1805]; *Eichochaitophorus* Essig, 1912 [type-species: *Eichochaitophorus populifolii* Essig, 1912]; *Pseudomicrella* Börner, 1949 [type-species: *Aphis vitellinae* Schrk., 1801].

Type-species. (*Chaitophorus populi* Koch, 1854) = *Chaitophorus populeti* (Panzer, 1805).

This genus containing as many as thirty species is widely distributed in the world. Insofar as the present investigation goes, eight species have been known to occur in Japan, of which one is new to science and another new to Japan.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 42, N, the setae being long, pointed; spinal setae arranged in parallel rows; pleural setae present; marginal setae single, not foliate. Cornicle indistinct.

Host plants: Salicaceae.

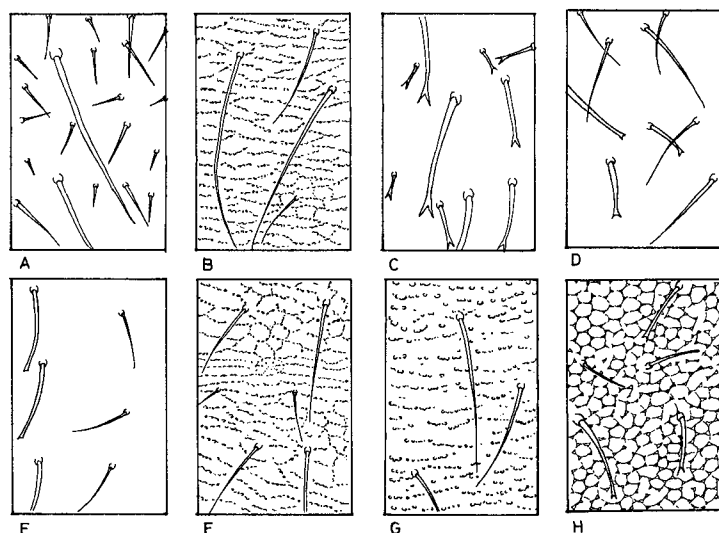
Distribution: Holarctic, Oriental, and Ethiopian regions.

### **Key to the Japanese species of *Chaitophorus***

Apterous viviparous female



1. Hind tibiae with pseudosensoria. . . . . 2
- Hind tibiae without pseudosensoria. . . . . 3
2. Rostrum reaching to middle coxae; ultimate segment with 2-4 secondary setae. Abdomen (fig. 29, G) granular; 6th segment with 16-24 setae. Third antennal segment with 1-3 setae. On *Salix* spp. . . . . 7. *saliniger* Shinji
- Rostrum long, reaching to 1st abdominal segment; ultimate segment with 6-10 secondary setae. Abdomen (fig. 29, D) without granules and spinules; 6th segment with 8-12 setae. Third antennal segment with 12-18 setae. On *Populus* spp. . . . . 4. *populeti* (Panzer)
3. Dorsal setae at least partially truncate or furcate at apex. Body pale. . . . . 4
- Dorsal setae pointed or blunt at apex. Body brown or pale. . . . . 6
4. Body (fig. 29, H) scabrous on dorsum. Third antennal segment with 6-12 setae. Processus terminalis 2.0-2.7 (mostly 2.3) times as long as base of 6th antennal segment. First tarsal segment with 7 setae. Caudal setae 6 in number. On *Populus* spp. . . . 8. *tremulae* Koch



**Fig. 29.** *Chaitophorus dorocola* Matsumura (A), *C. hokkaidensis*, sp. nov. (B), *C. horii* Takahashi (C), *C. populeti* (Panzer) (D), *C. saliapteris* Shinji (E), *C. salijaponicus* Essig & Kuwana (F), *C. saliniger* Shinji (G), and *C. tremulae* Koch (H). Apterous viviparous female:—A-H, dorsal setae and sculpture of abdominal segment.

- Body (figs. 29, C & E) smooth or faintly roughened, but not scabrous. Third antennal segment with at most 5 setae. Processus terminalis 2.4-3.5 times as long as base of 6th antennal segment. First tarsal segment with 5 setae. Caudal setae 9-13 in number. . . . . 5
5. Antennae shorter than 1/2 of body length. Cephalic and marginal setae not pointed at apex. Sixth abdominal segment with 16-21 setae between cornicles, the longest seta being 7.3-8.8 times as long as middle breadth of 3rd antennal segment. On *Salix* spp. . . . . 3. *horii* Takahashi
- Antennae longer than 1/2 of body length. Cephalic and marginal setae at least partially pointed at apex. Sixth abdominal segment with 5-7 setae between cornicles, the longest seta being 2.8-5.2 times as long as middle breadth of 3rd antennal segment. On *Salix* spp. . . . . 5. *saliapteris* Shinji
6. Body (fig. 29, A) pale, not reticulated on dorsum. Sixth abdominal segment with 25-35 setae between cornicles. Processus terminalis 3.3-4.0 times as long as base of 6th antennal seg-

- ment. Ultimate rostral segment with 6-10 secondary setae. First tarsal segment with 7 setae. Caudal setae 9 in number. On *Populus* spp. . . . . 1. *dorocola* Matsumura
- Body (figs. 29, B & F) brown, reticulated on dorsum. Sixth abdominal segment with at most 15 setae between cornicles. Processus terminalis at most 2.8 times as long as base of 6th antennal segment. Ultimate rostral segment with 2-4 secondary setae. First tarsal segment with 5 setae. Caudal setae 6 or 7 in number. . . . . 7
7. Body with a pale median zone from metathorax to 3rd abdominal segment. Longest seta on 6th abdominal segment 5.5-7.0 times as long as middle breadth of 3rd antennal segment. On *Salix* spp. . . . . 6. *salijaponicus* Essig & Kuwana
- Body without a pale median zone as above. Longest seta on 6th abdominal segment at least 8.5 times as long as middle breadth of 3rd antennal segment. On *Salix* spp. . . . . 2. *hokkaidensis*, sp. nov.
- Alate viviparous female (except for *salijaponicus*)
1. Hind tibiae with pseudosensoria. . . . . 2
- Hind tibiae without pseudosensoria. . . . . 3
2. Pseudosensoria distributed on thickening part near basal part of hind tibiae. Chaetotaxy of 3rd-6th antennal segments 3-5, 1-3, 1-2, 1-2. On *Salix* spp. . . . . 7. *saliniger* Shinji
- Pseudosensoria distributed along whole length of hind tibiae. Chaetotaxy of 3rd-6th antennal segments 13-15, 9-11, 6-7, 3. On *Populus* spp. . . . . 4. *populeti* (Panzer)
3. Antennae shorter than 1/2 of body length. Third antennal segment with 4 secondary sensoria. Chaetotaxy of 3rd-6th antennal segments 1-2, 1-2, 1, 1. On *Salix* spp. . . . . 3. *horii* Takahashi
- Antennae longer than 1/2 of body length. Third antennal segment at least with 6 secondary sensoria and 5 setae. . . . . 4
4. Black sclerotic band on 4th abdominal segment bearing 26-28 setae. Third antennal segment with 16-18 secondary sensoria. On *Populus* spp. . . . . 1. *dorocola* Matsumura
- Black sclerotic band on 4th abdominal segment bearing at most 16 setae. Third antennal segment at most with 14 secondary sensoria. . . . . 5
5. Antennae at least 0.72 as long as body. Black sclerotic band on 4th abdominal segment bearing 6 or 7 setae. Secondary sensoria often present on 5th antennal segment. On *Salix* spp. . . . . 5. *saliapterus* Shinji
- Antennae at most 0.65 as long as body. Black sclerotic band on 4th abdominal segment bearing at least 10 setae. Secondary sensoria absent on 5th antennal segment. . . . . 6
6. Third antennal segment with 13-14 secondary sensoria. Black sclerotic band on 4th abdominal segment bearing 14-16 setae. Chaetotaxy of 3rd-6th antennal segments 9-12, 2-4, 3-5, 2-3. On *Populus* spp. . . . . 8. *tremulae* Koch
- Third antennal segment with 9-10 secondary sensoria. Black sclerotic band on 4th abdominal segment bearing 10-13 setae. Chaetotaxy of 3rd-6th antennal segments 4-7, 3-5, 2-4, 2. On *Salix* spp. . . . . 2. *hokkaidensis*, sp. nov.

# 1. *Chaitophorus dorocola* Matsumura

References. Matsumura 1919: 113; Shinji 1941: 399.

On the basis of the present material, a redescription is given below:—

Apterous viviparous female: Body pale yellow in life. Antennae and legs pale. Cornicle and cauda pale. Body (fig. 29, A) rather smooth on dorsum, about 1.67 mm. in length; dorsal setae not furcate at apex. Head: cephalic setae variable in length, the longest seta is 5.6-8.4 times as long as middle breadth of 3rd antennal segment. Antennae (fig. 30, B) about 0.67 as long as body; 3rd segment 2.8-3.3 (mostly 3.0) times as long as base of 6th antennal segment; 6th with processus terminalis 3.3-4.0 (mostly 3.7) times as long as base of the segment; length of 3rd-6th segments in

proportion 18 : 9 : 9 : 6+22. Antennal setae: 3rd segment with 6-8 setae, of which the longest one is 2.4-4.7 times as long as middle breadth of the segment, 4th with 3-5, and 5th with 1-3. Rostrum surpassing middle coxae; ultimate segment 1.0-1.1 times as long as 2nd segment of hind tarsus, with 6-10 setae besides apical ones. Legs: tibial setae slender, variable in length, the longest one is 5.0-7.6 times as long as middle breadth of 3rd antennal segment; hind tibiae without pseudosensoria; 1st tarsal segment with 7 setae ventrally. Abdomen covered with many short, blunt setae and some long ones; 1st-7th segments fused, 8th segment well defined from 7th; 6th segment with 25-35 setae between cornicles, the longest seta being 7-10 times as long as middle breadth of 3rd antennal segment; 7th with 20-28 setae. Marginal sclerites invisible. Cornicle reticulated, 0.44-0.67 as long as 2nd segment of hind tarsus, at most 5/6 as long as base of 6th antennal segment. Cauda knobbed, with 9 setae.

Alate viviparous female: Body about 1.88 mm. in length. Head and thorax black sclerotic. Antennae (fig. 30, A) about 0.75 as long as body; 3rd segment with 16-18 secondary sensoria, 4th with 1-4; chaetotaxy of 3rd-6th segments 8-10, 4-6, 2-6, 2-3; length of 3rd-6th segments in proportion 27 : 13 : 12 : 6.5+26. Abdomen with broad,

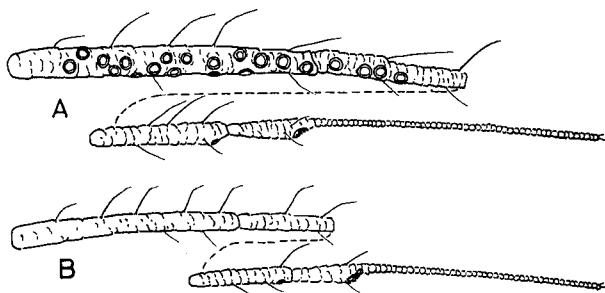


Fig. 30. *Chaitophorus dorocola* Matsumura. Alate viviparous female:—A, 3rd-6th antennal segments. Apterous viviparous female:—B, 3rd-6th antennal segments.

black bands on all segments, the band on 4th segment bearing 26-28 setae; intersegmental dots present and marginal sclerites distinct, rather large. Cornicle 1.0-1.1 times as long as 2nd segment of hind tarsus. Other characters as in apterae viviparae.

Specimens examined: Some apterous viviparous females, Dōya, Hokkaidō, 22-vi-1964, ex *Populus maximowiczii*, M. Miyazaki leg.; Futamata, Hokkaidō, 24-vii-1968, ex *Populus maximowiczii*. 4 alate viviparous females, Futamata, Hokkaidō, 24-vii-1968.

Host plants: *Populus maximowiczii* Henry, and *Populus sieboldi* Miq. (after Matsumura, 1919).

Distribution: Japan (Hokkaidō; Honshū).

This species is readily distinguished from any other related ones by the following characters:—(1) Dorsal setae numerous in number, 6th abdominal segment with 35-40 setae. (2) Processus terminalis long, about 3.7 times as long as base of 6th antennal segment. (3) Third antennal segment bearing at least 16 secondary sensoria.

## 2. *Chaitophorus hokkaidensis*, sp. nov.

Apterous viviparous female: Body colour in life unknown. In mounted speci-

mens head, thorax and abdomen brown. Antennae: 2nd segment on distal part, 3rd-4th segments, and 5th segment on basal part pale. Legs pale; hind femur, hind tibia on basal part, and tarsi brown. Body (fig. 29, B) distinctly reticulated, about 1.75 mm. in length; dorsal setae not furcate at apex. Head: cephalic setae variable in length, the longest seta is about 8.3 times as long as middle breadth of 3rd antennal segment. Antennae (fig. 31, B) about 0.56 as long as body; 3rd segment 1.9-2.1 (mostly 2.0) times as long as base of 6th antennal segment; 6th with processus terminalis 2.3-2.4 (mostly 2.4) times as long as base of the segment; length of 3rd-6th segments in proportion 14:10:10:7+16.5. Antennal setae slender; 3rd segment with 5-7 setae, of which the longest one is about 3.7 times as long as middle breadth of 3rd antennal segment, 4th with 3-5 setae, and 5th with 2-4 setae. Rostrum short, reaching just to middle coxae; ultimate segment 0.82-1.1 times as long as 2nd segment of hind tarsus, with 4 setae besides apical ones. Legs: tibial setae slender, variable in length, the longest seta is 6.3-6.7 times as long as middle breadth of 3rd antennal segment; hind tibiae without pseudosensoria; 1st tarsal segment with 5 setae ventrally. Abdomen: 2nd-6th segments fused, the other segments mutually free; 6th

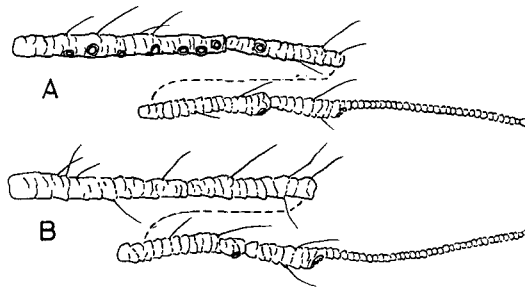


Fig. 31. *Chaitophorus hokkaidensis*, sp. nov. Alate viviparous female:—A, 3rd-6th antennal segments. Apterous viviparous female:—B, 3rd-6th antennal segments.

segment with 12-15 setae between cornicles, the longest seta being about 9.3 times as long as middle breadth of 3rd antennal segment; 7th with 12-14 setae. Marginal sclerites indistinct. Cornicle reticulated, 0.35-0.40 as long as 2nd segment of hind tarsus, at most  $\frac{3}{7}$  as long as base of 6th antennal segment. Cauda knobbed, with 6 or 7 setae.

Alate viviparous female: Body about 1.70 mm. in length. Head and thorax black sclerotic. Antennae (fig. 31, A) about 0.62 as long as body; 3rd segment with 9 or 10 secondary sensoria, 4th with 0-2; chaetotaxy of 3rd-6th segments 4-7, 3-5, 2-4, 2; length of 3rd-6th segments in proportion 18.5:10:11:6.5+15.5. Abdomen with broad, black bands on all segments, the band on 4th segment bearing 10-13 setae; marginal sclerites rather large. Cornicle 0.56-0.65 as long as 2nd segment of hind tarsus. Other characters as in apterae viviparae.

Specimens examined: 2 apterae and 2 alatae (syntypes) taken at Shôwa-shinzan, Hokkaidô, 23-vi-1964, ex *Salix* sp., M. Miyazaki leg.

Host plants: *Salix* sp.

Distribution: Japan (Hokkaidô).

In general appearance this species is very similar to *C. salijaponicus* Essig & Kuwana, 1918, but it differs from the latter by the following aspects:—(1) Body without a pale median zone from metathorax to 3rd abdominal segment. (2) Longest seta on 6th abdominal segment about 9.3 times as long as middle breadth of 3rd antennal segment. (3) Third antennal segment 1.9–2.1 times as long as base of 6th antennal segment.

### 3. *Chaitophorus horii* Takahashi

References. Takahashi 1939: 122; Börner 1950: 3 [*Tranaphis beuthani*]; ibid. 1952: 53 [*Tranaphis beuthani*]; Szelegiewicz 1961: 245 [*beuthani*]; ibid. 1968: 66 [*beuthani*].

Synonyms. *Tranaphis beuthani* Börner, 1950. **Syn. nov.**

On the basis of the present material, a redescription is given below:—

Apterous viviparous female: Body pale green in life. Antennae pale; 3rd–5th segments at apex pale or pale brown. Legs pale; femora and tibiae at base pale brown. Cornicle pale brown. Cauda pale. Body (fig. 29, C) smooth on dorsum, about 1.46 mm. in length; dorsal setae very stout, furcate at apex. Head: cephalic setae variable in length, the longest seta is 5.2–8.9 times as long as middle breadth of 3rd antennal segment. Antennae about 0.37 as long as body, often 3rd and 4th segments connected; 3rd segment 1.5–2.6 (mostly 1.9) times as long as base of 6th antennal segment; 6th with processus terminalis 2.5–3.5 (mostly 2.7) times as long as base of the segment; length of 3rd–6th segments in proportion 8.5:4:9:4+11. Antennal setae short; 3rd segment with 1 or 2 setae, of which the longer one is 0.88–1.5 times as long as middle breadth of the segment, 4th with 1, and 5th with 1. Rostrum short, not reaching to middle coxae; ultimate segment 1.0–1.8 times as long as 2nd segment of hind tarsus, with 2 setae besides apical ones. Legs: tibial setae slender, variable in length, the longest seta is 3.0–5.0 times as long as middle breadth of 3rd antennal segment; hind tibiae without pseudosensoria; 1st tarsal segment with 5 setae ventrally. Abdomen: 1st–7th segments fused; 6th with 16–21 setae between cornicles, the longest seta being 7.3–8.8 times as long as middle breadth of 3rd antennal segment; 7th with 14–17 setae. Marginal sclerites invisible. Cornicle reticulated, 0.33–0.58 as long as 2nd segment of hind tarsus, at most 7/8 as long as base of 6th antennal segment. Cauda knobbed, with 9–13 setae.

Alate viviparous female: Body about 1.48 mm. in length. Head and thorax black sclerotic. Antennae about 0.44 as long as body; 3rd segment with 4 secondary sensoria, 4th without secondary sensoria; chaetotaxy of 3rd–6th segments 1–2, 1–2, 1, 1; length of 3rd–6th segments in proportion 11.5:5:5:5+10. Abdomen with black bands on dorsum, the band on 4th segment bearing 20–22 setae; intersegmental dots present and marginal sclerites distinct, with 5–9 setae. Cornicle about 0.55 as long as 2nd segment of hind tarsus. Other characters as in apterae viviparae.

Specimens examined: Many apterous viviparous females taken at the following localities: Hokkaidô—Shikotsuko, 30–viii–1969, ex *Salix* sp. Honshû—Tôkyô, 27–ix–1953, ex *Salix* sp., R. Takahashi leg.; Oku-kinu, Tochigi-ken, 11–vii–1967, ex *Salix gilgiana*; Nikkô, Tochigi-ken, 10–viii–1967, ex *Salix* sp.; Shirahone, Nagano-ken, 26–vii–1961, ex *Salix* sp., R. Takahashi leg. Kyûshû—Kagoshima-ken, 28–iv–1965, ex *Salix koriyanagi*, M. Miyazaki leg. 2 alate viviparous females, Tôkyô, 27–ix–1953, R. Takahashi leg.

Host plants: *Salix gilgiana* Seemen, *Salix koriyanagi* Kimura, and *Salix sachalinensis* Fr. Schm. (after Takahashi, 1939).

Distribution: Japan (Hokkaidô; Honshû; Kyûshû); Europe.

This species is characterized by the following characters:—(1) Dorsal setae furcate at apex. (2) Caudal setae 9–13 in number. (3) Antennal setae few in number, 3rd segment with 1 or 2, 4th with 1 or 2, and 5th with 1. On account of the characters mentioned above, *C. beuthani* (Börner, 1950) may be rightly identified with *C. horii* Tak., 1939.

#### 4. *Chaitophorus populeti* (Panzer)

References. Panzer 1805: 6 [*Aphis*]; Koch 1854: 12 [*populi*]; van der Goot 1915: 354 [*betulinus*]; Matsumura 1917: 354 [*populi*]; ibid. 1919: 112 [*populisieboldi*]; Okamoto & Takahashi 1926: 142 [*coreanus*]; Shinji 1941: 418 [*yamanarashi*]; Börner 1952: 53; Stroyan 1957: 338; Szelegiewicz 1961: 278; Tao 1963: 46 [*coreanus*]; Paik 1965: 35 [*coreanus*]; Szelegiewicz 1968: 68.

Synonyms. *Chaitophorus populi* Koch, 1854, nec Linné, 1758; *Chaitophorus betulinus* van der Goot, 1915; *Chaitophorus populisieboldi* Matsumura, 1919; *Chaitophorus coreanus* Okamoto & Takahashi, 1926. **Syn. nov.** *Chaitophorus yamanarashi* Shinji, 1941.

#### **Syn. nov.**

On the basis of the present material, a redescription is given below:—

Apterous viviparous female: Body blackish brown or brown except on a middle part in life. Antennae brown; 3rd segment on basal 4/5 pale and 4th segment on basal part often pale. Legs brown; fore femur on distal part and tibiae on middle part pale. Cornicle brown. Cauda pale or pale brown. Body (fig. 29, D) not smooth, but without spinules and granules on dorsum, about 1.75 mm. in length; dorsal setae at least partially truncate at apex. Head a little imbricated on marginal parts; cephalic setae variable in length, the longest seta is 3.5–5.3 times as long as middle breadth of 3rd antennal segment. Antennae about 0.68 as long as body; 3rd segment 2.9–4.5 (mostly 3.5) times as long as base of 6th antennal segment; 6th with processus terminalis 1.8–2.8 (mostly 2.4) times as long as base of the segment; length of 3rd–6th segments in proportion 23.5 : 13.5 : 11 : 7+16. Antennal setae slender; 3rd segment with 12–18 setae, of which the longest one is 1.8–3.5 times as long as middle breadth of the segment, 4th with 6–10 setae, and 5th with 4–6 setae. Rostrum long, reaching to 1st abdominal segment; ultimate segment 1.0–1.2 times as long as 2nd segment of hind tarsus, with 6–10 setae besides apical ones. Legs: tibial setae slender, variable in length, the longest seta is 2.7–4.3 times as long as middle breadth of 3rd antennal segment; hind tibiae with 7–13 pseudosensoria widely scattered; 1st tarsal segment with 6 setae ventrally. Abdomen not reticulated; 1st–7th segments fused; 6th with 8–12 setae between cornicles, the longest seta being 3.5–7.0 times as long as middle breadth of 3rd antennal segment; 7th with 8–11 setae. Marginal sclerites distinct, but the anterior marginal sclerites are smaller than the posterior ones. Cornicle reticulated, 0.33–0.50 as long as 2nd segment of hind tarsus, at most 11/13 as long as base of 6th antennal segment. Cauda knobbed, with 6–8 setae.

Alate viviparous female: Body about 1.77 mm. in length. Head and thorax black sclerotic. Antennae about 0.72 as long as body; 3rd segment with 13–15 secondary sensoria, 4th with 2; chaetotaxy of 3rd–6th segments 13–15, 9–11, 6–7, 3; length of 3rd–6th segments in proportion 25 : 14.5 : 12 : 7+17. Abdomen with equally thick,

black bands on all segments, the band on 4th segment bearing 9-12 setae; marginal sclerites rather large and intersegmental dots present. Cornicle 0.33-0.65 as long as 2nd segment of hind tarsus. Other characters as in apterae viviparae.

Specimens examined: Many apterous viviparous females taken at the following localities: Honshû—Morioka, Iwate-ken, 3-ix-1964, ex *Populus nigra* var. *italica*, M. Miyazaki leg.; Mt. Rokkô, Hyôgo-ken, 2-vi-1956, ex *Populus* sp., R. Takahashi leg.; Ôsaka, 2-x-1955, ex *Populus* sp., R. Takahashi leg. Some alate viviparous females, Morioka, Iwate-ken, 3-ix-1964, M. Miyazaki leg.

Host plants: *Populus balsamifera* (after Matsumura, 1917), *Populus nigra* var. *italica* Muenchh., *Populus sieboldii* Miq. (after Shinji, 1941). Furthermore, according to the literature the following plants are recorded as hosts:—*Populus adenopoda* (in China, after Tao, 1963), *P. alba* (in England, after Stroyan, 1957; in Poland, after Szelegiewicz, 1961), *P. tomentosa* (in China, after Tao, 1963), *P. tremula* (in England, after Stroyan, 1957; in Poland, after Szelegiewicz, 1961; in China, after Tao, 1963), *P. tremula* var. *davidiana* (in Korea, after Okamoto & Takahashi, 1926).

Distribution: Japan (Honshû; Kyûshû); Korea; China; Europe.

In the course of the present study I have come to the conclusion that *coreanus* Okamoto & Takahashi and *yamanarashi* Shinji should be suppressed as synonyms of this species.

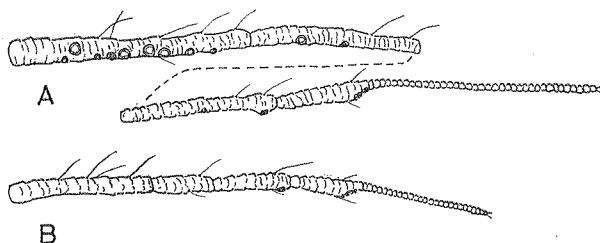


Fig. 32. *Chaitophorus saliaapterus* Shinji. Alate viviparous female:—A, 3rd-6th antennal segments. Apterous viviparous female:—B, 3rd-6th antennal segments.

## 5. *Chaitophorus saliaapterus* Shinji

References. Shinji 1924: 349; *ibid.* 1927: 39; *ibid.* 1941: 410.

On the basis of the present material, a redescription is given below:—

Apterous viviparous female: Body pale green in life. Antennae pale; 5th segment on distal half and 6th segment brown. Legs pale; tarsi brown. Cornicle pale or pale brown. Cauda pale. Body (fig. 29, E) not sclerotized, small, about 1.23 mm. in length; dorsal setae at least partially truncate or furcate at apex. Head: cephalic setae variable in length, the longest seta is 4.4-5.6 times as long as middle breadth of 3rd antennal segment. Antennae (fig. 32, B) about 0.61 as long as body; 3rd segment 1.7-2.6 (mostly 2.2) times as long as base of 6th antennal segment; 6th with processus terminalis 2.4-3.0 (mostly 2.6) times as long as base of the segment; length of 3rd-6th segments in proportion 11:6.5:7:5+13.5. Antennal setae: 3rd segment with 3-5 setae, of which the longest one is 2.2-4.0 times as long as middle breadth of the segment, 4th with 2 or 3, 5th with 2 or 3. Rostrum extending almost to middle

coxae; ultimate segment 0.53–0.72 as long as 2nd segment of hind tarsus, with 2 setae besides apical ones. Legs: tibial setae variable in length, the longest seta is 4.3–6.0 times as long as middle breadth of 3rd antennal segment; hind tibiae without pseudo-sensoria; 1st tarsal segment with 5 setae ventrally. Abdomen: 2nd–6th segments solidly fused, the other segments mutually free; 6th with 5–7 setae between cornicles, the longest seta being 2.8–5.2 times as long as middle breadth of 3rd antennal segment; 7th with 7–10 setae. Marginal sclerites indistinct (in some specimens distinct). Cornicle reticulated, 0.29–0.57 as long as 2nd segment of hind tarsus, at most  $\frac{4}{5}$  as long as base of 6th antennal segment. Cauda knobbed, with 9 or 10 setae.

Alate viviparous female: Body about 1.55 mm. in length. Head and thorax black sclerotic. Antennae (fig. 32, A) about 0.76 as long as body; 3rd segment with 6–10 secondary sensoria, 4th with 1 or 2, and 5th with 0–3; chaetotaxy of 3rd–6th segments 6–9, 2–4, 1–2, 1–2; length of 3rd–6th segments in proportion 18 : 12.5 : 12 : 7 + 19.5. Abdomen with pale brown bands on all segments, the band on 4th segment bearing 6 or 7 setae; marginal sclerites present. Cornicle 0.56–0.72 as long as 2nd segment of hind tarsus. Other characters as in apterae viviparae.

Specimens examined: Many apterous viviparous females taken at the following localities in Honshû: Ikezuki, Miyagi-ken, 25-v-1966, ex *Salix* sp., M. Miyazaki leg.; Nikkô, Tochigi-ken, 23-vii-1967, ex *Salix* sp.; Tôkyô, 30-vii-1958, ex *Salix* sp., R. Takahashi leg.; Shimonoseki, Yamaguchi-ken, 6-v-1965, ex *Salix* sp., M. Miyazaki leg.

Host plants: *Salix babylonica* L. (after Shinji, 1935), *Salix kinuyanagi* Kimura (after Shinji, 1941), *Salix koriyanagi* Kimura (after Shinji, 1941).

Distribution: Japan (Honshû; Kyûshû).

This species is characterized by the following aspects:—(1) Body small, about 1.23 mm. in length. (2) Dorsal setae few in number, 5–7 on 6th abdominal segment. (3) Caudal setae 9 or 10 in number.

## 6. *Chaitophorus salijaponicus* Essig & Kuwana

References. Essig & Kuwana 1918: 84; Mordwilko 1929: 29 [*niger*]; Börner 1950: 3 [*Pseudomicrella jacobii*]; ibid. 1952: 52 [*Pseudomicrella jacobii*]; Stroyan 1957: 339 [*niger*]; Szelegiewicz 1961: 271 [*niger*]; ibid. 1968: 69.

Synonyms. *Chaitophorus niger* Mordwilko, 1929; *Pseudomicrella jacobii* Börner, 1950.

On the basis of the present material, a redescription is given below:—

Apterous viviparous female: Body colour in life unknown. In mounted specimens head and thorax brown. Antennae brown; 2nd segment on distal part and 3rd–4th segments pale. Abdomen brown; on the middle part and around cornicles pale. Legs pale; tarsi pale brown. Cornicle brown. Cauda pale. Body (fig. 29, F) distinctly reticulated, about 1.67 mm. in length; dorsal setae not furcate at apex. Head: cephalic setae variable in length, the longest seta is 4.9–6.7 times as long as middle breadth of 3rd antennal segment. Antennae about 0.54 as long as body; 3rd segment 2.1–2.7 (mostly 2.4) times as long as base of 6th antennal segment; 6th with processus terminalis 2.2–2.5 (mostly 2.4) times as long as base of the segment; length of 3rd–6th segments in proportion 15 : 8 : 9 : 6 + 14. Antennal setae slender; 3rd segment with 5–8 setae, of which the longest one is 3.1–4.2 times as long as middle breadth of 3rd antennal segment, 4th with 2–4 setae, and 5th with 1–3 setae. Rostrum short, reaching



a little beyond or just attaining middle coxae; ultimate segment 0.75–0.88 as long as 2nd segment of hind tarsus, with 4 setae besides apical ones. Legs: tibial setae slender, variable in length, the longest seta is 3.7–4.5 times as long as middle breadth of 3rd antennal segment; hind tibiae without pseudosensoria; 1st tarsal segment with 5 setae ventrally. Abdomen: 2nd–6th segments solidly fused, the other segments mutually free; 6th with 11–15 setae between cornicles, the longest seta being 5.5–7.0 times as long as middle breadth of 3rd antennal segment; 7th with 10–12 setae. Cornicle reticulated, 0.37–0.63 as long as 2nd segment of hind tarsus, at most  $\frac{5}{7}$  as long as base of 6th antennal segment. Cauda knobbed, with 7 setae.

Specimens examined: Some apterous viviparous females taken at Kagoshima, Kagoshima-ken, 28-iv-1965, ex *Salix koriyanagi*, M. Miyazaki leg.

Host plants: *Salix integra* Thunb. (after Takahashi, 1924) and *Salix koriyanagi* Kimura. Furthermore, according to the literature the following plants are recorded as hosts:—*Salix alba*, *S. fragilis*, *S. amygdalina* and *S. babylonica* (in Poland, after Szelegiewicz, 1961); *Salix laurina* and *S. purpurea* (in England, after Stroyan, 1957).

Distribution: Japan (Honshû; Kyûshû); Europe.

Specimens examined agree very well with Szelegiewicz's redescription (1961) of *C. niger* Mordwilko, 1929.

## 7. *Chaitophorus saliniger* Shinji

References. Shinji 1924: 350; Takahashi 1930: 9 [*chinensis*]; ibid. 1935: 52 [*chinensis*]; Tao 1963: 44 [*chinensis*].

Synonyms. *Chaitophorus chinensis* Takahashi, 1930. **Syn. nov.**

On the basis of the present material, a redescription is given below:—

Apterous viviparous female: Body blackish brown in life. Antennae pale brown; 1st, 5th and 6th segments blackish brown. Legs pale brown; femora and tibiae on basal part sometimes blackish brown and tarsi blackish brown. Cornicle blackish brown. Cauda pale brown. Body (fig. 29, G) granular on dorsum, about 1.51 mm. in length; dorsal setae at least partially truncate or furcate at apex. Head: cephalic setae variable in length, the longest seta is 4.0–7.0 times as long as middle breadth of 3rd antennal segment, 2–4 times as long as shorter setae on head. Antennae (fig. 33, B) short, 0.43 as long as body; 3rd segment 1.8–2.6 (mostly 2.2) times as long as base of 6th antennal segment; 6th segment with processus terminalis 1.0–2.5 (mostly 1.6) times as long as base of the segment; length of 3rd–6th segments in proportion 11:6:6:5+8. Antennal setae: 3rd segment with 1–3 setae, of which the longest one is 2.7–3.7 times as long as middle breadth of the segment, 4th with 0 or 1, and 5th with 1. Rostrum not surpassing middle coxae; ultimate segment 0.9–1.1 times as long as 2nd segment of hind tarsus, with 2–4 setae besides apical ones. Legs: tibial setae variable in length, the longest seta is 2.9–4.7 times as long as middle breadth of 3rd antennal segment; hind tibiae (fig. 33 C) with small pseudosensoria on swollen part near the base; 1st tarsal segment with 5 setae ventrally. Abdomen: 1st–6th segments almost fused together, 7th segment not well defined from 6th, but 8th well defined; 6th with 16–24 setae between cornicles, the longest seta being 4.7–7.3 times as long as middle breadth of 3rd antennal segment; 7th with 14–18 setae. Marginal sclerites distinct. Cornicle reticulated, 0.14–0.25 as long as 2nd segment of hind tarsus, at most  $\frac{3}{8}$  as long as base of 6th antennal segment. Cauda faintly

constricted, with 7 setae.

Alate viviparous female: Body about 1.51 mm. in length. Head and thorax black sclerotic. Antennae (fig. 33, A) about 0.59 as long as body; 3rd segment with 6-10 secondary sensoria, 4th with 2-4, and 5th with 0 or 1; chaetotaxy of 3rd-6th segments 3-5, 1-3, 1-2, 1-2; length of 3rd-6th segments in proportion 16.5 : 10 : 8 : 6+11. Abdomen with large, black bands on all segments, the band on 4th segment bearing 8-12 setae. Cornicle 0.29-0.77 as long as 2nd segment of hind tarsus. Other characters as in apterae viviparae.

Male: Body smaller, about 1.30 mm. in length; dorsal setae subequal to those of apterae in length, but they are not branched at apex. Head granular on dorsum as in apterae, but abdomen spiculose imbricated. Antennae about 0.66 as long as body; 3rd segment with 10-15 secondary sensoria, 4th with 9-13, and 5th with 7 or 8; length of 3rd-6th segments in proportion 17 : 11 : 8 : 5+9. Other characters as in apterae viviparae.

Oviparous female: Body larger, about 2.06 mm. in length; dorsal setae longer than those of apterae, not furcate at apex. Head and thorax granular on dorsum, but

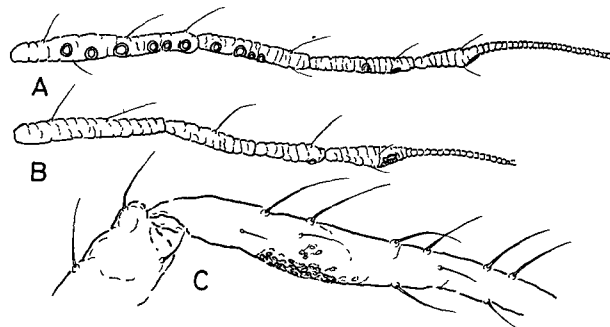


Fig. 33. *Chaitophorus saliniger* Shinji. Alate viviparous female:—A, 3rd-6th antennal segments. Apterous viviparous female:—B, 3rd-6th antennal segments; C, hind tibia.

abdomen smooth. Antennae short, about 0.39 as long as body; length of 3rd-6th segments in proportion 16 : 8 : 7 : 5.5+10. Abdomen with small sclerites, each of which bears a seta; marginal sclerites smaller. Cornicle smaller. Other characters as in apterae viviparae.

Specimens examined: Many apterous viviparous females taken at the following localities: Honshû—Tôkyô, 28-vii-1959, ex *Salix* sp., R. Takahashi leg.; Yokohama, Kanagawa-ken, 8-vii-1953, ex *Salix* sp., K. Sato leg.; Mt. Tanzawa Kanagawa-ken, 9-viii-1961, ex *Salix* sp., R. Takahashi leg.; Ôsaka, 16-v-1959, ex *Salix* sp., R. Takahashi leg.; Hiroshima, Hiroshima-ken, 29-iv-1965, ex *Salix babylonica*, M. Miyazaki leg. Kyûshû—Miyakonojô, Miyazaki-ken, 19-iv-1962, ex *Salix* sp., T. Tanaka leg.; Yatsushiro, Kumamoto-ken, 20-iv-1965, ex *Salix eriocarpa*, M. Miyazaki leg. Some alate viviparous females, Ôsaka, 16-v-1959, R. Takahashi leg. 2 males, Hirao, Ôsaka, 25-xi-1959, ex *Salix* sp., M. Sorin leg. 3 oviparous females, Hirao, Ôsaka, 25-xi-1959, M. Sorin leg.

Host plants: *Salix babylonica* L., *Salix eriocarpa* Franch. & Savat. In Formosa *Salix babylonica* has been recorded as host (after Tao, 1963).

Distribution: Japan (Honshû; Kyûshû); Formosa; China.

This species is not confused with other related ones in Japan, since it is distinct from any others by the presence of small pseudosensoria on a somewhat swollen part near the base of hind tibia.

In the course of the present study I have come to the conclusion that *Chaitophorus chinensis* Takahashi, 1930, should be suppressed as a synonym of *saliniger* Shinji, 1924.

#### 8. *Chaitophorus tremulae* Koch

References. Koch 1854: 8; Theobald 1929: 14; Börner 1939: 77 [*corax*]; ibid. 1952: 52 [*Eichochaitophorus*]; Szelegiewicz 1961: 300; ibid. 1968: 70.

Synonyms. *Chaitophorus corax* Börner, 1939.

This species is new to Japan. On the basis of the present material, a redescription is given below:—

Apterous viviparous female: Body colour in life unknown. In mounted specimens head and thorax pale brown. Antennae pale brown; 5th segment on distal part and 6th segment brown. Abdomen pale. Legs pale brown; tarsi brown. Cornicle and cauda pale brown. Body (fig. 29, H) scabrous on dorsum, about 1.6 mm. in length;

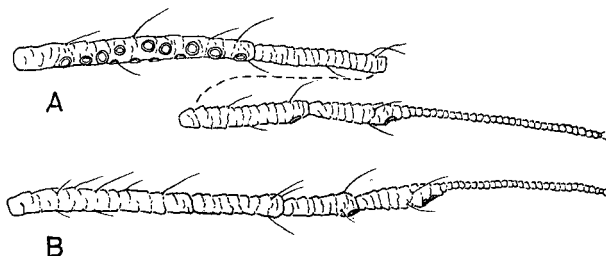


Fig. 34. *Chaitophorus tremulae* Koch. Alate viviparous female:—A, 3rd-6th antennal segments. Apterous viviparous female:—B, 3rd-6th antennal segments.

dorsal setae at least partially truncate or furcate at apex. Head: cephalic setae variable in length, the longest seta is 4.5-8.0 times as long as middle breadth of 3rd antennal segment, 4.0-5.7 times as long as shorter setae on head. Antennae (fig. 34, B) about 0.59 as long as body; 3rd segment 2.1-2.5 (mostly 2.3) times as long as base of 6th antennal segment; 6th with processus terminalis 2.0-2.7 (mostly 2.3) times as long as base of the segment; length of 3rd-6th segments in proportion 16 : 9 : 9 : 7+16. Antennal setae variable in length; 3rd segment with 6-12 setae, of which the longest one is 2.0-3.4 times as long as middle breadth of the segment, 4th with 3-5 setae, and 5th with 2-4 setae. Rostrum reaching to middle coxae; ultimate segment 0.8-1.0 as long as 2nd segment of hind tarsus, with 4 setae besides apical ones. Legs: femora faintly enlarged; tibial setae variable in length, the longest seta is 2.7-5.0 times as long as middle breadth of 3rd antennal segment; hind tibiae without pseudosensoria; 1st tarsal segment with 7 setae ventrally. Abdomen: 1st-6th segments fused, the other segments mutually free; 6th segment with 14-17 setae between cornicles, the longest seta being 4.0-6.8 times as long as middle breadth of 3rd antennal segment, 7th with 12-15 setae. Cornicle reticulated, 0.17-0.20 as long as 2nd segment of hind tarsus, at most 3/13 as long as base of 6th antennal segment. Cauda knobbed, with 6 setae.

Alate viviparous female: Body about 1.85 mm. in length. Head and thorax black sclerotic. Antennae (fig. 34, A) about 0.63 as long as body; 3rd segment with 13 or 14 secondary sensoria, 4th segment without secondary sensoria; chaetotaxy of 3rd-6th segments 9-12, 2-4, 3-5, 2-3; length of 3rd-6th segments in proportion 21:11.5:11:7+18.5. Abdomen with broad, black bands on all segments, the band on 4th segment bearing 14-16 setae; marginal sclerites rather large and intersegmental dots present. Cornicle about 0.5 as long as 2nd segment of hind tarsus. Other characters as in apterae viviparae.

Specimens examined: Many apterous viviparous females taken at Nagano, Ōsaka, 3-, 8-v-1959, ex *Populus* sp., R. Takahashi leg. 2 alate viviparous females, Nagano, Ōsaka, 3-, 8-v-1959, R. Takahashi leg.

Host plants: *Populus* sp. In Europe *Populus tremula* has been recorded as host (after Szelegiewicz, 1961).

Distribution: Japan (Honshū); Europe.

Japanese specimens somewhat differ from European ones in having slightly longer setae on the outer side of 3rd antennal segment. In European specimens the longer setae on the inner side of the 3rd antennal segment are 3-4 times as long as those on the outer side, whereas in Japanese ones they are 2.5-3.0 times as long.

### Species of *Chaitophorus* not included in the key

#### 9. *Chaitophorus matsumurai* Hille Ris Lambers

References. Matsumura 1917: 376 [*salicicolus*, nec Essig, 1911]; Hille Ris Lambers 1960: 23.

Host plants: *Salix bakko* Kimura (after Matsumura, 1917).

Distribution: Japan (Hokkaidō).

This species is excluded from the present key since I have seen no representatives. Judging from the original description, this species resembles *Chaitophorus horii* Takahashi by the body of apterae bearing tubercles and by the body colouration, but it differs from the latter by the number of secondary sensoria.

The aphid mentioned under the name *C. salicicolus* by Shinji (1941) seems to be another species.

#### 10. *Chaitophorus yomefuri* Shinji

References. Shinji 1922b: 732; *ibid.* 1941: 420.

Host plants: *Populus sieboldii* Miquel (after Shinji, 1941).

Distribution: Japan (Honshū).

According to the diagnosis given by Shinji (1941), this species is very similar to *Chaitophorus tremulae* Koch, but it may be distinguished from the latter by the length of processus terminalis and by the number of antennal setae.

### 32. Genus *Periphyllus* van der Hoeven

References. van der Hoeven 1863: 1; van der Goot 1915: 369 [*Chaitophorinella*]; Baker 1920: 34; Theobald 1929: 35; Shinji 1941: 139; Hille Ris Lambers 1947: 225; Essig & Abernathy 1952: 1; Börner 1952: 51; Palmer 1952: 94; Eastop 1966: 523.

Synonyms. *Phyllophora* Fernie, 1852, nec Thunberg, 1815 [type-species: *Phyllophora testudinacea* Fernie, 1852]; *Chelymorphia* Clark, 1858, nec Dejean, 1835 [type-

species: *Chelymorphe phyllophora* Clark, 1858]; *Periphyllus* van der Hoeven, 1863 [type-species: (*Periphyllus testudo* van der Hoeven, 1863) = *Phyllophora testudinacea* Fernie, 1852]; *Chaitophorinella* van der Goot, 1913 [type-species: *Phyllophorus testudinatus* Thornt., 1852]; *Chaitophorinus* Börner, 1930 [type-species: *Chaitophorus lyropictus* Kessler, 1886]; *Chaetophoria* Börner, 1940 [type-species: *Chaitophorus xanthomelas* Koch, 1854]; *Chaetophorella* Börner, 1940 [type-species: *Aphis aceris* L., 1746].

Type-species. (*Periphyllus testudo* van der Hoeven, 1863) = *Phyllophora testudinacea* Fernie, 1852.

This genus is widely distributed over the world. It is noteworthy that many species produce in summer modified first-instar larvae of resting stage, usually known as "aestivales". Most species of this genus are associated with Aceraceae and some others with Sapindaceae and Hippocastanaceae.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 42, M, the setae being pointed or foliate; marginal setae usually foliate in spring and early summer. Cornicle indistinct.

Host plants: Aceraceae, Hippocastanaceae, and Sapindaceae.

Distribution: Holarctic, Oriental and Australian regions.

#### Key to the Japanese species of *Periphyllus*

Alate viviparous female

1. Body without black bands. Antenna 0.8-1.0 as long as body. Processus terminalis 2.9-4.0 times as long as base of 6th antennal segment. Ultimate rostral segment 0.6-0.7 as long as 2nd segment of hind tarsus. On *Acer* spp. . . . . 4. *viridis* (Matsumura)
- Body with black bands. Antenna 0.5-0.8 as long as body. Processus terminalis 1.9-3.0 times as long as base of 6th antennal segment. Ultimate rostral segment 0.7-0.9 as long as 2nd segment of hind tarsus. . . . . 2
2. Hind tibia pale on middle part. Sixth abdominal segment with 16-20 setae between cornicles, of which the longest one is about 5.5 times as long as middle breadth of 3rd antennal segment. Cornicle shorter than wide at base. Body about 2.0 mm. in length. On *Acer* spp. . . . . 3. *kuwanaii* (Takahashi)
- Hind tibia wholly pigmented. Sixth abdominal segment with 8-14 setae between cornicles, of which the longest one is about 6.4 times as long as middle breadth of 3rd antennal segment. Cornicle longer than wide at base. Body about 3.0 mm. in length. . . . . 3
3. Third antennal segment with 16-29 secondary sensoria and 10-16 setae. Longer tibial setae about 0.26 mm. in length. On *Acer* spp. . . . . 1. *californiensis* (Shinji)
- Third antennal segment with 31-37 secondary sensoria and 16-20 setae. Longer tibial setae about 0.31 mm. in length. On *Aesculus* spp. and *Koelreuteria* spp. . . . . 2. *koelreuteriae* (Takahashi)

Apterous viviparous female (except for *koelreuteriae*)

1. Body longer than 3.2 mm., without black bands. Third antennal segment with 19-25 setae. Processus terminalis 3.0-3.4 times as long as base of 6th antennal segment. Ultimate rostral segment 0.6-0.7 as long as 2nd segment of hind tarsus. . . . . 4. *viridis* (Matsumura)
- Body at most 3.1 mm. in length, with black bands. Third antennal segment with 8-15 setae. Processus terminalis at most 2.5 times as long as base of 6th antennal segment. Ultimate rostral segment 0.7-0.8 as long as 2nd segment of hind tarsus. . . . . 2
2. Hind tibia wholly pigmented. Sixth abdominal segment with 8-15 setae between cornicles. . . . . 1. *californiensis* (Shinji)
- Hind tibia pale on middle part. Sixth abdominal segment with 18-21 setae between cornicles. . . . . 3. *kuwanaii* (Takahashi)

## 1. *Periphyllus californiensis* (Shinji)

References. Shinji 1917: 61 [*Thomasia*]; Matsumura 1917: 354 [*aceris*]; Baker 1918: 85 [*Chaitophorus japonicus*]; Takahashi 1919a: 273 [*Chaitophorinella acerifoliae*]; *ibid.* 1919c: 175 [*Chaitophorinella acerifoliae*]; Shinji 1941: 422; Essig & Abernathy 1952: 39; Tao 1963: 49; Paik 1965: 37; Eastop 1966: 524.

Synonyms. *Chaitophorus japonicus* Baker, 1918; *Chaitophorinella acerifoliae* Takahashi, 1919.

Alate viviparous female: Measurements of 10 species in mm. Body 3.01 (2.30–3.61); antennal segments (1st–6th): 0.08 (0.07–0.09), 0.06 (0.05–0.06), 0.69 (0.58–0.81), 0.37 (0.30–0.45), 0.34 (0.24–0.39), 0.13 (0.11–0.17)+0.35 (0.26–0.45); ultimate rostral segment 0.13 (0.11–0.14); hind femur 0.90 (0.68–1.06); hind tibia 1.61 (1.22–1.92); 2nd segment of hind tarsus 0.17 (0.15–0.20); longest seta on head 0.202 (0.197–0.252), that on 3rd antennal segment 0.174 (0.129–0.189), that on 6th abdominal segment 0.242 (0.152–0.288), that on hind tibia 0.250 (0.212–0.288).

Apterous viviparous female: Measurements of 5 species in mm. Body 2.95 (2.68–3.12); antennal segments (1st–6th): 0.09 (0.07–0.09), 0.06 (0.05–0.06), 0.60 (0.58–0.63), 0.31 (0.30–0.32), 0.30 (0.29–0.32), 0.13 (0.12–0.14)+0.27 (0.27–0.29); ultimate rostral segment 0.13 (0.13–0.14); hind femur 0.79 (0.76–0.82); hind tibia 1.28 (1.22–1.33); 2nd segment of hind tarsus 0.17 (–); longest seta on head 0.242 (0.202–0.244), that on 3rd antennal segment 0.167 (0.158–0.169), that on 6th abdominal segment 0.293 (0.280–0.301), that on hind tibia 0.250 (0.239–0.258).

Specimens examined: Many alate and apterous viviparous females taken at the following localities: Hokkaidô—Sapporo, 8–vi-1967, ex *Acer mono*. Honshû—Niigata, Niigata-ken, 9–v-1956, K. Shibata leg.; Mt. Kongô, Ôsaka, 30–iv-1961, ex *Acer* sp., R. Takahashi leg. Kyûshû—Hikosan, Fukuoka-ken, 9–v-1957, ex *Acer* sp., S. Takagi leg.

Host plants: *Acer carpiniifolium* Sieb. & Zucc. (after Moritsu, 1958), *Acer japonicum* Thunb. (after Matsumura, 1917), *Acer miyabei* Maxim. (after Matsumura, 1917), *Acer mono* Maxim., *Acer palmatum* Thunb. (after Matsumura, 1917), *Aesculus turbinata* Blume (after Takahashi, 1919). Furthermore, according to the literature the following plants have been recorded as hosts:—*Acer palmatum* (in Australia, after Eastop, 1966), *Acer circinatum* and *Acer macrophyllum* (in U.S.A., after Essig & Abernathy, 1952), *Acer tricidum* (in China, after Tao, 1963).

Distribution: Japan; Korea; China; Australia; New Zealand; Canada; U.S.A.; England; Holland.

This species is common in Japan on several *Acer* spp.

## 2. *Periphyllus koelreuteriae* (Takahashi)

References. Takahashi 1919a: 277 [*Chaitophorinella*]; *ibid.* 1919c: 175 [*Chaitophorinella*]; Shinji 1927: 46; *ibid.* 1941: 426; Essig & Abernathy 1952: 77; Tao 1963: 50.

Alate viviparous female: Measurements of one specimen in mm. Body 2.92; antennal segments (1st–6th): 0.09, 0.07, 0.81, 0.42, 0.38, 0.15+0.42; ultimate rostral segment 0.13; hind femur 1.08; hind tibia 1.08; 2nd segment of hind tarsus 0.19; longest seta on head 0.224, that on 3rd antennal segment 0.182, that on 6th abdominal segment 0.264, that on hind tibia 0.310.

Specimens examined: 1 alate viviparous female, Morioka, Iwate-ken, 24–vi-1967, *Aesculus turbinata*.

Host plants: *Aesculus turbinata* Blume, *Koelreuteria paniculata* Laxm. (after Takahashi, 1919a).

Distribution: Japan (Honshû); Formosa; China.

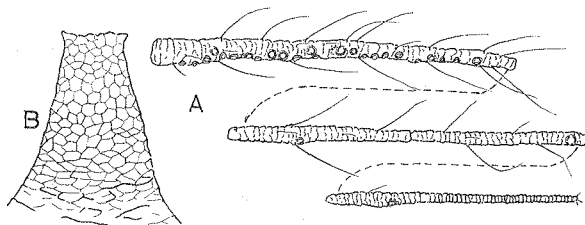


Fig. 35. *Periphyllus koelreuteriae* (Takahashi). Alate viviparous female:—A, 3rd–6th antennal segments; B, cornicle.

### 3. *Periphyllus kuwanai* (Takahashi)

References. Essig & Kuwana 1918: 82 [*Chaitophorus japonica*]; Takahashi 1919a: 277 [*Chaitophorinella japonica*]; ibid. 1919c: 176 [*Chaitophorinella*]; Shinji 1941: 439 [*testudinatus*]; Essig & Abernathy 1952: 81.

Synonyms. *Chaitophorus japonica* Essig & Kuwana, 1918 nec Baker, 1918.

Alate viviparous female: Measurements of 8 specimens in mm. Body 2.12 (1.64–2.44); antennal segments (1st–6th): 0.07 (0.06–0.07), 0.06 (0.05–0.06), 0.47 (0.35–0.53), 0.26 (0.23–0.29), 0.24 (0.21–0.27), 0.11 (0.09–0.12)+0.26 (0.23–0.29); ultimate rostral segment 0.11 (0.09–0.12); hind femur 0.59 (0.45–0.76); hind tibia 1.00 (0.82–1.20); 2nd segment of hind tarsus 0.15 (0.11–0.18); longest seta on head 0.181 (0.154–0.204), that on 3rd antennal segment 0.139 (0.103–0.159), that on 6th abdominal segment 0.174 (0.129–0.206), that on hind tibia 0.180 (0.129–2.06).

Apterous viviparous female: Measurements of 5 specimens in mm. Body 1.74 (1.44–2.42); antennal segments (1st–6th): 0.08 (–), 0.06 (0.06–0.07), 0.38 (0.25–0.47), 0.19 (0.12–0.23), 0.18 (0.11–0.23), 0.10 (0.08–0.11)+0.21 (0.18–0.24); ultimate rostral segment 0.10 (0.08–0.11); hind femur 0.47 (0.33–0.63); hind tibia 0.77 (0.52–1.03); 2nd segment of hind tarsus 0.13 (0.09–0.17); longest seta on head 0.203 (0.161–0.220), that on 3rd antennal segment 0.145 (0.129–0.166), that on 6th abdominal segment 0.208 (0.174–0.220), that on hind tibia 0.165 (0.136–0.202).

Specimens examined: Many alate and apterous viviparous females taken at the following localities: Hokkaidô—Sapporo, 26–v–, 8–vi–1961, ex *Acer mono*, S. Takagi leg.; Abashiri, 6–vi–1956, ex *Acer* sp., S. Takagi leg. Honshû—Towada, Aomori-ken, 22–vi–1967, ex *Acer* sp.; Shirahone, Nagano-ken, 27–vii–1961, ex *Acer* sp., R. Takahashi leg.

Host plants: *Acer mono* Maxim., *Acer pictum* var. *dissectum* Wesmael. (after Essig & Kuwana, 1918).

Distribution: Japan (Hokkaidô; Honshû).

### 4. *Periphyllus viridis* (Matsumura)

References. Matsumura 1919: 111 [*Chaitophorus*]; Shinji 1941: 434.

On the basis of the present material, a brief redescription is given below:—

Alate viviparous female: Body about 3.4 mm. in length. Antennae (fig. 36, A) 0.8–1.0 as long as body; 3rd segment with 17–22 setae, of which the longest one is about 3.8 times as long as middle breadth of the segment, and with 15–27 (mostly 18) secondary sensoria; 4th segment with 7–13 setae, 5th segment with 7 or 8 setae; 6th segment with processus terminalis 2.9–4.0 times as long as the base; length of 3rd–6th segments in proportion 61 : 43 : 36 : 10+36. Rostrum not reaching middle coxae; ultimate rostral segment 0.6–0.7 as long as 2nd segment of hind tarsus, with 1 or 2 pairs of secondary setae. Clypeus with a pair of anterior setae; mandibular lamina with 2 setae. Hind tibiae black, with numerous long setae, of which the longest one is about 5.5 times as long as middle breadth of 3rd antennal segment. First tarsal segment of fore, middle and hind legs with 7, 7, 7 setae respectively. Abdomen without black bands; 6th segment with 15–18 setae between cornicles, the longest seta being about 4.9 times as long as middle breadth of 3rd antennal segment. Cornicle (fig. 36, B) with polygonal reticulation almost over the entire length. Cauda short and rounded, rather a thumbnail-like in shape.

Apterous viviparous female: Differs from the alate viviparous female as follows:—

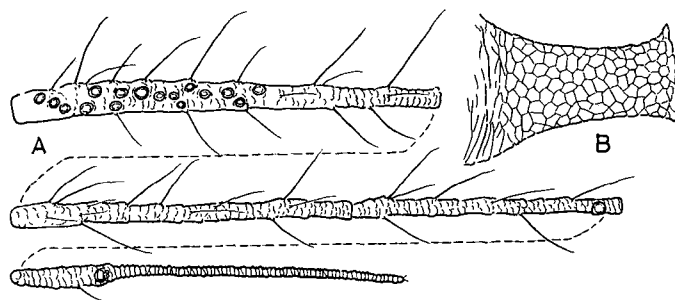


Fig. 36. *Periphyllus viridis* (Matsumura). Alate viviparous female:—A, 3rd–6th antennal segments; B, cornicle.

Antennae 0.7–0.9 (mostly 0.8) times as long as body; 3rd segment without secondary sensoria; length of 3rd–6th segments in proportion 54 : 36 : 31 : 10+32. Cornicle with reticulation on distal 2/3 part.

Specimens examined: Many alate and apterous viviparous females, Sapporo, Hokkaidô, 8-vi-1961, ex *Acer mono*, S. Takagi leg.; 26-v-, 8-vi-1967, ex *Acer mono*.

Host plants: *Acer mono* Maxim.

Distribution: Japan (Hokkaidô; Honshû).

### ***Trichaitophorus* group**

On account of the same number of rudimentary gonapophyses, the multicorreal eyes, the somewhat flattened empodial setae and the host association the *Trichaitophorus* group may be placed near the *Chaitophorus* group. This group is characterized by the following features:—Head fused with prothorax. Antennae 5-segmented. Processus terminalis 0.7–1.8 times as long as base of last antennal segment. Ultimate rostral segment with 0–2 secondary setae. Apical tibial setae not differing from other tibial setae in shape. First tarsal segment with 3 ventral setae, and without dorsal



setae. Empodial setae somewhat flattened. Eighth abdominal segment with 6-8 setae. Rudimentary gonapophyses 4 in number.

The embryo of any species of this group has not yet been examined by myself.

### 33. Genus *Trichaitophorus* Takahashi

References. Takahashi 1937: 17.

Type-species. *Trichaitophorus aceris* Takahashi, 1937.

This is probably Asiatic, being represented by the following three species: *T. aceris* Takahashi from Formosa, *T. recurvispinus* Hille Ris Lambers & Basu from India and *T. koyaensis* Takahashi from Japan.

Embryo: Unknown.

Host plants: Aceraceae.

Distribution: Oriental region.

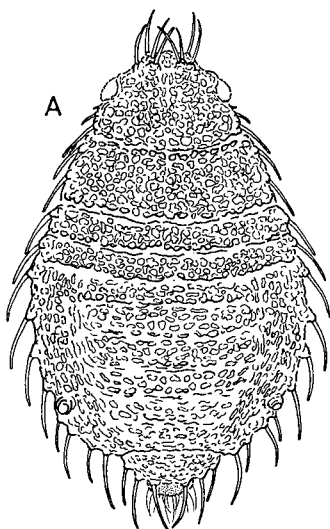


Fig. 37. *Trichaitophorus koyaensis* Takahashi.

Apterous viviparous female:—A, outline of the aphid.

#### 1. *Trichaitophorus koyaensis* Takahashi

References. Takahashi 1961b: 248.

Apterous viviparous female: Measurements of one specimens in mm. Body 1.05; antennal segments (1st-5th): 0.05, 0.03, 0.20, 0.07, 0.07+0.10; ultimate rostral segment 0.06; hind femur 0.16; hind tibia 0.26; 2nd segment of hind tarsus 0.08; longest seta on head 0.091, that on hind tarsus 0.038.

Specimens examined: 1 aptera (holotype), Mt. Kôya, Wakayama-ken, 23-ix-1960, ex *Acer rufinerve*.

Host plants: *Acer rufinerve* Sieb & Zucc.

Distribution: Japan (Honshû).

### 34. Genus *Yamatochaitophorus*, gen. nov.

Type-species. *Trichaitophorus albus* Takahashi, 1961.

The new genus is proposed for the reception of *Trichaitophorus albus* Takahashi, which was originally described from Japan as a feeder of *Acer* sp.

Head fused with pronotum. Eyes consisting of about 10-15 facets. Antennae 5-segmented, about 1/3 as long as body. Processus terminalis a little shorter than base of 6th antennal segment. Secondary sensoria absent. Ultimate rostral segment without secondary setae. Legs: apical tibial setae not differing from the other tibial setae. First tarsal segment bearing 3 ventral setae, without dorsal setae. Empodial setae somewhat flattened. Abdomen: 1st-7th segments solidly fused; each segment bearing 2 marginal setae on either side. Cornicle short, not reticulated. Cauda rounded and anal plate broadly rounded. Alatae unknown.

In most respects this genus (fig. 38, A) is closely allied to *Trichaitophorus* (fig. 37, A), but it differs from the latter by the number of marginal setae and facets, and by the shape and length of dorsal setae.

Embryo: Unknown.

Host plants: Aceraceae.  
Distribution: Eastern Asia.

1. *Yamatochaitophorus albus* (Takahashi), comb. nov.

References. Takahashi 1961a: 8 [*Trichaitophorus*].

Apterous viviparous female: Measurements of 5 specimens in mm. Body 0.92 (0.82–0.95); antennal segments (1st–5th): 0.04 (0.03–0.04), 0.03 (–), 0.08 (0.07–0.10), 0.05 (0.04–0.06), 0.06 (0.05–0.06)+0.05 (0.05–0.06); ultimate rostral segment 0.06 (0.05–0.06); hind femur 0.14 (0.13–0.15); hind tibia 0.23 (0.22–0.27); 2nd segment of hind tarsus 0.08 (0.08–0.09); longest seta on head 0.099 (0.071–0.110), that on 6th abdominal segment 0.121 (0.084–0.148), that on hind tibia 0.019 (0.015–0.019).

Specimens examined: Some apterous viviparous females (syntypes of *Trichaitophorus albus* Tak.), Mt. Norikura, Nagano-ken, 12–viii–1959, ex *Acer* sp., R. Takahashi leg. 5 apterous viviparous females, Suganuma, Gumma-ken, 22–vii–1967, ex *Acer* sp.

Host plants: *Acer* sp.

Distribution: Japan (Honshû).

This species seems to be restricted to mountainous regions in Japan.

***Neophyllaphis* group**

This is the only group associated with conifers in this subfamily and it is regarded as an old group by Mordwilko (1930), Eastop (1966), Hille Ris Lambers (1967), etc. This group is characterized by the combination of the following characters:—Head of apterae fused with prothorax, and there is no V-shaped suture in the head capsule, while that of alatae not fused with prothorax, but having a V-shaped suture. Eyes of apterae consisting of only triommatidia. Processus terminalis very short, about 1/4 as long as base of 6th antennal segment. Secondary sensoria annular and without cilia. Ultimate rostral segment without secondary setae. Apical tibial setae not differing from other tibial setae. First tarsal segment of apterae without dorsal setae. Empodial setae hair-like. Dorsal abdominal tubercles absent. Eighth abdominal segment with 4 setae. Cornicle short, ring-like and cauda elongated. Rudimentary gonapophyses 4 in number.

The embryonic chaetotaxy of this group is characterized as follows:—Dorsal abdominal setae very short, pointed; pleural setae present; marginal setae single in number.

35. Genus *Neophyllaphis* Takahashi

References. Takahashi 1920a: 19; Shinji 1941: 119; Eastop 1966: 514; Hille Ris Lambers 1967: 55.

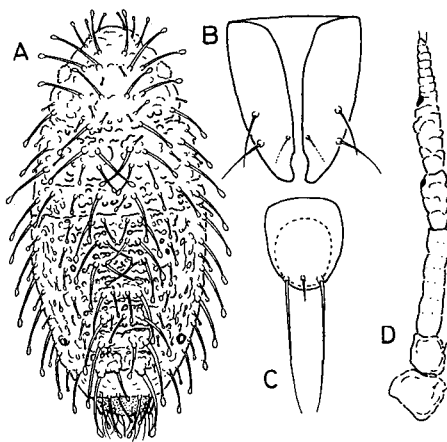


Fig. 38. *Yamatochaitophorus albus* (Takahashi). Apterous viviparous female:—A, outline of the aphid; B, ultimate rostral segment; C, 1st segment of hind tarsus (ventral view); D, antenna.

Type-species. *Neophyllaphis podocarpi* Takahashi, 1920.

According to Hille Ris Lambers (1967), this genus comprises eight species and seems to be widely distributed in the tropical and temperate parts of the southern hemisphere.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 42, O, the setae being short, pointed; pleural setae present; marginal setae single. Cornicle invisible.

Host plants: Podocarpaceae.

Distribution: Oriental, Australian, Ethiopian, and Neotropical regions.

### 1. *Neophyllaphis podocarpi* Takahashi

References. Takahashi 1920a: 20; ibid. 1921b: 77; Shinji 1922a: 532 [*Mindarus podocarpi*]; Takahashi 1923: 129; ibid. 1924: 112; Shinji 1941: 288; Tao 1963: 37; ibid. 1964a: 210; Eastop 1966: 516; Hille Ris Lambers 1967: 57.

Synonyms. *Mindarus podocarpi* Shinji, 1922.

Alate viviparous female: Measurements of 5 specimens in mm. Body 1.60 (1.45–1.81); antennal segments (1st–6th): 0.06 (0.05–0.06), 0.05 (–), 0.45 (0.44–0.50), 0.16 (0.14–0.18), 0.17 (0.15–0.18), 0.12 (0.10–0.13)+0.03 (0.02–0.04); ultimate rostral segment 0.08 (–); hind femur 0.39 (0.37–0.42); hind tibia 0.62 (0.58–0.65); 2nd segment of hind tarsus 0.11 (0.10–0.12); longest seta on head 0.016 (0.013–0.022), that on 3rd antennal segment 0.012 (0.008–0.016), that on 6th abdominal segment 0.019 (0.013–0.023), that on hind tibia 0.023 (0.019–0.026).

Apterous viviparous female: Measurements of 5 specimens in mm. Body 1.81 (1.65–2.02); antennal segments (1st–6th): 0.07 (0.07–0.08), 0.06 (–), 0.29 (0.26–0.30), 0.12 (0.10–0.12), 0.14 (0.13–0.15), 0.12 (0.10–0.13)+0.03 (0.02–0.04); ultimate rostral segment 0.08 (–); hind femur 0.35 (0.31–0.36); hind tibia 0.48 (0.45–0.50); 2nd segment of hind tarsus 0.11 (0.10–0.11); longest seta on head 0.032 (0.026–0.045), that on 3rd antennal segment 0.014 (0.010–0.019), that on 6th abdominal segment 0.026 (0.019–0.032), that on hind tibia 0.027 (0.023–0.032).

Specimens examined: Many apterous viviparous females taken at the following localities: Honshû—Nara, Nara-ken, 10-v-1959, ex *Podocarpus* sp., R. Takahashi leg. Kyûshû—Kagoshima, Kagoshima-ken, 5-viii-1964, ex *Podocarpus macrophyllus*, H. Takada leg.; Uragami, Amami-Ôshima, 6-iii-1964, ex *Podocarpus macrophyllus*, H. Takada leg. Some alate viviparous females, Ôsaka, 28-vi-1956, ex *Podocarpus* sp., R. Takahashi leg.; Hirao, Ôsaka, 12-xi-1960, ex *Podocarpus macrophyllus* var. *maki*, M. Sorin leg.; Amami-Ôshima, 29-iv-1965, ex *Podocarpus macrophyllus*, M. Miyazaki leg. 1 oviparous female, Tsubaki, Wakayama-ken, 28-x-1959, R. Takahashi leg.

Host plants: *Podocarpus macrophyllus* (Thunb.), *Podocarpus macrophyllus* var. *maki* Sieb., *Podocarpus* sp. In Australia *Podocarpus alata* has been recorded as host (after Eastop, 1966).

Distribution: Japan (Honshû; Kyûshû); Formosa; China; Malaya; Australia; North America (California).

### Isolated genera

The following two genera, *Dasyaphis* and *Parachaitophorus* do not belong to any of the preceding groups.

### 36. Genus *Dasyaphis* Takahashi

References. Shinji 1932: 120 [*Tuberocarpus*]; Takahashi 1938: 13.

Synonyms. *Tuberocarpus* Shinji, 1932, nec Shinji, 1929 [type-species: *Tuberocarpus onigurumi* Shinji, 1932]; *Sinocallis* Tseng & Tao, 1938 [type-species: *Sinocallis mirabilis*, 1938].

This genus is characterized by the following aspects:—Body (fig. 39, F) of apterae with long projections. Head of apterae fused with prothorax. Third and fourth antennal segments of alatae with transversely elongated secondary sensoria. First tarsal

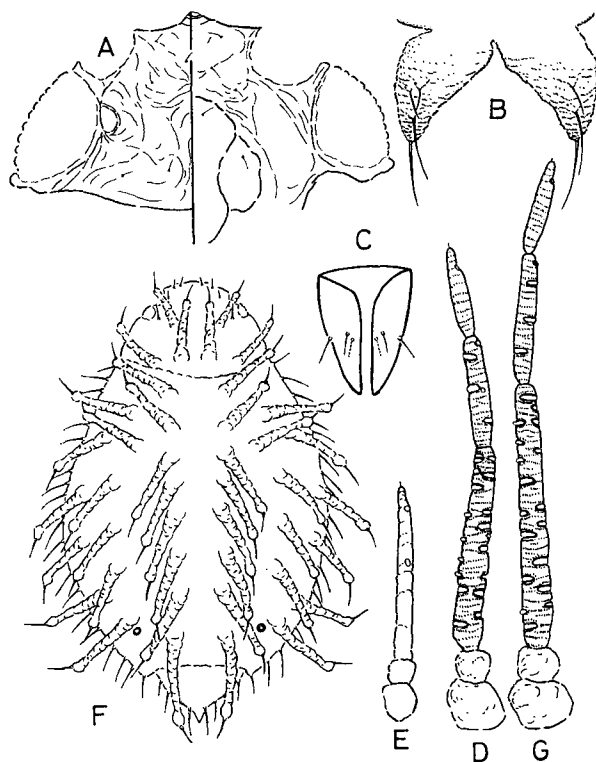


Fig. 39. *Dasyaphis onigurumi* (Shinji). Alate viviparous female:—A, head; B, anal plate; C, ultimate rostral segment; D, antenna. Apterous viviparous female:—E, antenna; F, outline of the aphid. Alate male:—G, antenna.

segment with 2 or 3 ventral setae.

Embryo: Marginal setae being long, thick and spinal setae short, pointed. Cornicle visible.

Host plants: Juglandaceae.

Distribution: Eastern Asia.

#### 1. *Dasyaphis onigurumi* (Shinji)

References. Shinji 1932: 120 [*Tuberocarpus*]; Tseng & Tao 1938: 213 [*Sinocallis mirabilis*];

Takahashi 1938: 13; Shinji 1941: 702 [*Tubercorpus*]; Tao 1963: 73 [*Tubercorpus*]; Paik 1965: 126 [*Tubercorpus coreanus*]; Takahashi 1965: 58.

Synonyms. *Sinocallis mirabilis* Tseng & Tao, 1938; *Tubercorpus coreanus* Paik, 1965. **Syn. nov.**

Alate viviparous female: Measurements of 2 specimens in mm. Body 1.48–1.52; antennal segments (1st–5th): 0.04, 0.03–0.04, 0.19–0.20, 0.10, 0.06–0.07 + 0.02–0.03; ultimate rostral segment 0.07–0.08; hind femur 0.21–0.22; hind tibia 0.40; 2nd segment of hind tarsus 0.08; longest seta on head 0.010–0.012, that on 3rd antennal segment 0.002, that on 6th abdominal segment 0.008–0.013, that on hind tibia 0.013–0.016.

Apterous viviparous female: Measurements of 5 specimens in mm. Body 1.27 (0.97–1.40); antennal segments (1st–3rd): 0.03 (0.03–0.04), 0.02 (0.02–0.03), 0.14 (0.13–0.17) + 0.02 (0.01–0.02); ultimate rostral segment 0.06 (0.05–0.06); hind femur 0.18 (0.15–0.20); hind tibia 0.27 (0.22–0.31); 2nd segment of hind tarsus 0.06 (0.06–0.07); longest seta on 3rd antennal segment 0.003 (0.002–0.006), that on hind tibia 0.016 (0.010–0.019).

Specimens examined: Many apterous viviparous females taken at the following localities: Hokkaidô—Sapporo, 12-vi-1968, ex *Juglans* sp. Honshû—Oirase, Aomori-ken, 21-vi-1967, ex *Juglans ailanthifolia*; Morioka, Iwate-ken, 24-vi-1967, ex *Juglans ailanthifolia*; Kaigake, Niigata-ken, 2-vii-1967, *Juglans* sp.; Nikkô, Tochigi-ken, 21-vii-1967, ex *Juglans ailanthifolia*; Tôkyô, 28-vii-1958, ex *Juglans* sp., R. Takahashi leg.; Kyôto, 15-ix-1965, ex *Juglans* sp., H. Takada leg. Some alate viviparous females, Hokkaidô—Misumai, 27-ix-1967; Sapporo, 28-ix-1967. 2 alate males, Gifu, Gifu-ken, 26-x-1957, R. Takahashi leg.

Host plants: *Juglans ailanthifolia* Carr., *Juglans* sp.

Distribution: Japan (Hokkaidô; Honshû); Korea; China.

Judging from the description, *Tubercorpus coreanus* Paik should be suppressed as a synonym of this species.

### 37. Genus *Parachaitophorus* Takahashi

References. Takahashi 1937: 90.

Type-species. *Patchia spiraeae* Takahashi, 1924.

*Parachaitophorus* Takahashi is the only genus associated with Rosaceae (*Spiraea*) in the Callipterinae. It is recognized by the following characters:—Body of apterae with long blunt setae. Head of apterae fused with prothorax. Third–5th antennal segments (fig. 40, F) of alatae with oval, protuberant secondary sensoria. First tarsal segment with 2 or 3 ventral setae. Empodial setae hair-like. Cauda (fig. 40, D) elongated, with 2 setae.

Embryo: Dorsal abdominal chaetotaxy as shown in Fig. 42, P, the setae being long, pointed; pleural setae present, shorter than spinal ones. Cornicle invisible.

Host plants: Rosaceae.

Distribution: Eastern Asia.

#### 1. *Parachaitophorus spiraeae* (Takahashi)

References. Takahashi 1924: 114 [*Patchia*]; ibid. 1937: 90; ibid. 1961 b: 250.

Alate viviparous female: Measurements of 3 specimens in mm. Body 1.46 (1.29–1.50); antennal segments (1st–6th): 0.06 (–), 0.06 (–), 0.33 (0.32–0.34), 0.14 (0.14–0.16),

0.12 (0.12-0.13), 0.06 (0.06-0.07)+0.17 (0.15-0.17); ultimate rostral segment 0.10 (---); hind femur 0.44 (---); hind tibia 0.75 (0.74-0.77); 2nd segment of hind tarsus 0.11 (0.10-0.12); longest seta on head 0.142 (0.132-0.161), that on 3rd antennal segment 0.083 (0.065-0.097), that on 6th abdominal segment 0.197 (0.181-0.203), that on hind tibia 0.045 (0.041-0.045).

Specimens examined: Many apterous viviparous females, Mt. Kongô, Ôsaka, 30-iv-1961, ex *Spiraea cantoniensis*, R. Takahashi leg.; Kotohira, Kagawa-ken, 21-iv-1965,

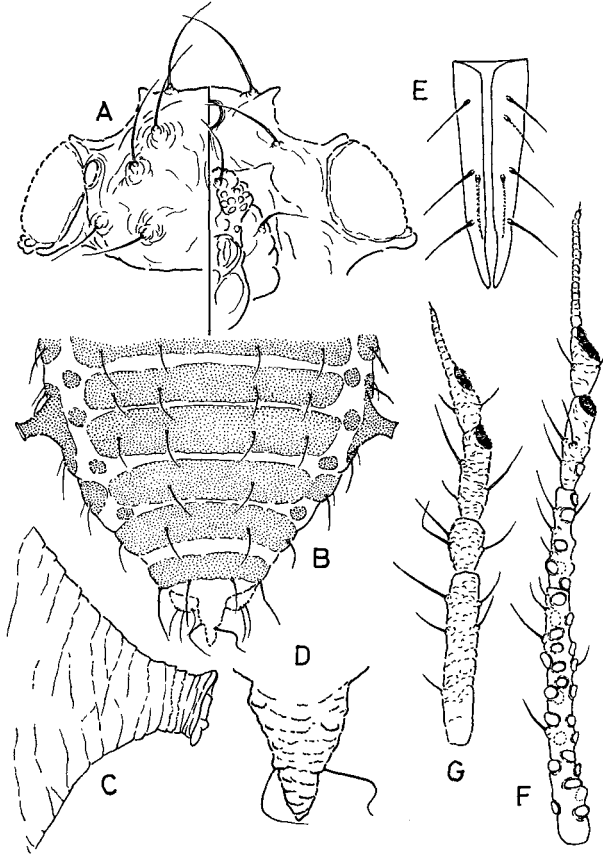


Fig. 40. *Parachaitophorus spiraeae* (Takahashi). Alate viviparous female:—A, head; B, abdomen; C, cornicle; D, cauda; E, ultimate rostral segment; F, 3rd-6th antennal segments. Apterous viviparous female:—G, 3rd-6th antennal segments.

ex *Spiraea japonica*, H. Takada leg. Some alate viviparous females, Yokohama, Kanagawa-ken, 24-v-, 1-vi-1953, ex *Spiraea japonica*, K. Sato leg.

Host plants: *Spiraea cantoniensis* Lour., *Spiraea japonica* L.

Distribution: Japan (Honshû; Shikoku).

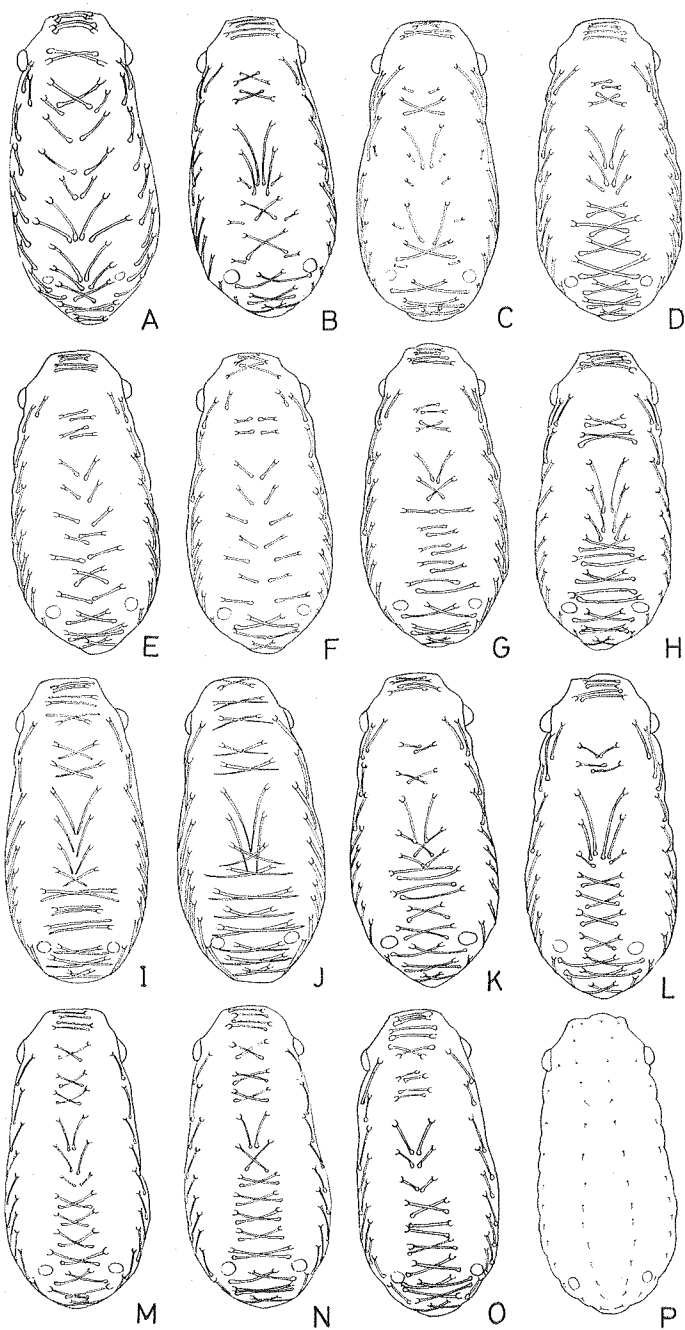
This species is easily recognized by the characters given under the generic description.

### Species of Callipterinae unknown to the writer

The species which follow below in alphabetical order were described as members of Callipterinae, but their true systematic positions have not yet been known to the writer.

1. *Chaitophorus abdominalis* Shinji  
References. Shinji 1924: 349.  
Host plants: *Betula* sp.
2. *Chaitophorus fraxinicolus* Matsumura  
References. Matsumura 1919: 112.  
Host plants: *Fraxinus longicuspis* Sieb. & Zucc.
3. *Chaitophorus narae* Shinji  
References. Shinji 1941: 404.  
Host plants: *Quercus serrata* Thunb.
4. *Chaitophorus shidai* (Shinji)  
References. Shinji 1922b: 732 [*Thomasia*]; *ibid.* 1935b: 14.  
Host plants: *Dryopteris crassirhizoma* and ferns.
5. *Euceraphis betulifoliae* Shinji  
References. Shinji 1922b: 730.  
Host plants: *Betula* sp.
6. *Mesocallis fagicola* Matsumura  
References. Matsumura 1919: 103.  
Host plants: *Fagus crenata* Blume.
7. *Myzocallis alnicola* Shinji  
References. Shinji 1924: 345.  
Host plants: *Alnus hirsuta* var. *sibirica* (Fischer).
8. *Myzocallis alnifoliae* (Shinji)  
References. Shinji 1924: 347 [*Lutaphis*]; *ibid.* 1941: 304.  
Host plants: *Alnus firma* Sieb. & Zucc. and *Alnus hirsuta* var. *sibirica* (Fischer).
9. *Sappocallis alnifoliae* (Shinji)  
References. Shinji 1922b: 731 [*Telocallis*].  
Host plants: *Alnus serrulatoidea* Callier.
10. *Therioaphis ononidis*: Shinji  
References. Shinji 1941: 362.  
Host plants: *Trifolium* sp.  
Judging from the literature the aphid stated by Shinji (1941) under the name *Therioaphis ononidis* seems to be not the true *ononidis* Kaltenbach.
11. *Therioaphis tilicola* Shinji  
References. Shinji 1933c: 164; *ibid.* 1941: 360.  
Host plants: *Tilia japonica* (Miq.) and *Tilia miqueliana* Maxim.

**Fig. 41.** Embryo:—A, *Mesocallis sawashibae* (Matsumura); B, *M. pteleae* Matsumura; C, *Paratinocallis corylicola*, sp. nov.; D, *Sappocallis ulmicola* Matsumura; E, *Tinocallis ulmiparvifoliae* Matsumura; F, *T. zelkowae* (Takahashi); G, *Tiliaphis shinae* (Shinji); H, *Chromocallis nirecola* (Shinji); I, *Neochromaphis carpinicola* (Takahashi); J, *N. coryli* Takahashi; K, *Recticallis nigrostriata* (Shinji); L, *Myzocallis kuricola* (Matsumura); M, *Takecallis arundinariae* (Essig); N, *T. saşae* (Matsumura); O, *Tuberculatus yokoyamai* (Takahashi); P, *Shivaphis celti* Das.





### Key to the Japanese genera of Callipterinae\*

1. Apical tibial setae strongly differentiated from other tibial setae, but rarely, weakly differentiated in some genera\*\*. Rudimentary gonapophyses 1 or 2. Mostly on Fagaceae, Ulmaceae, and Betulaceae, rarely on bamboos, Lauraceae and Magnoliaceae. . . . . 2
- Apical tibial setae not differentiated from other tibial setae. Rudimentary gonapophyses usually 3 or 4, if they are 2, then the antenna 3-5-segmented or the ocular tubercle absent. Mostly on Aceraceae, Salicaceae and Cyperaceae, rarely on Podocarpaceae, Hippocastanaceae, Sapindaceae, Rosaceae, and Juglandaceae. . . . . 28
2. Second antennal segment shorter than the 1st. Wax plate usually absent, if present, then 1st tarsal segment bearing dorsal setae. First tarsal segment often with dorsal setae and bearing 5-7 ventral setae. Processus terminalis 0.5-7.0 times as long as base of 6th antennal segment, if short processus terminalis produced, then 1st tarsal segment bearing dorsal setae. Empodial setae flattened. Ultimate rostral segment with 2-22 secondary setae. Apterae absent or present. . . . . 3
- Second antennal segment longer than the 1st. Wax plate present. First tarsal segment without dorsal setae and bearing 2-5 ventral setae. Processus terminalis 0.1-0.5 as long as base of 6th antennal segment. Empodial setae hair-like or flattened (*Phyllaphis*). Ultimate rostral segment with 2-4 secondary setae. Apterae present. . . . (*Diphyllaphis* group) 26
3. In embryo the abdominal pleural setae absent and the thoracic marginal setae single. Head never with V-shaped suture. Processus terminalis 0.1-2.0 times as long as base of 6th antennal segment. First tarsal segment always with a pair of dorsal setae. Apterae absent or present (*Shivaphis* and *Mesocallis*). Mostly on Fagaceae, Betulaceae (*Alnus*, *Carpinus* and *Corylus*) and Ulmaceae, rarely on *Celtis* spp., *Tilia* spp. and bamboos. . . . . (*Myzocallis* group) 4
- In embryo the abdominal pleural setae present and the thoracic marginal setae double. Head sometimes with V-shaped suture. Processus terminalis 0.6-7.0 times as long as base of 6th antennal segment. First tarsal segment usually without dorsal setae. Apterae usually present. Mostly on Betulaceae (*Alnus* and *Betula*), rarely on Magnoliaceae. . . . . (*Symydobius* group) 15
4. Marginal abdominal setae single on all segments. . . . . 5
- Marginal abdominal setae at least double on anterior segments. . . . . 10
5. Clypeus bearing a finger-like swelling anteriorly. On bamboos. . . . 9. *Takecallis* Matsumura
- Clypeus normally rounded at front. . . . . 6
6. Abdomen with finger-like tubercles. Spinal setae on abdominal segments III, V, and VII show a considerably greater mutual distance than the other spinal setae. . . . . 7
- Abdomen without finger-like tubercles. Spinal setae arranged in parallel rows, if they are not placed in the arrangement as above, then the body not having finger-like tubercles. . . . 8
7. Media of forewing with two forks. On various plants (mostly on *Ulmus* spp.). . . . . 11. *Tinocallis* Matsumura

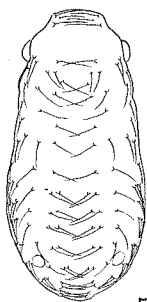
**Fig. 42.** Embryo:—A, *Symydobius alniaria* (Matsumura); B, *Clethrobius comes* (Walker); C, *Callipterinella calliptera* (Hartig); D, *Euceraphis punctipennis* (Zetterstedt); E, *Betacallis alnicolens* Matsumura, F, *Hannabura alnicola* Matsumura; G, *Neocalaphis magnoliae* (Essig & Kuwana); H, *N. magnolicolens* (Takahashi); I, *Boernerina alni* Takahashi; J, *Betulaphis japonica* Takahashi; K, *Phyllaphis fagi* (Linne); L, *Yamatocallis tokyoensis* (Takahashi); M, *Periphyllus californiensis* (Shinji); N, *Chaitophorus saliniger* Shinji; O, *Neophyllaphis podocarp* Takahashi; P, *Parachaitophorus spiraeae* Takahashi.

\* The present key is based on the alate viviparous females unless otherwise stated.

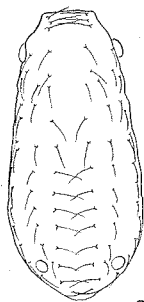
\*\* *Betulaphis*, *Hannabura*, *Machilaphis*, *Neocalaphis*, and *Phyllaphis*.



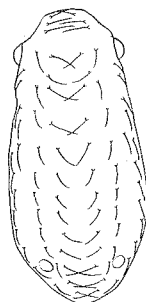
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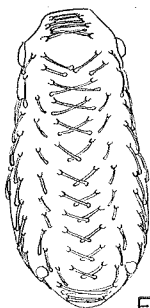
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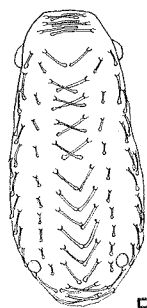
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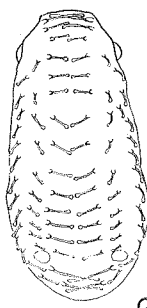
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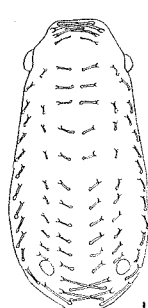
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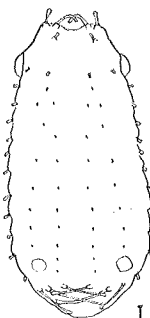
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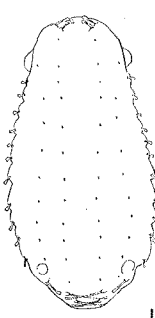
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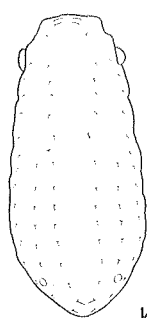
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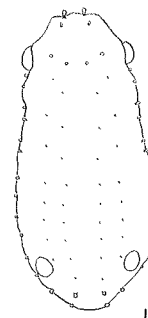
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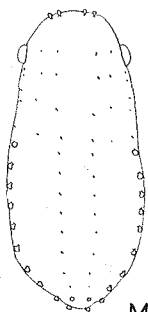
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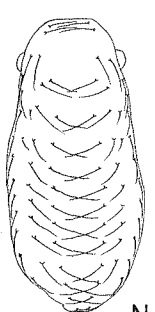
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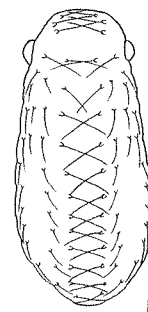
M



N



O



P

- Media of forewing with one fork. On *Ulmus* spp. . . . . 7. *Sappocallis* Matsumura
- 8. Wax plate present. Processus terminalis about 0.2 as long as base of 6th antennal segment. Cornicle short, ring-like. On *Celtis* spp. . . . . 8. *Shrivaphis* Das
- Wax plate absent. Processus terminalis at least 0.7 as long as base of 6th antennal segment. Cornicle rather long, truncated. . . . . 9
- 9. Dorsal setae rather long, at least 1.5 times as long as middle breadth of 3rd antennal segment. Anal plate deeply bilobed. Forewing with brown marking as shown in Fig. 8, C. On *Tilia* spp. . . . . 10. *Tiliaphis* Takahashi
- Dorsal setae short, at most 0.8 as long as middle breadth of 3rd antennal segment. Anal plate never deeply bilobed as above. Forewing (figs. 2, F & 3, H) without marking as above. Mostly on *Carpinus* spp. and *Corylus* spp. . . . . 2. *Mesocallis* Matsumura
- 10. Head with wax pores. Marginal sclerites bearing 10-16 setae on anterior 5 segments. Cauda bearing 22-25 setae. On *Ulmus* spp. . . . . 1. *Chromocallis* Takahashi
- Head without wax pores. Marginal sclerites bearing at most 7 setae. Cauda bearing at most 17 setae. . . . . 11
- 11. Finger-like tubercles present. . . . . 12
- Finger-like tubercles absent. . . . . 13
- 12. Abdomen with paired spinal tubercles. Eighth abdominal segment with 6-12 setae. On *Quercus* spp. . . . . 12. *Tuberculatus* Mordwilko
- Abdomen with unpaired median tubercles. Eighth abdominal segment with 6 setae. On *Alnus* spp. . . . . 6. *Reticallis* Matsumura
- 13. Spinal setae (fig. 6, B) on abdominal segments III, V and VII displaced laterally. On *Corylus* spp. . . . . 5. *Paratinocallis*, gen. nov.
- Spinal setae not placed in the arrangement as above. . . . . 14
- 14. Posterior cephalic setae 4 in number. Processus terminalis 0.2-1.0 (in foreign species 0.5-4.0) as long as base of 6th antennal segment. On various plants. . . . 3. *Myzocallis* Passerini
- Posterior cephalic setae at least 8 in number. Processus terminalis very short, at most 0.3 as long as base of 6th antennal segment. On *Carpinus* spp. and *Corylus* spp. . . . . 4. *Neochromaphis* Takahashi
- 15. Anal plate entire. Processus terminalis shorter than base of 6th antennal segment. First tarsal segment bearing 7 ventral setae. . . . . 16
- Anal plate divided. Processus terminalis often longer than base of 6th antennal segment. First tarsal segment bearing 5 or 6 ventral setae, rarely 7 (*Boernerina*). . . . . 18
- 16. Cauda rounded. Sixth antennal segment with more than 6 setae. Wax plates absent. Apterae present. On *Alnus* spp. and *Betula* spp. . . . . 24. *Symydobius* Mordwilko
- Cauda knobbed. Sixth antennal segment with 1 or 2 setae. Wax plates present. Apterae absent. . . . . 17
- 17. Marginal sclerites bearing 12-24 setae. Antennal setae about 1.5-2.0 times as long as middle breadth of 3rd antennal segment. Eighth abdominal segment with 14-16 setae. On *Betula* spp. . . . . 18. *Clethorobius* Mordwilko
- Marginal sclerites bearing 2-6 setae. Antennal setae about 0.5 as long as middle breadth of 3rd antennal segment. Eighth abdominal segment with 7 or 8 setae. On *Betula* spp. . . . 19. *Euceraphis* Walker
- 18. Cauda crescent-shaped or elongated. . . . . 19
- Cauda knobbed. . . . . 20
- 19. Cauda crescent-shaped. Abdomen without tubercles. On *Betula* spp. . . . . 14. *Betulaphis* Blendenning
- Cauda elongated. Abdomen (alatae unknown) with small tubercles, each of which bears a long, capitate seta. On *Betula* spp. . . . . 22. *Neobetulaphis* Basu
- 20. Head (fig. 14, A) with a broad band on venter. Marginal tubercles on 4th and 5th abdominal segments longer than 2nd antennal segment. On *Alnus* spp. and *Betula* spp. . . . . 13. *Betacallis* Matsumura

- Head without dark band on venter. Marginal tubercles on abdomen shorter than 2nd antennal segment. . . . . 21
- 21. Cornicle very short, at most 2/3 as long as middle breadth of 3rd antennal segment. Apterae present. . . . . 22
  - Cornicle long, at least twice as long as middle breadth of 3rd antennal segment. Apterae absent or present (*Callipterinella* and *Hannabura*). . . . . 23
- 22. Head (fig. 15, A) with a pair of prominent tubercles near anterior margin. Antenna shorter than body. Processus terminalis at most 0.9 as long as base of 6th antennal segment. Secondary sensoria 2-10 in number. On *Alnus* spp. . . . . 15. *Boernerina* Bramstedt
  - Head without tubercles. Antenna longer than body. Processus terminalis very long, about 5 times as long as base of 6th antennal segment. Secondary sensoria 30-40 in number. On *Betula* spp. . . . . 21. *Monaphis* Walker
- 23. Antenna shorter than body. Abdomen of apterae bearing pointed setae, and with black bands on dorsum. On *Betula* spp. . . . . 17. *Callipterinella* v. d. Goot
  - Antenna longer than body. Apterae, when produced, with capitate setae and without black bands on dorsum of abdomen. . . . . 24
- 24. Processus terminalis 5.0-7.0 times as long as base of 6th antennal segment. Primary sensoria circular. On *Magnolia* spp. . . . . 23. *Neocalaphis* Shinji
  - Processus terminalis at most 3.1 times as long as base of 6th antennal segment. Primary sensoria oval or elongated longitudinally. . . . . 25
- 25. First tarsal segment with a pair of dorsal setae. Eighth abdominal segment with 7-12 setae. Marginal tubercles well developed. Apterae absent. On *Alnus* spp. and *Betula* spp. . . . . 16. *Calaphis* Walsh
  - First tarsal segment without dorsal setae. Eighth abdominal segment with 15-17 setae. Marginal tubercles faintly developed. Apterae present. On *Alnus* spp. . . . . 20. *Hannabura* Matsumura
- 26. Empodial setae flattened. Eighth abdominal segment with 6-8 setae. On *Fagus* spp. . . . . 27. *Phyllaphis* Koch
  - Empodial setae hair-like. Eighth abdominal segment with 4 setae. . . . . 27
- 27. First tarsal segment with 2 or 3 ventral setae. Cauda with 2-4 setae. On *Quercus* spp. . . . . 25. *Diphyllaphis* Takahashi
  - First tarsal segment with 5 ventral setae. Cauda with 4-6 setae. On *Machilus* spp. . . . . 26. *Machilaphis* Takahashi
- 28. First tarsal segment with 4-7 ventral setae. . . . . 29
  - First tarsal segment with 2 or 3 ventral setae. . . . . 34
- 29. Processus terminalis 0.2-0.3 as long as base of 6th antennal segment. Secondary sensoria annular. Ultimate rostral segment without secondary setae. Head of apterae fused with prothorax. Eyes of apterae consisting of only 3 facets. On Podocarpaceae. . . . . 35. *Neophyllaphis* Takahashi
  - Processus terminalis 0.5-4.0 times as long as base of last antennal segment. Secondary sensoria circular or transversely elongate. Ultimate rostral segment mostly with secondary setae. Head of apterae not fused with prothorax. Eyes of apterae consisting of many facets. . . . . 30
- 30. Ocular tubercle absent. Cornicle not reticulated. Rudimentary gonapophyses 2. Wax plates often present. Body elongated. On Cyperaceae. . . . . (*Saltusaphis* group) 31
  - Ocular tubercle present. Cornicle reticulated. Rudimentary gonapophyses 3 or 4. Wax plates absent. Body oblong. Mostly on Aceraceae and Salicaceae. . . . . 32
- 31. Body with short, fan-like setae. Antennae and legs densely spined. Empodial setae flattened. On *Carex* spp. . . . . 28. *Subsaltusaphis* Quednau
  - Body with short, pointed setae. Antennae and legs sparsely spined. Empodial setae hair-like or flattened. On *Carex* spp. . . . . 29. *Thripsaphis* Gillette
- 32. Antennal setae not many in number and shorter than middle breadth of 3rd antennal seg-

- ment. Secondary sensoria transversely elongated, with hairy fringe. Rudimentary gonapophyses 3. Fore femora enlarged. Abdomen without black bands. On *Acer* spp. . . . . 30. *Yamatocallis* Matsumura
- Antennal setae numerous in number and longer than middle breadth of 3rd antennal segment. Secondary sensoria circular or oval, without hairy fringe. Rudimentary gonapophyses 4. Fore femora normal. Abdomen with black bands. . . . . (*Chaitophorus* group) 33
33. Tibiae without spinules on apical part. Cauda knobbed. Empodial setae usually hair-like. Abdomen of apterae mostly with completely sclerotic segments. Embryo never with foliate marginal setae. On *Salix* spp. and *Populus* spp. . . . . 31. *Chaitophorus* Koch
- Tibiae mostly with spinules on apical part. Cauda broadly rounded. Empodial setae flattened. Abdomen of apterae never with wholly sclerotic segments. Embryo mostly with foliate marginal setae. Mostly on *Acer* spp. but also on *Aesculus* spp. and *Koelreuteria* spp. . . . . 32. *Periphyllus* van d. Hoeven
34. Cauda elongated, with 2 setae. Eyes of apterae consisting of only 3 facets. Ultimate rostral segment with secondary setae. Processus terminalis 1.9-2.0 times as long as base of last antennal segment. Eighth abdominal segment with 4-6 setae. Empodial setae hair-like. On *Spiraea* spp. . . . . 37. *Parachaitophorus* Takahashi
- Cauda rounded or knobbed, with 8-15 setae. Eyes of apterae consisting of at least 10 facets. Ultimate rostral segment without secondary setae. Processus terminalis 0.2-1.8 times as long as base of last antennal segment. Eighth abdominal segment with 6-10 setae. Empodial setae flattened. . . . . 35
35. Body (fig. 39, F) of apterae with long projections. Processus terminalis about 0.2 as long as base of last antennal segment. Cauda knobbed and anal plate divided. Alatae bearing transversely elongated secondary sensoria on 3rd and 4th antennal segments. On *Juglans* spp. . . . . 36. *Dasyaphis* Takahashi
- Body of apterae without projections. Processus terminalis 0.7-1.8 times as long as base of last antennal segment. Cauda rounded and anal plate not divided. Alatae unknown. On *Acer* spp. . . . . (*Trichaitophorus* group) 36
36. Eyes consisting of 20-30 facets. Marginal setae on metanotum and anterior 5 abdominal segments single. Spinal and pleural setae on abdomen inconspicuous. On *Acer* spp. . . . . 33. *Trichaitophorus* Takahashi
- Eyes consisting of 10-15 facets. Marginal setae on metanotum and anterior 5 abdominal segments at least double. Spinal and pleural setae on abdomen variable in length, the longest seta is at least 5 times as long as middle breadth of 3rd antennal segment. On *Acer* spp. . . . . 34. *Yamatochaitophorus*, gen. nov.

### Host List†

*Acer carpinifolium* Sieb. & Zucc.  
*Periphyllus californiensis* (Shinji)\*  
*Acer diabolicum* Blume  
*Yamatocallis hirayamae* Matsumura\*  
*Acer japonicum* Thunb.  
*Periphyllus californiensis* (Shinji)\*  
*Yamatocallis hirayamae* Matsumura\*  
*Acer miyabei* Maxim.  
*Periphyllus californiensis* (Shinji)\*

*Acer mono* Maxim.  
*Periphyllus californiensis* (Shinji)  
*Periphyllus kuwanaii* (Takahashi)  
*Periphyllus viridis* (Matsumura)  
*Yamatocallis hirayamae* Matsumura  
*Acer palmatum* Thunb.  
*Periphyllus californiensis* (Shinji)\*  
*Acer pictum* var. *dissectum* Wesmael.  
*Periphyllus kuwanaii* (Takahashi)\*

† In this list hosts are restricted to those recorded in Japan. A single asterisk (\*): The host-records cited from the literature in the present paper. A double asterisk (\*\*): Doubtful host plants.

- Acer rufinerve* Sieb. & Zucc.  
*Trichaitophorus koyaensis* Takahashi
- Acer** sp.  
*Mesocallis sawashibae* (Matsumura)\*\*  
*Periphyllus viridis* (Matsumura)  
*Yamatocallis hirayamae* Matsumura  
*Yamatocallis takagii* (Takahashi)  
*Yamatocallis tokyoensis* (Takahashi)  
*Yamatochaitophorus albus* (Takahashi)
- Aesculus turbinata** Blume  
*Periphyllus californiensis* (Shinji)\*  
*Periphyllus koelreuteriae* (Takahashi)
- Alnus alnobetula** var. *fruticosa*  
*Boernerina alni* Takahashi\*  
*Eucraphis ontakensis* Sorin\*
- Alnus firma** Sieb. & Zucc.  
*Myzocallis alnifoliae* (Shinji)\*  
*Recticallis alnijaponica* Matsumura\*  
*Recticallis nigrostriata* (Shinji)\*
- Alnus hirsuta** Turcz.  
*Betacallis alnicolens* Matsumura\*  
*Boernerina alni* Takahashi  
*Recticallis alnijaponica* Matsumura  
*Symydobius alniaria* (Matsumura)
- Alnus hirsuta** var. *sibirica* (Fischer)  
*Betacallis alnicolens* Matsumura  
*Hannabura alnicola* Matsumura  
*Myzocallis alnicola* Shinji\*  
*Myzocallis alnifoliae* (Shinji)\*  
*Recticallis alnijaponica* Matsumura\*  
*Recticallis nigrostriata* (Shinji)  
*Symydobius alniaria* (Matsumura)
- Alnus japonica** (Thunb.)  
*Betacallis alnicolens* Matsumura\*  
*Hannabura alnicola* Matsumura\*  
*Recticallis alnijaponica* Matsumura  
*Recticallis nigrostriata* (Shinji)
- Alnus matsumurae** Callier  
*Betacallis alnicolens* Matsumura  
*Boernerina alni* Takahashi  
*Hannabura alnicola* Matsumura\*  
*Mesocallis pteleae* Matsumura
- Alnus maximowiczii** Callier  
*Boernerina alni* Takahashi
- Alnus serrulatoidea** Callier  
*Sappocallis alnifoliae* (Shinji)\*
- Bamboo**  
*Takecallis arudinariae* (Essig)
- Bambusa** sp.  
*Takecallis sasae* (Matsumura)
- Betula ermanii** Cham.  
*Betacallis odaiensis* Takahashi  
*Calaphis betulaeacolens* (Fitch)  
*Clethrobis comes* (Walker)  
*Eucraphis ontakensis* Sorin\*  
*Eucraphis punctipennis* (Zetterstedt)
- Betula maximowicziana** Regel  
*Betacallis odaiensis* Takahashi  
*Betulaphis japonica* Takahashi  
*Clethrobis comes* (Walker)  
*Eucraphis punctipennis* (Zetterstedt)  
*Monaphis antennata* (Kaltenbach)  
*Symydobius kabae* (Matsumura)\*
- Betula platyphylla** var. *japonica* (Miq.)  
*Betacallis odaiensis* Takahashi  
*Betulaphis japonica* Takahashi  
*Calaphis betulaeacolens* (Fitch)  
*Callipterinella calliptera* (Hartig)  
*Clethrobis comes* (Walker)  
*Eucraphis punctipennis* (Zetterstedt)  
*Monaphis antennata* (Kaltenbach)  
*Neobetulaphis alba*, sp. nov.  
*Symydobius kabae* (Matsumura)
- Betula** sp.  
*Betulaphis japonica* Takahashi  
*Callipterinella calliptera* (Hartig)  
*Chaitophorus abdominalis* Shinji\*  
*Eucraphis betulifoliae* Shinji\*  
*Eucraphis punctipennis* (Zetterstedt)
- Carex** sp.  
*Subsaltusaphis saracola*, sp. nov.  
*Thripsaphis ossiannilssoni* Hille Ris  
 Lambers
- Carpinus cordata** Blume  
*Mesocallis sawashibae* (Matsumura)  
*Myzocallis corylii* (Goeze)\*
- Carpinus japonica** Blume  
*Neochromaphis carpinicola* (Takahashi)\*
- Carpinus laxiflora** (Sieb. & Zucc.)  
*Neochromaphis coryli* Takahashi\*
- Carpinus tschonoskii** Maxim.  
*Neochromaphis carpinicola* (Takahashi)\*
- Carpinus** sp.  
*Mesocallis pteleae* Matsumura  
*Neochromaphis carpinicola* (Takahashi)\*
- Castanea crenata** Sieb. & Zucc.  
*Myzocallis kuricola* (Matsumura)
- Celtis sinensis** var. *japonica* (Planch.)  
*Shivaphis celti* Das
- Corylus heterophylla** Fischer  
*Tinocallis nikkoensis*, sp. nov.
- Corylus heterophylla** var. *thunbergii*

Blume

*Mesocallis pteleae* Matsumura\*

***Corylus sieboldiana*** Blume

*Mesocallis pteleae* Matsumura

*Myzocallis corylii* (Goeze)\*

*Myzocallis montana*, sp. nov.

*Paratinocallis corylicola*, sp. nov.

*Tinocallis nikkoensis*, sp. nov.

***Corylus sieboldiana***

var. *mandshurica* (Maxim.)

*Mesocallis pteleae* Matsumura

***Dryopteris crassirhizoma*** Nakai

*Chaitophorus shidai* (Shinji)\*\*

***Fagus crenata*** Blume

*Mesocallis fagicola* Matsumura\*

*Phyllaphis fagi* (Linné)

***Fagus japonica*** Maxim.

*Phyllaphis fagi* (Linné)\*

***Fraxinus longicuspis*** Sieb. & Zucc.

*Chaitophorus fraxinicolus* Matsumura\*\*

***Juglans ailanthifolia*** Carr.

*Dasyaphis onigurumi* (Shinji)

***Juglans*** sp.

*Dasyaphis onigurumi* (Shinji)

***Koelreuteria paniculata*** Laxm.

*Periphyllus koelreuteriae* (Takahashi)\*

***Lagerstroemia indica*** Linné

*Tinocallis kahawaluokalani* (Kirkaldy)

***Machilus thunbergii*** Sieb. & Zucc.

*Machilaphis machili* (Takahashi)\*

***Machilus*** sp.

*Machilaphis machili* (Takahashi)

***Magnolia kobus*** DC.

*Neocalaphis magnoliae* (Essig & Kuwana)

***Magnolia liliflora*** Desr.

*Neocalaphis magnoliae* (Essig & Kuwana)\*

***Magnolia obovata*** Thunb.

*Neocalaphis magnolicolens* (Takahashi)

***Magnolia*** sp.

*Neocalaphis magnoliae* (Essig & Kuwana)

*Neocalaphis magnolicolens* (Takahashi)

***Neolitsea sericea*** (Blume)

*Machilaphis machili* (Takahashi)\*

***Phyllostachys*** sp.

*Takecallis arundicolens* (Clarke)

*Takecallis sasae* (Matsumura)

***Podocarpus macrophyllus*** (Thunb.)

*Neophyllaphis podocarpi* Takahashi

***Podocarpus macrophyllus***

var. *maki* Sieb.

*Neophyllaphis podocarpi* Takahashi

***Podocarpus*** sp.

*Neophyllaphis podocarpi* Takahashi

***Populus balsamifera***

*Chaitophorus populeti* (Panzer)\*

***Populus maximowiczii*** Henry

*Chaitophorus dorocola* Matsumura

***Populus nigra*** var. *italica* Muenchh.

*Chaitophorus populeti* (Panzer)

***Populus sieboldi*** Miq.

*Chaitophorus dorocola* Matsumura\*

*Chaitophorus populeti* (Panzer)\*

*Chaitophorus yomefuri* Shinji\*

***Populus*** sp.

*Chaitophorus tremulae* Koch

***Ptelea trifoliata***

*Mesocallis pteleae* Matsumura\*\*

***Quercus acutissima*** Carruthers

*Diphyllaphis konarae* (Shinji)

*Diphyllaphis quercus* (Takahashi)

*Myzocallis kuricola* (Matsumura)\*

*Tuberculatus capitatus* (Essig & Kuwana)\*

*Tuberculatus kunugi* (Shinji)\*

*Tuberculatus quercicola* (Matsumura)\*

***Quercus dentata*** Thunb.

*Diphyllaphis konarae* (Shinji)\*

*Tuberculatus capitatus* (Essig & Kuwana)\*

*Tuberculatus fulviabdominalis* (Shinji)

*Tuberculatus japonicus* Higuchi

*Tuberculatus kashirvae* (Matsumura)\*

*Tuberculatus naganoe* (Shinji)\*

*Tuberculatus quercicola* (Matsumura)

*Tuberculatus querciformosanus* (Takahashi)

*Tuberculatus stigmatus* (Matsumura)\*

***Quercus mongolica***

var. *grosseserrata* Blume

*Diphyllaphis konarae* (Shinji)\*

*Tuberculatus capitatus* (Essig & Kuwana)\*

*Tuberculatus fulviabdominalis* (Shinji)

*Tuberculatus kashirvae* (Matsumura)

*Tuberculatus naganoe* (Shinji)\*

*Tuberculatus quercicola* (Matsumura)\*

*Tuberculatus stigmatus* (Matsumura)

*Tuberculatus yokoyamai* (Takahashi)

***Quercus phillyraeoides*** A. Gray

*Diphyllaphis alba* Takahashi

*Tuberculatus pilosus* (Takahashi)

***Quercus phillyraeoides*** var. *crispa* Mats.

*Diphyllaphis alba* Takahashi

***Quercus serrata*** Thunb.

*Chaitophorus narae* Shinji\*\*

*Diphyllaphis konarae* (Shinji)

- Diphyllaphis quercus* (Takahashi)\*  
*Tuberculatus capitatus* (Essig & Kuwana)\*  
*Tuberculatus fulvibdominalis* (Shinji)\*  
*Tuberculatus kashiwae* (Matsumura)  
*Tuberculatus konaracola* (Shinji)\*  
*Tuberculatus kunugi* (Shinji)\*  
*Tuberculatus naganoe* (Shinji)\*  
*Tuberculatus quercicola* (Matsumura)  
*Tuberculatus stigmatus* (Matsumura)  
*Tuberculatus yokoyamai* (Takahashi)  
***Quercus variabilis*** Blume  
*Tuberculatus capitatus* (Essig & Kuwana)\*  
***Salix babylonica*** Linné  
*Chaitophorus saliapteris* Shinji\*  
*Chaitophorus saliniger* Shinji  
***Salix bakko*** Kimura  
*Chaitophorus matsumurai* Hille Ris Lambers\*  
***Salix eriocarpa*** Franch. & Savat.  
*Chaitophorus saliniger* Shinji  
***Salix gilgiana*** Seemen  
*Chaitophorus horii* Takahashi  
***Salix integra*** Thunb.  
*Chaitophorus salijaponicus* Essig & Kuwana\*  
***Salix kinnuyanagi*** Kimura  
*Chaitophorus saliapteris* Shinji\*  
***Salix koriyanagi*** Kimura  
*Chaitophorus horii* Takahashi  
*Chaitophorus saliapteris* Shinji\*  
*Chaitophorus salijaponicus* Essig & Kuwana  
***Salix sachalinensis*** Fr. Schm.  
*Chaitophorus horii* Takahashi\*  
***Salix*** sp.  
*Chaitophorus hokkaidensis*, sp. nov.  
***Sapindus*** sp.  
*Tinocallis insularis* (Takahashi)  
***Sasa nipponica*** (Makino)  
*Takecallis arundicolens* (Clarke)  
*Takecallis sasae* (Matsumura)  
***Sasa palmata*** (Bean)  
*Takecallis arundicolens* (Clarke)  
***Sasa senanensis*** (Franch. & Sav.)  
*Takecallis arundicolens* (Clarke)  
*Takecallis sasae* (Matsumura)\*  
***Sasa*** sp.  
*Takecallis taiwanus* (Takahashi)  
***Spiraea cantoniensis*** Lour.  
*Parachaitophorus spiraeae* (Takahashi)  
***Spiraea japonica*** Linné  
*Parachaitophorus spiraeae* (Takahashi)  
***Tilia japonica*** (Miq.)  
*Therioaphis tilicola* Shinji\*  
*Tiliaphis shinae* (Shinji)  
*Tiliaphis shinjii*, sp. nov.\*  
***Tilia miqueliana*** Maxim.  
*Tiliaphis shinae* (Shinji)\*  
***Tilia*** sp.  
*Tiliaphis shinjii*, sp. nov.  
***Trifolium*** sp.  
*Therioaphis ononidis*: Shinji  
***Ulmus campestris*** var. *major* (Rehd.)  
*Chromocallis nirecola* (Shinji)\*  
***Ulmus davidiana*** var. *japonica* (Rehd.)  
*Chromocallis nirecola* (Shinji)  
*Sappocallis ulmicola* Matsumura  
*Tinocallis zekowae* (Takahashi)\*\*  
***Ulmus davidiana*** var. *japonica*  
f. *suberosa* Nakai  
*Chromocallis nirecola* (Shinji)  
*Sappocallis ulmicola* Matsumura  
***Ulmus parvifolia*** Jacq.  
*Tinocallis ulmiparvifoliae* Matsumura\*  
***Ulmus*** sp.  
*Tinocallis sapporoensis*, sp. nov.  
*Tinocallis takachihoensis*, sp. nov.  
*Tinocallis ulmiparvifoliae* Matsumura  
***Zelkova serrata*** (Thunb.)  
*Tinocallis zekowae* (Takahashi)

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## Index\*

abdominalis Shinji, Chaitophorus 104  
*Acanthocallis* Matsumura 46  
*acerifloris* Shinji, Chaitophoraphis 78, 80  
*acerifoliae* Takahashi, Chaitophorinella 95  
*aceris* Linné, Aphis 94  
*aceris*, Periphyllus 95  
*aceris* Takahashi, Trichaitophorus 98  
*Agrioaphis* Walker 26  
 alba, sp. nov., Neobetulaphis 64  
 alba Takahashi, Diphyllaphis 71  
 albus Takahashi, Trichaitophorus 98, 99  
 albus (Takahashi), Yamatochaitophorus 99  
 Allaphis Mordwilko 76  
 alni Takahashi, Boernerina 53  
 alniaria (Matsumura), Symydobius 67, **68**, 69  
 alniaria Matsumura, Yezocallis 68  
*alnicola*, Calaphis 63  
 alnicola Matsumura, Hannabura 60, **61**  
 alnicola Shinji, Myzocallis 104  
 alnicolens Matsumura, Betacallis 50, **51**  
 alnifoliae Shinji, Lutaphis 104  
 alnifoliae (Shinji), Myzocallis 104  
 alnifoliae (Shinji), Sappocallis 104  
 alnifoliae Shinji, Telocallis 33, 104  
*alnifoliae* Shinji, Tuberculoides 32  
 alnijaponicae Matsumura, Reticallis 31, **32**  
*annulata* (Koch), Callipterinella 56  
*annulatus* Koch, Chaitophorus 56, 57  
*annulatus* (Koch), Neosymydobius 56  
 antennata Kaltenbach, Aphis 63  
 antennata (Kaltenbach), Bradyaphis 63  
 antennata (Kaltenbach), Monaphis **63**  
*Arakawana* Matsumura 46  
*Arctaphis* Walker 81  
 arctosetis Richards, Betulaphis 52  
 arundinariae Essig, Myzocallis 35, 36  
 arundinariae (Essig), Takecallis **35**, 36  
*arundinariae*, Myzocallis 36  
*arundinariae*, Takecallis 36  
 arundicolens Clarke, Callipterus 35  
 arundicolens (Clarke), Myzocallis 35  
 arundicolens (Clarke), Takecallis 35  
 aureus Richards, Betulaphis 52, 53  
*avellanae* Blanchard, Aphis 28  
 ballii Gillette, Brachycolus 76  
*bambusae* Matsumura, Takecallis 35  
*bambucifoliae* (lapsus of bambusifoliae Takahashi), Myzocallis 35

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\* Names of aphids considered to be synonyms or misidentifications are in italics. Page numbers in bold type are principal references.

*bambusifoliae* (Takahashi), Agrioaphis 36  
*bambusifoliae* Takahashi, Myzocallis 36  
 Betacallis Matsumura 20, 50, 108  
*betulae*, Aphis 59  
*betulae*, Euceraphis 59, 60  
*betulae* Koch, Callipterus 59, 60  
*betulaecolens* Fitch, Aphis 55  
*betulaecolens* (Fitch), Calaphis 55  
 Betulaphis Glendinning 20, 50, 52, 106, 108  
*betularia* Kaltenbach, Aphis 56  
*betulifoliae* Shinji, Euceraphis 104  
*betulijaponicae* Matsumura, Mimocallis 59, 60  
*betulinus* van der Goot, Chaitophorus 87  
*betullela* Walsh, Calaphis 55, 56  
*beuthani* (Börner), Chaitophorus 86, 87  
*beuthani* Börner, Tranaphis 86  
 Boernerina Bramstedt 20, 50, 53, 108, 109  
*Bradyaphis* Mordwilko 63  
 Calaphis Walsh 20, 50, 55, 109  
*californiensis* (Shinji), Periphyllus 94, 95  
*californiensis* Shinji, Thomasia 95  
 Callaphis Walker 21  
*calliptera* Hartig, Aphis 56  
*calliptera* (Hartig), Calaphis 56  
*calliptera* (Hartig), Callipterinella 56  
 Callipterinella van der Goot 20, 50, 56, 109  
*Callipteroides* Mordwilko 59  
*capitata* Essig & Kuwana, Myzocallis 47  
*capitatus* (Essig & Kuwana), Tuberculatus 47  
*capitatus* (Essig & Kuwana), Tuberculoides 47  
*capreae* Mosley, Aphis 81  
*carpini* Takahashi, Neochromaphis 28, 29  
*carpinicola*, Chromaphis 29, 30  
*carpinicola* Matsumura, Neocallis 22, 24, 25, 26  
*carpinicola* Takahashi, Chromaphis 28, 29  
*carpinicola* (Takahashi), Neochromaphis 29  
*caryaefoliae* Davis, Callipterus 39  
*celti* Das, Shivaphis 21, 34  
*celticolens* Essig Kuwana, Chromaphis 34  
*celticolens* (Essig & Kuwana), Phyllaphis 34  
*celticolens* (Essig & Kuwana), Shivaphis 34  
*Chaetophorella* Börner 94  
*Chaetophoria* Börner 94  
*Chaitophoraphis* Shinji 78  
*Chaitophorinella* van der Goot 93, 94  
*Chaitophorinus* Börner 94  
 Chaitophorus Koch 20, 81, 110  
*Chelymorpha* Clark 93  
*chinensis* Takahashi, Chaitophorus 90, 92  
 Chromaphis Walker 28  
 Chromocallis Takahashi 20, 21, 108  
 Clethrobis Mordwilko 20, 50, 57, 108

*colyricola* Shinji, Myzocallis 23  
*comes* Walker, Aphis 57  
*comes* (Walker), Betacallis 57  
*comes* (Walker), Clethrobium 57, 58  
*corax* Börner, Chaitophorus 92  
*coreanus* Paik, Tuberocarpus 102  
*coreanus* Okamoto & Takahashi, Chaitophorus 87, 88  
*coryli* Goeze, Aphis 26, 28  
*coryli* (Goeze), Myzocallis 28  
*coryli* Takahashi, Neochromaphis 29  
*corylicola*, sp. nov., Paratinocallis 30  
*Dasyaphis* Takahashi 20, 100, 101, 110  
*depressa* Bramstedt, Boernerina 53  
*Diphyllaphis* Takahashi 20, 70, 109  
*dorocola* Matsumura, Chaitophorus 83  
*Drepanaphis* del Guercio 78  
*Eichochaitophorus* Essig 81  
*Eucallipterus* Schouteden 36  
*Euceraphis* Walker 20, 50, 59, 108  
*fagi* Linné, Aphis 73  
*fagi* (Linné), Phyllaphis 73  
*fagicola* Matsumura, Mesocallis 104  
*fagifoliae* Takahashi, Phyllaphis 73, 74  
*fraxinicolus* Matsumura, Chaitophorus 104  
*fulviabdominalis* (Shinji), Tuberculatus 47, 48  
*fulviabdominalis* Shinji, Tuberculoidea 48  
*giganteus* Cholodkovsky, Callipterus 57  
*giganteus* (Cholodkovsky), Clethrobium 57  
*Hannabura* Matsumura 20, 50, 60, 106, 109  
*hashibamii* Shinji, Agrioaphis 23, 24  
*hashibamii* (Shinji), Myzocallis 23  
*hirayamae* (Matsumura), Drepanaphis 80  
*hirayamae* Matsumura, Yamatocallis 78, 79, 80  
*hokkaidensis*, sp. nov., Chaitophorus 83, 84  
*horii* Takahashi, Chaitophorus 82, 83, 86, 87, 93  
*insularis* Takahashi, Myzocallis 40  
*insularis* (Takahashi), Sarucallis 40  
*insularis* (Takahashi), Tinocallis 40  
*intermedia* Hille Ris Lambers, Saltusaphis 75  
*jacobi* Börner, Pseudomicrella 89  
*japonica* (Essig & Kuwana), Chaitophorinella 96  
*japonica* Essig & Kuwana, Chaitophorus 96  
*japonica* Essig & Kuwana, Euceraphis 68, 69  
*japonica* Shinji, Therioaphis 37, 38  
*japonica* Takahashi, Betulaphis 52, 53  
*japonicus* Baker, Chaitophorus 95  
*japonicus* Higuchi, Tuberculatus 47, 48  
*kabae* (Matsumura), Symydobius 59, 67, 68, 69  
*kabae* Matsumura, Yezocallis 67, 69  
*kabae*, Symydobius 70  
*kahawaluokalani* (Kirkaldy), Callipterus 41  
*kahawaluokalani* Kirkaldy, Myzocallis 41



kahawaluokalani (Kirkaldy), Sarucallis 41  
 kahawaluokalani (Kirkaldy), Tinocallis 39, 40, 41  
 Kallistaphis Kirkaldy 60  
 kashiwae Matsumura, Myzocallis 48  
 kashiwae (Matsumura), Tuberculatus 47, 48  
*kashiwae*, Tuberculatus 49  
 kienshuensis Shinji, Saltusaphis 76  
 koelreuteriae Takahashi, Chaitophorinella 95  
 koelreuteriae (Takahashi), Periphyllus 94, 95  
 konaracola (Shinji), Tuberculatus 49  
 konaracola Shinji, Tuberculoides 49  
*konarae*, Phyllaphis 72  
 konarae (Shinji), Diphyllaphis 71, 72  
 konarae Shinji, Phloeomyzus 70, 72  
 konarae (Shinji), Phyllaphis 72  
 koyaensis Takahashi, Trichaitophorus 98  
 kunugi Shinji, Myzocallis 49  
 kunugi (Shinji), Tuberculatus 49  
 kunugi (Shinji), Tuberculoides 49  
 kuricola (Matsumura), Callipterus 26  
 kuricola (Matsumura), Myzocallis 26  
 kuricola Matsumura, Nippocallis 26  
 kuwanaii Takahashi, Chaitophorinella 96  
 kuwanaii (Takahashi), Periphyllus 94, 96  
*lagerstroemiae* Takahashi, Monellia 41  
 Larvaphis Ossiannilsson 76  
*Lutaphis* Shinji 39  
 lyropictus Kessler, Chaitophorus 94  
*lythrae* Shinji, Sarucallis 39, 41  
 Machilaphis Takahashi 20, 70, 72, 106, 109  
 machili (Takahashi), Machilaphis 73  
 machili Takahashi, Phyllaphis 72, 73  
*macrotuberculata* Essig & Kuwana, Myzocallis 48  
*macrotuberculata* (Essig & Kuwana), Tuberculoides 48  
 magnoliae Essig & Kuwana, Calaphis 66  
 magnoliae (Essig & Kuwana), Neocalaphis 66  
 magnolicolens Takahashi, Calaphis 67  
 magnolicolens (Takahashi), Neocalaphis 66, 67  
*magnolifoliae* Shinji, Eucraphis 66  
 matsumurai Hille Ris Lambers, Chaitophorus 93  
*Megalocallis* Takahashi 78  
*Melanocallis* Oestlund 39  
 Mesocallis Matsumura 20, 22, 106, 108  
*Mimocallis* Matsumura 59  
*mirabilis* Tseng & Tao, Sinocallis 101, 102  
 Monaphis Walker 20, 63, 109  
 montana, sp. nov., Myzocallis 26, 27  
*moriokae* Shinji, Agrioaphis 32  
*moriokae* (Shinji), Drepanaphis 80  
*moriokae* (Shinji), Myzocallis 32  
*moriokae* Shinji, Yamatocallis 80, 81  
*moriokaensis* Takahashi, Nippochaitophorus 22, 24, 25, 26

myricae Kaltenbach, Aphis 26  
 Myzocallis Passerini 20, 21, 22, **26**, 30, 39, 108  
 naganoe (Shinji), Tuberculatus **50**  
 naganoe Shinji, Tuberculoides 50  
 naracola Matsumura, Myzocallis 48  
 naracola, Tuberculoides 48  
 narae Shinji, Chaitophorus 104  
 Neobetulaphis Basu 20, **64**, 108  
 Neocalaphis Shinji 20, **66**, 106, 109  
 Neocallis Matsumura 22  
 Neochromaphis Takahashi 20, **28**, 108  
 Neophyllaphis Takahashi 20, 70, **99**, 109  
 niger Mordwilko, Chaitophorus 89, 90  
 nigra Okamoto & Takahashi, Myzocallis 49  
 nigratarsis Heyden, Aphis 59, 60  
 nigratarsis (Heyden), Callipteroides 59  
 nigrostriata (Shinji), Recticallis 32, **33**  
 nigrostriata Shinji, Tuberculoides 33  
 nikkoensis, sp. nov., Tinocallis 40, **42**  
 Nippocallis Matsumura 26  
 Nippochaitophorus Takahashi 22  
 nirecola Shinji, Chromaphis 21  
 nirecola (Shinji), Chromocallis **21**  
 nirecola Shinji, Lutaphis 39, 45, 46  
 nirecola (Shinji), Myzocallis 45  
 Nymphaphis Takahashi 70  
 oblongus Heyden, Aphis 67  
 oblongus (Heyden), Symydobius 67, 69  
 occidentalis Glendinning, Betulaphis 52  
 odaiensis Takahashi, Betacallis 51, **52**  
 onigurumi (Shinji), Dasyaphis **101**, 102  
 onigurumi Shinji, Tuberocarpus 101, 102  
 ononidis, Therioaphis 104  
 ontakensis Sorin, Euceraphis **60**  
 ossiannilssoni Hille Ris Lambers, Thripsaphis (Trichocallis) **77**  
 ossiannilssoni (Hille Ris Lambers), Trichocallis 77  
 Parachaitophorus Takahashi 20, 100, **102**, 110  
 Paratinocallis, gen. nov. 20, **30**, 108  
 pelei Hille Ris Lambers, Betulaphis 52  
 Peltaphis Frison & Ross 76  
 Periphyllus van der Hoeven 20, 78, 81, **93**, 94, 110  
 Phyllaphis Koch 20, 70, **73**, 106, 109  
 phyllophora Clark, Chelymorpha 94  
 Phyllophora Fernie 93  
 picta (Hille Ris Lambers), Subsaltusaphis 76  
 pilosus Takahashi, Myzocallis 48  
 pilosus (Takahashi), Tuberculatus 47, **48**  
 pilosus (Takahashi), Tuberculoides 48  
 podocarpi Shinji, Mindarus 100  
 podocarpi Takahashi, Neophyllaphis **100**  
 populeti Panzer, Aphis 81, 87  
 populeti (Panzer), Chaitophorus 81, 82, 83, **87**

*populi*, Aphis 81  
*populi* Koch, Chaitophorus 81, 87  
*populifolii* Essig, Eichochaitophorus 81  
*populisieboldi* Matsumura, Chaitophorus 87  
*Procalaphis* Quednau 56  
*pseudoalni* (Takahashi), Recticallis 32  
*Pseudomicrella* Börner 81  
*pteleae* Matsumura, Mesocallis 22, 23, 24  
*Pterocallis* Passerini 21, 31  
*punctipennis* Zetterstedt, Aphis 59  
*punctipennis* (Zetterstedt), Euceraphis 59, 60  
*pusilla* Basu, Neobetulaphis 64, 65  
*quadrītuberculata* (Kaltenbach), Betulaphis 52, 53  
*quercea* Kaltenbach, Aphis 46  
*quercicola* Matsumura, Acanthocallis 46, 48  
*quercicola* Matsumura, Ptychodes 48  
*quercicola* (Matsumura), Tuberculatus 47, 48  
*quercicola*, Myzocallis 49  
*quercicola*, Tuberculoides 48  
*querciformosanus* Takahashi, Myzocallis 49  
*querciformosanus* (Takahashi), Tuberculatus 47, 49  
*querciformosanus* (Takahashi), Tuberculoides 49  
*quercus* (Takahashi), Diphyllaphis 70, 72  
*quercus* Takahashi, Nymphaphis 70, 72  
*Recticallis* Matsumura 20, 21, 31, 108  
*recurvispinus* Hille Ris Lambers & Basu, Trichaitophorus 98  
*saliapterus* Shinji, Chaitophorus 82, 83, 88  
*salicicolus*, Chaitophorus 93  
*salicicolus* Matsumura, Chaitophorus 93  
*salicivora* Walker, Aphis 81  
*salijaponicus* Essig & Kuwana, Chaitophorus 83, 86, 89  
*saliniger* Shinji, Chaitophorus 82, 83, 90, 92  
*Sappocallis* Matsumura 20, 33, 108  
*saltans* Nevsky, Tubercocallis 39  
*sapporoensis*, sp. nov., Tinocallis 40, 43  
*saracola*, sp. nov., Subsaltusaphis 75  
*Sarucallis* Shinji 39  
*sasae* Matsumura, Myzocallis 36  
*sasae* (Matsumura), Takecallis 35, 36  
*sasae*, Myzocallis 36  
*sasae*, Takecallis 36  
*sasacola* Shinji, Agrioaphis 36  
*sasacola* (Shinji), Myzocallis 36  
*sasacola*, Takecallis 36  
*sauteri* Takahashi, Drepanaphis 80  
*sawashibae* (Matsumura), Mesocallis 22, 23, 24, 26  
*sawashibae* Matsumura, Myzocallis 22, 24  
*shidae* (Shinji), Chaitophorus 104  
*shidae* Shinji, Thomasia 104  
*shinae* Shinji, Therioaphis 36, 37  
*shinae* (Shinji), Tiliaphis 37, 38  
*shinae*, Therioaphis 38

shinjii, sp. nov., Tiliaphis 37, 38  
 Shivaphis Das 20, 21, 34, 106, 108  
*Sinocallis* Tseng & Tao 101  
 spiraeae Takahashi, Patchia 102  
 spiraeae (Takahashi), Parachaitophorus 102  
*Stegophylla* Oestlund 70  
 stigmata Matsumura, Arakawana 46, 49  
 stigmatus (Matsumura), Tuberculatus 47, 49  
 stigmatus (Matsumura), Tuberculoides 49  
*Subsaltusaphis* Quednau 20, 75, 109  
*Symydobius* Mordwilko 20, 50, 67, 108  
*Synthripsaphis* Quednau 76  
 taiwanus (Takahashi), Agrioaphis 36  
 taiwanus Takahashi, Myzocallis 36  
 taiwanus (Takahashi), Takecallis 35, 36  
 takachihoensis, sp. nov., Tinocallis 40, 44  
 takagii Takahashi, Megalocallis 78, 80  
 takagii (Takahashi), Yamatocallis 79, 80  
 Takecallis Matsumura 20, 21, 35, 106  
*tectae* Tissot, Therioaphis 36  
*Telocallis* Shinji 33  
 testudinacea Fernie, Phyllophora 93, 94  
*testudinatus*, Periphyllus 96  
*testudinatus* Thornton, Phyllophorus 94  
*testudo* van der Hoeven, Periphyllus 94  
*Thripsaphis* Gillette 20, 76, 109  
 Tiliaphis Takahashi 20, 36, 108  
 tilicola Shinji, Therioaphis 104  
 Tinocallis Matsumura 20, 22, 30, 33, 39, 106  
 tokyoensis Takahashi, Drepanaphis (lapsus of Drepanaphis) 80  
 tokyoensis (Takahashi), Yamatocallis 79, 80  
*Tranaphis* Walker 81  
 tremulae Koch, Chaitophorus 82, 83, 92, 93  
 tremulae (Koch), Eichochaitophorus 92  
*Trichaitophorus* Takahashi 20, 98, 110  
*Trichocallis* Börner 76  
 tuberculata v. Heyden, Aphis 56  
 tuberculata (v. Heyden), Callipterinella 56, 57  
 Tuberculatus Mordwilko 20, 21, 46, 108  
 Tuberculoides van der Goot 49  
*Tuberocallis* Nevsky 39  
*Tuberocarpus* Shinji 101  
 ulmicola Matsumura, Sappocallis 33  
 ulmiparvifoliae Matsumura, Tinocallis 39, 40, 45  
 viridis Matsumura, Chaitophorus 96  
 viridis (Matsumura), Periphyllus 94, 96  
 viridis Richards, Betulaphis 52  
 viridis Takahashi, Myzocallis 45  
 vitellinae Schrank, Aphis 81  
 xanthomelas Koch, Chaitophorus 94  
 yamanarashi Shinji, Chaitophorus 87, 88  
 Yamatocallis Matsumura 20, 78, 110

Yamatochaitophorus, gen. nov. 20, 98, 110  
*Yezocallis* Matsumura 67  
yokoyamai Takahashi, Myzocallis 49  
yokoyamai (Takahashi), Tuberculatus 47, 49  
yomefuri Shinji, Chaitophorus 93  
zelkovaе Dzhibladze, Tinocallis 46  
zelkovaе Takahashi, Myzocallis 45  
zelkovaе (Takahashi), Sarucallis 45  
zelkovaе (Takahashi), Tinocallis 39, 40, 42, 45

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