HOKKAIDO UNIVERSITY

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A REVISION OF THE SPECIES OF THE TRIBE *PEMPHIGINI* OCCURRING IN HOKKAIDO AND SAGHALIEN

(STUDIES ON *APHIDIDAE* OF THE NORTHERN PART OF JAPAN, I)

By

MATSUJI HORI

(堀　松　次)

(With Plate II and 7 Textfigures)

As far as the author is aware, certain species belonging to the tribe *Pemphigini* of the subfamily *Eriosomatinae* have been reported from Hokkaido and Saghalien by S. MATSUMURA (1917), R. TAKAHASHI (1921), M. HORI (1929), and A. C. MAXON and G. F. KNOWLTON (1937).

In this paper two new species will be desbribed, making a total of seven species which have been recognized in the present study. Those species are as follows:—

1. *Prociphilus* (*Prociphilus*) *oriens* MORDVILKO... Hokkaido and Saghalien
   Pr. bumeliae MATSUMURA (1917) (nec SCHRANK)
2. *Prociphilus* (*Stagona*) *kônoi* sp. nov. ..... Hokkaido
3. *Prociphilus* (*Prociphilus*) *kuwanai* MONZEN ... Hokkaido
   Pr. pyri TAKAHASHI (1921) (nec FITCH)
   Pr. takahashii MAXON et KNOWLTON (1937) (syn. nov.)
4. *Thecabius lati-sensoria* sp. nov. .... Hokkaido and Saghalien
5. *Pemphigus dorocola* MATSUMURA ..... Hokkaido
6. *Pemphigus matsumurai* MONZEN ..... Hokkaido
   Pem. dorocola HORI (1929) (nec MATSUMURA)
7. *Pemphigus niisimae* MATSUMURA ..... Hokkaido

Some of the cotypes and paratypes as well as other determined materials have been presented to the Entomological Institute of the Hokkaido Imperial University and to the Hokkaido Agricultural Experiment Station. Most of the specimens, inculding the types, are in the author's collection, and the paratypes of certain species are in Dr. H. KÔNO's collection.

[Ins. Mats., Vol. XII, No. 2 & 3, March, 1938]

On this occasion, the author wishes to express his appreciation to Professor Emeritus S. MATSUMURA for constant encouragement and suggestions in his aphid work. Special acknowlegement is due to Dr. R. TAKAHASHI for the loan of specimens and in settling taxonomic questions in the determination of species. Thanks are due to Dr. H. KÔNO, for his kind assistance in permitting the use of his biological data, in the collection of materials and in other ways during the course of the preparation of this paper, and also to Dr. S. KUWAYAMA, Prof. K. MONZEN and Dr. G. F. KNOWLTON for their valuable specimens and literature. The author must also render grateful thanks to Dr. C. WATANABE for kind counsel and advice.

HOST PLANT INDEX TO THE SPECIES LISTED

Abies Mayriana (Ao-todomatsu*) ..... *Prociphilus* (*Prociphilus*) *oriens*
Fraxinus excelsissima (Yachidamo) ..... *Prociphilus* (*Prociphilus*) *oriens*
F. mandshurica (Okuezo-yachidamo) ..... *Prociphilus* (*Prociphilus*) *oriens*
F. Sieboldiana (Aodamo) ..... *Prociphilus* (*Prociphilus*) *oriens*
Lonicera Morrowii (Kinginboku or Hyôtanboku) .....
..... *Prociphilus* (*Stagona*) *kônoi*
Picea Glehni (Aka-ezomatsu) ..... *Prociphilus* (*Stagona*) *kônoi*
Pirus communis (Seiyô-nashi) ..... *Prociphilus* (*Prociphilus*) *kuwanai*
Populus Maximowiczii (Doronoki) ..... *Thecabius lati-sensorius*
" " " ..... *Pemphigus dorocola*
" " " ..... *Pemphigus matsumurai*
" " " ..... *Pemphigus niisimae*
Syringa vulgaris (Murasaki-hashidoi) ..... *Prociphilus* (*Prociphilus*) *oriens*

DESCRIPTIONS AND NOTES

Tribe *Pemphigini*

Key to the Genera

1. Antennae of the fundatrix 4-jointed. Cornicles developed at least in the alate form, making mere rings. The aerial form forming a true gall and the host plant only *Populus Maximowiczii* ... ... *Pemphigus*
– Antennae of the fundatrix 5-jointed. Cornicles absent. The aerial form forming a pseudogall or curling leaves, and the host plant not always poplar 2
2. Wax glands on the dorsum of the mesothorax of the alate form large, i. e., with the distance between them subequal to or shorter than their greatest diameter ... ... *Prociphilus*
– Wax glands on the dorsum of the mesothorax of the alate form not well developed, i. e., with the distance between them much longer than their greatest diameter ... ... *Thecabius*

* Japanese name.

Genus ***Prociphilus*** KOCH

Key to the Subgenera

1. Stigma of the fore wing rather short, the posterior margin almost straight ... *Prociphilus* s. str.
- Stigma of the fore wing elongated, falcate in form, the posterior margin conspicuously concave ... ... *Stagona*

Key to the Species

(Fundatrix)

1. Body dusky yellowish brown, 3.8 mm. in length; hind tarsi longer than the antennal joint III. Species on *Fraxinus* or *Syringa* ... ... *oriens* MORDV.
- Body yellowish green or greenish, about 3.0 mm. in length; hind tarsi shorter than the antennal joint III. Species not on *Fraxinus* or *Syringa* 2
2. Body yellowish green; antennal joint V 1.5 times as long as IV. Species on *Lonicera* ... ... *kênoi* sp. nov.
- Body green; antennal joint V 2 times as long as IV. Species on *Pirus* ... ... *kuwanai* MONZ.

(Fundatrigenia)

1. Head without wax glands; glands on the mesothorax separated by a distance longer than their greatest diameter. Species on *Pirus* ... ... *kuwanai* MONZ.
- Head with wax glands; glands on the mesothorax separated by a distance shorter than their greatest diameter. Species not on *Pirus* 2
2. Medium sized species: Body, 2.5–2.8 mm.; fore wings, 4.4 mm.; stigmatic cell elongated, the posterior margin concave, "Rs" originating from the basal one-third of stigma. Species on *Lonicera* ... ... *kônoi* sp. nov.
- Large species: Body, 4.0–4.5 mm.; fore wings, 6.0 mm.; stigmatic cell not so elongated, the posterior margin straight, "Rs" originating from the middle of stigma. Species on *Fraxinus* or *Syringa* ... ... *oriens* MORDV.

(Sexupara)

1. Medium sized species: Body, 1.7 mm.; antennae, 1.0 mm.; fore wings, 3.3 mm.; secondary sensoria on the antennal joints linear, not encircling the joints ... ... *kônoi* sp. nov.
- Large species: Body, 3.2 mm.; antennae, 2.0 mm.; fore wings, about 5.0 mm.; secondary sensoria on the antennal joints annular, encircling the joints ... ... *oriens* MORDV.

1. ***Prociphilus* (*Prociphilus*) *oriens*** MORDVILKO (Pl. II, figs. 1 & 2)

MORDVILKO, Abdruck aus Ergebnisse und Fortschritte der Zoologie, Bd. 8, p. 89, fig. 24 (1935).

Prociphilus bumeliae MATSUMURA (nec SCHRANK), A Collection of Essays for Mr. Y. NAWA, p. 87, Pl. XI, fig. 4 (1917).

Prociphilus nidificus MONZEN (nec LÖW) Saito Ho-on Kai, Monogr. No. 1, p. 43, Pl. III, fig. 11; Pl. XII, fig. 46 (1929).

Fundatrix

Colour: Generally dusky yellowish brown with several blackish bands on the dorsum; abdomen covered with white secretion. Head and antennae

dusky brown. Legs dusky brown with the tibiae at the apices and tarsi blackish. Cauda and anal plate black.

Structural characters: Antennae broad and very short, as long as one-fourth the length of the body, 5-jointed; joint I wider but shorter than II; joint III the longest, twice the length of IV; V as long as I and II taken together; flagellum of V very short and blunt; IV and V with each the usual primary sensorium. Rostrum broad and short, slightly beyond the 1st coxa; the last two joints about equal in length. Rostrum of the first instar very long, more than twice the length of the body. Legs broad, provided with rather long hairs; hind tarsi as long as the antennal joints IV and V taken together. Head, thorax and abdomen provided with prominent wax glands.

Measurements: Body, 3.8 × 1.7 mm.; antennae, 0.8 mm. (I–0.08, II–0.12, III–0.27, IV–0.14, V–0.19); hind femora, 1.10 mm.; hind tibiae, 1.60 mm.; hind tarsi, 0.35 mm.

Fundatrigenia

Colour: Generally dull reddish brown, with several black bands and lateral black spots on the dorsum of the abdomen. Head and eyes black. Mesothorax blackish brown. Antennae brown, the apices of the joints III, IV and V, and the whole of VI blackish. Rostrum brown with the apex blackish. Legs pale brown, the apical halves of femora, the apices of tibiae and the whole of tarsi blackish. Wing veins brown; stigma greenish brown.

Structural characters: Antennae 6-jointed, about one-third the length of the body, provided with short hairs; joint I as long as II; III the longest, as long as IV and V taken together; IV slightly shorter than V; VI a little longer than V; secondary sensoria present on III, IV and V, and partially annulated, arranged in number as follows:— 22–29 on III, 6–13 on IV, 4–10 on V.

Rostrum reaches to a point near the 2nd coxa. Wing veins normal; stigma rather narrow and "Rs" slightly curved; "A" and "Cu" slightly separated at the bases. Wax glands present on the head, thorax and abdomen; one pair on the head circular, separated by a distance more than their greatest diameter (diameter, 0.056 mm.; distance between them, 0.100 mm.); one pair on the prothorax nearly triangular in shape, the distance between them about equal to their shortest diameter (diameter, 0.12 × 0.08 mm.; distance between them, 0.08 mm); one pair on the mesothorax oval, variable in size, separated by a distance a little shorter than their greatest diameter (diameter, 0.96 × 0.056 mm.; distance between them, 0.072 mm.). Legs long, provided with numerous rather long hairs.

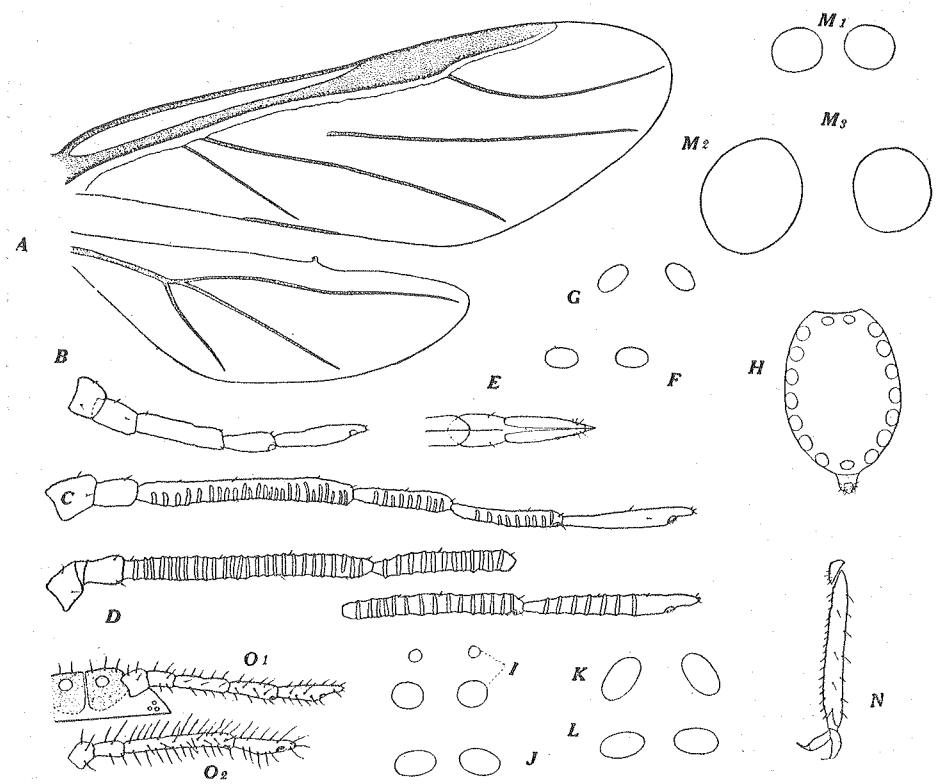

Fig. 1

Prociphilus (*Prociphilus*) *oriens* MORDVILKO

Fundatrix: *B*, antenna. Fundatrigenia: *C*, antenna; *E*, rostrum; *F*, a pair of wax glands of head; *G*, a pair of mesothoracic wax glands; *N*, hind tarsus. Sexupara: *A*, wings; *D*, antenna; *H*–*M*, wax glands (*H*, distribution of abdominal wax glands; *I*, a pair of head; *J*, a pair of prothorax; *K*, a pair of mesothorax; M_1, a pair at the frontal portion of abdomen; M_2, one at the lateral margins of abdomen; M_3, one at the caudal portion of abdomen). Virgogenia: O_1, head and antenna of the last instar; O_2, antenna of young instar.

Measurements: Body, 4.2–4.6 mm.; antennae, 1.32–1.72 mm. (I, 0.11–0.14; II, 0.11–0.14; III, 0.42–0.59; IV, 0.20–26; V, 0.22–0.28; VI, 0.26–0.31); fore wings, 6.0 × 2.0 mm.; hind femora, 1.25 mm.; hind tibiae, 2.00 mm.; hind tarsi, 0.44 mm.

Virgogenia (Larva, on *Picea Glehni*)

Colour: Dull yellowish green with white woolly matter. Head, caudal

portion, antennae, legs and apical part of the rostrum dusky.

Structural characters: Oblong, provided with many rather stout hairs. Antennae short, shorter than one-half the length of the body, with numerous hairs, 5-jointed; joint I wider but shorter than II; V the longest, a little longer than III; IV and basal part of V nearly equal in length; IV and V with each the usual primary sensorium surrounded by the cilia. Head small with a white median line, presenting two circular wax glands (diameter, 0.024 mm.) Eyes composed of three ocelli, arranging in triangle. Rostrum broad, reaching far beyond the 3rd coxa; the last joint much longer than the proximal joint. Legs stout, with numerous hairs. Cauda and anal plate provided with many hairs.

Measurements: Body, 1.36×0.8 mm.; antennae, 0.51 mm. (I–0.05, II–0.06, III–0.14, IV–0.11, V–0.15); hind femora, 0.30 mm.; hind tibiae, 0.50 mm.; hind tarsi, 0.15 mm.

Sexupara

Colour: Almost similar to the fundatrigenia in colour.

Structural characters: Antennae long, slightly longer than half the length of the body; joint I wider and as long as II; III the longest, a little shorter than IV and V taken together; IV as long as or a little shorter than V; VI somewhat shorter than V or as long as IV. Secondary sensoria annular, located on joints III, IV, V and VI, and distributed as follows:— 19–28 on III, 11–14 on IV, 12–16 on V, 6–9 on VI. Joints V and VI with each a large, circular primary sensorium. Rostrum rather long and slender, reaching to the 3rd coxa; the last joint longer than that of the proximal joint. Legs slender and shorter than those of the fundatrigenia, provided with rather long hairs. Wax glands prominent; one pair on the head circular, variable in size, the distance between them a little longer than their diameter (diameter, 0.024-0.064 mm.; distance between them, 0.064-0.096 mm.); one pair on the prothorax oval and separated as widely as their shortest diameter (diameter, 0.096×0.056 mm.; distance between them, 0.060 mm.); one pair on the mesothorax oval, separated as widely as their shortest diameter (diameter, 0.12×0.064 mm., 0.16×0.072 mm.; distance between them, 0.064–0.08 mm); one pair on the metathorax almost similar to those of the prothorax; abdomen with seven pairs of large, circular wax glands at the lateral sides, 0.24 mm. in diameter; one pair in front and another one on the caudal portion being 0.04 mm. in diameter. Wings similar to those of the fundatrigenia.

Measurements: Body, 3.20–3.40 mm.; antennae, 1.71–1.87 mm. (I, 0.12; II, 0.11; III, 0.54–0.62; IV, 0.32–0.34; V, 0.32–0.36; VI, 0.30–0.32); fore wings, 4.90×1.10 mm.; hind femora, 0.88 mm.; hind tibiae, 1.44 mm.; hind

tarsi, 0.29 mm.

Described from the fundatricis and fundatrigeniae collected on *Fraxinus* and *Syringa* at Sapporo in May and July, 1924 (M. HORI), and from the sexuparae collected on *Abies* at Sapporo in October and November, 1937 (H. KÔNO). Some of the specimens are in the collection of Dr. H. KÔNO.

Food Plants— *Fraxinus excelsissima* (Yachidamo); *F. mandshurica* (Okuezo-yachidamo); *F. Sieboldiana* (Aodamo); *Syringa vulgaris* (Murasaki-hashidoi); *Abies Mayriana* (Ao-todomatsu).

Localities — Hokkaido (Sapporo and Nopporo); Saghalien (Konuma); Honshu (Morioka); Siberia (Amur and Ussuri, after MORDVILKO).

Biology and Notes—This species is quite common, being widely distributed throughout Hokkaido and Saghalien. It infests the tender leaves of *Fraxinus* or *Syringa* during spring, making a pseudogall, the so-called "insect nest". According to Dr. H. KÔNO's observation it migrates in early summer to the coniferous plant, *Abies Mayriana*, and then it feeds on the roots. The virgogeniae are found abundantly during September on the main roots of *Abies Mayriana*, being covered with a mass of white flocculence.

The life cycle of this species in Sapporo is as follows:—

In autumn and early winter the eggs are laid under the curled edges of the bark or on the axils of new buds, and they hatch in the following spring. The young stem mothers are seen on the buds of *Fraxinus* in the early part of May, and in the latter part of this month they mature and begin to deposit their living young, all of which are alate females so far as the author has been able to observe. The females generally colonize at the basal part of the underside of the leaves, causing them to curl. The alate females or fundatrigeniae migrate from the ash to the above-mentioned coniferous plant. The migration begins in the middle of June and continues for about two weeks. The fall migrants or sexuparae begin to appear in the end of September and fly together in the air before arriving at the primary host plant. The migrants return to the primary host plant and then the eggs are laid.

Japanese name—*Todo-no-ne-ôwatamushi.*

Taxonomy—This species is distinct in that it has secondary sensoria on the antennal joint V of the fundatrigenia and also by the large size of the body of each form. On account of these characters it can be easily distinguished from the European Fraxinus-aphides, namely *Pr. bumeliae* SCHR. and *Pr. nidificus* LÖW. It is also closely allied to the American Fraxinus-aphid, *Pr. fraxinifolii* (RILEY), but examining examples of the fundatrigenia of the latter species sent by G. F. KNOWLTON, the former is easily distinguishable from the latter by the

number of sensoria on the antennal joint III and by the body-length.

2. ***Prociphilus* (*Stagona*) *kônoi*** sp. nov. (Pl. II, figs. 2 & 3)

Fundatrix

Colour: Generally yellowish green. Head and antennae dark brown. Legs light brown, except the apical halves of femora, the apices of tibiae and the whole of tarsi black. Cauda pale brown.

Structural characters: Body oval. Antennae short, not reaching to the apical one-third of the body, with a few short hairs, 5-jointed. Antennal joint I stouter and shorter than II; III the longest, about twice as long as IV; V longer than IV, each with the typical permanent sensorium surrounded by the cilia. In some specimens, the antennal joint III is divided into two parts. Rostrum short, reaching slightly beyond the 1st coxa. Head with two large wax glands at the base and two small ones at the apex. Prothorax and abdomen provided with several wax glands. The apical two joints of the rostrum nearly equal in length; apex of the last joint obtuse.

Measurements: Body, 3.0 × 1.7 mm.; rostrum, 0.24 mm.; antennae, 0.78 mm. (I–0.08, II–0.10, III–0.27, IV–0.14, V–0.19); hind femora, 0.64 mm.; hind tibiae, 0.75 mm.; hind tarsi, 0.20 mm.

Fundatrigenia

Colour: Generally greenish brown. Antennae black. Rostrum dark green. Legs light brown with the apices of femora, the apices of tibiae and the whole of tarsi black. Wing veins pale brown and stigma dusky brown.

Structural characters: Antennae about half the length of the body, 6-jointed; joint II narrower and longer than I; III the longest, as long as IV and V taken together; IV and V nearly equal in length; VI slightly longer than V; secondary sensoria narrowly oval, not encircling the joints. Sensoria are as follows:— 17-22 on III, 8-10 on IV, 5-8 on V. On V and VI the primary sensorium is surrounded by the cilia. Rostrum short, reaching to a point between the 1st and 2nd coxae. Wax glands of the mesothorax oval, nearly equal to metathoracic ones in diameter; distance between them short, about half as widely as their greatest diameter (diameter, 0.10 × 0.05 mm.; distance between them, 0.05 mm.) Head and prothorax with circular wax glands, of which the prothoracic ones are the largest; one pair on the head: diameter, 0.06 mm.; distance between them, 0.064 mm.; one pair on the prothorax: diameter, 0.11 mm.; distance between them, 0.06 mm. Abdominal glands present, strongly developed at the lateral margins. Stigmatic cell of the fore wings elongated and the posterior margin concave, "Rs" originating from the apical

one-third of the stigma; "A" and "Cu" separated at the bases. Hind wings with three hooklets.

Measurements: Body length, 2.5–2.8 mm.; antennae, 1.20–1.40 mm. (I, 0.09; II, 0.10; III, 0.42–0.51; IV, 0.20–0.24; V, 0.19–0.24; VI, 0.20–0.25); fore wings, 4.4 mm.; hind femora, 0.77 mm.; hind tibiae, 1.10 mm.; hind tarsi, 0.24 mm.

Sexupara

Colour: Generally yellowish green. Antennae pale brown. Legs brown.

Structural characters: Antennae shorter than the body, 6-jointed; joint III the longest; IV and V equal in length; VI slightly longer than V. Secondary sensoria linear or narrowly oval, not encircling the joints; numbering 15–16 on III, 8–9 on IV, 7–8 on V, and 3–4 on VI. Primary sensorium on joints V and VI oval, surrounded by the cilia. Wax glands as follows:— one pair on the mesothorax oval, smaller than those of the prothorax, the distance between them being about half the length of their greatest diameter (diameter, 0.08 × 0.06 mm.; distance between them, 0.04 mm.); each pair on the pro- and metathorax circular, rather close to each other; one pair on the prothorax: diameter, 0.08 × 0.07 mm.; distance between them, 0.03 mm.; one pair on the metathorax: diameter, 0.07 mm.; distance between them, 0.03 mm. Abdominal glands prominent, strongly developed at the lateral margins (diameter, 0.12–0.15 mm.) Wax glands on the head indistinct. Rostrum short, reaching slightly beyond the 1st coxa; the last joint about twice as long as the proximal one. Wing venation normal; stigmatic cell narrower and longer than that of the fundatrigenia, the lateral margins strongly concave, reaching near the end of "Rs"; "A" and "Cu" slightly separated at the bases. Hind wings with three hooklets; two diagonals distinctly separated at the bases.

Measurements: Body, 1.7 × 0.8 mm.; antennae, 0.96–1.05 mm. (I, 0.07; II, 0.08; III, 0.32–0.34; IV, 0.14–0.17; V, 0.14–1.17; VI, 0.21–0.22); fore wings, 3.30 × 0.90 mm.; hind femora, 0.64 mm.; hind tibiae, 0.86 mm.; hind tarsi, 0.24 mm.

Described from specimens collected at Sapporo in May and July, 1924 by the author, and in October and November, 1937, by H. Kôno. Some of the paratypic specimens are in the collection of H. Kôno.

Food plants— *Lonicera Morrowii* (Kinginboku or Hyôtanboku); *Picea Glehni* (Aka-ezomatsu).

Locality— Hokkaido (Sapporo).

Biology and Notes— This aphid is exceedingly abundant in Hokkaido. During spring it feeds on the terminal leaves of *Lonicera Morrowii*, curling them

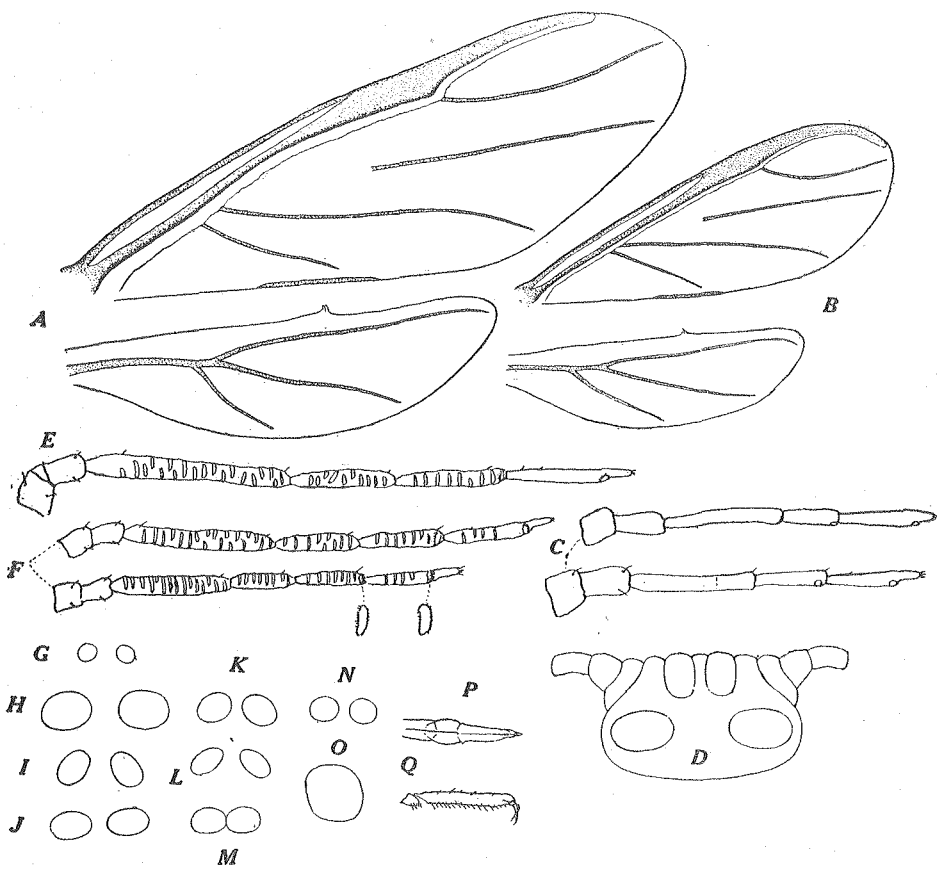

Fig. 2

Prociphilus (*Stagona*) *kônoi* sp. nov.

Fundatrix: *C*, antenna; *D*, head. Fundatrigenia: *A*, wings; *E*, antenna; *G*–*J*, wax glands (*G*, a pair of head; *H*, a pair of prothorax; *I*, a pair of mesothorax; *J*, a pair of metathorax); *P*, rostrum; *Q*, hind tarsus. Sexupara: *B*, wings; *F*, antenna; *K*–*O*, wax glands (*K*, a pair of prothorax; *L*, a pair of mesothorax; *M*, a pair of metathorax; *N*, a pair at the frontal portion of abdomen; *O*, one at the lateral margins of abdomen).

longitudinally and making a pseudogall. It overwinters in the egg stage on *Lonicera*. The full-grown stem mother appears about the end of May and deposits its living young on the underside of the leaves. In the middle of June the spring migrant appears and migrates to its summer host plant, *Picea Glehni*. The migration continues until about the middle of July. According to Dr. H. Kôno this coniferous aphid infests the rootlets of *Picea Glehni* in the nursery-

ree causing great damage to them. From the above-mentioned fact the author comes to the conclusion that this aphid is sure to alternate between *Lonicera* and *Picea.*

Japanese name—*Kôno-ôwatamushi.*

Taxonomy— This species is closely allied to *Prociphilus xylostei* DEG. in structure, but may be separated from the latter because of the following facts: the former has 6-7 secondary sensoria on antennal joint V of the fundatrigenia and 5-8 sensoria on joint VI of the sexupara, while according to TULLGREN[1] and MORDVILKO (1935, loc. cit.), the latter has no sensoria on joint V of the fundatrigenia and on joint VI of the sexupara.

This species is named in honour of Dr. H. KÔNO, collecter of the sexupara.

3. ***Prociphilus*** ***(Prociphilus) kuwanai*** MONZEN (Pl. II, fig. 5)

Prociphilus pyri ESSIG and KUWANA (nec FITCH), Proc. Callif. Acac. Sci., 4th Ser., Vol. VIII, No. 3, p. 106 (1918); TAKAHASHI, Japanese Aphididae I, p. 26 (1921).

Prociphilus kuwanai MONZEN, Morioka Agric. & Forest. Coll. Alumni Soc., Bull. 4, p. 10 (1927); HORI; Hokkaido Agr. Expt. Sta., Rept. No. 23, p. 158, figs. 70, 71 (1929); MONZEN, Saito Ho-on Kai, Monogr. No. 1, p. 38, Pl. III, fig. 9, Pl. XII, fig. 44 (1929).

Prociphilus takahashii MAXON et KNOWLTON, Ann. Entom. Soc. Amer., Vol. XXX, No. 1, p. 24, fig. 1 (1937) (syn. nov.)

Fundatrix

Colour: Generally green. Head dark green. Eyes reddish brown. Antennal joints I and II concolorous with the head and the others light green. Legs pale and dark green, except the apices of femora, the apices of tibiae and the whole of tarsi dusky.

Structural characters: Body oval. Head small, with a white longitudinal line on the middle. Two pairs of wax glands present on the head, one of which on the basal part is larger; two pairs are visible on the prothorax. Abdomen with several large wax glands at the lateral margins. Antennae short, 5-jointed; joints I and II nearly equal in length; III the longest, slightly longer than V; IV shorter than one-half the length of V; V with short flagellum; IV and V with each the typical primary sensorium surrounded by the cilia. Rostrum short, extending slightly beyond the 1st coxa. Cornicles absent. Cauda rounded, with several short hairs.

Measurements: Body, 3.2 × 2.1 mm.; antennae, 0.59 mm. (I–0.07, II–0.07, III–0.20, IV–0.08, V–0.17); hind tarsi, 0.13 mm.

Fundatrigenia

Colour: Generally yellowish green. Head blackish brown. Compound

1) A. TULLGREN: Aphidologische Studien I. (Arkiv för Zoologie, Bd. 5, No. 14, p. 83, 1909).

eyes blackish. Antennae and legs entirely dark brown.

Structural characters: Head rounded in front, with a longitudinal white line on the middle. Abdomen with several small brownish tubercles at the lateral margins. Antennae short, one-third the length of the body, 6-jointed; joint I wider, but not longer than II; III the longest, as long as IV and V taken together; IV slightly shorter than V; VI longer than V. Secondary

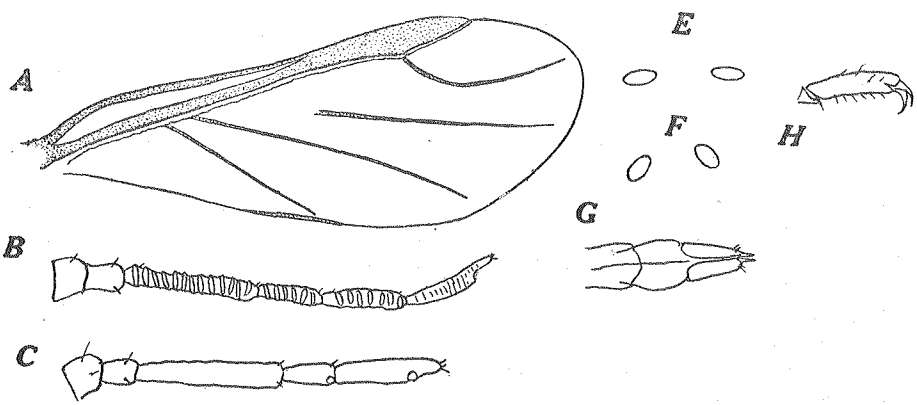

Fig. 3

Prociphilus (*Prociphilus*) *kuwanai* MONZEN

Fundatrix: *C*, antenna. Fundatrigenia: *A*, fore wing; *B*, antenna; *E*, a pair of prothoracic wax glands; *G*, rostrum; *H*, hind tarsus.

sensoria present on joints III, IV and V, linear or oblong, not encircling the joints; numbering as follows:— 19-24 on III, 7–10 on IV, 9–11 on V. Primary sensoria on V and VI, surrounded by the cilia. Wax glands on the head indistinct; wax glands on the mesothorax oval, separated by a distance slightly wider than their greatest diameter (diameter, 0.06 × 0.03 mm.; distance between them, 0.064 mm.); the hindmost pair on the prothorax oval, separated by a distance longer than their greatest diameter (diameter, 0.075 × 0.04 mm.; distance between them, 0.09 mm.); one pair on the metathorax about equal to that of the prothorax in diameter; abdominal wax glands circular, strongly developed at the lateral margins (diameter, 0.10 mm.) Rostrum short, not reaching the 2nd coxa, the apical two joints about equal in length. Legs provided with several short hairs on the tibiae and tarsi. Wing venation normal; "A" and "Cu" separated at the bases; hind wings with three hooklets. Cauda and anal plate rounded, with a few hairs.

Measurements: Body length, 2.6 mm.; antennae, 0.87 mm. (I-0.05, II-0.07, III-0.30, IV-0.13, V-0.15, VI-0.17); fore wings, 3.28 × 1.10 mm.; hind

femora, 0.60 mm; hind tibiae, 0.88 mm.; hind tarsi, 0.20 mm.

Food plant— *Pirus communis* (Seiyô-nashi).

Localities— Hokkaido (Sapporo, Yoichi and Hakodate); Honshu (Morioka and Tokyo).

Biology and Notes— This species is very common in Hokkaido, being injurious to pear-trees. The stem mother, at first, attacks the leaf-edges, so the leaf turns over towards the underside, forming a bag-like gall. The gall is yellowish green with a somewhat reddish tinge, being 24-38 mm. in length and 9-13 mm. in width. The life circle of this species near Sapporo is as follows:— In autumn and early winter the eggs are laid at the bases of the new buds of twigs. They hatch in the following spring, and then the stem mothers mature in the latter part of May and begin to deposit their living young, all of which may be alate forms according to the present author's observation. On June 20th, 1924, several colonies of this aphid were found by the author in a pear orchard near Sapporo, each colony consisting of about 200 individuals of the pupae and alate forms, but on July 14th, no individual being found in the galls. The fall migrant or sexupara begins to appear in the latter part of October and flies back to the primary host plant and then it produces the sexuales. The secondary host plant may probably be *Rumex* sp.

Japanese name—*Nashi-no-ôwatamushi.*

Taxonomy— This species is distinct from the allied species of this group in that it has thoracic wax glands separated by a distance wider than their greatest diameter and no wax glands on the head, and in that the shape of the pseudogall is different.

Genus ***Thecabius*** KOCH

4. ***Thecabius lati-sensoria*** sp. nov. (Pl. II, fig. 6)

Fundatrigenia

Colour: Generally dirty yellow. Antennae and legs entirely dusky brown. Head and thorax black. Wing veins and stigma brown. Cauda dusky. Rostrum dusky yellow, darkened towards the apex. Abdomen with several blackish spots on the caudal portion, dusky short tubercles at the lateral margins and also one dusky band in front of the cauda.

Structural characters: Antennae rather longer than half the length of the body, 6-jointed; joints I and II equal in length; III the longest, as long as IV and V taken together; IV slightly shorter than V; VI longer than V. Secondary sensoria conspicuously broad, but not encircling the joints; number of sensoria as follows:— 22-23 on III, 11-12 on IV, 10-14 on V, 12-15 on VI.

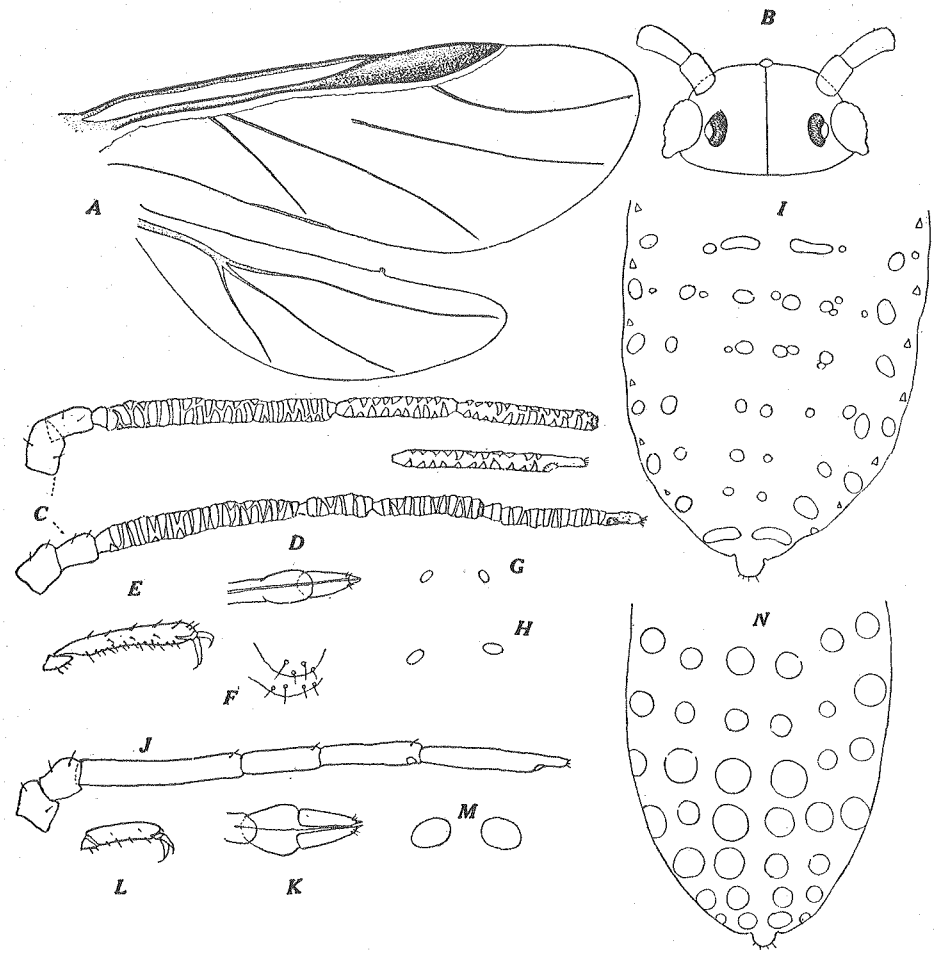

Fig. 4

Thecabius lati-sensoria, sp. nov.

Fundatrigenia : *A*, wings ; *B*, head ; *C*, antenna ; *D*, rostrum ; *E*, hind tarsus ; *F*, cauda and anal plate ; *G*, a pair of mesothoracic wax glands ; *H*, a pair of metathoracic wax glands ; *I*, distribution of abdominal wax glands. Pupa : *J*, antenna ; *K*, rostrum ; *L*, hind tarsus ; *M*, a pair of mesothoracic wax glands ; *N*, distribution of abdominal wax glands.

Primary sensoria at the distal extremity of V and at the base of flagellum on VI more or less oval, fringed with the cilia. Rostrum broad and very short, reaching a little beyond the 1st coxa, the last joint as long as antennal joint I. Wax glands on the mesothorax oval and very small, 0.056 × 0.024 mm. in

diameter, and separated by a distance three times as long as their greatest diameter. Abdominal wax glands numerous and variable in size, arranged almost symmetrically on each segment (vide figure). Wing venation normal; "A" and "Cu" slightly separated at the bases; hind wings with two diagonals which are united at the bases and with three hooklets. Hind tarsi as long as antennal joint IV.

Measurements: Body, 3.0-3.3 mm.; antennae, 1.70-1.90 mm. (I, 0.12; II, 0.12; III, 0.54-0.62; IV, 0.24-0.28; V, 0.30-0.38; VI, 0.38-0.44); fore wings, 4.10 × 1.60 mm.; hind femora, 0.76–0.84 mm.; hind tibiae, 1.12–1.24 mm.; hind tarsi, 0.24–0.32 mm.

Pupa

Colour: Generally yellow with pulverulence. Antennae light yellow, with the joints IV and V dusky. Legs yellowish brown except the apices of the femora, the apices of tibiae and the whole of tarsi dusky. Rostrum pale brown, with the apical portion dusky. Wing pads yellowish green with the apices greenish brown.

Structural characters: Antennae 6-jointed; joint I wider than II; III the longest, as long as IV and V taken together; IV somewhat shorter than V; VI longer than V; joints III, IV and V with a rather long hair at each apical edge. Rostrum broad and short, attaining a point between the 1st and 2nd coxae; the last two joints subequal in length. Thoracic wax glands large, semicircular and rather close to each other (1.10 × 0.06 mm. in diameter). Abdominal wax glands prominent, circular and generally larger than those of the alatae, arranged regularly and symmetrically in a transversal row (0.08–0.2 mm. in diameter). Arrangement of the glands shown in the figure.

Measurements: Body, 3.2 mm.; antennae, 1.3 mm. (I–0.09, II–0.10, III–0.40, IV–0.16, V–0.24, VI–0.31); hind femora, 0.58 mm.; hind tibiae 0.64 mm.; hind tarsi, 0.28 mm.

Food plant—*Populus Maximowiczii* (Doronoki).

Localities— Hokkaido (Sapporo); Saghalien (Konuma).

Biology and Notes— This aphid makes a bread-like gall on the upper side of the leaves of *Populus Maximowiczii* in early summer. The gall is composed of a confluent series of pale yellow ovoid swellings on both sides of the midrib. The fundatrigenia appears during the time from midsummer to early autumn.

Japanese name—*Doro-no-ôwatamushi.*

Taxonomy— This species is characteristic in having well-defined broad sensoria on the antennae and in forming a bead-like gall.

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1) C. V. RILEY: Bull. U. S. Geogr. Surv. Terr., Vol. 5, No. 1, p. 13 (1879).

In the shape of the gall it resembles *Th. populi-monilis* (RILEY),[1] but differs from the latter in the number of sensoria on antennal joint III and in the presence of the secondary sensoria on joint VI of the fundatrigenia. It is also closely allied to *Th. affinis* (KALT.), but upon examining the examples of the latter species determined by HILLE RIS LAMBERS of Holland and sent by R. TAKAHASHI, it seems to differ from the latter in the structure and number of the antennal sensoria and in the shape of the gall. It differs also from *Th. affinis orientalis* MORDVILKO (1935, loc. cit.) from Ussuri district in the size of the body and in the number of antennal sensoria, especially in joint VI of the fundatrigenia having 12 to 15 sensoria, not having 6 to 8 as in the latter species.

Genus ***Pemphigus*** HARTIG

Three species have been recognized in Hokkaido. The food plant of those species is only *Populus Maximowiczii*.

Key to the Species

(Based on Fundatrigenia)

1. Secondary sensoria absent on antennal joint V; cockscomb-like long gall formed on the leaves... ... ... *niisimae* MATS.
– Secondary sensoria usually present on antennal joint V; globular gall formed on petioles or twigs... 2
2. Secondary sensoria completely annular, occuring on joints III–VI; gall formed on twigs ... ... *dorocola* MATS.
– Secondary sensoria linear and not annular, occurring on joints III–V; gall formed on petiols ... ... *matsumurai* MONZ.

5. ***Pemphigus dorocola*** MATSUMURA (Pl. II, fig. 7)

MATSUMURA, A Collection of Essays for Mr. Y. NAWA, p. 84, Pl. X, fig. 7; Pl. XIII, fig. 5 (1917); MONZEN, Saito Ho-on Kai, Monogr. No. 1, p. 34, Pl. XI, fig. 41 (1929).

Pemphigus borealis TAKAHASHI (nec TULLGREN), Zool. Mag. Tokyo, Vol. XXXII, p. 197 (1920).

Fundatrix

Colour: Generally yellowish green. Antennae concolorous with the body. Legs yellowish brown, slightly mealy.

Structural characters: Ovate to oblong in form. Antennae short, 4-jointed; joints I and II equal in length; III the longest; III and IV with each a rather small, primary sensorium; flagellum of the apical joint very short, with several short hairs at the apex. Abdominal wax glands well developed. Cornicles apparently obsolete.

Measurements: Body, 2.3 × 2.0 mm.; antennae, 0.5 mm.

Fundatrigenia

Colour: Generally yellowish green. Antennae and legs entirely dusky brown.

Structural characters: Antennae short, about half the length of the body, 6-jointed; joint I a little longer than II; III the longest, longer than IV and V taken together; IV shorter than V; VI as long as IV and V taken together.

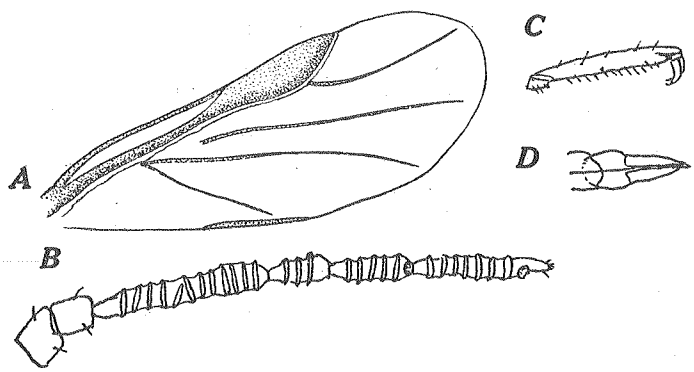


Fig. 5

Pemphigus dorocola MATSUMURA

Fundatrigenia: *A*, fore wing; *B*, antenna; *C*, hind tarsus; *D*, rostrum.

Secondary sensoria on III, IV, V and VI annular, encircling the joints; the number of sensoria ranging as follows:— 12–14 on III, 3–4 on IV, 5–6 on V, 7–9 on VI.

Rostrum short, not attaining to the 2nd coxa. Wing venation normal; "A" and "Cu" not separating at the bases; hind wings with two hooklets. Cornicles present, but forming mere rings.

Measurements: Body, 1.7 mm.; antennae, 0.77 mm. (I–0.06, II–0.05, III–0.26, IV–0.09, V–0.12, VI–0.19); fore wings, 2.40 × 0.60 mm.; hind femora, 0.48 mm.; hind tibiae, 0.75 mm.; hind tarsi, 0.22 mm.

Described from the cotype which is preserved in the Entomological Institute of the Hokkaido Imp. Univ. (collected at Maruyama, Sapporo, November 7, 1917) and from the material sent by Prof. K. MONZEN (collected at Morioka by MONZEN).

Food plant— *Populus Maximowiczii* (Doronoki).

Localities— Hokkaido (Sapporo); Honshu (Morioka).

Biology and Notes— According to S. MATSUMURA (1917) and K. MONZEN

(1929), this species forms a globular gall near the tops of the young twigs of *Populus Maximowiczii*. The gall is about 13 mm. in diameter, and opens in a suture transversely, sometimes longitudinally or obliquely with the axis of twigs. It is green when fresh, and becomes brown. It is certain that the gall may be produced in late summer or early autumn, because the alate forms and pupae in the gall are found in the beginning of November.

Japanese name—*Doro-no-edatamafushi.*

Taxonomy— This species is characteristic in forming the gall on twigs and in having a large number of annular sensoria on antennal joints III to VI. It resembles *Pem. borealis* TULLG. in the arrangement of the antennal sensoria, but may be easily distinguished from the latter by the structure of the gall and by the size of the body. It is also closely allied to *Pem. populi-ramulorum* RILEY in the shape of the gall, but examining the specimens of the fundatrigenia of the latter species sent by G. F. KNOWLTON from Utah, the former is found to be distinct from the latter in the number of sensoria of the antennal joints, especially those of VI. Furthermore, the antennae of the fundatrix of the former species are 5-jointed, not 4-jointed as in the latter species.

6. ***Pemphigus matsumurai*** MONZEN (Pl. II, fig. 8)

MONZEN, Morioka Agric. & Forest Coll. Alumni Soc., Bull. 4, p. 8, (1927); MONZEN, Saito Ho-on Kai., Monogr. No. 1, p. 32, Pl. II, fig. 6, Pl. XI, fig. 40 (1929).

Pemphigus borealis HORI (nec. TULLGREN), Hokkaido Agr. Expt. Sta., Rept. No. 23, Pl. II, fig. E (1929).

Fundatrix

MONZEN's original description is as follows:—

"Body oval, swollen, length 2.17 mm., width 1.58 mm. Head brown, thorax and abdomen greenish. Agglomerate eyes brown, composed of three facets. Antennae yellowish brown, 4-segmented, length 0.43 mm., 1st the shortest, 2nd about twice as long as 1st, 3rd the longest, 3rd and 4th with the oval sensoria on their extremities. Cornicles absent. Cauda rudimentary."

As a supplement to the original description the following characters may be added:—

Fundatrigenia

Colour: Generally yellowish green. Head and thorax blackish brown. Wing veins and stigma brown.

Structural characters: Abdomen with several dusky tubercles at the lateral margins. Antennae short, as long as one-third the length of the body, 6-jointed; joint II somewhat longer than I; III the longest, longer than IV and

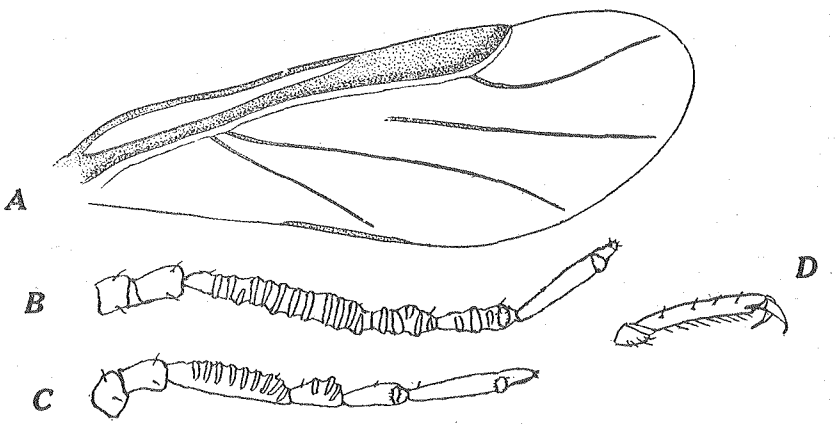


Fig. 6

Pemphigus matsumurai MONZEN

Fundatrigenia: *A*, fore wing; *B*. antenna; *D*, hind tarsus.
Sexupara: *C*, antenna.

V taken together; IV slightly shorter than V; VI longer than V; secondary sensoria present on III, IV and V, annular, not quite encircling the joints but irregular; number of the sensoria as follows:— 9–12 on III, 4–5 on IV, 3 on V.

Head and mesothorax without any wax glands; prothorax with wax glands. Rostrum attaining nearly to the 2nd coxa. Wing venation normal, "A" and "Cu" not separated at the bases. Hind wings normally possessing four hooklets, rarely three in number. Cornicles invisible.

Measurements: Body, 2.5–2.9 mm.; antennae, 0.85 mm. (I–0.05, II–0.08, III–0.30, IV–0 10, V–0.12, VI–0 20); fore wings, 3.30 × 1.20 mm.; hind femora, 0.56 mm.; hind tibiae, 0.88 mm.; hind tarsi, 0.22 mm.

Sexupara

Colour: Closely resembles the fundatrigenia.

Structural characters: Antennal joint II longer than I; III the longest, longer than IV and V taken together; IV as long as or a little shorter than V; VI about twice the length of V; secondary sensoria restricted to joints III and IV, linear, arranged in a straight row on the dorsal side as follows:— 8–9 on III, 3–4 on IV.

Measurements: Body, 2.3 mm; antennae, 0.83 mm. (I–0.07, II–0.09, III–0.24, IV–0.10, V–0.11, VI–0 22); fore wings, 3.0 × 1.0 mm.; hind femora, 0.50 mm.; hind tibiae, 0.76 mm.; hind tarsi, 0.20 mm.

Described from one paratypic specimen (Fundatrigenia) received from Prof. K. MONZEN and from other specimens of the fundatrigenia and sexupara collected at Sapporo during July and October, 1922-24, by the author.

Food plant— *Populus Maximowiczii* (Doronoki).

Localities— Hokkaido (Sapporo); Honshu (Morioka).

Biology and Notes— This species rather common near Sapporo. It makes a globous or spherical gall upon the petioles near the bases of the leaves of *Populus Maximowiczii*. The gall is concolorous with the leaves at first and then it becomes tinged with red day by day. The full-grown gall is brown completely closed, nearly 10 mm. in diameter, with a rather long and narrow slit. It appears that this species overwinters in the egg stage on the poplar. The fundatrix makes its gall and the progeny becomes alate and flies away to the secondary host plant, which may be *Sonchus arvensis*.

Japanese name—*Doro-no-tamafushi*.

Taxonomy— The gall of this species is closely allied to that of *Pem. bursarius* (L.) This species, however, can be distinguished from the latter in that the fundatrigenia has no sensoria on antennal joint VI. It also resembles *Pem. populi-globuli* FITCH, but examining the examples of the latter sent by G. F. KNOWLTON from Utah, it differs from the latter in the large size of the body which is 2.5 to 2.9 mm. as well as in the absence of sensoria on antennal joint VI of the fundatrigenia.

7. ***Pemphigus niisimae*** MATSUMURA (Pl. II, fig. 9)

MATSUMURA, A Collection of Essays for Mr. Y. NAWA, p. 85, Pl. XIII, fig. 7 (1917); HORI, Hokkaido Agr. Expt. Sta., Rept. No. 23, Pl. II, fig. F (1929); MONZEN, Saito Ho-on Kai, Monogr. No. 1, p. 35, Pl. II, fig. 7, Pl. XI, fig. 42 (1929).

Fundatrix

Colour: Generally greenish brown. Head, antennae and legs dusky brown.

Structural characters: Body oval with white secretion. Head very small with a median white line. Antennae short, as long as one-sixth the length of the body, 4-jointed; joint I wider and as long as II; III the longest, as long as I and II taken together; III and IV with each a circular primary sensorium. Rostrum broad and short, reaching slightly beyond the 1st coxa; the apical two joints subequal in length. Legs thick and short; hind femora as long as the tibiae or the antennae.

Measurements: Body, 2.6 × 1.8 mm.; antennae, 0.44 mm. (I-0.08, II-0.09, III-0.16, IV-0.11); hind femora, 0.44 mm.; hind tibiae, 0.44. mm.; hind tarsi, 0.12 mm.

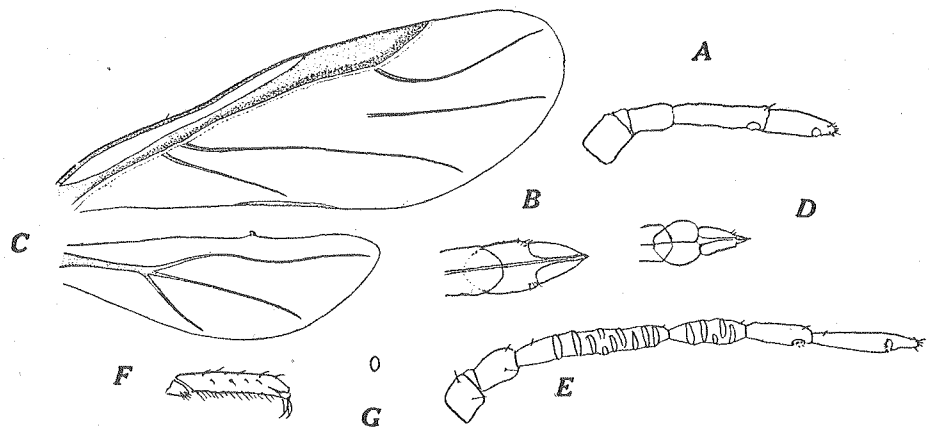


Fig. 7

Pemphigus niisimae MATSUMURA

Fundatrix: *A*, antenna; *B*, rostrum. Fundatrigenia: *C*, wings; *D*, rostrum; *E*, antenna; *F*, hind tarsus; *G*, cornicle.

Fundatrigenia

Colour: Generally yellowish green. Head, thorax and antennae black. Wing veins and stigma brown.

Structural characters: Antennae 6-jointed, shorter than half the length of the body; joint II slightly longer than I; III the longest, as long as IV and V taken together; IV a little longer than V; VI much longer than V; III and IV with somewhat broad linear secondary sensoria, the number of sensoria as follows:— 7–9 on III, 4–5 on IV; the last two joints with each the typical primary sensorium and without secondary sensoria. Abdomen with several dusky tubercles at the lateral margins. Rostrum short, reaching slightly beyond the 1st coxa; the last two joints nearly equal in length. Wing venation normal; stigma narrower than those of *Pem. dorocola* and *Pem. matsumurai*; "A" and "Cu" slightly separated at the bases. Hind wings with three hooklets; two diagonals not separated at the bases.

Measurements: Body, 1.60 mm. (f. minima), 2.30 mm. (f. maxima); antennae, 0.70 mm. (f. minima) (I–0.056, II–0.074, III–0.20, IV–0.10, V–.0 09, VI–0.18); 0.86 mm. (f. maxima) (I–0.064, II–0.086, III–0.27, IV–0.14, V–0.12, VI–0.18); fore wings, 2.5–3.0 × 0.9–1.0 mm.; hind femora, 0.44 mm.; hind tibiae, 0.68 mm., hind tarsi, 0.18 mm.

Described from 20 fundatrigeniae and 5 fundatricis collected at Sapporo, in June and July, 1924, by the author.

Food plant— *Populus Maximowiczii* (Doronoki).

Localities— Hokkaido (Sapporo and Hakodate); Honshu (Morioka); East Siberia (after MORDVILKO, 1935).

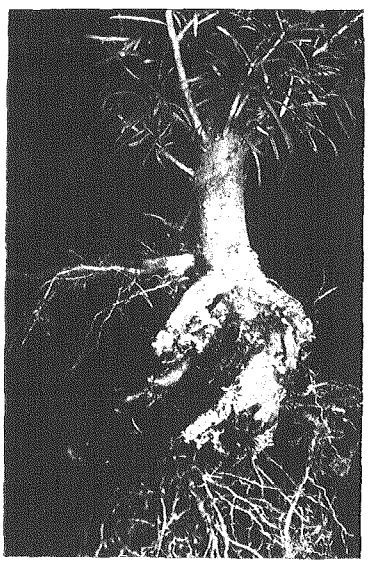
Biology and Notes— This species forms a cockscomb-like gall on the upper side of the leaves of *Populus Maximowiczii*. The gall is yellowish in colour, long and narrow, 30-40 mm. in length and 4 mm. in width. The edge of the gall is not smooth, with several tubercles, and the underside is loosely closed. It is evident that this aphid overwinters on the poplar in the egg stage and in the latter part of June the spring migrant or fundatrigenia appears and migrates to the secondary host plant. No definite information with regard to the alternate host has been reported.

Japanese name—*Doro-no-tosakafushi.*

Taxonomy— This species is distinct from the allied species of this group in the shape of the gall and in the absence of the sensoria on antennal joints V and VI of the fundatrigenia.

Explanation of Plate II.

1. Colony of the summer form of *Prociphilus* (*Prociphilus*) *oriens* MORDV. on the main root of *Abies Mayriana*. (Photo by H. KÔNO).
2. Pseudogall on the leaf of *Fraxinus excelsissima* caused by *Prociphilus* (*Prociphilus*) *oriens* MORDV.; normal foliage on the right and infested foliage on the left.
3. Pseudogall on the leaf of *Lonicera Morrowii* caused by *Prociphilus* (*Stagona*) *kônoi* sp. nov.
4. Colony of the summer form of *Prociphilus* (*Stagona*) *kônoi* sp. nov. on the rootlets of *Picea Glehni*. (Photo by H. KÔNO)
5. Bag-like gall on the leaf of pear, *Pirus communis*, caused by *Prociphilus* (*Prociphilus*) *kuwanai* MONZ.
6. Bead-like gall on the leaf of *Populus Maximowiczii* caused by *Thecabius lati-sensoria* sp. nov.
7. Twig gall on *Populus Maximowiczii* caused by *Pemphigus dorocola* MATS. (after K. MONZEN, 1929).
8. Leaf petiole gall on *Populus Maximowiczii* caused by *Pemphigus matsumurai* MONZ.
9. Cockscomb-like gall on the leaf of *Populus Maximowiczii* caused by *Pemphigus niisimae* MATS.



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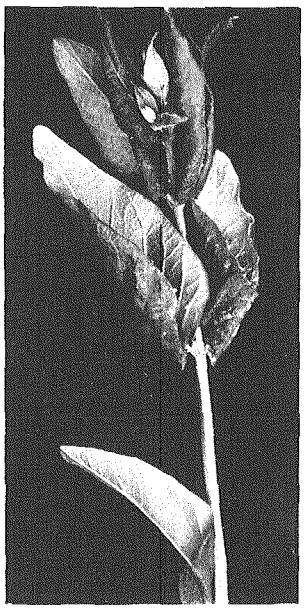

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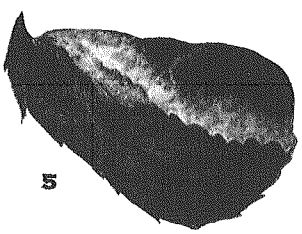

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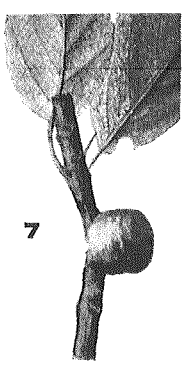

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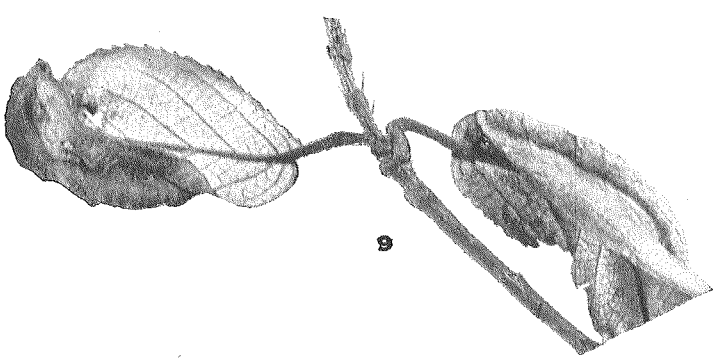

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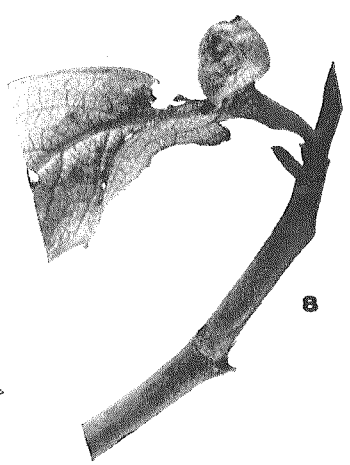

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M. Hori