

CONTRIBUTIONS TO A MONOGRAPH OF THE APHIDIDAE OF EUROPE

III. THE GENERA PHARALIS LEACH, 1826¹⁾; MICROSIPHUM CHOL., 1902; ANTHRACOSIPHON NOV. GEN.; DELPHINIOBIUM MORDV., 1914; CORYLOBIUM MORDV., 1914; ACYRTHOSIPHON MORDV., 1914; SUBACYRTHOSIPHON NOV. GEN.; SILENOBIUM BÖRNER, 1939; TITANOSIPHON NEVSKY, 1928; METOPOLOPHIUM MORDV., 1914; CRYPTAPHIS NOV. GEN.; RHODOBIUM NOV. GEN.; IMPATIENTINUM MORDV., 1914; AULACORTHUM MORDV., 1914

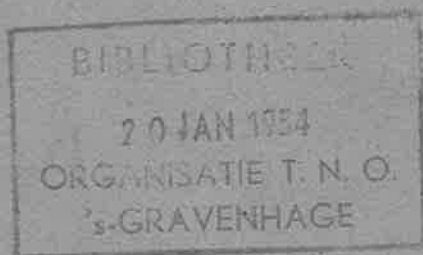
by

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by

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Pharalis Leach, 1826¹⁾.

A. NOTE.

Since the publication of the preceding Contribution, Dr. Börner, Naumburg/Saale most kindly sent me cotypes of his *Microsiphum enslini* Börner, 1933. After examining the insects I find that they can better be placed in *Pharalis* Leach.

B. SYNONYMY.

The synonymy can easily be extracted from that of *Pharalis tanacetii* (L.). The following item is new:
1933. Börner, C., Kl. Mitt. über Blattl., ed. Börner, p. 4, *Microsiphon* Chol.

C. GENERAL BIOLOGY.

The species which at present are known all live on the stems of *Tanacetum* (Compositae, Anthemideae). They do not migrate. Though Börner does not mention it in *Pharalis enslini*, the species most probably are myrmecophilous.

1) Continued from Temminckia, vol. IV, p. 132, 1939.

D. GEOGRAPHICAL DISTRIBUTION.

Species of this genus have been recorded from the Northern Hemisphere only. I have not yet examined material from North America, so that I do not know whether the American identifications were correct.

E. GENERAL MORPHOLOGY.

I. Macroscopical morphology.

Body of medium size, rather broad and *Aphis*-like. Waxy excretion absent. Colour dark, sometimes with the disc of the abdomen dark, the margins red. Antennae, siphunculi and cauda blackish, sclerotic. Larvae with about the same colour-pattern as the imagines. Alatae and apterae with the same sclerotisation of abdomen, in the former the marginal sclerites better developed. Males green.

II. Microscopical morphology.

1. Head. Rather broad, without true frontal tubercles, but front more or less concave, smooth, with long and fine hairs along the margin and ventrally; head dorsally with very short, inconspicuous hairs, without tubercles on vertex. Antennae of 6 segments, long, about as long as the body; in fundatrices only the IIIrd segment with rhinaria, in other forms IIIrd, often IVth and rarely Vth segment with numerous rhinaria, which on the IIIrd segment are irregularly grouped along one side of the segment, on the other segments more or less in a row. Antennal hairs at least on basal segments very fine and long, of the same type as those on the venter. Rostrum rather long, with rather acute, but less stiletto-shaped apex than in *Macrosiphoniella* Del Guercio.

2. Thorax. Normal. Legs long, blackish sclerotic, with only the bases of the femora paler. At least the femora with long, fine, acute hairs, the tibiae with often thicker, shorter and often bluntish hairs; first tarsal joints with 3 hairs. Venation of the wings normal, the veins not darkly bordered.

3. Abdomen. Tergum without sclerites, at most with rudiments of a sclerite in front of each siphunculus in apterae. In alatae marginal sclerites are always little developed. Both forms with a transverse sclerotic bar on VIIIth tergite and often scattered sclerites on VIIth tergite. Marginal tubercles sometimes present on segments II-V, but always very small. Spinal tubercles on VIIIth tergite absent. Hairs on tergum very short and even hardly visible on the anterior segments, but those on the posterior tergites often very much longer. Siphunculi cylindrical, sclerotic, black,

constricted at the very base, imbricated and the imbrications more or less gradually passing into reticulations of the *Dactynotus*-type; flange completely absent. Cauda rather broadly triangular, not much longer than broad at base, acute or acuminate even, darkish sclerotic, basally slightly paler, with multihaired character. Subanal plate more or less resembling a conical processus under the cauda, sometimes even cauda-like. The whole body ventrally with long, thin, acute hairs, which extend at least to the femora, the basal antennal segments and the front. The subgenital plate with the anterior half paler and there usually with many more hairs than the usual two.

F. MORPHOLOGICAL RELATION TO OTHER GENERA.

In *Pharalis enslini* Börner the subanal plate in dorsal view looks like a very short triangular cauda. This character is also known in the Nearctic genus *Bipersona* Hottes, 1926¹⁾, which seems to differ in the cauda consisting as it were of two parts: a broad basal part, which is conical, as in *Pharalis*, and on top of that a narrow, obelisk-like apical part. This type of cauda is present in some species of *Microsiphum*, though not nearly so pronounced. Therefore it seems, that also *Bipersona* Hottes must be included in the small group of genera allied to *Pharalis* Leach.

G. TAXONOMY OF SPECIES.

I. KEY TO SPECIES.

- 1(2) Siphunculi much shorter than the cauda, about 1/20 times as long as body. *Ph. enslini* (Börner), p. 181.
 2(1) Siphunculi considerably longer than the cauda. *Ph. tanacetii* (L.), p. 183.

II. DESCRIPTION OF THE SPECIES.

Pharalis enslini (Börner, 1933) (Pl. XII fig. 1).

1933. Börner, C., Kl. Mitt. über Blattl., ed. Börner, p. 4, *Microsiphon enslini*.

Apterous viviparous female.

Morphological characters. Body rather broadly oval. Head sclerotic, remainder membraneous, with rudiments of a sclerite in front of the siphunculi sometimes present. Hairs on tergum extraordinarily short, longer towards the cauda; VIIIth tergite with about 6-8 hairs, which are about $1\frac{3}{4}$ — $2\frac{1}{4}$ times as long as basal diameter of IIIrd ant. segment. Ventral hairs very long, fine and acute, numerous, about 12—16 times as long as

1) Hottes, F. C., 1926, Proc. Biol. Soc. Washington, vol. XXXIX, p. 115, *Bipersona*. Soliman, L. B., 1927, Univ. Cal. Publ. Ent., vol. IV, pp. 96-98, *Bipersona*.

the spinal hairs of Ist-IIIrd abd. tergite. Front without distinct frontal tubercles, rather strongly concave only, with hairs of the ventral type, but vertex with normal, short hairs. Antennae about as long as the body, IIIrd segment with 24—35 rather tuberculate rhinaria, irregularly placed along one side, IVth with 5—12 rhinaria in a row, Vth only exceptionally with 1 or 2 rhinaria. Antennal hairs thin, fine, those on IIIrd segment $1\frac{1}{5}$ — $1\frac{1}{3}$ times as long as the basal diameter of this segment. Rostrum reaching to the hind coxae or just past, apical segment acute, with approximately straight margins, length about $\frac{9}{10}$ of the second joint of hind tarsi. Siphunculi short, about $\frac{1}{20}$ of the length of the body only, sclerotic, approximately cylindrical with a constriction at the very base, more or less imbricated, with apical $\frac{1}{3}$ — $\frac{1}{2}$ distinctly reticulated, without any flange. Cauda short and broadly triangular, acute, with pale base and dark apex, $1\frac{4}{7}$ — $1\frac{5}{7}$ times as long as the siphunculi, with 16—23 hairs. Subanal plate in dorsal view triangular, rather acute, half as long as the cauda, but much broader. Subgenital plate with 10—15 hairs on anterior half and the normal row along the posterior margin. Legs sclerotic black, with the basal part of the femora colourless, hairy; first tarsal joints with 3 hairs.

Colour (according to Börner, 1933). "Blackish, legs from the middle of the femora black, like the antennae, "flagellum" (probably processus terminalis) pale." Cauda and siphunculi probably also black.

Measurements of two specimens: (I) Length of body: 2.86 mm; ant.: 2.76 mm; siph.: 0.14 mm; cau.: 0.24 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{72}{IV} : \frac{66}{V} : \frac{(24 + 117)}{VI}$. Rhin. on IIIrd ant. segment: 28 and 29; on IVth: 9 and 11; on Vth: 1 and 0. (II) Length of body: 2.94 mm; ant.: 2.76 mm; siph.: 0.14 mm; cau.: 0.22 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{81}{IV} : \frac{69}{V} : \frac{(23 + 135)}{VI}$. Rhin. on IIIrd ant. segment: 27 and 31; on IVth: 7 and 11; on Vth: 0 and 0.

Hostplant: *Tanacetum vulgare*.

Geographical distribution: Only known from Donaustaufen near Regensburg, Germany.

Biology: According to the label of the cotypes, which Dr. Börner sent me, the insects were taken on the middle of the stems of their host on June 25th. At that time apparently no alatae were present.

Note. There is no reason to place this species in *Microsiphum* Chol. as Börner does. He separates (1933) the genera *Pharalis* Leach and *Microsiphum* Chol. by the comparative length of the siphunculi and cauda. As we have seen in *Macrosiphoniella* Del Guercio it is not right to use this character

generally, though there is every reason to regard *Microsiphum* as a *Pharalis* with strongly reduced siphunculi (see p. 187). The few species which have been described of the real *Microsiphum* Chol. perfectly agree in that the siphunculi are reduced to little more than rings. It would be spoiling a homogeneous genus to include *enslini* in *Microsiphum*.

Types: In the collection of Dr. Börner, Naumburg (Saale) and in the author's collection (6 apterae viviparae).

Pharalis tanaceti (L., 1758).

Apterous viviparous female (late summer forms).

Morphological characters. Much like those of the described early summerforms¹⁾. Body smaller. Antennae sometimes as long as body; IIIrd segment with about 4-12 protruding rhinaria about the middle, or over whole length; IVth segment without rhinaria. Siphunculi sometimes hardly or not reticulated. Cauda with sometimes as few as 11 hairs. Subgenital plate on anterior half with 2-10 hairs, usually with about 4-6.

Colour. As in the other apterae.

Measurements of one specimen: Length of body: 2.13 mm; ant.: 2.01 mm; siph.: 0.30 mm; cau.: 0.19 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{65}{\text{IV}} : \frac{53}{\text{V}} : \frac{(26 + 129)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 9 and 10. (From *Tanacetum vulgare*, Odobesti, Roumania, 20-VII-'37, leg. Dr. Knechtel).

Oviparous female.

Morphological characters. Very much like the preceding form, but more swollen. Siphunculi a little shorter. Hind tibiae slightly swollen, not darker than the other tibiae, with mainly on basal half 0-25 small pseudosensoria. Subgenital plate with many hairs on anterior half, more or less perforated along the median line or divided into two parts.

Colour. As in other apterous females.

Measurements of one specimen: Length of body: 2.51 mm; ant.: 1.84 mm; siph.: 0.25 mm; cau.: 0.20 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{60}{\text{IV}} : \frac{60}{\text{V}} : \frac{(28 + 118)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 7 and 9. (Bennekom, 10-X-'46).

Apterous male.

Morphological characters. Body very narrow, small. Head and thorax dark to blackish sclerotic, abdomen membranous, with both dorsally and

1) Temminckia, vol. IV, p. 129-132, 1939.

ventrally distinct, blackish transverse pleural sclerites intersegmentally, and ventrally scattered, much paler sclerites mainly laterally. Antennae shorter than body, with very exceptional sensoriation: IIIrd segment with 6-25, but in most specimens with less than 15 bulging rhinaria, as in late summer apterae viviparae; IVth segment with 1-12 little conspicuous rhinaria, often most on distal half; Vth with 0-7 rhinaria. Siphunculi very small and thin, not or hardly reticulated. Cauda very short, as in *Sappaphis* Mats., with some 5-10 hairs only. Genitalia strongly developed, with large, blunt, very hairy claspers. Remainder as in other forms.

Colour. Head and thorax blackish grey, but abdomen rather bright pale green. Remainder as in apterae viviparae.

Measurements of one specimen: Length of body: 1.60 mm; ant.: 1.27 mm; siph.: 0.10 mm; cau.: 0.09 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{85}{IV} : \frac{65}{V} : \frac{(39+138)}{VI}$. Rhin. on IIIrd ant. segment: 6 and 7; on IVth: 3 and 1; on Vth: 3 and 3.

Notes. When receiving apterae, identified as *lilacina* Ferr. from Dr. Knechtel, Bucarest, I thought that they belonged to a new species, because of their small number of rhinaria, hairs on the subgenital plate, etc. Similar specimens were received from Prof. Essig, who had them from Italy, but in 1946 I had a colony in front of my house under observation and found that in summer the morphology of the apterae changed considerably and did not agree with the material in my collection, described in the preceding part of this paper¹⁾. Therefore a special description of apterae belonging to the later generations is published here. The sexuales are described for the first time. The males are as larvae bright green and resemble larvae of a *Macrosiphoniella*. Also when mature they do not look like the females, which lay about 10-15 pale green eggs each. They are deposited at the bases of the old stems and on debris at the bases of the plants; in a few days they turn shiny black.

Microsiphum Cholodkovsky, 1902.

A. HISTORY.

The genus was erected by Cholodkovsky for *Microsiphum ptarmicae* Chol., collected on *Achillea* in the Crimea. He characterizes it by the rudimentary siphunculi and compares it with *Brachycolus* Buckt. and *Cryptosiphum* Buckt., which also have very reduced siphunculi.

The genus is very homogeneous and has been accepted by all authors of generic classifications. Most of these emphasize the very short siphunculi, but (with the exception of Mordvilko, 1914) make the fundamental mistake

1) Temminckia, vol. IV, p. 129-132, 1939.

of placing it somewhere near *Aphis* L. (Baker, 1920) or *Anuraphis* (Börner, 1930). Later, in 1933, Börner himself has corrected this when he placed it more near *Macrosiphum* Pass. and isolated it, together with *Pharalis* Leach, because of the very remarkable chaetology. The species, which have been described as *Microsiphums* in the Old World, all belong in this genus, with the exception of "*Microsiphon*" *enslini* Börner, which is better placed in *Pharalis* Leach (see p. 187).

B. SYNONYMY.

The synonymy is quite simple, but some remarks should be made here. Cholodkovsky twice described *Microsiphum ptarmicae*, both times as new genus, new species, once in Russian, in 1902, once in German, in 1908. In a footnote to the latter diagnosis he refers to the first, which I have not seen. The genus, however, is generally quoted as from 1908 (Wilson & Vickery: *M. ptarmicae* Chol., Baker, 1920, Oestlund, 1922, even Nevsky, 1929). In 1907 G. del Guercio also erected a genus *Microsiphon*, with *Aphis tormentillae* Pass. as type, a synonym of *Aphis* L.

In 1933 Börner starts to write "-siphon", instead of -siphum, but it is evident, that he means *Microsiphum* Chol., when he writes *Microsiphon*.

1902. Cholodkovsky, N., Jahrb. d. St. Peterburger Forst-Inst., part 8, *Microsiphum*, type *Microsiphum ptarmicae* Chol.
 1908. Cholodkovsky, N., Zool. Anz., vol. XXXII, no. 23, p. 687, *Microsiphum* Chol.
 1914. Mordvilko, A. K., Faune d. l. Russie, Ins. Hémipt., vol. I, livr. 1, p. 67, *Microsiphum* Chol.
 1920. Baker, A. C., U. S. Dept. of Agric., Bull. 826, p. 49, *Microsiphum* Chol.
 1922. Oestlund, O. W., 19th Rept. State Entom. Minnesota, p. 140, *Microsiphum* Chol.
 1928. Nevsky, W. P., Entom. Mitteilungen, vol. XVII, p. 191, *Microsiphum* Chol.
 1929. Nevsky, W. P., Tli Srednei Asii, p. 113, *Microsiphum* Chol.
 1930. Börner, C., Archiv f. Klass. u. Phylog. Entom., vol. I, p. 170, *Microsiphum* Chol.
 1931. Judenko, E., Bull. Ent. d. l. Pologne, vol. X, p. 114, *Microsiphum* Chol.
 1933. Börner, C., Kl. Mitt. über Blattl., ed. Börner, p. 1, *Microsiphon* Chol.

C. GENERAL BIOLOGY.

The hitherto described species live on Compositae, exclusively on species of the Anthemideae. From the genus *Artemisia* 3 species have been described, and 2 from *Achillea*. They live on subterranean or superterranean parts of the plants, mainly on the stems, and apparently do not cause malformation of the hostplant. Probably migration does not occur in this genus, though very little is known about hibernation. Up to now every species has been recorded from one hostplant only, so that it seems that the species are monophagous.

Of only one species sexuales are known, the males being apterous. According to E. Judenko the eggs of this species, *M. woronieckae* Jud., are pale yellow, when just laid.

Of several species myrmecophily has been recorded and most probably all species are myrmecophilous.

D. GEOGRAPHICAL DISTRIBUTION.

A number of species have been described from the Palaearctic zone, from Central and Northern Europe to Turkestan. It would seem as if the genus was restricted to the Old World. American species have occasionally been placed in *Microsiphum* Chol., but the single American "*Microsiphum*" which I examined does not belong here¹).

E. GENERAL MORPHOLOGY.

I. Macroscopical morphology.

Body 1.70-3.20 mm long, pyriform, the head and the prothorax rather narrow, the abdomen very broad. Colour varying from green to reddish, sometimes within the species (*M. giganteum* Nevsky), which suggests that, like in other *Macrosiphum*-like aphids, a green and a red variety of the same species exist. Antennae and legs always very dark. The colour of the larvae is about like that of the mature forms.

II. Microscopical morphology.

1. Head. Sclerotic in all forms, without distinct frontal tubercles, but with rather strongly concave front, which is quite smooth. Frontal hairs long, thin, but those on vertex always very short. Antennae as long as or longer than the body, rather uniformly sclerotic, thick, stiff, imbricated; in apterae viviparae and oviparae IIIrd ant. segment always with numerous rhinaria, which usually are absent on the basal $\frac{1}{4}$ — $\frac{1}{3}$ part and which are not confined to basal half; sometimes also the IVth segment with rhinaria; processus terminalis $3\frac{1}{2}$ — $4\frac{1}{2}$ times as long as base of VIth segment, longer than IIIrd segment. Antennal hairs like the frontal ones on segment I, II and sometimes the base of III; on the remainder of the

1) I erect the new genus **Microsiphoniella** for *Chaitophorus artemisiae* Gill., 1911, which is placed by Gillette & Palmer, 1932, Ann. Ent. Soc. America, vol. XXV, p. 475, in *Microsiphum* Chol. The new genus does not show the peculiar short dorsal and long ventral hairs of *Microsiphum*, but spiny, very blunt dorsal hairs, siphunculi with a conical base and small but distinct flange, without reticulations and in the apterous forms a completely sclerotic, blackish pigmented tergum. The general shape and also the structure of the cauda and subanal plate are like *Microsiphum* Chol.

antennae shorter than the diameter of the IIIrd ant. segment. Eyes normal. Rostrum long, reaching considerably past the hind coxae, with the apical segment rather acute, but not with distinctly concave margins as in *Macrosiphoniella* Del Guercio. No spinal tubercles on vertex.

2. Thorax. Normal. Legs long; femora with the same hairs as the venter, which sometimes occur on the base of the tibiae also; tibiae with shorter, spiny, semiblunt hairs; tarsi with 3, 3, 3 hairs. Wings normal.

3. Abdomen. Tergum not sclerotic, also without sclerites. The last segments also dorsally with long hairs like the sternites. VIIIth segment rather constricted, without spinal tubercles. Structure of the male tergite unknown. Siphunculi very short, hardly longer than thick, straight, cylindrical, flangeless, imbricate-striate, usually with some rows of hexagonal sculpture at apex. Cauda triangular, rather acute to acuminate, as long as its basal width, blackish sclerotic, with a rather large number of hairs. Subanal plate semiglobular, rather stiff. Subgenital plate probably always with numerous hairs on anterior half.

F. MORPHOLOGICAL RELATION TO OTHER GENERA.

As I have pointed out in Contribution no. 2 (*Temminckia*, vol. IV, p. 128), and here on p. 188, *Pharalis* Risso and *Microsiphum* Chol. are very closely allied, and probably *Bipersona* Hottes ought to be placed with them. The most curious character is the occurrence of two totally different types of hairs on the head, the absence of a flange at the apex of the siphunculi and the short triangular cauda. There are other genera with flangeless siphunculi, but they do not belong here.

The difference between *Pharalis* Risso and *Microsiphum* Chol. is in the length of the siphunculi. In the latter genus they are hardly longer than thick, in *Pharalis* Risso much longer. Except this there is no difference. The reason why I think it better to separate the two genera is, that the known species of *Microsiphum* (*M. ptarmicae* Chol., *M. giganteum* Nevsky, *M. wahlgreni* nov. spec., *M. jazykovi* Nevsky, *M. woronieckae* Judenko, *M. millefolii* Wahlgren) perfectly agree as to the shape of their siphunculi. If one includes "*M.*" *enslini* Börner, there is no reason to exclude *Pharalis tanacetii* (L.); *enslini* is intermediate between *Microsiphum*, as defined here, and *Pharalis tanacetii* (L.).

G. NOTES ON PHYLOGENY.

In most papers on generic classification one finds this genus in one group with *Aphis* L. or *Anuraphis* Del Guercio. Only Mordvilko and

Nevsky place it near *Macrosiphum* Pass. At the same time *Pharalis* Leach is generally placed under *Macrosiphum* Pass. Indeed it is not easy to decide where these genera belong. Reticulated siphunculi in the Aphidina occur in *Macrosiphum* and its allies only. Therefore *Pharalis* seems to belong in this relationship and consequently also *Microsiphum*, where still a few hexagonal cells are found.

Myrmecophily is exceptional in *Dactynotus*-like genera. One finds it in *Titanosiphon* Nevsky, *Pharalis* Leach and *Microsiphum* Chol. only. As we saw (Temminckia, vol. IV, p. 129) myrmecophily frequently results in reduction. Now reduction can be the only reason for the absence of a flange to the siphunculi (cfr. *Semiaphis* v. d. G., *Aspidaphis* Gill., etc.) in *Pharalis* and *Microsiphum*. In *Microsiphum* the reduction has reached a higher degree, also in the size of the siphunculi. In this regard there is continuity from *Pharalis tanacetii* (L.) via *P. enslini* (Börner) to *Microsiphum* Chol.

In many regards *Microsiphum* Chol. and *Pharalis* Leach stand completely apart from the other Aphids of this group (which form a strongly continuous series), though they can be considered as derived from it.

H. TAXONOMY OF SPECIES.

I. KEY TO SPECIES.

Apterous viviparous females.

- 1(2) IIIrd ant. segment almost up to the middle with a number of long, fine hairs like those on the front and venter, more distally with shorter, spiny hairs.
 IIIrd ant. segment with about 6-10 rhinaria, usually restricted to basal $\frac{2}{3}$ part.
 IVth ant. segment without rhinaria. On *Artemisia vulgaris*.
M. woronieckae Judenko, p. 192.
- 2(1) IIIrd ant. segment with at most a few longer hairs near base, or only with spiny hairs shorter than the basal diameter of the segment. IIIrd ant. segment with 10-34 rhinaria over nearly whole length and also the IVth segment frequently with some rhinaria.
- 3(4) IIIrd ant. segment only with spiny hairs shorter than its basal diameter, and with about 15-34 rhinaria. Siphunculi with at most one complete row of hexagonal cells at apex. On *Artemisia absinthium*. *M. wahlgreni* nov. spec., p. 190.
- 4(3) IIIrd ant. segment normally near base with 1-3 conspicuously longer and thinner hairs than those near its apex. IIIrd ant. segment with about 11-19 rhinaria. Siphunculi with several rows of distinct hexagonal reticulation on distal half. On *Achillea millefolium*. *M. millefolii* Wahlgren, p. 188.

II. DESCRIPTION OF THE SPECIES.

Microsiphum millefolii Wahlgren, 1940 (Pl. XII fig. 2).

1940. Wahlgren, E., Opuscula Entomologica 1940, p. 1-2, *Microsiphum millefolii*.

Apterous viviparous female.

Morphological characters. Body pyriform, with rather narrow head and prothorax but with the abdomen rather swollen and broad. Hairs on dorsum just longer than thick, exceedingly short, those on venter rather long, fine and acute. Head sclerotic, dark. Frontal tubercles not much developed, but the front strongly and widely concave (with a slightly convex part in the middle), so that seemingly broad, conical, strongly diverging frontal tubercles are present. Median frontal tubercle absent. Hairs on front about twice as long as basal diameter of IIIrd ant. segment, of the same type as those on venter, but different from those on vertex, which are like those on dorsum. Antennae uniformly dark sclerotic, thick, especially the IIIrd segment, about as long as body. IIIrd segment on one side with about 11-19 rhinaria of various size, not in a row; IVth segment also (always?) with a few (2-4) rhinaria, usually towards the distal half. Processus terminalis $4-4\frac{1}{2}$ times as long as base of VIth segment, about $1\frac{1}{3}-1\frac{1}{2}$ times as long as IIIrd segment. With the exception of one to three near base the hairs on the IIIrd segment considerably shorter and thicker than those on venter, about $\frac{5}{6}-\frac{6}{7}$ of its diameter at its basal articulation; the processus terminalis with some hairs which are slightly longer than its diameter and which have blunt apices; the hairs on the basal segments only slightly shorter than those on venter. Rostrum long, reaching well beyond the hind coxae; apical segment a little shorter than the rather long second joints of the hind tarsi, with straight, not convex margins, with about 6 hairs besides the apical 3 pairs. Siphunculi about as long as wide, at base distinctly constricted in lateral view because at base their cross-section is transversely oval, seemingly cylindrical in frontal view; the apex is circular; basal $\frac{2}{3}$ sclerotic, dark, remainder colourless, more or less reticulated on distal half. VIIIth tergite with some 16 hairs. Cauda conical, about as long as its basal width, distinctly acuminate, dark sclerotic, on distal $\frac{3}{8}$ with about 9-12 hairs, part of which often is bluntish or sometimes enlarged at apex. Subgenital plate with a number of hairs on anterior half. Legs rather long, the hairs on the femora only little shorter than those on the venter, but those on tibiae distinctly thicker and shorter. First tarsal joints with 3, 3, 3 rather short hairs.

Colour (according to Wahlgren, 1940). Colour of the body in life yellow-, grey- or dark red to dark brown. Judging from material in alcohol the antennae, head, legs, siphunculi and cauda are dark, excepting the bases of the femora.

Measurements of two specimens: (I) Length of body: 2.14 mm; ant.: 2.22 mm; siph.: 0.04 mm; cau.: 0.13 mm. Prop. of ant. segments:

$\frac{100}{III} : \frac{76}{IV} : \frac{70}{V} : \frac{(30+125)}{VI}$. Rhin. on IIIrd ant. segment: 17 and 18; on IVth: 2 and 2. (II) Length of body: 2.22 mm; ant.: 2.20 mm; siph.: 0.04 mm; cau.: 0.13 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{89}{IV} : \frac{72}{V}$ $\frac{(38+140)}{VI}$. Rhin. on IIIrd ant. segment: 12 and 13; on IVth: 4 and 2.

Hostplant: *Achillea millefolium*.

Geographical distribution: Only known from Höör (Schonen, Sweden).

Biology: Dr. E. Wahlgren collected this species from the subterranean parts of *Achillea millefolium* where it formed colonies. At the dates of collection (24-VII and 9-VIII-'39) only larvae and apterae viviparae were present. Whether ants were present is not stated, but it is probable that they were in attendance.

Notes. I want to thank Lector Dr. E. Wahlgren and Prof. Dr. N. A. Kemner for their kindness to send me the type material. It consists of a number of apterae and larvae, preserved in alcohol. I have macerated and mounted two apterae, which I have described here. A few characters are not mentioned in the original description, such as the presence of rhinaria on the IVth ant. segment.

Dr. Wahlgren supposes that the species is different from the genotype, *M. ptarmicae* Chol., but this is not certain. Cholodkovsky (1908) undoubtedly figures and describes nearly fullgrown larvae, which accounts for the different interrelations of the antennal segments and the fact that no rhinaria are present. In larvae of *M. millefolii* Wahlgren, as in those of other species, the IIIrd ant. segment is frequently or usually shorter than the IVth. I never saw material from *Achillea ptarmica*, so that this question must remain unsettled for the present.

Types: Cotypes (several apterae viviparae in alcohol and 2 in slides) in the Entomological Department of the Zoological Institute of the University of Lund, Sweden.

***Microsiphum wahlgreni* nov. spec.**

1938. Wahlgren, E., Entomologisk Tidskrift, vol. LIX, p. 172, *Microsiphum jazykovi*.

Apterous viviparous female.

Morphological characters. Body shortly pear-shaped, with rather narrow head and thorax, about 1.90—2.20 mm long. Tergum membranous, with on abdomen faint pleural intersegmental sclerites. Dorsal hairs very short and inconspicuous, on IIIrd abd. segment as long as $\frac{1}{7}$ — $\frac{1}{5}$ of the basal

diameter of IIIrd ant. segment, $\frac{1}{12}$ — $\frac{1}{8}$ of the ventral hairs on the same abd. segment; hairs on abd. tergites V—VIII about as long as the ventral hairs on those segments; VIIIth tergite with about 8—14 hairs. Head sclerotic, dark. Front concave with a faintly indicated median tubercle, with long and fine hairs. Antennae $1\frac{1}{10}$ — $1\frac{1}{3}$ times as long as body, completely dark sclerotic, rather thick, imbricated; IIIrd segment with 15-34 bulging rhinaria of varying size along one side from basal $\frac{2}{7}$ —apex; IVth segment especially in specimens with faint traces of ocelli with some rhinaria, up to 7; processus terminalis $1\frac{1}{3}$ — $1\frac{2}{3}$ times as long as IIIrd segment. Hairs on IIIrd segment $\frac{2}{3}$ — $\frac{6}{7}$ of basal diameter of the segment, all rather spiny and of the same length; also processus terminalis with a number of conspicuous, recurved hairs. Rostrum reaching past hind coxae; apical segment triangular, rather acute, about $\frac{2}{3}$ of second joint of hind tarsi, with about 6—8 long hairs besides the 3 apical pairs. Siphunculi very short, thin, cylindrical, flangeless, dark sclerotic, faintly imbricated with only one row of cells at the very apex. Cauda triangular, rather acute, dark, not constricted, about 4 times as long as the siphunculi, with about 20 hairs. Subanal plate with a blunt, conical processus. Subgenital plate with 6—10 hairs on anterior half. Legs rather long, black sclerotic except the bases of the femora, spiny; first tarsal joints with 3, 3, 3 hairs.

Colour. Unknown.

Measurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on segment		Prop. of ant. segments		
					III	IV	III: IV: V:	VI	
1	2.00	2.31	0.035	0.16	32 & 33	3 & 0	100: 84: 72:	(32 + 132)	
2	1.97	2.39	0.035	0.15	31 & 34	2 & 3	100: 77: 71:	(29 + 142)	
3	2.16	2.47	0.040	0.15	24 & 27	0 & 0	100: 71: 83:	(31 + 163)	
4	1.95	2.20	0.035	0.15	15 & 17	0 & 0	100: 65: 65:	(29 + 149)	
5	2.14	2.19	0.035	0.15	29 & 32	3 & 7	100: 72: 66:	(30 + 151)	
6	2.13	2.58	0.035	0.15	19 & 22	0 & 0	100: 78: 66:	(31 + 159)	

Alate viviparous female.

Morphological characters. Very similar to apterous form. IIIrd ant. segment with about 39—48 rhinaria; IVth with about 12—18 rhinaria. Cauda a little more acute. Venation of wings normal.

Colour. Unknown.

Measurements of one specimen: Length of body: 2.14 mm; ant.: 2.45 mm; siph.: 0.03 mm; cau.: 0.15 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{76}{IV} : \frac{68}{V} : \frac{(29 + 151)}{VI}$. Rhin. on IIIrd ant. segment: 41 and 42; on IVth: 12 and 16.

Hostplant: *Artemisia absinthium*.

Geographical distribution: Only known from Borgholm, Sweden, 21-VII-'36, leg. Lector Dr. Einar Wahlgren.

Biology: Dr. Wahlgren found this species on the flowerstems of its host. At the time of collection both alate and apterous forms were present. Whether ants were present was not stated, but this may safely be assumed.

Notes. Though this species must be very closely related to *Microsiphum jazykovi* Nevsky, so that Wahlgren identified it with that species, it differs in a few minor characters from Nevsky's descriptions. Nevsky gives the body hairs as being as long as one-third of the diameter of IIIrd ant. segment. If this diameter is taken in the middle of the segment they are only $\frac{1}{10}$ — $\frac{1}{7}$ that length in the Swedish aphids, and if taken at the very base, as I am accustomed to do, then they are $\frac{2}{15}$ — $\frac{1}{5}$ of the diameter of IIIrd ant. segment. Apparently Nevsky's species has longer hairs than ours. As the number of rhinaria in both forms is a little higher than Nevsky gives it and as he does not mention rhinaria on the IVth ant. segment in apterae viviparae, I think it better to describe Dr. Wahlgren's *jazykovi* as a new species. I am very much obliged to Lector Dr. Wahlgren and Prof. Dr. N. A. Kemner for their kindness in letting me examine the material in the Zoological Museum at Lund, Sweden.

Types: Cotypes in the Entomological Department of the Zoological Institute of the University, Lund, Sweden, and in the author's collection.

***Microsiphum woronieckae* Judenko, 1931.**

1931. Judenko, E., Bull. Ent. d. l. Pologne, vol. X, p. 114-118, *Microsiphum woronieckae*.

Apterous viviparous female.

Morphological characters. Body pyriform, with a rather narrow thorax; on tergum with very short, blunt hairs, those on Vth tergite about $\frac{1}{5}$ times as long as basal diameter of IIIrd ant. segment, but those on VIth-VIIIth tergite about as long as the very fine, fragile hairs on the sternum. Head broad, without distinct frontal tubercles, but rather strongly concave. Hairs on front long, fine, but the 2 pairs on posterior half of vertex exceedingly short. Antennae rather thick, about $\frac{9}{10}$ of length of body, blackish sclerotic, the IIIrd and IVth segment about equal in length; IIIrd segment on its middle portion with 6—10 (according to Judenko, 1931, even 14) rhinaria, which sometimes extend to distal $\frac{3}{4}$ part of the segment. Antennal hairs on the two basal segments and those on the basal part of IIIrd segment of the same type as those on the front; those on distal part of the

IIIrd segment and on the other segments shorter and thicker, about $\frac{4}{7}$ — $\frac{7}{8}$ of basal diameter of IIIrd segment long; processus terminalis with several hairs, which are about as long as its diameter. Rostrum long, reaching the IIInd or IIIrd abd. sternite; apical segment slender, acute, with straight margins, just shorter than 2nd joint of hind tarsi. Siphunculi very short, just longer than wide, only $\frac{2}{7}$ — $\frac{1}{3}$ times as long as second joint of hind tarsi, the flangeless apex pale, with distinct reticulations, remainder dark sclerotic with some imbrications (not completely reticulated as Judenko's figure shows them). Cauda as long as its basal width, triangular, rather acute, about $3\frac{1}{2}$ —4 times as long as siphunculi, sclerotic, dark, with some 20—30 long, stiff hairs in multiple rows along its margins. Subanal plate semiglobular. Subgenital plate with the normal number of hairs along posterior margin and also with many hairs on anterior half. Legs rather long, completely dark sclerotic with the exception of the bases of the femora; femur with long hairs like the venter, tibia with shorter, thicker and subacute hairs, which are shorter towards its apex. First tarsal joints with 3, 3, 3 hairs.

Colour. According to Judenko (1931): "head dusky with a bright centre, antennae black, I and II segments dark-green, eyes dark-red. The proximal part of rostrum dirty yellow, the distal part black. Prothorax dusky, pronotum with a light centre, mesothorax dirty rosy, metathorax rosy. Legs black, basal halves of femora dirty yellow. Abdomen black-reddish, the centre of its abdominal¹⁾ side is dirty rosy. Cornicles green in their proximal part, black in the distal part. Cauda yellowish-brown."

Measurements of two specimens: (I) Length of body: 2.40 mm; ant.: 2.26 mm; siph.: 0.042 mm; cau.: 0.185 mm. Prop. of ant. segments $\frac{100}{III} : \frac{94}{IV} : \frac{72}{V} : \frac{(32+140)}{VI}$. Rhin. on IIIrd ant. segment: 7 and 8. (II) Length of body: 2.32 mm; ant.: ?; siph.: (diam.!) 0.04; cau.: 0.17 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{94}{IV} : \frac{70}{V} : \frac{(32+?)}{VI}$. Rhin. on IIIrd ant. segment: 8 and 10. (I from Puławy, 2-IX-1931, leg. Judenko; II from Mannheim, 31-VII-1933, leg. Börner).

Alate viviparous female.

Morphological characters. Very much like apterous viviparous female. Abdomen without marginal sclerites. IIIrd ant. segment with about 15 small, protruding rhinaria scattered along one side of the segment over its

1) Possibly Judenko means ventrally.

whole length except at its base. Siphunculi and cauda about as in apterous viviparous female.

Colour: ?

Measurements of one specimen: Length of body: 2.38 mm; ant.: ?; siph.: 0.045 mm; cau.: 0.16 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{100}{IV} : \frac{76}{V} : \frac{(33+?)}{VI}$. Rhin. on IIIrd ant. segment: 15 and 16. (Mannheim, 31-VII-1933, leg. Börner).

Oviparous female.

Morphological characters. Very much like apterous viviparous female. Hind tibiae slightly swollen on basal $\frac{1}{4}$ — $\frac{2}{5}$ part and there with some pseudosensoria.

Colour. According to Judenko (1931): "Brown. Dorsal part of the body brilliant. Eyes red, the proximal part of snout yellowish, the distal brown. Legs brown, basal halves of femora yellowish. Borders of the abdomen pale-green. Cauda light brown."

Measurements of one specimen: Length of body: 2.56 mm; ant.: 2.36 mm; siph: 0.05 mm; cau.: 0.17 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{96}{IV} : \frac{84}{V} : \frac{(39+161)}{VI}$. Rhin. on IIIrd ant. segment: 6 and 8.

Apterous male.

Morphological characters, according to Judenko. IIIrd ant. segment with 25—27 rhinaria, IVth with 15—18, Vth with 4—6. Cauda very short, about $\frac{3}{5}$ times as long as its basal width, with 16—20 hairs, chiefly on its distal part. Other characters as in apterous viviparous female, but from Judenko's measurements it seems that males are smaller and considerably more slender than other apterous forms.

Colour. According to Judenko (1931): "Green. Head, prothorax and antennae brown, apex of segment III bright. Rostrum yellowish, end brown. Legs yellowish, distal parts of femora, tibiae and tarsi brown. Penis, valvae and cauda dark."

Measurements of one specimen (Judenko): Length of body: 2.06 mm; ant.: 2.28 mm; siph.: 0.014 mm; cau.: 0.12 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{86}{IV} : \frac{71}{V} : \frac{(31+139)}{VI}$. Rhin. on IIIrd ant. segment: 27 and ?; on IVth: 4 and ?

Hostplant: *Artemisia vulgaris*.

Geographical distribution: Poland, Germany.

Biology: Judenko says, that the aphids occur only on such plants, the lower parts of the stalks of which are in the shadow of neighbouring vegetation. They usually lived on subterranean, sometimes on overground parts of the stems in compact colonies, visited by ants. Sexuales were found in the end of September and the beginning of October. The eggs were not found on parts of the plant, but in the soil surrounding the plants. They were pale yellow. Dr. Börner found alate viviparous females in July in Germany.

Notes. I am much indebted to Dr. E. Judenko for his kindness to give me some cotypes of apterous viviparous females and oviparae. Dr. Börner sent me an apterous and an alate viviparous female from his capture, in the opinion that his species was a new one, but it apparently is identical with Judenko's. Judenko gives the measures of the siphunculi in the males as 0.014 mm long and 0.034 mm wide. It is possible that the first of these measurements is not quite correct, as it is rather difficult to get the siphunculi in definite dorsal view.

Types: Judenko does not mention the existence of types and I forgot to ask him about them during his visit here¹). Some of his original, cotypic, material is in my collection.

Anthracosiphon nov. gen.

A. INTRODUCTION.

Type of the genus is the new species *A. hertae*, a shiny black aphid from *Potentilla anserina*. In the classification of older authors it would be placed in *Macrosiphum* Pass., but in my system it must form a separate genus. Primarily the frontal tubercles have angular and rough inner sides, a character which does not occur in any *Macrosiphum*-like aphid with reticulated siphunculi; secondarily the tergum in apterae viviparae and in a lesser degree in oviparae is completely and densely black sclerotic. A similar tergum occurs in *Sitobion* Mordv., but there the oviparae have a membraneous tergum, while in the new genus also in oviparae the abdomen is covered by a black shield. The short, triangular, black sclerotic cauda is rather like that of *Rhopalosiphoninus* Baker and very unlike anything occurring in *Macrosiphum* and allied genera. This amply justifies the erection of a new genus, which is defined as follows:

Tergum in apterae viviparae uniformly black sclerotic, in oviparae with the posterior tergites of abdomen sometimes membraneous. Hairs normal.

1) In a letter just received from Dr. Judenko, he informs me that his belongings were lost during the war.

Frontal tubercles well developed, with parallel inner sides and angular, rough inner apices. Antennae long, in apterae and alatae with rhinaria on the IIIrd segment. Siphunculi long, about cylindrical, with at their apices 5—8 rows of very well developed hexagonal reticulation, with well developed flange. Cauda shortly triangular, without constrictions.

B. DESCRIPTION OF THE SPECIES.

Anthracosiphon hertae nov. spec. (Pl. XVIII fig. 26).

Apterous viviparous female.

Morphological characters. Body rather broadly oval, strongly convex, ventrally more flat, about 2.25—2.80 mm long. Tergum uniformly blackish brown sclerotic without visible segmental borders, with the pronotum and VIIIth tergite quite free and the mesonotum partly free, smooth to indistinctly wrinkled. Hairs short, rather numerous, with slightly enlarged apex; VIIIth abd. tergite with 8—10 hairs. Spinal tubercles sometimes present on VIIIth abd. tergite. In front of the base of each siphunculus a rather conspicuous membranous and colourless perforation. Frontal tubercles well developed, with parallel inner sides and strongly rounded to nearly rectangular inner apices. Median frontal tubercle not or hardly developed, frontal furrow widely rectangular. Antennae a little longer than body, with only the base of IIIrd segment brownish yellow, remainder blackish brown; basal segments scabrous; IIIrd segment with slightly rough base, with 3—9 rhinaria about in a line on basal half; processus terminalis 4—5 times as long as base of VIth segment, about as long as IIIrd segment. Hairs on IIIrd segment rather varying in length, a little knobbed, $\frac{1}{2}$ — $\frac{3}{4}$ times as long as basal diameter of the segment. Rostrum reaching to the hind coxae; apical segment rather slender, about $1\frac{1}{4}$ — $1\frac{2}{7}$ times as long as 2nd joint of hind tarsi, with about 6—8 hairs besides the 3 apical pairs. Siphunculi rather thick, slightly curved inwards, in older specimens completely jet black sclerotic, in younger ones with the middle portion paler, rather evenly finely imbricated, with distal $\frac{1}{6}$ — $\frac{1}{5}$ markedly constricted and reticulated, with very well developed flange. Cauda a little longer than wide at base, black sclerotic, triangular without constrictions, nearly acute, about $\frac{1}{4}$ — $\frac{2}{7}$ times as long as the siphunculi, with 7—9 hairs. Legs dark brown; first tarsal joints with 3, 3, 3 hairs.

Colour. Shiny black, with the abdomen ventrally lead-coloured with a rosy hue. Antennae, siphunculi, cauda and legs blackish; base of IIIrd ant. segment and of the femora brownish yellow to brownish.

Measurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III:IV:V:VI
1	2.43	2.59	0.70	0.19	5 & 6	100: 74: 51: (22 + 100)
2	2.46	2.63	0.71	0.19	6 & 7	100: 73: 63: (23 + 116)
3	2.50	2.62	0.71	0.21	4 & 5	100: 66: 53: (23 + 100)
4	2.64	2.86	0.76	0.22	4 & 5	100: 78: 62: (24 + 101)
5	2.54	2.70	0.72	0.21	6 & 9	100: 72: 60: (22 + 109)
6	2.53	2.65	0.70	0.19	5 & 6	100: 77: 64: (25 + 113)

(1-4, from *Potentilla anserina*, Bergen op Zoom, 19-IX-'43; 5-6, idem, 26-IX-'43).

Alate viviparous female.

Morphological characters. Body more slender than in apterous form. Abdomen with most of its tergum covered by a brown central sclerite in which dark, oval, pleural intersegmental sclerites are clearly visible; marginal sclerites with a dark brown central spot, with small marginal tubercles; postsiphuncular sclerites large, a little rough. Antennae markedly longer than body; IIIrd segment along one side with some 20-34 rhinaria of varying sizes; IVth segment not with rhinaria. Wings with normal venation, the veins very faintly shadowed, rather pale yellowish. Legs brownish with dark apices to the femora and black apices to the tibiae. Other characters about as in apterous viviparous female.

Colour. Head and thorax black, abdomen dirty lead coloured, with its dorsum brownish. Remainder as in apterae viviparae.

Measurements of one specimen: Length of body: 2.74 mm; ant.: 2.98 mm; siph.: 0.73 mm; cau.: 0.22 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{76}{IV} : \frac{56}{V} : \frac{(19+95)}{VI}$. Rhin. on IIIrd ant. segment: 26 and 30.

Oviparous female.

Morphological characters. Very much like apterous viviparous female, but the sclerotisation of the abd. tergum different. From the cauda cephalad the sclerotic shield is more or less shattered and perforated; in extreme cases about the anterior half of the body is black sclerotic, the remainder completely membraneous, but normally a solid shield reaches to about the Vth abd. tergite and the part caudad is maculated black and white. Hind tibiae a little swollen, with numerous small pseudosensoria on basal $\frac{2}{3}$ part.

Colour. As in apterous viviparous females, but the membraneous dorsal parts, viz., sometimes the posterior half of abdomen, coloured like the underside of the body.

Measurements of one specimen: Length of body: 2.60 mm; ant.:

2.82 mm; siph.: 0.70 mm; cau.: 0.21 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{75}{IV} : \frac{61}{V} : \frac{(24 + 109)}{VI}$. Rhin. on IIIrd ant. segment: 4 and 5.

Alate male.

Morphological characters. Body narrow, but otherwise like alate female. Sclerotisation of abdominal tergum very reduced. Antennae much longer than body; IIIrd segment with about 35—50 rhinaria along one side; IVth with 8—20 in a line; Vth with 10—18; also the VIth often with a secondary rhinarium, near its base. Cauda not longer than wide at base, acutely triangular. Claspers acute.

Colour. As in alate viviparous female.

Measurements of one specimen: Length of body: 2.20 mm; ant.: 2.82 mm; siph.: 0.56 mm; cau.: 0.15 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{64}{IV} : \frac{56}{V} : \frac{(24 + 100)}{VI}$. Rhin. on IIIrd ant. segment: 39 and 45; on IVth: 13 and 16; on Vth: 14 and 12; on VIth: 1 and 0.

Hostplant: *Potentilla anserina*.

Geographical distribution: Only once found in one locality near Bergen op Zoom.

Biology: During the year this aphid forms families on the runners of its host, apparently avoiding higher parts. In the autumn I collected apterae viviparae, oviparae and numerous nymphs, which partly developed into alate viviparous females, partly into males. The sexuales were mature by September the 20th. Oviposition was observed on the undersides of the runners, on various substrata near the plants, etc. The eggs are very pale yellow if just laid. The plants show no reaction. The species is not visited by ants.

This curious aphid, the larvae of which are completely lead-grey like those of *Sappaphis* spp., is very much rarer than *Pentatrichopus potentillae* (Wlk.), which infests the same plant. The latter species is everywhere quite common, but *Anthracosiphon hertae* nov. spec. seems to be very rare and local.

I take pleasure in naming this species after its discoverer, my wife, whose cooperation has been of eminent value for the study of Dutch aphides.

Types: Cotypes in the author's collection and in the Rijksmuseum van Natuurlijke Historie, Leiden.

Delphiniobium Mordvilko, 1914.

A. HISTORY.

Though Mordvilko (1914) erected this genus without fixing a type, it is

evident from figs. 34 and 50 in his monograph that it was meant for *Rhopalosiphum aconiti* van der Goot, 1912.

Van der Goot described his species as a *Rhopalosiphum*, because he used this genus with *ampullata* Buckton as genotype (1913, 1915) and interpreted it in the sense of *Amphorophora* Buckton. This was quite wrong, of course, as the type of *Rhopalosiphum* Koch had been fixed long before, while *ampullata* was not included in *Rhopalosiphum* when this genus was erected. Later authors placed *aconiti* in *Amphorophora* or in *Megoura*. In general habitus the latter genus resembles *Delphiniobium* very strongly, but it has smooth siphunculi, contrary to *Delphiniobium*, which has the apex of the siphunculi distinctly reticulated. As I have pointed out earlier reticulated siphunculi in this group may be considered a monophyletically developed character.

In Europe one species only is known.

B. SYNONYMY.

1912. Goot, P. van der, Tijdschr. v. Entomologie, vol. LV, p. 73-75, *Rhopalosiphum* Koch partim.
1914. Mordvilko, A. K., Faune d. l. Russie, Ins. Hémipt., vol. I, livr. 1, p. 65, *Delphiniobium*, type (monotypical) *Delphiniobium aconiti* Mordv. = *Rhopalosiphum aconiti* v. d. Goot.
1915. Goot, P. van der, Beitr. z. Kenntnis d. Holl. Blattläuse, p. 140, *Rhopalosiphum* Koch partim.
1925. Mason, P. W., Proc. U.S. Nat. Mus., vol. LXVII, art. 20, p. 7, *Amphorophora* Buckt. partim.
1926. Theobald, F. V., Aph. Great Britain, vol. I, p. 7, 29, *Amphorophora* Buckt. partim.
1929. Mordvilko, A. K., Food-Plant Catalogue, p. 49, *Delphiniobium* Mordv.
1930. Börner, C., Archiv f. Klass. u. Phylog. Entom., vol. I, p. 140, *Megoura* Buckt. partim.
1932. Börner, C., in Sorauer, Handb. d. Pflanzenkr., ed. IV, vol. V, pars 2, p. 627, *Megoura* Buckt. partim.
1933. Börner, C., Kl. Mitt. über Blattl., ed. Börner, p. 2, *Amphorophora* Buckt. partim.

C. GENERAL BIOLOGY, GEOGRAPHICAL DISTRIBUTION.

See under *D. aconiti* v. d. G.

D. MORPHOLOGICAL RELATION TO OTHER GENERA.

In general aspects this genus resembles *Megoura* Buckton, from which it can be easily separated by the reticulated apices of the siphunculi. On the other hand many *Macrosiphum*-like species in America have swollen siphunculi with a reticulated area, but in none of them a black, sclerotic cauda occurs. Other genera with swollen siphunculi have either no reticulated area (*Amphorophora* Buckton), or (*Rhopalosiphoninus* Baker) often

no rhinaria on the IIIrd ant. segment in apterae viviparae. Confusion with other genera is hardly possible.

E. NOTES ON PHYLOGENY.

The reticulated area indicates a close relation to *Macrosiphum* Pass. That the siphunculi are swollen is of little importance, since this character occurs in genera, which phylogenetically do not show any close relation (e.g., *Pterocomma* Buckton, *Amphorophora* Buckton, *Hyadaphis* Kirkaldy, etc.). Both swollen and cylindrical siphunculi may even occur in the same species, e.g., *Myzus persicae* (Sulzer), where the fundatrices and the 2nd generation have cylindrical siphunculi, while later generations have swollen siphunculi, if reared at a not too high temperature; at a high temperature the siphunculi sometimes are hardly swollen or not at all.

F. DESCRIPTION OF THE SPECIES.

Delphiniobium aconiti (Van der Goot, 1912) sensu latiore.

Of this species at present two forms are known, one occurring from Western Europe to Russia, in which the oviparae and apterous viviparous females have about 20—35 rhinaria on basal $\frac{4}{7}$ — $\frac{4}{5}$ part of IIIrd ant. segment and another from Roumania in which these forms have only 5—18 rhinaria limited to the basal half of IIIrd ant. segment. This latter form has recently been described as subspec. *sylvanae* by Knechtel & Manolache. These key as follows:

- 1(2) IIIrd ant. segment in apterae viviparae and oviparae with 20-35 small rhinaria extending over more than the basal half of the segment. Processus terminalis 9-11 times as long as base of VIth ant. segment. Siphunculi with about the distal $\frac{1}{5}$ part reticulated. On *Delphinium* and *Aconitum* spp.. Western Europe to Russia. *D. aconiti* (V. d. Goot) s.s., p. 200.
- 2(1) IIIrd ant. segment in these forms with only 5-17 rhinaria which are confined to basal half of the segment. Processus terminalis in apterae viviparae 11-12 times, in oviparae 10 $\frac{1}{2}$ -12(?) times as long as base of VIth ant. segment. Siphunculi, at least in apterae viviparae, with distal $\frac{1}{6}$ — $\frac{1}{5}$ part reticulated. On various *Aconitum* spp., Roumania.

D. aconiti subspec. *sylvanae* Kn. & Manol., p. 203.

Delphiniobium aconiti (Van der Goot, 1912) sensu stricto.

1912. Goot, P. van der, Tijdschr. v. Entomologie, vol. LV, p. 73-75, *Rhopalosiphum aconiti*.
1914. Mordvilko, A. K., Faune d. l. Russie, Ins. Hémipt., vol. I, livr. 1, fig. 34, *Delphiniobium aconiti*.

1) According to my two specimens. In Knechtel & Manolache's description $\frac{1}{12}$ — $\frac{1}{10}$ part, in their figure $\frac{1}{8}$ part.

1915. Goot, P. van der, Beitr. z. Kenntnis d. Holl. Blattläuse, p. 140, *Rhopalosiphum aconiti*.
1917. Theobald, F. V., Entomologist, vol. L, p. 81, *Rhopalosiphum aconiti*.
1925. Mason, P. W., Proc. U.S. Nat. Mus., vol. LXVII, art. 3, p. 7, *Amphorophora aconiti*.
1926. Theobald, F. V., Aph. Great Britain, vol. I, p. 206, *Amphorophora aconiti*.
1929. Mordvilko, A. K., Food-Plant Catalogue, p. 49, *Delphinobium aconiti*.
1930. Judenko, E., Bull. Ent. d. l. Pologne, vol. IX, p. 162, *Delphinobium aconiti*.
1932. Börner, C., in Sorauer, Handb. d. Pflanzenkr., ed. IV, vol. V, pars 2, p. 627, *Megoura aconiti*.

Apterous viviparous female.

Morphological characters. Body rather large, rather broadly spindle-shaped, with rather long, spear-shaped hairs. VIIIth tergite with 4—6 hairs, standing in two groups. Body without local sclerotisation, only the frontal tubercles darkly sclerotic on inner side. Frontal tubercles well developed, a little rounded, smooth. Median frontal tubercle often very conspicuous. Frontal furrow wide and more or less W-shaped. Antennae usually longer than the body, the first two segments dark sclerotic, the other segments paler with dark apices, except the part of the IIIrd segment on which the rhinaria are placed, which is dark also; base of IIIrd segment with conspicuous scabrous imbrications, remainder completely smooth; basal $\frac{4}{7}$ — $\frac{4}{5}$ of IIIrd segment crowded on one side with 20—35 very tubercular rhinaria of various sizes; IIIrd segment up to twice as long as IVth; processus terminalis very long, 9—11 times as long as basal part of VIth segment, $1\frac{1}{8}$ — $1\frac{2}{5}$ times as long as IIIrd segment. Antennal hairs like those on dorsum, those on IIIrd segment about as long as basal diameter of this segment. Rostrum reaching to the hind coxae or just past, apical segment rather slender, $1\frac{2}{7}$ — $1\frac{3}{7}$ times as long as second joint of hind tarsi. Siphunculi rather short, $\frac{1}{8}$ — $\frac{1}{6}$ of the length of the body, black sclerotic, paler at the base, basal $\frac{2}{5}$ — $\frac{1}{2}$ nearly cylindrical, remainder dilated, with largest diameter near distal $\frac{3}{5}$, smooth, with distal $\frac{1}{5}$ distinctly reticulated and with some imbrications basally of the reticulated area, constricted near the well developed flange. Cauda thick, blackish sclerotic, rather long, nearly cylindrical, very blunt, $\frac{3}{4}$ of to as long as the siphunculi, with 11—18 stiff hairs. Legs long, with distal halves of femora and apices of tibiae sclerotic, black, remainder brownish-yellow, first tarsal joints with 3, 3, 3 hairs.

Colour. Bluish green. Antennae, siphunculi and cauda black, flagellum and siphunculi often with green bases. Legs varying from very pale, transparent, to rather dark, with always the distal halves of the femora and the apices of the tibiae quite black.

Measurements of one specimen: Length of body: 3.24 mm; ant.: 3.53 mm; siph.: 0.54 mm; cau.: 0.46 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{53}{\text{IV}} : \frac{50}{\text{V}} : \frac{(15 + 137)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 21 and 23.

Alate viviparous female.

Morphological characters. Very much like apterous viviparous female. Head and thorax blackish sclerotic. Antennae much longer than the body, IIIrd segment with 40—56 rhinaria over whole length. Abdomen with hardly visible marginal sclerites and very small, pale, intersegmental pleural sclerites. Siphunculi only very slightly swollen, nearly cylindrical, with the basal $\frac{2}{5}$ part a little thinner than the distal remainder.

Colour. Head and thorax black, other characters as in apterous viviparous female.

Measurements of one specimen: Length of body: 3.14 mm; ant.: 4.30 mm; siph.: 0.56 mm; cau.: 0.42 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{57}{\text{IV}} : \frac{50}{\text{V}} : \frac{(12 + 130)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 49 and 53.

Oviparous female.

Morphological characters. Very much like the apterous viviparous female. Cauda slightly thicker and more blunt. Hind tibiae little swollen with numerous rather large pseudosensoria, often only on basal half.

Colour. As in apterous viviparous female, but hind tibiae always wholly dark to black.

Measurements of one specimen: Length of body: 3.16 mm; ant.: 3.84 mm; siph.: 0.56 mm; cau.: 0.40 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{58}{\text{IV}} : \frac{58}{\text{V}} : \frac{(15 + 131)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 22 and 30.

Alate male.

Morphological characters. Body smaller than in the other forms, narrow. Antennae up to $1\frac{1}{2}$ times as long as the body, IIIrd segment with 40—60 rhinaria arranged as in the other forms; IVth with 7—12, Vth with 7—10, placed in a line along one side of the segments. Abdomen with marginal sclerites and intersegmental pleural sclerites, which are a little more developed than in alate viviparous female; sometimes the spinal hairs on IVth, Vth and VIth tergite with sclerites. Siphunculi more or less as in alate viviparous female, cauda comparatively much shorter, elongated conical. Genitalia not strongly developed, claspers positively small. Other characters as in alate viviparous female.

Colour. As in alate viviparous female, but abdomen darker, legs brown.

Measurements of one specimen: Length of body: 2.70 mm; ant.: 3.62 mm; siph.: 0.44 mm; cau.: 0.27 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{60}{IV} : \frac{51}{V} : \frac{(13 + 136)}{VI}$. Rhin. on IIIrd ant. segment: 45 and 47; on IVth: 8 and 9; on Vth: 7 and 8.

Hostplants: *Aconitum* sp., *Delphinium* spp.

Geographical distribution: England, Netherlands, Germany, Russia.

Biology: This species infests its host in often enormous numbers, which in summer are mainly present on the flowerstems and between the flowers. In autumn, however, the sexuales descend to the basal leaves. I observed oviposition on *Delphinium* in the Netherlands. In a nursery at Bennekom I could observe, that one plant standing in a row with other garden varieties was full of lice every summer, while the other plants had either few lice or none at all. The attacked plant was very much hampered in its growth.

Van der Goot originally described this species from *Aconitum*. I have not yet found it on that plant. Whether oviposition occurs on *Aconitum* wants investigation.

The eggs are pale bluish green when just laid. They are deposited on the underside of the leaves and on all possible substrata around the basis of the stems.

Notes. One of the most curious features and a character which is very rare in aphids is the structure of the prothoracal and mesothoracal stigmata. They are placed on the basis of a crater, situated in a large semi-globular tubercle. The inner wall of the crater is covered with transverse hexagonal sculpture, but the tubercle itself is quite smooth. In the larvae this is already distinctly visible, though here the whole structure is smaller, of course.

Also the abdominal stigmata are deviating from the common type in the *Macrosiphum*-like Aphids. The stigmal plates, except those on the VIIth segment, completely enclose the stigmal pori. On the 1st abd. segment the stigmal pori are placed centrally in the stigmal plate.

Types: A slide from Van der Goot's original material, which I design as lectocotypes, is in the Entomological Laboratory at Wageningen. Another slide, designed by Mason as metatype, is in the U. S. National Museum, Washington, D. C.

***Delphiniobium aconiti* subsp. *sylvanae* (Knechtel & Manolache, 1942).**

1942. Knechtel, W. K. & Manolache, C. I., Acad. Roumaine, Bull. Sect. Scient., vol. XXV, p. 267-270, *Megoura aconiti* subsp. *sylvanae*.

Apterous viviparous female.

Morphological characters. Very much as in the main species, body 3.60—3.80 (in my macerated specimens up to 4.10 mm) long. IIIrd ant. segment with 5—17 (in my specimens 10—18) small rhinaria on a darker pigmented part on basal half of the otherwise pale segment; processus terminalis 11—12 times (in my specimens $10\frac{1}{3}$ —11) times as long as base of VIth segment. Siphunculi according to the description with apical $\frac{1}{12}$ — $\frac{1}{10}$, but according to their fig. 9 with distal $\frac{1}{9}$ — $\frac{1}{8}$ reticulated, in my specimens, however, with distal $\frac{1}{6}$ — $\frac{1}{5}$ reticulated. Other characters about as in the main species, but the whole insect less strongly pigmented, so that the antennae are pale brownish yellow with dark to black apices to the segments, the siphunculi have a considerable part of the base pale, and the legs are mostly pale.

Colour. Green. Antennae green, only the apices of segments III, IV and V and the VIth segment black. Legs yellowish green; distal half of femora, apices of tibiae and the tarsi black. Siphunculi, except their base, cauda and anal plate black.

Measurements of two specimens: Length of body: (I) 3.90 mm, (II) 4.10 mm; ant.: (I) 4.66 mm, (II) 4.00 mm; siph.: (I) 0.78 mm, (II) 0.66 mm; cau.: (I) 0.53 mm, (II) 0.50 mm. Prop. of ant. segments: (I) $\frac{100}{III} : \frac{63}{IV} : \frac{49}{V} : \frac{(12+123)}{VI}$, (II) $\frac{100}{III} : \frac{65}{IV} : \frac{51}{V} : \frac{(11+116)}{VI}$. Rhin. on IIIrd ant. segment: (I) 10 and 11, (II) 15 and 18. (Both from *Aconitum napellus*, Sinaia Prehova, Roumania, 8-VIII-'46, leg. Manolache).

Oviparous female.

Morphological characters (extracted from the original description). Length of body 2.80—3.00 mm. IIIrd ant. segment with 5—6 rhinaria on basal part, processus terminalis 1.24—1.30 mm, base of VIth segment 0.116—0.120 mm long. Rostrum reaching the hind coxae or a little longer. Remainder as in apterae viviparae.

Colour. As in apterae viviparae, but antennae sometimes darker, though still with the apices of the segments distinctly blackish. Hind tibiae nearly completely brown.

Alate male.

Morphological characters (as above). IIIrd ant. segment with 29 rhinaria, IVth with 7, Vth with 7. The figure, no. 13, shows the apical $\frac{2}{11}$ — $\frac{2}{9}$ part reticulated (total length 72.5 mm, reticulated area 13—16 mm), i.e., about as in Dutch specimens of the main species.

Hostplants: *Aconitum napellus*; cultivated *Aconitum* spp.

Geographical distribution: Various localities in Rumania, 1000 or more m above sea-level.

Biology: Found on the young shoots of *Aconitum*, in September, when only apterae viviparae were present, and in the middle of October, when males and oviparae were found.

Notes. Knechtel & Manolache suggest that their new subspecies differs from the main species in the colour of its antennae and legs, the small number of rhinaria in apterae viviparae, the shorter rostrum and the cauda being rather shorter than the siphunculi (about $\frac{8}{11}$ of their length). I received two apterae identified as subspec. *sylvanae* Kn. & Man. from Dr. Manolache, Bucarest. These differ only in the smaller number of rhinaria and their being restricted to the basal half of IIIrd segment from Dutch material. The pigmentation of the antennae is less developed than in nearly all Dutch specimens. But in other respects, such as the reticulation of the siphunculi they differ considerably from the original description by Knechtel & Manolache, which in itself shows some contradictions between the figures and the text. I can not explain this, but for the present give the different number and distribution of the rhinaria as the only difference between the two forms.

Types: In the collection of Prof. Dr. Knechtel and Dr. Manolache, Bucarest.

Corylobium Mordvilko, 1914.

A. HISTORY.

The genotype and single species had been placed in various genera, before Mordvilko created the genus *Corylobium* in 1914, without species. In 1928 this genus appeared to be meant for *Aphis avellanae* Schrank. The name *Corylobium* has not been used by other authors, except by Börner (1933), who appears to include in it not only species with reticulated siphunculi, but also with non-reticulate siphunculi, though he names only the genotype in association with the generic name. I have not seen any species without reticulate siphunculi which might be placed in this genus.

As *avellanae* Schrank has knobbed hairs it has been removed to *Capitophorus* by Theobald (1926), in my opinion erroneously.

B. SYNONYMY.

In short the synonymy is as follows:

1801-1855. Auctores diversi, *Aphis* L. partim.

1855-1930. Auctores diversi, *Siphonophora* Koch partim.

1913. Theobald, F. V., Journ. Econ. Biol., vol. VIII, p. 119, *Macrosiphum* Pass. partim.
1914. Mordvilko, A. K., Faune d. l. Russie, Ins. Hémipt., vol. I, livr. I, p. 71, *Corylobium*.
1926. Theobald, F. V., Aph. Great Britain, vol. I, p. 252, *Capitophorus* v. d. Goot partim.
1928. Mordvilko, A. K., in Filipjev, Opredelitel Nasekomich, p. 193, *Corylobium* (*avellanae* Schrank).
1929. Mordvilko, A. K., Food-Plant Catalogue, p. 38, *Corylobium* Mordv.
1930. Börner, C., Arch. f. Klass. u. Phylog. Entom., vol. I, p. 185, *Macrosiphum* Pass. partim.
1932. Börner, C., in Sorauer, Handb. d. Pflanzenkr., ed. IV, vol. V, pars 2, p. 630, *Macrosiphum* Pass. partim.
1933. Börner, C., Kl. Mitt. über Blattl., ed. Börner, p. 2, *Corylobium* Mordv.
1933. Hille Ris Lambers, D., Stylops, vol. II, p. 173, no. 54, *Corylobion* Mordv.

C. BIOLOGY AND GEOGRAPHICAL DISTRIBUTION.

See description of the species.

D. GENERAL MORPHOLOGY.

Though the morphology of the single species is extensively described hereafter, I will enumerate those characters, which justify the maintaining of a separate genus for it.

Apterous and alate forms morphologically strongly different. Body in apterous forms with long, thick, slightly knobbed hairs with strong bases, implanted on tuberculous elevations of the tergite, named hereafter protuberances. Spinal protuberances as well as marginal protuberances with two hairs each, the others with one hair. Viviparous apterae with very thick, strongly sclerotic, but pale tergite, covered with subcircular papillae; larvae and oviparae with membraneous, approximately smooth tergite. Frontal tubercles diverging, smooth. Median frontal process in apterae very well developed, prominent, rectangular. Antennae with the same type of hairs as the body, in apterous forms with a few rhinaria near the base of the IIIrd segment. Spinal tubercles present on the head and on the VIIIth, sometimes VIIth tergite, in apterae placed on the protuberances; marginal tubercles present on segments II—V of abdomen, in apterae placed on the protuberances. Siphunculi in apterae of a shape different from that in the alatae, in both forms with a narrow, but distinct reticulate area at the apex.

In alate forms hairs normal, thin, fine and long, without knobbed apices and implanted on hardly developed protuberances, but with the same arrangement as in apterae, so that the hairs of each double spinal row stand remarkably close to each other. The abdomen with marginal and pleural intersegmental sclerites only.

First tarsal joints of all legs with 3 hairs.

E. MORPHOLOGICAL RELATION TO OTHER GENERA.

Several characters indicate that this genus is closely allied to *Macrosiphum* Pass. or its ancestors. The reticulate siphunculi, the presence of scleroite-like structures in alate forms, the fact, that both red and green forms occur and finally the presence of spinal tubercles on the vertex and on the last abdominal tergites prove that it must be even closely allied to *Macrosiphum* Pass. itself.

As I will discuss hereafter, there is not much reason to place this genus near *Capitophorus* v. d. Goot (see also p. 297).

F. NOTES ON PHYLOGENY.

The long rostrum and especially the shape of its ultimate segment form a remarkable adaptation to the difficulties caused by the long, stiff glandular hairs on those parts of the foodplant, where the species usually lives. This suggests, that the association between parasite and host is a fairly old one.

I pointed out that several morphological characters indicate relation to *Macrosiphum* Pass. and other allied genera. But also in another genus inhabiting Rosaceae, viz., *Pentatrichopus* Börner, we find many typical features or *Corylobium* Mordv., such as the arrangement, shape and insertion of the dorsal hairs, the same differences between apterae and alatae, etc. The interrelation between *Macrosiphum* Pass. and *Corylobium* Mordv. is about the same as that between *Metopolophium* Mordv. and *Pentatrichopus* Börner. All this does not explain, of course, how a Rosaceae-inhabiting group gets a representative on *Corylus*, but it is an indication for the correctness to place *Corylobium* here ¹).

Capitate hairs occur so commonly in Aphids that I can see no reason to unite all the species which show this character in one genus, as is done by Baker, Theobald, Hottes & Frison and others. As a result of this, species of *Coloradoa* Wilson, *Rhopalomyzus* Mordvilko, *Pleotrichophorus* Börner, *Myzaphis* v. d. Goot and *Pentatrichopus* Börner have been described as *Capitophorus* spp. in recent years by English and American authors. They could as well have included the many Phyllaphidini with capitate hairs.

It seems that in many groups of Aphids there is a tendency towards developing capitate hairs. In *Dactynotus* some of the species may show the apex of the hairs rather strongly incrassate, others hardly or not at all. It is quite easy to find more examples of this kind. Therefore I see not the least reason to place *Corylobium avellonae* (Schrank) in *Capitophorus* v. d. Goot, because it happens to have capitate hairs.

1) In the U.S.A. *Macrosiphum coryli* Davidson lives on *Corylus*.

G. DESCRIPTION OF THE SPECIES.

Corylobium avellanae (Schrank, 1801) (Pl. XII fig. 3).

1801. Paula von Schrank, F., Fauna Boica, vol. II, p. 112, *Aphis avellanae*.
 1841. Mosley, O., Gard. Chronicle, vol. I, p. 628, *Aphis coryli*.
 1843. Kaltenbach, J. H., Mono. d. Pflanzenläuse, p. 143, *Aphis avellanae*.
 1848. Walker, F., Ann. Mag. Nat. Hist. (2), vol. II, p. 302, *Aphis avellanae*.
 1855. Koch, C. L., Die Pflanzenläuse Aphiden, p. 168, *Siphonophora avellanae*.
 1863. Passerini, G., Arch. p. l. Zool., vol. II, p. 135 (reprint, p. 12), *Siphonophora avellanae*.
 1872. Ferrari, P. M., Ann. Mus. Civ. Stor. Nat. Genova, vol. II, p. 13, *Myzus tetrarhoda* partim.
 1876. Buckton, G. B., Mono. Brit. Aphides, vol. I, p. 149, *Siphonophora avellanae*.
 1913. Theobald, F. V., Journ. Econ. Biol., vol. VIII, p. 119, *Macrosiphum avellanae*.
 1926. Theobald, F. V., Aph. Great Britain, vol. I, p. 252, *Capitophorus avellanae*.
 1928. Mordvilko, A. K., in Filipjev, Opredelitel Nasekomich, p. 193, *Corylobium avellanae*.
 1929. Mordvilko, A. K., Food-Plant Catalogue, p. 38, *Corylobium avellanae*.
 1930. Hovasse, R., Rev. Path. Vég. Ent. Agric., vol. XVII, p. 411, *Siphonophora avellanae*.

Fundatrix.

Morphological characters. Rather like apterous viviparous female, but much broader and thicker. Tergum thick and strongly papillated, the hair-bearing protuberances very small, however. The capitate hairs much shorter than in later apterae. IIIrd ant. segment with 0—1 very small rhinarium. Siphunculi hardly reticulated at apex.

Colour. More or less shiny sea-green.

Measurements of one specimen: Length of body: 2.80 mm; ant.: 2.79 mm; siph.: 0.79 mm; cau.: 0.20 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{80}{IV} : \frac{86}{V} : \frac{(33 + 106)}{VI}$. Rhin. on IIIrd ant. segment: 1 and 1.

Apterous viviparous female.

Morphological characters. Body spindle-shaped, rather convex ventrally, dorsally with protuberances, bearing one long, thick, pale hair with slightly swollen apex, except the marginal protuberances and those on both sides of the median line from the head to the VIIIth abd. segment, which are larger and each have two such hairs. The latter two-haired marginal protuberances on abd. segment II-V, and the spinal ones on the head and on VIIIth tergite each have a small, smooth, very slender tubercle also. Tergite very strongly sclerotic, pale, with sometimes faint intersgmental sclerites pleurally, densely covered with rather large semi-globular papillae, which only on the head and on a small area in

front of the base of each siphunculus are absent; these papillae in dorsal view look like subcircular rings with a much smaller, corrugate, inner ring. Head with the normal numbers of hairs. Frontal tubercles smooth, diverging, with 2 to 3 hairs on inner angles and 3-4 on the underside, all on strong bases. Median frontal process very strongly developed, rectangular, with two pairs of thick hairs. Antennae usually $1\frac{1}{4}$ — $1\frac{2}{5}$ times as long as body, with a few articulations of the flagellum dusky, remainder pale, to very dark brown with jet black apex in old individuals; Ist segment with 16-21 hairs of very different size, IInd with 4 thick hairs, which are about $1\frac{1}{4}$ times as long as basal diameter of IIIrd segment, IIIrd segment with 1-3 small rhinaria near base, with the thickish hairs about $\frac{3}{4}$ of its basal diameter long, like the other segments of the flagellum with very thick wall; IIIrd segment about as long as IVth, process terminalis about $1\frac{1}{2}$ times as long as IIIrd segment, $5\frac{3}{4}$ — $7\frac{1}{2}$ times as long as base of VIth segment. Rostrum very hairy, pale, reaching well beyond the hind coxae, apical segment very long, thin and acute, hairy, about twice as long as the short second joint of the hind tarsi. Siphunculi about $\frac{2}{7}$ — $\frac{1}{3}$ of length of body, rather thick, tapering towards the apex, gently curved, pale, very sclerotic, with blunt imbrications and a very narrow area of normal, not transversely hexagonal reticulations in front of the well developed flange; the very apex black. VIIIth tergite with 7—10 thick hairs. Cauda very shortly triangular, blunt, about $\frac{1}{4}$ of the length of the siphunculi, pale, with normally 7 hairs. Legs spinose, long and thin, with curved tibiae, pale, with the apices of the tibiae black, first tarsal joints with 3, 3, 3 hairs.

Colour. Usually green, sometimes reddish. Antennae sometimes pale with blackish articulations and black apex, in old individuals black with pale brownish-yellow base. Legs yellowish, with black apices to the tibiae and dusky knees. Siphunculi yellowish, with the very apices black. Cauda colour of body.

Measurements of one specimen: Length of body: 2.60 mm; ant.: 3.49 mm; siph.: 0.84 mm; cau.: 0.20 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{97}{IV} : \frac{83}{V} : \frac{(22 + 145)}{VI}$. Rhin. on IIIrd ant. segment. 1 and 2.

Alate viviparous female.

Morphological characters. Very much like apterous viviparous female. Head and thorax dark brown sclerotic, abdomen membraneous, not papillated, only slightly scabrous behind each siphunculus. Spinal hairs in couples on small, flattish protuberances, which are faintly sclerotic and some-

times partly fused with intersegmental sclerotic transverse bars connecting pleura with pleura. Hairs shorter and thinner than those in apterae. Head with a very marked, prominent median tubercle. Antennae much longer than body, scabrously imbricated, very dark sclerotic with the exception of the colourless very base of IIIrd segment; IIIrd segment with 12—25 rhinaria nearly in a line, IVth segment without rhinaria. Antennal hairs just shorter than in apterae, also thinner. Siphunculi cylindrical, straight, rather slender, imbricated, gradually darker from the colourless base to the apex. VIIIth tergite as well as vertex with a pair of small tubercles. Wings with normal venation, the veins faintly shadowed with pale brown.

Colour. Green or dirty reddish with dark brown head and thorax. Siphunculi brownish with paler bases. Antennae black. Remainder as in apterous viviparous female.

Measurements of one specimen: Length of body: 2.54 mm; ant.: 3.92 mm; siph.: 0.76 mm; cau.: 0.18 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{95}{IV} : \frac{85}{V} : \frac{(24 + 146)}{VI}$. Rhin. on IIIrd ant. segment: 17 and 19.

Oviparous female

Morphological characters. Much like apterous viviparous female, but the integumentum not sclerotic, without distinct papillae, except on the tuberculous bases of the dorsal hairs, which are arranged as in the apterous viviparous female. (Some specimens show an extremely faint ornamentation of the tergum, which reminds of the papillae). Antennae with 1—3 rhinaria on IIIrd segment. Siphunculi and cauda as in apterous viviparous female. Hind tibiae swollen, brown, with very numerous pseudosensoria.

Colour. More or less flesh-coloured. Other characters as in apterous viviparous female, except hind tibiae, which are distinctly brown.

Measurements of one specimen: Length of body: 2.22 mm; ant.: 3.12 mm; siph.: 0.76 mm; cau.: 0.19 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{102}{IV} : \frac{90}{V} : \frac{(26 + 144)}{VI}$. Rhin. on IIIrd ant. segment: 1 and 2.

Alate male.

Morphological characters. All hairs normal, thin, long, with very slightly incrassate apices. Head and thorax black, abdomen with black marginal sclerites, which on 1st segment are small, on the other segments large, also with very pronounced, fuscous, intersegmental sclerites. From 1st to VIIth segment non-tubercular, small, paired spinal scleroites with each two hairs; these scleroites often fused with each other and sometimes, if they

are larger, with the intersegmental sclerites caudad also. Pleural abd. hairs with small scleroites. Antennae black, except the very base of IIIrd segment, IIIrd segment with 35—49 rhinaria, IVth with 20—30, Vth with 8—16. Processus terminalis to $8\frac{1}{4}$ times as long as base of VIth segment. Siphunculi straight, thinner and shorter than in apterous forms, dark and, except for the reticulated area, nearly smooth. Cauda very short, acute, $\frac{2}{11}$ — $\frac{2}{9}$ of the length of the siphunculi, dark. Genitalia well developed, claspers small, narrow and subacute.

Colour. Head, thorax, antennae, siphunculi and cauda blackish. Abdomen greenish, rather dark, with the sclerotic areas brown. Legs with the distal third part of the femora and tibiae black.

Measurements of one specimen: Length of body: 2.32 mm; ant.: 3.34 mm; siph.: 0.56 mm; cau.: 0.11 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{103}{IV} : \frac{84}{V} : \frac{(21 + 162)}{VI}$. Rhin. on IIIrd ant. segment: 38 and 42; on IVth: 26 and 24; on Vth: 12 and 12.

Hostplants: *Corylus avellana*, *C. maxima*, and other species of *Corylus*.

Geographical distribution: Europe, Russia.

Biology: This species lives during the whole year on the apices of young shoots, the petioles and the underside of the youngest leaves of its host, often in dense colonies. The plant shows no reaction. The sexuales were found on a sucker of *Corylus avellana* in October. The eggs, which are very pale greenish when just laid, are deposited on the youngest branches.

Notes. Paula von Schrank describes this aphid as follows: "Der Körper eiförmig, etwas feinhaarig, grün; die Augen schwarz; die Fühlhörner länger als der Körper: die zwei untersten Gelenke und die Spitze (auch die Spitze des Saugstachels) schwarz. Der After stumpf." The last sentence is quite typical, because the cauda is not easily seen, not even with a small-power lens. There is no confusion about the species. See also under morphology of the genus.

Types: Paula von Schrank left no material.

Acyrthosiphon Mordvilko, 1914.

A. HISTORY.

Besides the many *Dactynotus*-like species which have a distinct reticulated area to the apex of the siphunculi, there are several other species of this section, in which a reticulated area is very small or completely absent. Both types formerly were included in *Macrosiphum* Pass., though some of those with non-reticulate siphunculi were sometimes placed in *Myzus* Pass.

Those species which have non-reticulated siphunculi, and some other characters, were placed in *Acyrtosiphon* by Mordvilko (1914). He included species with:

- a) non-reticulate siphunculi,
- b) diverging, approximately smooth frontal tubercles,
- c) a cauda without a constriction.

The type was the well-known species *Aphis pisi* Kaltenbach. Four subgenera were erected, three of which were new:

1. *Acyrtosiphon* Mordv. sensu stricto, type *Aphis pisi* Kltb. (= *pisum* Harris); frontal tubercles diverging, not or very slightly rough; median frontal tubercle very small or absent.
2. *Microlophium* Mordv., type *Aphis urticae* Schrank (= *schranski* Theob.); frontal tubercles rather rough, with approximately parallel inner margins; median frontal process distinct; hairs rather long; alatae often with fuscous to black transverse striae on abdomen.
3. *Amphorophora* Buckton, type *Amphorophora ampullata* Buckton; frontal tubercles often rather rough, nearly as in *Microlophium*; median frontal process distinct; siphunculi swollen in the middle or on distal half; hairs rather long.
4. *Metopolophium* Mordv., type *Aphis dirhoda* Walker; frontal tubercles more or less rough, rather low; median frontal tubercle well developed; hairs short; siphunculi cylindrical; cauda sometimes constricted.

Mordvilko's conception seems to me very acceptable. In this paper I will use his subgenera as genera. It is curious, that he includes the genotype of his genus *Aulacorthum* in *Acyrtosiphon* under the name "*Acyrtosiphon ranunculinum* Wlk." It is not Walker's species, but *Aulacorthum solani* (Kltb.), which he describes. This, if anything, proves that the group of Aphids under consideration is taxonomically very difficult.

Most of the authors have placed *Acyrtosiphon* as a synonym to *Macrosiphum* Pass. Baker (1920), however, places it under *Illinoia* Wilson because the cauda is conical and not constricted. I have dealt with this argument in *Temminckia*, vol. IV, p. 72. Baker is followed by some American authors. Oestlund (1922) accepts *Acyrtosiphon* as a receptaculum for such species, which have 1—4 rhinaria on the IIIrd ant. segment in apterae and which in other respects are *Macrosiphum*-like. *A. pisum* (Harris), *Sitobion avenae* (F.) and *Macrosiphum euphorbiae* (Thomas) are the species included. Börner (1930), like Baker examining genotypes only, separates *Acyrtosiphon* Mordv. from *Megoura* Buckton by the comparative lengths of siphunculi and cauda, *Megoura* including species with

siphunculi and cauda equally long (compare *Acyrthosiphon cyparissiae* (Koch)!), *Acyrthosiphon* species having the siphunculi about twice as long as the cauda or longer. In 1932 he places *Acyrthosiphon* as subgenus to *Amphorophora* Buckton, and one species in *Macrosiphum*. In 1933 the genus is placed under *Aulacorthum* Mordv. In 1939 he acknowledges it.

In 1939 the species *A. cyparissiae* (Koch) is placed in a separate subgenus, *Mirotarsus*, by Börner. This species, living on *Euphorbia cyparissias*, *E. esula*, *E. gerardiana*, etc., is very closely allied to *A. euphorbiae* Börner, living on *E. esula* and *E. palustris*. Both species are variable as to the number and arrangement of hairs on the first tarsal joints. *A. cyparissiae* (Koch) has 1—4 short bristles and 2—3 longer hairs, *A. euphorbiae* 1 short bristle and 2—3 longer hairs. In other regards such as the further morphology, biology, etc., both species show no important differences. The foodplants also suggest a close relation. So the only and absolutely only basis for the erection of a different subgenus for *A. cyparissiae* lies in the unusually large number of short bristles of the first tarsal joint. *Mirotarsus* Börner is a good example of what can result from a rigid artificial system. There is no reason to accept it.

Aphis chelidonii Kltb., a species which seems to be rare, is placed by Börner (1939) in a new genus, *Liporrhinus* Börner. In some regards this species differs from typical *Acyrthosiphon* Mordv. The mesothoracal furca is, in correlation with the legs, short, especially in the fundatrices, in which, as usual, the legs are shorter than in the other forms. The apterae never have rhinaria on the IIIrd ant. segment. All forms are covered with whitish grey powder. Börner's genus *Liporrhinus* is placed here as a subgenus to *Acyrthosiphon*.

Macchiatiella Del Guercio, 1917 (nec 1909), type *M. trifolii* Del Guercio, is a synonym of *Acyrthosiphon*. The specimens described as *M. trifolii* are larvae of *Acyrthosiphon pisum* (Harris), as appears from Del Guercio's figures in Redia XII, 1917 and XIX, 1930. These figures are slightly fantastic, as the frontal tubercles are represented as a 3rd basal segment to the antennae. In 1930 Del Guercio places this genus as a subgenus to *Anuraphis* Del Guercio.

Takahashi (1931) uses *Acyrthosiphon* in a rather different sense. While Mordvilko erected it for species with approximately smooth frontal tubercles, which moreover are diverging, Takahashi uses it for species with imbricated or spinulose frontal tubercles. In Takahashi's scheme species with smooth, diverging frontal tubercles and non-reticulate siphunculi come in *Macrosiphum*. Notwithstanding this conception *pisi* Kltb. (= *pisum*

Harris), the genotype, which has smooth frontal tubercles, is placed in *Acyrtosiphon* (Takahashi, 1931, p. 64).

The genus as interpreted here corresponds to Mordvilko's *Acyrtosiphon* sensu stricto. In a morphological sense it is rather homogeneous, but not nearly like *Dactynotus* or *Macrosiphoniella*. Within the genus some groups of closely related species and some isolated species are present. I distribute them over 3 subgenera:

1. *Acyrtosiphon* Mordv. sensu stricto (H.R.L.), type *Aphis pisi* Kltb., including two groups of species:

- a) On Papilionaceae, Euphorbiaceae and Umbelliferae.
 - b) On Geraniaceae and Rosaceae (also on *Malva* and *Primula*).
2. *Lactucobium* nov. subg., type *Acyrtosiphon scariolae* Nevsky.
3. *Liporrhinus* Börner, type *Aphis chelidonii* Kltb.

A more ample discussion of this sub-division is given under Morphology and in the Key to subgenera.

B. SYNONYMY OF ACYRTHOSIPHON MORDV.

1. *Acyrtosiphon* Mordv. sensu stricto.

- 1841-1855. Auctores diversi, *Aphis* L. partim.
 1855-±1901. Auctores diversi, *Siphonophora* Koch partim.
 1887-±1911. Auctores diversi americani, *Nectarophora* Oestlund partim.
 1901-1941. Auctores diversi, *Macrosiphum* Pass. partim.
 1914. Mordvilko, A. K., Faune d. l. Russie, Ins. Hémipt. vol. I, livr. I, p. 75, *Acyrtosiphon*, type *Aphis pisi* Kltb.
 1917. Guercio, G. del, Redia, vol. XII, p. 210, *Macchiatiella*, type *M. trifolii* Del Guercio.
 1922. Oestlund, O. W., 19th Rept. State Entom. Minnesota, p. 143, *Acyrtosiphon* Mordv. partim.
 1928. Nevsky, W. P., Entom. Mitt., vol. XXVII, p. 185, *Acyrtosiphon* Mordv.
 1929. Nevsky, W. P., Tli Srednei Asii, p. 77, *Acyrtosiphon* Mordv. partim.
 1930. Guercio, G. del, Redia, vol. XIX, p. 86, *Macchiatiella* Guercio partim.
 1930. Börner, C., Arch. f. Klass. u. Phylog. Entom., vol. I, p. 140, *Acyrtosiphon* Mordv.
 1931. Takahashi, R., Aph. Formosa, vol. VI, p. 62, *Acyrtosiphon* Mordv. partim.
 1932. Börner, C., in Sorauer, Handb. d. Pflanzenkr., ed. IV, vol. V, pars 2, p. 626, *Acyrtosiphon* Mordv. (subg. of *Amphorophora* Buckt.).
 1933. Börner, C., Kl. Mitt. über Blattl., ed. Börner, *Aulacorthum* Mordv. partim.
 1939. Börner, C., Arb. Phys. u. Angew. Entom., vol. VI, p. 83, *Mirotarsus*, type *Siphonophora cyparissiae* Koch.

2. The synonyms of the subgenus *Lactucobium* nov. subgen. can be extracted from that of the single species (p. 257).

3. Subg. *Liporrhinus* Börner.

1939. Börner, C., Arb. Phys. u. Angew. Entom., vol. VI, p. 83, *Liporrhinus*, type *Aphis chelidonii* Kltb.

C. GENERAL BIOLOGY.

Not of all the species included here full details of the biology are available. Of *A. euphorbiae* Börner and *A. nigripes* H.R.L. only the summerforms are known. The other species are fairly well known as to their biology.

Acyrtosiphon Mordvilko sensu stricto contains three biological groups: the Papilionaceae inhabiting species, those on Euphorbiaceae and Umbelliferae, and those on Geraniaceae and Rosaceae. None of these migrate. The genotype is rather polyphagous. It develops sexuales on a number of Papilionaceae, such as *Ononis*, *Sarothamnus*, *Trifolium*, *Vicia*, *Lathyrus*, but apparently not on annual species. In summer it occurs on a great many herbaceous Papilionaceae and *Sarothamnus*, *Genista* and *Ononis*, frequently also on *Capsella bursa pastoris*. The other species on Papilionaceae are nearly monophagous, *A. loti* living on *Lotus* only, *A. caraganae* exclusively on shrubs or trees. Males of European species as far as known are apterous (see p. 254).

The second group is also oligophagous or monophagous. Of only one species the males are known, which are alate. Migration does not occur. The species inhabit the upper sides of the leaves of their hosts.

The third group consists of one species with 4 subspecies, which are less limited in their number of foodplants. *Geranium*, *Pelargonium*, *Erodium*, *Malva* and *Primula* are infested. Two other subspecies live on *Fragaria*, resp. *Agrimonia*. The subspecies are very similar, but differ in their biology.

Liporrhinus Börner most probably has two species. One lives throughout the year on *Chelidonium* in Europe, the other which probably belongs here, was described from *Papaver nudicaule* from Eastern Russia. The European species does not migrate.

Lactucobium nov. subgen. is limited to Compositae, on which it lives without migration.

The biology generally is, that the 3rd generation contains the first alatae, the fundatrices and the 2nd generation usually being completely apterous. In summer nearly continually alate forms may be found. The gynoparae are apterous. After copulation the eggs are deposited somewhere on or near the remains of the plants by those species which live on herbaceous plants; species on deciduous shrubs lay their eggs on the branches of their hosts. The species, especially those of the first two groups of *Acyrtosiphon* sensu stricto, on disturbance immediately let themselves fall and, with adpressed legs, remain quiet for some time.

None of the species is visited by ants.

D. GEOGRAPHICAL DISTRIBUTION.

Some of the species of this genus are widely distributed. *A. pisum* (Harris) has been recorded from America, Africa, Asia and Australia, sometimes as a serious pest on alfalfa, peas, etc. Most probably its large distribution is due to human civilization. *A. malvae* (Mosley) s.l. occurs in the U.S.A. as well. *Lactucobium* is found in Europe and Asia. On the whole I cannot form a definite opinion on the many related species from the U.S.A., the generic status of which from our point of view is uncertain.

E. GENERAL MORPHOLOGY.

I. Macroscopical morphology.

Body usually slender, from 2.5-4.75 mm long, in fullgrown specimens with but the faintest traces of waxy exsudation, except in *Liporrhinus* and *Lactucobium*, which are grey by wax powder. Mature forms sometimes shiny, or with vague, intersegmental wax-excretion. Of many species there exists a reddish form besides the more common green form. The "red" form of some species is only very faintly reddish grey. Oviparae frequently are more yellowish green to yellow.

II. Microscopical morphology.

1. Head. Frontal tubercles well developed in *Acyrtosiphon* s.s., smaller in *Liporrhinus* and *Lactucobium*; inner margin approximately smooth. Antennae about as long as the body. Apterous forms of *Acyrtosiphon* s.s. with 1-10 rhinaria (in fundatrices often and in later generations exceptionally without) on basal half of IIIrd ant. segment; those living on Geraniaceae-Rosaceae often intermediate between apterae and alatae and their number of rhinaria varying accordingly from 2-20; apterae of *Liporrhinus* without rhinaria on IIIrd ant. segment; apterae of *Lactucobium* with rhinaria often well over the basal half of IIIrd ant. segment, placed approximately in a row. Alatae of *Acyrtosiphon* s.s. on Papilionaceae with the rhinaria on IIIrd segment in a row, often confined to basal $\frac{2}{3}$; those on Euphorbiaceae, Geraniaceae-Rosaceae with 20-30 rhinaria over whole length, on one side of the segment, but not in a row; those of *Liporrhinus* with 6-10 rhinaria in a row. In the males rhinaria frequently are absent on the IVth ant. segment, though numerous on segments III and V. The oviparae do not differ from apterous viviparous forms in the presence or absence of rhinaria. Antennal hairs always considerably shorter than basal diameter of IIIrd ant. segment. Vertex sometimes with two small spinal tubercles on posterior half. Rostrum varying according to foodplant,

short in those *Acyrtosiphon* s.s. species which live on plants without hairs, rather long in those, which live on plants with rather long hairs.

2. Thorax. Normal. Legs rather short to very long. If the legs are short, then the mesothoracal furca is sessile or placed on a short broad base (*Liporrhinus*). First tarsal joints of all legs normally with 3 hairs; except in *Acyrtosiphon cyparissiae* (Koch), in which the first tarsal segments usually have 6 hairs, except the fundatrices and oviparae sometimes, in which fewer hairs are present. Wings normal, veins not bordered by black or brown.

3. Abdomen. Tergum in apterae and alatae sometimes sclerotic and dark on head and thorax, but abdomen in all viviparous forms, though often slightly sclerotic, not or hardly coloured, except usually for small marginal sclerites in alatae. Transverse striae or sclerites are usually absent in alate viviparous females, but sometimes present in alate *A. malvae* (Mosley), though hardly visible. Sclerites are completely absent. Hairs on tergum usually short, longer on the posterior segments. Siphunculi colourless to black, slightly longer than cauda to three times as long (in which case they are usually remarkably slender towards the apex), more or less distinctly imbricate, sometimes with 1-3 rows of incomplete strongly transverse hexagonal cells just basally of the flange, which is small, but distinct. Cauda very well developed, elongate, acuminate to blunt, constricted or not, not coloured (except in *Acyrtosiphon nigripes* H.R.L., in which species it is jet black), with 7-20 hairs.

F. MORPHOLOGICAL RELATION TO OTHER GENERA.

Closely allied are the *Dactynotus*-like genera with reticulate siphunculi, which I have described in the previous parts of this work. But there is also a certain number of genera with siphunculi not swollen without reticulations which belong in this relation. These are: *Subacyrtosiphon* nov. gen., *Metopolophium* Mordv., *Microlophium* Mordv., *Rhodobium* nov. gen., *Titanosiphon* Nevsky, *Impatientinum* Mordv., and *Aulacorthum* Mordv. *Titanosiphon* is like *Macrosiphoniella*, but without reticulations to the siphunculi and with relatively longer siphunculi. In the same way *Metopolophium* is like *Sitobion* Mordv., *Acyrtosiphon* like *Macrosiphum* Pass., as well as *Microlophium* and *Rhodobium*, which are nearly intermediate between the two. *Impatientinum* and *Aulacorthum* stand more or less apart.

These genera key as follows:

- 1 (2) Siphunculi completely smooth with a dilated part at apex, $\frac{1}{3}$ - $\frac{4}{9}$ of length of body, without flange (Pl. XIV fig. 9). Spinal hairs irregularly with small scler-

- roites, hairs on VIIIth tergite with rather large scleroites. Ultimate rostral segment stiletto-shaped. On *Artemisia* spp. . . . *Titanosiphon* Nevsky, p. 267.
- 2 (1) Siphunculi always imbricated or rough, though sometimes very slightly, less than $\frac{1}{3}$ of length of body, always with a flange. Spinal hairs completely without scleroites.
- 3 (4) Tergite in apterae viviparae completely and evenly sclerotic, quite black (Pl. XIV fig. 10). In apterae rhinaria distributed over the whole length of IIIrd ant. segment, even if only 4 rhinaria are present. Also IVth and Vth ant. segment in apterae frequently with rhinaria. On *Impatiens*.
Impatientinum Mordv., p. 303.
- 4 (3) Tergite in apterae viviparae sometimes sclerotic and blackish pigmented (vide Pl. XIV fig. 12), but never completely black. If the tergite is pigmented then apterae only with 0-6 rhinaria on the base of IIIrd ant. segment and without rhinaria on IVth and Vth ant. segment.
- 5 (6) Tergum in apterae membranous, with very small but distinct dark ante- and postsiphuncular sclerites, but without marginal sclerites. Alatae with only 2-11 rhinaria on IIIrd ant. segment and these usually confined to basal half of the segment. On *Trifolium*. . . . *Subacyrthosiphon* nov. gen., p. 260.
- 6 (5) Tergum membranous or sclerotic in apterae, but if membranous, then never with antesiphuncular sclerites. Alatae usually with rhinaria over more than basal two-thirds of IIIrd ant. segment.
- 7(10) Frontal tubercles rectangular, the inner apices of the frontal tubercles protracted inwards¹⁾. Head normally scabrous by minute spinules, especially the front part and ventrally. Tergum usually sclerotic in apterae, in alatae frequently ornamented with a spino-pleural pattern of sclerites. Larvae shiny or powdered.
- 8 (9) Apterae with 0-6 rhinaria on base of IIIrd ant. segment and with a distinctly sclerotic, often pigmented tergum. Alatae with usually ornamented abd. tergum. Larvae usually nude and shiny like the apterae viviparae. On various plants. . . . *Aulacorthum* Mordv., p. 307.
- 9 (8) Apterae with 7-15 rhinaria on IIIrd ant. segment, with membranous abd. tergum. Alatae only with marginal sclerites. On *Rosa* in hothouses.
Rhodobium nov. gen., p. 300.
- 10 (7) Frontal furrow V- to W- shaped, the inner apices of the frontal tubercles sometimes a little protracted but their inner sides always diverging, if sometimes only little. Tergum in apterae sometimes sclerotic, but very rarely pigmented. Median frontal tubercle sometimes remarkably developed. Head usually not scabrous.
- 11(12) Siphunculi attenuated near the flange, smooth or almost smooth, more rarely imbricated, often with a few rows of hardly transverse, complete hexagonal cells just basally of the flange, more than twice as long as the cauda. Frontal tubercles little diverging, with often slightly rough inner sides. Alatae sometimes with sclerotic spinopleural transverse bars on abd. tergum. Larvae distinctly powdered, apterae nude and often dorsally shiny
Microlophium Mordv.
- 12(11) Siphunculi usually not attenuated near apex, imbricated, more rarely smooth, sometimes with 2-3 transverse striae, which on the underside sometimes may be connected with each other, so that a few strongly transverse cells are formed just below the flange. If the frontal tubercles are protracted at inner apices, then the median frontal tubercle very conspicuous. Larvae powdered or nude, in this respect like the mature insects.

1) This character may become very obscure after mounting.

- 13(14) Siphunculi suddenly constricted at their very apices, sometimes a little swollen. Apteræ with most of their rhinaria on distal half of IIIrd ant. segment, also with rhinaria on IVth and sometimes Vth segment; alatae always with numerous rhinaria on IIIrd, IVth and Vth ant. segment. On *Melandryum*.
Silenobium Börner, p. 264.
- 14(13) Siphunculi without sudden apical constriction, cylindrical with wider base. Both apteræ and alatae only with rhinaria on IIIrd ant. segment, those in apteræ most numerous on basal half of the segment.
- 15(16) Median frontal tubercle as a rule very well developed (Pl. XVI fig. 18; Pl. XVII figs. 22, 23). Apterous viviparous females with 0-4 rhinaria near base of IIIrd ant. segment, with the abd. tergum always sclerotic, though usually not pigmented. Alatae with often very conspicuous spinal tubercles on vertex (seemingly with 5 ocelli) and/or with a distinct sclerotic pattern consisting at least of pleural intersegmental sclerites and marginal sclerites on abdominal tergum. On *Rosa* and Gramineae. . . . *Metopolophium* Mordv., p. 272.
- 16(15) Median frontal tubercle entirely absent or little conspicuous. Apteræ viviparæ often with more rhinaria on IIIrd ant. segment, with the abd. tergum not, or only in very old specimens sclerotic (and then markedly reticulated, vide Pl. XIII fig. 7). Alatae rarely with a then hardly visible sclerotic pattern of spino-pleural origin, normally only with small marginal sclerites. Head sometimes with very small and inconspicuous tubercles on vertex, and these tubercles always very much smaller than the ocelli of alatae. On various plants.
Acyrtosiphon Mordv., p. 220.

G. NOTES ON PHYLOGENY.

In discussing the phylogeny of *Macrosiphum* (Contrib. no. 2, Temminckia, vol. IV, p. 76-77) I placed *Metopolophium* Mordv. in a series of genera supposed to be closely allied. Now the pair of small tubercles on the posterior half of the vertex, which is characteristic for most of the Aphids of this group associated with Rosaceae, is often found in *Acyrtosiphon* (those on the VIIIth tergite are frequently absent). Therefore the morphological resemblance between the genus under consideration and those with reticulated siphunculi is apparently not accidental, but in correlation with a phylogenetic relation. It must be pointed out, that *Lactucobium* shows resemblance to the *Ribes*-Compositae inhabiting genus *Nasonovia* Mordv. also, but it may probably better be placed near *Acyrtosiphon*.

The hostplants do not offer indications of great value. One group of *Acyrtosiphon* s.s. lives on Papilionaceae, Euphorbiaceae and Umbelliferae. It is interesting that another group of Aphids, *Pergandeida* Schouteden, lives mainly on Papilionaceae and Euphorbiaceae, while also some Umbelliferae serve it as hostplants. The hostplants of the 2nd group of *Acyrtosiphon* s.s. have practically only their hairiness in common and I know of no other group of Aphids distributed over both Geraniaceae and Rosaceae.

H. TAXONOMY OF SUBGENERA AND SPECIES.

I. KEY TO SUBGENERA.

- 1 (2) IIIrd ant. segment in apterae always without rhinaria. Hairs on IIIrd ant. segment about half as long as diameter of that segment at its very base. On Papaveraceae. *Liporrhinus* Börner.
- 2 (1) IIIrd ant. segment with rhinaria in apterae, but if, exceptionally, they are absent, then hairs on IIIrd ant. segment less than $\frac{1}{3}$ of basal diameter of that segment long.
- 3 (4) Apterae slightly greyish by wax exsudation. Apical segment of rostrum with about 20 long hairs, all of about the same length. The long hairs on first tarsal joints about $2\frac{1}{2}$ - $3\frac{1}{2}$ times as long as the median spinule.
Lactucobium nov. subg.
- 4 (3) Apterae not evenly covered by wax powder, at most with pale intersegmental lines of very faint wax excretion. Apical segment of rostrum sometimes with 20 or more hairs but then one pair just in front of the apex considerably longer than the others and lateral hairs on first tarsal joints at most $2\frac{1}{2}$ times as long as the middle spinule. . *Acyrtosiphon* Mordv. sensu stricto.

II. KEY TO SPECIES.

Apterous viviparous females.

- 1 (2) IIIrd ant. segment always without rhinaria. On *Chelidonium majus*.
A. (Liporrhinus) chelidonii (Kltb.), p. 257.
- 2 (1) IIIrd ant. segment exceptionally without rhinaria, but then also the hairs on IIIrd ant. segment less than $\frac{1}{3}$ of the basal diameter of this segment long.
- 3 (4) Ultimate rostral segment slightly shorter than 2nd joint of hind tarsi, with about 20 long, curving, fine hairs, all of approximately equal length. On *Lactuca* spp. *A. (Lactucobium) scariolae* Nevsky, p. 255.
- 4 (3) Ultimate rostral segment often shorter than 2nd joint of hind tarsi, but then always with less than 16 hairs. If more than 16 hairs are present, then one pair distinctly stouter and longer than the others and moreover the processus terminalis more than $4\frac{1}{2}$ times as long as base of VIth ant. segment (*Acyrtosiphon* s.s.).
- 5 (6) Ultimate rostral segment just longer than 2nd joint of hind tarsi, rather acute and slender. On various plants. . . . *A. malvae* (Mosley) s.l., p. 233.
- 6 (5) Ultimate rostral segment shorter than 2nd joint of hind tarsi, frequently very short and blunt.
- 7 (8) First tarsal joints with 2-4 short spines and 2-3 longer hairs. Siphunculi $1\frac{1}{8}$ - $1\frac{1}{4}$ times as long as cauda. On *Euphorbia* spp. *A. cyparissiae* (Koch), p. 225.
- 8 (7) First tarsal joints with 1 short spine and 2 (rarely 3) longer hairs. Siphunculi usually relatively much longer.
- 9(10) Siphunculi and cauda both completely black. IVth ant. segment longer than IIIrd. On *Laserpithium Siler*. *A. nigripes* H.R.L., p. 246.
- 10 (9) Siphunculi and cauda either both nearly colourless or at most the siphunculi black. IVth segment nearly always shorter than IIIrd.
- 11(12) Cauda distinctly acuminate, without traces of a basal constriction, with often adpressed hairs. Ist ant. segment with about 13-23 hairs, IIIrd segment with 1-5 usually small rhinaria near base. On Papilionaceae and *Capsella bursa pastoris*. *A. pisum* (Harris), p. 247.
- 12(11) Cauda more or less blunt, frequently slightly constricted at basal $\frac{2}{5}$ part. Ist ant. segment with less than 14 hairs.

- 13(14) IIIrd ant. segment with 3-10 (normally 6-7) rhinaria. Ultimate rostral segment about half as long as 2nd joint of hind tarsi. Processus terminalis usually less than 3 times as long as base of VIth ant. segment. Cauda with about 18 hairs. On *Euphorbia* spp. *A. euphorbiae* Börner, p. 229.
- 14(13) IIIrd ant. segment with 0-5 rhinaria. Ultimate rostral segment at least $\frac{3}{5}$ of 2nd joint of hind tarsi. Processus terminalis at least 3 times as long as base of VIth ant. segment. Cauda with at most 14 hairs.
- 15(16) Siphunculi more than twice as long as cauda. Processus terminalis about 7 times as long as base of VIth ant. segment. On *Urtica*.
Genus *Microlophium* Mordv.
- 16(15) Siphunculi not more than twice as long as cauda, not darker than the cauda, superficially imbricated. Processus terminalis at most $5\frac{1}{2}$ times as long as base of VIth ant. segment. On Leguminosae.
- 17(18) Siphunculi gradually decreasing in diameter from base to apex, in the middle about $1\frac{1}{2}$ times as thick as the middle of the hind tibiae, 5-7 times as long as ultimate rostral segment. On various arboreous Papilionaceae.
A. caraganae (Chol.), p. 222.
- 18(17) Siphunculi tapering from base to basal $\frac{1}{3}$ - $\frac{1}{2}$, but from there on cylindrical, $3\frac{1}{2}$ - $5\frac{1}{2}$ times as long as ultimate rostral segment, in the middle about 1 - $1\frac{1}{4}$ times as thick as the middle of the hind tibia. On *Lotus* spp.
A. loti (Theob.), p. 231.

Alate viviparous females.

- 1 (2) First tarsal segments with 2-3 long and 3-4 short hairs. Siphunculi much darker than cauda, approximately as long as cauda. On *Euphorbia* spp.
A. cyparissiae (Koch), p. 225.
- 2 (1) First tarsal segments with 2 (rarely 3) long and one short hair. Siphunculi about as dark as the cauda or paler.
- 3 (4) [Siphunculi and cauda both black. On *Laserpithium Siler*.
A. nigripes H.R.L., p. 246].
- 4 (3) Siphunculi and cauda both pale.
- 5 (6) Ultimate rostral segment with about 20 long, fine curving hairs, all of approximately the same length. IIIrd ant. segment with more than 15 rhinaria. On *Lactuca* spp. *A. (Lactucobium) scariolae* (Nevsky), p. 255.
- 6 (5) Ultimate rostral segment sometimes with about 20 hairs, but if they have about the same length, then IIIrd ant. segment with less than 15 rhinaria.
- 7 (8) IIIrd ant. segment with less than 12 rhinaria. Ultimate rostral segment hardly shorter than base of VIth ant. segment. Proc. terminalis about 3 times as long as base of VIth segment. On *Chelidonium majus*.
A. (Liporrhinus) chelidonii (Kltb.), p. 257.
- 8 (7) IIIrd ant. segment sometimes with less than 12 rhinaria, but then either ultimate rostral segment much shorter than base of VIth ant. segment or the processus terminalis at least $3\frac{3}{4}$ times as long as base of IVth segment.
- 9(10) Ultimate rostral segment just longer than 2nd joint of hind tarsi. Processus terminalis $4\frac{1}{2}$ - $6\frac{1}{2}$ times as long as base of VIth ant. segment. IIIrd ant. segment with 18-31 rhinaria. On various plants. *A. malvae* (Mosley) s. l., p. 233.
- 10 (9) Ultimate rostral segment shorter than 2nd joint of hind tarsi or at most as long.
- 11(12) Rhinaria over the whole length of IIIrd ant. segment. Processus terminalis about 3 times as long as base of VIth segment. On *Euphorbia* spp.
A. euphorbiae Börner, p. 229.
- 12(11) Rhinaria usually confined to basal $\frac{4}{5}$ of IIIrd ant. segment. Processus terminalis usually more than 3 times as long as base of VIth ant. segment. On Papilionaceae and *Capsella*.

- 13(14) Hind tibiae at basal $\frac{1}{3}$ about $1\frac{1}{2}$ times as thick as siphunculi in the middle. Cauda acuminate, very elongate triangular, with rather short, adpressed hairs. Ist ant. segment with about 13-24 hairs. On Papilionaceae and *Capsella bursa pastoris*.
A. pisum (Harris), p. 247.
- 14(13) Hind tibiae at basal $\frac{1}{3}$ not thicker, sometimes even thinner than siphunculi in the middle. Cauda with rather normal, spreading hairs. Ist ant. segment with less than 14 hairs.
- 15(16) Siphunculi at most $1\frac{1}{2}$ times as long as cauda, in the middle about as thick as hind tibiae at their basal $\frac{1}{3}$ part. On *Lotus* spp. *A. loti* (Theob.), p. 231.
- 15(15) Siphunculi about $1\frac{2}{3}$ times as long as cauda, in the middle thicker than the hind tibiae at their basal $\frac{1}{3}$ part. On *Caragana*, *Colutea* and *Cytisus*.
A. caraganae (Chol.), p. 221.

III. DESCRIPTION OF THE SPECIES.

Acyrthosiphon caraganae (Cholodkovsky, 1907) (Pl. XIII fig. 6).

1848. Walker, F., Ann. Mag. Nat. Hist. (2), vol. II, p. 421, *Aphis ulmariae* partim.
1901. Mordvilko, A. K., Horae Soc. Ent. Ross., vol. XXXIII, p. 297, *Siphonophora* sp.
1906. Schouteden, H., Mém. Soc. Ent. Belg., vol. XII, p. 240, *Macrosiphum ulmariae* partim.
1907. Cholodkovsky, N., Russian Entom. Review (in Russian), no. 2-3, p. 87-95, *Siphonophora caraganae*.
1908. Mordvilko, A. K., Biol. Centralbl., vol. XXVIII, p. 661, *Siphonophora caraganae*.
1909. Mordvilko, A. K., Biol. Centralbl., vol. XXIX, p. 103, *Siphonophora caraganae*.
1909. Cholodkovsky, N., Works of Bureau of Entomology (Russia), vol. VIII, p. 4-5, 10, *Macrosiphum caraganae*.
1909. Cholodkovsky, N., Works of Bureau of Entomology (Russia), vol. VIII, p. 10-13, *Siphonophora caraganae*.
1914. Mordvilko, A. K., Faune d. l. Russie, Ins. Hémipt., vol. I, livr. 1, p. 152, *Acyrthosiphon caraganae*.
1928. Opmanis, K., Acta Univ. Latviensis, vol. XVIII, p. 392, *Macrosiphum caraganae*.
1930. Judenko, E., Bull. Ent. d. l. Pologne, vol. IX, p. 163, *Acyrthosiphon caraganae*.
1932. Börner, C., in Sorauer, Handb. d. Pflanzenkr., ed. IV, vol. V, pars 2, p. 627, *Acyrthosiphon caraganae*.

Fundatrix.

Morphological characters. Body rather shortly oval, swollen, usually smaller than in apterous viviparous female. Median frontal tubercle conspicuous. Antennae very much shorter than the body; IIIrd ant. segment usually without rhinaria, sometimes with one near base; processus terminalis at most twice as long as base of VIth segment, at most half as long as IIIrd segment, but usually shorter. Siphunculi more or less brownish, dark towards the flange, irregularly tapering from base to apex. Cauda triangular, sometimes constricted, rather acute. Legs short.

Colour. From peasoup-green to dull dark apple-green, in the latter case with pale intersegmental lines of waxy excretion, so that the insects are

distinctly transversely striped. Head rather whitish. Siphunculi pale greenish brown with dark apices. Cauda and legs about as the body. Antennae with the flagellum brownish.

Measurements of one specimen: Length of body: 2.88 mm; ant.: 2.16 mm; siph.: 0.59 mm; cau.: 0.34 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{66}{IV} : \frac{69}{V} : \frac{(27+42)}{VI}$. Rhin. on IIIrd ant. segments: 0 and 0.

Apterous viviparous female.

Morphological characters. Body rather large, spindle-shaped, with on dorsum very short, blunt hairs, which increase in length towards the cauda; those on IInd abd. segment about $\frac{1}{4}$ of basal diameter of IIIrd ant. segment long; VIIIth tergite with usually 8-10 hairs, which are about as long as basal diameter of IIIrd segment, or a little shorter. Tergite not, or in very old specimens a little, sclerotic, uniformly pale to very pale brownish (in old specimens), nearly smooth. Frontal tubercles well developed, diverging, very slightly rough, but not imbricated. Median frontal process small, but distinct. Antennae $\frac{8}{9}$ — $\frac{1}{10}$ of length of body, Ist and IInd segment slightly rough, Ist segment with about 10 hairs, IIIrd segment with 1-4 rhinaria near base. Rostrum reaching to just past the middle coxae, length of apical segment $\frac{3}{4}$ — $\frac{4}{5}$ of the second joint of hind tarsi. Siphunculi often rather thick at base and tapering towards the flange, sometimes nearly cylindrical with expanded base and suddenly attenuated at apex, about $\frac{1}{4}$ — $\frac{2}{7}$ of length of body, pale, with only the very apex dusky, surface transversely striate-imbricate in a very regular way, flange small, but distinct. Cauda slender, elongate, slightly constricted at basal third part, $\frac{5}{9}$ — $\frac{3}{5}$ of the length of the siphunculi, with 7-10 hairs. Legs long and thin, first tarsal joints with 3, 3, 3 hairs.

Colour. Greyish green to very dark apple-green, in not too old specimens with pale grey intersegmental transverse lines of waxy exudation and often with a brighter green spinal stripe also. Siphunculi nearly colourless with the very apices dusky. Cauda whitish. Antennae dark brown towards apex. Legs pale greenish.

Measurements of one specimen: Length of body: 3.28 mm; ant.: 2.92 mm; siph.: 0.87 mm; cau.: 0.52 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{78}{IV} : \frac{66}{V} : \frac{(20+81)}{VI}$. Rhin. on IIIrd ant. segment: 1 and 1.

Alate viviparous female.

Morphological characters. Very much like the apterous female. Abdomen

without distinct sclerites. Antennae 1—1¹/₇ times as long as body, IIIrd segment with 7—10 rhinaria, often confined to basal half. Siphunculi and cauda thinner than in apterae, the cauda also more acute.

Colour. As in apterous viviparous female.

Measurements of one specimen: Length of body: 3.67 mm; ant.: 4.09 mm; siph.: 0.79 mm; cau.: 0.47 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{70}{\text{IV}} : \frac{67}{\text{V}} : \frac{(16+83)}{\text{VI}}$. Rhin. on IIIrd ant. segments: 7 and 9.

Oviparous female.

Morphological characters. Very much like apterous viviparous female. IIIrd ant. segment with 0—2 rhinaria. Hind tibiae rather strongly swollen in true oviparae; very slightly swollen in ovipariform apterae viviparae, which sometimes may contain an egg.

Colour. Rather yellowish green.

Measurements of one specimen: Length of body: 2.98 mm; ant.: 3.05 mm; siph.: 0.74 mm; cau.: 0.32 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{80}{\text{IV}} : \frac{72}{\text{V}} : \frac{(24+87)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 1 and 2.

Apterous male.

Morphological characters. Rather small, narrow, nearly linear. Head sclerotic, black, with small ocelli. Antennae 1¹/₂—1³/₄ times as long as body, IIIrd segment with 50—65 rhinaria, IVth with 12—28, Vth with 10—25. Abdomen with prominent, dark, intersegmental pleural sclerites. Siphunculi dark, short, $\frac{2}{9}$ — $\frac{1}{4}$ of length of body. Cauda short, $\frac{1}{2}$ — $\frac{4}{7}$ of length of siphunculi, dark, slender and acute. Legs, antennae all rather dark, sclerotic.

Colour. Dull red, with a grey hue of waxy excretion. Antennae, etc., as in apterous viviparous female.

Measurements of one specimen: Length of body: 2.15 mm; ant.: 3.40 mm; siph.: 0.51 mm; cau.: 0.27 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{90}{\text{IV}} : \frac{83}{\text{V}} : \frac{(25+95)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 55 and 58; on IVth: 18 and 22; on Vth: 19 and 16.

Hostplants: *Colutea media*, *Caragana arborescens*, *Colutea* sp.; *Cytisus laburnum* (according to R. Korschefsky of the Deutsches Entomologisches Institut, Berlin-Dahlem).

Geographical distribution: Netherlands, Germany, Russia, Poland.

Biology: This species lives during the whole year on various deciduous Papilionaceae. The eggs hatch in the middle of March. Fundatrices are fullgrown towards May (1941). In spring and summer the insects live on the underside of the leaflets, also on the petioles. Towards the autumn, when the leaves drop, one finds most of the lice concentrated on suckers; if these also lose their foliage they may be found in small colonies on the youngest branches. Alatae occur from the 3rd generation, apparently not earlier. The apterous males appeared earlier than the oviparae and in 1939 most of them perished before oviparae were present. The eggs are deposited on the young branches. Oviposition started in the first week of November in 1939.

Notes. I found this species in the Netherlands, wherever its foodplants were present. Thrashing the shrubs is the quickest way to detect this species. I failed to find it on *Cytisus*, so that it seems not excluded that Korschefky's record from this plant is a result of misidentification of its host. Mordvilko describes the male as alate and therefore I give the Western European form with apterous males the name subspecies **occidentale** nov. subsp.

Morphologically the species is closer allied to *A. loti* (Theob.) than to *A. pisum* (Harris). It might be quite easily mistaken for *loti* and therefore I give microphotographs of the posterior part of the abdomen of both. The males especially might cause difficulties, both being reddish, whereas in *A. pisum* (Harris) they are coloured like the other forms.

Old specimens may show a curious dark green colour, about like that, which Koch gives for his *Siphonophora spartii*. In such dark specimens the integumentum after maceration appears to be pigmented (cf. Pl. XIII fig. 7).

Types: In the author's collection.

Acyrtosiphon cyparissiae (Koch, 1855).

1855. Koch, C. L., Die Pflanzenläuse Aphiden, p. 174, *Siphonophora cyparissiae*.
 1863. Passerini, G., Archiv. p. l. Zool., vol. II, p. 134 (reprint, p. 11), *Siphonophora cyparissiae*.
 1871. Passerini, G., Boll. Soc. Ent. Ital., vol. III, p. 294, *Siphonophora cyparissiae*.
 1872. Ferrari, P. M., Ann. Mus. Civ. Stor. Nat. Genova, vol. III, p. 212, *Siphonophora cyparissiae*.
 1883. Macchiati, L., Boll. Soc. Ent. Ital., vol. XV, p. 220, 275, *Siphonophora cyparissiae*.
 1900. Guercio, G. del, N. Rel. R. Staz. Ent. Agrar., Firenze (1), no. 2, p. 164, *Siphonophora cyparissiae*.
 1914. Mordvilko, A. K., Faune d. l. Russie, Ins. Hémipt., vol. I, livr. 1, p. 188, *Acyrtosiphon cyparissiae cyparissiae*.

1914. Mordvilko, A. K., Faune d. l. Russie, Ins. Hémipt., vol. I, livr. 1, p. 193, *Acyrtosiphon cyparissiae propinquum*.
 1915. Goot, P. v. d., Beitr. z. Kenntnis d. Holl. Blattläuse, p. 87, *Macrosiphum spec.*
 1939. Börner, C., Arb. Phys. u. Angew. Entom., vol. VI, p. 83, *Mirotarsus cyparissiae*.
 1940. Börner, C., Neue Blattläuse aus Mitteleuropa, ed. Börner, p. 4, *Acyrtosiphon cyparissiae*.

Fundatrix.

Morphological characters. Body broader than in next form. Head pale. Frontal tubercles hardly developed. Antennae of 6, rarely 5 segments, little more than half as long as body, pale with the apices of IIIrd, IVth and Vth and the whole of VIth segment blackish; IIIrd segment without rhinaria; processus terminalis only about twice as long as base of last segment, $\frac{2}{3}$ of IIIrd. Siphunculi rather thick, pale with the very apices dusky, about $\frac{1}{7}$ of body. Cauda pale, thick, as long as the siphunculi, with only 6—9 hairs. Legs short, pale with dark apices to the tibiae; first tarsal joints with 2—3 short and thick median spines and 2 longer lateral ones. Remainder as in the next form 1).

Colour. Pale sea-green. Legs, siphunculi, cauda and antennae like body, the antennae with black apices to the segments of the flagellum.

Measurements of one specimen: Length of body: 2.85 mm; ant.: 1.60 mm; siph.: 0.43 mm; cau.: 0.44 mm. Prop. of ant. segments:
 $\frac{100}{III} : \frac{57}{IV} : \frac{68}{V} : \frac{(39+68)}{VI}$.

Apterous viviparous female.

Morphological characters. Body rather large, spindle-shaped. Tergite not sclerotic, except often the anterior $\frac{2}{3}$ part of the head which may be black (forma typica) or nearly colourless (forma *propinquum* Mordv.). Frontal tubercles well developed, smooth, diverging. Antennae about as long as body, jet black (f. typica) or with at least IIIrd segment paler; proc. terminalis about as long as IIIrd segment, in small specimens sometimes much longer; IIIrd ant. segment with 1—3 (exceptionally 4) rhinaria near base. Antennal hairs $\frac{5}{11}$ — $\frac{7}{11}$ of basal diameter of IIIrd segment. First segment with 8—10 hairs. Head very often with one very small median ocellus or even with 3 ocelli. Rostrum in both forms completely pale, short, just reaching middle coxae, with apical segment very short, only half as long as second joint of hind tarsi, with 8—10 hairs. Siphunculi about $\frac{1}{5}$

1) I saw only 3 specimens from one plant of *Euphorbia cyparissias*, with in total 3 IIIrd ant. segments; they may belong to the forma *propinquum* Mordv., but their offspring was not studied.

of length of body, thinnest in the middle and slightly enlarged at apex, often thinner than IIIrd ant. segment, imbricate, with small flange, very sclerotic black except the very base (f. *typica*), or gradually darker towards apex, rather pale (f. *propinquum* Mordv.). Cauda long, pale, rather thick, $\frac{4}{5}$ — $\frac{19}{20}$ of length of siphunculi, with 12—15 hairs. Legs either black, with the exception of the basal halves of the femora and the middle portion of the tibiae (f. *typica*) or with only the apices of the tibiae black and the knees very slightly dusky. First tarsal joints with 5—7 hairs, namely two lateral long spines and between these a row of 3, rarely 4, blunt spines about $\frac{1}{3}$ the length of the former, placed so close to each other in a row, that the bases touch; exceptionally one longer hair may be present basally of those mentioned above.

Colour. Green, with head, antennae, siphunculi except their base and most of the legs black (*typica*) or more yellowish green, with distal part of siphunculi brown, apices of tibiae black, antennae brown, remainder greenish brownish yellow.

Measurements of two specimens (forma *typica*): (I) Length of body: 3.34 mm; ant.: 3.50 mm; siph.: 0.63 mm; cau.: 0.55 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{89}{IV} : \frac{74}{V} : \frac{(26 + 102)}{VI}$. Rhin. on IIIrd ant. segments: 2 and 2. (II) Length of body: 2.18 mm; ant.: 2.36 mm; siph.: 0.32 mm; cau.: 0.30 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{98}{IV} : \frac{89}{V} : \frac{(37 + 141)}{VI}$. Rhin. on IIIrd ant. segment: 1 and 1.

A late viviparous female (forma *typica*).

Morphological characters. Very much like apterous viviparous female, with the anterior two-thirds part of the head very dark sclerotic, much darker than the thorax. Abdomen with the marginal sclerites often scarcely visible, remainder membranous. Antennae about as in apterae, but IIIrd segment with about 4—12 rather large rhinaria in a row on basal $\frac{1}{2}$ — $\frac{7}{8}$. Siphunculi and cauda about as in apterous viviparous female, the latter more slender.

Colour. As in apterous viviparous female.

Measurement of one specimen: Length of body: 2.60 mm; ant.: 2.88 mm; siph.: 0.42 mm; cau.: 0.38 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{107}{IV} : \frac{90}{V} : \frac{(28 + 131)}{VI}$. Rhin. on IIIrd ant. segment: 8 and 9.

Oviparous female.

Morphological characters. Very much like apterous viviparous female,

and like this form occurring in a dark type and a paler form. Though the front- and midlegs differ as described for the apterous viviparous female, the hind legs in both forms are brownish yellow, strongly swollen and covered with pseudosensoria.

Colour. As in apterous viviparous female, but more yellowish.

Measurements of one specimen (forma typica): Length of body: 2.85 mm; ant.: 3.31 mm; siph.: 0.60 mm; cau.: 0.48 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{98}{IV} : \frac{74}{V} : \frac{(28 + 108)}{VI}$. Rhin. on IIIrd ant. segment: 1 and 1.

Alate male.

Morphological characters. Much like apterous form. Abdomen with distinct, rather large marginal sclerites, moreover with often rudimentary narrow spinal sclerotic transverse bars. Antennae much longer than body, IIIrd segment with 25-35 rhinaria, IVth without rhinaria, Vth with 10-17. Siphunculi very thin on distal two-thirds part, enlarged at apex. Cauda rather shortly triangular, semi-acute, pale. Genitalia normal.

Colour. Head, thorax, etc., black. Abdomen green with marginal and spinal sclerites brownish.

Measurements of one specimen: Length of body: 2.43 mm; ant.: 3.30 mm; siph.: 0.31 mm; cau.: 0.25 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{98}{IV} : \frac{82}{V} : \frac{(30 + 127)}{VI}$. Rhin. on IIIrd ant. segments: 27 and 29; on IVth: 0 and 0; on Vth: 12 and 16.

Hostplants: *Euphorbia cyparissias*, *E. esula*, *E. gerardiana* and probably other species (*E. pepus*, Van der Goot, 1915).

Geographical distribution: Europe.

Biology: I found this species always feeding on the upperside of the higher leaves, often occurring in large numbers. Sexuales were found in the last week of September. In the Netherlands it is most common on *E. esula*; but also on *E. cyparissias* I found it frequently in the Netherlands as well as in Germany in the valley of the Mosel. At Lith (N. Br.) I found colonies of another species, *A. euphorbiae* Börner, between this species. At Wageningen this species was found on *E. cyparissias*, together with colonies of *Aphis euphorbiae* Kltb. The larvae are slightly greyish.

Notes. Of this species two parallel forms occur, which Mordvilko regards as different subspecies. Both forms may occur together or separately. At Lith and Oss (N. Br.) I found the pale form only, on *E. esula*. In my garden this species occurs in the forma typica only, on *E. cyparissias*, but along the dykes of the Rhine near Wageningen I found both forms mixed

and in more or less continuous variation on *E. esula*. I therefore treat them as one species, because no constant difference could be found.

The hairs on the first tarsal joints are rather an exception in the whole group. In *Longicaudus* v. d. Goot 6 hairs are present as well, but what strikes me here is the presence of 5-7 hairs in one species and 3 in another, which differs very little only (*A. euphorbiae* Börner). This is the best proof I know, that the number of tarsal hairs as a generic character ought to be handled with the utmost care. There is not the slightest reason to erect a separate systematic group for *A. cyparissiae* only as Börner did. An analogous case occurs between *Toxoptera aurantii* (Fonsc.) and *T.* (formerly *Aphis*) *citricidus* (Kirk.) in the furcation of the media, to which great value has been given, until Takahashi placed the two in one genus, rightly in my opinion.

This species was described by Buckton from *Rubus* and *Scabiosa*. The *Rubus* material is *Macrosiphum funestum* (Macch.), the *Scabiosa* insects probably were *M. rosae* (L.).

Types: Koch's material seems to be lost.

***Acyrtosiphon euphorbiae* Börner, 1940.**

1940. Börner, C., Neue Blattläuse aus Mitteleuropa, ed. Börner, p. 4, *Acyrtosiphon euphorbiae*.

Apterous viviparous female.

Morphological characters. Body large, 3.60—4.35 mm long, elongated oval. Tergum not sclerotic, not even the front, not coloured, with very short hairs. Frontal tubercles moderately developed, strongly diverging, quite smooth. Antennae only $\frac{3}{4}$ — $\frac{9}{10}$ times as long as the body, nearly colourless excepting the very apices of the segments III, IV and V, and the environment of the rhinaria on VI, which sometimes are darker; IIIrd segment on basal $\frac{1}{3}$ — $\frac{2}{5}$ with 3—10 rather small, flat rhinaria in a row; processus terminalis short, usually less than 3 times as long as base of VIth segment, $\frac{2}{3}$ — $\frac{9}{10}$ times as long as IIIrd segment. Antennal hairs only $\frac{1}{4}$ — $\frac{1}{3}$ times as long as basal diameter of IIIrd segment. Rostrum very short, reaching to the middle coxae; apical segment hardly as long as broad at base, blunt, only half as long as second joint of hind tarsi, with 2—4 hairs besides the 3 apical pairs. Siphunculi $\frac{1}{5}$ — $\frac{2}{9}$ times as long as body, approximately cylindrical, rather thin, pale, faintly imbricated, with very small flange. Cauda very long and slender, pale, $\frac{5}{7}$ — $\frac{3}{4}$ times as long as the siphunculi, with about 12—18 hairs. Legs long, normal, rather uniformly pale; first tarsal joints with 3, 3, 3 hairs, rarely with one hair more basally of the median spine on one or two of the legs.

Colour. Green with a yellowish tinge. Legs, antennae, etc., about like the body.

Measurements of two specimens: (I) Length of body: 4.20 mm; ant.: 3.75 mm; siph.: 0.88 mm; cau.: 0.65 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{81}{\text{IV}} : \frac{67}{\text{V}} : \frac{(33+89)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 7 and 7. (II) Length of body: 4.02 mm; ant.: 2.99 mm; siph.: 0.88 mm; cau.: 0.71 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{60}{\text{IV}} : \frac{51}{\text{V}} : \frac{(23+71)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 5 and 6. (I, from *Euphorbia esula*, Lith, IX-'29; II, from *E. palustris*, Rheinau, 5-VI-'32, leg. Börner).

Alate viviparous female.

Morphological characters. Very much like apterous form, but smaller. Head and thorax only slightly brownish sclerotic, abdomen only with very small marginal sclerites. IIIrd ant. segment with about 22 rhinaria, not in a row, over the whole length.

Colour. Probably about as in apterous viviparous female.

Measurements of one specimen: Length of body: 2.86 mm; ant.: 3.10 ? mm; siph.: 0.62 mm; cau.: 0.48 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{75}{\text{IV}} : \frac{63}{\text{V}} : \frac{(26+79?)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 21 and 23. (From *Euphorbia palustris*, Rheinau, 5-VI-'32, leg. Börner).

Hostplants: *Euphorbia esula*, *E. palustris*.

Geographical distribution: Netherlands, Germany.

Biology: About the biology of this species little is known with certainty, but most probably it passes its complete cyclus on *Euphorbia*. I found it with *A. cyparissiae* (Koch) in small colonies on the uppersides of the leaves of *E. esula*. In the two months of observation (August-September 1929) I found no alatae. Börner described it from *E. palustris* from Germany.

Notes. The curious short ultimate rostral segment places this species quite near *A. cyparissiae* (Koch), for the pale form of which it might easily be mistaken. It is curious that two so closely allied species should differ so strongly in the chaetae on the first tarsal joints. It is probably significant, that *euphorbiae* shows irregularities in this regard, though they do not clearly go in the direction of *cyparissiae*.

I am much indebted to Dr. Börner for sending me two apterae and an alate female, most probably 'cotypes. His material resembles my apterae strongly, but there are some small differences. In my rather large material there are 12—16 hairs present on the 1st ant. segment, in the apterae and alata from Börner 7—9; the cauda is in his aphids thin and it has about

12 hairs, in my specimens it is thicker and it has about 18 hairs. Therefore I name the Dutch form *Acyrtosiphon euphorbiae* subsp. *neerlandicum* nov. subsp.

Types: Börner's types in his collection, cotypes in the author's collection. Cotypes of the subsp. *neerlandicum* in the author's collection.

Acyrtosiphon loti (Theobald, 1912) (Pl. XIII fig. 7).

1848. Walker, F., Ann. Mag. Nat. Hist. (2), vol. II, p. 421, *Aphis ulmariae* partim.
 1912. Theobald, F. V., Trans. Intern. Congr. Ent., vol. II, p. 384, *Macrosiphum loti*.
 1913. Theobald, F. V., Journ. Econ. Biol., vol. VIII, p. 139-140, *Macrosiphum loti*.
 1914. Mordvilko, A. K., Faune d. l. Russie, Ins. Hémipt., vol. I, livr. 1, p. 185-188, *Acyrtosiphon loti*.
 ?1915. Goot, P. van der, Beitr. z. Kenntnis d. Holl. Blattläuse, p. 85, *Macrosiphum pisi* partim.
 1917. Theobald, F. V., Entomologist, vol. L, p. 78, *Macrosiphum loti*.
 1926. Theobald, F. V., Aph. Great Britain, vol. I, p. 133, *Macrosiphum loti*.
 1935. Hille Ris Lambers, D., Stylops, vol. IV, p. 114-115, *Acyrtosiphon geranicola* partim.

Apterous viviparous female.

Morphological characters. Body spindle-shaped, rather broad, with exceedingly short hairs on abd. segments I—IV and slightly longer ones towards the cauda; VIIIth tergite with 7—9 hairs with slightly capitate apex, which are about $\frac{3}{5}$ of basal diameter of IIIrd ant. segment long. Tergite not sclerotic except in very old specimens, completely pale. Frontal tubercles not much developed, strongly diverging, smooth, at least not scabrous; median frontal tubercle prominent, but low and flat. Antennae $\frac{9}{10}$ — $1\frac{1}{10}$ times as long as body, Ist and IInd segment very faintly imbricated, Ist segment with 7—9 hairs, IIIrd segment with 0—3 not protruding rhinaria near the hardly incrassate base; processus terminalis $3\frac{1}{4}$ —4 times as long as base of VIth segment, shorter than IIIrd segment. Antennal hairs on IIIrd segment short, thick, curved, blunt, about $\frac{2}{9}$ — $\frac{1}{4}$ of basal diameter of IIIrd segment. Rostrum reaching to just past middle coxae, apical segment rather slender, about $\frac{2}{3}$ — $\frac{8}{9}$ of second joint of hind tarsi. Siphunculi rather slender, approximately cylindrical with incrassate base, about $\frac{1}{5}$ — $\frac{1}{4}$ of length of body, pale with darker apex, slightly imbricate, with distinct, rather wide flange. Cauda elongated, constricted (usually very little only) on basal $\frac{2}{5}$, slightly blunt, $\frac{3}{5}$ — $\frac{4}{5}$ of length of siphunculi, with 6—9 spreading hairs, 5—6 of which usually are placed laterally, the others on dorsum near apex. Legs thin, pale, rather long, first tarsal joints with 3, 3, 3 hairs.

Colour. Green with often faint greyish transverse lines, exactly the

colour of younger leaves of the foodplant. Antennae pale brownish yellow, dark brown to black towards the apex. Siphunculi green with dusky apices, cauda pale green.

Measurements of one specimen: Length of body: 2.59 mm; ant.: 2.45 mm; siph.: 0.57 mm; cau.: 0.40 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{78}{\text{IV}} : \frac{72}{\text{V}} : \frac{(24 + 86)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 2 and 2.

Alate viviparous female.

Morphological characters. Head and thorax pale brownish, with on the head small blackish areas around the ocelli. Abdomen with hardly visible marginal sclerites and pleural intersegmental sclerites. Antennae $1\frac{9}{20}$ — $1\frac{1}{10}$ times as long as body, IIIrd segment distinctly gradually thinner towards the apex, with 4—10 rather large rhinaria, which usually are confined to basal half. Siphunculi slightly thinner than in apterous viviparous female, also a little more acute. Other characters as in apterous viviparous female.

Colour. As in apterous viviparous female.

Measurements of one specimen: Length of body: 2.69 mm; ant.: 2.64 mm; siph.: 0.52 mm; cau.: 0.39 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{79}{\text{IV}} : \frac{76}{\text{V}} : \frac{(23 + 95)}{\text{VI}}$. Rhin. on IIIrd ant. segments: 7 and 8.

Apterous male.

Morphological characters. Body small, very narrow and elongated to nearly linear. Head dark to blackish sclerotic, with small ocelli. Abdomen with more or less distinct marginal sclerites and with much more distinct, often rather large pleural intersegmental sclerites, which sometimes are nearly black and on IIIrd and IVth segment may form an interrupted bar; also VIIth and VIIIth tergite with rather narrow transverse sclerites. Antennae very dark, about $1\frac{1}{4}$ times as long as body, IIIrd segment with 40—50 small rhinaria, mainly on one side, IVth with 12—20, Vth with 10—20. Siphunculi thin, dark, usually less than $\frac{1}{5}$ of length of body. Cauda about as dark as siphunculi, elongated triangular, slightly blunt. Genitalia prominent.

Colour. Greyish red; more bright red in recently moulted specimens. Antennae, siphunculi and cauda brownish, legs paler.

Measurements of one specimen: Length of body: 1.78 mm; ant.: 2.18 mm; siph.: 0.32 mm; cau.: 0.21 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{66}{\text{IV}} : \frac{65}{\text{V}} : \frac{(16 + 92)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 44 and 46; on IVth: 17 and 19; on Vth: 15 and 13.

Hostplants: *Lotus uliginosus*, *L. corniculatus*.

Geographical distribution: England, Netherlands, France, Germany.

Biology: Lives during the whole year on its host, infesting the upper parts, young shoots, flowers, etc. Alatae are rather rare except in the 3rd generation. Sexual forms were discovered in October 1939. The males are very active and are easily detected by their colour. As larvae they are red already. The eggs were laid on the leaves in captivity. They are very pale transparent greenish first and turn black in a few days.

Notes. In several regards this species closely resembles *A. caraganae occidentale*. It even might be considered as a small subspecies of this form. On the whole it is smaller, with shorter and thinner siphunculi; the frontal tubercles are lower and more diverging, the median frontal process is more prominent; but such characters are not very useful for practical purposes. The best way to separate the two is by measuring the length of the longest hairs on the VIIIth abd. tergite. Are these more than $\frac{7}{10}$ of the diameter of IIIrd ant. segment at its basal articulation, then *A. caraganae occidentale* is involved. This character is applicable to all mature forms.

Theobald says about this species that it is rare in England. In the Netherlands it is quite common. Hq says also, that Mordvilko found it in Russia, but Mordvilko describes it from English material. One of Theobald's specimens has abnormally long siphunculi; this is not *loti*, but *pisum*, which may occur on *Lotus* as well.

Types: In the British Museum (Natural History), London.

Acyrtosiphon malvae (Mosley) sensu latiore.

Under this name four groups of aphids are united in this paper. I do not know, whether they are one polyphagous species or whether they are four systematic units. At all events I have failed to find characters which are fit for use to separate them all. As long as my material was rather small I could distinguish three of the forms. But since I have quite a number of slides most of the differences appear to be irreal. Special investigations may prove the identity or difference. For convenience's sake I describe them as subspecies. These subspecies are the following:

1. *A. malvae malvae* (Mosley), living on *Malva* spp., *Pelargonium* spp. div. and *Primula* in hothouses.
2. *A. malvae geranii* (Kltb.), living on *Geranium Robertianum*, *G. molle* and *Erodium cicutarium*.
3. *A. malvae rogersii* (Theob.), living on *Fragaria*.
4. *A. malvae agrimoniella* (Cockerell), living on *Agrimonia*.

One would suppose, that the imported *Pelargonium* had its aphids from the wild *Geraniums*, but my rather extensive material shows a difference between subspecies 1 and 2. In no. 1 the processus terminalis is 6—7 times as long as base of VIth ant. segment, in nos. 2—4 at most 6 times as long as base of VIth segment. Also nos. 3 and 4 might be supposed to be identical, but no. 3 in autumn is still pale green and does not like to feed on *Agrimonia*, while no. 4 is yellow in autumn and readily accepts *Fragaria* as food-plant. Attempts to induce males of either subspecies to mate with oviparae of the other failed completely. But morphological differences could not be found. Very extensive transmission experiments will perhaps solve this problem.

All these subspecies have a very interesting character in common. In most of the colonies, especially in those of nos. 1 and 4, one finds numerous apterae viviparae, which strongly differ from normal ones in that they have a much larger number of rhinaria on the IIIrd ant. segment, sometimes ocelli also. These alatiform apterae or intermediates occur in numerous other species, but then generally the thorax shows abnormalities, whereas in this species no trace of abnormal sclerotisation is present.

Another described Aphid, *Myzus erigeroniella* Theob., 1926 (Aph. Great Britain, vol. I, p. 354), is a synonym of *Acyrthosiphon malvae* (Mosley), but I do not know of which of the subspecies, though it is not *malvae* sensu stricto. Measurements of Theobald's apterous viviparous type are the following: Length of body: 2.20 mm; ant.: 2.28 mm; siph.: 0.58 mm; cau.: 0.31 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{63}{IV} : \frac{52}{V} : \frac{(20 + 102)}{VI}$. Rhin. on IIIrd ant. segment: 5 and 7. Proportion of ultimate rostral segment: second joint of hind tarsi = 37:32.5. Another specimen has 2 and 3 rhinaria on IIIrd ant. segment. This corresponds rather strongly with some of my measurements of subspec. *geranii* (Klth.) and subspec. *agrimoniella* (Cockerell).

***Acyrthosiphon malvae* (Mosley, 1841) sensu stricto.**

1841. Mosley, O., Gard. Chronicle, vol. I, p. 684, *Aphis malvae*.
 1843. Kaltentbach, J. H. Mono. d. Pflanzenläuse, *Aphis pelargonii*.
 1848. Walker, F., Ann. Mag. Nat. Hist. (2), vol. II, p. 427, *Aphis urticae* partim.
 1848. Walker, F., Ann. Mag. Nat. Hist. (2), vol. II, p. 429, *Aphis malvae*.
 1849. Walker, F., Zoologist, vol. VII, p. 47, *Aphis malvae*.
 1863. Passerini, G., Aph. Ital. (reprint from Arch. p. l. Zool., vol. II, fasc. 2), p. 14, *Siphonophora malvae* partim.
 1876. Buckton, G. B., Mono. Brit. Aphides, vol. I, p. 136, *Siphonophora malvae* partim.
 1910. Henrich, C., Verh. Mitt. Siebenburg Verein., vol. LIX, p. 25, *Siphonophora pelargonii*.

1911. Williams, T. A., Univ. Studies, Nebraska, vol. X, p. 168 (reprint, p. 84), *Siphonophora pelargonii* partim.
1912. Davis, J. J., Contrib. Dept. Entomology, Nebraska, p. 284 (reprint, p. 32), *Macrosiphum pelargonii* partim (slide no. 150).
1913. Theobald, F. V., Journ. Econ. Biol., vol. VIII, p. 91, *Macrosiphum primulae* (partim?).
1913. Theobald, F. V., Journ. Econ. Biol., vol. VIII, p. 122, *Macrosiphum diplantereae*.
1913. Theobald, F. V., Journ. Econ. Biol., vol. VIII, p. 149, *Macrosiphum malvae* partim.
1926. Patch, E. M., Ann. Ent. Soc. America, vol. XIX, p. 334-335, *Macrosiphum cornelli*.
1926. Theobald, F. V., Aph. Great Britain, vol. I, p. 124, *Macrosiphum pelargonii* partim.
1926. Theobald, F. V., Aph. Great Britain, vol. I, p. 338, *Myzus primulae* (partim?).
1928. Opmanis, K., Acta Univ. Latviensis, vol. XVIII, p. 399, *Macrosiphum pelargonii* partim.
1932. Börner, C., in Sorauer, Handb. d. Pflanzenkr., ed. IV, vol. V, pars 2, p. 628, *Macrosiphum pelargonii* partim.
1934. Gillette, C. P. & Palmer, M. A., Ann. Ent. Soc. America, vol. XXVII, p. 174-175, *Macrosiphum cornelli*.
1934. Gillette, C. P. & Palmer, M. A., Ann. Ent. Soc. America, vol. XXVII, p. 192-193, *Macrosiphum pelargonii*.

Apterous viviparous female.

Morphological characters. Body spindle-shaped, rather small. Tergum slightly sclerotic, quite pale, sometimes faintly wrinkled, with very short hairs; those on VIIIth tergite $1-1\frac{1}{3}$ times as long as basal diameter of IIIrd ant. segment. Frontal tubercles well developed, slightly diverging, a little rounded at inner side, smooth or with some dispersed imbrications on underside, each with 3 hairs on inner side and sometimes one ventrally. Sinus frontalis wide, median frontal tubercle not or hardly developed. Antennae $1\frac{1}{5}-1\frac{1}{2}$ times as long as body; in alatform apterae always pale brown to fuscous with the exception of the basal segments; in apterae with few rhinaria sometimes completely pale, IIIrd segment in true apterae with 3-8 rather large rhinaria bunched together on basal $\frac{1}{4}-\frac{2}{7}$, in alatform apterae with 14-24 rhinaria not in a row along the whole length of the segment; processus terminalis about $6\frac{1}{2}-7\frac{1}{2}$ times as long as base of VIth segment, $1\frac{1}{4}-1\frac{1}{2}$ times as long as IIIrd segment. Antennal hairs on IIIrd segment up to about half as long as basal diameter of this segment. Rostrum fully reaching hind coxae; apical segment slender, with about 8 pairs of hairs besides the apical 3 pairs, $1\frac{1}{10}-1\frac{1}{5}$ times as long as the rather long second joints of hind tarsi. Siphunculi uniformly yellowish, slender, cylindrical, slightly expanded towards base (and apex, sometimes), $\frac{1}{5}-\frac{1}{4}$ of the length of body, from nearly smooth to distinctly imbricated, with some transverse striae forming irregular, transverse cells

near the well developed flange. Cauda rather thick, hardly constricted, slightly acute, about $1/2-6/11$ times as long as the siphunculi, with 8—12 long hairs. Legs rather long, uniformly brownish yellow, with the apices of the tibiae black; first tarsal with 3, 3, 3 hairs.

Colour. Pale green to bright green. Antennae greenish to brown with darker apex. Siphunculi and cauda coloured like the body.

Measurements in mm and proportions of ant segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III: IV: V: VI
1	2.36	2.63	0.47	0.26	2 & 3	100: 80: 54: (21 + 140)
2	2.30	2.75	0.49	0.28	19 & 21	100: 75: 61: (20 + 144)
3	2.14	2.66	0.48	0.24	17 & 18	100: 77: 66: (23 + 151)
4	2.58	3.07	0.60	0.30	16 & 19	100: 77: 70: (20 + 140)
5	2.40	2.98	0.58	?	21 & 22	100: 80: 66: (20 + 140)
6	2.62	3.25	0.58	0.32	23 & 23	100: 74: 66: (19 + 139)
7	2.28	2.89	0.58	0.28	21 & 22	100: 71: 63: (21 + 138)
8	2.30	3.25	0.55	0.28	18 & 19	100: 67: 60: (19 + 131)
9	2.32	2.91	0.52	0.26	22 & 23	100: 76: 63: (21 + 134)
10	2.32	3.02	0.56	0.28	17 & 20	100: 75: 58: (21 + 136)
11	2.36	3.05	0.54	0.32	4 & 5	100: 72: 58: (19 + 142)
12	2.48	2.99	0.61	0.30	3 & 5	100: 73: 60: (18 + 136)
13	2.60	3.13	0.66	0.32	5 & 5	100: 71: 58: (18 + 134)

(1-2, on *Pelargonium zonale*, Wageningen, III-1933; 3-13, on *P. spp. div.* Wageningen, III-1941).

Alate viviparous female.

Morphological characters. Very much like the apterous form. Abdominal tergum sometimes with vague traces of spinal sclerites and intersegmental pleural sclerites. Legs and antennae darker than in apterous viviparous female, the IIIrd ant. segment with 19—28 rhinaria. Cauda and siphunculi about as in apterous viviparous female or both slightly thinner. Wings sometimes with numerous abnormalities in the venation (fig. 1).

Colour. Nearly exactly as in apterous viviparous female, but thorax and head more brownish.

Measurements in mm and proportions of ant segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III: IV: V: VI
1	2.24	2.83	0.50	0.26	25 & 25	100: 81: 69: (20 + 141)
2	2.30	2.96	0.52	0.28	21 & 23	100: 68: 62: (19 + 124)
3	2.12	2.93	0.44	0.26	22 & 24	100: 77: 63: (18 + 144)

(1-3, from *Pelargonium spp. div.*, Wageningen III-1941).

Hostplants: *Pelargonium spp. div.*, *Malva spp.*, *Primula obconica* (Theobald).

Geographical distribution: Europe, U.S.A.

Biology: This form lives without forming sexuales on its hosts, nearly only in houses, hothouses, etc. Alatae frequently are very rare. Very numerous is a form of apterae, which differs from normal apterae in the darker antennae only, and, sometimes, in the darker legs and in the number of rhinaria, which is about as high as that in alate viviparous females. The underside of the leaves and young parts of the plants are its habitat. Enormous numbers may be present on a single plant, causing a slight deformation of leaves and shoots.

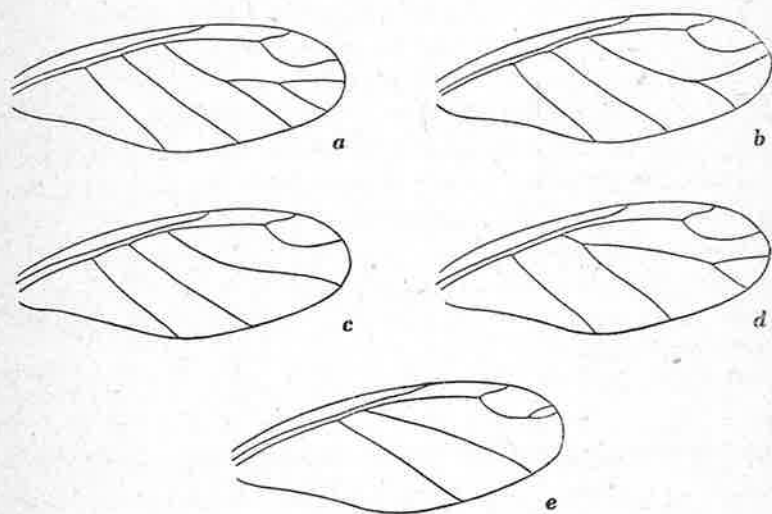


Fig. 1. Abnormalities in the venation of the wings of *Acyrthosiphon malvae* (Mosley) s.s.

Notes. This very interesting species is undoubtedly Kalténbach's *pelargonii*. He says of the apterae: "Drittes Glied gekörnt", which, in his language, means, that the apterae have rhinaria along the whole length of the IIIrd. ant. segment. So clearly in Kalténbach's times alateform apterae were as common as they are now. This abnormality does not occur in *Aulacorthum solani* (Kltb.), which by Mordvilko (1914) and Van der Goot (1915) was called *pelargonii* Kalt., see p. 307. Another reason why these authors undoubtedly are wrong is the following: the alatae of *pelargonii* according to Kalténbach's description have the wings "Glasshell, Geäder sehr fein, blass; Randmahl und Unterrandnerv weisslich". In *solani* the veins are very dark, even bordered with brown. In *solani* Kalténbach duly describes the black apices of the antennal segments, but he does not mention them in *pelargonii*, where they do not occur.

I did not find this species on *Malva*, but I identify it with *Aphis malvae* Mosley, because I examined a slide of F. Walker, labelled *Aphis pelargonii* from *Malva*, which is this species. Theobald's *Macr. "diplanterae"* is a synonym, contrary to Koch's *S. diplanterae*, which belongs under *Aulacorthum solani* (Kltb.). *Macrosiphum (Myzus) primulae* Theob. also is a synonym, if not of *malvae* sensu stricto, then of one of the subspecies.

Davis (1912), in his redescription of Williams' material gives some notes on slide no. 150 of Williams, which contrary to nos. 148 and 149 is of this species, containing alatifform apterae with 18—21 rhinaria! Nos. 148 and 149 most probably are *Macrosiphum euphorbiae* (Thomas).

The description of *Macrosiphum cornelli* by Patch and Gilette & Palmer relates to alatifform apterae of *pelargonii* Kltb.

The relative number of alatifform apterae frequently may be extraordinarily high. In a sample taken in Februari 1941 the ratio alatifforms: apterae with few rhinaria was 48 : 5! This means that it becomes difficult to say what is normal: about 20 rhinaria or 2—8 rhinaria.

Abnormalities in the venation of the wings as well as unilaterally winged specimens are frequent. I add some drawings to illustrate this (fig. 1a—e). Abnormal wing venation is not very rare in Aphids, but generally it is limited to the media.

Types: No material from Mosley seems to exist.

Acyrtosiphon malvae* subspec. *agrimoniella (Cockerell, 1903).

1903. Cockerell, T. D. A., Canad. Entomologist, vol. XXXV, p. 168, *Nectarophora agrimoniella*.

1940. Börner, C., Neue Blattläuse aus Mitteleuropa, ed. Börner, p. 4, *Aulacorthum agrimoniae*.

Apterous viviparous female.

Morphological characters. Body rather slender with a very pale, nearly smooth, slightly sclerotic tergite. Hairs on tergum rather short, those on VIIIth tergite about twice as long as diameter of IIIrd ant. segment at its basal articulation. Frontal tubercles smooth, distinctly diverging, though rather angular, well developed. Hairs on frontal tubercles $\frac{3}{4}$ — $1\frac{1}{2}$ times as long as basal diameter of IIIrd ant. segment. Antennae $1\frac{1}{20}$ — $1\frac{1}{5}$ times as long as body, pale with darker apex, but brownish in alatifform apterae; IIIrd segment in normal apterae with 2—10 (see measurements!) rhinaria, rather irregularly placed on one side of the segment over basal $\frac{1}{3}$ — $\frac{4}{9}$; processus terminalis 5—6 times as long as base of VIth segment, in small specimens sometimes $1\frac{1}{2}$ times as long as IIIrd segment. Antennal hairs on IIIrd segment about $\frac{1}{4}$ — $\frac{1}{3}$ times as long as basal diameter of this

segment. Rostrum reaching to hind coxae, apical segment $1\frac{1}{6}$ — $1\frac{2}{5}$ times as long as second joint of hind tarsi, with about 20 rather long, thin hairs and one pair of much longer hairs in front of the apex, marginally. Siphunculi slender to very thin, cylindrical, $\frac{1}{5}$ — $\frac{2}{7}$ of length of body, very slightly attenuated just in front of apex, quite pale, finely imbricate with 2—3 transverse lines near the very distinct flange. Cauda rather thick, blunt, darker than siphunculi, slightly constricted in the middle, about $\frac{2}{5}$ — $\frac{1}{2}$ times as long as siphunculi, with 7—9 (rarely 6 or 10) hairs. Legs pale, long, first tarsal joints with 3, 3, 3 hairs.

Colour. In summer pale transparent green; antennae, legs, siphunculi and cauda nearly colourless. In autumn very pale yellow. Apex of antennae dusky.

Measurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III:IV:V:VI
1	2.76	3.14	0.72	0.38	9 & 10	100: 73: 65: (21 + 117)
2	2.60	2.95	0.64	0.32	7 & 8	100: 70: 62: (22 + 115)
3	2.52	2.86	0.68	0.32	5 & 6	100: 69: 66: (20 + 123)
4	2.48	3.02	0.70	0.32	6 & 6	100: 70: 62: (22 + 124)
5	2.30	2.43	0.48	0.26	15 & 21	100: 67: 60: (25 + 120)
6	2.36	2.39	0.54	0.28	6 & 7	100: 66: 55: (23 + 110)
7	2.00	2.11	0.42	0.22	3 & 4	100: 72: 63: (26 + 150)
8	2.08	2.26	0.51	0.25	4 & 5	100: 69: 59: (24 + 104)
9	2.40	2.59	0.62	0.27	9 & ?	100: 68: 56: (21 + 104)
10	2.30	2.36	0.52	0.34	13 & ?	100: 59: 47: (22 + 110)

(Nos. 1-4, Bergen op Zoom, 25-VII-'40; 5-8, Wageningen, 30-IX-'30; 9, Roermond, 8-IX-'32; 10, Wageningen, X-'39. 5 and 10 are more or less alatiform apterae with rhinaria covering the whole length of the IIIrd ant. segment).

Alate viviparous female.

Morphological characters. Very much like apterous viviparous female. Vertex of head and thorax with about the same colour as the pale brown antennae, abdomen without any sclerites. Antennae considerably longer than body, IIIrd segment with 18—30 rhinaria along one side, not in a row. Siphunculi more slender, cauda slimmer and more distinctly constricted than in apterous viviparous female. Wings normal.

Colour. As in apterous viviparous female, antennae pale brown.

Measurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III:IV:V:VI
1	2.76	3.14	0.60	0.32	19 & 24	100: 70: 63: (20 + 113)
2	2.56	3.08	0.58	0.28	24 & 25	100: 73: 68: (22 + 127)
3	2.54	3.03	0.58	0.28	21 & 21	100: 75: 67: (21 + 132)

Oviparous female.

Morphological characters. A little broader than the apterous viviparous female, but generally very much alike. IIIrd ant. segment with 3—7 rhinaria. Cauda thick. Hind tibiae slightly more pigmented than the other tibiae, a little swollen, completely covered with a very large number of small pseudosensoria.

Colour. As in the apterous viviparous female, but easily recognisable by the conspicuous hind tibiae.

Measurements of one specimen: Length of body: 2.16 mm; ant.: 2.36 mm; siph.: 0.50 mm; cau.: 0.24 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{61}{\text{IV}} : \frac{52}{\text{V}} : \frac{(23 + 115)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 5 and 6.

Apterous male.

Morphological characters. Very small and slender. Tergite of abdomen with the same sclerotic pattern as in males of *A. malvae rogersii* (Theob.), only less distinctly developed. Frontal tubercles rather more developed than in apterous viviparous female. Antennae up to $1\frac{1}{2}$ times as long as body, IIIrd segment with 44—55 rhinaria, IVth with 0—3 (usually 0), Vth with 6—12. Siphunculi and cauda shorter and thinner, the latter more acute than in apterae viviparae. Genitalia well developed. Legs remarkably long and thin.

Colour. As in apterous viviparous female, but the pale yellow abdomen with very faint darker marginal spots. Antennae dark.

Measurements of one specimen: Length of body: 1.68 mm; ant.: 2.53 mm; siph.: 0.40 mm; cau.: 0.20 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{61}{\text{IV}} : \frac{53}{\text{V}} : \frac{(19 + 94)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 49 and 50; on IVth: 3 and 2; on Vth: 10 and 10.

Hostplant: *Agrimonia eupatorium*, *A. odorata*.

Geographical distribution: Netherlands, widely distributed, not common, Germany, U.S.A.

Biology: In summer colonies are present between the flowers, but, in autumn this species is found on the underside of the undermost leaves of its host. The insects pass notice quite easily, because they are usually well hidden. Alate forms were taken in July. In autumn, when most of the captures were made, very often viviparae without wings, but with an abnormally large number of rhinaria, dark antennae and traces of ocelli were found. The oviparae and the very small apterous males were reared in the last week of October 1939. I found oviparae in the field in October

1929 at Houten (U.), Netherlands. The eggs are deposited on the leaves. They are greenish white first and turn black later. I could quite easily transmit this species to *Fragaria* (var. "Baron Solemacher").

Types: Unknown.

Acyrtosiphon malvae* subsp. *geranii (Kltb., 1862).

1843. Kaltenbach, J. H., Mono. der Pflanzenläuse, p. 13, *Aphis urticae* partim.
 1855. Koch, C. L., Die Pflanzenläuse Aphiden, p. 193, *Siphonophora pelargonii*.
 1862. Kaltenbach, J. H., Verh. Naturh. Ver. Preuss. Rheinl. u. Westphal., vol. XIX, p. 16-17, *Aphis geranii*.
 1874. Kaltenbach, J. H., Die Pflanzenfeinde aus der Klasse der Insekten, p. 81-82, *Aphis geranii*.
 ?1887. Oestlund. O. W., Geol. Nat. Hist. Survey of Minnesota, Bull. 4., p. 80, *Nectarophora geranii*.
 1932. Börner, C., in Sorauer, Handb. d. Pflanzenkr., ed. IV, vol. V, pars 2, p. 628, *Macrosiphum pelargonii* partim.
 1935. Hille Ris Lambers, D., Stylops, vol. IV, p. 114-115, *Acyrtosiphon geranicola* partim.
 1935. Knowlton, G. F., Canad. Entomologist, vol. LXVII, p. 194, *Macrosiphum zerozalphum*.
 1936. Knowlton, G. F., Entomological News, vol. XLVII, p. 213, *Macrosiphum zerozalphum*.

Apterous viviparous female.

Morphological characters. Body rather slender, with pale, slightly corrugate, slightly sclerotic tergite. Tergital hairs of medium length, those on VIIIth tergite $1\frac{3}{7}$ —2 times as long as diameter of IIIrd ant. segment at its basal articulation. Frontal tubercles smooth, diverging, well developed. Median frontal tubercle distinct, flat. Hairs on margin of frontal tubercle about $1\frac{1}{2}$ times as long as basal diameter of IIIrd ant. segment. Antennae $\frac{9}{10}$ — $1\frac{1}{4}$ times as long as body, pale, slightly darker at apex; IIIrd segment with 3—12 rather large rhinaria at irregular intervals on one side of the segment on basal $\frac{1}{3}$ — $\frac{4}{7}$, usually not in a row if more than 5 are present; processus terminalis 5—6 times as long as base of VIth segment. Antennal hairs on IIIrd segment about half as long as its basal diameter. Rostrum reaching the hind coxae, apical segment $1\frac{1}{5}$ — $1\frac{1}{2}$ times as long as second joint of hind tarsi, with about 20 rather short, thin hairs and one pair of much longer hairs in front of the apex marginally. Siphunculi rather slender, cylindrical, pale, with the apex hardly darker, finely and dispersely imbricate with 2 or 3 transverse striae just in front of the well developed, small flange, about $\frac{2}{9}$ — $\frac{2}{7}$ of length of body. Cauda rather thick and blunt, darker than the siphunculi, hardly or not constricted, about half as long as the siphunculi, with 7—9 hairs. Legs rather long, femora

slightly imbricate on distal half, pale, with only the apices of the tibiae and the tarsi darker, first tarsal joints with 3, 3, 3 hairs.

Colour. Semitransparent dull green, rather pale, not shiny. Legs etc. nearly colourless. Moreover a very pale reddish grey form occurs on *Geranium molle* and *G. pusillum* (the form which Kaltenbach described).

Measurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III:IV:V: VI
1	2.43	2.70	0.64	0.33	8 & 9	100: 63: 58: (19 + 116)
2	2.83	3.14	0.70	0.35	6 & 6	100: 77: 61: (21 + 114)
3	2.43	2.90	0.65	0.35	5 & 6	100: 76: 67: (21 + 120)
4	2.40	2.70	0.63	0.34	4 & 5	100: 62: 53: (21 + 113)
5	2.60	2.56	0.64	0.34	7 & 8	100: 66: 53: (19 + 97)
6	2.52	2.56	0.62	0.32	6 & 9	100: 61: 51: (21 + 96)
7	2.58	2.49	0.62	0.32	6 & 7	100: 65: 51: (18 + 100)
8	2.54	2.59	0.62	0.32	8 & 9	100: 63: 48: (19 + 90)
9	2.56	2.46	0.66	0.33	7 & 7	100: 60: 49: (17 + 94)
10	2.52	2.48	0.64	0.32	7 & 8	100: 60: 51: (17 + 94)
11	2.18	2.35	0.56	0.30	4 & 5	100: 59: 53: (18 + 105)
12	2.22	2.34	0.52	0.28	5 & 6	100: 63: 50: (19 + 103)
13	2.36	2.59	0.62	0.28	7 & 9	100: 59: 49: (18 + 95)
14	2.36	2.56	0.62	0.30	6 & 9	100: 63: 51: (17 + 103)
15	2.61	2.56	0.61	0.34	6 & 9	100: 68: 55: (19 + 114)
16	2.69	2.73	0.73	0.37	11 & 12	100: 84: 63: (20 + 116)
17	2.94	2.75	0.68	0.35	7 & 11	100: 63: 55: (19 + 114)
18	2.88	2.60	0.61	0.32	7 & 10	100: 64: 62: (20 + 114)

(Nos. 1-4, from *Geranium molle*, Uithuizen, 8-VII-'32; 5-14, from *Geranium molle*, Bergen op Zoom, 25-VII-'40; 15-18, from *Erodium cicutarium*, Zandvoort, 2-VIII-'36).

Alate viviparous female.

Morphological characters. Very much like apterous viviparous female. The head and thorax brownish yellow. Abdomen without any sclerites. Antennae as in apterous viviparous female, the IIIrd segment with 20-30 rather large, more or less protruding rhinaria, which are placed along one side of the segment, but distinctly not in a row. Siphunculi and cauda both very slightly more slender than in apterae. Wings normal.

Colour. As in apterous viviparous female.

Measurements of two specimens: Length of body: (I) 2.68, (II) 2.24 mm; ant.: (I) 2.76, (II) 2.49 mm; siph.: (I) 0.56, (II) 0.48 mm; cau.: (I) 0.30, (II) 0.24 mm. Prop. of ant. segments: (I) $\frac{100}{III} : \frac{65}{IV} : \frac{52}{V} : \frac{(18+95)}{VI}$, (II) $\frac{100}{III} : \frac{74}{IV} : \frac{61}{V} : \frac{(20+113)}{VI}$. Rhin. on IIIrd ant. segment: (I) 25 and 29, (II) 26 and 27.

Hostplants: *Geranium molle*, *G. robertianum* (*G. pusillum* according to Kaltenbach), *Erodium cicutarium*.

Geographical distribution: England, Netherlands, Germany, U.S.A. (Utah).

Biology: Little is known at present about the biology of this subspecies. It seems to visit only specimens of its foodplant which grow on very warm, sunny places. In the Netherlands I usually found it at southern slopes of sadykes on *G. molle*. In England it is not rare on *G. robertianum* in Somerset and Wales (Anglesey). In the dunes near Zandvoort I found it on the curious low form of *Er. cicutarium*. Alatae were found in July. Sexuales were found in October 1943, but the material was stolen¹⁾.

Notes. Judging after Prof. Knowlton's description of his *Macrosiphum zerozalphum* from *Erodium* he was dealing with this form. My material from *Erodium* differs from that from *Geranium* in having the apices of the siphunculi slightly dusky; in other regards it falls within the limits of the material from *G. molle*. The alatae which I described in the original description of *geranicola* do not belong to this subspecies. They are alate *Acyrtosiphon loti* (Theob.), which was swarming at the time of the capture.

Types: Kaltenbach left no types.

Acyrtosiphon malvae* subsp. *rogersii (Theobald, 1913).

1913. Theobald, F. V., Journ. Econ. Biol., vol. VIII, p. 126, *Macrosiphum rogersii*.
1926. Theobald, F. V., Aph. Great Britain, vol. I, p. 139-141, *Macrosiphum rogersii*.

Apterous viviparous female.

Morphological characters. Body rather broadly spindle-shaped, sometimes slender, spindle-shaped. Tergite faintly sclerotic, but entirely pale and colourless. Hairs very short, increasing in length towards the cauda; VIIIth tergite with 6—8 (usually 8) rather long hairs. Surface of tergum slightly corrugate, especially behind the siphunculi. Frontal tubercles well developed, diverging, sometimes very slightly imbricate on inner- and underside. Median frontal tubercle flat, distinct. Antennae longer than the body, thin, IIIrd segment with 3—9 rhinaria, which are irregularly placed, usually more or less in a line on basal $\frac{2}{7}$ — $\frac{4}{9}$. Processus terminalis about 5—6 times as long as base of VIth segment, usually slightly longer than IIIrd segment. Rostrum reaching to hind coxae, apical segment rather elongate, about $1\frac{1}{10}$ times as long as second joint of hind tarsi. Siphunculi

1) The males are apterous.

very slender, slightly enlarged at base, remainder cylindrical, pale sclerotic, regularly imbricated, with small flange, about $\frac{1}{4}$ of the length of the body long. Cauda blunt, indistinctly constricted, $\frac{3}{7}$ — $\frac{1}{2}$ times as long as the siphunculi, with 7—9 hairs. Legs long, femora slightly imbricated on distal half, first tarsal joints with 3, 3, 3 hairs.

Colour. Rather transparent bluish green to bright green, often shining. Legs, siphunculi, cauda, and most of the antennae very pale greenish.

Measurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III:IV:V:VI
1	2.60	3.10	0.68	0.31	5 & 6	100: 68: 56: (20 + 110)
2	2.56	2.94	0.68	0.30	4 & 6	100: 67: 55: (20 + 116)
3	2.62	3.11	0.68	0.30	5 & 6	100: 68: 56: (20 + 107)
4	2.03	2.56	0.54	0.26	3 & 3	100: 64: 50: (22 + 125)
5	2.58	3.11	0.68	0.32	4 & 8	100: 68: 56: (20 + 113)
6	2.38	2.93	0.64	0.28	4 & 4	100: 67: 59: (20 + 113)
7	2.44	2.72	0.62	0.30	4 & 6	100: 64: 56: (21 + 110)
8	2.40	2.77	0.66	0.30	4 & 4	100: 64: 56: (21 + 116)
9	2.50	2.98	0.64	0.31	6 & 6	100: 68: 58: (21 + 118)
10	2.50	2.98	0.68	0.32	4 & 5	100: 63: 53: (18 + 103)

(All from *Fragaria*, var. "Baron Solemacher", Bilthoven, August 1939).

Alate viviparous female.

Morphological characters. Very much like the apterous form. Abdomen either completely membraneous or with very pale marginal sclerites, but never with spino-pleural transverse sclerotic bars. IIIrd ant. segment with 20—30 rhinaria of various sizes, placed along one side of the segment, but not in a row.

Colour. As in apterous viviparous female.

Measurements of one specimen: Length of body: 2.31 mm; ant.: 2.92 mm; siph.: 0.56 mm; cau.: 0.27 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{68}{IV} : \frac{57}{V} : \frac{(18 + 130)}{VI}$. Rhin. on IIIrd ant. segment: 25 and 26.

Oviparous female.

Morphological characters. Very much like apterous viviparous female. Abdominal tergite slightly thinner, but still rough, especially on the posterior segments. Antennae much longer than body, IIIrd segment with 2—6 (average: 3.5) rhinaria near base. Siphunculi thin, often slightly curved. Hind tibiae rather thick, with numerous small pseudosensoria on basal $\frac{4}{5}$ part.

Colour. As in apterous viviparous female, but hind tibiae slightly darker than the other tibiae.

Measurements of one specimen: Length of body: 1.94 mm; ant.: 2.49 mm; siph.: 0.50 mm; cau.: 0.27 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{64}{IV} : \frac{63}{V} : \frac{(23 + 128)}{VI}$. Rhin. on IIIrd ant. segment: 2 and 3.

Apterous male.

Morphological characters. Body narrow, elongate. Head and antennae dark, sclerotic. Abdomen with rather large, brown intersegmental pleural sclerites and with very pale, imbricate marginal sclerites and very irregular spino-pleural, imbricate sclerites, which are often connected with the intersegmental sclerites. Frontal tubercles large. Antennae very long, to $1\frac{2}{3}$ times as long as body, IIIrd segment with 40—60 rhinaria, Vth with 12—20, but IVth apparently without rhinaria. Siphunculi very thin, with remarkably wide flange. Cauda rather small, with conspicuously long hairs. Genitalia well developed.

Colour. As in the apterous viviparous female, but antennae, head and cauda brown, abdomen with very faint ornamentation.

Measurements of one specimen: Length of body: 2.00 mm; ant.: 3.11 mm; siph.: 0.40 mm; cau.: 0.20 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{74}{IV} : \frac{60}{V} : \frac{(18 + 113)}{VI}$. Rhin. on IIIrd ant. segment: 49 and 50; on IVth: 0 and 0; on Vth: 18 and 14.

Hostplant: *Fragaria* spec.

Geographical distribution: England, Netherlands.

Biology: This species lives during the whole year on its host on which I found all forms except the fundatrices. Mainly the petioles of young leaves are infested, often by rather large colonies, but sometimes also young, still folded leaves or the underside of older leaves may be inhabited. Alatae seem to be exceedingly rare in summer. I could rear a few in August. Sexuales were reared in my room in November. Copulation was observed. Transmission to *Agrimonia* gave negative results.

Notes. The differences between this insect and subsp. *agrimoniella* are so small, that I thought at first that they were identical. Quite easily *agrimoniella* could be included to live on *Fragaria*, where it remained yellow. But *rogersii* did not like *Agrimonia* for food. To settle this point I tried to induce males and oviparae of both subspecies to mate, but males of *rogersii* did not react on oviparae of *agrimoniella*, neither did males of *agrimoniella* mate with oviparous *rogersii*. This points to specific differences between both species.

It is also difficult to separate this subspecies from *geranii* Klth. It is possible that they are identical, though I could not yet induce *rogersii* to

feed on *Pelargonium zonale*. The morphological differences certainly are too small to be of great value. More extensive experiments may show the identity of the two forms.

Types: In the British Museum (Natural History), London (larvae).

***Acyrthosiphon nigripes* H.R.L., 1935.**

1935. Hille Ris Lambers, D., Mem. Mus. Stor. Nat. Venezia Tridentina, Trento, vol. III, p. 57, *Acyrthosiphon nigripes*.

Apterous viviparous female.

Morphological characters. Body very large. Tergite not sclerotic, except the anterior $\frac{4}{5}$ of the head, distinct postsiphuncular sclerites, marginal sclerites on segment VII and a transverse bar on segment VIII, which are blackish sclerotic. Frontal tubercles large, smooth, diverging. Antennae very long, jet black sclerotic. IVth segment much longer than IIIrd! IIIrd segment on base with a group of 4—9 rhinaria, which are nearly invisible by the strong sclerotisation. Antennal hairs rather long, $\frac{3}{5}$ — $\frac{3}{4}$ of basal diameter of IIIrd segment. Ist segment with 12—14 hairs. Rostrum short, reaching to the middle coxae, pale as in *A. cyparissiae* (Koch); apical segment very short, nearly half as long as second joint of hind tarsi, with 10 hairs. Siphunculi extremely long, about $\frac{1}{3}$ of length of body, at apex thinner than base of IIIrd ant. segment, sclerotic, imbricated; flange small, with a little constriction just before it. VIIIth tergite with 8—12 long hairs. Cauda bluntish triangular, not or little constricted, sclerotic black, about $\frac{4}{11}$ — $\frac{3}{7}$ of length of siphunculi, with 12—18 hairs. Legs long, jet black sclerotic, except the bases of the femora. First tarsal joints with 3, 3, 3 hairs.

Colour. According to the collector green; with black head, siphunculi, cauda, legs and antennae.

Measurements of one specimen: Length of body: 3.85 mm; ant.: 4.96 mm; siph.: 1.28 mm; cau.: 0.49 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{117}{IV} : [\frac{92}{V} : \frac{(35 + 102)}{VI}] ?$. Rhin. on IIIrd ant. segment: 5 ? and 6 ?

Hostplant: *Laserpithium Siler*.

Geographical distribution: Only known from Madonna di Campiglio, Italy.

Biology: According to its discoverer, Count F. Hartig, this species lives on the upperside of the leaves of its host.

Notes. In many respects this species resembles *A. cyparissiae* (Koch). The structure of the ultimate rostral segment is much the same, but also

the strong sclerotisation of the legs and siphunculi are uncommon in apterous *Acyrtosiphon* spp., and present in both species. Both feed on the upperside of the leaves, which may or may not account for the similar structure of the ultimate rostral segment. Curious is the fact that the IIIrd ant. segment is shorter than the IVth, an unusual interrelation. In the last larval instar I found the IVth segment $1\frac{1}{2}$ times as long as the IIIrd. These phenomena are not rare in larvae of *Acyrtosiphon* s.s. The measurements of the last two antennal segments are placed with a query, because it is not absolutely certain whether they belong to this specimen or to another of nearly the same proportion and size in the same slide.

Types: Cotypes in the author's collection.

***Acyrtosiphon pisum* (Harris, 1776) (Pl. XIII fig. 5).**

1776. Harris, M., Exposit. English Insects, London, p. 66-67, *Aphis pisum*.
 1841. Boyer de Fonscolombe, M., Ann. Soc. Ent. France, vol. X, p. 169, *Aphis onobrychis*.
 1841. Mosley, O., Gard. Chronicle, vol. I, Oct. 16th, p. 684, *Aphis lathyri*.
 1843. Kaltenbach, J. H., Mono. d. Pflanzenläuse, p. 23-24, *Aphis pisi* partim.
 1848. Walker, F., Ann. Mag. Nat. Hist. (2), vol. II, p. 421, *Aphis ulmariae* partim.
 1852. Walker, F., Cat. Homopt. British Museum, vol. IV, p. 966, *Aphis lathyri*.
 1855. Koch, C. L., Die Pflanzenläuse Aphiden, p. 172-173, *Siphonophora spartii*.
 1855. Koch, C. L., Die Pflanzenläuse Aphiden, p. 175-176, *Siphonophora ononis*.
 1855. Koch, C. L., Die Pflanzenläuse Aphiden, p. 190-191, *Siphonophora pisi*.
 1863. Passerini, G., Archiv. p. l. Zoologia, vol. II, p. 136 (reprint, p. 13), *Siphonophora ulmariae*.
 1872. Ferrari, P. M., Ann. Mus. Civ. Stor. Nat. Genova, vol III, p 212, *Siphonophora ononis*.
 1876. Buckton, G. B., Mon. Brit. Aphides, vol. I, p. 134-135, *Siphonophora pisi*.
 1883. Macchiati, L., Boll. Soc. Entom. Ital. vol. XV, p. 230, *Siphonophora ononis*.
 1883. Macchiati, L., Boll. Soc. Entom. Ital., vol. XV, p. 231, *Siphonophora ulmariae*.
 1886. Oestlund, O. W., 14th Ann. Rept. Geol. Nat. Hist. Survey Minnesota, p. 25, *Siphonophora corydalis* ¹).
 1900. Guercio, G. del, N. Relaz. R. Staz. d. Entom. Agrar., Firenze (1), no. 2, p. 162, *Siphonophora ononis*.
 1900. Guercio, G. del, N. Relaz. R. Staz. d. Entom. Agrar., Firenze (1), no. 2, p. 165, *Siphonophora ulmariae*.
 1900. Schouteden, H., Ann. Soc. Ent. Belg., vol. XLIV, p. 116, *Siphonophora ulmariae* partim.
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Fundatrix.

Morphological characters. Body rather broadly oval, swollen. Antennae shorter than the body, IIIrd segment with 1—2 small rhinaria near base, processus terminalis very short, only about twice as long as the base of the VIth ant. segment. Other characters about as in the apterous viviparous females of later generations.

Colour. As in apterous viviparous female.

Measurements of one specimen: Length of body: 3.76 mm; ant.: 2.95 mm; siph.: 0.79 mm; cau.: 0.60 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{51}{IV} : \frac{60}{V} : \frac{(30+56)}{VI}$. Rhin. on IIIrd ant. segment: 1 and 2.

Apterous viviparous female.

Morphological characters. Body spindle-shaped, usually rather slender, large (3.5—5.5 mm long), with very short, blunt hairs; VIIIth tergite usually with 6—8 hairs dorsally and 2 more laterally or nearly ventrally. Tergite not, or in very old individuals slightly, sclerotic, without any local sclerotisation, colourless, smooth. Frontal tubercles large, diverging, smooth. Frontal furrow narrow, U-shaped; median frontal process absent. Antennae long, $\pm 1\frac{1}{4}$ — $1\frac{3}{5}$ times as long as the body, in the 2nd generation as usually shorter, Ist and IInd segment a little rough on inner side; IIIrd segment usually not much longer than the IVth, with 1—5 small rhinaria near base; IVth and Vth segment on an average of equal length; base of VIth segment comparatively long, $\frac{1}{4}$ — $\frac{3}{8}$ of length of IIIrd segment; processus terminalis about as long as IIIrd segment or a little longer. Length of antennal hairs $\frac{1}{4}$ — $\frac{1}{3}$ of the diameter of the IIIrd segment at its very base, Ist segment with 15—23 hairs. Rostrum reaching past the middle coxae, apical segment rather slender, though short, about $\frac{3}{4}$ — $\frac{5}{6}$ of the length of the 2nd joint of the hind tarsi. Siphunculi remarkably thin, rarely thicker than the IIIrd ant. segment, at least in the middle, but with the base enlarged and more or less tuba-shaped towards the usually small flange, usually very long, $\frac{1}{4}$ — $\frac{3}{11}$ of the length of the body, regularly but only slightly imbricated, pale, with usually only the very apex dark. Cauda very elongated triangular, acute, without the least constriction, $\frac{3}{5}$ — $\frac{3}{4}$ of the length of the siphunculi, pale and nearly colourless, with 8—13 often adpressed, rather stiff, partly blunt hairs, which are very irregularly placed. Legs long, first tarsal joints with 3, 3, 3 hairs.

Colour. Green, with a greyish hue of wax, more rarely reddish¹⁾.

1) On *Lotus uliginosus* I collected larvae and apterae which were bright lemon-yellow to yolk-yellow.

Antennae dusky to pale brownish with the articulations often blackish. Legs with the colour of the body, transparent, the apices of the femora sometimes a little darker, the apices of the tibiae black. Siphunculi pale with brown apices. Cauda a little paler than the body, often very transparent.

Measurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III: IV: V: VI
1	3.34	4.61	0.78	0.54	2 & 2	100: 80: 85: (30 + 104)
2	3.00	4.76	0.68	0.52	1 & 1	100: 92: 88: (33 + 114)
3	3.24	5.02	0.96	0.64	2 & 2	100: 91: 84: (36 + 111)
4	3.24	4.54	0.88	0.58	3 & 3	100: 82: 77: (32 + 112)
5	3.22	4.61	0.78	0.56	3 & 3	100: 77: 76: (29 + 108)
6	3.78	4.52	1.00	0.62	1 & 2	100: 78: 72: (26 + 124)
7	3.50	4.28	0.96	0.62	2 & 3	100: 89: 78: (30 + 132)
8	3.26	4.08	0.88	0.54	1 & 2	100: 87: 75: (31 + 115)
9	4.56	4.90	1.20	0.84	3 & 4	100: 82: 66: (27 + 97)
10	4.12	4.57	1.18	0.76	3 & 3	100: 84: 70: (30 + 97)

(1-5 from *Sarothamnus vulgaris*, Bennekom, 30-VI-'33; 6-8, from *Ononis spinosa*, Huissen, July '39; 9-10, from ??, San Giuliano, Venice, 26-V-'32).

Alate viviparous female.

Morphological characters. Very much like apterous viviparous female, head and thorax sclerotic, but hardly coloured, pale brownish; the abdomen with very faint and small marginal sclerites. Antennae rather dark, with the base of IIIrd segment pale, IIIrd segment with 13-23 rhinaria over basal $\frac{2}{3}$ - $\frac{4}{5}$ part, more or less in a row. Siphunculi varying from pale with the apex dark, to very dark with the basal $\frac{1}{4}$ pale, thinner and shorter than in the apterous viviparous female.

Colour. As in apterous viviparous female, but antennae, legs and siphunculi darker, to brownish black locally.

Measurements of one specimen: Length of body: 4.13 mm; ant.: 4.52 mm; siph.: 0.92 mm; cau.: 0.68 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{85}{IV} : \frac{78}{V} : \frac{(27 + 111)}{VI}$. Rhin. on IIIrd. ant segment: 1 and 2.

Oviparous female.

Morphological characters. Very much like the apterous viviparous form. Siphunculi a little shorter, cauda thinner and slightly blunt. Hind tibiae brown, a little incrassate, with very numerous small pseudosensoria.

Colour. As in apterous viviparous female, but slightly more yellowish and with the hind tibiae conspicuously darker.

Measurements of one specimen: Length of body: 3.24 mm; ant.:

3.43 mm; siph.: 0.74 mm; cau.: 0.42 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{79}{IV} : \frac{79}{V} : \frac{(37 + 108)}{VI}$. Rhin. on IIIrd ant. segment: 1 and 2.

Apterous male.

Morphological characters. Body very narrow and slender, with hardly visible pleural intersegmental sclerites and marginal sclerites on the abdomen. Frontal tubercles and small areas around each ocellus dark. Antennae blackish brown, with base of IIIrd segment pale, IIIrd segment with $\pm 37-50$ very small rhinaria along one side, Vth with about 20 rhinaria in a row, but IVth segment apparently always without rhinaria. Siphunculi very dark, with only the base pale and transparent, less than $\frac{1}{4}$ of the length of the body. Cauda dark also, small, acute. Legs brown, with the base of the femora and tibiae paler. Genitalia not much developed, claspers small.

Colour. Green, a little darker than the other forms. Head dark. Antennae, siphunculi and cauda dark brownish, the latter two with a greenish tinge. Legs pale brownish-green.

Measurements of one specimen: Length of body: 2.28 mm; ant.: 3.90 mm; siph.: 0.66 mm; cau.: 0.32 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{88}{IV} : \frac{92}{V} : \frac{(32 + 129)}{VI}$. Rhin. on IIIrd ant. segment: 44 and 46; on IVth: 0 and 0; on Vth: 21 and 22.

Hostplants: Papilionaceae, but mainly herbaceous species; also on *Sarothamnus vulgaris*, *Spartium junceum*, *Ononis* spp., *Genista* spp. In summer often on *Capsella bursa pastoris*.

Geographical distribution: All over the world. Possibly originally Palearctic and transported.

Biology: This species may be found on nearly every Papilionaceae, except on typically arboreous species, where it is replaced by *A. caraganae* (Chol.). It forms large colonies, usually on the apices of the infested plants, where it may live on the shoots, on the flowers, the pods, the under- and upper-side of the leaves, etc. Hibernation as egg is possible on a vast number of biennial and perennial species. In the Netherlands *Vicia cracca* seems to be its principal winterhost, but also on *Ononis*, *Lathyrus*, *Trifolium* and *Medicago* sexuales were seen. No sexuales could be found on annuals in the Netherlands¹⁾. In milder climates the sexual reproduction is completely eliminated.

1) Mordvilko (1909, p. 110) states, that fundatrices can develop on *Pisum sativum*, if placed on it, but he never found hibernation on annual Papilionaceae.

Data associated with the biology of this species in the Netherlands are as follows. Fundatrices usually are mature in the first week of May. The second generation is often apterous, the third always partly winged. Sexuales appear in the last week of September, but they may go on being formed until December. The males die first, then the oviparae. The eggs are deposited on any part of the plant or near it, they are pale greenish when just laid and in a few days turn shiny black.

Notes. This species has been known under various names, such as *ulmariae* Schrank, *pisi* Kltb., *destructor* Johnson and recently *onobrychis*. The identification with *ulmariae* was wrong, the others right. Though some authors quote *Aphis pisum* Harris, they do not use this name in combination with the generic names they use. Yet this name has to be used, which is not unpleasant, since *Pisum* is one of the plants as a pest of which this species is generally known.

As Harris' book is not present in any of the Dutch libraries I have asked Dr. H. Sachtleben of the Deutsches Entomologisches Institut, Berlin-Dahlem for information and I want to thank him very much for his valuable help. I will quote part of his letter here.

"The name "*pisum*" is nowhere immediately connected with the name *Aphis*. On p. 65 one finds the superscription "Tab. XVIII. Hemeptera. Aphides". Then comes an article "general characters", the first words of which are: "The *Aphis* has four wings, ...". On p. 66 are the following species: *Rosae*, *Brassicae*, *Althaeae* and *Pisum*. The names might as well indicate hostplants. On p. 63, however, one finds the following superscription: "Tab. XII. Diptera: Asili." Then the species *Crabroniformis*, *Delector* and *Maculosus* are dealt with. This arrangement looks very much as if one simply has to use the singular of the superscription to get the generic name".

I think that indeed *pisum* is meant as species-name. As for the diagnosis, this might relate to any green aphid, but the fig. 11 of plate XVIII is a remarkable good and well coloured picture of an alate viviparous female, which excludes every doubt as to the identification. Dr. Sachtleben sent me a coloured copy of fig. 11 and informed me that fig. 10 represents parasitized specimens and fig. 12 the parasite, a Braconid.

Dr. Sachtleben had only the 3rd edition of Harris' book at hand, which is dated 1782; according to Horn & Schenkling's Index Litteraturae Entomologicae the first edition, of 1776, has the same number of pages and plates, so that I use that date.

I have also quoted North American references to this species and this may be wrong. For, as Mordvilko rightly remarks, when the American

authors mention males of their species, they speak of alate males whereas the European form has apterous males. Apparently it is not known whether also apterous males occur in North America. The American form with alate males should be named *Acyrtosiphon pisum* subspec. *destructor* Johnson.

Larvae of *pisum* Harris are described by Del Guercio (1930) as *Anuraphis* (*Macchiatiella*) *trifolii* and *promedicaginis* Guercio. He figures the antennae of *trifolii* with 3 basal segments, but the basal segment must be the frontal tubercle.

Mordvilko describes a few subspecies from Russia, which differ from the main species by the length of the antennal hairs. I find this character rather variable in my material from various localities in Europa and I do not think it justified to base subspecies upon it, so that I have placed Mordvilko's subspecies as synonyms.

Recent experimental work by Harrington (1943, 1945) suggests that in the U.S.A. 5 races are present, differing in their speed of reproduction, etc. It is to be expected that also in Europe the species is composed of a number of forms, of which particularly a bright yellow one on *Lotus uliginosus*, apparently not on other hosts, is conspicuous. Also the red-or-green forms on *Ononis* may form a strain, while the aphids on *Sarothamnus* differ from those from other hostplants by being smaller and more slender. All these forms are morphologically too uniform to separate them, though their restriction to certain foodplants indicates that they are more than modifications. In the case of its rôle as a vector of virus diseases in Europe necessitating a detailed study of its biology, these facts should not be neglected.

Economic importance. In Europe this species would seem to be rather harmless, though in 1921 Jablonowski, Wahl and Vielwerth all record severe infestations from Hungary, Austria and Chechoslovakia, respectively. In other parts of the world, particularly North America, it is a very dangerous enemy to agriculture, so that a growing stream of papers on its economic importance, control, etc., is produced. Also its importance as a vector of virus diseases is the subject of many papers. Besides the burning off of fields with flamethrowers, which seems to do little harm to alfalfa, but kills the lice, many insecticides have been used, and also catching machines ("aphidozers"). Recently successes have been reached with the selection of resistant varieties of some of the infested crops, a very interesting subject. For the literature on the economic aspects the reader is referred to the Review of Applied Entomology, series A.

Types: Unknown.

Subgenus **Lactucobium** nov. subg. 1)**Acyrthosiphon (Lactucobium) scariolae** (Nevsky, 1929).

1860. Passerini, G., Gli Afidi, ed. II, Parma²⁾, p. 34, *Siphonophora lactucae*.
 1863. Passerini, G., Arch. p. l. Zool., vol. II, p. 137 (reprint, p. 14), *Siphonophora lactucae*.
 1872. Ferrari, P. M., Ann. Mus. Civ. Stor. Nat. Genova, vol. III, p. 213, *Siphonophora lactucae*.
 1906. Schouteden, H., Mém. Soc. Ent. Belg., vol. XII, p. 239, *Macrosiphum lactucae*.
 1918. Wilson, H. F., & Vickery, R., List of the Aphididae of the world, *Macrosiphum lactucae*.
 1929. Nevsky, W. P., Zool. Anz., Wasmann Festband, p. 197, *Acyrthosiphon scariolae*.
 1929. Nevsky, W. P., Tli Srednei Asii, p. 89, *Acyrthosiphon scariolae*.
 1931. Börner, C., Anz. f. Schädlingssk., vol. III, p. 11, *Macrosiphum lactucarium*.
 1932. Börner, C., in Sorauer, Handb. d. Pflanzenkr., ed. IV, vol. V, pars 2, p. 627, *Macrosiphon lactucarius*.

Apterous viviparous female.

Morphological characters. Body rather broadly spindle-shaped with largest width on posterior half, with very short hairs. Tergite completely membranous, without local sclerotisation, smooth. VIIIth abd. tergite with ± 6 hairs, which are as long as basal diameter of IIIrd ant. segment. Frontal tubercles low, flat, smooth, frontal furrow very shallow. Antennae shorter than body, pale, with the junctions of segment III and IV, IV and V, the part near the rhinaria of VI and the apex of the processus terminalis dusky; IIIrd segment with 4—11 rather tuberculate large rhinaria, the basal one of which is placed rather far from the base of the segment, the others at rather large and regular intervals on basal $\frac{2}{5}$ — $\frac{2}{3}$ part; IVth and Vth segment about equally long, processus terminalis about $3\frac{1}{2}$ —4 times as long as base of VIth segment, usually a little longer than IIIrd segment. Antennal hairs on IIIrd segment about $\frac{1}{2}$ — $\frac{5}{7}$ of basal diameter of that segment. Rostrum

1) Type *Acyrthosiphon scariolae* Nevsky. See also p. 214, etc.

2) This paper is a reprint from the journal "Giornale i Giardini". It was first published as "Gli Afidi" in Giornale XII, June 1857. "XII" stands for 12th monthly issue. I have never seen this periodical which apparently is extraordinarily rare. Gerstaecker (1858, Arch. f. Naturgesch., Jahrg. XXIV, vol. II, p. 441) has seen a reprint of the first edition. He says that it is a popularized description of the natural history of the aphids, in which their biology, reproduction, economy and destruction are dealt with. This suggests that the systematic part was added in the 2nd edition, which according to Mordvilko (1914, p. 368) is published in vol. III of the same journal in 1860. This also I could not obtain in Europe and no author except Mordvilko has quoted either of the original publications. A reprint of the second edition which is titled: "Gli Afidi con un prospetto dei generi ed alcune specie nuove italiane, Parma", pp. 1-40, is not rare and at my disposal. In the previous two parts of these monographical contributions I could quote Mordvilko who has seen the original of ed. II, but in future I will have to quote the reprint.

rather short, reaching to just past the middle coxae with the rather short ultimate segment about $\frac{2}{3}$ times as long as the comparatively long second joint of hind tarsi, remarkably hairy (with ± 20 hairs). Siphunculi $\frac{2}{9}$ — $\frac{1}{4}$ of length of body, pale, cylindrical, with expanded base, slender, very finely imbricated, with small, thick flange. Cauda elongate, blunt, hardly constricted, $\frac{3}{7}$ — $\frac{4}{7}$ times as long as siphunculi, pale, with 8—11 hairs. Legs not very long, thin, hairy, first tarsal joints with 3, 3, 3 hairs, the middle of which is about $\frac{2}{5}$ times as long as the lateral ones, which are very fine.

Colour. Pale yellowish-green, with thin layer of greyish white waxy exsudation. Cauda, siphunculi and legs pale, transparent, the antennae moreover with the junctions of the segments dark.

Measurements of one specimen: Length of body: 2.82 mm; ant.: 2.57 mm; siph.: 0.64 mm; cau.: 0.34 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{64}{IV} : \frac{63}{V} : \frac{(29+113)}{VI}$. Rhin. on IIIrd ant. segment: 5 and 6.

Alate viviparous female.

Morphological characters (from one specimen with damaged antennae). Very much like the apterous viviparous female. Abdomen without any local sclerites, only the head and the thorax sclerotic, very pale. IIIrd ant. segment with about 21 rhinaria along one side, more or less in a row over the whole length, arranged as in apterae. Siphunculi as in apterae, but thinner. Cauda distinctly constricted, more slender and a little more acute than in apterae. Wings in the specimen which I possess with the media forked once only.

Colour. Probably as in apterous viviparous female, but antennae not annulated.

Measurements: Length of body: 2.36 mm; ant.: ?; siph.: 0.50 mm; cau.: 0.28 mm. Rhin. on IIIrd ant. segment: 21 and 21.

Oviparous female.

Morphological characters (according to Nevsky, 1929, p. 198). Segment III of antennae with 2—3 rhinaria. Hind tibiae on basal half broadened, with some pseudosensoria.

Colour. Yellow-green with brownish tinge.

Measurements: Length of body: 2.38 mm; ant.: 2.47 mm; siph.: 0.65 mm; cau.: 0.27 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{56}{IV} : \frac{52}{V} : \frac{(24+83)}{VI}$. Rhin. on IIIrd ant. segment: 2 and 2.

Hostplants: *Lactuca scariola*, *L. sativa*, *L. virosa*.

Geographical distribution: Recorded from Belgium, Germany, Italy and Turkestan.

Biology: From Nevsky's and Börner's notes it appears, that this species hibernates on *Lactuca* spp. According to Börner it may become a pest on young *Lactuca sativa* plants.

Notes. There is no doubt, that my specimens belong to Nevsky's species. I received some apterae and an alate female with broken antennae from the Deutsches Entomologisches Institut, collected at Grünewald.

Its most typical character is the very hairy rostrum, by which it is easily separated from the other species of this genus. The distribution of the rhinaria, of which Nevsky (1929) gives a figure, is quite typical, as well as the long hairs on the first tarsal joints.

Passerini's name *Siphonophora lactucae* is preoccupied by *S. lactucae* Koch, a *Dactynotus*.

Types: Nevsky's types are in the Zoological Museum of the Academy of Sciences of the U.S.S.R., Leningrad. Börner's types are in his collection.

Subgenus **Liporrhinus** Börner, 1939.

Acyrthosiphon (Liporrhinus) chelidonii (Kaltenbach, 1843).

(Pl. XIII fig. 8).

1843. Kaltenbach, J. H., Mono. d. Pflanzenläuse, p. 41, *Aphis chelidonii*.
 1855. Koch, C. L., Die Pflanzenläuse Aphiden, p. 169, *Siphonophora chelidonii*.
 1910. Henrich, C., Verh. Mitt. Siebenburg. Verein, vol. LIX, p. 32-33, *Myzus chelidonii*.
 1928. Opmanis, K., Acta Univ. Latviensis, vol. XVIII, p. 394, *Macrosiphum chelidonii*.
 1929. Mordvilko, A. K., Food-Plant Catalogue, p. 50, *Acyrthosiphon (?) chelidonii*.
 1939. Börner, C., Arb. Phylog. u. Angew. Ent., vol. VI, p. 82, *Liporrhinus chelidonii*.

Fundatrix.

Morphological characters. Much like apterous viviparous female, but broader and more *Aphis*-like. Frontal tubercles little developed; median frontal tubercle small. Antennae about $\frac{1}{2}$ of the length of the body, rather dark, processus terminalis half as long as IIIrd ant. segment, $1\frac{1}{3}$ — $1\frac{3}{7}$ times base of VIth segment. Siphunculi and cauda both dusky, the latter very thick, blunt, as in *Aphis* L.

Colour. Very pale yellowish green, rather thickly covered by grey wax-powder. Siphunculi brownish yellow, antennae brown, cauda like the body.

Measurements of one specimen: Length of body: 2.32 mm; ant.: 1.10 mm; siph.: 0.46 mm; cau.: 0.26 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{60}{IV} : \frac{60}{V} : \frac{(36 + 50)}{VI}$. Rhin. on IIIrd ant. segment: 0 and 0.

Apterous viviparous female.

Morphological characters. Body rather broadly spindle-shaped, with short hairs. VIIIth tergite with 6 hairs, which are about as long as basal diameter of IIIrd segment of antennae. Tergite hardly sclerotic, marginally just perceptibly smoky, behind the siphunculi a little scaly. Frontal tubercles little developed, strongly diverging, rounded inwards, nearly smooth. Median frontal process very distinct. Spinal tubercles on vertex apparently always absent. Antennae normally shorter than body, in small specimens sometimes just longer than the body, rather pale with dark apex, IIIrd segment without rhinaria, processus terminalis $3-3\frac{1}{3}$ times as long as base of VIth segment, approximately as long as IIIrd segment. Antennal hairs on IIIrd segment nearly half as long as basal diameter of this segment. Rostrum rather long, reaching to the hind coxae or just past, apical segment slender, about $\frac{5}{6}$ of the second joint of hind tarsi. Siphunculi nearly cylindrical, very pale, with the flange darker to brown, about $\frac{1}{5}$ of the length of the body, a little imbricated, with rather well developed flange. Cauda constricted just basally of the middle, though slightly only, blunt, pale, about half as long as the siphunculi, with 9-14 hairs. Legs pale, first tarsal joints with 3, 3, 3 hairs.

Colour. Very pale green to greenish white, covered by a greyish white waxpowder, which accentuates the segmentation, because the junctions of the segments are bare. Antennae brownish yellow with often dusky flange, cauda and legs colour of body.

Measurements of one specimen: Length of body: 2.18 mm; ant.: 1.88 mm; siph.: 0.46 mm; cau.: 0.24 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{70}{IV} : \frac{70}{V} : \frac{(35+95)}{VI}$. Rhin. on IIIrd ant. segment: 0 and 0.

Alate viviparous female.

Morphological characters. Very much like apterous viviparous female. Mesothorax rather sclerotic, but abdomen with only the marginal sclerites present, although they are nearly colourless. IIIrd ant. segment with 6-10 rhinaria in a row at regular intervals along the whole length. Siphunculi a little thinner than in apterae, colourless, with dusky flange. Cauda more slender than in apterae, pale also. Wings with normal venation, veins rather pale.

Colour. As in apterous viviparous female, thorax under the wax brownish.

Measurements of one specimen: Length of body: \pm 2.08 mm; ant.: 2.10 mm; siph.: 0.41 mm; cau.: 0.33 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{75}{IV} : \frac{64}{V} : \frac{(30+96)}{VI}$. Rhin. on IIIrd ant. segment: 7 and 7.

Oviparous female.

Morphological characters. Very much like the apterous viviparous female and nearly only differing from it in the cauda being not constricted, but thick and blunt as in the fundatrix. Hind tibiae pale, a little thicker than normal, with numerous pseudosensoria.

Colour. As in apterous viviparous female, but under the wax a little more yellowish.

Measurements of one specimen: Length of body: 2.20 mm; ant.: 2.08 mm; siph.: 0.46 mm; cau.: 0.22 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{69}{\text{IV}} : \frac{64}{\text{V}} : \frac{(27 + 87)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 0 and 0.

Alate male.

Morphological characters. Body rather small and narrow. Antennae a little longer than the body, IIIrd segment with 17-24 rhinaria, IVth usually without rhinaria, rarely with up to 3, Vth with 5-9. Head dark. Abdomen dorsally with distinct marginal and pleural intersegmental sclerites, without spinal sclerites; also ventrally with small, faint, paired sclerites. Siphunculi much shorter than in the other forms, but not thinner, about $\frac{1}{6}$ of the length of the body, pale like the narrow, acute cauda. Genitalia well developed.

Colour. Head and mesothorax brown, remainder greenish, powdered grey. Antennae dark, distal apices of femora dusky.

Measurements of one specimen: Length of body: 1.94 mm; ant.: 2.16 mm; siph.: 0.30 mm; cau.: 0.17 mm. Prop. of ant. segments: $\frac{160}{\text{III}} : \frac{69}{\text{IV}} : \frac{62}{\text{V}} : \frac{(26 + 86)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 20 and 22; on IVth: 0 and 3; on Vth: 8 and 6.

Hostplant: *Chelidonium majus*.

Geographical distribution: Netherlands, Germany, Hungary, Latvia (Poland, according to Mordvilko, 1929).

Biology: Fundatrices of this species were mature on April 25th 1938 at Maastricht, Netherlands. They had not yet deposited any larvae and sat in the inflorescences and on the youngest leaves. In Oct. 1939 I found many apterous sexuparae, one alate viviparous female and sexuales, mostly immature, on the same spot, all sitting on the youngest radical leaves, on the upperside as well as on the underside. In the first days of November I reared oviparae and males at home. A week later I found numerous eggs on the plants at Maastricht, mainly on the petioles, but also on the leaves. The eggs were very pale greenish and transparent when just deposited. The

colonies then were still very large, but inconspicuous, because the colour of the powdered lice is very much like that of the young foliage of *Chelidonium*.

Notes. It seems that this species is rare. There are only few reliable records of its occurrence and only recently I detected this species in the Netherlands, where it seems to occur in the province Limburg only, and even there very locally, though the foodplant is quite common. Kaltenbach found it near Aix la Chapelle and says, that it strongly resembles „*Aphis brassicae* L.” so that in his *Pflanzenfeinde aus der Klasse der Insekten* (1874) he even suggests identity between the two species. A more recent record in literature is that by Börner, who bases a new genus on it, because the mesothoracal furca according to Börner is sessile. But this character is present in the fundatrices only, a quite common feature in this and allied genera. The apterae of later generations have a normal furca with a slender, elongate base.

The records from England all seem to relate to other species. Theobald's description and material show that he was dealing with *Aulacorthum solani* (Kltb.), which I frequently found on *Chelidonium*. Theobald described the cauda as $\frac{1}{3}$ of the length of the siphunculi, bearing 5 hairs, and says that the apterae have 0-3 rhinaria on the IIIrd antennal segment. One of the most striking characters of true *chelidonii* is that the cauda is very hairy and that rhinaria are lacking on the IIIrd antennal segment. According to Theobald (1926, p. 347) Buckton's *chelidonii* described from *Rubus* is *Macrosiphum rubifolium* Theobald (= *M. funestum* (Macch.)).

Acyrtosiphon ilka Mordvilko, 1914, from *Papaver nudicaule*, is very closely allied or identical. There is a small difference between the description of the single specimen which Mordvilko examined and the figures which he gives. He describes the aptera with one rhinarium on the IIIrd ant. segment, but he does not draw it, though as a rule his illustrations are remarkably accurate. With the exception of this rhinarium his description covers Kaltenbach's species completely. It is significant that both species live on Papaveraceae.

Types: Kaltenbach left no types.

Subacyrtosiphon nov. gen.

A. INTRODUCTION.

I erect this genus for *Subacyrtosiphon cryptobium* nov. spec., an aphid which lives hidden on *Trifolium repens*. The genus is closest related to *Acyrtosiphon* Mordv. and may be regarded as derived from that genus.

But several characters of *Subacyrthosiphon* differ from those of *Acyrtosiphon*. The front of *Subacyrthosiphon* is more like that of *Aulacorthum* Mordv., with the frontal tubercles rather angular on inner side, though they still diverge a little. *Microlophium* Mordv. has similar frontal tubercles, but in that genus the apex of the siphunculi is differently shaped. Although both *Acyrtosiphon* and *Microlophium* have larvae with a slight waxy exsudation, those of *Subacyrthosiphon* are nude like those of many *Aulacorthum*. But unlike in *Aulacorthum* the tergum in apterae is distinctly membraneous, the abdomen of alatae has only marginal sclerites and both apterous and alate forms show small but marked ante- and postsiphuncular sclerites. A very typical character of the alatae is of specific value, viz., the fact that the antennae have hardly any rhinaria and that the few rhinaria present are usually confined to the basal half of the IIIrd ant. segment. This character is so rare in aphids that alatae of *Subacyrthosiphon cryptobium* should be recognized immediately if their IIIrd ant. segment is present.

Though as to most of its morphological details the species most resembles *Acyrtosiphum pisum* (Harris) of the various *Acyrtosiphon* spp., its general habitus is very different. The species might be mistaken for *Metopolophium tenerum* nov. spec., which has a similar shape of body and about the same colour in older specimens.

B. DESCRIPTION OF THE SPECIES.

Subacyrthosiphon cryptobium nov. spec. (Pl. XVIII fig. 27).

Apterous viviparous female.

Morphological characters. Body rather shortly oval, in well fed specimens dorsally strongly convex, about 2.00-2.80 mm long. Tergum from approximately smooth to very distinctly reticulated, membraneous and colourless with the exception of rather dark, rough, inner apices of the frontal tubercles, small but very distinct brownish ante- and postsiphuncular sclerites, a usually very incomplete band across VIIth abd. tergite and a paler band on VIIIth abd. tergite. Dorsal hairs short, about as long as those on IIIrd ant. segment; VIIIth tergite with 4-6 slightly longer hairs. Frontal tubercles very well developed, with inner sides more or less diverging, never parallel, but with at inner apex a small, dark, roundish processus so that they are rather angular. Median frontal tubercle not developed. Antennae $1\frac{1}{10}$ - $1\frac{1}{3}$ times as long as body with the basal segments about as dark brown as the inner apex of the frontal tubercles, the flagellum brown with blackish apex and blackish apices to the segments,

imbricated; IIIrd segment near base with 1-2, rarely 0 or 3 very small rhinaria; processus terminalis $1\frac{1}{7}$ - $1\frac{1}{3}$ times as long as IIIrd segment, about 4 times as long as base of VIth segment. Hairs on IIIrd segment with thick apices, about $\frac{1}{4}$ - $\frac{2}{7}$ times as long as basal diameter of IIIrd segment. Rostrum not reaching the hind coxae; apical segment as long as 2nd joint of hind tarsi, with normally 2 hairs besides the 3 apical pairs. Siphunculi brownish yellow sclerotic with blackish brown apices, imbricated with small, acute scales, thin, cylindrical with expanded base, slightly constricted just before the rather well developed flange, about $\frac{1}{5}$ times as long as body. Cauda as dark as the base of the siphunculi, triangular without constriction, rather acute, $\frac{1}{2}$ - $\frac{2}{3}$ times as long as the siphunculi, with 6-8 hairs; those on apical part have spear-shaped apices and are much shorter than the more basal hairs. Legs long, brownish yellow with the very apices of the femora and tibiae fuscous, the femora markedly rough; first tarsal joints with 3, 3 hairs.

Colour. Very pale olive-green, sometimes the head faintly reddish, opaque, not powdered or pruinose, evenly coloured. Antennae dark green with blackish apices. Siphunculi, cauda and legs with the colour of the body.

Measurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III:IV:V:VI
1	2.57	2.98	0.52	0.26	1 & 2	100: 74: 67: (29 + 118)
2	2.04	2.72	0.44	0.22	1 & 1	100: 84: 72: (31 + 118)
3	2.07	2.64	0.43	0.24	1 & 1	100: 79: 74: (31 + 131)
4	2.11	2.62	0.45	0.24	0 & 1	100: 75: 69: (30 + 115)
5	2.33	2.74	0.47	0.25	1 & 1	100: 79: 74: (30 + 125)
6	2.42	2.72	0.45	0.28	1 & 1	100: 82: 72: (30 + 121)

(1-6, from *Trifolium repens*, Bergen op Zoom, 10-IX-'43).

Alate viviparous female.

Morphological characters. Rather like apterous viviparous female, but head and thorax brown sclerotic, abdomen with rather small marginal sclerites and larger antesiphuncular sclerites. Antennae with only the base of IIIrd segment pale, remainder dark brown, IIIrd segment with only 2-11 rhinaria, usually confined to basal half; processus terminalis up to 5 times base of VIth segment. Siphunculi rather evenly dark brown, thinner than in apterae. Cauda slightly constricted in the middle. Femora somewhat darker than in apterae. Wings with normal venation, the veins very distinctly shadowed with brown, especially the basal veins of the forewings.

Colour. Head and thorax blackish brown, abdomen as in apterous form but with dark marginal spots. Siphunculi and cauda brown.

Measurements of one specimen: Length of body: 2.38 mm; ant.: 2.88 mm; siph: 0.43 mm; cau.: 0.24 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{87}{IV} : \frac{79}{V} : \frac{(30+141)}{VI}$. Rhin. on IIIrd ant. segment: 3 and 4.

Oviparous female.

Morphological characters. Much as in apterous viviparous female, but tergum thinner and finely and densely wrinkled. Anterior sclerites only very small. Hind tibiae very little swollen on basal half and there with a number of rather large pseudosensoria.

Colour. As in apterous viviparous female.

Measurements of one specimen: Length of body: 2.08 mm; ant.: 2.44 mm; siph.: 0.40 mm; cau.: 0.22 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{82}{IV} : \frac{70}{V} : \frac{(28+130)}{VI}$. Rhin. on IIIrd ant. segment: 1 and 1.

Apterous male.

Morphological characters. Body small and very narrow, about 1.20-1.55 mm long. Sometimes vague scleroites around the bases of the spinal and pleural hairs on the abd. tergum; marginal sclerites large, sometimes nearly fusing, but often pale. Head completely brown sclerotic. Antennae more than $1\frac{1}{2}$ times as long as body, brown to blackish, with the basal segments as dark as the head and the basal parts of the segments of the flagellum paler; IIIrd segment along one side with about 16-25 small, irregularly placed rhinaria; IVth with 12-21 rhinaria; Vth with about 7-13 in a line. Siphunculi very thin, as in alatae. Cauda short, as dark as the siphunculi. Genitalia well developed, claspers small. Other characters more or less as in apterous viviparous female.

Colour. Marginally somewhat mottled with vague brown, but otherwise as in apterous viviparous female.

Measurements of one specimen: Length of body: 1.47 mm; ant.: 2.35 mm; siph.: 0.31 mm; cau.: 0.14 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{80}{IV} : \frac{74}{V} : \frac{(32+144)}{VI}$. Rhin. on IIIrd ant. segment: 17 and 18; on IVth: 12 and 19; on Vth: 11 and 7.

Hostplant: *Trifolium repens*.

Geographical distribution: Only known from the environments of Bergen op Zoom and Bennekom, Netherlands, but probably all over Europe.

Biology: I found this species through the year on the older parts of the lying stems of *Trifolium repens*, usually in small families. In September I collected a small number of alate females, which most probably are

much more common in the 2nd or 3rd generation. Copulating males were present on September 19th, 1943, but very rare and in most of the spots where I collected this aphid they did not appear till some weeks later. The eggs are deposited on the plants. When just laid they are pale greenish.

On disturbance the aphids let fall themselves so that it is rather an exception to find a mature specimen on its host. Ants do not visit this plantlouse. The plant shows no reaction.

Notes. It is easy to recognize this aphid, because it is the only of the *Acyrtosiphon*-like species with distinct antesiphuncular sclerites. The frontal tubercles with their angular inner margin and rough inner apex are rather different from those of most of the other species. *Acyrtosiphon pisum* (Harris) is not common on *Trifolium repens*, though rather common on other *Trifolium* species such as *T. pratense*, *T. procumbens*, *T. hybridum* and others. *S. cryptobium* nov. spec. is probably not rare, but it is very difficult to find.

Types: In the author's collection and in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden.

Silenobium Börner, 1939.

A. HISTORY.

Börner created his genus for *Silenobium schusteri* Börner, a rather abnormal aphid, which in many respects resembles *Acyrtosiphon* Mordv. and also *Nasonovia* Mordv. But the genus has some characters in which it differs from all other genera. The IIIrd ant. segment in apterae and oviparae has a number of rhinaria, which is not remarkable, but they are especially concentrated on the distal half of the segment; on the basal half they are more or less placed in a line, but towards the apex they are placed in a multiple row. Also the IVth segment of apterae viviparae and oviparae usually has some rhinaria, sometimes even the Vth segment. Alatae have rhinaria on the IIIrd, IVth and Vth segment of the antennae. These characters do not occur in *Acyrtosiphon*-like genera, but in *Nasonovia* the same antennal segments have rhinaria, though in apterae and oviparae they are more numerous on the basal half of the IIIrd ant. segment than on the distal half. The stigmal pori of *Silenobium* are reniform and somewhat covered, but in *Nasonovia* they are circular and open. Also the shape of the siphunculi is rather typical so that the erection of a separate genus for the species seems to be justified. Börner's original description of the genus is very inadequate so that I give here a new diagnosis.

Apterae slender, more or less spindle-shaped, with membranous, not

pigmented, smooth tergum. Hairs short, blunt. Frontal tubercles rather small, distinctly diverging, slightly granulated; front between them convex (as in *Nasonovia* Mordv.). Antennae rather long, in apterae viviparae and oviparae with numerous rhinaria on segments III-IV or V, most of which are placed on the distal halves of the segments, especially on the IIIrd segment. Siphunculi about cylindrical, usually very faintly swollen on distal third part and with a slight constriction at their very apices, with small flange. Cauda elongated, pale like the siphunculi. First tarsal joints with 3, 3, 3 hairs.

Börner mentions as a typical character that the furca of the mesosternum has two widely separated dentes.

B. SYNONYMY.

1939. Börner, C., Arb. Phys. Angew. Entom., vol. VI, p. 78-79, *Silenobium*, type *Silenobium schusteri* Börner.

C. NOTES ON PHYLOGENY.

Most probably the genus is closest related to *Acyrthosiphon* Mordv., because the alatae probably have no sclerotic pattern on the abd. tergum. This character rather excludes *Nasonovia* as an allied genus, because in that group of genera always a well developed sclerotic pattern is present in alatae. The exact place of *Solenobium*, however, remains obscure, as it differs in several characters from the *Acyrthosiphon*-like genera¹).

D. DESCRIPTION OF THE SPECIES.

Silenobium schusteri Börner, 1939 (Pl. XVIII fig. 25).

1939. Börner, C., Arb. Phys. Angew. Entom., vol. VI, p. 78-79, *Silenobium schusteri*.

Apterous viviparous female.

Morphological characters. Body rather slender, spindle-shaped, about 1.70-2.00 mm long. Tergum quite membranous, not pigmented, smooth with the exception of small scabrous areas behind each siphunculus and on the VIIIth abd. tergite. Dorsal hairs very short, those on IIIrd abd. tergite as long as the antennal hairs, the 4 hairs on VIIIth tergite hardly or not longer. Frontal tubercles little developed, strongly diverging, a little scabrous. Median frontal tubercle broad and conspicuous. Antennae about $\frac{4}{5}$ - $\frac{9}{10}$ of the length of the body, somewhat pigmented, with darker apices to the segments of the flagellum; 1st segment slightly rough and rounded on

¹) Possibly the genus can be linked with *Brachycolus* Buckt., via *Volutaphis* Börner, living on *Coronaria flos cuculi*.

inner side; IIIrd segment about twice as long as IVth or a little longer, over the whole of its length with 6-20 small, round rhinaria, which on basal half stand in a row, but which on distal half are more or less irregularly grouped in multiple rows; IVth segment with 1-5, rarely 0 rhinaria, which also often are mainly placed on distal half of the segment; Vth exceptionally with a secondary rhinarium; processus terminalis long, $5\frac{1}{2}$ - $6\frac{1}{2}$ times as long as base of VIth segment, about $1\frac{1}{2}$ times as long as IIIrd. Hairs on IIIrd ant. segment very short, only about $\frac{1}{3}$ - $\frac{2}{5}$ of the basal diameter of IIIrd segment long. Rostrum just reaching the hind coxae; apical segment long and slender, $1\frac{1}{3}$ times as long as 2nd joint of hind tarsi, with 7-12 hairs besides the 3 pairs near apex. Siphunculi about $\frac{2}{9}$ of the length of the body, cylindrical or with a just perceptible swelling on distal third part, a little constricted at their very apex, slightly imbricated on basal half to nearly smooth, with small flange, pale brownish yellow pigmented. Cauda elongated, slender, not or hardly constricted, as pale as the siphunculi and about $\frac{3}{5}$ of their length long, with about 7-10 hairs. Legs evenly pale brownish yellow pigmented; first tarsal joints with 3, 3, 3 hairs.

Colour. According to Börner yellowish to yellowish green.

Measurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on			Prop. of ant. segments	
					III	IV	V	III: IV: V:	VI
1	1.91	1.63	0.44	0.25	15 & 19	4 & 4	0 & 0	100: 48: 43:	(24 + 153)
2	1.89	1.65	0.42	0.25	12 & 17	4 & 3	0 & 0	100: 48: 43:	(28 + 157)
3	1.99	1.80	0.45	0.27	13 & 14	3 & 4	0 & 1	100: 49: 44:	(24 + 147)
4	1.83	1.62	0.41	0.26	7 & 10	2 & 1	0 & 0	100: 45: 40:	(25 + 155)

(1-3, from *Melandryum album*, Müncheberg, 1-IX-'38; 4, idem, 27-IX-'38).

Alate viviparous female.

Morphological characters. (According to Börner). Rhinaria on ant. segments III, IV and V. Venation of the wings normal, veins darkly bordered.

Colour (according to Börner). With brown legs and antennae.

Oviparous female.

Morphological characters. Very much like apterous viviparous female, but smaller. IIIrd ant. segment with about 2-11 rhinaria, distributed as in apterae viviparae; IVth segment with 0-1 rhinarium. Hind tibiae hardly swollen, on basal half with a few pseudosensoria; the hind tibiae not more pigmented than the other tibiae.

Colour. Unknown.

Measurements of one specimen: Length of body: 1.58 mm; ant.: 1.34 mm; siph.: 0.34 mm; cau.: 0.21 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{44}{\text{IV}} : \frac{35}{\text{V}} : \frac{(25 + 150)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 6 and 11; on IVth: 0 and 1.

Hostplant: *Melandryum album*.

Geographical distribution: Only known from the province Brandenburg, East of Berlin.

Biology: According to Börner the species causes a yellowing of the veins of the leaves of its host, so that presumably it lives on the leaves. I received oviparae from Dr. Börner, collected on 27-IX-'38, so that apparently the species hibernates on its host.

Notes. The species is easily recognisable by the distribution of its rhinaria in the apterae viviparae and oviparae. I owe many thanks to Dr. Börner, who provided me with the four measured apterae viviparae and two oviparae of this species. I had to treat the specimens with KOH, which attacks the pigment, so that I do not exactly know to what extent the legs and antennae are pigmented.

Types: In the collection of Dr. Börner, cotypes in the collection of the „Zweigstelle Naumburg der biologischen Reichsanstalt" and in the author's collection.

Titanosiphon Nevsky, 1928.

A. HISTORY.

This genus was erected by Nevsky for two new species, which he found on *Artemisia* spp. in Turkestan. He characterized it as follows: depth of the frontal furrow one-sixth to one twelfth the distance between the antennal bases; median frontal tubercle absent; IIIrd ant. segment in apterae with secondary rhinaria; siphunculi cylindrical, about half as long as body or longer, smooth or finely imbricate; cauda rather short, bluntly acuminate, sometimes faintly constricted, four to five times shorter than the siphunculi. The genotype is *T. bellicosum* Nevsky, 1928, a species in which the siphunculi are $\frac{2}{3}$ of the length of the body long! His other species has them a little more than $\frac{1}{3}$ of the length of the body and this is more in accordance with the single European species, *T. artemisiae* (Koch), in which they are $\frac{1}{3}$ - $\frac{4}{9}$ of the length of body. Nevsky does not mention the shape of the ultimate rostral segment of his species, but one can safely assume that this is, just like that of the European species, very acute and more or less stiletto-shaped.

Our European species was described as a *Siphonophora*. The last author who records it was Ferrari, but Judenko described it as *Titanosiphon Minkiewiczii* nov. spec. from Poland. In 1936 I found it in Germany.

B. SYNONYMY.

The synonymy is quite simple.

1855. Koch, C. L., Die Pflanzenläuse Aphiden, p. 165, *Siphonophora* partim.
 1872. Ferrari, P. M., Ann. Mus. Civ. Stor. Nat. Genova, vol. III, p. 212, *Siphonophora* Koch partim.
 1928. Nevsky, W. P., Entom. Mitt., vol. XVII, p. 189, *Titanosiphon*, type *T. bellicosum* Nevsky, 1928.
 1929. Takahashi, R., Trans. Nat. Hist. Soc. Formosa, vol. XIX, p. 247, *Titanosiphon* Nevsky.
 1929. Nevsky, W. P., Tli Srednei Asii, p. 92, *Titanosiphon* Nevsky.
 1930. Takahashi, R., Proc. Ent. Soc. Washington, vol. XXXII, p. 15, *Titanosiphon* Nevsky.
 1930. Börner, C., Arch. f. Klass. u. Phylog. Ent., vol. I, p. 176, *Amphorophora* Buckt. partim.
 1931. Judenko, E., Bull. Ent. d. l. Pologne, vol. X, p. 111, *Titanosiphon* Nevsky.
 1933. Börner, C., Kl. Mitt. 6ber Blattl., ed. Börner, p. 2, *Aulacorthum* Mordv. partim.

C. GENERAL BIOLOGY.

All known species of this genus live on the upper part of the stalks of *Artemisia* species without causing any deformation. Migration probably does not occur, though as yet of only two species males and oviparae are known. The species seem to be monophagous. Alate viviparae are evidently rare and most probably occur in the 3rd generation only.

The lice are very mobile, but I do not know whether they have the habit of dropping if disturbed.

Nevsky records that *T. dracunculi* Nevsky is visited by *Formica rufibarbis*. I noted that also *T. artemisiae* (Koch) is visited by a *Formica* species.

D. GEOGRAPHICAL DISTRIBUTION.

Only from the Palaearctic region species of this genus are known, though their hosts, *Artemisia* spp., occur also in the Nearctic zone.

E. GENERAL MORPHOLOGY.

I. Macroscopical morphology.

Rather small, slender Aphids, 1.70-2.50 mm long, colour varying from green to blackish green, sometimes with parts of the body coloured otherwise, e.g., head and thorax orange (*T. dracunculi* Nevsky), a reddish band

over segments V and VI (*T. bellicosum* Nevsky, alatae). Of the males of *T. bellicosum* Nevsky green and red forms are recorded. Siphunculi very long. Larvae coloured like the mature insects.

II. Microscopical morphology.

1. Head. Rather narrow, sclerotic, smooth. Frontal tubercles not much developed, front always distinctly concave. Antennae at least as long as body; IIIrd ant. segment with 3-20 rhinaria, which in the apterous viviparous females are restricted to basal $\frac{2}{5}$ - $\frac{7}{10}$; in males also the IVth and Vth segment with rhinaria; processus terminalis 3-4 times as long as base of VIth segment. Antennal hairs about as long as basal diameter of IIIrd ant. segment. Rostrum rather long, reaching just past the hind coxae, apical segment rather acute, with approximately straight margins. Vertex without spinal tubercles.

2. Thorax. Normal. Legs rather long, blackish, completely sclerotic or with the middle portion of the tibiae pale. First tarsal joints with 3, 3, 3 hairs. Wings normal.

3. Abdomen. Hairs frequently with small scleroites at their bases, especially the spinal hairs and those on VIIIth tergite. Marginal sclerites probably only developed in alate forms. Hairs on tergum short to rather long, with bluntish apices. Siphunculi extraordinary long, cylindrical, without flange, frequently completely smooth, sometimes imbricate, $\frac{1}{3}$ or more of the length of the body, sclerotic. Cauda rather short, blunt, sometimes slightly constricted, $\frac{1}{5}$ - $\frac{1}{3}$ times as long as siphunculi, with numerous hairs (the number of hairs in the Central Asiatic species is not known, but Nevsky (1928) gives a drawing of the cauda of *T. bellicosum* Nevsky with 14 hairs).

F. MORPHOLOGICAL RELATION TO OTHER GENERA.

This genus is closely related to *Macrosiphoniella* Del Guercio, with which it agrees in the presence of scleroites and the shape of the ultimate rostral segment, but from which it differs in the absence of a reticulated area on the much longer siphunculi and in the absence of an antesiphuncular sclerite. From *Acyrtosiphon* Mordv. and other genera with not reticulated siphunculi it is distinguished by the flangeless siphunculi and the longer antennal hairs. Confusion with other genera is hardly possible.

G. NOTES ON PHYLOGENY.

This is the fourth genus we are dealing with which is restricted to Anthemideae. It shows the typical feature of this ecological group, i.e., the

structure of the ultimate rostral segment. It differs very much from all other typical Anthemideae-inhabiting genera. In the Aphidina Börner the absence of a flange is common in genera with short, reduced siphunculi; but one finds it also in *Pharalis*, which has fairly long siphunculi and lives on Anthemideae, like *Titanosiphon* Nevsky. I am inclined to look upon this character as a symptom of reduction. In this regard it is interesting, that *Titanosiphon* Nevsky, like *Pharalis* Leach and its ally *Microsiphum* Chol. is visited by ants, which in this group of Aphids definitely is an exception. I do not know whether the excreting capacity via the siphunculi still exists in these genera, but it would not be surprising if the siphunculi had lost their function.

It is not probable that *Titanosiphon* and *Pharalis-Microsiphum* are derived from each other. The loss of the flange to the siphunculi may be regarded as well as convergence. The presence of scleroites is so rare, that because of them I am inclined to consider *Titanosiphon* as a specialized relation of the genera *Dactynotus* or *Macrosiphoniella*. The absence of reticulations on the siphunculi in some respects, however, is rather strange.

H. DESCRIPTION OF THE SPECIES.

Titanosiphon artemisiae (Koch, 1855) (Pl. XIV fig. 9).

1855. Koch, C. L., Die Pflanzenläuse Aphiden, p. 165, *Siphonophora artemisiae*.
 1872. Ferrari, P. M., Ann. Mus. Civ. Stor. Nat. Genova, vol. III, p. 212, *Siphonophora Kochi*.
 1931. Judenko, E., Bull. Ent. d. l. Pologne, vol. X, p. 111, *Titanosiphon minkiewiczii*.

Apterous viviparous female.

Morphological characters. Body elongated oval, with rather numerous, rather long hairs. Spinal hairs irregularly with rather small scleroites, the other hairs usually without scleroites; hairs on VIIth tergite with rather large scleroites, which often fuse into a more or less complete sclerotic band across the tergite; VIIIth tergite with a sclerotic transverse band, with 6-10 hairs. Ante- and postsiphuncular sclerites completely absent. Head rather broad, front without distinct frontal tubercles, but rather strongly concave. Antennae about as long as body; IIIrd ant. segment with 10-22 rather large rhinaria on an incrassate part; basal $\frac{1}{6}$ and apical $\frac{1}{2}$ - $\frac{3}{10}$ of the segment without rhinaria; processus terminalis longer than IIIrd segment. Ant. hairs long, up to $1\frac{1}{3}$ times as long as basal diameter of IIIrd segment. Rostrum reaching to just past 3rd pair of coxae, apical segment stiletto-shaped, as long as second joint of hind tarsi. Siphunculi extremely long, $\frac{1}{3}$ - $\frac{4}{9}$ of the length of the body, cylindrical with enlarged base and distal

$\frac{1}{5}$ part, surface completely smooth, flange entirely absent. Cauda just more than $\frac{1}{3}$ of the length of the siphunculi, blunt, sclerotic, with 18-26 hairs, many of which on dorsal surface. Legs long, sclerotic, first tarsal joints with 3 hairs.

Colour. Very dark green to blackish. Antennae, legs, siphunculi and cauda greenish black, base of IIIrd segment, base of femora and base of siphunculi greenish.

Measurements of one specimen: Length of body: 2.34 mm; ant.: 2.35 mm; siph.: 1.05 mm; cau.: 0.36 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{81}{IV} : \frac{73}{V} : \frac{(31 + 118)}{VI}$. Rhin. on IIIrd ant. segment: 16 and 18.

Oviparous female.

Morphological characters. According to Judenko's description (1931) there is little difference from the apterae viviparae. The hind tibiae are swollen, with 50-70 pseudosensoria.

Colour. According to Judenko's description approximately like the apterae viviparae.

Measurements of one specimen (Judenko): Length of body: 2.38 mm; ant.: 1.98 mm; siph.: 0.94 mm; cau.: 0.26 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{75}{IV} : \frac{73}{V} : \frac{(30 + 130)}{VI}$. Rhin. on IIIrd ant. segment: 11 and ?.

Apterous male.

Morphological characters (from Judenko, 1931). Antennae $1\frac{1}{20}$ - $1\frac{1}{4}$ times as long as body; IIIrd segment with 29-32 rhinaria, IVth with 7-9, Vth with 2-3; processus terminalis $1\frac{1}{4}$ - $1\frac{2}{5}$ times as long as IIIrd segment. Siphunculi $\frac{5}{11}$ - $\frac{6}{11}$ of the length of body long. Cauda $\frac{2}{9}$ - $\frac{1}{4}$ times as long as siphunculi, not constricted.

Colour. According to Judenko about like apterous viviparous female.

Measurements of one specimen (Judenko): Length of body: 1.60 mm; ant.: 1.68 mm; siph.: 0.75 mm; cau.: 0.17 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{84}{IV} : \frac{65}{V} : \frac{(32 + 141)}{VI}$. Rhin. on IIIrd ant. segment: 29 and ?; on IVth: 7 and ?; on Vth: 3 and ?

Hostplant. *Artemisia campestris*.

Geographical distribution: Germany, Poland, Italy, Switzerland.

Biology: This species lives on the thin stems of its host, usually single, rarely in small colonies. In July I found apterous viviparous females only. Judenko found the oviparae and the apterous males in the end of September and in the first days of October, males being scarce.

Notes. Koch described the species as *Siphonophora artemisiae* Koch; he records *Macrosiphoniella artemisiae* (Fonsc.) as *S. tanacetaria* Kalt. In Ferrari's days both species named *artemisiae* came in *Siphonophora*, so that Ferrari rechristened Koch's *artemisiae* *Siphonophora Kochi*.

Koch described his species as being black; it is, however, not black, but very dark green. Koch was half blind when he wrote the diagnoses, as is known. Our species undoubtedly is the one figured by Koch.

It is quite different from the Central-Asiatic species by the much larger number of rhinaria.

Types: Koch seems to have left no types. Cotypes of Judenko in my collection, apterous viviparous females.

Metopolophium Mordvilko, 1914.

A. HISTORY.

Mordvilko erected *Metopolophium* as a subgenus to *Acyrtosiphon*. In 1919 he includes three species in this subgenus: *M. dirhodum* (Wlk.), the genotype, *M. graminearum* Mordv., and *M. graminum* (Theob.), all living on Gramineae. Very few authors have acknowledged this genus, which is not surprising, because the species sometimes very strongly resemble those of *Acyrtosiphon* Mordv., and there is but one constant character to separate the genera, i.e., the very well developed median frontal tubercle in *Metopolophium*, which is completely or nearly absent in *Acyrtosiphon* species. This certainly is not a very great difference.

But if one postulates a genus to be a natural group of species, which not only morphologically, but also phylogenetically is a unity, then *Metopolophium* Mordv. undoubtedly deserves to be considered a genus. At present at least six species are known, which allows a fairly good opinion as to the value of the genus as a whole. It consists of one species migrating from *Rosa* to Gramineae and a number of species split off from this cycle and living on Gramineae only.

The genotype has been placed in *Aphis*, *Siphonophora*, *Macrosiphum*, *Amphorophora*, *Aulacorthum* and *Acyrtosiphon*, while Theobald described *M. festucae* (Theob.) as a *Myzus* and still in 1926 places it in *Myzus*, together with *Siphonophora longipennis* Buckton, which is identical with the genotype.

B. SYNONYMY.

1849-1875. Auctores diversi, *Aphis* L. partim.

1875-± 1901. Auctores diversi, *Siphonophora* Koch partim.

1901-1940. Auctores diversi, *Macrosiphum* Pass. partim.

1914. Mordvilko, A. K., Faune d. l. Russie, Ins. Hémipt., vol. I, livr. 1, p. 82, *Metopolophium*.
1919. Mordvilko, A. K., Faune d. l. Russie, Ins. Hémipt., vol. I, livr. 2, p. 270, *Metopolophium* nov. gen., type *Aphis dirhoda* Walker.
1923. Theobald, F. V., Res. Dept., South Eastern Agric. Coll., Bull. 2, *Myzus* Pass.
1926. Börner, C., in Abderhalden, Handb. d. biol. Arbeitsmethoden, Abt. IX, vol. 1/II, p. 229, *Illinoia* Wilson.
1926. Theobald, F. V., Aph. Great Britain, vol. I, pp. 335, 354, *Myzus* Pass. partim.
1929. Nevsky, W. P., Tli Srednei Asii, p. 77, *Acyrtosiphon* Mordv. partim.
1930. Börner, C., Arch. f. Klass. u. Phylog. Entom., vol. I, p. 141, *Amphorophora* Buckt. partim.
1930. Judenko, E., Bull. Ent. d. l. Pologne, vol. IX, p. 164, *Metopolophium* Mordv.
1932. Börner, C., in Sorauer, Handb. d. Pflanzenkr., ed. IV, vol. V, pars 2, p. 626, *Amphorophora* Buckt. partim.
1933. Börner, C., Kl. Mitt. über Blattl., ed. Börner, p. 2, *Aulacorthum* Mordv. partim.
1938. Börner, C., Biol. Reichsanstalt, Flugblatt 51, ed. VI, p. 4, *Acyrtosiphon* Mordv. partim.

C. GENERAL BIOLOGY.

The genotype, *M. dirhodum* (Wlk.) migrates between *Rosa* spp. and Gramineae. The 2nd generation on *Rosa* is alate and flies to grass. The migration, both to grass and back to *Rosa*, is complete and obligatory; not a single specimen is found on *Rosa* in summer, while in autumn the colonies on grass turn into alate gynoparae and males. The biology of the other species is quite simple as far as it is known. They live on Gramineae exclusively. Of some of these species the sexuales are known. Of two the males are alate, of one apterous.

It is not quite clear, how the Nearctic species live. Several American authors record a species which migrates from *Rosa* to cereals and grasses as *Macrosiphum dirhodum* Wlk. An alate viviparous female in material from *Elymus*, however, collected by L. C. Bragg in Colorado and identified as *M. dirhodum* Wlk., which Prof. Gillette sent me, most probably is not our European species.

On *Rosa* the insects live on the buds and the underside of the leaves. On grass one finds them on the upperside of the leaves, sitting with their heads in the direction of the haulms and usually exactly on the midrib, rarely in the ears. The larvae, developing into males, in *M. dirhodum* (Wlk.) are born from apterous androparae. This is quite easily seen, because the larval males are red and are visible as yellowish orange spots in the androparae. The eggs of *M. dirhodum* (Wlk.) are deposited on rose branches, the other species oviposit on the leaves of grass; eggs are whitish green to pale green when just laid, black later.

None of the species is visited by ants.

D. GEOGRAPHICAL DISTRIBUTION.

This genus seems to be limited to the Northern Hemisphere. No species belonging to it have been recorded from the tropics or Eastern Asia. Most of the species have been described from Europe. The genotype is found as far East as Turkestan and it has been recorded from the U.S.A. also, though it is not yet quite certain whether this is the European species.

E. GENERAL MORPHOLOGY.

I. Macroscopical morphology.

Body usually rather slender, sometimes elongated and depressed, about 1.50-3.75 mm long, without distinct wax excretion. Colour varying from pale yellowish white to rather dark olive green, sometimes mottled with reddish spots (*M. tenerum* nov. spec.) or reddish. Larvae of alate males reddish, those of other forms coloured exactly like mature apterae viviparae. Alatae with the head and thorax pale yellowish brown and the abdomen green, or with a black head and thorax and a distinct pattern of olive green to blackish brown transverse bars on abdomen. Siphunculi and cauda in all forms of the colour of the body, the siphunculi rarely dark.

II. Microscopical morphology.

1. Head. Often rather broad. Frontal tubercles usually rather low, inner margin rounded, nearly smooth to imbricate. Median frontal tubercle usually very strongly developed and rather broad. Antennae of 6 segments, a little shorter to just longer than body, curved, pale with or without dusky apices to the segments, to very dark brown. IIIrd ant. segment in apterae viviparae always with 0-4 rather small rhinaria, placed on a slightly incrassate part near the base; in oviparae and fundatrices sometimes without rhinaria; in alatae viviparae with 7-30 rhinaria in a row or irregularly placed along one side. IVth segment in viviparous forms without rhinaria, in males sometimes with rhinaria. Vth segment in males with rhinaria. Antennal hairs of the Mvzine type, i.e., in the shape of a bottle with the bottom up, very short, less than $\frac{1}{3}$ of the diameter of IIIrd ant. segment long. Rostrum short, never reaching the hind coxae, the apical segment usually very short and with few hairs. On the posterior half of the vertex usually two spinal tubercles, which especially in alate forms may be rather large, sometimes resembling ocelli (for which Buckton mistook them).

2. Thorax. Normal. Legs often short, rather uniformly coloured, never with the apices of femora and bases of tibiae black; first tarsal joints of

all legs with 3, 3, 3 hairs, rarely those of the hind legs have 2 hairs. Wings normal, not ornamented with dark areas along veins.

3. Abdomen. Tergum of abdomen like that of the whole body in apterae viviparae uniformly sclerotic and more or less wrinkled or papillated, uniformly coloured, pale to smoky brown, sometimes with the exception of intersegmental pleural sclerites, which may be even blackish. In alate viviparous forms frequently, in males always, a sclerotic, often dark pattern of sclerotic areas is present on abdomen which consists of rather small marginal sclerites, rather large intersegmental pleural sclerites and often narrow transverse spinopleural sclerotic bars, which may be broken up into scattered spinal sclerites. All these sclerites may be connected per segment, so that transverse sclerotic bars are formed. Marginal tubercles are usually present on abd. segments II-V, but in apterous females as a rule these are hardly visible. On all segments, as well as on the thorax, small spinal tubercles may occur. These tubercles are nearly always present on the VIIIth tergite, between the innermost pair of hairs. Siphunculi usually pale, rarely dark brown, of about the same colour as the cauda, cylindrical to tapering from base to apex, rather sparsely and vaguely imbricated, sometimes with a few apical transverse striae, rather often with a constriction just in front of the usually small flange, $\frac{1}{7}$ - $\frac{1}{4}$ of the length of the body. Cauda from $\frac{4}{11}$ - $\frac{20}{21}$ times as long as the siphunculi, in apterous females usually rather thick, with a faint constriction at basal two fifth part, apex blunt; in alatae the cauda more slender and more distinctly constricted. Caudal hairs 5-12, usually not distinctly in pairs.

F. MORPHOLOGICAL RELATION TO OTHER GENERA.

In many respects this genus strongly resembles *Acyrtosiphon*. The species have a different type of frontal structure, however, due to the very well developed median frontal tubercle. For further details see p. 217.

G. NOTES ON PHYLOGENY.

In the previous part of this work (Temminckia, vol. IV, p. 77), I have placed this genus in a series of allied genera, between *Myzus* Pass. and *Macrosiphum* Pass. In many respects this position is in accordance with morphological correlations and differences. The presence of the spinal tubercles on the head and abdomen determines its place in the series of Rosaceae-inhabiting Aphids. The frontal tubercles show a tendency to the converging type found in *Myzus*, moreover, the presence of imbrications on the frontal tubercles and other parts of the head are typical for *Myzus*

and its allies. On the other hand many characters common with *Macrosiphum* are present. The genus may be considered as a parallel without reticulated siphunculi of *Sitobion* Mordv., which even has the same biology.

The primary hostplants are roses, not Gramineae. In the species, living on Gramineae only, all forms, the fundatrix and oviparae included, are nearly alike. But in the migrating *M. dirhodum* (Wlk.) we find large fundatrices, producing many more larvae than later forms, as well as small, more or less reduced oviparae, which, for instance, lack secondary rhinaria. Consequently the migration is a rather old affair, which has led to specialisation (fundatrix) as well as to reduction (oviparae). The species inhabiting grass only, may be considered as split off from the migrating

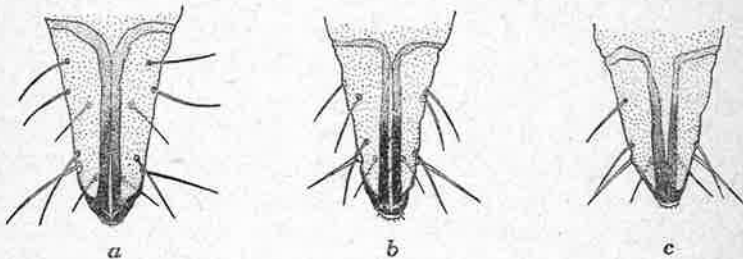


Fig. 2. Ultimate rostral segment of apterous viviparous female of: a, *Metopolophium dirhodum* (Wlk.); b, *Metopolophium tenerum* nov. spec.; c, *Metopolophium friscicum* nov. spec. $\times 250$.

type. In the not migrating species in autumn numerous alate viviparae may be formed, which, however, are not gynoparae and cannot be induced to feed on roses. In *M. friscicum* nov. spec. every trace of migration is lost, the males being wingless.

H. TAXONOMY OF SPECIES.

I. KEY TO SPECIES.

Apterous viviparous females.

- 1 (2) Tergum smoky brown, conspicuously darker than the sternum, sometimes split up into isolated sclerites. Siphunculi $2^{1/8}$ - $2^{2/3}$ times as long as cauda. Ultimate rostral segment with only 0-2 hairs besides the 3 pairs near apex. First tarsal joints of hind legs normally with 2 hairs. On *Poa trivialis*.
M. friscicum nov. spec., p. 290.
- 2 (1) Tergum normally at most faintly yellowish pigmented, rarely smoky or broken up into isolated sclerites. Siphunculi at most twice as long as the cauda. Ultimate rostral segment with 2-6 hairs besides the 3 pairs near apex. First tarsal joints of hind legs usually with 3 hairs, exceptionally with 2.
- 3 (4) Processus terminalis $2-2^{3/4}$ times as long as base of VIth ant. segment. Ultimate segment of rostrum as long as or longer than second joint of hind

- tarsi, with 4-6 hairs besides the 3 apical pairs. On *Deschampsia flexuosa* and *Festuca ovina* in woods and moors. *M. tenerum* nov. spec. p. 293.
- 4 (3) Processus terminalis only in specimens from *Rosa* less than 3 times as long as base of VIth segment, but then the ultimate rostral segment considerably shorter than second joint of hind tarsi and the cauda with 9-12 hairs. Usually processus terminalis more than 3 times as long as base of VIth ant. segment.
- 5 (6) Antennae $1^{3/20}$ - $1^{1/10}$ times as long as body. Siphunculi $1/5$ - $1/4$ of the length of the body long. Flagellum of the antennae gradually darker from base to apex. Siphunculi evenly coloured, without dusky apices. On *Arrhenatherum elatius*. *M. albidum* nov. spec., p. 278.
- 6 (5) Antennae $2/5$ - $9/10$ of the length of the body. Siphunculi $2/13$ - $2/9$ of the length of the body, sometimes with the apices dusky. The segments of the flagellum sometimes with dusky apices, so that the base of VIth segment is paler than the apex of Vth segment.
- 7 (8) The segments of the flagellum with dusky apices, so that the base of VIth segment is paler than the apex of Vth segment. Frontal tubercles quite smooth. Siphunculi pale with usually the apices a little smoky, $2^{1/2}$ - $3^{1/4}$ times as long as second joint of hind tarsi, $1^{1/5}$ - $1^{3/4}$ times as long as the cauda, the latter with 7-12 hairs. On Rosaceae and various Gramineae. *M. dirhodum* (Wlk.), p. 281.
- 8 (7) Antennae with the flagellum evenly pigmented, gradually darker from base to apex, so that the base of VIth segment is not paler than the apex of Vth segment. Frontal tubercles faintly rough. Siphunculi evenly pigmented, at most with the flange itself a little dusky, 3 - $4^{1/4}$ times as long as second joint of hind tarsi, $1^{1/2}$ - 2 times as long as the cauda, the latter with 5-8 hairs. On various Gramineae. *M. festucae* (Theob.), p. 287.

Alate viviparous females.

- 1 (4) Abdomen without or with only very little pigmented pleural intersegmental sclerites, with very small pale brownish marginal sclerites.
- 2 (3) IIIrd ant. segment with 14-29 rhinaria along one side, not in a row and extending over nearly the whole length of the segment. Siphunculi usually pale with brownish apices. Processus terminalis $2^{3/4}$ - $3^{3/4}$ times as long as base of VIth segment, shorter than IIIrd segment. On *Rosa* and various Gramineae. *M. dirhodum* (Wlk.), p. 281.
- 3 (2) IIIrd ant. segment with 8-18 rhinaria in a row over basal $2/3$ - $7/8$ part of the segment. Siphunculi always evenly coloured, not with darker apices. Processus terminalis $3^{1/4}$ - $4^{1/4}$ times as long as base of VIth segment, about as long, seldom a very little shorter than IIIrd segment. On *Arrhenatherum elatius*. *M. albidum* nov. spec., p. 278.
- 4 (1) Abdomen with a dark brown to blackish sclerotic pattern (Pl. XV fig. 16; Pl. XVI fig. 17), consisting at least of well developed pleural intersegmental sclerites, usually also marginal sclerites and sometimes spino-pleural bars connecting the pleural sclerites.
- 5 (6) Siphunculi more than twice as long as cauda. Ultimate rostral segment with 0-2 hairs besides the 3 apical pairs (fig. 2 c). First tarsal joints of hind legs usually with 2 hairs. On *Poa trivialis*. *M. friscum* nov. spec., p. 290.
- 6 (5) Siphunculi at most twice as long as the cauda, usually shorter. Ultimate rostral segment with 2-6 hairs besides the 3 apical pairs (fig. 2 a, 2 b). First tarsal joints of hind legs usually with 3 hairs, exceptionally with 2 hairs.
- 7 (8) Processus terminalis $2^{1/4}$ - $2^{3/4}$ times as long as base of VIth ant. segment. IIIrd ant. segment with 8-14 rhinaria. Apical segment of rostrum with 4-6 hairs

- besides the 3 apical pairs (fig. 2b). On *Deschampsia flexuosa* and *Festuca ovina* in woods and moors. *M. tenerum* nov. spec., p. 293.
- 8 (7) Processus terminalis $2\frac{3}{4}$ - $3\frac{3}{4}$ times as long as base of VIth segment. IIIrd ant. segment with 15-30 rhinaria. Apical segment of rostrum with 2-6 hairs besides the 3 apical pairs, shorter than second joint of hind tarsi. On various Gramineae. *M. festucae* (Theob.), p. 287.

II. DESCRIPTION OF THE SPECIES.

Metopolophium albidum nov. spec. (Pl. XVI fig. 18)

Fundatrix.

Morphological characters. A little broader than the next form, but otherwise similar. Antennae about $\frac{3}{4}$ - $\frac{4}{5}$ of the body's length long; IIIrd segment frequently without rhinaria; processus terminalis $\frac{3}{4}$ - $\frac{5}{6}$ of IIIrd segment, $2\frac{1}{4}$ -3 times as long as base of VIth segment.

Colour. As in the following form, often with a green spot near the base of each siphunculus.

Measurements of one specimen: Length of body: 2.60 mm; ant.: 2.13 mm; siph.: 0.54 mm; cau.: 0.30 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{62}{\text{IV}} : \frac{47}{\text{V}} : \frac{(30 + 80)}{\text{VI}}$. Rhin. on IIIrd ant. segment: ϕ and τ .

Apterous viviparous female.

Morphological characters. Body spindle-shaped, rather slender, not depressed, with extremely short hairs. VIIIth abd. tergite with 5-7, usually 6 hairs, which are only $\frac{2}{7}$ - $\frac{2}{5}$ of the basal diameter of IIIrd ant. segment long. Small spinal tubercles always present on the head and VIIIth abd. segment, sometimes also on prothorax or abd. segments III-VII, but then irregularly. Tergum distinctly sclerotic, wrinkled or corrugated, uniformly pale. Frontal tubercles prominent, diverging, hardly rough. Median frontal tubercle well developed. Antennae about as long as body, without darker apices to the segments of the flagellum, pale yellowish to pale brown with darker apex; IIIrd segment near its base with 0-2 very small rhinaria; processus terminalis usually just longer than IIIrd segment, $3\frac{1}{2}$ - $4\frac{1}{2}$ times as long as base of VIth segment. Antennal hairs very short, those on IIIrd segment $\frac{1}{4}$ of basal diameter of the segment long. Rostrum short, well reaching the middle coxae; apical segment short, rather acute, about $\frac{2}{3}$ - $\frac{3}{4}$ of the second joint of the hind tarsi long, with 2-4 hairs besides the 3 apical pairs. Siphunculi approximately cylindrical, with a slightly enlarged base, slender, about $\frac{1}{5}$ - $\frac{1}{4}$ of the length of the body, evenly imbricated, pale, even without darker apex, with small flange. Cauda elongate, rather

slender, blunt, constricted, about $\frac{1}{2}$ - $\frac{3}{5}$ of the length of the siphunculi long, with 6-9, usually 7 hairs. Legs rather long, pale with only the tarsi dark; first tarsal joints with 3, 3, 3 hairs.

Colour. Pale opaque whitish yellow to yellowish green (in late autumn), without brighter median line, but sometimes with small green spots near the base of each siphunculus. Antennae pale brownish, darker towards apex. Siphunculi, cauda and legs with the colour of the body.

Measurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III:IV:V: VI
1	2.40	2.46	0.53	0.32	I & I	100: 74: 55: (29 + 106)
2	2.23	2.15	0.45	0.27	I & I	100: 66: 59: (32 + 119)
3	2.40	2.52	0.54	0.32	I & I	100: 66: 54: (24 + 105)
4	2.29	2.19	0.42	0.31	0 & I	100: 67: 53: (26 + 97)
5	2.50	2.51	0.60	0.32	I & 2	100: 75: 59: (27 + 97)
6	2.56	2.68	0.66	0.33	I & I	100: 73: 64: (30 + 118)
7	2.70	2.66	0.61	0.35	I & 2	100: 66: 56: (26 + 103)
8	2.21	2.39	0.60	0.32	I & I	100: 74: 69: (28 + 110)

(1-2, St. Pietersberg, X-'39; 3-4, Rilland, 29-IX-'41; 5-6, Bergen op Zoom, 5-X-'43; 7, Wageningen, 11-X-'43; 8, Wageningen, 9-V-'44; all from *Arrhenatherum elatius*).

Alate viviparous female.

Morphological characters. Much like apterous viviparous female, but the mesoscutal lobes pale brownish sclerotic; abdomen membranous except for very small, nearly unpigmented intersegmental pleural sclerites, very small pale brownish marginal sclerites and sometimes with vaguely visible spinal transverse sclerites. Antennae a little longer than the body; IIIrd segment with 8-18 (average 11.4) rhinaria in a row on basal $\frac{2}{3}$ - $\frac{7}{8}$ part. Siphunculi and cauda both very slender, pale as in apterae. Wings with normal venation.

Colour. Pale greenish yellow with the mesoscutal lobes bright pale brown-orange coloured. Antennae pale brown. Remainder as in apterae.

Measurements of one specimen: Length of body 2.10 mm; ant.: 2.76 mm; siph.: 0.50 mm; cau.: 0.28 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{81}{IV} : \frac{66}{V} : \frac{(30 + 105)}{VI}$. Rhin. on IIIrd ant. segment: 13 and 14.

Oviparous female.

Morphological characters. As in apterous viviparous female, but the tergum membranous with very small, pale brownish yellow intersegmental sclerites on abdomen. Antennae smoky, otherwise as in viviparous apterae.

Siphunculi slightly brownish yellow. Cauda somewhat thicker, less constricted. Legs slightly brownish yellow, the hind tibiae brown, swollen to about twice the diameter of the siphunculi, with a great many pseudosensoria.

Colour. Body rather bright pale yellow, faintly greenish. Legs yellowish, but the tibiae conspicuous blackish brown. Remainder as in apterae viviparae.

Measurements of one specimen: Length of body: 2.60 mm; ant.: 2.62 mm; siph.: 0.60 mm; cau.: 0.35 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{63}{IV} : \frac{54}{V} : \frac{(27 + 102)}{VI}$. Rhin. on IIIrd ant. segment: 1 and 2.

Alate male.

Morphological characters. Rather strongly different from alate female. Head and thorax dark sclerotic; abdomen with very well developed blackish sclerotic pattern, consisting of marginal sclerites and large pleural intersegmental sclerites mutually connected by irregular spinal transverse bars. Antennae considerably longer than the body, black; IIIrd segment mainly along one side with 34-49 rhinaria; IVth apparently always without rhinaria; Vth with 12-25 rhinaria; processus terminalis up to $4\frac{3}{4}$ times as long as base of VIth segment, but not longer. Siphunculi evenly pale brown, thin. Cauda about as dark as the siphunculi, at most half as long. Other characters about as in alate viviparous female.

Colour. Head and thorax black. Abdomen dirty red with the sclerotic parts blackish brown. Siphunculi brown. Cauda with the colour of the body.

Measurements of one specimen: Length of body: 2.09 mm; ant.: 2.57 mm; siph.: 0.40 mm; cau.: 0.19 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{84}{IV} : \frac{67}{V} : \frac{(25 + 115)}{VI}$. Rhin. on IIIrd ant. segment: 40 and 45; on IVth: 0 and 0; on Vth: 14 and 14.

Hostplants: *Arrhenatherum elatius*, incidentally also on other Gramineae, but only temporarily.

Geographical distribution: Netherlands, England 1).

Biology: Lives during the whole year on the leaves of its host, often in large numbers, but not in families. The fundatrices are mature in the end of April. The second generation contains a number of alatae, which occur also in later generations, until in late autumn. Sexuales were found in large numbers in the first half of October. Oviposition was not yet observed. The plants show no reaction to the attacks of this aphid.

1) I identified specimens of this species in the collections of Dr. Thomas and Dr. Gimingham, Harpenden.

Ants do not visit this species.

Notes. This is a very common species in the Netherlands and probably elsewhere, but to discover a specimen sitting on its host is difficult. Since some time I examine plants for aphids by thrashing on a piece of cardboard or triplex, and by this method I soon found that the species is very common. It occurs on nearly every specimen of its host, though usually in small numbers. I could transmit it easily to *Poa annua*, where it did not change its habitus or colour. Usually the colonies of this species do not develop sexuales, but they form viviparae till late in autumn. Only on sunny southern slopes sexuales were found and then hardly any viviparae were present. The larvae which are to become males are very conspicuous by their light red colour, while normal nymphs are yellowish white to greenish yellow.

Live specimens are easily recognized by their colour and slender body, alatae especially by the brownish orange colour of the mesonotum. Prepared alatae resemble those of *M. dirhodum* in that the abdomen has no sclerotic pattern. Apteræ can be distinguished from those of *M. dirhodum* by the pigmentation of the antennae; in *dirhodum* the apex of each of the segments of the flagellum has a darker apex and the base of the Vth segment is consequently paler than the apex of the IVth; but in all the other species in apteræ the antennae are gradually darker from base to apex, without darker apices to the segments.

M. graminearum Mordv., a species from an unidentified grass from Russia must be closely allied, but it is larger. Its oviparae are 3.60-3.80 mm long, with 4-6 pairs of caudal hairs, the processus terminalis is $1\frac{1}{3}$ - $1\frac{3}{8}$ times as long as IIIrd segment and $6\frac{1}{2}$ times as long as base of VIth segment, in alate males even 7 times as long as base of VIth segment. Apparently this is a different species which I have not found in this country.

Most probably *M. albidum* has often been mistaken for *M. dirhodum*, but it is most certainly a good species, which differs from all the other species of the genus by its long antennae.

Types: In the author's collection.

Metopolophium dirhodum (Walker, 1848) (Pl. XVI figs. 19, 20).

1848. Walker, F., Ann. Mag. Nat. Hist. (2), vol. I, p. 372, *Aphis dirhoda*.
 1849. Walker, F., Ann. Mag. Nat. Hist. (2), vol. III, p. 43, *Aphis dirhoda*.
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 1906. Schouteden, H., Mém. Soc. Ent. Belg., vol. XII, p. 238, *Macrosiphum dirhoda*.
 1913. Theobald, F. V., Journ. Econ. Biol., vol. VIII, p. 118, *Macrosiphum longipennis*.
 1913. Theobald, F. V., Journ. Econ. Biol., vol. VIII, p. 128, *Macrosiphum dirhodum*.

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 1915. Goot, P. van der, Beitr. zur Kenntnis d. Holl. Blattläuse, p. 62, *Macrosiphum dirhodum*.
 1916. Börner, C. & Blunck, H., Mitt. Kais. Biol. Anstalt, Heft 16, p. 27, 32, *Macrosiphum dirhodum*.
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 1926. Theobald, F. V., Aph. Great Britain, vol. I, p. 135, *Macrosiphum dirhodum*.
 1926. Theobald, F. V., Aph. Great Britain, vol. I, p. 138, *Macrosiphum graminum*.
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 1928. Opmanis, K., Acta Univ. Latviensis, vol. XVIII, p. 396, *Macrosiphum dirhodum*.
 1929. Mordvilko, A. K., Food-Plant Catalogue, p. 86, 89, 90, *Metopolophium dirhodum*.
 1930. Judenko, E., Bull. Ent. d. l. Pologne, vol. IX, p. 164, *Metopolophium dirhodum*.
 1932. Börner, C., in Sorauer, Handb. d. Pflanzenkr., ed. IV, vol. V, pars 2, p. 626, *Amphorophora dirhoda*.
 1936. Börner, C., Biol. Reichsanstalt, Flugblatt 51, ed. V, p. 4, *Aulacorthum dirhodum*.
 1938. Börner, C., Biol. Reichsanstalt, Flugblatt 51, ed. VI, p. 4, *Acyrtosiphon dirhodum*.
 1941. Knechtel, W. K. & Manolache, C. I., Acad. Roumaine, Bull. Sect. Scient., vol. XXIV, p. 551-552, *Acyrtosiphon dirhodum*.

Fundatrix.

Morphological characters. Antennae about half as long as body, often of 5 segments; IIIrd segment without any rhinaria (though slightly swollen there, where rhinaria are present in other forms); processus terminalis less than $2\frac{1}{2}$ times as long as base of VIth segment. Other characters as in apterous viviparous female.

Colour. Green in the colour of the young shoots, rarely with a very indistinct brighter green spinal stripe; the underside faintly powdered.

Measurements of one specimen: Length of body: 2.99 mm; ant.: 1.47 mm; siph.: 0.52 mm; cau.: 0.32 mm. Prop. of ant. segments:

$$\frac{100}{III} : \frac{49}{IV} : \frac{43}{V} : \frac{(47 + 62)}{VI}$$

Apterous viviparous female (2nd generation).

Morphological characters. Body rather elongate, with short, blunt hairs. Tergite very faintly sclerotic, entirely colourless, smooth. Frontal tubercles little developed, diverging, usually smooth; median frontal tubercle prominent; frontal furrow shallow and wide. Antennae about $\frac{3}{5}$ of length of body, very pale, with the apices of the segments dusky, IIIrd segment with 1-3 rather small rhinaria near base, processus terminalis much shorter than IIIrd segment, length $2\frac{1}{2}$ - $3\frac{1}{5}$ times base of VIth segment. Antennal hairs on IIIrd segment about $\frac{1}{3}$ - $\frac{1}{2}$ of basal diameter of this segment long. Rostrum short, reaching to 2nd pair of coxae, apical segment rather short and blunt (fig. 2a), $\frac{5}{8}$ - $\frac{2}{3}$ of second joint of hind tarsi. Siphunculi about $\frac{2}{13}$ - $\frac{2}{11}$ of length of body, nearly cylindrical, slightly dilated at base and sometimes attenuated at apex, very pale, colourless to yellowish with dusky apex, finely and dispersely imbricated with usually some striae or some cellulae in front of the distinct flange. Cauda elongated triangular, blunt, with a faint constriction at basal two fifth, pale, nearly colourless, about $\frac{4}{7}$ - $\frac{2}{3}$ of length of siphunculi, with 9-12 hairs. Legs rather long, femora with more or less distinct imbrications on the underside near apex; first tarsal joints with 3, 3, 3 hairs.

Colour. Uniformly green, often with a brighter green spinal stripe along dorsum. Antennae pale, with the very apices of the segments III-V, the VIth segment near the rhinaria and the processus terminalis distinctly dusky to blackish. Legs, siphunculi and cauda with the colour of the body.

Measurements of one specimen: Length of body: 3.01 mm; ant.: 1.99 mm; siph.: 0.51 mm; cau.: 0.35 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{64}{IV} : \frac{58}{V} : \frac{(25 + 81)}{VI}$. Rhin. on IIIrd ant. segment: 1 and 2.

Alate viviparous female (Spring migrant).

Morphological characters. Head and the inner twothirds of the meso-scutal lobes sclerotic brown, with fuscous areas around the ocelli. Abdomen membranous, but rather often with very vague brownish spinal transverse sclerites on the anterior segments and always with a small fuscous area on the otherwise colourless marginal sclerites. Antennae uniformly dusky, though sometimes the apices of the segments a little darker; IIIrd segment with 14-29 rhinaria along one side, not in a line, extending over almost the whole length of the segment. Siphunculi pale brownish with a slightly darker apex. Other characters about as in the preceding form.

Colour. Abdomen green, the thorax more or less brown.

Measurements of one specimen: Length of body: 2.84 mm; ant.:

2.24 mm; siph.: 0.46 mm; cau.: 0.29 mm. Prop. of ant. segments:
 $\frac{100}{III} : \frac{72}{IV} : \frac{55}{V} : \frac{(30 + 87)}{VI}$. Rhin. on IIIrd ant. segment: 22 and 25.

Apterous viviparous female (Exules on Gramineae).

Morphological characters. Much like apterae of the second generation but body much more elongated and rather depressed. Frontal tubercles better developed. Antennae about $\frac{3}{4}$ - $\frac{5}{6}$ of the length of the body; IIIrd segment with 1-3 rhinaria near base; processus terminalis $3\frac{3}{7}$ -4 times as long as base of Vth segment, $\frac{9}{10}$ - $1\frac{1}{10}$ times as long as IIIrd segment. Siphunculi $\frac{1}{7}$ - $\frac{1}{5}$ of the length of the body. Cauda usually thick, little constricted, $\frac{4}{7}$ - $\frac{3}{4}$ of the length of the siphunculi long, with 7-10 hairs.

Colour. Pale green to yellowish green, always with a distinct brighter green spinal stripe along dorsum. Androparae (apterae which produce male larvae) often with orange spots on abdomen. Remainder as in apterae of the second generation.

Measurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III:IV:V: VI
1	2.59	1.95	0.45	0.29	1 & 2	100: 64: 57: (26 + 90)
2	2.54	1.98	0.43	0.29	1 & 1	100: 62: 55: (28 + 98)
3	2.40	1.99	0.39	0.26	1 & 1	100: 68: 65: (32 + 110)
4	2.36	1.84	0.39	0.25	1 & 2	100: 63: 58: (28 + 105)
5	2.55	1.96	0.40	0.30	1 & 2	100: 65: 54: (26 + 90)
6	2.24	1.96	0.39	0.28	1 & 2	100: 60: 59: (30 + 100)
7	2.21	1.95	0.38	0.24	1 & 2	100: 60: 54: (32 + 102)
8	2.95	2.32	0.46	0.32	2 & 3	100: 63: 53: (24 + 81)

(1-4, from *Glyceria fluitans*, Zwolle, VIII-'39; 5, from *Arundo phragmites*, Lith, VIII-'29; 6-8, from *Bromus tectorum*, St. Pietersberg, X-'39).

Alate viviparous female (Exules and gynoparae).

Morphological characters. Much like spring migrants, but the spinal tubercles on vertex and on VIIIth abd. tergite much less developed and rather often absent.

Colour. As in spring migrants.

Measurements of one specimen: Length of body: 2.50 mm; ant.: 2.19 mm; siph.: 0.36 mm; cau.: 0.23 mm. Prop. of ant. segments:
 $\frac{100}{III} : \frac{67}{IV} : \frac{53}{V} : \frac{(24 + 94)}{VI}$. Rhin. on IIIrd ant. segment: 23 and 27.

Oviparous female.

Morphological characters. In many regards like apterous viviparous

female, but much smaller and relatively shorter. Tergite very thin, membranous. Frontal tubercles little developed. Antennae about $\frac{2}{3}$ of the length of the body, ornamented as in apterae viviparae, though the dusky areas at the apices of the segments may be larger, so that sometimes the whole Vth segment is dark; IIIrd segment always without rhinaria; processus terminalis always longer than IIIrd segment. Siphunculi about as in apterous viviparous females, but the cauda much shorter and broader, broadly conical, very blunt, about $\frac{1}{2}-\frac{4}{9}$ of the length of the siphunculi long. Hind tibiae strongly swollen, pale, with a large number of pseudosensoria.

Colour. Pale yellowish white to yellow. Antennae as in apterae viviparae. Siphunculi and cauda with the colour of the body or paler.

Measurements of one specimen: Length of body: 1.85 mm; ant.: 1.37 mm; siph.: 0.28 mm; cau.: 0.15 mm. Prop. of ant. segments:

$$\frac{100}{III} : \frac{82}{IV} : \frac{71}{V} : \frac{(40 + 142)}{VI}$$

Alate male.

Morphological characters. Very much like alate viviparous females, but as a rule much narrower and slightly smaller. Abdomen with distinct blackish marginal sclerites, paler intersegmental pleural sclerites and irregular, dark, spinopleural transverse sclerotic bars, which sometimes are connected with the intersegmental sclerites. Antennae slightly longer than body, IIIrd segment with 46-68 rhinaria, Vth with 7-15, but IVth apparently always without rhinaria. Siphunculi and cauda rather dusky, the latter not constricted, a little acute. Genitalia normal.

Colour. Head and thorax blackish brown, abdomen usually reddish, with the mentioned sclerites brown to blackish. Antennae black, siphunculi and cauda pale brownish yellow to reddish.

Measurements of one specimen: Length of body: 2.11 mm; ant.: 2.43 mm; siph.: 0.30 mm; cau.: 0.16 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{68}{IV} : \frac{63}{V} : \frac{(22 + 100)}{VI}$. Rhin. on IIIrd ant. segment: 57 and 60; on IVth: 0 and 0; on Vth: 13 and 11.

Hostplants: (I) *Rosa* spp., (II) Gramineae, occasionally also (I) *Agri-
monia* or *Fragaria* and (II) *Iris*.

Geographical distribution: Europe, Northern Asia, ? America.

Biology: Fundatrices in the Netherlands may be full grown in the second half of April. Then they sit more or less between the leaflets laterally and are not easily found because of their similarity in colour to the leaves. The 2nd generation sometimes is nearly completely apterous, sometimes nearly

completely alate, so that migration may take place already in the first week of May. A third generation is completely alate.

The spring migrants fly to various grasses, but mainly to annual ones, such as *Poa annua*, cereals, *Bromus sterilis*, etc., and aquatic species such as *Glyceria*, and *Phalaris arundinacea*. Return migration according to my observations is rather late, rarely before October, and it may last till the second half of November.

Walker already in 1848 and 1849 records the migration. Van der Goot describes it in 1915 and Börner & Blunck in 1916. The latter two authors claim precedence to Van der Goot as they discovered it already in 1914, but they overlooked the fact that Van der Goot did his work before 1913 and apparently did not know that Walker (1848) recorded the migration even before he described (1849) the species!

Notes. Most probably this species has been confused with others of the genus. Biologically it differs from the others, but also morphologically it is easily recognisable. Apterous forms normally have dusky apices to the first 3 segments of the flagellum, which none of the other species has. In life nearly all forms of *dirhodum* Wlk., also the larvae and nymphs, show a distinct brighter green stripe along the dorsum, which does not occur in the other species.

As Theobald says of his *Macrosiphum graminum* that the apices of the antennal segments are dark I have placed it as a synonym. Tentatively I have placed *Macrosiphum rosaeollae* Theob., 1915, as a synonym. This species from *Rosa* in England was never fully described, but Theobald gives figures of the antenna, siphunculus and cauda and some contradictory notes. On p. 111 he says: 1 to 3 sensoria on the third antennal segment, on p. 112, however: third segment with 3-5 sensoria. I have not seen his material, but as he figures one rhinarium only I suppose that the first statement is right.

Records of this species from the U.S.A. may all relate to other species. Material received from Prof. Gillette as *dirhodum*, collected on *Elymus* by L. C. Bragg at Fort Collins, 8-V-'13, contains one alate specimen of this genus, but I am not certain whether it really is *dirhodum* Wlk. This may be the species which Patch has described as *dirhodum* (Wlk.).

As the larvae developing into males are flesh coloured, it is easy to recognize the apterous androparae in which the male larvae are visible through the skin as more or less orange spots.

Theobald thought hibernation on Gramineae possible, because he found the species on cereals already in April. It is possible that this species in Kent migrates already in April but also confusion with other species, such as *M. albidum* nov. spec. or *festucae* (Theob.) is not excluded.

Types: I do not know, whether Walker's types still exist.

Metopolophium festucae (Theobald, 1917) (Pl. XV fig. 16, Pl. XVI fig. 17).

1917. Theobald, F. V., Entomologist, vol. L, p. 80, *Myzus festucae* (partim?).
 1923. Theobald, F. V., South Eastern Agric. Coll., Bull. 2, p. 8-10, *Myzus festucae* (partim?).
 1926. Theobald, F. V., Aph. Great Britain, vol. I, p. 335, *Myzus festucae* (partim?).
 1935. Jary, S. G. & Austin, M. D., Journ. South Eastern Agric. Coll., no. 37, p. 9-14, *Myzus festucae*.
 1935. Warburton, C., Journ. Roy. Agric. Soc., vol. XCVI, p. 499-506, *Myzus festucae*.
 1936. Massee, A. M., Rept. East Malling Res. Stat. 1935, p. 164-170, *Myzus festucae*.

Fundatrix.

Morphological characters. Much like apterae of later generations but slightly shorter and broader. Tergite usually pale brownish. Frontal tubercles not much developed. Antennae $2/3-7/10$ of the length of the body, with only the base of IIIrd segment pale, remainder very dark; IIIrd segment usually without rhinaria or with one rhinarium near its base; processus terminalis about twice as long as base of VIth segment, $2/3$ of IIIrd segment long.

Colour. Yellowish green to bright green, with nearly black antennae, remainder as in the next form.

Measurements of one specimen: Length of body: 2.04 mm; ant.: 1.40 mm; siph.: 0.43 mm; cau.: 0.26 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{50}{IV} : \frac{56}{V} : \frac{(33 + 65)}{VI}$. Rhin. on IIIrd ant. segment: 1 and 1.

Apterous viviparous female.

Morphological characters. Body 2.00-3.15 mm long, but out of doors not longer than 2.60 mm, rather broadly spindle-shaped, not or little depressed with very short hairs. VIIIth abd. tergite usually with 6 hairs, which are about $2/3-5/6$ of the basal diameter of IIIrd ant. segment long. Spinal tubercles usually present on the vertex and on abd. segments VII and VIII, sometimes on other abd. segments also, but then irregularly. Tergum distinctly sclerotic, faintly yellowish, slightly wrinkled or corrugated. Frontal tubercles fairly well developed, rather rounded inwards, nearly smooth. Median frontal tubercle very conspicuous. Antennae distinctly shorter than the body (vide measurements), basally pale brown and gradually darker towards apex; IIIrd segment with 1-4 small rhinaria near base; processus terminalis about as long as IIIrd segment, $3-3\frac{3}{4}$ times as long as base of VIth segment. Antennal hairs very short, those on IIIrd segment about $1/4-1/3$ of the basal diameter of the segment long. Rostrum reaching to the middle coxae; apical segment about $3/4-9/10$ times as long as second joint of hind tarsi, with 2-4 hairs besides the 3 apical pairs. Siphunculi rather

gradually decreasing in diameter from base to apex, about $\frac{3}{16}$ - $\frac{2}{9}$ of the length of the body, slightly imbricated, pale brownish yellow, without darker apex, with small flange. Cauda rather thick, blunt, constricted at basal third, coloured like the siphunculi, about $\frac{1}{2}$ - $\frac{2}{3}$ of the length of the siphunculi, with 5-8 hairs. First tarsal joints of the evenly pale brownish sclerotic legs with 3, 3, 3 hairs.

Colour. Rather shiny yellowish green to bright grass-green, more rarely greyish green, always evenly coloured. Antennae dark brownish green, except the very base of IIIrd segment which is pale greenish. Siphunculi, cauda and legs with the colour of the body.

Measurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III: IV: V: VI
1	2.40	2.15	0.51	0.30	1 & 2	100: 63: 54: (29 + 104)
2	2.40	2.18	0.52	0.31	1 & 2	100: 60: 57: (28 + 97)
3	2.28	2.02	0.51	0.16	3 & 4	100: 56: 52: (28 + 104)
4	2.33	1.87	0.50	0.26	1 & 2	100: 68: 60: (32 + 112)
5	2.29	1.94	0.44	0.29	2 & 2	100: 62: 55: (29 + 103)
6	2.18	1.65	0.35	0.22	2 & 2	100: 63: 54: (29 + 100)
7	2.04	1.64	0.43	0.26	1 & 1	100: 57: 50: (31 + 96)
8	2.19	1.93	0.49	0.28	1 & 1	100: 65: 52: (32 + 96)
9	2.12	1.87	0.42	0.26	2 & 3	100: 63: 53: (33 + 98)
10	2.07	1.87	0.43	0.24	2 & 2	100: 61: 51: (29 + 104)
11	2.90	2.36	0.65	0.34	2 & 2	100: 60: 52: (28 + 102)
12	2.83	2.33	0.60	0.34	1 & 2	100: 61: 51: (28 + 94)

(1-2, from *Triticum repens*, Bergen op Zoom, 15-X-'41; 3-4, from *Lolium perenne*, Bergen op Zoom, 2-XI-'43; 5-6, from *Bromus mollis*, Uithuizen, 8-VII-'32; 7-8, from Gramineae, Anglesey, VI-'38; 9-10, from *Poa pratensis*, Bergen op Zoom, 20-V-'43; 11-12, from *Secale cereale*, Wageningen, in glasshouse, 30-1-'30).

Alate viviparous female.

Morphological characters. Head and thorax blackish sclerotic. Abdomen with dark to blackish sclerotic pattern, consisting of marginal sclerites, rather large pleural intersegmental sclerites and more or less developed spinal to spino-pleural transverse bars connecting the pleural sclerites. Antennae shorter than the body; IIIrd segment with 15-30 rhinaria, always over its whole length. Siphunculi more slender than in apterae, usually much darker than the more slender cauda. Wings with normal venation, the veins not shadowed. Other characters about as in apterous viviparous female.

Colour. Head and thorax dark brown to blackish brown. Abdomen green to dark green; if dark green, then the abdomen with vaguely visible spinal transverse bands on segments II and III, but if paler green, then with distinct brown pleural sclerites and less conspicuous spinal transverse bands in the same colour. Antennae blackish brown. Siphunculi and cauda evenly green.

Measurements of two specimens: Length of body: 2.20 mm; ant.: 2.11 mm; siph.: 0.40 mm; cau.: 0.23 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{64}{\text{IV}} : \frac{55}{\text{V}} : \frac{(33+93)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 16 and 17. (Gramineae, Anglesey, VI-'38). Length of body: 3.15 mm; ant.: 2.90 mm; siph.: 0.61 mm; cau.: 0.31 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{65}{\text{IV}} : \frac{50}{\text{V}} : \frac{(24+86)}{\text{VI}}$. Rhin on IIIrd ant. segment: 24 and 26. (*Secale cereale*, Wageningen, in glasshouse, 30-I-'30).

Hostplants: Various Gramineae, such as *Festuca* spp., *Poa* spp., *Lolium perenne*, *Agrostis* spp., *Deschampsia flexuosa*, *Secale cereale*, *Triticum repens*, etc.

Biology: During the whole year this species can be found on most of its hosts. Fundatrices and their progeny have been collected from *Poa pratensis*, *Deschampsia flexuosa*, *Bromus mollis* and *Triticum repens*, but most probably almost any grass can serve as winterhost to this species. Sexuales were not yet observed and attempts to rear them had no success, for asexual reproduction continued through the winter in a glasshouse. The fundatrices are fullgrown in the end of April. Their progeny is always partly alate, often for the larger part. Also in summer and even until late autumn alatae are produced, which all deposit their larvae on Gramineae. Usually the plants show no reaction, but once I found large colonies of this species on *Poa pratensis*, where they had turned the apical halves of the infested leaves a bright crimson red. This symptom is also produced by species of *Sipha* on *Agrostis* spp., especially *A. canina*.

Ants do not visit this aphid.

Notes. This is by far the most common and most widely distributed of the various European *Metopolophiums* of Gramineae. Undoubtedly it frequently has been mistaken for *M. dirhodum* (Wlk.), which, however, in life distinguishes itself by its brighter green median dorsal line and elongated body. Mounted specimens can be separated by means of the characters indicated in the key.

In Southern England and Scotland this species has sometimes caused much damage to meadow-grasses. Sometimes it is recorded as *Myzus kaltenbachi* Schouteden, which is not correct, as that species, or rather *Nasonovia ribis-nigri* (Mosley) (*ribicola* Klth.) is restricted to Dicotyledonous plants, has rhinaria in much larger numbers in apterae, on the IIIrd, IVth and often Vth segment in alatae, a very much longer processus terminalis, etc. The alatae of *festucae* can much resemble those of *malvae* Mosley sensu latiore, but the latter can be recognized by their more hairy ultimate rostral segment, relatively longer processus terminalis and longer siphunculi.

Types. Theobald's types are in the British Museum (Natural History), London, a cotypic slide in the collection of the Plant Pathology Laboratory of the Ministry of Agriculture and Fisheries, Harpenden.

Metopolophium friscum nov. spec. (Pl. XVII fig. 22).

Apterous viviparous female.

Morphological characters. Body small, 1.30-2.05 mm long, slender, not depressed. Tergum very distinctly sclerotic, with metanotum and abd. tergites I-VI fused to a sometimes broken single shield without visible segmentation, which is approximately smooth, rather dark smoky brown with darker, vague, pleural intersegmental sclerites and with a membranous, colourless area in front of each siphunculus. Spinal tubercles on vertex and VIIIth abd. tergite only exceptionally present. Dorsal hairs very short; those on IIIrd abd. tergite as long as those on IIIrd ant. segment; VIIIth tergite with 4 hairs, which are about 2-3 times as long. Frontal tubercles moderately developed, with rounded, faintly rough inner sides. Median tubercle very conspicuous, semiglobular. Antennae sometimes longer than the body, as dark as the tergum, with black apex; 1st segment with protruding inner side, a little rough; flagellum imbricated; IIIrd segment with 0-2 very small rhinaria, very frequently without rhinaria; processus terminalis $2\frac{3}{4}$ - $3\frac{1}{4}$ times as long as base of VIth segment, on an average a little longer than IIIrd segment. Hairs on IIIrd ant. segment about $\frac{1}{3}$ times as long as basal diameter of that segment. Rostrum short, reaching to just past the middle coxae; apical segment (fig. 2c) short, but not blunt, $\frac{3}{4}$ - $\frac{10}{11}$ times as long as 2nd joint of hind tarsi, with 0-2 hairs besides the 3 apical pairs. Siphunculi as dark as the tergum, evenly coloured, thin, cylindrical with expanded base, bluntly imbricated, about $3\frac{1}{2}$ times as long as 2nd joint of hind tarsi, a little more than $\frac{1}{5}$ of the length of the body, often with a very slight constriction just before the small, rounded flange. Cauda a little darker than the siphunculi, elongated, not or hardly constricted, about $\frac{3}{7}$ times as long as the siphunculi, with normally 5 hairs. Legs brown like the siphunculi, with nearly nude femora; first tarsal joints with 3, 3, 2 or 3, 3, 3 hairs.

Colour. Shiny. Ventrally pale green, dorsally with the sclerotic areas olive-green to brownish green, very much darker than the pale greenish venter; pleurally a row of darker to blackish brown spots. Antennae blackish with green base. Siphunculi and legs dark greenish. Cauda brownish green.

Measurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III:IV:V:VI
1	1.46	1.52	0.33	0.14	0 & 0	100: 62: 57: (38 + 110)
2	1.63	1.62	0.36	0.15	0 & 0	100: 60: 59: (38 + 110)
3	1.70	1.66	0.39	0.15	0 & 0	100: 70: 55: (39 + 113)
4	1.55	1.61	0.34	0.14	0 & 0	100: 59: 58: (39 + 118)
5	1.63	1.64	0.38	0.14	0 & 1	100: 63: 65: (35 + 112)
6	1.86	1.79	0.42	0.18	1 & 1	100: 61: 60: (38 + 110)

(1-6, from *Poa trivialis*, Bergen op Zoom, 5-X-'43).

Alate viviparous female.

Morphological characters. Head and thorax dark to blackish sclerotic. Abdomen with rather small marginal sclerites, each with a darker center and with very conspicuous, very dark pleural intersegmental sclerites, which as a rule are not connected by dark transverse bars. IIIrd ant. segment with about 13-29 rather large, little elevated rhinaria more or less in a line. Cauda hardly constricted. Wings with normal venation, veins rather dark, not bordered. Other characters as in apterous viviparous female.

Colour. Head and thorax brownish black, abdomen with evenly coloured, dark green dorsum, ventrally hardly paler. Remainder as in apterous viviparous female.

Measurements of one specimen: Length of body: 1.94 mm; ant.: 2.10 mm; siph.: 0.38 mm; cau.: 0.14 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{62}{IV} : \frac{65}{V} : \frac{(35 + 108)}{VI}$. Rhin. on IIIrd ant. segment: 16 and 16.

Oviparous female.

Morphological characters. Much like apterous viviparous female, but tergite membranous, with an irregular net of fine wrinkles. Pleural intersegmental sclerites dark and distinctly biparted; on segments IV and V the inner part placed far inwards. Besides these sclerites often also traces of small marginal or even pleural sclerites visible, but usually very vaguely only. IIIrd ant. segment with 0-2 rhinaria near base; processus terminalis usually rather longer than IIIrd segment. Siphunculi slightly thinner than in apterae viviparae. Cauda dark, not or hardly constricted. Hind tibiae not very much swollen, with numerous pseudosensoria.

Colour. Yellowish-green, with a line of dark to black spots along the pleura. Siphunculi rather pale, about with the colour of the body, cauda dark. Remainder as in apterous viviparous female.

Measurements of one specimen: Length of body: 1.69 mm; ant.: 1.69 mm; siph.: 0.38 mm; cau.: 0.15 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{57}{IV} : \frac{57}{V} : \frac{(36 + 118)}{VI}$. Rhin. on IIIrd ant. segment: 1 and 1.

Apterous male.

Morphological characters. Rather narrow and elongate. Sclerotisation of the abdomen in principle like that of alate female, but very much better developed and more irregular, so that the abdomen looks rather blackish sclerotic. Antennae much longer than the body, thin; IIIrd segment with 22-30 rhinaria; IVth with 2-8; Vth with 5-11. Siphunculi thin, cylindrical, not darker coloured than the legs. Cauda bluntish triangular, blackish. Genitalia well developed. Legs rather long and thin. Other characters about as in alate viviparous female.

Colour. Head black, remainder of the body rather dark green with the sclerites black, so that the whole dorsum looks nearly black. Siphunculi dusky, dark greenish. Cauda and antennae black.

Measurements of one specimen: Length of body: 1.61 mm; ant.: 2.05 mm; siph.: 0.34 mm; cau.: 0.14 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{58}{IV} : \frac{58}{V} : \frac{(34 + 108)}{VI}$. Rhin. on IIIrd ant. segment: 28 and 29; on IVth: 3 and 3; on Vth: 8 and 9.

Hostplant: *Poa trivialis*, possibly other *Poa* spp.

Geographical distribution: Only known from the Netherlands (Weidum, Bennekom, Bergen op Zoom), and England¹).

Biology: One finds this species in small colonies on the uppersides of the basal leaves of its host. I found numerous nymphs in October, from which I reared a number of alatae, which produced larvae on grass. Sexuales were collected on an unidentified species of *Poa* in the last week of October. The eggs are laid on the upperside of the leaves.

Apparently the species is rather monophagous, for in the associations where I collected it, only *Poa trivialis* was inhabited and also the sexuales lived only on a *Poa* species. Ants did not attend this species.

Notes. This is the rarest species of the genus. It is easily recognisable, especially in life. Larvae are uniformly semitransparent pale greenish, but adult apterae have a dark olive-green dorsum which sharply contrasts with the pale green venter. Prepared specimens show a dark smoky tergum, and they can also be recognized by the presence of at most 2 hairs on the base of the very short ultimate rostral segment, where the other species have at least 2 and mostly 4 hairs. The cauda has normally only 5 hairs, also in alatae. The apterous males separate it from all the other species.

Types: In the author's collection.

1) I identified two alatae for Professor Essig, who swept them from grasses near Reigate, Surrey, 20-V-'37.

Metopolophium tenerum nov. spec. (Pl. XVII fig. 23).

- ?1917. Theobald, F. V., Entomologist, vol. L, p. 80, *Myzus festucae* partim.
 ?1923. Theobald, F. V., South Eastern Agric. Coll., Bull. 2, p. 8-10, *Myzus festucae* partim?
 ?1926. Theobald, F. V., Aph. Great Britain, vol. I, p. 335, *Myzus festucae* partim?.

Fundatrix.

Morphological characters. Body ventrally rather flat, but dorsally strongly convex, sometimes nearly semiglobular, shortly oval. Tergite very pale smoky, sclerotic, with obsolete segmentation, but marginally the separate tergites are free with colourless connexivum. Head as in apterous viviparous female. Antennae very short, $\frac{3}{5}$ - $\frac{2}{3}$ as long as body, rather thick. IIIrd ant. segment frequently without rhinaria (of the 3 specimens available one has a rhinarium on both IIIrd segments, one on one only and one none). Processus terminalis about $\frac{2}{3}$ - $\frac{4}{5}$ of IIIrd ant. segment, $1\frac{1}{3}$ - $1\frac{4}{7}$ times as long as base of VIth segment. Other characters as in apterous viviparous female.

Colour. Head and thorax more or less pale champagne-coloured, abdomen more or less dirty greenish, semitransparent. Siphunculi and cauda about like the body. Antennae fuscous. The insects look as if parasitized.

Measurements of one specimen: Length of body: 1.92 mm; ant.: 1.32 mm; siph.: 0.34 mm; cau.: 0.19 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{70}{IV} : \frac{70}{V} : \frac{(60 + 80)}{VI}$. Rhin. on IIIrd ant. segment: 0 and 0.

Apterous viviparous female.

Morphological characters. Body pyriform, slightly depressed, rather small. Tergite sclerotic, but pale and, with the exception of pale brown, rather vague, intersegmental pleural sclerites, without ornamentation. Hairs very short, sparse, with hardly enlarged apex, blunt. On VIIIth tergite usually 4 hairs, sometimes with two very small spinal tubercles between the middle pair. Surface of tergum rather rough, with rather distinct minute scales just behind the siphunculi. Frontal tubercles distinctly diverging, but with considerably rounded inner margin, slightly imbricate, especially on inner and underside. Median frontal process very prominent. Antennae usually shorter than body, first and second segment a little scabrous, IIIrd segment with 0-2 rather small rhinaria near base, processus terminalis $2\text{-}2\frac{3}{4}$ times as long as base of VIth segment, usually shorter than IIIrd segment. Antennal hairs $\frac{1}{3}$ - $\frac{2}{7}$ of basal diameter of IIIrd segment long. Rostrum rather short, nearly reaching the 3rd pair of coxae, apical segment (fig. 2b) $1\text{-}1\frac{1}{10}$ times as long as second joint of hind tarsi, with 4-6 hairs be-

sides the 3 apical pairs. Siphunculi about $\frac{1}{5}$ of length of body, nearly straight and cylindrical, slender, pale sclerotic, with slightly imbricated surface, with distinct flange. Cauda pale sclerotic, thick, bluntly conical, about half as long as the siphunculi, with 5-7 hairs. Legs long and slender, femora distinctly imbricate, first tarsal joints with 3, 3, 3 hairs.

Colour. Dirty semi-translucent whitish greenish, to reddish. Legs, antennae, siphunculi and cauda with about the colour of the body to slightly brownish yellow.

Measurements of one specimen: Length of body: 1.68 mm; ant.: 1.54 mm; siph.: 0.34 mm; cau.: 0.18 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{73}{IV} : \frac{64}{V} : \frac{(36 + 94)}{VI}$. Rhin. on IIIrd ant. segment: 0 and 1.

Alate viviparous female.

Morphological characters. Abdomen with very distinct dark brown intersegmental pleural sclerites, pale brown marginal sclerites with a central dark brown spot and very irregular spinopleural pale brown sclerotic transverse bars, which often are completely broken up and which sometimes are connected with the intersegmental sclerites. Head often with a pair of small spinal tubercles on posterior part of vertex. Antennae shorter than body, IIIrd segment with about 8-14 rhinaria in a row over whole length. Wings with normal venation, the veins very faintly bordered with pale brown.

Colour. Transparent pale greenish to reddish, with the sclerotic areas olive-brown. Legs, siphunculi and cauda about as in apterae, but antennae dark brown to blackish.

Measurements of one specimen: Length of body: 1.96 mm; ant.: 1.81 mm; siph.: 0.30 mm; cau.: 0.16 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{75}{IV} : \frac{66}{V} : \frac{(36 + 100)}{VI}$. Rhin. on IIIrd ant. segment: 10 and 11.

Oviparous female.

Morphological characters. Much like apterous viviparous female, but abdominal tergum distinctly not sclerotic, membraneous and colourless, covered with a texture of fine wrinkles, with very sharply bordered, dark intersegmental pleural sclerites and very indistinct, pale, smooth, marginal sclerites, which often show small tubercles in the center; sometimes with faint scattered sclerites. IIIrd ant. segment with 0-2 rhinaria, processus terminalis often longer than IIIrd segment. Cauda rather dusky. Hind tibiae incrassate, pale brown, with many pseudosensoria.

Colour. About as in apterous viviparous female, with the pleural sclerites rather distinctly visible as small dark spots. Cauda also rather dark.

Measurements of one specimen: Length of body: 1.54 mm; ant.: 1.46 mm; siph.: 0.35 mm; cau.: 0.19 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{79}{IV} : \frac{61}{V} : \frac{(32 + 111)}{VI}$. Rhin. on IIIrd ant. segment: 0 and 1.

Alate male.

Morphological characters. Abdomen with dorsally about the same pattern as in alate viviparous females, ventrally with distinct, paired, rather large transverse sclerites from segment II-VII. Antennae $1\frac{1}{8}$ - $1\frac{3}{8}$ times as long as body, IIIrd segment with 20-30 tuberculate rhinaria, IVth with 1-10, Vth with 4-12. Siphunculi slightly thinner than in alate females, not darker than the legs. Cauda rather short, bluntly triangular. Genitalia well developed. Other characters as in alate viviparous females.

Colour. Head, thorax, antennae and cauda black. Abdomen dark green with blackish brown sclerites. Siphunculi pale greenish brown.

Measurements of one specimen: Length of body: 1.65 mm; ant.: 2.21 mm; siph.: 0.26 mm; cau.: 0.11 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{83}{IV} : \frac{74}{V} : \frac{(38 + 99)}{VI}$. Rhin. on IIIrd ant. segment: 27 and 27; on IVth: 9 and 6; on Vth: 7 and 8.

Hostplants: *Deschampsia flexuosa*, *Festuca ovina*.

Geographical distribution: Only known from England and Netherlands.

Biology: The species lives during the whole year on its hosts, but as far as I know only on the dark green shadow-forms of its foodplants. In July and August apterae were quite numerous, but alatae very rare. In October 1939 I succeeded in finding males and oviparae on *Deschampsia flexuosa* and also in October 1943. Both were produced by apterous females, so that migration seems to be lost since long. Oviposition on the leaves was observed. The eggs are very pale greenish white when just laid.

Notes. Though this species when alive is easily recognized, mounted specimens strongly resemble those of *M. festucae* (Theob.), especially apterae. They can, however, be distinguished by the shorter processus terminalis of *tenerum* and by the slightly longer ultimate rostral segment in this species. Both species may occur on the same host, but *tenerum* is strictly limited to a few narrow-leaved species of grass such as mentioned, and even then one almost only finds it on plants growing in deep shadow. When transferred to a grass with flat leaves, such as *Poa annua*, the insects do not

settle on the leaves, but on the roots or inflorescences. Here they reproduce rather well, but in the open I have never found it on such a grass.

M. friscicum resembles this species in the alate form, but the characters used in the key to alatae of this genus make it possible to separate these also. Apteræ, oviparæ and males are very different from those of *friscicum*.

In the Netherlands this species is locally common, but apparently very stenotopic. I saw specimens belonging to this species in the collection of Dr. Thomas, Harpenden, collected in Wales, on *Festuca rubra*.

Types: In the author's collection.

Cryptaphis nov. gen.

A. INTRODUCTION.

In this genus at present one species is placed, the genotype *C. setiger* nov. spec. In the generic classifications of the English and American authors this species would be placed in *Capitophorus* Van der Goot, but as I have pointed out on p. 207, the presence of capitate hairs is a polyphyletic character, which occurs in apterous forms of various groups of Aphididae. At present quite a number of genera of the Aphidinae are known in Europe, which all have capitate hairs in the apterous forms, viz., *Capitophorus* v. d. Goot, *Cryptomyzus* Oestlund, *Pleotrichophorus* Börner, *Pentatrichopus* Börner, *Rhopalomyzus* Mordv., etc. For convenience's sake I give a short key to some of these genera with well developed frontal tubercles and capitate hairs in the apterous females. The key is valid for European apteræ only.

- 1 (2) First tarsal joints of all legs with 5 hairs. IIIrd ant. segment with some capitate hairs, without rhinaria. Siphunculi not reticulated at apices. On Rosaceae. *Pentatrichopus* Börner.
- 2 (1) First tarsal joints of front and mid legs with 3 hairs, those of hind legs with 2 or 3 hairs.
- 3 (4) Apex of siphunculi with a well developed, but small reticulated area. Spinal hairs placed on tuberculous structures, usually two or more per tubercle. First tarsal joints all with 3 hairs. On *Corylus. Corylobium* Mordvilko, p. 205.
- 4 (3) Apex of siphunculi not with a reticulated area, at most with one or two rows of strongly transverse cells.
- 5 (8) IIIrd ant. segment without rhinaria.
- 6 (7) Siphunculi distinctly swollen. Hairs short, all about of the same length. Siphunculi dark. On *Poa* spp. (and *Lonicera*). *Rhopalomyzus* Mordvilko.
- 7 (6) Siphunculi sometimes swollen near apex, but then the spinal hairs on the anterior abdominal segments very much shorter than those on the posterior 3 segments. Siphunculi pale. Last segment of rostrum rostrate. Migrating from Elaeagnaceae to Compositae and *Polygonum* spp. or holocyclic on Compositae. *Capitophorus* Van der Goot.

- 8 (5) IIIrd ant. segment only exceptionally without rhinaria.
- 9(10) Siphunculi with pale apical half, but dark basal half. Body with rather large spinal tubercles, each with one or two hairs. Cauda with 4 hairs. On Ferns in rooms and hothouses, exceptionally also on other plants. *Idiopterus* Davis.
- 10 (6) Siphunculi either completely dark or with the apical part the darkest.
- 11(14) IIIrd ant. segment with only 1-3 rhinaria near base. Tergum completely sclerotic or membranous.
- 12(13) Apical segmen of rostrum stiletto-shaped, with the longest hairs near its base. IIIrd ant. segment usually only with short hairs. Flange of the siphunculi very little developed. On Anthemideae. *Pleotrichophorus* Börner.
- 13(12) Ultimate segment of rostrum with convex margins, with the longest hairs near the apex. IIIrd ant. segment with some hairs of the same type and length as those on dorsum of abdomen. On Gramineae.
- Cryptaphis* nov. gen.
- 14(11) IIIrd ant. segment nearly always with numerous rhinaria; if only a few rhinaria are present, then the tergum completely membranous and colourless and the longest pair of hairs on the apical segment of the rostrum near the apex of that segment.
- 15(16) Tergum membranous, colourless. Siphunculi quite pale, with small flange, frequently slightly swollen on distal half, in which case the rhinaria are confined to the basal half of the IIIrd ant. segment. Migrating from *Ribes* spp. to Labiatae and holocyclic on Labiatae. *Cryptomyzus* Oestlund.
- 16(15) Tergum sclerotic, at least with pleural intersegmental dark spots, but usually with part of the disc of the abdomen dark. Siphunculi with at least the very apex dark, cylindrical. Migrating from *Ribes* to liguliflorous Compositae and Scrophulariaceae or holocyclic on *Hieracium* spp. *Nasonovia* Mordvilko.

Of these genera *Pentatrichopus* is closely related to *Corylobium*, and also to *Metopolophium* (see p. 207) *Cryptaphis* nov. gen. is very closely allied to *Metopokophium*, from which it differs nearly only in the structure of the hairs. *Pleotrichophorus* is allied to *Capitophorus* and *Cryptomyzus*, *Idiopterus* to *Micromyzus* v. d. Goot (see p. 312). The place of *Rhopalomyzus* Mordv., the genotype of which I found here some years ago, is rather uncertain.

I define *Cryptaphis* as follows. Apterous viviparous and oviparous females with a few rhinaria on the base of IIIrd ant. segment, with a uniformly sclerotic tergum with obsolete segmentation, with a nearly normal number of long, stiff, slightly capitate hairs which are not placed on tubercles and which occur also on the IIIrd ant. segment and on the femora. Siphunculi cylindrical, not reticulated at apex, with very well developed flange. Front about as in *Metopolophium* Mordv., with well developed median tubercle and with capitate hairs. Alate viviparous females with the disc of the abdomen sclerotic, but with visible segmentation, with exactly the same type of long hairs as the apterae, with only few rhinaria on the IIIrd ant. segment.

B. DESCRIPTION OF THE SPECIES.

Cryptaphis setiger nov. spec. (Pl. XVI fig. 21).

Apterous viviparous female.

Morphological characters. Body small, 1.40-2.00 mm long, oval, swollen, abdomen sometimes nearly globular. Tergite completely and strongly sclerotic, quite smooth, pale to dark brown, uniformly coloured, covered with numerous very stiff, dark, long, rather thick hairs, standing on large bases, the partly black apices swollen; VIIth tergite free, with 4-5 hairs, VIIIth free, with 4 shorter(!) hairs. Hairs on sternites very thin and rather short. Frontal tubercles well developed, seemingly rectangular on inner side because two hairs are placed there, strongly diverging, smooth except for some imbrications on underside, where one hair may be present. Frontal furrow wide. Median frontal tubercle sometimes hardly visible. Antennae $1\frac{1}{4}$ - $1\frac{1}{2}$ times as long as body, rather strongly curved; 1st segment rather swollen or tubercular on distal half on the innerside, slightly scabrous; IIIrd segment with 1-3 rhinaria at about $\frac{2}{7}$ - $\frac{1}{3}$ of its length from the base; processus terminalis about $1\frac{1}{2}$ times as long as IIIrd segment, 4-5 times as long as base of VIth segment. Antennal hairs on the flagellum of two types: IIIrd segment on inner side, especially on basal half, with rather thick, slightly knobbed hairs of a length of $\frac{3}{4}$ - $1\frac{1}{3}$ times the basal diameter of the segment, those on outer side with a length of $\frac{1}{3}$ - $\frac{1}{2}$ of the other hairs; the other segments with normal chaetotaxy. Rostrum nearly reaching the hind coxae; apical segment rather acute, dorsally with 2 pairs of hairs, ventrally with 1 pair, besides the 3 pairs near apex, about $1\frac{1}{10}$ times as long as second joint of hind tarsi. Siphunculi straight to slightly curved, thin, cylindrical with slightly thicker base, slightly imbricated with some apical striae near the very well developed flange, $\frac{2}{11}$ - $\frac{3}{14}$ of the length of body, coloured like the tergum. Cauda rather slender, triangular, rather acute, $\frac{3}{5}$ - $\frac{1}{2}$ times as long as the siphunculi, with 2 pairs of hairs and one hair on dorsum rather far before the apex. Legs uniformly pale brown, chaetotaxy about like IIIrd ant. segment, first tarsal joints with 3, 3, 3 hairs.

Colour. Very shiny. Mottled green with red, to brownish black. Antennae rather dark brown. Other appendages about like the body.

Measurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III:IV:V:VI
1	1.40	2.11	0.30	0.12	I & I	100: 82: 80: (34 + 150)
2	1.54	2.15	0.29	0.12	I & I	100: 70: 78: (33 + 150)
3	1.58	2.17	0.30	0.13	I & I	100: 76: 80: (33 + 153)
4	1.60	2.01	0.28	0.12	I & I	100: 71: 81: (33 + 155)
5	1.52	2.23	0.29	0.14	I & I	100: 80: 83: (30 + 154)

Alate viviparous female.

Morphological characters. Thorax blackish brown sclerotic, head paler. Abdomen with broad spino-pleural sclerotic transverse bars which are more or less completely fused, and with small marginal sclerites which sometimes fuse with the central sclerite. Hairs on head, thorax and abdomen as in apterous viviparous female. Antennae much longer than the body, dark; 1st segment cylindrical, rather long; IIIrd segment thin, with a row of about 8 flat rhinaria on basal $\frac{2}{3}$ - $\frac{3}{4}$. Antennal hairs rather thin, not longer than basal diameter of IIIrd segment. Siphunculi and cauda about as in the apterous form, the latter more slender. Wings with normal venation, the second furcation of the media close near the margin of the wing; veins dark and rather heavy, but not shadowed.

Colour. Shiny brownish.

Measurements of one specimen: Length of body: 1.76 mm; ant.: 2.52 mm; siph.: 0.32 mm; cau.: 0.14 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{73}{IV} : \frac{80}{V} : \frac{(29 + 132)}{VI}$. Rhin. on IIIrd ant. segment: 7 and 8.

Oviparous female.

Morphological characters. The only difference from the apterous viviparous form is that the hind tibiae are swollen, especially on basal half, where about 30-50 pseudosensoria are present; the hind tibiae are hardly darker than the other tibiae.

Colour. As in apterous viviparous female.

Measurements of one specimen: Length of body: 1.94 mm; ant.: 2.48 mm; siph.: 0.39 mm; cau.: 0.16 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{87}{IV} : \frac{79}{V} : \frac{(33 + 142)}{VI}$. Rhin. on IIIrd ant. segment: 1 and 1.

Apterous male.

Morphological characters. Body very small and narrow, 1.10-1.35 mm long. Anterior part of head rather dark sclerotic, thoracal nota and rather narrow transverse sclerites, intersegmental sclerites and marginal sclerites on abdomen much paler. Hairs on body and antennae as in alate females (the antennal hairs quite normal, not capitate). Antennae much longer than body; IIIrd segment with 13-25 small rhinaria, IVth with 10-15, Vth with 10-15. Siphunculi thin, cauda rather blunt. Genitalia well developed, claspers rather small, blunt. Legs very long.

Colour. Very dark brown to blackish.

Measurements of one specimen: Length of body: 1.42 mm; ant.: 2.15 mm; siph.: 0.28 mm; cau.: 0.11 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{73}{IV} : \frac{67}{V} : \frac{(29+131)}{VI}$. Rhin. on IIIrd ant. segment: 23 and ?; on IVth: 16 and ?; on Vth: 12 and ?.

Hostplants: *Festuca ovina*, *Holcus mollis*.

Geographical distribution: Netherlands, widely distributed (Bennekom, Wageningen, Bergen op Zoom, Wahlwijlre, Uithoorn), England 1).

Biology: This curious Aphid passes its complete cycle on its hosts. It forms usually small colonies on the superterranean parts, just where they emerge from the soil or under stones, so that it is exceedingly difficult to find the small lice. One alata was reared from a nymph caught on 12-IX-'41, but alatae are common in the third generation. Oviparae and small males were collected and reared in the middle of October. Fresh eggs are greenish white. They are deposited on various parts of the hostplant as well as on other substrata near the plants. The insects let fall themselves immediately on disturbance. Apparently this species is not visited by ants. The plant shows no reaction.

Notes. One finds this species only on plants growing in the shadow or quite near water, and there it seems to be not rare if one knows where to look for it. After discovering it in the autumn of 1939 I could not refind the species, until in 1941 I found it everywhere by thrashing plants on suitable spots. The two males which I possess were reared from larvae which from birth were more slender than others. All larval forms have the same hairs as the mature apterous viviparous female, but the abdominal tergite is not sclerotic and the hairs stand on rather small brown scleroites.

Types: Cotypes, 5 apterous viviparous females (the measured specimens), Wageningen, Oct. 1939, in the author's collection.

Rhodobium nov. gen.

A. HISTORY.

The genotype, *Macrosiphum rosaefolium* Theob., 1915, which Van der Goot (1917) described as *Aulacorthum viride*, has been placed in *Acyrtosiphon* Mordv. by Takahashi (1931). It differs from *Macrosiphum* Pass. by the absence of a reticulated area to the siphunculi, though as to shape of cauda and abdominal sclerotisation in alatae it comes near this genus. From *Acyrtosiphon* it may be distinguished by the very rough frontal

1) I identified a specimen taken on a sticky trap for Mr. J. P. Doncaster, Harpenden.

tubercles, which are more or less protracted inwards and rather small, so that the frontal furrow is wide. Also in *Aulacorthum* it can hardly be placed, because in that genus alatae have a well developed spino-pleural sclerotic pattern, while in *Rhodobium* only the marginal sclerites are well developed, as in *Macrosiphum*; the IIIrd ant. segment, moreover, has rhinaria over its whole length in apterae. Therefore I think it right to place *M. rosaefolium* Theob. in a new genus.

B. SYNONYMY, ETC.

For synonymy, biology etc., see under the species.

C. NOTES ON PHYLOGENY.

The presence of very well developed tubercles on vertex and spinal tubercles on abd. tergites VIII and VII, as well as other characters, make it certain, that this genus belongs in the Rosaceae-strain of Aphids.

D. DESCRIPTION OF THE SPECIES.

Rhodobium rosaefolium (Theobald, 1915) (Pl. XIV fig. 11).

1915. Theobald, F. V., Bull. Ent. Research, vol. VI, p. 109, *Macrosiphum rosaefolium*.
 1917. Goot, P. van der, Contrib. Faune Ind. Néerland., vol. I, livr. 3, p. 31, *Aulacorthum viride*.
 1922. Blanchard, E. E., Physis, Buenos Ayres, vol. V, p. 199-201, *Aulacorthum pseudorosaefolium*.
 1923. Timberlake, P. H., Proc. Hawaiian Ent. Soc., vol. V, p. 456, *Aulacorthum* spec.
 1925. Takahashi, R., Aph. Formosa, vol. IV, p. 9, *Macrosiphum rosaefolium*.
 1926. Hall, W. J., Min. Agric. Egypt, Tech. Sc. Serv., Bull. 68, p. 39, *Macrosiphum rosaefolium*.
 1929. Theobald, F. V., Entomologist, vol. LXII, p. 9, *Macrosiphum rosaefolium*.
 1931. Takahashi, R., Aph. Formosa, vol. VI, p. 64, *Acyrtosiphon rosaefoliae*.
 1936. Shen Tseng & Chia-Chu Tao, Ent. & Phytopath., Hangchow, vol. IV, p. 146, *Acyrtosiphon rosaefoliae*.

Apterous viviparous female.

Morphological characters. Body spindle-shaped, with extremely short, blunt hairs. VIIIth tergite with 4 hairs, which are about half as long as basal diameter of IIIrd ant. segment. Abdominal tergite hardly sclerotic, faintly yellowish, nearly smooth, but scabrous behind each siphunculus. Frequently spinal tubercles present on VIIIth and VIIth tergite. Head with very well developed frontal tubercles, which are strongly rounded inwards and rather roughly imbricated on inner side and underside. Median frontal tubercle very conspicuous. Usually distinct spinal tubercles present on

vertex. Antennae on an average just shorter than the body, thick, remarkably coloured: Ist and IIrd segment pale, yellowish; IIIrd segment with pale base, but with the $\frac{3}{5}$ - $\frac{5}{6}$ part bearing the rhinaria brown, the junction with the IVth segment black, with sometimes the part just basally of it paler; IVth segment with pale base and darker apex, Vth with pale base, remainder brown, the junctions of these segments black; VIth black. IIIrd segment with 5-18 rather large rhinaria in a row along basal $\frac{3}{5}$ - $\frac{5}{6}$ of the segment. Antennal hairs very short, their length on IIIrd segment only about $\frac{1}{5}$ - $\frac{1}{4}$ of the basal diameter of this segment. Rostrum reaching past the middle coxae, apical segment with 4 pairs of hairs besides the apical 3 pairs, about $\frac{3}{4}$ - $\frac{14}{15}$ of second joint of hind tarsi long. Siphunculi rather thick, tapering from base to apex, where they increase in diameter towards the flange, which part usually is slightly dusky, the remainder pale brownish yellow; length about $\frac{1}{4}$ - $\frac{2}{7}$ of length of body, surface imbricated, though lightly only, usually a few striae before the flange, which is rather small. Cauda extraordinarily slender, considerably constricted, pale like the siphunculi, about $\frac{1}{2}$ - $\frac{2}{3}$ of the length of the siphunculi, with 5-7 hairs only! Legs long, the apices of the femora and of the tibiae black, first tarsal joints with 3, 3, 3 hairs.

Colour. Head brownish yellow, remainder bright apple-green (rather dark), shiny. Siphunculi and cauda transparent, nearly colourless, the siphunculi with dusky apex. Antennae with segments I, II, base (and often apex) of III, IV and V very pale to pale brownish, remainder of IIIrd segment yellowish brown to dark brown, junctions of the segments and segment VI black. Legs pale with the distal parts of femora and tibiae darker to dark brown. Eyes black.

Mesurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III: IV: V: VI
1	2.54	2.35	0.63	0.38	8 & 11	100: 70: 56: (22 + 88)
2	2.06	1.91	0.46	0.30	12 & 13	110: 68: 58: (24 + 96)
3	2.08	1.98	0.50	0.32	11 & 12	100: 64: 57: (24 + 94)
4	2.48	2.38	0.63	0.38	8 & 12	100: 69: 57: (23 + 80)
5	2.12	2.18	0.54	0.32	11 & 13	100: 69: 59: (24 + 93)

Alate viviparous female.

Morphological characters. Much like apterous viviparous female. Head and thorax dark sclerotic, tubercles on vertex conspicuous, antennae about as long as body, IIIrd segment often a little darker than the next segments, with 14-22 rhinaria more or less in a row, IVth with 4-11 rhinaria. Rarely

also Vth segment with a few rhinaria. Abdomen with distinct brown marginal sclerites, which on segment II-V often bear distinct tubercles, also sometimes with indistinct pleural intersegmental sclerites. Siphunculi shorter and thinner than in apterae, more cylindrical and more distinctly dilated towards the flange, with an inclination of the imbrications near the flange to pass into reticulations, darker than in the apterae, $\frac{1}{5}$ - $\frac{1}{4}$ of length of body. Cauda still more slender than in apterae, very acute, as dark as the siphunculi or slightly paler. Wings with normal venation, but the veins black and bordered with brown, especially the cubitus 2.

Colour. Head brownish yellow to brown, prothorax green, mesothorax brown to blackish brown, abdomen vivid apple-green with the marginal sclerites darker, olive green. Antennae blackish brown to black. Siphunculi pale yellow, cauda transparent yellowish white. Legs with more black than in the apterae. Wings not hyaline, slightly smoky with very dark veins.

Measurements of one specimen: Length of body: 2.04 mm; ant.: 2.15 mm; siph.: 0.44 mm; cau.: 0.22 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{81}{IV} : \frac{72}{V} : \frac{(25 + 103)}{VI}$. Rhin. on IIIrd ant. segment: 16 and 17; on IVth: 4 and 8.

Hostplants: *Rosa* spp. div.

Geographical distribution: Africa, British India, Dutch East India, Formosa, China, Argentine; Netherlands in hothouses.

Biology: Apparently this species does not form sexuales. It lives on the young shoots, leaves, etc., where it apparently does not do any harm.

Notes. In habitus this species very closely resembles several *Macrosiphum*-species. It differs from the latter genus nearly only by the non-reticulate siphunculi and the very short hairs. It differs from all *Acyrtosiphon* species in the dark colour of the IIIrd ant. segment in the apterae, in contrast to the other segments, which are distinctly paler. The alatae differ of course in the presence of rhinaria on the IVth ant. segment. Theobald places *rosaecola* Pass. as a possible synonym, but this is the red variety of *Macrosiphum rosae* (L.).

Types: In the British Museum (Natural History), London.

Impatientinum Mordvilko, 1914.

A. HISTORY.

The genus was erected by Mordvilko without species, but in 1928 he used the name *Impatientinum fuscum* Mordv., which according to Mordvilko (1929) is identical with *Aphis balsamines* Klth., 1862. Kaltenbach's

species has been placed in *Macrosiphoniella* Del Guercio by Theobald, because the siphunculi are about as long as the cauda, which is about the only character both genera have in common. In 1930 Börner places *Impatientinum* as a synonym to *Amphorophora* Buckt., later, in 1933, he acknowledges it, placing *Neomyzus* v. d. Goot and *Submacrosiphum* H. R. L. under it. *Neomyzus* in my opinion is a subgenus of *Aulacorthum* Mordv., while *Submacrosiphum* H. R. L. is a synonym of *Nasonovia* Mordv., type *Aphis ribicola* Klth.

The genus certainly is a very good one. It differs from all its allies by the strongly sclerotic tergum with obsolete segmentation, the distribution of the rhinaria, which even in apterous viviparous females cover the whole length of the IIIrd ant. segment and usually occur on the IVth and Vth segment also. The shape of the reniform stigmal pori separates it from *Nasonovia*, in which the pori are nearly circular, as well as the tergal hairs, which are not as in the latter genus placed on tubercles.

For further details, see description of the species, p. 305.

B. SYNONYMY.

The synonymy is quite simple, because none of the older authors has recorded this species.

1862. Kaltenbach, J. H., Verh. Naturh. Ver. Preuss. Rheinl. u. Westphal., vol. XIX, p. 57, *Aphis* L.
 1914. Mordvilko, A. K., Faune d. l. Russie, Ins. Hémipt., vol. I, livr. I, p. 72, *Impatientinum*.
 1925. Theobald, F. V., Ent. Monthly Mag., vol. LXI, p. 71, *Macrosiphoniella* Del Guercio.
 1926. Theobald, F. V., Aph. Great Britain, vol. I, p. 168, *Macrosiphoniella* Del Guercio partim.
 1928. Mordvilko, A. K., in Filipjev, Opredelitelj Nasekomich, p. 193, *Impatientinum* (*fuscum* Mordv.) (= *Aphis balsamines* Klth.).
 1929. Mordvilko, A. K., Food-Plant Catalogue, p. 60, *Impatientinum* Mordv.
 1929. Nevsky, W. P., Tli Srednei Asii, p. 127, *Impatientinum* Mordv.
 1930. Börner, C., Arch. f. Klass. u. Phylog. Ent., vol. I, p. 187, *Amphorophora* Buckt. partim.
 1933. Börner, C., Kl. Mitt. über Blattl., ed. Börner, p. 2, *Impatientinum* Mordv. partim.

C. GENERAL BIOLOGY, ETC.

See under the species.

D. RELATION TO OTHER GENERA AND PHYLOGENY.

I cannot connect this genus with any other I know. Other *Macrosiphum*-like species have been described from *Impatiens* in the U.S.A., but as I

have no material at my disposal, I cannot say in what genus they should be placed, or what the genera they have been placed in are like.

The differences from other genera have been pointed out on p. 217 already.

E. DESCRIPTION OF THE SPECIES.

Impatientinum balsamines (Kaltenbach, 1862) (Pl. XIV fig. 10).

1862. Kaltenbach, J. H., Verh. Naturh. Ver. Preuss. Rheinl. u. Westphal., vol. XIX, p. 57, *Aphis balsamines*.
 1874. Kaltenbach, J. H., Die Pflanzenfeinde, etc., p. 84, *Aphis balsamines*.
 1925. Theobald, F. V., Ent. Monthly Mag., vol. LXI, p. 71, *Macrosiphoniella balsamines*.
 1926. Theobald, F. V., Aph. Great Britain, vol. I, p. 168, *Macrosiphoniella balsamines*.
 1928. Mordvilko, A. K., in Filipjev, Opređelitelj' Nasekomich, p. 193, *Impatientinum fuscum*.
 1929. Mordvilko, A. K., Food-plant Catalogue, p. 60, *Impatientinum balsamines*.
 1929. Nevsky, W. P., Tli Srednei Asii, p. 127, *Impatientinum balsamines*.

Apterous viviparous female.

Morphological characters. Body oval, with largest width on posterior half, strongly convex, with rather long, pale hairs. VIIIth tergite usually with 4 hairs, which are about twice as long as basal diameter of IIIrd segment. Tergum completely sclerotic (segmentation invisible), smooth, black, with a colourless, more or less membranous "hole" at the base of each siphunculus; bases of dorsal hairs conspicuous as perforations; VIIIth tergite free, only slightly sclerotic. Frontal tubercles very well developed, inner margins diverging to nearly parallelous, quite smooth; median frontal process not developed. Antennae very pale with the junctions of the segments dark, about $1\frac{1}{5}$ - $1\frac{1}{7}$ times as long as body. IIIrd segment with 4-12 (average: 7.5) rather large, flattish rhinaria, which, even if only 4 are present, are placed in a row over the whole length of the segment; the segment attenuated just basally of the basal rhinarium and between the rhinaria; IVth segment with 0-4 (average: 1.7) rhinaria, Vth with 0-4 (average: 0.9) rhinaria, but if the IVth has no rhinaria, then also the Vth without secondary rhinaria. Antennal hairs on III rd segment about $\frac{1}{2}$ - $\frac{2}{3}$ of basal diameter of IIIrd segment. Rostrum pallid, reaching to about the hind coxae, apical segment constricted at base, length about $\frac{2}{3}$ - $\frac{5}{7}$ of second joint of hind tarsi. Siphunculi black, more or less calf-shaped, i.e., constricted at the very base, tapering to distal third part, from thereon either cylindrical or dilating towards the flange, about $\frac{1}{6}$ of length of body, rather roughly imbricated, with sometimes the imbrications just in front of the

small flange passing into a few (1-3) rows of strongly transverse cells. Cauda very pale, thick, elongate triangular with rather blunt apex, about $\frac{3}{4}$ of the length of the siphunculi, with 6-8 (normally 7) hairs. Legs rather long and pale, apices of femora dusky. First tarsal joints with 3, 3, 3 hairs.

Colour. Shiny black, siphunculi black, antennae whitish with junctions of the segments dusky, legs pale yellowish, with dusky knees, cauda yellowish white.

Measurements of two specimens: (I) Length of body: 2.12 mm; ant.: 2.29 mm; siph.: 0.32 mm; cau.: 0.27 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{69}{IV} : \frac{59}{V} : \frac{(28+107)}{VI}$. Rhin. on IIIrd ant. segment: 6 and 8; on IVth: 1 and 3; on Vth: 1 and 3. (Zwolle, Netherlands, July 1938). (II) Length of body 2.28 mm; ant.: 2.38 mm; siph.: 0.40 mm; cau.: 0.28 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{66}{IV} : \frac{63}{V} : \frac{(27+106)}{VI}$. Rhin. on IIIrd ant. segment: 7 and 11; on IVth: 2 and 4; on Vth: 1 and 0. (Valmiera, Latvia, 1930, J. Zirnits).

A late viviparous female.

Morphological characters. Very much like apterous viviparous female. Antennae with each segment of flagellum gradually darker towards apex, IIIrd segment constricted as in apterae, with 10-23 rhinaria; IVth with 5-11, Vth with 4-9. Abdomen still rather sclerotic, but the sclerite rather broken up, so that the Ist, IInd and IIIrd segment are nearly membraneous, except for marginal sclerites and occasionally some small scattered sclerites; between the next segments spinally and in front of the bases of the siphunculi membraneous areas; caudad from Vth segment sclerotisation very irregular and interrupted; a conspicuously large, slightly imbricated sclerite behind each siphunculus. Cauda slightly darker than in apterous viviparous female.

Colour. Black. Antennae pale brownish-yellow with the bases of the segments paler, legs with distal $\frac{1}{3}$ of femora dark to black, siphunculi black, cauda pale yellow.

Measurements of one specimen: Length of body: 2.40 mm; ant.: 2.58 mm; siph.: 0.37 mm; cau.: 0.25 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{68}{IV} : \frac{63}{V} : \frac{(24+105)}{VI}$. Rhin. on IIIrd ant. segment: 15 and 18; on IVth: 6 and 5; on Vth: 8 and 6.

Hostplant: *Impatiens noli tangere*.

Geographical distribution: Europe (Engeland, Netherlands, Germany), U.S.S.R.

Biology: Up till now only the summer forms are known, but it seems that the species can live during the whole year on this host¹). The insects are usually sitting on the underside of the upper leaves and in the inflorescences. Alatae were numerous in the first week of July 1939 near Zwolle, Netherlands. The species is not visited by ants.

Notes. This species has a few characters which are exceptional. The curious constriction at the base of the IIIrd ant. segment in apterae and alatae is abnormal; the cardiform ultimate rostral segments occurs in a few species of aphids living on grass. The structure of the siphunculi occurs also in some species of *Macrosiphoniella*, cf. *M. oblonga* (Mordv.).

In the Netherlands the foodplant is not common, but the aphids seem to be present, wherever its occurs. Material received from Latvia shows no differences from Dutch material. This species was never found on *Impatiens parviflora*, though this plant is more common here.

Types: Kalténbach left no types.

Aulacorthum Mordvilko, 1914²).

A. HISTORY.

The first time Mordvilko used the name *Aulacorthum* is in the caption of a figure of the head of *solani* Kltb., which Mordvilko there calls *Aulacorthum pelargonii* Kalténbach. As I showed on p. 237, the true *pelargonii* Kltb. is a different insect from that figured by Mordvilko, and now the question arises which is the type of *Aulacorthum*, Mordvilko's *pelargonii* (= *solani* Kltb.) or the true *pelargonii* Kalt., which Mordvilko evidently did not know. If true *pelargonii* Kltb. is declared the type by the International Commission, then *Aulacorthum* becomes a synonym of *Acyrtosiphon* Mordv. But I prefer to accept Mordvilko's genus just as he meant it and use it with *pelargonii* Mordv. nec Kalténbach (= *solani* Kltb.) as type. According to a note which Mordvilko made in my copy, the material, from which the figure was drawn, came from Amsterdam, from Van der Goot, and therefore it is probable that Van der Goot also identified these aphids as *pelargonii* Kltb. There still exists material of *solani* from Amsterdam, labelled *pelargonii* by Van der Goot, and also Van der Goot's description of *pelargonii* in 1915 shows that he really dealt with *solani* Kltb. There-

1) How the larvae hatching from the eventual hibernating eggs find their food is a question which wants investigation. For no seedlings survive the winter. And the seed-throwing mechanism of the hostplant would seem to make the finding of food in the next spring more difficult. Yet migration seems unlikely.

2) In 1928 and 1929 Mordvilko starts to write *Aulacorthum*, but in 1914 he wrote several times *Aulacorthum* so that I assume that that spelling is correct.

fore also *Neomacrosiphum* Van der Goot, 1915, type „*pelargonii* Kltb.“, is listed as a synonym of *Aulacorthum* Mordv. in this paper, as it has the same type.

Of the authors after Mordvilko only a few used the genus, viz., Van der Goot (1917), Blanchard (1922), Hille Ris Lambers (1933) and recently Börner (1939, 1940). They all use it in Mordvilko's sense, except Börner (1940), who also places his *agrimoniae*, a subspecies of *pelargonii* or rather *malvae* Mosley in it. He first rejected the genus (1930, 1932) and I cannot make such a construction that both true *pelargonii* and *solani* come in one genus, so that I do not understand what Börner understands as *Aulacorthum* Mordv. in 1940.

There is hardly a genus which has caused such a confusion as this. Primarily the misidentifications by Mordvilko and Van der Goot made it difficult to understand what they meant, but also the structure of the genotype itself made it difficult for authors, who rejected *Aulacorthum* Mordv. in their interpretation, to decide whether they should place *solani* in *Myzus* or in *Macrosiphum*. In Van der Goot's, Baker's and Theobald's sense a species with diverging frontal tubercles and long, cylindrical siphunculi is a *Macrosiphum*, one with converging, rough frontal tubercles a *Myzus*. From their point of view *A. solani* is about intermediate between the two, but the decision of Theobald, who described *solani* as a *Myzus*, has been rather generally accepted. There are, however, several very good differences from *Myzus*. Alate *Myzus* have a large black patch on the abdomen, of typical shape. Apterous *Myzus* never have rhinaria on the IIIrd ant. segment, while these are only exceptionally absent in *Aulacorthum*. In *Aulacorthum* the inner margins of the frontal tubercle may be parallel, but they do not converge. The larvae of *Myzus* and related genera have distinct spinules between the hairs at the apices of the hind tibiae¹⁾, but these do not occur in *Aulacorthum*.

It is interesting, that those authors who do not hesitate to place *A. solani* Kltb. in *Myzus*, place *schranksi* Theob. in *Macrosiphum*. From the micro-photograph of *schranksi* this would seem logical, but the frontal tubercles of that species diverge only after mounting, and in fresh material they do not diverge much more than those of *A. solani* Kltb., and the differences between *schranksi* and *solani* are really only very small, so that I could place them in one genus, though in different subgenera.

Until recently there was only one species of *Aulacorthum* known in

1) *Myzus varians* Davidson, just discovered near Lugano, Switzerland, does not show them.

Europe and then one could be somewhat sceptical about placing it in a separate genus, but at present the number has considerably increased and all the species, though mutually often very distinct, show a remarkable uniformity in their generic characters.

Neomyzus Van der Goot, 1915, type *Siphonophora circumflexa* Buckton, is used as a subgenus here. It differs from *Aulacorthum* Mordv. s.s. in the presence of rhinaria also on the IVth ant. segment in alatae. In other regards it so closely resembles *Aulacorthum*, that Van der Goot at first considered it a mere variety of his *pelargonii*. It generally has been placed in *Myzus* Pass., but its apterae have rhinaria on the IIIrd ant. segment as a rule and the type of sclerotisation of the tergum in both alatae and apterae is typically like that of *Aulacorthum* sensu stricto.

In 1939 Börner erected *Dysaulacorthum*, type *D. langei* Börner, as a subgenus to *Aulacorthum* Mordv. The subgenus was erected because the apterae show no rhinaria on the IIIrd ant. segment, and later (1942) Börner made it a full genus, because according to him also the alatae completely lack secondary rhinaria on the antennae. I received a single apterous female from Börner and this shows no rhinaria on the IIIrd ant. segment, but they, though rarely, are sometimes also absent in apterae of *solani*, from which I cannot separate the genotype of *Dysaulacorthum* by other characters. As to the absence of secondary rhinaria in the alatae, this would be the first species of the Aphidina in which this occurs. Börner does not say how often and in how many specimens he observed this character and I would like to know that before accepting the genus. For also in other species belonging to a number of different genera I have occasionally found alatae with more or less larval characters, like antennae without secondary rhinaria, larval siphunculi without the typical ornamentation of adults, etc. Such teratological aberrations are not very rare and as Börner often examines only a few specimens of his material, I am reluctant to accept his genus.

B. SYNONYMY.

- 1841-1855. Auctores diversi, *Aphis* L. partim.
 1855-1901. Auctores diversi, *Siphonophora* Koch partim.
 1901-1926. Auctores diversi, *Macrosiphum* Pass. partim.
 1914. Mordvilko, A. K., Faune d. l. Russie, Ins. Hémipt., vol. I, livr. 1, p. 68, *Aulacorthum*, type *Aulacorthum pelargonii* Mordv. (= *Aphis solani* Kltb.).
 1915. Goot, P. v. d., Beitr. z. Kenntnis d. Holl. Blattläuse, p. VII, *Neomacrosiphum*, type *Macrosiphum pelargonii* van der Goot (= *Aphis solani* Kltb.).
 1919. Mordvilko, A. K., Faune d. l. Russie, Ins. Hémipt., vol. I, livr. 2, p. 239, *Acyrtosiphon* Mordv. partim.
 1919-1941. Auctores diversi, *Myzus* Pass. partim.
 1930. Börner, C., Arch. f. klass. u. phylog. Ent., vol. I, p. 141, *Amphorophora* Buckt. partim.

1932. Börner, C., in Sorauer, Handb. d. Pflanzenkr., ed. IV, vol. V, pars 2, p. 628, *Macrosiphon* Pass. partim.
 ?1939. Börner, C., Arb. phys. & angew. Ent., vol. VI, p. 82, *Dysaulacorthum*, type *D. langei* Börner.

For the synonymy of *Neomyzus* Van der Goot see that of *N. circumflexus* (Buckt.).

C. GENERAL BIOLOGY.

In this genus true migration has not been recorded. Patch believed to have found migration in *A. solani* (Kltb.), but she overlooked the fact that in this group of Aphids gynoparae are alate, androparae apterous, males alate if migration occurs. The presence of apterous males, which Patch records for the first time, simply excludes migration in this part of the family. The capacity for hibernation as egg on a number of different plants of the genotype is rather exceptional in aphids.

The other species are mostly monophagous and live on a number of plants belonging to very different families (Liliaceae, Boraginaceae, Umbelliferae, etc.). Most of their hosts are also host of the very polyphagous *A. solani* (Kltb.). The latter species regularly hibernates also on various plants in rooms, green- and hothouses and on stored bulbs, potatotubers, etc.

In the subgenus *Neomyzus* v. d. Goot sexual forms are eliminated. None of the species is visited by ants.

D. GEOGRAPHICAL DISTRIBUTION.

Though some species occur in the temperate zones of the Northern Hemisphere, most allied forms are found in the Asiatic tropics. *Aulacorthum solani* (Kltb.) occurs in the U.S.A. and New Zealand, where most probably it has been imported from Europe. *Neomyzus circumflexus* (Buckt.) is a tropical species of unknown origin, which at present occurs all over the world and which has been imported into countries with a temperate climate where it occurs indoors throughout the year, though in summer occasionally out-of-doors.

E. GENERAL MORPHOLOGY.

I. Macroscopical morphology.

Body of medium size, not very slender, 1.8-3.2 mm long, yellowish, green or reddish in colour, sometimes with a darkish to black sclerotic pattern. Colour of larvae and apterae viviparae often more or less alike, sometimes strikingly different. Alatae usually with a more or less well developed

sclerotic pattern of spinopleural nature on abdomen. Some of the wing-veins in alatae sometimes bordered, but never all the veins. Antennae and legs long and thin. Larvae powdered or nude.

II. Microscopical morphology.

1. Head (Pl. XV fig. 14). Frontal tubercles well developed with inner margins about parallel, varying from just converging to just diverging, rather strongly rounded inwards; in apterous females usually distinctly rough, especially on the underside; sometimes the whole head rough; median frontal tubercle usually very small. Antennae with the two basal segments and the base of IIIrd segment in apterae always imbricated; IIIrd segment in apterous females with 0-6 (usually 1-2) rhinaria near its base, in alate females with more rhinaria, which may occur on the IVth (in *Neomyzus* v. d. Goot). Antennal hairs like those on dorsum of the head and body very short, of the Myzine type.

2. Thorax. Normal. Legs usually long, not completely dark, but usually quite pale with the apices of the tibiae blackish and the apices of the femora variably dark. First tarsal joints with 3, 3, 3 hairs. Wings with normal venation; sometimes the two basal veins bordered with brown, but the other veins, though sometimes dark, never bordered.

3. Abdomen. Tergite in apterae always sclerotic, frequently slightly coloured, without marginal sclerites, more rarely with a marked dark sclerotic pattern, smooth, sometimes behind the siphunculi an imbricated area. In alatae usually a sclerotic pattern, composed of spinal sclerites, pleural sclerites (intersegmental) and marginal sclerites present, though sometimes little developed and pale. Siphunculi cylindrical, thin, rather long, more or less imbricated, with a wide flange and some transverse striae often forming a few hexagonal cells just before it. Cauda rather short, blunt, hardly or not constricted, usually coloured like the siphunculi, with few hairs (6-8).

F. MORPHOLOGICAL RELATION TO OTHER GENERA.

Quite a number of aphids with about the same details exist in South Eastern Asia and Africa. Because my material is not sufficiently extensive I cannot give a full review and classification of these forms, but some genera may be indicated. The genus *Micromyzus* v. d. Goot, living exclusively (?) on Ferns, is widely distributed in the tropics. It differs from *Aulacorthum* in that the alatae have black borders along all the veins of the wings. The following species belong to it with certainty: *M. nigrum* v. d. Goot, 1917, *M. („Myzus”) pterisoides* (Theob., 1918), *M. („Myzus”)*

arthraxonis (Takah., 1921). This genus has frequently been placed as a synonym of *Fullawayella* Del Guercio, type *Macrosiphum kirkaldyi* Fullaway, 1909, but this is wrong, as *Macr. kirkaldyi* is identical with *Idiopterus nephrolepidis* Davis, according to a letter received from Dr. Fullaway and a paper by Timberlake (Proc. Hawaiian Ent. Soc., vol. V, 1924), so that *Fullawayella* becomes a synonym of *Idiopterus* Davis. *Neotoxoptera* Theob. has quite different siphunculi.

Rhodobium nov. gen., also a tropical genus, resembles the subgenus *Neomyzus* v. d. G. as far as the structure of the frontal tubercles is concerned. The IIIrd ant. segment in apterae, however, has numerous rhinaria, the cauda is very long and thin, the abd. tergum is hardly sclerotic in apterae, whereas in the alatae large marginal sclerites with tubercles are present, while the pleural and spinal sclerites are not or hardly developed.

Confusion with the European *Myzus* Pass. and allied genera (*Ovatus* v. d. G., *Phorodon* Pass.) is hardly possible, but the genus **Tubaphis** nov. gen., type *Aphis ranunculina* Wlk., might be confused with *Aulacorthum*. In *Tubaphis*, however, the cauda has a curious strong constriction at its very base; in apterae viviparae the IIIrd ant. segment never has rhinaria, which in alatae are distributed over the whole surface of the IIIrd segment and along one side of the IVth; the processus terminalis is only $2\frac{1}{3}$ - $2\frac{1}{2}$ times as long as base of VIth segment.

On the other hand some species might be mistaken for *Acyrtosiphon* or *Metopolophium*. If apterae are involved the structure of the frontal tubercles and the absence of spinal tubercles on the head, as well as the very small median frontal process exclude *Metopolophium*; the imbricated frontal tubercles with nearly parallel inner margins distinguish it from *Acyrtosiphon*. In alatae the difficulty may be larger, especially if a specimen with undeveloped sclerotic ornamentation of abdomen is under consideration. Then too the absence of spinal tubercles on head and abd. segments VIII and VII may help to distinguish it from *Metopolophium*, in which also the ratio processus terminalis: base of VIth segment usually is under 4, but in *Aulacorthum* as a rule over 4. *Acyrtosiphon* lacks the sclerotic ornamentation of the abdomen. Probably the figures will help to lessen these difficulties.

G. NOTES ON PHYLOGENY.

The place of this genus is very difficult to state. In morphological respect its closest relation is *Metopolophium* Mordv., which can be connected with the Rose-strain (see p. 275), but tubercles on vertex and spinal tubercles on abd. tergites VIII and VII are rare in *Aulacorthum*, although they may

occur, but then very reduced. It is uncertain whether *Aulacorthum* and *Neomyzus* really are so closely allied that they belong in one genus, though on morphological grounds this is justified.

H. TAXONOMY OF SPECIES.

I. KEY TO SPECIES.

Apterous viviparous females.

- 1(2) Siphunculi with dark base and apex, the middle part pale (Pl. XIV fig. 12). Dorsum with large black sclerotic areas, without a paler median stripe. Head rough by many scales. On *Convallaria majalis*. *A. speyeri* Börner 1).
- 2(1) Siphunculi uniform in colour, usually pale or with the very apex darker. Dorsum sometimes with large blackish areas, but then with a pale median stripe from head till about IIIrd abd. tergite. Head rough or almost smooth.
- 3(4) Dorsum of abdomen with a horseshoe-shaped blackish area (Pl. XVII fig. 24). Rostrum with usually only 2 hairs besides the 3 apical pairs. Siphunculi at most twice as long as cauda. On various plants, usually indoors.
A. (Neomyzus) circumflexum (Buckt.) 1).
- 4(3) Dorsum without pronounced local pigmentation, usually rather uniformly pale smoky. Rostrum with more than 3 hairs besides the 3 apical pairs. Siphunculi usually more than twice as long as cauda.
- 5(6) Head both ventrally and less distinctly dorsally with small scales or spinules between the hairs (Pl. XV figs. 13, 14). Ist ant. segment on basal half on outer side with one hair, seldom with on one antenna 0 or 2 hairs, exceptionally on both sides with 2-3 hairs (in subspec. *aquilegiae* Theob.). Colour in life greenish, rarely yellowish white. Larvae smooth and shiny, like the adults without waxy exsudations. *A. solani* (Kltb.) s. l. 1).
- 6(5) Head sometimes ventrally slightly, but not dorsally with small spinules between the hairs. Ist. ant. segment with 2-4 hairs on outer side near base. Colour either green, or reddish to dark brown. Larvae (and sometimes also the adults especially ventrally) with distinct waxy exsudation, at least ventrally.
- 7(8) Processus terminalis more than 1.45 times as long as IIIrd ant. segment. Tergum usually with some perforations besides the marginal incisions. Rostrum with apical segment as long as or hardly longer than 2nd joint of hind tarsi. Colour in life usually dull brownish red to very dark, sometimes green. Adults often ventrally and at the sides of the thorax with traces of waxy exsudation. On *Vaccinium myrtillus*. *A. rufum* nov. spec., p. 316.
- 8(7) Processus terminalis less than 1.45 times as long as IIIrd ant. segment. Tergum only with marginal membraneous incisions. Rostrum with apical segment about $1\frac{1}{3}$ times as long as 2nd joint of hind tarsi. Colour in life somewhat translucent pink or pale green, with bright green or rusty spots near the base of each siphunculus. Adults without waxy exsudation, shiny. On *Leontodon* sp. *A. palustre* nov. spec., p. 314.

Alate viviparous females.

- 1(2) IIIrd and IVth ant. segment with numerous rhinaria. On various plants, mostly indoors. *A. (Neomyzus) circumflexum* (Buckt.) 1).
- 2(1) IVth ant. segment only rarely with 1 rhinarium, normally without rhinaria.

1) To be described in the next part.

- 3(4) Siphunculi with dark base and apex, the middle part distinctly paler. On *Convallaria majalis*. *A. speyeri* (Börner)²⁾.
- 4(3) Siphunculi either pale with dark apices or uniformly dark, not with a pale middle part.
- 5(6) Ist ant. segment on basal half on outer side with 1, se'dom on one antenna with 0 or 2 hairs¹⁾. Underside of abdomen greenish. Nymphs shiny, without waxy exsudation. *A. solani* (Kltb.). s. 1.²⁾.
- 6(5) Ist ant. segment on basal half on outer side with 2-4 hairs. Underside of abdomen often reddish. Nymphs ventrally or also dorsally powdered.
- 7(8) Ultimate rostral segment about as long as 2nd joint of hind tarsi. IIIrd ant. segment with about 5-12 rhinaria. Siphunculi with up to 6 rows of isodiametric hexagonal cells at apex. On *Vaccinium myrtillus*. *A. rufum* nov. spec., p. 316.
- 8(7) Ultimate rostral segment about $1\frac{1}{3}$ times 2nd joint of hind tarsi. IIIrd ant. segment with about 15-26 rhinaria. Siphunculi with 1-3 rows of hexagonal cells at apex. On *Leontodon* spec. *A. palustre* nov. spec., p. 314.

II. DESCRIPTION OF THE SPECIES.

Aulacorthum palustre nov. spec.

Apterous viviparous female.

Morphological characters. Body about 2.5-3.2 mm long, oval, ventrally more convex than dorsally. Tergum uniformly strongly sclerotic, without perforations except marginally, evenly pale brownish, wrinkled, with the small pleural intersegmental sclerites a little darker and a small membranous, colourless area around the base of each siphunculus. Dorsal hairs very short, those on IIIrd abd. tergite about as long as hairs on IIIrd ant. segment, with swollen apices; VIIIth tergite with 6-10 hairs. Head not darker than rest of body, dorsally without scales or spinules, but its underside faintly and the undersides and inner apices of the frontal tubercles distinctly scabrous. Frontal tubercles very well developed, with almost parallel inner margins and rather rectangular inner apices. Hairs on head longer than those on abdomen. Antennae pigmented like the head, dark towards apex and at the apices of the segments of the flagellum, slightly imbricated, about $1\frac{1}{10}$ - $1\frac{2}{5}$ times body; IIIrd segment near base with 1-3 rhinaria; processus terminalis $1\frac{1}{10}$ - $1\frac{4}{9}$ times IIIrd segment, $4\frac{1}{4}$ -5 times base of VIth segment. Hairs on IIIrd segment $\frac{2}{7}$ - $\frac{1}{3}$ of basal diameter of the segment. Rostrum just reaching hind coxae; apical segment about $1\frac{1}{3}$ times 2nd joint of hind tarsi, with 6-8 hairs besides the 3 apical pairs. Siphunculi pale or with the flanges brownish, about $\frac{2}{9}$ - $\frac{1}{4}$ body, cylindrical with widened base, somewhat attenuated near apex and therefore seemingly

1) I do not know whether alatae of subspec. *aquilegiae* Theob. show this character.
2) To be described in the next part.

slightly swollen, bluntly (in imagines with larviform siphunculi finely acutely spinulose) imbricated, with 1-3 rows of transversely hexagonal cells near the wide flange. Cauda sometimes a little dusky, thick, blunt, hardly or not constricted, $\frac{2}{5}$ - $\frac{6}{11}$ of the siphunculi. Legs long and thin, with only the apices of the tibiae dark brown; first tarsal joints with 3, 3, 3 hairs.

Colour. Somewhat translucent pink or pale greenish, with usually a rusty or bright green spot near the base of each siphunculus, slightly shiny, not or only faintly ventrally powdered. Siphunculi, cauda and legs like the body or paler. Antennae pale with conspicuous dark apices to the segments of the flagellum.

Measurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III: IV: V: VI
1	2.82	3.04	0.66	0.28	2 & 3	100: 83: 77: (33 + 136)
2	2.50	2.93	0.59	0.27	2 & 2	100: 78: 68: (27 + 134)
3	2.80	3.42	0.60	0.26	1 & 2	100: 74: 71: (28 + 125)
4	2.77	3.12	0.64	0.27	1 & 1	100: 75: 66: (25 + 111)
5	2.54	3.39	0.64	0.25	1 & 3	100: 80: 73: (30 + 140)
6	3.10	3.31	0.76	0.30	1 & 2	100: 78: 67: (26 + 120)

Alate viviparous female.

Morphological characters. Head and thorax blackish sclerotic, abdomen with a sclerotic pattern in brown to blackish brown, consisting of marginal sclerites, large pleural intersegmental sclerites with a darker center, the latter connected by usually very fragmentary spino-pleural transverse bars. Head smooth. Frontal tubercles rounded, not angular. Antennae much longer than body, dark brown to jet black with the very base of IIIrd segment pale; IIIrd segment with about 15-26 rather bulging rhinaria along whole length in a single or double row; IVth segment sometimes with a rhinarium. Siphunculi usually distally very slightly swollen, pale with dark apex to wholly brownish, imbricated, with 1-3 rows of rather isodiametric hexagonal cells at apex. Cauda as dark as the apex of the siphunculi, hardly or not constricted. Wings with dark brown veins, of which especially the anal is conspicuously bordered with pale brown. Legs with the femora brownish with pale base and fuscous apex, tibiae yellow with black apices. Other characters as in apterous form.

Colour. Head and thorax brown to blackish brown, abdomen with the sclerotic parts olive to brown, remainder as in apterae. Antennae black. Legs pale with dark knees and apices to the tibiae. Cauda green or reddish like the body but paler.

Measurements of one specimen: Length of body: 2.45 mm; ant.:

3.36 mm; siph.: 0.59 mm; cau.: 0.24 mm. Prop. of ant. segments: $\frac{100}{\text{III}} : \frac{82}{\text{IV}} : \frac{67}{\text{V}} : \frac{(27 + 118)}{\text{VI}}$. Rhin. on IIIrd ant. segment: 22 and 26; on IVth: 0 and 0.

Hostplant: *Leontodon* sp., probably *autumnale*.

Geographical distribution: Only known from one locality near Tietjerk, Fr.

Biology: This aphid lived in large numbers on the undersides of the midveins of very narrow, erect leaves of its hostplant, growing in the high grass of a boggy meadow. At the time of collection, June 6th, the alatae were very numerous. The collected colonies died before I reached home. It seems that the species is strictly limited to its mentioned host, as no other plant in the field was infested. Probably it is also restricted to the biotope I found it in, for I did not find it on the host elsewhere, though the various species of *Leontodon* are very common in this country.

Notes. Morphologically the species resembles *A. solani* (Kltb.) and especially *A. rufum* nov. spec., but in life it looks very different from both these species, particularly its larvae. For these are also either pink or greenish, but they are covered with a very conspicuous waxy powdering in transverse bands. Because the colour of the body shows through the wax the larvae look curiously greenish or rosy chalky. The mature insects look like *A. solani* (Kltb.), at least the green form; the red form has a quite different colour and shape from *A. rufum*. Morphologically both species differ in the apterous form from *A. solani* by their head being dorsally smooth, and from most specimens of both alate and apterous *solani* in having 2-4 hairs on the outer side basally of the first ant. segment, where *solani* has 1, rarely on one side 0 or 2 hairs. The mutual differences between *rufum* and *palustre* are very small; the differences are in the interrelation between the IIIrd ant. segment and the processus terminalis in both species; in *rufum* the processus terminalis is more than 1.45 times as long as IIIrd segment, probably also in the little known alatae, but in *palustre* it is less than 1.45 times as long. Both species, however, are closely related and will almost certainly remain difficult to identify when mounted.

Types: In the author's collection.

***Aulacorthum rufum* nov. spec.**

Apterous viviparous female.

Morphological characters. Body spindle-shaped, about 2.00-2.65 mm long. Tergum sclerotic, pale to mottled brownish, about smooth, often perforated

or broken. Dorsal hairs very short, about as long as the antennal hairs, with nearly globular apices. Head smooth or in old specimens ventrally slightly rough. Frontal tubercles rather large, rounded at inner apex and there rough, with inner sides distinctly but often very little diverging, with 1-2 hairs on underside and 3-4 near inner apex. Median frontal tubercle little developed but perceptible. Antennae very long and slender, $1\frac{1}{5}$ - $1\frac{1}{2}$ times as long as body, brown with black apex, without darker apices to segments III and IV; basal segments on inner sides somewhat scaly, flagellum slightly imbricated; IIIrd segment only very little longer than IVth, with 0-2 rhinaria near base, usually with 1 rhinarium; IVth and Vth segment about equal in length; processus terminalis about $3\frac{3}{4}$ - $4\frac{1}{2}$ times as long as base of VIth segment, about $1\frac{4}{9}$ -2 times as long as IIIrd segment. Hairs on IIIrd segment very short, only $\frac{1}{4}$ - $\frac{2}{7}$ times as long as its diameter at its base. Rostrum just reaching to hind coxae; apical segment rather short, 1 - $1\frac{1}{6}$ times as long as 2nd joint of hind tarsi, with 6-8 hairs besides the 3 apical pairs. Siphunculi cylindrical, rather thin, with a sometimes hardly perceptible swelling on distal half and an often distinct attenuation near apex, pale to brown sclerotic with dark to blackish brown apex, evenly imbricated, but at apex with 3-4 distinct rows of reticulation of which the apical cells are transverse but the more basal ones not at all, about $\frac{1}{4}$ - $\frac{3}{11}$ times as long as body, with very well developed flange. Cauda as dark as the siphunculi, distinctly constricted in the middle, rather slender, a little less than half as long as the siphunculi, with 7 hairs. Legs long, thin, brownish yellow to brown, with black apices to the tibiae; first tarsal joints with 3, 3, 3 nearly equally long hairs.

Colour. Shiny or dull apple-green, or more commonly dirty brown-reddish, laterally and ventrally faintly powdered. Antennae, etc., paler than the body.

Measurements in mm and proportions of ant. segments:

No.	Length body	Ant.	Siph.	Cau.	Rhin. on III	Prop. of ant. segments III: IV: V: VI
1	2.48	3.25	0.63	0.29	I & I	100: 94: 94: (39 + 147)
2	2.46	3.24	0.67	0.25	I & I	100: 88: 91: (38 + 153)
3	2.27	2.98	0.60	0.28	I & I	100: 91: 87: (37 + 147)
4	2.40	3.32	0.64	0.30	I & I	100: 94: 95: (36 + 159)
5	2.06	2.97	0.50	0.25	0 & 0	100: 91: 93: (36 + 173)
6	2.04	2.96	0.49	0.26	I & I	100: 94: 93: (39 + 196)
7	2.04	2.86	0.54	0.27	I & I	100: 78: 83: (32 + 155)

(1-4, *Vaccinium myrtillus*, Bennekom, 12-V-'43; 5-7, idem, Bennekom, 9-VII-'33).

Alate viviparous female.

Morphological characters. Head and thorax dark brown sclerotic. Abdomen with large marginal sclerites and postsiphuncular sclerites and very conspicuous, rather large, equally dark brown pleural intersegmental sclerites; VIIth and VIIIth tergite, with paler sclerotic transverse bands. Antennae about $1\frac{1}{2}$ times as long as body, with very thin flagellum; IIIrd, IVth and Vth segment about equal in length, the IIIrd with about 5-12 rather small, flat rhinaria in a row usually not reaching to its apex. Siphunculi as dark as in apterae, distinctly swollen on distal half, i.e., thinner below and past an area on distal half, with up to 6 rows of cells at apex. Cauda slender. Wings with normal veins; all veins of about equal thickness, dark brown, all hardly or not faintly shadowed. Other characters as in apterae.

Colour. Head, thorax and abd. sclerites brown, remainder as in apterae.

Measurements of one specimen: Length of body: 2.36 mm; ant.: 3.27 mm; siph.: 0.55 mm; cau.: 0.25 mm. Prop. of ant. segments: $\frac{100}{III} : \frac{96}{IV} : \frac{96}{V} : \frac{(38 + 153)}{VI}$. Rhin. on IIIrd ant. segment: 9 and 11.

Hostplants: *Vaccinium myrtillus*, possibly other Ericaceae.

Geographical distribution: Netherlands, Latvia?

Biology: One finds this aphid from early spring till autumn on its host, of which it inhabits young shoots and the undersides of the leaves, usually very dispersed. The plants show no reaction. Alatae, belonging to the 3rd generation, were reared indoors. The insects drop immediately when disturbed. Ants do not visit this species though they usually attend *Aphis vaccinii* (Börner), which lives on the same host. Sexuales have not yet been found¹⁾.

Notes. This species when mounted looks very much like *solani* Kltb., but the differences enumerated in the key are very constant. In life it does not resemble that species in the least. I know no other aphid with such variation in the reticulation of the siphunculi, but there's no reason to suspect the mixing of more than one species. Until now I have only found this species in the neighbourhood of Bennekom, where in some years it is common on its host, in others very rare. The reddish form is usually more common than the green one and they are greenish when just moulted, after which they become darker, first brownish red and finally very dark brownish and mottled.

1) In cultures, started July 1946, until the end of November only apterae viviparae developed,

I have tried to transmit this species to several hostplants of *solani* Kltb., but with negative results. Also *Leontodon* spp. where refused as food.

A. rufum may be a complication in the identification of aphids caught in traps, for it will almost certainly be identified as *solani* Kltb. As only 4 alatae were reared, of which only one was left undamaged by the Germans, the differences given in the key to alatae are not yet reliable. The species is, however, not very common, so that eventual mistakes usually will not be very important.

Types: In the author's collection.

ADDENDA AND CORRIGENDA TO CONTRIBUTION No. 2, TEMMINCKIA, VOL. IV.

In his Food-Plant Catalogue Mordvilko (1929) speaks about "*Macrosiphum montanum* Nevsky", from *Crataegus* in Turkestan. Nevsky, as far as I know, never described a species under this name, but in 1929 described a species named *Macrosiphum crataegi* Monell from *Crataegus* in Turkestan. *Macrosiphum montanum* H.R.L., 1931, is preoccupied and for this species I propose the new name **Macrosiphum hartigi** (Contr. 2, p. 95).

Siphonophora rubi var. *rufa* Buckt. (Mono. Brit. Aphides, vol. IV, 1883, p. 104) is a synonym of *Macrosiphum funestum* (Macchiati, 1885). Though Buckton's name is older, the name cannot be accepted, because it is described as a variety. Varieties' names do not follow the rules of priority.

Some authors use the name *Sitobium* Mordv. in stead of *Sitobion* Mordv. *Sitobium* is once used by Mordvilko in 1914, when he used the name in his key to the genera, without naming a species. Already in 1919, in the second part of his book he used the name *Sitobion*, and on p. 354 fixes *Aphis granarium* Kirby as type. This fixation has been overlooked, by myself and all other authors. In 1921 Mordvilko fixes *Aphis avenae* F. as type of *Sitobion* Mordv. In his Food-Plant Catalogue he 14 times uses the name *Sitobion avenae* F. (pp. 86, 87, 88, 89, 90). Therefore apparently *Sitobium* must be regarded as an error and in all events it is a nomen nudum.

Lack of space made it impossible to print the complete 3rd part of the Contributions to a Monograph of the Aphididae of Europe as it was planned. The plates, however, on which some aphids are represented, the descriptions of which have to be reserved for the following part of these Contributions, are printed without a cut.

EXPLANATION OF THE PLATES

PLATE XII

- Fig. 1. *Pharalis enslini* (Börner), apt. viv. fem., $\times 35$.
Fig. 2. *Microsiphum millefolii* Wahlgren, apt. viv. fem., $\times 32$.
Fig. 3. *Corylobium avellanae* (Schrank), apt. viv. fem., $\times 33$.
Fig. 4. *Amphorophora pulmonariae* (Börner), ovip. fem., $\times 25$.

PLATE XIII

- Fig. 5. *Acyrtosiphon pisum* (Harris), apt. viv. fem., $\times 23$.
Fig. 6. *Acyrtosiphon caraganae occidentale* nov. subspec., apt. viv. fem.,
 $\times 33$.
Fig. 7. *Acyrtosiphon loti* (Theob.), apt. viv. fem., $\times 35$.
Fig. 8. *Acyrtosiphon* (*Liporrhinus*) *chelidonii* (Kltb.), apt. viv. fem.,
 $\times 36$.

PLATE XIV

- Fig. 9. *Titanosiphon artemisiae* (Koch), apt. viv. fem., $\times 31$.
Fig. 10. *Impatientinum balsamines* (Kltb.), apt. viv. fem., $\times 31$.
Fig. 11. *Rodobium rosaefolium* (Theob.), apt. viv. fem., $\times 35$.
Fig. 12. *Aulacorthum speyeri* Börner, apt. viv. fem., $\times 31$.

PLATE XV

- Fig. 13. *Aulacorthum solani* (Kltb.), apt. viv. fem., $\times 32$.
Fig. 14. *Aulacorthum solani* (Kltb.), head of specimen of fig. 13, $\times 87$.
Fig. 15. *Microlophium schranki* (Theob.), apt. viv. fem., $\times 24$.
Fig. 16. *Metopolophium festucae* (Theob.), specimen from *Poa* spec., al.
viv. fem., $\times 32$.

PLATE XVI

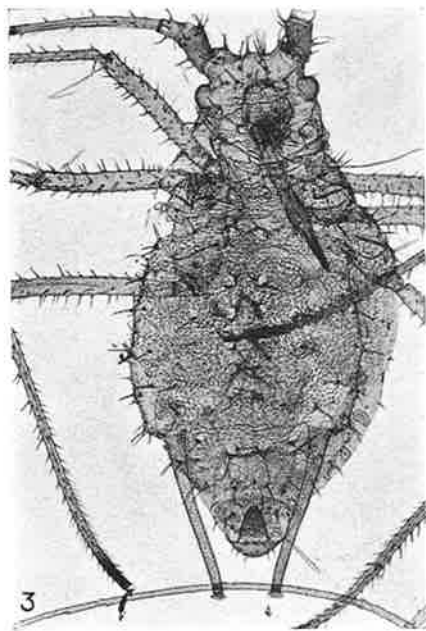
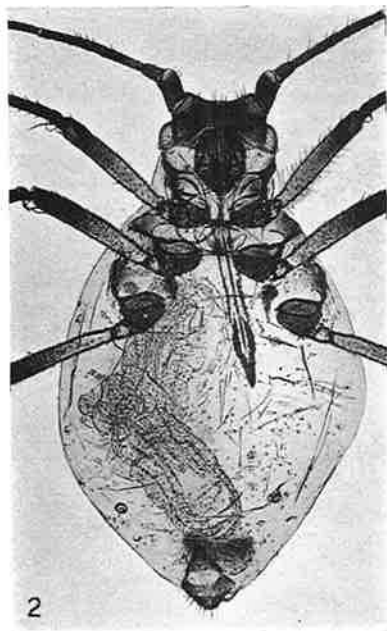
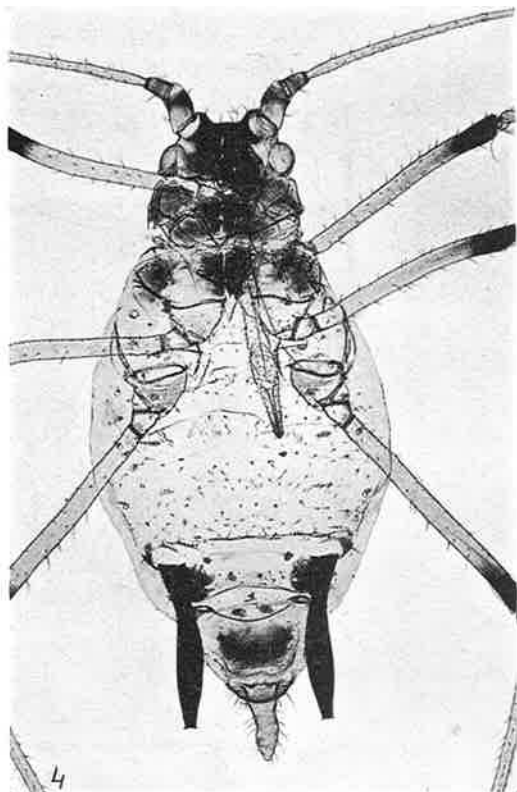
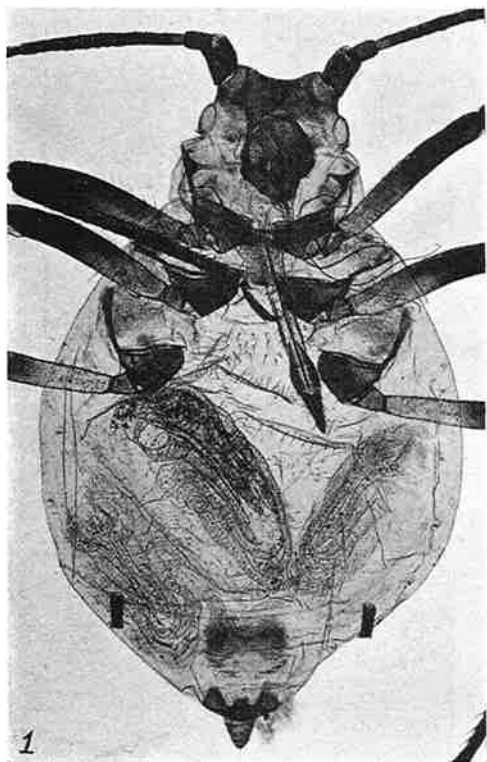
- Fig. 17. *Metopolophium festucae* (Theob.), specimen from *Secale*, abdomen
of al. viv. fem., $\times 29$.
Fig. 18. *Metopolophium albidum* nov. spec., apt. viv. fem., $\times 27$.
Fig. 19. *Metopolophium dirhodum* (Wlk.), abdomen of al. viv. fem.,
 $\times 28$.
Fig. 20. *Metopolophium dirhodum* (Wlk.), apt. viv. fem., $\times 31$.
Fig. 21. *Cryptaphis setiger* nov. spec., apt. viv. fem., $\times 33$.

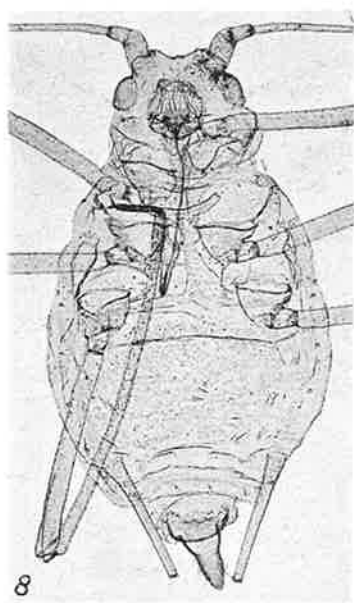
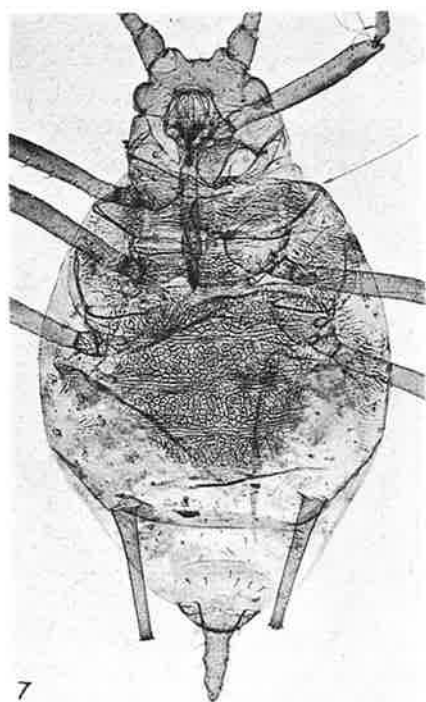
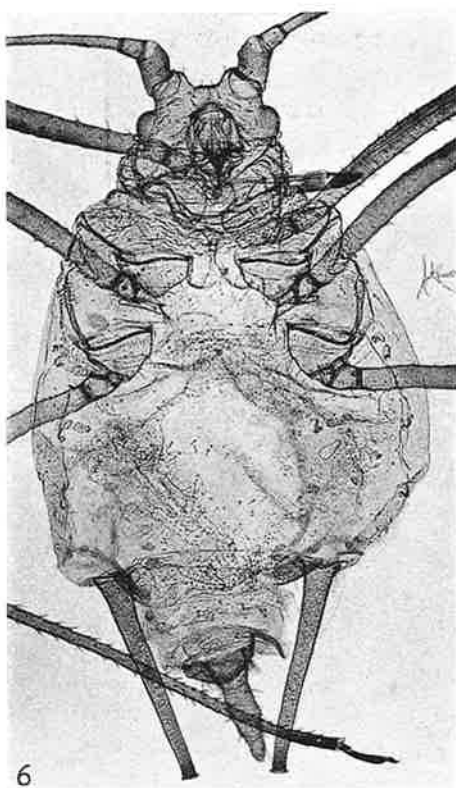
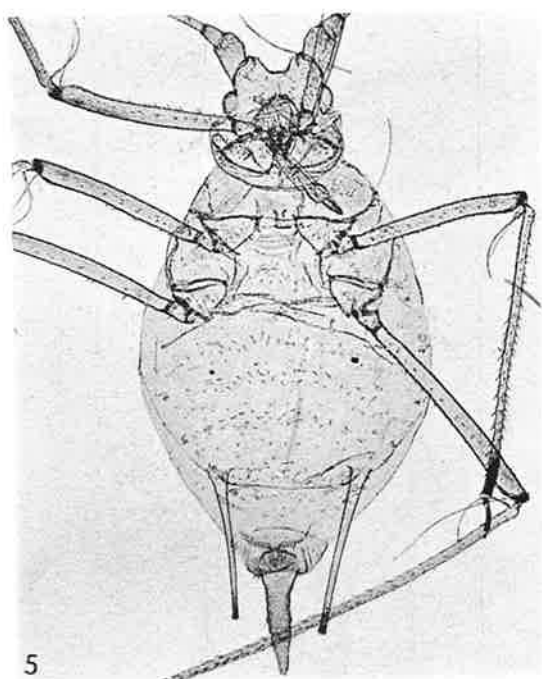
PLATE XVII

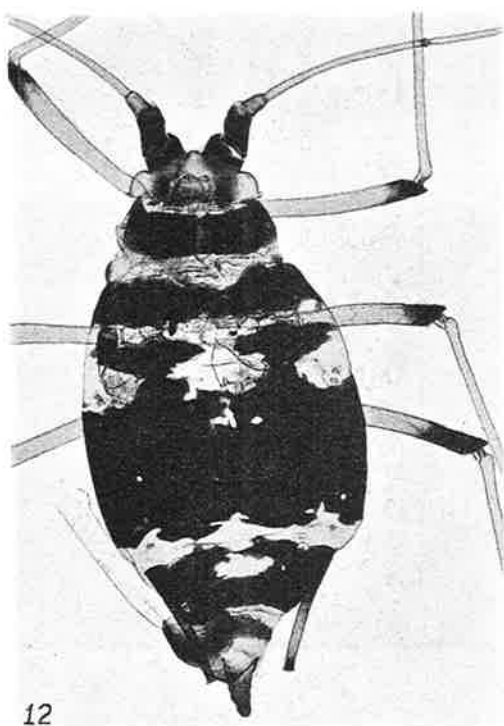
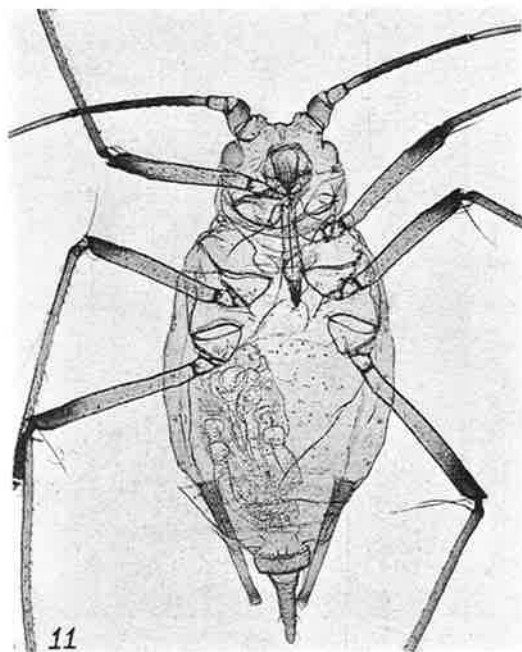
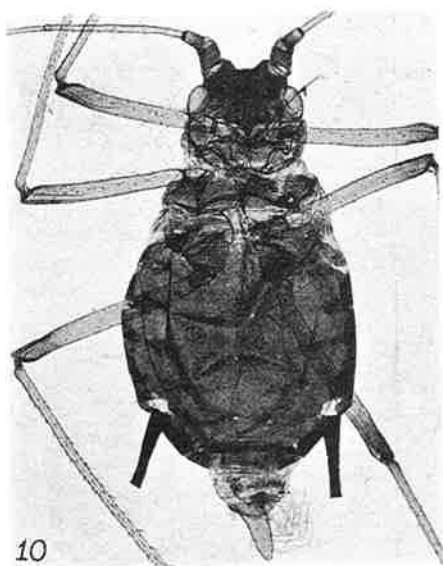
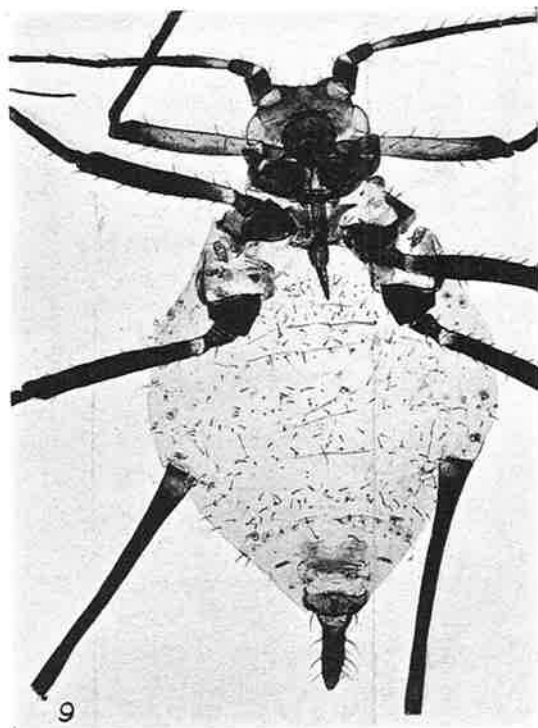
- Fig. 22. *Metopolophium friscum* nov. spec., ovip. fem., $\times 32$.
Fig. 23. *Metopolophium tenerum* nov. spec., ovip. fem., $\times 33$.
Fig. 24. *Aulacorthum* (*Neomyzus*) *circumflexus* (Buckt.), apt. viv. fem.
and larvae on tulip leaf, $\times 8\frac{1}{2}$.

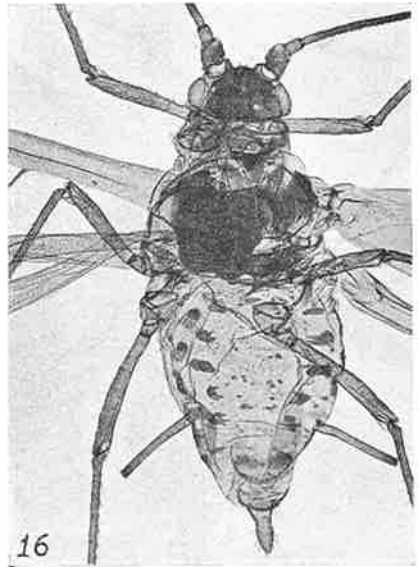
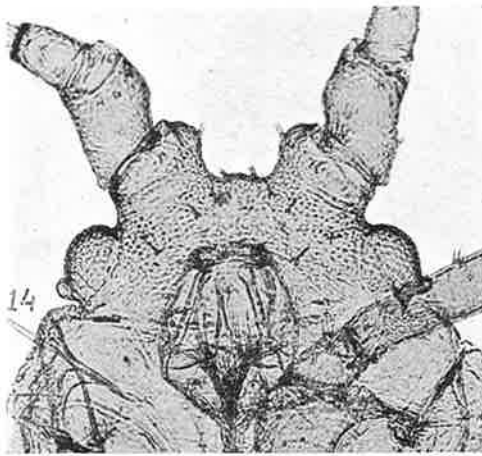
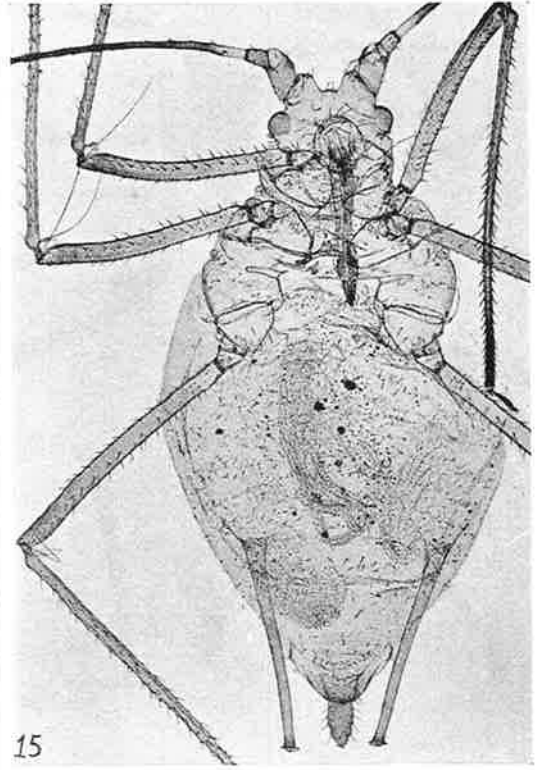
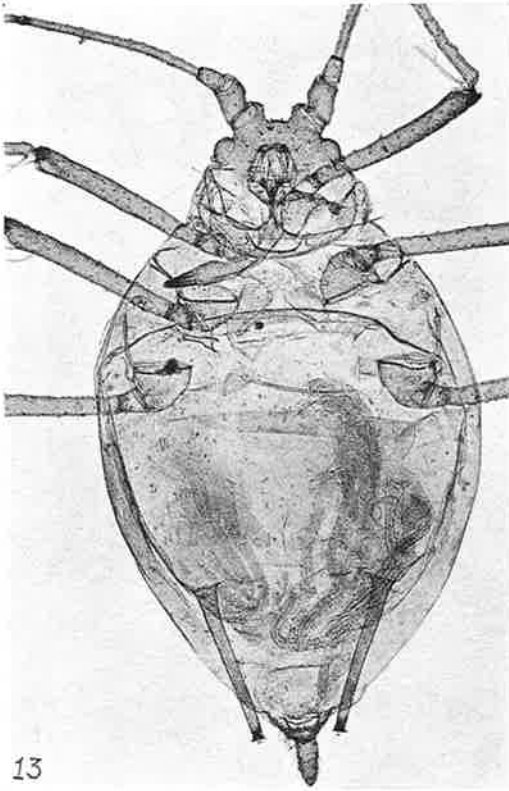
PLATE XVIII

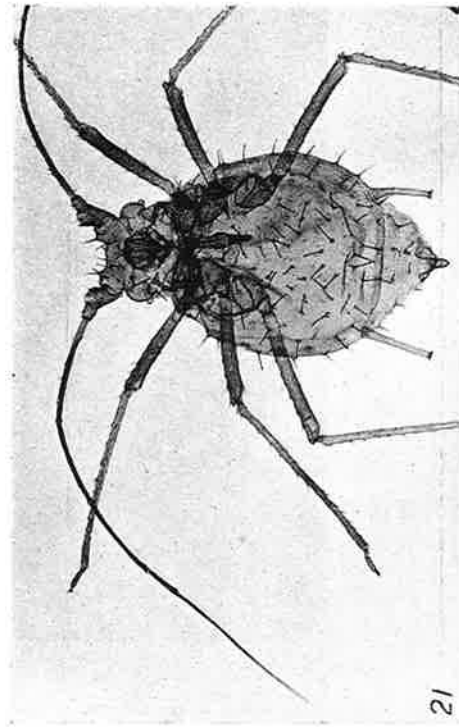
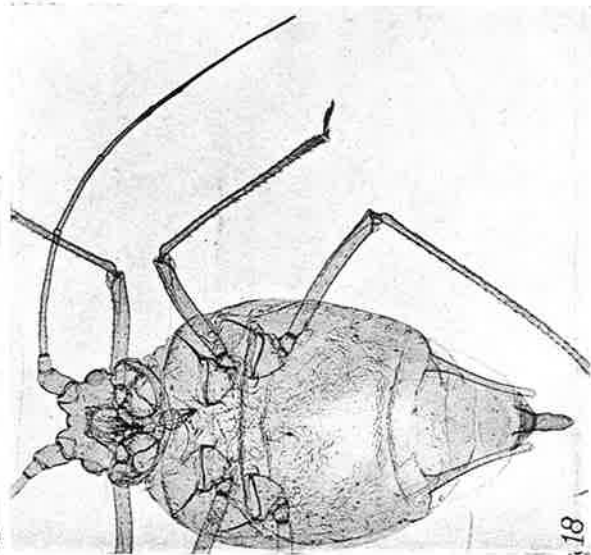
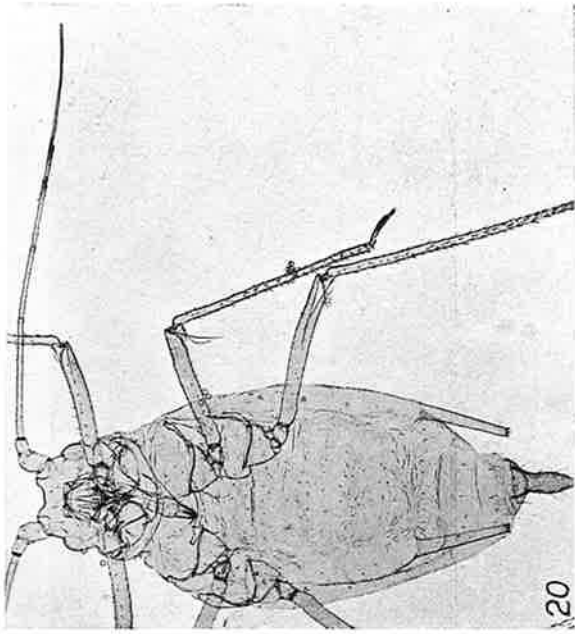
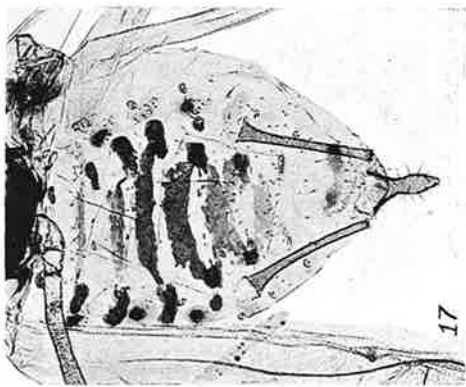
- Fig. 25. *Silenobium schusteri* Börner, apt. viv. fem., $\times 34$.
Fig. 26. *Anthracosiphon hertae* nov. spec., apt. viv. fem., $\times 25$.
Fig. 27. *Subacyrtosiphon cryptobium* nov. spec., apt. viv. fem., $\times 30$.

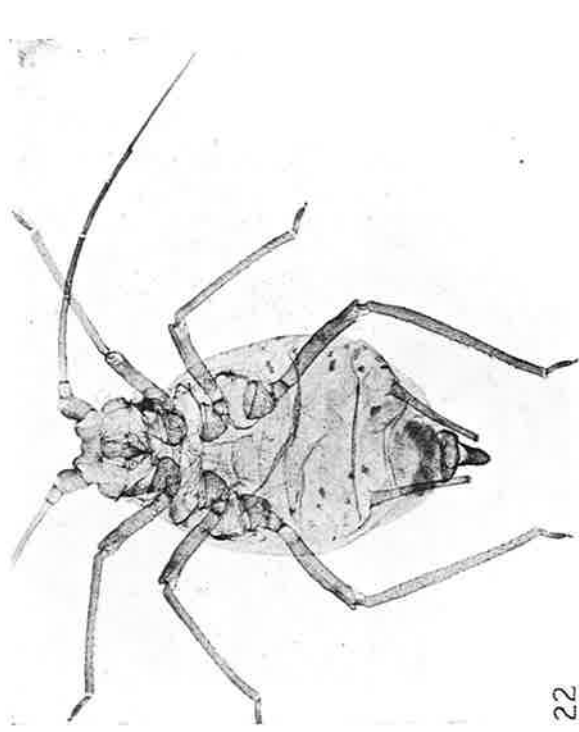




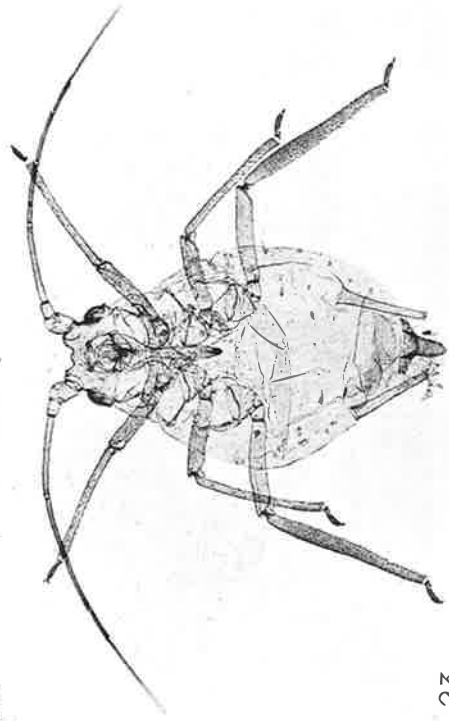




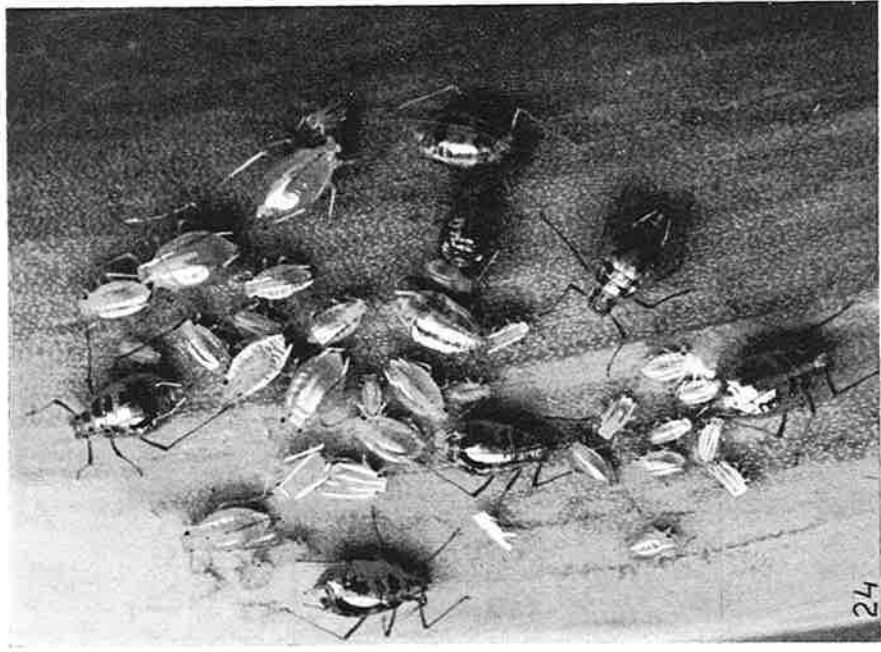




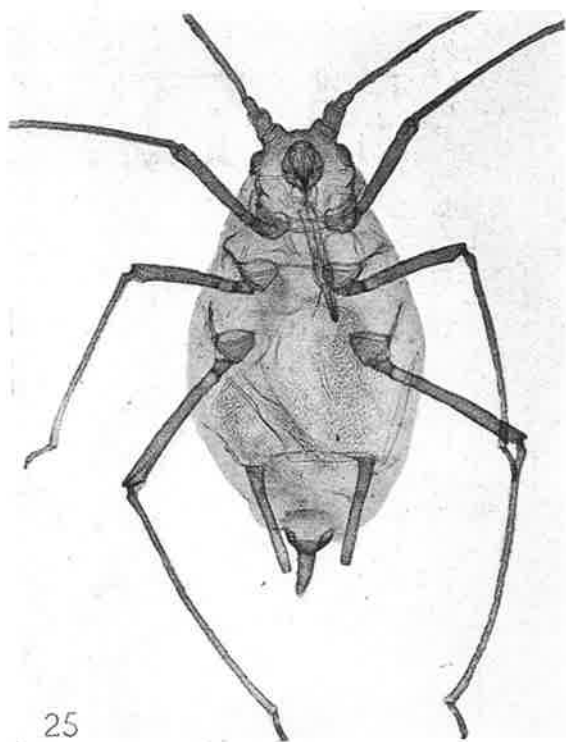
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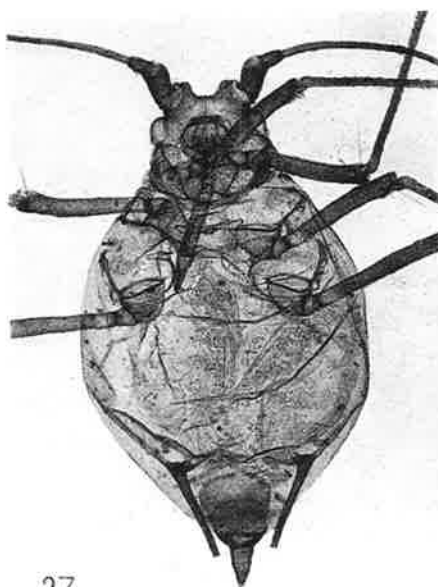
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