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Aphidological Notes. V-X¹. (*Homoptera*, *Aphidoidea*)

[With 17 text-figures]

V

The identity of *Pentaphis pawlowae* MORDVILKO, 1901

Pentaphis pawlowae was generally considered as being a synonym of *Forda marginata* KOCH, 1857 (SZELEGIEWICZ 1968, EASTOP, HILLE RIS LAMBERS 1976). It seems that no authority in aphids have consulted the original description which is written in Russian and clearly contradicts such a synonymy. MORDVILKO, who was very uncertain as to the specific differences in *Forda*, has changed many times his view and later (MORDVILKO 1921, 1935) identified *P. pawlowae* with *Forda marginata* MORDVILKO nec KOCH. In MORDVILKO's collection in Leningrad there is a slide from Warsaw with a label bearing a double inscription: "*Forda marginata* MORDV." in ink, and "*pawlowae*" in pencil, both in MORDVILKO's handwriting. The apterous specimens on this slide correspond both with the description of *P. pawlowae* and with that of *marginata* sensu MORDVILKO, but they are not types of *P. pawlowae*. MORDVILKO stated clearly in his description of *pawlowae* that this species was not found in Warsaw but in the vicinity of Warsaw on the roots of *Bromus mollis*, late in Mai. The types of *Pentaphis pawlowae* are probably lost.

The original description, however, especially that of the alate morph, leave no room for doubt that the described species is identical with *Forda dactylidis* BÖRNER, 1950. MORDVILKO (1901:83) write that the alata of *P. pawlowae*

¹ Cf. Ann.: Zool., Warszawa, 13, 1959: 191-219.

differs from *P. trivialis* PASS. "by more numerous secondary rhinaria on 3rd antennal segment (about 40 in *pawlowae* and only 19–23 in *trivialis*)". The host plant of *pawlowae* does not contradict the postulated synonymy as also ZWÖLFER (1958) found *Forda dactylidis* on the roots of *Bromus erectus*. Therefore I am of the opinion that *Forda pawlowae* (MORDVILKO, 1901) is the oldest available and valid name for the species found frequently on the roots of *Dactylis glomerata* and less frequently on *Bromus* spp. The resulting synonymy is as follows:

Forda pawlowae (MORDVILKO, 1901).

Synonyms: *Pentaphis pawlowae* MORDVILKO, 1901.

Forda marginata: MORDVILKO 1921 nec KOCH, 1857.

Forda dactylidis BÖRNER, 1950 **syn. nov.**

Forda mordvilko BÖRNER, 1950 **syn. nov.**

Forda sensoriata BÖRNER, 1950 **syn. nov.**

VI

Redescription of *Tactilotrama antennata* (MORDVILKO, 1935)

Trama antennata was described by MORDVILKO very superficially in a key to the species of the genus *Trama* VON HEYD. The original material was not collected by MORDVILKO himself but delivered by KOZHANCHIKOV who has found this species in Dushanbe (Tadjikistan) on the roots of *Rumex* sp., a very unusual host plant for a *Trama*. Later BÖRNER (1952) erected for *T. antennata* the subgenus *Tactilotrama* within the genus *Protrama* BAKER. After a revision of the type material of *T. antennata* I came to the conclusion that *Tactilotrama* has nothing to do with *Protrama* and the subtribe *Protramina* but represented a separate genus in the subtribe *Tramina*.

The Leningrad collection contains 2 slides labeled: "*Trama radicis* K.?, roots of *Rumex* sp., Dushanbe, A. KOZHANCHIKOV, no. 6638" and "*Trama* sp. (*radicis*?), roots of *Rumex* sp., Dushanbe, Turkestan, 12.IV.1928, A. KOZHANCHIKOV, no. 6725" both in MORDVILKO's handwriting. The later slide bears an additional label (not in MORDVILKO's handwriting): "*Neotrama antennata* MORDV., typus". These slides contain 3 adult apterae and 4 larvae from which the following short description has been made.

Tactilotrama antennata (MORDVILKO, 1935)

Apterous viviparous female

Morphological characters. Body 3.46–3.64 mm long, membraneous, with dark perisiphonal sclerites on tergite VI and a transverse bar on tergite VIII. Dorsal hairs bristle-like, the longest spinal ones on tergite III about

0.08–0.10 mm and 1.6 times as long as the basal diameter of 3rd antennal segment: VIIIth tergite with about 40 hairs which are 0.08–0.13 mm long. Head with a longitudinal suture and with triommatidion only, densely covered with 0.06 mm long hairs. Antennae 6-segmented, 0.64–0.67 of body length, without secondary rhinaria. Primary rhinaria without rim, about 0.07 mm in diameter, longer than the processus terminalis which bears 7 short hairs. The primary rhinarium on last antennal segment with 6 accessory rhinaria of which 4 are placed above and 2 below the primary rhinarium. Antennal hairs long, 0.06–0.08 mm and 1.5–2 times as long as the basal diameter of 3rd antennal segment. Rostrum about 1.92 mm long with distinctly visible first segment: ultimate rostral segment 0.30–0.32 mm long, about as long as antennal segment IV, bearing 28–35 subsidiary hairs. Legs very long, hind femur 1.2–1.4 mm, hind tibia 1.7–1.8 mm, and hind tarsal segment II 1.0–1.2 mm long and 0.6–0.66 times as long as hind tibia. Hairs on femora about 0.07 mm long: hind tibiae with numerous short (0.08 mm long) spiny hairs and less numerous very long (0.17 mm) fine tactile hairs. Siphunculi on cushion-like, broad cones (0.25–30 mm in diameter) with small orifices (0.05–0.07 mm in diameter). Cauda broadly rounded, hairs not visible. Other characters not visible.

Colour in life unknown but probably whitish.

Measurements in mm:

No	Bo- dy	Ant.	Antennal segment:				Last ros. seg.	Hind tibia	Hind t. II	Ø of siph.
			III	IV	V	VI				
1	3.57	2.34	0.86	0.30	0.59	0.25+0.05	0.32	2.88	1.15	0.30
		2.40	0.90	0.32	0.61	0.25+0.05		?	?	0.29
2	3.64	2.43	0.86	0.34	0.61	0.26+0.06	0.31	1.86	1.17	0.25
		2.38	0.86	0.32	0.59	0.25+0.05		1.78	1.18	0.26
3	3.56	2.30	0.82	0.26	0.54	0.24+0.04	0.30	1.79	1.10	0.25
		?	?	?	?	?		1.77	1.08	0.30

VII

On *Lachnus piceicola* var. *viridescens* CHOLODKOVSKY, 1898

There are 4 original slides of *Lachnus piceicola* in the collection of the Zoological Institute in Leningrad labeled: "*Lachnus piceicola* m., Merreküll 1895/6". These contain 5 alatae and 7 apterae viviparous females. The alate specimens and most of the apterae correspond well with the description of *Lachnus piceicola* CHOLODKOVSKY, 1896 which is without doubt identical with *Cinara pili-cornis* (HARTIG, 1841). Some apterae correspond with CHOLODKOVSKY's description of his var. *viridescens* and are specifically distinct from *C. pilicornis* (HTG.)

but not from *Cinara stroyani* EASTOP, 1972. Therefore I am of the opinion that *C. stroyani* is a synonym of *Cinara viridescens* (CHOL.). This resulted in the following synonymy:

Cinara viridescens (CHOLODKOVSKY, 1898) **stat. nov.**

Synonyms: *Lachnu spicicicola* var. *viridescens* CHOLODKOVSKY, 1898.

Cinara cistata auct. nec BUCKTON, 1881.

Cinaropsis cistata var. *stroyani* PAŠEK, 1954.

Cinara stroyani ESATOP, 1972, **syn. nov.**

VIII

The European species of the genus *Glyphina* KOCH

The genus *Glyphina* KOCH included five described species, all of which are little known and of uncertain status. Two species are recorded from Europe but their specific distinctness has been often questioned. Both species were revived recently by HEIE (1980) who stated that "they seem to be different only with regard to host plant affinity, and not morphologically" and that "further studies are needed to show if *schränkiana* is conspecific with *betulae* or if they represent two good species restricted to *Alnus* and *Betula*".

This state of our knowledge has stimulated me to examine my material of this genus from *Alnus* and *Betula*. The examination has showed that two morphologically different species are involved, viz. *Glyphina betulae* (LINNAEUS, 1758) which lives only on *Betula* spp. and *G. schränkiana* BÖRNER, 1950 which lives on both *Alnus* spp. and *Betula pubescens*. It is evident that the hitherto existing uncertainty about the European species was caused by the unfounded supposition that each species is confined to a different plant genus. This circumstance may also explain the discrepancy about the chromosome number in European *Glyphina* noted by BLACKMAN (1980).

Key to European species of *Glyphina* KOCH

1. Apterous viviparous females 2
- Alate viviparous females 3
2. In life dark green to almost blackish, young larvae green. Cuticula (Fig. 1) densely covered with distinct small warts. Dorsal hairs sparse and rather short: abdominal tergites II-V with 26-34 hairs together (the marginal ones not included); the longest spinal hairs on abdominal tergite III 0.8-1.7 times as long as basal diameter of antennal segment III which bears 6-11 hairs of 0.04-0.05 mm in length (Fig. 2). Cauda with 5-7 hairs. On *Betula pendula* and *B. pubescens*.
 *Glyphina betulae* (L.)

- In life brown, young larvae pinkish brown. Cuticula (Fig. 3) covered with short wrinkles, sometimes forming a reticulation. Dorsal hairs more numerous and longer: abdominal tergites II-V with 35-57 hairs together, the longest spinal hairs on tergite III 1.7-2.6 times as long as the basal diameter of antennal segment III which bears 12-23 hairs (Fig. 4) of 0.05-0.07 mm in length. Cauda with 7-10 (12) hairs. On *Alnus* spp. and *Betula pubescens*.
 *Glyphina schrankiana* BÖRN.
3. Antennal segment III with 8-12 hairs and 3-5 secondary rhinaria. Cauda with 6-8 hairs.
 *Glyphina betulae* (L.)
- Antennal segment III with 16-25 hairs and 5-7 secondary rhinaria. Cauda with 8-10 hairs.
 *Glyphina schrankiana* BÖRN.

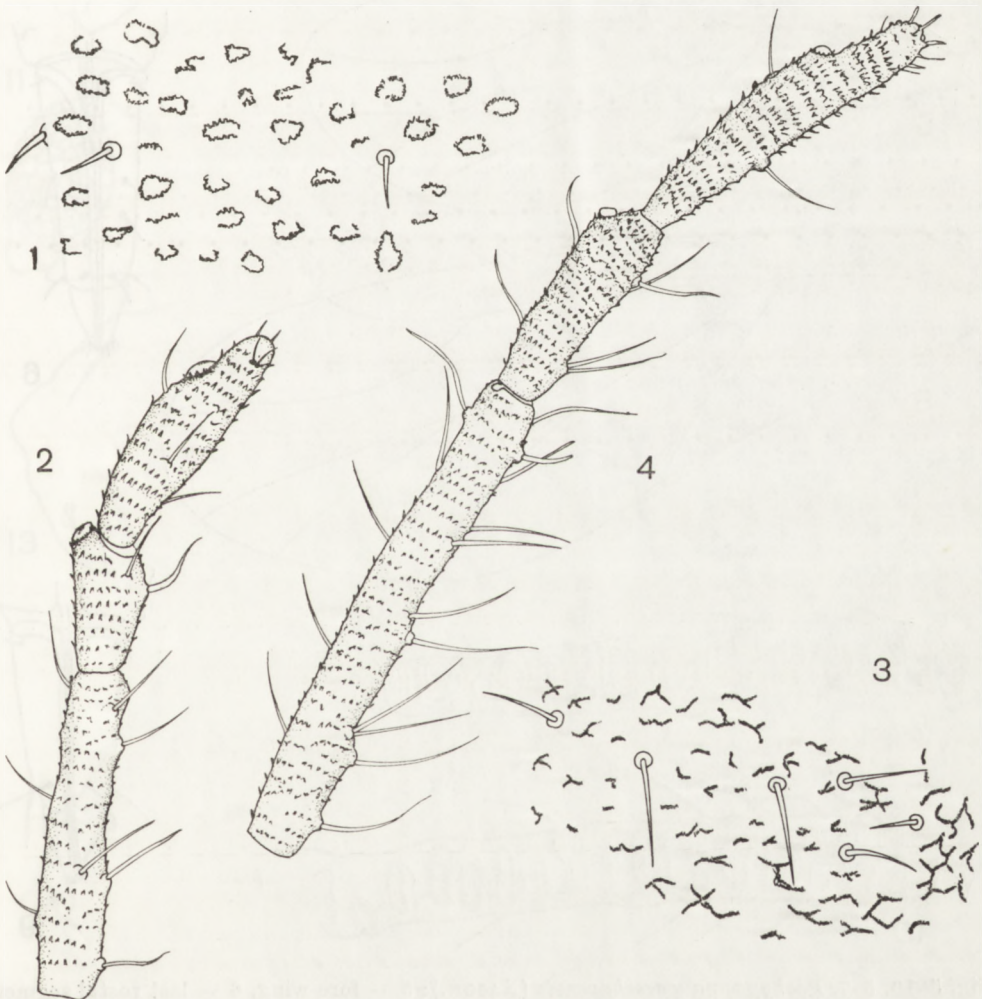


Fig. 1-4. 1-2. *Glyphina betulae* (L.): 1 - sculpture of dorsal cuticula, 2 - antenna; 3-4. *Glyphina schrankiana* BÖRN.: 3 - sculpture of dorsal cuticula, 4 - antenna.

IX

Pachypappa marsupialis KOCH, 1856

The species seems to be very local and rare. Till now it was found only in West and East Germany, Austria, Poland, Estonia, Romania and Portugal (only once or few times in each of those countries). There exists no modern description of this species. Such characters of *P. marsupialis* as the hairless membrane of fore wing, distinctly delimited wax gland plates on abdomen, few hairs on anterior part of genital plate and the secondary rhinaria with dot-

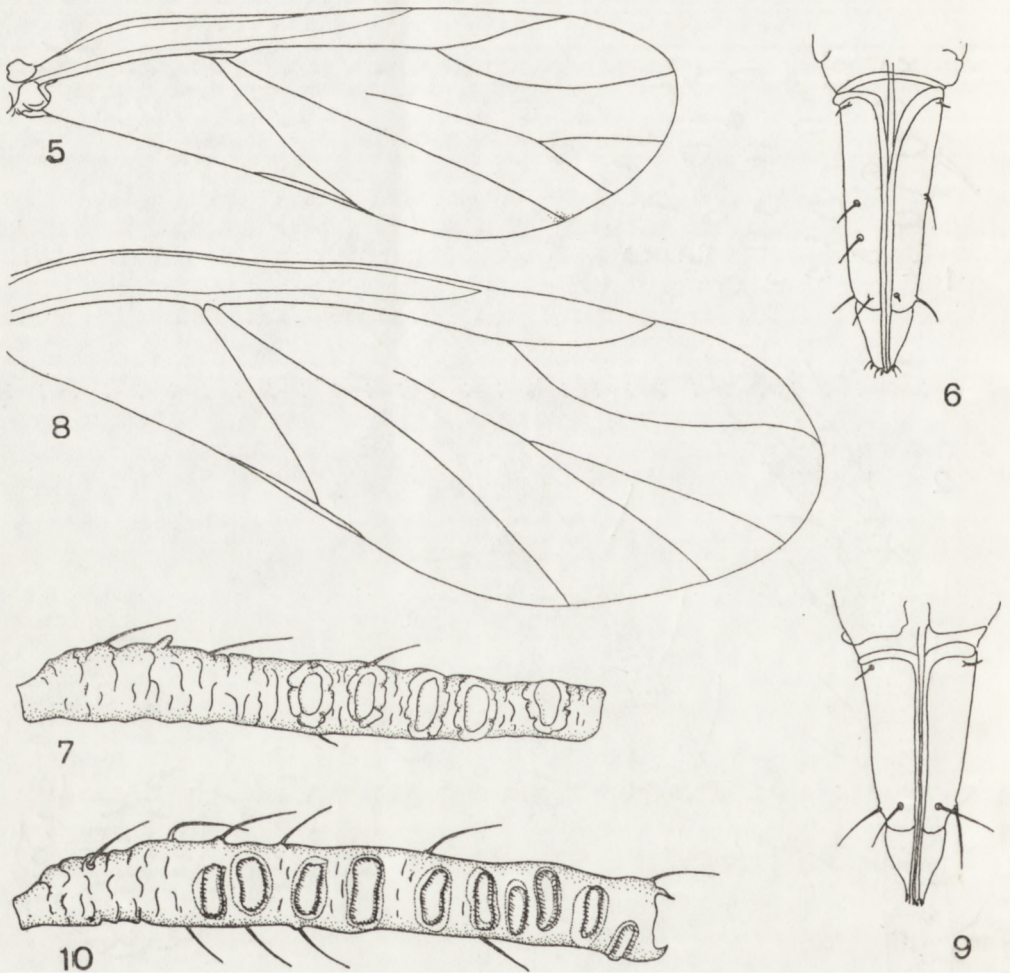


Fig. 5-10. 5-7. *Pachypappa warschavensis* (NASON.): 5 - fore wing, 6 - last rostral segment, 7 - 3rd antennal segment; 8-10. *Pachypappa marsupialis* KOCH: 8 - fore wing, 9 - last rostral segment, 10 - 3rd antennal segment.

ted borders places the species close to *P. tremulae* (L.) and *P. warschavensis* (NASONOV). The fundatrigeniae of all three species can be distinguished by means of the following key:

1. Media of fore wing (Fig. 5) with very short fork. Ultimate rostral segment (Fig. 6) 0.66-0.75 times as long as hind tarsal segment II, with 2 or 3 subsidiary hairs. Secondary rhinaria (Fig. 7) with distinct broad rim, not dotted, and present also on antennal segment V; segment III with 3-7 secondary

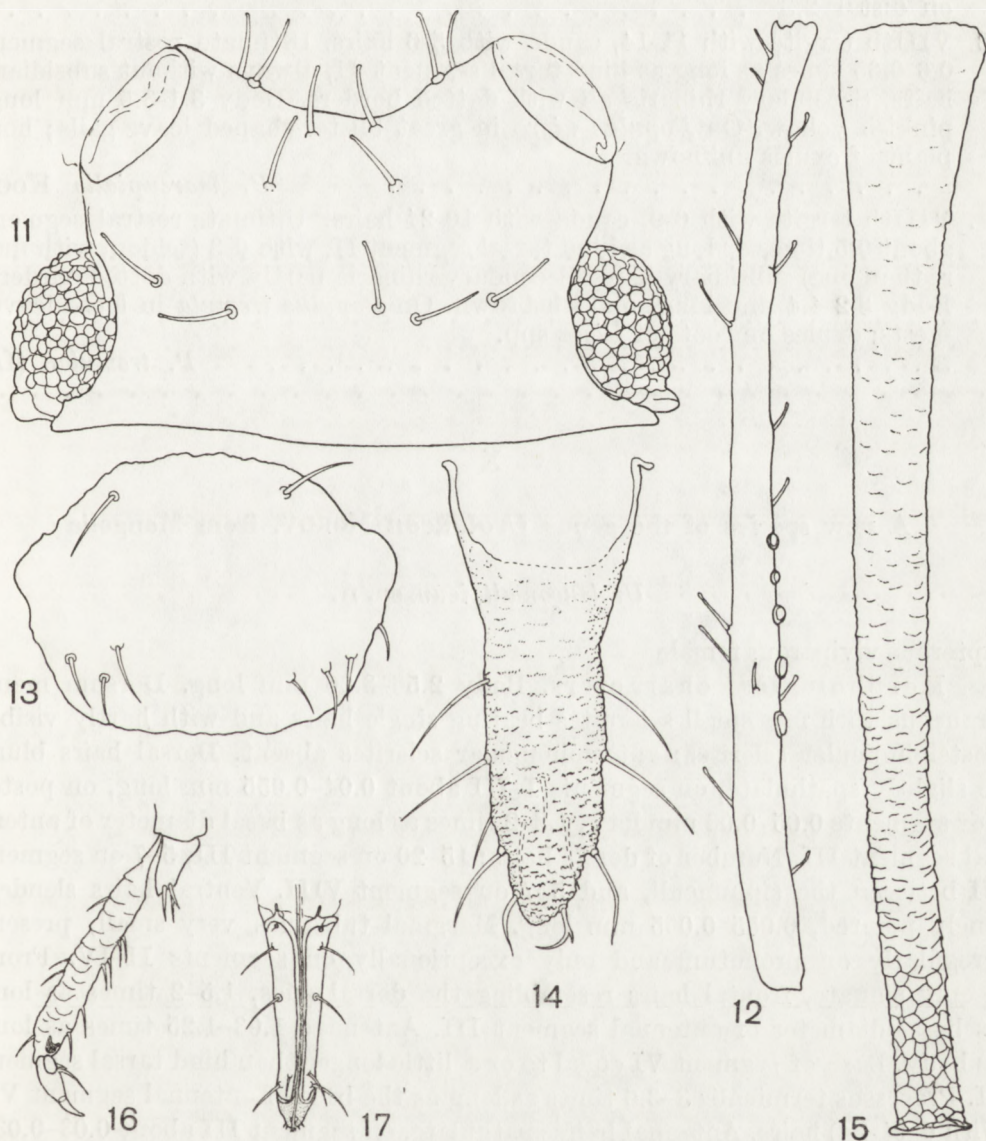


Fig. 11-17. *Uroleucon altaicum* sp. n.: 11 - head, 12 - 3rd antennal segment, 13 - genital plate, 14 - cauda, 15 - siphunculus, 16 - hind tarsus, 17 - last rostral segment.

rhinaria placed in distal half. VIIIth abdominal tergite with 6-9, cauda with 7-11 hairs. Body 3.0-3.2 mm long, yellowish orange. On *Populus alba* and *P. × canescens* in loose leave-nests; exules on roots of *Salix caprea*.

..... *P. warschavensis* (NASON.)

- Media of fore wing (Fig. 8) with long fork. Ultimate rostral segment (Fig. 9) 0.5-0.65 times as long as hind tarsal segment II, normally without subsidiary hairs. Secondary rhinaria (Fig. 10) at least partly with dotted borders, and not present on segment V; segment III with 5-12 secondary rhinaria placed on distal 2/3 2

2. VIIIth tergite with 11-14, cauda with 5-6 hairs. Ultimate rostral segment 0.6-0.65 times as long as hind tarsal segment II, always without subsidiary hairs. Secondary rhinaria all with dotted borders. Body 3.1-3.5 mm long, pinkish yellow. On *Populus nigra* in great blister-shaped leave-galls; host plant of exules unknown.

..... *P. marsupialis* KOCH

- VIIIth tergite with 6-9, cauda with 10-24 hairs. Ultimate rostral segment about 0.5 times as long as hind tarsal segment II, with 0-3 (seldom with more than one) subsidiary hairs. Secondary rhinaria partly with dotted borders. Body 3.2-4.4 mm long, pinkish brown. On *Populus tremula* in loose leave-nests; exules on roots of *Picea* spp.

..... *P. tremulae* (L.)

X

A new species of the genus *Uroleucon* MORDV. from Mongolia

Uroleucon altaicum sp. n.

Apterous viviparous female

Morphological characters. Body 2.56-3.26 mm long. Dorsum membranous with few small scleroites bearing single hairs and with hardly visible postsiphuncular sclerites: antesiphuncular sclerites absent. Dorsal hairs blunt to slightly spathulate, on segments I-III about 0.04-0.055 mm long, on posterior segments 0.05-0.06 mm long, 1.3-2 times as long as basal diameter of antennal segment III. Number of dorsal hairs: 15-20 on segment III, 5-7 on segment VI between the siphunculi, and 5-7 on segment VIII. Ventral hairs slender, finely pointed, 0.055-0.065 mm long. Marginal tubercles very small, present irregularly on pronotum and only exceptionally on segments II-IV. Frons deeply sinuate, frontal hairs resembling the dorsal ones, 1.5-2 times as long as basal diameter of antennal segment III. Antennae 1.03-1.25 times as long as body. Base of segment VI equal to or a little longer than hind tarsal segment II. Processus terminalis 3-3.6 times as long as the base of antennal segment VI, with 6-9 (+4) hairs. Antennal hairs spathulate, on segment III about 0.03-0.035 mm long, 0.8-1 of the basal diameter of that segment. Secondary rhinaria 6-11, situated on basal half of segment III. Rostrum reaching to the hind coxae.

Ultimate rostral segment 0.16–0.18 mm long, 0.8–0.9 times as long as hind tarsal segment II, with 6 subsidiary hairs. Siphunculi 0.3–0.36 of the body length, 1.1–1.3 times as long as antennal segment III, and 2–2.5 times as long as cauda, reticulated over apical 0.12–0.19. Flange small but distinct. Cauda elongate tongue-shaped, constricted, bearing 14–21 hairs. Genital plate widely oval, with 2 or 3 long hairs on the disc and 9–15 shorter ones along the posterior margin. Legs slender, hind femora and hind tibiae 0.38–0.42 and 0.70–0.78 of the body length respectively. Hind tarsal segment II about 0.180–0.210 mm long. Ventral trochantal hair a little shorter than diameter of adjacent trochantro-femoral suture. Femoral hairs blunt, maximally 0.045 mm long, 1–1.5 times as long as basal diameter of antennal segment III. Tibial hairs 0.05–0.075 mm long, from slightly shorter than to as long as the middle diameter of hind tibia. First tarsal segment with 3,3,3 hairs.

Colour. In life pale, presumably green. In cleared specimens head brown with dark brown antennal tubercles, dorsal sclerites fuscous to pale brown, genital plate smoky. Antennae brown, segments III and IV with proximal 0.5–0.8 pale. Siphunculi basal pale, towards apex gradually becoming darker. Cauda pale. Legs dark brown on apical parts of femora and tibiae, and the tarsi; other parts of legs colourless.

Measurements in mm:

No	Body	Ant.	Antennal segments:				U. r.s.	H.t. s. II	Cau- da	Si- pho
			III	IV	V	VI				
1	2.83	3.48	0.83	0.74	0.63	0.25+0.75	0.17	0.21	0.44	0.98
		3.56	0.85	0.79	0.64	0.24+0.75		0.21		
2	2.60	3.17	0.71	0.64	0.54	0.24+0.76	0.17	0.20	0.36	0.85
		3.17	0.73	0.62	0.55	0.23+0.76		0.20		
3	2.94	3.05	0.73	0.64	0.52	0.20+0.68	0.18	0.21	0.45	0.91
		3.05	0.72	0.62	0.50	0.23+0.76		?		
4	2.60	3.04	0.78	0.62	0.49	0.20+0.70	0.17	0.19	0.37	0.86
		2.98	0.76	0.60	0.49	0.21+0.67		0.18		
5	2.64	3.24	0.72	0.68	0.54	0.22+0.80	0.17	0.19	0.38	0.90
		3.22	0.72	0.64	0.56	0.22+0.80		0.19		
6	3.23	3.34	0.85	0.68	0.59	0.23+0.71	0.18	?	0.50	1.04
		?	0.85	0.68	0.60	0.25+?		0.21		
7	2.91	3.29	0.76	0.68	0.57	0.23+0.78	0.17	0.19	0.42	0.90
		?	0.76	0.64	0.58	0.24+?		0.19		

Host plant: *Cichorium intybus* L.

Bionomy: Found on apical parts of the plant. Presumably holocyclical and monoecious.

Type material. Holotype (apterous viviparous female, slide no. 4871/apt. 1): Hovd (= Kobdo), Western Mongolia, Mongolian Altai, 14.VII.1977, *Cichorium intybus*, S. M. KLIMASZEWSKI col. Paratypes: Same data, 12 apt. viv. females.

Taxonomic notes. The new species occupied an intermediate position between the subgenera *Uroleucon* s. str and *Lambersius* OLIVE. Some of its characters, such as the body colour, shape of the ultimate rostral segment, and the presence of small marginal tubercles on pronotum place the new species in the subgenus *Lambersius*. Other characters, i.e. the small scleroites at the base of dorsal hairs, the hardly visible postsiphuncular sclerites, the shape of siphunculi, and the host plant suggest *Uroleucon* s. str. Such characters as the pale cauda and the first tarsal chaetotaxy are inconclusive. Therefore I place *U. altaicum* sp. n. tentatively in the subgenus *Uroleucon* s. str. As a representative of this subgenus the new species is easily separable from other known Palaearctic species by the following combination of characters: pale body colour with indistinct dorsal scleroites and postsiphuncular sclerites, 3 hairs on first tarsal segments, long siphunculi with small reticulated part, short ultimate rostral segment, small number of secondary rhinaria, and numerous caudal hairs.

LITERATURE

- BLACKMAN R. L. 1980. Chromosome numbers in the *Aphididae* and their taxonomic significance. *Systematic Entomology*, London, **5**: 7–25.
- BÖRNER C. 1952. Europae centralis Aphides. *Mitt. thür. bot. Ges.*, Weimar, Beiheft **3**, I–II, 484 pp.
- CHOLODKOVSKY N. 1898. Beiträge zu einer Monographie der Coniferen-Läuse. Theil II. Die Gattung *Lachnus* BURM. *Horae Soc. Ent. Ross. S.-Peterburg*, **31**: 603–674.
- EASTOP V. F., HILLE RIS LAMBERS D. 1976. *SURVEY of the World's Aphids*. The Hague, 586 pp.
- HEE O. P. 1980. The *Aphidoidea* (Hemiptera) of Fennoscandia and Denmark. I. Fauna Entom. Scand., Klampenborg, **9**: 1–236.
- HOLMAN J. Aphids of the genus *Uroleucon* from Mongolia (*Homoptera, Aphididae*). *Acta ent. bohemoslav.*, Praha, **72**: 171–183.
- MORDVILKO A. 1901. Zur Biologie und Morphologie der Pflanzenläuse (Fam. *Aphididae* PASS.). *Horae Soc. ent. Ross.*, S.-Peterburg, **33**: 1–84.
- MORDVILKO A. K. 1921. Les pucerons des Graminées (*Aphidodea*). *Izv. Petrogr. obl. St. Zašč. Rast.*, Petrograd, **1**: 1–72.
- MORDVILKO A. 1935. Die Blattläuse mit unvollständigen Generationscyclus und ihre Entstehung. *Ergeb. Fortschr. Zool.*, Jena, **8**: 36–328.
- SZELIEGIEWICZ H. 1968. *Mszyce Aphidodea*. *Catalogus faunae Poloniae*. Warszawa, XXI, 4, 316 pp.
- ZWÖLFER H. 1958. Zur Systematik. Biologie und Ökologie unterirdisch lebender Aphiden (*Homoptera, Aphidoidea*). Teil III (*Fordinae*). *Z. ang. Ent.*, Hamburg u. Berlin, **42**: 129–172.

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STRESZCZENIE

[Tytuł: Notatki afidologiczne. V-X. (*Homoptera*, *Aphidoidea*)]

W piątej części notatek autor uzasadnia, że najstarszą i ważną nazwą dla gatunku znanego ostatnio pod nazwą *Forda dactylidis* BÖRNER, 1950 jest wprowadzona przez Mordvilkę nazwa *Forda pawlowae*.

W następnej części autor daje redeskrypcję gatunku *Tactilotrampa antennata* (MORDVILKO, 1953) i omawia jego pozycję systematyczną.

Siódma część notatek zawiera wyniki rewizji typów CHOŁODKOVSKYEGO. Autor udowadnia, że *Lachnus piceicola* CHOŁODKOVSKY, 1896 jest synonimem nazwy *Cinara pilicornis* (HARTIG, 1841), a jego odmiana var. *viridescens* CHOŁODKOVSKY, 1898 jest najstarszą i zarazem ważną nazwą dla gatunku znanego ostatnio jako *Cinara stroyani* EASTOP, 1972.

Część ósma notatek omawia europejskie gatunki rodzaju *Glyphina* KOCH i zawiera klucz do ich oznaczania na podstawie bezskrzydłych i uskrzydłych dzieworódek.

W dziewiątej części autor omawia stanowisko systematyczne mało znanego gatunku *Pachypappa marsupialis* KOCH, 1856 i daje klucz do oznaczania uskrzydłych dzieworódek pokolenia pierwotnego.

W końcowej części autor opisuje nowy gatunek z rodzaju *Uroleucon* MORDV. znaleziony w górach Ałtaju w zachodniej Mongolii na *Cichorium intybus*. Gatunek ten, *U. altaicum* sp. n., zajmuje przejściowe miejsce między podrodzajem *Uroleucon* s. str., a podrodzajem *Lambersius* OLIVE.

РЕЗЮМЕ

[Заглавие: Афидологические заметки. V-X. (*Homoptera*, *Aphidoidea*)]

В пятой части заметок автор доказывает, что наиболее старым и действительным названием для вида, известного в последнее время под названием *Forda dactylidis* BÖRNER, 1950, является название *Forda pawlowae*, введенное MORDVILKO.

В следующей части автор приводит переописание вида *Tactilotrampa antennata* (MORDVILKO, 1953) и обсуждает его систематическое положение.

В седьмой части содержатся результаты ревизии типов Холодковского. Автор обосновывает мнение, что *Lachnus piceicola* CHOŁODKOVSKY, 1896 является синонимом названия *Cinara pilicornis* (HARTIG, 1841), а его варриетет var. *viridescens* CHOŁODKOVSKY, 1898 является наиболее старым и одновременно действительным названием для вида, известного в последнее время как *Cinara stroyani* EASTOP, 1972.

В восьмой части обсеждены европейские виды из рода *Glyphina* KOCH и приведен их определитель, основанный на бескрылых и крылатых девственницах.

В девятой части автор представляет систематическое положение мало известного вида *Pachyrappa marsupialis* Кошн, 1858 и дает определитель крылатых девственниц, обитающих на первом прокормителе.

В заключительной части автор описывает новый вид из рода *Uroleucon* MORDV., найденный в горах Алтая в западной Монголии на *Cichorium intybus*. Этот вид, названный *U. altaicum* sp. n., занимает промежуточное положение между подродом *Uroleucon* s. str. и подродом *Lambersius* OLIVE.

Redaktor pracy — prof. dr J. Nast

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