

## Detailed description of oviparous females and males of *Tubaphis ranunculina* (Homoptera: Aphididae) with comments on the species distribution

## Подробное описание яйцекладущих самок и самцов *Tubaphis ranunculina* (Homoptera: Aphididae) с комментариями о распространении этого вида

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Detailed descriptions of oviparous females and males of *Tubaphis ranunculina* (Walker, 1852) (Homoptera: Aphididae) are given. The most complete data on the distribution of this species are overviewed. *Acyrtosiphon (Microlophium) ranunculi* Mordvilko, 1914 is considered as a **new subjective synonym** of *Acyrtosiphon malvae* (Mosley, 1841).

В статье дается подробное морфологическое описание яйцекладущих самок и самцов *Tubaphis ranunculina* (Walker, 1852) (Homoptera: Aphididae) и приводятся самые полные данные по распространению этого вида. *Acyrtosiphon (Microlophium) ranunculi* Мордвилко, 1914 рассматривается как **новый субъективный синоним** *Acyrtosiphon malvae* (Mosley, 1841).

**Key words:** aphids, geographical distribution, host plants, life cycle, *Ranunculus*, *Tubaphis ranunculina*

**Ключевые слова:** тли, географическое распространение, растения-хозяева, жизненный цикл, *Ranunculus*, *Tubaphis ranunculina*

*Tubaphis ranunculina* was described as *Aphis ranunculina* by Francis Walker in 1852. The original article (Walker, 1852) contains short descriptions of apterous viviparous females. According to Doncaster (1961) the type material of the species was collected 23 August 1847 from *Ranunculus* sp. in Southgate (United Kingdom). Del Guercio collected alate and apterous viviparous females from the underside of

the leaves and stem of *Ranunculus velutinus* Ten. in April and May 1898 in le Cascine di Firenze (Italy) and described as a new species, *Myzus ranunculis*, on page 148 in the key or *Myzus ranunculi* on page 151 (Del Guercio, 1900). Schouteden (1906) recorded *Myzus ranunculi* Del Guercio for Belgium from *Ranunculus acris* L. and provided a brief description of the collected specimens. Later, Börner (1952) established that *Myzus ranunculi* Del Guercio should be considered as a synonym of *Tuba-*

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*phis ranunculina* (Walker, 1852). Theobald (1913) referred *Aphis ranunculina* Walker to the genus *Macrosiphum* Passerini, 1860 with a note that the material was collected in May in Guildford (Southeast England) from *Ranunculus* spp. His description and drawing included reticulations on the siphunculi, indicating that he was not actually working with Walker's species, which does not have such reticulations. Subsequently, Theobald (1926) assigned the species to the genus *Myzus*, omitting any mention of the reticulations on the siphunculi of apterous and alate females.

Mordvilko (1914) in fact described a new species, *Acyrthosiphon (Microlophium) ranunculi* in the key of genus *Acyrthosiphon* Mordvilko, 1914, but amended it in his "Additions and corrections", using the other authorship: *Acyrthosiphon ranunculinum* (Walker). Five years later, in the second part of the his book, Mordvilko (1919) gave a detailed description of an apterous female and a short description of an oviparous female (one specimen) and an apterous male (two specimens) of the species, which he considered to be *Acyrthosiphon ranunculinum* (Walker). Mordvilko's material included apterous viviparous females collected from *Ranunculus* sp. in Estonia, and viviparae together with oviparous females and apterous males from unknown plant in the Faroe Islands. Hille Ris Lambers (1949) supposed that both Mordvilko's *Acyrthosiphon (Microlophium) ranunculi* and *Acyrthosiphon ranunculinum* (Walker) were in reality *Aulacorthum solani* (Kaltenbach, 1843). However, our study of the Mordvilko's slides, preserved in the collection of the Zoological Institute of the Russian Academy of Sciences (St Petersburg) (ZIN RAS), reveals that these are *Acyrthosiphon malvae* (Mosley, 1841) which is known to have apterous males (Prior & Stroyan, 1964). So, *Acyrthosiphon (Microlophium) ranunculi* Mordvilko, 1914 is a **new subjective synonym** of *Acyrthosiphon malvae* (Mosley, 1841).

Hille Ris Lambers (1947) briefly described a new monotypic genus, *Tubaphis*, with a type species, *Aphis ranunculina* Walker, 1852. According to the original comparison, the genus is close to *Aulacorthum* Mordvilko, 1914, but differs in the form of a cauda, by the absence of secondary rhinaria on the 3rd antennal segment of apterous females, by the distribution of secondary rhinaria on 3rd and 4th antennal segments of alate females, and by a lower value of the ratio of the processus terminalis to the base of last antennal segment. Stroyan (1954) considered that the differences between *Tubaphis* and *Myzus* Passerini, 1860 were not great and considered it a subgenus of *Myzus*. This opinion was supported by a number of other specialists who subsequently used the species name *Myzus (Tubaphis) ranunculina*.

Remaudière (1951) collected oviparous females 20 October 1948 near Paris (France) on *Ranunculus* sp. and presented the fact that *T. ranunculina* is monoecious and holocyclic. One year later, Börner (1952) also indicated that *T. ranunculina* is monoecious and holocyclic, but without any explanations. Börner & Heinze (1957) reported that males of *T. ranunculina* are apterous, but up to now morphological description of oviparous females and males have been made only in a few lines by Blackman (2010).

## DISTRIBUTION OF *TUBAPHIS RANUNCULINA*

*T. ranunculina* is widespread in Eurasia, but its distribution has been studied most extensively in the Europe. It was registered from the following territories:

**United Kingdom:** The species is known from many counties of England from *Ranunculus repens* L. and *Ranunculus* sp. (Walker, 1852 [as *Aphis ranunculina*]; Theobald, 1913 [as *Macrosiphum ranunculus* Walker], 1926 [as *Myzus ranunculus* Walker]; Hancock, 1978; Wood-Baker, 1980), from Scotland on *R. acris*, *R. repens*, *Ranunculus* sp. and from trap (Theobald, 1926 [as *Myzus*

*ranunculus* Walker]; Shaw, 1952, 1964; Stroyan, 1977), from Wales (Blackman, 2010) and from the Island of Guernsey on *Ranunculus* sp. (Eastop, 1953). **Ireland:** *T. ranunculina* was noted on *R. repens* and apparently accidentally, on *Potentilla ?erecta* Uspenski ex Ledeb. in the South-West of Ireland (County Cork) (Carter et al., 1987), and later was captured there in Moericke-traps (Kennedy & Connery, 2000). **Portugal–Madeira:** The species was recorded in Madeira Island on *R. repens* (Ilharco 1974, 1984; Pita & Ilharco, 2004). **Spain:** Aphids were collected in the provinces of Cantabria on *R. acris* (Nieto Nafría, 1976 as *Ranunculus acer* auct.), Zamora on *Ranunculus* sp. (Mier Durante, 1978) and León on *R. repens* (Tizado Morales, 1990), as well as caught using Moericke-traps and suction traps in the provinces of León and Salamanca (Mazé González, Suáñez Fidalgo & Mier Durante, 1985; Seco Fernández et al., 1989; Seco Fernández et al., 1991). **France:** Remaudière (1951) provided the data that the species was collected 20 October 1948 on *R. acris* in the region Île-de-France and he pointed out that oviparous females have been present in the colony. Also, a lot of specimens of the species collected from *R. acris* and *Ranunculus* sp. in the regions of Alsace, Aquitaine, Brittany, Île-de-France, Limousin, Lorraine, Lower Normandy, Pays de la Loire, Provence-Alpes-Côte d'Azur and are stored in the Muséum national d'Histoire naturelle (MNHN) (Paris, France). Alate specimens were collected in France also from *Carpinus* sp., *Melandryum album* (Mill.) Garcke and *Scabiosa* sp., but it seems these are incidental hosts. **Belgium:** Schouteden (1906) referred the species in the catalogue of aphids of Belgium as *Myzus ranunculi* Del Guercio. The slide with single alate viviparous female from the province of Namur (the region of Wallonia) is stored in MNHN. **Netherlands:** The only evidence of the presence of this species in the Netherlands is given by Ponsen (1991). Aphids were collected 22 September 1982 from *R. repens* in Opheusden (province Gelderland). **Italy:** The species

was collected in northern Italy (regions Trentino-Alto Adige/Südtirol, Tuscany, Emilia Romagna) on *R. velutinus*, *R. repens* and *Ranunculus* sp. (Del Guercio, 1900 [as *Myzus ranunculi* sp. n.]; Barbagallo & Patti, 1994; Barbagallo et al., 1994, 2011), as well as in the south (Barbagallo et al., 1994) and in Sardinia (Barbagallo, 1985). **Switzerland:** The species was observed on *R. acris* in the canton of Zürich and the canton of Zug (Lampel & Meier, 2007). **Austria:** Aphids were collected on *R. acris* in southern Austria (state Carinthia) (Franz, 1959, as *R. acer*). **Germany:** Börner (1952), Börner & Heinze (1957) and Heinze (1961) give some data about *T. ranunculina*, but nowhere indicated that the species was found in Germany. Börner (1952) and Heinze (1961) focused on the aphids of Central Europe without indicating of their exact distribution, and Börner & Heinze (1957) indicated a distribution of the species simply as 'Europe'. Börner (1952) referred to the paper of Ross & Hedicke (1927), suggesting that '*Rhopalosiphoninus dianthi* Schrank' from *Ranunculus* is in fact *T. ranunculina*. However, Ross & Hedicke (1927) also did not indicate this species for Germany. Thus, the note of Gleiss (1967) on finding of this species on *R. repens* in Schleswig-Holstein is the first and still the only record for Germany. **Norway:** All samples of *T. ranunculina* in this country were taken in southern Norway. Aphids were collected from *R. acris* in the Hordaland County and caught in traps in counties Akershus, Rogaland and Hordaland (Tambs-Lyche, 1970; Heie, 1994). **Sweden:** Wahlgren (1935) recorded *Myzus ranunculimus* Walker from *R. repens* in Stockholm County, but in the same time pointed the greenish colour of collected apterae in contrast to the yellow colour reported by Theobald (1926). More importantly, he wrote about the presence of secondary rhinaria on the antennae of apterous viviparous females. Probably Wahlgren (1935) had a different species of aphids living on *Ranunculus*. In Sweden *T. ranunculina* was recorded in the provinces of Skåne,

Smaland, Öland, Narke, Uppland, Värmland, Medelpad, Jamtland, Västerbotten, Norrbotten (Ossiannilsson, 1959 [as *Myzus* (*Tubaphis*) *ranunculina* (Walker)], 1964; Heie, 1994; Bygebjerg, 2012). **Denmark:** According to Heie (1964, 1971, 1994) the species is widespread in Denmark. **Finland:** *T. ranunculina* is recorded in 6 regions of Finland—Åland, Uusimaa, Southern Savonia, Ostrobothnia, Southern Ostrobothnia, Lapland (Heie, 1994; Albrecht, 2012). **Poland:** *T. ranunculina* was collected from *R. repens* in Warmian-Masurian Voivodeship (Huculak, 1965), Upper Silesia, Lublin Uppland, Western Beskidy Mountains (Osia-dacz and Hałaj, 2009) and also was caught by sweep nets and Moericke traps in Greater Poland Voivodeship (Borowiak-Sobkowiak et al., 2009). Szelegiewicz (1968) supposed that '*Rhopalosiphoninus dianthi* Schrank' in Szulczewski (1933) (Greater Poland Voivodeship), Urbański (1935) (Great Poland: Kujawy Lowland) and Szulczewski (1929) (Silesian Voivodeship) was in fact *T. ranunculina*. **Czech Republic:** *T. ranunculina* was recorded on *R. repens* in Prague (Holman, 1991). **Slovakia:** Holman (2009) recorded the species from *R. repens* without exact data about locality and date of the collection. **Hungary:** A few apterous viviparous females were collected in the autumn of 1965 on *R. repens* in southern Hungary (Baranya County) (Szelegiewicz, 1968). **Slovenia:** The species was collected in Upper Carniola on the border with Austria (Wurzen Pass) from unknown host plant (Eastop & Tanasijevic, 1966). **Albania:** The slide of one alate male (29 October 1968, in Korçë) is stored in MNHN collection. **Greece:** Tsitsipis et al. (2007) recorded, without exact date and locality data, that this species was caught in Greece using traps. **Crimea:** This species was collected from the lower side of leaves of *R. repens* in early September (Holman, 1961). **Belarus:** The species is widespread in Belarus and recorded on *R. repens* in Minsk, Gomel, Grodno, Mogilev, and Vitebsk Provinces (Buga & Stekolshchikov, 2012). **Latvia:** A slide containing one male

and five oviparous females from the vicinity of Cēsis (Cēsis Municipality) on *R. acris*, 19 September–15 October 1928 (apparently there were several samples which were then combined, or aphids was reared in culture), and the slide with one male and two oviparous females found 19 October 1931 in the same place, on *Ranunculus* sp., are stored in the collection of the ZIN RAS. **Russia:** The distribution of this species in Russia is poorly known. In 1954 in his Ph.D. dissertation Aizenberg gave description of genus *Ovatopsis* with a single species *Ovatopsis ranunculi* based on specimens collected in the vicinity of Moscow. Furthermore, this work was printed 'as a manuscript' and so, based on The International Code of Zoological Nomenclature, Articles 8.1.1 & 9.9, *Ovatopsis* is an unpublished name. Therefore Remaudière & Remaudière (1997) erroneously considered *Ovatopsis ranunculi* as a synonym of *Tubaphis ranunculina*. Shaposhnikov (1964) did not mention *Ovatopsis* in "Keys to the insects of the European part of the USSR", although he studied Aizenberg's (1954) dissertation. Regarding the distribution of *T. ranunculina*, Shaposhnikov (1964) indicated the centre of the European part of the USSR, which includes Moscow and the Moscow Province belong. This allows us to suppose that Shaposhnikov considered specimens collected by Aizenberg as *T. ranunculina* and did not note *Ovatopsis* due to the fact that the description of this genus had not been published. Holman (2009) also mentioned *T. ranunculina* from the centre of the European part of the former USSR and, most likely, he found it in the Moscow region where most of his material was collected. The indication by Shaposhnikov (1964) of the location of *T. ranunculina* in the North-West of the European part of the USSR undoubtedly refers to Estonia and was based on the above-mentioned error of Mordvilko (1919). An indication to a location in the South of the European part of the USSR refers to Crimea and was based on the data of Holman (1961). In the European part of Russia this species was collected by

A.A. Przhiboro by sweeping on 21 August 1993 in the Murmansk Region on the coast of the White Sea near Kandalaksha (estuary of the river Luven'ga). At the moment, this is the most northern record of the species (above the Arctic Circle). The third known record of this species in Russia is Altai Republic where several apterous females were collected from the lower side of leaves of *R. polyanthemus* L. (Stekolshchikov & Novgorodova, 2013). And the last known record of this species in Russia is Kamchatka, where several apterous and alate specimens were collected in the area of Elizovsky (Kronotsky) (Pashtshenko, 1988; Pashtshenko & Lobkova, 1990). Pashtshenko (1988) recorded *Ranunculus propinquus* CA Mey. as host, but then Pashtshenko and Lobkova (1990) indicated another host species, *Ranunculus subcorymbosus* Kom., for the same sample. *R. propinquus* CA Mey. has a transcontinental distribution, extending to Europe, but is not found on the Kamchatka Peninsula. *R. subcorymbosus* is endemic to Kamchatka (Lufarov, 1995). Therefore, the host plant should be recorded as *R. subcorymbosus*. **India:** *T. ranunculina* was noted in the article by Ghosh, Ghosh & Raychaudhuri (1971) as *Myzus (Tubaphis) ranunculinus* (Walker). Two apterous viviparous females were collected on 24 January 1970 in West Bengal from an undetermined species of Urticaceae. It is unlikely that *T. ranunculina* is able to live on plants other than *Ranunculus*, so most likely a mistake was made, either in determining the plant, or in the identification of the aphids. **Japan:** This species was first noted as *Myzus (Tubaphis) ranunculimus* Walker by Takahashi (1965) who collected several apterous viviparous females on 29 June 1960 in Osaka Prefecture on *Ranunculus* sp. Takahashi also gives information that on 4 August 1958 one apterous viviparous female was found in Osaka on the same plant by M. Sorin. Moritsu (1983) notes that in Japan, this aphid lives in small colonies, usually on the underside of leaves, but sometimes on the petioles of *Ranunculus japonicus* Thunb.

Thus the host plants of *T. ranunculina* are buttercups and spearworts (*Ranunculus* L.): *Ranunculus repens* L., *Ranunculus acris* L. and *Ranunculus velutinus* Ten. in Europe, *Ranunculus subcorymbosum* Kom. in the Far East of Russia, and *Ranunculus japonicus* Thunb. in Japan. Aphids live on the lower side of the leaf, sometimes moving to the upper side and stems. They are never visited by ants.

### MORPHOLOGICAL DESCRIPTIONS OF *TUBAPHIS RANUNCULINA*

Detailed descriptions of the viviparae of this species have been given by O. Heie (1994), but oviparous females and males of *T. ranunculina* practically undescribed until now. Blackman (2010) notes: "Oviparae (BL 1.2–1.7 mm), with hind tibiae moderately swollen and bearing c.30–50 scent glands, and alate males (BL c.1.5 mm), with secondary rhinaria distributed III 42–48, IV 12–14, V 2–8, VI base 0–1, are produced in October". Some data for the males were also given in the identification keys in this book.

We present a detailed description of oviparous female and male of *T. ranunculina* on the basis of original material collected in the field in Belarus and specimens stored in the collections of the MNHN and the ZIN RAS. All measurements (always in micrometers), number of setae, rhinaria, etc., and ratios are presented as ranges, and in brackets as ranges of arithmetical mean for different samples (if they differ strongly), for example 309–417 (322–402). In the description oviparous female is examined in more detail and for male differences from oviparous female are specified only.

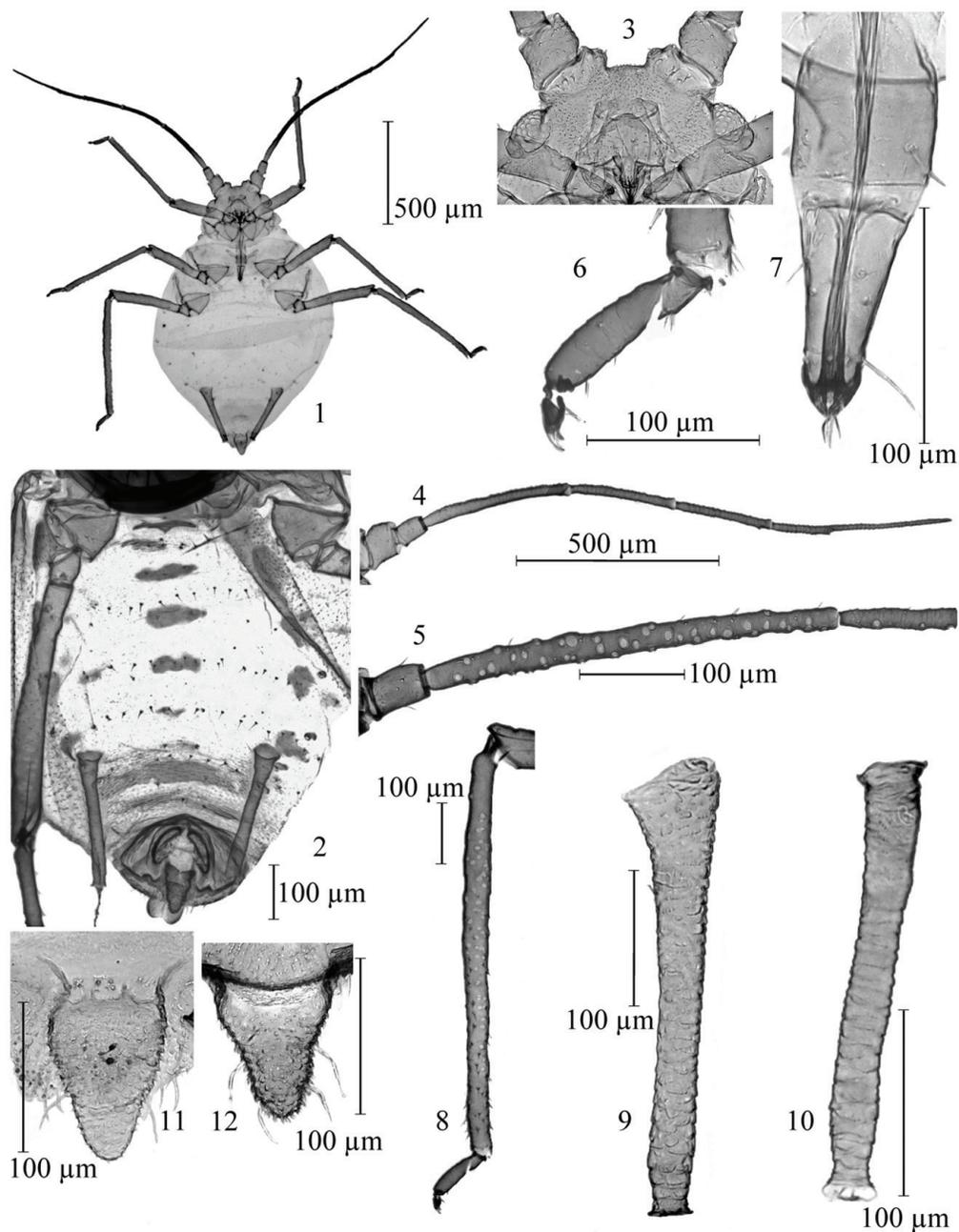
***Tubaphis ranunculina*** (Walker, 1852)  
(Table 1, Figs 1–12)

**Material. France:** Île-de-France, Yvelines, Bonnières-sur-Seine, *Ranunculus acris* L., 20.X.1948, 4 oviparous females, leg. G. Remaudière; Lorraine, Vosges, NE Raon, *Ranuncu-*

*lus* sp., 22.X.1974, 4 males, 7 oviparous females, leg. G. Remaudière; Alsace, Haut-Rhin, Sewen, *Ranunculus* sp., 24.X.1974, 1 male, 3 oviparous females, leg. J.-P. Latgé, Provence-Alpes-Côte d'Azur, Hautes-Alpes, Guillemestre, *Ranunculus* sp., 15.X.1986, 4 males, 20 oviparous females, leg. G. Remaudière (all at the MNHN). **Albania:** Korçë, 29.X.1968, 1 male, leg. Manse-Petrit (at the MNHN). **Latvia:** Cēsis Municipality, vicinity of Cēsis, *Ranunculus acris* L. (as *R. acer*), 19.IX–15.X.1928, 1 male, 5 oviparous females, leg. J. Zirnits; Cēsis Municipality, Cēsis, *Ranunculus* sp., 19.X.1931, 1 male, 2 oviparous females, leg. J. Zirnits (all at the ZIN RAS). **Belarus:** Gomel Prov., Oktyabr'skiy Distr., near Moshny railway station, mixed forest, 28.IX.2009, *Ranunculus repens* L., on lower side of leaves, 5 oviparous females, leg. S.V. Buga; Mogilev Prov., Gorki Distr., 0.8 km N vill. Kukshinovo, black alder wood in brook valley, 10.X.2000, *Ranunculus repens* L., on lower side of leaves, 1 oviparous female, leg. S.V. Buga (all at the ZIN RAS).

**Description. Oviparous female.** Body elliptic or broad elliptic, 1.4–2.1 (1.6–2.1) times as long as its width. Colour in life: head, thorax and abdomen light olive, olive-green or dirty-green, antennae pale ash, the 1st and 2nd segments of antennae light-gray-olive or olive, legs, siphunculi and cauda light olive, apices of femora and tibia are dark. Cleared specimens with dark brown 3rd–6th antennal segments (except base of 3rd segment) and tarsi, femora (except their bases), tibia and siphunculi brown; two ultimate segments of rostrum, peritremes, band on VIII tergite, subgenital and anal plates and cauda light brown. Abdominal dorsum not sclerotized, light, membranous except very light-brown peritremes and band on VIII tergite which often completely disappears. Surface of head spiculate, dorsal side of thorax and abdominal tergites I–VI faintly wrinkled, abdominal tergites VII and VIII with faint rows of spinules, which on tergite VIII partially fuse to form scales; ventral side of thorax wrinkled with large spinules on and around the coxae, ventral side of abdomen with rows of small spinules sometimes forming strongly stretched cells. Setae on dorsal surface of thorax and abdominal tergites I–

VII sparse, short, rod-shaped, blunt; setae on ventral surface of thorax and abdomen relatively long, pointed or blunt; abdominal segment III with 5–9 (6.3–8.2) dorsal and marginal setae; setae on tergite VIII blunt or pointed. Marginal and spinal tubercles absent. Head without epicranial coronal suture, sometimes vestigial as a faint line. Antennal tubercles moderately developed, relatively high, convergent; median tubercle very low; ratio of depth of frontal sinus to the width between antennal bases 0.17–0.34 (0.21–0.33). Occipital and frontal setae blunt or pointed. Antennae 6-segmented, 1st and 2nd antennal segments with short scale on ventral side and rarely on dorsal side, 3rd–6th antennal segments with more or less strong scales. Secondary rhinaria absent. Antennae with short, blunt, almost rod-shaped setae. Rostrum reaching mesothorax or anterior margin of metathorax. Ultimate rostral segment wedge-shaped with slightly concave or parallel side. Legs normal. Setae on legs short, blunt or rod-shaped, but pointed on apices of tibia. Chaetotaxy of first tarsal segments 3, 3, 3. Second segment of hind tarsus with 1–3 (1.7–2.1) dorsal and 1–4 (1.9–2.5) ventral setae. Arms of mesosternal furca connected by wide, unsclerotized base. Peritremes on abdominal segments I and II continuous and fused, or separated only by a distance less than the diameter of the peritreme. Siphunculi relatively long, with distinct flange, with wide conical base, gradually tapering towards apex, with weak swelling before the flange (maximum diameter of swollen part 1.00–1.33 (1.10–1.20) time as long as minimum diameter of basal part), very coarsely imbricated, with growing imbrication apically, and sometimes with a row of polygonal cells at apex. Subgenital plate oval, with pointed or blunt setae on anterior half and short, pointed, blunt or rod-shaped setae along the hind margin. Setae on anal plate finely pointed. Cauda tongue-shaped with a constriction near base, with long, pointed or finely pointed setae. Hind tibia with 29–99



**Figs 1–12.** *Tubaphis ranunculina*. 1, body of oviparous female; 2, abdomen of male; 3, head of oviparous female; 4, antenna of oviparous female; 5, 3rd antennal segment of male; 6, ultimate segment of rostrum of oviparous female; 7, hind tarsus of oviparous female; 8, hind tibia of oviparous female; 9–10, siphunculi (9, of oviparous female; 10, of male); 11–12, cauda (11, of oviparous female; 12, of male).

**Table 1.** Biometric data for males and oviparous females of *Tubaphis ranunculina* (Walker, 1852).

			Oviparous females	Males	
Number of samples/specimens			8/47	6/11	
Length of body			1315–1731 (1340–1650)	1340–1614 (1340–1533)	
Length of antennae			1270–1732 (1363–1704)	1649–2105 (1799–2031)	
Length of antennae / length of body			0.81–1.16 (0.91–1.07)	1.07–1.52 (1.22–1.52)	
Hind femura	length		364–487 (380–473)	437–523 (444–503)	
	length / body length		0.22–0.31 (0.23–0.30)	0.29–0.37 (0.29–0.37)	
	length / head width across the compound eyes		1.00–1.31 (1.00–1.27)	1.14–1.38 (1.22–1.33)	
Hind tibia	length		601–792 (644–765)	772–1046 (779–962)	
	length / body length		0.38–0.54 (0.39–0.52)	0.52–0.71 (0.53–0.70)	
Head width across the compound eyes			333–410 (336–389)	360–401 (360–401)	
Setae	on head	occipital	length	8–23 (12–23)	13–23 (13–23)
			length / articular diameter of 3rd antennal segment	0.32–0.90 (0.46–0.88)	0.40–1.18 (0.55–1.18)
		frontal	length	13–25 (17–25)	10–28 (10–26)
			length / articular diameter of 3rd antennal segment	0.45–1.00 (0.69–0.98)	0.40–1.18 (0.40–1.07)
	on 1st antennal segment	number	5–9 (6.7–8.0)	7–9 (7.5–8.0)	
		length	10–19 (13–19)	18–28 (22–25)	
	on 3rd antennal segment	number	8–23 (13.2–18.0)	12–21 (13.1–18.0)	
		length	8–14 (10–13)	13–18 (13–15)	
		length / articular diameter of 3rd antennal segment	0.27–0.60 (0.39–0.52)	0.45–0.82 (0.48–0.69)	
	on base of 6th antennal segment	number	1–3 (1.6–3.0)	1–4 (1.5–3.1)	
		length	8–18 (11–16)	10–15 (10–15)	
		length / articular diameter of base of 6th antennal segment	0.46–1.17 (0.63–0.97)	0.80–1.20 (0.80–1.09)	
ventral seta on hind trochanter / basal diameter of hind femur			0.26–0.60 (0.38–0.46)	0.41–0.73 (0.45–0.60)	

Table 1 (Continued).

			Oviparous females	Males	
Setae	length of longest on hind femora	dorsal	10–18 (12–15)	13–20 (15–20)	
		ventral	10–20 (13–17)	20–28 (20–24)	
		dorso-apical	9–18 (12–15)	13–18 (14–18)	
	on hind tibia	longest dorsal	23–43 (26–41)	20–28 (25)	
		longest dorsal / mid-diameter of the hind tibia	0.50–1.03 (0.58–0.94)	0.67–1.05 (0.76–0.89)	
	on abdominal tergite III	dorsal	length	6–13 (8–10)	11–18 (13–16)
			length / articular diameter of 3rd antennal segment	0.23–0.50 (0.30–0.39)	0.45–0.71 (0.48–0.69)
		marginal	length	6–13 (7–11)	9–18 (12–15)
			length / articular diameter of 3rd antennal segment	0.23–0.53 (0.29–0.42)	0.37–0.74 (0.48–0.60)
		ventral	length	16–25 (19–21)	30–35 (30–42)
			length / articular diameter of 3rd antennal segment	0.64–1.11 (0.75–0.87)	1.09–1.60 (1.15–1.43)
	number on abdominal tergite VI between siphunculi			2–3 (2.0–2.2)	2–4 (2.0–4.0)
	on abdominal tergite VIII	number		3–6 (4.0–5.0)	4–5 (4.0–4.3)
		length		12–32 (15–21)	18–25 (20–25)
		length / articular diameter of 3rd antennal segment		0.45–1.25 (0.60–0.79)	0.74–1.18 (0.80–1.14)
number on subgenital plate	on anterior half		4–15 (5.8–11.7)	–	
	along the hind margin		12–24 (14.0–18.3)	–	
Last antennal segment	length of base		129–185 (139–173)	148–192 (161–181)	
	length of processus terminalis		271–390 (286–367)	339–410 (351–397)	
	length of processus terminalis / length of base		1.75–2.42 (1.92–2.20)	2.00–2.70 (2.05–2.46)	
Ultimate rostral segment	number of accessory setae		2–5 (2.0–4.2)	4–5 (4.0–4.3)	
	length		89–106 (90–103)	89–101 (89–97)	

Table 1 (Continued).

			Oviparous females	Males
Ultimate rostral segment	length /	head width across the compound eyes	0.25–0.29 (0.26–0.28)	0.23–0.27 (0.23–0.27)
		length of 2nd segment of hind tarsus	0.97–1.18 (1.01–1.11)	0.92–1.13 (0.99–1.09)
		length of base of last antennal segment	0.53–0.75 (0.59–0.79)	0.50–0.65 (0.53–0.60)
		basal width of ultimate rostral segment	1.48–2.24 (1.81–2.00)	1.71–2.33 (1.85–2.33)
2nd segment of hind tarsus	length /	length	78–99 (84–95)	85–99 (86–94)
		head width across the compound eyes	0.23–0.29 (0.24–0.27)	0.23–0.27 (0.23–0.26)
		length of base of last antennal segment	0.50–0.75 (0.54–0.69)	0.48–0.62 (0.50–0.57)
		maximum width of 2nd segment of hind tarsus	3.14–4.33 (3.26–4.06)	3.58–4.88 (3.88–4.52)
Siphunculi		length	309–417 (322–402)	235–288 (245–272)
		length/body length	0.20–0.28 (0.23–0.26)	0.15–0.20 (0.16–0.20)
		length/width of siphunculi at base	3.55–6.24 (4.05–5.02)	5.00–7.71 (5.55–7.42)
		length/width of siphunculi at half length	9.07–15.33 (10.42–12.70)	9.30–15.00 (10.50–12.43)
		length/ length of 3rd antennal segment	0.86–1.16 (0.96–1.07)	0.41–0.55 (0.45–0.54)
Length of cauda		length	126–164 (132–158)	94–115 (100–114)
		length / basal width	1.16–1.77 (1.28–1.40)	0.98–1.26 (0.98–1.26)
		number of setae	4	4–5 (4.0–4.3)
Length of siphunculi / length of cauda			2.18–2.76 (2.32–2.59)	2.20–2.72 (2.33–2.66)

(45.4–91.1) oval or rounded pheromone plates (known as scent glands or “pseudosensoria”).

**Measurements of one specimen.** Body–1573×1076, antennae–1473: III–374×27 (in the middle), IV–357, V–240, VI–152+283; hind femur–431, hind tibia–700; siphunculus–356×32 (in the mid-

dle); cauda–140×105 (at base) × 71 (before base). For more biometric data see Table 1.

**Male.** Body elongated elliptic, 2.3–2.8 (2.4–2.8) times as long as wide. Colour in life: head black, thorax light brown with brown notum, abdomen pale olive-brown from above and light brown from below, antennae black with 1st and 2nd segments

paler, the legs are brown with darker apices of femora and tibia, siphunculi ash-olive-brown with a dark flange, cauda dark olive-brown; without waxy pulverulence. Cleared specimens with dark brown head, thorax, antennae (except for base of 3rd antennal segment), apices of front and middle femora, distal half of hind femora, and base and apices of tibia, with brown front and middle femora (except their apices and base), proximal half of hind femora (except their base), tarsi, band, spots and marginal maculae on abdominal segments, siphunculi, and cauda; with light brown base of 3rd antennal segment, coxae, trochanters, base of femora, and peritremes on abdominal tergites. Abdominal dorsum with brown band on abdominal tergites I–VIII and marginal maculae on abdominal segments II–VII; band on abdominal tergites I–VI very short, appearing like large sclerites on the middle line of abdomen, often divided into separate sclerites and sometimes almost absent; marginal maculae on abdominal segments II–IV large, on segments V–VII small and very pale; sclerotized band and marginal maculae on tergite VII often fused. Setae on abdominal tergite VII pointed. Antennal tubercles well developed, high, slightly convergent, almost parallel, median tubercle reduced, almost flat; ratio of depth of frontal sinus to the width between antennal bases 0.06–0.24 (0.08–0.24). Occipital and frontal setae pointed. 3rd antennal segment with 32–57 (42.5–53.0) oval or round secondary rhinaria arranged uniformly over the whole of length of segment, 4th segment with 5–20 (9.0–16.0), 5th segment with 5–14 (7.0–11.1) and base of 6th segment with 0–1 (0.0–0.1) secondary rhinaria which have low sclerotized rim and slightly convex membrane. Antennae with blunt or pointed setae. Rostrum reaching mesothorax. Setae on legs pointed or blunt. Second segment of hind tarsus with 2–4 (2.0–3.5) dorsal and 1–2 (1.7–2.0) ventral setae. Maximum diameter of swollen part of siphunculi 1.05–1.38 (1.05–1.31) time as long as minimum diameter of basal part.

### Measurements of one specimen.

Body–1472×579, fore wing–2415, antennae–1908: III–518×33 (in the middle), IV–332, V–316, VI–180+383; hind femur–477, hind tibia–934; siphunculus–253×22 (in the middle); cauda–115×106 (at base) × 68 (before base). For more biometric data see Table 1.

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