

**A new gall midge species *Janetiella convolvuli* sp. nov. (Diptera:  
Cecidomyiidae) causing galls on *Convolvulus arvensis*  
(Convolvulaceae) in Armenia**

Lyudmila MIRUMYAN<sup>1)</sup> & Marcela SKUHRAVÁ<sup>2)</sup>

<sup>1)</sup> Scientific Centre of Zoology and Hydroecology, National Academy of Sciences of Armenia, 7, Sevak str., 0014, Yerevan, Armenia; e-mail: lmirumyan@mail.ru

<sup>2)</sup> Bítovská 1227/9, CZ–140 00 Praha 4, Czech Republic; e-mail: marcela.skuhrava@gmail.com

Received 20 October 2016; accepted 27 January 2017

Published 7 August 2017

**Abstract.** *Janetiella convolvuli* sp. nov. is described and its taxonomically important structural features are illustrated. Larvae develop in flower and leaf buds of *Convolvulus arvensis* L. (Convolvulaceae) and pupate in the soil. Three or more generations develop per year. Flower and leaf buds of *Convolvulus arvensis* attacked by *Janetiella convolvuli* sp. nov. were found only in Armenia where this species is used for biological control of the weed *Convolvulus arvensis*.

**Key words.** Taxonomy, new species, biology, Diptera, Cecidomyiidae, *Janetiella*, Palaearctic region.

#### INTRODUCTION

In Armenia a total of 96 species of the family Cecidomyiidae were found during extensive faunal investigations at 88 localities carried out in the years 1988–2010 (Mirumyan 2011). Among them a new species of gall midges was discovered larvae of which are associated with the host plant of the genus *Convolvulus* L. of the family Convolvulaceae. Larvae develop in flower and leaf buds of *Convolvulus arvensis* L. and cause galls.

The field bindweed, *Convolvulus arvensis*, is native to continental Europe and Asia. It is a climbing or creeping herbaceous perennial plant. At present, it is one of the most serious weeds of agricultural fields in temperate regions of the world. It is introduced, naturalised or invasive in East Africa. It is reported as invasive in parts of Kenya and Uganda (CABI Crop Compendium 2007).

In Europe only two gall-inducing arthropods are known to be associated with *Convolvulus arvensis*: *Aceria convolvuli* (Nalepa, 1898) and *Vasates convolvuli* (Nalepa, 1898) (Acari: Eriophyoidea) (Buhr 1965, Houard 1909, Redfern et al. 2002). In Asia two gall midge species are known to occur in Kazakhstan but they are not associated with *Convolvulus arvensis*. Larvae of *Contarinia convolvulicola* Fedotova, 1991 develop in swollen flower buds of *Convolvulus traganthoides* and larvae of *Contarinia convolvuliflora* Fedotova, 1991 in flower buds of *Convolvulus fruticosus* (Fedotova 2000). In North America only one species of gall midges is associated with *Convolvulus*: larvae of *Lasioptera convolvuli* Felt, 1907 cause tapered stem swellings on *Convolvulus sepium* (Gagné 1989).

In June 1989 the senior author (LM) discovered deformed flower and leaf buds of *Convolvulus arvensis* at several localities in Armenia and reared adults from them. Adults belong to the genus *Janetiella* Kieffer, 1898. We provide here a description of this new species.

## MATERIAL AND METHODS

*Convolvulus pratensis* plants with galls were collected in the field, put into polyethylene bags and brought to the laboratory. Attacked plants were placed in rearing cages and emergence of adults has been observed each day. Larvae and adults obtained from galls were put into 75% ethanol and mounted on microscope slides using Canada balsam as medium. Holotype and some of the paratypes are deposited in the Institute of Zoology of the Scientific Centre of Zoology and Hydroecology of the National Academy of Sciences of Armenia, Yerevan, Armenia, and in the Zoological Museum of M. V. Lomonosov State University, Moscow, Russia.

## TAXONOMY

### *Janetiella* Kieffer, 1898

*Janetiella* Kieffer, 1898: 23.

TYPE SPECIES. *Cecidomyia thymi* Kieffer, 1888 (subsequent designation of Coquillett 1910: 556).

The genus is defined by the following combination of characters: Antennae 2+12 to 2+15, flagellomeres in male with necks, in female without necks, mouthparts well developed, palpi three or four segmented, wing with  $R_5$  uniting with costa before wing apex, cu forked, tarsal claws simple, without tooth, empodium about as long as the claws, ovipositor long, cylindrical, cerci of female fused, male genitalia with gonostyli gradually tapering and pubescent; larva with bilobed sternal spatula and eight terminal papillae (Skuhravá 1997).

*Janetiella* is a Holarctic genus with 22 species (Gagné & Jaschhof 2014). Fourteen occur in Europe, three in Asia and five in North America (Skuhravá 2006). Larvae cause stem swellings, leaf galls and leaf and flower bud galls. They are associated with host plants belonging to twelve plant families. Most species of this genus are poorly known, insufficiently described and the original material of most species, including the type species, is lost. Gagné (2009) redescribed the male and female of *Janetiella thymi* (Kieffer, 1888), the type species of this genus, on the basis of material collected, reared and identified by E. Sylvén in Sweden and illustrated important morphological characters of adults.

### *Janetiella convolvuli* sp. nov.

(Figs. 1–17)

TYPE MATERIAL. **Holotype:** male, microscope slide No. 197/1, in Canada balsam with the label: Armenia, Oktemberianskij Rajon, AES, on *Convolvulus arvensis*, 27 July 1989. **Paratypes:** 5 males, 5 females, slides No. 197/2–197/4, same data (L. Mirumian).

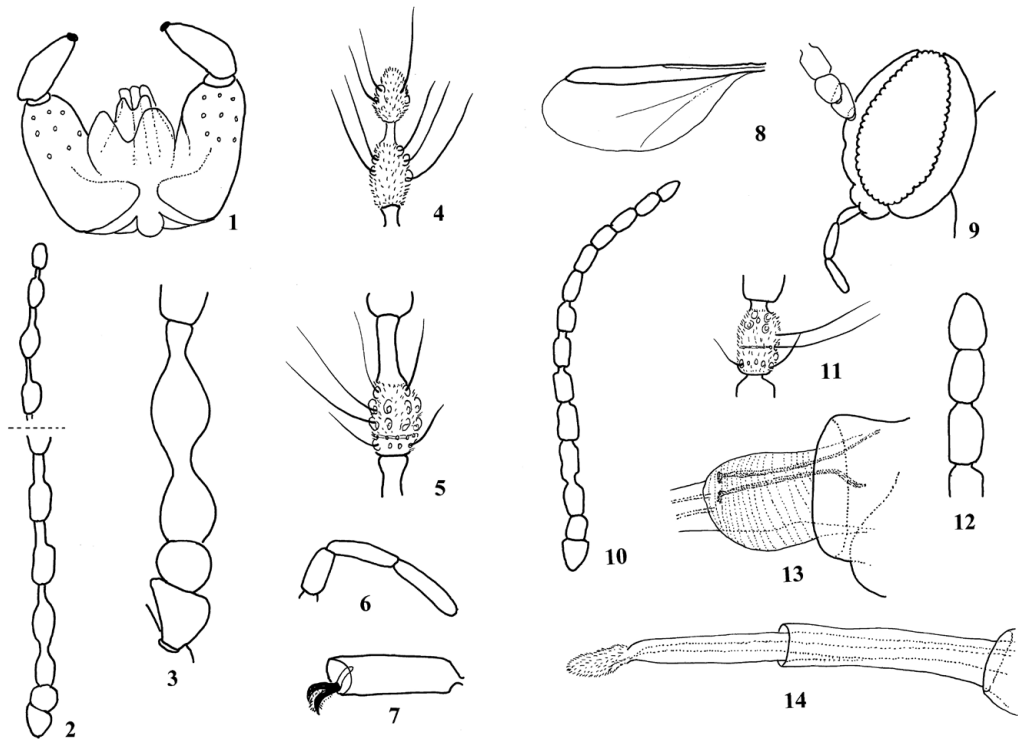
**DESCRIPTION. Male.** Body size: 1.3–1.5 mm (n=2); wing length 1.6 mm, wing width 0.48 mm; head black, thorax dark brown, abdomen brown coloured.

Head relatively large, with holoptic eyes, eye bridge five ommatidia long at vertex. Ommatidia relatively small, densely arranged. Mouthparts normally developed, frontoclypeus with several setae. Palpi 3-segmented, covered with long setae; first segment short and thick, second and third segments slender and of the same length. Antennae 2+12 segmented; scape obconical, pedicel globular, flagellomeres composed of basal node and neck; necks are as long as nodes; the first flagellomere with shortened neck; 1st and 2nd flagellomeres connate, the 12th flagellomere at the end with egg-shaped pointed part, or this part is separated by a shortened neck. Flagellomeres are covered with microtrichia and with whorls of long bent setae which form a regular row at the base of the node. Sensorial thread (circumfilum) is joined closely, forming a ring.

Thorax. Wing with  $R_1$  joining with costa before its middle,  $R_5$  joining with costa before the wing apex, costa broken at this point, cu poorly visible, forked. Legs long, covered with short setae; tarsal claws simple, without tooth at the base, sickle-shaped bent, empodium as long as claws.

Abdomen. Second to sixth segments relatively large with sclerotized dorsal side covered with short setae, ventral side with long setae; seventh segment smaller, eighth segment very small and unsclerotized. Terminalia: gonocoxites cylindrical, slightly swollen at the inner side near the tip, sparsely covered with long setae which are more abundant in apical part, with sclerotised rounded apodeme at the base. Gonostyli short, about half of length of gonocoxites, with parallel sides, covered with microtrichia, apically with black claw; cerci broad, lobes triangle-shaped, deeply separated, broadened laterally in basal third; hypoproct narrow, with rounded excision, as long as cerci. Aedeagus tubular with rounded tip, as long as gonocoxites. Mediobasal lobes of gonocoxites with small excision at tip, shorter than aedeagus.

**Female.** Body size: 1.3–1.5 mm long without ovipositor (n=4), wing length 1.5 mm, wing width 0.6 mm, body similarly coloured as in male. Antennae 2+12 segmented; scape obconical, pedicel subglobular, flagellomeres cylindrical, without necks, a little broader in basal part; the 12th



Figs. 1–13. *Janetiella convolvuli* sp. nov. 1–7 – male. 1 – terminalia, 2 – antenna, 3 – scape, pedicel and two flagellomeres, 4 – two last flagellomeres, 5 – fifth flagellomere, 6 – palpus, 7 – fifth tarsomere with claw and empodium. 8–14 – female. 8 – wing, 9 – head, 10 – antenna, 11 – fifth flagellomere, 12 – last flagellomeres, 13 – eighth abdominal segment with a pair of sclerites, 14 – ovipositor.

flagellomere 1.5 times longer than the 11th flagellomere. Flagellomeres with whorls of long bent setae. Sensorial thread forming net or two rings which are connected with a commissure. Palpi as in male.

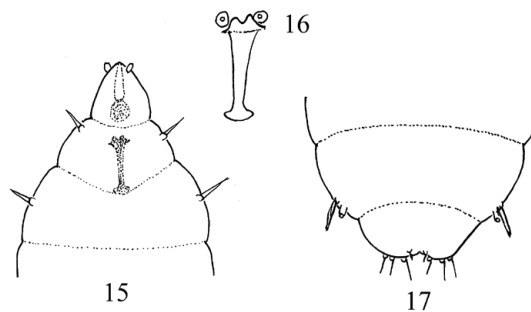
Thorax and wings as in male.

Abdomen. Second to sixth segments relatively large, with sclerotized dorsal side covered with short setae, ventral side without setae; seventh segment small, eighth segment about two times longer than its height, in retracted position transversally striated, with two separate, narrow longitudinal sclerites; the ovipositor far protrusible, lower part before cerci slightly broadened; cerci fused at the end into one lengthened lamella, hypoproct small and narrow; ovipositor and hypoproct densely setose.

**Larva.** The third larval instar (mature larva) is 3.1 mm long, 0.75 mm broad, pink-orange coloured; integument covered with small oval plates. Head is small, conical, with a pair of small short antennae, cephalic apodemes shorter than head capsule. Black oval spot inside posterior part of head capsule are larval eyes (stemmata) which are visible only in freshly mounted larvae; they consist of many small oval black particles. Spatula sternalis on ventral side of prothoracic segment is brown coloured, 137–140  $\mu\text{m}$  long, with bilobed anterior blade and slender stem which is broadened at the bottom. All papillae with relatively long setae. Terminal segment with eight papillae; six of them with long setae, two papillae with shorter setae.

**DIFFERENTIAL DIAGNOSIS.** *Janetiella convolvuli* sp. nov. differs from *Janetiella thymi* (Kieffer, 1888), the type species of the genus *Janetiella* Kieffer, 1898 which was redescribed by Gagné (2009), in the shape of the ovipositor: in *J. convolvuli* sp. nov. it is longer, slender and far protrusible (Figs. 13–14) than in *J. thymi*, cerci of *J. convolvuli* form a lengthened slender lamella; longitudinal sclerites on the eighth abdominal segment are long and very narrow, at the end broadened (Fig. 13), in contrast to sclerites of *J. thymi* which are short and broad (Gagné 2009; Fig. 9). *J. convolvuli* sp. nov. differs in the shape of this sclerites also from *J. potentillogemmae* Skuhravá, 2011 where these sclerites resembles the letter Y, with two anterior arms merging into a single posterior shaft (Skuhravá et al. 2011; Fig. 12). In addition to morphological differences, *Janetiella convolvuli* sp. nov. is specifically associated with its host plant *Convolvulus pratensis* from the family Convolvulaceae where larvae induce galls on flower buds.

**BIOLOGY.** Three up six larvae of *Janetiella convolvuli* sp. nov. develop in flower buds of *Convolvulus pratensis*. Attacked buds do not open, they are enlarged and swollen and are covered with whitish pubescence (Figs. 18–19). Sometimes larvae develop in leaf buds which form small



Figs. 15–17. *Janetiella convolvuli* sp. nov., larva. 15 – head, prothoracic and mesothoracic segments, ventral side, 16 – detail of spatula sternalis, 17 – eighth to ninth abdominal segments.



Figs. 18, 19. 18 – Flower buds of *Convolvulus arvensis* changed into galls by larvae of *Janetiella convolvuli* sp. nov. 19 – Three plants of *Convolvulus arvensis* heavily damaged by larvae of this species.

rosettes of small leaves on tips of shoots. Galls are 5–10 mm in diameter. Fully grown larvae leave galls and enter the soil where they pupate. Pupation lasts 8–11 days. Larvae occur in galls from May to September. More than three generations develop per year. The galls occurred frequently at localities where this species has been discovered.

**DISTRIBUTION.** *Janetiella convolvuli* sp. nov. has been found only in Armenia. Galls were discovered at six localities in south-western Armenia at altitudes from 845 m to 900 m a. s. l.: in the Ararat Province at Aintap, 868 m a. s. l., Marmarashen, 846 m a. s. l., Urtsadzor, 900 m a. s. l. and at the town Vedi, 900 m a. s. l.; in the Armavir Province at the village Taronik, 845 m a. s. l. and in the surroundings of Yerevan at the Khimreaktiv factory, 868 m a. s. l.

From the ecological point of view, the galls of *Janetiella convolvuli* sp. nov. were found on the field with bindweed plants growing on saline soils in Hoktemberian region (now Armavir Marz), in surroundings of Armenian Atomic Power Station (APS). The galls were discovered also in semiarid areas of the village Chimán of the Ararat Marz.

**ECONOMIC IMPORTANCE.** *Janetiella convolvuli* sp. nov. was used for the biological control of the weed *Convolvulus arvensis* L. in Armenia in the years 2003–2004 (Mirumán 2006). This biological control of *Convolvulus arvensis* is successful also in recent years in the Ararat Valley, Armenia, where the main cultivated lands are concentrated.

ETYMOLOGY. The name *convolvuli* is the genitive form of *Convolvulus*, the generic name of the host plant.

#### Acknowledgements

We thank K. M. Harris, Ripley, Woking, Surrey, UK, for valuable comments and for the correction of the text of our manuscript. We also thank the anonymous reviewers for their careful reading and valuable comments on our article.

#### REFERENCES

- BUHR H. 1965: *Bestimmungstabellen der Gallen (Zoo- und Phytocecidien) an Pflanzen Mittel- und Nordeuropas*. Jena: Gustav Fischer Verlag, 1572 pp.
- COQUILLETT D. W. 1910: The type-species of of the North American genera of Diptera. *Proceedings of the United States Museum* **37**: 499–647.
- FEDOTOVA Z. A. 1991: [New species of Contarinia and Contarinomyia gen. n. (Diptera, Cecidomyiidae) occurring on brush in Kazakhstan]. *Zoologicheskij Žurnal* **70**(2): 40–54 (in Russian).
- FEDOTOVA Z. A. 2000: [Plant-feeding Gall Midges (Diptera, Cecidomyiidae) of Deserts and Mountains of Kazakhstan: Morphology, Biology, Distribution, Phylogeny and Systematics]. Samara: Samara Academy of Agriculture, 803 pp (in Russian).
- FELT E. P. 1907: New species of Cecidomyiidae. *New York State Museum Bulletin* **110**: 97–165.
- GAGNÉ R. J. 1989: *The Plant-feeding Gall Midges of North America*. Ithaca & London: Comstock Publishing Associates, Cornell University Press, 356 pp.
- GAGNÉ R. J. 2009: Taxonomy of *Janetiella thymi* (Kieffer) (Diptera: Cecidomyiidae) and of the species formerly in *Janetiella* that feed on *Vitis* (Vitaceae). *Proceedings of the Entomological Society of Washington* **111**: 399–409.
- GAGNÉ R. J. & JASCHHOF M. 2014: *A Catalog of the Cecidomyiidae (Diptera) of the World. Third Edition. Digital version 2*. Washington, D.C.: U.S. National Museum of Natural History, 493 pp.
- HOUARD C. 1909: *Les Zoocécidies des Plantes d'Europe et du Bassin de la Méditerranée*. Paris: A. Hermann et Fils, 1247 pp.
- KIEFFER J. J. 1898: Synopse des cécidomyies d'Europe et d'Algérie décrites jusqu'à ce jour. *Bulletin de la Société d'Histoire Naturelle de Metz* (2)**8**: 1–64.
- MIRUMÂN L. S. 2006: [Monophagous gall midges as a tool in biological control of weeds: main principles and practical application in Armenia]. *Biologičeskij Žurnal Armenii* **58**: 279–284 (in Russian).
- MIRUMIAN L. 2011: Phytophagous gall midges (Diptera: Cecidomyiidae) of Armenia. *Acta Societatis Zoologicae Bohemicae* **75**: 87–106.
- REDFERN M., SHIRLEY P. & BLOXHAM M. 2002: British plant galls. Identification of galls on plants and fungi. *Field Studies* **10**: 207–531.
- SKUHRÁVÁ M. 1997: Family Cecidomyiidae. Pp.: 71–204. In: PAPP L. & DARVAS B. (eds.): *Contributions to a Manual of Palaearctic Diptera (With Special Reference to Flies of Economic Importance). Volume 2. Nematocera and Lower Brachycera*. Budapest: Science Herald, 592 pp.
- SKUHRÁVÁ M. 2006: Species richness of gall midges (Diptera: Cecidomyiidae) in the main biogeographical regions of the world. *Acta Societatis Zoologicae Bohemicae* **69**: 327–372.
- SKUHRÁVÁ M., GROSSKOPF G., SCHAFFNER U. & TURANLI F. 2011: A new gall midge species *Janetiella potentillogemmae* sp. nov. (Diptera: Cecidomyiidae), causing galls on *Potentilla recta* (Rosaceae) in western Turkey, a candidate for biological weed control. *Acta Societatis Zoologicae Bohemicae* **75**: 297–306.