

**FIRST REPORT OF THE OCCURRENCE OF *LIVIA JUNCII* (SCHRANK, 1789) (HEMIPTERA: PSYLLIDAE) ON *JUNCUS FONTANESII* J. GAY EX LAHARPE (JUNCACEAE) FROM PORTUGAL**

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**Abstract** - “Witches’ brooms” is a disease or deformity in a plant where the natural structure of the plant is changed, i.e., a dense mass of shoots grows, usually from a single point, with the resulting structure resembling a broom. The specimens of *Juncus fontanesii* J. Gay ex Laharpe were collected on July 21, 2003, in Portugal (LISU 189105). We observed the larvae of the last (i.e., fifth) stadium of *Livia junci* (Schrank, 1789) (Hemiptera: Psyllidae). Many exuvia of the early larval stages from *Livia junci* were obtained from the galls. This confirmed that the parasites lived in its larval period on *Juncus fontanesii*. Additionally, *J. fontanesii* formed the galls as a result of response to feeding, similar to other representatives of the genus *Juncus*. *Livia junci* is the only representative of the genus *Livia* that feeds on *Juncus* species in the Western Palearctic area.

**Key words:** *Livia junci*, gall, witches’ brooms, Hemiptera, Psyllidae, *Juncus fontanesii*, Juncaceae, Portugal

## INTRODUCTION

*Juncus fontanesii* J. Gay ex Laharpe (Juncaceae) is a species occurring in southern Europe, northern Africa and western Asia, extending to Pakistan (Kirschner, 2002). The taxon is highly variable and includes four subspecies. In Europe, it grows mainly in Mediterranean humid grasslands of tall grasses and rushes, and alongside streams and in temporarily inundated places, mostly at 0-1000 m a.s.l. (Kirschner, 2002).

“Witches’ brooms” is a disease or deformity in a plant, where the natural structure of the plant is changed, i.e., a dense mass of shoots grows, usually from a single point, with the resulting structure

resembling a broom. The direct causes of the enormous changes of the inflorescence are been known to date, although they were related to the presence of *Livia junci* (Schrank, 1789) (Hemiptera: Psyllidae) in plants (Schmidt and Meyer, 1966). To date, the Hemiptera parasite has been found on different rushes mainly belonging to the section Ozophyllum (and also others), i.e., *Juncus acutiflorus* Ehrh., *J. alpinoarticulatus* Chaix, *J. anceps* Laharpe, *J. articulatus* L., *J. atratus* Krock., *J. atricapillus* Drejem, *J. bufonius* L., *J. gerardi bulbosus* L., *J. capitatus* Weigel., *J. conglomeratus* L., *J. effusus* L., *J. fuscoater* Schreb., *J. Lois.*, *J. glaucus* Ehrh., *J. subnodulosus* Schrank (Hodkinson and Bird, 2000).

However, often the morphological modifications of



**Fig. 1.** Herbarium sheet LISU 189105 with the specimens of *Juncus fontanesii* that includes “Witches’ brooms” resulting from the occurrence of *Livia junci*.

the host plants were so serious that these specimens were wrongly classified as a species new to science. An example is *Juncus viviparus* Relhan, 1785, whose name later turned out to be the synonym of another rush, namely, *Juncus bulbosus* L. The type specimen of *J. viviparus* had been collected in the vicinity of Cambridge, UK, and it was obviously infected by parasites (Buchenau, 1890). Additionally, in heads of *J. bulbosus* f. *submucronatus* J. Pročków infected by *Livia junci*, the distinct and usually sharp dorsal mucros, which are located just below the apices of the outer perianth segments, can be completely invisible (Pročków, 2010).

#### MATERIALS AND METHODS

During our research on the life cycles of the host plants, i.e., representatives of the Juncaceae family, and the insects attacking them, in the gathered herbarium material we found *J. fontanesii* specimens with transformed shoots, so called “witches’ brooms”. The plants were collected on July 21, 2003,



**Fig. 2.** “Witches’ brooms” (magnification) on the *Juncus fontanesii* specimens from the herbarium sheet LISU 189105.



Fig. 3. Larva of the last V stadium of *Livia junci* (both sides) from *Juncus fontanesii* of the herbarium sheet LISU 189105.

in Portugal (Beja, Vidigueira, Pedrógão: Estrada de Alqueva para Marmelar), 230 m a.s.l. (LISU 189105, Herbarium Jardim Botânico – Museu Nacional de História Natural, Lisboa, Portugal, Figs 1-2). Altered inflorescences were treated with water mist in order to achieve a more flexible tissue. Then we observed the larvae of *Livia junci* (Hemiptera: Psyllidae) inside the studied inflorescences. From the available material, nine insects were taken out, of which two were well-preserved specimens. The nomenclature of the Juncaceae family is congruent with Kirschner's work (2002), whereas the nomenclature of *Livia* was adapted after Ossiannilsson (1992).

#### RESULTS AND DISCUSSION

Within the studied herbarium sheet (LISU 189105, Figs 1-2), there were three plants in which six “witches’ brooms” of various sizes were formed. From the available material, two well-preserved insect specimens were successfully labeled as larvae of the last fifth stadium of *Livia junci* (Fig. 3).

Unfortunately, as a result of herbarium conservation, a large part of the entomological material was damaged to a degree that made the species identification impossible. Nevertheless, the additional seven specimens were determined as belonging to the genus *Livia*. Moreover, many exuvia of the early larval stages from *Livia junci* were gained from the galls. This confirmed that the parasites lived in its larval period on *Juncus fontanesii*.

To date, *Livia junci* has not been mentioned from *J. fontanesii*. Therefore, this is the first report of the feeding of this parasite on this host plant species. Additionally, this taxon formed galls in response to the feeding, similar to other representatives of the genus *Juncus*.

According to Hodkinson and Bird (2000), *Livia junci* is the only representative of the genus *Livia* that feeds on *Juncus* species in the Western Palearctic area. Thus the mass occurrence of this insect can cause a decrease in the yields of different rush species (e.g.,

Ozophyllum section), which are usually common components of the meadow communities of various parts of Europe. Namely, in such situations the plants cannot flourish, so it is impossible to produce fruit and seeds to be spread.

Unlike most psyllids, which develop on dicotyledonous plants, the *Livia junci* larvae feed on different rushes (monocots) (Hodkinson, 2009). The morphological modifications of the host plants were so serious that in the past specimens were wrongly classified, even as species new to science. The direct causes of the enormous changes of the inflorescence have not been known to date, although they were always related to the presence of a Hemiptera parasite on the plants. Taking into account the character of these changes as well as the manner of feeding of the insect (pricking tissues near vascular bundles), it is suspected that *L. junci* is only a vector, while the factor responsible for producing galls are phytoplasma (Weitraub and Beanland, 2006), as in apple proliferation (AP) where psyllids of the genus *Cacopsylla* (*C. picta*) are vectors for AP phytoplasma and contribute considerably to the spreading of the disease (Jarusch et al., 2003).

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