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Biology and morphology of immature stages of *Lixus canescens* (Coleoptera: Curculionidae: Lixinae)

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Abstract

Mature larvae and pupae of *Lixus (Eulixus) canescens* Steven, 1829 (Curculionidae: Lixinae: Lixini) are described and compared with known larvae and pupae of other *Lixus* species. The biology of the species was studied in Ukraine. A species of *Crambe* (Brassicaceae) was identified as host plant of both larvae and adults of this weevil. The weevil is very likely oligophagous. *Lixus canescens* prefers dry, sunny places, such as open areas of sand close to sea shores with growing host plants. Overwintering beetles emerge in the late spring (mid-May), and then feed and mate on the host plants. The highest level of activity of the adults was observed at the end of May. Larvae are endophagous in the host plant stem. At the end of July, the larvae pupate within the stem inside a pupation cell. Adults leave the cells at the end of summer and do not hibernate on the host plants. They then, most likely, spend some time feeding on the host plants and looking for suitable shelter in which to overwinter.

Key words: weevil, larva, pupa, morphology, host plant, *Crambe pontica*, Brassicaceae, larval development, life history, eastern Europe, Palaearctic

Introduction

The genus *Lixus* Fabricius, 1801, belongs to the tribe Lixini in the subfamily Lixinae with approximately 500 species described in the world fauna (Nikulina 2007), and 170 of these species found in the Palaearctic Region (Gültekin & Fremuth 2013). The genus *Lixus* is cosmopolitan and composed of seven subgenera (Meregalli 2014). The immature stages of *Lixus* species usually develop in the stems and the root crowns of plants (Hoffmann 1954). Basic data on the life cycle of *Lixus* species are rather scarce, with a few exceptions (e.g., Volovnik 2007, 2013). Some of these species are actual (e.g., *Lixus incanescens* Boheman, 1835; Manole 1990) or potential pests of agriculture (Volovnik 1988, Nikulina 1989). Some *Lixus* species can be used for the biological control of weeds (e.g., *Lixus filiformis* (Fabricius, 1781) for musk thistle; Gültekin 2004) or have already been used (e.g., *Lixus cardui* Olivier, 1807 in Australia; Nikulina & Gültekin 2011). For the most part, the preimaginal stages of most of these species remain unknown and/or unstudied. Detailed morphological descriptions have been published for the larvae of 19 *Lixus* species, but for only seven species are there also detailed descriptions of their pupae (Scherf 1964; Lee & Morimoto 1988; Nikulina 2001, 2007; Zotov 2009a, b; Nikulina & Gültekin 2011; Gosik & Wanat 2014).

Several reasons justify the need for a detailed investigation of *Lixus canescens* Steven. This weevil is oligophagous on *Crambe* L. (Brassicaceae) (Volovnik 2007). Some plants of this genus are known to have the potential for agricultural, industrial, medicinal and landscape use (Carlson *et al.* 1996, Peterson *et al.* 2000). Hence, this weevil appears to be a potential pest. *Lixus canescens* is listed in the Red Data Book of Ukraine as a rare species (Volovnik & Nazarenko 2009) yet only some basic information on the biology of this weevil has been published (Volovnik 2007). The immature stages of *L. canescens* have never been described. Knowledge of the immature stages and life histories of a species are important for taxonomic, and also applied use, and can help more effectively protect this species. In this paper, we describe the immature stages of this species and provide details on its life history based on Volovnik's observations obtained during field work in Ukraine.