ON BIOLOGY AND DISTRIBUTION OF WEEVIL *LIXUS FASCICULATUS* (COLEOPTERA: CURCULIONIDAE) – A POTENTIAL AGENT AGAINST *ARTEMISIA* WEEDS

Semyon Volovnik*

* State Teacher-Training University of Melitopol, Lenina, 20, Melitopol, 72312, UKRAINE. E-mail: voseve@mail.ru

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ABSTRACT: Geographical distribution, habitat, phenology, food plants of the imago and larva, feeding, mating and egg-laying behavior, the development of larva of *Lixus fasciculatus* were studied. In Ukrainian steppe *L. fasciculatus* is univoltine. Adults feed on *Artemisia vulgaris* and *A. absinthium*. Preimaginal development occurs into stems of *A. vulgaris*. Data on geographic distribution (especially in Ukraine) are given. This species seems to be a potential agent against *Artemisia* weeds.

KEY WORDS: *Artemisia* weeds, beetle, behavior, development, oviposition.

Lixus fasciculatus Boheman, 1835 is a palearctical weevil, 6.5–14 mm long with poorly known biology. It was only reported that this species is connected with on common wormwood *Artemisia vulgaris* (Dieckmann, 1983), probably feeds on tansy (*Tanacetum vulgare)* too (Sorel, 1954) and lay eggs into stems of *A. vulgaris* (Gültekin, 2007). Worm wood is a common weed in the northern hemisphere.

MATERIAL AND METHODS

This report is based on direct field observations that were conducted in the South of Ukraine in summer of 1983-1984 and in 2001-2003. Private and state museum entomological collections were used.

RESULTS AND DISCUSSION

Distribution: *Lixus fasciculatus* is an Eurasian species. In Ukraine it found in southern and middle oblasts namely Lugansk, Odessa, Zaporozhye, Dnepropetrovsk, Donetsk, Kharkov, Poltava, Kirovograd, Cherkassy, Lvov, in the steppes and mountains of the Crimea. In the rest of Europe it is known in the north-east of France (Haut-Rhin – Sorel, 1974), south-west of Germany (Baden), Eastern Slovakia, Hungary (Dieckmann, 1983), Peninsular Italy (Stoch, 2003), South of Poland (Smreczyński, 1955), Moldova (Ruşcinski, 1937), and Russia (Moscow region - Posedko, 2008; Rostov Oblast, North Caucasus – Arzanov, 1988). In Asia *L. fasciculatus* occurs in Turkey (Gültekin, 2007), the south of Russia (oblasts of Tomsk, Novosibirsk, Kemerovo, Altai, Khabarovsk Kray, Primorsky Kray – Legalov, 2010), "Middle Asia" (Ter-Minasyan, 1978), Mongolia (Ulan-Bator – Kuśka, 1982), North of China (Dieckmann, 1983), central part of Korean Peninsula (Hong et al., 2011), Kunashir Island (Krivolutskaya, 1973). So *L. fasciculatus* is found between latitude 57 and 38 north approximately. Such distributional pattern suggests that L. fasciculatus occurs in the region of mesozoic Thetys Ocean like some others *Lixus* and Lixinae in whole. It seems to be true that *L. fasciculatus* prefers the regions with a mild winter (Mediterranean)

as well as regions with continental (Ukraine, Altai) and monsoon (Amur region) climate. However in regions with cool, moist summers (North Germany, Britain), frosty winters (West Siberia) or in arid zones it is absent.

Habitat: This species is common in the grasslands near water, glades and in the roadsides and other ruderal biotopes. It occurs in the steppe forests (in the glades, borders) too. In Ukraine all adults (n=78) were found between May 17 (Belaya Skala in Crimea) and September 28 (Lugansk Oblast).

Feeding: The whole life cycle of this weevil is connected with common wormwood (*Artemisia vulgaris*; Asteraceae). In the "islets" of this plant the density of imago reaches as many as 13 adults on 1 sq. m (in Stone Tomb reservation). Occasionally adults were found on *Artemisia absinthium* too. Adults feed on the margins of leaves or chew the small longitudinal furrows in the peripheral tissues of petioles and young stems. Sometimes eating beetles extend the apex of these furrows or make enclosed roundish holes in a leaf plates. After eating adults clean its mouthparts by apical parts of fore tibiae. When adult cleans antennae it passes its scapus in the angle point between tibia and tarsus; this angle at that time is 60° approximately. Between eating adults often remain motionless on plants for a long time. To get to neighbor plant weevils accomplish if it's necessary short (some centimeters) flights.

Mating and Oviposition: Mating occurs on the host plants from the second half of May and to the end of June. Being in copula male is motionless whereas the female often moves, feeds, and prepares the place for egg-laying. Oviposition begins in the mid of June. It occurs on the food plant of adults, i. e. *Artemisia vulgaris*. The eggs are laid singly in small pits chewed by the females in the main stems or bases of petioles. One act of oviposition lasts as long as 2.25-29 min. Like other *Lixus* spp. (Volovnik, 1994) the female spends most of this time excavating the ovipositional pit with her mouthparts (Fig. 1). Excavating female makes drill-like motions: turns head right and left around its longitudinal axis. Obviously in this way she tears solid plant fibers. Her efforts on the petiole are so considerable that large Artemisia leaf is trembling. When the pit is completed, she rapidly turns over 180°, lowers the tip of her abdomen over the pit and remains motionless in this position for 1-3 min while depositing a single egg. The eggs are yellowish-white, polish-glistening, oval, about 0.5–0.9 x 1–1.1 mm. Feeding and oviposition occurs during daylight hours only.

Larva: Larva is C-like curved, yellow-brown; its head is strong scleritized and long (the ratio of head length to its width equals to 1.3–1.5). The larva bores the tunnel in the pith of host plant and feeds by its tissue. Tunnels are straight (commonly) or curved. Dissection of the stems revealed that sometimes there were 4 tunnels in the part of stem about 20 cm long. Usually every tunnel is located in its level of the stem, but sometimes two tunnels are located in parallel. At the end of the last instar larva widens its burrow in ovoid cell with the thin brown walls.

Pupa and Imago Emergency: The pupation occurs in this cell. Larvae (or occasionally pupae and adults of new generation) hibernate in the stems of wormwood. Stems are thick and heavy so in winter insects have a good protection from low temperature and insectivores animals. Once I found live adults in the stems as early as on March 10 (Zaporozhye Oblast). After hatching the

integuments of adults are brown and soft. Gradually integuments become dark and solid, the pits of elytra and pronotum are filled up with yellow wax-like scales. Usually in spring imago gnaws oval hole (3 x 4 mm approximately) in the stem wall and go outside. The duration of exit of adult lasts to 2 days. Sometimes its body sticks in the hole and adults perish. I found dead adults in the stems without holes too. As many as 4–6 (maximum 12) teneral adults may be found out in the same stem.

Artemisia vulgaris is native weed to temperate Europe, Asia, and northern Africa. This weed is naturalized in North America where it is among weedy or invasive species (USDA PLANTS Database). Apparently *L. fasciculatus* is specialized as oligophagous in *Artemisia*-genus. So no doubt weevil is worthy of the special research as an agent for biological control of *Artemisia* weeds.

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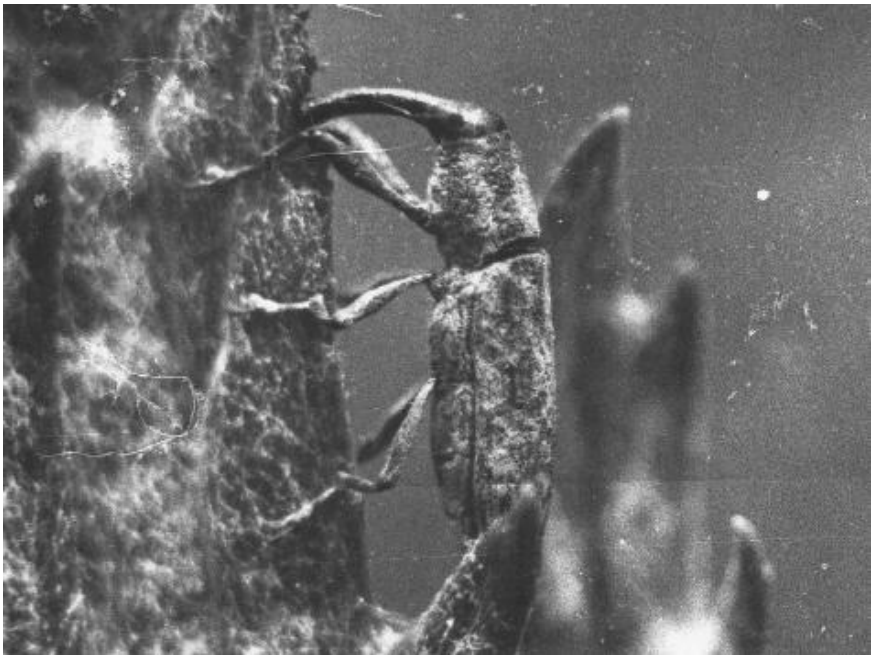

Figure 1. A female *Lixus fasciculatus* prepares place for egg-laying in the stem *Artemisia vulgaris*.