



***Lixus fasciculatus* Boheman, 1836 (Coleoptera: Curculionidae) – a nationally rare weevil species recorded on the Czechowskie Hills in Lublin (East Poland)**

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Abstract: Considered rare weevil species *Lixus fasciculatus* Boheman, 1836 (Curculionidae) was recorded on the Czechowskie Hills in Lublin (E Poland) in 2022. More than 30 adults were found, as well as numerous L1 – L3 larvae and eggs. All the developmental stadia were found on mugwort (*Artemisia vulgaris*) growing in localities with xerothermic or ruderal plant communities.

Key words: weevils, faunistics, xerothermophilous species, climat changes

INTRODUCTION

Lixus fasciculatus Boheman, 1836 is a Palearctic species. In Europe it inhabits Austria, Czech Republic, north-eastern France, south-western Germany, Hungary, Italy, Moldova, Poland, Slovakia, Switzerland, southern and central Ukraine, the northern Caucasus, southern Russia and Crimea. In Asia it has been recorded in Afghanistan, China, Iran, the Korean Peninsula, Mongolia, Russia and Turkey (Löbl & Smetana 2013, Volovnik 2012, Alonso-Zarazaga et al. 2023). Its range lies between latitudes 57°N and 38°N, usually wherever the climate is mild and warmer. It is not found in regions where winter frosts are severe or where summers are cool and moist (Volovnik 2012).

In Poland, *L. fasciculatus* is considered rare; it is on the Red List of Threatened Animals in Poland, category LC (Burakowski et al. 1993; Głowaciński 2002; Smreczyński 1968). To date it has been recorded at just a few isolated localities: the Przemyśl area, Stalowa Wola, Bochoznica near Kazimierz, Nowa Wieś near Lubartów, the Jarosław area, Bieszczady Mountains, Eastern Sudety Mountains, and in Upper Silesia (Gosik & Rozwałka 2011; Grzywocz & Szotyś 2017; Kania et al. 2004; Petryszak & Dąbek 1997; Wanat et al. 2016, 2022). At most localities only single weevils were found.

Lixus fasciculatus is an oligophagous species, trophically associated with the genus *Artemisia* L. Adults feed primarily on mugwort (*A. vulgaris* L.) and wormwood (*A. absinthium* L.), but some observations suggest that it may also feed on Common tansy (*Tanacetum vulgare* L.) (Burakowski et al. 1993). The eggs are laid in mugwort stems, which is where the subsequent preimaginal stadia develop. In host plant clumps of average density, the adult weevils achieve an abundance of up to a dozen or so individuals per square metre, but Iranian scientists have found them capable of colonizing 77.3–87.3% of high-density clumps of *Artemisia* (Shahand & Karimpour 2017). Mating, recorded on these plants from mid-May to late June, takes place exclusively during the daytime. The yellowish eggs, 0.5–0.9 x 1–1.1 mm in size, are laid singly in ca 90% of cases, less often in clutches of two (Shahand & Karimpour 2017). Oviposition in the Polish climate begins around mid-June and is preceded by the females “drilling” shallow

depressions in stems and leaf stalks, which later wither as a result of this damage (Volovnik 1994). According to experimental data from Iran, female fertility was estimated at 23.4 ± 4.6 (range: 17–32), and the incubation period in natural conditions lasted for 8.3 ± 1.8 days (range: 6–11 days) (Shahand & Karimpour 2017). The larva tunnels into and then feeds on the parenchyma. This is also where the larva metamorphoses in a widened pupation chamber. The larvae, pupae and teneral adults overwinter in the plant stems. In spring, the tenerals chew oval holes in the stems and within 1–2 days emerge into the open. From 4 to 6 tenerals (12 at most) usually appear on one plant. Adults grow to a length of 6.5–14 mm. They fly well, but on sensing danger, they drop off the plant on to the ground (Shahand & Karimpour 2017).

MATERIALS AND METHODS

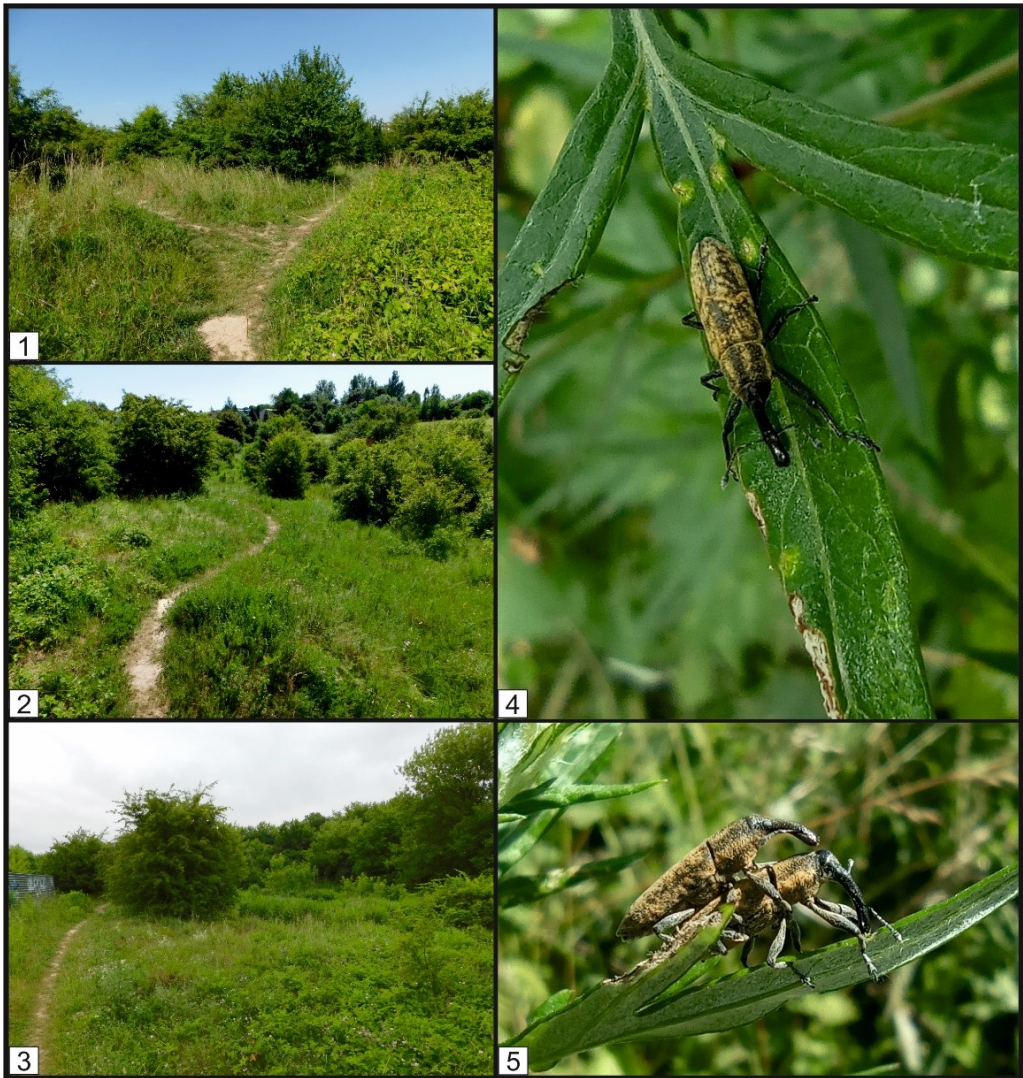
The weevils were caught on sight at localities on the Czechowskie Hills in Lublin (E Poland) from mid-May to the end of August 2022; adults were searched for on the leaves and stems of *Artemisia* spp. and neighbouring plants. The stems and leaf stalks were also examined for signs of oviposition. Floristic surveys were made of the study plots during the height of the growing season. The coverage of particular species was assessed using the Braun-Blanquet method as modified by van der Maarel (Piernik 2008). Species were assigned to particular ecological groups of plants on the basis of Zarzycki et al. (2002); the plant nomenclature is according to Mirek et al. (2002).

RESULTS

Towards the end of August 2021 one specimen of *L. fasciculatus* was found on the Czechowskie Hills in Lublin. In 2022 a large population of this species was come across in this area: 34 adults of both sexes were found, along with larvae L1-L3 and eggs (leg. et det. Magdalena Kowalczyk, Wojciech Czarniawski). Beetles were found on leaves of *Artemisia vulgaris*, larvae were found inside the woody stems of *A. vulgaris*, in the thick parts of the plant but always at least 20 cm above the ground. Pupae have not been found.

Study plot I: This locality is situated by a fork in a path running some 300 m from the eastern boundary of a former army training area; the coordinates of the locality's centre are $51^{\circ}15'58.69''\text{N}$, $22^{\circ}32'06.79''\text{E}$. The plot is a compact mosaic of herbaceous plants and scattered shrubs. The patches of vegetation are anthropogenic and betray signs of degradation and transformation from thermophilous scrub and sward communities to ruderal communities with grasses and dicotyledonous perennials, often invasive. The dominant plants in this group are grasses – *Bromus inermis* Leyss., *Calamagrostis epigeios* (L.) Roth, *Dactylis glomerata* L., *Arrhenatherum elatius* (L.) P.Beauv., *Phleum pratense* L., *Agrostis stolonifera* L. and *Poa angustifolia* L. – along with ruderal herbaceous species like *Tanacetum vulgare* L., *Solidago canadensis* L., *S. gigantea* Aiton, *Achillea millefolium* L. and *Urtica dioica* L. The following thermophilous plants were identified: *Trifolium medium* L., *Hieracium umbellatum* L., *Origanum vulgare* L., *Galium verum* L., *Agrimonia eupatoria* L. and *Medicago falcata* L., along with scattered shrubs like *Crataegus monogyna* Jacq., *Prunus spinosa* L., *Berberis vulgaris* L., *Rubus* sp. and *Rosa* sp. On this plot *Artemisia vulgaris* makes up around 5% of the plant cover, but grows in scattered clumps of a dozen or so individual plants at some distance from each other (Fig. 1).

- 18 June 2022: 8 adults (4♀ and 4♂, including 3 pairs in copula) on mugwort leaves, 2 eggs in a clutch on a stem near the ground;
- 25 June 2022: 6 adults (3♀ and 3♂, including 2 pairs *in copula*) on mugwort leaves;
- 2 July 2022: 8 adults (3♀ and 5♂, including 2 pairs *in copula*) on mugwort leaves;
- 16 July 2022 1♂ on a mugwort leaf;
- 9 August 1♂ on a mugwort leaf;



Figs 1–5: New localities of *Lixus fasciculatus* on the Czechowskie Hills in Lublin. 1 – Study plot I; 2 – Study plot II; 3 – Study plot III; 4 – *Imago* of *Lixus fasciculatus* on a mugwort leaf; 5 – Copulating pair of *Lixus fasciculatus* (Photographs taken by W. Czarniawski (1–3) and M. Kowalczyk (4 & 5).

Study plot II: This locality is situated along a path on a gentle slope with a southerly exposure, some 100 m from the eastern boundary of the army training area; the coordinates of the locality's center are 51°15'48.97"N, 22°32'13.73"E. The vegetation on study plot II is similar to that on plot I, but has a greater proportion and variety of thermophilous flora. The herbaceous plants are dominated by *Calamagrostis epigeios*, *Fragaria vesca* and *Tanacetum vulgare*, while the thermophilous vegetation is represented by *Medicago falcata* L., *Origanum vulgare*, *Agrimonia eupatoria*, *Pimpinella saxifraga* L., *Hypericum perforatum* L., *Hieracium umbellatum*, *Clinopodium vulgare* L., *Centaurea stoebe* L., *Falcaria vulgaris* Bernh., *Euphorbia cyparissias* L., *Thalictrum aquilegifolium* L. and *Campanula rapunculoides* L. There are also scattered shrub species like *Crataegus monogyna*, *Euonymus europaeus* L., *Viburnum opulus* L., *Pyrus*

communis L. and *Rubus* sp. *Artemisia vulgaris* comprises only ca 1% of the herbaceous vegetation on this plot and is more widely scattered, growing singly or in clumps of just a few plants (Fig. 2).

- 25 June 2022: 4 adults (2♂ and 1 pair *in copula*).

Study plot III: This locality lies along a path near the western edge of the army training area, near the spot where Północna and Willowa Streets cross (the coordinates of the locality's centre are 51°15'49.72"N, 22°31'52.30"E), between a fence around land that is to be developed and an embankment, overgrown with trees and shrubs, surrounding a former shooting range. The vegetation on plot III is transformed to a far greater degree than on plots I and II. Evidence for this is the absolute dominance of ruderal and segetal species, including *Solidago canadensis*, *S. gigantea*, *Tanacetum vulgare*, *Geranium pratense* L., *Cichorium intybus* L., *Anchusa arvensis* L. and *Urtica dioica*. Thermophilous species of both herbaceous plants and shrubs are few in number and occur singly: *Prunus spinosa* L., *Rubus* sp. *Crataegus monogyna*, *Origanum vulgare*, *Clinopodium vulgare* and *Centaurea stoebe*. Mugwort, making up around 2% of the herbaceous vegetation, grows in widely separated clumps consisting of a few to at most 10 plants (Fig. 3).

- 2 July 2022: 6 adults (2♂, 2♀ and 1 pair *in copula*).

The weevils recorded and caught were living on the leaves and stems of mugwort (Figs 4 and 5). Oviposition and larval development were observed solely on mugwort stems.

DISCUSSION

The Czechowskie Hills, ca 160 ha in area and situated in the catchment of the River Czechówka, are covered with an up to 20 m thick layer of loess overlying chalk rocks and clayey-sandy sediments. Until 1999 they were utilized as a training area for the local army garrison (Balana et al. 2004). As far back as 1959, the City of Lublin's spatial development plan drew attention to the need to protect this area for its landscape value and the necessity of retaining open areas, important for maintaining the city's unique local climate and the functioning of the natural environment (Czarniawski et al. 2002, Harasimiuk 1993, Harasimiuk et al. 1992). The creation of a nature reserve 21.4 ha in area together with a steppe-woodland park in its buffer zone was postulated by Professor Dominik Fijałkowski. The task of the reserve was intended to be the conservation of the area's rich flora, as a classic example of a minimally transformed loess area on the Lublin Upland, with its characteristic valley formations and diverse soil profiles (Balana et al. 2004).

The botanical survey carried out at that time revealed that the southern and central parts of the army training area were colonized by 222 herbaceous plant species, 44 species of trees and shrubs, and 24 species of bryophytes and lichens (Harasimiuk et al. 1992). Growing there were protected species (guelder rose *Viburnum opulus*, common centaury *Centaureum umbellatum* and snowdrop anemone *Anemone silvestris* L.) as well as over a dozen rare plant species, which together formed a mosaic of xerothermic, scrub, pasture and synanthropic (ruderal and segetal) communities. The dominant associations were xerothermic swards of the classes Festuco-Brometea (patches of *Origano-Brachypodietum pinnati*, *Thalictro-Salvietum pratensis*) and *Trifolio-Geranietae sanguinei* (e.g., *Geranio-Trifolietum alpestris*), and also thermophilous scrub communities *Pruno-Crataegetum* and *Ligustro-Prunetum*. Associations representative of the ruderal communities included *Echio-Melilotetum*, *Tanaceto-Artemisietum* and *Chenopodietum ruderales*.

The entomological inventories carried on since 2001 on the Czechowskie Hills (Furtak 2001), together with fragmentary faunistic data from the 20th century, indicate that this area is home to many interesting beetle species associated with xerothermic, steppe, psammophilous and ruderal habitats. The 66 weevil species recorded there include e.g. *Stenopterapion intermedium* (Eppelsheim) and *Centricnemus leucogrammus* (Germar), which are regarded as

typical xerothermophilous species (Burakowski et al. 1992, 1997; Balana et al. 2004). Moreover, there are records of stenotopic rove beetle species (Staphylinidae) from the genus *Bledius* – *B. erraticus* Erichson, *B. gallicus* (Gravenhorst) and *B. procerulus* Erichson (Staniec 2001), as well as a range of ground beetle species (Carabidae). The rare snakefly *Inocellia crassicornis* Schummel was also found there (Czarniawski et al. 2003).

The latest report on the inventory and natural valorization of this area (Harasimiuk et al. 2019) covered only specific groups of insects. Worth mentioning are the 42 butterfly species (including one protected species – *Lycaena dispar* (Haworth)), as well as such insects as *Mantis religiosa* L. and *Sceliphron destillatorium* (Illiger), the occurrence of which signify the very high natural value of this former army training area as a hotspot of insect diversity in the increasingly urbanized landscape of Lublin. Nevertheless, repeated attempts at having this area designated as a protected nature reserve have unfortunately failed. Although some parts of the Czechowskie Hills have already been built over, the most attractive patches, in their southern part, remain a naturally valuable area, despite ongoing impoverishment of its flora and the uncontrolled expansion of goldenrod.

Until now, *Lixus fasciculatus* was never found during all the decades of research on the Czechowskie Hills. But ongoing climate change is playing a key part in the range expansions of many thermophilous species (Staniak et al. 2021). Therefore, the discovery there of an abundant population of this xerophilous weevil testifies to the evident expansion of its range and the survival of its preferred habitat with an abundant supply of food. More and more frequent reports of its presence in the west of Poland, as well as the large population discovered and described in this article close to the northern limit of the range of *L. fasciculatus* in the country, confirm the spread of the species, which was mentioned a few years ago by Wanat et al. (2016). It should be assumed that in the near future this species will appear in other regions of the country, and then the term "rare" that has been used in many articles (e.g. Gosik & Rozwałka 2011; Grzywocz & Szoltys 2017; Kania et al. 2004; Wanat et al. 2022) will no longer be justified.

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STRESZCZENIE

[*Lixus fasciculatus* Boheman, 1836 (Coleoptera: Curculionidae) – rzadko występujący w kraju gatunek ryjkowca odkryty na Górkach Czechowskich w Lublinie (wschodnia Polska)]

Lixus fasciculatus to gatunek chrząszcza z rodziny ryjkowcowatych (Curculionidae), który jest związany troficznie z roślinami należącymi do rodzaju bylica (*Artemisia*). Chrząszcz ten składa jaja w łodygach i tam przechodzi swój rozwój przedimaginalny. Jest gatunkiem palearktycznym. Nie jest spotykany na terenach z bardzo mroźnymi zimami oraz chłodnymi i wilgotnymi latami. W Polsce rzadko łowiony. W 2022 roku na terenie Górek Czechowskich w Lublinie (obszar dawnego poligonu wojskowego) stwierdzono obecność populacji gatunku *L. fasciculatus*. Odnaleziono 34 osobniki postaci imago, liczne larwy w stadiach L1 – L3 oraz jaja. Wszystkie stadia rozwojowe stwierdzono na bylicy pospolitej (*Artemisia vulgaris*) rosnącej w zbiorowiskach roślinności kserotermicznej lub ruderalnej.