

# Biology of two weevils, *Lixus ochraceus* Boheman and *Melanobaris gloriae* sp.n. (Insecta: Coleoptera: Curculionidae), associated with *Tchihatchewia isatidea* Boissier, a cruciferous plant endemic of Turkey

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**Abstract.** The biology of two weevil species, *Lixus ochraceus* Boheman, 1843 and *Melanobaris gloriae* sp.n., living on *Tchihatchewia isatidea* Boissier, 1860 (the sole species of a monotypic genus of the family Brassicaceae and endemic to Turkey) and the host plant distribution were studied in NE Anatolia. *Melanobaris gloriae* sp.n. is described. *T. isatidea* is a new host record for *L. ochraceus*. Adults of *L. ochraceus* fly to host plants in spring from overwintering places. After feeding on leaves and flowers, females lay eggs in the stem. The first instar larva makes a tunnel along the stem. In late summer, larvae complete their growth and pass the pupal stage in the tunnels. New generation adults open a hole in the stem for emergence, and fly to the mountains for hibernation. Thus in NE Anatolia, this weevil has one generation per year. No data on the species' phenology and biology in other countries have been published. *M. gloriae* sp.n. hibernates in roots as adults. In early spring, the adults emerge from roots, feed on and lay eggs in young leaves. The young larva makes a tunnel in a leaf midrib and reaches the root crown; it continues growth in the root and then passes the pupal stage in the tunnel, where adults remain during hibernation. This weevil also has one generation per year.

**Key words.** *Lixus ochraceus*, *Melanobaris gloriae* sp.n., weevils, biology, Brassicaceae, food-plants

## Introduction

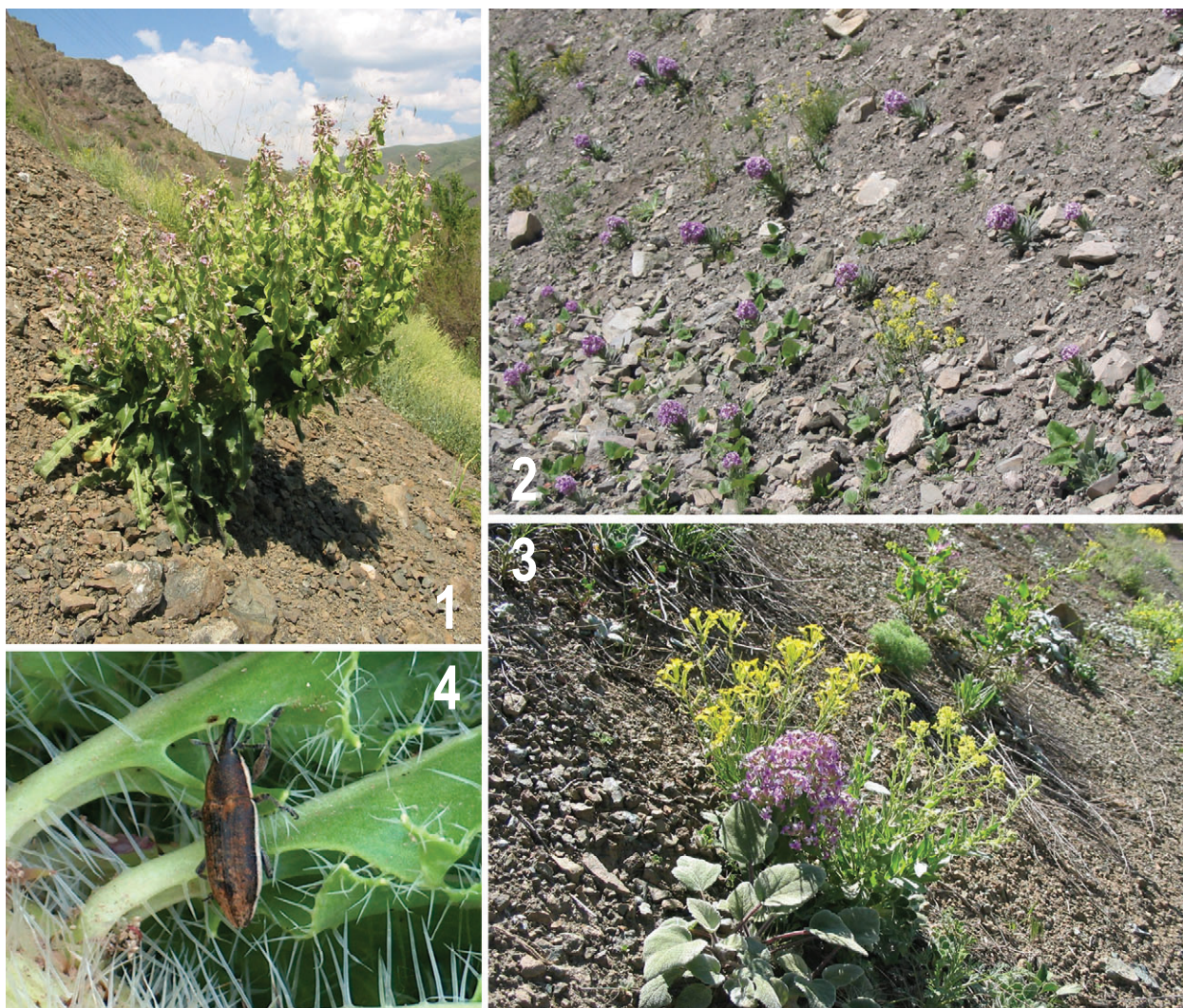
*Tchihatchewia isatidea* Boissier, 1860 is endemic of Turkey and is the sole species of the monotypic genus with uncertain position in the family Brassicaceae. It is distributed in Giresun, Gümüşhane, Erzurum, Sivas, Elazığ, Tunceli, and Erzincan Provinces (DAVIS 1965). The flowers of this plant were used for paint production (BAYTOP 1994). The very unusual appearance of this densely foliate, densely and coarsely pubescent plant growing on steep dry slopes (Figs. 1, 2) rather high in the mountains, appealed to us for a search of phytophagous beetles.

In the course of the faunistic survey in NE Anatolia, two weevil species, *Lixus ochraceus* Boheman, 1843 and *Melanobaris gloriae* sp.n., were found to be associated closely with *T. isatidea*. In addition, only beetles of the genus *Meligethes* Stephens, 1830 (Nitidulidae) were fairly common on flowers, and single specimens of a *Phyllotreta* Chevrolat, 1837 species (Chrysomelidae: Alticinae), *Ceutorhynchus assimilis* Paykull, 1792 (= *C. pleurostigma* Marsham, 1802), and *C. contractus* Marsham, 1802 (Curculionidae), all not specific to *T. isatidea*, have been collected.

In the habitats where *T. isatidea* occurs, three species of the genus *Hesperis* Linnaeus, 1753, *Erucastrum armoracioides* (Czernjaew ex Turczaninov) Cruchet, 1902, *Crambe orientalis* Linnaeus, 1753, and several species of *Erysimum* Linnaeus, 1753 and *Isatis* Linnaeus, 1753 (all Brassicaceae) also are common, most of them being attacked by specialized species of *Ceutorhynchus* Germar, 1824 (Curculionidae) and *Bruchela* Dejean, 1821 (Urodontidae; on *Erysimum* and *Isatis*). In the sites investigated, *Lixus ochraceus* has never been found on any crucifer other than *T. isatidea*, whereas *Melanobaris gloriae* was also collected from *Isatis* sp., *Erucastrum armoracioides*, *Hesperis cappadocica* Fournier, 1866, *H. persica* Boissier, 1842, *H. bicuspidata* (Willdenow) Poiret, 1813, *Sterigmostemum tomentosum* (Willdenow) Bieberstein, 1819, and *S. incanum* Bieberstein, 1819.

The genera *Lixus* Fabricius, 1801 and *Melanobaris* Alonso-Zarazaga & Lyal, 1999 constitute a considerable part of the weevil assemblages associated with plants of the family Brassicaceae in the Palaearctic Region. These assemblages include also the genus *Bruchela*, endemic to the Palaearctic and including approximately 35 described species; several small Palaearctic genera and the widely distributed genus *Ceutorhynchus* of the subfamily Ceutorhynchinae with about 300 described species; and 4 other Palaearctic genera of the subfamily Baridinae: *Aulacobaris* Desbrochers, 1892 with some 30 species, *Neobaris* Reitter, 1895 with 2 species, and the monotypic *Eremobaris* Zaslavskij, 1956 and *Bariscelis* Reitter, 1895. The genus *Melanobaris* is endemic to the Palaearctic and comprises about 30 described species. All species of *Bruchela* and the genera mentioned of the subfamilies Ceutorhynchinae and Baridinae are specific to Brassicaceae, except for a few species of *Bruchela*, *Ceutorhynchus*, *Melanobaris*, and *Aulacobaris*, which are all associated with *Reseda* Linnaeus, 1753, and *Ceutorhynchus debskii* Pic, 1919 associated with *Ochradenus* Delile, 1813 in North Africa and the Middle East; both *Reseda* and *Ochradenus* belong to the family Resedaceae closely related to Brassicaceae.

The genus *Lixus* has a nearly worldwide distribution and comprises over 200 described species classified in 18 subgenera (ALONSO-ZARAZAGA & LYAL 1999). The host range includes several families of higher plants, but many, if not most, of the accepted subgenera are not known to be associated with a single plant family. The majority of the comparatively well-known species develop or at least feed on species of several genera of a single plant family. With some plant families, e.g., the Chenopodiaceae, Brassicaceae, and Apiaceae, species of more than one subgenus of *Lixus* are associated, and it is not always clear if this reflects a multiple transition of the genus to plants of these families or the broad diversification of the phyletic lineages associated with the respective plant families. Only Palaearctic



**Fig. 1.** *Tchihatchewia isatidea*, a fructifying plant. **Fig. 2.** Typical habitat of *Tchihatchewia isatidea*. **Fig. 3.** *Tchihatchewia isatidea* growing in close association with *Isatis ?cappadocica* and *Erysimum pulchellum*. **Fig. 4.** *Lixus ochraceus* Boheman, 1843 on *Tchihatchewia isatidea*.

species of *Lixus* are known to develop on Brassicaceae; the majority, including *L. ochraceus*, belong to the subgenus *Compsolixus* Reitter, 1916, in which 17 species have been placed by CSIKI (1934), although the type species of this subgenus, *L. junci* Boheman, 1835, develops on Chenopodiaceae. Some species developing on crucifers are placed in the subgenera *Eulixus* Reitter, 1916, *Lixoglyptus* Reitter, 1916, *Dilixellus* Reitter, 1916, and *Scaphomorphus* Motschulsky, 1860 (= *Lixestus* Reitter, 1916), the latter recently transferred to the tribe Cleonini as a distinct genus (ANDERSON 1987, as *Cleonidius* Casey, 1891). So, Brassicaceae is one of the families with which the greatest numbers of species of *Lixus* from several subgenera are linked, and *Compsolixus* harbours most of these.

Information on the biology and host plants of *Lixus ochraceus* was summarized by DIECKMANN (1980), all having been by that time provided by French entomologists although the species is widely distributed in the Western Palaearctic. *L. ochraceus* was collected in France on *Raphanus raphanistrum* Linnaeus, 1753, *Raphanus* sp., and *Alliaria petiolata* (Bieberstein) Cavara & Grande, 1913; in Germany, it probably occurs on *Brassica oleracea* Linnaeus, 1753. Prior to DIECKMANN (1980), in, e.g., PETRI

(1904–1905) and TER-MINASSIAN (1967) the name of *L. ochraceus* was erroneously attributed to the Eastern Palaearctic *L. fairmairei* Faust, 1890 (KRIVETS & KOROTYAEV 1998: 845).

In this paper *Melanobaris gloriae* sp.n. is described and preliminary results of a study of the development of this species and *Lixus ochraceus* on *T. isatidea* are reported. The two weevils have similar phenology and their ecological niches seem to overlap slightly, but their interrelationships need a more detailed examination which is beyond the scope of the present paper.

#### Material and Methods

This study was carried out in NE Anatolia in 2001–2003. Biological observations were made in Erzurum Province on Mt. Kopdağı 14 km NW of Aşkale City, near Pırnakapan Village, at an altitude of 1750 m. Field observations were performed every 7–10 days. When the larvae reached the mature stage, host plants were cut and taken to the laboratory for continuing observations.

Type material of the new species described in this paper is deposited in the Zoological Institute, Russian Academy of

Sciences, St. Petersburg (ZIN); the Department of Plant Protection, Faculty of Agriculture, Atatürk University, Erzurum (AU); the Museum für Tierkunde Dresden (MTD); the University of Rome (UR); the National Museum of Natural History, Washington, D.C. (USNM); and the E. Colonnelli collection, Rome (EC).

## Results

### *Lixus ochraceus* Boheman, 1843

**Biology.** Adult *Lixus ochraceus* appeared on host plants on the 29th of May in 2001, and on the 15th of May in 2002. The beetles fed on the outer margin of the leaf and made semi-round cuttings of the edge; some also ate flowers. In 2002, mating was first observed on the 22nd of May; both males and females mated several times. Copulation lasts 25–40 minutes. Usually, only one male and one female were observed per plant. Adults were present on plants until the 21st of June in 2001 and were most abundant in mid-June. On the 31st of May 2002, females deposited eggs one by one into the stem, making a 1.0–1.5 mm-deep excavation with their rostrum. Usually 7 or 8 eggs were put in one stem, but sometimes their number reached 11 or 12. Newly hatched larvae (15th of June 2002) bored directly into the stem and fed on pith; they continued growth, making longitudinal tunnels in this tissue. One plant stem can contain 1–5 larvae, depending on plant height. Five larvae can completely destroy a stem. Most of the larvae reached the mature stage by the 25th of July in 2001 and passed the pupal stage in the tunnel. Larvae were found in stems in the field until the 8th of August 2001. The pupal stage lasted 11–14 days and pupae were found in nature up to the 16th of August 2001. From this time on, adults of the new generation started to emerge; teneral individuals remained for several days within the plants, then opened a hole for emergence. After approximately one hour, they flew north of the Erzurum University Campus in the direction of high mountains. In 2002, adult *L. ochraceus* were found in stems and roots on the 31st of August. *L. ochraceus* produces apparently one generation per year in Northeast Anatolia.

In addition to the material collected and reared from *T. isatidea*, two specimens of *L. ochraceus* were found on *Bunias orientalis* Linnaeus, 1753 in Bayburt Province, and one male was taken from *Hesperis breviscapa* Boissier, 1842 in Erzincan Province (26 km W of Erzincan, 1900 m, detritus slope along road, 18.vi.2003).

Three parasitized pupae of *L. ochraceus* were found in a host plant stem in the field on the 27th of March 2002. In the first week of April, a specimen of the ichneumonid wasp, *Xylophrurus nigricornis* Thomson, 1885 emerged from one of these pupae in the laboratory (KASPARYAN & GÜLTEKIN 2002).

### *Melanobaris gloriae* sp.n.

**Description. Measurements.** Body length 2.9–4.3 mm, usually 3.5–4.3 mm.

**Coloration.** Body black, basal part of antennal scape and tarsi dark reddish brown; legs rarely dark brown. Dorsal surface bare, shining. Legs and underside sparsely clothed with short, fine, pale setae.

**Head** ♂. Rostrum 4 times as long as wide, 0.75 times as long as pronotum, parallel-sided or somewhat narrowing in middle, not widening apically. Ventral margin of antennal scrobe visible dorsally at antennal base. In lateral view, rostrum moderately and more or less evenly curved, with dorsal margin regularly arcuate, ventral margin emarginate in

basal third, straight in middle part, and arcuately convex near apex. Sparse, long, proclinate setae situated along ventral margin of sides and on ventral surface of rostrum. Dorsal surface of rostrum moderately convex in cross-section, somewhat flattened in apical part, shining, finely and not very densely punctate; punctures denser, longer, and partly confluent in apical part of rostrum. Antennae inserted at 0.20–0.29 length of rostrum from apex. Funicle moderately widening apically. Club ovate.

**Pronotum** ♂. Pronotum 1.00–1.07 times as long as wide, weakly to moderately rounded on sides and often slightly narrowing apically, weakly to moderately and evenly convex dorsally, with moderately sharp apical constriction. Punctuation fine and even; small, weakly elongate punctures separated mostly by 1.5–2.0 times own diameter; usually no smooth median line present. Sides of pronotum densely covered with larger shallow, partly confluent punctures. Scutellum pentagonal, not protruding over elytral surface, with more or less strongly rounded, sometimes medially depressed, posterior margin. Sides of meso- and metathorax with medium-sized punctures.

**Elytra** ♂. Elytra 1.39–1.49 times as long as wide, 1.1 times as wide as pronotum, with weakly convex humeral prominences; behind latter subparallel-sided or slightly widening to near middle, gradually narrowing to apex from there. Disc weakly convex, somewhat flattened along suture. Striae fine, entire, slightly widening basally, matte, with remote inconspicuous punctures on bottom; 7th and 8th striae split to separate punctures in basal part and with larger punctures in apical part. Intervals flat, finely microreticulate, with 1 or 2 confused rows of fine punctures.

**Legs** ♂. Legs rather stout, femora subclavate. Foretibia (Fig. 8) weakly outcurved apically, its outer apical angle armed with 1 spine or 2 connate spines noticeably coarser than setae of apical comb. 1st tarsomere about as long as wide (slightly longer in hind tarsus), 2nd weakly transverse, 3rd in foretarsus 1.4 times as long and 1.5 times as wide as 2nd. 5th tarsomere subparallel-sided, extending from lobes of 3rd tarsomere by 2/3 of its length. Claws fine, length slightly exceeding apical width of 5th tarsomere.

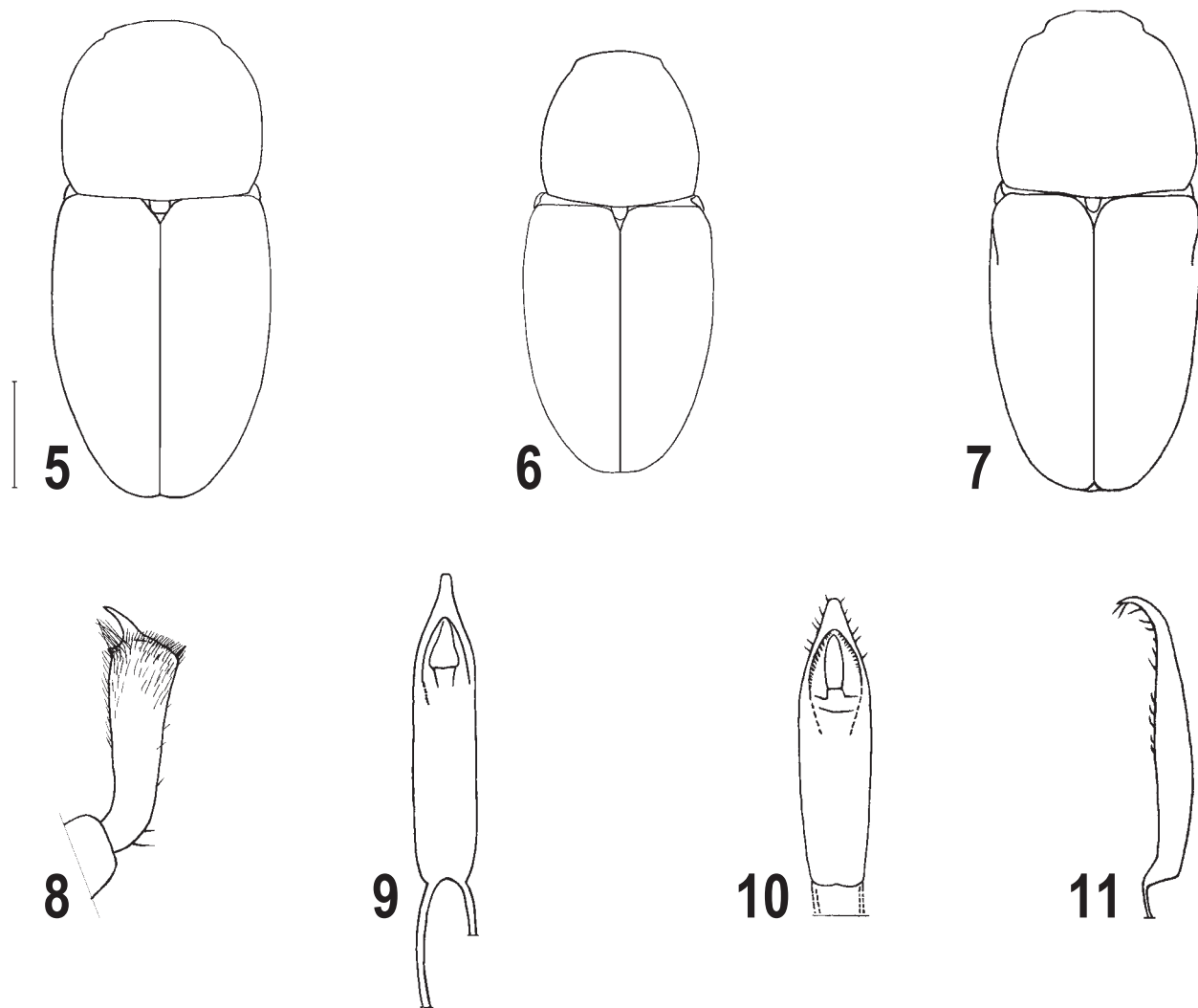
**Genitalia** ♂. Aedeagus (Fig. 9) as in *Melanobaris laticollis* (Marsham, 1802) – with apex produced in a narrow, strongly ventrally bent projection and sides densely covered with long setae in apical part.

**Differences in** ♀. Rostrum 3.7–4.0 times as long as wide, 0.80–0.85 times as long as pronotum. Antennae inserted at 0.25–0.30 length of rostrum from apex. Pronotum 0.96–1.03 times as long as wide. Elytra 1.09–1.17 times as wide as pronotum, 1.44–1.64 times as long as wide.

**Differential diagnosis.** The new species belongs to a group of closely related species including the European *Melanobaris laticollis*, Southeastern European *M. nigritarsis* (Boheman, 1844), and Middle Eastern *M. crambephaga* (Korotyaev & Gültekin, 1999) (KOROTYAEV & GÜLTEKIN 1999).

All these species are hardly distinguishable by the shape of the aedeagus and have a characteristic structure of the foretibia: its outer apical angle bears a stout spine (rarely two connate spines). Many species of the genus *Melanobaris* have such a spine, which is present also in some other Baridinae, including *Baris artemisiae* Herbst, 1795, but it is absent in the species of *Melanobaris* with widely rounded outer apical angle of foretibia, e.g., *M. semistriata* (Boheman, 1836) and *M. hochhuthi* (Faust, 1882).

In addition to the structure of the foretibia and the shape of the aedeagus, species of the *M. laticollis* group may be recognized by the following combination of characters: size



**Figs. 5–11.** *Melanobaris* Alonso-Zarazaga & Lyal, 1999, body outline (5–7), right fore tibia of female (8), aedeagus dorsally (9, 10), and laterally (11). 5, 8, 9: *M. gloriae* sp.n. 6: *M. laticollis* (Marsham, 1802). 7, 10, 11: *M. crambephaga* Korotyaev & Gültekin, 1999. Scale bar: 1 mm for Figs. 5–7, 0.28 mm for Fig. 8, and 0.4 mm for Figs. 9–11.

small to medium (2.9–4.3 mm); body relatively narrow, with dorsal surface sparsely to moderately densely and rather finely punctate, submatte to rather strongly shining, and meso- and metasterna with dense medium-sized, not foveiform, punctuation; pronotum weakly to moderately constricted apically; most of elytral striae entire, rather fine; 3<sup>rd</sup> tarsomere narrow, noticeably to scarcely wider than 2<sup>nd</sup> tarsomere. *M. atramentaria* is closest to this group and considerably differs from it only in the shape of the aedeagus, which is gradually narrowing and not hooked apically. Middle Eastern species of the *M. laticollis* group have a brown coloration of the body not found in any other species of the genus.

*M. gloriae* sp.n. differs from *M. laticollis* (Fig. 6) in the less strongly anteriorly narrowing and more densely and coarsely punctate pronotum and is less convex along the midline of the pronotum and elytra. From *M. nigritarsis*, to which the new species is most similar in the shape of the body, it differs in the finer and sparser punctuation of the pronotum, mostly leaving no smooth median line, which is usually present in *M. nigritarsis*; the pronotum in *M. gloriae* is not raised along the midline, somewhat less sharply constricted and often more or less narrowing anteriorly. *M. crambephaga* has the pronotum more conspicuously narrowing anteriorly, always reddish brown elytra and legs, narrower

tarsi, and shorter and wider apical process of the aedeagus (Figs. 7, 10, 11). All specimens of *M. crambephaga* we collected (partly in the same habitat with *M. gloriae*) were taken from *Crambe orientalis* Linnaeus, 1753. *M. nigritarsis* lives in the N Caucasus on *Isatis tinctoria* Linnaeus, 1753 and *Erysimum cuspidatum* (Bieberstein) De Candolle, 1821; in the middle Volga area, on *Erucastrum armoracoides* and *Matthiola fragrans* Bunge, 1839. *M. gloriae* was not found on a dense population of *E. cuspidatum* in Erzurum Province 40 km N of Ilica, where a single specimen of this weevil was taken from a root of *Hesperis bicuspadata*.

**Derivatio nominis.** The species is named for Gloria Antonini, a molecular insect taxonomist at the University of Rome, who was the first to find this species feeding on *T. isatidea*.

**Biology.** This weevil hibernates in the larval tunnels in the root crown and root as adults. Hibernating adults were found in the plants on the 27th of March, 12th of April, and 10th of May 2002 in the field. 1–13 adults can be found in a single root. In 2002, adults started to emerge from roots on the 15th of May and associated with young *T. isatidea* plants. Adults fed mostly on the underside of leaf, making round holes. Usually 1–4 *Melanobaris* individuals were found on a plant. From the 22nd of May, mating and egg

laying were observed. For oviposition, females prefer the 6–7th leaves from the plant base; they make a hole with the rostrum in or near the leaf midrib and lay eggs one by one, covering them with a secretion which, upon becoming dry and hardened, acquires black colour. The diameter of these black spots is 2–3 mm. Three or four eggs are laid normally on one leaf; 1–22 eggs may be on a plant, depending on its size. Young larvae were first observed on the 31st of May 2002; they bored a tunnel in the leaf midrib and reached the root crown by the 15th of June 2002. The larvae continued a longitudinal tunnel under the root bark; larval growth lasted to the beginning of August (6th of August 2001) in nature, and the first pupae were found in the tunnels at the end of July (31st of July 2001, and 22nd of July 2002). Adults of the new generation were observed on the 9th of August 2001 and on the 31st of August 2002; and thus, *M. gloriae* produces only one generation per year in Northeast Anatolia.

**Material.** Holotype ♂, “TURKEY, Erzurum Prov., 14 km NW of Aşkale, Pirnakapan Vill., 1750 m, reared from *Tchihatchewia isatidea*, 16.viii.2001 (L. Gültekin)”, “Holotypus *Melanobaris gloriae* Korotyaev et Gültekin” (ZIN). – Paratypes 29♂, 49♀: TURKEY, Erzurum Prov.: 6♂, 12♀, same data as holotype (ZIN, AU, MTD, USNM); 2♂, 2♀, same data as holotype, but 22.v.2002 (L. Gültekin) (AU); 3♂, 4♀, same data as holotype, but 31.viii.2002 (L. Gültekin) (AU, EC); 1♂, 6 km E of Aşkale, 1750 m, clay slope, on *Isatis* sp., 07.vi.1999 (B. Korotyaev) (ZIN); 1♀, as previous specimen, but on *Sterigmostemum incanum*, 29.v.2001 (B. Korotyaev) (ZIN); 1♂, 40 km NW of Ilica, 1950 m, on *Erucastrum armoracioides*, 22.vi.2003 (B. Korotyaev) (ZIN); 1♀, as previous specimen, but on *Hesperis bicuspidata*, 22.vi.2003 (L. Gültekin) (ZIN); 1♀, 29 km NW of Ilica, 1900 m, on *T. isatidea*, 22.vi.2003 (B. Korotyaev) (ZIN); 2♀, 32 km S of Köprüköy, 1800 m, on *Hesperis cappadocica*, 23.vi.2003 (L. Gültekin) (AU, ZIN); 3♂, 5♀, as above, but on *T. isatidea*, 12.ix.2002 (L. Gültekin) (AU); 1♀, 42 km S of Köprüköy, 1850 m, on *Erucastrum armoracioides*, 23.vi.2003 (B. Korotyaev) (ZIN); 4♂, 2♀, 52 km S of Köprüköy, 1900 m, on *Hesperis persica*, 23.vi.2003 (B. Korotyaev) (AU, ZIN); 2♂, 5♀, 24 km S of Horasan, 1850 m, on *Erucastrum armoracioides*, 20.vi.2003 (B. Korotyaev) (AU, ZIN); 1♂, 2♀, 18 km S of Çat, 1800 m, clay slope, on *T. isatidea*, 08.vi.2001 (G. Antonini, B. Korotyaev) (UR, ZIN); TURKEY, Bayburt Prov.: 1♀, 2 km NW of Bayburt, 1850 m, on *Erucastrum armoracioides*, 21.vi.2003 (B. Korotyaev) (ZIN); 2♂, 31 km SE of Bayburt, detritus slope, under *Hesperis cappadocica* and *Isatis* sp., 07.vi.1999 (B. Korotyaev) (USNM, ZIN); 1♀, 3 km N of Kop Pass, 2300 m, on *Hesperis bicuspidata*, 15.vi.2003 (B. Korotyaev); TURKEY, Kağızman Prov.: 1♀, 34 km W of Tuzluca Vill., left bank of Araks River, steppe, on the ground near *Sterigmostemum tomentosum*, 02.vi.2002 (B. Korotyaev) (ZIN); TURKEY, Ağrı Prov.: 1♂, 1♀, 10 km W of Dogubayazit, 1580 m, on *Erucastrum armoracioides*, 11.vi.2003 (B. Korotyaev) (ZIN); 3♂, 7♀, as previous specimens, but L. Gültekin (AU, ZIN).

#### Distribution records of *Tchihatchewia isatidea*

**Bayburt Prov.:** 31 km S of Bayburt, Mt. Kopdağı, 1750 m.  
**Erzurum Prov.:** 14 km NW of Aşkale, Mt. Kopdağı, 39°59'N 40°34'E, 1750 m; 18 km S of Çat, 1800 m; 32 km NW of Ilica, Eğerti Vill. env., 40°09.033'N 41°01.905'E, 1950 m; 32 km S of Köprüköy, 1800 m. **Erzincan Prov.:** 35 km W of Tercan, 1364 m, 39°34.674'N 40°09.054'E.

#### Discussion

The data reported illustrate some characteristics of the weevil assemblages associated with plants growing in the peculiar conditions of the steep, dry detritus or clay slopes in the NE Anatolian mountains. This highly movable substrate, though providing easy access to water, is subjected to erosion and abrasion and holds a characteristic vegetation of a few species of Brassicaceae and a highly xeromorphous poppy, *Papaver fugax* Poir., 1804 (Papaveraceae). A rapid change of the weevil habitats is facilitated by the biennial life cycle of the plants. In one of the sites where *Hesperis cappadocica* was abundant in 2001, only a few specimens of this crucifer were found in 2002 and 2003. A group of specialized weevils, all highly vagile and with well-developed wings, attacks most of the plant species on the slopes. Some of these weevils have distribution ranges only slightly wider than those of their hosts, or are exclusively sympatric with these plant species. This is apparently true for *Melanobaris crambephaga* on *Crambe orientalis*; *Ceutorhynchus loici* Korotyaev & Gültekin, 2001 on *Hesperis cappadocica* and *H. schischkini* Tzvelev, 1961; *Bruchela ?cretacea* Daniel, 1903 on *Isatis*; and *Glocianus (Neoglocianus) transcaucasicus* Korotyaev, 1980 on *Papaver fugax*.

The situation is different with *Tchihatchewia isatidea*, a plant species of uncertain phylogenetic affinities within Brassicaceae and with a restricted distribution in NE Turkey. One of the two weevil species associated with this plant, *Lixus ochraceus*, has a wide Western Palaearctic range and feeds on several species of Brassicaceae, being the commonest species of *Lixus* on crucifers in Italy (E. Colonnelli, pers. comm.). Yet, of the ca. 100 species of Brassicaceae briefly examined in the course of the expeditions in NE Turkey in June 2002 and 2003, *L. ochraceus* was found only on two species in addition to *T. isatidea*. Two specimens were collected on *Bunias orientalis* in a woodland river valley in Bayburt Province, and one male was taken from *Hesperis breviscapa* in Erzincan Province. This latter record is of special interest because *H. breviscapa* occupies in Erzincan Province detritus slopes at the elevation 1800–2000 m, which is typical of *T. isatidea* in the eastern part of its range, whereas in Erzincan Province *T. isatidea* usually occurs at altitudes of 1100–1300 m (DAVIS 1965). Sparse vegetation on steep screens on the southern slope of the Sakaltutam Pass, 40 km W of Erzincan, is dominated by *H. breviscapa*, *Iberis taurica* De Candolle, 1821, and *Ricotia aucheri* (Boissier, 1842) B.L. Burt, 1952. In contrast to *T. isatidea*, *H. breviscapa* has numerous slender stems apparently not suitable for large weevils like *Lixus*. No other weevils or leaf beetles (Coleoptera; Chrysomelidae) were found on a large and dense population of *H. breviscapa* examined by us in 2003. *L. ochraceus* was never found on many dozens of plants of 3 other species of *Hesperis* investigated in the seasons of 2001–2003 east of Erzincan Province. So, *T. isatidea* in a considerable part of its range is apparently the primary or preferred host of *L. ochraceus*.

To better estimate the ecological characteristics of *L. ochraceus*, it is noteworthy that this weevil was collected in Western Europe on two cultivated plants. Phytocenotic characteristics of cultivated plants are similar to those of ruderal species and plants exploring pioneer habitats in their being unable to exist in developed multi-species plant communities. Plant species of this ecological group are called cenophobic (RAZUMOVSKII 1981: 154). Association of *L. ochraceus* with *T. isatidea* seems to confirm its prefe-

rence for cenophobic plants, here also occurring in typical pioneer habitats. The highly developed defence against herbivores in the form of dense and coarse pubescence clothing all the plant does not save it from *L. ochraceus* attack. Similar to *Lixus ochraceus*, *Melanobaris gloriae* also clearly demonstrates preference of cenophobic plants occupying mountain slopes with easily movable substrate. Unlike the latter, it feeds on other crucifers co-occurring with *T. isatidea*, sometimes in no smaller numbers than on this plant. Interestingly, the distribution range of *M. gloriae* is apparently not much wider than that of *T. isatidea* – in spite of its looser trophic association with the host plant than in *L. ochraceus*.

So, the two weevils associated with *T. isatidea* significantly differ in their ecology and distribution. *L. ochraceus* feeds on *T. isatidea* in a small part of its range but is more closely associated with this host than *M. gloriae*, which is sympatric with *T. isatidea* in a considerable part of its range.

This study also shows the existence of a group of very closely related species of the *Melanobaris laticollis* group in the Caucasus and Anatolia, developing on different hosts. Although most of the European *Melanobaris* species, including *M. laticollis*, are known to have wide host ranges, some may be monophagous in a vast territory, and very similar species may have different hosts. Very closely related species, both sympatric (and syntopic – *M. crambephaga* and *M. gloriae*) and allopatric (*M. laticollis*, *M. nigritarsis*, and *M. gloriae*) have almost indistinguishable anatomy of the aedeagus.

Noteworthy also is the co-occurrence of two weevil species with similar phenology and larval habits on *Tchihatchewia isatidea*. Both attack leaves and stem in spite of the highly developed pubescence (Fig. 4), one of the functions of which is the defence of the plant against herbivores, while flowers seem to be used only by *Meligethes* spp. very similar to those found on the co-occurring *Hesperis cappadocica*. In more than half of the infested host plant specimens, larvae of both weevil species have been found.

Notwithstanding the similar ecological niches of the Lixinae (*Lixus*) and species of the Baridinae (*Melanobaris* and *Aulacobaris*), whose larvae are stem and root borers, weevils of these two subfamilies often co-occur on hosts (the following data are based on the authors' unpublished studies). In addition to the pair of species associated with *Tchihatchewia*, those from *Crambe orientalis* (*Lixus circumcinctus* Boheman, 1836 and *Melanobaris crambephaga*), *Isatis ?glauca* Aucher ex Boissierte, 1842 (*Lixus (Compsolixus)* sp. and *Aulacobaris ?cribellata* Kiesenwetter, 1864), *Erucastrum armoracioides* (*Lixus (Compsolixus)* sp. and *Melanobaris gloriae*), *Erysimum pulchellum* (*Lixus (Compsolixus)* sp. and *Melanobaris atramentaria*) have been found in NE Turkey. Especially interesting is a co-occurrence of different complexes of *Lixus* and *Melanobaris* species on *T. isatidea* and on species of *Erysimum*, often growing in very close association (Fig. 3). On *T. isatidea*, these weevil genera are represented by *L. ochraceus* and *M. gloriae*; the respective complexes on *Erysimum pulchellum* (Willdenow) J. Gay, 1842 and *E. pusillum* Bory & Chaubard, 1832 are constituted by *L. (Compsolixus)* sp. pr. *ochraceus* and *M. atramentaria*. In 2003, a specimen of *L. sp. pr. ochraceus* was found on *Erysimum pusillum* standing about 20 cm from a plant of *T. isatidea*, the latter harbouring one individual each of *M. atramentaria* and *M. gloriae*.

Considering that only 8 species of *Lixus* and 10 species of Baridinae have been found on ca. 100 species of Brassicaceae and on two species of *Reseda* briefly examined by

us in NE Turkey (whereas about 90 species of *Ceutorhynchus* have been collected), one must estimate the frequency of *Lixus* and Baridinae co-occurrence on hosts as unexpectedly high. It can probably mean that there is not much competition for the host species between these two weevil subfamilies, but rather a tendency to optimum sharing of a food resource for some unknown reason favourable or attractive for the weevils. Noteworthy is a common presence of more polyphagous baridines on crucifers infested by specialized weevil complexes. For instance, a small population of *Erucastrum armoracioides* 24 km S of Horasan, where the highest densities of both *M. gloriae* and *Lixus (Compsolixus)* sp. were found in 2003, was also attacked by *Eremobaris picturata* Schoenherr, 1849, manifesting no clear preference of any of the many crucifers attacked by it within the vast range.

All variants of the *Lixus* and baridine species combinations on crucifers and *Reseda* spp. with respect to the degree of the weevil specialization have been found. On *Tchihatchewia*, two non-specialized weevils co-occur. *Melanobaris semistriata* is apparently monophagous on *Cardaria draba* (Linnaeus) Desvaux, 1814 and is occasionally accompanied by *Lixus (Compsolixus) albomarginatus* Boheman, 1843 and *Lixus (Eulixus) myagri* Olivier, 1807 in SE Europe, whereas in NE Turkey we also found *M. semistriata* together with *L. myagri* on *Lepidium latifolium* Linnaeus, 1753 and *L. crassifolium* Waldstein & Kitaibel, 1799, but no specimen of *Lixus albomarginatus* was found on these plants. On *Crambe maritima* Linnaeus, 1753 and *C. tataria* Sebeok, 1779 in the Ukraine and North Caucasus, the specialized *Lixus canescens* Fischer de Waldheim, 1835 and polyphagous *Melanobaris carbonaria* (Boheman, 1836) and *Aulacobaris coerulea* (Scopoli, 1763) develop. *Crambe orientalis* has two specialized weevils in Turkey, *Lixus circumcinctus* Boheman, 1836 and *Melanobaris crambephaga*. *Isatis glauca* seems to have the most strictly specialized assemblage in NE Turkey, composed by *Lixus (Compsolixus)* sp. and *Aulacobaris ?cribellata*.

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