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Description of the larva of *Cucullia mixta* (Freyer) (Lepidoptera, Noctuidae)

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The larval foodplant (=Aster linosyris) and certain features of the biology of *Cucullia mixta* (Freyer, 1842), are examined on the basis of ex ovo rearing. Details of hypopharyngeal complex, labrum and mandible of last instar larvae are given and ornaments are described. Larval characters are compared with those of *C. dracunculi* (Hübner,[1809-1813]) and *C. xeranthemi* Boisduval, 1840, species that also feed on Aster.

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1. Introduction

According to Ronkay & Ronkay (1994) the species *Cucullia mixta* Freyer, 1841 inhabits the European and Siberian steppe-zone as the nominate subspecies. The other European subspecies *mixta lorica* Ronkay & Ronkay, 1987 occurs in Hungary. Larval stages of both populations remained undescribed. Because of lack of material of the nominate subspecies, our description of the larva concerns the latter. The possible larval differences between these two populations remain unknown.

2. Material and methods

Five larvae of Hungarian origin preserved in alcohol were examined for their morphology. Microscopic slide mounts of hypopharyngeal complex, labrum and mandible were made and the distances of setae were measured for study of chaetotaxy. The setal nomenclature and abbreviations used follow Hinton (1946), as interpreted by Ahola (1986), and the description of ornamentation is according to Beck (1974).

3. Diagnosis

The larva of *C. mixta lorica* resembles in habitus most closely that of C.dracunculi (Hübner,[1809-1813]) also feeding on *Aster linosyris*. Ornamentally both larvae possess a broad pale inner dorsal and dark brownish outer dorsal zone. The colour pattern of the head and the spiracular line of *C. dracunculi* are, however, more prominent. The brown form of the larva of *C. xeranthemi* Boisduval, 1840, also living on *Aster*, resembles that of *C. mixta*, too. This species, however, has very weak subdorsal lines on the back and its spiracular line is ventrally sharply bordered by a dark pleural zone. These differences are also visible in the illustrations presented by Ronkay & Ronkay (1994). In the mouthparts the shape of the inner tooth of the mandible of *C.mixta* is quite different

with parallel sides. Those of *dracunculi* and *xeranthemi* have an enlarged apex.

4. Description

Mouthparts. (Figs. 1-4): Spinneret tubular, long and rather stout (length about 5-6 x width and 4-5 x Lps1). Labial setae Lp1 and Lp2 equal in length to Lps2. Length of Lps1 about twice its width and 7-9-x Lp2. Stipular setae 4-5 times longer than Lp2. Hypopharynx with medial transverse cleft, posterior part of distal region covered by short stout spines, group of longer and stouter spines present on lateral area, region otherwise bare. Proximolateral region with row of long and narrow sharply pointed spines, 19-24 in number, and above this row slightly shorter spines . Proximomedial region without spines. On galeal lobe sensilla styloconica with distally tapering basal segment. Cutting margin of mandible with weak first tooth, strong 2.-4. teeth and small 5.-6. teeth. Inner surface of mandible with three ridges terminating on processes before cutting margin and on base of first ridge strong tooth-like, parallel-sized retinaculum . First ridge swollen between retinaculum and process, second and third ridges without swellings but fused at base. Labrum with low notch and relatively short setae, lateral setae forming row, L1 and L2 well separated. Epicranial index (length of epicranial suture/height of frons) of head varies between 1.1 and 1.3. Large distance between fourth and sixth ocelli (Oc4-Oc6 3.5 - 5.0 x Oc2-Oc3) and short distance between second ocellus and seta A3 (O2-O3 3.7 - 5.4 x Oc2-A3) typical for species.

Chaetotaxy. Setae L2 on prothorax and SD2 on thorax hair-like, seta SD1 on S9 not reduced. Warts of setae low. SV group bisetose on S1 and trisetose on S2. Dorsal setae relatively short (seta D2 of S8 sligthly longer than height of spiracle of same segment). On prothorax distance between setae D1-D1 rather long when compared with XD1-XD1 (XD1-XD1 1.3-1.6 x D1-D1 and D1-D1 1.2-1.6 x XD1-D1). Crochets uniordinal on S3, biordinal on S6 and S10, in number 18-21 on S3, 24-31 on S6 and 32-37 on S10.

Ornaments. Head pale ochreous-brown. Stripes, anterior zone, genae and postgenae pale. Reticulation with chocolate-brown fields and pale bands, all groups of reticulation present. Frons pale with dark brown spots between F1 and adfrontal suture. Adfrons darker than frons, ochreous brown. Setal rings brown or blackish. Cervical shield with broad, whitish middorsal line and slightly narrower subdorsal line. Bases of XD1 and D1 setae brownish, that of D1 enlarged dorsally reaching middorsal line. Pores and punctures blackish, setal rings dark brown. Lateral row of punctures fleck-like, located on shield. Dorsal and subdorsal zones yellowish-brown. Anal shield with broad whitish middorsal line, subdorsal line less prominent. Dorsal zone of shield dark greyish-brown, subdorsal zone paler.

Body with whitish-grey inner dorsal zone, mottled with brown flecks. Middorsal line of same colour, visible only because of narrow reddish-brown border, clear on thorax, diffuse on other segments. Outer dorsal zone darker reddish-brown decorated by few pale ochreous colour elements. Bases of D setae small, whitish-grey, narrowly lined by dark brown colour. Subdorsal line narrow, whitish-ochreous, dorsally and ventrally bordered by narrow reddish-brown edge. On segments S1-S8 subdorsal zone dorsally of same colour with outer dorsal zone, ventral part paler with weak dark brown longitudinal flecks cephalad from spiracles and from SD1 setae . Bases of SD1 setae brown. Supraspiracular line broken into large, white flecks above SD1 setae. Spiracular line obscure, whitish, mottled with brownish colour, visible because of dark dorsal border. Spiracles pale yellowish-brown with black rings. Pleural and ventral zones of larva pale greenish-grey.

5. Biology

The nominate *C. mixta mixta* occurs in open grasslands and Artemisia steppes. The central European subspecies *C. mixta lorica* inhabits dry xerothermic steppes and rocky swards on limestone conglomerate; it flies in May and June, and is single-brooded.

During the summer of 1989 a female *C. mixta lorica* was found in the wild by G. Ronkay. It laid eggs in a box with natural food for the female. The larvae hatched after 8-12 days and accepted

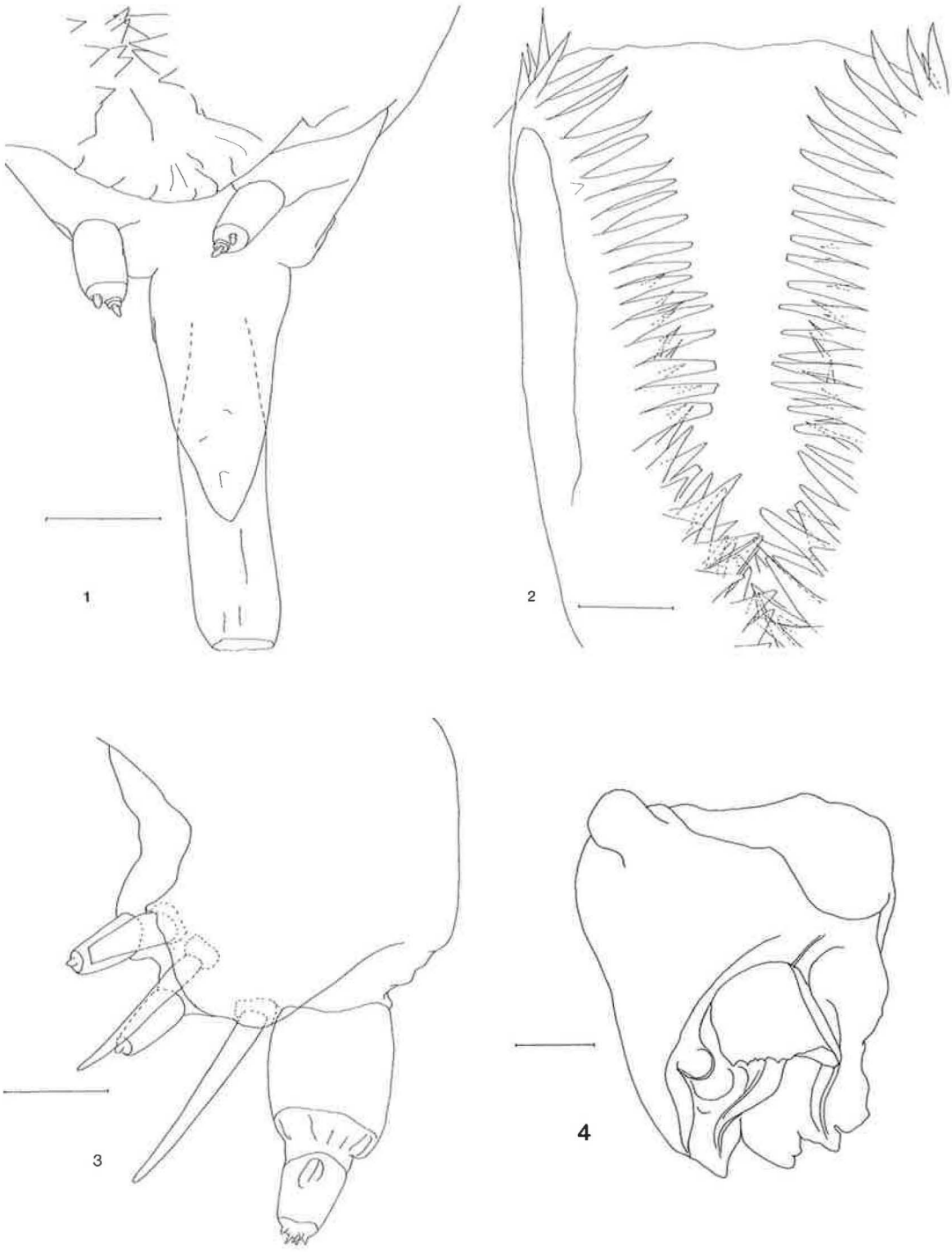

Fig. 1-4: 1. Spinneret and labial palpi on dorsal view of larva of *C. mixta*. Scale of drawings = 0.1 mm; 2: Hypopharynx on dorsal view of larva of *C. mixta*; 3: Left maxillary palp on dorsal view of larva of *C. mixta*; 4: Inner surface of mandible of larva of *C. mixta*.

Aster linosyris as food. Larvae were fullgrown in August and pupation took place in the soil. Ten larvae were preserved in alcohol for study. Between 31th March and 17th April 1990 adults emerged from the pupae. One male and one female mated succesfully in an artificial environment and after four days the female began to lay eggs. It laid about 200 fertile eggs in a rather large bottle with some plants as food for the female. The natural foodplant of the larvae, *Aster linosyris*, was not needed in the bottle during the laying time. The development took place as earlier.

Young larvae feed on the leaves of the foodplant. After the third moult they are hiding in the soil during the daytime and feed at night, also on the flowers.

6. Discussion

According to Ronkay & Ronkay (1994) the different subspecies of *C. mixta* have different habitats and life histories. The nominate race is bivoltine in the Ural region and inhabits dry *Artemisia* steppes and open grassland. The subspecies *lorica* is single-brooded and occurs in dry xerothermic steppes and rocky swards on dolomite or limestone area. The Turkish subspecies *ronkayi* (Hacker & Pinker, 1987) inhabits high montane steppes and the Central Asian subspecies *lucida* (Ronkay & Ronkay, 1986) occurs in xerothermic montane slopes and semideserts. Larvae of these non-European subspecies are unrecorded. Therefore, the range of variation of larval stages remains unknown to us.

The larva of *C. cemenelensis* Boursin, 1923 has recently been discovered and studied by Petit (unpublished). It seems habitually to be close to that of *C. mixta*, and its foodplant is *Aster acris*. Unfortunately the larvae could not be compared. Other European *Cucullia* species associated with Aster are *C. asteris* ([Denis & Schiffermüller], 1775), *C. amota* Alphéraky, 1887, *C. virgaureae* Boisduval, 1840, *C. dracunculi* and *C. xeranthemi*. Larvae of the last two species are now compared with that of *C. mixta*. We have not yet seen larval stages of *C. amota* or *C. virgaureae*. The larva of *C.asteris* has broad yellow middorsal and spiracular lines and rather a broad white subdorsal line. The coloration of the straight longitudinal lines without any transverse pattern seems typical for *Aster*-feeding larvae of European Cucullia. The Asian species, *C. elongata* (Butler, 1880) also belongs to this group (Sugi & al, 1987). In the Nearctic region some Cucullia species are feeding on Aster, e.g. *C. asteroides* Guenée, 1852, *C. omissa* Dod, 1916, *C. florea* Guenée, 1852, *C. postera*, Guenée, 1852 and *C. convexipennis* Grote & Robinson, 1868. According to Poole (1994) larvae of these species possess mainly continuous longitudinal lines on their back. This pattern is rare in species not feeding on *Aster*, which commonly have differently coloured spots, flecks, oblique lines or transverse bands.

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