

**Morphology of the immature stages of *Thryogenes festucae*  
(HERBST, 1795) (Coleoptera: Curculionidae)**

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**ABSTRACT.** The article contains the first detailed and illustrated description of the larva and pupa of *Thryogenes festucae* (HERBST, 1795). Diagnostic characters of immature stages, keys for determinations, and notes on the life-cycle and ecology of this species are also presented.

**KEY WORDS:** Coleoptera, Curculionidae, *Thryogenes festucae*, morphology, larva, pupa, life cycle, host plants.

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INTRODUCTION

The Palearctic genus *Thryogenes* BEDEL, 1884 includes only 4 species: *Thryogenes festucae* (HERBST, 1795), *Th. fiorii* ZUMPT, 1928 = *Thryogenes atrirostris* LOHSE, 1992, *Th. nereis* (PAYKULL, 1800) and *Th. scirrhosus* (GYLLENHAL, 1836) (SMRECZYŃSKI 1972, LOHSE 1992, BOOTH 2002). *Th. fiorii* is a very rare and endangered species, while *Th. nereis* and *Th. scirrhosus* are mentioned as very rare taxa. *Th. festucae* is also a rather rare species, despite its being widespread in many European countries (BOOTH 1993, BURAKOWSKI et al. 1995, WANAT & MOKRZYCKI 2005, ALONSO-ZARAZAGA 2007).

*Thryogenes* species are tiny, occasionally medium-sized beetles (3.4-5.0 mm in length); they are stenotopic, hygrophilous weevils associated with plants growing around lakes, ponds, old river beds, slow flowing waters and on wet meadows (KOCH 1992). The following water plant species are hosts of *Th. festucae*: common club-rush (*Schoenoplectus lacustris* (L.) PALLA), softstem bulrush (*S. tabernaemontani* (GMEL.) PALLA), blister sedge (*Carex vesicaria* L.) and sea clubrush (*Bolboschoenus maritimus* (L.) PALLA) (KOCH 1992,

BURAKOWSKI et al. 1995).

*Th. festucae* is distinguished from other *Thryogenes* species by its relatively large, elongated body, densely covered with wide squamae and a funicle with elongated, narrow segments (FREUDE et al. 1983).

The biology of the immature stages of *Th. festucae* is still incompletely known. The beetles always remain above the water surface, on the leaves and stems of its host plants. Adults are found from April to September. Oviposition takes place in May and June. The larval instars burrow inside the lower parts of stems (also below the water surface). Pupation takes place inside the stem from the end of June to July, and the new generation appears in the first ten days of August. Adults spend the winter in plant remains on the banks of water bodies (BURAKOWSKI et al. 1995).

The morphology of larval instars and the pupae of *Th. fiorii* and *Th. nereis* were described by GOSIK (2009). However, the immature stages of *Th. festucae* are still completely unknown.

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### MATERIAL AND METHODS

*Thryogenes festucae*: 44 exx. of larvae, 15 exx. of pupae; collected in Gródek (UTM GB03) (CE Poland) on 10 and 24 June and 15 and 30 July 2008. The developmental stages were extracted from the lower parts of stems of sea clubrush growing on an old river bank.

Observations on the life-cycle of this species were conducted during the plant growth seasons of 2002-2008. In order to identify the species, some larvae were kept alive under laboratory conditions until pupation and afterwards until metamorphosis. The preimaginal stages were preserved in a liquid containing 75% ethanol. The punctured larvae and pupae were rinsed in distilled water, cleared in 10% aq. potassium hydroxide (KOH) and placed in a 10% glycerin solution to prepare the microscope slides. The drawings were made using a camera lucida (MNR-1, 10<sup>X</sup>, PZO). The terminology given by SCHERF (1964) and MAY (1977, 1994) was used in the morphological description of the larva and the pupa.

### DESCRIPTIONS

#### **Mature larva**

Body length 7.30-8.50 mm (mean 7.60 mm), slender, elongate, rounded in cross-section (Fig 1). Thoracic segments almost equal in length (Fig. 2). The first abdominal segment

slightly larger than the metathorax (Fig. 3). Abdominal segments I-IV almost of equal length, slightly larger than segments V-VII. Segment VIII narrow, smaller than the previous ones. Segment VIII with 2 and segment IX with 4 protuberances dorsally, on the posterior margin of each one (Fig. 4). Abdominal segment X reduced to anal lobes. Anus ventrally. Cuticle on the dorsal parts of the thoracic segments with minute, thorn-like cuticular processes, on abdominal segments minutely spiculate. All thoracic and abdominal segments white in colour.

Chaetotaxy of the body (Figs 2, 3, 4) strongly reduced. Setae (except those on abdominal segments VII-IX) short, light yellow, poorly visible. Prothorax with 3 long setae and 3 short setae (*prns*) on pronotal sclerite; 1 seta dorsopleurally (*dpls*) and 2 setae equal in length, ventropleurally (*vpls*) on each side. Mesothorax with 2 microsetae prodorsally (*prs*), 1 macroseta postdorsally (*pds*), 1 seta dorsolaterally (*dls*), 1 seta dorsopleurally (*dpls*) and 1 seta ventropleurally (*vpls*) on each side. Chaetotaxy of meso- and metathorax similar to each other. Each pedal area of thoracic segments well isolated, with 1 macroseta and 3-4 microsetae (*ps*). Thoracic segments with 2 microsetae placed ventrally between pedal lobes. Abdominal segments I-VII possess: 2 microsetae prodorsally (*prs*), 1 macro- and 4 microsetae postdorsally (*pds*), 1 macro- and 1 microseta dorsopleurally (*dpls*), 1 macroseta ventropleurally (*vpls*), 1 macroseta laterosternally (*lsts*) and 1 microseta mesosternally (*msts*) on each side. Abdominal segment VIII: with 2 microsetae prodorsally (*prs*), 5 setae of unequal length postdorsally (*pds*), 1 seta dorsolaterally (*dls*), 1 seta dorsopleurally (*dpls*), 1 seta ventropleurally (*vpls*), 1 microseta laterosternally (*lsts*) and 1 mediosternally (*msts*) on each side. Segment IX with 3 dorsal setae (*ds*) of unequal length, 2 short lateral setae (*ls*) and 2 sternal setae (*sts*) different in length. Abdominal segment X reduced to four anal lobes of unequal size. Each anal lobe with 1 microseta. Spiracles bicameral, placed laterally, except those of abdominal segment VIII, which are placed dorsally.

Head width 0.90-1.00 mm (mean 0.95 mm), subglobose, slightly oblate laterally, frontal suture distinct, Y-shaped, extended to antennae; epicranial suture visible (Figs 5, 6). Macrosetae of head: 10 dorsal epicranial setae (2 *des<sub>1-5</sub>*), *des<sub>1</sub>* placed near the suture coronalis, *des<sub>2</sub>* located on the frontal suture, *des<sub>3</sub>* located in the central part of the epicranium, *des<sub>4</sub>* and *des<sub>5</sub>* placed in the vicinity of the ocellus; 6 frontal setae: *fs<sub>1</sub>* absent, *fs<sub>2,3</sub>* very short placed medially, *fs<sub>4</sub>* as long as *des<sub>1</sub>*, located near epistoma. Lateral epicranial seta (*les<sub>1</sub>*) shorter than *des<sub>3</sub>*. Epicranial area with a group of five pores: one pore placed between *des<sub>1</sub>* and *des<sub>3</sub>*, one located close to the frontal suture, three pores laterally on each side of the head. Double ocelli (*oc*) and antenna placed on each side latero-posteriorly, at the end of the suture frontalis. Antenna long, finger-like, extending slightly beyond the outline of head, basal membranous area with 2 setal sensillae and one pore (Fig. 7).

Clypeus 3.4 times as wide as long with 3 clypeal setae (*cls<sub>1-3</sub>*) placed in the vicinity of posterior margin on each side (Fig. 8). Clypeal setae relatively short, sharp. Labrum about

1.9 times as wide as long. Labral setae (*lrms*<sub>1-3</sub>) of different length, straight, blunt, placed mediano-laterally; *lrms*<sub>1</sub> and *lrms*<sub>2</sub> very long, distinctly exceeding the outline of the labrum, *lrms*<sub>3</sub> three times shorter than previous ones; the anterior margin of the labrum doubly sinuate (Fig. 8). Epipharynx with 2 pairs of short, sharp, anteromedian setae (*ams*<sub>1,2</sub>) and 5 pairs of antero-lateral setae (*als*<sub>1-5</sub>), different in shape and length. Tormae (t) poorly developed, kidney-shaped, almost parallel. Median part of epipharynx densely covered with long, thorn-like cuticular processes and microsetae.

Mandible (Fig. 9) broad, bifid, teeth almost of equal height, slightly truncate; with 2 short setae (*mds*<sub>1,2</sub>), equal in length. Molar board with a sharp, triangular tooth.

Maxilla (Fig. 10) with 1 stipal (*stps*) and 3 palpiferal setae; (*pfs*<sub>1,2</sub>) long, placed ventro-laterally, *pfs*<sub>3</sub> short, situated ventrally. Mala with 7 dorso-apical setae (*dms*<sub>1-7</sub>): *dms*<sub>1-5</sub> short, slightly curved, *dms*<sub>6,7</sub> long, straight; 3 ventro-apical setae (*vms*<sub>1-3</sub>) short, different in length. Median part of mala sparsely covered with spine-like cuticular processes and microsetae different in shape and length. Maxillary palp 2-segmented; basal segment 3 times longer than distal. Basal segment with 1 pore and 1 microseta (*mpxs*); distal segment with a group of 5 conical, cuticular processes apically.

Praelabium (*plb*) heart-shaped (Fig. 11), with two pairs of ligular setae (*lgs*<sub>1,2</sub>) and 2 pairs of praelabial setae (*plbs*<sub>1,2</sub>) different in length. Labial palp (*lpa*) very long, two-segmented; basal segment almost 5 times longer and distinctly wider than distal segment. Distal segment with a pore and 4 conical cuticular processes apically. Postlabium (*pslb*) divided by a horizontal furrow, with 3 pairs of setae (*pslbs*<sub>1-3</sub>) different in length.

### Pupa

Body length: male: 5.70-6.50 mm (mean 5.80 mm), width in widest place (between apex of femora of the second pair – 2.50 mm); female: 5.70-7.40 mm (mean 6.20 mm); width in widest place – 2.70 mm.

Body elongate (Figs 12-14), white or yellowish; setae long (very long on pronotum), light brown, placed on a more or less visible protuberance. Head with a pair of long vertical setae (*vs*), 2 pairs of superorbital setae (*sos*<sub>1,2</sub>) and a pair of orbital setae (*os*). Rostrum: very long, thin, about 5.7 times as long as wide, almost reaching the hind coxae, with 3 pairs of rostral setae (*rs*<sub>1-3</sub>) and a pair of very short epistomal setae (*es*). The setae on the rostrum shorter than those on the head. Antennae long and relatively thin. Pronotum almost as wide as long at base, with a pair of apical setae (*as*), 2 pairs of lateral setae (*ls*<sub>1,2</sub>), 2 pairs of discal setae (*ds*<sub>1,2</sub>), 5 pairs of posterolateral setae (*pls*<sub>1-5</sub>) and 2 pairs of superlateral setae (*sls*<sub>1,2</sub>). *Pls*<sub>4,5</sub> and *sls*<sub>1,2</sub> distinctly shorter than the other pronotal setae. Mesonotum (Th. II) and metanotum (Th. III) almost equal in length. Mesonotum with a pair of setae, metanotum with 2 pairs of micro- and macrosetae placed laterally on each side. Each apex of femora with a pair of short, light setae. Abdominal segments: I-VIII tapering gradually to

the end of the body, segment VI semicircular. Tergites I-V with 7 pairs of setae unequal in length on each side. Setae numbers 1, 2, 4, 5 and 7 short, 3 and 6 long, placed on protuberances. Setae numbers 3 and 6 and their protuberances gradually increasing in length from abdominal segments I to V. Abdominal segments VI and VII each with 4 pairs of very long setae. Segment VIII with some setae unequal in length. Segment IX with pseudocerci (*pc*) and some microsetae. Pseudocerci (*pc*) thorn-like, straight, short. Spiracles on abdominal segments placed ventro-laterally on sternites; on segments I-V functional, on segments VI-VIII atrophied. Sternites VII-IX with well-marked sexual dimorphism. Gonotheca of female double, of male single.

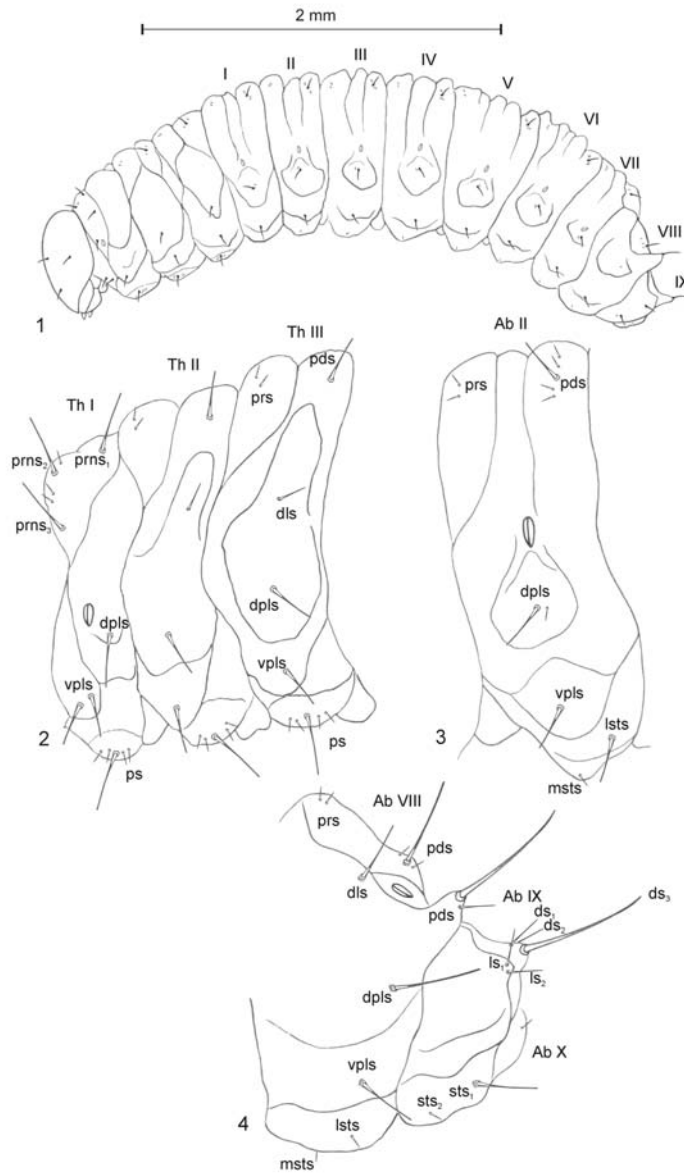
### DISCUSSION

The chaetotaxy of the immature stages of *Th. festucae* is rather similar to that described for *Th. nereis* and *Th. fiorii*. The diagnostic features of *Thryogenes* larvae are as follows: (1) dorsal parts of thoracic segments covered by thorn-like cuticular processes; (2) pedal lobes clearly isolated; (3) head capsule laterally oblate; (4) two pairs of ocelli on each side of the head; (5) head with 5 pairs of *des*; (6) labral setae very long, exceeding the outline of the head; (7) mala and median parts of epipharynx covered by long, thorn-like cuticular processes and microsetae; (8) relatively short tormae rods.

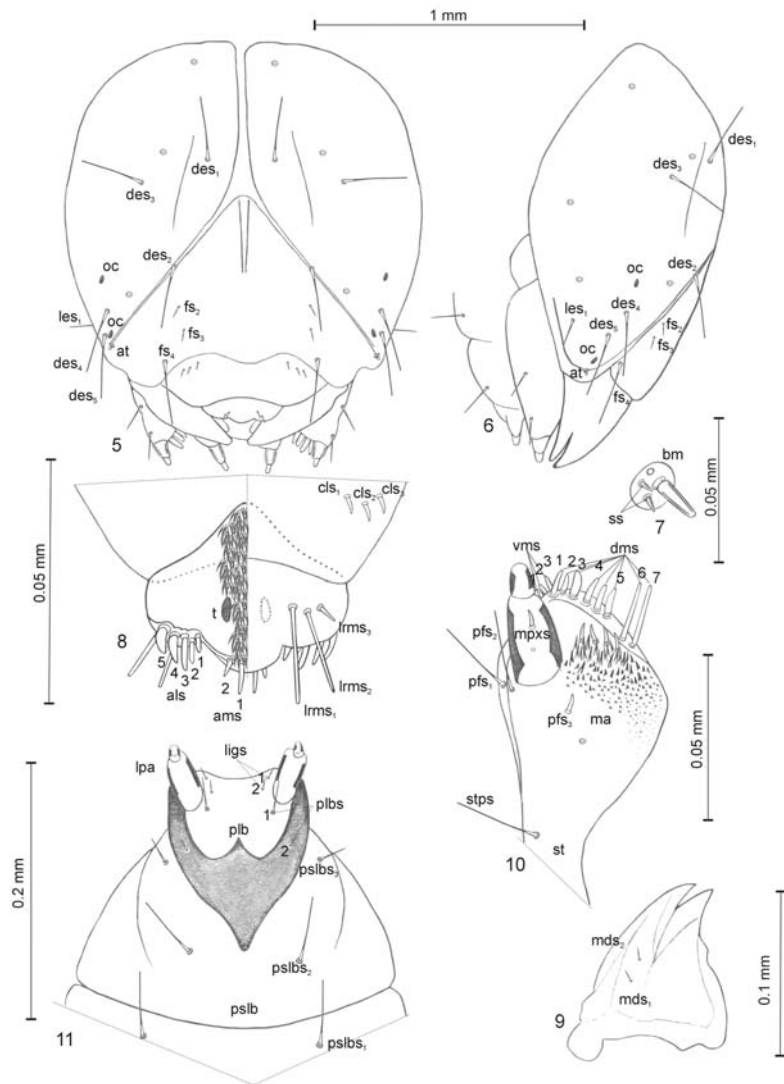
Mature larvae of some *Thryogenes* species can be identified using the following key:

- 1(2)** Body length >7.00 mm; head width >0.90 mm; *fs*<sub>1</sub> absent; mala sparsely covered by cuticular processes and microsetae; prothorax with 1 *dpls*, abdominal segments I-VII with 2 *prs*..... *Th. festucae* (HERBST)
- 2(3)** Body length <7.00 mm; head width <0.90 mm; *fs*<sub>1</sub> present; mala densely covered with cuticular processes and microsetae; prothorax with more than 1 *dpls*, abdominal segments I-VII without *prs*..... 3
- 3(4)** Body length >4.70-7.00 mm; head width 0.75-0.80 mm; prothorax with 2 *dpls*, abdominal segments I-VII with 1 *dpls*; *lrms*<sub>3</sub> distinctly shorter than other *lrms*; *cls* relatively long, sharp; labium with 4 pairs of *ams* and 5 *als*; *mpxs* present; mala with 7 *dms*; ligula with a pair of setae..... *Th. fiorii* (ZUMPT)
- 4** Body length >4.00-5.20 mm; head width 0.60-0.70 mm; prothorax with 3 *dpls*, abdominal segments I-VII with 2 *dpls*; all *lrms* almost equal in length; *cls* short, conical; labium with 2 pairs of *ams* and 4 pairs of *als*; *mpxs* absent; mala with 4 *dms*; ligula with 2 pairs of setae..... *Th. nereis* (PAYK.)

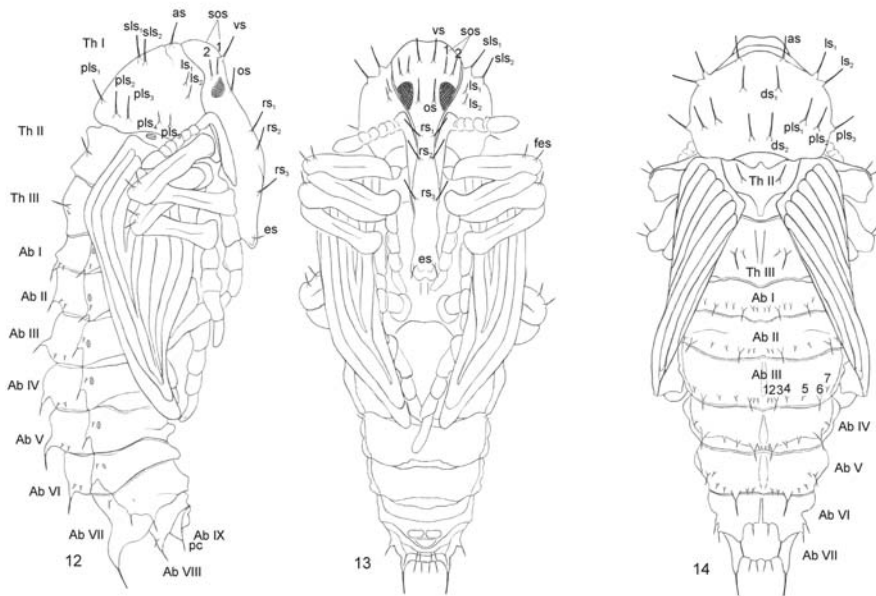
The larvae of the genus *Thryogenes* have some features in common (e.g. reduction of chaetotaxy, shape of antenna) that are also present in the larvae of other hygrophilous weevils (e.g. *Bagous*, *Poophagus*, *Tapeinotus*).



**Figs 1-4.** *Thryogenes festucae* (HERBST), mature larva: 1 – habitus, 2 – lateral view of thoracic segments, 3 – lateral view of the second abdominal segment, 4 – lateral view of abdominal segments VIII-X (prns – pronotal setae, dpls – dorsopleural s., vpls – ventropleural s., prs – prodorsal s., pds – postdorsal s., dis – dorsolateral s., lsts – laterosternal s., msts – mesosternal s., sts – sternal s., ls – lateral s., ds – dorsal s., ps – pedal s., Th I-III, Ab. I-X – number of thoracic and abdominal segments).



**Figs 5-11.** *Thryogenes festucae* (HERBST), mature larva, head and mouth parts: 5 – dorsal view, 6 – lateral view (des – dorsoepicranial setae, fs – frontal s., les – lateral epicranial s., oc – ocellus, at – antenna), 7 – antenna (ss – setal sensillae), 8 – epipharynx (left side), labrum and clypeus (right side) (lrms – labral setae, ams – anteromedial s., als – anteriolateral s., t – tormae), 9 – left mandible (mds – mandible dorsal s.), 10 – right maxilla, dorsal view (dms – dorsally malae setae, vms – ventrally malae s., ma – mala, st – stipes, mpxs – maxillary palps s., pfs – palpiferal s., stps – stipal s.), 11 – praelabium and postlabium, ventral aspect (plb – praelabium, lpa – labial palp, pslb – postlabium, plbs – prelabial s., pslbs – postlabial s.).



**Figs 12-14.** *Thryogenes festucae* (HERBST), pupa, habitus: 12 – lateral view, 13 – ventral view 14 – dorsal view (pc – pseudocerci, as – apical s., ls – lateral s., ds – discal s., pls – posterolateral s., sls – superlateral s., vs – vertical s., sos – superorbital s., os – orbital s., rs – rostral s., es – epistomal s., Th I-III, Ab. I-X – number of thoracic and abdominal segments).

The following are diagnostic features of the pupa of the genus *Thryogenes*: (1) body slender, elongate; (2) head with a pair of vertical setae, 2 pairs of superorbital setae, 1-2 pairs of orbital setae, 3-4 pairs of rostral setae; (3) mesothorax with a pair of setae; (4) metathorax with one or two pairs of setae; (5) abdominal segments I-V with 4 or 7 pairs of setae (some of them located on distinct protuberances); (6) abdomen with 5 pairs of spiracles; (7) relatively short pseudocerci on abdominal segment IX.

Pupae of *Thryogenes festucae*, *Th. fiorii* and *Th. nereis* can be identified using the following key:

- 1(2)** body length >5.70 mm, width >2.50 mm; rostrum with a pair of epistomal setae; head with a pair of orbital setae; prothorax with 2 pairs of superlateral setae and 5 pairs of postlateral setae; metathorax with 2 pairs of setae; abdominal segments I-V each with 7 pairs of setae..... *Th. festucae* (HERBST)
- 2(3)** body length <5.60 mm, width <2.20 mm; rostrum without epistomal setae; head with 2 pairs of orbital setae; prothorax with 4 pairs of postlateral setae; superlateral setae

- absent; metathorax with a pair of setae; abdominal segments I-V each with 4 pairs of setae..... 3
- 3(4)** body length 4.40-5.60 mm, width 1.90-2.20 mm, moderately slender; rostrum with 4 pairs of rostral setae;  $rs_3$  distinctly shorter than other ones; femoral setae equal in length; protuberances on dorsal parts of abdominal segments I-V long, thorn-like..... *Th. fiorii* (ZUMPT)
- 4** body length 3.10-4.60 mm, width 1.30-1.70 mm, very slender; rostrum with 3 pairs of very short rostral setae; femoral setae unequal in length; protuberances on dorsal parts of abdominal segments I-V short, conical..... *Th. nereis* (PAYK.)

The immature stages of *Th. festucae* were found only on *Bolboschoenus maritimus* (L.) PALLA – a rare plant species in the Bug River valley (DOMBROWSKI et al. 2002). Nonetheless, we also found other plant species known to be hosts of *Th. festucae* at the investigated locations, but we did not see it feeding on those plants. The effects of local host plant selection are similar in *Th. fiorii* and *Th. nereis* – we found their larvae on only one of the few potential host plant species.

The information on the development, feeding and life-cycle of *Th. festucae* given by BURAKOWSKI et al. (1995) concurs with my observations. The feeding and pupation of *Th. festucae* larvae take place in the stem parts below the water surface. Usually one weevil larva was found on a single stem. The plant specimens inhabited by larvae of *Th. festucae* exhibited distinctly decreased vitality. No attack of parasites or parasitoids on the immature stages of *Th. festucae* was observed.

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