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# *Hypera kayali* sp. nov. (Coleoptera: Curculionidae, Hyperini) from Syria, with bionomic data

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## Abstract

*Hypera* (*Dapalinus*) *kayali* **sp. nov.** from Syria is described and illustrated. An illustrated key to the species of the subgenus *Dapalinus* Capiomont, 1868 is given. The species most similar externally to *H. kayali* is *H. striata* (Boheman, 1834), whose elytral intervals 2, 4 and 6 are dark for their entire length and the remaining elytral intervals reddish or pale. *Hypera kayali* has a characteristic coloration with the elytra reddish brown interspersed with dark areas on the basal two third of interval 1, the apical quarter of interval 2, the basal third of interval 3, the apical half of interval 4, a short apical part of interval 5 and the whole of interval 6. Bionomic data are provided, including the larval host plant, *Vicia palaestina* Boiss. (Fabaceae). Male and female genitalia of *H. contaminata* (Herbst 1795), *H. dapalis* (Boheman, 1842), *H. subvittata* (Capiomont, 1867), and *H. striata* are illustrated and compared with *H. kayali*. A summary of the distribution of the members of the subgenus *Dapalinus* is given.

**Key words:** Taxonomy, new species, *Dapalinus*, genitalia, host plant, Coleoptera, Curculionidae, Hyperinae, *Hypera*, Palaearctic region

## Introduction

The genus *Hypera* Germar, 1817 currently includes more than 115 Palaearctic species (Smreczyński 1968) and 17 species from North America (Titus 1911, Csiki 1934, Anderson 2002). The last taxonomical revision was published over 100 years ago by Petri (1901), who divided the genus into 11 groups, but using the junior synonym *Phytonomus* Schönherr, 1826 as the valid name. Alonso-Zarazaga & Lyal (1999) recognized six subgenera of *Hypera*: *Antidonus* Bedel, 1886; *Eririnomorphus* Capiomont, 1868; *Tigrinellus* Capiomont, 1868; *Dapalinus* Capiomont, 1868; *Boreohypera* Korotyaev, 1999 and *Hypera*. Petri (1901) and Csiki (1934) treated also *Metadonus* Capiomont, 1868 as a subgenus of *Hypera*, whereas Alonso-Zarazaga & Lyal (1999) regarded this as a separate

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genus. Later, Alonso-Zarazaga & Lyal (2002) transfered the subgenus *Antidonus* to the genus *Donus* Jekel, 1865, but without any discussion of this nomenclatorical change. Alonso-Zarazaga (2005b) described a new subgenus *Kippenbergia*. In my opinion, it is highly probably only species group of *Hypera arator* (Linné, 1758) in the nominotypical subgenus *Hypera* as it is also presented in the monograph by Petri (1901) and/or in the revision of this species group by Kippenberg (1986). The concept of *Hypera* as in Alonso-Zarazaga & Lyal (1999) is accepted here.

The subgenus *Dapalinus* includes 8 species: *H. contaminata* (Herbst, 1795); *H. dapalis* (Boheman, 1842); *H. fornicata* (Penecke, 1928); *H. maculipennis* (Fairmaire, 1859); *H. meles* (Fabricius, 1792); *H. subvittata* (Capiomont, 1867); *H. striata* (Boheman, 1834) and *H. tenuirostris* (Petri, 1901). All species are known from the Palaearctic region (Petri 1901, Csiki 1934). Most of the species occur in Europe (Petri 1901, Csiki 1934, Skuhrovec 2003, Alonso-Zarazaga 2005a), except *H. tenuirostris* which inhabits Turkey and north Syria (Petri 1901, Csiki 1934). *H. meles* is also known from the Nearctic region (Titus 1911). More details of the distribution of these species are given below. The last taxonomic revision of the subgenus *Dapalinus* was by Petri (1901), who called this subgenus "VI. Gruppe des *Phyt. meles*". *Dapalinus* may be diagnosed by the following combination of characters: bifid scales cleft to more than one fourth of their length (Fig. 5) (versus *Antidonus*, *Eririnomorphus*, which have oval and/or round scales); rostrum slightly shorter or longer than pronotum (0.6–1.5 x), pronotum distinctly, strongly convex, rostrum more strongly curved (versus *Boreohypera*, *Tigrinellus*, *Hypera*). In *Boreohypera* rostrum is shorter than pronotum (0.4–0.6 x), pronotum is oval and rostrum almost straight. In *Tigrinellus* rostrum is distincly longer than pronotum (1.5–1.8 x) and strongly curved, pronotum is strongly convex, elytra with very long strongly projecting setae. In *Hypera* rostrum is shorter than pronotum (0.4–0.7 x) with exception of species groups of *Hypera nigrirostris* (Fabricius, 1775) and *Hypera constans* (Boheman, 1824), which have rostrum longer than pronotum (1.1–1.5 x), but rostrum not strongly curved; pronotum is strongly convex with one exception, *Hypera plantaginis* (De Geer, 1775).

Within the subgenus *Dapalinus*, many taxonomic problems remain unsolved. Borovec & Košťál (1987) tried to resolve the taxonomic problem of the sibling species, *H. fornicata* and *H. meles*, but unfortunately they did not study large numbers of specimens and the taxonomy of this complex remains confused, especially in central Europe (Winkelmann 2001, Skuhrovec 2003). The relationships of *H. fornicata* and *H. meles*, are still confused despite this study.

Petri (1901) included also unusual the species *Hypera tychioides* (Capiomont, 1868) in the subgenus *Dapalinus*. This species was later synonymized with *Tanyrhynchus asiaticus* Schoenherr, 1849 and a new genus, *Adonus* Zaslavskij 1999, was proposed for it, so that its valid name is *Adonus asiaticus* (Schoenherr, 1849). It does not belong in the genus *Hypera* (Alonso-Zarazaga & Lyal 1999).

In the present paper, a new species of *H.* (*Dapalinus*) from Syria is described.

Information about the host plant of this species was obtained by rearing larvae to the adult stage. This species is compared with others in the subgenus *Dapalinus*.

## Material and methods

Specimens are deposited in the following museums and private collections (acronyms according to Arnett et al. 1993): CNC—Canadian National Collection of Insects, Ottawa (P. Bouchard); HWIC—private collection of Herbert Winkelmann, Berlin; JSKC—private collection of Jiří Skuhrovec, Praha; JVOC—private collection of Oldřich Vořížek, Kladno; MZMB—Moravské Zemské Muzeum, Brno (V. Kubáň); NHRS—Naturhistoriska Riksmuseet, Stockholm (B. Viklund); NMPC—Národní muzeum, Praha (J. Hájek); RBOC—private collection of Roman Borovec, Nechanice; ZMHB—Museum für Naturkunde der Humboldt-Universität, Berlin (J. Frisch).

The following abbreviations are used throughout the text: coll.—collection of, design.—designated by, env.—environs, lgt.—collected by, no.—number, prov.—province. Label data are cited in the description, separate lines on labels are indicated by "/ " and separate labels by "// ". Author's remarks and comment are in square brackets. [p]—the preceding data were printed, [h]—the same were hand-written.

Dissected male and female genitalia were embedded in glycerine. Genitalia are mounted on the same card as the respective specimen. Drawings were made using drawing tube on binocular microscope or microscope and processed in the computer (Adobe Photoshop, Corel Draw 9).

### ***Hypera kayali* sp. nov.**

(Figs. 1–5, 7, 12, 17, 22)

*Type material*. Holotype ♂ (NMPC): "SYRIA occ., 2. iv. 2001 / prov. Tartus / MASHTAL´HELU env. / J. Skuhrovec lgt. " [p] (white label) // "EX LARVAE / Breed no. [p] / 2001/8" [h] (yellow label) // "*Vicia* / *palaestina* / Boiss." [h] (green label) // "Holotype / *Hypera* / *kayali* **sp. nov.** / design. J. Skuhrovec 2006" [p] (red label); Paratypes, 8 ♂♂ and 10 ♀♀, all with same data as holotype (1 ♀ NMPC; 4 ♂♂, 4 ♀♀ JSKC; 1 ♂, 1 ♀ HWIC; 1 ♂, 1 ♀ RBOC; 1 ♂, 1 ♀ JVOC; 1 ♂, 1 ♀ CNC; 1 ♀ MZMB).

Description

*Color (Figs 1, 2).* Frons with pale setae. Rostrum dark reddish to black, without distinct punctation, setae sparser than on frons. Base of rostrum with distinct black carina dorsally. Antennae reddish, distal part of each antennomere darker, more distinctly so in antennomeres near club. Club dark reddish.

Surface of pronotum black, covered with pale setae and pale reddish to reddish brown

scales, which are bifid to apical third of their length (Fig. 5). Scales on middle of pronotum and lateral lines pale. Remaining scales on pronotum reddish to brown, forming three light lines on pronotum.

Elytra covered with scales and setae. Elytral intervals with pairs of pale setae and intervals 1, 2 and 4 with black setae near apex. Scales forming following color pattern: interval 1 black on basal two thirds, reddish on apical third except for black coloration at apex; interval 2 reddish, apical quarter black, connecting at apex with interval 1; interval 3 black on basal third, reddish on apical two thirds; interval 4 reddish on basal half, black on apical half; interval 5 reddish on basal half, very pale for remainder except for black coloration near apex, connecting at elytral apex with intervals 4 and 6; interval 6 black apically, connecting apically with intervals 4 and 5; intervals 7, 8 and 9 reddish.

Proximal parts of femora black with pale setae, apex slightly reddish. Tibiae light reddish to brown, bearing stout pale setae apically. Tarsi black with pale setae. Claws dark brown.

Abdomen reddish with pale setae and scales on abdominal ventrites, scales bifid to apical third their length.

*Head.* Eye oval, upper margin higher than base of rostrum in lateral view; nearly as wide as base of rostrum. Distance between eyes shorter than base of rostrum. Rostrum long, narrow, slightly shorter than pronotum (ratio = 0.72), slightly but distinctly down-curved, near base with small, distinct, ventral process in lateral view.

Antennae inserted one third from rostrum apex; scrobe in front of antenna broad and very short, near base of rostrum hardly noticeable. Antenna narrow, funicle 7-segmented, club oval, 4-segmented. Funicle segments 1 and 2 about three to four times as long as 5 to 7; 3 and 4 slightly longer than 5 to 7, 5 to 7 almost as long as wide. Club slightly shorter than funicle segments 3 to 7 together, but longer than 4 to 7 (Figs 1, 2).

*Thorax.* Pronotum wider than long (ratio = 1.27), widest near middle (Figs 1, 2), anterior margin almost straight in dorsal view, sides distinctly rounded, noticeably constricted basally, heavily punctated.

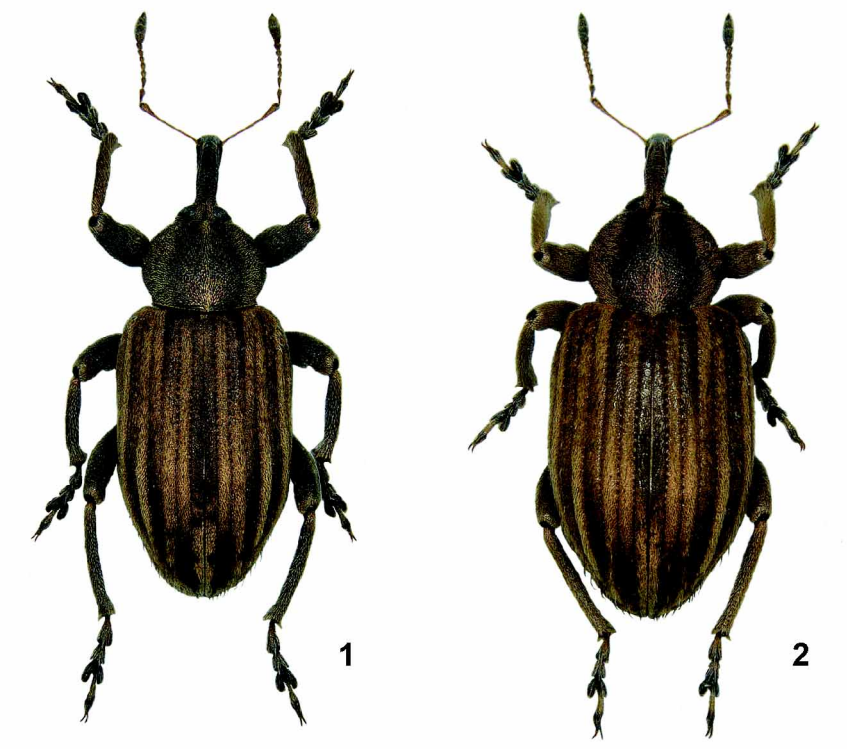
Elytra longer than wide (ratio = 1.83), base wider than base of pronotum, humeral angles prominent, sides slightly convex.

Profemur almost twice as wide as rostrum; mesofemora and metafemora more slender, all widest near middle. Protibia apically with distinct tooth on innner side. Tarsi with first tarsomere twice as long as second, third distinctly bilobed, fifth twice as long as third. Claws free (not connate at base).

*Abdomen.* Last abdominal ventrite with shallow impression medially.

*Sexual dimorphism.* Male with elytra oval (Fig. 1), female disciform (Fig. 2). Tibiae incurved in males, nearly straight in females. First abdominal ventrite with distinct depression in male (Fig. 3), not depressed in female (Fig. 4). Aedeagus (Fig. 7) moderately sclerotised, especially near apex of median lobe and parameres; inner medial part of medial lobe lacking stronger sclerotised projection present in all allied species (see Figs

8–11). Absence of inner medial part of medial lobe can be however caused by incomplete sclerotization of the whole aedeagus. Internal sac not easily visible (dotted in Fig. 7). Sternite 8 weakly sclerotised (Figs 12, 17). Spermatheca C-shaped (Fig. 22); weakly sclerotised.




**FIGURES 1–2.** *Hypera* (*Dapalinus*) *kayali* **sp. nov.**, 1, holotype, 7.6 mm; 2, paratype, female, 7.7 mm.

*Measurements.* Length: holotype 7.6 mm; paratypes 7.3–8.0 mm.

*Variability.* No variability was observed in coloration. The ratio of rostral to pronotal length in all specimens varies between 0.65 and 0.85, the ratio of pronotal width to length between 1.14 and 1.46 and the ratio of elytral length to width between 1.62 and 1.85. No genitalic variatons was observed.

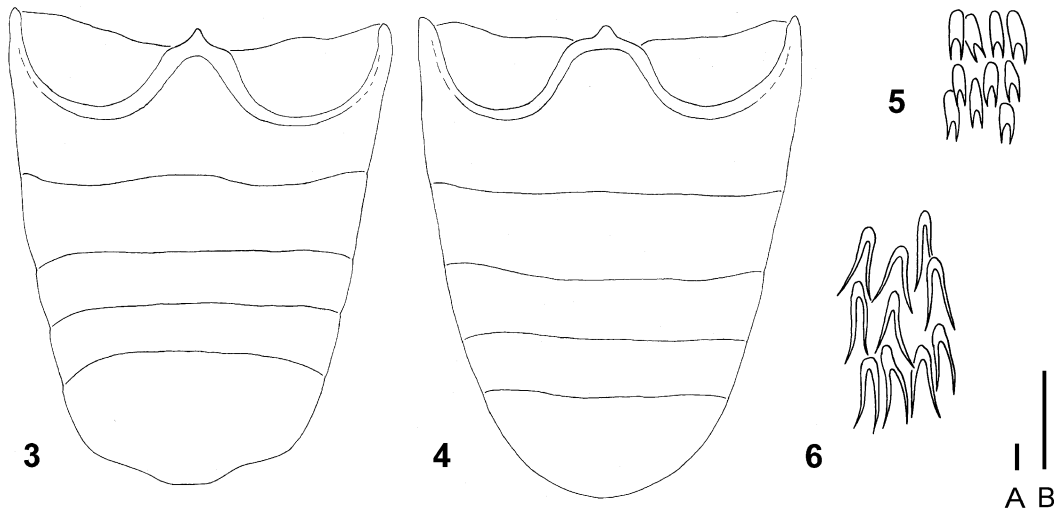
*Etymology.* The species is dedicated to my friend Naman Kayal from Syria, who assisted on our expedition to Syria where this new species was discovered.

*Distribution.* Western Syria (province Tartus).

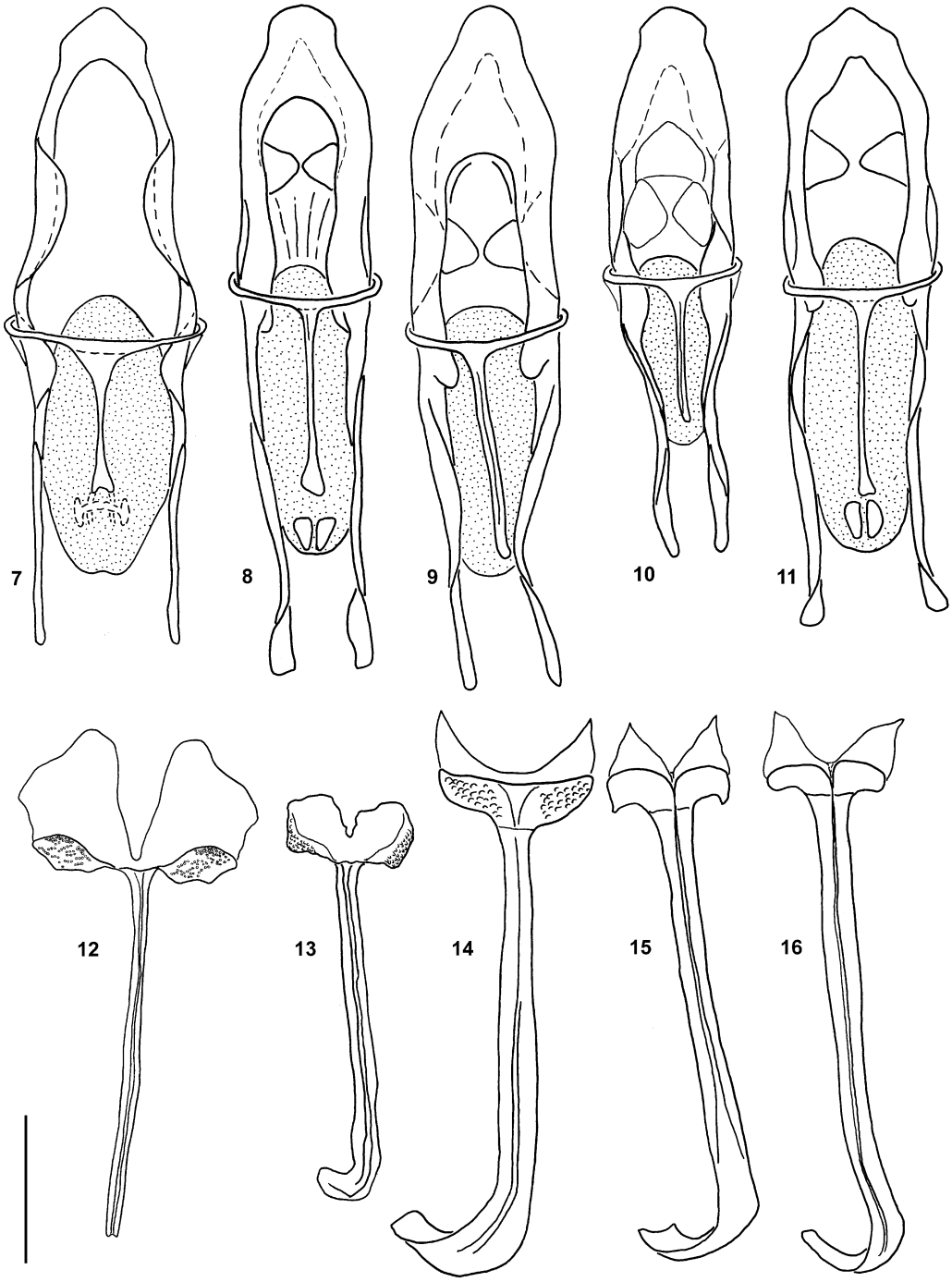
*Bionomics.* Specimens of *Hypera kayali* **sp. nov.** were collected as larvae on *Vicia palaestina* Boiss. (Fabaceae). All larvae successfully pupated and hatched. The larvae are ectophagous, like those of most other Hyperinae (Skuhrovec 2003, Costa et al. 2004), except for *Hypera nigrirostris* (Fabricius, 1775) (Skuhrovec 2003) and other small species of tribe Hyperini Marseul, 1863 (unpublished data). Coloration of the larvae is similar to

that reported for other larvae of tribe Hyperini, i.e. green with three white longitudinal stripes dorsally (unpublished data, Skuhrovec).

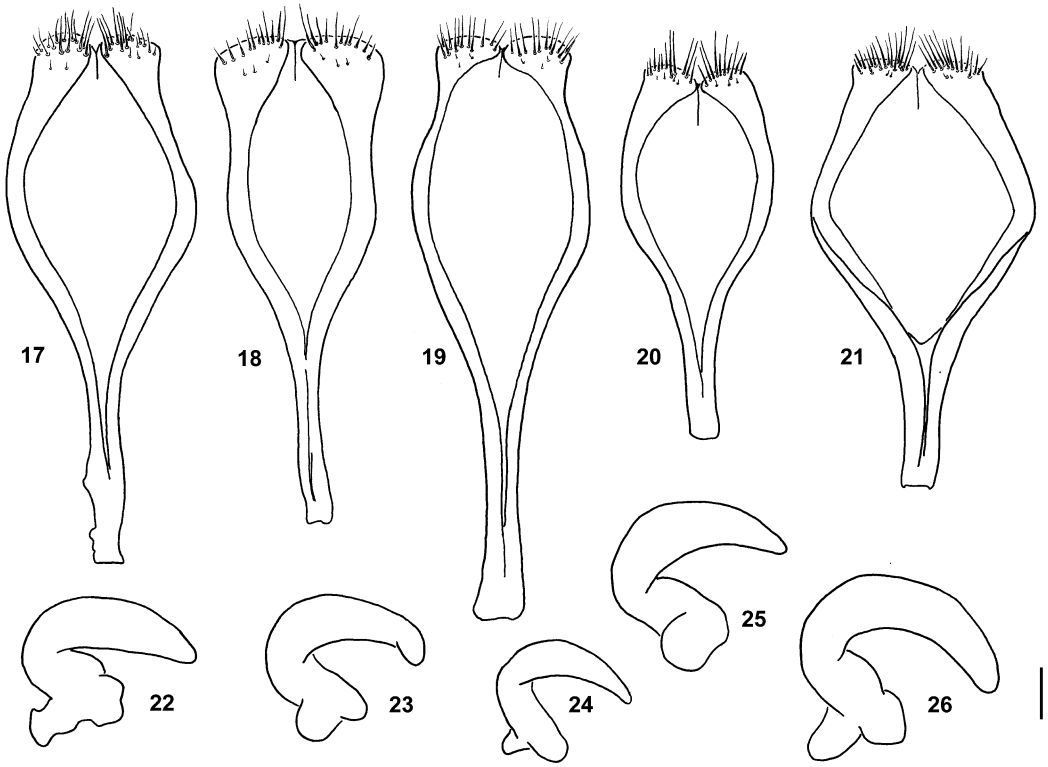
*Diagnosis. Hypera kayali* **sp. nov.** belongs to the subgenus *Dapalinus*. The most similar species are *H. contaminata*, *H. striata* and *H. subvittata*, which have alternating pale and dark elytral intervals (versus *H. dapalis*, *H. fornicata*, *H. maculipennis*, *H. meles* and *H. tenuirostris*, which have not alternating pale and dark elytral intervals). Some specimens of *H. fornicata* and *H. meles* have alternating pale and dark intervals as well, but bifid scales to the base on the elytra (Fig. 6). *H. contaminata* has dark spots on alternating intervals or at least on the sides and on the apex of elytra (versus *H. dapalis*, *H. fornicata*, *H. kayali*, *H. maculipennis*, *H. meles*, *H. striata*, *H. subvittata* and *H. tenuirostris*, which have no dark spots on elytra), and *H. subvittata* has elytra with long, projecting, bent setae before the apex (versus *H. contaminata*, *H. dapalis*, *H. fornicata*, *H. kayali*, *H. maculipennis*, *H. meles*, *H. striata* and *H. tenuirostris*, which have very short or without setae before the apex). The species closest to *H. kayali* **sp. nov.** based on external similarity is *H. striata*, whose elytral intervals 2, 4 and 6 are dark for their entire length, and the remaining elytral intervals reddish or pale. *Hypera kayali* has a characteristic coloration with dark parts on elytra occurring on the basal two thirds of interval 1, the apical quarter of interval 2, the basal third of interval 3, the apical half of interval 4, a short apical part of interval 5 and the whole interval 6, with the remaining parts being reddish (see Figs 1, 2).



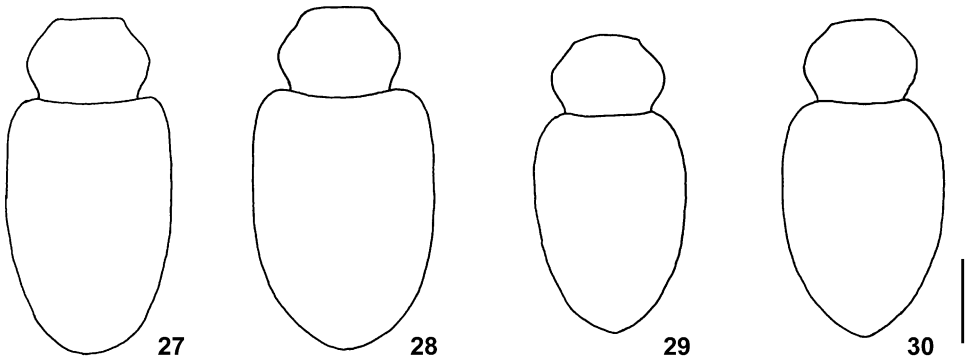

**FIGURES 3–6.** *Hypera* (*Dapalinus*) *kayali* **sp. nov.**, 3, male abdomen, 4, female abdomen, both ventral view; 5, bifid scales on pronotum and/or elytra; *H. meles*; 6, bifid scales on pronotum and/or elytra, both dorsal view. Scale bar 0.1 mm: A, Figs 3, 4; B, Figs 5, 6.




**FIGURES 7–16.** Male genital structures. Male genitalia, aedeagus, 7, *Hypera* (*Dapalinus*) *kayali* **sp. nov.**, 8, *H. contaminata*; 9, *H. dapalis*; 10, *H. striata*; 11, *H. subvittata*; Male sternite 8, 12, *H. kayali* **sp. nov.**; 13, *H. contaminata*; 14, *H. dapalis*; 15, *H. striata*; 16, *H. subvittata*. All dorsal view. Scale bar 0.5 mm.




**FIGURES 17–26.** Female genital structures. Female sternite 8, 17, *Hypera* (*Dapalinus*) *kayali* **sp. nov.**; 18, *H. contaminata*; 19, *H. dapalis*; 20, *H. striata*; 21, *H. subvittata*, all dorsal view. Female genitalia, spermatheca, 22, *H. kayali* **sp. nov.**; 23, *H. contaminata*; 24, *H. dapalis*; 25, *H. striata*; 26, *H. subvittata*, all lateral view. Scale bar 0.1 mm.




**FIGURES 27–30.** *Hypera* (*Dapalinus*) *meles*. 27, male habitus; 28, female habitus; *H. fornicata*, 29, male habitus; 30, female habitus, all dorsal view. Scale bar 1 mm.

Only the shape of the apical third of aedeagus is usually used for distinguishing the Hyperini species in most published papers (e.g. Smreczyński 1968, Kippenberg 1983),

even though it does not show any considerable interspecific variability. In this paper I have examined male and female genitalia of *H. kayali* (Figs 7, 12, 17, 22) as well as of four species of the subgenus *Dapalinus* (Figs 8–11, 13–16, 18–21, 23–26) which are most similar to it. The shape of sternite 8 of both sexes was found to be most characteristic for each species examined. According to the shape of male sternite 8 it is moreover possible to distinguish two groups—the first group (*H. kayali* and *H. contaminata*) is characterized by oval shape of sternite 8, the second group (*H. dapalis*, *H. subvittata* and *H. striata*) by triangular shape of sternite 8. These structures are thus easy-to-use for identification of species, whereas they do not seem to be as variable on higher taxonomic levels and their utility for diagnosis of genera and subgenera requires further study. At present, the most important characters at genus and subgenus levels were found by the author in larval chaetotaxy and bionomy (Skuhrovec, unpubl. data).

**Key to the species of subgenus *Dapalinus***

1. Pronotum nearly heart-shaped; dorsum without projecting setae; elytra with dark discoidal spots on basal half of humeri.....*Hypera maculipennis* (Fairmaire, 1859)
- Pronotum more oblique oval; elytra without discoidal pattern. ..... 2
2. First funicle segment 1.5 x longer than second; covering of bifid scales of elytra not reaching base (Fig. 5). ..... 3
- First funicle segment almost twice as long as second; covering of bifid scales of elytra reaching base (Fig. 6). ..... 7
3. Elytra with long, projecting, bent setae before apex; alternating pale and dark intervals. Male and female genital structures (Figs 11, 16, 21, 26)..... .....*Hypera subvittata* (Capiomont, 1867)
- Elytra with recumbent setae, distinctly visible from lateral view. ..... 4
4. Elytra with white lateral stripe. Male and female genital structures (Figs 9, 14, 19, 24). ..... *Hypera dapalis* (Boheman, 1842)
- Elytra without lateral stripe. ..... 5
5. Dark spots on alternating intervals of elytra or at least on the sides and on the apex. Male and female genital structures (Figs 8, 13, 18, 23)..... .....*Hypera contaminata* (Herbst, 1795)
- Elytra with alternating pale and dark interval; without dark spots. ..... 6
6. Elytral intervals 2, 4 and 6 dark for their entire length, remaining intervals reddish or pale. Male and female genital structures (Figs 10, 15, 20, 25) ..... .....*Hypera striata* (Boheman, 1834)
- Elytra with dark parts on basal two thirds of interval 1, apical quarter of interval 2, basal third of interval 3, apical half of interval 4, small apical part of interval 5 and all interval 6; remaining parts reddish. Male and female genital structures (Figs 7, 12, 17, 22) .....*Hypera kayali* **sp. nov.**

7. Elytra covered with long, strongly projecting setae....*Hypera tenuirostris* (Petri, 1901)
- Elytra with short, recumbent setae. ..... 8
8. Pronotum strongly oblique, base of elytra distinctly wider than pronotum (Figs 27, 28), size: 3.5–5.0 mm; dorsum grey to cupreous brown ..... ..... *Hypera meles* (Fabricius, 1792)
- Smaller and more gracile, (size: 3.6–4.2 mm), base of elytra slightly wider than pronotum, pronotum strongly oblique, but somewhat less expanded than in *H. meles* (Figs 29, 30) ..... *Hypera fornicata* (Penecke, 1928)

**Distribution of the species of subgenus *Dapalinus***

***Hypera contaminata* (Herbst, 1795):** Europe: central (Germany, Poland, Czech Republic, Austria, Slovakia, Hungary), southern and southeastern (France, Italy, Slovenia, Croatia, Bosnia and Herzegovina, Serbia and Montenegro, Macedonia, Latvia, Ukraine, Russia, Republic of Moldavia, Romania, Bulgaria, Greece, European Turkey) and Near East (Smreczyński 1968, Skuhrovec 2003, Alonso-Zarazaga 2005a).

***Hypera dapalis* (Boheman, 1842):** southern Spain, Morocco and Algeria (Petri 1901, Alonso-Zarazaga 2005a).

***Hypera fornicata* (Penecke, 1928):** Europe: northern (Sweden, Finland), central (Poland, Czech Republic (?), Austria, Slovakia, Hungary), southern and southeastern (northern Italy, Romania, Bulgaria, Ukraine and Russia) (Borovec & Košt'ál 1987, Winkelmann 2001, Skuhrovec 2003, Alonso-Zarazaga 2005a).

***Hypera kayali* sp. nov.:** western Syria.

***Hypera maculipennis* (Fairmaire, 1859):** southern Europe (Spain, southern France, Corsica, Sardinia, Sicily, Italy) and Algeria (Petri 1901, Alonso-Zarazaga 2005a).

***Hypera meles* (Fabricius, 1792):** Europe (except Iceland, Ireland, Portugal, Spain and some islands in the Mediterranean Sea), North Africa and Siberia; introduced to North America (Petri 1901, Borovec & Košťál 1987, Skuhrovec 2003, Alonso-Zarazaga 2005a).

***Hypera striata* (Boheman, 1834):** Europe: central (Czech Republic, Austria, Slovakia, Hungary), southern and southeastern (France, Sardinia, Sicily, Italy, Croatia, Slovenia, Bosnia and Herzegovina, Serbia and Montenegro, Macedonia, Romania, Bulgaria, Greece, Ukraine), Turkey and Israel (Petri 1901, Csiki 1934, Smreczyński 1968, Skuhrovec 2003, Alonso-Zarazaga 2005a).

***Hypera subvittata* (Capiomont, 1867):** Bulgaria, Greece, Turkey, Syria, Israel and Jordan (Petri 1901, Csiki 1934, Angelov 1978).

***Hypera tenuirostris* (Petri, 1901):** northern Syria, Turkey (Petri 1901, Csiki 1934).

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# 2. Papers on larval morphology

## 2.1. Descriptions of larvae of the tribe Hyperini (Coleoptera: Curculionidae): I. Mature larvae of the nominotypical subgenus *Hypera* [published in *Acta Societatis Zoologicae Bohemicae* **68**: 245-280]

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# Descriptions of larvae of the tribe Hyperini (Coleoptera: Curculionidae): I. Mature larvae of the nominotypical subgenus *Hypera*

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**Abstract**. Descriptions of mature larvae of nine species of the nominotypical subgenus *Hypera* Germar, 1817 are given: larvae of *H. denominanda* (Capiomont, 1868), *H. jucunda* (Capiomont, 1868), *H. venusta* (Fabricius, 1781) and *H. viciae* (Gyllenhal, 1813) are described for the first time, larvae of *H. arator* (Linné, 1758) and *H. plantaginis* (De Geer, 1775) are described for the first time in detail and larvae of *H. nigrirostris* (Fabricius, 1775), *H. postica* (Gyllenhal, 1813) and *H. suspiciosa* (Herbst, 1795) are redescribed. An identification key for the mature larvae of all nine species is presented.

**Taxonomy, morphology, larva, chaetotaxy, key, Coleoptera, Curculionidae, Hyperini, *Hypera*, Palaearctic region**

## INTRODUCTION

The genus *Hypera* Germar, 1817 currently includes more than 115 Palaearctic species (Smreczyński 1968) and 16 species from North America (Titus 1911, Csiki 1934, www. nearctica.com/nomina/beetle/colcurc1.htm). The last taxonomical revision was published more than 100 years ago by Petri (1901), who divided the genus *Hypera* into 11 groups. Alonso-Zarazaga & Lyal (1999) recognize six subgenera of the genus *Hypera*: *Antidonus* Bedel, 1886; *Eririnomorphus* Capiomont, 1868; *Tigrinellus* Capiomont, 1868; *Dapalinus* Capiomont, 1868; *Boreohypera* Korotyaev, 1999 and *Hypera*. Later, Alonso-Zarazaga & Lyal (2002) transfered the subgenus *Antidonus* to the genus *Donus* Jekel, 1865 without any discussion of this nomenclatorical change. This is why the concept of *Hypera* published by Alonso-Zarazaga & Lyal (1999) is accepted here.

There is published data on the larval morphology of 17 species of genus *Hypera* (Goureau 1844, Heeger 1851, Perris 1851, Laboulbène 1862, Rupertsberger 1872, Rosenhauer 1882, Titus 1911, Servadei 1944, Anderson 1947, Anderson 1948, Peterson 1952, Zaslavskij 1959, Scherf 1964, Dieckmann 1975, Bland 1983, Strejček & Dieckmann 1987, Lee & Morimoto 1988, Dieckmann 1989, Stehr 1992, May 1994). Most of descriptions and illustrations are based on material from European populations with the exception of *H. basalis* Voss, 1937 described from the Far East (Lee & Morimoto 1988) and *H. brunneipennis* (Boheman, 1834) and *H. compta* (Say, 1831) from the Nearctic (Anderson 1948). Descriptions of the species *H. nigrirostris* (Fabricius, 1775), *H. postica* (Gyllenhal, 1813), *H. rumicis* (Linné, 1758) and *H. zoila* (Scopoli, 1763) are based on material from both European and Nearctic populations (Anderson 1947, 1948 and Bland 1983). The earlier papers (Goureau 1844, Heeger 1851, Perris 1851, Laboulbène 1862, Rupertsberger 1872, Rosenhauer 1882) include only descriptions of body coloration and size and lack precise data on their morphology and chaetotaxy. The important papers were written by Anderson (1948) and Zaslavskij (1959). These papers include some basic characters and an identification key and can still be used to

Table 1. Ratio of important larval sizes: (1) HW – head width, (2) LW – head length, (3) BL – length of the body (larvae fixed in "C"-shape were measured in segments) and (4) BW – width of abdominal segment IV. Average, minimum and maximum measurements are presented. All measurements in millimeters. These measurments are cited in the descriptions of each species

| | (1) HW | | | (2) LW | | | (3) BL | | (4) BW | |
|---|---|---|---|---|---|---|---|---|---|---|
| species | avg. | min. | max. | avg. | min. | max. | min. | max. | min. | max. |
| *Hypera arator* | 0.79 | 0.74 | 0.86 | 0.68 | 0.62 | 0.76 | 5.5 | 12.0 | 1.0 | 2.3 |
| *Hypera denominanda* | 0.71 | 0.70 | 0.74 | 0.57 | 0.50 | 0.64 | 9.0 | 10.0 | 1.6 | 1.8 |
| *Hypera jucunda* | 0.52 | – | – | 0.48 | – | – | 8.5 | – | 1.3 | – |
| *Hypera nigrirostris* | 0.48 | 0.42 | 0.52 | 0.43 | 0.36 | 0.48 | 4.0 | 7.0 | 0.6 | 1.4 |
| *Hypera plantaginis* | 0.69 | 0.54 | 0.72 | 0.58 | 0.44 | 0.64 | 6.0 | 10.0 | 1.6 | 1.6 |
| *Hypera postica* | 0.60 | 0.56 | 0.68 | 0.53 | 0.48 | 0.60 | 5.5 | 10.0 | 1.0 | 1.8 |
| *Hypera suspiciosa* | 0.68 | 0.50 | 0.80 | 0.59 | 0.40 | 0.70 | 4.5 | 13.5 | 0.5 | 2.0 |
| *Hypera venusta* | 0.44 | 0.42 | 0.44 | 0.40 | 0.38 | 0.42 | 4.0 | 6.0 | 1.0 | 1.2 |
| *Hypera viciae* | 0.60 | 0.58 | 0.62 | 0.51 | 0.50 | 0.52 | 5.5 | 8.0 | 0.8 | 1.4 |

identify larvae. A recent paper by Lee & Morimoto (1988) contains detailed drawings and descriptions the chaetotaxy based on the general chaetotaxy plan proposed by May (1994).

This paper provides detailed descriptions of larvae of nine species of the subgenus *Hypera*, of which *H. denominanda* (Capiomont, 1868), *H. jucunda* (Capiomont, 1868), *H. venusta* (Fabricius, 1781) and *H. viciae* (Gyllenhal, 1813) are described for the first time, *H. arator* (Linné, 1758) and *H. plantaginis* (De Geer, 1775) are described for the first time in detail, and *H. nigrirostris* (Fabricius, 1775), *H. postica* (Gyllenhal, 1813) and *H. suspiciosa* (Herbst, 1795) are redescribed. A key for the identification of these nine species is presented. This paper is partly based on the author's MSc. Thesis, which was defended in the Department of Zoology, Charles University in Prague (Skuhrovec 2003).

## MATERIAL AND METHODS

**Larvae examined**

The study is based on the examination of larvae reared from eggs laid by adult weevils (*H. denominanda*, *H. plantaginis*, *H. postica*, *H. suspiciosa* and *H. viciae*); or larvae collected in the field and reared to the adult stage (*H. arator*, *H. denominanda*, *H. jucunda*, *H. nigrirostris*, *H. plantaginis*, *H. postica* and *H. suspiciosa*). All adults were identified by the author. Information on the origin of the parental weevils and/or larvae and their host plants are given for each species described. Localities in the Czech and Slovak Republics include numbers map squares assigned by the software FAUNA 2002 and compared to Pruner & Míka (1996). Larvae of all nine species were reared in a laboratory of the Department of Zoology, Charles University, Prague, during the years 2000–2004.

**Preparation**

Larvae were fixed in Pampel liquid (4 parts glacial acetic acid, 6 parts 4% formaldehyde, 15 parts 95% ethyl alcohol and 30 parts distilled water) (Švácha 1981). Slides were prepared as follows (for details see May (1993, 1994)): a larva was decapitated and its head placed in lactic acid for one or two weeks to digest the soft tissues. After that, the mouthparts were separated from the head capsule and labrum and the mandibulae boiled in 10 % KOH. All body parts were then mounted on temporary slides in glycerine. All this material (slides, weevils, larvae) is deposited in the collection of the author.

**Measurements**

Material (slides and larvae) was examined under a binocular microscope SZ 60 (Olympus) or microscope AX 70 Provis (Olympus). Measurements were made using calibrated oculars. The following characters of each specimens were measured: (1) head width (HW), (2) head length (LW), (3) length of the body (larvae fixed in a "C"-shape were measured in segments) and (4) width of abdominal segment IV. These measurements (1 and 2) are presented in the descriptions of the species and in Table. 1. As the thorax and abdomen are not sclerotized and may be affected by the fixation process, size measurements (3) and (4) are given only for comparison (Table. 1).

**Illustrations**

Drawings were traced from photographs made using a digital camera (SONY DXC-950P) and processed in the computer (Adobe Photoshop, Corel Draw 9).

For easy description, four types of trichoid seta are recognized (Figs 1–4); 1 – hairform, apex of this seta acute; 2 – bacilliform, apex of seta rounded, slender and long; 3 – clubform, bacilliform seta with a very broad and expanded apex; 4 – dippleform, very short bacilliform seta, length of seta is only 3 to 5 times longer than it widths.

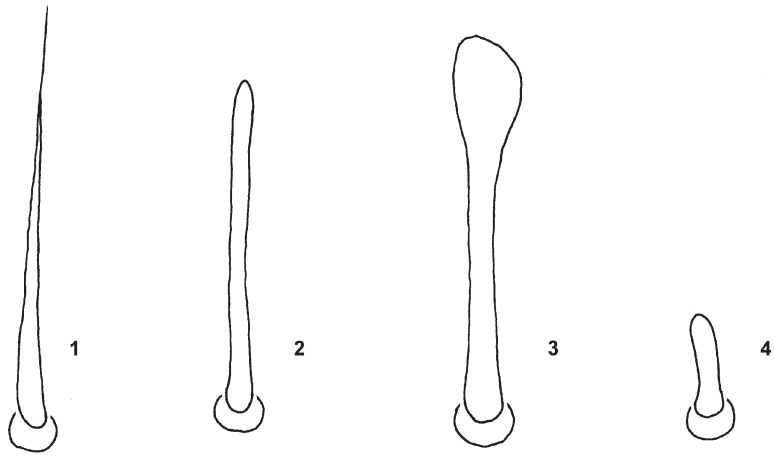
Apex of mandible has three lobes (see Figs 10, 19, 29, 37, 48, 52, 64, 73, 82). The number of lobes and teeth do not agree. The last lobe does not bear a tooth, its only connection is with the incisor area of the mandible (K. Hůrka, pers. comm.).

The spiraculum on the prothorax in the drawings of the thorax (see Figs 11, 20, 29, 38, 47, 56, 65, 74, 83) is in fact of mesothoracic origin as in all other insects (Marvaldi et al. 2002, Marvaldi 2003). In the descriptions of species, this spiraculum is refered to as being on the mesothorax. Drawings of the thoracic and abdominal spiracula are schematic (see Figs 11, 12, 20, 21, 29, 30, 38, 39, 47, 48, 56, 57, 65, 66, 74, 75, 83, 84).

Chaetotaxy on the postdorsum of abdominal segments I–VIII is as follows: between *pds1* and *pds5* there is an imaginary line. The species differ from each other in the position of the setae, *pds2–4*. These can be on this line, or shifted anteriad or posteriad relative to it. For the abdominal segments, which differ from the general plan described for the remaining segments, only the differences from the general plan are mentioned.

Chaetotaxy on the pedal lobe of the thorax is as follows: two long setae (*pda1–2*) and a few minute setae (*pda*) are always present. Number of setae on the pedal lobes is variable because of the variable number of minute setae. The most frequent number of setae is presented in the descriptions. The variability is presented in brackets.

The minute setae on the ventral side of the mala and on the pedal lobe of the thorax are trichoid setae. More minute setae may be present in these regions, however a scanning electron microscope is necessary for a more precise examination of these setae. That is, why these characters are not used for identifying the species. A description of the epipharynx is omitted for the same reason. Seta *sts3* is possibly a palpifer, however, this problem is not resolved here.




Figs 1–4. Trichoid setae; (1) hairform, (2) bacilliform, (3) clubform, (4) dippleform.

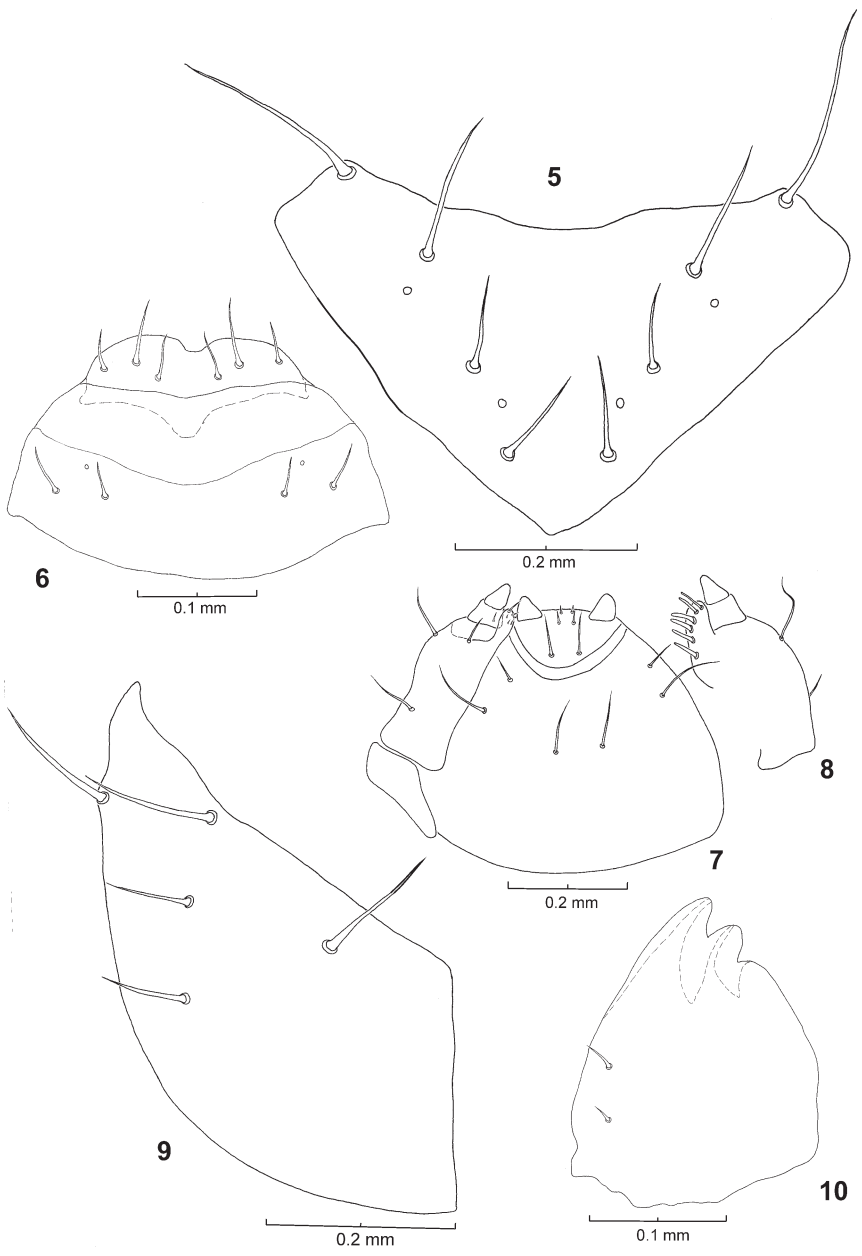
**Terminology**

Names and abbreviations of the setae of the mature larva follows May (1994) (see Figs 46–54). May (1994) uses this nomenclature for all Curculionoidea, but unfortunately her nomenclature is not identical with that used for other groups of beetles (Bousquet & Goulet 1984 – Carabidae, Švácha 1981 – Cerambycidae). Even though it may be neccessary to solve this problem if comparing the nomenclature used for various groups of beetles, such a comparison is not the goal of this paper.

The species are arranged alphabetically. In the descriptions, the following information is presented: references to previous descriptions, list of material examined, detailed description of the morphology of mature larvae and a comparison with previously published data.

**Descriptions of the mature larvae of the nominotypical subgenus *Hypera***

Coloration. Head brown or maculate with dark lines along lateral margins of head. Dorsal side of body pale green with slightly white median stripe; ventral side of body whitish to white-green.
Head. Frontal sutures distinct, slender. Frontoclypeal suture slightly concave medially. On each side one convex stemma. Clypeus slender, anterior margin distinctly concave with weak pigmentation (Fig. 53). Labrum with anterior margin bearing slender median excision; lateral margins rounded; posterior margin with short and wide median projection (Fig. 53), connected with clypeus by clypeolabral membrane. Antennae monomerous, membranose, with six sensoric setae apically (Bland 1983). Mandibles with two teeth apically (Fig. 52), subapical tooth larger than apical tooth; basal part of mandible with distinct tuberosity. Maxilla includes: cardo, stipes, mala and two palpomeres on maxillary palpi. Cardo, stipes, mala and distal parts of palpomeres pigmented. Maxilla connected with labium, forming the labiomaxillar complex. Labium includes: postlabium, prelabium, monomerous labial palpi and ligula. Membranose prelabium divided from membranose postlabium by a sclerotizated "U" shaped.
Thorax (Fig. 56). Prothorax divided in five areas: pronotum, dorsopleural, ventropleural, pedal and mediosternal lobes. Pronotum with weakly pigmented dorsal sclerite, this sclerite subdivided in two triangular plates medially. Dorsopleural and ventropleural lobes not distinctly divided. Meso- and metathorax divided into seven areas: dorsal lobe, dorsolateral lobe, spiracular area, dorsolateral, ventrolateral, pedal and mediosternal lobes. Dorsal lobe subdivided by a diagonal groove into prodorsum and postdorsum. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned postero-dorsad.
Abdomen (Figs 57, 58). Includes ten distinct segments. Abdominal segments I–VIII divided into six areas: dorsal lobes, spiracular areas, dorsopleural, ventropleural, laterosternal and mediosternal lobes. Dorsal lobes on abdominal segments I–VII divided by two diagonal groove into prodorsum, dorsum and postdorsum. Dorsum very slender, without setae. Dorsal lobe on abdominal segment VIII divided only by one diagonal groove into prodorsum and postdorsum. Spiraculum on abdominal segments I–VIII situated above the dorsopleural lobe; with oval peritrema positioned posteriad. Abdominal segment IX divided into three areas: dorsal, pleural and sternal lobes. Abdominal segment X reduced, without setae.
Chaetotaxy. **Head**. Dorsum of epicranium with five setae (*des1–5*); *des1*, *des3* and *des5* positioned along the frontal suture; *des2* and *des4* on lateral margin of head, latter setae shorter than *des1*, *des3* and *des5* (Fig. 51). Both lateral setae (*les1–2*) of epicranium long and located under stemmata. Ventral setae (*ves1–2*) short, located on anterior part on ventrum of epicranium. Frons with four setae (*fs1–5*, *fs2* missing); *fs4* and *fs5* located on anterior part, *fs5* the longest, *fs1* and *fs3* the shortest (Fig. 50). Clypeus with two setae on lateral margins (*cls1–2*), labrum with three setae (*lrms1–3*) (both Fig. 53). Mandible with two short setae (*mds1–2*) on lateral margin (Fig. 52). Stipes with two long and one short seta (*sts1–3*) (Fig. 54). Mala on dorsal side with six stout (*dms1–6*) (Fig. 55) and on the ventral side five minute setae (*vms1–5*). Maxillary palpi with one minute seta (*mxps*). Postlabium with three pairs (*plbs1–3*) and the prelabium with one pair of setae (*prms*). Ligula with two pairs of minute setae (*lig*) (all Fig. 54). **Thorax** (Fig. 56). Bases of the setae pigmented. *Prothorax*: pronotum with ten hairform or bacilliform setae (*prn1–10*); dorsal margin of triangular plate with three setae (*prn1–3*), anterior margin of sclerite with four setae (*prn4–7*), posterior margin of sclerite with three setae (*prn8–10*). Ventropleural lobe with two hairform setae (*vpls1–2*). Pedal lobe with four (from three to five) hairform setae (*pda*); *pda1–2* long, *pda2* about 0.75× *pda1*; remaining setae minute. Mediosternal lobe with one very short or minute seta (*msts*). *Meso- and metathorax*: prodorsum with one seta (*prs*), postdorsum with four setae (*pds1–4*). Dorsolateral area with two setae (*dls*), in spiracular area two setae (*ss*). Setae hairform to bacilliform. Dorsop-




Figs 5–10. *Hypera arator* (Linné), dorsal views, except for (7), which is a ventral view: (5) frons, (6) clypeus and labrum, (7) labium and maxilla, (8) maxilla, (9) dorsum of epicranium, (10) mandible.

leural lobe with one seta (*dpls*). Ventropleural lobe with 1 hairform seta (*vpls*), positioned above the pedal lobe. Pedal lobe with four (from three to five) hairform setae (*pda*); *pda1–2* long, *pda2* about 0.75× *pda1*; remaining setae minute. Mediosternal lobe with one very short or minute seta (*msts*). **Abdomen**. Bases of the setae pigmented. *Abdominal segments I–VIII* (Fig. 57): prodorsum with one seta (*prs*); postdorsum with five setae (*pds1–5*). Spiracular seta (*sps*) located postero-dorsally from spiraculum. Dorsopleural lobe with two setae (*dpls1–2*). Setae hairform or bacilliform to clubform. Ventropleural lobe with one or two hairform setae, *vpls2* minute. Laterosternal lobe with one short hairform seta (*lsts*). Mediosternal lobe with one very short hairform seta (*msts*). *Abdominal segment VIII*: *pds2* and *pds4* more anteriad of the line joining *pds1* and *pds5* than on abdominal segments I–VII, *pds4* positioned more anterior than *pds2*; *pds1*, *pds3* and *pds5* approximately in one line. *Abdominal segment IX* (Fig. 58): dorsum with four hairform or clublike setae (*ds1–4*); *ds2–4* positioned in a line, sometimes *ds3* anteriad of the line joining *ds2* and *ds4*; *ds3* the longest. Pleural lobe with two long hairform setae (*ps*). Sternal lobe with two very short hairform setae (*sts*).

## DESCRIPTIONS OF SPECIES

### *Hypera arator* (Linné, 1758)

Rupertsberger 1872: 14–17; Anderson 1948: 27–29, fig. 3; Zaslavskij 1959: 215–218, figs 7 V, 11 D; Scherf 1964: 177; Dieckmann 1989: 100.

Material (13 mature larvae), collected in the field: Bohemia mer. 6549, Blatná env., Buzice, 12. v. 2000, P. Bogusch leg. (5 specimens); 26. v. 2001, P. Bogusch leg. (4); Hungary centr., Örkeny env. (2 km S of Örkeny), 4.–5. v. 2001, P. Bogusch leg. (4) (all on *Dianthus carthusianorum* L.).

Differential diagnosis. Bases of the setae on thorax and abdomen enlarged, prominent, strongly pigmented (× *H. denominanda*, *H. jucunda*, *H. nigrirostris*, *H. plantaginis*, *H. postica*, *H. suspiciosa*, *H. venusta* and *H. viciae*) (Figs 11–13). *Prs* and *pds1–5* hairform (× *H. denominanda*, *H. nigrirostris*, *H. plantaginis*, *H. postica*, *H. suspiciosa* and *H. venusta*) (Fig. 12). *Prs* and *pds1–5* on abdominal segments I–VIII long (× *H. viciae*) (Fig. 12). *Ds1–4* hairform (× *H. nigrirostris* and *H. plantaginis*) (Fig. 13).

**Description of mature larva**

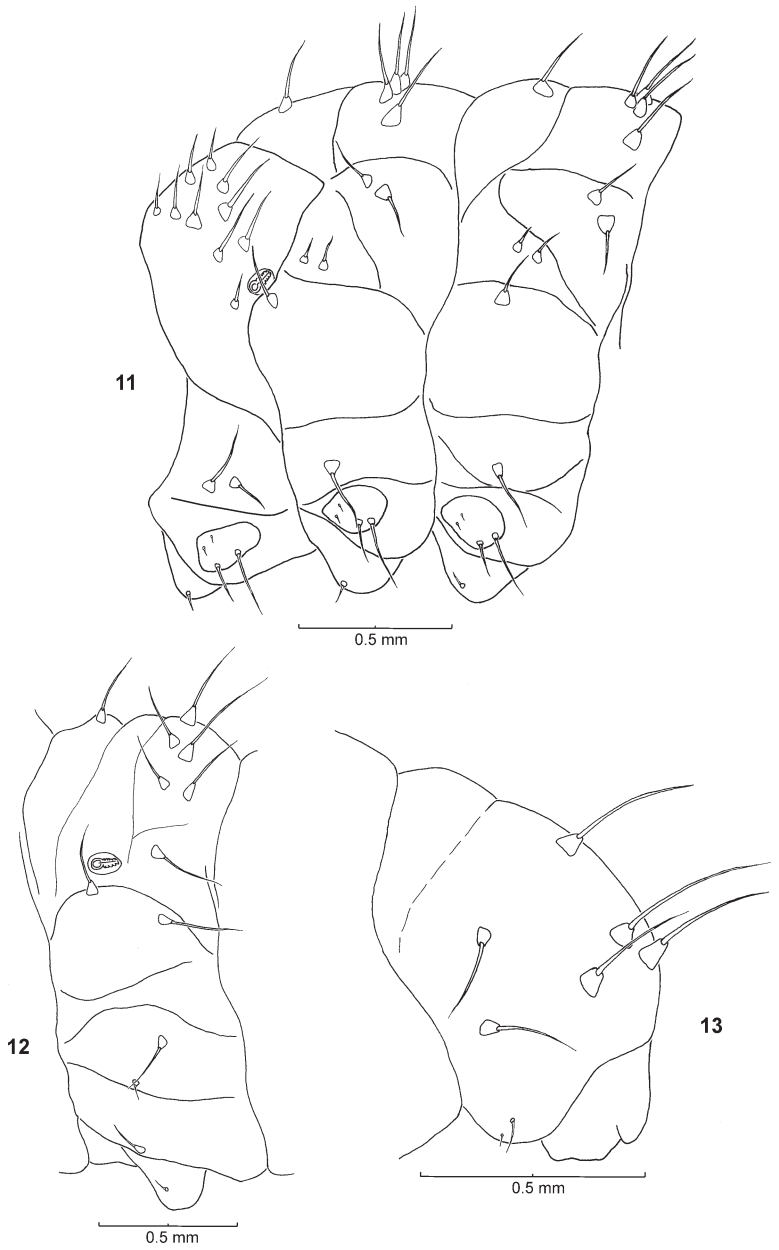
Coloration. Head brown, posterior epicranium dark brown, with dark lines along lateral margins of head. Dorsal side of body pale green with three narrow white longitudinal stripes, sometimes with violet stripes running parallel with the white ones; ventral side of body whitish to white-green.

Head. Head width 0.74–0.86 mm (average 0.79 mm), head length 0.62–0.76 mm (average 0.68 mm) (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus distinctly concave with weak pigmentation. Labrum black; anterior margin with slender median excision, posterior margin with short and wide median projection (Fig. 6). Mandibles with two rounded teeth apically (Fig. 10).

Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned postero-dorsad.

Abdomen. Spiraculum on abdominal segments I–VIII located above the dorsopleural lobe; with oval peritrema positioned posteriad.

Chaetotaxy. **Head**. Setae hairform. *Des2* and *des4* short, about 0.5× as long as remaining setae (*des1*, *des3*, *des5*), the latter three setae approximately of the same length (Fig. 9). Both *les* long, *les1* about 0.8× *les2*. Both *ves* short, *ves2* about 0.75× *ves1*. *Fs1* and *fs3* the shortest, about 0.7× *fs4*; *fs4* about 0.7× *fs5* (Fig. 5). Both *cls* short, *lrms1–3* short (Fig. 6). Both *mds* very short (Fig. 10). *Sts1–2* long, *sts3* short (Fig. 7). *Dms1–6* stout (Fig. 8), *vms1–5* minute. *Mxps* very short. *Plbs1–2* long, *plbs3* short; *prms* longer than *plbs3*; both *lig* minute (Fig. 7).




Figs 11–13. *Hypera arator* (Linné), lateral views: (11) thorax, (12) abdominal segment IV, (13) abdominal segment IX.

**Thorax** (Fig. 11). Bases of the setae prominent and broad, strongly pigmented. Setae unpigmented, long, hairform. *Prothorax*: *prn1–3* of the same length; *prn7* shorter than *prn4–6*, the latter three setae approximately of the same length; *prn8–10* approximately of the same length. *Vpls2* shorter than *vpls1*, approximately 0.7× *vpls1*. Pedal lobe with four setae (*pda*); *pda1–2* long, *pda2* about 0.75× *pda1*; remaining two setae minute. *Msts* very short. *Meso- and metathorax*: *prs* as long as *pds1–4*, *pds3* slightly longer. Both *dls* long, both *ss* short, *dpls* and *vpls* long. Pedal lobe with four setae (*pda*); *pda1–2* long, *pda2* about 0.75× *pda1*; remaining two setae minute. *Msts* very short. **Abdomen**. Bases of the setae prominent and broad, strongly pigmented. Setae unpigmented, long, hairform. *Abdominal segments I–VIII* (Fig. 12): *pds2* and *pds4* anteriad of the line joining *pds1* and *pds5*; *pds3* the longest, remaining four setae slightly shorter. *Sps* of the same length as *prs*. Both *dpls* approximately of the same length. *Vpls2* long, *vpls1* very short. *Lsts* short, *msts* very short. *Abdominal segment VII*: *pds3* of the same length as remaining four *pds*. *Abdominal segment VIII*: *pds2* and *pds4* more anteriad of the line joining *pds1* and *pds5* than on abdominal segments I–VII, *pds4* positioned more anteriorly than *pds2*; *pds1*, *pds3* and *pds5* approximately in one line. *Dpls1* shorter than *dpls2*. *Abdominal segment IX* (Fig. 13): *ds2–4* not in line, *ds3* anteriad of the line joining *ds2* and *ds4*; *ds3* the longest, remaining three dorsal (*ds*) setae approximately of the same length. Both *ps* long, both *sts* very short.

Remarks. The head width recorded by both Anderson (1948) and Zaslavskij (1959) (L4: 0.72–0.81 mm) agrees with measurements presented in this paper (Table. 1). Body length recorded by (Scherf 1964) (L4: 5–7 mm) agrees with the length of larvae studied here (Table. 1). Scherf (1964) and Dieckmann (1989) recorded the following body coloration: "yellowgreen to pale green with slender longitudinal stripes".

### *Hypera denominanda* (Capiomont, 1868)

Material (4 mature larvae), reared : Bohemia bor.-occ. 5447, Most, Šibeník hill, 20. v. 2001, J. Skuhrovec leg. (1); collected in the field: Bohemia occ. 5746, district Žatec, Podbořany env., Dolánky – Rubín hill, 31. v. 2002, J. Skuhrovec leg. (3) (both on *Vicia tenuifolia* Roth).

Differential diagnosis. *Prs* and *pds1–5* clubform (× *H. arator*, *H. jucunda* and *H. viciae*) (Fig. 21). *Prn1–10* bacilliform to clubform (× *H. nigrirostris*, *H. postica* and *H. venusta*) (Fig. 20). *Ds1–4* hairform to slightly bacilliform (× *H. nigrirostris* and *H. plantaginis*) (Fig. 22). Setae on thorax and abdomen unpigmented (× *H. suspiciosa*).

**Description of mature larva**

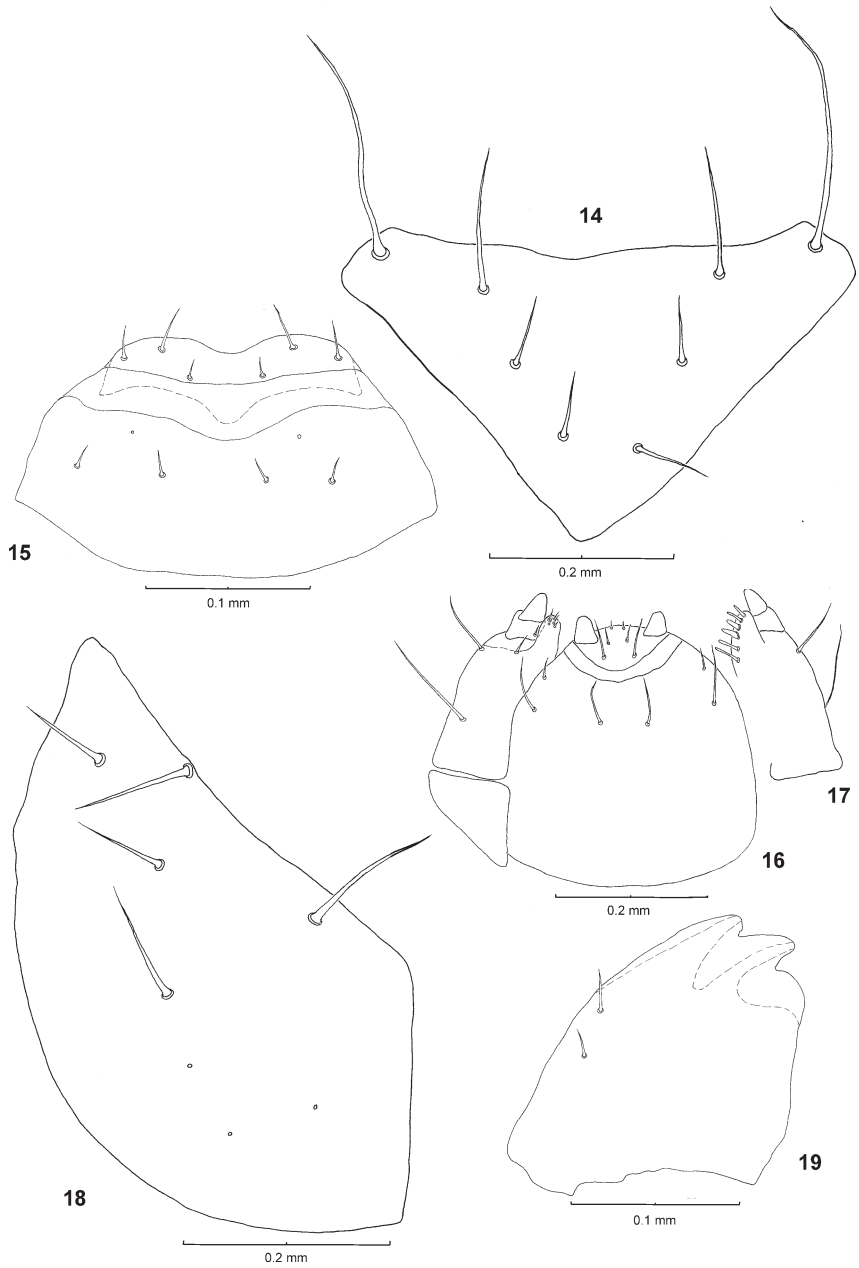
Coloration. Head orange, posterior epicranium dark brown to black (this dark coloration slightly extending on to front part of the head). Dorsal side of body green with white median longitudinal stripe.

Head. Head width 0.70–0.74 mm (average 0.71 mm), head length 0.50–0.64 mm (average 0.57 mm) (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus distinctly concave with weak pigmentation. Labrum black; anterior margin with slender median excision, posterior margin with short and wide median projection (Fig. 15). Mandibles with two rounded teeth apically (Fig. 19).

Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.

Abdomen. Spiraculum on abdominal segments I–VIII positioned above the dorsopleural lobe; with oval peritrema located postero-dorsad.

Chaetotaxy. **Head**. Setae hairform. *Des2* and *des4* the shortest, about 0.75× *des1* and *des3*; *des5* about 0.8× *des1* and *des3* (Fig. 18). Both *les* long, approximately of the same length. Both *ves* short,




Figs 14–19. *Hypera denominanda* (Capiomont), dorsal views, except for (16), which is a ventral view: (14) frons, (15) clypeus and labrum, (16) labium and maxilla, (17) maxilla, (18) dorsum of epicranium, (19) mandible.

*ves2* about 0.75× *ves1*. *Fs1* and *fs3* the shortest, about 0.5× *fs4*, *fs4* about 0.7× *fs5* (Fig. 14). Both *cls* short, *lrms1–3* short (Fig. 15). Both *mds* short (Fig. 19). *Sts1–2* long, *sts3* short (Fig. 16). *Dms1–6* stout (Fig. 17), *vms1–5* minute. *Mxps* short. *Plbs1–2* long, *plbs3* short; *prms* as long as *plbs3*; both *lig* very short (Fig. 16). **Thorax** (Fig. 20). Bases of the setae strongly pigmented, setae unpigmented. Setae bacilliform to clubform or hairform (*vpls*, *pda*, *msts*). *Prothorax*: *prn1* short, *prn2–3* approximately of the same length; ventral seta (*prn7*) shorter than *prn4–6*, the latter three setae approximately of the same length; *prn8–10* as long as *prn7*. *Vpls2* shorter than *vpls1*, about 0.7× *vpls1*. Pedal lobe with four (five) setae (*pda*); *pda1–2* long, *pda2* about 0.75× *pda1*; remaining two (three) setae minute. *Msts* minute. *Meso- and metathorax*: *prs* longer than *pds1–4*; *pds1–4* approximately of the same length, *pds4* slightly shorter. Both *dls* long, both *ss* short, *dpls* and *vpls* long. Pedal lobe with four (five) setae (*pda*); *pda1–2* long, *pda2* about 0.75× *pda1*; remaining two (three) setae minute. *Msts* very short. **Abdomen**. Bases of the setae strongly pigmented, setae unpigmented. Setae clubform or hairform (*vpls*, *lsts*, *msts*). *Abdominal segments I–VIII* (Fig. 21): *pds2* and *pds4* slightly minutely anteriad of the line joining *pds1* and *pds5*, *pds3* slightly posteriad of the line; *pds3* the longest; *pds2*, *pds4* and *pds5* about 0.7× *pds3*; *pds1* slightly shorter than *pds3*. *Sps* shorter than *prs*. Both *dpls* short clubform setae, approximately of the same length. *Vpls* short. *Lsts* short, *msts* minute. *Abdominal segment VII*: *pds3* very long, clubform; *pds1* about 0.25× *pds3*. *Abdominal segment VIII*: *pds2* and *pds4* more anteriad of the line joining *pds1* and *pds5* than on abdominal segments I–VII, *pds4* positioned more anteriorly than *pds2*; *pds1*, *pds3* and *pds5* approximately in one line; *pds3* very long, hairform; *pds2*, *pds4* and *pds5* about 0.7× *pds1*. *Dpls1* about 0.7× *dpls2*. *Abdominal segment IX* (Fig. 22): *ds1–4* hairform to bacilliform; *ds2–4* not in line, *ds3* anteriad of the line joining *ds2* and *ds4*; *ds3* the longest; remaining three dorsal (*ds*) setae about 0.7× *ds3*. Both *ps* long;, s*ts1* very short, s*ts2* minute.

### *Hypera jucunda* (Capiomont, 1868)

Material (1 mature larva), collected in the field: Turkey mer., prov. Adana (Çatalan), Çingöz env., 3. iv. 2002, J. Skuhrovec leg. (1) (on *Lotus* cf. *collinus* (Boiss.) Heldr.).

Differential diagnosis. *Prs* and *pds1–5* hairform (× *H. denominanda*, *H. nigrirostris*, *H. plantaginis*, *H. postica*, *H. suspiciosa* and *H. venusta*) (Fig. 30). *Prs* and *pds1–5* on abdominal segments I–VIII long (× *H. viciae*) (Fig. 30). Bases of the setae on thorax and abdomen small, not distinctly enlarged (× *H. arator*) (Figs 29–31). *Ds1–4* hairform (× *H. nigrirostris* and *H. plantaginis*) (Fig. 31).

**Description of mature larva**

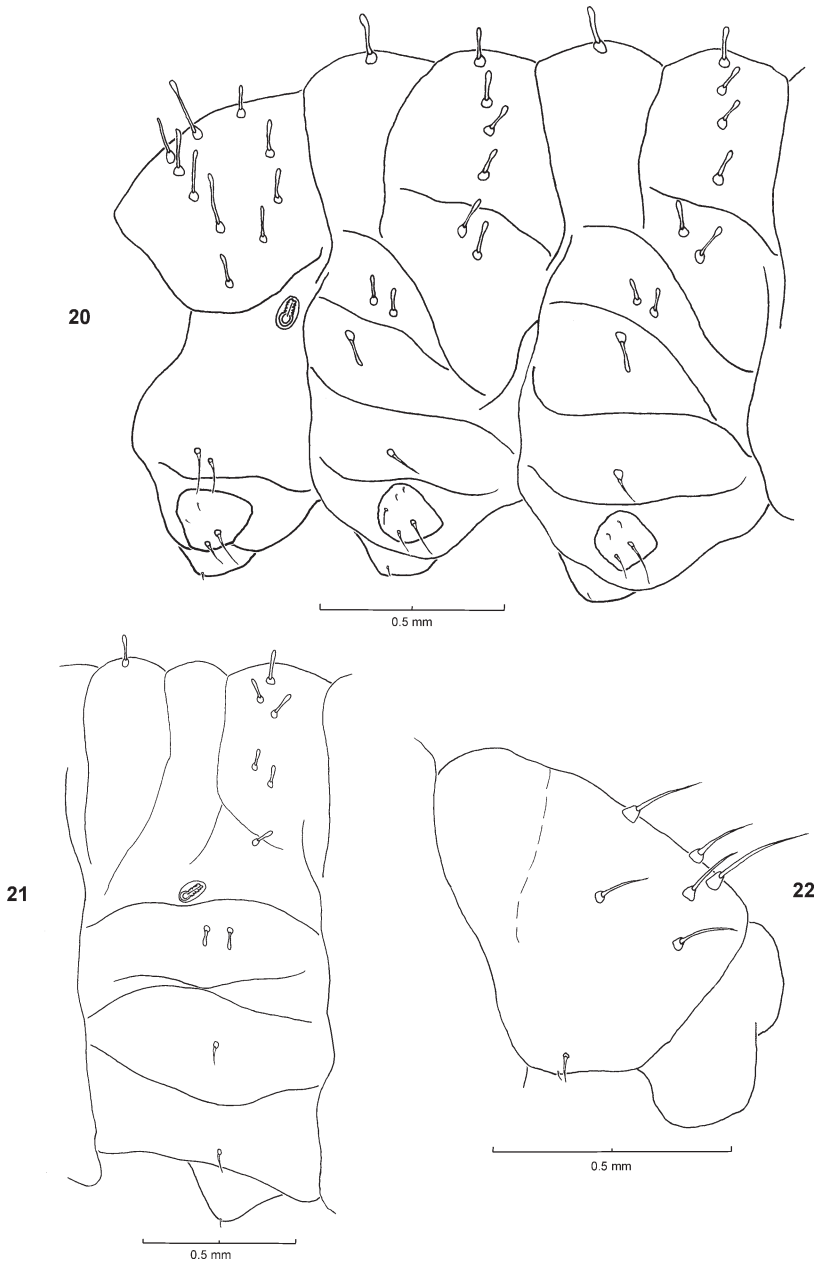
Coloration. Head orange, with dark lines along lateral margins of epicranium. Dorsal side of body green with a longitudinal white stripe. Body with soft granulation.

Head. Head width 0.52 mm, head length 0.48 mm (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus distinctly concave with weak pigmentation. Labrum black; anterior margin with a slender median excision, posterior margin with short and wide median projections (Fig. 24). Mandibles with two sharp teeth apically (Fig. 28).

Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas located dorsad.

Abdomen. Spiraculum on abdominal segments I–VIII located above the dorsopleural lobe; with oval peritrema positioned posteriad.

Chaetotaxy. **Head**. Setae hairform. *Des2* and *des4* short; remaining setae broken and not examined (Fig. 27). Both *les* long, *les1* about 0.8× *les2*. Both *ves* short, *ves2* about 0.75× *ves1*. *Fs1* and *fs3* the shortest, about 0.7× *fs4*; *fs4* about 0.7× *fs5* (Fig. 23). Both *cls* short, *lrms1–3* longer than *cls* (both Fig. 24). Both *mds* short (Fig. 28). *Sts1* long, *sts3* short, *sts2* broken (Fig. 25). *Dms1–6* stout (*dms*)




Figs 20–22. *Hypera denominanda* (Capiomont), lateral views: (20) thorax, (21) abdominal segment IV, (22) abdominal segment IX.

(Fig. 26), *vms1–5* minute. *Mxps* very short. *Plbs1–2* long, *plbs3* short; *prms* longer than *plbs3*; both *lig* very short (Fig. 25). **Thorax** (Fig. 29). Bases of the setae strongly pigmented, setae unpigmented. Setae long hairform. *Prothorax*: *prn2* the longest; *prn1* and *prn3* approximately of the same length; *prn4–7* approximately of the same length; *prn8–10* shorter than setae on anterior margin of the sclerite. *Vpls2* about 0.7× *vpls1*. Pedal lobe with four setae (*pda*); *pda1–2* long, *pda2* about 0.75× *pda1*; remaining two setae minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1–4* approximately of the same length, *pds3* slightly longer. Both *dls* as long as *pds3*, setae *ss* short, located close to each other. *Dpls* and *vpls* long. Pedal lobe with four setae (*pda*); *pda1–2* long, *pda2* about 0.75× *pda1*; remaining two setae minute. *Msts* very short. **Abdomen**. Bases of the setae strongly pigmented, setae unpigmented. Setae long hairform. *Abdominal segments I–VIII* (Fig. 30): *pds1*, *pds3* and *pds5* approximately in line, *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5*; *pds1*, *pds3* and *pds5* approximately of the same length; *pds2* and *pds4* slightly shorter. *Sps* shorter than *prs*. Both *dpls* approximately of the same length. *Vpls2* long, *vpls1* minute. *Lsts* long, *msts* minute. *Abdominal segment VII*: *pds2* removed from *pds4* and *pds3* from *pds5*. The lengths of the setae on postdorsum identical to those on abdominal segments I–VI. *Abdominal segment VIII*: *pds2* more removed from *pds4* and *pds3* to *pds5*. *Pds3* approximately in line with *pds1* and *pds5*. The lengths of the setae on postdorsum identical to those on abdominal segments I–VII. Dorsopleural seta (*dpls1*) slightly shorter than *dpls2*. *Abdominal segment IX* (Fig. 31): *ds1–4* hairform; *ds2–4* in line; *ds3* the longest, remaining three setae approximately of the same length. Both *ps* long;, s*ts1* very short, s*ts2* minute.

### *Hypera nigrirostris* (Fabricius, 1775)

Titus 1911: 446–447; Servadei 1944: 133–148, figs 7–10; Anderson 1948: 27–30, figs 10, 13, 29; Peterson 1951: 134, figs C25 O–Q; Miller 1956: 572; Zaslavskij 1959: 215–218, figs 7 D, 11 E; Scherf 1964: 178–179, figs 15, 20 e, 22 e, 330–334; Dieckmann 1989: 101; Stehr 1992: 602, figs 34 862 a–b.

Material (4 mature larvae), collected in the field: Slovakia or. 6988, Spišká Nová Ves env., Primovce, 18. v. 2002, J. Skuhrovec leg. (4) (all on *Trifolium pratense* L.).

Differential diagnosis. *Prs* and *pds1–5* dippleform (× *H. arator*, *H. jucunda* and *H. viciae*) (Fig. 39). *Prn1–10* hairform (× *H. denominanda*, *H. plantaginis* and *H. suspiciosa*) (Fig. 38). Setae on thorax and abdomen unpigmented (× *H. suspiciosa*). *Pds2* on abdominal segments I–VII very short, shorter than 0.5× *pds3* (× *H. denominanda*, *H. plantaginis*, *H. postica* and *H. suspiciosa*) (Fig. 39). *Ds1–4* dippleform (except *ds3*) (× *H. arator*, *H. denominanda*, *H. jucunda*, *H. postica*, *H. suspiciosa*, *H. venusta* and *H. viciae*) (Fig. 40).

**Description of mature larvae**

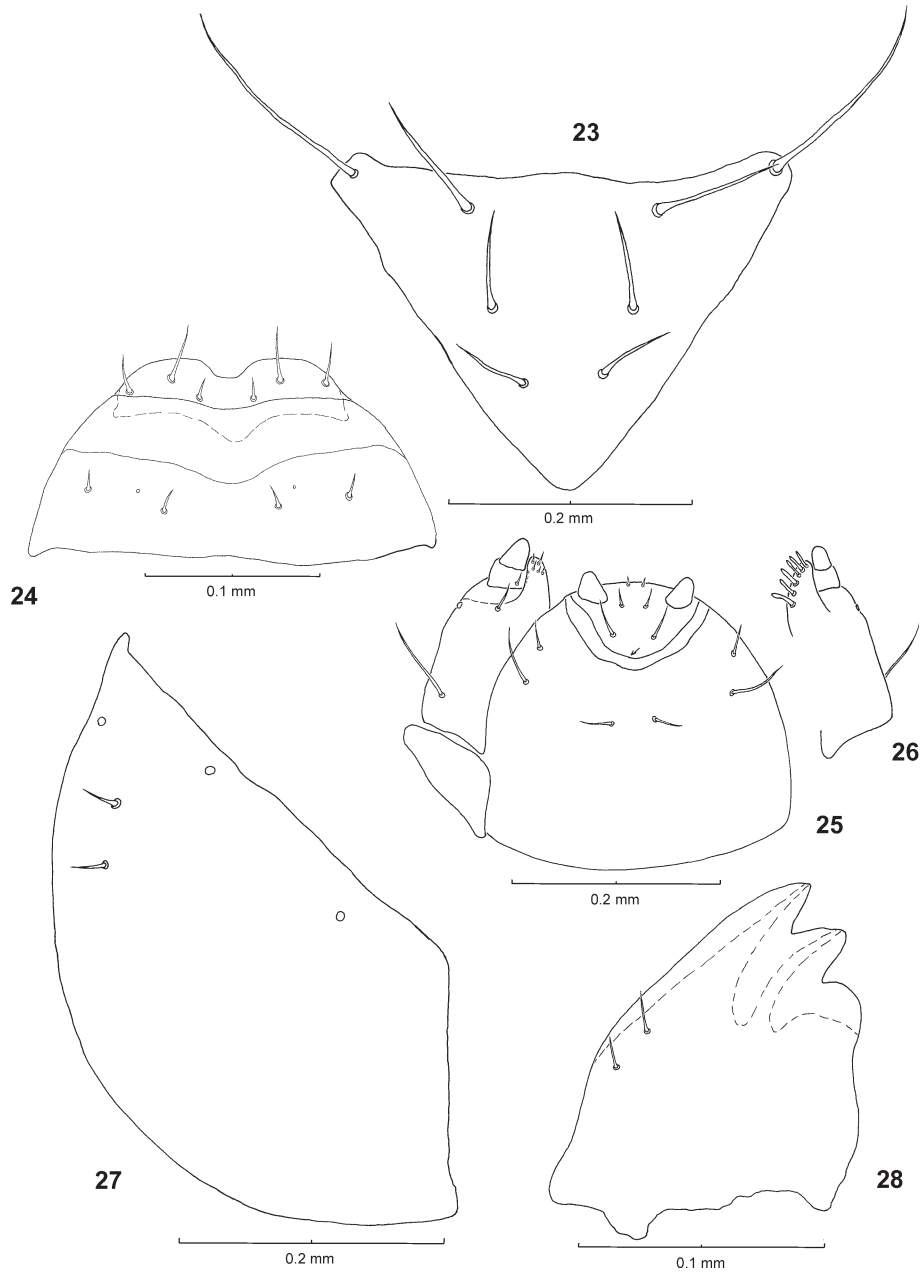
Coloration. Head orange, posterior and lateral margins of epicranium dark. Dorsal side of body yellow-green to grey-green.

Head. Head width 0.42–0.52 mm (average 0.48 mm), head length 0.36–0.48 mm (average 0.43 mm) (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus weakly concave and slightly pigmented. Labrum slightly pigemented; anterior margin with deep median excision, posterior margin with short and wide median projection (Fig. 33). Mandibles with two rounded teeth apically (Fig. 37).

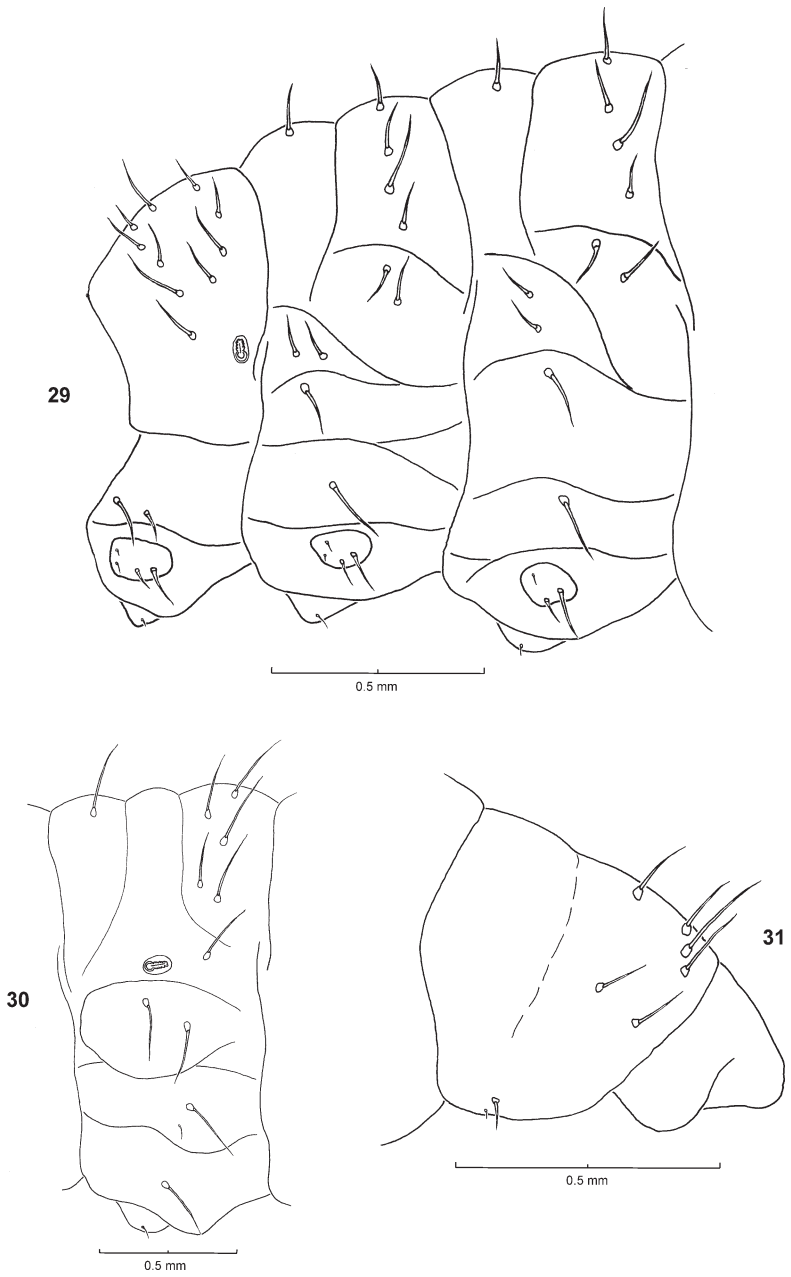
Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.

Abdomen. Spiraculum on abdominal segments I–VIII laying above the dorsopleural lobe; with oval peritrema positioned posteriad.

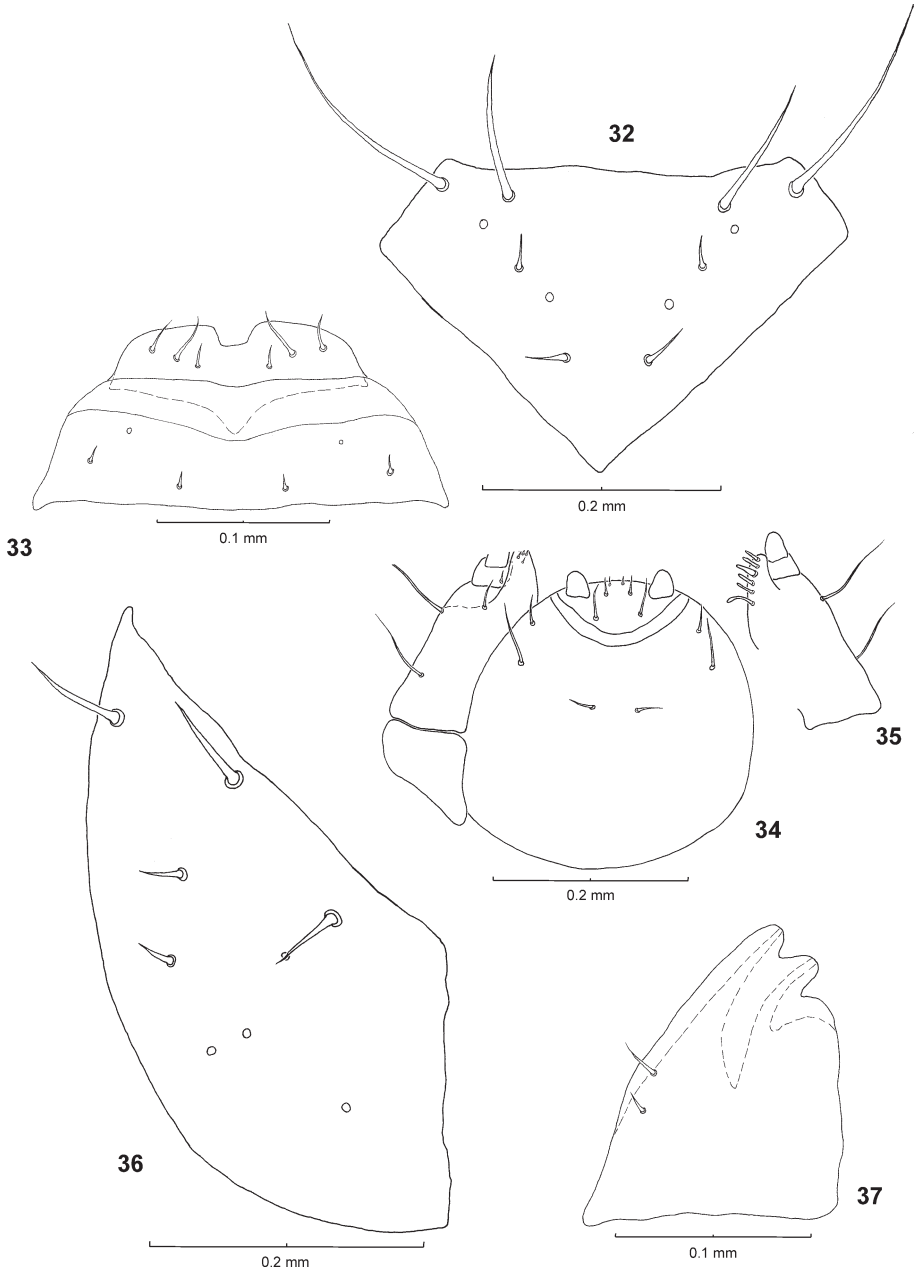
Chaetotaxy. **Head**. Setae hairform. *Des2* and *des4* very short, about 0.33× *des1*, slightly shorter than *des3* and *des5* (Fig. 36). Both *les* short, *les1* about 0.5× *les2*. Both *ves* very short. *Fs1* and *fs3* very short; *fs4* about 0.7× *fs5* (Fig. 32). Both *cls* minute, *lrms1–3* short (Fig. 33). Both *mds* very



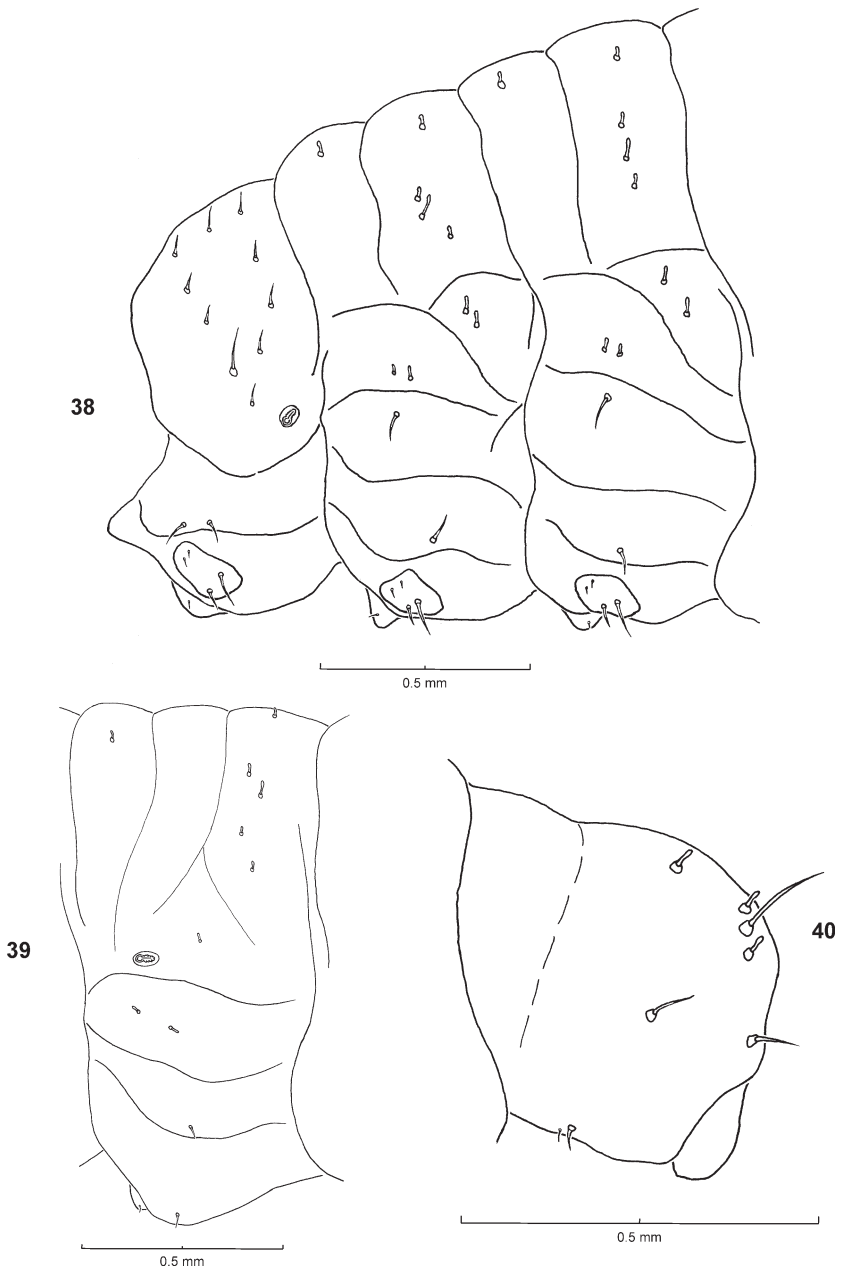

Figs 23–28. *Hypera jucunda* (Capiomont), dorsal views, except for (25), which is a ventral view: (23) frons, (24) clypeus and labrum, (25) labium and maxilla, (26) maxilla, (27) dorsum of epicranium, (28) mandible.




Figs 29–31. *Hypera jucunda* (Capiomont), lateral views: (29) thorax, (30) abdominal segment IV, (31) abdominal segment IX.




Figs 32–37. *Hypera nigrirostris* (Fabricius), dorsal views, except for (34), which is a ventral view: (32) frons, (33) clypeus and labrum, (34) labium and maxilla, (35) maxilla, (36) dorsum of epicranium, (37) mandible.




Figs 38–40. *Hypera nigrirostris* (Fabricius), lateral views: (38) thorax, (39) abdominal segment IV, (40) abdominal segment IX.

short (Fig. 37). *Sts1–2* long, *sts3* short (Fig. 34). *Dms1–6* stout (Fig. 35), *vms1–5* minute. *Mxps* very short. *Plbs1* long, *plbs2–3* short; *prms* as long as *plbs3*; both *lig* very short (Fig. 34). **Thorax** (Fig. 38). Bases of the setae strongly pigmented, setae unpigmented. Setae very short. *Prothorax*: setae hairform. *Prn1–3* short and of the same length; *prn6* long, ventral seta (*prn7*) very short; *prn8–10* approximately of the same length as *prn1*. *Vpls2* about 0.7× *vpls1*. Pedal lobe with four (three) setae (*pda*); *pda1–2* long, *pda2* about 0.75× *pda1*; remaining two (one) setae minute. *Msts* minute. *Meso- and metathorax*: setae dippleform or hairform (*dpls*, *vpls*, *pda*, *msts*). *Prs*, *pds1–2* and *pds4* very short, *pds3* short. Both *dls* very short, both *ss* minute. *Dpls* slender, *vpls* shorter, both hairform. Pedal lobe with four (three) setae (*pda*); *pda1–2* long, *pda2* about 0.75× *pda1*; remaining two (one) setae minute. *Msts* minute. **Abdomen**. Bases of the setae strongly pigmented, setae unpigmented. Setae very short. *Abdominal segments I–VIII* (Fig. 39): setae dippleform or hairform (*vpls*, *lsts*, *msts*). *Prs* short. *Pds2* and *pds4* positioned slightly anteriad of the line joining *pds1* and *pds5*, *pds3* positioned slightly posteriad of the line; *pds3* the longest, as long as *prs*; remaining setae very short. Setae on abdominal segment VI longer than on abdominal segments I–V, ratio in length as the setae on abdominal segments I–V. *Sps* very short. Both *dpls* approximately of the same length. *Vpls* very short. *Lsts* very short, *msts* minute. *Abdominal segment VII*: *pds3* long hairform; remaining setae about 0.33× *pds3*. *Abdominal segment VIII*: *pds2* and *pds4* positioned further from the line joining *pds1* and *pds5* than on abdominal segments I–VII, *pds4* positioned more anterior than *pds2*; *pds1*, *pds3* and *pds5* approximately in line; *pds3* very long hairform; *pds1–2*, *pds4* and *pds5* very short. *Dpls1* about 0.5× *dpls2*. *Abdominal segment IX* (Fig. 40): *ds1–4* dippleform or hairform (*ds3*); *ds2–4* not in line, *ds3* anteriad of the line joining *ds2* and *ds4*; *ds3* the longest, remaining three setae very short. Both *ps* long;, s*ts1* very short, s*ts2* minute.

Remarks. Head width recorded in the literature (L4: 0.52–0.55 mm (Anderson 1948, Zaslavskij 1959)) does not agree with the measurements presented in this paper (Table. 1). Upper limit presented in this paper coincide with the lower limit recorded by Anderson (1948) and Zaslavskij (1959). Body length of mature larva recorded in the literature (L4: 4.5–7.5 mm (Peterson 1951, Miller 1956, Scherf 1964, Stehr 1992)) agrees with measurements presented in this paper (Table. 1). Scherf (1964) recorded the same arrangement of setae on the head: frons with only two setae, labrum with two pairs of setae; postlabium with two setae, prelabium with two setae; mandibles with three teeth. Servadei (1944) described the mature larva in detail, but used a different nomenclature from May (1994) and provides no detailed description or drawing. Thus, his description cannot be compared with that presented here.

### *Hypera plantaginis* (De Geer, 1775)

Anderson 1948: 27–29, figs 16–17, 25–26; Zaslavskij 1959: 215–218, figs 8 B, V, G; Dieckmann 1989: 101.

Material (7 mature larvae), reared: Bohemia centr. 5952, Praha (Kunratický les [forest]), 10. v. 2000, P. Bogusch leg. (1); 15. v. 2000, J. Skuhrovec leg. (2); collected in the field: Bohemia occ. 5845, district Žatec, near Podbořany, Vrbička env., old stonepit Vrbička, 1. vi. 2002, J. Skuhrovec leg. (4) (all on *Lotus corniculatus* L.).

Differential diagnosis. *Fs1–4* (Fig. 41) and *des1–5* (Fig. 45) bacilliform to clubform (× *H. arator*, *H. denominanda*, *H. jucunda*, *H. nigrirostris*, *H. postica*, *H. suspiciosa*, *H. venusta* and *H. viciae*). *Prs* and *pds1–5* clubform (× *H. arator*, *H. jucunda* and *H. viciae*) (Fig. 48). *Prn1–10* clubform (× *H. arator*, *H. jucunda*, *H. nigrirostris*, *H. postica*, *H. venusta* and *H. viciae*) (Fig. 47). Setae on thorax and abdomen unpigmented (× *H. suspiciosa*). *Ds1–4* bacilliform to clubform (except of *ds3*) (× *H. arator*, *H. denominanda*, *H. jucunda*, *H. postica*, *H. suspiciosa*, *H. venusta* and *H. viciae*) (Fig. 49).

**Description of mature larva**

Coloration. Head brown, posterior epicranium dark. Dorsal side of body green with yellow-whitish median stripe and short white stripes along median stripe.

Head. Head width 0.54–0.72 mm (average 0.67 mm), head length 0.44–0.64 mm (average 0.58 mm) (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus strongly concave and slightly pigmented. Labrum dark brown; anterior margin with deep median excision, posterior margin with short and wide median projection (Fig. 42). Mandibles with two rounded teeth apically (Fig. 46).

Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.

Abdomen. Spiraculum on abdominal segments I–VIII positioned above the dorsopleural lobe; with oval peritrema positioned posteriad.

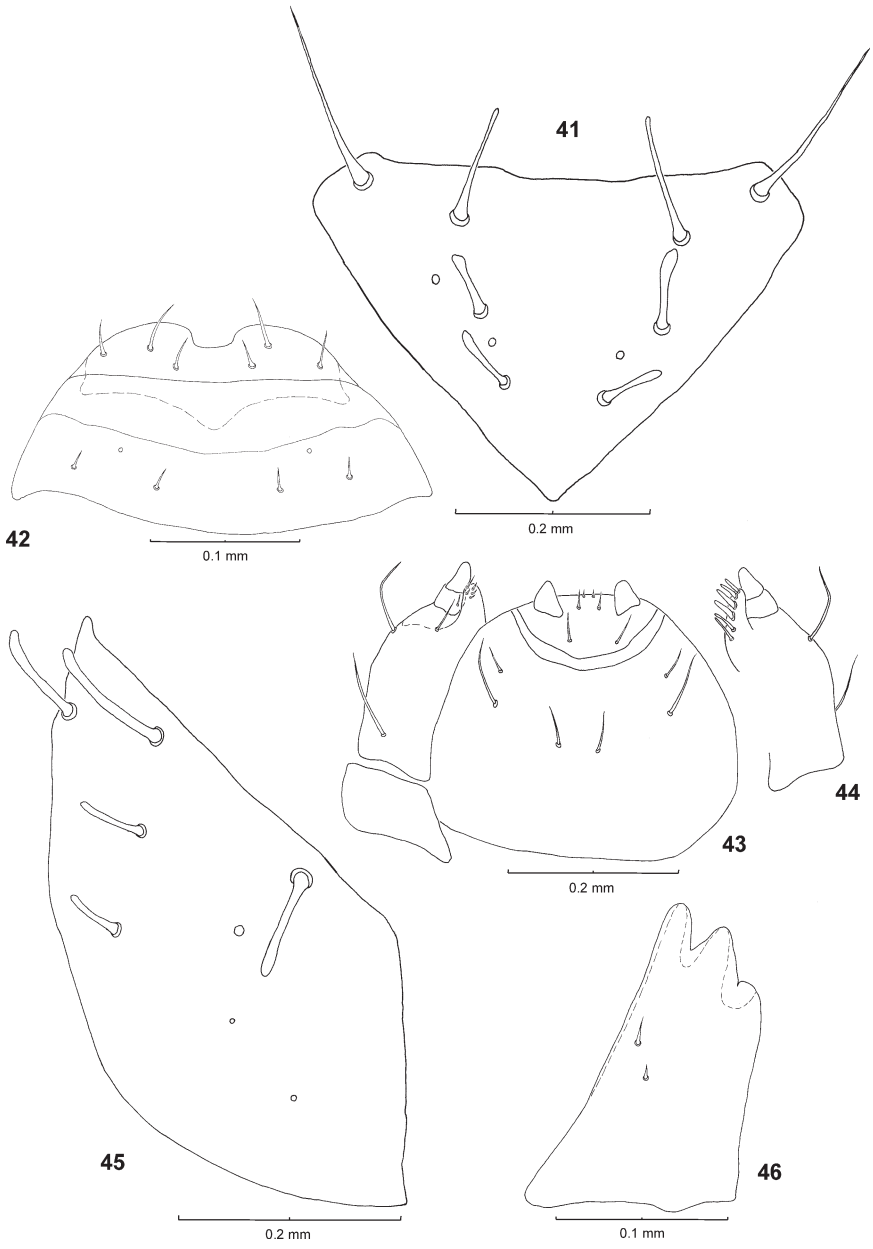
Chaetotaxy. **Head**. Frons and dorsum of epicranium with bacilliform to clubform setae, except hairform *fs5*; remaining setae on head hairform. *Des2* and *des4* short, about 0.5× *des1*; *des1* about 0.7× *des3*; *des5* about 0.8× *des3* (Fig. 45). Both *les* long, *les1* about 0.7× *les2*. Both *ves* short, *ves1* slightly longer than *ves2*. *Fs1* and *fs3* the shortest, about 0.5× *fs4*; *fs4* about 0.7× *fs5* (Fig. 41). Both *cls* very short, *lrms1–3* long (Fig. 42). Both *mds* short (Fig. 46). *Sts1–2* long, *sts3* short (Fig. 43). *Dms1–6* stout (Fig. 44), *vms1–5* minute. *Mxps* short. *Plbs1* long, *plbs2–3* shorter; *prms* as long as *plbs3*; both *lig* very short (Fig. 43). **Thorax** (Fig. 47). Bases of the setae strongly pigmented, setae unpigmented. *Prothorax*: setae bacilliform to clubform or hairform (*pda*, *msts*). *Prn1*, *prn3* short, *prn2* long; *prn4–6* as long as *prn2*, *prn7* very short; *prn8–10* short. *Vpls2* about 0.33× *vpls1*. Pedal lobe with three setae (*pda*); *pda1–2* long, *pda2* about 0.75× *pda1*; remaining seta minute. *Msts* minute. *Meso- and metathorax*: setae clubform or hairform (*pda*, *msts*). *Prs* and *pds1–4* approximately of the same length, *pds4* slightly shorter. Both *dls* short, both *ss* very short. *Dpls* as long as *vpls*. Pedal lobe with three (four) setae (*pda*); *pda1–2* long, *pda2* about 0.75× *pda1*; remaining one or two setae minute. *Msts* minute. **Abdomen**. Bases of the setae strongly pigmented, setae unpigmented. *Abdominal segments I–VIII* (Fig. 48): setae clubform or hairform (*lsts*, *msts*). *Prs* short. *Pds1–5* positioned approximately in a line; *pds1* and *pds3* approximately of the same length, *pds2* about 0.5× *pds1* and *pds3*; *pds4* and *pds5* short. *Pds3* on abdominal segment VI as long as *pds1*; *pds2* about 0.33× *pds1*. *Sps* very short. Both *dpls* about 0.7× *pds3*. *Vpls* short. *Lsts* very short, *msts* minute. *Abdominal segment VII*: *pds3* very long hairform; *pds1* about 0.5× *pds3*. *Abdominal segment VIII*: *pds2* and *pds4* further from the line joining *pds1* and *pds5*; *pds4* positioned more anterior than *pds2*; *pds1*, *pds3* and *pds5* approximately in a line; *pds3* very long; *pds1* and *pds2* about 0.5× *pds3*. Dorsopleural seta (*dpls1*) slightly shorter than *dpls2*. *Abdominal segment IX* (Fig. 49): *ds1–4* bacilliform to clubform; *ds2–4* in a line; *ds3* the longest, remaining three setae about 0.7× *ds3*. *Ps1* about 0.8× *ps2*, both bacilliform. *Sts1* very short, s*ts2* minute; both hairform.

Remarks. Head width recorded in the literature (L4: 0.63–0.72 mm (Anderson 1948, Zaslavskij 1959) is similar to that presented in this paper (Table. 1). The body coloration of the material studied is similar to that reared by Dieckmann (1989).

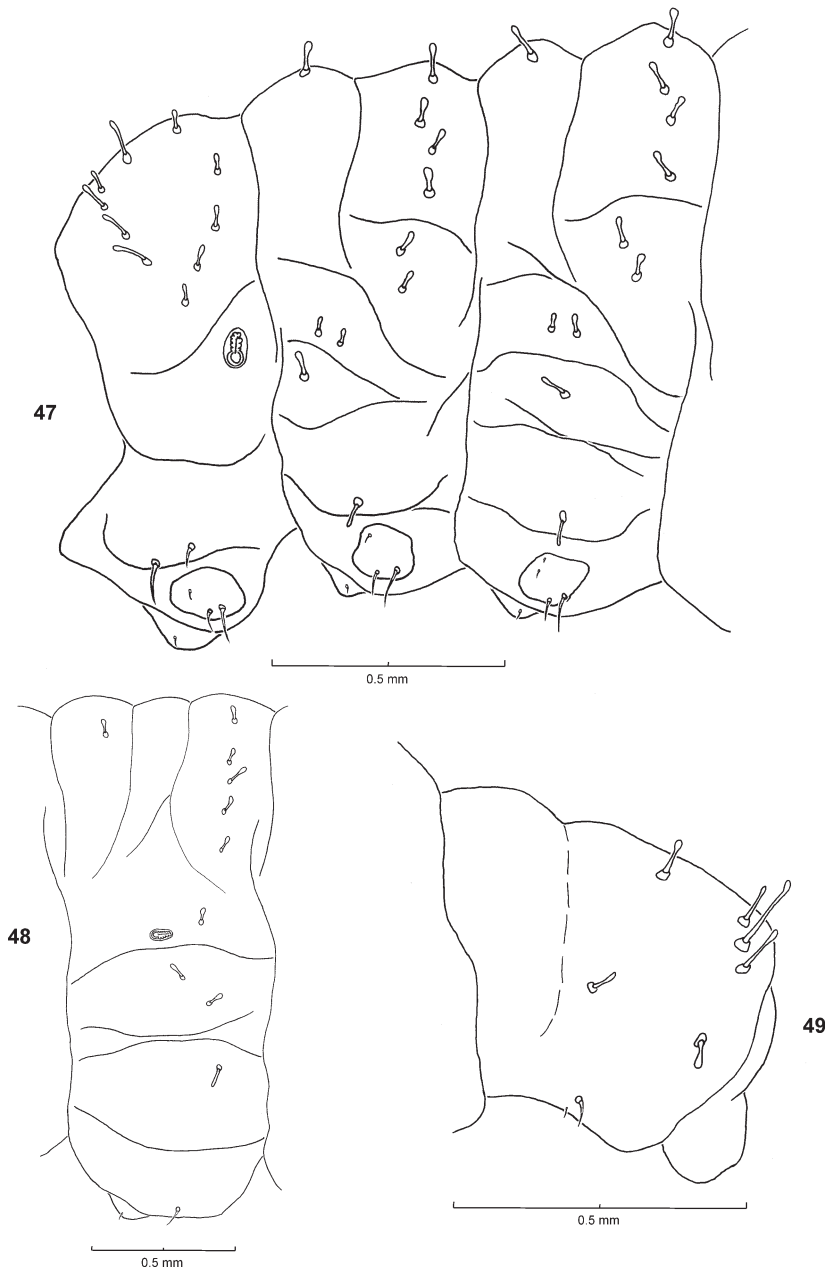
### *Hypera postica* (Gyllenhal, 1813)

Titus 1911: 459, figs XXXI 1–2, XXXII 1,2,9; Anderson 1948: 27–29, 30, figs 1, 12, 20–21; Peterson 1951: 124, figs C20 D–E, C21 G–I; Miller 1956: 569–571; Zaslavskij 1959: 215–218, figs 3 V, 4 V, 10 A, 11 M, O; Scherf 1964: 180–181, figs 336–337; Bland 1983: 261–270, figs 1–17; Dieckmann 1989: 101; Stehr 1992: 601, figs 34 861 a–e.

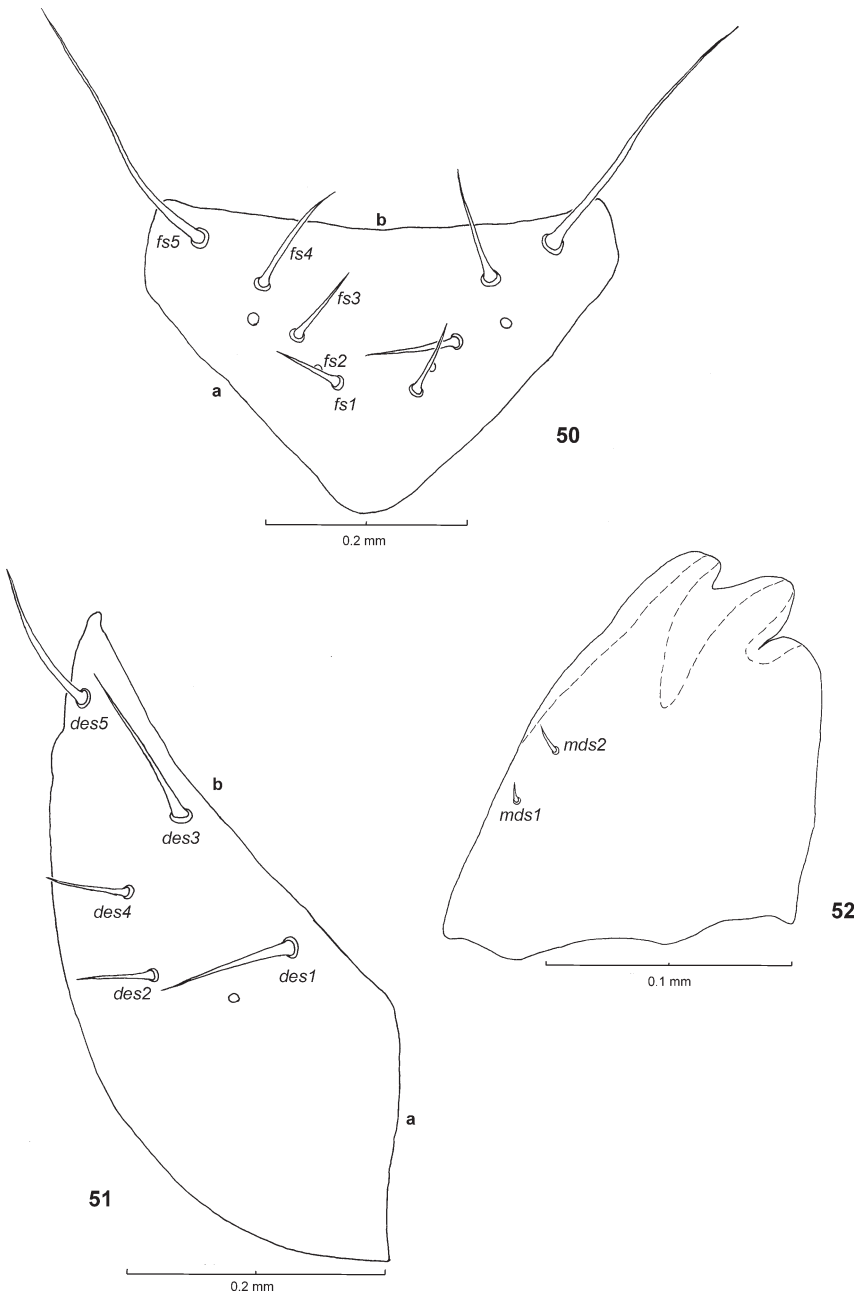
Material (24 mature larvae), reared: Bohemia bor.-occ. 5548, Louny env., Raná hill, 1. v. 2000, J. Skuhrovec leg. (1); Bohemia bor.-occ. 5548, Louny env., Milá hill, 15. v. 2002, J. Skuhrovec leg. (13) (both on *Medicago sativa* L.); Bohemia centr. 5551, Litoměřice env., Oleško (Travčický les [forest]), 6. v. 2000, J. Skuhrovec leg. (1);




Figs 41–46. *Hypera plantaginis* (De Geer), dorsal views, except for (43), which is a ventral view: (41) frons, (42) clypeus and labrum, (43) labium and maxilla, (44) maxilla, (45) dorsum of epicranium, (46) mandible.




Figs 47–49. *Hypera plantaginis* (De Geer), lateral views: (47) thorax, (48) abdominal segment IV, (49) abdominal segment IX.




Figs 50–52. *Hypera postica* (Gyllenhal), dorsal views: (50) Frons: a – frontal suture, b – frontoclypeal suture (setae: *fs1–5*). (51) Dorsum of epicranium: a – coronal suture, b – frontal suture (setae: *des1–5*). (52) Mandlible (setae: *mds1–2*).

Bohemia centr. 5952, Praha (Prokopské údolí [valley]), 27. iv. 2000, J. Skuhrovec leg. (1); Bohemia centr. 5952, Praha (Kunratický les [forest]), 10. v. 2000, P. Bogusch leg. (1) (all on *Medicago* × *varia* Martyn); collected in the field: Moravia mer. 7162, The National Park "Podyjí", district Znojmo, Popice, 29. vi. 2001, J. Skuhrovec leg. (4); Moravia mer. 7162, The National Park "Podyjí", district Znojmo, Havraníky, 28. vi. 2001 and 24. vi. 2002, both J. Skuhrovec leg. (2 or 1, respectivelly) (all on *Medicago falcata* L.).

Differential diagnosis. *Prs* and *pds1–5* bacilliform to clubform (× *H. arator*, *H. jucunda* and *H. viciae*) (Fig. 57). *Prn1–10* hairform (× *H. denominanda*, *H. plataginis* and *H. suspiciosa*) (Fig. 56). Setae on thorax and abdomen unpigmented (× *H. suspiciosa*). *Pds2* on abdominal segments I–VII short, longer than 0.5× *pds3* (× *H. nigrirostris* and *H. venusta*) (Fig. 57). *Ds1–4* hairform to bacilliform (× *H. nigrirostris* and *H. plantaginis*) (Fig. 58).

**Description of mature larva**

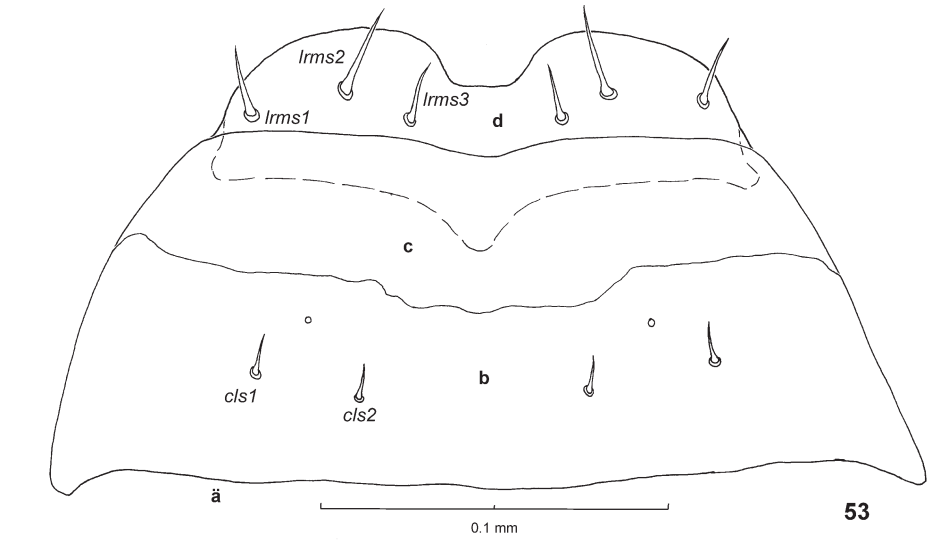
Coloration. Head brown, dorsal epicranium darker brown, dark lines along lateral margins of head. Dorsal side of body green with slender white median stripe with two short whitish longitudinal stripes parallel to the median stripe.

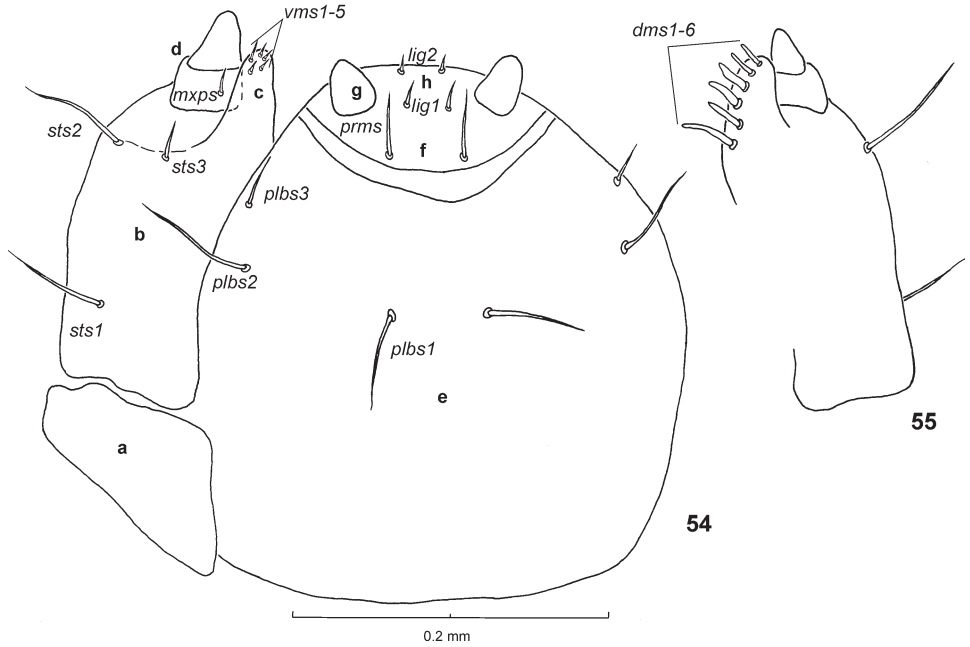
Head. Head width 0.56–0.68 mm (average 0.60 mm), head length 0.48–0.60 mm (average 0.53 mm) (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus distinctly concave and slightly pigmented. Labrum black; anterior margin with slender median excision, posterior margin with short and wide median projection (Fig. 53). Mandibles with two rounded teeth apically (Fig. 52).

Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.

Abdomen. Spiraculum on abdominal segments I–VIII positioned above the dorsopleural lobe; with oval peritrema positioned postero-dorsad.

Chaetotaxy. **Head**. Setae hairform. *Des2* and *des4* short, about 0.5× *des1* and *des3*; *des5* about 0.8× *des1* and *des3* (Fig. 51). Both *les* long, approximately of the same length. Both *ves* short, *ves2* about 0.75× *ves1*. *Fs1* and *fs3* the shortest, about 0.7× *fs4*; *fs4* about 0.5× *fs5* (Fig. 50). Both *cls* very short, *lrms1–3* short (Fig. 53). Both *mds* very short (Fig. 52). *Sts1–2* long, *sts3* short (Fig. 54). *Dms1–6* stout (Fig. 55), *vms1–5* minute. *Mxps* very short. *Plbs1–2* long, *plbs3* short; *prms* as long as *plbs3*; both *lig* very short (Fig. 54). **Thorax** (Fig. 56). Bases of the setae strongly pigmented, setae unpigmented. *Prothorax*: setae hairform. *Prn1–3* short, approximately of the same length; *prn4–7* approximately of the same length as *prn1*; *prn8–10* shorter than *prn1–7*. *Vpls2* about 0.7× *vpls1*. Pedal lobe with four (five) setae (*pda*); *pda1–2* long, *pda2* about 0.75× *pda1*; remaining two (three) setae minute. *Msts* minute. *Meso- and metathorax*: setae slender and elongated bacilliform to clubform or hairform (*vpls*, *pda*, *msts*). *Prs* and *pds1–4* approximately of the same length, *pds2* shorter. Both *dls* short, *ss* slightly shorter than *dls*. *Dpls* and *vpls* long. Pedal lobe with four (five) setae (*pda*); *pda1–2* long, *pda2* about 0.75× *pda1*; remaining two (three) setae minute. *Msts* minute. **Abdomen**. Bases of the setae strongly pigmented, setae unpigmented. *Abdominal segments I–VIII* (Fig. 57): setae slightly clubform or hairform (*vpls*, *lsts*, *msts*). *Pds2* and *pds4* positioned slightly anteriad of the line joining *pds1* and *pds5*, *pds3* positioned posteriad of the line; *pds3* the longest, *pds1* and *prs* about 0.75× *pds3*; *pds2*, *pds4* and *pds5* slightly shorter than *pds1*. *Sps* shorter than *prs*. Both *dpls* approximately of the same length as *prs* and *pds1*. *Vpls* short. *Lsts* very short, *msts* minute. *Abdominal segment VII*: *pds3* very long, hairform; *pds1* and *pds2* about 0.5× *pds3*. *Abdominal segment VIII*: *pds2* and *pds4* more anteriad of the line joining *pds1* and *pds5* than on abdominal segments I–VII, *pds4* positioned more anterior than *pds2*; *pds1*, *pds3* and *pds5* approximately in line; *pds3* very long; *pds1* and *pds2* about 0.5× *pds3*, *pds4* and *pds5* shorter than *pds1* and *pds2*. *Dpls1* shorter than *dpls2*. *Abdominal segment IX* (Fig. 58): setae hairform to bacilliform. *Ds3* the longest. *Ps1* slightly longer than *ps2*. *Sts1* very short, s*ts2* minute.




Figs 53–55. *Hypera postica* (Gyllenhal), dorsal views (53, 55), ventral view (54): (53) Clypeus and labrum: a – clypeolabral suture, b – clypeus (setae: *cls1–2*), c – clypeolabral membrane, d – labrum (setae: *lrms1–3*). (54–55) Labium and maxilla: a – cardo, b – stipes (setae: *sts1–3*), c – mala (setae: *vms1–5*; *dms1–6*), d – maxillary palpi (seta: *mxps*), e – postlabium (setae: *plbs1–3*), f – prelabium (seta: *prms*), g – labial palpi, h – ligula (setae: *lig1–2*).

Remarks. Head width recorded in the literature (L4: 0.54–0.66 mm (Anderson 1948, Miller 1956, Zaslavskij 1959, Scherf 1964) agrees with measurements presented in this paper (Table. 1). Scherf (1964) recorded that *fs2* is present on the head of *H. postica*, even if *fs2* is absent in larve of all *Hypera* species. Titus (1911) records a number of setae on thorax and abdomen, but his data do not agree with chaetotaxy presented in this paper. Number of setae he records the on meso- and metathorax, and between abdominal segments differs.

### *Hypera suspiciosa* (Herbst, 1795)

Anderson 1948: 27–29, figs 27–28; Zaslavskij 1959: 215–218, figs 3 B, 8 A, 11 I; Scherf 1964: 179; Dieckmann 1989: 100.

Material. (31 mature larvae ), reared: Bohemia bor.-occ. 5447, Most, Šibeník hill, 20. v. 2001 (1), J. Skuhrovec leg.; Bohemia bor.-occ. 5548, Louny env., Milá hill, 30. iv. 2000, J. Skuhrovec leg. (1) (both on *Vicia tenuifolia* Roth); Bohemia centr. 5952, Praha (Prokopské údolí [valley]), 29. iv. 2000, J. Skuhrovec leg. (1) (on *Medicago falcata* L.); collected in the field: Slovakia or. 6988, Spišká Nová Ves env., Primovce, 18. v. 2002 (7) (on *Medicago sativa* L.); Bohemia occ. 5745, district Žatec, Podbořany, Dvérce env., The Natural Reservation "Dětanský Chlum", 1. vi. 2002, J. Skuhrovec leg. (1); Bohemia occ. 5749, district Žatec, Podbořany, Nová Ves env., 1. vi. 2002, J. Skuhrovec leg. (20) (both on *Lathyrus pratensis* L.).

Differential diagnosis. Setae on thorax and abdomen pigmented (× *H. arator*, *H. denominanda*, *H. jucunda*, *H. nigrirostris*, *H. postica*, *H. suspiciosa*, *H. venusta* and *H. viciae*). *Prs* and *pds1–5* bacilliform to dippleform (× *H. arator*, *H. jucunda* and *H. viciae*) (Fig. 62). *Prn1–10* bacilliform (× *H. arator*, *H. jucunda*, *H. nigrirostris*, *H. postica*, *H. venusta* and *H. viciae*) (Fig. 61). *Ds1–4* hairform (× *H. nigrirostris* and *H. plantaginis*) (Fig. 63).

**Description of mature larva**

Coloration. Head yellow-brown with dark spots. Dorsal side of body green with white median stripe.
Head. Head width 0.50–0.80 mm (average 0.68 mm), head length 0.40–0.70 mm (average 0.59 mm) (Table. 1). Frontal sutures distinct, slender. Anterior margin of clypeus distinctly concave and slightly pigmented. Labrum black; anterior margin with slender median excision, posterior margin with short and wide median projection (Fig. 60). Mandibles with two rounded teeth apically (Fig. 64).
Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.
Abdomen. Spiraculum on abdominal segments I–VIII positioned above the dorsopleural lobe; with oval peritrema located posteriad.
Chaetotaxy. **Head**. Setae hairform. *Des2* and *des4* short, about 0.7× *des3*; *des1* and *des5* about 0.8× *des3* (Fig. 63). Both *les* long, *les1* about 0.7× *les2*. Both *ves* short, *ves2* about 0.5× *ves1*. *Fs1* about 0.7× *fs3*; *fs3* about 0.75× *fs4*; *fs4* about 0.5× *fs5* (Fig. 59). Both *cls* very short, *lrms1–3* short (Fig. 60). Both *mds* short (Fig. 64). *Sts1–2* long, *sts3* short (Fig. 61). *Dms1–6* stout (Fig. 62), *vms1–5* minute. *Mxps* very short. *Plbs1–2* long, *plbs3* short; *prms* longer than *plbs3*; both *lig* very short (Fig. 61). **Thorax** (Fig. 65). Bases of the setae strongly pigmented, setae with pigmentation. Setae short. *Prothorax*: setae slender and elongated, bacilliform or hairform (*vpls*, *pda*, *msts*). *Prn1* and *prn3* short, *prn2* long; *prn7* short, *prn4–6* long; *prn8–10* short. *Vpls2* about 0.7× *vpls1*. Pedal lobe with four (five) setae (*pda*); *pda1–2* long, *pda2* about 0.7× *pda1*; remaining two (three) setae minute. *Msts* minute. *Meso- and metathorax*: setae bacilliform to dippleform or hairform (*vpls*, *pda*, *msts*). *Pds4* about 0.5× *prs*, *pds1–2* and *4*. Both *dls* short, both *ss* shorter than *dls*. *Dpls* and *vpls* long. Pedal lobe with four (five) setae (*pda*); *pda1–2* long, *pda2* about 0.7× *pda1*; remaining two (three) setae minute. *Msts* minute. **Abdomen**. Bases of the setae strongly pigmented, setae with pigmentation. *Abdominal segments I–VIII* (Fig. 66): setae bacilliform to dippleform or hairform (*vpls*, *lsts*, *msts*). *Prs* and *pds1–5* very short, only *pds3* long. *Sps* shorter than *prs*. Both *dpls* longer than *pds1*. *Vpls* longer than *dpls*. *Lsts* very short, *msts* minute. *Abdominal segment*

*VII*: *pds3* very long, hairform; remaining four setae on postdorsum (*pds*) about 0.25× *pds3*. *Abdominal segment VIII*: *pds2* and *pds4* anteriad of the line joining *pds1* and *pds5*; *pds4* positioned more anterior than *pds2*; *pds1*, *pds3* and *pds5* approximately in a line; *pds3* very long; remaining four setae about 0.25× *pds3*. *Abdominal segment IX* (Fig. 67): setae hairform or bacilliform (*ds1*, *ps1–2*). *Ds2–4* in line; *ds1* short, *ds3* the longest. Both *ps* as long as *ds1*; s*ts1* very short, s*ts2* minute.

Remarks. Head width recorded in the literature (L4: 0.77–0.80 mm; Anderson 1948, Miller 1956, Zaslavskij 1959, Scherf 1964) is different from that presented here. Minimum value of head width is distinctly different (Table. 1) from that recorded by previous authors. Scherf (1964) incorrectly recorded the presence of only two setae on frons (*fs1*, *fs2*) (larvae studied always

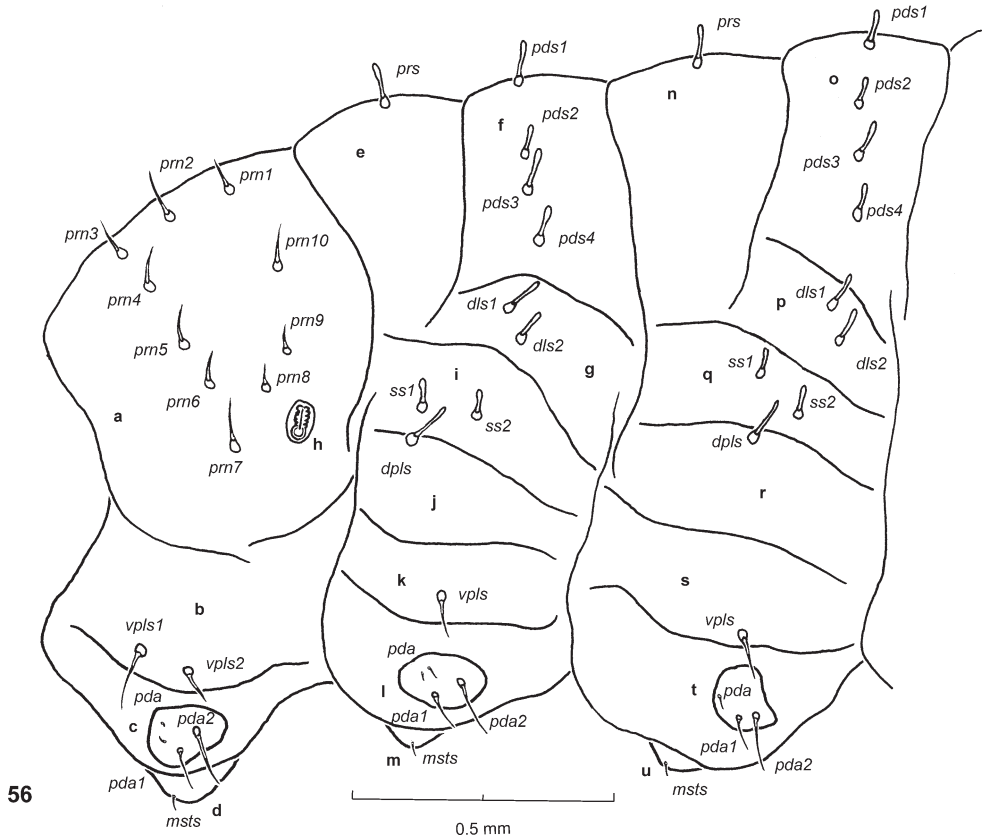
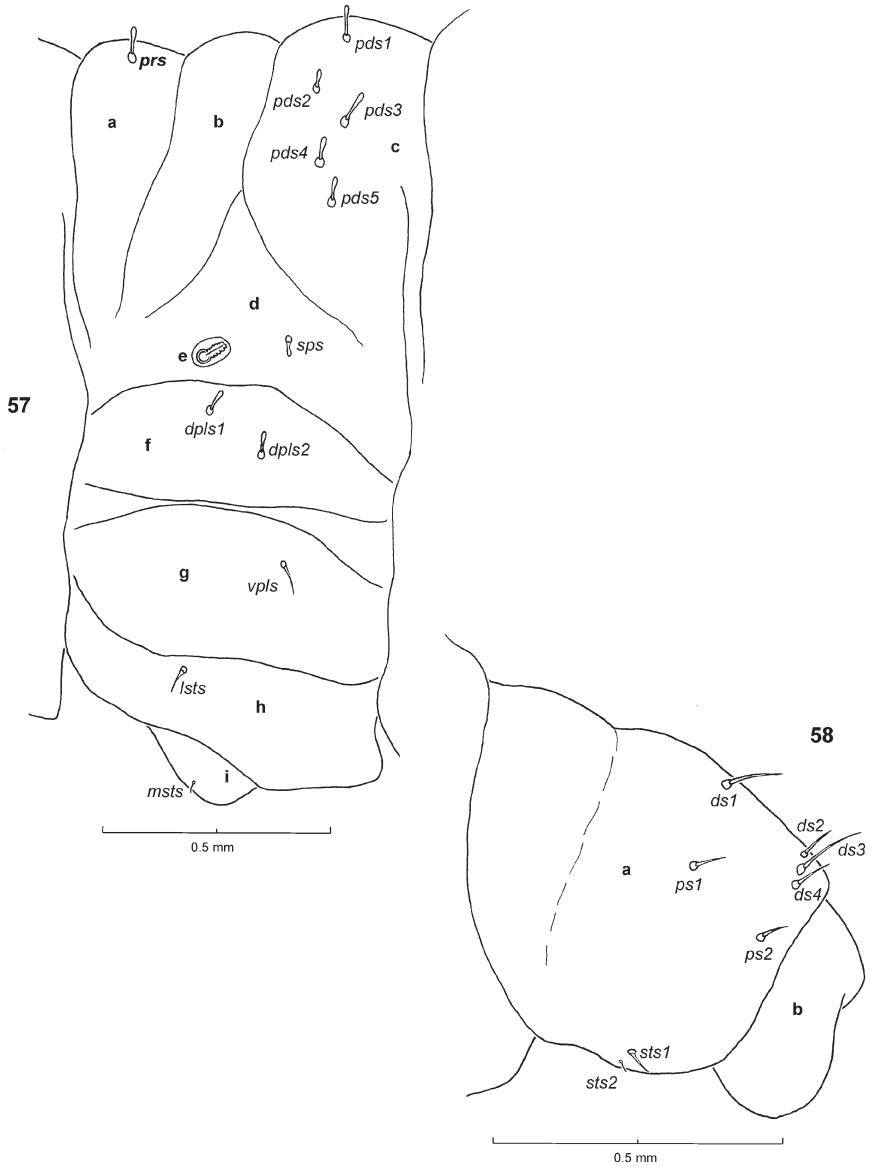
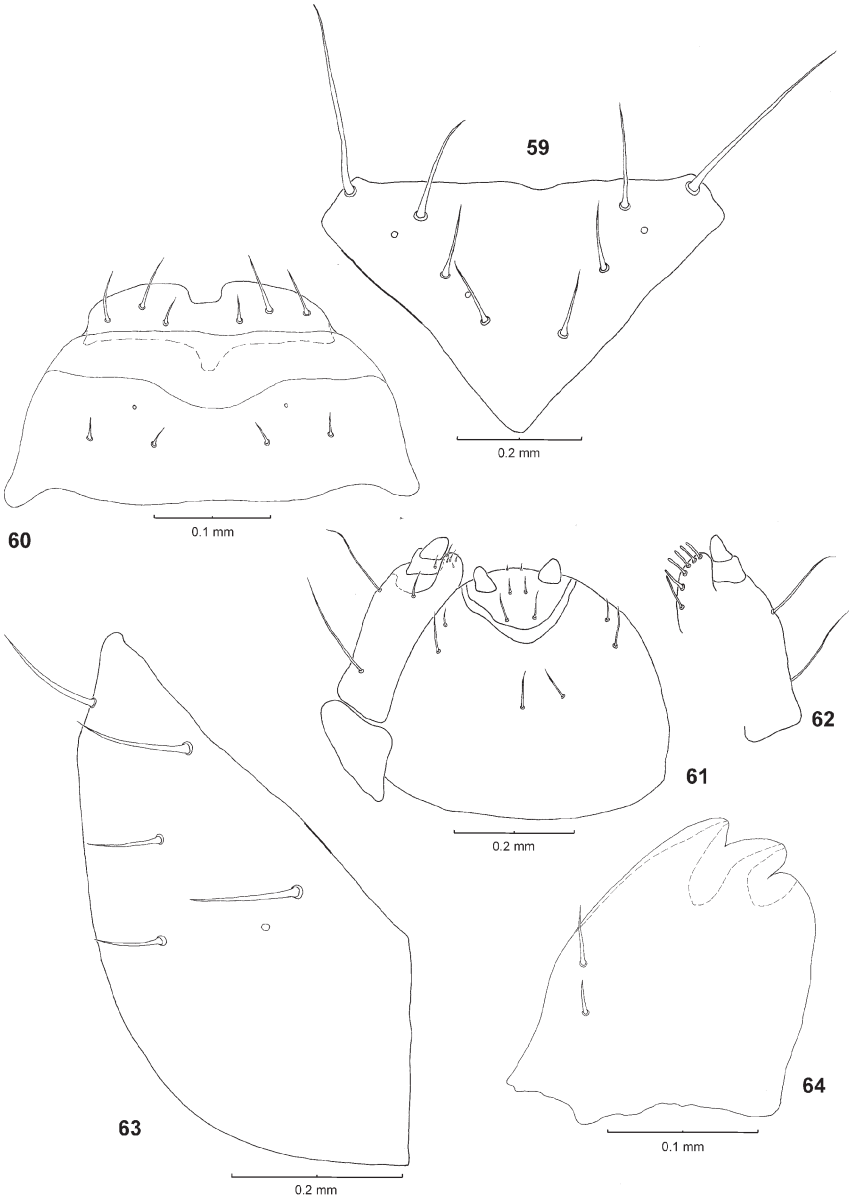



Fig 56. *Hypera postica* (Gyllenhal), thorax, lateral view. Prothorax (a–d): a – pronotum (setae: *prn1–10*), b – ventropleural lobe (setae: *vpls1–2*), c – pedal area (setae: *pda1–2*), d – mesosternal lobe (setae: *msts*); meso(meta)thorax (e–u): e (n) – promeso(meta)dorsum (seta: *prs*); f (o) – postmeso(meta)dorsum (setae: *pds1–4*); g (p) – dorsolateral area (setae: *dls1–2*); h – spiraculum; i (q) – spiracular area (setae: *ss1–2*); j (r) – dorsopleural lobe (seta: *dpls*); k (s) – ventropleural lobe (seta: *vpls*); l (t) – pedal area (setae: *pda1–2*); m (u) – mesosternal lobe (seta: *msts*).




Figs 57–58. *Hypera postica* (Gyllenhal), lateral views: (57) Abdominal segment IV: a – prodorsum (seta: *prs*), b – dorsum, c – postdosrum (setae: *pds1–5*), d – spiracular area (seta: *sps*), e – spiraculum, f – dorsopleural lobe (setae: *dpls1–2*), g – ventropleural lobe (seta: *vpls*), h – laterosternal lobe (seta: *lsts*), i – mesosternal lobe (seta: *msts*). (58) Abdominal segments IX–X: a – abdominal segment IX (setae: *ds1–4* (dorsum), *ps1–2* (pleurum), *sts1–2* (sternum)), b – abdominal segment X.




Figs 59–64. *Hypera suspiciosa* (Herbst), dorsal views, except for (61), which is a ventral view: (59) frons, (60) clypeus and labrum, (61) labium and maxilla, (62) maxilla, (63) dorsum of epicranium, (64) mandible.

had four setae on frons). Scherf recorded tridentate mandibles. For an explanation of the difference in the number of mandibular teeth see Material and Methods. Scherf also incorrectly recorded that mala has ten stout setae. Scherf (1964) and Dieckmann (1989) recorded the coloration of body as yellowgreen with a white median stripe.

### *Hypera venusta* (Fabricius, 1781)

Material (10 mature larvae), collected in the field: Turkey mer., prov. Mersin, Aslanli env., 17.–18. iv. 2002, J. Skuhrovec leg. (10) (all on cf. *Medicago* sp.).

Differential diagnosis. *Prs* and *pds1–5* bacilliform to clubform (× *H. arator*, *H. jucunda* and *H. viciae*) (Fig. 75). *Prn1–10* hairform (× *H. denominanda*, *H. plantaginis* and *H. suspiciosa*) (Fig. 74). Setae on thorax and abdomen unpigmented (× *H. suspiciosa*). *Pds2* on abdominal segments I–VII very short, shorter than 0.5× *pds3* (× *H. denominanda*, *H. plantaginis*, *H. postica* and *H. suspiciosa*) (Fig. 75). *Ds1–4* hairform (× *H. nigrirostris* and *H. plantaginis*) (Fig. 76).

**Description of mature larva**

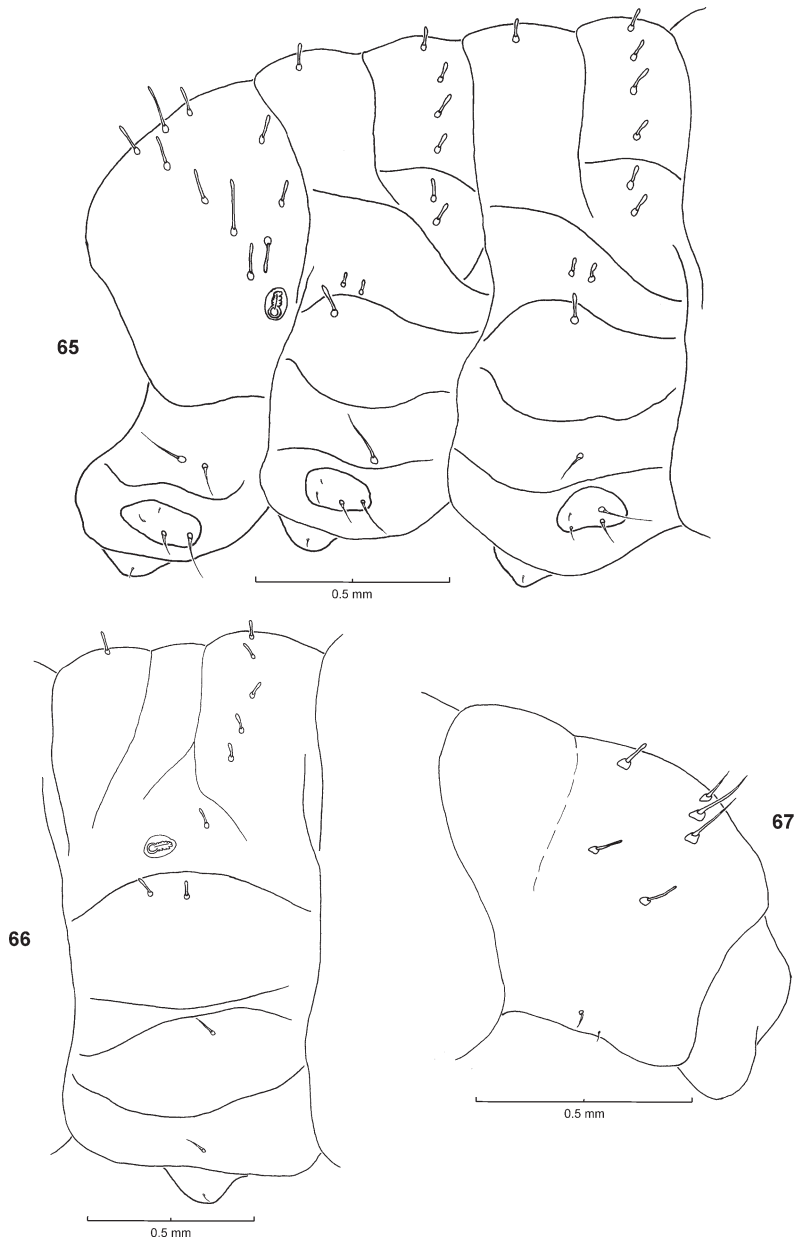
Coloration. Head brown, dorsum of epicranium dark. Dorsal side of body dark green with longitudinal whitish stripe; thorax and abdomen with fine superficial granulation.

Head. Head width 0.42–0.44 mm (average 0.44 mm), head length 0.38–0.42 mm (average 0.40 mm) (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus slightly concave and pigmented. Labrum black; anterior margin with deep median excision, posterior margin with short and wide median projection (Fig. 69). Mandibles with two sharp, slender teeth apically (Fig. 73).

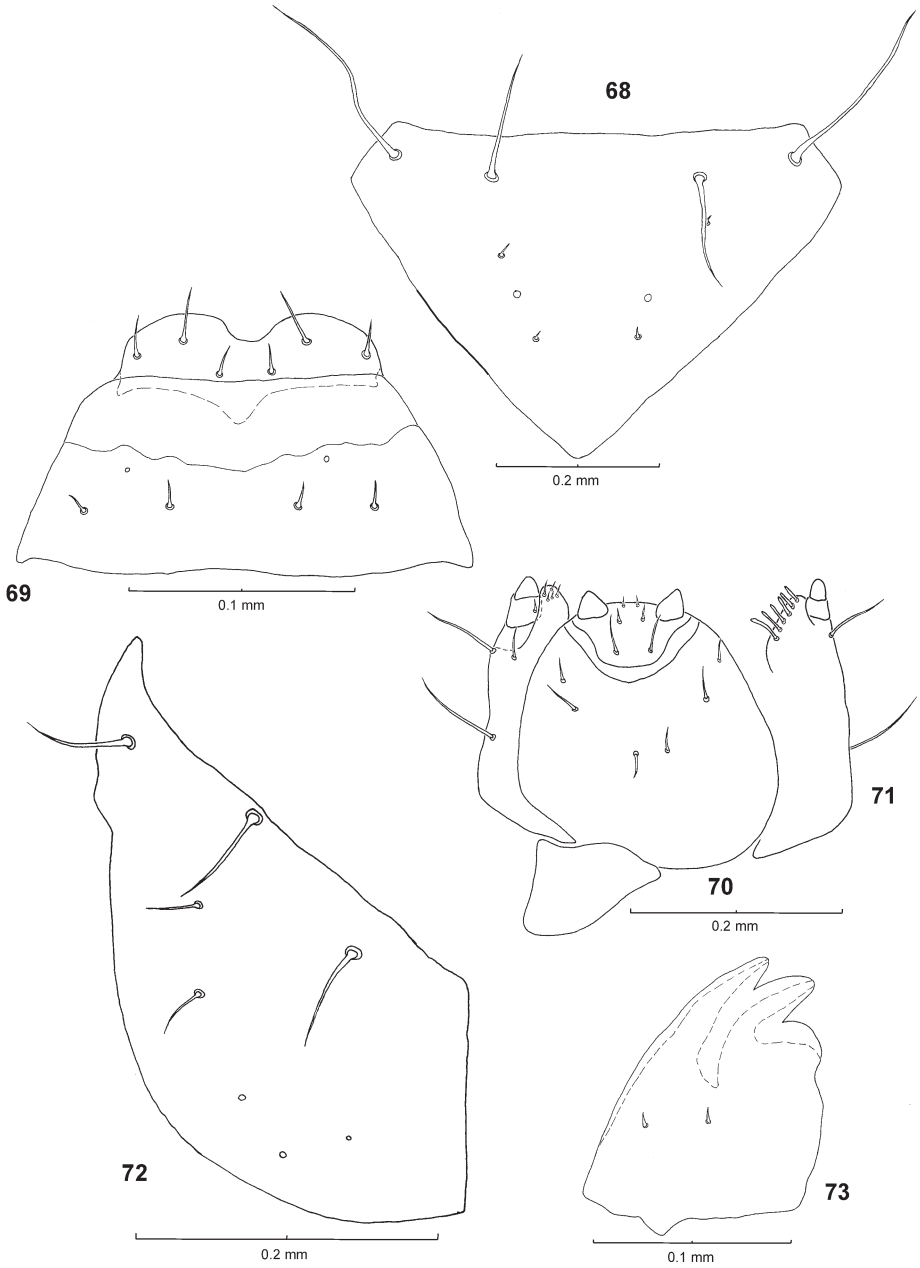
Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas located dorsad.

Abdomen. Spiraculum on abdominal segments I–VIII laying above the dorsopleural lobe; with oval peritrema located posteriad.

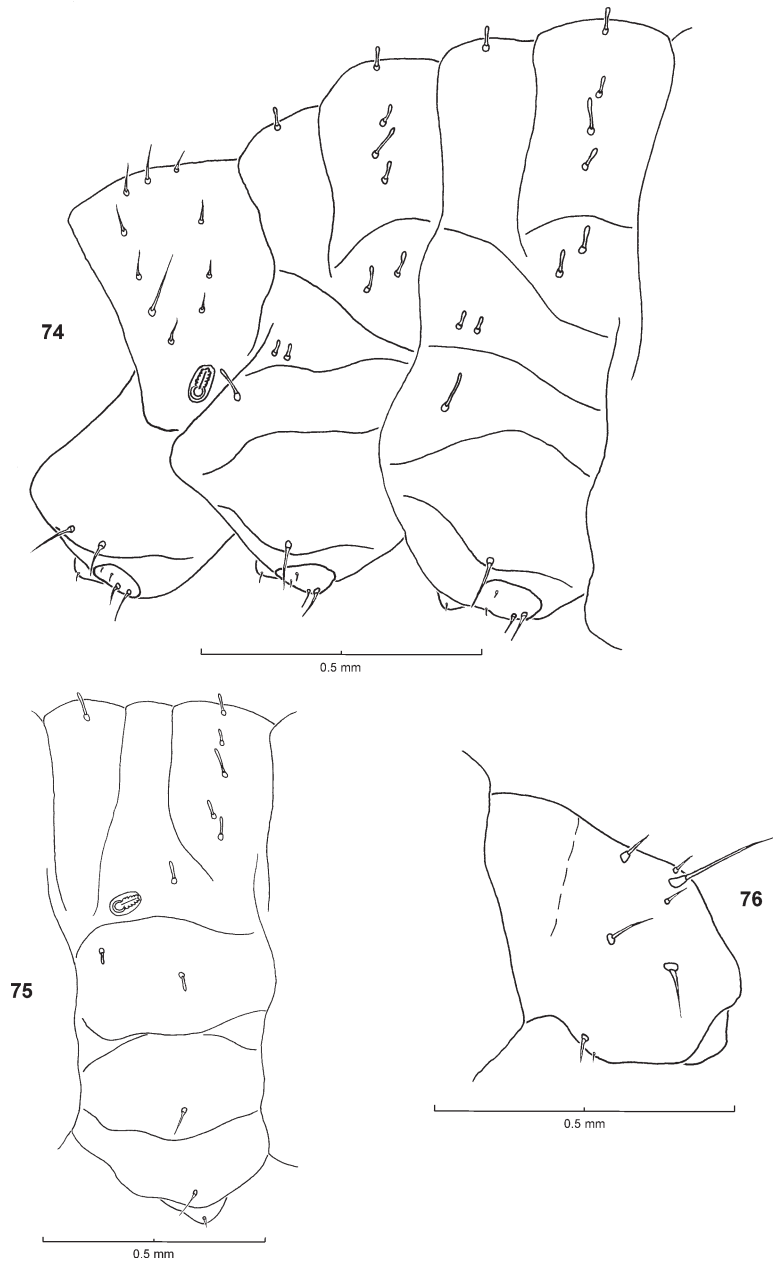
Chaetotaxy. **Head**. Setae hairform. *Des2* and *des4* short; *des1*, *des3* and *des5* approximately of the same length (Fig. 72). Both *les* long, *les1* about 0.7× *les2*. Both *ves* very short. *Fs1* and *fs3* minute; *fs4* long, about 0.5× *fs5* (Fig. 68). Both *cls* short, *lrms1–3* longer than *cls* (Fig. 69). Both *mds* very short (Fig. 73). *Sts1–2* long, *sts3* short (Fig. 70). *Dms1–6* stout (Fig. 71), *vms1–5* minute. *Mxps* very short. *Plbs1* long, *plbs2–3* short; *prms* as long as *plbs1*; both *lig* very short (Fig. 70). **Thorax** (Fig. 74). Bases of the setae strongly pigmented, setae unpigmented. Setae short. *Prothorax*: setae hairform. *Prn1* and *prn3* short, *prn2* long; ventral seta (*prn7*) very short, *prn4* and *prn5* about 0.5× *prn6*; *prn8–10* very short. *Vpls2* about 0.5× *vpls1*. Pedal lobe with three (four) setae (*pda*); *pda1–2* long, *pda2* about 0.7× *pda1*; remaining one (two) setae minute. *Msts* minute. *Meso- and metathorax*: setae bacilliform to clubform or hairform (*vpls*, *pda*, *msts*). *Prs* short. *Pds3* long, remaining three *pds* setae short. Both *dls* short, both *ss* very short. *Dpls* and *vpls* long. Pedal lobe with three (four) setae (*pda*); *pda1–2* long, *pda2* about 0.7× *pda1*; remaining one (two) setae minute. *Msts* minute. **Abdomen**. Bases of the setae strongly pigmented, setae unpigmented. Setae short. *Abdominal segments I–VIII* (Fig. 75): setae slender bacilliform to clubform or hairform (*vpls*, *lsts*, *msts*). *Pds2* and *pds4* slightly anteriad of the line joining *pds1* and *pds5*, *pds3* slightly posteriad of the line; *pds3* the longest, *pds1* 0.7× *pds3*; remaining setae short. *Sps* shorter than *prs*. Both *dpls* approximately of the same length. *Vpls* longer than *dpls*. *Lsts* very short, *msts* minute. *Abdominal segment VII*: *pds3* very long, hairform; remaining setae about 0.25× *pds3*. *Abdominal segment VIII*: *pds2* and *pds4* more anteriad of the line joining *pds1* and *pds5* than on abdominal segments I–VII, *pds4* positioned more anterior than *pds2*; *pds1*, *pds3* and *pds5* approximately in line; *pds3* very long; *pds1–2*, *pds4* and *pds5* about 0.5× *pds3*. Dorsopleural seta (*dpls1*) shorter than *dpls2*. *Abdominal segment IX* (Fig. 76): setae hairform. *Ds2–4* laying in one line; *ds3* very long, remaining three *ds* short. Both *ps* long, approximately of the same length. *Sts1* short, *sts2* minute.




Figs 65–67. *Hypera suspiciosa* (Herbst), lateral views: (65) thorax, (66) abdominal segment IV, (67) abdominal segment IX.




Figs 68–73. *Hypera venusta* (Fabricius), dorsal views, except for (70), which is a ventral view: (68) frons, (69) clypeus and labrum, (70) labium and maxilla, (71) maxilla, (72) dorsum of epicranium, (73) mandible.




Figs 74–76. *Hypera venusta* (Fabricius), lateral views: (74) thorax, (75) abdominal segment IV, (76) abdominal segment IX.

## *Hypera viciae* (Gyllenhal, 1813)

Dieckmann 1989: 101.

Material (4 mature larvae), reared: Bohemia bor.-occ. 5447, Most, Šibeník hill, 17. and 19. iv. 2000, J. Skuhrovec leg. (1); Bohemia bor.-occ. 5548, Louny env., Milá hill, 12. v. 2001, J. Skuhrovec leg. (2); Bohemia centr. 5952, Praha (Prokopské údolí [valley]), 29. iv. 2000 (1), J. Skuhrovec leg (all on *Vicia tenuifolia* Roth).

Differential diagnosis. *Prs* and *pds1–5* hairform (× *H. denominanda*, *H. nigrirostris*, *H. plantaginis*, *H. postica*, *H. suspiciosa* and *H. venusta*) (Fig. 84). *Prs* and *pds1–5* on abdominal segments I–VIII short (× *H. arator* and *H. jucunda*) (Fig. 84). Bases of the setae on thorax and abdomen small, not distinctly enlarged (× *H. arator*) (Figs 83–85). *Ds1–4* hairform (× *H. nigrirostris* and *H. plantaginis*) (Fig. 85).

**Description of mature larva**

Coloration. Head pale brown, posterior epicranium brown, dark lines along lateral margins of head. Dorsal side of body green to brown with longitudinal white stripe. Body strongly superficially pigmented; more superficial granulation on dorsal side of body than on the ventral side. Lobes on thoracic and abdominal segments distinct.

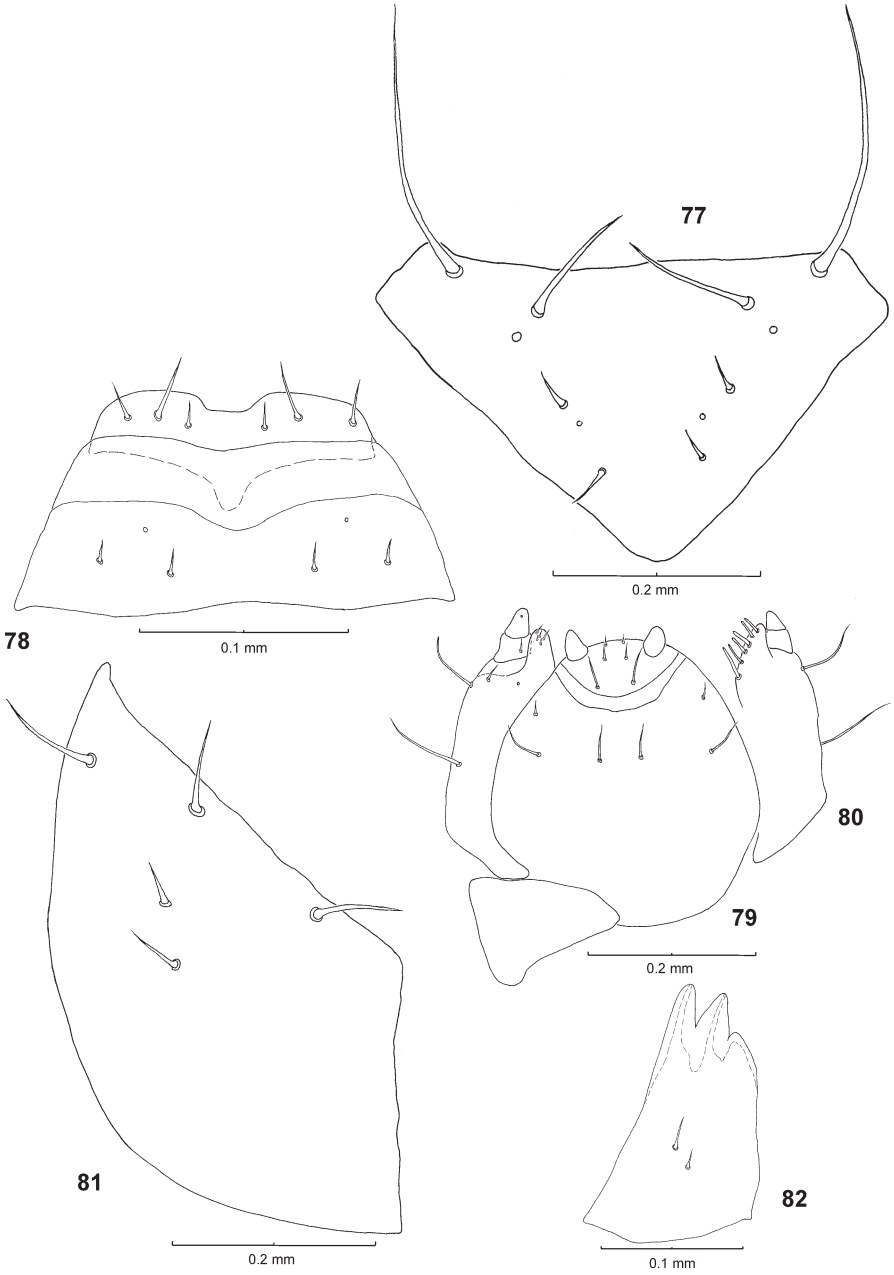
Head. Head width 0.58–0.62 mm (average 0.60 mm), head length 0.50–0.52 mm (average 0.51 mm) (Table. 1). Frontal sutures distinct, slender. Anterior margin of clypeus slightly concave and pigmented. Labrum dark brown; anterior margin with slender median excision; posterior margin with short and wide median projection (Fig. 78). Mandibles with two sharp, slender teeth apically (Fig. 82).

Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.

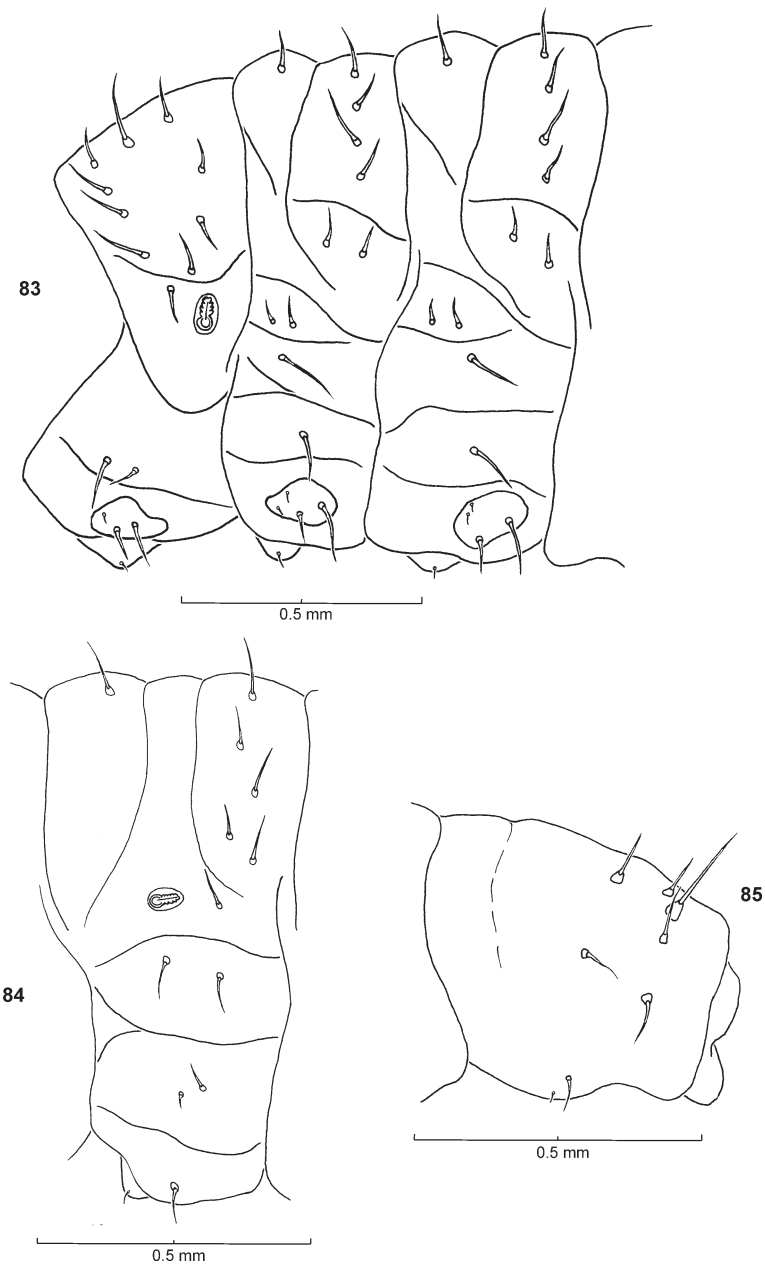
Abdomen. Spiraculum on abdominal segments I–VIII laying above the dorsopleural lobe; with oval peritrema positioned posteriad.

Chaetotaxy. **Head**. Setae hairform. *Des2* and *des4* short, about 0.5× *des1*, *des3* and *des5* (Fig. 81). Both *les* long, *les1* about 0.7× *les2*. Both *ves* short, approximately of the same length. *Fs1* and *fs3* the shortest, about 0.7× *fs4*; *fs4* about 0.5× *fs5* (Fig. 77). Both *cls* short, *lrms1–3* short (Fig. 78). Both *mds* short (Fig. 82). *Sts1–2* long, *sts3* very short (Fig. 79). *Dms1–6* stout (Fig. 80), *vms1–5* minute. *Mxps* very short. *Plbs1–2* long, *plbs3* very short; *prms* as long as *plbs1*; both *lig* short (Fig. 79). **Thorax** (Fig. 83). Bases of the setae strongly pigmented, setae unpigmented. Setae short hairform. *Prothorax*: *prn1* and *prn3* short, *prn2* long; *prn7* shorter than *prn4–6*, the latter three setae approximately of the same length; *prn8–10* shorter than *prn7*. *Vpls2* about 0.5× *vpls1*. Pedal lobe with four (five) setae (*pda*); *pda1–2* long, *pda2* about 0.7× *pda1*; remaining two (three) setae minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1–3* approximately of the same length, *pds4* minutely shorter. Both *dls* short, both *ss* shorter than *dls*. *Dpls* and *vpls* long. Pedal lobe with four (five) setae (*pda*); *pda1–2* long, *pda2* about 0.7× *pda1*; remaining two (three) setae minute. *Msts* minute. **Abdomen**. Bases of the setae strongly pigmented, setae unpigmented. Setae short hairform. *Abdominal segments I–VIII* (Fig. 84): *pds2* and *pds4* slightly anteriad of the line joining *pds1* and *pds5*; *pds3* slightly posteriad of the line; *pds3* the longest, *pds1–2*, *pds4* and *pds5* about 0.7× *pds3*. *Sps* shorter than *prs*. Both *dpls* as long as *sps*. *Vpls2* short, anterior seta (*vpls1*) very short. *Lsts* short, *msts* minute. *Abdominal segment VII*: *pds3* very long; *pds1* and *pds2* about 0.5× *pds3*. *Abdominal segment VIII*: *pds2* and *pds4* more anteriad of the line joining *pds1* and *pds5* than on abdominal segments I–VII, *pds4* located more anterior than *pds2*; *pds1*, *pds3* and *pds5* approximately in a line; *pds3* very long, *pds1* and *pds2* about 0.5× *pds3*. *Dpls1* minutely shorter than *dpls2*. *Abdominal segment IX* (Fig. 85): *ds2–4* in line; *ds3* the longest, remaining setae about 0.5× *ds3*. Both *ps* as long as *ds1*. *Sts1* short, *sts2* minute.

Remarks. Dieckmann (1989) recorded only body length, coloration of the body and setae; his data agree with that presented here.




Figs 77–82. *Hypera viciae* (Gyllenhal), dorsal views, except for (79), which is a ventral view: (77) frons, (78) clypeus and labrum, (79) labium and maxilla, (80) maxilla, (81) dorsum of epicranium, (82) mandible.




Figs 83–85. *Hypera viciae* (Gyllenhal), lateral views: (83) thorax, (84) abdominal segment IV, (85) abdominal segment IX.

## Key to the mature larvae of the subgenus *Hypera*

1 (6) *Prs* and *pds1–5* on abdominal segments I–VIII hairform (Figs 12, 30, 84).
2 (3) *Prs* and *pds1–5* on abdominal segments I–VIII short (Fig. 84). *Fs1* and *fs3* shorter than 0.33× *fs4* (Fig. 77). ..... ***H. viciae* (Gyllenhal)**
3 (2) *Prs* and *pds1–5* on abdominal segments I–VIII long (Figs 12, 30).
4 (5) Bases of the setae on thorax and abdomen distinctly enlarged (Figs 11–13). ..... ***H. arator* (Linné)**
5 (4) Bases of the setae on thorax and abdomen small, not distinctly enlarged (Figs 29–31). ..... ***H. jucunda* (Capiomont)**
6 (1) *Prs* and *pds1–5* on abdominal segments I–VIII bacilliform, clubform or dippleform (Figs 21, 39, 48, 57, 66, 75).
7 (10) *Pds2* on abdominal segments I–VII very short, shorter than 0.5× *pds3* (Figs 39, 75).
8 (9) *Prs* and *pds1–5* on abdominal segments I–VIII very short (Fig. 69), *ds1–4* on abdominal segment IX dippleform, except of *ds3* (Fig. 40). ..... ***H. nigrirostris* (Fabricius)**
9 (8) *Prs* and *pds1–5* on abdominal segments I–VIII short (Fig. 75), *ds1–4* on abdominal segment IX hairform (Fig. 76). ..... ***H. venusta* (Fabricius)**
10 (7) *Pds2* on abdominal segments I–VII short, longer than 0.5× *pds3* (Figs 21, 48, 53, 66).
11 (12) Setae on thorax and abdomen pigmented. *Des2* about 0.7× *des3* and *des5* (Fig. 59); *plbs2* approximately of the same length as *plbs1* (Fig. 61). ..... ***H. suspiciosa* (Herbst)**
12 (11) Setae on thorax and abdomen unpigmented.
13 (16) *Fs1–5* (Figs 14, 50) and *des1–5* (Figs 18, 51) hairform; *prs* and *pds1–5* on abdominal segments I–VIII slender, softly bacilliform (Figs 21, 57).
14 (15) *Prn1–10* bacilliform to clubform (Fig. 20). ..... ***H. denominanda* (Capiomont)**
15 (14) *Prn1–10* hairform (Fig. 56). Ventropleural seta (*vpls*) on meso- and metathorax hairform to bacilliform (Fig. 56). ..... ***H. postica* (Gyllenhal)**
16 (13) *Fs1–4* (Fig. 41) and *des1–5* (Fig. 45) bacilliform to clubform, *fs5* hairform (Fig. 41); *prs* and *pds1–5* on abdominal segments I–VIII clubform (Fig. 48). ..... ***H. plantaginis* (De Geer)**

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## 2.2. Descriptions of larvae of the tribe Hyperini (Coleoptera: Curculionidae): II. Mature larvae of the subgenera *Antidonus*, *Eririnomorphus*, *Dapalinus* and *Boreohypera* of the genus *Hypera* [published in *Entomologica Basiliensia et Collectionis Frey*, **28**: 365-396]

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# Descriptions of larvae of the tribe Hyperini (Coleoptera, Curculionidae): II. Mature larvae of the subgenera *Antidonus*, *Eririnomorphus*, *Dapalinus* and *Boreohypera* of the genus *Hypera* Germar, 1817

by **Jiří Skuhrovec**

**Abstract.** Descriptions of mature larvae of ten species of the subgenera *Antidonus* Bedel, 1886, *Eririnomorphus* Capiomont, 1868, *Dapalinus* Capiomont, 1868, and *Boreohypera* Korotyaev, 1999 of the genus *Hypera* Germar, 1817 are given. Larvae of *H.* (*Antidonus*) *lunata* Wollaston, 1854, *H.* (*Dapalinus*) *kayali* Skuhrovec, 2006, *H.* (*Dapalinus*) *striata* (Boheman, 1834), and *H.* (*Boreohypera*) *diversipunctata* (Schrank, 1798) are described for the first time, while larvae of *H.* (*Antidonus*) *dauci* (Olivier, 1807), *H.* (*Antidonus*) *vidua* Gené, 1837, *H.* (*Eririnomorphus*) *arundinis* (Paykull, 1792), and *H.* (*Dapalinus*) *contaminata* (Herbst, 1795) are described in detail for the first time and larvae of *H.* (*Antidonus*) *zoila* (Scopoli, 1763) and *H.* (*Eririnomorphus*) *rumicis* (Linné, 1758) are redescribed. An identification key the mature larvae of the nineteen *Hypera*-species known to date is presented.

**Key words.** Taxonomy – morphology – larva – chaetotaxy – key – Coleoptera – Curculionidae – Hyperini – *Hypera* – Palaearctic region

## Introduction

The genus *Hypera* Germar, 1817 currently includes more than 115 Palaearctic species (Smreczyński 1968) and 17 species from North America (Titus 1911, Csiki 1934, Anderson 2002). The last taxonomical revision was published more than 100 years ago by Petri (1901), who divided the genus *Hypera* into 11 groups. He used the synonym *Phytonomus* Schönherr, 1826 for the genus *Hypera* in his revision. Alonso-Zarazaga & Lyal (1999) recognize six subgenera of the genus *Hypera*: *Antidonus* Bedel, 1886, *Eririnomorphus* Capiomont, 1868, *Tigrinellus* Capiomont, 1868, *Dapalinus* Capiomont, 1868, *Boreohypera* Korotyaev, 1999 and *Hypera*. Later, Alonso-Zarazaga & Lyal (2002) transferred the subgenus *Antidonus* to the genus *Donus* Jekel, 1865 without discussion of this nomenclatural change. Thus, the concept of *Hypera* published by Alonso-Zarazaga & Lyal (1999) is accepted here.

Descriptions of the larvae of species of the subgenera *Antidonus* Bedel, 1886, *Eririnomorphus* Capiomont, 1868, *Dapalinus* Capiomont, 1868 and *Boreohypera* Korotyaev, 1999 and of the genus *Hypera* Germar, 1817 are relatively scarce, with a few exceptions (Goureau 1844, Laboulbène 1862, Rosenhauer 1882, Titus 1911, Anderson 1948, Peterson 1951, Zaslavskij 1959, Scherf 1964, Strejček & Dieckmann 1987, Lee & Morimoto 1988, Dieckmann 1989, Stehr 1992, May 1994). Some papers (Goureau 1844, Laboulbène 1862, Rosenhauer 1882, Peterson 1951, Strejček & Dieckmann 1987, Dieckmann 1989) include only descriptions of body coloration and size and lack precise data on the morphology and chaetotaxy. The most important papers were written by Anderson (1948) and Zaslavskij (1959). These include some basic characters and an identification key; they may still be used to identify larvae.

This paper provides detailed descriptions of the larvae of ten species of *Hypera* belonging to the subgenera *Antidonus* Bedel, 1886, *Eririnomorphus* Capiomont, 1868, *Dapalinus* Capiomont, 1868 and *Boreohypera* Korotyaev, 1999. Of these, *H.* (*Antidonus*) *lunata* Wollaston, 1854, *H.* (*Dapalinus*) *kayali* Skuhrovec, 2006, *H.* (*Dapalinus*) *striata* (Boheman, 1834) and *H.* (*Boreohypera*) *diversipunctata* (Schrank, 1798) are described for the first time, *H.* (*Antidonus*) *dauci* (Olivier, 1807), *H.* (*Antidonus*) *vidua* Gené, 1837, *H.* (*Eririnomorphus*) *arundinis* (Paykull, 1792) and *H.* (*Dapalinus*) *contaminata* (Herbst, 1795) are described for the first time in detail and *H.* (*Antidonus*) *zoila* (Scopoli, 1763) and *H.* (*Eririnomorphus*) *rumicis* (Linné, 1758) are redescribed. An identification key to the mature larvae of the nineteen *Hypera* species known to date is presented. This paper is the second part of the author's account of the morphology of larval Hyperinae.

## Material and methods

*Larvae examined.* This study is based on the examination of larvae collected in the field and reared to the adult stage. All adults were identified by the author. Information on the origin of the larvae and their host plants is given for each species described. Localities in the Czech and Slovak Republics include the numbers of the map squares assigned by FAUNA 2002 software and compared with PRUNER & MÍKA (1996). The larvae of all ten species were reared in a laboratory of the Department of Zoology, Charles University, Prague, during the years 2000–2005.

*Preparation.* Larvae were fixed in Pampel liquid (4 parts glacial acetic acid, 6 parts 4% formaldehyde, 15 parts 95% ethyl alcohol and 30 parts distilled water) (ŠVÁCHA & DANILEVSKY 1987). Slides were prepared as follows [for further details see MAY (1993, 1994)]: the larva was decapitated. Its head was placed in lactic acid for one or two weeks to digest the soft tissues. The mouthparts were then separated from the head capsule. All body parts were mounted in glycerine on temporary slides. All this material (slides, weevils, larvae) is deposited in the collection of the author.

*Measurements.* Material (slides and larvae) was examined under an Olympus SZ X9 binocular microscope or an Olympus BX 40 microscope. Measurements were made by means of calibrated optics.

The following characters of each specimens were measured:

- head width (HW)
- head length (HL)
- length of the body (larvae fixed in a "C"-shape were measured in segments)
- width of abdominal segment IV

Measurements 1 and 2 are presented in the descriptions of the species and in Tab. 1. As the thorax and abdomen are not sclerotized and may be affected by the fixation process, size measurements (3) and (4) are given only for comparison (Tab. 1).

*Illustrations.* Drawings were made using a drawing tube on the binocular microscope or microscope and digitally processed using Adobe Photoshop and/or Corel Draw 9.

| Measurements | (1) HW | | | (2) HL | | | (3) BL | | (4) BW | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Species** | **avg.** | **min.** | **max.** | **avg.** | **min.** | **max.** | **min.** | **max.** | **min.** | **max.** |
| *Hypera dauci* | 1.03 | 0.95 | 1.13 | 0.87 | 0.80 | 0.93 | 7.5 | 11.5 | 1.7 | 2.5 |
| *Hypera lunata* | 1.04 | 0.95 | 0.10 | 0.89 | 0.75 | 0.95 | 6.5 | 12.5 | 1.5 | 2.6 |
| *Hypera vidua* | 0.95 | 0.70 | 1.36 | 0.78 | 0.54 | 1.10 | 4.5 | 12.5 | 1.0 | 2.7 |
| *Hypera zoila* | 1.27 | 1.20 | 1.34 | 1.03 | 1.00 | 1.06 | 10.0 | 11.0 | 2.0 | 2.1 |
| *Hypera arundinis* | 0.97 | 0.92 | 1.00 | 0.80 | 0.78 | 0.84 | 11.0 | 12.0 | 2.1 | 2.6 |
| *Hypera rumicis* | 0.84 | 0.80 | 0.88 | 0.73 | 0.70 | 0.75 | 7.5 | 9.0 | 1.5 | 2.0 |
| *Hypera contaminata* | 0.76 | 0.70 | 0.83 | 0.63 | 0.58 | 0.68 | 6.0 | 10.0 | 1.2 | 1.8 |
| *Hypera kayali* | 0.84 | 0.80 | 0.90 | 0.75 | 0.70 | 0.80 | 7.5 | 12.5 | 1.5 | 2.6 |
| *Hypera striata* | 0.68 | 0.60 | 0.80 | 0.59 | 0.50 | 0.70 | 6.5 | 9.5 | 1.0 | 1.8 |
| *Hypera diversipunctata* | 0.85 | - | - | 0.78 | - | - | 9.5 | - | 1.7 | - |

**Tab. 1.** Ratio of important larval sizes: (1) HW – head width, (2) HL – head length, (3) BL – length of the body (larvae fixed in "C"-shape were measured in segments) and (4) width of abdominal segment IV. Average, minimum and maximum measurements are presented. All measurements in millimeters. These measurements are cited in the descriptions of each species.

For easy description, four types of trichoid seta are recognized (see SKUHROVEC 2005: Figs 1–4).

The apex of the mandible has three (see Figs 4, 11, 18, 25) or five lobes (see Figs 32, 39, 46, 53, 60, 67). The numbers of lobes and teeth are not the same. The last lobe does not bear a tooth; its only connection is with the incisor area of the mandible (K. Hůrka, pers. comm.).

The spiraculum on the prothorax in the drawings of the thorax (see Figs 5, 12, 19, 26, 33, 40, 47, 54, 61, 68) is in fact of mesothoracic origin, as in all other insects (MARVALDI et al. 2002, MARVALDI 2003). In the descriptions of species, this spiraculum is referred to as being on the mesothorax. Drawings of the thoracic and abdominal spiracula are schematic (see Figs 5, 6, 12, 13, 19, 20, 26, 27, 33, 34, 40, 41, 47, 48, 54, 55, 61, 62, 68, 69).

The chaetotaxy on the postdorsum of abdominal segments I–VIII is as follows: an imaginary line is assumed between *pds1* and *pds5*. The species differ from each other in the position of the setae, *pds2–4*. These may be on this line, or be shifted forwards or backwards relative to it. For abdominal segments VI–VIII, which differ from the general plan described for the remaining segments, only deviations from the general plan are mentioned.

Chaetotaxy on the pedal lobe of the thorax is as follows: two long setae (*pda1–2*) and a few minute setae (*pda*) are always present. The number of setae on the pedal lobes is variable because of the variable number of minute setae. The most frequent number of setae is presented in the descriptions. The range of variability is presented in brackets.

The minute setae on the ventral side of the mala, on the pedal lobe of the thorax, on the prodorsum and on the spiracular area of the abdominal segments I–VIII, are trichoid. More minute setae may be present in these regions. However, a scanning electron microscope would be needed for a more precise examination of these setae, so these characters are not used for identifying the species. A description of the epipharynx is omitted for the same reason. Seta *sts3* is possibly situated on the palpifer; however, this problem is not addressed here.

*Terminology.* Names and abbreviations of the setae of the mature larva follow MAY (1994) (see SKUHROVEC 2005: Figs 46–54). MAY (1994) uses this nomenclature for all the Curculionoidea, but unfortunately her nomenclature is not identical with that used for other groups of beetles (e.g. BOUSQUET & GOULET 1984 – Carabidae, ŠVÁCHA & DANILEVSKY 1987 – Cerambycidae). Even though it may be neccessary to tackle this problem if comparing the nomenclature used for various groups of beetles, such a comparison is not the goal of this paper.

The species are arranged alphabetically within the respective subgenera. In the descriptions, the following information is presented: references to previous descriptions, list of material examined, detailed description of the morphology of the mature larva and a comparison with previously published data.

## Description of the mature larvae of the genus *Hypera*

Coloration. Head brown, maculate or black. Dorsal surface of body mostly green with slightly whiter median stripe; ventral surface of body whitish to white-green.

Head. Frontal sutures distinct, slender. Frontoclypeal suture slightly concave towards centre. Two convex stemmata on each side of epicranium. Clypeus slender, anterior margin distinctly concave and pigmented. Labrum with anterior margin bearing slender median excision; lateral margins rounded; posterior margin with median projection (Fig. 1); connected with clypeus by clypeolabral membrane. Antennae monomerous, membranose, with six sensoric setae apically (BLAND 1983). Mandibles with two or four teeth apically (Figs 4, 32), subapical tooth larger than apical tooth; basal part of mandible with distinct tuberosity. Maxilla consisting of cardo, stipes, mala and two palpomeres of maxillary palpi. Cardo, stipes, mala and distal parts of palpomeres pigmented. Maxilla connected with labium, forming labiomaxillar complex. Labium consisting of postlabium, prelabium, monomerous labial palpi and ligula. Membranose prelabium divided from membranose postlabium by a sclerotized "U" shape.

Thorax (Fig. 5). Prothorax divided into five areas: pronotum, dorsopleural, ventropleural, pedal and mediosternal lobes. Pronotum with weakly pigmented dorsal sclerite, this sclerite subdivided into two triangular plates medially. Dorsopleural and ventropleural lobes not distinctly divided. Meso- and metathorax divided into seven areas: dorsal lobe, dorsolateral lobe, spiracular area, dorsolateral, ventrolateral, pedal and mediosternal lobes. Dorsal lobe subdivided into prodorsum and postdorsum by a diagonal groove. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned postero-dorsad.

Abdomen (Figs 6, 7). Includes ten distinct segments. Abdominal segments I–VIII divided into six areas: dorsal lobes, spiracular areas, dorsopleural, ventropleural, laterosternal and mediosternal lobes. Dorsal lobes on abdominal segments I–VII subdivided by two diagonal grooves into prodorsum, dorsum and postdorsum. Dorsum very gracile, without setae. Dorsal lobe on abdominal segment VIII subdivided by only one diagonal groove into prodorsum and postdorsum. Spiracula on abdominal segments I–VIII situated above dorsopleural lobes; with oval peritrema positioned posteriad. Abdominal segment IX divided into three areas: dorsal, pleural and sternal lobes. Abdominal segment X reduced, without setae.

Chaetotaxy. Head. Dorsum of epicranium with five setae (*des1–5*); *des1, des3* and *des5* positioned along frontal suture; *des2* and *des4* on lateral margin of head, setae of latter shorter than *des1, des3* and *des5* (Fig. 1). Both lateral setae (*les1–2*) of epicranium long, located under stemmata. Ventral setae (*ves1–2*) short, located on anterior part on ventrum of epicranium. Frons with four setae (*fs1–5*, *fs2* missing); *fs4* and *fs5* located on anterior part, *fs5* the longest, *fs1* and *fs3* the shortest (Fig. 1). Clypeus with two setae on lateral margins (*cls1–2*), labrum with three setae (*lrms1–3*) (both Fig. 1). Mandible with two short setae (*mds1–2*) on lateral margin (Fig. 4). Stipes with two long setae and one short (*sts1–3*) (Fig. 2), sometimes present minute *sts4* (Fig. 2). Mala with six or seven stout setae (*dms1–6*(*7*)) on dorsal side (Fig. 3) and five minute setae (*vms1–5*) on ventral side. Maxillary palpi with one minute seta (*mxps*). Postlabium with three pairs (*plbs1–3*) and prelabium with one pair of setae (*prms*). Ligula with two pairs of minute setae (*lig*) (all Fig. 2).

Thorax (Figs 5, 12, 33, 68). Bases of setae pigmented. *Prothorax*: pronotum with ten or eleven hairform or bacilliform setae (*prn1–10*(*11*)); dorsal margin of triangular plate with three setae (*prn1–3*), anterior margin of sclerite with four setae (*prn4–7*), posterior margin of sclerite with three setae (*prn8–10*(*11*)). Ventropleural lobe with two hairform setae (*vpls1–2*). Pedal lobe with four (from three to six) hairform setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining setae minute. Mediosternal lobe with one very short or minute seta (*msts*). *Meso- and metathorax*: prodorsum with one seta (*prs*), postdorsum with four setae (*pds1–4*). Dorsolateral area with two setae (*dls*), in spiracular area two or three setae (*ss*). Setae hairform to bacilliform. Dorsopleural lobe with one seta (*dpls*). Ventropleural lobe with 1 or 3 hairform setae (*vpls*), positioned above pedal lobe. Pedal lobe with four (from three to six) hairform setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining setae minute. Mediosternal lobe with one very short or minute seta (*msts*).

Abdomen. Bases of setae pigmented. *Abdominal segments I–VIII* (Figs 6, 13, 34): prodorsum with one or two setae (*prs1–2*), *prs2* minute; postdorsum with five setae (*pds1–5*). Spiracular seta (*sps1*) located postero-dorsally from spiraculum, minute *sps2–3* located antero-dorsally from spiraculum. Dorsopleural lobe with two setae (*dpls1–2*). Setae hairform or bacilliform to clubform. Ventropleural lobe with one or two hairform setae, *vpls2* minute. Laterosternal lobe with one short hairform seta (*lsts*). Mediosternal lobe with one very short hairform seta (*msts*). *Abdominal segment IX* (Figs 7, 14): dorsum with four hairform or clubform setae (*ds1–4*); *ds2–4* positioned in a line, sometimes *ds3* anteriad of line joining *ds2* and *ds4*; *ds3* the longest. Pleural lobe with two or three hairform or bacilliform setae (*ps*). Sternal lobe with two hairform setae (*sts*).

## Subgenus *Antidonus* Bedel, 1886

**Differential diagnosis.** Mandible with four teeth (× *Eririnomorphus*, *Dapalinus*, *Boreohypera* and *Hypera*) (Figs 4, 11, 18, 25). Bases of setae on thorax and abdomen not prominent and broad, but strongly pigmented (× *Eririnomorphus*) (Figs 5–7, 12–14, 19–21, 26–28). Pronotum with ten setae (*prn1–10*) (× *Eririnomorphus*) (Figs 5, 12, 19, 26). Meso- and metathorax with one *vpls* (× *Boreohypera*) (Figs 5, 12, 19, 26).

## Descriptions of *Antidonus* species

### *Hypera dauci* (Olivier, 1807)

Dieckmann 1989: 99–100.

**Material.** (16 mature larvae), collected in the field: MAROCCO mer., Moyen Atlas, 20 km NE Ifrane, 1550 m. a.s.l., 3.i.2002, Ch. Bayer leg. (16) (on *Geranium* sp.).

**Description of mature larva.** Coloration. Head orange, posterior and lateral margins of epicranium dark brown. Dorsal surface of body pale green with yellow-white median stripe.

Head. Head width 1.03 mm (0.95–1.13 mm), head length 0.87 mm (0.80–0.93 mm) (Tab. 1). Frontal sutures distinct, slender, anteriorly more indistinct. Anterior margin of clypeus distinctly concave (Fig. 1) with weak pigmentation. Labrum dark brown; anterior margin with slender median excision, posterior margin with long and wide median projection (Fig. 1). Mandibles with four sharp teeth apically (Fig. 4), first tooth largest; basal part of mandible with distinct tuberosity.

Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.

Abdomen. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned posterio-dorsad.

Chaetotaxy. Head. Setae hairform. *Des2* minutely shorter than *des4*; *des2* about 0.8 × *des1*, *des3* and *des5*, of approximately equal length (Fig. 1). Both *les* long, *les1* about 0.7 × *les2*. Both *ves* short. *Fs1*, *fs3* and *fs4* of approximately equal length, about 0.7 × *fs5* (Fig. 1). Both *cls* short, *lrms1–3* short (Fig. 1). Both *mds* long (Fig. 4). *Sts1–2* long, *sts3* short, *sts4* minute (Fig. 2). *Dms1–6* stout (Fig. 3), *vms1–5* minute. *Mxps* short. *Plbs2* long, *plbs1*, *3* short; *prms* short; both *lig* minute (Fig. 2).

Thorax (Fig. 5). Bases of setae strongly pigmented, setae unpigmented. Setae long, hairform. *Prothorax*: *prn1–10* long, of approximately equal length. *Vpls1–2* of approximately equal length. Pedal lobe with six (four to six) setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining four (two to four) setae minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1–4* long, of approximately equal length, *pds4* slightly shorter. Both *dls* short; *ss1–2* long as *dls*, *ss3* short. *Dpls* and *vpls* as long as *ss1–2*. Pedal lobe with six (four to six) setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining four (two to four) setae minute. *Msts* minute.

Abdomen. Bases of setae strongly pigmented, setae unpigmented. Setae long, hairform. *Abdominal segments I–VIII* (Fig. 6): *prs1* long, *prs2* minute. *Pds1*, *pds3* and *pds5* approximately in line, *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5*; *pds1*, *pds3* and *pds5* of approximately equal length, *pds2* and *pds4* slightly shorter.

*Sps1–2* shorter than *prs*, *sps3* minute. Both *dpls* of approximately equal length. *Vpls2* long, *vpls1* short. *Lsts* long, *msts* minute. *Abdominal segment VII*: *pds2* removed from *pds4* and *pds3* from *pds5*; *pds3* very long, remaining setae about 0.7 ×. *Abdominal segment VIII*: *pds2* more removed from *pds4* and *pds3* to *pds5*. *Pds3* approximately in line with *pds1* and *pds5*; *pds3* very long, remaining setae about 0.7 ×. *Abdominal segment IX* (Fig. 7): *ds1–4* hairform; *ds2–4* not in line, *ds3* anteriad of line joining *ds2* and *ds4*; *ds1* the longest, remaining three setae of approximately equal length. *Ps1–2* about 0.5 × *ds1*, *ps3* short; both *sts* long as *ps2*.

**Differential diagnosis.** *Prs* and *pds1–5* on abdominal segments I–VIII hairform (× *H. lunata* and *H. zoila*) (Fig. 6). Meso- and metathorax with three *ss*; *ss1–2* long, *ss3* present, minute (× *H. lunata*, *H. vidua* and *H. zoila*) (Fig. 5). *Plbs1* short (× *H. lunata*, *H. vidua* and *H. zoila*) (Fig. 2).

**Remarks.** DIECKMANN (1989) recorded only coloration of the body and setae. His data agree with what is presented here.

### *Hypera lunata* Wollaston, 1854

**Material.** (24 mature larvae), collected in the field: GREECE mer., prov. Peloponnesse, Skala env. (Lakonia), 50 km SE of Sparti, 36 m. a.s.l., 5.iv.2005, J. Skuhrovec leg. (12); GREECE mer., prov. Peloponnesse, Kladas env. (Lakonia), 5 km NE of Sparti, 251 m. a.s.l., 8.iv.2005, J. Skuhrovec leg. (12) (all on *Geranium* sp.).

**Description of mature larva.** Coloration. Head orange, posterior and lateral margins of epicranium dark brown. Dorsal surface of body pale green with yellow-white median stripe and red/violet coloration along median stripe. Body strongly pigmented.

Head. Head width 1.04 mm (0.95–1.10 mm), head length 0.89 mm (0.75–0.95 mm) (Tab. 1). Frontal sutures distinct, slender, anteriorly more indistinct. Anterior margin of clypeus markedly concave (Fig. 8) with weak pigmentation. Labrum dark brown; anterior margin with slender median excision, posterior margin with short and wide median projection (Fig. 8). Mandibles with four sharp teeth apically (Fig. 11), first tooth largest; basal part of mandible with distinct tuberosity.

Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned posterio-dorsad.

Abdomen. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned posterio-dorsad.

Chaetotaxy. Head. Setae hairform. *Des2* minutely shorter than *des4*; *des2* about 0.6 × *des1*, *des3* and *des5*, of approximately equal length (Fig. 8). Both *les* long, *les1* about 0.7 × *les2*. Both *ves* short. *Fs1*, *fs3* and *fs4* of approximately equal length, about 0.7 × *fs5* (Fig. 8). Both *cls* short, *lrms1–3* short (Fig. 8). Both *mds* long (Fig. 11). *Sts1–2* long, *sts3* short, *sts4* minute (Fig. 9). *Dms1–6* stout (Fig. 10), *vms1–5* minute. *Mxps* very short. *Plbs1–2* long, *plbs3* very short; *prms* long as *plbs3*; both *lig* minute (Fig. 9).

Thorax (Fig. 12). Bases of setae strongly pigmented, setae unpigmented. Setae bacilliform to hairform (*dpls*, *vpls*, *pda*, *msts*). *Prothorax*: *prn1–7* long, of approximately equal length; *prn8–10* shorter than setae on anterior margin of sclerite. *Vpls2* about 0.7 × *vpls1*. Pedal lobe with four setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining two setae minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1–4* long,

of approximately equal length, *pds3* slightly longer. Both *dls* shorter than *prs*, setae *ss* long as *dls*. *Dpls* and *vpls* long as *prs*. Pedal lobe with four setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining two setae minute. *Msts* very short.

Abdomen. Bases of setae strongly pigmented, setae unpigmented. Setae bacilliform to hairform (*vpls*, *lsts*, *msts*). *Abdominal segments I–VIII* (Fig. 13): *pds1*, *pds3*, *pds4* and *pds5* approximately in line, *pds2* positioned anteriad to *pds3*; *pds1*, *pds3* and *pds5* of approximately equal length, *pds2* and *pds4* slightly shorter. *Sps* shorter than *prs*. Both *dpls* of approximately equal length. *Vpls2* long, *vpls1* short. *Lsts* long, *msts* minute. *Abdominal segment VII*: *pds3* very long, remaining setae about 0.7 ×. *Abdominal segment VIII*: *pds2* and *pds4* positioned more forward of line joining *pds1* and *pds5* than on abdominal segments I–VII, *pds2* positioned more anteriad than *pds4*; *pds1, pds3* and *pds5* approximately in line; *pds3* very long, remaining setae about 0.7 ×. *Dpls1* about 0.5 × *dpls2*. *Abdominal segment IX* (Fig. 14): *ds1–4* bacilliform; *ds2–4* not in line, *ds3* anteriad of line joining *ds2* and *ds4*; *ds3* the longest, remaining three setae of approximately equal length. Both *ps* long; *sts1* long, *sts2* short.

**Differential diagnosis.** *Prs* and *pds1–5* on abdominal segments I–VIII bacilliform or clubform (× *H. dauci* and *H. vidua*) (Fig. 13). Thoracic and abdominal setae long (× *H. zoila*) (Figs 12, 13). *Dpls* on meso- and metathorax hairform (× *H. zoila*) (Fig. 12). *Prms* very short (× *H. vidua* and *H. zoila*) (Fig. 9).

### *Hypera vidua* Gené, 1837

Strejček & Dieckmann 1987: Figs 1–4; Dieckmann 1989: 99.

**Material.** (4 mature larvae), collected in the field: CZ–Bohemia bor. (5450), Ústí nad Labem env., Dubice (Doerellova vyhlídka (viewpoint)), 30.v.2002 (2), 31.v.2003 (2) J. Skuhrovec leg. (all on *Geranium sanguineum* L.).

**Description of mature larva.** Coloration. Head orange, posterior and lateral margins of epicranium dark brown. Dorsal surface of body olivaceous with yellow-white median stripe. Lobes on thoracic and abdominal segments distinct.

Head. Head width 0.95 mm (0.70–1.36 mm), head length 0.78 mm (0.54–1.10 mm) (Tab. 1). Frontal sutures distinct, slender, anteriorly more indistinct. Anterior margin of clypeus distinctly concave (Fig. 15) with weak pigmentation. Labrum dark brown; anterior margin with slender median excision, posterior margin with short and wide median projection (Fig. 15). Mandibles with four sharp teeth apically (Fig. 18), second tooth largest; basal part of mandible with distinct tuberosity.

Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.

Abdomen. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned posteriad.

Chaetotaxy. Head. Setae hairform. *Des2* minutely shorter than *des4* short; *des1*, *des4* and *des5* of approximately equal length; *des3* about 1.3 × as long as previous three setae (Fig. 15). Both *les* long, *les1* about 0.7 × *les2*. Both *ves* short. *Fs1* and *fs3* the shortest, about 0.75 × *fs4*; *fs4* about 0.5 × *fs5* (Fig. 15). Both *cls* long, *lrms1–3* short (Fig. 15). Both *mds* long (Fig. 18). *Sts1–3* long (Fig. 16). *Dms1–7* stout (Fig. 17), *vms1–5*

minute. *Mxps* very short. *Plbs1–2* long, *plbs3* short; *prms* long as *plbs2*; both *lig* minute (Fig. 16).

Thorax (Fig. 19). Bases of setae strongly pigmented, setae unpigmented. Setae long, hairform. *Prothorax*: *prn1* and *prn3* of approximately equal length; *prn4–7* long, of approximately equal length; *prn8–10* shorter than setae on anterior margin of sclerite. *Vpls2* about 0.7 × *vpls1*. Pedal lobe with five (four to six) setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining three (two to four) setae minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1–4* long, of approximately equal length, *pds3* slightly longer. Both *dls* as long as *prs*, setae *ss* short. *Dpls* and *vpls* long. Pedal lobe with five (four to six) setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining three (two to four) setae minute. *Msts* very short.

Abdomen. Bases of setae strongly pigmented, setae unpigmented. Setae long, hairform. *Abdominal segments I–VIII* (Fig. 20): *pds1–5* approximately in line, *pds2* and *pds4* positioned slightly anteriad, *pds3* slightly posteriad; *pds1*, *pds3* and *pds5* of approximately equal length, *pds3* slightly longer; *pds2* and *pds4* about 0.7 ×. *Sps* shorter than *prs*. Both *dpls* of approximately equal length. *Vpls2* long, *vpls1* minute. *Lsts* long, *msts* minute. *Abdominal segment VII*: *pds3* very long, remaining setae about 0.7 ×. *Abdominal segment VIII*: *pds2* and *pds4* positioned more anteriad of line joining *pds1* and *pds5* than on abdominal segments I–VII, *pds4* positioned more anteriad than *pds2*; *pds1, pds3* and *pds5* approximately in line; *pds3* very long, remaining setae about 0.7 ×. *Dpls1* about 0.5 × *dpls2*. *Abdominal segment IX* (Fig. 21): *ds1–4* hairform; *ds2–4* not in line, *ds3* forward of line joining *ds2* and *ds4*; *ds3* the longest, remaining three setae of approximately equal length. Both *ps* long; *sts1* very long, *sts2* short.

**Differential diagnosis.** *Prs* and *pds1–5* on abdominal segments I–VIII hairform (× *H. lunata* and *H. zoila*) (Fig. 20). Meso- and metathorax with two *ss*; *ss1–2* long, *ss3* absent (× *H. dauci* and *H. zoila*) (Fig. 19). *Plbs1* long (× *H. dauci*) (Fig. 16).

**Remarks.** Dieckmann (1989) mentioned only the coloration of the body and setae; his data agree with what is presented here. Strejček & Dieckmann (1987) gave a larval figure and mentioned that the mandibles have only two teeth. This does not agree with the data presented here. All specimens examined have four teeth on mandibles. Before pupation, wear could well occur to larval teeth, eventually leaving a depleted number.

### *Hypera zoila* (Scopoli, 1763)

Titus 1911: 403; Anderson 1948: 27–29, Figs 7, 9, 22; Peterson 1951: 124, Figs C20 C, C21 D–F; Miller 1956: 572–573; Scherf 1964: 179–180, Fig. 335; Dieckmann 1989: 99; Stehr 1992: Figs 34 863 a–d; May 1993: 65, Figs 581–590.

**Material.** (2 mature larvae), collected in the field: CZ–Bohemia bor. (5450), Ústí nad Labem env., Malé Žernoseky, 26.v.2001, J. Skuhrovec leg. (1) (on *Medicago sativa* L.); CZ-Bohemia bor.-occ. (5548), Louny env., vrch Milá, 30.iv.2000, J. Skuhrovec leg. (1) (on *Trifolium pratense* L.)

**Description of mature larva.** Coloration. Head pale brown maculate with dark spots close to stemmata. Dorsal surface of body pale yellow-green with white median stripe and red coloration along median stripe. Body strongly pigmented.

Head. Head width 1.27 mm (1.20–1.34 mm), head length 1.03 mm (1.00–1.06 mm) (Tab. 1). Frontal sutures distinct, slender, anteriorly more indistinct. Anterior margin of

clypeus weakly concave (Fig. 22) with weak pigmentation. Labrum dark brown; anterior margin with deep median excision, posterior margin with short and wide median projection (Fig. 22). Mandibles with four apically rounded teeth (Fig. 25), third tooth largest; first two slightly smaller.

Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.

Abdomen. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned posteriad.

Chaetotaxy. Head. Setae hairform. *Des2* short, about 0.6 × *des4*; *des4* about 0.5 × remaining three setae (*des1, des3, des5*) (Fig. 22). Both *les* long, *les1* about 0.7 × *les2*. Both *ves* short. *Fs1* and *fs3* the shortest, about 0.7 × *fs4*; *fs4* about 0.5 × *fs5* (Fig. 22). Both *cls* long, *lrms1–3* long (Fig. 22). Both *mds* short (Fig. 25). *Sts1–3* long (Fig. 23). *Dms1–7* stout (Fig. 24), *vms1–5* minute. *Mxps* short. *Plbs1–2* long, *plbs3* short; *prms* long as *plbs2*; both *lig* minute (Fig. 23).

Thorax (Fig. 26). Bases of setae strongly pigmented, setae unpigmented. Setae short, bacilliform to hairform (*prn*, *vpls*, *pda*, *msts*). *Prothorax*: *prn2*, *6* long; remaining setae short, of approximately equal length. *Vpls1* about 0.7 × *vpls2*. Pedal lobe with four (three to five) setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining two (one to three) setae minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1–4* of approximately equal length, *pds3* slightly longer than remaining setae. Both *dls* and both *ss* of approximately equal length as *prs*, *dpls* and *vpls* long. Pedal lobe with four (three to five) setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining two (one to three) setae minute. *Msts* minute.

Abdomen. Bases of setae strongly pigmented, setae unpigmented. Setae short, clubform to bacilliform or hairform (*vpls*, *lsts*, *msts*). *Abdominal segments I–VIII* (Fig. 27): *pds1–5* approximately in line, *pds2* and *pds4* positioned slightly anteriad, *pds3* slightly posteriad; *pds3* the longest, remaining setae about 0.8 ×. *Sps* shorter than *prs*. Both *dpls* of approximately equal length. *Vpls2* long, *vpls1* minute. *Lsts* short, *msts* minute. *Abdominal segment VII*: *pds3* very long, remaining setae about 0.5 ×. *Abdominal segment VIII*: *pds2* and *pds4* positioned more anteriad of line joining *pds1* and *pds5* than on abdominal segments I–VII, *pds4* positioned more anteriad than *pds2*; *pds1, pds3* and *pds5* approximately in line; *pds3* very long, remaining setae about 0.3 ×. *Abdominal segment IX* (Fig. 28): *ds1–4* bacilliform; *ds2–4* in line; *ds3* the longest, remaining three setae of approximately equal length. Both *ps* bacilliform, short. Both *sts* hairform; *sts1* very short, *sts2* minute.

**Differential diagnosis.** *Prs* and *pds1–5* on abdominal segments I–VIII bacilliform or clubform (× *H. dauci* and *H. vidua*) (Fig. 27). Thoracic and abdominal setae very short (× *H. dauci*, *H. lunata* and *H. vidua*) (Figs 26, 27). *Dpls* on meso- and metathorax bacilliform (× *H. dauci*, *H. lunata* and *H. vidua*) (Fig. 26). *Prms* long (× *H. lunata*) (Fig. 23).

**Remarks.** Head width recorded in the literature (L4: 1.14–1.25 mm; Anderson 1948, Peterson 1951, Scherf 1964, May 1993) agrees with measurements presented in this paper (Tab. 1). Body length presented in the literature (L4: 8–15 mm; Titus 1911, Miller 1956, Scherf 1964, Stehr 1992) is identical with data presented here. Scherf

(1964) incorrectly records the dorsum of epicarnium with three setae (*des1*, *des3*, *des4*) and frons with two setae (*fs1*, *fs2*). MAY (1993) incorrectly records that *fs3* is absent. STEHR (1992) emphasized that larva has four teeth on mandible and not just the two occurring in other *Hypera* larvae.

## Subgenus *Eririnomorphus* Capiomont, 1868

**Differential diagnosis.** Mandible with two teeth (× *Antidonus*) (Figs 32, 39). Bases of setae on thorax and abdomen prominent and broad, and strongly pigmented (× *Antidonus*, *Dapalinus*, *Boreohypera* and *Hypera*) (Figs 33–35, 40–42). Pronotum with eleven setae (*prn1–11*) (× *Antidonus*, *Dapalinus*, *Boreohypera* and *Hypera*) (Figs 33, 40). Meso- and metathorax with one *vpls* (× *Boreohypera*) (Figs 33, 40).

## Descriptions of *Eririnomorphus* species

### *Hypera arundinis* (Paykull, 1792)

ROSENHAUER 1882: 137–138; ANDERSON 1948: 27–29, Fig. 5; ZASLAVSKIJ 1959: 215–218, Figs 7 A, B; DIECKMANN 1989: 100.

**Material.** (11 mature larvae), collected in the field: POLAND centr., Bydgoszcz, Osowiec–Twierdza, 24.vii.1996, M. Wanat leg. (11) (on *Sium latifolium* L.).

**Description of mature larva.** Coloration. Head orange, posterior and lateral margins of epicranium dark. Dorsal and ventral side of body yellow-green to grey-green. Body strongly pigmented. Lobes on thoracic and abdominal segments distinct.

Head. Head width 0.97 mm (0.92–1.00 mm), head length 0.80 mm (0.78–0.84 mm) (Tab. 1). Frontal sutures distinct, slender, anteriorly more indistinct. Anterior margin of clypeus markedly concave (Fig. 29) with weak pigmentation. Labrum black; anterior margin with slender median excision, posterior margin with short and wide median projection (Fig. 29). Mandibles with two sharp teeth apically (Fig. 32).

Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned posterio-dorsad.

Abdomen. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned posteriad. Around spiracula with distinct tuberosity.

Chaetotaxy. Head. Setae hairform. *Des1–5* broken and not examined (Fig. 29). Both *les* long, of approximately equal length. Both *ves* short. *Fs1–5* broken and not examined (Fig. 29). Both *cls* long, *lrms1–3* long (Fig. 29). Both *mds* short (Fig. 32). *Sts1–2* long, *sts3* short (Fig. 30). *Dms1–6* stout (Fig. 31), *vms1–5* minute. *Mxps* very short. *Plbs1–2* long, *plbs3* short; *prms* longer than *plbs3*; both *lig* very short (Fig. 30).

Thorax (Fig. 33). Bases of setae prominent and broad with tuberosity, strongly pigmented. Setae unpigmented, short, hairform. *Prothorax*: *prn2*, *4*, *5* and *7* long; *prn6* minute; *prn8–11* shorter than setae on anterior margin of sclerite. *Vpls2* about 0.5 × *vpls1*. Pedal lobe with five (four to six) setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining three (two to four) setae minute. *Msts* minute. *Meso- and metathorax*:

*prs* and *pds1–4* of approximately equal length. Both *dls* short, *ss1–3* short, *ss4* minute, *dpls* and *vpls* long. Pedal lobe with five (four to six) setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining three (two to four) setae minute. *Msts* minute.

Abdomen. Bases of setae prominent and broad with tuberosity, strongly pigmented. Setae unpigmented, short, hairform. *Abdominal segments I–VIII* (Fig. 34): *pds1–5* in line and of approximately equal length. *Sps1* long as *prs1*; *prs2* and *sps2–3* minute. Both *dpls* of approximately equal length. *Vpls2* long, *vpls1* minute. *Lsts* very short, *msts* minute. *Abdominal segment VII*: *pds2* and *pds4* positioned slightly anteriad, *pds3* slightly posteriad; *pds3* the longest, remaining setae about 0.5 × *pds3*. *Abdominal segment VIII*: *pds2* and *pds4* positioned more anteriad of line joining *pds1* and *pds5* than on abdominal segments I–VII, *pds4* positioned more anteriad than *pds2*; *pds1, pds3* and *pds5* approximately in line; *pds3* very long, remaining setae of approximately equal length. *Dpls1* slightly shorter than *dpls2*. *Abdominal segment IX* (Fig. 35): *ds1–4* hairform; *ds2–4* in line; *ds3* the longest, remaining three setae of approximately equal length. Both *ps* long; *sts1* very short, *sts2* minute.

**Differential diagnosis.** Thoracic and abdominal setae short (× *H. rumicis*) (Figs 33–35). Meso- and metathorax with three short setae (*ss1–3*) (× *H. rumicis*) (Fig 33). Dorsal and ventral side of body yellow-green to grey-green (× *H. rumicis*).

**Remarks.** Head width recorded in the literature (L4: 0.84–1.00 mm; Anderson 1948, Zaslavskij 1959) agrees with measurements presented in this paper (Tab. 1). Dieckmann (1989) recorded only coloration of the body and setae; his data agree with what is presented here.

### *Hypera rumicis* (Linné, 1758)

Goureau 1844: 49–59; Anderson 1948: 29, 31, Figs 4, 6, 15; Zaslavskij 1959: 215–218, Fig. 6 V, G; Scherf 1964: 176–177, Figs 324–329; Dieckmann 1989: 100.

**Material.** (2 mature larvae), collected in the field: CZ–Bohemia centr. (5952); Praha – Chodov (meadow near Milíčovský les Forest), 20.vi.2004 (2), J. Skuhrovec leg. (all on *Rumex hydrolapathum* Huds.).

**Description of mature larva.** Coloration. Head black. Dorsal surface of body dark brown with median pale brown stripe. Ventral side of thorax dark brown, ventral side of abdomen yellow. Body strongly pigmented superficially. Lobes on thoracic and abdominal segments distinct.

Head. Head width 0.84 mm (0.80–0.88 mm), head length 0.73 mm (0.70–0.75 mm) (Tab. 1). Frontal sutures distinct, slender. Anterior margin of clypeus distinctly concave (Fig. 36) with strong pigmentation. Labrum black; anterior margin with deep median excision, posterior margin with short and wide median projection (Fig. 36). Mandibles with two sharp teeth apically (Fig. 39).

Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.

Abdomen. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned posterio-dorsad.

Chaetotaxy. Head. Setae hairform. *Des4* the shortest, *des4* about 0.6 × *des2*, *des2* about 0.4 × *des1*, *des3* and *des5* (Fig. 36). Both *les* long, of approximately equal length.

Both *ves* short. *Fs1* the shortest, about 0.5 × *fs3*; *fs3* about 0.5 × *fs4*; *fs4* about 0.6 × *fs5* (Fig. 36). Both *cls* short, *lrms1–3* short (Fig. 36). Both *mds* very short (Fig. 39). *Sts1–2* long, *sts3* short (Fig. 37). *Dms1–6* stout (Fig. 38), *vms1–5* minute. *Mxps* very short. *Plbs2* long, *plbs1*, *3* short; *prms* long as *plbs3*; both *lig* minute (Fig. 37).

Thorax (Fig. 40). Bases of setae prominent and broad with tuberosity, strongly pigmented. Setae unpigmented, long, hairform. *Prothorax*: *prn2*, *4–7*, *11* long; *prn1,8* short. Both *vpls* short, of approximately equal length. Pedal lobe with five (three to five) setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining three (one to three) setae minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1–4* of approximately equal length. Both *dls* long, both *ss* long, *dpls* and *vpls* long. Pedal lobe with five (three to five) setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining three (one to three) setae minute. *Msts* minute.

Abdomen. Bases of setae prominent and broad with tuberosity, strongly pigmented. Setae unpigmented, long, hairform. *Abdominal segments I–VIII* (Fig. 41): *pds1–5* approximately in line, *pds2* and *pds4* positioned slightly anteriad, *pds3* slightly posteriad; *pds2* and *pds4* the shortest, remaining setae of approximately equal length. *Sps* long as *prs*. Both *dpls* of approximately equal length. *Vpls2* long, *vpls1* minute. *Lsts* short, *msts* minute. *Abdominal segment VII*: *pds2* and *pds4* positioned slightly anteriad, *pds3* slightly posteriad. *Abdominal segment VIII*: *pds2* and *pds4* positioned more anteriad of line joining *pds1* and *pds5* than on abdominal segments I–VII, *pds4* positioned more anteriad than *pds2*; *pds1, pds3* and *pds5* approximately in line; *pds3* very long, remaining setae of approximately equal length. *Dpls1* slightly shorter than *dpls2*. *Abdominal segment IX* (Fig. 42): *ds1–4* hairform; *ds2–4* in line; *ds3* the longest, remaining three setae of approximately equal length. *Ps1* long, *ps2* very short; *sts1* very short, *sts2* minute.

**Differential diagnosis.** Thoracic and abdominal setae long (× *H. arundinis*) (Figs 40–42). Meso- and metathorax with two long setae (*ss1–2*) (× *H. arundinis*) (Fig 40). Dorsal surface of body dark brown with median pale brown stripe; ventral surface of thorax dark brown, ventral surface of abdomen yellow (× *H. arundinis*).

**Remarks.** Head width recorded in the literature (L4: 0.80–0.85 mm; Anderson 1948, Zaslavskij 1959) agrees with measurements presented in this paper (Tab. 1). Scherf (1964) presented a detailed description of the immature stages with clear and accessible drawings. However, the head width he recorded is different from that presented here. Dieckmann (1989) recorded only coloration of the body and setae; his data agree with what is presented here.

### Subgenus *Dapalinus* Capiomont, 1868

**Differential diagnosis.** Mandible with two teeth (× *Antidonus*) (Figs 46, 53, 60). Bases of setae on thorax and abdomen not prominent and broad, but strongly pigmented (× *Eririnomorphus*) (Figs 47–49, 54–56, 61–63). Pronotum with ten setae (*prn1–10*) (× *Eririnomorphus*) (Figs 47, 54, 61). Meso- and metathorax with one *vpls* (× *Boreohypera*) (Figs 47, 54, 61). Differences between subgenera *Dapalinus* and *Hypera* not observed.

## Descriptions of *Dapalinus* species

### *Hypera contaminata* (Herbst, 1795)

DIECKMANN 1989: 100.

**Material.** (23 mature larvae), collected in the field: CZ–Bohemia bor.-occ. (5548), Louny env., vrch Milá, 8.vi.2004, J. Skuhrovec leg. (23) (on *Lathyrus tuberosus* L.).

**Description of mature larva.** Coloration. Head orange, posterior and lateral margins of epicranium dark. Dorsal surface of body pale green to grey-green with white median stripe and short white stripes parallel with median stripe. Body strongly pigmented; granulation more apparent dorsally than ventrally. Lobes on thoracic and abdominal segments distinct.

Head. Head width 0.76 mm (0.70–0.83 mm), head length 0.63 mm (0.58–0.68 mm) (Tab. 1). Frontal sutures distinct, slender, anteriorly more indistinct. Anterior margin of clypeus distinctly concave (Fig. 43) with weak pigmentation. Labrum black; slender anterior margin with deep median excision, posterior margin with short and wide median projection (Fig. 43). Mandibles with two sharp teeth apically (Fig. 46).

Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned posterio-dorsad.

Abdomen. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned posterio-dorsad.

Chaetotaxy. Head. Setae hairform. *Des2* and *des4* short, about 0.3 × *des1* and *des3*, *des5* minutely shorter than *des1* and *des3* (Fig. 43). Both *les* long, of approximately equal length. Both *ves* short. *Fs1* the shortest, less than 0.5 × *fs3*and *fs4*, *fs4* minutely longer than *fs3*; *fs4* about 0.6 × *fs5* (Fig. 43). Both *cls* short, *lrms1–3* short (Fig. 43). Both *mds* very short (Fig. 46). *Sts1–2* long, *sts3* short (Fig. 44). *Dms1–6* stout (Fig. 45), *vms1–5* minute. *Mxps* short. *Plbs1*, *3* short, *plbs2* long; *prms* shorter than *plbs3*; both *lig* minute (Fig. 44).

Thorax (Fig. 47). Bases of setae strongly pigmented, setae unpigmented. Setae short, bacilliform to hairform (*prn1–8*, *dpls*, *vpls*, *pda*, *msts*). *Prothorax*: *prn1–7* of approximately equal length; *prn8* shortest, *prn9–10* bacilliform. *Vpls2* about 0.4 × *vpls1*. Pedal lobe with four setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining two setae minute. *Msts* minute. *Meso- and metathorax*: *pds1-4* about 0.5 × *prs*, *pds3* on metathorax 2 × *prs*. Both *dls* short, both *ss* short, *dpls* and *vpls* long. Pedal lobe with four setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining two setae minute. *Msts* minute.

Abdomen. Bases of setae strongly pigmented, setae unpigmented. Setae short, bacilliform to hairform (*dpls*, *vpls*, *lsts*, *msts*). *Abdominal segments I–VIII* (Fig. 48): *pds1–5* approximately in line, *pds2* and *pds4* positioned slightly anteriad, *pds3* slightly posteriad; *pds2* and *pds4* the shortest, remaining setae of approximately equal length. *Sps1* long as *prs*, *sps2* minute. Both *dpls* of approximately equal length. *Vpls2* long, *vpls1* minute. *Lsts* short, *msts* minute. *Abdominal segment VII*: *pds3* very long. *Abdominal segment VIII*: *pds2* and *pds4* positioned more anteriad from line joining *pds1* and *pds5* than on abdominal segments I–VII, *pds4* positioned more anteriad than *pds2*; *pds1, pds3* and *pds5* approximately in line; *pds3* long, remaining setae about 0.5 ×.

*Dpls1* slightly shorter than *dpls2*. *Abdominal segment IX* (Fig. 49): *ds1–2*, *4* bacilliform, *ds3* hairform; *ds2–4* in line; *ds3* the longest, remaining three setae of approximately equal length. Both *ps* long; *ps1* bacilliform, *ps2* hairform. Both *sts* hairform; *sts1* very short, *sts2* minute.

**Differential diagnosis.** *Prs* and *pds1–5* on abdominal segments I–VIII bacilliform, clubform or dippleform (× *H. arator*, *H. jucunda* and *H. viciae*) (Fig. 48). *Pds2* on abdominal segments I–VII short, longer than 0.5 × *pds3* (× *H. nigrirostris* and *H. venusta*) (Fig. 48). *Pds3* on metathorax more than twice as long as additional *pds* (× *H. kayali* and *H. postica*) (Fig. 47). Majority of *prn1–10* hairform (× *H. denominanda*) (Fig. 47). Setae on thorax and abdomen unpigmented (× *H. striata* and *H. suspiciosa*). *Fs1–5* and *des1–5* hairform (× *H. plantaginis*) (Fig. 43).

**Remarks.** DIECKMANN (1989) recorded only coloration of the body and setae; his data agree with what is presented here.

### *Hypera kayali* Skuhrovec, 2006

SKUHROVEC 2006: 21–22.

**Material.** (4 mature larvae), collected in the field: SYRIA occ., province Tartus, Mashtal'helu env. (3 km East), 2.iv.2001, J. Skuhrovec leg. (4) (all on *Vicia palaestina* Boiss.).

**Description of mature larva.** Coloration. Head orange, posterior margins of epicranium dark. Dorsal surface of body pale green with white median stripe and short white stripes parallel with median stripe.

Head. Head width 0.84 mm (0.80–0.90 mm), head length 0.75 mm (0.70–0.80 mm) (Tab. 1). Frontal sutures distinct, slender, anteriorly more indistinct. Anterior margin of clypeus markedly concave (Fig. 50) with weak pigmentation. Labrum black; anterior margin with slender median excision, posterior margin with short and wide median projection (Fig. 50). Mandibles with two rounded teeth apically (Fig. 53).

Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.

Abdomen. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned posteriad.

Chaetotaxy. Head. Setae hairform. *Des2* and *des4* short, about 0.5 × *des1*and *des3*, *des5* minutely shorter than *des1* and *des3* (Fig. 50). Both *les* long, *les1* about 0.75 × *les2*. Both *ves* short. *Fs1* and *fs3* the shortest, less than 0.4 × *fs4*; *fs4* about 0.7 × *fs5* (Fig. 50). Both *cls* short, *lrms1–3* longer than *cls* (Fig. 50). Both *mds* short (Fig. 53). *Sts1–2* long, *sts3* short (Fig. 51). *Dms1–6* stout (Fig. 52), *vms1–5* minute. *Mxps* very short. *Plbs* broken and not examined; *prms* long; both *lig* minute (Fig. 51).

Thorax (Fig. 54). Bases of setae strongly pigmented, setae pigmented. Setae short, bacilliform or hairform (*prn*, *dpls*, *vpls*, *pda*, *msts*). *Prothorax*: *prn1* and *prn3* short; *prn4–7* of approximately equal length; *prn8–10* shorter than setae on anterior margin of sclerite. *Vpls2* about 0.7 × *vpls1*. Pedal lobe with three setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining seta minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1–4* of approximately equal length. Both *dls* short, both *ss* short, *dpls* and *vpls* short.

Pedal lobe with three setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining seta minute. *Msts* minute.

Abdomen. Bases of setae strongly pigmented, setae pigmented. Setae short, bacilliform or hairform (*vpls*, *lsts*, *msts*). *Abdominal segments I–VIII* (Fig. 55): *pds1–5* not in line, *pds2* and *pds4* positioned anteriad, *pds3* slightly posteriad; setae of approximately equal length. *Sps* shorter than *prs*. Both *dpls* of approximately equal length. *Vpls2* long, *vpls1* minute. *Lsts* very short, *msts* minute. *Abdominal segment VII*: *pds3* very long. *Abdominal segment VIII*: *pds2* and *pds4* positioned more anteriad from line joining *pds1* and *pds5* than on abdominal segments I–VII, *pds4* positioned more anteriad than *pds2*; *pds1, pds3* and *pds5* approximately in line; *pds3* very long, remaining setae about 0.5 ×. *Dpls1* slightly shorter than *dpls2*. *Abdominal segment IX* (Fig. 56): *ds1–4* hairform; *ds2–4* in line; *ds3* the longest, remaining three setae of approximately equal length. Both *ps* long; *sts1* short, *sts2* minute.

**Differential diagnosis.** *Prs* and *pds1–5* on abdominal segments I–VIII bacilliform, clubform or dippleform (× *H. arator*, *H. jucunda* and *H. viciae*) (Fig. 55). *Pds2* on abdominal segments I–VII short, longer than 0.5 × *pds3* (× *H. nigrirostris* and *H. venusta*) (Fig. 55). *Pds3* on metathorax less than twice as long as additional *pds* (× *H. contaminata*) (Fig. 55). *Dpls* and *vpls* on meso- and metathorax hairform (× *H. postica*) (Fig. 54). Majority of *prn1–10* hairform (× *H. denominanda*) (Fig. 54). Setae on thorax and abdomen unpigmented (× *H. striata* and *H. suspiciosa*). *Fs1–5* and *des1–5* hairform (× *H. plantaginis*) (Fig. 50).

**Remarks.** SKUHROVEC (2006) recorded only coloration of the body; the data agree with what is presented here.

### *Hypera striata* (Boheman, 1834)

**Material.** (3 mature larvae), collected in the field: SLOVAKIA mer. (7677), Čajkov env., vill. Rybnik, 25.v.2002, J. Skuhrovec leg. (3) (all on agg. *Vicia sativa* L.).

**Description of mature larva.** Coloration. Head orange, posterior and lateral margins of epicranium dark. Dorsal surface of body yellow to brown with pale green lobes.

Head. Head width 0.68 mm (0.60–0.80 mm), head length 0.59 mm (0.50–0.70 mm) (Tab. 1). Frontal sutures distinct, slender. Anterior margin of clypeus distinctly concave (Fig. 57) with pigmentation. Labrum darkly pigmented; anterior margin with slender median excision, posterior margin with short and wide median projection (Fig. 57). Mandibles with two sharp teeth apically (Fig. 60).

Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.

Abdomen. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; oval peritrema positioned posteriad.

Chaetotaxy. Head. Setae hairform. *Des2* and *des4* short, about 0.5 × *des1*, *des3* and *des5* minutely shorter than *des1* (Fig. 57). Both *les* long, of approximately equal length. Both *ves* short. *Fs1* and *fs3* shortest, about 0.5 × *fs4*; *fs4* about 0.5 × *fs5* (Fig. 57). Both *cls* short, *lrms1–3* short (Fig. 57). Both *mds* very short (Fig. 60). *Sts1–2* long, *sts3* short

(Fig. 58). *Dms1–6* stout (Fig. 59), *vms1–5* minute. *Mxps* very short. *Plbs1–2* long, *plbs3* short; *prms* twice longer than *plbs3*; both *lig* minute (Fig. 58).

Thorax (Fig. 61). Bases of setae strongly pigmented, setae pigmented. Setae short, clubform to bacilliform and hairform (*prn*, *dpls*, *vpls*, *pda*, *msts*). *Prothorax*: *prn2* and *prn6* long; remaining setae of approximately equal length. *Vpls2* about 0.3 × *vpls1*. Pedal lobe with four (four to five) setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining two (two to three) setae minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1–4* of approximately equal length. Both *dls* short, both *ss* short, *dpls* and *vpls* long. Pedal lobe with four (four to five) setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining two (two to three) setae minute. *Msts* minute.

Abdomen. Bases of setae strongly pigmented, setae pigmented. Setae short, bacilliform and hairform (*vpls*, *lsts*, *msts*). *Abdominal segments I–VIII* (Fig. 62): *pds1–5* approximately in line, *pds2* and *pds4* positioned slightly anteriad, *pds3* slightly posteriad; *pds2* and *pds4* shortest, remaining setae of approximately equal length. *Sps* shorter than *prs*. Both *dpls* of approximately equal length. *Vpls2* long, *vpls1* minute. *Lsts* short, *msts* minute. *Abdominal segment VII*: *pds3* very long, hairform. *Abdominal segment VIII*: *pds2* and *pds4* positioned more anteriad from line joining *pds1* and *pds5* than on abdominal segments I–VII, *pds4* positioned more anteriad than *pds2*; *pds1, pds3* and *pds5* approximately in line; *pds3* long, remaining setae about 0.3 ×. *Dpls1* slightly shorter than *dpls2*. *Abdominal segment IX* (Fig. 63): *ds1–4* hairform; *ds2–4* in line; *ds3* longest, remaining three setae of approximately equal length. Both *ps* long; *ps1* bacilliform, *ps2* hairform. Both *sts* hairform; *sts1* very short, *sts2* minute.

**Differential diagnosis.** *Prs* and *pds1–5* on abdominal segments I–VIII bacilliform, clubform or dippleform (× *H. arator*, *H. jucunda* and *H. viciae*) (Fig. 62). *Pds2* on abdominal segments I–VII short, longer than 0.5 × *pds3* (× *H. nigrirostris* and *H. venusta*) (Fig. 62). Setae on thorax and abdomen pigmented (× *H. contaminata*, *H. denominanda*, *H. plantaginis* and *H. postica*).

## Subgenus *Boreohypera* Korotyaev, 1999

**Differential diagnosis.** Mandible with two teeth (× *Antidonus*) (Fig. 67). Bases of setae on thorax and abdomen not prominent and broad, but strongly pigmented (× *Eririnomorphus*) (Fig. 68–70). Pronotum with ten setae (*prn1–10*) (× *Eririnomorphus*) (Fig. 68). Meso- and metathorax with three *vpls*; *vpls1* short, *vpls2–3* minute (× *Antidonus*, *Eririnomorphus*, *Dapalinus* and *Hypera*) (Fig. 68).

## Descriptions of *Boreohypera* species

### *Hypera diversipunctata* (Schrank, 1798)

**Material.** (1 mature larva), collected in the field: CZ–Bohemia or. (5855); Králický Sněžník Mts., 7 km N of Velká Morava (meadow), 23.vi.2004 (1) (on *Cerastium arvense* L.).

**Description of mature larva.** Coloration. Head orange, posterior and lateral margins of epicranium dark. Dorsal surface of body yellow.

Head. Head width 0.85 mm, head length 0.78 mm (Tab. 1). Frontal sutures distinct, slender, anteriorly almost indistinct. Anterior margin of clypeus distinctly concave (Fig. 64) with weak pigmentation. Labrum dark brown; slender anterior margin with deep median excision, posterior margin with short and wide median projection (Fig. 64). Mandibles with two sharp teeth apically (Fig. 67).

Thorax. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.

Abdomen. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; oval peritrema positioned posterio-dorsad.

Chaetotaxy. Head. Setae hairform. *Des2* and *des4* short, about 0.5 × *des1* and *des3*, *des5* minutely longer than *des1* and *des3* (Fig. 64). Both *les* long, of approximately equal length. Both *ves* short. *Fs1* and *fs3* shortest, less than 0.7 × *fs4*; *fs4* about 0.7 × *fs5* (Fig. 64). Both *cls* short, *lrms1–3* short (Fig. 64). Both *mds* short (Fig. 67). *Sts1–2* long, *sts3* short (Fig. 65). *Dms1–6* stout (Fig. 66), *vms1–5* minute. *Mxps* very short. *Plbs2* long, *plbs1*, *3* about 0.5 × *plbs2*; *prms* short; both *lig* minute (Fig. 65).

Thorax (Fig. 68). Bases of setae strongly pigmented, setae unpigmented. Setae short, clubform to bacilliform or hairform (*vpls*, *pda*, *msts*). *Prothorax*: *prn1* and *prn3* very short; *prn4–5*, *7* of approximately equal length, *prn6* the longest; *prn8–10* shorter than setae on anterior margin of sclerite. *Vpls2* about 0.4 × *vpls1*. Pedal lobe with five setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining three setae minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1–4* of approximately equal length. Both *dls* very short, both *ss* very short. *Dpls* short, *vpls1* short, *vpls2–3* minute. Pedal lobe with five setae (*pda*); *pda1–2* long, *pda2* about 0.75 × *pda1*; remaining three setae minute. *Msts* minute.

Abdomen. Bases of setae strongly pigmented, setae unpigmented. Setae short, clubfrom to bacilliform or hairform (*vpls1*, *lsts*, *msts*). *Abdominal segments I–VIII* (Fig. 69): *pds1–5* approximately in line, *pds2* and *pds4* positioned slightly anteriad, *pds3* slightly posteriad; *pds2* and *pds4* the shortest, remaining setae of approximately equal length. *Sps* long as *prs*. Both *dpls* of approximately equal length. *Vpls2* short, *vpls1* minute. *Lsts* short, *msts* minute. *Abdominal segment VII*: *pds3* longer than remaining setae. *Abdominal segment VIII*: *pds2* and *pds4* positioned more anteriad from line joining *pds1* and *pds5* than on abdominal segments I–VII, *pds4* positioned more anteriad than *pds2*; *pds1, pds3* and *pds5* approximately in line; *pds3* long, remaining setae about 0.5 ×. *Dpls1* slightly shorter than *dpls2*. *Abdominal segment IX* (Fig. 70): *ds1–4* clubfrom to bacilliform; *ds2–4* not in line, *ds3* anteriad of line joining *ds2* and *ds4*; *ds3* the longest, remaining three setae of approximately equal length. Both *ps* short; *sts1* very short, *sts2* minute.

### Key to the mature larvae of the genus *Hypera*

1(8) Mandible with four teeth (Figs 4, 11, 18, 25). ..... ..... **(subgenus *Antidonus* Bedel, 1886)**

2(5) *Prs* and *pds1–5* on abdominal segments I–VIII hairform (Figs 6, 20).

3(4) Meso- and metathorax with two *ss*; *ss1–2* long, *ss3* absent (Fig. 19). *Plbs1* long (Fig. 16). ..... ***H. vidua* Gené, 1837**

4(3) Meso- and metathorax with three *ss*; *ss1–2* long, *ss3* present, minute (Fig. 5). *Plbs1* short (Fig. 2). ..... ***H. dauci* (Olivier, 1807)**

5(2) *Prs* and *pds1–5* on abdominal segments I–VIII bacilliform or clubform (Figs 13, 27).

6(7) Thoracic and abdominal setae long (Figs 12, 13). *Dpls* on meso- and metathorax hairform (Fig. 12). *Prms* very short (Fig. 9). ..... ..... ***H. lunata* Wollaston, 1837**

7(6) Thoracic and abdominal setae very short (Figs 26, 27). *Dpls* on meso- and metathorax bacilliform (Fig. 26). *Prms* long (Fig. 23). ..... ..... ***H. zoila* (Scopoli, 1763)**

8(1) Mandible with two teeth (Figs 32, 39, 46, 53, 60, 67; Skuhrovec 2005: Figs 10, 19, 28, 37, 46, 52, 64, 73, 82).

9(12) Bases of setae on thorax and abdomen prominent and broad with tuberosity, and strongly pigmented (Figs 33–35, 40–42). Pronotum with eleven setae (*prn1–11*) (Figs 33, 40). ..... ..... **(subgenus *Eririnomorphus* Capiomont, 1868)**

10(11) Thoracic and abdominal setae short (Figs 33–35). Meso- and metathorax with three short setae (*ss1–3*) (Fig. 33). Dorsal and ventral surfaces of body yellow-green to grey-green. ..... ..... ***H. arundinis* (Paykull, 1792)**

11(10) Thoracic and abdominal setae long (Figs 40–42). Meso- and metathorax with two long setae (*ss1–2*) (Fig. 40). Dorsal surface of body dark brown with median pale brown stripe; ventral surface of thorax dark brown, ventral surface of abdomen yellow. ... ***H. rumicis* (Linné, 1758)**

12(9) Bases of setae on thorax and abdomen not prominent and broad, but strongly pigmented (Figs 47–49, 54–56, 61–63, 68–70; Skuhrovec 2005: Figs 11–13, 20–22, 29–31, 38–40, 47–49, 56–58, 65–67, 74–76, 83–85). Pronotum with ten setae (*prn1–10*) (Figs 47, 54, 61, 68; Skuhrovec 2005: Figs 11, 20, 29, 38, 47, 56, 65, 74, 83).

13(18) *Prs* and *pds1–5* on abdominal segments I–VIII hairform (Skuhrovec 2005: Figs 12, 30, 84).

14(15) *Prs* and *pds1–5* on abdominal segments I–VIII short (Skuhrovec 2005: Fig. 84). *Fs1* and *fs3* shorter than 0.33 × *fs4* (Skuhrovec 2005: Fig. 77). ..... ***H. viciae* (Gyllenhal, 1813)**

15(14) *Prs* and *pds1–5* on abdominal segments I–VIII long (Skuhrovec 2005: Figs 12, 30). *Fs1* and *fs3* longer than 0.5 × *fs4* (Skuhrovec 2005: Figs 5, 23).

16(17) Bases of setae on thorax and abdomen distinctly enlarged (SKUHROVEC 2005: Figs 11–13) ..... ***H. arator*** **(Linné, 1758)**

17(16) Bases of setae on thorax and abdomen small, not distinctly enlarged (SKUHROVEC 2005: Figs 29–31) ..... ***H. jucunda*** **(Capiomont, 1868)**

18(13) *Prs* and *pds1–5* on abdominal segments I–VIII bacilliform, clubform or dippleform (Figs 48, 55, 62, 69; SKUHROVEC 2005: Figs 21, 39, 48, 57, 66, 75).

19(20) Meso- and metathorax with three *vpls*; *vpls1* short, *vpls2–3* minute (Fig. 68). ..... ***H. diversipunctata*** **(Schrank, 1798)**

20(19) Meso- and metathorax with one *vpls* (Figs 47, 54, 61; SKUHROVEC 2005: Figs 20, 38, 47, 56, 65, 74).

21(24) *Pds2* on abdominal segments I–VII very short, shorter than 0.5 × *pds3* (SKUHROVEC 2005: Figs 39, 75).

22(23) *Prs* and *pds1–5* on abdominal segments I–VIII very short (SKUHROVEC 2005: Fig. 39), *ds1–4* on abdominal segment IX dippleform, except of *ds3* (SKUHROVEC 2005: Fig. 40) ..... ***H. nigrirostris*** **(Fabricius, 1775)**

23(22) *Prs* and *pds1–5* on abdominal segments I–VIII short (SKUHROVEC 2005: Fig. 75), *ds1–4* on abdominal segment IX hairform (SKUHROVEC 2005: Fig. 76). ..... ***H. venusta*** **(Fabricius, 1781)**

24(21) *Pds2* on abdominal segments I–VII short, longer than 0.5 × *pds3* (Figs 48, 55, 62; SKUHROVEC 2005: Figs 21, 48, 53, 66).

25(28) Setae on thorax and abdomen pigmented.

26(27) *Des2* about 0.7 × *des3* and *des5* (SKUHROVEC 2005: Fig. 63); *plbs2* of approximately the same length as *plbs1* (SKUHROVEC 2005: Fig. 61). .... ..... ***H. suspiciosa*** **(Herbst, 1795)**

27(26) *Des2* about 0.5 × *des3* and *des5* (Fig. 57); *plbs2* twice longer than *plbs1* (Fig. 58). ..... ***H. striata*** **(Boheman, 1834)**

28(25) Setae on thorax and abdomen unpigmented.

29(36) *Fs1–5* (Figs 43, 50; SKUHROVEC 2005: Figs 14, 50) and *des1–5* (Figs 43, 50; SKUHROVEC 2005: Figs 18, 51) hairform; *prs* and *pds1–5* on abdominal segments I–VIII slender, softly bacilliform (Figs 48, 55; SKUHROVEC 2005: Figs 21, 57).

30(31) All *prn1–10* bacilliform to clubform (SKUHROVEC 2005: Fig. 20). ..... ..... ***H. denominanda*** **(Capiomont, 1868)**

31(30) Majority of *prn1–10* hairform (Figs 47, 54; SKUHROVEC 2005: Fig. 56).

32(33) *Pds3* on metathorax more than twice longer than additional *pds* (Fig. 47). ..... ***H. contaminata*** **(Herbst, 1795)**

33(32) *Pds3* on metathorax less than twice as long as additional *pds* (Fig. 54; SKUHROVEC 2005: Fig. 56).

34(35) *Dpls* and *vpls* on meso- and metathorax hairform (Fig. 54). ..... ..... ***H. kayali* Skuhrovec, 2006**

35(34) *Dpls* on meso- and metathorax bacilliform and *vpls* on meso- and metathorax hairform to bacilliform (SKUHROVEC 2005: Fig. 56). ..... ..... ***H. postica* (Gyllenhal, 1813)**

36(29) *Fs1–4* (SKUHROVEC 2005: Fig. 41) and *des1–5* (SKUHROVEC 2005: Fig. 45) bacilliform to clubform, *fs5* hairform (SKUHROVEC 2005: Fig. 41); *prs* and *pds1–5* on abdominal segments I–VIII clubform (SKUHROVEC 2005: Fig. 48). ..... ***H. plantaginis* (De Geer, 1775)**

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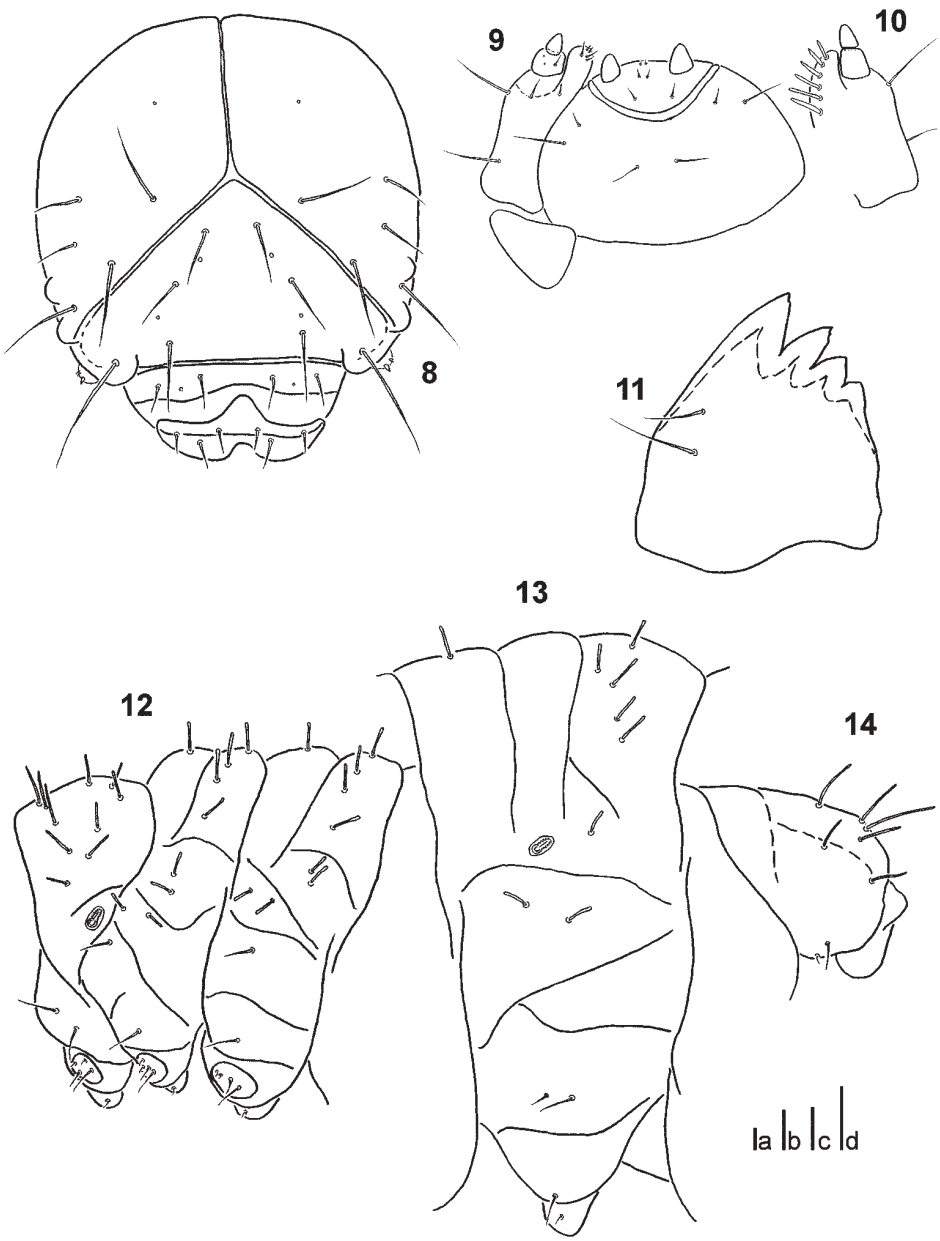
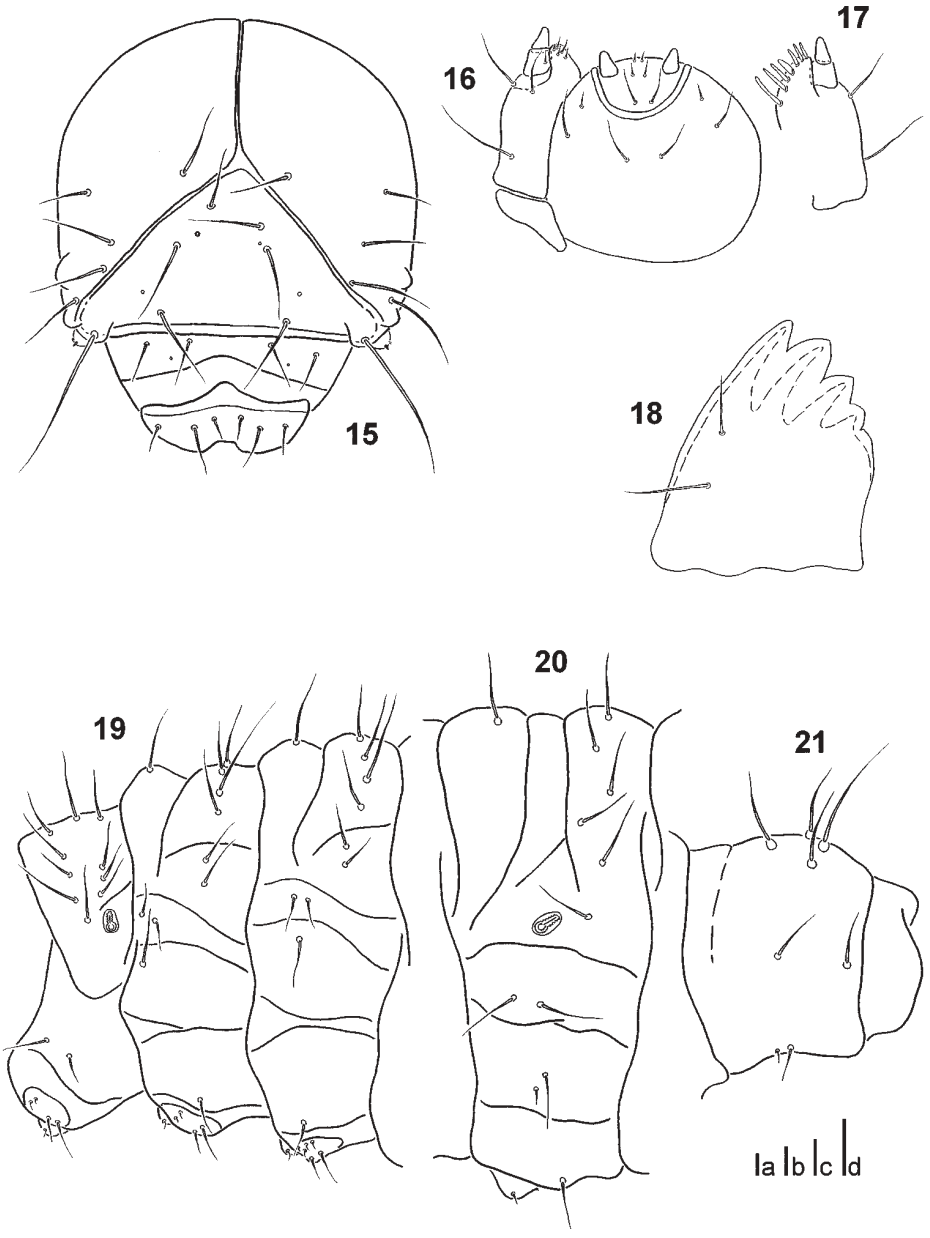
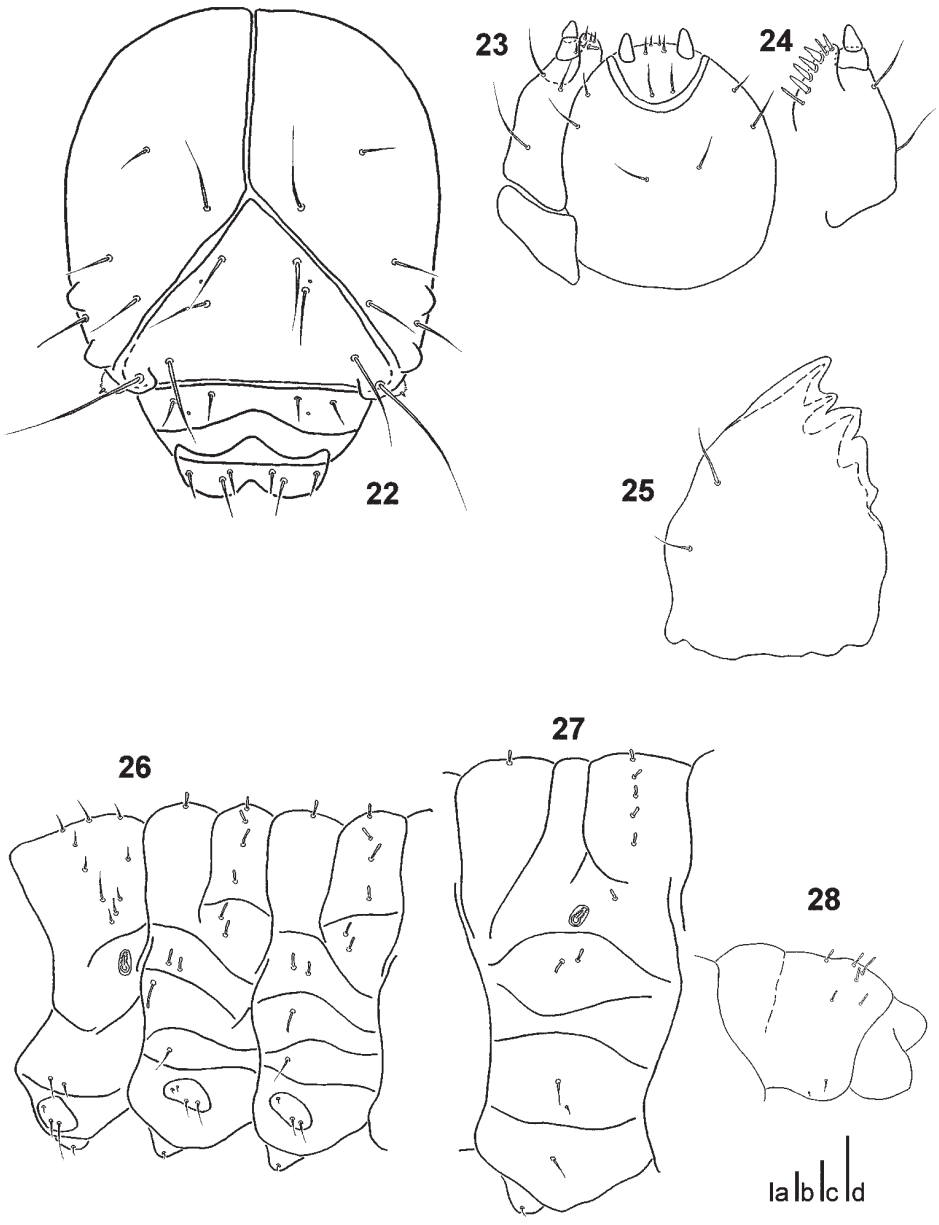
**Figs 1–7.** *Hypera dauci*: (1) head, (2) labium and maxilla, (3) maxilla, (4) mandible, (5) thorax, (6) abdominal segment IV, (7) abdominal segment IX; Figs 1, 3–4 dorsal view, Fig. 2 ventral view and Figs 5–7 lateral view. Scale bar 0.1 mm: a – Figs 5–7; b – Fig. 1; c – Figs 2–3; d – Fig. 4.



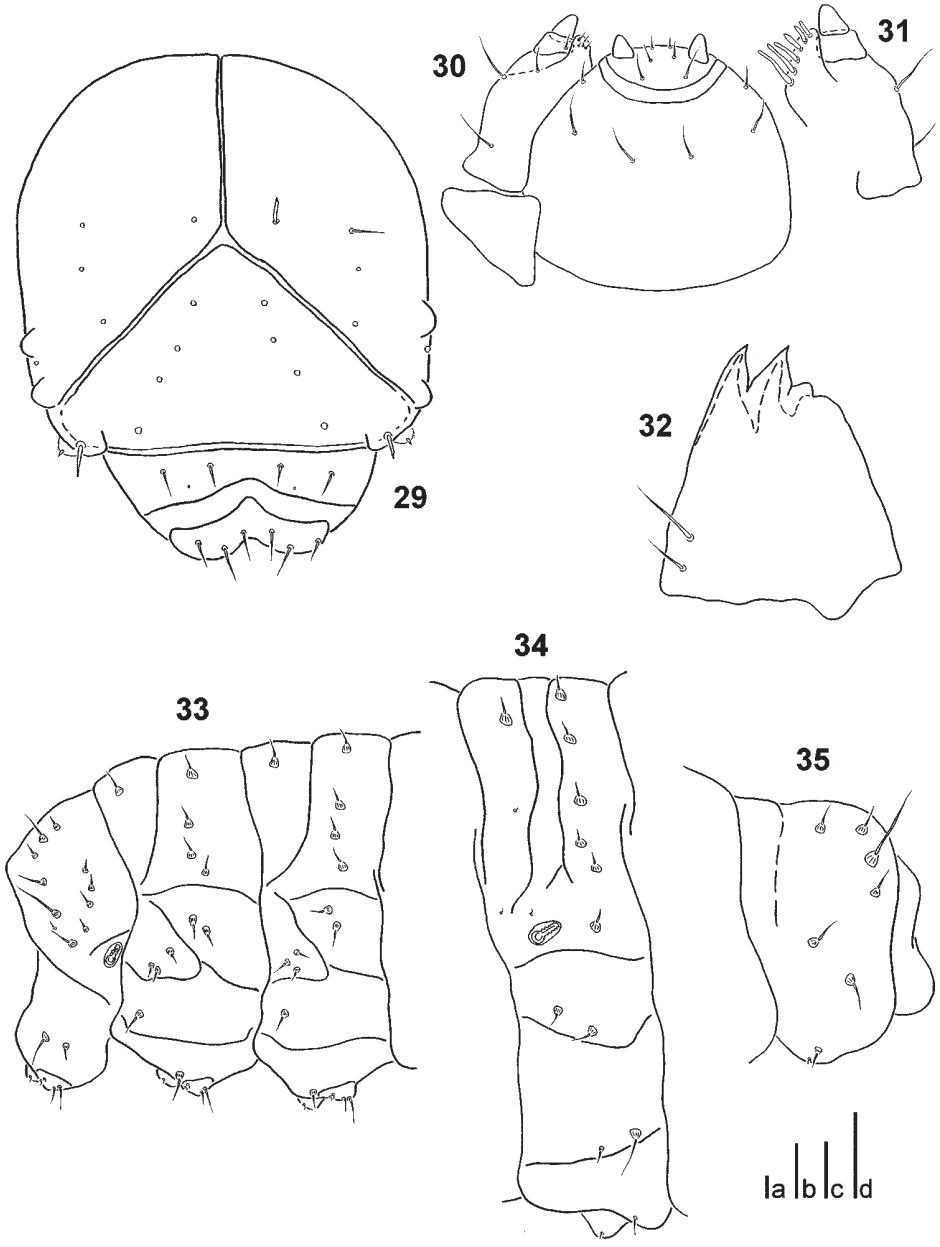

**Figs 8–14.** *Hypera lunata*: (8) head, (9) labium and maxilla, (10) maxilla, (11) mandible, (12) thorax, (13) abdominal segment IV, (14) abdominal segment IX; Figs 8, 10–11 dorsal view, Fig. 9 ventral view and Figs 12–14 lateral view. Scale bar 0.1 mm: a – Figs 12–14; b – Fig. 8; c – Figs 9–10; d – Fig. 11.



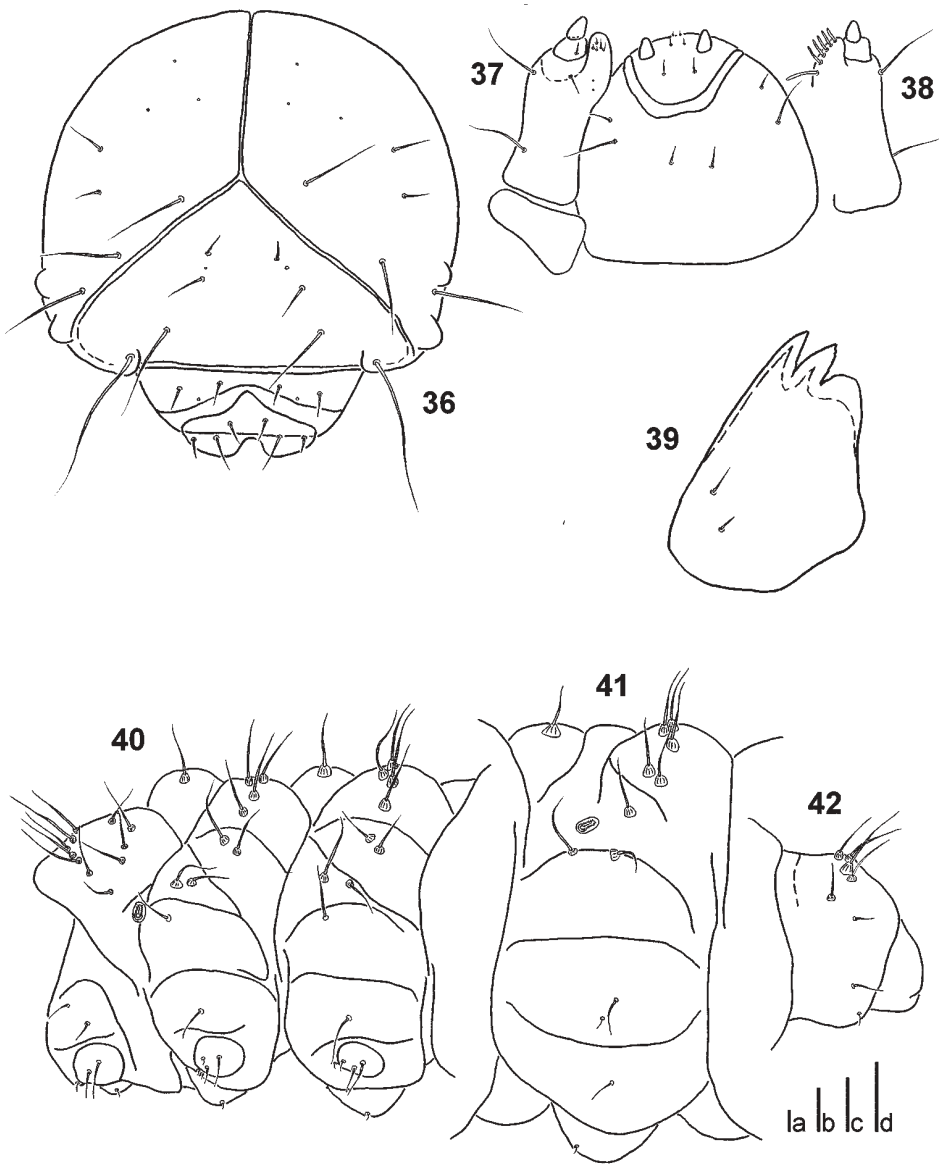

**Figs 15–21.** *Hypera vidua*: (15) head, (16) labium and maxilla, (17) maxilla, (18) mandible, (19) thorax, (20) abdominal segment IV, (21) abdominal segment IX; Figs 15, 17–18 dorsal view, Fig. 16 ventral view and Figs 19–21 lateral view. Scale bar 0.1 mm: a – Figs 19–21; b – Fig. 15; c – Figs 16–17; d – Fig. 18.



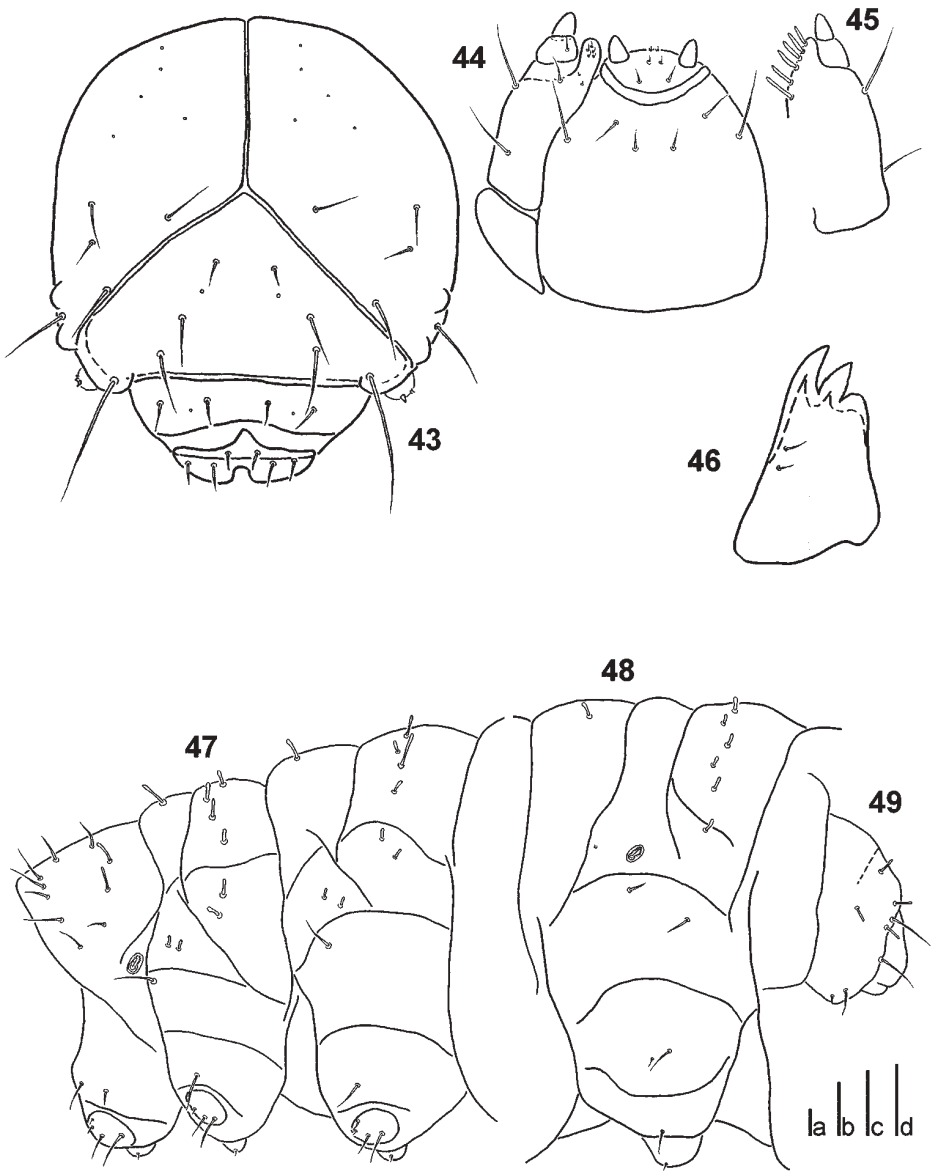

**Figs 22–28.** *Hypera zoila*: (22) head, (23) labium and maxilla, (24) maxilla, (25) mandible, (26) thorax, (27) abdominal segment IV, (28) abdominal segment IX; Figs 22, 24–25 dorsal view, Fig. 23 ventral view and Figs 26–28 lateral view. Scale bar 0.1 mm: a – Figs 26–28; b – Fig. 22; c – Figs 23–24; d – Fig. 25.



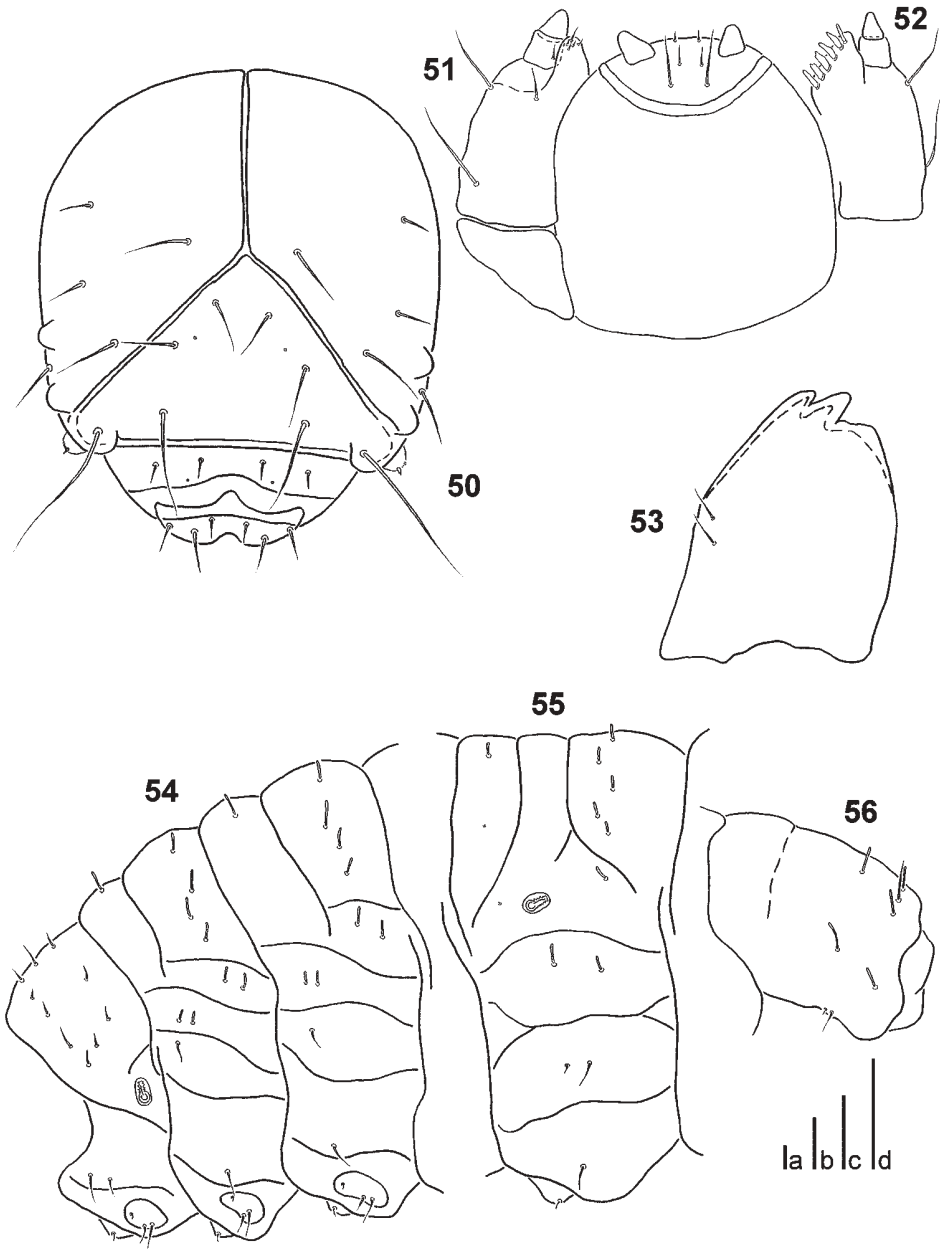

**Figs 29–35.** *Hypera arundinis*: (29) head, (30) labium and maxilla, (31) maxilla, (32) mandible, (33) thorax, (34) abdominal segment IV, (35) abdominal segment IX; Figs 29, 31–32 dorsal view, Fig. 30 ventral view and Figs 33–35 lateral view. Scale bar 0.1 mm: a – Figs 33–35; b – Fig. 30–31; c – Figs 29; d – Fig. 32.



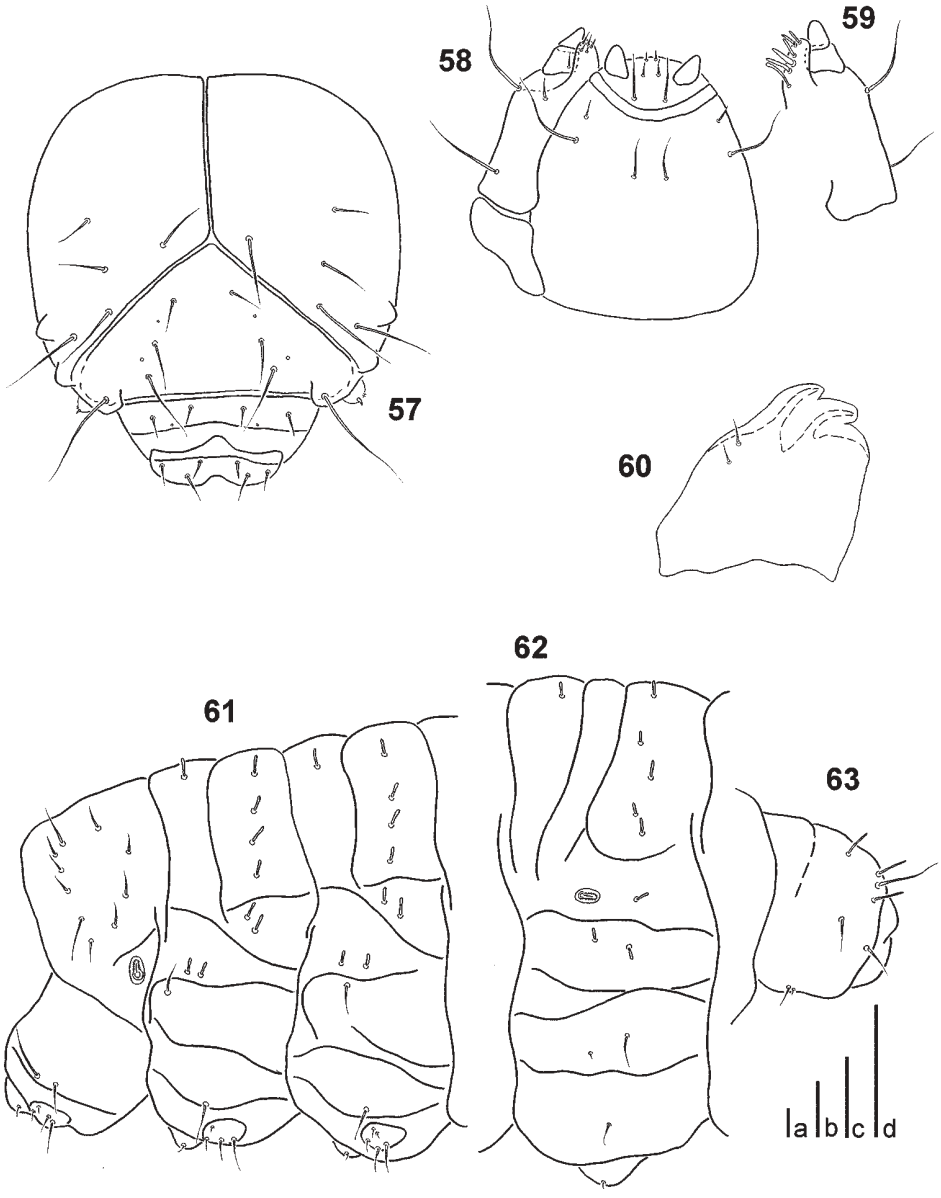

**Figs 36–42.** *Hypera rumicis*: (36) head, (37) labium and maxilla, (38) maxilla, (39) mandible, (40) thorax, (41) abdominal segment IV, (42) abdominal segment IX; Figs 36, 38–39 dorsal view, Fig. 37 ventral view and Figs 40–42 lateral view. Scale bar 0.1 mm: a – Figs 40–42; b – Fig. 36; c – Figs 37–38; d – Fig. 39.



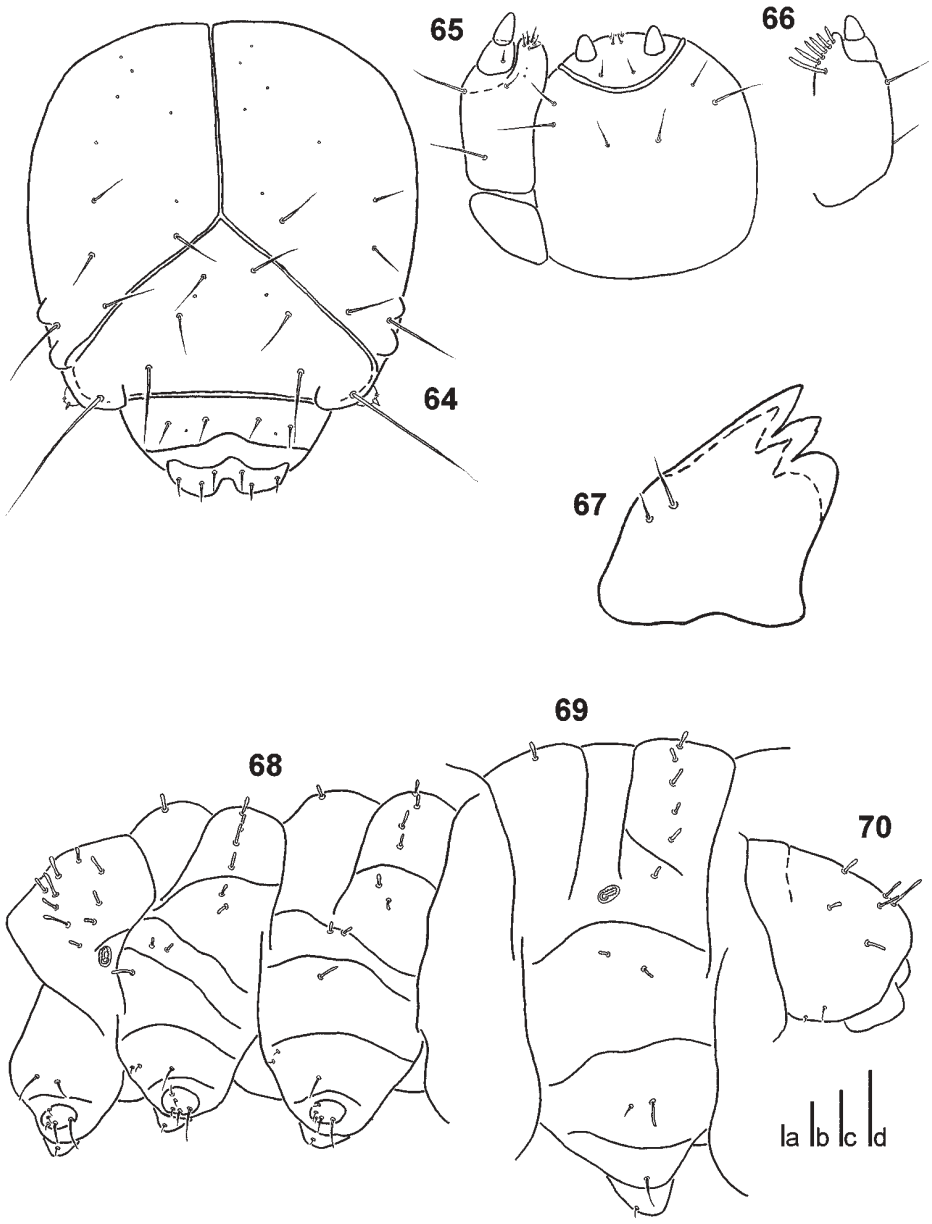

**Figs 43–49.** *Hypera contaminata*: (43) head, (44) labium and maxilla, (45) maxilla, (46) mandible, (47) thorax, (48) abdominal segment IV, (49) abdominal segment IX; Figs 43, 45–46 dorsal view, Fig. 44 ventral view and Figs 47–49 lateral view. Scale bar 0.1 mm: a – Figs 47–49; b – Fig. 43; c – Figs 44–45; d – Fig. 46.




**Figs 50–56.** *Hypera kayali*: (50) head, (51) labium and maxilla, (52) maxilla, (53) mandible, (54) thorax, (55) abdominal segment IV, (56) abdominal segment IX; Figs 50, 52–53 dorsal view, Fig. 51 ventral view and Figs 54–56 lateral view. Scale bar 0.1 mm: a – Figs 54–56; b – Fig. 50; c – Figs 51–52; d – Fig. 53.




**Figs 57–63.** *Hypera striata*: (57) head, (58) labium and maxilla, (59) maxilla, (60) mandible, (61) thorax, (62) abdominal segment IV, (63) abdominal segment IX; Figs 57, 59–60 dorsal view, Fig. 58 ventral view and Figs 61–63 lateral view. Scale bar 0.1 mm: a – Figs 61–63; b – Fig. 57; c – Figs 58–59; d – Fig. 60.




**Figs 64–70.** *Hypera diversipunctata*: (64) head, (65) labium and maxilla, (66) maxilla, (67) mandible, (68) thorax, (69) abdominal segment IV, (70) abdominal segment IX; Figs 64, 66–67 dorsal view, Fig. 65 ventral view and Figs 68–70 lateral view. Scale bar 0.1 mm: a – Figs 68–70; b – Fig. 64; c – Figs 65–66; d – Fig. 67.

## 2.3. Descriptions of larvae of the tribe Hyperini (Coleoptera: Curculionidae): III. Mature larvae of the genus *Donus* [submitted in *Zootaxa*]

# Descriptions of larvae of the tribe Hyperini (Coleoptera: Curculionidae): III. Mature larvae of the genus *Donus*

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**Abstract**

Descriptions of mature larvae of ten species of the genus *Donus* Jekel, 1865 are given: larvae of *D. austerus* (Boheman, 1834); *D. cyrtus* (Germar, 1821); *D. osellai* Winkelmann, 2001 and *D. reichei* (Capiomont, 1868) are described for the first time, larvae of *D. comatus* (Boheman, 1842); *D. oxalidis* (Herbst, 1795); *D. palumbarius* (Germar, 1821) and *D. tesselatus* (Herbst, 1795) are described for the first time in detail and larvae of *D. crinitus* (Boheman, 1834) and *D. intermedius* (Boheman, 1842) are redescribed. An identification key so far known for the mature larvae of twenty-nine Hyperini-species is presented.

**Key words:** Taxonomy, morphology, larva, chaetotaxy, key, Coleoptera, Curculionidae, Hyperini, *Donus*, Palaearctic region

## Introduction

The genus *Donus* Jekel, 1865 currently includes more than 115 Palaearctic species (Smreczyński 1968). The last taxonomical revision was published more than 100 years ago by Petri (1901), who divided the genus *Donus* into 10 groups. He used for the genus *Donus* the synonym *Hypera* Capiomont, 1868 in his revision. Alonso-Zarazaga & Lyal (1999) divided the genus *Donus* into two genera: *Neoglanis* Alonso-Zarazaga & Lyal, 1999 and *Donus*. Later, Alonso-Zarazaga & Lyal (2002) transfered the subgenus *Antidonus* Bedel, 1886 from the genus *Hypera* Germar, 1817 to the genus *Donus* without any discussion of this nomenclatorical change. In the same paper, the first group of *Donus* "*Pachypera*" has been classified as separate genus, also without any

discussion of this nomenclatorical change. This is why the concept of *Donus* published by Petri (1901) is accepted here. It is still not exists any revision with discussion of these nomenclatorical changes. The majority of specialists on weevils are not able to resolve which species are belong to each group and that it is the reason for not acception new changes without any discussion about these problems.

Descriptions of larvae of species of the genus *Donus* Jekel, 1865 are very scarce with a few exception (Zaslavskij 1959, Scherf 1964, Dieckmann 1989, Nazarenko 1998, 2000a, 2000b). Some papers (Dieckmann 1989) include only descriptions of body colouration and size and lack precise data on the morphology and chaetotaxy. Descriptions of larvae by Nazarenko (1998, 2000a, 2000b) are detail, but unfortunately he used in ever paper other nomenclature of chaetotaxy. In one his papers, Nazarenko (2000a) used the combination of two nomenclature (Emden 1952 and Scherf 1964). In the recent, the nomenclature of Curculionoidea is listed in May (1994), but unfortunately her nomenclature is not identical with that used for other groups of beetles. The most important papers about Hyperini larvae were written by Anderson (1948) and Zaslavskij (1959). These papers include some basic characters and an identification key and can still be used to identify larvae.

This paper provides detailed descriptions of larvae of ten species *Donus*. Larvae of *D. austerus* (Boheman, 1834); *D. cyrtus* (Germar, 1821); *D. osellai* Winkelmann, 2001 and *D. reichei* (Capiomont, 1868) are described for the first time, larvae of *D. comatus* (Boheman, 1842); *D. oxalidis* (Herbst, 1795); *D. palumbarius* (Germar, 1821) and *D. tesselatus* (Herbst, 1795) are described for the first time in detail and larvae of *D. crinitus* (Boheman, 1834) and *D. intermedius* (Boheman, 1842) are redescribed. An identification key so far known for the mature larvae of twenty-nine Hyperini-species is presented. This paper is the third part of author's project focused on the morphology of larval of Hyperinae.

## Material and methods

*Larvae examined.* The study is based on the examination of larvae collected in the field and reared to the adult stage. All adults were identified by the author. Information on the origin of the larvae and their host plants are given for each species described. Localities in the Czech and Slovak Republics include numbers map squares assigned by the software FAUNA 2002 and compared to Pruner & Míka (1996). Larvae of all ten

species were reared in a laboratory of the Department of Zoology, Charles University, Prague, during the years 2001-2005.

*Preparation.* Larvae were fixed in Pampel liquid (4 parts glacial acetic acid, 6 parts 4% formaldehyde, 15 parts 95% ethyl alcohol and 30 parts distilled water) (Švácha & Danilevsky 1987). Slides were prepared as follows (for details see May (1993, 1994)): a larva was decapitated. Its head was placed in lactic acid for one or two weeks to digest the soft tissues. After that, the mouthparts were separated from the head capsule. All body parts were then mounted on temporary slides in glycerine. All this material (slides, weevils, larvae) is deposited in the collection of the author.

*Measurements.* Material (slides and larvae) was examined under a binocular microscope SZ X9 (Olympus) or light microscope BX 40 (Olympus). Measurements were made using calibrated oculars. The following characters of each specimens were measured: (1) head width (HW), (2) head length (LW), (3) length of the body (larvae fixed in a "C"-shape were measured in segments) and (4) width of abdominal segment IV. The measurements 1 and 2 are presented in the descriptions of the species and in Table. 1. As the thorax and abdomen are not sclerotized and may be affected by the fixation process, size measurements (3) and (4) are given only for comparison (Table. 1).

*Illustrations.* Drawings were made using drawing tube on binocular microscope or microscope and processed in the computer (Adobe Photoshop, Corel Draw 9).

For easy description, four types of trichoid seta are recognized (see Skuhrovec 2005: figs 1-4).

Apex of mandible has four (see Figs 4, 11, 25, 32, 39, 46, 53, 67) or five lobes (see Figs 18, 60). The number of lobes and teeth do not agree. The last lobe does not bear a tooth, its only connection is with the incisor area of the mandible (K. Hůrka, pers. comm.).

The spiraculum on the prothorax in the drawings of the thorax (see Figs 5, 12, 19, 26, 33, 40, 47, 54, 61, 68) is in fact of mesothoracic origin as in all other insects (Marvaldi et al. 2002, Marvaldi 2003). In the descriptions of species, this spiraculum is refered to as being on the mesothorax. Drawings of the thoracic and abdominal spiracula are schematic (see Figs 5, 6, 12, 13, 19, 20, 26, 27, 33, 34, 40, 41, 47, 48, 54, 55, 61, 62, 68, 69).

Chaetotaxy on the postdorsum of abdominal segments I-VIII is as follows: between *pds1* and *pds5* there is an imaginary line. The species differ from each other in the position of the setae, *pds2-4*. These can be on this line, or be shifted anteriad or posteriad relative to it. For the abdominal segments VI-VIII, which differ from the general plan described for the remaining segments, only the differences from the general plan are mentioned.

Chaetotaxy on the pedal lobe of the thorax is as follows: two long setae (*pda1-2*) and a few minute setae (*pda*) are always present. Number of setae on the pedal lobes is variable because of the variable number of minute setae. The most frequent number of setae is presented in the descriptions. The variability is presented in brackets.

The minute setae on the ventral side of the mala and on the pedal lobe of the thorax, are trichoid setae. More minute setae may be present in these regions, however a scanning electron microscope is necessary for a more precise examination of these setae. That is why these characters are not used for identifying the species. A description of the epipharynx is omitted for the same reason. Seta *sts3* is possibly situated on the palpifer, however, this problem is not resolved here.

*Terminology.* Names and abbreviations of the setae of the mature larva follows May (1994) (see Skuhrovec 2005: figs 46-54). May (1994) uses this nomenclature for all Curculionoidea, but unfortunately her nomenclature is not identical with that used for other groups of beetles (e.g. Bousquet & Goulet 1984 – Carabidae, Švácha & Danilevsky 1987 – Cerambycidae). Even though it may be neccessary to solve this problem if comparing the nomenclature used for various groups of beetles, such a comparison is not the goal of this paper.

The species are arranged alphabetically. In the descriptions, the following information is presented: references to previous descriptions, list of material examined, detailed description of the morphology of mature larva and a comparison with previously published data.

## Descriptions of the mature larva of the genus *Donus*

COLOURATION. Head brown, maculate or black. Dorsal side of body mostly green with slightly white median stripe; ventral side of body whitish to white-green.

HEAD. Frontal sutures distinct, slender. Frontoclypeal suture slightly concave medially. Two convex stemmata on each side of epicranium. Clypeus slender, anterior margin distinctly concave and pigmented. Labrum with anterior margin bearing slender median excision; lateral margins rounded; posterior margin with median projection (Fig. 1); connected with clypeus by clypeolabral membrane. Antennae monomerous, membranose. Mandibles with three or four teeth apically (Figs 4, 18), subapical tooth larger than apical tooth; basal part of mandible with distinct tuberosity. Maxilla consisted from cardo, stipes, mala and two palpomeres of maxillary palpi. Cardo, stipes, mala and distal parts of palpomeres pigmented. Maxilla connected with labium, forming labiomaxillar complex. Labium consisted from postlabium, prelabium, monomerous labial palpi and ligula. Membranose prelabium divided from membranose postlabium by a sclerotizated "U" shaped.

THORAX (Fig. 5). Prothorax divided in five areas: pronotum, dorsopleural, ventropleural, pedal and mediosternal lobes. Dorsopleural and ventropleural lobes not distinctly divided. Meso- and metathorax divided into seven areas: dorsal lobe, dorsolateral lobe, spiracular area, dorsolateral, ventrolateral, pedal and mediosternal lobes. Dorsal lobe subdivided by a diagonal groove into prodorsum and postdorsum. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned postero-dorsad.

ABDOMEN (Figs 6, 7). Includes ten distinct segments. Abdominal segments I-VIII divided into six areas: dorsal lobes, spiracular areas, dorsopleural, ventropleural, laterosternal and mediosternal lobes. Dorsal lobes on abdominal segments I-VII subdivided by two diagonal groove into prodorsum, dorsum and postdorsum. Dorsum very gracile, without setae. Dorsal lobe on abdominal segment VIII subdivided only by one diagonal groove into prodorsum and postdorsum. Spiracula on abdominal segments I–VIII situated above dorsopleural lobes; with oval peritrema positioned posteriad. Abdominal segment IX divided into three areas: dorsal, pleural and sternal lobes. Abdominal segment X reduced, without setae.

CHAETOTAXY. **Head.** Dorsum of epicranium with five setae (*des1-5*); *des1, des3* and *des5* positioned along frontal suture; *des2* and *des4* on lateral margin of head, latter setae shorter than *des1, des3* and *des5* (Fig. 1). Both lateral setae (*les1-2*) of epicranium long, located under stemmata. Ventral setae (*ves1-2*) short, located on anterior part on ventrum of epicranium. Frons with four setae (*fs1-5*, *fs2* missing); *fs4* and *fs5* located on anterior part, *fs5* the longest, *fs1* and *fs3* the shortest (Fig. 1). Clypeus with two setae on

lateral margins (*cls1-2*), labrum with three setae (*lrms1-3*) (both Fig. 1). Mandible with two setae (*mds1-2*) on lateral margin (Fig. 4). Stipes with two long and one short seta (*sts1-3*) (Fig. 2). Mala with six stout setae (*dms1-6*) on dorsal side (Fig. 3) and five minute setae (*vms1-5*) on ventral side. Maxillary palpi with one minute seta (*mxps*). Postlabium with three pairs (*plbs1-3*) and prelabium with one pair of setae (*prms*). Ligula with two pairs of minute setae (*lig*) (all Fig. 2).

**Thorax** (Figs 5, 12, 26, 68). Bases of setae pigmented. *Prothorax*: pronotum with ten hairform or bacilliform setae (*prn1-10*); dorsal margin of triangular plate with three setae (*prn1-3*), anterior margin of sclerite with four setae (*prn4-7*), posterior margin of sclerite with three setae (*prn8-10*). Ventropleural lobe with two hairform setae (*vpls1-2*). Pedal lobe with four (from three to six) hairform setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining setae minute. Mediosternal lobe with one very short or minute seta (*msts*). *Meso- and metathorax*: prodorsum with one seta (*prs*), postdorsum with four setae (*pds1-4*). Dorsolateral area with two setae (*dls*), in spiracular area two setae (*ss*). Setae hairform to bacilliform. Dorsopleural lobe with one seta (*dpls*). Ventropleural lobe with 1 hairform seta (*vpls*), positioned above pedal lobe. Pedal lobe with four (from three to six) hairform setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining setae minute. Mediosternal lobe with one very short or minute seta (*msts*).

**Abdomen.** Bases of setae pigmented. *Abdominal segments I-VIII* (Figs 6, 13, 27, 41): prodorsum with one or two setae (*prs*); postdorsum with five setae (*pds1-5*). Spiracular seta (*sps*) located postero-dorsally from spiraculum. Dorsopleural lobe with two setae (*dpls1-2*). Setae hairform or bacilliform to clubform. Ventropleural lobe with two hairform setae, *vpls2* minute. Laterosternal lobe with one short hairform seta (*lsts*). Mediosternal lobe with one very short hairform seta (*msts*). *Abdominal segment IX* (Figs 7): dorsum with four hairform or bacilliform setae (*ds1-4*); *ds2-4* positioned in a line, sometimes *ds3* anteriad of line joining *ds2* and *ds4*; *ds3* the longest. Pleural lobe with two hairform or bacilliform setae (*ps*). Sternal lobe with two hairform setae (*sts*).

## Descriptions of species

### *Donus austerus* (Boheman, 1834)

**Material.** (5 mature larvae), collected in the field: PORTUGAL mer., prov. Algarve, 12 km S of Monchique (Serra da Monchique), 43 m a.s.l., 16.iv.2004, J. Skuhrovec leg. (5) (on Polygonaceae).

**Differential diagnosis.** Mandible with three teeth (x *D. crinitus, D. reichei* and *Hypera*-species) (Fig. 4). *Prs* and *pds1-4* on thoracal segments bacilliform (x *D. comatus*, *D. cyrtus*, *D. oxalidis*, *D. palumbarius* and *D. tesselatus*). *Pds2* on dorsum of meso- and metathorax not the shortest seta (x *D. palumbarius* and *D. tesselatus*). *Pds2* and *pds3* on meso- and metathorax not close each other (x *D. intermedius*, *D. oxalidis* and *D. tesselatus*) (all Fig. 5). *Prn*, *prs* and *pds1-4* on thoracal segments and *prs*, *pds1-5* on abdominal segments I-VIII short (x *D. cyrtus*, *D. intermedius* and *D. oxalidis*) (Figs 5-6). *Prs* and *pds1-5* on abdominal segments I-VIII bacilliform or clubform (x *D. comatus*, *D. cyrtus* and *D. oxalidis*). Prodorsum of abdominal segments I-VII only with one seta (*prs*) (x *D. osellai*). *Pds1-5* in line on abdominal segments I-VII, not *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5* (x *D. cyrtus*, *D. intermedius*, *D. oxalidis* and *D. tesselatus*). *Pds4* on dorsum of abdominal segments I-VI not the longest seta (x *D. palumbarius*) (all Fig. 6).

**Description of mature larva.**

COLORATION. Head orange, posterior and lateral margins of epicranium dark brown. Dorsal side of body green with slightly white median stripe.

HEAD. Head width 1.09 mm (1.05–1.18 mm), head length 1.00 mm (0.95–1.05 mm) (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus distinctly concave (Fig. 1) with weak pigmentation. Labrum pale brown; anterior margin with slender median excision, posterior margin with long and wide median projection (Fig. 1). Mandibles with three sharp teeth apically (Fig. 4), second tooth largest; basal part of mandible with distinct tuberosity.

THORAX. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned posterio-dorsad.

ABDOMEN. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned dorsad.

CHAETOTAXY. **Head.** Setae hairform. *Des2* minutely shorter than *des4*; *des2* about 0.6 x *des1*and *des5*, approximately of same length; about 0.6 x *des3* (Fig. 1). Both *les* long, *les1* about 0.7 x *les2*. Both *ves* short. *Fs1* and *fs3* minutely shorter than *fs4*; *fs4*

about 0.4 x *fs5* (Fig. 1). Both *cls* short, *lrms1-3* short (Fig. 1). *Mds1* short, about 0.4 x *mds2* (Fig. 4). *Sts1-2* long, *sts3* about 0.5 x *sts1-2* (Fig. 2). *Dms1-6* stout (Fig. 3), *vms1-5* minute. *Mxps* short. *Plbs1* about 0.7 x long *plbs2*, *plbs3* very short, about 0.3 x *plbs1*; *prms* as *plbs1*; both *lig* minute (Fig. 2).

**Thorax** (Fig. 5). Bases of setae strongly pigmented, setae unpigmented. Setae short, bacilliform to hairform (*vpls*, *pda*, *msts*). *Prothorax*: *prn1-2* and *prn9-10* short, about 0.5 x *prn3-8*, long, approximately of same length. *Vpls1-2* short, approximately of same length. Pedal lobe with three (three to five) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining one (one to three) setae minute. *Msts* minute. *Meso- and metathorax*: *prs* long, *pds1-4* short, about 0.5 x *prs*. Both *dls* and *ss* short as *pds1-4*. *Dpls* minutely longer than *ss1-2*. *Vpls* minutely longer than *dpls*. Pedal lobe with three (three to five) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining one (one to three) setae minute. *Msts* minute.

**Abdomen.** Bases of setae strongly pigmented, setae unpigmented. Setae long, bacilliform to hairform (*vpls*, *lsts*, *msts*). *Abdominal segments I-VIII* (Fig. 6): *pds1-5* approximately in line, *pds2* positioned slightly anteriad; short, approximately of same length. *Sps* shorter than *prs*. Both *dpls* short, approximately of same length. *Vpls2* longer than remaining setae on abdomin, *vpls1* minute. *Lsts* long as *vpls2*, *msts* minute. *Abdominal segment VII(VIII)*: *pds3* longer than remaining setae, about 0.8 x. *Abdominal segment IX* (Fig. 7): *ds1-4* bacilliform; *ds2-4* not in line, *ds3* posteriad of line joining *ds2* and *ds4*; *ds3* the longest, remaining three setae approximately of same length, about 0.6 x *ds3*. *Ps1-2* bacilliform, about 0.5 x *ds1*. Both *sts* hairform, *sts1* minute, *sts2* short.

***Donus comatus* (Boheman, 1842)**

Dieckmann 1989: 99.

**Material.** (7 mature larvae), collected in the field: CZ–Moravia bor., Hrubý Jeseník Mts., Karlov env., NPR Velký kotel, 29.vi.2003, J. Skuhrovec leg. (7) (on *Chaerophyllum hirsutum* L.).

**Differential diagnosis.** Mandible with three teeth (x *D. crinitus, D. reichei* and *Hypera*-species) (Fig. 11). *Prn*, *prs* and *pds1-4* on thoracal segments hairform (x *D. austerus*, *D. intermedius*, *D. osellai*, *D. reichei* and *D. tesselatus*). *Pds2* on dorsum of meso- and metathorax not the shortest seta (x *D. palumbarius* and *D. tesselatus*). *Pds2*

and *pds3* on meso- and metathorax not close each other (x *D. intermedius*, *D. oxalidis* and *D. tesselatus*) (all Fig. 12). *Prn*, *prs* and *pds1-4* on thoracal segments and *prs*, *pds1-5* on abdominal segments I-VIII short (x *D. cyrtus*, *D. intermedius* and *D. oxalidis*) (Figs 12-13). *Prs* and *pds1-5* on abdominal segments I-VIII hairform (x *D. austerus*, *D. crinitus*, *D. intermedius*, *D. osellai*, *D. palumbarius*, *D. reichei* and *D. tesselatus*). Prodorsum of abdominal segments I-VII only with one seta (*prs*) (x *D. osellai*). *Pds1-5* on abdominal segments I-VII in line, not *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5* (x *D. cyrtus*, *D. intermedius*, *D. oxalidis* and *D. tesselatus*). *Pds4* on dorsum of abdominal segments I-VI not the longest seta (x *D. palumbarius*) (all Fig. 13).

**Description of mature larva.**

COLORATION. Head orange, posterior and lateral margins of epicranium dark brown. Dorsal side of body green with slightly white median stripe and short white stripes along median stripe.

HEAD. Head width 1.07 mm (1.00–1.13 mm), head length 0.99 mm (0.93–1.03 mm) (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus distinctly concave (Fig. 8) with weak pigmentation. Labrum pale brown; anterior margin with slender median excision, posterior margin with long and wide median projection (Fig. 8). Mandibles with three sharp teeth apically (Fig. 11), first tooth largest; basal part of mandible with distinct tuberosity.

THORAX. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.

ABDOMEN. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned posteriad.

CHAETOTAXY. **Head.** Setae hairform. *Des2* minutely shorter than *des4*; *des2* about 0.6 x *des1*and *des5*, approximately of same length; about 0.8 x *des3* (Fig. 8). Both *les* long, *les1* about 0.7 x *les2*. Both *ves* short. *Fs1* and *fs3* shorter than *fs4*; *fs4* about 0.5 x *fs5* (Fig. 8). Both *cls* short, *lrms1-3* short (Fig. 8). Both *mds* long (Fig. 11). *Sts1-2* long, *sts3* short, about 0.4 x *sts1-2* (Fig. 9). *Dms1-6* stout (Fig. 10), *vms1-5* minute. *Mxps* very short. *Plbs1-2* long, *plbs3* very short, about 0.3 x *plbs1-2*; *prms* long as *plbs3*; *lig1* very short, *lig2* minute (Fig. 9).

**Thorax** (Fig. 12). Bases of setae strongly pigmented, setae unpigmented. Setae hairform. *Prothorax*: *prn2-6* and *prn9-10* short, approximately of same length; *prn1*, *7-8*

shorter than remaining setae. *Vpls1-2* approximately of same length. Pedal lobe with three (three to four) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining one (one to two) seta minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1-4* short, approximately of same length, *pds1* slightly longer. Both *dls* shorter than *prs*, setae *ss* long as *dls*. *Dpls* longer than *prs*, *vpls* shorter than *dpls*. Pedal lobe with three (three to four) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining remaining one (one to two) seta minute. *Msts* minute.

**Abdomen.** Bases of setae strongly pigmented, setae unpigmented. Setae hairform. *Abdominal segments I-VIII* (Fig. 13): *pds1*, *pds3*, and *pds5* approximately in line, *pds2* and *pds4* positioned slightly anteriad; *pds1*, *pds3*and *pds5* approximately of same length, *pds3* slightly longer; *pds2* and *pds4* about 0.8 x. *Sps* short as *prs* and *pds1*. Both *dpls* long, approximately of same length. *Vpls2* long, *vpls1* minute. *Lsts* very short, *msts* minute. *Abdominal segment VII*: *pds3* longer than remaining setae, about 0.7 x. *Abdominal segment VIII*: *pds2* and *pds4* positioned more anteriad from line joining *pds1* and *pds5* than on abdominal segments I-VII, *pds2* positioned more anteriad than *pds4*; *pds1, pds3* and *pds5* approximately in line; *pds3* longer than remaining setae, about 0.7 x. *Abdominal segment IX* (Fig. 14): *ds2-4* not in line, *ds3* anteriad of line joining *ds2* and *ds4*; *ds3-4* longer than *ds1-2*. Both *ps* long as *ds1-2*; *sts1* very short, *sts2* minute.

**Remarks.** Dieckmann (1989) mentioned only colouration of the body and setae; his data agree with that presented here.

***Donus crinitus* (Boheman, 1834)**

Baccetti 1958: 161-173, figs VIII-XVI.

**Material.** (6 mature larvae), collected in the field: GREECE mer., prov. Peloponnesse, Skala env. (Lakonia), 50 km SE of Sparti, 36 m a.s.l., 4.iv.2005, J. Skuhrovec leg. (6) (on *Medicago* sp.).

**Differential diagnosis.** Mandible with four teeth (x *D. austerus*, *D. comatus*, *D. cyrtus*, *D. intermedius*, *D. osellai*, *D. oxalidis*, *D. palumbarius*, *D. tesselatus* and *Hypera*-species (subgenera *Eririnomorphus*, *Dapalinus*, *Boreohypera* and *Hypera* s.str.)) (Fig. 18). *Prn1-10* hairform (x *D. austerus*, *D. intermedius*, *D. osellai*, *D. reichei*,

*D. tesselatus*, *H. lunata* and *H. zoila*). *Prs* and *pds1-4* on thoracal segments bacilliform (x *D. comatus*, *D. cyrtus*, *D. oxalidis*, *D. palumbarius*, *D. tesselatus*, *H. dauci* and *H. vidua*). *Pds2* on dorsum of meso- and metathorax not the shortest seta (x *D. palumbarius* and *D. tesselatus*). *Pds2* and *pds3* on meso- and metathorax not close each other (x *D. intermedius*, *D. oxalidis* and *D. tesselatus*). *Dpls* on meso- and metathorax hairform (x *D. austerus*, *D. intermedius*, *D. reichei* and *H. zoila*) (all Fig. 19). *Prn*, *prs* and *pds1-4* on thoracal segments and *prs*, *pds1-5* on abdominal segments I-VIII short (x *D. cyrtus*, *D. intermedius*, *D. oxalidis*, *H. dauci* and *H. vidua*) (Figs 19-20). *Prs* and *pds1-5* on abdominal segments I-VIII bacilliform (x *D. comatus*, *D. cyrtus*, *D. oxalidis*, *D. tesselatus*, *H. dauci* and *H. vidua*). Prodorsum of abdominal segments I-VII only with one seta (*prs*) (x *D. osellai*). *Pds1-5* in line on abdominal segments I-VII, not *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5* (x *D. cyrtus*, *D. intermedius*, *D. oxalidis*, *D. tesselatus*, *H. dauci* and *H. vidua*). *Pds4* on dorsum of abdominal segments I-VI not the longest seta (x *D. palumbarius*) (all Fig. 20). *Ds3* long as *ds1-2*, *4* (x *D. reichei*, *H. lunata*, *H. vidua* and *H. zoila*) (Fig. 21).

**Description of mature larva.**

COLORATION. Head pale brown, posterior and lateral margins of epicranium dark brown. Dorsal side of body green with slightly white median stripe.

HEAD. Head width 1.12 mm (1.05–1.18 mm), head length 1.03 mm (0.95–1.05 mm) (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus distinctly concave (Fig. 15) with weak pigmentation. Labrum pale brown; anterior margin with slender median excision, posterior margin with short and wide median projection (Fig. 15). Mandibles with four apically rounded teeth (Fig. 18), first tooth largest; basal part of mandible with distinct tuberosity.

THORAX. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned posterio-dorsad.

ABDOMEN. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned posterio-dorsad.

CHAETOTAXY. **Head.** Setae hairform. *Des2* minutely shorter than *des4*; *des1*, *des3* and *des5* approximately of same length; about 1.3 x *des2* (Fig. 15). Both *les* long, *les1* about 0.7 x *les2*. Both *ves* short. *Fs3* the shortest, about 0.75 x *fs1*; *fs1* about 0.7 x *fs4*; *fs4* about 0.7 x *fs5* (Fig. 15). Both *cls* short, *lrms1-3* short (Fig. 15). Both *mds* short (Fig. 18). *Sts1-2* long, *sts3* about 0.5 x *sts1-2* (Fig. 16). *Dms1-6* stout (Fig. 17), *vms1-5*

minute. *Mxps* very short. *Plbs1* short, about 0.5 x long *plbs2*, *plbs3* very short, about 0.4 x *plbs2*; *prms* minutely longer than *plbs2*; both *lig* minute (Fig. 16).

**Thorax** (Fig. 19). Bases of setae strongly pigmented, setae unpigmented. Setae short, bacilliform to hairform (*prn*, *dpls*, *vpls*, *pda*, *msts*). *Prothorax*: *prn1* and *prn7-10* short, about 0.7 x *prn2-6*, approximately of same length. *Vpls2* short, about 0.4 x *vpls1*. Pedal lobe with three (three to five) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining one (one to three) seta minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1-4* short, approximately of same length, *prs* slightly longer. Both *dls* and *ss* short, as long as *pds1-4*. *Dpls* and *vpls* longer than remaining setae on meso- or metathorax. Pedal lobe with three (three to five) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining one (one to three) seta minute. *Msts* minute.

**Abdomen.** Bases of setae strongly pigmented, setae unpigmented. Setae short, bacilliform to hairform (*vpls*, *lsts*, *msts*). *Abdominal segments I-VIII* (Fig. 20): *prs* minutely longer than *pds1-5*. *Pds1-5* approximately in line, *pds2* and *pds4* positioned slightly anteriad, *pds3* slightly posteriad; *pds1-5* short, approximately of same length, *pds3* slightly longer. *Sps* about 0.5 x *prs*. Both *dpls* approximately of same length, as long as *prs*. *Vpls2* long, *vpls1* minute. *Lsts* long, *msts* minute. *Abdominal segment VII*: *pds3* longer than remaining setae about 0.8 x. *Abdominal segment VIII*: *pds2* and *pds4* positioned more anteriad from line joining *pds1* and *pds5* than on abdominal segments I-VII, *pds4* positioned more anteriad than *pds2*; *pds1, pds3* and *pds5* approximately in line; *pds3* longer than remaining setae about 0.7 x. *Abdominal segment IX* (Fig. 21): *ds2-4* not in line, *ds3* posteriad of line joining *ds2* and *ds4*; *ds2* the longest, remaining three setae approximately of same length. Both *ps* short; *sts1* very short, *sts2* minute.

**Remarks.** Baccetti (1958) presented detailed description of mature larva including several figures. Unfortunately, the nomencalture of larval morphology and chatetotaxy is unnoticed.

***Donus cyrtus* (Germar, 1821)**

**Material.** (11 mature larvae), collected in the field: GREECE mer., prov. Peloponnesse, Kladas env. (Lakonia), 5 km NE of Sparti, 251 m a.s.l., 10.iv.2005, J. Skuhrovec leg. (11) (on Apiaceae).

**Differential diagnosis.** Mandible with three teeth (x *D. crinitus, D. reichei* and *Hypera*-species) (Fig. 25). *Plbs3* short, about 0.5 x *plbs2* (x *D. oxalidis*) (Fig. 23). *Prn*, *prs* and *pds1-4* on thoracal segments hairform (x *D. austerus*, *D. intermedius*, *D. osellai*, *D. reichei* and *D. tesselatus*). *Pds2* on dorsum of meso- and metathorax not the shortest seta (x *D. palumbarius* and *D. tesselatus*). *Pds2* and *pds3* on meso- and metathorax not close each other (x *D. intermedius*, *D. oxalidis* and *D. tesselatus*) (all Fig. 26). *Prn*, *prs* and *pds1-4* on thoracal segments and *prs*, *pds1-5* on abdominal segments I-VIII very long (x *D. austerus*, *D. comatus*, *D. crinitus*, *D. osellai*, *D. palumbarius*, *D. reichei* and *D. tesselatus*) (Figs 26-27). *Prs* and *pds1-5* on abdominal segments I-VIII hairform (x *D. austerus*, *D. crinitus*, *D. intermedius*, *D. osellai*, *D. palumbarius*, *D. reichei* and *D. tesselatus*). Prodorsum of abdominal segments I-VII only with one seta (*prs*) (x *D. osellai*). *Pds1-5* on abdominal segments I-VII not in line, *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5* (x *D. austerus*, *D. comatus*, *D. crinitus*, *D. osellai*, *D. palumbarius* and *D. reichei*). *Pds4* on dorsum of abdominal segments I-VI not the longest seta (x *D. palumbarius*) (all Fig. 27).

**Description of mature larva.**

COLORATION. Head pale brown maculate, posterior margin of epicranium dark. Dorsal side of body green with slightly white median stripe.

HEAD. Head width 0.97 mm (0.85–1.03 mm), head length 0.89 mm (0.78–0.95 mm) (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus weak concave (Fig. 22) with weak pigmentation. Labrum dark brown; anterior margin with deep median excision, posterior margin with short and wide median projection (Fig. 22). Mandibles with three apically rounded teeth (Fig. 25), second tooth largest; first two slightly smaller.

THORAX. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned posterio-dorsad.

ABDOMEN. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned posteriad.

CHAETOTAXY. **Head.** Setae hairform. *Des2* minutely shorter than *des4*; *des4* about 0.7 x remaining three setae (*des1, des3, des5*) (Fig. 22). Both *les* long, *les1* about 0.7 x *les2*. Both *ves* short. *Fs1* and *fs3* shorter than *fs4*, about 0.7 x; *fs4* about 0.6 x *fs5* (Fig. 22). Both *cls* short, *lrms1-3* short (Fig. 22). Both *mds* short (Fig. 25). *Sts1-2* long, *sts3*

shorter than two previous setae, about 0.4 x (Fig. 23). *Dms1-6* stout (Fig. 24), *vms1-5* minute. *Mxps* very short. *Plbs1-2* long, *plbs3* very short, about 0.4 x *plbs1-2*; *prms* about 0.8 x *plbs2*; both *lig* minute (Fig. 23).

**Thorax** (Fig. 26). Bases of setae strongly pigmented, setae unpigmented. Setae long, hairform. *Prothorax*: *prn1-10* long; approximately of same length. *Vpls1* about 0.5 x *vpls2*. Pedal lobe with four (three to five) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining two (one to three) setae minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1-4* very long, approximately of same length. Both *dls* and *ss* long, minutely shorter than *prs*. *Dpls* and *vpls* as long as *dls*. Pedal lobe with four (three to five) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining two (one to three) setae minute. *Msts* minute.

**Abdomen.** Bases of setae strongly pigmented, setae unpigmented. Setae long, hairform. *Abdominal segments I-VIII* (Fig. 27): *pds1*, *pds3* and *pds5* approximately in line, *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5*; *prs* and *pds1-5* very long, approximately of the same length. *Sps* long, about 0.5 x *prs*. Both *dpls* long, about 0.7 x *prs*. *Vpls2* very long, *vpls1* minute. *Lsts* long, *msts* minute. *Abdominal segment VII*: *pds3* very long, remaining setae about 0.8 x. *Abdominal segment VIII*: *pds2* positioned more anteriad to *pds3* and *pds4* more anteriad to *pds5*; *pds1, pds3* and *pds5* approximately in line; *pds3* very long, remaining setae about 0.8 x. *Abdominal segment IX* (Fig. 28): *ds2-4* in line; *ds1-4* very long, approximately of same length. Both *ps* long. *Sts1* very short, *sts2* minute.

***Donus intermedius* (Boheman, 1842)**

Dieckmann 1989: 98.

**Material.** (5 mature larvae), collected in the field: SLOVAKIA mer. (7677), Čajkov env., vill. Rybnik, 25.v.2002, J. Skuhrovec leg. (5) (on *Centaurea jacea* L.).

**Differential diagnosis.** Mandible with three teeth (x *D. crinitus, D. reichei* and *Hypera*-species) (Fig. 32). *Prn*, *prs* and *pds1-4* on thoracal segments bacilliform (x *D. comatus*, *D. cyrtus*, *D. oxalidis*, *D. palumbarius* and *D. tesselatus*). *Pds2* and *pds3* on meso- and metathorax close each other (x *D. austerus*, *D. comatus*, *D. crinitus*, *D. cyrtus*, *D. osellai*, *D. palumbarius* and *D. reichei*) (all Fig. 33). *Prn*, *prs* and *pds1-4* on thoracal segments and *prs*, *pds1-5* on abdominal segments I-VIII very long (x *D.*

*austerus*, *D. comatus*, *D. crinitus*, *D. osellai*, *D. palumbarius*, *D. reichei* and *D. tesselatus*) (Figs 33-34). *Prs* and *pds1-5* on abdominal segments I-VIII bacilliform (x *D. comatus*, *D. cyrtus*, *D. oxalidis* and *D. tesselatus*). Prodorsum of abdominal segments I-VII only with one seta (*prs*) (x *D. osellai*). *Pds1-5* on abdominal segments I-VII not in line, *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5* (x *D. austerus*, *D. comatus*, *D. crinitus*, *D. osellai*, *D. palumbarius* and *D. reichei*). *Pds4* on dorsum of abdominal segments I-VI not the longest seta (x *D. palumbarius*) (all Fig. 34).

**Description of mature larva.**

COLORATION. Head pale brown, posterior and lateral margins of epicranium dark. Dorsal side of body green with slightly white median stripe.

HEAD. Head width 1.08 mm (1.05–1.13 mm), head length 1.01 mm (0.98–1.05 mm) (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus distinctly concave (Fig. 29) with weak pigmentation. Labrum pale brown; anterior margin with deep median excision, posterior margin with short and wide median projection (Fig. 29). Mandibles with three sharp teeth apically (Fig. 32).

THORAX. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned postrio-dorsad.

ABDOMEN. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned postrio-dorsad.

CHAETOTAXY. **Head.** Setae hairform. *Des2* minutely shorter than *des4*; *des4* about 0.7 x remaining three setae (*des1, des3, des5*) (Fig. 29). Both *les* long, approximately of same length. Both *ves* short. *Fs1* and *fs3* shorter than *fs4*, about 0.7 x; *fs4* about 0.8 x *fs5* (Fig. 29). Both *cls* long, *lrms1-3* short (Fig. 29). Both *mds* short (Fig. 32). *Sts1-2* long; *sts3* short, about 0.6 x *sts1-2*(Fig. 30). *Dms1-6* stout (Fig. 31), *vms1-5* minute. *Mxps* very short. *Plbs1-2* long, *plbs3* short, about 0.6 x *plbs1-2*; *prms* minutely longer than *plbs3*; both *lig* very short (Fig. 30).

**Thorax** (Fig. 33). Bases of setae strongly pigmented, setae unpigmented. Setae long, bacilliform to hairform (*vpls*, *lsts*, *msts*). *Prothorax*: *prn2-10* very long; *prn1* shorter than remaining setae, about 0.7 x. *Vpls2* about 0.5 x *vpls1*. Pedal lobe with three (three to six) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining one (one to four) setae minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1-4* very long, approximately of same length; *pds1-4* not in line, *pds2* positioned anteriad to *pds3*. Both *dls* long, close each other; *ss1-2* distinctly shorter than *dls1-2*. *Dpls* as long as *dls*; *vpls*

minutely shorter than *dpls*. Pedal lobe with three (three to six) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining one (one to four) setae minute. *Msts* minute.

**Abdomen.** Bases of setae strongly pigmented, setae unpigmented. Setae short, bacilliform to hairform (*dpls*, *vpls*, *lsts*, *msts*). *Abdominal segments I-VIII* (Fig. 34): *pds1*, *pds3* and *pds5* approximately in line, *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5*; *prs* and *pds1*, *3* and *5* very long, *pds2* and *pds4* shorter than remaining setae, about 0.8 x. *Sps* long, about 0.4 x *prs*. Both *dpls* short as *sps*. *Vpls2* long, *vpls1* minute. *Lsts* short, *msts* minute. *Abdominal segment VII*: *pds2* positioned more anteriad to *pds3* and *pds4* more anteriad to *pds5*; *pds3* the longest, *pds2* and *pds4* about 0.7 x. *Abdominal segment VIII*: *pds2* and *pds4* positioned more anteriad from line joining *pds1* and *pds5* than on abdominal segments I-VIII; *pds3* very long, *pds2* and *pds4* about 0.7 x. *Abdominal segment IX* (Fig. 35): *ds2-4* in line; *ds4* the longest, remaining three setae approximately of same length. Both *ps* long, about 0.5 x *ds1-3*. *Sts1* short, *sts2* minute.

**Remarks.** Dieckmann (1989) recorded only colouration of the body and setae; his data agree with that presented here.

***Donus osellai* Winkelmann, 2001**

**Material.** (8 mature larvae), collected in the field: ITALY bor., Sella Nevea, Monte Canin, 1800-2000 m a.s.l., 26.vi.2004, H. Winkelmann leg. (8) (on *Achillea clavennae* L.).

**Differential diagnosis.** Mandible with three teeth (x *D. crinitus, D. reichei* and *Hypera*-species) (Fig. 39). *Prs* and *pds1-4* on thoracal segments bacilliform (x *D. comatus*, *D. cyrtus*, *D. oxalidis*, *D. palumbarius* and *D. tesselatus*). *Pds2* on dorsum of meso- and metathorax not the shortest seta (x *D. palumbarius* and *D. tesselatus*). *Pds2* and *pds3* on meso- and metathorax not close each other (x *D. intermedius*, *D. oxalidis* and *D. tesselatus*) (all Fig. 40). *Prn*, *prs* and *pds1-4* on thoracal segments and *prs*, *pds1-5* on abdominal segments I-VIII short (x *D. cyrtus*, *D. intermedius* and *D. oxalidis*) (Figs 40-41). *Prs* and *pds1-5* on abdominal segments I-VIII bacilliform or clubform (x *D. comatus*, *D. cyrtus* and *D. oxalidis*). Prodorsum of abdominal segments I-VII with two setae (*prs1-2*) (x *D. austerus*, *D. comatus*, *D. crinitus*, *D. cyrtus*, *D. osellai*, *D. oxalidis*, *D. palumbarius*, *D. reichei* and *D. tesselatus*). *Pds1-5* in line on abdominal

segments I-VII, not *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5* (x *D. cyrtus*, *D. intermedius*, *D. oxalidis* and *D. tesselatus*). *Pds4* on dorsum of abdominal segments I-VI not the longest seta (x *D. palumbarius*) (all Fig. 41).

**Description of mature larva.**

COLORATION. Head orange, posterior and lateral margins of epicranium dark. Dorsal side of body pale caesious with slightly white median stripe.

HEAD. Head width 0.77 mm (0.75–0.80 mm), head length 0.69 mm (0.68–0.70 mm) (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus distinctly concave (Fig. 36) with strong pigmentation. Labrum dark brown; anterior margin with deep median excision, posterior margin with short and wide median projection (Fig. 36). Mandibles with three sharp teeth apically (Fig. 39).

THORAX. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned posterio-dorsad.

ABDOMEN. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned postrio-dorsad.

CHAETOTAXY. **Head.** Setae hairform. *Des2* minutely shorter *des4*, *des4* about 0.8 x *des5*, *des5* about 0.7 x *des1* and *des3* (Fig. 36). Both *les* long, approximately of same length. Both *ves* short. *Fs1* the shortest, about 0.7 x *fs3*; *fs3* about 0.7 x *fs4*; *fs4* about 0.7 x *fs5* (Fig. 36). Both *cls* short, *lrms1-3* short (Fig. 36). Both *mds* short (Fig. 39). *Sts1-2* long, *sts3* very short (Fig. 37). *Dms1-6* stout (Fig. 38), *vms1-5* minute. *Mxps* minute. *Plbs2* short, *plbs1*, *3* very short, about 0.3 x *plbs2*; *prms* long as *plbs1*; both *lig* minute (Fig. 37).

**Thorax** (Fig. 40). Bases of setae strongly pigmented, setae unpigmented. Setae short, clubform or bacilliform to hairform (*dpls*, *vpls*, *pda*, *msts*). *Prothorax*: *prn1*, *7* very short, about 0.5 x remaining setae on pronotum. *Vpls2* about 0.5 x *vpls1*. Pedal lobe with three (three to five) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining one (one to three) seta minute. *Msts* minute. *Meso- and metathorax*: *pds2*, *pds4* on mesothorax and *pds2-4* on metathorax short, about 0.5 x *prs*, *pds1*, *3* on mesothorax and *prs*, *pds1* on metathorax. *Dls1-2* not closed each other; *dls1* short as *pds4*, *dls2* longer than *dls1*, about 1.3 x. *Ss* long as *dls1*. *Dpls* and *vpls* long as *dls2*. Pedal lobe with three (three to five) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining one (one to three) seta minute. *Msts* minute.

**Abdomen.** Bases of setae strongly pigmented, setae unpigmented. Setae short, clubform or bacilliform to hairform (*dpls*, *vpls*, *lsts*, *msts*). *Abdominal segments I-VIII* (Fig. 41): *pds1-5* approximately in line, *pds2* and *pds4* positioned slightly anteriad; *pds2-5* short, about 0.6 x *pds1*. *Prs1* long as *pds1*, *prs2* short as *pds2*. *Sps* long as *prs2*. Both *dpls* long as *pds1*. *Vpls2* long, *vpls1* minute. *Lsts* long as *dpls1-2*, *msts* minute. *Abdominal segment VII*: *pds2* and *pds4* positioned slightly anteriad, *pds3* slightly posteriad. *Abdominal segment VIII*: *pds2* and *pds4* positioned more anteriad from line joining *pds1* and *pds5* than on abdominal segments I-VII, *pds4* positioned more anteriad than *pds2*; *pds1, pds3* and *pds5* approximately in line; *pds3* longer than remaining setae. *Abdominal segment IX* (Fig. 42): *ds1-4* bacilliform; *ds2-4* in line; *ds3* the longest, remaining three setae approximately of same length. Both *ps* bacilliform; shorter than *ds1-4*, about 0.5 x. Both *sts* hairform, *sts1* very short, *sts2* minute.

***Donus oxalidis* (Herbst, 1795)**

Dieckmann 1989: 98.

**Material.** (4 mature larvae), collected in the field: SLOVAKIA centr. (7286), NP Muráňská planina, Muráň env., Pod Cigánkou (meadow), 22.v.2002, J. Skuhrovec leg. (4) (on *Chaerophyllum aromaticum* L.).

**Differential diagnosis.** Mandible with three teeth (x *D. crinitus, D. reichei* and *Hypera*-species) (Fig. 46). *Plbs3* very short, about 0.3 x *plbs2* (x *D. cyrtus*) (Fig. 44). *Prn*, *prs* and *pds1-4* on thoracal segments hairform (x *D. austerus*, *D. intermedius*, *D. osellai*, *D. reichei* and *D. tesselatus*). *Pds2* on dorsum of meso- and metathorax not the shortest seta (x *D. palumbarius* and *D. tesselatus*). *Pds2* and *pds3* on meso- and metathorax close each other (x *D. austerus*, *D. comatus*, *D. crinitus*, *D. cyrtus*, *D. osellai*, *D. palumbarius* and *D. reichei*) (all Fig. 47). *Prn*, *prs* and *pds1-4* on thoracal segments and *prs*, *pds1-5* on abdominal segments I-VIII very long (x *D. austerus*, *D. comatus*, *D. crinitus*, *D. osellai*, *D. palumbarius*, *D. reichei* and *D. tesselatus*) (Figs 47-48). *Prs* and *pds1-5* on abdominal segments I-VIII hairform (x *D. austerus*, *D. crinitus*, *D. intermedius*, *D. osellai*, *D. palumbarius*, *D. reichei* and *D. tesselatus*). Prodorsum of abdominal segments I-VII only with one seta (*prs*) (x *D. osellai*). *Pds1-5* on abdominal segments I-VII not in line, *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5* (x *D. austerus*, *D. comatus*, *D. crinitus*, *D. osellai*, *D. palumbarius* and *D. reichei*). *Pds4*

on dorsum of abdominal segments I-VI not the longest seta (x *D. palumbarius*) (all Fig. 48).

**Description of mature larva.**

COLORATION. Head pale brown maculate, posterior margin of epicranium dark. Dorsal side of body green with slightly white median stripe.

HEAD. Head width 1.30 mm (1.26–1.35 mm), head length 1.20 mm (1.15–1.25 mm) (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus distinctly concave (Fig. 43) with weak pigmentation. Labrum dark brown; slender anterior margin with deep median excision, posterior margin with short and wide median projection (Fig. 43). Mandibles with three sharp teeth apically (Fig. 46).

THORAX. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned postriad.

ABDOMEN. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned posterio-dorsad.

CHAETOTAXY. **Head.** Setae hairform. *Des2* the shortest, about 0.5 x *des1*, *des4* and *des5*; *des1* about 0.5minutely shorter than *des1* and *des3* (Fig. 43). Both *les* long, approximately of same length. Both *ves* short. *Fs1* and *fs3* short, about 0.6 x *fs4*; *fs4* about 0.5 x *fs5* (Fig. 43). Both *cls* short, *lrms1-3* short (Fig. 43). *Mds2* very short, about 0.5 x *mds1* (Fig. 46). *Sts1-2* long; *sts3* short, about 0.4 x *sts1-2* (Fig. 44). *Dms1-6* stout (Fig. 45), *vms1-5* minute. *Mxps* very short. *Plbs1-2* short, *plbs3* very short, about 0.2 x *plbs1-2*; *prms* about 0.5 x *plbs1*; both *lig* minute (Fig. 44).

**Thorax** (Fig. 47). Bases of setae strongly pigmented, setae unpigmented. Setae long, hairform. *Prothorax*: *prn1-10* long, approximately of same length; *prn8* the shortest one. Both *vpls2* approximately of same length. Pedal lobe with five (three to six) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining three (one to four) setae minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1-4* very long, approximately of same length, bases of setae broad enlarged more than remaining bases of setae; *pds1-4* not in line, *pds2* positioned anteriad to *pds3*. Both *dls* short, about 0.3 x *prs*; both *ss* short as *dls*. *Dpls* and *vpls* longer than *ss*, about 1.4 x. Pedal lobe with five (three to six) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining three (one to four) setae minute. *Msts* minute.

**Abdomen.** Bases of setae strongly pigmented, setae unpigmented. Setae long, hairform. *Abdominal segments I-VIII* (Fig. 48): *pds1*, *pds3* and *pds5* approximately in line, *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5*; *prs* and *pds1-5* very long, *pds2*, *pds4* and *pds5* slightly shorter; bases of setae broad enlarged more than remaining bases of setae. *Sps* short, about 0.3 x *prs*. Both *dpls* long as *pds5*. *Vpls2* long, *vpls1* very short. *Lsts* short, *msts* minute. *Abdominal segment VII*: *pds2* positioned more anteriad to *pds3* and *pds4* more anteriad to *pds5*; *pds3* the longest, *pds2* and *pds4* about 0.7 x. *Abdominal segment VIII*: *pds2* and *pds4* positioned more anteriad from line joining *pds1* and *pds5* than on abdominal segments I-VIII; *pds3* very long, *pds2* and *pds4* about 0.7 x. *Dpls1* slightly shorter than *dpls2*. *Abdominal segment IX* (Fig. 49): *ds2-4* in line; *ds1* the longest, remaining three setae approximately of same length. *Ps1* long as 0.5 x *ds2*, *ps2* about 0.7 x *ps1*. *Sts1* very short, *sts2* minute.

**Remarks.** Dieckmann (1989) recorded only colouration of the body and setae; his data agree with that presented here.

***Donus palumbarius* (Germar, 1821)**

Dieckmann 1989: 98-99.

**Material.** (6 mature larvae), collected in the field: CZ–Bohemia occ. (6348), Brdy mts., vill. Teslíny, Getsemanka, 5.vi.2002, J. Skuhrovec leg. (6) (on *Lamium* sp.).

**Differential diagnosis.** Mandible with three teeth (x *D. crinitus, D. reichei* and *Hypera*-species) (Fig. 53). *Prn1-10* hairform (x *D. austerus*, *D. intermedius*, *D. osellai*, *D. palumbarius*, *D. reichei* and *D. tesselatus*). *Prs* and *pds1-4* on thoracal segments hairform (x *D. austerus*, *D. intermedius*, *D. osellai*, *D. reichei* and *D. tesselatus*). *Pds2* on dorsum of meso- and metathorax the shortest seta (x *D. austerus*, *D. comatus*, *D. crinitus*, *D. cyrtus*, *D. intermedius*, *D. osellai*, *D. oxalidis* and *D. reichei*). *Pds2* and *pds3* on meso- and metathorax not close each other (x *D. intermedius*, *D. oxalidis* and *D. tesselatus*). *Dpls* on meso- and metathorax hairform (x *D. austerus*, *D. intermedius*,and *D. reichei*) (all Fig. 54). *Prn*, *prs* and *pds1-4* on thoracal segments and *prs*, *pds1-5* on abdominal segments I-VIII short (x *D. cyrtus*, *D. intermedius*, *D. oxalidis*, *H. dauci* and *H. vidua*) (Figs 54-55). *Prs* and *pds1-5* on abdominal segments I-VIII bacilliform (x *D. comatus*, *D. cyrtus*, *D. oxalidis* and *D. tesselatus*). Prodorsum of

abdominal segments I-VII only with one seta (*prs*) (x *D. osellai*). *Pds1-5* in line on abdominal segments I-VII, not *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5* (x *D. cyrtus*, *D. intermedius*, *D. oxalidis*,and *D. tesselatus*). *Pds4* on dorsum of abdominal segments I-VI the longest seta (x *D. austerus*, *D. comatus*, *D. crinitus*, *D. cyrtus*, *D. intermedius*, *D. osellai*, *D. oxalidis*, *D. reichei* and *D. tesselatus*) (all Fig. 55).

**Description of mature larva.**

COLORATION. Head orange, posterior margins of epicranium dark. Dorsal side of body pale green with slightly white median stripe.

HEAD. Head width 1.08 mm (1.00–1.10 mm), head length 0.99 mm (0.95–1.03 mm) (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus distinctly concave (Fig. 50) with weak pigmentation. Labrum pale brown; anterior margin with deep median excision, posterior margin with short and wide median projection (Fig. 50). Mandibles with three sharp teeth apically (Fig. 53).

THORAX. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.

ABDOMEN. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned posteriad.

CHAETOTAXY. **Head.** Setae hairform. *Des2* minutely shorter than *des4*, *des4*about 0.8 x *des1*and *des5*, *des3* about 0.7 x *des1* (Fig. 50). Both *les* long, *les1* about 0.75 x *les2*. Both *ves* short. *Fs1* and *fs3* the shortest, about 0.7 x *fs4*; *fs4* about 0.6 x *fs5* (Fig. 50). Both *cls* short, *lrms1-3* short (Fig. 50). Both *mds* long (Fig. 53). *Sts1-2* long; *sts3* short, about 0.4 x *sts1-2* (Fig. 51). *Dms1-6* stout (Fig. 52), *vms1-5* minute. *Mxps* minute. *Plbs1*, *2* long, *plbs3* very short, about 0.4 x *plbs1*. *Prms* about 0.7 x *plbs2*; both *lig* minute (Fig. 51).

**Thorax** (Fig. 54). Bases of setae strongly pigmented, setae pigmented. Setae hairform. *Prothorax*: *prn1* the shortest, about 0.6x remaining setae (*prn2-10*). *Vpls2* about 0.8 x *vpls1*. Pedal lobe with three (three to five) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining one (one to three) seta minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1*, *3-4* approximately of same length; *pds2* very short, about 0.3 x *prs*. Both *dls* short, both *ss* short. *Dpls* and *vpls* minutely shorter than *prs*. Pedal lobe with three (three to five) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining one (one to three) seta minute. *Msts* minute.

**Abdomen.** Bases of setae strongly pigmented, setae pigmented. Setae bacilliform or hairform (*dpls*, *vpls*, *lsts*, *msts*). *Abdominal segments I-VIII* (Fig. 55): *prs* minutely longer than *pds5*. *Pds1-5* not in one line, *pds2* positioned anteriad; *pds1*, *3* and *5* approximately of same length, *pds2* about 0.4 *pds1*, *pds4* about 1.4 x *pds1*. *Sps* minutely shorter than *pds5*. Both *dpls* approximately of same length. *Vpls2* long as *dpls*, *vpls1* minute. *Lsts* very short, *msts* minute. *Abdominal segment VIII*: *pds2* and *pds4* positioned more anteriad from line joining *pds1* and *pds5* than on abdominal segments I-VII, *pds2* positioned more anteriad than *pds4*; *pds1, pds3* and *pds5* approximately in line. *Abdominal segment IX* (Fig. 56): *ds1-4* bacilliform; *ds2-4* not in line, *ds3* posteriad of line joining *ds2* and *ds4*; *ds3* the longest, remaining three setae approximately of same length. Both *ps* hairform, about 0.6 x *ds2*. *Sts1* very short, *sts2* minute.

**Remarks.** Dieckmann (1989) recorded only colouration of the body and setae; his data agree with that presented here.

***Donus reichei* (Capiomont, 1868)**

**Material.** (2 mature larvae), collected in the field: SYRIA occ., province Tartus, Mashtal'helu env. (3 km East), 31.iii.2001, J. Skuhrovec leg. (2) (on *Medicago* sp.).

**Differential diagnosis.** Mandible with four teeth (x *D. austerus*, *D. comatus*, *D. cyrtus*, *D. intermedius*, *D. osellai*, *D. oxalidis*, *D. palumbarius*, *D. tesselatus* and *Hypera*-species (subgenera *Eririnomorphus*, *Dapalinus*, *Boreohypera* and *Hypera* s.str.)) (Fig. 60). *Prn1-10* bacilliform (x *D. comatus*, *D. crinitus*, *D. cyrtus*, *D. oxalidis*, *D. palumbarius*, *H. dauci* and *H. vidua*). *Prs* and *pds1-4* on thoracal segments bacilliform (x *D. comatus*, *D. cyrtus*, *D. oxalidis*, *D. palumbarius*, *D. tesselatus*, *H. dauci* and *H. vidua*). *Pds2* on dorsum of meso- and metathorax not the shortest seta (x *D. palumbarius* and *D. tesselatus*). *Pds2* and *pds3* on meso- and metathorax not close each other (x *D. intermedius*, *D. oxalidis* and *D. tesselatus*). *Dpls* on meso- and metathorax bacilliform (x *D. comatus*, *D. crinitus*, *D. cyrtus*, *D. osellai*, *D. oxalidis*, *D. palumbarius*, *D. tesselatus*, *H. dauci*, *H. lunata* and *H. vidua*) (all Fig. 61). *Prn*, *prs* and *pds1-4* on thoracal segments and *prs*, *pds1-5* on abdominal segments I-VIII short (x *D. cyrtus*, *D. intermedius*, *D. oxalidis*, *H. dauci* and *H. vidua*) (Figs 61-62). *Prs* and *pds1-5* on abdominal segments I-VIII bacilliform (x *D. comatus*, *D. cyrtus*, *D. oxalidis*, *D.*

*tesselatus*, *H. dauci* and *H. vidua*). Prodorsum of abdominal segments I-VII only with one seta (*prs*) (x *D. osellai*). *Pds1-5* in line on abdominal segments I-VII, not *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5* (x *D. cyrtus*, *D. intermedius*, *D. oxalidis*, *D. tesselatus*, *H. dauci* and *H. vidua*). *Pds4* on dorsum of abdominal segments I-VI not the longest seta (x *D. palumbarius*) (all Fig. 62). *Ds3* 1.3 x longer than *ds1-2*, *4* (x *D. austerus*, *D. comatus*, *D. crinitus*, *D. cyrtus*, *D. intermedius*, *D. osellai*, *D. oxalidis*, *D. palumbarius*, *D. tesselatus* and *H. dauci*) (Fig. 63).

**Description of mature larva.**

COLORATION. Head pale brown, posterior and lateral margins of epicranium dark. Dorsal side of body green with white median stripe.

HEAD. Head width 1.25 mm (1.23–1.28 mm), head length 1.18 mm (1.15–1.20 mm) (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus distinctly concave (Fig. 57) with pigmentation. Labrum pale brown; anterior margin with slender median excision, posterior margin with short and wide median projection (Fig. 57). Mandibles with four sharp teeth apically (Fig. 60).

THORAX. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.

ABDOMEN. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned posterio-dorsad.

CHAETOTAXY. **Head.** Setae hairform. *Des2* the shortest, about 0.5 x *des4*; *des4* about 0.6 x *des1*, *des3* and *des5*, approximately of same length (Fig. 57). Both *les* long, approximately of same length. Both *ves* short. *Fs1* and *fs3* the shortest, about 0.7 x *fs4*; *fs4* about 0.5 x *fs5* (Fig. 57). Both *cls* very short, *lrms1-3* short (Fig. 57). Both *mds* very short (Fig. 60). *Sts1-2* long; *sts3* short, about 0.5 x *sts1-2* (Fig. 58). *Dms1-6* stout (Fig. 59), *vms1-5* minute. *Mxps* very short. *Plbs1-2* long; *plbs3* very short, about 0.25 x *plbs1-2*; *prms* long as *plbs1*; both *lig* minute (Fig. 58).

**Thorax** (Fig. 61). Bases of setae strongly pigmented, setae pigmented. Setae short, bacilliform or hairform (*vpls*, *pda*, *msts*). *Prothorax*: *prn1-8* short; *prn9-10* shorter than previous setae (*prn1-8*), about 0.7 x. *Vpls2* about 0.3 x *vpls1*. Pedal lobe with three (three to five) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining one (one to three) seta minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1-4* very short, approximately of same length. Both *dls* very short, both *ss* very short. *Dpls* and *vpls* 2 x longer than previous setae. Pedal lobe with three (three to five) setae (*pda*);

*pda1-2* long, *pda2* about 0.75 x *pda1*; remaining one (one to three) seta minute. *Msts* minute.

**Abdomen.** Bases of setae strongly pigmented, setae pigmented. Setae short, bacilliform or hairform (*lsts*, *msts*). *Abdominal segments I-VIII* (Fig. 62): *pds1-5* approximately in line, *pds2* and *pds4* positioned slightly anteriad; *pds1-5* very short, *pds2* and *pds4* slightly shorter. *Sps* minutely shorter than *prs*, long as *pds1*. Both *dpls* long as *sps*. *Vpls2* 2.5 x longer than *vpls1*. *Lsts* short, *msts* minute. *Abdominal segment VIII*: *pds2* and *pds4* positioned more anteriad from line joining *pds1* and *pds5* than on abdominal segments I-VII, *pds4* positioned more anteriad than *pds2*; *pds1, pds3* and *pds5* approximately in line; *pds3* the longest, remaining setae about 0.5 x. *Abdominal segment IX* (Fig. 63): *ds1-4* bacilliform; *ds2-4* in line; *ds3* the longest, remaining three setae about 0.2 x. Both *ps* bacilliform, about 2x longer than *ds1*. Both *sts* hairform; *sts1* very short, *sts2* minute.

***Donus tesselatus* (Herbst, 1795)**

Dieckmann 1989: 99.

**Material.** (4 mature larvae), collected in the field: SLOVAKIA or. (6988), Spišská Nová Ves env., vill. Gánovce (steppe), 18.v.2002, J. Skuhrovec leg. (4) (on *Achillea millefolium* L.).

**Differential diagnosis.** Mandible with three teeth (x *D. crinitus, D. reichei* and *Hypera*-species) (Fig. 39). *Prs* and *pds1-4* on thoracal segments clubform (x *D. austerus*, *D. comatus*, *D. crinitus*, *D. cyrtus*, *D. intermedius*, *D. osellai*, *D. oxalidis*, *D. palumbarius*, and *D. reichei*). *Pds2* on dorsum of meso- and metathorax not the shortest seta (x *D. austerus*, *D. comatus*, *D. crinitus*, *D. cyrtus*, *D. intermedius*, *D. osellai*, *D. oxalidis* and *D. reichei*). *Pds2* and *pds3* on meso- and metathorax not close each other (x *D. austerus*, *D. comatus*, *D. crinitus*, *D. cyrtus*, *D. osellai*, *D. palumbarius* and *D. reichei*) (all Fig. 40). *Prs* and *pds1-5* on abdominal segments I-VIII bacilliform or clubform (x *D. comatus*, *D. cyrtus* and *D. oxalidis*). Prodorsum of abdominal segments I-VII only with one seta (*prs*) (x *D. osellai*). *Pds1-5* on abdominal segments I-VII not in line, *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5* (x *D. austerus*, *D. comatus*, *D. crinitus*, *D. osellai*, *D. palumbarius* and *D. reichei*). *Pds4* on dorsum of abdominal segments I-VI not the longest seta (x *D. palumbarius*) (all Fig. 41).

**Description of mature larva.**

COLORATION. Head pale brown, posterior and lateral margins of epicranium dark. Dorsal side of body green with slightly white median stripe and short white stripes along median stripe.

HEAD. Head width 0.82 mm (0.80–0.88 mm), head length 0.76 mm (0.75–0.80 mm) (Table. 1). Frontal sutures distinct, slender, anteriorly nearly indistinct. Anterior margin of clypeus distinctly concave (Fig. 64) with weak pigmentation. Labrum dark brown; slender anterior margin with deep median excision, posterior margin with short and wide median projection (Fig. 64). Mandibles with three sharp teeth apically (Fig. 67).

THORAX. Spiracular area of mesothorax with one spiraculum; oval peritremas positioned dorsad.

ABDOMEN. Spiracula on abdominal segments I–VIII located above dorsopleural lobes; with oval peritrema positioned postriad.

CHAETOTAXY. **Head.** Setae hairform. *Des2* minutely shorter than *des4*, *des4* about 0.7 x *des1*and *des5*, *des3* about 0.7 x *des1* and *des5* (Fig. 64). Both *les* long, approximately of same length. Both *ves* short. *Fs1* and *fs3* the shortest, less than 0.7 x *fs4*; *fs4* about 0.6 x *fs5* (Fig. 64). Both *cls* about 0.5 x *fs1*, *lrms1-3* shorter than *cls1-2* (Fig. 64). Both *mds* long (Fig. 67). *Sts1-2* long; *sts3* short, about 0.6 x *plbs1-2* (Fig. 65). *Dms1-6* stout (Fig. 66), *vms1-5* minute. *Mxps* very short. *Plbs2* long, *plbs1*, *3* about 0.3 x *plbs2*; *prms* about 0.5 x *plbs2*; both *lig* minute (Fig. 65).

**Thorax** (Fig. 68). Bases of setae strongly pigmented, setae unpigmented. Setae long, clubform or hairform (*dpls*, *vpls*, *pda*, *msts*). *Prothorax*: *prn7* short; remaining setae on pronotum longer than *prn7*, about 1.3 x. *Vpls2* about 0.8 x *vpls1*. Pedal lobe with four (three to five) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining two (one to three) setae minute. *Msts* minute. *Meso- and metathorax*: *prs* and *pds1-4* long, *pds2-3* shorter than remaining setae; *pds1-4* not in line, *pds2* positioned anteriad to *pds3*. Both *dls* long, both *ss* long as *pds4* and *dls*. *Dpls* long, *vpls* long as *dpls*. Pedal lobe with four (three to five) setae (*pda*); *pda1-2* long, *pda2* about 0.75 x *pda1*; remaining two (one to three) setae minute. *Msts* minute.

**Abdomen.** Bases of setae strongly pigmented, setae unpigmented. Setae long, clubfrom or hairform (*vpls*, *lsts*, *msts*). *Abdominal segments I-VIII* (Fig. 69): *pds1*, *pds3* and *pds5* approximately in line, *pds2* positioned anteriad to *pds3* and *pds4* anteriad to

*pds5*; *prs* and *pds1-5* long, *pds2* and *pds4* slightly shorter. *Sps* long as *prs*. Both *dpls* shorter than *prs*, about 0.6 x. Both *vpls* long. *Lsts* long, *msts* minute. *Abdominal segment VII*: *pds3* longer than remaining setae. *Abdominal segment VIII*: *pds2* and *pds4* positioned more anteriad from line joining *pds1* and *pds5* than on abdominal segments I-VII, *pds4* positioned more anteriad than *pds2*; *pds1, pds3* and *pds5* approximately in line; *pds3* long, remaining setae about 0.5 x. *Abdominal segment IX* (Fig. 70): *ds1-4* clubfrom to bacilliform; *ds2-4* not in line, *ds3* anteriad of line joining *ds2* and *ds4*; *ds3-4* longer than remaining two setae, about 0.6 x. Both *ps* clubform to bacilliform, about 0.5 x *ds1*. *Sts1-2* hairform; *sts1* very short, *sts2* minute.

**Remarks.** Dieckmann (1989) recorded only colouration of the body and setae; his data agree with that presented here.

**Key to the mature larvae of the tribe Hyperini**

1 (30) Mandible with two teeth (Skuhrovec 2005: figs 10, 19, 28, 37, 46, 52, 64, 73, 82; Skuhrovec 2006: figs 32, 39, 46, 53, 60, 67). (genus ***Hypera*** **Germar, 1817**; except subgenus ***Antidonus***)

2 (5) Bases of setae on thorax and abdomen prominent and broad with tuberosity, and strongly pigmented (Skuhrovec 2006: figs 33-35, 40-42). Pronotum with eleven setae (*prn1-11*) (Skuhrovec 2006: figs 33, 40). (subgenus ***Erirnomorphus*** **Capiomont, 1868**)

3 (4) Thoracal and abdominal setae short (Skuhrovec 2006: figs 33-35). Meso- and metathorax with three short setae (*ss1-3*) (Skuhrovec 2006: fig. 33). Dorsal and ventral side of body yellow-green to grey-green. ……..... ***H. arundinis*** **(Paykull, 1792)**

4 (3) Thoracal and abdominal setae long (Skuhrovec 2006: figs 40-42). Meso- and metathorax with two long setae (*ss1-2*) (Skuhrovec 2006: fig. 40). Dorsal side of body dark brown with median pale brown stripe; ventral side of thorax dark brown, ventral side of abdomen yellow. ..... ***H. rumicis*** **(Linné, 1758)**

5 (2) Bases of setae on thorax and abdomen not prominent and broad, but strongly pigmented (Skuhrovec 2005: figs 11-13, 20-22, 29-31, 38-40, 47-49, 56-58, 65-67, 74-76, 83-85; Skuhrovec 2006: figs 47-49, 54-56, 61-63, 68-70).

Pronotum with ten setae (*prn1-10*) (Skuhrovec 2005: figs 11, 20, 29, 38, 47, 56, 65, 74, 83; Skuhrovec 2006: figs 47, 54, 61, 68).

6 (11) *Prs* and *pds1-5* on abdominal segments I-VIII hairform (Skuhrovec 2005: figs 12, 30, 84).

7 (8) *Prs* and *pds1-5* on abdominal segments I-VIII short (Skuhrovec 2005: fig. 84). *Fs1* and *fs3* shorter than 0.33 x *fs4* (Skuhrovec 2005: fig. 77). ..... ***H. viciae* (Gyllenhal, 1813)**

8 (7) *Prs* and *pds1-5* on abdominal segments I-VIII long (Skuhrovec 2005: figs 12, 30). *Fs1* and *fs3* longer than 0.5 x *fs4* (Skuhrovec 2005: figs 5, 23).

9 (10) Bases of setae on thorax and abdomen distinctly enlarged (Skuhrovec 2005: figs 11-13) ..... ***H. arator* (Linné, 1758)**

10 (9) Bases of setae on thorax and abdomen small, not distinctly enlarged (Skuhrovec 2005: figs 29-31) ..... ***H. jucunda* (Capiomont, 1868)**

11 (6) *Prs* and *pds1-5* on abdominal segments I-VIII bacilliform, clubform or dippleform (Skuhrovec 2005: figs 21, 39, 48, 57, 66, 75; Skuhrovec 2006: figs 48, 55, 62, 69).

12 (13) Meso- and metathorax with three *vpls*; *vpls1* short, *vpls2-3* minute (Skuhrovec 2006: fig. 68). ..... ***H. diversipunctata* (Schrank, 1798)**

13 (12) Meso- and metathorax with one *vpls* (Skuhrovec 2005: figs 20, 38, 47, 56, 65, 74; Skuhrovec 2006: figs 47, 54, 61).

14 (17) *Pds2* on abdominal segments I-VII very short, shorter than 0.5 x *pds3* (Skuhrovec 2005: figs 39, 75).

15 (16) *Prs* and *pds1-5* on abdominal segments I-VIII very short (Skuhrovec 2005: fig. 39), *ds1-4* on abdominal segment IX dippleform, except of *ds3* (Skuhrovec 2005: fig. 40) ..... ***H. nigrirostris* (Fabricius, 1775)**

16 (15) *Prs* and *pds1-5* on abdominal segments I-VIII short (Skuhrovec 2005: fig. 75), *ds1-4* on abdominal segment IX hairform (Skuhrovec 2005: fig. 76). ..... ***H. venusta* (Fabricius, 1781)**

17 (14) *Pds2* on abdominal segments I-VII short, longer than 0.5 x *pds3* (Skuhrovec 2005: figs 21, 48, 53, 66; Skuhrovec 2006: figs 48, 55, 62).

18 (21) Setae on thorax and abdomen pigmented.

19 (20) *Des2* about 0.7 x *des3* and *des5* (Skuhrovec 2005: fig. 63); *plbs2* approximately of same length as *plbs1* (Skuhrovec 2005: fig. 61). ..... ***H. suspiciosa*** **(Herbst, 1795)**

20 (19) *Des2* about 0.5 x *des3* and *des5* (Skuhrovec 2006: fig. 57); *plbs2* twice longer than *plbs1* (Skuhrovec 2006: fig. 58). ..... ***H. striata*** **(Boheman, 1834)**

21 (18) Setae on thorax and abdomen unpigmented.

22 (29) *Fs1-5* (Skuhrovec 2005: figs 14, 50; Skuhrovec 2006: figs 43, 50) and *des1-5* (Skuhrovec 2005: figs 18, 51; Skuhrovec 2006: figs 43, 50) hairform; *prs* and *pds1-5* on abdominal segments I-VIII slender, softly bacilliform (Skuhrovec 2005: figs 21, 57; Skuhrovec 2006: figs 48, 55).

23 (24) All *prn1-10* bacilliform to clubform (Skuhrovec 2005: fig. 20). ..... ***H. denominanda*** **(Capiomont, 1868)**

24 (23) Majority of *prn1-10* hairform (Skuhrovec 2005: fig. 56; Skuhrovec 2006: figs 47, 54).

25 (26) *Pds3* on metathorax more than twice longer than additional *pds* (Skuhrovec 2006: fig. 47). ..... ***H. contaminata*** **(Herbst, 1795)**

26 (25) *Pds3* on metathorax less than twice longer than additional *pds* (Skuhrovec 2005: fig. 56; Skuhrovec 2006: fig. 54).

27 (28) *Dpls* and *vpls* on meso- and metathorax hairform (Skuhrovec 2006: fig. 54). ..... ***H. kayali*** **Skuhrovec, 2006**

28 (27) *Dpls* on meso- and metathorax bacilliform and *vpls* on meso- and metathorax hairform to bacilliform (Skuhrovec 2005: fig. 56). ..... ***H. postica*** **(Gyllenhal, 1813)**

29 (22) *Fs1-4* (Skuhrovec 2005: fig. 41) and *des1-5* (Skuhrovec 2005: fig. 45) bacilliform to clubform, *fs5* hairform (Skuhrovec 2005: fig. 41); *prs* and *pds1-5* on abdominal segments I-VIII clubform (Skuhrovec 2005: fig. 48). ..... ***H. plantaginis*** **(De Geer, 1775)**

30 (1) Mandible with three or four teeth (Figs 4, 11, 18, 25, 32, 39, 46, 53, 60, 67; Skuhrovec 2006: figs 4, 11, 18, 25).

31 (46) Mandible with three teeth (Figs 4, 11, 25, 32, 39, 46, 53, 67) (part ***Donus* Jekel, 1865**).

32 (37) *Prs* and *pds1-5* on abdominal segments I-VIII hairform (Figs 13-14, 27-28, 48-49).

33 (34) *Prn*, *prs* and *pds1-4* on thoracal segments and *prs*, *pds1-5* on abdominal segments I-VIII short (Figs 12-14). *Pds1-5* on abdominal segments I-VII in line, not *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5* (Fig. 13). ..... ***D. comatus* (Boheman, 1842)**

34 (33) *Prn*, *prs* and *pds1-4* on thoracal segments and *prs*, *pds1-5* on abdominal segments I-VIII long (Figs 26-28, 47-49). *Pds1-5* on abdominal segments I-VII not in line, *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5* (Figs 27, 48).

35 (36) *Pds1-4* on meso- and metathorax not in line, *pds2* positioned anteriad to *pds3* (Figs 47). *Plbs3* very short, about 0.3 x *plbs2* (Fig. 44). …….. ***D. oxalidis* (Herbst, 1795)**

36 (35) *Pds1-4* on meso- and metathorax in line, *pds2* not positioned anteriad to *pds3* (Fig. 26). *Plbs3* short, about 0.5 x *plbs2* (Fig. 23). ..... ***D. cyrtus* (Germar, 1821)**

37 (32) *Prs* and *pds1-5* on abdominal segments I-VIII bacilliform or clubform (Figs 6-7, 34-35, 41-42, 55-56, 69-70).

38 (39) *Prn*, *prs* and *pds1-4* on thoracal segments and *prs*, *pds1-5* on abdominal segments I-VIII very long, bacilliform (Figs 33-35). ..... ***D. intermedius* (Boheman, 1842)**

39 (38) *Prn*, *prs* and *pds1-4* on thoracal segments and *prs*, *pds1-5* on abdominal segments I-VIII short (Figs 5-7, 40-42, 54-56, 68-70).

40 (41) *Prn*, *prs* and *pds1-4* on thoracal segments hairform (Fig. 54). *Pds2* on dorsum of meso- and metathorax the shortest seta (Fig. 54). *Pds4* on dorsum of abdominal segments I-VI the longest seta (Fig. 55). ..... ***D. palumbarius* (Germar, 1821)**

41 (40) *Prn*, *prs* and *pds1-4* on thoracal segments bacilliform (Figs 5, 40, 68). *Pds2* on dorsum of meso- and metathorax not the shortest seta (Figs 5, 40, 68). *Pds4* on dorsum of abdominal segments I-VI not the longest seta (Figs 6, 41, 69).

42 (43) Prodorsum of abdominal segments I-VII with two setae (*prs1-2*) (Fig. 41). *Sts3* very short, less than 0.5 x *sts1-2* (Fig. 37). ***D. osellai* Winkelmann, 2001**

43 (42) Prodorsum of abdominal segments I-VII only with one seta (*prs*) (Figs 6, 69). *Sts3* very short, more than 0.6 x *sts1-2* (Figs 2, 65).

44 (45) *Prn*, *prs* and *pds1-4* on thoracal segments and *prs*, *pds1-5* on abdominal segments I-VIII long, clubform (Figs 68-70). *Pds2* and *pds3* on meso- and metathorax (close each other Fig. 68). *Pds1-5* on abdominal segments I-VII not in line, *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5* (Fig. 69). ..... ***D. tesselatus* (Herbst, 1795)**

45 (44) *Prn*, *prs* and *pds1-4* on thoracal segments and *prs*, *pds1-5* on abdominal segments I-VIII short to very short, bacilliform (Figs 5-7). *Pds2* and *pds3* on meso- and metathorax not close each other (Fig. 5). *Pds1-5* on abdominal segments I-VII in line, not *pds2* positioned anteriad to *pds3* and *pds4* anteriad to *pds5* (Fig. 6). ..... ***D. austerus* (Boheman, 1834)**

46 (31) Mandible with four teeth (Figs 18, 60; Skuhrovec 2006: figs 4, 11, 18, 25). (subgenus ***Antidonus* Bedel, 1886;** part ***Donus* Jekel, 1865**)

47 (50) *Prs* and *pds1-5* on abdominal segments I-VIII hairform (Skuhrovec 2006: figs 6, 20).

48 (49) Meso- and metathorax with two *ss*; *ss1-2* long, *ss3* absent (Skuhrovec 2006: fig. 19). *Plbs1* long (Skuhrovec 2006: fig. 16). ..... ***H. vidua* Gené, 1837**

49 (48) Meso- and metathorax with three *ss*; *ss1-2* long, *ss3* present, minute (Skuhrovec 2006: fig. 5). *Plbs1* short (Skuhrovec 2006: fig. 2). ..... ***H. dauci* (Olivier, 1807)**

50 (47) *Prs* and *pds1-5* on abdominal segments I-VIII bacilliform or clubform (Figs. 20, 62; Skuhrovec 2006: figs 13, 27).

51 (54) *Prn1-10* hairform (Figs 19; Skuhrovec 2006: fig. 26).

52 (53) *Dpls* on meso- and metathorax hairform (Fig. 19). *Ds3* long as *ds1-2*, *4* (Fig. 21). ..... ***D. crinitus* (Boheman, 1834)**

53 (52) *Dpls* on meso- and metathorax bacilliform (Skuhrovec 2006: fig. 26). *Ds3* 1.3 x longer than *ds1-2*, *4* (Skuhrovec 2006: Fig. 28). ***H. zoila* (Scopoli, 1763)**

54 (51) *Prn1-10* bacilliform (Fig. 61; Skuhrovec 2006: fig. 12).

55 (56) Thoracal and abdominal setae long (Skuhrovec 2006: figs 12, 13). *Dpls* on meso- and metathorax hairform (Skuhrovec 2006: fig. 12). *Prms* very short (Skuhrovec 2006: fig. 9). ..... ***H. lunata* Wollaston, 1837**

56 (55) Thoracal and abdominal setae very short (Fig. 61, 62; Skuhrovec 2006: figs 26, 27). *Dpls* on meso- and metathorax bacilliform (Fig. 61; Skuhrovec 2006: fig. 26). *Prms* long (Fig. 58; Skuhrovec 2006: fig. 23). ..... ***D. reichei* (Capiomont, 1868)**

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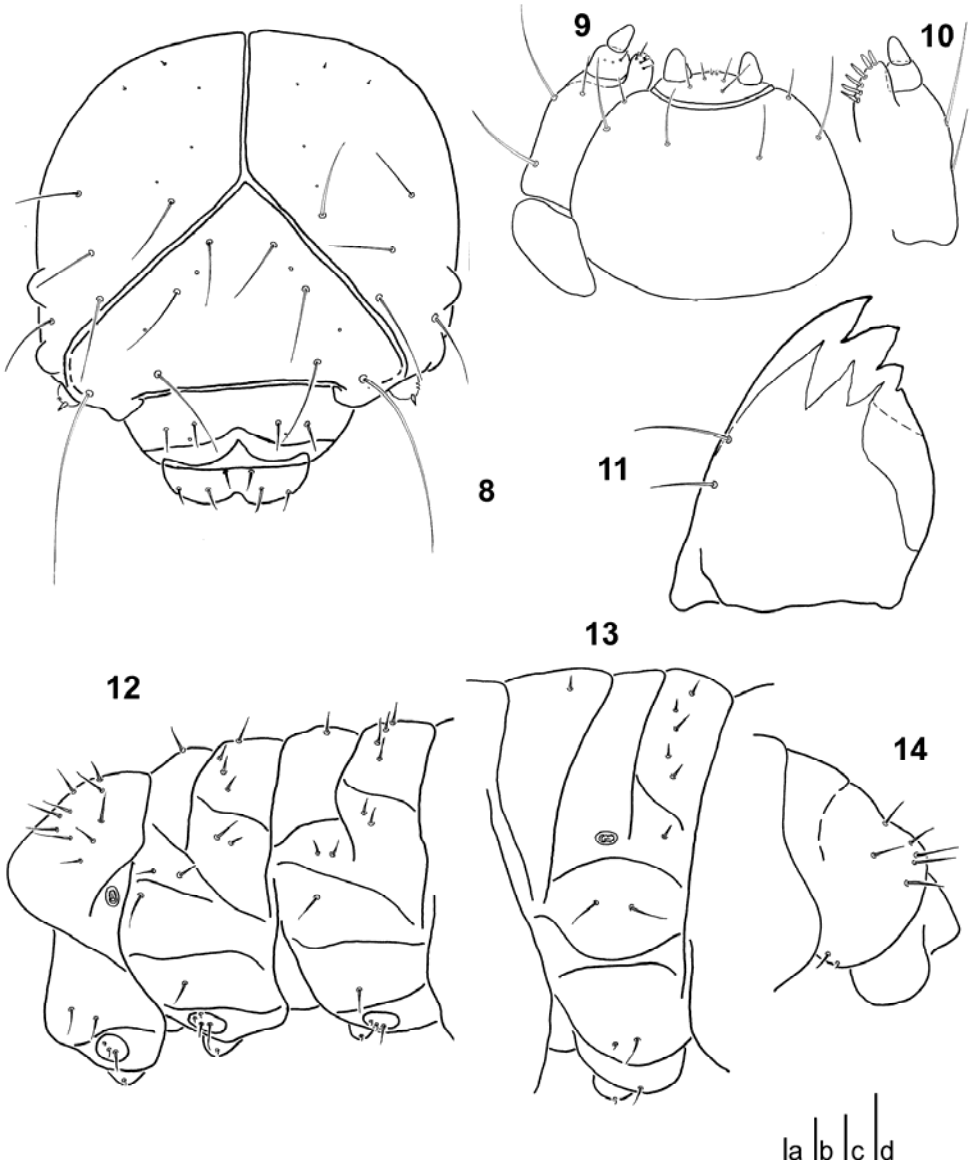
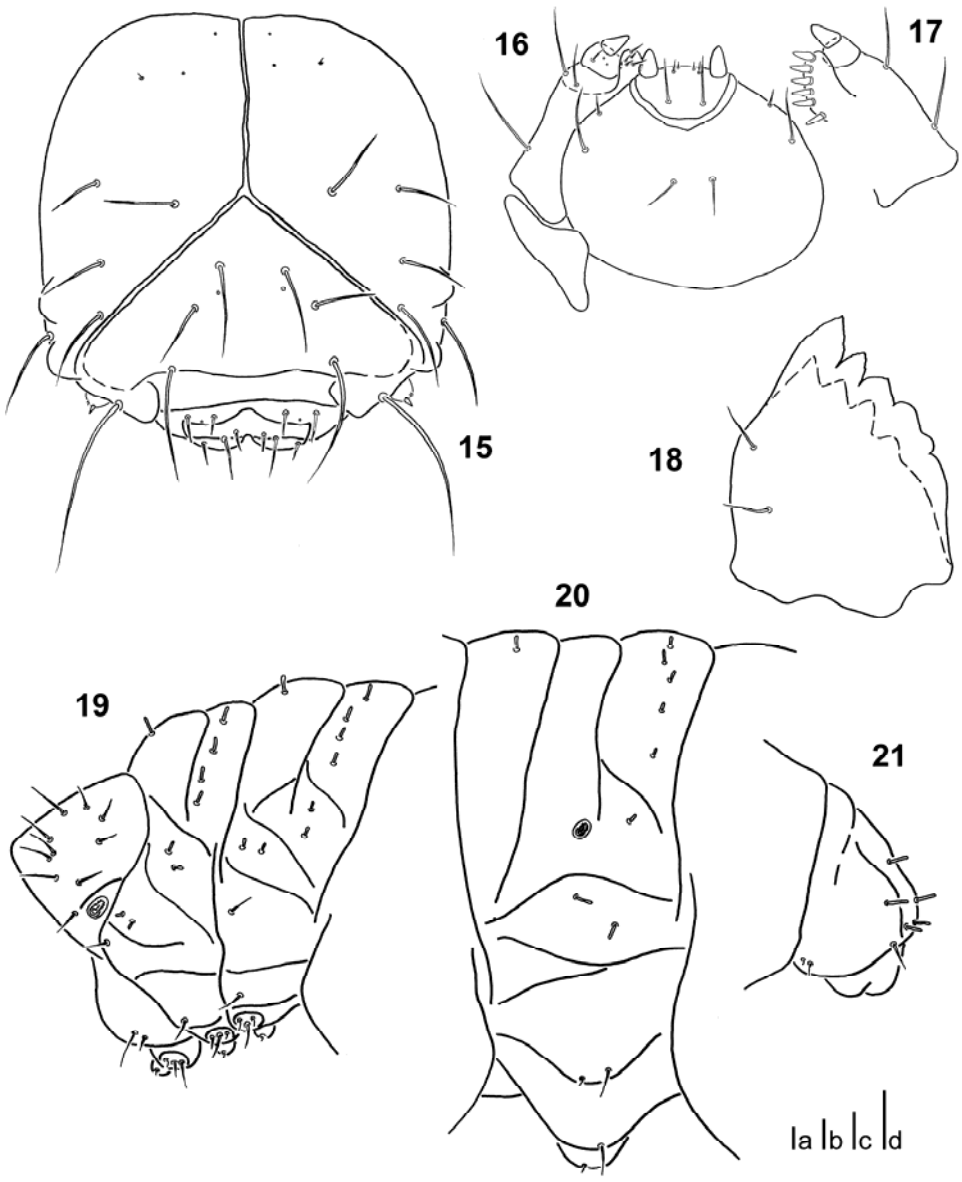
**TABLE 1. Ratio of important larval sizes.** (1) HW – head width, (2) LW – head length, (3) BL – length of the body (larvae fixed in "C"-shape were measured in segments) and (4) width of abdominal segment IV. Average, minimum and maximum measurements are presented. All measurements in millimeters. These measurements are cited in the descriptions of each species.

| | **(1) HW** | | | **(2) HL** | | | **(3) BL** | | **(4) BW** | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Species** | avg. | min. | max. | avg. | min. | max. | min. | max. | min. | max. |
| ***Donus austerus*** | **1.09** | **1.05** | **1.18** | **1.00** | **0.95** | **1.05** | **9.0** | **11.5** | **1.7** | **2.7** |
| ***Donus comatus*** | **1.07** | **1.00** | **1.13** | **0.99** | **0.93** | **1.03** | **11.0** | **13.0** | **2.5** | **2.9** |
| ***Donus crinitus*** | **1.12** | **1.05** | **1.18** | **1.03** | **0.95** | **1.05** | **8.5** | **9.5** | **2.0** | **2.5** |
| ***Donus cyrtus*** | **0.97** | **0.85** | **1.03** | **0.89** | **0.78** | **0.95** | **8.5** | **14.0** | **2.5** | **3.1** |
| ***Donus intermedius*** | **1.08** | **1.05** | **1.13** | **1.01** | **0.98** | **1.05** | **8.5** | **11.0** | **2.1** | **2.5** |
| ***Donus osellai*** | **0.77** | **0.75** | **0.80** | **0.69** | **0.68** | **0.70** | **6.5** | **8.0** | **1.6** | **2.0** |
| ***Donus oxalidis*** | **1.30** | **1.26** | **1.35** | **1.20** | **1.15** | **1.25** | **9.5** | **16.5** | **2.3** | **3.5** |
| ***Donus palumbarius*** | **1.08** | **1.00** | **1.10** | **0.99** | **0.95** | **1.03** | **9.0** | **14.5** | **2.0** | **2.7** |
| ***Donus reichei*** | **1.25** | **1.23** | **1.28** | **1.18** | **1.15** | **1.20** | **8.0** | **9.5** | **1.5** | **2.2** |
| ***Donus tesselatus*** | **0.82** | **0.80** | **0.88** | **0.76** | **0.75** | **0.80** | **6.0** | **8.0** | **1.3** | **1.8** |

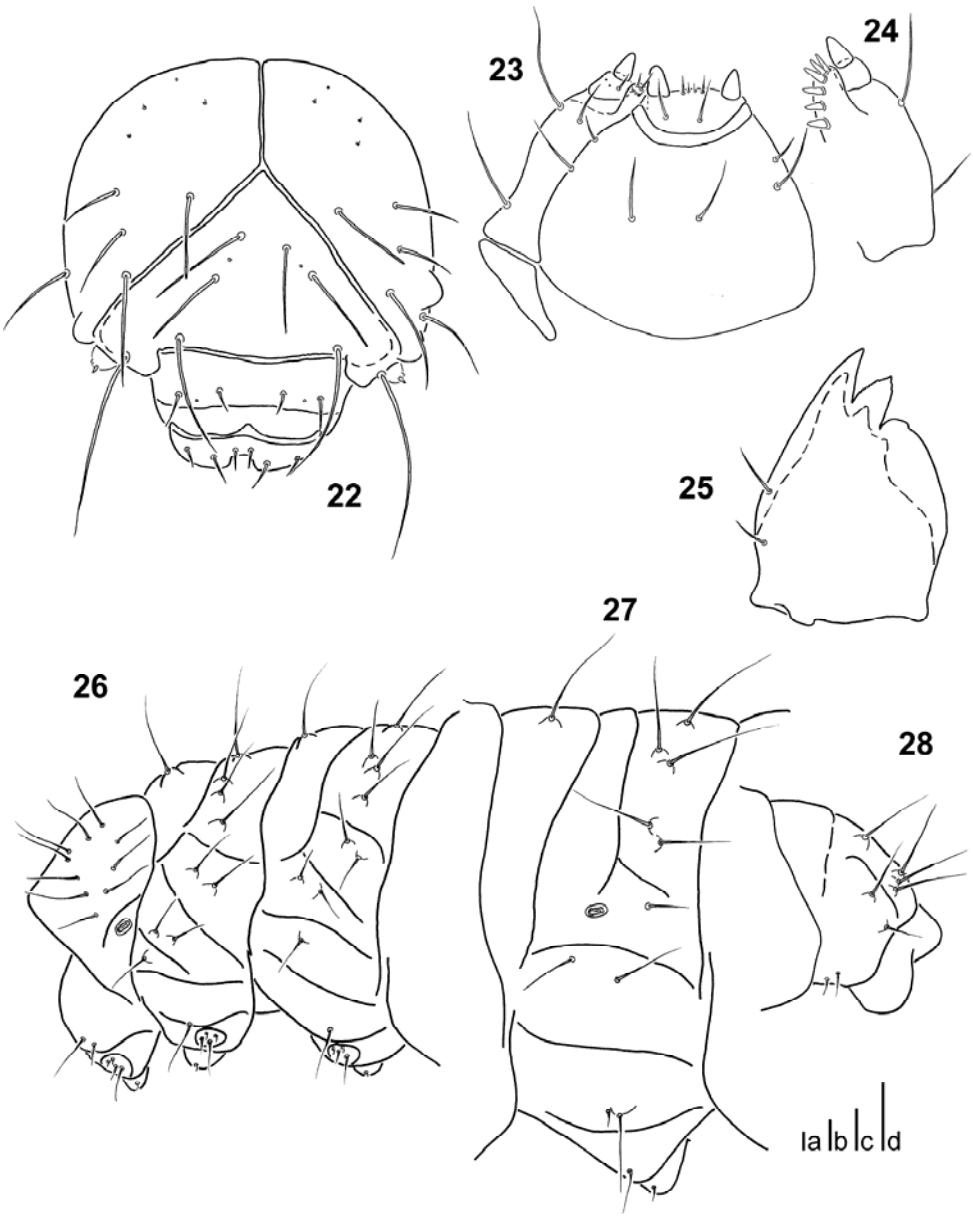

**FIGURES 1-7. *Donus austerus*.** (1) head, (2) labium and maxilla, (3) maxilla, (4) mandible, (5) thorax, (6) abdominal segment IV, (7) abdominal segment IX; Figs 1, 3-4 dorsal view, Fig. 2 ventral view and Figs 5-7 lateral view. Scale bar 0.1 mm: a – Figs 5-7; b – Fig. 1; c – Figs 2-3; d – Fig. 4.



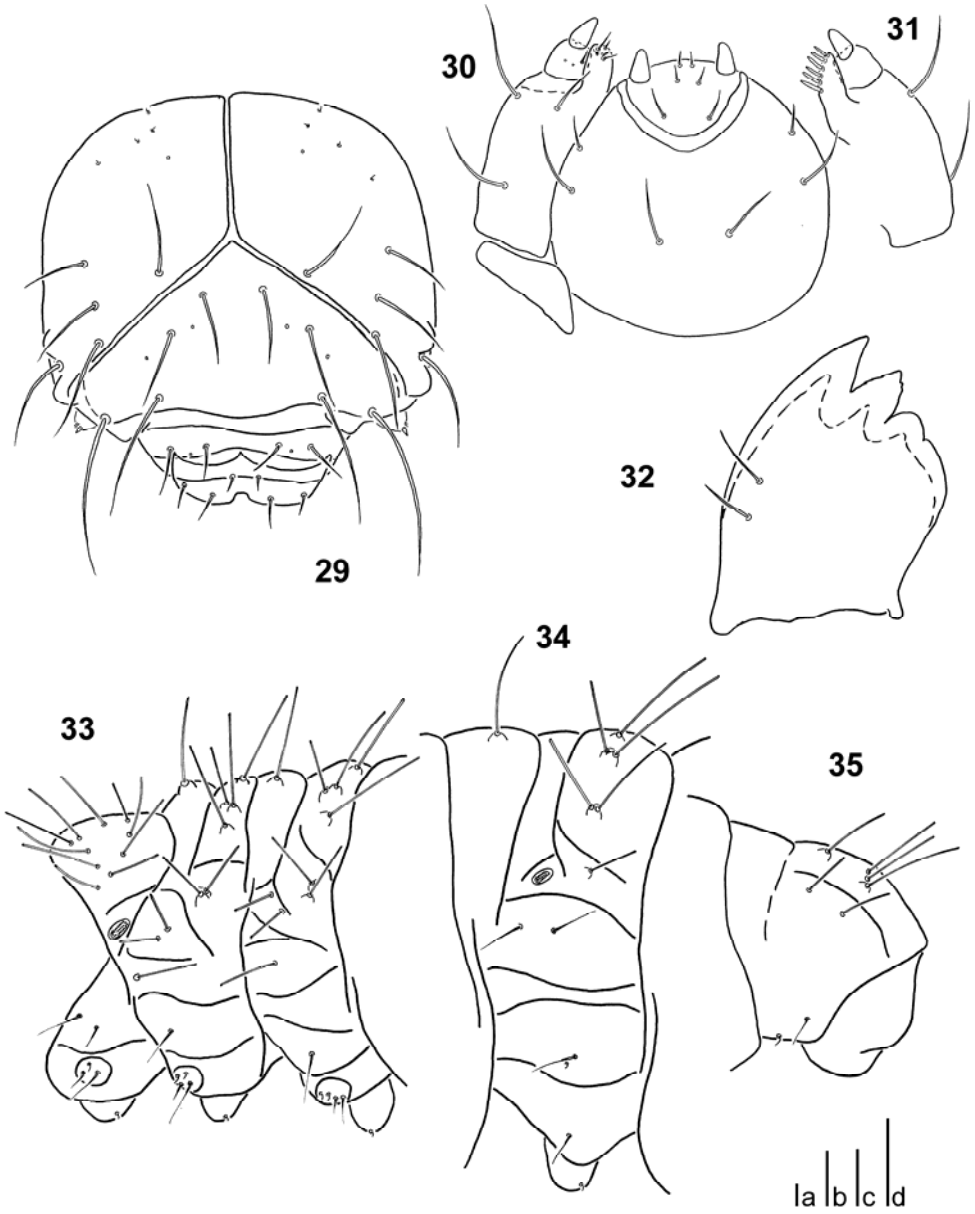

**FIGURES 8-14.** ***Donus comatus*****.** (8) head, (9) labium and maxilla, (10) maxilla, (11) mandible, (12) thorax, (13) abdominal segment IV, (14) abdominal segment IX; Figs 8, 10-11 dorsal view, Fig. 9 ventral view and Figs 12-14 lateral view. Scale bar 0.1 mm: a – Figs 12-14; b – Fig. 8; c – Figs 9-10; d – Fig. 11.



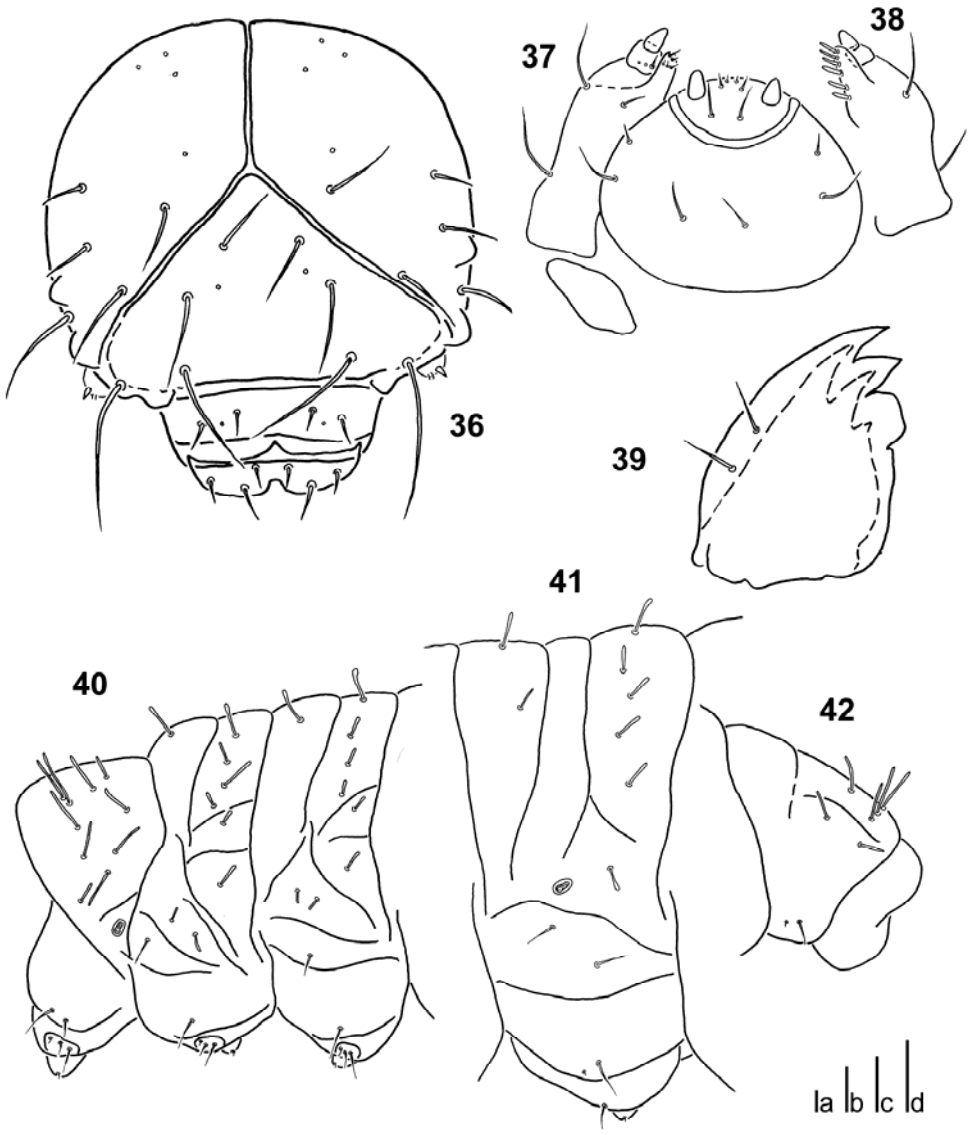

**FIGURES 15-21.** ***Donus crinitus*****.** (15) head, (16) labium and maxilla, (17) maxilla, (18) mandible, (19) thorax, (20) abdominal segment IV, (21) abdominal segment IX; Figs 15, 17-18 dorsal view, Fig. 16 ventral view and Figs 19-21 lateral view. Scale bar 0.1 mm: a – Figs 19-21; b – Fig. 15; c – Figs 16-17; d – Fig. 18.



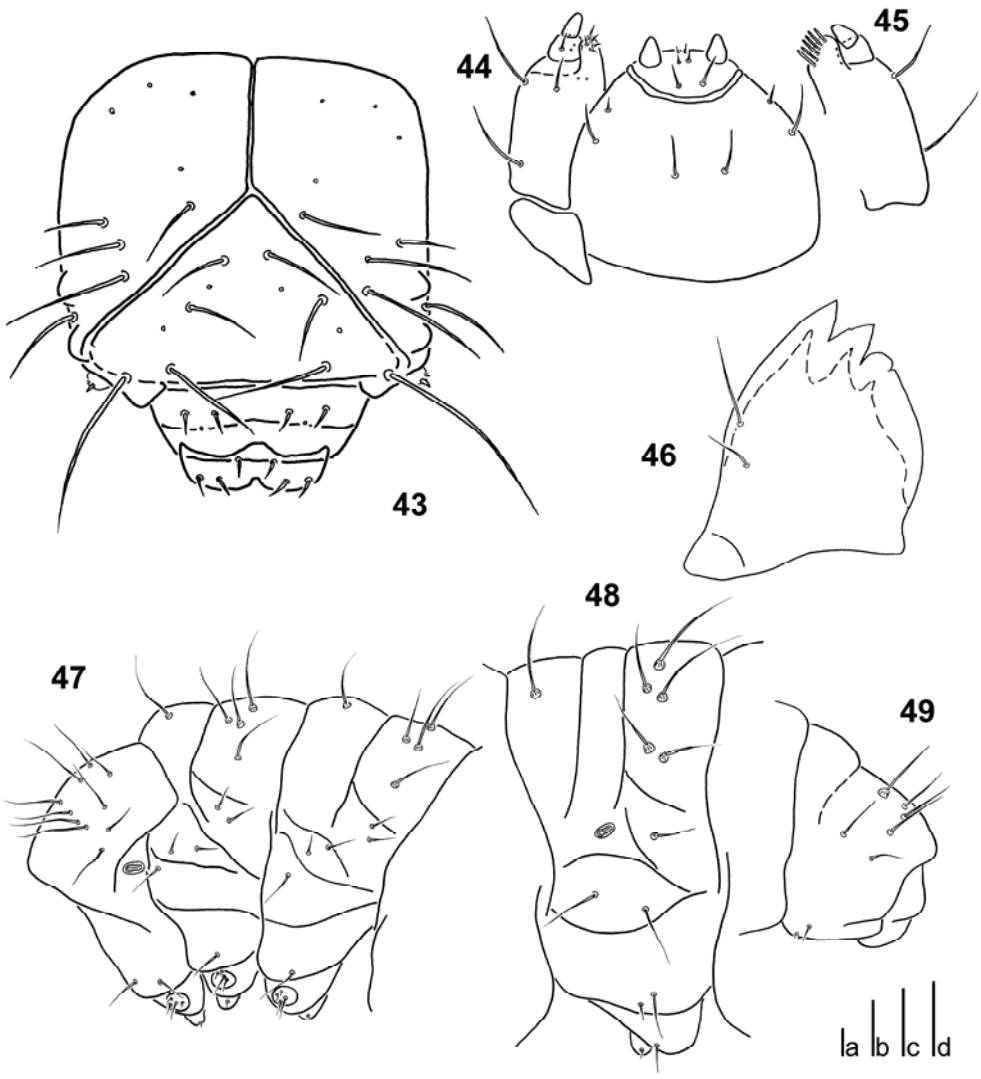

**FIGURES 22-28.** ***Donus cyrtus*****.** (22) head, (23) labium and maxilla, (24) maxilla, (25) mandible, (26) thorax, (27) abdominal segment IV, (28) abdominal segment IX; Figs 22, 24-25 dorsal view, Fig. 23 ventral view and Figs 26-28 lateral view. Scale bar 0.1 mm: a – Figs 26-28; b – Fig. 22; c – Figs 23-24; d – Fig. 25.



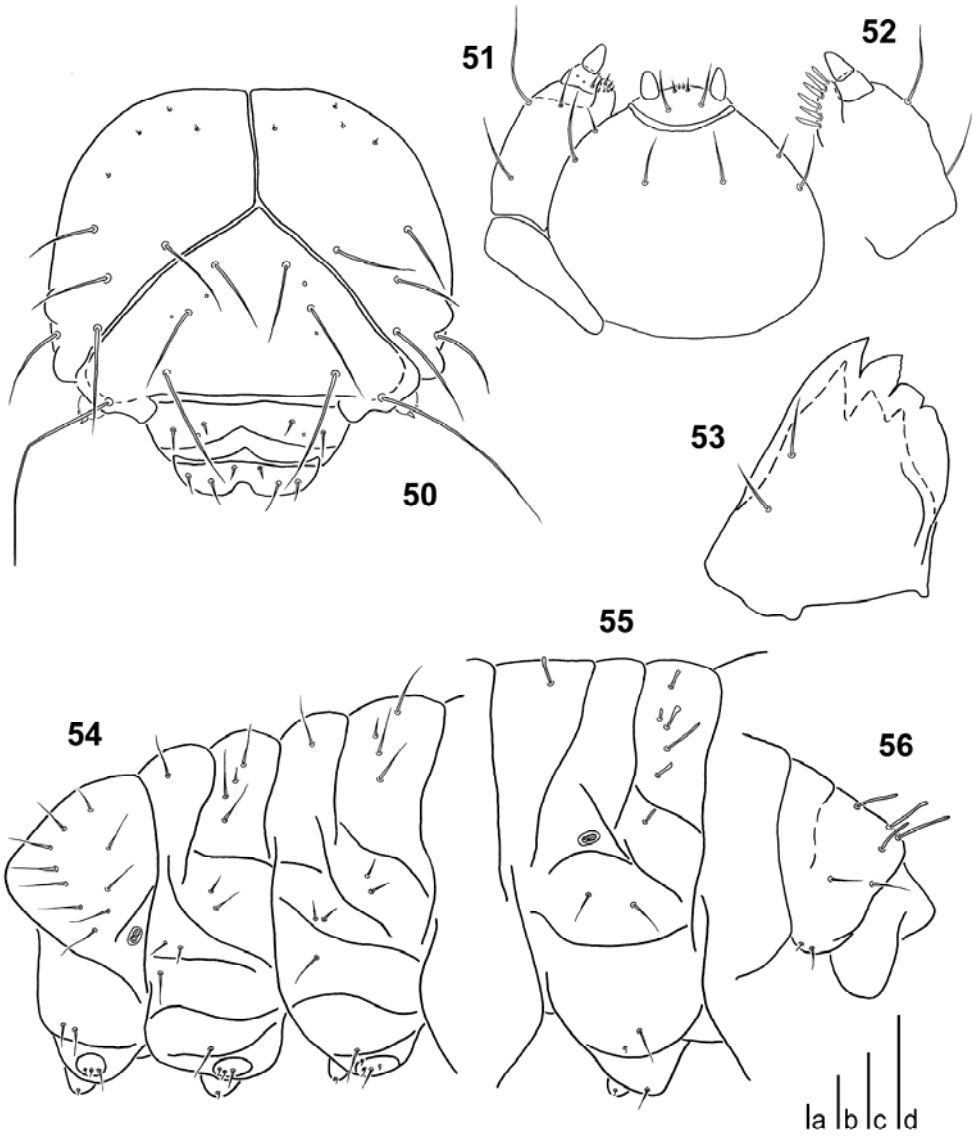

**FIGURES 29-35.** ***Donus intermedius*****.** (29) head, (30) labium and maxilla, (31) maxilla, (32) mandible, (33) thorax, (34) abdominal segment IV, (35) abdominal segment IX; Figs 29, 31-32 dorsal view, Fig. 30 ventral view and Figs 33-35 lateral view. Scale bar 0.1 mm: a – Figs 33-35; b – Fig. 30-31; c – Figs 29; d – Fig. 32.



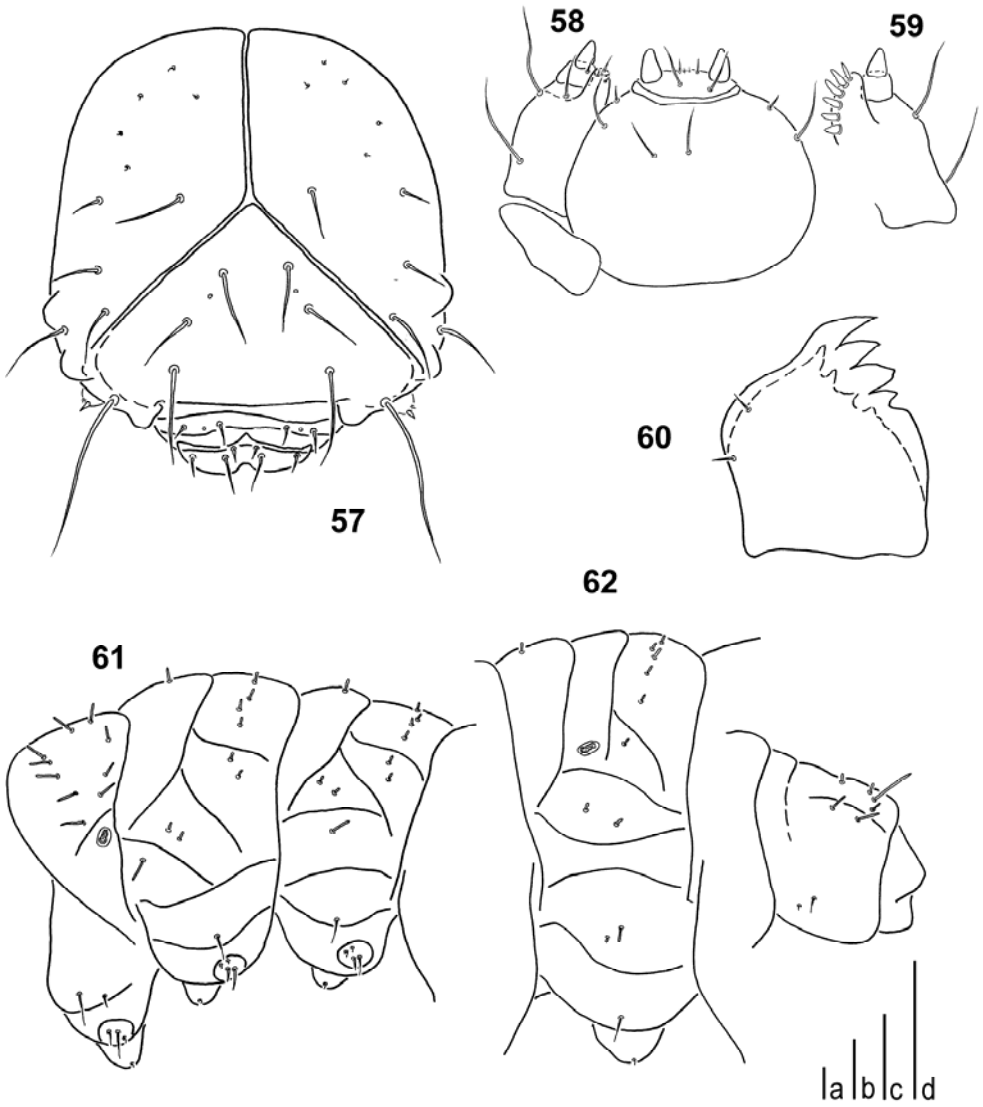

**FIGURES 36-42.** ***Donus osellai*****.** (36) head, (37) labium and maxilla, (38) maxilla, (39) mandible, (40) thorax, (41) abdominal segment IV, (42) abdominal segment IX; Figs 36, 38-39 dorsal view, Fig. 37 ventral view and Figs 40-42 lateral view. Scale bar 0.1 mm: a – Figs 40-42; b – Fig. 36; c – Figs 37-38; d – Fig. 39.



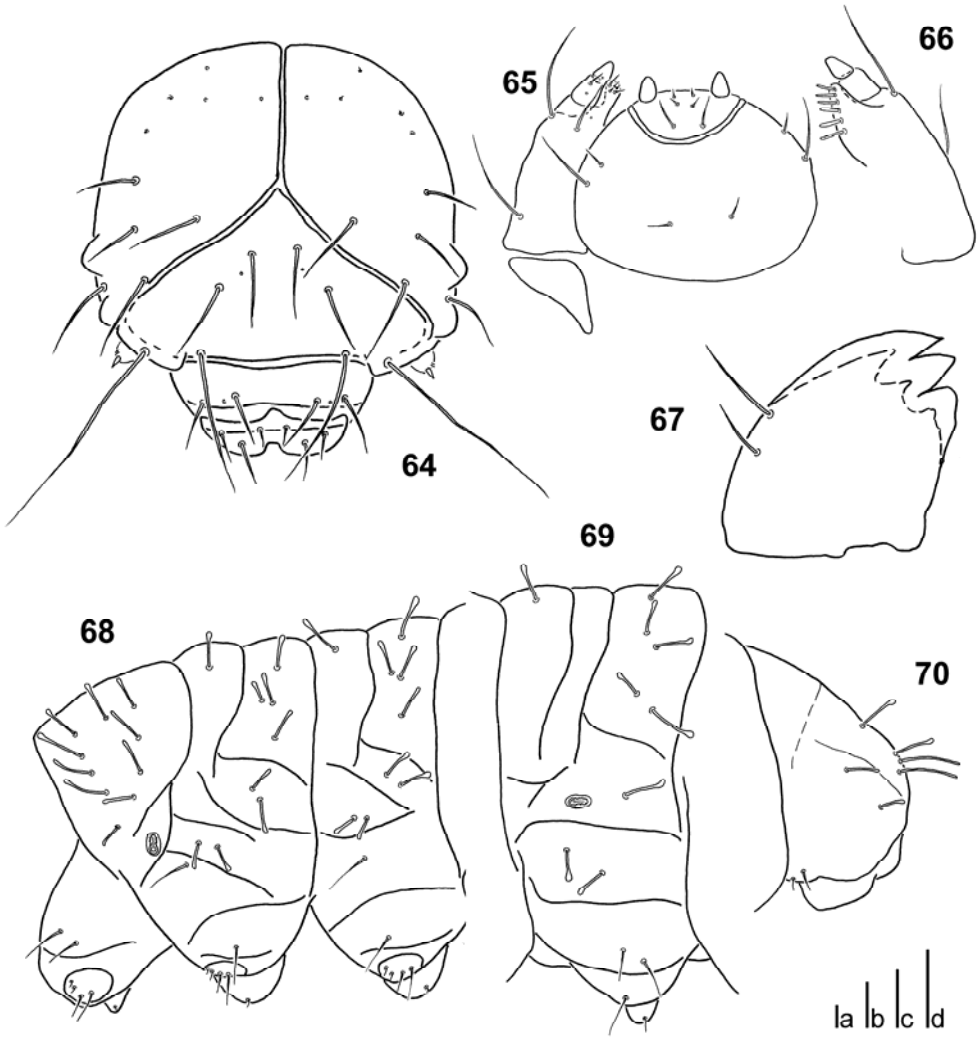

**FIGURES 43-49.** ***Donus oxalidis*****.** (43) head, (44) labium and maxilla, (45) maxilla, (46) mandible, (47) thorax, (48) abdominal segment IV, (49) abdominal segment IX; Figs 43, 45-46 dorsal view, Fig. 44 ventral view and Figs 47-49 lateral view. Scale bar 0.1 mm: a – Figs 47-49; b – Fig. 43; c – Figs 44-45; d – Fig. 46.




**FIGURES 50-56.** ***Donus palumbarius*****.** (50) head, (51) labium and maxilla, (52) maxilla, (53) mandible, (54) thorax, (55) abdominal segment IV, (56) abdominal segment IX; Figs 50, 52-53 dorsal view, Fig. 51 ventral view and Figs 54-56 lateral view. Scale bar 0.1 mm: a – Figs 54-56; b – Fig. 50; c – Figs 51-52; d – Fig. 53.




**FIGURES 57-63.** ***Donus reichei*****.** (57) head, (58) labium and maxilla, (59) maxilla, (60) mandible, (61) thorax, (62) abdominal segment IV, (63) abdominal segment IX; Figs 57, 59-60 dorsal view, Fig. 58 ventral view and Figs 61-63 lateral view. Scale bar 0.1 mm: a – Figs 61-63; b – Fig. 57; c – Figs 58-59; d – Fig. 60.




**FIGURES 64-70.** ***Donus tesselatus*****.** (64) head, (65) labium and maxilla, (66) maxilla, (67) mandible, (68) thorax, (69) abdominal segment IV, (70) abdominal segment IX; Figs 64, 66-67 dorsal view, Fig. 65 ventral view and Figs 68-70 lateral view. Scale bar 0.1 mm: a – Figs 68-70; b – Fig. 64; c – Figs 65-66; d – Fig. 67.

## 2.4. Distinct larval characters of weevils of the tribe Hyperini (Coleoptera: Curculionidae) [published in *VIIIth European Congress of Entomology, Supplementary Abstract book 2*, p 25]

# Distinct larval characters of weevils of the tribe Hyperini (Coleoptera: Curculionidae)

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## Introduction

**The weevil tribe Hyperini includes 19 genera (Alonso-Zarazaga & Lyal, 1999) with more than 350 species occurring chiefly in the Palaearctic Region with exception of four genera (*Agriochaeta* & *Lycosura* – Australia, *Lamprohypera* – New Guinea and *Diastrophilus* – Neotropical region).**

**Larvae of these weevils are characterized mainly by ectophagous, feeding mainly on leaves and sometimes on flowers. Mature larvae of the tribe Hyperini form cocoons, in which they pupate, and the adults hatch after one or two weeks. Main characters of larvae of Hyperini presented in literature are as follow: epipharynx and maxilla with simple setae, epipharynx with two *als* and four *ams*, *des3* on epicranium, *fs5* longer than *fs4*, one-segment labial palpus, mandible with sharp teeth, labral rods absent, postoccipital condyles present, pedal areas swollen to form prolegs or large lobes, head maculate and body pigmented.**

### Material and methods

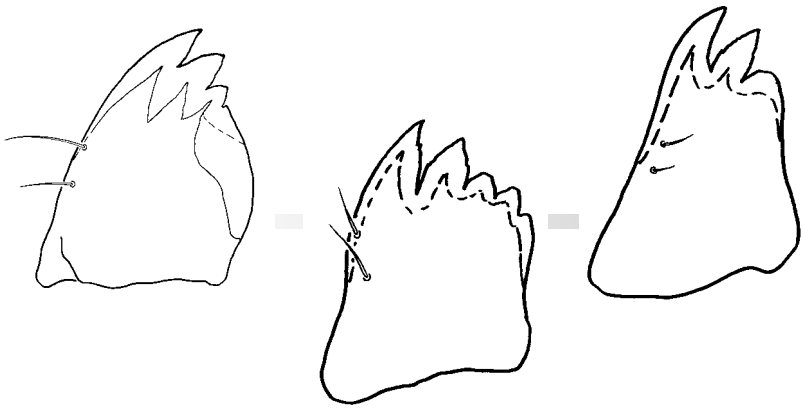
**Larvae of 30 Hyperini-species (6 sp. of *Donus*, 15 sp. of *Hypera*, 8 sp. of *Neoglanis*, 1 sp. of *Coniatus*) have been described. These descriptions are being published in a series of papers (Skuhrovec 2005, 2006a, 2006b).**

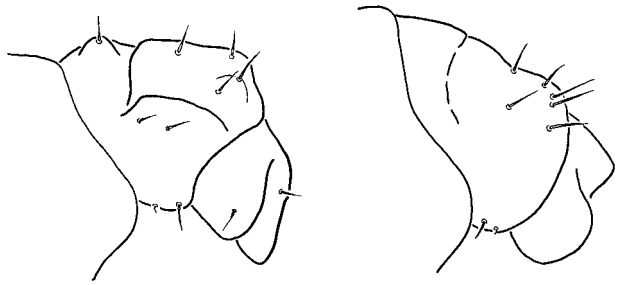
## Results

**Number of teeth of mandible seems to be crucial the character of larvae for genera.**

***Neoglanis* with three teeth, *Donus* with four teeth and *Hypera* with two teeth.**

**Chaetotaxy provides characters more useful for identification of species rather than genera. In spite of it several characters are specific for identification of genus. Presence of setae on abdominal segment IX is known only by *Coniatus*-species, which has two setae there. No other larvae of Hyperini, nor any other Curculionidae, has setae on their abdominal segment.**





## Discussion

**Larval characters seem to correspond well with the prelusive results of phylogenetic analysis based on adults (Skuhrovec, unpubl. data). The character of number of teeth seems like crucial character of larvae for genera, but we do not know anything about its phylogenetic value.**

*Research was supported by grant GAUK 228/2004/B-BIO.*

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## 2.5. Identification of larval instars of *Hypera postica* using chaetotaxy [published in *Journal of Economic Entomology*, **99(6)**: 2216-2218]

SHORT COMMUNICATION

# Identification of Instars of *Hypera postica* Using Chaetotaxy

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J. Econ. Entomol. 99(6): 2216–2218 (2006)

**ABSTRACT** A new method using chaetotaxy for identification of instars of *Hypera postica* (Gyllenhal) is presented and compared with earlier methods. I recommend a combined method using separation of small (first and second instars) and large (third and fourth instars) followed by identification of particular instars by using chaetotaxy.

**KEY WORDS** morphology, chaetotaxy, larva, Hyperini, alfalfa weevil

The alfalfa weevil, *Hypera postica* (Gyllenhal), has four instars. The first (L1) and second (L2) instars usually feed on the young growing stem tips of alfalfa, *Medicago sativa* L. The third (L3) and fourth (L4) instars also feed on leaves and can cause serious defoliation (Hoff et al. 2002). Therefore, monitoring of larval abundance is essential for crop protection. Shake-bucket or sweep-net methods (Hoff et al. 2002) are frequently applied for monitoring; the first method is more useful for detection of L1 and L2 instars and the second method for larger larvae (Hoff et al. 2002). Although discriminating between small and large larva is often sufficient for control decisions, the knowledge of determining particular instars is essential for precise pest monitoring.

The importance of a larva as a pest increases with its age. The L1 larva mostly searches for food in adequate supply to complete development (J.S., unpublished data) and causes nearly no harm. The food consumption of L2 larvae is also unimportant. For practical control, however, it is useful to determine the time to expect molting from L2 to L3 larvae, which are more damaging. Therefore, differentiating between L1 and L2 is useful for timely control decisions. The discrimination of L3 from L4 larvae may be useful for further research.

Larval morphology of *H. postica* has been studied mainly on fourth instars (Anderson 1948; Bland 1983; Skuhrovec 2003, 2005). The instars differ in body length and head width (Table 1). Identification using body measures is rapid but often not accurate, because the widths of head capsules of successive larval instars overlap (Table 1). Even the improved method for instar identification, the head capsule caliper (Bartell and Roberts 1974), is still limited by the overlapping ranges of the head width measurements. A larva is moved along the angular caliper until the head capsule width fits within the range of one of the four instars.

In this article, I present a method for identification of *H. postica* instars by using chaetotaxy, which is applicable for all larvae of weevils of the subfamily Hyperinae (J.S., unpublished data).

## Materials and Methods

*H. postica* larvae were reared from eggs laid by adults collected in Kačice, Czech Republic (50° 09′ 14″ N, 14° 00′00′ E [WGS-84]; 388 m above sea level) in 2002–2005. The larvae fed with leaves of *Medicago sativa* L. were reared in petri dishes at constant 20°C and a long-day photoperiod of 16:8 (L:D) h.

Forty individuals of each instar were fixed in Pampel liquid (4 parts glacial acetic acid, 6 parts 4% formaldehyde, 15 parts 95% ethyl alcohol and 30 parts distilled water). In making slides (May 1994), a larva was decapitated and its head and were body placed in lactic acid for 2 wk to remove the soft tissues. Remaining body parts were then mounted on temporary slides in glycerin. Head width was measured under a binocular microscope (10–100× magnification) by using calibrated oculars. Drawings were traced from photographs of digital camera (SONY DXC-950P) and processed in the computer (Adobe Photoshop, Adobe Systems, Mountain View, CA; CorelDRAW, Corel Corporation, Ottawa, Ontario, Canada).

All material (slides, adult weevils, larvae) is deposited in the collection of the author.

## Results

Head width overlapped between instars (Table 1). Important morphological differences between instars are on lateral parts of abdominal segments I–VIII (dorsum; see square in Fig. 1A) where numbers of setae differ. The first instar has only one seta (Fig. 1B), the second instar has three setae (Fig. 1C), and the third and the fourth instars have five setae on each of abdom-

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0022-0493/06/2216–2218$04.00/0 

**Table 1. Head width of *H. postica* instars**

| Instar | Head width (mm) | | | Head width (mm) | |
|---|---|---|---|---|---|
| | Avg. | Min. | Max. | Min. | Max. |
| L1 | 0.19 | 0.18 | 0.20 | 0.2 | 0.212 |
| L2 | 0.27 | 0.22 | 0.30 | 0.29 | 0.29 |
| L3 | 0.44 | 0.30 | 0.52 | 0.436 | 0.44 |
| L4 | 0.60 | 0.56 | 0.68 | 0.54 | 0.66 |

The head width measurements in the right-most column are from the literature.

inal segment I–VIII. Setae of L3 are short (Fig. 1D), less than the half of the length of the setae of L4 (Fig. 1E).

## Discussion

Three methods for the identification of larval instars are now available: measurement of head width by ocular micrometer or head capsule caliper, and using chaetotaxy. Using an ocular micrometer is slow and still imperfect in determining the instars (Bartell and Roberts 1974). Using chaetotaxy takes about the same time as using a caliper and allows a precise identification of instars. A stereomicroscope (10× magnification) with good illumination is necessary. Instar identification during the period of molting may be difficult, particularly the L2 to L3 ecdysis. Before ecdysis, new cuticle is visible through the old cuticle, already showing setae of the older instar.

The best method of instar identification is first to differentiate between small and large larvae by visual inspection, and then to use a stereomicroscope for exact differentiation between L1 versus L2 and L3 versus L4. Such knowledge enables us to refine the timing of control decisions in the pest management.

## Acknowledgments

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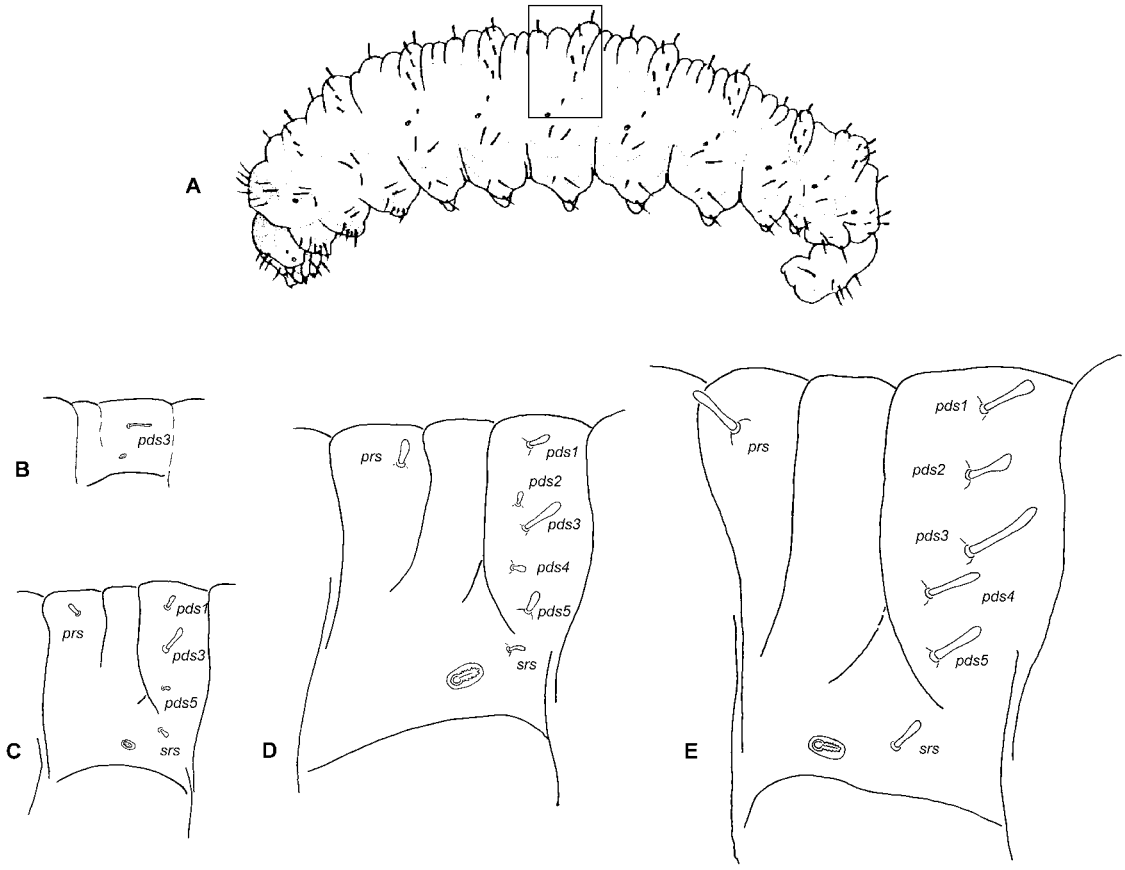


**Fig. 1.** Larva of *H. postica* from lateral views. (A) Habitus of L4 larva. The square shows the upper part of abdominal segment. Details of the upper parts of abdominal segment (dorsum and spiracular area) IV. (B) L1 larva. (C) L2 larva. (D) L3 larva. (E) L4 larva.

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# 3. Papers on ecology

## 3.1. Host plants of weevils of the genus Hypera (Coleoptera: Curculionidae) occuring in the Czech Republic [published in *Klapalekiana*, **41**: 215-255]

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ISSN 1210-6100

# Živné rostliny nosatců rodu *Hypera* (Coleoptera: Curculionidae) vyskytujících se na území České republiky

# Host plants of weevils of the genus *Hypera* (Coleoptera: Curculionidae) occurring in the Czech Republic

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**Host plants, bionomy, Coleoptera, Curculionidae, Hyperinae, *Hypera*, Central Europe, Palaearctic Region**

**Abstract.** I review the host plants of the weevil genus *Hypera* Germar, 1817 from the Czech Republic, based on my own investigation and literature data including previous feeding experiments. Host plants of 22 *Hypera* species are currently known; 23 host plant species are confirmed. *Coronilla varia* is recorded as the host plant of *Hypera plantaginis* (De Geer, 1775) for the first time. Three new host plant species (*Medicago falcata*, *M. sativa* and *Vicia tenuifolia*) are discovered for *H. suspiciosa* (Herbst, 1795). Some problems with host plants, *Chrysaspis* and *Trifolium* spp., of *H. venusta* (Fabricius, 1781) are commented. New observations on larval development are recorded for *H. arator* (Linnaeus, 1758) and *H. nigrirostris* (Fabricius, 1775): the former may feed inside or on the surface of flowers of *Dianthus* spp.; the latter feed inside unripe flowers of *Trifolium pratense* and *T. repens*. The larvae of *H. plantaginis* develop on *Anthyllis*, *Coronilla*, *Lotus* and *Oxytropis* spp. from the Fabaceae but not on *Plantago* spp. from the Plantaginaceae, where they only build the cocoon and pupate. Sixty-five host plants recorded in literature are regarded as incorrect.

## ÚVOD

Larvy nosatců (Curculionidae) se převážně vyvíjejí uvnitř pletiv nadzemních částí rostlin. V rámci středoevropské fauny jsou mezi nimi výjimkou druhy rodů *Cionus* Clairville, 1798; *Phytobius* Schönherr, 1833 a tribu Hyperini Marseul, 1863 (Dieckmann 1989). Larvy těchto nosatců žijí ektofágně, za potravu jim slouží především listy rostlin a někdy i květy. Poslední larvální instary zástupců tribu Hyperini si vytvářejí síťovitý kokon, v kterém se zakuklí a přibližně po jednom až dvou týdnech se líhne dospělec (Scherf 1964).

Rod *Hypera* Germar, 1817 zahrnuje více než 115 druhů vyskytujících se převážně v palearktické oblasti (Smreczyński 1968), výjimku tvoří 17 severoamerických druhů (Titus 1911, Csiki 1934, Anderson 2002). Na území České republiky je zatím spolehlivě známo 24 druhů (Skuhrovec 2003b). Můžeme mezi nimi nalézt jak oligofágy v širším slova smyslu (vyvíjejí se na více než 3 příbuzných rodech z jedné čeledi rostlin) (Strejček 2001) (např. *Hypera postica* (Gyllenhal, 1813); *H. rumicis* (Linnaeus, 1758)), tak i striktní monofágy (např. *H. libanotidis* (Reitter, 1896); *H. vidua* Gené, 1837).

U více než 75 druhů rodu *Hypera* není dosud známa bionomie ani poznatky o živných rostlinách. V rámci fauny ČR se to týká dvou druhů, *Hypera carinicollis septentrionalis* Kippenberg, 1986 a *H. cumana* (Petri, 1901) (Skuhrovec 2003b).

V literatuře (viz Kleine 1910) je uvedeno velké množství chybných údajů o živných rostlinách druhů rodu *Hypera*. Problémy pramení zpravidla z nedostatečnosti rozlišování pojmů živný a úživný žír. Rostlina, na níž probíhá vývoj druhu, je definována jako živná rostlina.

Dospělci mohou požírat nejen živné rostliny, ale i jiné příbuzné rostliny: tzv. úživný žír. To platí zejména pro immaturní jedince a podzimní generaci druhu (Miller 1956).

Cílem této práce, navazující na předchozí práci o rozšíření rodu *Hypera* v České republice (Skuhrovec 2003b), je shrnout poznatky o živných rostlinách nosatců rodu *Hypera* vyskytujících se v České republice a ze soupisu živných rostlin vyřadit ty druhy, které byly chybně označovány za živné.

## MATERIÁL, METODIKA A ZKRATKY

Oddíl „Živné rostliny druhů rodu *Hypera*" obsahuje literární údaje o živných rostlinách, dále pak soupis mnou zjištěných živných rostlin (lokality nálezů i soupis živných rostlin viz Skuhrovec 2003a,b) a revizi rostlinných druhů v literatuře chybně vydávaných za živné. Veškerá data o živných rostlinách s jednotlivými popisky jsou sjednoceny v Appendixu (Tab. 1-22).

Tabulky (Tab. 1-22) obsahují vždy tři sloupce; v prvním sloupci je uvedena živná rostlina, následuje zkratka čeledi rostliny a poslední sloupec obsahuje vypsané citace publikací, ve kterých je rostlina uváděna. V tabulkách (Tab. 1-22) jsou živné rostliny řazeny abecedně: nejdříve podle čeledí, dále podle jmen rodů a druhů. V rámci rodu jsou kříženci uvedeni vždy jako poslední. Rostliny, u nichž zpochybňuji správnost dříve publikovaného údaje o živné rostlině pro daný druh, jsou označeny „*".

Veškeré známé živné rostliny nosatců rodu *Hypera* jsou uvedeny v Appendixu (Tab. 23). Tato tabulka obsahuje ke každému rostlinnému taxonu soupis druhů rodu *Hypera*, které se na této rostlině vyvíjí. Druhy nosatců, u nichž zpochybňuji správnost dříve publikovaného údaje o vývoji na živné rostlině, jsou označeny „*" (viz Tab. 23); tyto rostliny jsou týmž způsobem označeny v Tab. 1-22.

Druhy rostlin, které byly v literatuře omylem uváděny jako živné rostliny, jsou shrnuty v Tab. 1-23 (označené „*"). Jedná se o rostliny z těchto 9 čeledí: Brassicaceae, Chenopodiaceae, Lamiaceae, Malvaceae, Plantaginaceae, Poaceae, Punicaceae, Rosaceae a Solanaceae. Pravděpodobně se ve většině případů jedná o úživný žír dospělců s výjimkou čeledi Plantaginaceae (viz *H. plantaginis*).

V kapitole „Shrnutí" jsou uvedeny komentáře k jednotlivým čeledím živných rostlin. Čeledi jsou uspořádány podle počtu druhů rodu *Hypera*, jejichž vývoj probíhá na rostlinách dané čeledi.

Systém a jména rostlin v plném znění jsou převzata z monografií Tutin et al. (1964, 1968, 1972, 1976); Hejný & Slavík (1990) a Slavík (1995, 1997).

Autoři popisu nebyli zjištěni u rostlin *Rubus vitis* a *Medicago indicus*. Scherf (1964) uvádí jako živnou rostlinu *Medicago indicus*, ale pravděpodobně myslel *Melilotus indicus*. *Rubus vitis* je zřejmě hybrid mezi vínem (*Vitis* sp.) a ostružiníkem (*Rubus* sp.) (J. Sádlo, pers. comm.).

Zkratky použité v Tab. 1-22:

API – Apiaceae (okoličnaté)
AST – Asteraceae (hvězdnicovité)
BRA – Brassicaceae (brukvovité)
CAR – Caryophyllaceae (hvozdíkovité)
CHE – Chenopodiaceae (merlíkovité)
FAB – Fabaceae (bobovité)
GER – Geraniaceae (kakostovité)
LAM – Lamiaceae (hluchavkovité)
MAL – Malvaceae (slézovité)
PLA – Plantaginaceae (jitrocelovité)
POA – Poaceae (lipnicovité)
POL – Polygonaceae (rdesnovité)
PUN – Punicaceae (marhaníkovité)
ROS – Rosaceae (růžovité)
SOL – Solanaceae (lilkovité)

## ŽIVNÉ ROSTLINY DRUHŮ RODU *HYPERA*

***Hypera adspersa*** (Fabricius, 1792)

(Tab. 1)

Vývoj *H. adspersa* byl pozorován na rostlinách sedmi rodů: *Aegopodium*, *Apium*, *Crithmum*, *Daucus*, *Oenanthe*, *Peucedanum* (Apiaceae) a *Bidens* (Asteraceae). Scherf (1964) uvádí ze střední Evropy tyto živné rostliny: *Aegopodium podagraria*, *Apium inundatum*, *A. nodiflorum*, *Daucus carota*, *Oenanthe aquatica* a *Peucedanum palustre* (Apiaceae). Západoevropské populace se vyvíjejí i na dalších rostlinách: *Apium inundatum*, *A. nodiflorum*, *Crithmum maritimum* a *Oenanthe crocata* (Apiaceae) (Hoffmann 1954, Tempère 1972,

Tempère & Péricart 1989). Dieckmann (1961) a Smreczyński (1968) uvádí jako živnou rostlinu *Bidens tripartita* (Asteraceae) a Sprick (1996) oznamuje nález larev, kokonů a imag na *B. cernua*.

Kleine (1910) uvádí chybně několik druhů živných rostlin. U rostlin z čeledí Brassicaceae, Lamiaceae, Poaceae a Punicaceae nejspíš jde o pouhé nálezy dospělců na rostlině. V případě čeledí Caryophyllaceae a Polygonaceae se zřejmě jedná o chybnou determinaci dospělců nalezených na zmíněných rostlinách; ve druhém případě Kleine (1910) pravděpodobně zaměnil *H. adspersa* za *H. rumicis*, který se na rostlinách čeledi Polygonaceae vyvíjí.

***Hypera arator*** (Linnaeus, 1758) (Tab. 2)

U *H. arator* je znám vývoj na rostlinách třinácti rodů: *Agrostemma*, *Cucubalus*, *Dianthus*, *Gypsophila*, *Lychnis*, *Minuartia*, *Moenchia*, *Oberna*, *Scleranthus*, *Silene*, *Spergula*, *Spergularia* a *Stellaria* (Caryophyllaceae).

Vilímová (1990) upozorňuje na zvláštní bionomii *H. arator.* Tento druh se vyvíjí na *Dianthus arenarius bohemicus* uvnitř semeníků (Vilímová 1990). U druhu *D. carthusianorum* se však vyvíjí na povrchu semeníků (J. Skuhrovec, nepubl. data). Nosatec *H. arator* se tedy může vyvíjet jak na povrchu tak uvnitř semeníků. Je možné, že rozhodujícím faktorem pro místo vývoje larev je prostor mezi semeny. U *D. carthusianorum* jsou semena blízko sebe na rozdíl od *D. arenarius bohemicus*, kde je prostoru mezi semeny mnohem více (Vilímová 1990); tam by se mohla vyvíjet larva. Vývoj larev tedy neprobíhá pouze na povrchu rostlin jak je uváděno v literatuře (Dieckmann 1989), ale i uvnitř květů (Skuhrovec 2003a,b; viz *H. nigrirostris*).

Larvy *H. arator* jsem sbíral i dochoval na *Dianthus carthusianorum* (Caryophyllaceae) v okolí Bratřic (Skuhrovec 2003a; viz Tab. 2).

Chybné údaje o živných rostlinách se vyskytují v pracích Rupertsbergera (1872), jenž uvádí jako živnou rostlinu *Polygonum aviculare* (Polygonaceae), a Schnella (1955), který uvádí *Ornithopus sativus* (Fabaceae). V obou případech se pravděpodobně jedná o nálezy dospělců na rostlině.

***Hypera arundinis*** (Paykull, 1792) (Tab. 3)

Druh se vyvíjí na mokřadních druzích rostlin čeledi Apiaceae. Vývoj je znám pouze na třech druzích: *Berula erecta*, *Oenanthe aquatica* a *Sium latifolium*. Rosenhauer (1882) uvádí jako živnou rostlinu *Betula angustifolium* (sic!); autor zřejmě míní *Berula angustifolium*, synonymum *B. erecta*.

Larvy druhu *H. arundinis* byly sbírány M. Wanatem (pers. comm.) v Polsku na *Sium latifolium* (Apiaceae) (viz Tab. 3).

Reitter (1916) uvádí jako živné rostliny *H. arundinis* „var. *hydrolapathum*“ dva druhy rodu *Rumex* (Polygonaceae). Tuto alternativu nelze vyloučit, ale zdá se velmi nepravděpodobná. Zmíněné rostliny nebyly již po Reitterovi (1916) publikovány. Údaj o *Phragmites communis* (Poaceae) (Kleine 1910) je chybný.

***Hypera contaminata*** (Herbst, 1795) (Tab. 4)

Vývoj druhu probíhá pouze na *Lathyrus tuberosus* (Fabaceae). První známá zmínka o živné rostlině tohoto monofága je uvedena v publikaci Kippenberga (1983).

Dospělce a larvy druhu *H. contaminata* jsem sbíral na *Lathyrus tuberosus* na vrchu Milá (Skuhrovec 2003a,b; viz Tab. 4).

***Hypera dauci*** (Olivier, 1807) (Tab. 5)

Druh je uváděn jako monofág na *Erodium cicutarium* (Geraniaceae) (Tempère 1972, Dieckmann 1989, Tempère & Péricart 1989, Koch 1992) nebo jako oligofág na rostlinách rodů *Erodium* a *Geranium* (Geraniaceae) (Smreczyński 1968, Angelov 1978, Dieckmann 1981). Údaje o vývoji na *Erodium moschatum* jsou uvedeny pouze ve dvou publikacích: Hoffmann (1954) a Scherf (1964). Koch (1992) uvádí na kakostu *Geranium pusillum* pouze požerky dospělců.

Dříve byla uváděna jako živná rostlina také *Daucus carota* (Apiaceae) (Kleine 1910, Hustache 1929). Lze předpokládat, že se jednalo o pouhý nález dospělce na rostlině.

***Hypera denominanda*** (Capiomont, 1868) (Tab. 6)

První známý údaj o živných rostlinách (*Lathyrus pratensis* a *Vicia cracca* z čeledi Fabaceae) uvádí Smreczyński (1968). Kippenberg (1983) uvádí navíc druh *Vicia tenuifolia*.

Dospělce i larvy jsem sbíral na *Vicia tenuifoila* na vrchu Šibeník (Skuhrovec 2003a,b; viz Tab. 6).

***Hypera diversipunctata*** (Schrank, 1798) (Tab. 7)

Druh se vyvíjí na rostlinách pěti rodů: *Cerastium*, *Minuartia*, *Myosoton*, *Silene* a *Stellaria* (Caryophyllaceae). Dieckmann (1989) uvádí jako živné rostliny středoevropských populací pouze tři rody: *Cerastium*, *Myosoton*, *Stellaria* (Caryophyllaceae). Údaj o rostlinách rodu *Minuartia* jako první publikovali Khruleva & Korotyaev (1999). *Silene dioica* je uváděna jako živná rostlina západoevropských populací druhu (Tempère 1972).

Larvy jsem sbíral na *Cerastium arvense* v okolí Králického Sněžníku (viz Tab. 7).

*Gnaphalium dioicum* (Asteraceae) je Hoffmannem (1954) chybně uváděno jako živná rostlina *H. diversipunctata*. Legalov & Opanasenko (1992) vycházející z práce Arnoldi et. al. (1974) publikovali jako živnou rostlinu nedeterminovaný druh rodu *Astragalus* (Fabaceae). Zřejmě se jedná o omyly založené pouze na nálezech imág (viz Materiál, metodika a zkratky). Kleine (1910) a Reitter (1916) uvádí jako živné rostliny *Plantago major* a *P. media*. Smreczyński (1968) obě rostliny uvádí také a upozorňuje, že je nutné potvrzení obou druhů jako živných rostlin. Pravděpodobně se jedná o stejný omyl jako u *H. plantaginis* (Skuhrovec 2003b, viz *H. plantaginis*).

***Hypera fornicata*** (Penecke, 1928) (Tab. 8)

Druh se vyvíjí na *Trifolium pratense* (Fabaceae). Tento konkrétní údaj o živné rostlině je publikován v pracích Kocha (1992) a Dieckmanna & Behneho (1994). Strejček (2001) uvádí jako živné rostliny druhy rodu *Trifolium* (blíže nespecifikuje).

Tento druh nemá dosud vyjasněnou taxonomii, některé jedince nelze jednoznačně odlišit od druhu *H. meles* (blíže viz Skuhrovec 2003b).

***Hypera fuscocinerea*** (Marsham, 1802) (Tab. 9)

*H. fuscocinerea* se vyvíjí na rostlinách šesti rodů: *Anthyllis, Medicago, Melilotus, Trifolium, Trigonella* a *Vicia* (Fabaceae). Jediný známý údaj o *Trigonella caerulea* jako živné rostlině pochází z práce Kleineho (1910). Dříve byla tato rostlina řazena do příbuzného rodu *Melilotus*. Údaj o druhu *Anthyllis vulneraria* jako živné rostlině publikoval také Kleine (1910).

***Hypera libanotidis*** (Reitter, 1896) (Tab. 10)

Moravský endemit, popsaný z lokality Kotouč u Štramberka, byl sbírán naposledy okolo roku 1900 (Purkyně 1957). Larvy a kukly byly sbírány na rostlině *Libanotis pyrenaica* (Apiaceae). Nálezy tohoto monofága jsou uváděny i v pozdějších letech 20. století z okolí Frýdku-Místku, ale nejsou známy dokladové exempláře (srovn. Skuhrovec 2003b).

***Hypera meles*** (Fabricius, 1792) (Tab. 11)

Druh se vyvíjí na rostlinách šesti rodů: *Chrysaspis*, *Dorycnium*, *Lotus*, *Medicago*, *Trifolium* a *Vicia* (Fabaceae). Jediný údaj o živných rostlinách z rodu *Vicia* publikoval Roubal (1941), ale bez uvedení druhových jmen.

Larvy se mi z dospělců nalezených na *Trifolium pratense* na Slovensku bohužel nepodařilo odchovat. *T. pratense* je v literatuře běžně uváděn jako živná rostlina druhu *H. meles* (viz Tab. 11).

***Hypera nigrirostris*** (Fabricius, 1775) (Tab. 12)

U druhu *H. nigrirostris* probíhá vývoj na rostlinách čtyř rodů: *Chrysaspis*, *Medicago*, *Ononis* a *Trifolium* (Fabaceae).

Larvy se na jeteli nevyvíjejí na listech, ale uvnitř květního lůžka. Vajíčka jsou pravděpodobně kladena na spodní stranu květního lůžka. Larvy 1. instaru se dostanou dovnitř a tam se začnou živit ještě nedozrálými částmi květu. Poslední larvální instar se kuklí mimo květní lůžko; vytváří si kokon na spodní straně listu. Tato odlišná bionomie se dá předpokládat i u dalších zástupců rodu *Hypera* menších rozměrů (*H. constans* (Boheman, 1834), *H. cumana*, *H. ononidis*, *H. venusta*) nebo u příbuzného rodu *Limobius* Schönherr, 1825 (ve střední Evropě pouze *L. borealis* (Paykull, 1792)) (Skuhrovec 2003b). Je možné, že vývoj *H. nigrirostris* uvnitř květního lůžka probíhá pouze na *Trifolium repens*, t.j. analogicky druhu *H. arator* (viz výše). Bionomie zjištěná u druhů *H. arator* a *H. nigrirostris* dokazuje, že larvy rodu *Hypera* nemají uniformní bionomii, jak je uváděno v literatuře (Dieckmann 1989). Důležitým faktorem je velikost larvy, ale roli může hrát i prostor uvnitř květu (Skuhrovec 2003a).

Dospělci i larvy *H. nigrirostris* byli sbíráni na *Trifolium pratense* a *T. repens* na Slovensku (Skuhrovec 2003a; viz Tab. 12).

Kleine (1910) podle mého názoru chybně uvádí jako živnou rostlinu *Buphthalmum salicifolium* (Asteraceae).

***Hypera ononidis*** (Chevrolat, 1863) (Tab. 13)

U druhu *H. ononidis* je znám vývoj pouze na rostlinách rodu *Ononis* (Fabaceae). Pro středoevropské populace jsou jako živné rostliny uváděny *O. natrix, O. repens* a *O. spinosa* (Kippenberg 1983, Dieckmann 1989). Hustache (1929) a Hoffmann (1954) uvádí pro západoevropské populace *H. ononidis* ještě *O. variegata* a *O. viscosa*. Normand (1937) jako jediný uvádí z Tunisu jako živnou rostlinu *O. biflora*.

Tento západopalearktický druh nemá dosud vyjasněnou taxonomii, některé jedince nelze jednoznačně odlišit od *H. nigrirostris* (srovn. Skuhrovec 2003b).

Kleine (1910) uvádí jako živnou rostlinu *Trifolium incarnatum*. Tento údaj je s největší pravděpodobností chybný, patrně díky záměně s *H. nigrirostris*.

***Hypera plantaginis*** (De Geer, 1775) (Tab. 14)

*H. plantaginis* se vyvíjí na rostlinách čtyř rodů: *Anthyllis, Coronilla, Lotus* a *Oxytropis* (Fabaceae). Jedinou zmínku o rodu *Coronilla* jako živných rostlinách *H. plantaginis* publikoval bez bližší specifikace Zaslavski (1961). *Oxytropis campestris* jako živnou rostlinu poprvé publikoval Kippenberg (1983).

Dospělce i larvy jsem sbíral na *Lotus corniculatus*, *Coronilla varia* a *Oxytropis campestris* (Fabaceae) na vrchu Šibeník. *Coronilla varia* je zde uváděna jako živná rostlina poprvé, zbývající dvě jsou známy z literatury (Tab. 14).

Jako živné rostliny *H. plantaginis* jsou chybně uváděny druhy z čeledi Caryophyllaceae (*Silene dioica*, *S. latifolia alba*). *Silene latifolia alba* publikovali Perris (1874), Bedel (1888) a Kryger (1921-1922). Podle Scherfa (1964) se jedná s velkou pravděpodobností o omyl. Jediný známý údaj o *S. dioica* publikoval Kleine (1910). Ve všech případech byli nejspíše chybně determinováni dospělci.

V mnoha publikacích (např. Kaltenbach 1874, Petri 1901, Kleine 1910, Hoffmann 1954) jsou chybně uváděny jako živné rostliny *Plantago lanceolata*, *P. major* a *P. media* (Plantaginaceae). Smreczyński (1968) uvádí také tyto tři druhy rodu *Plantago*, upozorňuje však na nutnost kontroly. Chyba u většiny autorů vznikla nejspíše při dochovávání dospělců z nalezených síťovitých kokonů. Larva posledního instaru opouští živnou rostlinu (*Lotus corniculatus*) a vyhledává vhodný prostor pro vytvoření síťovitého kokonu. Spodní strana listů v přízemní růžici zřejmě nabízí ochranu před parazity nebo proti vysychání kokonu. Z tohoto důvodu nalezneme kokony *H. plantaginis* na spodní straně listů rostlin rodu *Plantago*. Stejný omyl se pravděpodobně týká i dalších druhů (*H. diversipunctata*, *H. postica*, *H. suspiciosa* a *H. striata*), i když toto chování larev jsem zatím pozoroval pouze u *H. plantaginis* (Skuhrovec 2003b).

***Hypera postica*** (Gyllenhal, 1813) (Tab. 15)

Druh se vyvíjí na rostlinách devíti rodů: *Astragalus*, *Galega*, *Lathyrus*, *Lotus*, *Lupinus*, *Medicago*, *Melilotus*, *Trifolium* a *Vicia* (Fabaceae). Jediný údaj o rodu *Lupinus* jako živných rostlinách druhu *H. postica* uvádí – spolu s rodem *Lotus* a bez dalších údajů – Oprychałowa

(1957). Ojediněle byly dále v literatuře publikovány jako živné rostliny druhy *Galega officinalis*, *Lotus corniculatus* (Scherf 1964) a *Lathyrus odoratus* (Miller 1956). Rostliny ze zbývajících pěti rodů (*Astragalus*, *Medicago*, *Melilotus*, *Trifolium* a *Vicia*) byly jako živné rostliny *H. postica* uváděny vícekrát (Tab. 15).

Na rostlinách rodu *Medicago* byly prováděny experimenty s cílem zjistit, na kterých druzích se *H. postica* vyvíjí (Danielson et al. 1986). Vývoj proběhl především na *M. glutinosa*, *M. sativa* a *M. scutellata*. Na *M. disciformis* a *M. glandulosa* vývoj také proběhl, ale úmrtnost larev byla až 80%, zatímco průměrná úmrtnost larev na *M. sativa* dosáhla 25%. Vývoj na *M. disciformis* a *M. glandulosa* trval navíc při standardních podmínkách (20°C) o dva až pět dnů déle než na *M. glutinosa*, *M. sativa* a *M. scutellata* (průměrná délka vývoje larvy *H. postica* je přibližně 12 dní). Na *M. prostrata* vývoj neproběhl vůbec. Negativním faktorem byly pravděpodobně některé žlázy rostlin a denzita trichomů na listu (Danielson et al. 1986). Negativní vliv vyšší denzity trichomů na listech potvrdil pokus na rostlině *M. glutinosa*. K pokusu byly použity dva kultivary a na rostlinách s vyšší denzitou trichomů se larvy vyvíjely delší dobu a měly vyšší mortalitu než na kultivaru s nižší denzitou (Danielson et al. 1986).

Larvy *H. postica* jsem sbíral a dochoval na třech druzích rodu *Medicago*: *M. falcata*, *M. sativa* a *M.* x *varia* z Prokopského údolí (Praha) a vrchu Milá (Skuhrovec 2003a,b; viz Tab. 15).

Oprychałowa (1957) chybně uvádí jako živné rostliny *Phaseolus vulgaris* a *Robinia pseudoacacia* (Fabaceae), *Brassica capitata* (Brassicaeae), *Gossypium* sp. (Malvaceae), *Rubus* sp. (Rosaceae) a *Solanum tuberosum* (Solanaceae). *Solanum tuberosum* a *Rubus vitis* (Rosaceae) chybně uvádí také Kleine (1910), stejně jako *Plantago lanceolata* (viz *H. plantaginis*) a *Atriplex patula* (Chenopodiaceae). Oba autoři (Oprychałowa 1957, Kleine 1910) uvádí pouze nálezy dospělců na rostlinách, nikoliv jejich vývoj.

***Hypera rumicis*** (Linnaeus, 1758) (Tab. 16)

Vývoj *H. rumicis* je znám na rostlinách osmi rodů: *Acetosa*, *Bistorta*, *Fallopia*, *Oxyria*, *Persicaria*, *Polygonum*, *Rheum* a *Rumex* (Polygonaceae).

Jedinci druhu *H. rumicis*, kteří se vyvíjejí na *Bistorta major*, se několika morfologickými znaky (velikost habitu, barva těla, tvar šupinek) odlišují od jedinců vyvíjejících se na jiných rostlinách (Skuhrovec 2003b; J. Strejček, pers. comm.).

***Hypera striata*** (Boheman, 1834) (Tab. 17)

Tempère & Péricart (1989) publikovali jediný přesný údaj o živné rostlině, *Vicia sativa* (Fabaceae). Kippenberg (1983), Smreczyński (1976) a Tempère (1961, 1972) uvádějí jako živnou rostlinu blíže nespecifikovaný druh rodu *Vicia*. Koch (1992) uvádí *H. striata* jako oligofága na vikvi, *Vicia* spp; bohužel však nespecifikuje, z jakých konkrétních dat vychází.

Dospělci a larvy byli sbíráni na agregátu *Vicia sativa* na Slovensku (Skuhrovec 2003a; viz Tab. 17).

Podle Hoffmanna (1954), Smreczyńského (1968) a Angelova (1978) se *H. striata* vyvíjí na *Plantago coronopus* (Plantaginaceae). Mazur (2002) udává *H. striata* jako oligofága na rodu *Plantago*. V obou případech se jedná o chybné závěry (viz *H. plantaginis*).

***Hypera suspiciosa*** (Herbst, 1795) (Tab. 18)

Vývoj *H. suspiciosa* je znám na rostlinách šesti rodů: *Lathyrus*, *Lotus*, *Medicago*, *Melilotus*, *Trifolium* a *Vicia* (Fabaceae). První konkrétní údaje o druzích rodu *Trifolium* a *Melilotus latifolius albus* pocházejí až z práce Dieckmanna (1989). První záznam o rostlinách rodu *Melilotus* bez bližší specifikace publikoval již Zaslavskij (1959).

Larvy jsem sbíral a dochoval na čtyřech druzích rostlin čeledi Fabaceae. Druh jsem sbíral na *Lathyrus pratensis* v okolí Podbořan (Skuhrovec 2003a; viz Tab. 18). Údaje o zbývajících třech rostlinách: *Medicago falcata*, *M. sativa* z Prokopského údolí a *Vicia tenuifolia* z vrchu Šibeník a z okolí Podbořan, jako živných rostlinách *H. suspiciosa* byly publikovány teprve Skuhrovcem (2003a,b).

Kleine (1910) chybně uvádí jako živnou rostlinu *Plantago major* (viz *H. plantaginis*).

***Hypera venusta*** (Fabricius, 1781) (Tab. 19)

Druh se vyvíjí na rostlinách šesti rodů: *Anthyllis*, *Chrysaspis*, *Lotus*, *Onobrychis*, *Ulex* a *Vicia* (Fabaceae).

Scherf (1964) a Dieckmann (1989) uvádí jako živné rostliny také *Trifolium campestre* a *T. dubium*. Slavík (1997) odděluje od rodu *Trifolium* taxon *Chrysaspis*, do něhož řadí oba zmíněné druhy rostlin, zatímco Tutin et al. (1968) je považují za jediný rod *Trifolium*. Vývoj *H. venusta* byl potvrzen pouze na rostlinách taxonu *Chrysaspis* (viz Tab. 19), což poukazuje na určitý rozdíl mezi těmito dvěma taxony rostlin. V této práci jsou proto rozlišovány jako dva rody. Koch (1992) uvádí bez konkrétních dat jako živnou rostlinu i *Trifolium arvense*.

Dospělci *H. venusta* byli pozorováni při požerku na rostlinách rodů *Trifolium*, *Lotus* a *Melilotus* (Dieckmann 1989). Žádná jiná studie rod *Melilotus* jako živné rostliny druhu *H. venusta* nezmiňuje. Z Dieckmannova (1989) údaje o požercích na rostlinách rodu *Trifolium* také nelze odvodit, zda se jednalo o rod *Chrysaspis* nebo *Trifolium*.

***Hypera viciae*** (Gyllenhal, 1813) (Tab. 20)

*H. viciae* je oligofágem na rostlinách dvou rodů, *Lathyrus* a *Vicia* (Fabaceae).

Larvy jsem sbíral na *Vicia tenuifolia* na vrchu Šibeník (Skuhrovec 2003a,b; viz Tab. 20).

Kleine (1910) chybně uvádí jako živné rostliny *Apium nodiflorum*, *Berula erecta* a *Sium latifolium* (Apiaceae). První z nich uvádí i Perris (sec. rec., ex Capiomont (1868) a Petri (1901)), Capiomont (1868), Petri (1901) a Reitter (1916). U jedinců nalezených na této rostlině se pravděpodobně jedná o záměnu s *H. adspersa*, který se na ní vyvíjí. U *Berula erecta* a *Sium latifolium* se zřejmě jednalo o záměnu s *H. arundinis*, jehož vývoj na těchto druzích rostlin probíhá.

***Hypera vidua*** Gené, 1837 (Tab. 21)

Monofág na *Geranium sanguineum* (Geraniaceae).

Strejček & Dieckmann (1987) uvádí dochování larev *H. vidua* nejen na *Geranium sanguineum*, ale i na *G. molle* a *G. palustre*. Dieckmann nabídl larvám *H. vidua* jako potravu *G. molle* a *G. palustre*, protože v okolí Eberswalde neroste *G. sanguineum*. Strejček & Dieckmann

(1987) bohužel explicitně nezmiňují, jak probíhal vývoj larev na těchto dvou druzích kakostu. Dieckmann (1989) uvádí, že na nich byly pozorovány pouze požerky dospělců; pak by se jednalo pouze o úživný žír. Kippenberg (1983) označuje *H. vidua* jako oligofága na rodu *Geranium*. Zřejmě se však jedná o chybný závěr a není jasné, z jakých dat vycházel, jelikož do roku 1983 bylo jako živná rostlina uváděno pouze *G. sanguineum*.

Larvy jsem sbíral na *G. sanguineum* na lokalitách Dubičky a Deblík v Českém středohoří (Skuhrovec 2003a,b; viz Tab. 21).

***Hypera zoila*** (Scopoli, 1763) (Tab. 22)

Druh se vyvíjí na rostlinách čtyř rodů: *Medicago*, *Onobrychis*, *Ononis* a *Trifolium* (Fabaceae). Údaje o rostlinách z rodů *Onobrychis* a *Ononis* jsou uvedeny jen v práci Roubala (1941), pouze ještě Reitter (1916) uvádí jako živné rostliny druhy rodu *Ononis*.

Larvy jsem sbíral a dochoval na *Medicago sativa* z okolí Žernosek (Skuhrovec 2003a) a *Trifolium pratense* z vrchu Milá (Skuhrovec 2003a,b; viz Tab. 22).

Kleine (1910) uvádí, podle mého názoru chybně, jako živnou rostlinu *Helianthus tuberosus* (Asteraceae).

## SHRNUTÍ

Z území České republiky je zatím spolehlivě známo 24 druhů rodu *Hypera* (viz Skuhrovec 2003b). Pouze u dvou druhů, *H. carinicollis septentrionalis* a *H. cumana*, není dosud známa bionomie ani živné rostliny. Z 22 našich druhů rodu *Hypera*, jejichž živné rostlin jsou již známy, se 14 druhů (*H. contaminata*, *H. denominanda*, *H. fornicata*, *H. fuscocinerea*, *H. meles*, *H. nigrirostris*, *H. ononidis*, *H. plantaginis*, *H. postica*, *H. striata*, *H. suspiciosa*, *H. venusta*, *H. viciae* a *H. zoila*) vyvíjí na bobovitých rostlinách (Fabaceae); vývoj tři druhů (*H. adspersa*, *H. arundinis* a *H. libanotidis*) je znám na rostlinách z čeledi Apiaceae (*H. adspersa* se vyvíjí i na rostlinách z čeledi Asteraceae); na zástupcích čeledi Caryophyllaceae se vyvíjejí dva druhy (*H. arator* a *H. diversipunctata*); na Geraniaceae je znám vývoj také dvou druhů (*H. dauci* a *H. vidua*) a na Polygonaceae se vyvíjí pouze jediný druh (*H. rumicis*).

Tři druhy, jejichž vývoj probíhá na rostlinách čeledi Fabaceae, jsou (v kontextu současného stavu znalostí) striktní monofágové (vývoj je znám pouze na jednom druhu rostliny); *H. contaminata* na *Lathyrus tuberosus*, *H. fornicata* na *Trifolium pratense* a *H. striata* na *Vicia sativa*. Jedenáct druhů (*H. denominanda*, *H. fuscocinerea*, *H. meles*, *H. nigrirostris*, *H. ononidis*, *H. plantaginis*, *H. postica*, *H. suspiciosa*, *H. venusta*, *H. viciae* a *H. zoila*), jejichž vývoj je znám na bobovitých rostlinách (Fabaceae), řadíme mezi oligofágy: druhy *H. denominanda*, *H. ononidis* a *H.viciae* patří mezi oligofágy v užším slova smyslu (vyvíjejí se na méně než 3 příbuzných rodech z jedné čeledi rostlin) (Strejček 2001). Zbývajících osm druhů řadíme mezi oligofágy v širším slova smyslu (vyvíjejí se na více než 3 příbuzných rodech z jedné čeledi rostlin) (viz Úvod; Strejček 2001).

Osm druhů (*H. denominanda*, *H. fuscocinerea*, *H. meles*, *H. postica*, *H. striata*, *H. suspiciosa*, *H. venusta*, *H. viciae*) se vyvíjí na vikvi, *Vicia* spp. Na jeteli (*Trifolium*) je znám vývoj také osmi druhů (*H. fornicata*, *H. fuscocinerea*, *H. meles*, *H. nigrirostris*, *H. postica*, *H. suspiciosa*, *H. venusta*, *H. zoila*) a šest druhů (*H. fuscocinerea*, *H. meles*, *H. nigrirostris*, *H. postica*, *H. suspiciosa* a *H. zoila*) se vyvíjí na tolici (*Medicago* spp.).

Na rostlinách čeledi Apiaceae se vyvíjí tři druhy: *H. adspersa*, *H. arundinis* a zřejmě již vyhynulý (Purkyně 1957) moravský endemit *H. libanotidis*. Druh *H. adspersa* se vyvíjí na mokřadních rostlinách z čeledi Apiaceae, ale byl dochován též na druzích *Bidens cernua* a *B. tripartita* z čeledi Asteraceae. Je to jediný známý druh rodu *Hypera*, který se vyvíjí na rostlinách dvou čeledí. V této práci je druh považován za oligofága v širším slova smyslu. Mokřadní druh *H. arundinis* je oligofág v užším slova smyslu. Jeho vývoj je znám na *Berula erecta*, *Oenanthe aquatica* a *Sium latifolium*. *H. libanotidis* je striktním monofágem na *Libanotis pyrenaica* (Purkyně 1957).

Oba druhy (*H. arator* a *H. diversipunctata*), jejichž vývoj je znám na rostlinách čeledi Caryophyllaceae, patří mezi oligofágy v širším slova smyslu. Vývoj druhu *H. arator* je znám na rostlinách 13 rodů, *H. diversipunctata* na rostlinách pěti rodů (*Cerastium*, *Minuartia*, *Myosoton*, *Silene* a *Stellaria*).

Vývoj na rostlinách čeledi Geraniaceae je znám pouze u dvou vzácných druhů *H. dauci* a *H. vidua*. Druh *H. vidua* je striktním monofágem na *Geranium sanguineum*. *H. dauci* je oligofág v užším slova smyslu (vývoj na *Erodium* a *Geranium*).

Na rostlinách čeledi Polygonaceae je znám vývoj pouze u jediného druhu rodu *Hypera*. Druh *H. rumicis* je oligofág v širším slova smyslu. Jeho vývoj je znám na osmi rodech čeledi.

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## SUMMARY

### Introduction

Most curculionid larvae develop inside the tissues of the above-ground parts of plants. In central Europe, only weevils of the genera *Cionus* Clairville, 1798; *Phytobius* Schönherr, 1833 and the tribe Hyperini Marseul, 1863 develop on the surface of plants (Dieckmann 1989). Larvae of these weevils are ectophagous, feeding mainly on leaves and sometimes on flowers. Mature larvae from the tribe Hyperini form cocoons, in which they pupate, and the adults hatch after one or two weeks (Scherf 1964).

Genus *Hypera* Germar, 1817 includes more than 115 species occurring chiefly in the Palaearctic Region (Smreczyński 1968); 17 species occur in the North America (Titus 1911, Csiki 1934, Anderson 2002). In the Czech Republic, 24 species of the genus are reliably known at present (Skuhrovec 2003b).

Many incorrect records of host plants of *Hypera* species abound in the literature (e.g. Kleine 1910). Altogether, doubtful and incorrect host plant records belong to nine families: Brassicaceae, Chenopodiaceae, Lamiaceae, Malvaceae, Plantaginaceae, Poaceae, Punicaceae, Rosaceae and Solanaceae. This is partly due to the lack of distinction between host plants on which the larvae develop and other plants on which the adults feed. Feeding on related plants it is particularly frequent in immature specimens and the autumn generation (Miller 1956). In some cases (see the Plantaginaceae and *H. plantaginis*), the larvae also seek other plants for suitable pupation places.

The aim of this work is to provide a synopsis of all known host plants of the genus *Hypera* occurring in the Czech Republic and identify incorrect data in literature.

## Material, methods and abbreviations

"Host plants of *Hypera* species" include literature data on host plants, summary of host plants which I was able to verify directly by rearings (localities in Skuhrovec 2003a,b) and notes on incorrectly cited host plants. All data on host plants with additional details are summarized in Appendix (Tabs. 1-22). Host plants are sorted hierarchically and alphabetically for each species in Tabs. 1-22 with hybrids placed at the end of each genus. All known host plants with the associated species of *Hypera* are summarized in Tab. 23. Host plant associations that I regard as doubtful are labelled with asterisks in all tables. Families of host plants are commented in Conclusions.

System and valid names of plants follow Tutin et al. (1964, 1968, 1972, 1976), Hejný & Slavík (1990) and Slavík (1995, 1997). "*Medicago indicus*" recorded by Scherf (1964) probably refers to *Melilotus indicus* and "*Rubus vitis*" is probably a hybrid of vine (*Vitis* sp.) and bramble (*Rubus* sp.) (J. Sádlo, pers. comm.).

Abbreviations used in Tabs. 1-22:

API – Apiaceae
AST – Asteraceae
BRA – Brassicaceae
CAR – Caryophyllaceae
CHE – Chenopodiaceae
FAB – Fabaceae
GER – Geraniaceae
LAM – Lamiaceae
MAL – Malvaceae
PLA – Plantaginaceae
POA – Poaceae
POL – Polygonaceae
PUN – Punicaceae
ROS – Rosaceae
SOL – Solanaceae

## Host plants of *Hypera* species

***Hypera adspersa*** (Fabricius, 1792) (Tab. 1)

The species is known to develop on host plants of seven genera: *Aegopodium*, *Apium*, *Crithmum*, *Daucus*, *Oenanthe*, *Peucedanum* (all Apiaceae) and *Bidens* (Asteraceae). *Aegopodium podagraria*, *Apium inundatum*, *A. nodiflorum*, *Daucus carota*, *Oenanthe aquatica* and *Peucedanum palustre* (all Apiaceae) were recorded in central Europe (Scherf 1964). Hoffmann (1954), Tempère (1972) and Tempère & Péricart (1989) recorded *Apium inundatum*, *A. nodiflorum*, *Crithmum maritimum* and *Oenanthe crocata* (all Apiaceae) as host plants for West-European populations. Dieckmann (1961) and Smreczyński (1968) presented *Bidens tripartita* (Asteraceae) as a host plant and Sprick (1996) reported the findings of larvae, cocoons and adults on *B. cernua*.

Kleine (1910) incorrectly gave several additional host plants. Those from the families Brassicaceae, Lamiaceae, Poaceae and Punicaceae are probably based on findings of adult beetles on the plants. Adults found on plants from the Caryophyllaceae and Polygonaceae were probably misidentified; beetles found on the latter family were probably *H. rumicis*.

***Hypera arator*** (Linnaeus, 1758) (Tab. 2)

The species is known to develop on plants from 13 genera: *Agrostemma*, *Cucubalus*, *Dianthus*, *Gypsophila*, *Lychnis*, *Minuartia*, *Moenchia*, *Oberna*, *Scleranthus*, *Silene*, *Spergula*, *Spergularia* and *Stellaria* (all Caryophyllaceae).

Vilímová (1990) emphasized the particular bionomy of *H. arator*. This species develops on *Dianthus arenarius bohemicus* inside the ovary (Vilímová 1990). On *D. carthusianorum*, larvae were observed to develop also on the surface of the ovary (J. Skuhrovec, unpubl. data). It is possible that the decisive factor for the development of larvae is the space among seeds. The seeds of *D. carthusianorum* are tightly packed in contrast to *D. arenarius bohemicus*

(Vilímová 1990). The larvae of *Hypera* thus can develop on the plant surface (Dieckmann, 1989) as well as inside the ovary or flowers (Vilímová 1990, Skuhrovec 2003a,b; see *H. nigrirostris*).

I collected and reared the larvae on *Dianthus carthusianorum* (Caryophyllaceae) in the environs of Bratřice (Skuhrovec 2003a; Tab. 2).

Rupertsberger (1872) and Schnell (1955) incorrectly listed *Polygonum aviculare* (Polygonaceae) and *Ornithopus sativus* (Fabaceae) as a host plants, respectively. Both cases probably refer to findings of adults on the plant.

***Hypera arundinis*** (Paykull, 1792) (Tab. 3)

The species develops on wetland plants from the family Apiaceae. The development is known only on three species: *Berula erecta*, *Oenanthe aquatica* and *Sium latifolium*. Rosenhauer (1882) also recorded *Betula angustifolium* (sic!); he probably meant *Berula angustifolium*, a synonym of *B. erecta*.

Larvae of *H. arundinis* were collected on *Sium latifolium* (Apiaceae) by M. Wanat (pers. comm.) in Poland (Tab. 3).

Reitter (1916) recorded two species of *Rumex* (Polygonaceae) as host plants of *H. arundinis* "var. *hydrolapathum*". This is possible but very unlikely as these plants have not been mentioned since then. Data on *Phragmites communis* (Poaceae) by Kleine (1910) are erroneous.

***Hypera contaminata*** (Herbst, 1795) (Tab. 4)

The development of this species is known only on *Lathyrus tuberosus* (Fabaceae). The first record is due to Kippenberg (1983).

I collected adults and larvae on *Lathyrus tuberosus* on the Milá hill (Skuhrovec 2003a,b; Tab. 4).

***Hypera dauci*** (Olivier, 1807) (Tab. 5)

The species is recorded as monophagous on *Erodium cicutarium* (Geraniaceae) (Tempère 1972, Dieckmann 1989, Tempère & Péricart 1989, Koch 1992) or as oligophagous on the genera *Erodium* and *Geranium* (all Geraniaceae) (Smreczyński 1968, Angelov 1978, Dieckmann 1981). *Erodium moschatum* was recorded only by Hoffmann (1954) and Scherf (1964). Koch (1992) presented only feedings of adults on *Geranium pusillum*.

*Daucus carota* (Apiaceae) was also recorded as a host plant (Kleine 1910, Hustache 1929) but the data probably refer only to findings of adults on the plant.

***Hypera denominanda*** (Capiomont, 1868) (Tab. 6)

This oligophagous species develops on *Lathyrus pratensis* and *Vicia cracca* (Smreczyński 1968); Kippenberg (1983) also reported *Vicia tenuifolia* (all Fabaceae).

I collected adults and larvae on *Vicia tenuifoila* on the Šibeník hill (Skuhrovec 2003a,b; Tab. 6).

***Hypera diversipunctata*** (Schrank, 1798) (Tab. 7)

The species develops on plants of five genera: *Cerastium*, *Minuartia*, *Myosoton*, *Silene* and *Stellaria* (all Caryophyllaceae). Dieckmann (1989) recorded only *Cerastium*, *Myosoton* and *Stellaria* as host plants for central European populations. Data on the genus *Minuartia* are due to Khruleva & Korotyaev (1999). Tempère (1972) presented *Silene dioica* as a host plant for the West-European populations.

I collected adults and larvae on *Cerastium arvense* in the environs of Kralický Sněžník (Tab. 7).

Hoffmann (1954) incorrectly recorded *Gnaphalium dioicum* (Asteraceae) as a host plant. Legalov & Opanasenko (1992), following Arnoldi et. al. (1974), listed the genus *Astragalus* (Fabaceae) without giving further details. These data were based only on findings of adults. *Plantago major* and *P. media* were listed by Kleine (1910) and Reitter (1916). Smreczyński (1968) also recorded both plants, but he emphasized the neccessity to confirm both species as host plants. These data are probably based on pupation habits as in *H. plantaginis* (Skuhrovec 2003b).

***Hypera fornicata*** (Penecke, 1928) (Tab. 8)

The species develops on *Trifolium pratense* (Fabaceae) (Koch 1992, Dieckmann & Behne 1994). Strejček (2001) recorded the genus *Trifolium* without giving further details.

The taxonomic status of this species remains to be clarified as it is not possible to discern some specimens from *H. meles* (Skuhrovec 2003b).

***Hypera fuscocinerea*** (Marsham, 1802) (Tab. 9)

*H. fuscocinerea* develops on plants of six genera: *Anthyllis*, *Medicago*, *Melilotus*, *Trifolium*, *Trigonella* and *Vicia* (all Fabaceae). *Trigonella caerulea* and *Anthyllis vulneraria* were recorded only by Kleine (1910); the former species was formerly classified in the closely related genus *Melilotus*.

***Hypera libanotidis*** (Reitter, 1896) (Tab. 10)

This species is endemic to Moravia. It was described from the Kotouč hill near Štramberk and not found since about 1900 (Purkyně 1957). Larvae and pupae were collected on *Libanotis pyrenaica* (Apiaceae). This monophagous species was later recorded also from the environs of Frýdek-Místek, but no specimens are available to confirm the data (see Skuhrovec 2003b).

***Hypera meles*** (Fabricius, 1792) (Tab. 11)

*H. meles* develops on plants of six genera: *Chrysaspis*, *Dorycnium*, *Lotus*, *Medicago*, *Trifolium* and *Vicia* (all Fabaceae). Genus *Vicia* was published only by Roubal (1941) without further details.

I found adults on *Trifolium pratense* in Slovakia but was unable to rear any larvae. In literature (Tab. 11), *T. pratense* is often listed as a host plant.

***Hypera nigrirostris*** (Fabricius, 1775) (Tab. 12)

The species develops on plants of four genera: *Chrysaspis*, *Medicago*, *Ononis* and *Trifolium* (all Fabaceae).

The larvae do not develop on clover leaves but in the inner parts of the floral stalk. The eggs are probably laid on the bottom side of the stalk. First instar larvae enter the stalk and feed on immature parts of the blossom. Mature larvae pupate in a cocoon on the lower side of a leaf. This bionomy is probably shared by other small species of Hyperini Marseul, 1863 such as *H. constans* (Boheman, 1834), *H. cumana*, *H. ononidis*, *H. venusta* or *Limobius borealis* (Paykull, 1792) (Skuhrovec 2003b). It is possible that the development of *H. nigrirostris* inside the ovary only occurs on *T. repens*, analogous to *H. arator* (see above). The new data on *H. arator* and *H. nigrirostris* show that the larvae of *Hypera* may develop on the surface of plants (Dieckmann 1989) as well as inside them; the main factors may include the larval size as well as e.g. the space inside the blossom (Skuhrovec 2003a).

Adults and larvae were collected on *Trifolium pratense* and *T. repens* in Slovakia (Skuhrovec 2003a; Tab. 12).

In my opinion, Kleine (1910) incorrectly recorded *Buphthalmum salicifolium* (Asteraceae) as a host plant.

***Hypera ononidis*** (Chevrolat, 1863) (Tab. 13)

The development of *H. ononidis* is known to occur only on the genus *Ononis* (Fabaceae). *Ononis natrix*, *O. repens* and *O. spinosa* are recorded as host plants in central Europe (Kippenberg 1983 and Dieckmann 1989). The species also develops on *O. variegata* and *O. viscosa* in Western Europe (Hustache 1929, Hoffmann 1954). Normand (1937) listed *O. biflora* as a host plant from Tunisia.

The status of this West-Palaearctic species and its relationship to *H. nigrirostris* remain to be clarified (see Skuhrovec 2003b).

Kleine (1910) incorrectly recorded *Trifolium incarnatum* as a host plant. The data are probably based on misidentifed specimens of *H. nigrirostris*.

***Hypera plantaginis*** (De Geer, 1775) (Tab. 14)

*Hypera plantaginis* develops on plants of four genera: *Anthyllis*, *Coronilla*, *Lotus* and *Oxytropis* (all Fabaceae). Genus *Coronilla* was recorded only by Zaslavskij (1961) without giving further details. *Oxytropis campestris* was listed by Kippenberg (1983) for the first time.

I collected and reared the species on *Lotus corniculatus*, *Coronilla varia* and *Oxytropis campestris* (all Fabaceae) collected on the Šibeník hill. *Coronilla varia* is presented as a host plant of *H plantaginis* for the first time here (Tab. 14).

Species from the family Caryophyllaceae (*Silene dioica*, *S. latifolia alba*) were incorrectly listed as host plants by Perris (1874), Bedel (1888), Kleine (1910) and Kryger (1921-1922). Scherf (1964) regarded the records of the latter plant species as a mistake. All of them were probably based on misidentified specimens.

*Plantago lanceolata*, *P. major* and *P. media* (Plantaginaceae) were incorrectly presented as host plants in several publications (e. g. Kaltenbach 1874, Petri 1901, Kleine 1910, Hoffmann

1954). Smreczyński (1968) stated that their status as host plants must be verified. The error probably stemmed from rearings of adults from cocoons collected in the field. Mature larvae leave the host plant (*Lotus corniculatus*) and search for a suitable pupation place. The lower side of basal *Plantago* leaves, on which the cocoons are regularly found, probably provide protection from parasites and dessication. The same error probably concerns other species (*H. diversipunctata*, *H. postica*, *H. suspiciosa* and *H. striata*), but so far I have observed this interesting larval behaviour only in *H. plantaginis* (Skuhrovec 2003b).

***Hypera postica*** (Gyllenhal, 1813) (Tab. 15)

This species develops on plants of nine genera: *Astragalus*, *Galega*, *Lathyrus*, *Lotus*, *Lupinus*, *Medicago*, *Melilotus*, *Trifolium* and *Vicia* (all Fabaceae). *Lupinus* was recorded only by Oprychałowa (1957) – along with *Lotus* and without further details. Similarly, *Galega officinalis*, *Lotus corniculatus* (Scherf 1964) and *Lathyrus odoratus* (Miller 1956) were recorded only once. Records of the other five genera (*Astragalus*, *Medicago*, *Melilotus*, *Trifolium* and *Vicia*) are common (Tab. 15).

Danielson et al. (1986) conducted experiments to establish on which plants of the genus *Medicago* the species can develop. They found that development could be completed on *M. glutinosa*, *M. sativa* and *M. scutellata* as well as on *M. disciformis* and *M. glandulosa*, but the larval mortality on the latter two species reached 80% (mean mortality on *M. sativa* reached 25%). Moreover, the development on *M. disciformis* and *M. glandulosa* in constant conditions (20°C) lasted about two or five days longer than on *M. glutinosa*, *M. sativa* or *M. scutellata* (mean length of larval development 12 days). The larvae did not develop on *M. prostrata*. The development is probably inhibited by some glands of the plants and dense setae on leaves (Danielson et al. 1986). The role of the latter was confirmed on *M. glutinosa*: two cultivars with different density of setae on leaves were used and the development was more successful and faster on plants with a lower density (Danielson et al. 1986).

I collected and reared the larvae of *H. postica* on three species of genus *Medicago*, *M. falcata*, *M. sativa* and *M.* x *varia*, from the Prokopské údolí valley (Prague) and the Milá hill (Skuhrovec 2003a,b; Tab. 15).

Kleine (1910) and Oprychałowa (1957) incorrectly listed a number of other host plants (Tab. 15); their data were based only on findings of adults.

***Hypera rumicis*** (Linnaeus, 1758) (Tab. 16)

This species is known to develop on plants of eight genera: *Acetosa*, *Bistorta*, *Fallopia*, *Oxyria*, *Persicaria*, *Polygonum*, *Rheum* and *Rumex* (all Polygonaceae).

Specimens of *H. rumicis*, which develop on *Bistorta major*, have several morphological characters (habitus, coloration of body surface, shape of squames) different from specimens developing on other plants (Skuhrovec 2003b; J. Strejček, pers. comm.).

***Hypera striata*** (Boheman, 1834) (Tab. 17)

Tempère & Péricart (1989) were the first to publish detailed information on its host plant, *Vicia sativa* (Fabaceae), as Kippenberg (1983), Smreczyński (1968) and Tempère (1961,

1972) listed only the genus *Vicia* without further details. Koch (1992) stated that *H. striata* is oligophagous on vetch, *Vicia* spp., but I do not know on which data this claim is based.

Adults and larvae were collected on *Vicia sativa* agg. in Slovakia (Skuhrovec 2003a; Tab. 17).

Hoffmann (1954), Smreczyński (1968) and Angelov (1978) also reported that *H. striata* develops on *Plantago coronopus* (Plantaginaceae), and Mazur (2002) regarded the species as oligophagous on *Plantago*. These data are undoubtedly based on the pupation habits (see *H. plantaginis*).

***Hypera suspiciosa*** (Herbst, 1795) (Tab. 18)

The species is known to develop on plants of six genera: *Lathyrus*, *Lotus*, *Medicago*, *Melilotus*, *Trifolium* and *Vicia* (all Fabaceae). The first record of the genus *Melilotus* was published by Zaslavskij (1959) without further details. The first records of the genus *Trifolium* and *Melilotus latifolius albus* were published by Dieckmann (1989).

I collected and reared larvae on four species from the family Fabaceae, including *Lathyrus pratensis* from the environs of Podbořany (Skuhrovec 2003a; Tab. 18). The other three host plants, *Medicago falcata*, *M. sativa* (from the Prokopské údolí valley in Prague) and *Vicia tenuifolia* (from the Šibeník hill and the environs of Podbořany), have been discovered only recently (Skuhrovec 2003a,b).

Kleine (1910) incorrectly gave *Plantago major* as another host plant (see *H. plantaginis*).

***Hypera venusta*** (Fabricius, 1781) (Tab. 19)

The species develops on plants of six genera: *Anthyllis*, *Chrysaspis*, *Lotus*, *Onobrychis*, *Ulex* and *Vicia* (all Fabaceae).

Scherf (1964) and Dieckmann (1989) also listed *Trifolium campestre* and *T. dubium*. Slavík (1997) separated *Chrysaspis* and *Trifolium*, while Tutin et al. (1968) regarded them as a single genus. The development of *H. venusta* has been confirmed only on *Chrysaspis*, which suggests some differences between the two plant taxa, and I treat them as two genera here. Furthermore, Koch (1992) listed *Trifolium arvense* without additional details.

Adults of *H. venusta* were observed to feed on the genera *Trifolium*, *Lotus* and *Melilotus* (Dieckmann 1989). I do not know any other records of *Melilotus* as the host plant of *H. venusta*. It is also not possible to deduce from Dieckmann (1989) whether his record of *Trifolium* concerns *Chrysaspis* or *Trifolium* (as divided here).

***Hypera viciae*** (Gyllenhal, 1813) (Tab. 20)

*H. viciae* is oligophagous on two plant genera, *Lathyrus* and *Vicia* (Fabaceae).

I reared larvae on *Vicia tenuifolia* from the Šibeník hill (Skuhrovec 2003a,b; Tab. 20).

*Apium nodiflorum*, *Berula erecta* and *Sium latifolium* (all Apiaceae) were incorrectly listed as host plants of *H. viciae* (Perris (sec. rec., ex Capiomont (1868) and Petri (1901)); Capiomont 1868; Petri 1901; Kleine 1910; Reitter 1916). The data were probably based on misidentified specimens of *H. adspersa* found on *A. nodiflorum* and of *H. arundinis* on *B. erecta* and *S. latifolium*.

***Hypera vidua*** Gené, 1837 (Tab. 21)

The species is monophagous on *Geranium sanguineum* (Geraniaceae).

Strejček & Dieckmann (1987) also reared the larvae on *G. molle* and *G. palustre*. Unfortunately, they did not specify how well the larvae developed on these two species. Dieckmann (1989) also stated that only feedings of adults were observed on these species in the field. Kippenberg (1983) recorded *H. vidua* as oligophagous on the genus *Geranium* but the source of his statement is unclear to me; only *G. sanguineum* was known as a host plant at that time.

I collected and reared larvae on *G. sanguineum* from Dubičky and Deblík in the České středohoří hills (Skuhrovec 2003a,b; Tab. 21).

***Hypera zoila*** (Scopoli, 1763) (Tab. 22)

The species develops on plants of four genera: *Medicago*, *Onobrychis*, *Ononis* and *Trifolium* (all Fabaceae). *Onobrychis* and *Ononis* were only mentioned Roubal (1941) and the latter also by Reitter (1916).

I collected and reared larvae on *Medicago sativa* from the environs of Žernoseky (Skuhrovec 2003a) and on *Trifolium pratense* from the Milá hill (Skuhrovec 2003a,b; Tab. 22).

In my opinion, Kleine's (1910) record of *Helianthus tuberosus* (Asteraceae) as a host plant is incorrect.

## Conclusions

In more than 75 *Hypera* species including two species occuring in the Czech Republic, *Hypera carinicollis septentrionalis* Kippenberg, 1986 and *H. cumana* (Petri, 1901), the bionomy and host plants remain unknown (Skuhrovec 2003b). Twenty-four *Hypera* species are known to occur in the Czech Republic (Skuhrovec 2003b). Fourteen of the 22 species with known host plants develop on the Fabaceae (*H. contaminata*, *H. denominanda*, *H. fornicata*, *H. fuscocinerea*, *H. meles*, *H. nigrirostris*, *H. ononidis*, *H. plantaginis*, *H. postica*, *H. striata*, *H. suspiciosa*, *H. venusta*, *H. viciae* and *H. zoila*); three species develop on the Apiaceae (*H. adspersa*, *H. arundinis* and *H. libanotidis*; the former also develops on the Astereaceae); two species develop on the Caryophyllaceae (*H. arator* and *H. diversipunctata*) and the Geraniaceae (*H. dauci* and *H. vidua*); and only one species is known to develop on the Polygonaceae (*H. rumicis*).

Three species developing on the Fabaceae are strictly monophagous and develop on a single species: *H. contaminata* on *Lathyrus tuberosus*, *H. fornicata* on *Trifolium pratense* and *H. striata* on *Vicia sativa*. The remaining 11 species developing on the Fabaceae are oligophagous (*H. denominanda*, *H. fuscocinerea*, *H. meles*, *H. nigrirostris*, *H. ononidis*, *H. plantaginis*, *H. postica*, *H. suspiciosa*, *H. venusta*, *H. viciae* and *H. zoila*). Among these, *H. denominanda*, *H. ononidis* and *H.viciae* are narrowly oligophagous (i.e. developing on less than 3 related genera of one plant family, Strejček 2001). The remaining eight species are broadly oligophagous (i.e. developing on more than 3 related genera of one plant family).

Eight *Hypera* species develop on vetch, *Vicia* spp. (*H. denominanda*, *H. fuscocinerea*, *H. meles*, *H. postica*, *H. striata*, *H. suspiciosa*, *H. venusta*, *H. viciae*), and the same number develops on clover, *Trifolium* spp. (*H. fornicata*, *H. fuscocinerea*, *H. meles*, *H. nigrirostris*,

*H. postica*, *H. suspiciosa*, *H. venusta*, *H. zoila*). Six species develop on *Medicago* spp. (*H. fuscocinerea*, *H. meles*, *H. nigrirostris*, *H. postica*, *H. suspiciosa* and *H. zoila*).

Among the species known to develop on the Apiaceae, I classify *H. adspersa* as broadly oligophagous; it is the only known species of *Hypera* which develops on plants of two families. The wetland species *H. arundinis* is narrowly oligophagous and known to develop on *Berula erecta*, *Oenanthe aquatica* and *Sium latifolium*. *Hypera libanotidis* is monophagous on *Libanotis montana*.

Both species known to develop on the Caryophyllaceae are widely oligophagous; *H. arator* is known to develop on 13 genera and *H. diversipunctata* on five genera (*Cerastium*, *Minuartia*, *Myosoton*, *Silene* and *Stellaria*).

Both species developing on the Geraniaceae, *H. dauci* and *H. vidua*, are rare. The former is narrowly oligophagous (developing on species of *Erodium* and *Geranium*), while the latter is strictly monophagous on *Geranium sanguineum*.

Finally, the widely oligophagous *H. rumicis* develops on eight genera of the Polygonaceae.

# APPENDIX

**Vysvětlivky** (pro Tab. 1-22)**:**
[1] práce živnou rostlinu neuvádí, ale Sprick (1996) nebo Petri (1901) ji citují, jako by ji uváděla;
[2] Koch (1992) uvádí rod rostliny, nikoliv druh (viz Sprick 1996);
[3] práci nemám k dispozici;
[4] Hoffmann (1954) a Tempère & Péricart (1989) uvádí živnou rostlinu pod synonymem, nikoliv pod platným jménem jako Sprick (1996);
[5] není mi známa plná citace práce;
[6] autor upozorňuje na pozorování dospělců na rostlině, ale neuvádí rostlinu jako živnou pro příslušný druh;
[7] Scherf (1964) uvádí živnou rostlinu pod platným jménem, nikoliv pod synonymem (viz Tempère 1972);
[8] autor označuje dřívější informace o rostlině jako chybné;
[9] Kryger & Sønderup (1952) uvádí jako živnou rostlinu jeden konkrétní druh rostliny, nikoliv celý rod (viz Scherf 1964);
[10] během pokusů neproběhl vývoj druhu na rostlině;
# sběr larev na živné rostlině mnou (J. S.) nebo M. Wanatem;
***** podle mého názoru se jedná o chybně udávanou živnou rostlinu.

**Explanations** (for Tabs. 1-22)**:**
[1] host plant not listed, but Sprick (1996) or Petri (1901) cite the work as if it was listed;
[2] Koch (1992) listed only the genus but not species as stated by Sprick (1996);
[3] I have not seen this paper;
[4] Hoffmann (1954) and Tempère & Péricart (1989) presented a synonymical and not the valid name of the plant as stated by Sprick (1996);
[5] I do not know the full citation of this work;
[6] the author reports observation of adults on the plant but does not record it as a host plant;
[7] Scherf (1964) listed the valid name and not its synonym as stated by Tempère (1972);
[8] the author regards previous data on the plant as incorrect;
[9] Kryger & Sønderup (1952) listed one plant species and not the whole genus as stated by Scherf (1964);
[10] the species did not develop on the plant during experiments;
# larvae have been collected on this host plant by myself (J. S.) or by M. Wanat;
***** I regard these data as incorrect.

**Tabulka 1.** Známé živné rostliny druhu *Hypera adspersa* (Fabricius, 1792).
**Table 1.** Known host plants of *Hypera adspersa* (Fabricius, 1792).

| | | |
|---|---|---|
| *Aegopodium podagraria* | API | Hoffmann (1954)[1], Dieckmann (1989), Tempère & Péricart (1989)[1], Sprick (1996) (sec. rec., ex Hoffmann (1954), Tempère & Péricart (1989), Koch (1992)[2]) |
| *Aegopodium* sp. | API | Koch (1992) |
| *Apium inundatum* | API | Hoffmann (1954)[1], Scherf (1964), Tempère (1972) (sec. rec., ex Scherf (1964)), Tempère & Péricart (1989), Sprick (1996) (sec. rec., ex Hoffmann (1954), Tempère & Péricart (1989), Koch (1992)[2]);<br>pod jménem/as *Helosciadium inundatum*:<br>Smreczyński (1968) |
| *Apium nodiflorum* | API | Bedel (1886)[3], Kleine (1910), Duprez (1947), Scherf (1964), Tempère (1972) (sec. rec., ex Bedel (1886)), Tempère & Péricart (1989)[1], Sprick (1996) (sec. rec., ex Hoffmann (1954)[4], Tempère & Péricart (1989), Koch (1992)[2]);<br>pod jménem/as *Helosciadium nodiflorum*:<br>Choraut[5], Perris (1831)[3], Perris (1877), Hustache (1929) (sec. rec., ex Choraut[5], Perris (1831)), Hoffmann (1954), Dieckmann (1961) (sec. rec., ex Hoffmann (1954)) |

| | | |
|---|---|---|
| *Apium* sp. | API | Angelov (1978), Kippenberg (1983), Koch (1992) |
| *Crithmum maritimum* | API | Bedel (1886)[3], Gadeau de Kerville (1886)[3], Hustache (1929) (sec. rec., ex Gadeau de Kerville (1886)), Duprez (1947) (sec. rec., ex Gadeau de Kerville (1886)), Hoffmann (1954)[6] (sec. rec., ex Gadeau de Kerville (1886)), Tempère (1972) (sec. rec., ex Bedel (1886)), Tempère & Péricart (1989)[1], Koch (1992)[1], Sprick (1996) (sec. rec., ex Hoffmann (1954), Tempère & Péricart (1989), Koch (1992)) |
| *Daucus carota* | API | Hoffmann (1954)[1], Scherf (1964), Tempère (1972) (sec. rec., ex Scherf (1964)), Angelov (1978), Dieckmann (1989), Tempère & Péricart (1989), Sprick (1996) (sec. rec., ex Hoffmann (1954), Tempère & Péricart (1989), Koch (1992)[2]) |
| *Daucus* sp. | API | Koch (1992) |
| *Oenanthe aquatica* | API | Hoffmann (1954)[1], Scherf (1964), Smreczyński (1968), Dieckmann (1989), Sprick (1996) (sec. rec., ex Hoffmann (1954), Tempère & Péricart (1989)[4], Koch (1992)[2]);<br>pod jménem/as *O. phellandrium*:<br>Tempère (1972) (sec. rec., ex Scherf (1964)[7]), Tempère & Péricart (1989) |
| *Oenanthe crocata* | API | Hoffmann (1954)[1], Scherf (1964), Tempère (1972), Tempère & Péricart (1989), Sprick (1996) (sec. rec., ex Hoffmann (1954), Tempère & Péricart (1989), Koch (1992)[2]) |
| *Oenanthe* sp. | API | Angelov (1978), Kippenberg (1983), Koch (1992);<br>pod jménem/as *Phellandrium* sp.:<br>Anderson (1948) |
| *Oenanthe* spp. | API | Strejček (2001) |
| *Peucedanum palustre* | API | Hoffmann (1954)[1], Scherf (1964), Smreczyński (1968), Tempère (1972) (sec. rec., ex Scherf (1964)), Tempère & Péricart (1989), Sprick (1996) (sec. rec., ex Hoffmann (1954), Tempère & Péricart (1989), Koch (1992)[2]) |
| *Peucedanum* sp. | API | Angelov (1978), Kippenberg (1983), Koch (1992), Legalov & Opanasenko (1992) |
| *Sium* spp. | API | Strejček (2001) |
| *Bidens cernua* | AST | Sprick (1996) |
| *Bidens tripartita* | AST | Dieckmann (1961), Smreczyński (1968), Tempère (1972) (sec. rec., ex Dieckmann (1961)) |
| *Bidens* sp. | AST | Dieckmann (1961), Koch (1992), Sprick (1996) |
| **Nasturtium* sp. | BRA | Kleine (1910) |
| **Cucubalus* sp. | CAR | Roubal (1941) |
| **Oberna behen* | CAR | pod jménem/as *Silene inflata*:<br>Schiödte (1872)[3], Kleine (1910), Kryger (1913-1915)[3], Scherf (1964)[8] (sec. rec., ex Schiödte (1872), Kryger (1913-1915));<br>pod jménem/as *Cucubalus behen*:<br>Capiomont (1868), Perris (1877), Kleine (1910) |
| **Silene* sp. | CAR | Roubal (1941) |
| **Lycopus* sp. | LAM | Legalov & Opanasenko (1992) |
| **Mentha* sp. | LAM | Kleine (1910) |
| **Secale cereale* | POA | Kleine (1910) |
| **Acetosa pratensis* | POL | pod jménem/as *Rumex acetosa*:<br>Kleine (1910) |

**Tabulka 1** – pokračování.
**Table 1** continued.

| | | |
|---|---|---|
| **Persicaria hydropiper* | POL | pod jménem/as *Polygonum hydropiper*:<br>Kleine (1910) |
| **Polygonum aviculare* | POL | Kleine (1910) |
| **Rheum rhabarbarum* | POL | pod jménem/as *R. undulatum*:<br>Kleine (1910) |
| **Rumex crispus* | POL | Kleine (1910) |
| **Rumex obtusifolius* | POL | Kleine (1910) |
| **Rumex patientia* | POL | Kleine (1910) |
| **Rumex* x *pratensis* = *crispus* x x *obtusifolius* | POL | pod jménem/as *R. acutus*:<br>Kleine (1910) |
| **Punica* sp. | PUN | Legalov & Opanasenko (1992) |

**Tabulka 2.** Známé živné rostliny druhu *Hypera arator* (Linnaeus, 1758).
**Table 2.** Known host plants of *Hypera arator* (Linnaeus, 1758).

| | | |
|---|---|---|
| *Agrostemma githago* | CAR | Duverger[5], Hustache (1929) (sec. rec., ex Duverger[5]), Scherf (1964);<br>pod jménem/as *Lychnis githago*:<br>Hoffmann (1929), Hoffmann (1954), Kippenberg (1986)<br>pod jménem/as *Gittago segetum*:<br>Perris (1877), Kleine (1910) |
| *Agrostemma* sp. | CAR | Roubal (1941) |
| *Cucubalus baccifer* | CAR | Tempère (1927), Hoffmann (1929), Hustache (1929) (sec. rec., ex Tempère (1927)), Hoffmann (1954), Scherf (1964), Smreczyński (1968), Kippenberg (1986) |
| *Cucubalus* sp. | CAR | Roubal (1941), Angelov (1978), Kippenberg (1983), Koch (1992) |
| *Dianthus arenarius* subsp. *bohemicus* | CAR | Vilímová (1990) |
| *Dianthus barbatus* | CAR | Kleine (1910) |
| *Dianthus carthusianorum* | CAR | Hoffmann (1954), Scherf (1964), Smreczyński (1968), Kippenberg (1986), Vilímová (1990),<br># J. S. vidi |
| *Dianthus caryophyllus* | CAR | Scherf (1964) |
| *Dianthus deltoides* | CAR | Rupertsberger (1872), Kleine (1910), Hustache (1929) (sec. rec., ex Rupertsberger (1872)), Roubal (1941), Hoffmann (1954), Scherf (1964), Smreczyński (1968), Kippenberg (1986), Dieckmann (1989) |
| *Dianthus superbus* | CAR | Kleine (1910)[6] |
| *Dianthus* sp. | CAR | Rupertsberger (1872), Hoffmann (1929), Duprez (1947), Angelov (1978), Kippenberg (1983), Koch (1992) |
| *Gypsophila muralis* | CAR | Scherf (1964), Smreczyński (1968), Kippenberg (1986) |
| *Gypsophila* sp. | CAR | Kippenberg (1983), Koch (1992) |
| *Lychnis flos cuculi* | CAR | St. Claire-Deville[5], Mathieu[5], Kleine (1910), Hoffmann (1929), Hustache (1929) (sec. rec., ex St. Claire-Deville[5], Mathieu[5]), Hoffmann (1954), Scherf (1964), Smreczyński (1968), Kippenberg (1986) |

| | | |
|---|---|---|
| *Lychnis* sp. | CAR | Roubal (1941), Duprez (1947), Angelov (1978), Kippenberg (1983), Koch (1992) |
| *Minuartia* sp. | CAR | Dieckmann (1989) |
| *Moenchia erecta* | CAR | St. Claire-Deville[5], Hustache (1929) (sec. rec., ex St. Claire-Deville[5]), Hoffmann (1954), Scherf (1964);<br>pod jménem/as *Moerchia erecta*:<br>Kippenberg (1986)<br>pod jménem/as *Maenchia erecta*:<br>Hoffmann (1929) |
| *Moenchia* sp. | CAR | Roubal (1941), Angelov (1978) |
| *Oberna behen* | CAR | pod jménem *Cucubalus behen*:<br>Perris (1877), Kleine (1910)<br>pod jménem/as *Silene inflata*:<br>Rupertsberger (1872), Kleine (1910), Hoffmann (1929), Hustache (1929) (sec. rec., ex Rupertsberger (1872)), Hoffmann (1954), Scherf (1964), Smreczyński (1968), Kippenberg (1986) |
| *Scleranthus annuus* | CAR | Scherf (1964) |
| *Scleranthus* sp. | CAR | Kryger & Sønderup (1952) |
| *Silene dioica* | CAR | pod jménem/as *Lychnis dioica*:<br>Barrett[5], Tempère (1927), Hoffmann (1929), Hustache (1929) (sec. rec., ex Barrett[5]), Hoffmann (1954), Kippenberg (1986);<br>pod jménem/as *Melandryum rubrum*:<br>Scherf (1964), Tempère (1972) (sec. rec., ex Scherf (1964)) |
| *Silene latifolia* subsp. *alba* | CAR | pod jménem/as *Lychnis vespertina*:<br>Perris (1877), Kleine (1910)[6]<br>pod jménem/as *Melandryum album*:<br>Scherf (1964) |
| *Silene nutans* | CAR | Kryger & Sønderup (1952), Scherf (1964) |
| *Silene* sp. | CAR | Roubal (1941), Duprez (1947), Angelov (1978), Kippenberg (1983), Koch (1992) |
| *Spergula arvensis* | CAR | Faginez[5], Tempère (1927), Hoffmann (1929), Hustache (1929) (sec. rec., ex Faginez[5], Hoffmann (1929)), Anderson (1948), Scherf (1964), Smreczyński (1968), Kippenberg (1986), Tempère & Péricart (1989)<br>pod jménem/as *Spergularia arvensis*:<br>Kleine (1910), Hoffmann (1954), Dieckmann (1989) |
| *Spergula arvensis* subsp. *sativa* | CAR | pod jménem/as *S. sativa*:<br>Anderson (1948) |
| *Spergula* sp. | CAR | Roubal (1941), Kippenberg (1983), Koch (1992) |
| *Spergularia rubra* | CAR | Dieckmann (1989) |
| *Spergularia* sp. | CAR | Angelov (1978) |
| *Stellaria media* | CAR | Mathieu[5], Kleine (1910), Hoffmann (1929), Hustache (1929) (sec. rec., ex Mathieu[5]), Duprez (1947) (sec. rec., ex Hoffmann (1929)), Hoffmann (1954), Scherf (1964), Smreczyński (1968), Kippenberg (1986), Dieckmann (1989)[6] |
| *Stellaria* sp. | CAR | Angelov (1978), Kippenberg (1983), Koch (1992) |
| **Ornithopus sativus* | FAB | Schnell (1955) |
| **Trifolium repens* | FAB | Kryger & Sønderup (1952) |

**Tabulka 2** – pokračování.
**Table 2** continued.

| | | |
|---|---|---|
| **Trifolium* sp. | FAB | Scherf (1964)[8] (sec. rec., ex Kryger & Sřnderup (1952)[9]) |
| **Galeopsis speciosa* | LAM | pod jménem/as *Galeopsis versicolor*: Kleine (1910) |
| **Polygonum aviculare* | POL | Rupertsberger (1872), Kleine (1910) |
| **Polygonum* sp. | POL | Lunardoni (1899)[3], Scherf (1964)[8] (sec. rec., ex Lunardoni (1899)) |

**Tabulka 3.** Známé živné rostliny druhu *Hypera arundinis* (Paykull, 1792).
**Table 3.** Known host plants of *Hypera arundinis* (Paykull, 1792).

| | | |
|---|---|---|
| *Berula erecta* | API | Kippenberg (1983), Koch (1992)[6]; pod jménem/as *B. angutifolium*: Reitter (1916), Scherf (1964), Smreczyński (1968); pod jménem/as *Betula angustifolium*: Rosenhauer (1882); pod jménem/as *Sium angustifolium*: Hoffmann[5], Hustache (1929) (sec. rec., ex Rosenhauer (1882)[4]), Hoffmann (1954) (sec. rec., ex Hoffmann[5]) |
| **Daucus carota* | API | Dieckmann (1989)[6], Koch (1992)[6] |
| *Oenanthe aquatica* | API | Reitter (1916), Scherf (1964) |
| *Oenanthe* sp. | API | Zaslavskij (1959), Zaslavskij (1961); pod jménem/as *Phellandrium* sp.: Anderson (1948) |
| **Pastinaca sativa* | API | Dieckmann (1989)[6], Koch (1992)[6] |
| *Sium latifolium* | API | Capiomont (1868), Perris (1877), Gadeau de Kerville (1886)[3], Weise (1901), Kleine (1910), Reitter (1916), Hustache (1929) (sec. rec., ex Gadeau de Kerville (1886)), Roubal (1941), Duprez (1947), Hoffmann (1954) (sec. rec., ex Gadeau de Kerville (1886)), Scherf (1964), Smreczyński (1968), Kippenberg (1983), Dieckmann (1989), Koch (1992) # M. Wanat vidi |
| *Sium* sp. | API | Zaslavskij (1959), Zaslavskij (1961) |
| **Phragmites australis* | POA | pod jménem/as *Phragmites communis*: Kleine (1910) |
| **Rumex aquaticus* | POL | Reitter (1916) |
| **Rumex hydrolapathum* | POL | Reitter (1916) |

**Tabulka 4.** Známé živné rostliny druhu *Hypera contaminata* (Herbst, 1795).
**Table 4.** Known host plants of *Hypera contaminata* (Herbst, 1795).

| | | |
|---|---|---|
| *Lathyrus tuberosus* | FAB | Kippenberg (1983), Dieckmann (1989), Koch (1992), Strejček (2001) # J. S. vidi |

**Tabulka 5.** Známé živné rostliny druhu *Hypera dauci* (Olivier, 1807).
**Table 5.** Known host plants of *Hypera dauci* (Olivier, 1807).

| | | |
|---|---|---|
| **Daucus carota* | API | Bedel[5], Girard[5], Olivier[5], Capiomont (1868), Petri (1901), Kleine (1910), Hustache (1929) (sec. rec., ex Bedel[5], Girard[5], Olivier[5], Petri (1901)) |

| | | |
|---|---|---|
| **Oenanthe aquatica* | API | Rothkirsch (1913), Scherf (1964)[8] (sec. rec., ex Rothkirsch (1913)) |
| *Erodium cicutarium* | GER | Gobert[5], Lebon[5], Perris[5], Tempère[5], Perris (1877), Petri (1901) (sec. rec., ex Gobert[5]), Kleine (1910), Reitter (1916), Hustache (1929) (sec. rec., ex Gobert[5], Perris[5]), Roubal (1941), Hoffmann (1954) (sec. rec., ex Gobert[5], Lebon[5], Perris[5], Tempère[5]), Scherf (1964), Smreczyński (1968), Tempère (1972), Dieckmann (1981), Kippenberg (1983), Dieckmann (1989), Tempère & Péricart (1989), Koch (1992), Strejček (2001) |
| *Erodium moschatum* | GER | Hoffmann (1954), Scherf (1964), Dieckmann (1981)[6] |
| *Erodium* sp. | GER | Angelov (1978) |
| *Geranium molle* | GER | Schiödte[5], Petri (1901) (sec. rec., ex Schiödte[5]), Reitter (1916), Hustache (1929) (sec. rec., ex Schiödte[5]), Hoffamnn (1954) (sec. rec., ex Schiödte[5]), Scherf (1964), Smreczyński (1968), Dieckmann (1981)[6] |
| *Geranium pusillum* | GER | Dieckamnn (1981), Dieckmann (1989)[6], Koch (1992)[6] |
| *Geranium pyrenaicum* | GER | Hoffmann (1954), Smreczyński (1968) |
| *Geranium rotundifolium* | GER | Hoffmann (1954), Scherf (1964), Smreczyński (1968), Dieckmann (1981)[6] |
| *Geranium* sp. | GER | Roubal (1941), Angelov (1978), Kippenberg (1983) |

**Tabulka 6.** Známé živné rostliny druhu *Hypera denominanda* (Capiomont, 1868).
**Table 6.** Known host plants of *Hypera denominanda* (Capiomont, 1868).

| | | |
|---|---|---|
| *Lathyrus pratensis* | FAB | Smreczyński (1968), Kippenberg (1983), Koch (1992) |
| *Vicia tenuifolia* | FAB | Kippenberg (1983), Koch (1992)<br># J. S. vidi |
| *Vicia cracca* | FAB | Smreczyński (1968), Kippenberg (1983), Koch (1992) |

**Tabulka 7.** Známé živné rostliny druhu *Hypera diversipunctata* (Schrank, 1798).
**Table 7.** Known host plants of *Hypera diversipunctata* (Schrank, 1798).

| | | |
|---|---|---|
| **Gnaphalium dioicum* | AST | Hoffmann (1954) |
| *Cerastium arvense* | CAR | Scherf (1964), Smreczyński (1968), Tempère (1972) (sec. rec., ex Scherf (1964), Smreczyński (1968)), Kippenberg (1983), Koch (1992)<br># J. S. vidi |
| *Cerastium beeringianum* | CAR | Khruleva & Korotyaev (1999) |
| *Cerastium* sp. | CAR | Zaslavskij (1961), Dieckmann (1989), Legalov & Opanasenko (1992) (sec. rec., ex Zaslavskij (1961)), Khruleva & Korotyaev (1999) (sec. rec., ex Zaslavskij (1961)), Strejček (2001) |
| *Minuartia* spp. | CAR | Khruleva & Korotyaev (1999) |
| *Myosoton aquaticum* | CAR | Kippenberg (1983);<br>pod jménem/as *Malachium aquaticum*:<br>Dieckmann (1989), Koch (1992) |
| *Myosoton* sp. | CAR | pod jménem/as *Malachium* sp.:<br>Dieckmann (1989), Koch (1992), Strejček (2001) |
| *Silene dioica* | CAR | pod jménem/as *Melandryum silvestre*:<br>Tempère (1972) |
| *Stellaria crassifolia* | CAR | Scherf (1964), Smreczyński (1968), Tempère (1972) (sec. rec., ex Scherf (1964), Smreczyński (1968)), Kippenberg (1983), Koch (1992) |
| *Stellaria holostea* | CAR | Tempère (1972) |

**Tabulka 7** – pokračování.
**Table 7** continued.

| | | |
|---|---|---|
| *Stellaria media* | CAR | Dieckmann (1989) |
| *Stellaria uliginosa* | CAR | Scherf (1964), Smreczyński (1968), Tempère (1972) (sec. rec., ex Scherf (1964), Smreczyński (1968)), Kippenberg (1983), Koch (1992) |
| *Stellaria* sp. | CAR | Zaslavskij (1961), Dieckmann (1989), Legalov & Opanasenko (1992), Khruleva & Korotyaev (1999) (sec. rec., ex Zaslavskij (1961)) |
| *Stellaria* spp. | CAR | Strejček (2001) |
| **Astragalus* sp. | FAB | Arnoldi et al. (1974)[3], Legalov & Opanasenko (1992) (sec. rec., ex Arnoldi et al. (1974)) |
| **Plantago major* | PLA | Kleine (1910), Reitter (1916) |
| **Plantago media* | PLA | Kleine (1910), Reitter (1916), Smreczyński (1968) |
| **Plantago* sp. | PLA | Roubal (1941) |

**Tabulka 8.** Známé živné rostliny druhu *Hypera fornicata* (Penecke, 1928).
**Table 8.** Known host plants of *Hypera fornicata* (Penecke, 1928).

| | | |
|---|---|---|
| *Trifolium pratense* | FAB | Koch (1992), Dieckmann & Behne (1994) |
| *Trifolium* sp. | FAB | Strejček (2001) |

**Tabulka 9.** Známé živné rostliny druhu *Hypera fuscocinerea* (Marsham, 1802).
**Table 9.** Known host plants of *Hypera fuscocinerea* (Marsham, 1802).

| | | |
|---|---|---|
| *Anthyllis vulneraria* | FAB | Kleine (1910) |
| *Medicago falcata* | FAB | Mathieu[5], Kleine (1910), Hustache (1929) (sec. rec., ex Mathieu[5]), Hoffmann (1954), Miller (1956), Scherf (1964), Smreczyński (1968), Strejček (2001) |
| *Medicago lupulina* | FAB | Kleine (1910) |
| *Medicago sativa* | FAB | Heeger[5], Val[5], Capiomont (1868), Kleine (1910), Hustache (1929) (sec. rec., ex Heeger[5], Val[5]), Hoffmann (1954), Miller (1956), Zaslavskij (1959), Scherf (1964), Smreczyński (1968) |
| *Medicago* x *varia* = *falcata* x *sativa* | FAB | pod jménem/as *M. media*: Kleine (1910) |
| *Medicago* sp. | FAB | Perris (1877), Reitter (1916), Roubal (1941), Angelov (1978), Kippenberg (1983), Koch (1992) |
| *Melilotus albus* | FAB | Kleine (1910), Scherf (1964) |
| *Melilotus macrorhiza* | FAB | Kleine (1910) |
| *Melilotus officinalis* | FAB | Kleine (1910), Scherf (1964) |
| *Melilotus* sp. | FAB | Reitter (1916), Roubal (1941), Miller (1956) |
| *Trifolium pratense* | FAB | Hoffmann (1954), Scherf (1964), Smreczyński (1968) |
| *Trifolium repens* | FAB | Scherf (1964) |
| *Trifolium* sp. | FAB | Perris (1877), Miller (1956), Angelov (1978), Kippenberg (1983), Koch (1992) |
| *Trigonella caerulea* | FAB | pod jménem/as *Melilotus coerulea*: Kleine (1910) |

| | | |
|---|---|---|
| *Vicia sativa* | FAB | Tempère (1972), Smreczyński (1976), Tempère & Péricart (1989) |
| *Vicia* sp. | FAB | Zaslavskij (1961) |

**Tabulka 10.** Známé živné rostliny druhu *Hypera libanotidis* (Reitter, 1896).
**Table 10.** Known host plants of *Hypera libanotidis* (Reitter, 1896).

| | | |
|---|---|---|
| *Libanotis pyrenaica* | API | pod jménem/as *Libanotis montana*:<br>Reitter (1896), Petri (1901), Reitter (1916), Roubal (1941), Purkyně (1957), Smreczyński (1968), Kippenberg (1983), Koch (1992) |

**Tabulka 11.** Známé živné rostliny druhu *Hypera meles* (Fabricius, 1792).
**Table 11.** Known host plants of *Hypera meles* (Fabricius, 1792).

| | | |
|---|---|---|
| *Chrysaspis dubia* | FAB | pod jménem/as *Trifolium dubium*:<br>Scherf (1964), Borovec & Košťál (1987) (sec. rec., ex Scherf (1964));<br>pod jménem/as *Trifolium filiforme*:<br>Hoffmann (1954) |
| *Dorycnium germanicum* | FAB | pod jménem/as *D. suffruticosum:*<br>Hoffmann (1954) |
| *Dorycnium* sp. | FAB | Angelov (1978), Kippenberg (1983) |
| *Lotus corniculatus* | FAB | Hoffmann (1954), Scherf (1964), Smreczyński (1968), Borovec & Košťál (1987) (sec. rec., ex Scherf (1964)) |
| *Lotus* sp. | FAB | Angelov (1978), Kippenberg (1983) |
| *Medicago falcata* | FAB | Kleine (1910), Scherf (1964), Smreczyński (1968), Borovec & Košťál (1987) (sec. rec., ex Scherf (1964)) |
| *Medicago lupulina* | FAB | Kleine (1910), Scherf (1964), Borovec & Košťál (1987) (sec. rec., ex Scherf (1964)) |
| *Medicago sativa* | FAB | Kleine (1910), Hoffmann (1954), Miller (1956), Scherf (1964), Smreczyński (1968), Borovec & Košťál (1987) (sec. rec., ex Scherf (1964)) |
| *Medicago* x *varia* =<br>= *falcata* x *sativa* | FAB | pod jménem/as *M. media*:<br>Kleine (1910) |
| *Medicago* sp. | FAB | Angelov (1978), Kippenberg (1983) |
| *Trifolium arvense* | FAB | Anderson (1948), Hoffmann (1954), Scherf (1964), Smreczyński (1968), Borovec & Košťál (1987) (sec. rec., ex Scherf (1964)), Dieckmann (1989) |
| *Trifolium incarnatum* | FAB | Kleine (1910), Scherf (1964), Smreczyński (1968), Borovec & Košťál (1987) (sec. rec., ex Scherf (1964)), Chan et al. (1990) |
| *Trifolium pratense* | FAB | Laboulbène (1862), Capiomont (1868) (sec. rec., ex Laboulbène (1862)), Petri (1901) (sec. rec., ex Laboulbène (1862)), Kleine (1910), Reitter (1916), Hustache (1929) (sec. rec., ex Laboulbène (1862)), Hoffmann (1954), Zaslavskij (1959), Scherf (1964), Smreczyński (1968), Borovec & Košťál (1987) (sec. rec., ex Scherf (1964))<br># J. S. vidi |
| *Trifolium repens* | FAB | Hoffmann (1954), Scherf (1964), Smreczyński (1968), Borovec & Košťál (1987) (sec. rec., ex Scherf (1964)), Dieckmann (1989)[6] |
| *Trifolium* sp. | FAB | Perris (1877), Roubal (1941), Duprez (1947), Miller (1956), Zaslavskij (1961), Kippenberg (1983), Dieckmann (1989), Koch (1992) |
| *Vicia* sp. | FAB | Roubal (1941) |

**Tabulka 12.** Známé živné rostliny druhu *Hypera nigrirostris* (Fabricius, 1775).
**Table 12.** Known host plants of *Hypera nigrirostris* (Fabricius, 1775).

| | | |
|---|---|---|
| **Buphthalmum salicifolium* | AST | Kleine (1910) |
| *Chrysaspis aurea* | FAB | pod jménem/as *Trifolium agrarium*: Bargagli[5], Kleine (1910), Hustache (1929) (sec. rec., ex Bargagli[5]) |
| *Medicago sativa* | FAB | Kleine (1910), Scherf (1964), Smreczyński (1968), Kippenberg (1983) |
| *Medicago* spp. | FAB | Strejček (2001) |
| *Ononis spinosa* | FAB | Gobert[5], Capiomont (1868), Kleine (1910), Hustache (1929) (sec. rec., ex Gobert[5]), Hoffmann (1954) (sec. rec., ex Gobert), Smreczyński (1968), Kippenberg (1983), Koch (1992) |
| *Ononis* spp. | FAB | Perris (1877), Petri (1901), Reitter (1916), Roubal (1941), Duprez (1947), Angelov (1978), Dieckmann (1989), Morris, (1995), Strejček (2001) |
| *Trifolium alpestre* | FAB | Dieckmann (1989) |
| *Trifolium fragiferum* | FAB | Anderson (1948), Kryger & Sønderup (1952), Scherf (1964) |
| *Trifolium hybridum* | FAB | Schnell (1955), Scherf (1964) |
| *Trifolium incarnatum* | FAB | Hoffmann (1954), Scherf (1964), Smreczyński (1968) |
| *Trifolium medium* | FAB | Scherf (1964), Dieckmann (1989)[6] |
| *Trifolium pratense* | FAB | Kaltenbach[5], Mathieu[5], Hustache (1929) (sec. rec., ex Kaltenbach[5], Mathieu[5]), Anderson (1948), Hoffmann (1954), Markkula & Tinnilä (1955), Schnell (1955), Zaslavskij (1959), Zaslavskij (1961), Scherf (1964), Smreczyński (1968), Dieckmann (1989) # J. S. vidi |
| *Trifolium repens* | FAB | Hoffmann[5], Hoffmann (1954) (sec. rec., ex Hoffmann[5]), Schnell (1955), Scherf (1964), Smreczyński (1968), Dieckmann (1989)[6] # J. S. vidi |
| *Trifolium* sp. | FAB | Roubal (1941), Duprez (1947), Miller (1956), Angelov (1978), Kippenberg (1983), Legalov & Opanasenko (1992) |
| *Trifolium* spp. | FAB | Dieckmann (1989), Koch (1992), Morris (1995), Strejček (2001) |

**Tabulka 13.** Známé živné rostliny druhu *Hypera ononidis* (Chevrolat, 1863).
**Table 13.** Known host plants of *Hypera ononidis* (Chevrolat, 1863).

| | | |
|---|---|---|
| *Ononis biflora* | FAB | Normand (1937) |
| *Ononis natrix* | FAB | St. Claire-Deville[5], Hustache (1929) (sec. rec., ex St. Claire-Deville[5]), Hoffmann (1954), Smreczyński (1968), Kippenberg (1983), Koch (1992) |
| *Ononis repens* | FAB | St. Claire-Deville[5], Hustache (1929) (sec. rec., ex St. Claire-Deville[5]), Hoffmann (1954), Smreczyński (1968), Kippenberg (1983), Dieckmann (1989), Koch (1992) |
| *Ononis spinosa* | FAB | Kippenberg (1983), Dieckmann (1989) |
| *Ononis variegata* | FAB | Peyerimhoff[5], Hustache (1929) (sec. rec., ex Peyerimhoff[5]), Hoffmann (1954) (sec. rec., ex Peyerimhoff[5]) |
| *Ononis viscosa* | FAB | Aubé[5], Heyden[5], Capiomont (1868) (sec. rec., ex Aubé[5], Heyden[5]), Petri (1901) (sec. rec., ex Aubé[5], Heyden[5]), Kleine (1910), Reitter (1916), Hustache (1929) (sec. rec., ex Aubé[5]), Hoffmann (1954) (sec. rec., ex Aubé[5]), Smreczyński (1968), Koch (1992) |
| *Ononis* spp. | FAB | Perris (1877), Dieckmann (1989), Morris (1995) |
| **Trifolium incarnatum* | FAB | Kleine (1910) |

**Tabulka 14.** Známé živné rostliny druhu *Hypera plantaginis* (De Geer, 1775).
**Table 14.** Known host plants of *Hypera plantaginis* (De Geer, 1775).

| | | |
|---|---|---|
| **Silene dioica* | CAR | pod jménem/as *Lychnis divicia*:<br>Kleine (1910) |
| **Silene latifolia* subsp. *alba* | CAR | pod jménem/as *Melandryum album*:<br>Perris (1874)[3], Bedel (1888)[3], Kryger (1921-1922)[3], Scherf (1964)[8] (sec. rec., ex Perris (1874), Bedel (1888), Kryger (1921-1922)) |
| *Anthyllis vulneraria* | FAB | Scherf (1964), Tempère (1972) (sec. rec., ex Scherf (1964)) |
| *Anthyllis* sp. | FAB | Anderson (1948), Zaslavskij (1961) |
| *Coronilla varia* | FAB | # J. S. vidi |
| *Coronilla* sp. | FAB | Zaslavskij (1961) |
| *Lotus corniculatus* | FAB | Tempère (1972), Smreczyński (1976), Kippenberg (1983), Dieckmann (1989), Tempère & Péricart (1989), Koch (1992)<br># J. S. vidi |
| *Lotus subbiflorus* | FAB | pod jménem *L. hispidus*:<br>Tempère (1972), Tempère & Péricart (1989) |
| *Lotus uliginosus* | FAB | Hoffmann (1954), Scherf (1964), Smreczyński (1968), Tempère (1972) (sec. rec., ex Smreczyński (1968)), Kippenberg (1983), Dieckmann (1989), Tempère & Péricart (1989), Koch (1992) |
| *Lotus* sp. | FAB | Hustache (1929), Roubal (1941), Duprez (1947), Anderson (1948), Zaslavskij (1959), Zaslavskij (1961), Angelov (1978), Dieckmann (1989), Mazur (2002) |
| *Lotus* spp. | FAB | Strejček (2001) |
| *Oxytropis campestris* | FAB | Kippenberg (1983), Koch (1992)<br># J. S. vidi |
| **Plantago lanceolata* | PLA | Mathieu[5], Rabineau-Desvoidy[5], Kaltenbach (1874)[3], Petri (1901) (sec. rec., ex Rabineau-Desvoidy[5]), Kleine (1910), Reitter (1916), Hustache (1929) (sec. rec., ex Mathieu[5], Kaltenbach (1874)), Hoffmann (1954) (sec. rec., ex Kaltenbach (1874)), Smreczyński (1968) |
| **Plantago major* | PLA | De Geer[5], Mathieu[5], Rosenhauer[5], Petri (1901) (sec. rec., ex De Geer[5], Rosenhauer[5]), Kleine (1910), Reitter (1916), Hustache (1929) (sec. rec., ex Mathieu[5]), Hoffmann (1954), Smreczyński (1968) |
| **Plantago media* | PLA | De Geer[5], Mathieu[5], Kleine (1910), Hustache (1929) (sec. rec., ex Mathieu[5]), Hoffmann (1954) (sec. rec., ex De Geer[5], Mathieu[5]), Smreczyński (1968) |
| **Plantago* sp. | PLA | Schiödte (1861-1863)[3], Perris (1877), Roubal (1941), Hoffmann (1954), Scherf (1964)[8] (sec. rec., ex Schiödte (1861-1863), Hoffmann (1954)), Angelov (1978), Kippenberg (1983)[8] |

**Tabulka 15.** Známé živné rostliny druhu *Hypera postica* (Gyllenhal, 1813).
**Table 15.** Known host plants of *Hypera postica* (Gyllenhal, 1813).

| | | |
|---|---|---|
| **Brassica capitata* | BRA | Oprychałowa (1957) |
| *Astragalus baionensis* | FAB | Perris (1877), Kleine (1910), Hustache (1929) (sec. rec., ex Perris (1877)) |
| *Astragalus* spp. | FAB | Miller (1956) |
| *Galega officinalis* | FAB | Scherf (1964) |
| *Lathyrus odoratus* | FAB | Miller (1956) |

**Tabulka 15** – pokračování.
**Table 15** continued.

| | | |
|---|---|---|
| *Lathyrus* sp. | FAB | Oprychałowa (1957) |
| *Lotus corniculatus* | FAB | Scherf (1964) |
| *Lotus* sp. | FAB | Oprychałowa (1957) |
| *Lupinus* sp. | FAB | Oprychałowa (1957) |
| *Medicago arabica* | FAB | Scherf (1964) |
| **Medicago disciformis* | FAB | Danielson et. al. (1986)[10] |
| *Medicago falcata* | FAB | Kliene (1910), Scherf (1964), Smreczyński (1968), Dieckmann (1989) # J. S. vidi |
| **Medicago glandulosa* | FAB | Danielson et. al. (1986)[10] |
| *Medicago glutinosa* | FAB | Danielson et. al. (1986) |
| *Medicago lupulina* | FAB | Kleine (1910), Scherf (1964), Dieckmann (1989) |
| *Medicago minima* | FAB | Scherf (1964) |
| *Medicago orbicularis* | FAB | Scherf (1964) |
| *Medicago polymorpha* | FAB | pod jménem/as *M. hispida*: Scherf (1964) |
| **Medicago prostrata* | FAB | Danielson et. al. (1986)[10] |
| *Medicago sativa* | FAB | Kleine (1910), Anderson (1948), Schnell (1955), Miller (1956), Zaslavskij (1959), Scherf (1964), Smreczyński (1968), Bland (1984), Danielson et. al. (1986), Dieckmann (1989) # J. S. vidi |
| *Medicago scutellata* | FAB | Danielson et. al. (1986) |
| *Medicago turbinata* | FAB | Scherf (1964) |
| *Medicago* x *varia* = = *falcata* x *sativa* | FAB | pod jménem/as *M. media*: Kleine (1910), Scherf (1964) # J. S. vidi |
| *Medicago* sp. | FAB | Bedel[5], Webster (1912)[3], Hustache (1929) (sec. rec., ex Bedel[5], Webster (1912)), Roubal (1941), Oprychałowa (1957), Zaslavskij (1961), Angelov (1978), Koch (1992) |
| *Melilotus albus* | FAB | Scherf (1964), Dieckmann (1989) |
| *Melilotus altissimus* | FAB | Scherf (1964) |
| *Melilotus indicus* | FAB | pod jménem/as *Medicago indicus*: Scherf (1964) |
| *Melilotus neapolitanus* | FAB | Scherf (1964) |
| *Melilotus officinalis* | FAB | Scherf (1964) |
| *Melilotus* sp. | FAB | Oprychałowa (1957), Koch (1992) |
| **Phaseolus vulgaris* | FAB | Kleine (1910) |
| **Phaseolus* sp. | FAB | Miller (1956), Oprychałowa (1957) |
| **Robinia pseudoacacia* | FAB | Oprychałowa (1957) |
| *Trifolium hybridum* | FAB | Miller (1956), Scherf (1964) |
| *Trifolium incarnatum* | FAB | Scherf (1964) |
| *Trifolium pratense* | FAB | Miller (1956), Scherf (1964), Dieckmann (1989), Koch (1992) |
| *Trifolium repens* | FAB | Miller (1956), Scherf (1964), Dieckmann (1989)[6], Koch (1992) |

| | | |
|---|---|---|
| *Trifolium* sp. | FAB | Bedel[5], Webster (1912)[3], Hustache (1929) (sec. rec., ex Bedel[5], Webster (1912)), Roubal (1941), Oprychałowa (1957), Angelov (1978) |
| *Vicia angustifolia* | FAB | Scherf (1964) |
| *Vicia cassubica* | FAB | Scherf (1964) |
| *Vicia dumentor* | FAB | Dieckmann (1989) |
| *Vicia grandiflora* | FAB | Scherf (1964) |
| *Vicia narbonesis* | FAB | Scherf (1964) |
| *Vicia sativa* | FAB | Scherf (1964) |
| *Vicia villosa* | FAB | Scherf (1964) |
| *Vicia* spp. | FAB | Schnell (1955), Miller (1956), Oprychałowa (1957) |
| **Atriplex patula* | CHE | Kleine (1910) |
| **Gossypium* sp. | MAL | Oprychałowa (1957) |
| **Plantago lanceolata* | PLA | Kleine (1910) |
| **Rubus* sp. | ROS | Oprychałowa (1957) |
| **Rubus vitis* | ROS | Kleine (1910) |
| **Solanum tuberosum* | SOL | Kleine (1910), Oprychałowa (1957) |

**Tabulka 16.** Známé živné rostliny druhu *Hypera rumicis* (Linnaeus, 1758).
**Table 16.** Known host plants of *Hypera rumicis* (Linnaeus, 1758).

| | | |
|---|---|---|
| *Acetosa pratensis* | POL | pod jménem/as *Rumex acetosa*:<br>Decaux (1896)[3], Kleine (1910), Hustache (1929) (sec. rec., ex Decaux (1896)), Hoffmann (1954), Scherf (1964), Smreczyński (1968) |
| *Bistorta major* | POL | pod jménem/as *Polygonum bistorta*:<br>Dieckmann (1989) |
| *Fallopia convolvulus* | POL | pod jménem/as *Polygonum convolvulus*:<br>Kryger & Sønderup (1952), Scherf (1964) |
| *Oxyria digyna* | POL | Scherf (1964) |
| *Oxyria* sp. | POL | Angelov (1978) |
| *Persicaria amphibia* | POL | pod jménem/as *Polygonum amphibium*:<br>Reitter (1916) |
| *Polygonum aviculare* | POL | Boie (1850)[3], Kleine (1910), Hustache (1929) (sec. rec., ex Boie (1850)), Roubal (1941), Kryger & Sønderup (1952), Hoffmann (1954) (sec. rec., ex Boie (1850)), Scherf (1964), Dieckmann (1989), Koch (1992) |
| *Polygonum* sp. | POL | Duprez (1947), Zaslavskij (1959), Zaslavskij (1961), Angelov (1978) |
| *Rheum rhaponticum* | POL | Scherf (1964) |
| *Rheum* sp. | POL | Angelov (1978) |
| *Rumex crispus* | POL | Gadeau de Kerville (1886), Kleine (1910), Hustache (1929) (sec. rec., ex Gadeau de Kerville (1886)), Hoffmann (1954), Scherf (1964), Smreczyński (1968), Dieckmann (1989), Koch (1992) |
| *Rumex hydrolapathum* | POL | Schmidt (1840)[3], Weise (1901), Hustache (1929) (sec. rec., ex Schmidt (1840)), Anderson (1948), Hoffmann (1954), Scherf (1964), Smreczyński (1968) |
| *Rumex obtusifolius* | POL | Kleine (1910), Dieckmann (1989), Koch (1992) |

**Tabulka 16** – pokračování.
**Table 16** continued.

| | | |
|---|---|---|
| *Rumex patientia* | POL | Goureau (1844), Capiomont (1868), Petri (1901), Kleine (1910), Hustache (1929) (sec. rec., ex Goureau (1844)), Hoffmann (1954), Scherf (1964), Smreczyński (1968) |
| *Rumex* sp. | POL | Capiomont (1868), Petri (1901) (sec. rec., ex Capiomont (1868)), Reitter (1916), Roubal (1941), Duprez (1947), Anderson (1948), Zaslavskij (1959), Zaslavskij (1961), Angelov (1978), Kippenberg (1983), Dieckmann (1989), Mazur (2002) |
| *Rumex* spp. | POL | Koch (1992), Strejček (2001) |

**Tabulka 17.** Známé živné rostliny druhu *Hypera striata* (Boheman, 1834).
**Table 17.** Known host plants of *Hypera striata* (Boheman, 1834).

| | | |
|---|---|---|
| *Vicia sativa* | FAB | Tempère & Péricart (1989) |
| *Vicia* sp. | FAB | Tempère (1961), Tempère (1972) (sec. rec., ex Tempère (1961)), Smreczyński (1976), Kippenberg (1983) |
| *Vicia* spp. | FAB | Koch (1992) |
| **Plantago coronopus* | PLA | Hoffmann (1954), Smreczyński (1968), Tempère (1972)[8], Tempère & Péricart (1989)[8] |
| **Plantago* sp. | PLA | Angelov (1978), Mazur (2002) |

**Tabulka 18.** Známé živné rostliny druhu *Hypera suspiciosa* (Herbst, 1795).
**Table 18.** Known host plants of *Hypera suspiciosa* (Herbst, 1795).

| | | |
|---|---|---|
| *Lathyrus pratensis* | FAB | Kirsch[5], Kaltenbach (1872)[3], Petri (1901) (sec. rec., ex Kirsch[5]), Kleine (1910), Reitter (1916), Hustache (1929) (sec. rec., ex Kaltenbach (1872)), Hoffmann (1954) (sec. rec., ex Kaltenbach (1872)), Smreczyński (1968), Kippenberg (1983), Dieckmann (1989)<br># J. S. vidi |
| *Lathyrus* sp. | FAB | Roubal (1941), Zaslavskij (1959), Zaslavskij (1961), Arnoldi et al. (1974)[3], Angelov (1978), Dieckmann (1989), Koch (1992), Legalov & Opanasenko (1992) (sec. rec., ex Zaslavskij (1961), Arnoldi et al. (1974)) |
| *Lathyrus* spp. | FAB | Strejček (2001) |
| *Lotus corniculatus* | FAB | Kleine (1910) |
| *Lotus uliginosus* | FAB | Kirsch[5], Kaltenbach (1872)[3], Petri (1901) (sec. rec., ex Kirsch[5]), Kleine (1910), Reitter (1916), Hustache (1929), Hoffmann (1954) (sec. rec., ex Kaltenbach (1872)), Smreczyński (1968), Kippenberg (1983) |
| *Lotus* sp. | FAB | Roubal (1941), Zaslavskij (1961), Arnoldi et al. (1974)[3], Angelov (1978), Legalov & Opanasenko (1992) (sec. rec., ex Zaslavskij (1961), Arnoldi et al. (1974)) |
| *Lotus* spp. | FAB | Strejček (2001) |
| *Medicago falcata* | FAB | # J. S. vidi |
| *Medicago lupulina* | FAB | Dieckmann (1989)[6] |
| *Medicago sativa* | FAB | # J. S. vidi |
| *Melilotus albus* | FAB | Dieckmann (1989) |

| | | |
|---|---|---|
| *Melilotus* sp. | FAB | Zaslavskij (1959), Dieckmann (1989), Koch (1992) |
| *Trifolium pratense* | FAB | Dieckmann (1989)[6] |
| *Trifolium repens* | FAB | Dieckmann (1989) |
| *Trifolium* sp. | FAB | Dieckmann (1989), Koch (1992) |
| *Vicia cracca* | FAB | Scherf (1964), Smreczyński (1968), Kippenberg (1983), Dieckmann (1989) |
| *Vicia sativa* | FAB | Tempère (1972), Smreczyński (1976), Tempère & Péricart (1989) |
| *Vicia tenuifolia* | FAB | # J. S. vidi |
| *Vicia* sp. | FAB | Roubal (1941), Zaslavskij (1959), Zaslavskij (1961), Arnoldi et al. (1974)[3], Dieckmann (1989), Koch (1992), Legalov & Opanasenko (1992) (sec. rec., ex Zaslavskij (1961), Arnoldi et al. (1974)) |
| *Vicia* spp. | FAB | Strejček (2001) |
| **Plantago major* | PLA | Kleine (1910) |

**Tabulka 19.** Známé živné rostliny druhu *Hypera venusta* (Fabricius, 1781).
**Table 19.** Known host plants of *Hypera venusta* (Fabricius, 1781).

| | | |
|---|---|---|
| *Anthyllis vulneraria* | FAB | Tempère[5], Rosenhauer (1882), Petri (1901) (sec. rec., ex Rosenhauer (1882)), Hustache (1929) (sec. rec., ex Rosenhauer (1882)), Duprez (1947), Anderson (1948), Hoffmann (1954) (sec. rec., ex Tempère[5], Rosenhauer (1882)), Scherf (1964), Smreczyński (1968), Kippenberg (1983), Koch (1992) |
| *Anthyllis* sp. | FAB | Roubal (1941), Dieckmann (1989) |
| *Chrysaspis campestris* | FAB | pod jménem/as *Trifolium campestre*:<br>Dieckmann (1989) |
| *Chrysaspis dubia* | FAB | pod jménem/as *Trifolium dubium*:<br>Scherf (1964), Smreczyński (1968), Kippenberg (1983), Koch (1992) |
| *Chrysaspis* sp. | FAB | pod jménem/as *Trifolium* sp.:<br>Dieckmann (1989) |
| *Lotus corniculatus* | FAB | Bedel[5], Hoffmann (1954) (sec. rec., ex Bedel[5]), Scherf (1964), Smreczyński (1968), Kippenberg (1983), Koch (1992) |
| *Lotus* sp. | FAB | Bedel[5], Rosenhauer (1882)[1], Petri (1901) (sec. rec., ex Rosenhauer (1882)), Reitter (1916), Hustache (1929) (sec. rec., ex Bedel[5]), Roubal (1941), Duprez (1947), Angelov (1978), Dieckmann (1989)[6] |
| **Melilotus* sp. | FAB | Dieckmann (1989)[6] |
| *Onobrychis viciifolia* | FAB | Scherf (1964), Smreczyński (1968), Kippenberg (1983), Koch (1992);<br>pod jménem/as *O. sativa*:<br>Bargagli[5], Bedel[5], Kleine (1910), Hustache (1929) (sec. rec., ex Bargagli[5]), Hoffmann (1954) (sec. rec., ex Bargagli[5], Bedel[5]) |
| *Onobrychis* sp. | FAB | Zaslavskij (1961), Angelov (1978), Dieckmann (1989) |
| *Trifolium arvense* | FAB | Koch (1992) |
| *Ulex minor* | FAB | pod jménem/as *U. nana*:<br>Hoffmann (1954), Kippenberg (1983) |
| *Vicia sativa* | FAB | Tempère (1972), Smreczyński (1976), Tempère & Péricart (1989) |
| *Vicia* sp. | FAB | Dieckmann (1989), Koch (1992) |

**Tabulka 20.** Známé živné rostliny druhu *Hypera viciae* (Gyllenhal, 1813).
**Table 20.** Known host plants of *Hypera viciae* (Gyllenhal, 1813).

| | | |
|---|---|---|
| **Apium nodiflorum* | API | pod jménem/as *Helosciadium nodifolrum*:<br>Perris[5], Capiomont (1868) (sec. rec., ex Perris[5]), Petri (1901) (sec. rec., ex Perris[5]), Kleine (1910), Reitter (1916) |
| **Berula erecta* | API | pod jménem/as *Sium angustifolium*:<br>Kleine (1910) |
| **Sium latifolium* | API | Kleine (1910) |
| *Lathyrus aphaca* | FAB | Hoffmann (1929)[5], Hoffmann (1954) (sec. rec., ex Hoffmann (1929)[5]), Scherf (1964) |
| *Lathyrus pratensis* | FAB | Kippenberg (1983) |
| *Lathyrus* sp. | FAB | Tempère (1972) |
| *Vicia cracca* | FAB | Roubal (1941), Dieckmann (1989)[6], Tempère & Péricart (1989) |
| *Vicia sylvatica* | FAB | Bedel[5], Petri (1901) (sec. rec., ex Bedel[5]), Kleine (1910), Reitter (1916), Hoffmann (1929)[5], Hustache (1929) (sec. rec., ex Bedel), Roubal (1941), Hoffmann (1954) (sec. rec., ex Hoffmann (1929)[5]), Scherf (1964), Smreczyński (1968) |
| *Vicia tenuifolia* | FAB | Bedel[5], Hustache (1929) (sec. rec., ex Bedel[5]), Roubal (1941), Hoffmann (1954) (sec. rec., ex Bedel), Scherf (1964), Smreczyński (1968), Dieckmann (1989)<br># J. S. vidi |
| *Vicia villosa* | FAB | Dieckmann (1989) |
| *Vicia* sp. | FAB | Zaslavskij (1961), Tempère (1972), Angelov (1978), Kippenberg (1983), Dieckmann (1989), Legalov & Opanasenko (1992), Mazur (2002) |
| *Vicia* spp. | FAB | Koch (1992), Strejček (2001) |

**Tabulka 21.** Známé živné rostliny druhu *Hypera vidua* Gené, 1837.
**Table 21.** Known host plants of *Hypera vidua* Gené, 1837.

| | | |
|---|---|---|
| **Geranium molle* | GER | Strejček & Dieckmann (1987), Dieckmann (1989)[6] |
| **Geranium palustre* | GER | Strejček & Dieckmann (1987), Dieckmann (1989)[6] |
| *Geranium sanguineum* | GER | Hoffmann (1954), Strejček & Dieckmann (1987), Dieckmann (1989), Koch (1992), Dieckmann & Behne (1994) (sec. rec., ex Strejček & Dieckmann (1987))<br># J. S. vidi |
| *Geranium* sp. | GER | Kippenberg (1983) |

**Tabulka 22.** Známé živné rostliny druhu *Hypera zoila* (Scopoli, 1763).
**Table 22.** Known host plants of *Hypera zoila* (Scopoli, 1763).

| | | |
|---|---|---|
| **Helianthus tuberosus* | AST | Kleine (1910) |
| *Medicago falcata* | FAB | Scherf (1964) |
| *Medicago sativa* | FAB | Kleine (1910), Schnell (1955), Miller (1956), Scherf (1964), Peterson et al. (1995)<br># J. S. vidi |
| *Medicago* sp. | FAB | Reitter (1916), Roubal (1941), Dieckmann (1989), Koch (1992) |

| | | |
|---|---|---|
| *Onobrychis* sp. | FAB | Roubal (1941) |
| *Ononis* sp. | FAB | Reitter (1916), Roubal (1941) |
| *Trifolium incarnatum* | FAB | Kleine (1910) |
| *Trifolium pratense* | FAB | Kleine (1910), Schnell (1955), Miller (1956), Scherf (1964), Smreczyński (1968), Dieckmann (1989)<br># J. S. vidi |
| *Trifolium repens* | FAB | Scherf (1964), Smreczyński (1968), Dieckmann (1989)[6] |
| *Trifolium* sp. | FAB | Reitter (1916), Roubal (1941), Miller (1956), Kippenberg (1983), Dieckmann (1989), Koch (1992), Peterson et al. (1995) |
| *Trifolium* spp. | FAB | Strejček (2001) |

**Tabulka 23.** Seznam živných rostlin druhů rodu *Hypera*.
**Table 23.** List of host plants of *Hypera* species.

| | | | |
|---|---|---|---|
| **Apiaceae** | | | |
| *Aegopodium* L. | *H. adspersa* | *Libanotis pyrenaica* (L.) Bourgeau syn. *L. montana* Crantz | *H. libanotidis* |
| *Aegopodium podagraria* L. | *H. adspersa* | *Oenanthe* L. syn. *Phellandrium* L. | *H. adspersa, H. arundinis* |
| *Apium* L. | *H. adspersa* | *Oenanthe aquatica* (L.) Poiret syn. *O. phellandrium* Lam. | *H.adspersa, H. arundinis, *H. dauci* |
| *Apium inundatum* (L.) Reichenb. syn. *Helosciadium inundatum* (L.)Koch | *H. adspersa* | | |
| *Apium nodiflorum* (L.) Lag. syn. *Helosciadium nodiflorum* (L.) Koch | *H. adspersa*, **H. viciae* | *Oenanthe crocata* L. | *H. adspersa* |
| *Berula erecta* (Huds.) Coville syn. *B. angustifolium* (L.) Mert. et Koch syn. *Sium angustifolium* L. | *H. arundinis*, **H. viciae* | *Pastinaca sativa* L. | **H. arundinis* |
| | | *Peucedanum* L. | *H. adspersa* |
| | | *Peucedanum palustre* (L.) Moench | *H. adspersa* |
| | | *Sium* L. | *H. adspersa, H. arundinis* |
| *Crithmum maritimum* L. | *H. adspersa* | | |
| *Daucus* L. | *H. adspersa* | *Sium latifolium* L. | *H. arundinis, *H. viciae* |
| *Daucus carota* L. | *H. adspersa, *H. arundinis, *H. dauci* | | |
| **Asteraceae** | | | |
| *Bidens* L. | *H. adspersa* | *Gnaphalium dioicum* L. | **H. diversipunctata* |
| *Bidens cernua* L. | *H. adspersa* | | |
| *Bidens tripartita* L. | *H. adspersa* | *Helianthus tuberosus* L. | **H. zoila* |
| *Buphthalmum salicifolium* L. | **H. nigrirostris* | | |
| **Brassicaceae** | | | |
| *Brassica oleraceae* L. | **H. postica* | *Nasturtium* R. Br. | **H. adspersa* |
| **Caryophyllaceae** | | | |
| *Agrostemma* L. | *H. arator* | *Cucubalus* L. | **H. adspersa, H. arator* |
| *Agrostemma githago* L. syn. *Lychnis githago* (L.) Scop. | *H. arator* | *Cucubalus baccifer* L. | *H. arator* |
| *Cerastium* L. | *H. diversipunctata* | *Dianthus* L. | *H. arator* |
| | | *Dianthus arenarius bohemicus* (Novák) O. Schwarz | *H. arator* |
| *Cerastium arvense* L. | *H. diversipunctata* | *Dianthus barbatus* L. | *H. arator* |
| *Cerastium beeringianum* Cham. et Schlecht | *H. diversipunctata* | *Dianthus carthusianorum* L. | *H. arator* |
| | | *Dianthus caryophyllus* L. | *H. arator* |

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| **Caryophyllaceae** | |
| *Dianthus deltoides* L. | *H. arator* |
| *Dianthus superbus* L. | *H. arator* |
| *Gypsophila* L. | *H. arator* |
| *Gypsophila muralis* L. | *H. arator* |
| *Lychnis* L. | *H. arator* |
| *Lychnis flos-cuculi* L. | *H. arator* |
| *Minuartia* L. | *H. arator,* *H. diversipunctata* |
| *Moenchia* Ehrh. | *H. arator* |
| *Moenchia erecta* (L.) G., M. et Sch. | *H. arator* |
| *Myosoton* Moench<br>syn. *Malachium* Fries | *H. diversipunctata* |
| *Myosoton aquaticum* (L.) Moench<br>syn. *Malachium aquaticum* (L.) Fries | *H. diversipunctata* |
| *Oberna behen* (L.) Ikonn.<br>syn. *Cucubalus behen* L.<br>syn. *Silene inflata* Sm. | **H. adspersa*, *H. arator* |
| *Scleranthus* L. | *H. arator* |
| *Scleranthus annuus* L. | *H. arator* |
| *Silene* L. | **H. adspersa,* *H. arator* |
| *Silene dioica* (L.) Clairv.<br>syn. *Lychnis dioica* L.<br>syn. *Melandryum silvestre* (Schkuhr) Röhling<br>syn. *Melandryum rubrum* Garcke | *H. arator*, *H. diversipunctata*, **H. plantaginis* |
| *Silene latifolia alba* (Miller) Greuter et Burdet<br>syn. *Melandryum album* (Mill.) Garcke<br>syn. *Lychnis vespertina* Sibth. | *H. arator*, **H. plantaginis* |
| *Silene nutans* L. | *H. arator* |
| *Spergula* L. | *H. arator* |
| *Spergula arvensis* L. | *H. arator* |
| *Spergula arvensis sativa* L.<br>syn. *Spergularia arvensis* L.<br>syn. *Spergula sativa* Boenn. | *H. arator* |
| *Spergularia* (Pers.) J. Presl et C. Presl | *H. arator* |
| *Spergularia rubra* (L.) J. Presl et C. Presl | *H. arator* |
| *Stellaria* L. | *H. arator*, *H. diversipunctata* |
| *Stellaria crassifolia* Ehrh. | *H. diversipunctata* |
| *Stellaria holostea* L. | *H. diversipunctata* |
| *Stellaria media* (L.) Vill. | *H. arator*, *H. diversipunctata* |
| *Stellaria uliginosa* Murray | *H. diversipunctata* |
| **Chenopodiaceae** | |
| *Atriplex patula* L. | **H. postica* |
| **Fabaceae** | |
| *Anthyllis* L. | *H. plantaginis,* *H. venusta* |
| *Anthyllis vulneraria* L. | *H. fuscocinerea*, *H. plantaginis*, *H. venusta* |
| *Astragalus* L. | **H. diversipunctata,* *H. postica* |
| *Astragalus baionnensis* Loisel | *H. postica* |
| *Chrysaspis* Desv.<br>syn. *Trifolium* L. | *H. venusta* |
| *Chrysaspis aurea* (Pollich) Greene<br>syn. *Trifolium agraricum* L. | *H. nigrirostris* |
| *Chrysaspis campestris* (Schreber) Desv.<br>syn. *Trifolium campestre* Schreber | *H. venusta* |
| *Chrysaspis dubia* (Sibth.) Desv.<br>syn. *Trifolium dubium* Sibth.<br>syn. *Trifolium filiforme* Sibth. | *H. meles*, *H. venusta* |
| *Coronilla* L. | *H. plantaginis* |
| *Coronilla varia* L. | *H. plantaginis* |
| *Dorycinum* Miller | *H. meles*, *H. postica* |
| *Dorycnium germanicum* (Gremli) Rikli<br>syn. *D. suffruticosum* Vill. | *H. meles* |
| *Galega officinalis* L. | *H. postica* |
| *Lathyrus* L. | *H. postica,* *H. suspiciosa,* *H. viciae* |
| *Lathyrus aphaca* L. | *H. viciae* |
| *Lathyrus odaratus* L. | *H. postica* |
| *Lathyrus pratensis* L. | *H. denominanda*, *H. suspiciosa*, *H. viciae* |
| *Lathyrus tuberosus* L. | *H. contaminata* |
| *Lotus* L. | *H. meles*, *H. plantaginis*, *H. postica*, *H. suspiciosa*, *H. venusta* |

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|---|---|---|---|
| *Lotus corniculatus* L. | *H. meles*, | *Melilotus macrorhiza* (W. et K.) | *H. fuscocinerea* |
| | *H. plantaginis*, | Pers. | |
| | *H. postica*, | *Melilotus neapolitanus* Ten. | *H. postica* |
| | *H. suspiciosa*, | *Melilotus officinalis* (L.) Pallas | *H. fuscocinerea*, |
| | *H. venusta* | | *H. postica* |
| *Lotus subbiflorus* Lag. | *H. plantaginis* | *Onobrychis* Miller | *H. venusta*, |
| syn. *L. hispidus* Desf. ex DC. | | | *H. zoila* |
| *Lotus uliginosus* Schkuhr | *H. plantaginis*, | *Onobrychis viciifolia* Scop. | *H. venusta* |
| | *H. suspiciosa* | syn. *O. sativa* Lam. | |
| *Lupinus* L. | *H. postica* | *Ononis* L. | *H. nigrirostris*, |
| *Medicago* L. | *H. fuscocinerea*, | | *H. ononidis*, |
| | *H. meles*, | | *H. zoila* |
| | *H. nigrirostris*, | *Ononis biflora* Desf. | *H. ononidis* |
| | *H. postica*, | *Ononis natrix* L. | *H. ononidis* |
| | *H. zoila* | *Ononis repens* L. | *H. ononidis* |
| *Medicago arabica* (L.) Huds. | *H. postica* | *Ononis spinosa* L. | *H. nigrirostris*, |
| *Medicago disciformis* DC. | **H. postica* | | *H. ononidis* |
| *Medicago falcata* L. | *H. fuscocinerea*, | *Ononis variegata* L. | *H. ononidis* |
| | *H. meles*, | *Ononis viscosa* L. | *H. ononidis* |
| | *H. postica*, | *Ornithopus sativus* Brot. | **H. arator* |
| | *H. suspiciosa,* | *Oxytropis campestris* (L.) DC. | *H. plantaginis* |
| | *H. zoila* | *Phaseolus* L. | **H. postica* |
| *Medicago glandulosa* Davidoff | **H. postica* | *Phaseolus vulgaris* L. | **H. postica* |
| *Medicago glutinosa* Bieb. | *H. postica* | *Robinia pseudoacacia* L. | **H. postica* |
| *Medicago lupulina* L. | *H. fuscocinerea*, | *Trifolium* L. | **H. arator*, |
| | *H. meles*, | | *H. fornicata*, |
| | *H. postica*, | | *H. fuscocinerea*, |
| | **H. suspiciosa* | | *H. meles*, |
| *Medicago minima* (L.) L. | *H. postica* | | *H. nigrirostris*, |
| *Medicago orbicularis* (L.) Bartal. | *H. postica* | | *H. postica*, |
| *Medicago polymorpha* L. | *H. postica* | | *H. suspiciosa*, |
| syn. *M. hispida* Gaertner | | | *H. zoila* |
| *Medicago prostrata* Jacq. | **H. postica* | *Trifolium alpestre* L. | *H. nigrirostris* |
| *Medicago sativa* L. | *H. fuscocinerea*, | *Trifolium arvense* L. | *H. meles,* |
| | *H. meles*, | | *H. venusta* |
| | *H. nigrirostris*, | *Trifolium fragiferum* L. | *H. nigrirostris* |
| | *H. postica*, | *Trifolium hybridum* L. | *H. nigrirostris*, |
| | *H. suspiciosa,* | | *H. postica* |
| | *H. zoila* | *Trifolium incarnatum* L. | *H. meles*, |
| *Medicago scutellata* (L.) Miller | *H. postica* | | *H. nigrirostris*, |
| *Medicago turbinata* (L.) All. | *H. postica* | | **H. ononidis*, |
| *Medicago* x *varia* = *falcata* x | *H. fuscocinerea*, | | *H. postica,* |
| x *sativa* Martyn | *H. meles*, | | *H. zoila* |
| syn. *M. media* Pers. | *H. postica* | *Trifolium medium* L. | *H. nigrirostris* |
| *Melilotus* Miller | *H. fuscocinerea*, | *Trifolium pratense* L. | *H. fornicata*, |
| | *H. postica*, | | *H. fuscocinerea*, |
| | *H. suspiciosa*, | | *H. meles*, |
| | **H. venusta* | | *H. nigrirostris*, |
| *Melilotus albus* Medicus | *H. fuscocinerea*, | | *H. postica*, |
| | *H. postica*, | | *H. suspiciosa*, |
| | *H. suspiciosa* | | *H. zoila* |
| *Melilotus altissimus* Thuill. | *H. postica* | *Trifolium repens* L. | **H. arator*, |
| *Melilotus indicus* (L.) All. | *H. postica* | | *H. fuscocinerea*, |
| syn. *Medicago indicus* | | | *H. meles*, |

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|---|---|---|---|
| **Fabaceae** | | | |
| *Trifolium repens* L. | *H. nigrirostris*, | *Vicia cassubica* L. | *H. postica* |
| | *H. nigrirostris*, | *Vicia cracca* L. | *H. denominanda*, |
| | *H. postica*, | | *H. suspiciosa*, |
| | *H. suspiciosa*, | | *H. viciae* |
| | *H. zoila* | *Vicia dumentor* L. | *H. postica* |
| *Trigonella caerulea* (L.) Ser. | *H. fuscocinerea* | *Vicia grandiflora* Scop. | *H. postica* |
| syn. *Melilotus coerulea* (L.) Desr. | | *Vicia narbonensis* L. | *H. postica* |
| *Ulex minor* Roth | *H. venusta* | *Vicia sativa* L. | *H. fuscocinerea*, |
| syn. *U. nana* T. F. Forster | | | *H. postica*, |
| ex Symons | | | *H. striata*, |
| *Vicia* L. | *H. fuscocinerea*, | | *H. suspiciosa*, |
| | *H. meles*, | | *H. venusta* |
| | *H. postica*, | *Vicia silvatica* L. | *H. viciae* |
| | *H. striata*, | *Vicia tenuifolia* Roth | *H. denominanda*, |
| | *H. suspiciosa*, | | *H. suspiciosa,* |
| | *H. venusta*, | | *H. viciae* |
| | *H. viciae* | *Vicia villosa* Roth | *H. postica*, |
| *Vicia angustifolia* L | *H. postica* | | *H. viciae* |
| **Geraniaceae** | | | |
| *Erodium* L'Hér. | *H. dauci* | *Geranium palustre* L. | **H. vidua* |
| *Erodium cicutarium* (L.) L'Hér. | *H. dauci* | *Geranium pusillum* Burm. | *H. dauci* |
| *Erodium moschatum* (L.) L'Hér. | *H. dauci* | *Geranium pyrenaicum* Burm. | *H. dauci* |
| *Geranium* L. | *H. dauci*, | *Geranium rotundifolium* L. | *H. dauci* |
| | **H. vidua* | *Geranium sanguineum* L. | *H. vidua* |
| *Geranium molle* L. | *H. dauci*, | | |
| | **H. vidua* | | |
| **Lamiaceae** | | | |
| *Galeopsis speciosa* Miller | **H. arator* | *Lycopus* L. | **H. adspersa* |
| syn. *G. versicolor* Curtis | | *Mentha* L. | **H. adspersa* |
| **Malvaceae** | | | |
| *Gossypium* L. | **H. postica* | | |
| **Plantaginaceae** | | | |
| *Plantago* L. | **H. diversipunc-* | *Plantago major* L. | **H. diversipunc-* |
| | *tata*, | | *tata*, |
| | **H. plantaginis*, | | **H. plantaginis*, |
| | **H. striata* | | **H. suspiciosa* |
| *Plantago coronopus* L. | **H. striata* | *Plantago media* L. | **H. diversipunc-* |
| *Plantago lanceolata* L. | **H. plantaginis*, | | *tata*, |
| | **H. postica* | | **H. plantaginis* |
| **Poaceae** | | | |
| *Phragmites australis* (Cav.) Steud. | **H. arundinis* | *Secale cereale* L. | **H. adspersa* |
| syn. *P. communis* Trin. | | | |
| **Polygonaceae** | | | |
| *Acetosa pratensis* Miller | **H. adspersa*, | *Oxyria digyna* (L.) Hill | *H. rumicis* |
| syn. *Rumex acetosa* L. | *H. rumicis* | *Persicaria amphibia* (L.) Delarbie | *H. rumicis* |
| *Bistorta major* S. F. Gray | *H. rumicis* | syn. *Polygonum amphibium* L. | |
| syn. *Polygonum bistorta* L. | | *Persicaria hydropiper* (L.) Delarbie | **H. adspersa* |
| *Fallopia convolvulus* (L.) Á. Löve | *H. rumicis* | syn. *Polygonum hydropiper* L. | |
| syn. *Polygonum convolvulus* L. | | *Polygonum* L. | **H. arator*, |
| *Oxyria* Hill | *H. rumicis* | | *H. rumicis* |

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|---|---|---|---|
| *Polygonum aviculare* L. | **H. adspersa*, **H. arator*, *H. rumicis* | *Rumex hydrolapathum* Huds. | **H. arundinis*, *H. rumicis* |
| | | *Rumex obtusifolius* L. | **H. adspersa*, *H. rumicis* |
| *Rheum* L. | *H. rumicis* | | |
| *Rheum rhabarbarum* L. syn. *R. undulatum* L. | **H. adspersa* | *Rumex patientia* L. | **H. adspersa*, *H. rumicis* |
| *Rheum rhaponticum* L. | *H. rumicis* | *Rumex* x *pratensis* = *R. crispus* x x *obtusifolius* Mertens et Koch syn. *R. acutus* L. | **H. adspersa* |
| *Rumex* L. | *H. rumicis* | | |
| *Rumex aquaticus* L. | **H. arundinis* | | |
| *Rumex crispus* L. | **H. adspersa*, *H. rumicis* | | |
| **Punicaceae** | | | |
| *Punica* L. | **H. adspersa* | | |
| **Rosaceae** | | | |
| *Rubus* L. | **H. postica* | *Rubus vitis* | **H. postica* |
| **Solanaceae** | | | |
| *Solanum tuberosum* L. | **H. postica* | | |

**Vysvětlivka:** * – druh se podle mne na uváděné rostlině nevyvíjí.
**Explanation:** * – in my opinion the species does not develop on the plant.

## 3.2. Intraspecific larval aggression in two species of *Hypera* (Coleoptera: Curculionidae) [prepared for *Journal of Insect Behavior*]

# Intraspecific larval aggression in two species of *Hypera* (Coleoptera: Curculionidae)

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**ABSTRACT**

Two unusual types of behaviour (wandering and intraspecific aggressive behaviour) have been observed when rearing larvae of two species of *Hypera*. Wandering of *H. postica* in search for food was observed in L1, L2, L3 and young L4 larvae. L1 larvae disperse in response to crowding. Wandering of L2 to young L4 instars was a response to food shortage. Wandering of late L4 larva ("prepuppa") occurs because of searching place for spinning the cocoon and pupation. Intraspecific aggressive behaviour of weevil's larvae has never been described yet. Mutual encounter between the larvae may result in agonistic behaviour and some larvae may die as a consequence of fighting. The aggressivity increases with food limitation. Agonistic behaviour is artificial and probably does not occur under natural conditions where there is a plenty of food and larval densities are decreased by pathogens or parasitoids.

**KEY WORDS**: Resource competition, intraspecific aggressive behaviour of holometabolan larvae, Coleoptera, Curculionidae, Hyperini, *Hypera postica*, *Hypera vidua*, Palaearctic region

## INTRODUCTION

An incentive for writing this paper was observation of the first author (J.S.) that the larvae of two *Hypera* species (Coleoptera: Curculioniodae: Hyperini), both ectophagous herbivores, may in laboratory cultures show a pronounced intraspecific aggression while this has never been observed in the field.

Intraspecific aggressiveness (IA) is quite a common phenomenon among insects and may take different forms and evolve for a variety of reasons. It is obligatory for the social insects in their need to establish hierarchy and differentiate the adults into reproductive and non-reproductive castes, but this is a topic outside the scope of this paper. In other insects, IA is usually associated with sexual selection (ARNQVIST AND ROWE 2005), competition for limited and limiting resources (such as food, space, shelters, egg-laying sites; cf. SPEIGHT *ET AL* 1999), and cannibalistic predation (ELGAR AND CRESPI 1992), the latter being often subservient to former two. Considering the intraspecific aggressive interactions among non-parasitoid holometabolan larvae, only the competition and cannibalism apply.

The insects evolved numerous strategies (e.g. host marking behaviour - NUFIO AND PAPAI 2001) how to avoid intraspecific larval competition (hence also IA) and its intereference with development; the intraspecific competition is relatively rare among herbivores. Laboratory experiments often show negative effects of increased density (e.g.,GIBBS *ET AL*. 2004) but the adverse effects of over-crowding other than depletion of the food source are less easily demonstrated in natural populations. Both exploitative (scramble) and interference (contest) kinds of competition may be involved (SPEIGHT *ET AL* 1999; TOWNSEND *ET AL* 2003) may be involved. The actual IA may range from a mild form of ritualized or actual contest for sources (usually food) up to solving the competition "by means of murder" (STILLING AND STRONG, 1983 - larvae of various *Spartina* grass stem-borers).

Intraspecific larval cannibalism may occur among predators as an extension of their normal behaviour, among non-predacious species as a by-product of feeding on another resource (e.g., decaying wood), as an abnormal behaviour owing to over-crowding or scarcity of a trophic resources, and as a result redeployment of trophic resources. The cannibalizing larva benefits, although the overall costs of cannibalism may differ in non-kin and kin cannibalism. Cannibalism is frequent in beetle larvae, e.g. in predaceous species (e.g. coccinellids - MICHAUD 2003) and xylophagous taxa (e.g. cerambycids - WARE AND STEPHEN 2005); for a review see STEPHENS (1992),

Cannibalism or any other kinds of the aggressive intraspecific behaviour of larvae has never been observed the Curculionidae, although larvae of some species may indulge in interspecific aggression. Larvae of some taxa are parasitic in other insects (for a review, see SUGIURA *ET AL*. 2004). Moreover, larvae of some weevils are

destroying minute, insects from other orders, either food competitors (Hemiptera: Aphididae, larvae of Hymenoptera: Cynipidae and Tenthredinidae) or potential predators (larvae of Diptera: Cecidomyidae) (SCHERF 1964, SUGIURA *ET AL*. 2004).

However, for no species of Hyperini or Curculionidae or beetles or other holometabolans we have found a published evidence for co-existence of the usual kind of contests with suicidal combats as occurring in cultures of two *Hypera* species. These situations have been observed, experimentally analysed to find their potential dependence on the instar or presence/absence of food, and discussed in terms of their potential adaptive value.

## MATERIAL AND METHODS

### (1) *HYPERA* SPECIES

Larvae of most *Hypera* species develop on the surface of plants, feeding mainly on leaves and sometimes on flowers (DIECKMANN 1989). The ectophagy is an apomorphic trait in the Curculionidae (DIECKMANN 1989), and it is shared by the two *Hypera* species studied (SKUHROVEC 2003a, 2005b, COSTA *ET AL*. 2004). Only a few species may develop inside the inflorescences, e.g. *Hypera nigrirostris* (Fabricius, 1775) (SKUHROVEC 2003a) and other small species of the tribe Hyperini (J.S., unpublished data). Mature larvae spin cocoons in which they pupate, and the adults hatch after one or two weeks (SCHERF 1964).

The larvae of all *Hypera* species pass through four instars (J.S., unpublished data). The stadium of the fourth instar (L4) can be subdivided into two nearly equally long periods: in L4a the larva eats leaves of its host plant, while in the following L4b ("prepupa") it searches for a place to spin the cocoon and pupate (J.S., unpublished data).

The larvae are apodous, their locomotion is looper-like. The mouthparts are well developed, but perform only trophic functions and are never used in combats.

***Hypera postica*.** The alfalfa weevil, *Hypera postica* (Gyllenhal, 1813), is a species autochthonous in the Palaearctic region (TITUS 1911, CSIKI 1934, KIPPENBERG 1983) but it was introduced in the Nearctic region at the end of 19$^{th}$ century (TITUS 1911, KIPPENBERG 1983). It develops on plant species belonging to nine genera of Fabaceae (SKUHROVEC 2005b: *Astragalus*, *Galega*, *Lathyrus*, *Lotus*, *Lupinus*, *Medicago*,

*Melilotus*, *Trifolium* and *Vicia*). The alfalfa weevil is known as a serious pest of alfalfa (*Medicago sativa* L.) mainly in the Nearctic region (TITUS 1911, BERBERET *ET AL*. 1987, HOFF *ET AL*. 2002), while it is not noxious in its original area. Life and feeding of *Hypera* larvae takes place on the surface of plants; small first and second instars (L1 and L2) feed usually on the youngest parts of alfalfa (the growing stem tips) while large third and fourth instars (L3 and L4) may feed on the opened leaves as well (MILLER 1956, HOFF *ET AL*. 2002; J.S., pers. observ.). Large larvae cause a serious defoliation of alfalfa (MILLER 1956, HOFF *ET AL*. 2002; J.S., pers. observ.). The larvae occur on the top of the stem in loose groups.

The larvae of *Hypera postica* (all the four instars) were collected near the villages Kačice (50°09'14"N, 14°00'00"E (WGS-84), 390 m a.s.l.) and Raná (50°26' 00"N, 13°45' 20"E (WGS-84), 380 m a.s.l.) in NW Bohemia during the years 2002-2005 by sweeping field-grown *Medicago sativa*. The instars were identified according to SKUHROVEC (2006). Larvae were reared in Petri dishes with moist filter paper at the bottom; maintenance of a proper humidity is essential (BARNES AND RATCLIFFE 1967).

Body lengths of instars: L1 (2.0 mm), L2 (2.0-2.5 mm), L3 (2.5-6.5 mm) and L4 (5.5-10.0 mm) (SKUHROVEC 2003b, 2005a; data from alcohol-preserved, possibly slightly shrunken specimens).

***Hypera vidua*.** The other species, *Hypera vidua* Gené, 1837, occurs in the South of France, the north Italy, Switzerland, Gotland Island, (Sweden), Czech Republic (KIPPENBERG 1983, STREJČEK AND DIECKMANN 1987) and Germany (BUSSLER 1991). It inhabits rock-steppe and forest-steppe biotopes. Adults of this rare species are nocturnal (STREJČEK AND DIECKMANN 1987). The species is monophagous on *Geranium sanguineum* L. (Geraniaceae) (SKUHROVEC 2005b). Larvae of *H. vidua* are solitary: no more than one larva has ever been found at the same top of stem.

The larvae of *H. vidua* were collected individually on *Geranium sanguineum* in the rock-steppe near village Dubičky in the north Bohemia (50°36' 59"N, 14°01' 05"E (WGS-84), 490 m a.s.l.) during the years 2002-2004. Only two localities of this rare weevil are known in the Czech Republic at present (SKUHROVEC 2003a). Consequently, only a few larvae were collected, and only few experiments realized. The instars were identified according to SKUHROVEC (2003b). Larvae were reared as those of the alfalfa weevil. L1 was not found.

Body length of each instar: L2 (3.5-4.5 mm), L3 (4.0-6.0 mm) and L4 (4.5-12.5 mm) (SKUHROVEC 2003a; data from alcohol-preserved, possibly slightly shrunken material).

## (2) EXPERIMENTAL DESIGN

We attempted to find out what factor is responsible for the intraspecific aggressive behaviour of larvae in cultures. Four types of experiments were carried out; in *Hypera postica* with four individuals involved and with twenty replications each, and in *Hypera vidua* with two individuals and two replications each. In *H. postica,* the two stages of the 4th instar, L4a and L4b, were included into all the experiments simply as L4, but the differences of their behaviour during the experiments were noted. In *H. vidua,* stages L4a and L4b were a priori distinguished in single-instar experiments (1v and 2v) but not in mixed-instar groups (3v and 4v). The goals of the experiments with *H. postica* are formulated beneath, those with *H. vidua* have been the same in analogous and similarly indicated experiments.

**(A) Single-instar groups.**

**(1p).** Four larvae of the same instar were put in the centre of a Petri dish containing sufficient amount of small leaves of *Medicago sativa* placed at three sites along the dish perimeter. All four instars were tested independently. The experiment was designed to show whether the larvae attack each other when the food supply is sufficient.

**(1v) *Hypera vidua.*** As above, but L1 and L4b not examined, only two larval individuals used, and *Geranium sanguineum* as the host-plant.

**(2p) *H. postica***. The experiment was designed as **(1p)** but with no leaves of *M. sativa* in the Petri dishes. Larvae were deprived of food, and we could test whether a larva would attack other individuals or would be searching for leaves.

**(2v) *H. vidua.*** As in **(1v)** and **(2p)** - the larvae were deprived of food.

**(B) Mixed-instar groups.**

**(3p) *H. postica.*** Two small larvae (L1 and/or L2) and two large larvae (L3 and/or L4) were put into a Petri dish containing food (*Medicago sativa*) as in the experiment

**(1p)**. The experiment was designed to show whether the larger larvae are more aggressive than smaller ones when the food supply is sufficient.

**(3v) *H. vidua***. As in **(1v),** one small larva (L2) and one large larva (L3 or L4) were put in a Petri dish with the food (*Geranium sanguineum*).

**(4p) *H. postica.*** The experiment was designed as **(3p)**: two small and two large larvae but no food in a Petri dish. This experiment was a combination of **(2p)** and **(3p) aiming** to show whether the larger larvae are more aggressive than smaller ones when there is no food.

**(4v) *H. vidua.*** The experiment was designed as **(3v**): one small and one large larva (L3 or L4) but no food in Petri dishes. This experiment was combination of **(2v)** and **(3v).**

The experiments with both species lasted 30 minutes, and the larvae were controlled after each ten minutes. When they continued to fight, the experiment was carried on until the following day (12 hours) without interim controls. Different individuals were used in each experiment and repetition. The larvae of *H. postica* had been collected by sweeping *en masse*, and the solitary larvae of *H. vidua* by individual search; consequently, we have no information on the degree of kinship of the individuals used in experiments.

The results of experiments were combined with observation by the behaviour of larvae in the field, cultures and during experiments.

Larvae of both species were reared in the laboratory during the years 2002-2005. The following elements of behaviour were recorded (see under Terminology): combats contra feeding, function of larvae as offensive or defensive ones, forming of combat balls. The interesting situations were recorded as videos by a digital camera (SONY DCR-HC20) or as photographs by a digital camera (OLYMPUS C-765). All the material (larvae, weevils, photographs and recordings) is deposited in the first author's collection (J.S.) at the Department of Zoology, Charles University, Prague.

## (3) STATISTICS

To examine the effect of instar and presence of food on aggressive behaviour of the weevils, the data from experiments with *H. postica* were expressed as a number of fights observed during individual experiments (dependent variable), and instar number (L1–L4) and presence/absence of food during the experiment (factors). The data were analysed by two-way GLM ANOVA (Poisson distribution of errors) with interaction. Effect of the presence/absence of food on the number of aggressive interactions (fights) in mixed-instar groups was analysed by one-way GLM ANOVA with Poisson distribution of errors. Analyses were performed in STATISTICA 6.0 (STATSOFT, INC. 2001). Data from experiments with *H. vidua* were not sufficient for statistical treatments.

## (4) TERMINOLOGY OF BEHAVIOUR

Only the terms with a special and fixed meaning are explained here.

**Bobbing, to bob** (COSTA *ET AL.* 2005) - larva is adhering to the ground (or to another larva) by posterior abdominal segments, and it checks surrounding by jerky movements of its head and anterior part of body.

**Combat ball** - a cluster formed by several twisted fighting larvae.

**Defensive larva** - a larva attacked by another larva (the roles of defensive and offensive larvae are interchangeable during the fight).

**Offensive larva** - a larva attacking another larva.

**Wandering** - peregrination of larvae, seemingly aimless, mainly in search for food or pupation site.

## RESULTS

Formation of permanent combat ball always resulted in both *Hypera* species in a death of the larvae involved.

***Hypera postica***

(Figs 1, 2, 3)

**(A) Single-instar groups.** Number of fights recorded during the experiments was influenced by instar age (Wald Stat. = 27.1121, $p < 0.01$) and by the presence of food (Wald Stat. = 19.2669, $p < 0.01$); the interaction of the factors (instar age and presence of food) was not significant (Wald Stat. = 3.1902, $p = 0.36$). Attacks were more frequent among larvae of L2, L3 and L4 and in the absence of food (Fig. 1).

**Experiment p1** (see Fig. 1). Larvae of all the instars started immediately to bob around, and when they touched any kind of object (leaves of *Medicago sativa*, another larva), they moved closer to it. Would that be a leave, the larva could sample it, and, eventually eat it. When the larva touched another individual, it continued to bob, and for some time was repeatedly touching the other larva; then the attack followed. The mode of attack was constant: the offensive larva entwisted itself around the defensive one and pressed upon it. The defensive larva rotated and jerked at the ground, and tried to release itself. The offensive larva might have relaxed its grip after a while, and the defensive larva could extricate itself. The fight was then resumed, or the offensive larva started bobbing again and tried to find another object in its vicinity. Later, the offensive larva might have attacked again (the same or another defensive larva) or moved in another direction. The roles of the offensive larva and the defensive one might have changed during the fighting.

While fighting, the larvae might have come close to alfalfa leaves, and were the fight stopped in their proximity or upon them, the larvae could taste them. Both offensive and defensive larva preferred the food against the fight on almost all occasions. Nearly all the larvae were eating leaves after 10 minutes (see Fig. 3).

If several larvae were clumped and formed the combat ball, the fights might have continued longer since the larvae have been joining the ball by turns. However, they always stopped fighting whenever the food was found. The fights may have lasted only a few seconds till the whole day (particularly in combat balls).

The youngest (L1) and the oldest larvae (L4b) were wandering more than the others.

**Experiment p2** (see Fig. 1). Two major activities were apparent, wandering and fighting. The youngest (L1) and oldest larvae (L4b) were wandering more than the others. L4b did not fight even when they met. When the other larvae (L2-L4a) met each other, the fighting usually started immediately, but not each body contact resulted in a fight. At several occasions, all the larvae joined the fight, formed a combat ball (see Fig. 3), and continued to fight even over the last regular control (30 minutes). All the larvae,

which had been forming the combat ball, were found dead after 12 hours (by random checks even earlier). Their tissues, at sites attacked by other larvae, were black owing to necrosis.

**(B) Mixed-instar groups.** In mixed-instar groups, attacks were more frequent when the food was absent (Wald Stat. = 7.8387, $p < 0.01$, Fig. 2).

**Experiment p3** (see Fig. 2). The results were the same as in **(p1).** The older larvae (L3/L4) turned off the attacks of the small larvae (L1/L2) by employing their size and body mass. Finally, all the larvae were eating the leaves, and no fights were taking place.

**Experiment p4** (see Fig. 2)**.** The results combined those of the previous experiments (Fig. 2). The fights have occasionally resulted in death of all the larvae. The bodies of dead larvae were twisted into a combat ball.

The possibilities of behaviour of all the instars of *Hypera postica* (L1, L2, L3, L4a and L4b) are summarized in the diagram (Fig. 3).

***Hypera vidua***

(Table 1, Fig. 4)

Because of small number of experiments, all the experimental data are summarized in Table 1.

**(A) Single-instar groups.**

**Experiment v1.** Behaviour of larvae of *H. vidua* during mutual attacks was generally similar to that of *H. postica.* When the larva found the leaves of *Geranium sanguineum*, it fed upon them, but might have occasionally attacked another larva, if the latter moved to its vicinity. L3 and L4a were more aggressive than the youngest larval instar used in the experiment (L2). The prepupal larvae L4b were bobbing or wandering, avoiding the fights (see Fig. 4).

**Experiment v2.** The results were similar in the general behaviour as in the experiment with the larvae of *H. postica.* A larva used to attack the other one when the food was not available. L3 and L4a were more aggressive than the youngest larval instar used in the experiment (L2). L4b did not fight even when they met (see Fig. 4).

**(B) Mixed-instar groups.**

**Experiment v3.** Mutual attacks between larvae of *H. vidua* were similar as in **(v1)**. A larva attacked occasionally the other one, even when there was food enough.

**Experiment v4.** The results were similar to those obtained in the previous experiments with the larvae of *H. vidua.* The frequency of attacks was similar as in (v3).

The possibilities of behaviour of all the instars (L2, L3, L4a and L4b) of *Hypera vidua* are summarized in the diagram (Fig. 4).

## DISCUSSION

### (a) WANDERING

The wandering was observed in all the instars of both *Hypera* species, but the motivation could have been different in different instars. Particularly the motives of L1 and L4b may differ from those of other instars.

The main motive was apparently a **search for food** (observed in L1, L2, L3 and L4a.). The wandering of individuals of older instars (L2, L3 and L4a) only occurred when no food was available.

The youngest larvae (L1) have also **dispersal** motive for wandering. The eggs of *H. postica* are laid in packs of 3 to 30 eggs into the stem of the alfalfa. A first larva hatched from a large pack has to wander to find a suitable site for itself and its own future older instars as well; the latter would require more food and space. Egg-laying behaviour and the resulting activity of L1 are unknown in *H. vidua*, but taking into account their solitary habits and high aggressiveness of older larvae, we can hypothesize that single eggs are being inserted into *Geranium* stems. Consequently, the dispersal motive seems to be stronger for *H. postica* than for *H. vidua*. A similar strategy of L1 was observed in other Coleoptera (Coccinelidae – HODEK AND HONEK (1996). There are two major motives for dispersal - finding the food and avoiding competition (SPEIGHT ET AL. 1998).

The development of L4 instar takes twice that long as development of other instars, a phenomenon known also in other Coleoptera (e.g. Carabidae – SASKA AND HONEK (2004)). The first stage, L4a ("mature larva"), has mainly a feeding function, while the subsequent one, L4b ("prepupa"), stops feeding. The main motive for wandering of the latter stage is undoubtedly a **search for a pupation site** where L4b could spin the cocoon and the subsequent pupation could take place. This is probably also the main reason why L4b avoided fighting. Such behaviour of L4b was observed in both *Hypera* species studied.

**(b) INTRASPECIFIC AGGRESSIVE BEHAVIOUR**

***Hypera postica.*** All the fights were taking place only after the contacts between or amongst the larvae, which were searching for food, not looking actively for potential competitors. After finding the food, the wandering stopped (as to L1 and L4b, see above), and chances of encounters with other larvae were minimal. Fighting was observed only in cultures, never in the field.

Larvae of *H. postica* abound in fields of alfalfa, which always provide food enough. Larvae occurred in loose aggregations at tops of the alfalfa stems. Large and compact cooperative aggregations functioning in protection against predators such as described by COSTA *ET AL*. (2005) for larvae of another hyperine species *Phelypera distigma* (Boheman, 1842) are never formed by larvae of *H. postica.* Number of larvae of *H. postica* in the aggregation is controlled by a pathogenic fungus *Zoopthora phytonomi* (Arthur): when more then 3 larvae occur on the top of a stem, the occurrence of the fungus is enhanced (KUHAR *ET AL*. 1999), and the abundance of the whole population of *H. postica* declines. The larvae of *H. postica* are also parasitized by diverse species of Hymenoptera, e.g. *Bathyplectes anurus* (Thomson) (Ichneumonidae; KUHAR *ET AL*. 1999), which may potentially exert similar influence.

***Hypera vidua*** differs in many respects from *H. postica.* The larvae continued to fight even when the food was available; only L4b did not fight even when they met. In the field, the larvae of *H. vidua* occur singly at the tops of stems near the buds and do not form any clusters. Consequently, we could see the intraspecific aggressive behaviour in the laboratory cultures only.

**(c) WANDERING AND NON-AGGRESSIVE BEHAVIOUR IN THE FIELD**

The larval intraspecific aggressive behaviour has not been and probably will not be observed in the field, because the larvae do eschew dangerous situations behaviourally.

The wandering L1 of *Hypera postica* must find a suitable site for the whole future development. The chances of encounters leading to fights are decreased by the dispersal of larvae during the search, and, moreover, the food is nearly always present since the larvae hatch from eggs laid on the host plant.

Those L1 larvae, which are unsuccessful in finding the proper site, die either in this or future instars.

L2-L4a occur on its main host plant *Medicago sativa* in small and loose clusters with a plenitude of food around. Aggressive encounters are thus nearly excluded. Fungi and parasitoids would regulate the density of accidentally crowding larvae, and the population is always spatially diluted even if its density is high. L4b avoid combats during their wandering, and lack of suitable sites for spinning the cocoon and pupation never occurred in the field and cultures (although this parameter has not been really tested).

Another situation obtains with larvae 2-4 of *H. vidua**. They are solitary and never meet each other. Old L4b can meet during their wandering but they do not attack each other.

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FOOTNOTE

* The youngest instar (L1) of *H. vidua* has been never seen in the field in spite of great efforts to find it. Disregarding the incompetence of the collector as a reason, there could be two objective explanations of this, viz. (a) life of L1 in a different microhabitat than occupied by L2-4a, e.g., hypogeic life, or reversal to endophagy like in *Hypera nigrirostris* (Fabricius, 1775) (SKUHROVEC 2005b), or (b) occurrence of L1 in the fall and its hibernation as in *Hypera zoila* (Scopoli, 1763) (MILLER 1956).

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**(D) SIGNIFICANCE OF AGGRESSIVE BEHAVIOUR IN CULTURES**

The aggressive intraspecific behaviour of larvae of *Hypera postica* has never been observed in the field on *Medicago sativa* under the condition of permanent plenitude of food and lack of crowding. However, the combats seen in the cultures, with their definite techniques and regular outcomes must have evolved under natural conditions.

The transient combats observed in cultures with available food were obviously due to crowding; the bodily contacts of the larvae may function as stimuli for such behaviour. The potentiality of this behaviour may be advantageous also in the field since an occasional occurrence of crowding may be presumed; necessity to establish its own feeding and future pupation site is then essential for a larva. Wandering and transient combats may be synergistic during dispersal of the population, and the transient combats are undoubtedly adaptive.

What is more difficult to explain is engagement of both offensive and defensive larvae in mortal combat balls in situations of complete absence of food, and a seeming absence of any mechanisms of avoidance these combats (cf. RUXTON ET AL. 2004). We can envisage a variety of field situations in which this condition would be temporarily met, namely aggregation of larvae on the ground caused by their fall from shattered alfalfa plant, or exhaustion of food supply on an isolated stray alfalfa plant. However, the behaviour seems maladaptive - the fitness of both offensive and defensive larvae becomes zero. Evidently, better results in term of both inclusive and individual fitness would bring a combat strategy with obvious winners and losers.

Both proximate and ultimate reasons for such behaviour cannot be estimated unless the behaviour of larvae of related species is known in detail and a reliable cladogram is available. It seems quite feasible that larvae of *Hypera postica* simply do not recognize their conspecifics, and their way of combat had been evolved against some unknown or extinct soft-bodied and mostly losing heterospecific competitor or predator. We cannot also exclude a long-term functioning of an evolutionary ratchet transforming *ad absurdum* the original simple contest competition into deathly combats.

The above conclusions apply to less known *Hypera vidua* as well. Combativeness of its larvae in cultures is apparently associated with and enhanced by their solitary way of life in field.

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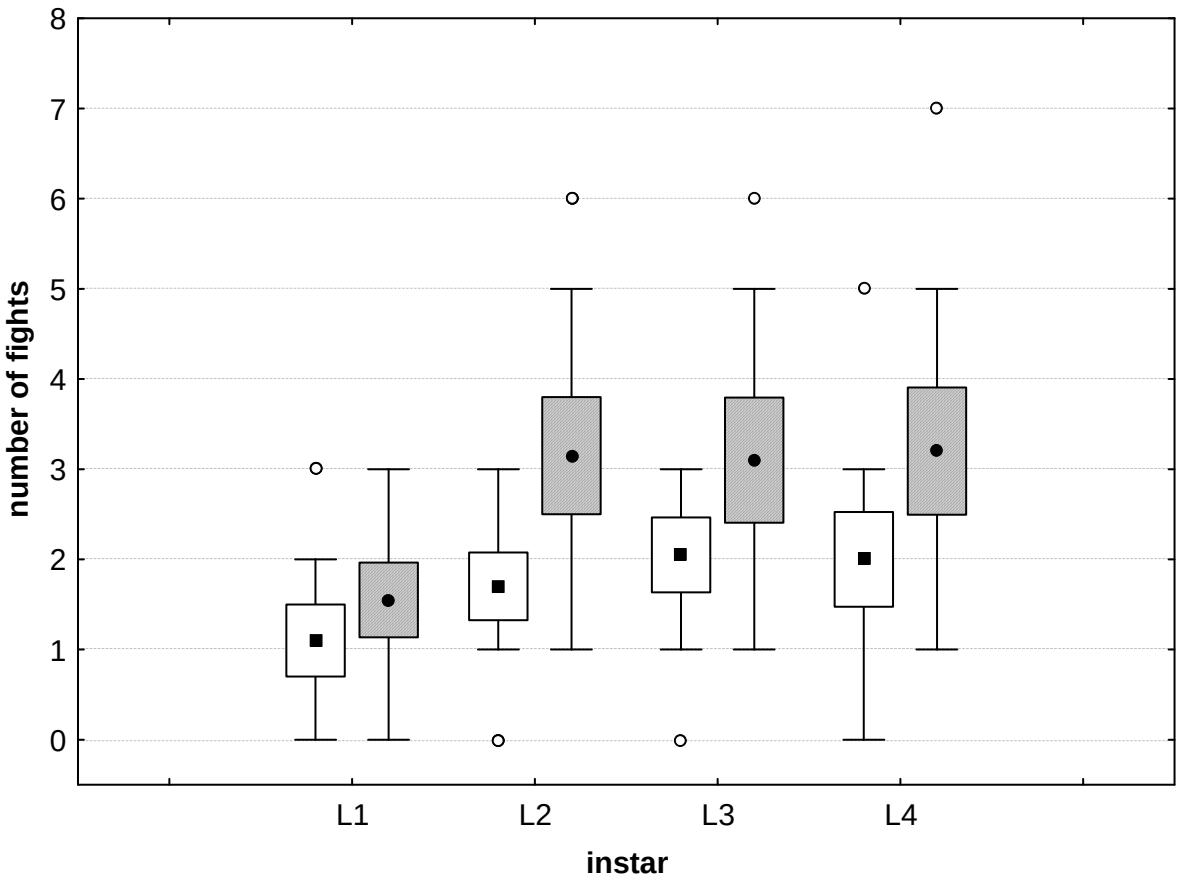


Figure 1. Number of fights observed in experiments with groups of *Hypera postica* larvae of various instars (L1 – L4), in the presence (plain boxes) or absence (hatched boxes) of food (leaves of *Medicago sativa*). Filled circles and squares = mean, box = confidential interval, whiskers = non-outlier range, empty circles = outliers.

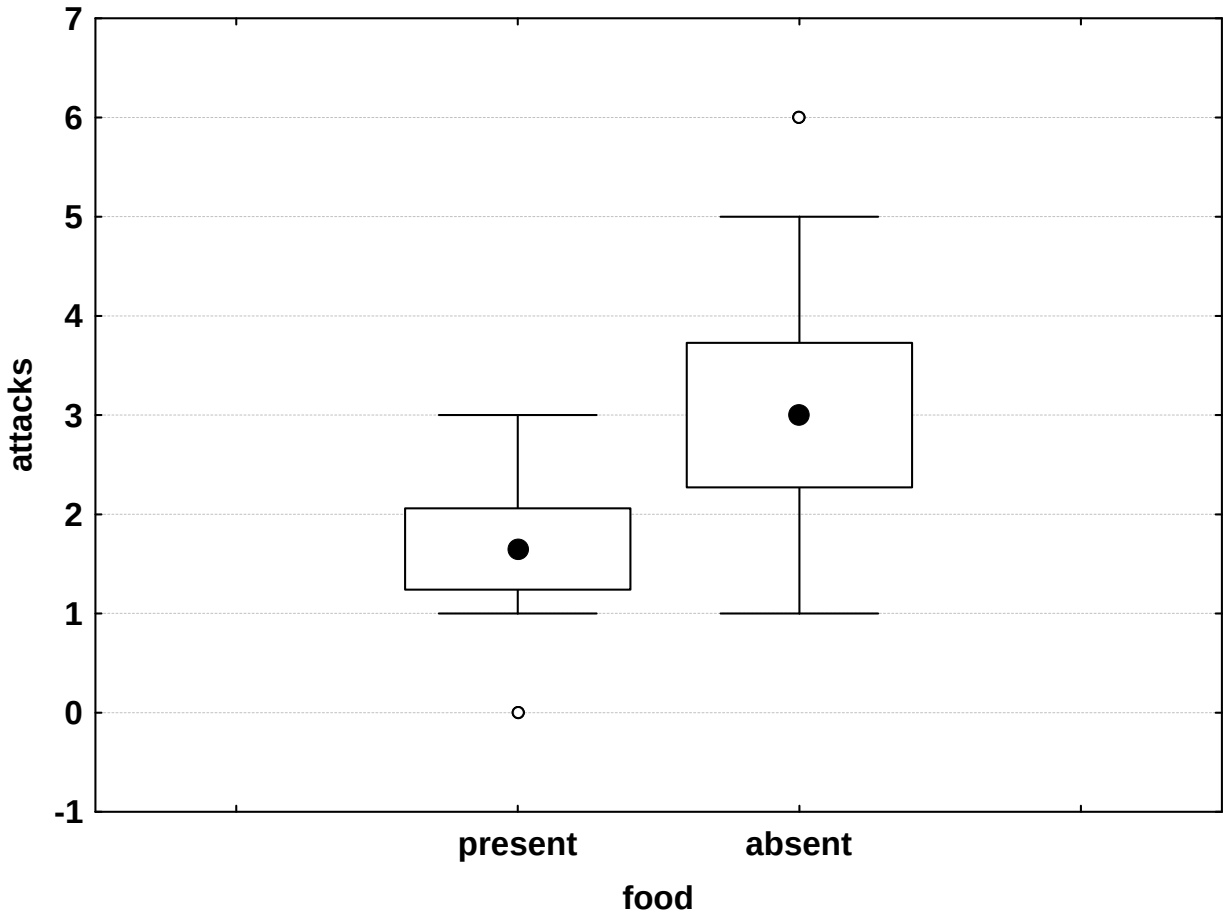


Figure 2. Number of fights observed in experiments with groups of mixed-instar groups of *Hypera postica* larvae in the presence or absence of food (leaves of *Medicago sativa*). Filled circles = mean, box = confidential interval, whiskers = non-outlier range, empty circles = outliers.

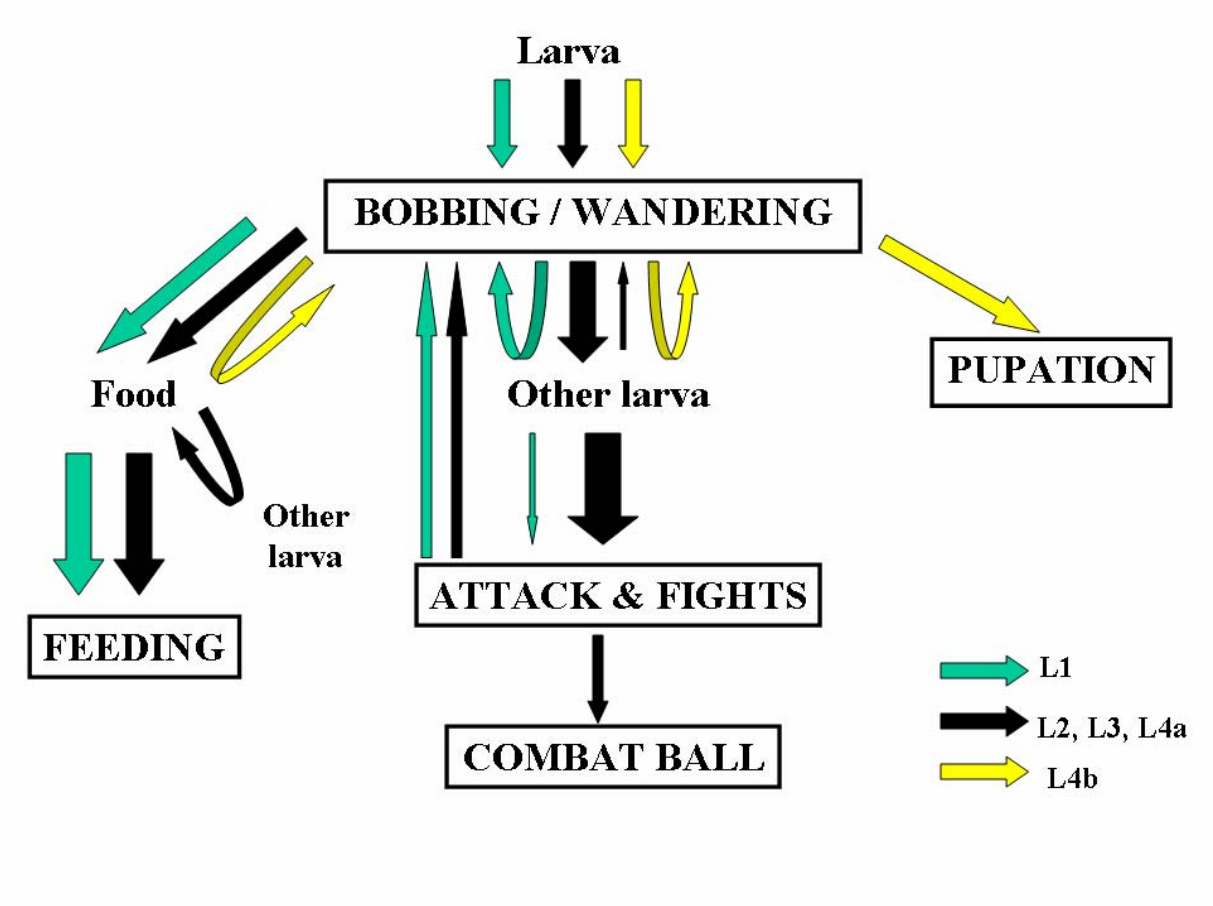


Figure 3. Possibilities of behaviour of each instar of *Hypera postica* (L1, L2, L3, L4a and L4b) summarized in a diagram.

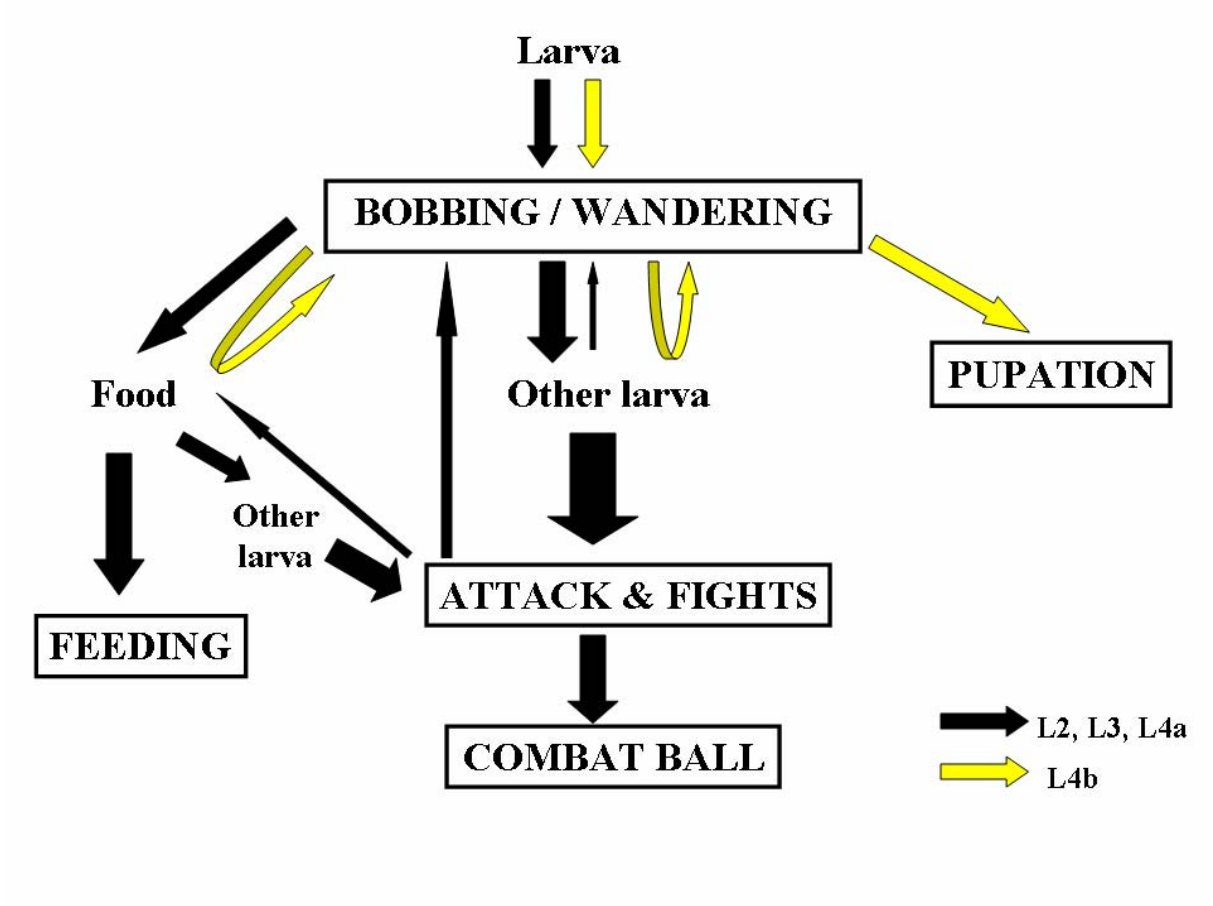


Figure 4. Possibilities of behaviour of each instar of *Hypera vidua* (L2, L3, L4a and L4b) summarized in a diagram.

Table 1. Experiments with *Hypera vidua* (two replications, two individuals). Upper row: experimental design; for **(1v), (2v), (3v), (4v)** see the text. Second row: larval instars 2-4: **L2, L3, L4a** (young stage, feeding), **L4b** (old stage, wandering), respectively, **L3/L4** – large larvae (L3 and/or L4). Third and fourth rows: number of fights during first 30 minutes in a Petri dish (number of killed larvae within the same period).

| **(1v)** | | | | **(2v)** | | | | **(3v)** | **(4v)** |
|---|---|---|---|---|---|---|---|---|---|
| **L2** | **L3** | **L4a** | **L4b** | **L2** | **L3** | **L4a** | **L4b** | **L2 vs.L3/L4** | **L2 vs.L3/L4** |
| 1 | 3 (2) | 3 (1) | 1 | 3 | 5 (2) | 4 | 0 | 2 (1) | 4 |
| 2 | 2 | 3 | 0 | 2 | 3 | 3 (1) | 0 | 3 | 3 (1) |