

Description of the larva and pupa of *Haploglossa picipennis* (Gyllenhal, 1827) and larva of *H. nidicola* (Fairmaire, 1852) (Coleoptera: Staphylinidae: Aleocharinae) with taxonomic remarks

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The poorly known mature larvae (L3) of *Haploglossa picipennis* (Gyllenhal, 1827) and *H. nidicola* (Fairmaire, 1852) and also hitherto unknown pupal cocoon and pupa of *H. picipennis* are described in detail, with the illustrations of structural features and setal pattern provided. The differences of the mature larvae between these two species and other known Aleocharinae larvae belonging to the tribes Athetini, Homalotini, Hoplandriini, Liparocephalini, Lomechusini and Oxypodini are presented. The diagnostic larval characters for the genus *Haploglossa* are proposed for the first time. The differences between pupa of *H. picipennis* and pupa of *Pella laticollis* (Märkell, 1844) are listed. Data on the distribution and ecological requirements of both *H. picipennis* and *H. nidicola* are also provided.

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1. Introduction

The global genus *Haploglossa* Kraatz, 1856 includes 11 described species, most of which are distributed in the Holarctic region. Six species are described from Europe and 5 occur in Poland (Klimaszewski & Ashe 1991, Staniec 2004). These beetles belong to the subtribe Oxypodina of the tribe Oxypodini. Members of *Haploglossa* are rather small rove beetles (body length: 2.5–4 mm, exceptionally 6 mm), usually associated with nests of ants, birds and mammals (Burakow-

ski *et al* 1981, Koch 1989, Drugmand 1990, Klimaszewski & Ashe 1991).

Haploglossa picipennis (Gyllenhal, 1827), habitus of adults and aedeagus as in Figs 12a, 12c–12d, is distributed in northern and central part of Europe and Caucasus. It is defined as an eurytopic, silvicolous and nidicolous species. Beetles inhabit nests of the following birds of prey: black kite *Milvus migrans* (Boddaret), common buzzard *Buteo buteo* (Linnaeus), northern goshawk *Accipiter gentilis* (Linnaeus), honey-buzzard *Pernis apivorus* (Linnaeus), marsh har-

rier *Circus aeruginosus* (Linnaeus), montagu's harrier *Circus pygargus* (Linnaeus), and eurasian sparrowhawk *Accipiter nisus* (Linnaeus). *Haploglossa nidicola* (Fairmaire, 1852), habitus of adults and aedeagus as in Figs 12b, 12c–12f₁, is recorded from almost the entire Europe. In Poland, it is known from a dozen or so localities. It is defined as a stenotopic, xerophilous and nidicolous beetle, which obligatorily occurs in nests of sand martin *Riparia riparia* (Linnaeus) (Burakowski et al. 1981, Koch 1989, Drugmand 1990, Krištofik et al. 1994, Staniec 2006).

The morphology of developmental stages of the genus *Haploglossa* is poorly known. The descriptions of adult morphology and ecology of the European and North American species of *Haploglossa*, including *H. picipennis* and *H. nidicola*, were done by Drugmand (1990) and Klimaszewski & Ashe (1991). With regard to immature stages, only Paulian (1941) provided the description of the larval stages for *H. (=Microglotta) pulla* (Gyllenhal, 1827) and *H. (=Microglotta) nidicola*, and Drugmand (1990) for *H. picipennis*. However, the existing descriptions are superficial and poorly illustrated. None of these authors used chaetotaxy as a source of diagnostic characters. The descriptions are also not useful for phylogenetic analysis. Therefore they urgently require supplements or revision.

The goals of this study are to describe morphology, including chaetotaxy, of the poorly known larvae of *H. picipennis* and *H. nidicola*, and pupa of *H. picipennis*, and point out their main diagnostic characters. The paper provides the first description of the pupae for the genus *Haploglossa*. We hope that this work will be useful for the future phylogenetic analysis of this genus.

2. Material and methods

Several hundred larvae together with numerous adults of *H. picipennis* were extracted from moist, deserted nests of marsh harrier (*Circus aeruginosus*) and montagu's harrier (*Circus pygargus*) on the peat bog in Gotówka village near Chełm (UTM: FB77, SE Poland) on 7 July 2004 and on 5 July 2005 (col. I. Kitowski). Adults and some one hundred larvae were preserved in a 1:3 solution of glycerine and alcohol (70 %). On

the basis of measurements of the head width and body length, three larval instars of *H. picipennis* were recognized. In order to obtain pupae and to confirm the correct identification of the species, a few dozen of collected larvae were reared to the end of metamorphosis. The rearing was conducted in plastic containers filled partly with nest substrate (decaying plants remains) ($T = 20 \pm 2$ °C). Larvae were fed with small ant larvae. After a few days, 7 pupal cocoons and 14 pupae were preserved for the further study.

About 10 larvae and a few adults of *H. nidicola* were extracted from deserted nests of sand martin (*Riparia riparia*) in Wólka Łańcuchowska (UTM: FB37, SE Poland) on 3 July 2005. Numerous adults were also collected in the vicinity of nests. During collecting the material in the field, neither inside nor outside the examined nests any other staphylinid species were observed. That fact and close morphological similarity of these larvae with larvae of *H. picipennis* confirmed correct identification of the larvae of both species.

Adults of both *Haploglossa* species were identified by the first author. For microscopic slides the punctured larvae of both staphylinids were rinsed in distilled water, cleared in KOH and finally placed in glycerin. Habitus illustrations of the larvae, pupae and adults were made on the basis of the photos. They were made just after killing of the insects by putting them into boiling water. The drawings of morphological details were made using camera lucida. Chaetotaxy of larvae was coded basing on the principles used for description of *Atheta coraria* Kraatz (Staphylinidae, Aleocharinae) by Ashe & Watrous (1984).

3. Descriptions

3.1. Description of mature larva (L3) of *Haploglossa picipennis*

Body length (from anterior margin of labrum to the end of pygopod). 3.70–4.38 mm (mean 3.97 mm); head width (between stemmata): 0.48–0.52 mm (mean 0.50 mm); pronotum width in the widest place: 0.62–0.66 mm (mean 0.63 mm). Body elongate, cylindrical, strongly sclerotized and relatively stocky. Colour: head dark brown with

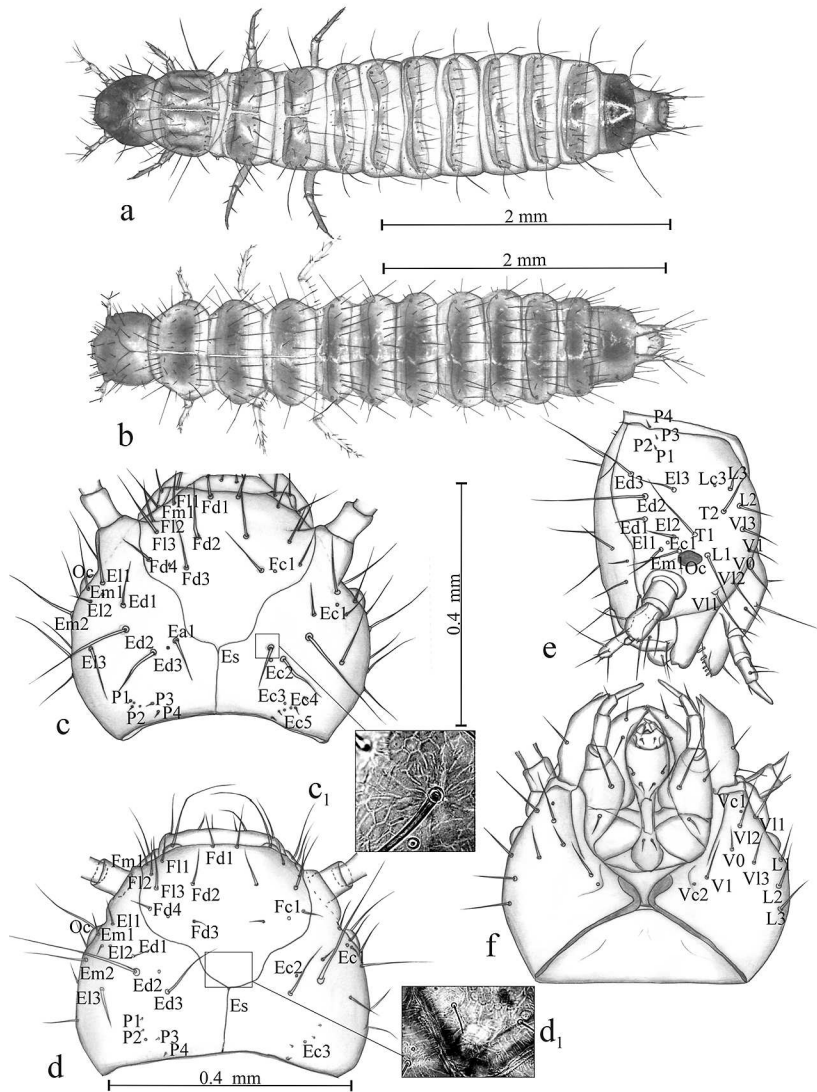


Fig 1. Mature larva of *Haploglossa picipennis* (a, c, e, f) and *H. nidicola* (b, d). – a, b. General view. – c–f. Head, in dorsal view (c, d) with microstructure (c₁, d₁), lateral view (e) and ventral view (f). Abbreviations: Oc, ocellus. Setae: Fd, frontal dorsal; Fl, frontal lateral; Fm, frontal marginal; Ea, epicranial additional, Ed, epicranial dorsal; El, epicranial lateral; Em, epicranial marginal; P, posterior; L, lateral; T, temporal; V, ventral; Vl, ventral lateral. Campaniform sensilla: Fc, frontal; Ec, epicranial; Lc, lateral; Vc, ventral; Es, ecdysial line.

lighter anterior part, thoracic and abdominal tergites I–VII only less lighter than head, pronotum with four light longitudinal strips, abdominal segment VIII dark brown, antennae and legs almost white with reddish edges, pygopod, urogomphi and long setae light brown, sternites and short setae almost colorless. Head distinctly narrower than thoracic segments, prothorax about 1.5 × longer than mesothorax, meso- and metathorax almost equal of length; abdomen slightly and gradually widened to segment V and then narrowed to the terminal segment of the body (Fig. 1a). Head and tergites (thoracic specially) with delicate reticulate microstructure (Fig. 1c₁).

Microstructure of terminal tergites as in Fig. 8f₁. All macro and micro setae simple.

Head (Figs 1c, 1e, 1f). prognathous, 1.1 × longer as wide, side margins distinctly rounded; dorsal ecdysial lines (Es) bifurcate in 1/3–1/4 of head length from the base; each side of head with 1 oval black ocellus (Oc) (Figs 1c, 1e). Chaetotaxy of dorsal part of head with: 18 epicranial, macro setae (code: Em1, Em2, Ed2, El1, El2, El3, Ed1, Ed2, Ea1), 8 posterior micro setae (P1–4), 10 pores (Ec1–5), 16 frontal setae (Fm1, F11–3, Fd1–4) and a pair of frontal campaniform sensilla probably (Fc1). Lateral parts of head with: 4 temporal setae (T1, T2), 6 lateral setae (L1–3) and 2

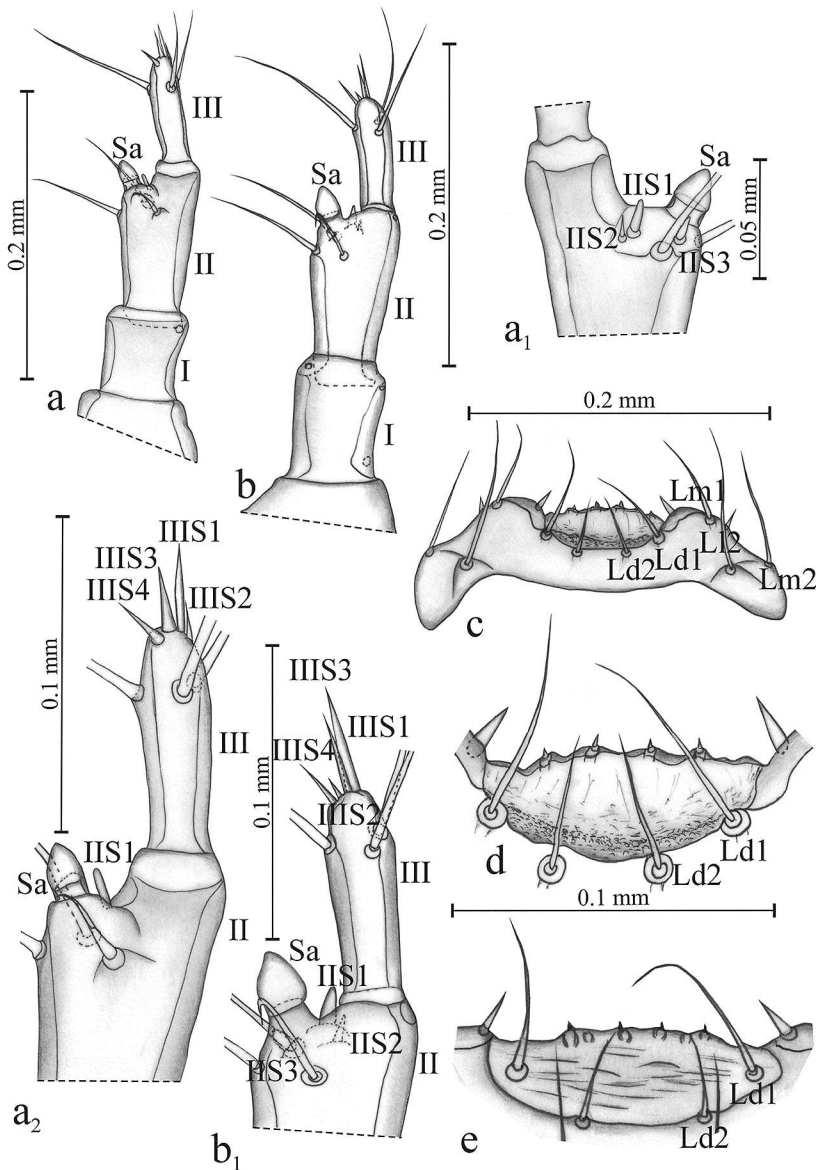


Fig. 2. Mature larva of *H. picipennis* (a, c, d) and *H. nidicola* (b, e). – a, b. Right antenna in dorsal view; a₁, apical part of second segment of right antenna in ventral view; a₂, b₁, apical part of right antenna in dorsal view. – c. Labrum. – d, e. Anterior margin of labrum. Abbreviations: I–III, antennal segments; IIS, solenidia of segment II; IIS, solenidia of segment III; Sa, sensory appendage; Ld, labral dorsal setae; Lm, labral marginal setae; L1, labral lateral setae.

lateral campaniform sensillae (Lc3) probably (Fig. 1e). Ventral side (Fig. 1f) with: 2 ventral setae (V1), 6 ventral lateral setae (VL1–3) and 4 ventral campaniform sensillae probably (Vc1, Vc2). Antenna (Figs 2a, 2a₁, 2a₂): 3-segmented, length ratio of segments I–III 1:1.7:1.2 respectively. Segment I almost 1.1 × as long as wide, with one pore dorso-apically; segment II 2 × as long as wide with 3 macro setae in the apical part (1 ventrally, 1 laterally and 1 dorsally), one semispherical sensory appendage (Sa) and 3 solenidia (IIS1–3) (Fig. 2a₁); segment III 3.5 × as

long as wide, with 3 setae and 4 solenidia (IIS1–4) apically (Fig. 2a₂). Labrum (Figs 2c, 2d): trapeziform in outline, narrowed anteriorly, anterior margin slightly rounded, with 10 long and 4 short spine-shaped setae; anterior part membranous with 4 short, micro spines at the margin (Fig. 2d). Adoral surface of labrum (epipharynx) membranous (Fig. 3a); almost whole surface, except for central parts, with numerous thick, tiny cuticular processes (microtrichia); central area with 12 pores distributed in two rows – the first with 4 big pores anteriorly and second of 2 big and 6

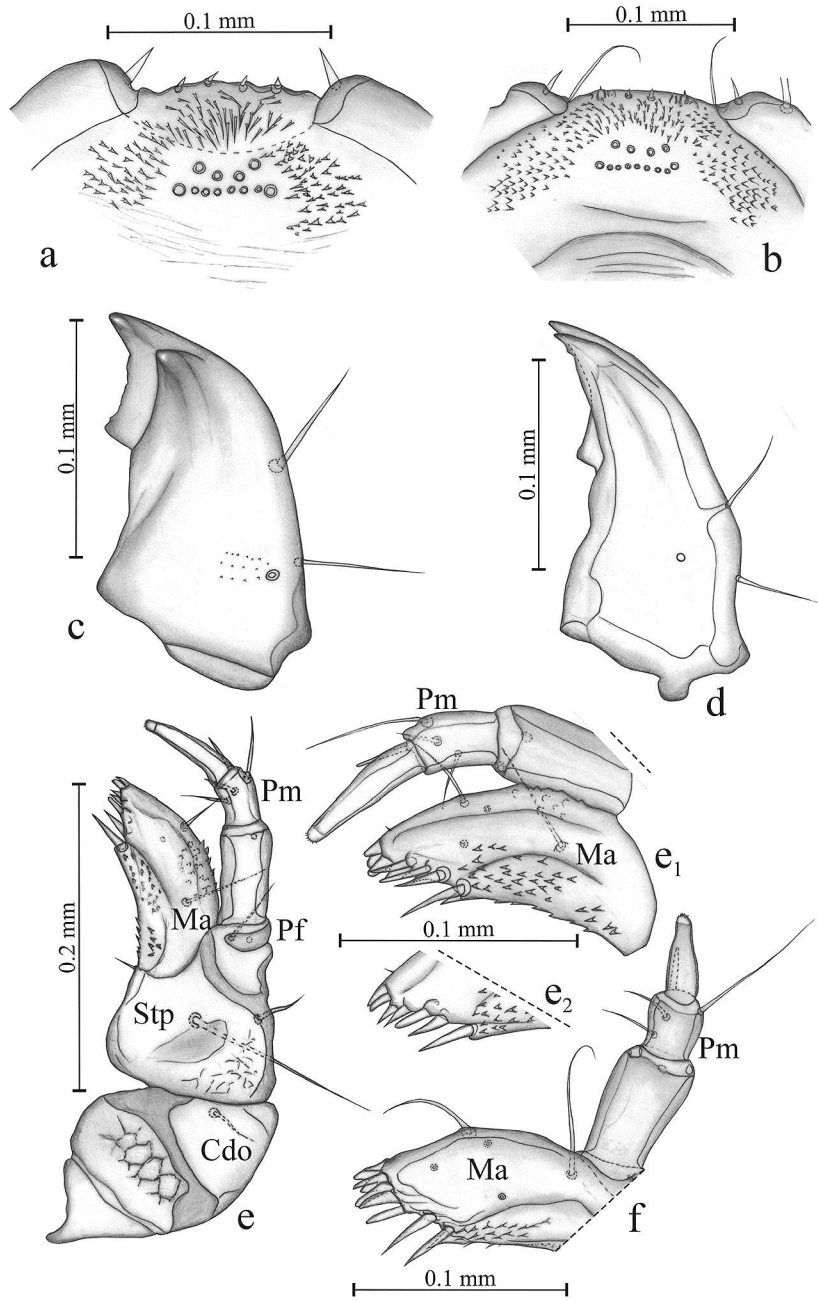


Fig 3. Mature larva of *H. picipennis* (a, c, e) and *H. nidicola* (b, d, f). – a, b. Epipharynx. – c, d. Right mandible in dorsal view. – e. Right maxilla in dorsal view; e₁, e₂, f, details of mala in dorsal view. Abbreviations: Cdo, cardo; Stp, stipes; Ma, mala; Pf, palpifer; Pm, maxillary palp.

small pores posteriorly. Mandibles (Fig. 3c): triangular, short and relatively stocky about 1.7–1.8 × as long as wide at the base, with 2 broad obtuse teeth – one short internal and one longer apical, located on different levels, each tooth with internal edge below, 2 setae at the outer margin, one pore and a few dozen tiny cuticular processes near pore dorsally. Maxilla: relatively stocky,

mainly in the basal part (Figs 3e–3e₂), consists of broad triangular in outline cardo (Cdo) completely divided into two parts by membranous transversal belt, broad stipes (Stp), relatively narrow mala (Ma), palpifer (Pf) and 3-segmented maxillary palp (Pm). Cardo with 1 setae ventrally; stipes with 3 setae; palpifer with 1 seta and 1 pore; mala distinctly separated from stipes (Fig.

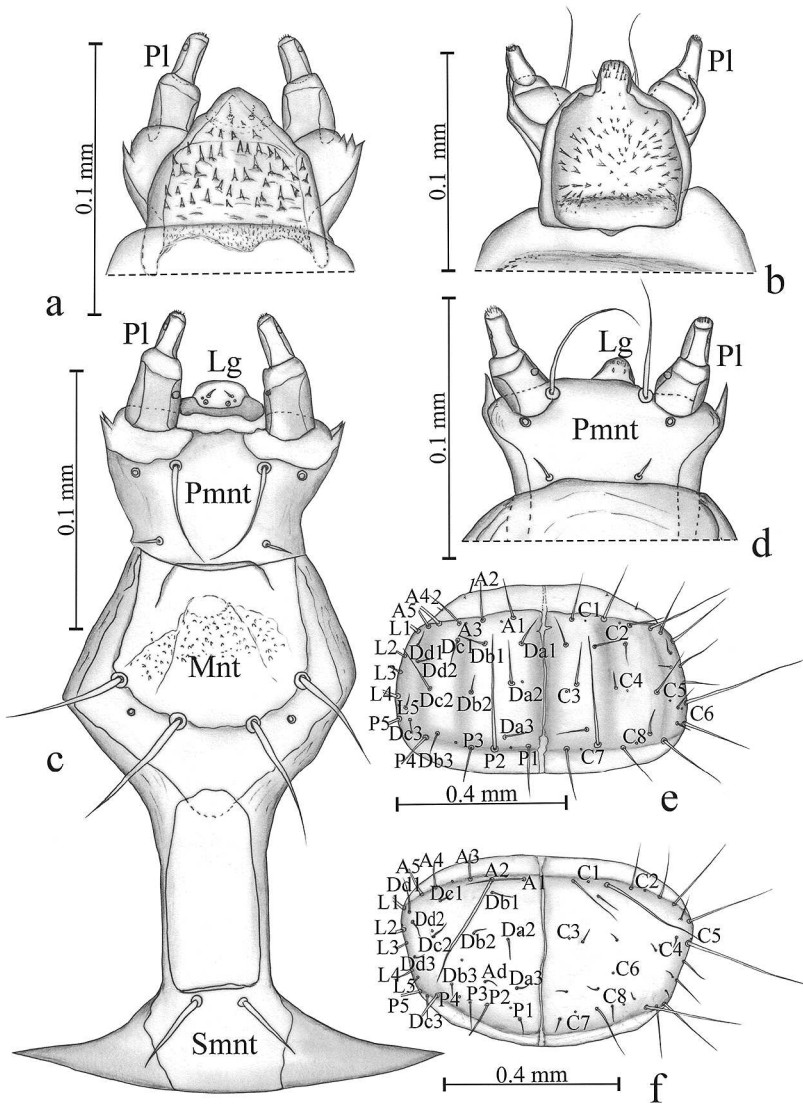


Fig. 4. Mature larva of *H. picipennis* (a, c, e) and *H. nidicola* (b, d, f). – a, b. Hypopharynx. – c. Labium in ventral view. – d. Apical part of labium. – e, f. Pronotum. Abbreviations: Lg, ligula; Pl, labial palp; Pmnt, prementum; Mnt, mentum; Smnt, submentum; C, campaniform sensilla; Setae: A, anterior; Ad, additional; D, discal, rows a–d; L, lateral; P, posterior.

3e) with 2 setae (one ventrally, one at the outer margin), 1 pore ventrally and several dozen triangular cuticular processes dorsally and ventrally; adoral margin of mala with 1 micro seta and ctenidium of 7–12 spine-shaped denticles (Figs 3e₁, 3e₂). Maxillary palp (Pm) (Fig. 3e₁): length ratio of segments I–III: 1.4:1:1.7 respectively; segment I with 2 pores ventro-apically, segment II with 3 setae (2 ventrally, 1 laterally), segment III with 1 digitiform sensory appendage latero-basally and a few tiny sensory apically. Hypopharynx: membranous, conical in outline with several dozen triangular processes directed to the apical part (Fig. 4a). Labium (Fig. 4c): ligula (Lg)

small, rounded apically, 2 × as wide as long with a pair of micro setae and 4 pores, separated from prementum by sclerotized belt; prementum (Pmnt) trapeziform, widened anteriorly, 1.5 × as wide (in the widest place) as long, with 4 setae (2 long anteriorly), 2 pores and 4 cuticular processes latero-anteriorly; mentum (Mnt) narrowed posteriorly with membranous central area, 4 long setae and 2 pores; submentum (Smnt) short with 2 long setae; labial palps (Pl) 2-segmented, length ratio of segment I and II 1.7:1, segment I 1.6 × as long as wide with one pore, segment II twice as long as wide with one pore and a few micro sensory appendages apically.

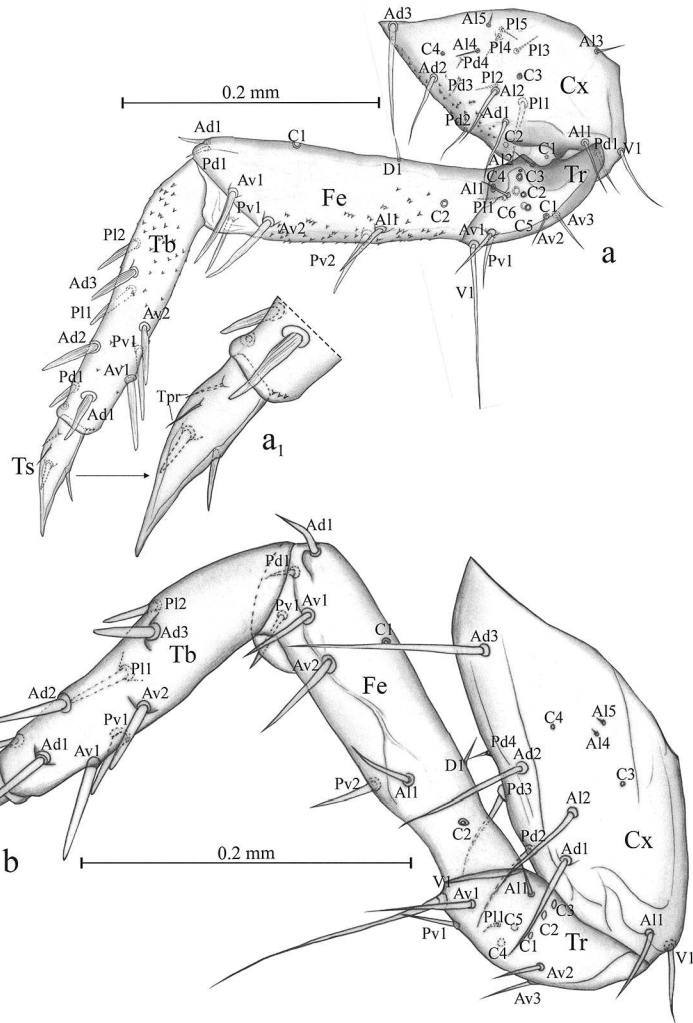


Fig. 5. Fore leg of mature larva, anterior view. – a. *H. picipennis*. – b. *H. nidicola*. Abbreviations: Cx, coxa; Tr, trochanter; Fe, femur; Tb, tibia; Ts, tarsungulus; C, campaniform sensilla; Tpr, hair-like processes; Setae: Ad, anterodorsal; Al, anterolateral; Av, anteroventral; D, discal, Pd, posterodorsal; Pl, posterolateral; Pv, posteroventral.

Thorax. Pronotum (Fig. 4e): with 56 setae ($2 \times [A1-5, L1-5, Da1-3, Db1-3, Dc1-3, Dd1-2, P1-5, 1-2]$) and 16 pores $2(C1-8)$. Foreleg (Fig. 5a): coxa (Cx) with 18 setae (Ad1-3, Al1-5, Pd1-4, Pl1-5, V1) and 4 pores (C1-4), trochanter (Tr) with 8 setae (Av1-3, Al1-2, Pl1, Pv1, V1) and 5 campaniform sensilla (C1-5) probably, femur (Fe) with 8 setae (Ad1, Al1, Av1-2, D1, Pd1, Pv1-2), 2 pores (C1-C2) and several dozen triangular processes, tibia (Tb) with 9 spin-shape setae (Ad1-3, Av1-2, Pd1, Pl1-2, Pv1) and several dozen triangular processes among them 3 arranged in row at the apical (Fig. 5a₁); tarsungulus (Ts) with 2 spine-shaped setae and 2 hair-like processes (Tpr) (Fig. 5a₁). Length ratio of Cx, Tr, Fe, Tb and Ts: 2.5:1.5:2.7:2.7:1 respectively.

Mesonotum and metanotum (Figs 6b, 6c) with 38 ($2 \times [A1-5, L1, L4, Da2-3, Db1-3, Dc2, P1-5]$) and 36 setae (lack A5 \times 2) respectively and each with 8 pores ($2 \times C1-4$). The lateral area between pro- and mesothorax with a pair of functional spiracles (Spf), 1 micro setae under each spiracle (Fig. 6d).

Ventral side of thorax (Fig. 6a): prothorax with 22 setae ($2 \times [Eul1-2, Ls2, Pr2, Prehy1-2, Pohy1-3, St1-2]$); anterior part of meso- and metathorax each with 8 well visible setae and 2 almost invisible micro setae.

Abdomen. Chaetotaxy of tergites I–VIII (Fig 7a, 7b, 8a, 8b): each with 28–30 setae ($2 \times [A2, A4-5, Da2, Db2-3, Dc2, Dd2, L1, L4, P1-5]$) and 6 pores (C1-3); sternite I (Fig. 7c) with 16 setae

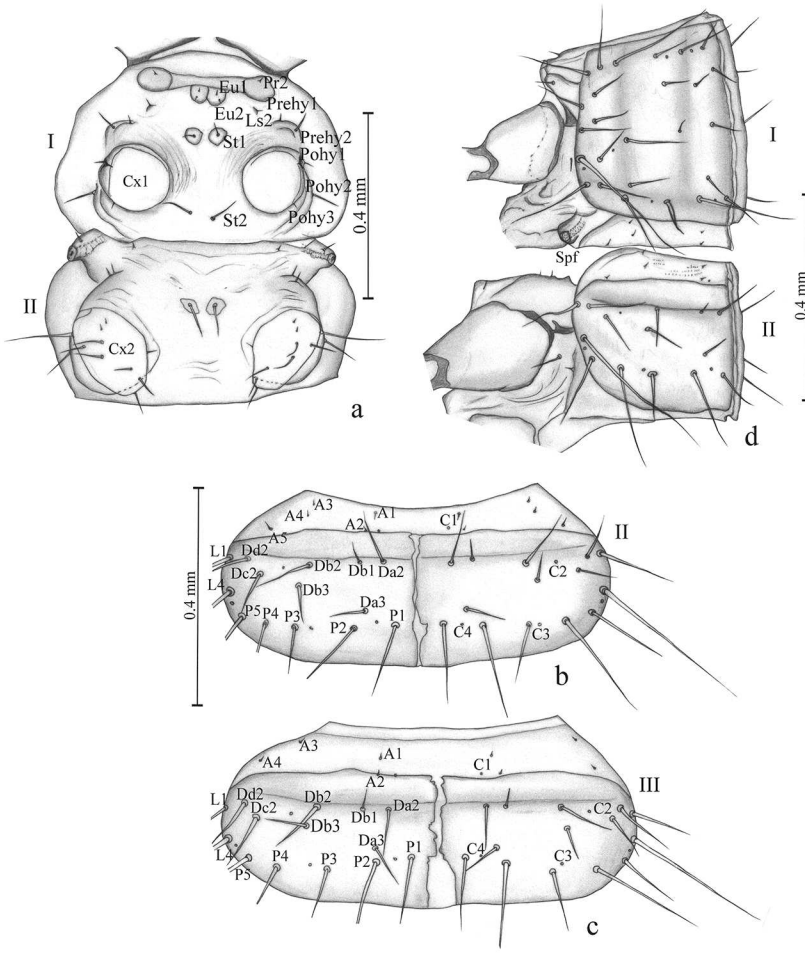


Fig. 6. Mature larva of *H. picipennis*. – a. Thoracic segment I and II in ventral view. – b. Mesonotum. – c. Metanotum. – d. Thoracic segments I and II in lateral view. Abbreviations: Cx1, coxal cavity; C, campaniform sensilla; Spf, functional spiracle; Eu, eusternum; Ls, laterosternum; Pohy, posthypopleuron; Prehyl, prehypopleuron; Pr, presternum; St, sternellum; Setae: A, anterior; D, discal, rows a–d; L, lateral; P, posterior; Ad, anterodorsal; Al, anterolateral; Av, anteroventral; Pd, posterodorsal; Pl, posterolateral; Pv, posteroventral.

($2 \times [D1-3, P1-4, Ps1]$) and 1 pore (C1), sternites II–VII (Fig. 7c) with 20 setae ($2 \times [D1-3, P1-6, Ps1]$); abdominal segment VIII with gland dorsally and its outlet (Ol) located at the posterior margin of tergite (Figs 8a, 8b, 8c, 8e). Segment IX: tergite and sternite fused in uniform ring with 18 setae (2 dorsally, 14 ventrally, 2 laterally) and 4 pores (Figs 8f, 9a, 9c); microstructure as in Fig. 8f₁. Urogomphi 2-segmented (Figs 8f, 9a, 9c, 9c₁); basal segment fused with segment IX, about $1.7 \times$ as long as wide at the base, with 4 setae; segment II slender, narrowed apically, $6 \times$ as long as wide at the base, with 1 micro seta near apex, 1 macro seta apically and 1 pore basally (Fig. 9c₁); length ratio of segments I, II and seta apically: 1:1.4:1.2 respectively; length ratio of segment IX and urogomphus (without seta apically) 1:1.5–1.6 respectively; urogomphi distinctly longer than pygopod (segment X). Segment X: dorsal

side with 8 setae, ventral side with 21 setae (13 micro) and 5–6 pores (Figs 8f, 9c).

3.2. Description of mature larva (L3) of *Haploglossa nidicola*

Body length (from anterior margin of labrum to the end of pygopod). 3.60–4.10 mm (mean 3.88 mm); head width (between stemmata): 0.52–0.55 mm (mean 0.53 mm); pronotum width: 0.70–0.75 mm (mean 0.72 mm). Body elongate, cylindrical, weakly sclerotized. Colour: head and pronotum light brown, meso-, metanotum and abdominal tergites yellowish brown except for light brown tergite VIII, antennae, legs, pygopod, urogomphi almost colorless at most with reddish edges, long setae light brown. Head distinctly narrower than thoracic segments, prothorax at most slightly longer than mesothorax, meso- and metathorax al-

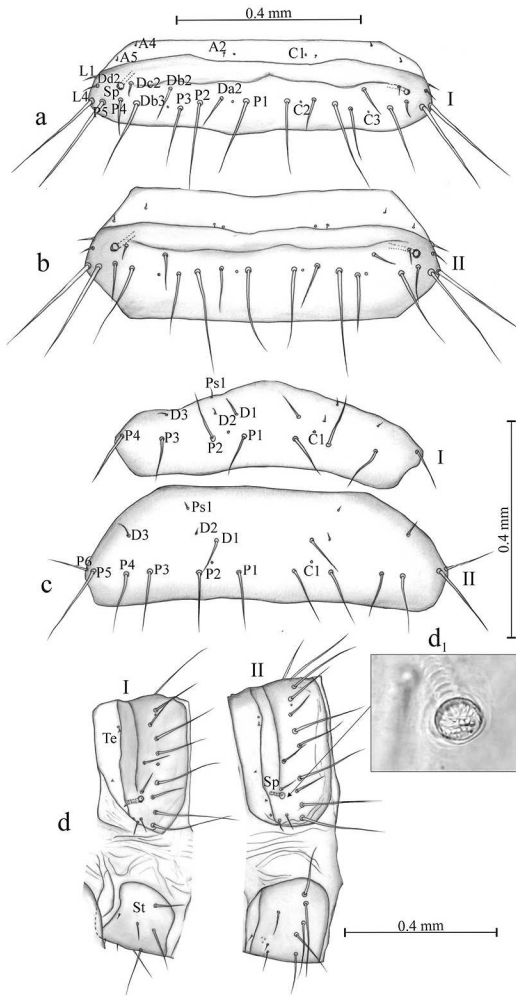


Fig. 7. Mature larva of *H. picipennis*. – a. Abdominal tergite I. – b. Abdominal tergite II. – c. Abdominal sternites I and II. – d. Abdominal segments I and II in lateral view and spiracle (d_1). Abbreviations: C, campaniform sensilla; Sp, spiracle; Te, tergite; St, sternite; Setae: A, anterior; D, discal, rows a–d; L, lateral; P, posterior; Ps, presteral.

most equal of length; abdomen slightly and gradually widened to segment V and then narrowed to the terminal segment of the body (Fig. 1b). All macro and micro setae simple.

Head (Fig. 1d). Prognathous, 1.2 time longer as wide, side margins distinctly rounded; dorsal ecdysial lines (Es) bifurcate in 1/3 of head length from the base; each side of head with 1 oval black ocellus. Chaetotaxy of dorsal part of head with: 16 epicranial, macro setae (codes: Em1, Em2, Ed2, El1, El2, El3, Ed1, Ed2), 8 posterior micro

setae (P1–4), 6 pores (codes: Ec1–3), 16 frontal setae (Fm1, F11–3, Fd1–4) and a pair of frontal campaniform sensilla probably (Fc1). Chaetotaxy of lateral and ventral side similar to *H. picipennis* (Figs 1e, 1f). Antenna (Figs 2b, 2b₁): 3-segmented, length ratio of segments I–III 1.1:1.4:1 respectively. Segment I 1.4 × as long as wide, with 2 pores dorso-apically and ventro-basally; segment II 1.8 × as long as wide with 3 macro setae in the apical part (1 ventrally, 1 laterally and 1 dorsally), one semispherical sensory appendage (Sa) and 3 solenidia (IIS1–3); segment III 2.8 × as long as wide, with 3 setae and 4 solenidia (IIIS1–4) apically (Fig. 2b₁). Labrum (Fig. 2e): in outline similar to labrum of *H. picipennis*, differences concern detail structure of the anterior part; anterior part membranous with 4 short, micro spines at the margin. Adoral surface of labrum (epipharynx) membranous (Fig. 3b); almost whole surface, except for central and hind parts of posterior area, with numerous thick, tiny cuticular processes (microtrichia); central area with 13 pores distributed in 2 rows – the first of 4 bigger pores anteriorly and second of 2 bigger and 7 smaller pores posteriorly. Mandibles: triangular moderately stocky, about twice as long as wide at the base (Fig. 3d): with 2 rather narrow sharp teeth, each tooth with internal edge below; 2 setae at the outer margin and one pore dorsally. Maxilla: adoral margin of mala with ctenidium of 10–12 spine-shaped denticles (Fig. 3f). Maxillary palp (Pm): length ratio of segments I–III: 2.4:1:1.6 respectively; segment I with 2 pores ventro-apically, segment II with 3 setae (2 ventrally, 1 laterally), segment III with 1 digitiform sensory appendage latero-basally and a few tiny sensory appendages apically (Fig. 3f). Hypopharynx: membranous, semispherical in outline with several dozen triangular processes, directed to the center (Fig. 4b).

Labium (Fig. 4d): ligula (Lg) small, rounded apically, almost as long as wide at the base with a few tiny processes apically; prementum (Pmnt) trapeziform, widened anteriorly, 2.2 × wider (in the widest place) than long, with 4 setae (2 long anteriorly), 2 pores at the labial palps and 2 long cuticular processes latero-anteriorly; length ratio of segment I and II of labial palps 1.3:1 respectively, segment I 1.4 × as long as wide with one pore, segment II 2.2 × as long as wide with one

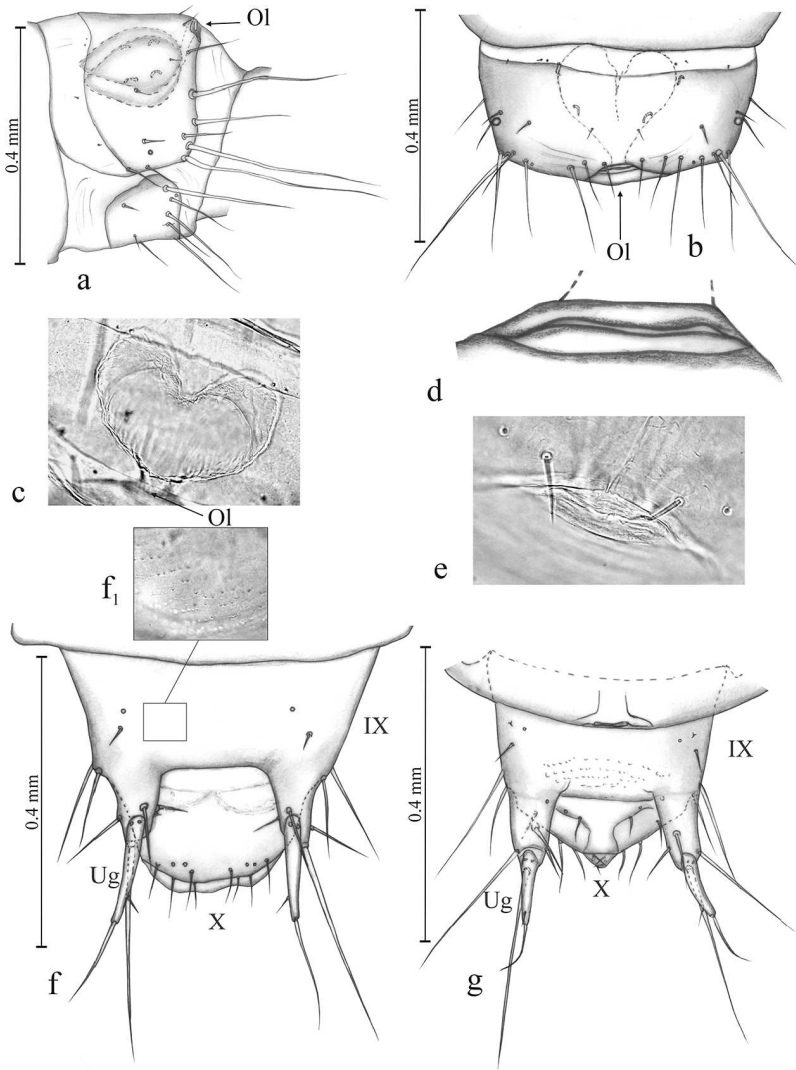


Fig. 8. Mature larva of *H. picipennis* (a–c, f) and *H. nidicola* (d, g). – a. Abdominal segment VIII with segmental gland in lateral view. – b. Abdominal segment VIII with segmental gland in dorsal view. – c. Segmental gland. – d, e. Outlet of segmental gland. – f, g. Abdominal segment IX and X in dorsal view with microstructure (f_1). Abbreviations: Ug, urogomphus; Ol, outlet of segmental glands.

pore laterally and a few micro sensory appendages apically.

Thorax. Pronotum (Fig. 4f) with 56 setae ($2 \times$ [A1-5, L1-5, Da2-3, Db1-3, Dc1-3, Dd1-3, P1-5, Ad]) and 16 pores $2 \times$ (C1-8); chaetotaxy of the remaining sclerites as in the case of *H. picipennis*. Foreleg (Fig. 5b): coxa (Cx) with 11 setae (Ad1-3, Al1-2, Al4-5, Pd2-4, V1) and 2 pores (C3-4), trochanter (Tr) with 7 setae (Av1-3, Al1, Pl1, Pv1, V1) and 5 campaniform sensilla (C1-5) probably, femur (Fe) with 8 setae (Ad1, Al1, Av1-2, D1, Pd1, Pv1-2) and 2 pores (C1-2) probably, tibia (Tb) with 9 spin-shape setae (Ad1-3, Av1-2, Pd1, Pl1-2, Pv1); tarsungulus (Ts) with 2 spine-shaped setae and 2 hair-like processes

(Tpr). Length ratio of Cx, Tr, Fe, Tb and Ts: 2:1:1.8:1.7:1 respectively.

Abdomen (Figs 8d, 8g, 9b, 9d, 9d₁). Chaetotaxy of abdominal segments I–VIII as in the case of *H. picipennis*; posterior margin of abdominal tergite VIII with outlet of gland as in Fig. 8d. Segment IX: tergite and sternite fused in uniform ring with 20 setae (4 dorsally, 14 ventrally, 2 laterally) and 2 pores (Figs 8g, 9b, 9d). Urogomphi 2-segmented (Figs 9d, 9b, 9d₁); basal segment fused with segment IX, about $1.4 \times$ as long as wide at the base, with 4 setae; segment II slender, narrowed apically, $5.2 \times$ as long as wide at the base, with 1 micro seta near apex and 1 macro seta apically and 2 pore basally (Fig. 9d₁);

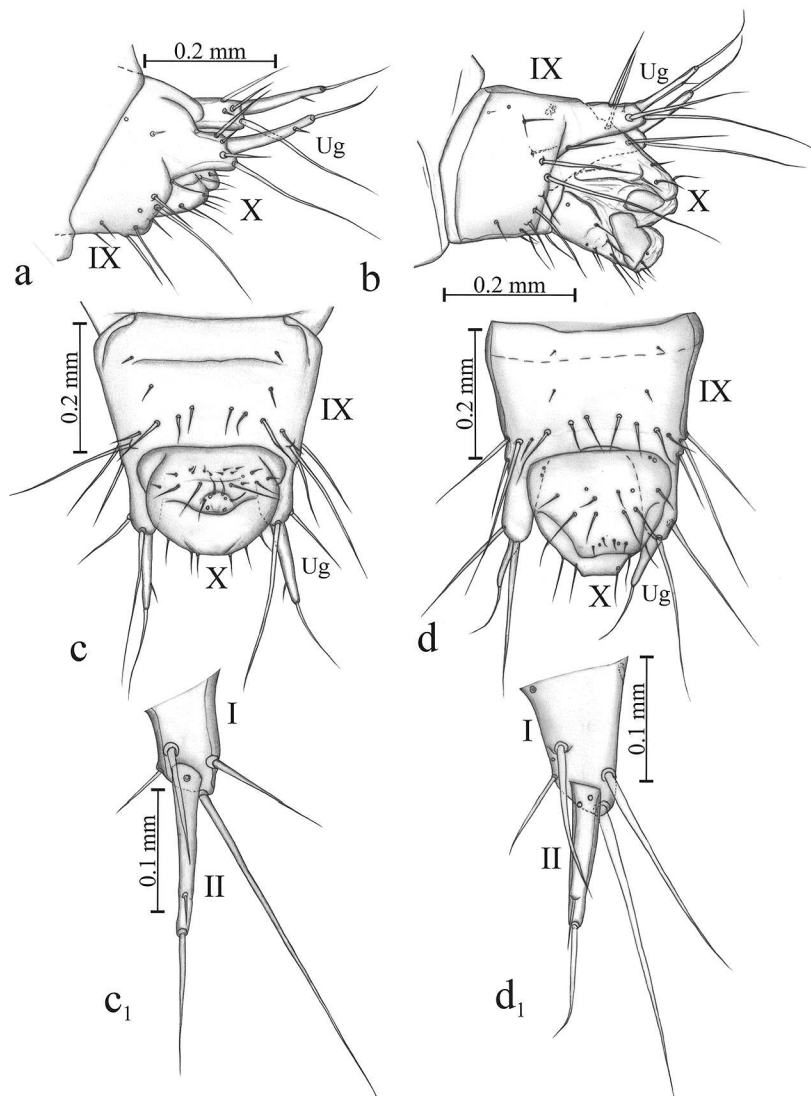


Fig. 9. Mature larva of *H. picipennis* (a, c) and *H. nidicola* (b, d). – a, b. Abdominal segments IX and X in lateral view. – c, d. Abdominal segments IX and X in ventral view with right urogomphus in dorsal view below (c₁, d₁). Abbreviations: I, II, segments of urogomphus; Ug, urogomphus.

length ratio of segments I, II and seta apically: 1.4:1.4:1 respectively; length ratio of segment IX and urogomphus (without seta apically) 1:1.2–1.3 respectively; urogomphi distinctly longer than pygopod (segment X). Segment X: dorsal side with 8 setae, ventral side with 12 setae (4 micro) and 8 pores.

3.3. Description of pupal cocoon and pupa of *Haploglossa picipennis*

Pupal cocoon (Figs 10a–10c₁). Before the pupation a mature larva (L3) spins a silken cocoon

covered additionally by plants remains (taken from material of a bird’s nest); length: 2.75–3.25 (mean 3.10 mm), width: 1.88–2.25 mm (mean 2.03 mm).

Pupa (Figs 10d–11g). Body length: 2.16–2.63 mm (mean 2.38 mm); maximal width (between middle knees): 1.00–1.19 mm (mean 1.08 mm); head width (between eyes): 0.50–0.56 mm (mean 0.53 mm); pronotum width (in the widest place): 0.66–0.78 mm (mean 0.72). Pupa of exarata type, body semi-cylindrical, lightly sclerotized, moderately flattened dorso-ventrally with numerous setae growing from basal, cuticular protuberances (Figs 11c, 11c₁); colour white, long setae

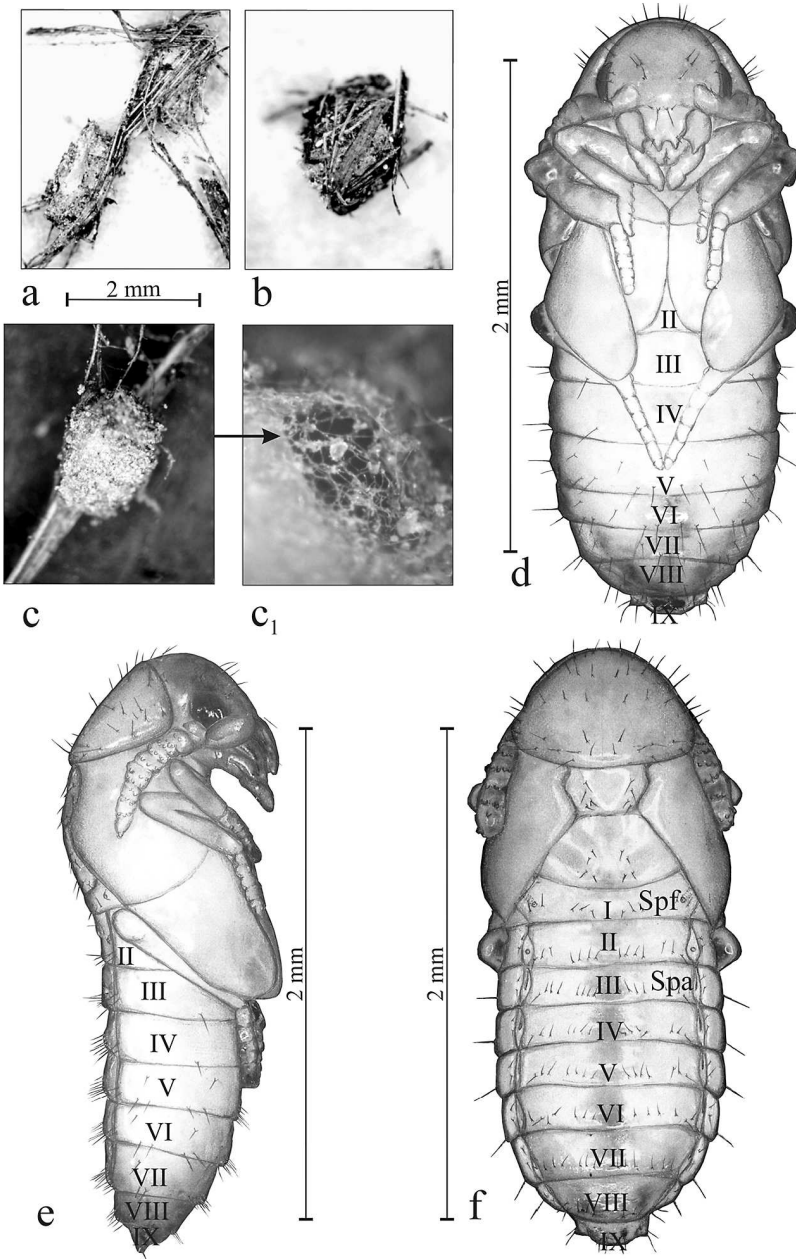


Fig. 10. *H. picipennis*. – a–c. Cocoon. – d–f. Pupa, ventral view (d), lateral view (e), dorsal view (f). Abbreviations: I, II, III, abdominal tergites or sternites; Spf, functional spiracle; Spa, atrophied spiracle.

light brown, short setae almost colourless. Head: directed downwards, with 24 setae: 2 very small on labrum anteriorly, 4 (2 small) at the base of labrum, 10 frontal between eyes and 8 posteriorly (Fig. 10d). Antennae curved, laying on the fore and middle knees, with numerous protuberances located around antennal segments III–XI, protruding distinctly beyond apex of middle knees, reaching half of elytra length (Fig. 10e). Prono-

tum: widest in the posterior part and then gradually narrowed to the anterior margin, 1.4 × as wide as long (in the widest place), posterior angles rounded, with 48–50 setae: 8 anteriorly, 12 centrally, 10 (or 12) laterally and 18 posteriorly (Fig. 10f). Meso- and metanotum each with 8 setae. Metanotum about 1.8 longer than mesonotum. Wings almost reaching posterior margin of abdominal sternite III. Tibiae and tarsi directed

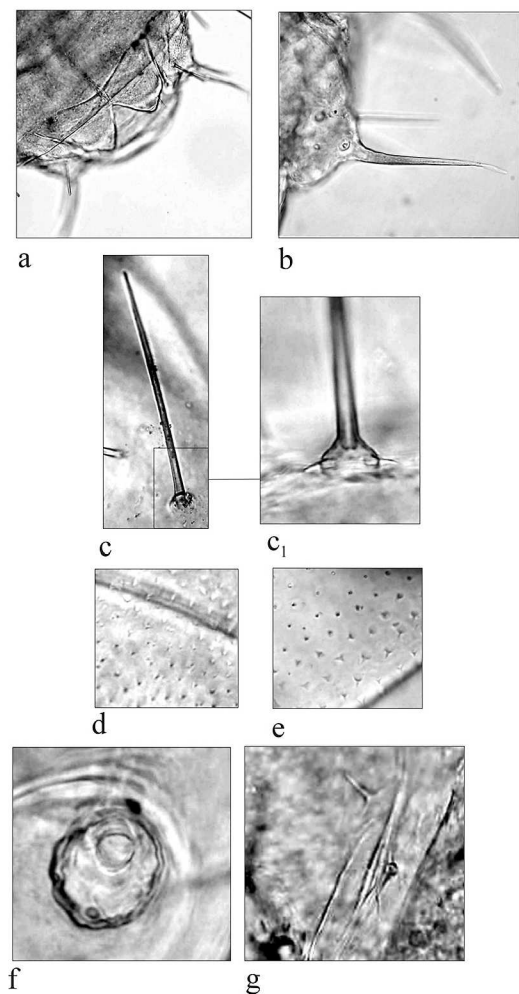


Fig 11. *H. picipennis*, pupa. – a. Terminal segment of female, ventral view. – b. Abdominal processes with terminal prolongation. – c. Seta with the base (c₁). – d. Microstructure of abdomen. – e. Microstructure of wings. – f. Functional spiracle of second pair. – g. Atrophied spiracle of sixth pair.

obliquely to the middle of the body. Hind tarsi reaching middle of abdominal sternite V (Figs 10d, 10e). Abdomen with 9 tergites and 8 visible sternites (Figs 10d–10f); gradually widened to segment V, and then narrowed below this segment to the terminal parts of the body. Chaetotaxy of abdominal tergites with only short setae (Fig. 10f): tergite I with 8, II with 14, III with 16, IV–VI with 14, VII with 12, VIII with 10, IX with 8 setae. Last tergite IX extended into two, relatively short abdominal lobe-like processes. Each one with 1 seta and terminal whip-like prolongation

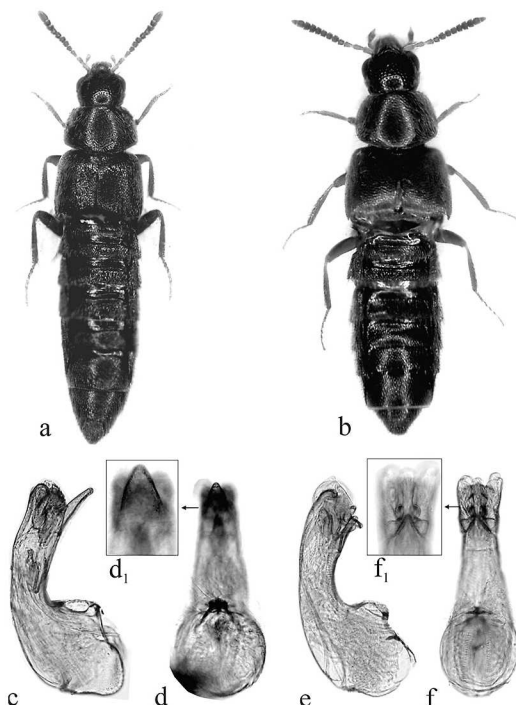


Fig. 12. *H. picipennis* (a, c, d) and *H. nidicola* (b, e, f), adult. – a, b. Habitus. – c, e. Aedeagus, lateral view. – d, f. Aedeagus, ventral view; d₁, f₁, apical part.

(Figs 11a, 11b). Sides of sternites I–VIII extended on the dorsal side. Chaetotaxy of abdominal sternites with relatively long setae except for short setae on dorsal side (Figs 10d–10f): III and IV each with 10 setae (4 on dorsal side), V and VI each with 20 setae (4 on dorsal side), VII with 19 setae, VIII with 12 setae, IX with 4 setae. Microstructure of abdominal sclerites and wings as in Fig. 11d and Fig. 11e respectively. Spiracles situated on the dorsal side, between abdominal tergites and sternites (Fig. 10f): 2 functional pairs (Spf) on abdominal segment I–II (Fig. 11f); 6 atrophied pairs (Spa) on abdominal segments III–VIII (Fig. 11g). Terminal segments in female with double gonotheca as in Fig. 11a.

4. Taxonomic remarks

Based on the data listed in Table 1 and description presented above, the differences between mature larva (L3) of *Haploglossa picipennis* (*H. p.*) and *H. nidicola* (*H. n.*) concern: (1) measurements of

Table 1. Diagnostic morphological characters of the known mature larvae of selected taxa of Aleocharinae. Abbreviations: **A. coria.**: *Atheta coriaria* Kraatz; **Hoplan.**: Hoplandriini; **H. Klim.**: *Hoplandria klimaszewskii* Génier; **H. nidic.**: *Haploglossa nidicola*; **H. picip.**: *Haploglossa picipennis*; **L. cordi.**: *Liparocephalus cordicollis* LeConte; **Liparoc.**: Liparocephalini; **Lomech.**: Lomechusini; **M. venu.**: *Meronea venustula* (Erichson); **P. latic.**: *Pella laticollis* (Märkell); **ab.**: about; **An. me. p.**: anterior membranous part; **ant.**: anteriorly; **Cut. proc.**: cuticular processes at the base; **Cx.**: coxa; **D.**: dorsal; **elongat.**: elongated; **Fe.**: femur; **Int. ed. ap. t.**: interior edge of apical tooth; **Lg.**: ligula; **Lr.**: length ratio; **Lwr.**: length to width ratio; **Nd.**: number of denticles (spines) on adoral margin of mala; **N. p. of a, c, l, p.**: number of pores of anterior, central, lateral (on each side), posterior part respectively; **NTpr.**: number of processes; **Nrs.**: number of setae; **Pl.**: labial palp; **Pm.**: maxillary palp; **Pmnt.**: prementum; **pr.**: processes; **S.**: segment; **Sa.**: sensory appendage of antennal segment II; **Sp.**: seta apically; **Tb.**: tibia; **Tr.**: trochanter; **transver.**: transverse; **triangul.**: triangular; **Ts.**: tarsungulus; **Ug.**: urogomphus; **?**: lack of data. Measurements in mm.

Character	Oxytodini <i>H. picip.</i>	<i>H. nidic.</i>	<i>M. venu.</i>	Athetini <i>A. coria.</i>	Lomech. <i>P. latic.</i>	Liparoc. <i>L. cordi.</i>	Hoplan. <i>H. Klim.</i>
Body							
Length	3.7–4.4	3.6–4.1	2.2–2.7	2.9–3.5	4.3–4.8	3.0–3.4	8
Head							
Width	0.48–0.52	0.52–0.55	0.23–0.29	0.40	0.57–0.63	?	0.60
Nrs: epicranial	18 (16+2Ea1)	16	12	18	16	22	16
Antenna							
Lr of S I–III	1:1.7:1.2	1.1:1.4:1	1:3.2:1.8	1:1.5:1	1.4:2.3:1	1.2:2.4:1	1:3.3:1
Lwr of S I	1.1×	1.4×	0.4×	0.7×	1.2×	1×	1×
Lwr of S II	2×	1.8×	1.6×	1.5×	2.4×	2.8×	2.5×
Lwr of S III	3.5×	2.8×	2.2×	1.5×	2.2×	3×	1.7×
Shape of Sa	semi-spherical	semi-spherical	inflated, sides parallel, bluntly pointed	semi-spherical	semi-spherical	semi-spherical	slender, tapered from base to apex
Labrum							
An. me. p.	present	present	absent	absent	absent	absent	absent
Anterior margin: pr./setae	4 short tooth-like/lack	4 short tooth-like/lack	lack/ lack	4 short tooth-like/lack	lack/2 micro	lack/4 micro	2 short tooth-like lack
Dorsal seta, Ld2	macro, thin	macro, thin	macro, thin	micro, robust	micro, thin	micro, robust	micro, robust
Epipharynx							
Cuticular processes: distribution/except	whole surface/central part	whole surface/central part	one group in central part	whole surface/central part	whole surface/central part	two groups	?
N. p. of a, c, l, p	0, 12 (in 2 rows), 0, 0	0, 13 (in 2 rows), 0, 0	2, 4 (in row), 1, 2	2, 6 (in 2 rows), 1, 4	2, 8 (in row), 0, 4	absent	?
Mandible							
Int. ed. ap. t.	regular	regular	thinly serrated	thinly serrated	thinly serrated	serrated	regular
Edge below interior tooth	regular	regular	serrated	serrated	serrated	serrated	serrated
Location of teeth	different levels	different levels	the same level	the same level	the same level	the same level	the same level
Shape	triangul., stocky slender	triangul., stocky slender	sinuate interiorly	sinuate interiorly	sinuate interiorly	sinuate interiorly	sinuate interiorly
Cut. proc.	present	absent	absent	absent	absent	absent	present
Maxilla							
Nd	7–12	10–12	at most 10	12–18	27–31	several	10 large, many small
Mala shape	narrowed ant.	narrowed ant.	distinctly widened ant.	slightly widened ant.	equilateral	slender, narrowed apically	distinctly widened ant.
Stipes and mala	separated	separated	fused	fused	fused	poorly separated	?
Pm: Lr S I–III	1.4:1:1.7	2.4:1:1.6	1.5:1:2.3	1.1:1:2.3	1.7:1:2.3	?	?

Table 1, continued

Hypopharynx							
Shape	conical	semi-spherical	?	?	conical, truncate	?	?
Cut. proc.: shape/distribution/directed	triangul./all area/directed apically	triangul./all area/directed to center	?	?	triangul., scale-like/all area no centrally	?	?
Labium							
Lg and Pmnt Shape of Lg	separated twice as wide as long	separated as wide as long	separated transver., 2.5× as wide as long	separated elongat., finger shaped	fused wide, short sinuate ant.	separated elongat., finger shaped	fused elongat., finger shaped
Pl: Lr S I–II	1.7:1	1.3:1	1:1.2	1:1.8	1:1.3	1:1.7	1:1
Thorax							
Nrs: Pronotum	56 (54 +2Da1)	54	34	52	52	ab. 90	64
Nrs: Mesonotum	38	38	26	38	40	50	30
Nrs: Cx, Tr, Fe, Tb, Ts	18, 8, 8, 9, 2	11, 8, 8, 9, 2	9, 7, 8, 9, 2	15, 8, 8, 9, 2?	10, 7, 8, 9, 2	?, ?, ?, ?, 2	7, 5, ab. 25, ab. 60, 2
Lr: Fe, Tb, Ts	2.7:2.7:1	1.8:1.7:1	1.8:2:1	2.4:2.2:1	2.3:2.2:1	?	?
NTpr of Ts	2	2	0	2?	2	2	0
Abdomen							
Nrs: Tergite I	28–30	28–30	22	30	30	?	26
Nrs: Sternite I	16	16	16	16	?	?	?
Nrs: Sternite II	20	20	20	20	?	?	?
Nrs: S IX, D	4	4	6?	6	6	ab. 20	ab. 90
Ug: Lr: I, II, Sp	1:1.4:1.2	1.4:1.4:1	?	1:1.8:3.2	1:1.1:1.2	?	1.1:1:4.3
Ug: Ltwr S I	1.7×	1.4×	?	1×	1×	?	0.7×
Ug: Ltwr S II	6×	5.2×	?	4.5×	2.8×	?	2×
References	Present study		Ashe (1985)	Ashe & Watrous (1984)	Staniec <i>et al.</i> (2009)	Ahn (1997)	Thayer <i>et al.</i> (2004)

the body; (2) colour – in *H. p.* head dark brown, pronotum brown with four lighter longitudinal strips, tergites brown to dark brown, in *H. n.* head and pronotum light brown, tergites yellowish brown (Figs 1a, 1b); (3) number of epicranial (E) setae – in *H. p.* 18, in *H. n.* 16 (lack 2Ea1); (4) length ratio of antennal segments I, II, III respectively – in *H. p.* 1:1.7:1.2, in *H. n.* 1.1:1.4:1; (5) ratio length to width of antennal segment I, III respectively – in *H. p.* 1.1 ×, 3.5 ×, in *H. n.* 1.4 ×, 2.8 ×; (6) labrum: detailed structure (Figs 2d, 2e); (7) epipharynx structure – in *H. p.* 8 pores in lower row, cuticular processes elongated, in *H. n.* 9 pores in lower row, cuticular processes not elongated (Figs 3a, 3b); (8) mandible structure – in *H. p.* with 2 broad obtuse teeth, cuticular processes near pore present, in *H. n.* with 2 rather narrow sharp teeth, cuticular processes near pore absent (Figs 3c, 3d); (9) length ratio of maxillary palps segment I, II respectively – in *H. p.* 1.4:1, in *H. n.*

2.4:1 (Figs 3e, 3f); (10) hypopharynx structure – in *H. p.* shape conical, cuticular processes directed anteriorly, in *H. n.* shape semispherical, cuticular processes directed to the central part (Figs 4a, 4b); (11) length ratio of labial palp segment I, II respectively – in *H. p.* 1.7:1, in *H. n.* 1.3:1; (12) ligula – in *H. p.* 2 × as wide as long with a pair of micro setae and 4 pores, in *H. n.* almost as long as wide with a few tiny processes; (13) pronotum: setae of Ad and Da1 – in *H. p.* Ad absent, Da1 present, in *H. n.* Ad present, Da1 absent (Figs 4e, 4f); (14) leg: length ratio of coxa, trochanter, femur, tibia, tarsus respectively – in *H. p.* 2.5:1.5:2.7:2.7:1, in *H. n.* 2:1:1.8:1.7:1 (Figs 5a, 5b); (15) tiny cuticular processes on fore legs – in *H. p.* present, in *H. n.* absent (Figs 5a, 5b); (16) urogomphi: length ratio of segment I, II and apical seta respectively – in *H. p.* 1:1.4:1.2, in *H. n.* 1.4:1.4:1; (17) urogomphi: ratio length to width of segment I and II – in *H. p.* 1.7 × and 6 ×,

Table 2. Some differences in morphological structure between the pupae of *Haploglossa picipennis* and *Pella laticollis*. Abbreviations: Ab. st.: abdominal sternites; Ab. te.: abdominal tergites; Nrs: number of setae; Tp: terminal prolongation. Measurements in mm.

Character or part of body	Oxypodini <i>H. picipennis</i>	Lomechusini <i>P. laticollis</i>	Figures	
			Present study	Staniec <i>et al.</i> (2009)
Cocoon length	2.75–3.25	3.0–4.5	–	–
Body shape	stocky moderately	stocky	10d–10f	31–33
Body length	2.16–2.63	2.91–3.19	–	–
Body width	1.00–1.19	1.61–1.82	–	–
Head width	0.50–0.56	0.74–0.78	–	–
Head: Nrs	24	26	–	–
Apex of antennae	reaching half of elytra	almost reaching hind margin of elytra	10d–10e	31–32
Pronotum shape	1.4x as wide as long	1.6x as wide as long	10f	33
Pronotum: Nrs	48–50	38	10f	33
Apex of hind tarsi	reaching middle of abdominal sternite V	reaching anterior margin of abdominal sternite V	10d	31
Abdomen	gradually widened to segment V	gradually widened to segment IV	10f	33
Nrs: Ab. te. I–IX	I–8, II–14, III–16, IV–14, V–VI–14, VII–12, VIII–10, IX–8	I–4, II–8, III–10, IV–12, V–10, VI–VIII–14, IX–16	10f	33
Nrs: Ab. st. VIII, IX	VIII–12, IX–4	VIII–16, IX–6	10d	31
Setae: colour	light brown or colourless	brown, basally lighter	–	35, 36
Tp: shape	whip-like	dagger-like	11b	42
Spiracles	characteristic structure	characteristic structure	11f, 11g	37–39

in *H. n.* 1.4 × and 5.2 × respectively; (18) segment X: number of setae and pores on ventral side – in *H. p.* 21 setae (13 micro) and 5–6 pores, in *H. n.* 12 setae (4 micro) and 8 pores.

Based on the morphological characters of the mature larvae of some known Aleocharinae belonging to 5 tribes, 6 genera and 7 species presented in Table 1, the diagnostic characters for the *Haploglossa* genus are established. They are the following: (I) labrum with anterior membranous part (Figs 2c–2e); (II) epipharynx with 12 or 13 pores located only in the center part (Figs 3a, 3b); (III) mandible with apical and interior tooth located on two levels (Figs 3c, 3d); (IV) interior edge of mandible regular without serrations (Figs 3c, 3d); (V) mandibles triangular, relatively stocky (Figs 3c, 3d); (VI) mala moderately narrowed in the anterior part (Figs 3e–3f); (VII) stipes and mala separated (Figs 3e, 3f); (VIII) hypopharynx with cuticular processes distributed on the all area; (IX) segment I of labial palp distinctly longer than segment II (Figs 4c, 4d).

Considering the above-mentioned diagnosis,

the *Haploglossa* larva is most similar in morphology to the larva of *Atheta coriaria* (Table 1). Both taxa share such characters as: semispherical sensory appendage on antennal segment II; four, short tooth-like processes on anterior margin of labrum; epipharynx: cuticular processes distributed almost on the entire surface, central pores arranged in two rows; labium: ligula separated from prementum; the same number of setae on thoracal tergite II, abdominal tergite I, sternite I and sternite II.

The production of pupal silken cocoon was observed in several tribes of Aleocharinae, including Oxypodini (Ashe 1981, Thayer *et al.* 2004). The abdominal glands were also described in *H. picipennis* and *H. nidicola* (located on the eighth segment, functioning probably as a silk producing organ). Detailed investigation of the form and function on these abdominal glands is highly needed. For example, for *Oligota oviformis* Casey Moore *et al.* (1975) state that this organ has a protective function and acts as an "osmeterium".

As regards the pupal stage, the present study of *H. picipennis* provides the second detailed description of pupa for Aleocharinae. Recently Staniec *et al.* (2009) provided the detailed description of the pupa of *Pella laticollis*. Previous very schematic descriptions with poor illustrations and without chaetotaxy taken into consideration are useless in higher level taxonomic analyses. The differences between pupa of *H. picipennis* and *P. laticollis* are listed in Table 2. They concern the following characters: (a) measurements of the body; (b) number of setae of the head, pronotum and abdominal segments; (c) length of antennae and hind legs; (d) colour of setae; (e) structure of spiracle; (f) structure of terminal prolongation.

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