Zoodiversity, 60(1): 53–78, 2026

DOI 10.15407/zoo2026.01.53
595.786: 551.432/.433

MORPHOLOGICAL CHARACTERISTICS OF THE GENUS PTILODON (LEPIDOPTERA, NOTODONTIDAE) LARVAE WITH KEYS TO THE SPECIES

I. V. Dolinskaya

I. I. Schmalhausen Institute of Zoology, NAS of Ukraine,
vul. B. Khmelnytskogo, 15,
Kyiv, 01054 Ukraine

E-mail: idfentonia@gmail.com

https://orcid.org/0000-0001-7635-3505

urn:lsid:zoobank.org:pub:80133E68-FEC5-4BC8-9D18-1D48B6995776

Morphological characteristics of the genus *Ptilodon* (Lepidoptera, Notodontidae) larvae with keys to the species. Dolinskaya, I. V. — The morphological characters of each larval instar of three Palaearctic notodontid moth species belonging to the genus *Ptilodon* Hübner, 1822, were examined using a scanning electron microscope and digital microphotography. The shape, colour, pattern and chaetotaxy of the head and body; the microsculpture of the head, and the forms and diversity of the setae, stemmata and mouthparts were examined. A comparative morphological analysis of all these structures is provided. The morphological characteristics during larval development and their transformations are discussed. A key to the three species of the genus *Ptilodon* from the Palaearctic Region is presented. As a result of the comparative morphological analysis, we identified diagnostic and taxonomic characters for the genus *Ptilodon* and the studied species. The common characters of some taxa within the family are identified.

Key words: prominent moths, Palaearctic Region, caterpillars 1–5 instars, descriptions, digital camera, scanning electron microscopy, illustrations.

Introduction

The Palaearctic–Oriental genus *Ptilodon* comprises 16 species, the majority of which are found in China (Schintlmeister, 2008; 2013). The morphological characteristics of the genus are presented based on a comparative morphological analysis of three studied species: these are the trans-Eurasian temperate species *P. capucina* (Linnaeus, 1758); the European species *P. cucullina* (Denis & Schiffermüller, 1775); and the eastern Palaearctic species

P. hoegei (Graeser, 1888). Several papers are devoted to the morphology of Notodontidae caterpillars. In his fundamental monograph on cladistics and classification of the Notodontidae, Miller (1991) provides detailed morphological descriptions of the imago and adult larvae of species from both the Old and New Worlds. Many caterpillar structures were examined using SEM in that work. There are also a number of works that provide more or less detailed descriptions of the caterpillars of various Notodontidae species from different regions of the world, including Europe (Garcia Conde & Schmidt, 1994; Fenili, 1956), India (Gardner, 1943, 1946), East Asia (Sugi & Nakamura, 1988; Liu & Jiang, 2023; Liu et al., 2023), and North America (Godfrey & Appleby, 1987; Godfrey et al., 1989, among others). Unfortunately, most of these studies were conducted on adult larvae, which does not allow us to trace the transformation of the caterpillar's various structures during its development or diagnose larvae of different instars. This gap is partially filled by this paper, which summarises information on the various morphological structures of caterpillars of all ages in the Notodontidae family (Dolinskaya, 2008, 2009, 2011a, 2013). The immature stages (e. g. eggs and pupae) of species in the *Ptilodon* genus are fairly well studied (Döring, 1955; Dolinskaya, 1984, 1987 a, b; Patočka, 1990; Nakamura, 2007). However, the caterpillars have not been studied extensively. Some morphological characteristics of the L1 larvae of *P. capucina* and *P. cucullina* were described in the paper by Dolinskaya & Pljushch (2003). Good colour images of *P. capucina* and *P. cucullina* caterpillars are available on European websites devoted to Lepidoptera (Lepiforum eV, 2025; Mazzei et al., 2025). Colour images, with brief descriptions of the larvae, of some Eastern Palaearctic caterpillars of the genus *Ptilodon* — *P. jezoensis* (Matsumura, 1919), *P. kuwayamae* (Matsumura, 1919), *P. robusta* (Matsumura, 1924) and *P. okanoi* (Inoue, 1958) are presented in a well-illustrated atlas of Japanese Lepidoptera (Nakatomi, 1987). Based on the above stated, the aim of this work is to describe in comparative-morphological aspect the larvae of all ages of 3 species of Palaearctic Notodontidae of the genus *Ptilodon* and to show the changes in morphological characters of caterpillars in the process of their growth. Identify diagnostic and taxonomic characters and compile keys for the identification of the species under study.

Material and Methods

This research is based on the material collected by the author in Ukraine and Russia (Primorskii krai, Far East). Eggs were obtained from females captured at light. The moths were placed in pasteboard boxes measuring 100 × 90 × 50 mm, without food plant. The larvae that emerged from the eggs were raised to pupae. The development period of larvae of each age, and the change in colour and pattern as they developed were recorded. The larvae of every age were placed into cold water which was then brought to a boil. After that the larvae were fixed in 75% alcohol. The cephalic capsule left by larvae after moulting, as well as fresh material preserved in alcohol, were studied. The microsculpture of the head, stemmata, mouthparts of larvae of all ages, were examined with a scanning electron microscope JSM-35C, and a binocular light microscope (MBS 9). The chaetotaxy of the larvae was examined and photographed using digital camera (Canon Power Shot SX10 IS) and a binocular light microscope (MBS 9). Terminology for larval morphology, chaetotaxy of the head and body follows Hinton (1946), Gerasimov (1952), Stehr (1987) and Miller (1991). The taxonomic arrangement of the genera and species of Notodontidae follows Schintlmeister (2008, 2013) and Kobayashi & Nonaka (2016).

Results

Morphological characteristics of the genus *Ptilodon* on the larval stage

L1. Larva length 0.19–0.24 mm, width 0.03–0.04 mm, cephalic capsule width 0.05–0.06 mm.

Head. Colouration and Pattern. Colouration of head is black and shiny, or pale light green with brown tinge. Coronal suture and frons of equal length or coronal suture 1/3–1/4 longer. Microsculpture of head is smooth (Fig. 2, *b*). Setae. Only primary setae are developed on head (Fig. 2, *b*). Setae are strong, long, conical, and located on small pinacula. Chaetotaxy is typical. P1 and P2 setae are located at same level in relation to epicranial suture. L1 seta is located at level of the P1 seta, slightly above or below it. Seta A3 is located closer to AF2 or AF1. Seta A2 is located slightly above seta F1 or at level between setae AF1 and F1. Seta A1 is located slightly above level of setae C2–C1 (Fig. 2, *b*). Stemmata (Fig. 2, *b*) are with typical arrangement. Anteclypeus is short, with transverse grooves. Labrum is moderately expanded, width exceeding length approximately 2 times. Notch of outer margin reaches 1/4–1/3 of lip length. Mandible. Mandibular margin is with 6 acutely-angled denticles. Labium palpi are smooth (Fig. 2, *c*). Spinneret short and wide, of same length and width as first segment of labium palpus or slightly shorter (Fig. 2, *c)*. Hypopharynx in distal area is granular or folded. In proximal part, it is covered with long hair-like setae only in posterior part, while the rest of it is smooth, without setae and with a large medial notch (Fig. 2, *d*, *e*).

Thorax and Abdomen. Thoracic and abdominal tergites of larvae are flat (*P. capucina*, *P. hoegei*) or with small tuberculate protrusions of the cuticle (*P. cucullina*), on which D1 seta is mainly located (Fig. 1, *b*). Colouration. Body colouration is light green with dark head, setae, pinacula, prothoracic and anal shields (*P. capucina*, *P. hoegei*, Figs 1, *a*; 15, *a*), or whitish with sharply defined brown setae (*P. cucullina*, Fig. 1, *b*). Cuticle is transparent. At magnification of 4000 μm, it is in form of densely intertwined fibres (Fig. 2, *f*). Setae are dark brown, some white, strong, hair-like, long (1/3 longer than the width of the segments). They are located on distinct, convex pinacula. Small chalazae are developed at base of setae (Fig. 1, *a*). Setae may be located on large chalazae (Fig. 1, *b*). Pinacula distinct, black or brown (*P. capucina*, *P. hoegei*, Fig. 1, *a*) or not distinct (*P. cucullina*, Fig. 1, *b*). Chalazae are small and dark in most cases, often located in middle part of pinacula (Figs 1, *a*; 3, *a*), which is characteristic of most Notodontidae. In *P. cucullina* chalazae are light-coloured, are of same colouration as body (Fig. 1, *b*). Prothoracic shield is clearly distinguished, dark brown or not distinguished, in tone with main colouration. Shield is short and wide (its width is 3–4 times longer than length) with smoothly rounded edges and with medial notch on proximal and distal margins. Setae brown, located on chalazae. D1 and D2 are 2–3 times shorter than XD1 and XD2. Setae XD1 and XD2 are dark brown, long, strong, and located on distinct chalazae. Their length exceeds length of shield by 5–6 times. They are equal in length or XD2 is slightly shorter (Fig. 3, *b*, *c*). Anal shield is clearly distinguished, dark brown or not distinguished, like body colour. It may be weaker than prothoracic shield. Shield is reverse-trapezoidal with smoothly rounded hind margin. Chaetotaxy is common. Chaetotaxy differs somewhat among species of genus. On T1 setae SD1 and SD2, L1 and L2, SV1 and SV2 — on common pinacula (*P. capucina*, *P. hoegei*) or on separate chalazae (*P. cucullina*). On T2–T3 setae D1, D2 — on common pinaculus (*P. capucina*, *P. hoegei*) or on separate chalazae (*P. cucullina*). The formula of thoracic setae of sub-ventral

group is 2–1–1. On A1–A2, setae SV1, SV2 and V1 are small and clearly defined. On A7–A9, there are only SV1 and V1 setae (the latter is very small). On A8, seta D1 is on more or less pronounced tubercle. On anal prolegs, in *P. hoegei* setae are located on large pinaculum or they are located separately (Figs 1, *a*, *b*; 3, *d*, *e*). Thoracic legs are of same colouration as body, with distinct large, black shields. Abdominal prolegs are of same colouration as body, or slightly darker. Lateral shields of abdominal prolegs with two rows of long setae (Fig. 4, *a*). Hooks disposed on planta inside, in uniordinal lateral penellipse, in the number of 20–25 (Dolinskaya & Pljushch, 2003). Anal prolegs are developed normally, with typical chaetotaxy (Fig. 3, *d*, *e*).

L2. Larva length 0.52 mm, width 0.05–0.08 mm, cephalic capsule width 0.09–0.10 mm.

Head. Colouration and Pattern. Head is light brown or light green, with large, black or brown spot on each hemisphere (Fig. 15, *b*) or light brown with brown, longitudinal bands. Microsculpture of head, setae and chaetotaxy are similar to L1 (Fig. 4, *b*). Anteclypeus is arched in middle part, which becomes sharply convex and large. As result, it is divided into three parts. In middle part, two large lateral slits and swelling lateral to them appear (Fig. 4, *b*). Labrum. Outer edge of lip has acute-angled notch reaching 1/3 of lip length. There is slight concavity along acute-angled notch. Setae M1 and M2 are located along acute-angled notch (unlike in L1). M2 seta is especially displaced, where it is located significantly lower than the M1 (compared to L1). Distance between setae M1–M1 is slightly larger than between M1–M2 (1.2–1.4 times). Distance between M1–M2 setae is same as between M2–M3. Distance between setae L1–L2 is only slightly smaller than between L2–L3 (Fig. 4, *b*). Mandible (Fig. 4, *c–d*). Mandibular margin is smooth. Carina is well developed. Labium palpi are similar to L1 (Figs 4, *f*; 5, *a*). Spinneret, in comparison with L1, is much wider than first segment of the labium palpus (Figs 4, *f*; 5, *a*). Hypopharynx are similar to L1 (Fig. 5, *a*).

Thorax and abdomen. Thoracic and abdominal tergites of larvae are the same as in L1. On A8, 2 tubercles (Fig. 15, *b*) or single tubercle divided in two in apical part are clearly distinguishable. Colouration and Pattern. Body colour is light green. Longitudinal bands are already expressed. Dorsal band is green, grey-green or light crimson. Subdorsal, stigmal and basal bands are light yellow (Fig. 15, *b*). Cuticle is shiny. Pinacula are small or very large ones are more or less clearly visible. Setae dark brown, long, located on pinacula or chalazae. Prothoracic and anal shields are weakly distinct, like body colour, or sharply distinct, black or dark brown. Chaetotaxy is same as in adult larvae (Figs 7–14). On A8, one or two tubercles are clearly visible (Fig. 11, *a*, *b*). Each tubercle is with 8 setae (*P. capucina*, *P. cucullina*) or 4 setae (*P. hoegei*). Thoracic legs and Abdominal prolegs are like body colour. Thoracic legs can be with crimson shields. Arrangement of hooks is similar to L1.

L3–L5. L3. Larva length 0.85–1.35 mm, width 0.18–0.22 mm, cephalic capsule width 0.14–0.16 mm. L4. Larva length 1.93–2.2 mm, width 0.22–0.3 mm, cephalic capsule width 0.22–0.25 mm. L5. Larva length 3.4–3.6 mm, width 0.37–0.6 mm, cephalic capsule width 0.32–0.34 mm.

Head. Colouration and Pattern. Head is black, light green, ochre, monochromatic, with pattern of longitudinal bands or, rarely, with two weakly expressed spots (Figs 15, *c–f*; 16, *a–d*, *f*). Microsculpture of head is weakly expressed. Sculpture is smooth in mid-

dle part. On rest of surface, it is represented by sparsely arranged, small and medium-sized granules (Fig. 5, *e*, *f*) or only medium-sized granules (Fig. 6, *a*). In ocular region (Fig. 6, *b*, *c*), sculpture is in form of homogeneous, small, densely arranged granules. Setae and Chaetotaxy are similar to L1 and L2 (Figs 3, *f*, *z*; 16, *d*). Stemmata with typical arrangement and more or less distinct sculpture (Fig. 6, *d*). Anteclypeus. Swelling of anteclypeus becomes much more pronounced (Fig. 5, *b*). Labrum. Outer lip cut reaches 1/2–2/3 of lip length. There is small sculpted concavity in cutout area. Distance between M1–M1 setae is 1.5–2.5 times larger than distance between M1–M2 setae. Distance between setae M1–M2 is 1.5–2.2 times smaller than that between M2–M3 (Fig. 5, *b*). Mandible. Mandibular margin is smooth as in L2. Mandibular carina with tooth (Fig. 5, *c*, *d*). Stipital lobe is developed (Godfrey et al., 1989). Labium palpi are similar to L1 and L2. Spinneret is significantly shorter and wider compared to L1 and L2 (Fig. 6, *e*, *f*). Hypopharynx are similar to L1 and L2 (Fig. 6, *f*).

Thorax and abdomen. Thoracic and abdominal tergites of larvae are flat (*P. capucina*, *P. hoegei*) or on tergites A2–A6 small, tuberculate protrusions of cuticle are developed (*P. cucullina*, Fig. 16, *a*, *c*). On A8, 2 bright crimson or orange-red tubercles are clearly visible (Figs 15, *c–f*; 16, *e*) or large tubercle in apical part slightly divided into two parts (Fig. 16, *a–c*). Colouration and pattern. Larvae of *P. capucina* and *P. cucullina* show polymorphism in colouration. Thus, in *P. cucullina* main colour is greenish-white. Dorsal field is sharply defined, wide, white-green, on thoracic segments and A1. Also, main colour can be pinkish-white with greyish-pink dorsal field, or white-yellow with dark brown dorsal field. Stigmal band is weakly marked or not expressed, brown (Fig. 16, *a–c*). In *P. capucina*, tergites and pleurites, up to stigmal band, are white with a greenish tinge or ochre-pink. Stigmal band is sharply defined, lemon yellow (Fig. 15, *c–f*). No colour polymorphism is observed in *P. hoegei*. In L3–L4, longitudinal greenish-lemon bands are developed on green background. In L5, larvae are dark, colouration is bright, consisting of alternating, pronounced, longitudinal grey-black and light green bands (Fig. 16, *e*). Prothoracic and anal shields like body colour (*P. capucina*, *P. cucullina*, Figs 8, *a*; 10, *b*), or sharply distinct, black or dark brown (*P. hoegei*, Figs 12, *a*; 14, *b*). Setae occupy typical position. Chaetotaxy is represented by usual arrangement of setae. On T1, setae SD1–SD2, L1–L2 and SV1–SV2 are located on common shields (Figs 8, *b*; 12, *b*; 13, *a*). On T2–T3 setae D1–D2 and SD1–SD2 are located on common shields (Figs 8, *b*; 12, *b*; 13, *a*). In *P. cucullina*, they are located on separate sheets (Fig. 7, *a*). Setae L1, L2, L3 and SV1 are located on separate shields. Seta SV1 is located, on common shield, with 1–2 additional, small setae. Setae SD2 and L2 are very small. Formula of setae of SV group on thoracic segments is 2–1–1. On A1–A7 there is typical arrangement of setae, which are placed on separate shields. If SD2 is visible, it is located on same shield as SD1 (Figs 9, *a*, *b*; 13, *a*, *b*; 7, *b*, *c*). A8. Tergite A8 has either 2 small tubercles (*P. capucina*, *P. hoegei*) or 1 (*P. cucullina*, Fig. 11, *b*). At the same time, *P. capucina* has 8 setae on each of tubercles (Fig. 11, *a*), while *P. hoegei* has 4 setae (Fig. 14, *b*), and *P. cucullina* has 8 setae (Fig. 11, *b*). Setae SD1 and SD2 and group L are same as on segments A2–A7. Setae D1 and D2 are located on tubercles. A9 has typical arrangement of setae, which are placed on separate shields. On A10, in area of intersegmental seta X, there are 1–2 additional, small setae laterally; all setae are located on common tubercle (Figs 10, *b*; 14, *a*; 7, *c*). On outer side of anal prolegs 7–9 setae developed (Figs 10, *b*; 14, *a*; 7, *c*). Thoracic legs and abdominal prolegs in tone with main colouration. Thoracic legs may be ochre with crimson stains. Hooks

on planta of abdominal prolegs are arranged in single-tiered, normal, medial row, in number 19–29. Stigmas with black peritremes and yellow-white border.

Keys to species

1. In L1 on T1, setae SD1–SD2, L1–L2, SV1–SV2 located on common pinacula (Fig. 1, *a*). In L2–L5 on T2–T3, setae SD1–SD2 — located on common pinacula (Figs 1, *a*; 8, *b*; 12, *b*; 13, *a*). In L2–L5, two tubercles developed on tergite A8 (Figs 11, *a*; 15, *d–f*; 16, *e*). On pleurite A8, one seta L1 developed (Figs 10, *a*; 14, *a, b*). In L2–L5, head black or light, monochromatic, or with large, black or brown spot on each hemisphere (Fig. 15, *b*) 2
— In L1 on T1, setae SD1 –SD2, L1–L2, SV1–SV2 located on separate chalazae (Fig. 1, *b*). In L2–L5 on T2–T3, setae SD1–SD2 located on separate chalazae (Fig. 7, *a*). In L2–L5, one tubercle developed on tergite A8 (Figs 11, *b*; 16, *a–c*). On pleurite A8, in the area of seta L1, two setae developed, located on common pinacula (Fig. 7, *c*). In L2–L5 on light background, each hemisphere of head, 2 submedial bands developed (Fig. 16, *a–d*) ..... *P. cucullina*
2. Head black in L1 and light-coloured in L2–L5. In L2–L5 pinacula of setae weakly visible, small, dark brown. Prothoracic and anal shields weakly expressed, like body colour, or slightly darker (Figs 8, *a*; 10, *a*, *b*). On A8, 2 elongated, thin tubercles, with 8 setae on each, clearly distinguishable (Figs 11, *a*; 15, *c–f*). On A9 pinacula of setae D1–D1 do not touch (Fig. 10, *a*). In L3–L5 larvae show polymorphism in colouration, where three colour forms with yellow, brown or green colouration were detected (Fig. 15, *c–f*) ..... *P. capucina*
— Head black in L1–L5. In L2–L5 pinacula sharply expressed, very large, black or dark brown. Prothoracic and anal shields sharply expressed, black or dark brown (Figs 12, *a*; 14, *a*, *b*). On A8, 2 flat, oval tubercles with 4 setae on each clearly visible (Figs 14, *b*; 16, *e*). On A9, pinacula of setae D1–D1 touch (Fig. 14, *b*). In L3–L5 larvae do not show polymorphism in colouration. In L3–L4, longitudinal greenish-lemon bands developed on green background. In L5, larvae dark, colour bright, consists of alternating, clearly expressed, longitudinal gray-black and light green bands (Fig. 16, *e*) ..... *P. hoegei*

Description of species

Ptilodon capucina (Linnaeus, 1758)

L1. Larva length 0.23–0.24 mm, width 0.03–0.04 mm, cephalic capsule width 0.04–0.05 mm. Head is black, shiny. Larvae light green with dark prothoracic, anal shields and distinct pinacula. Grown larvae, light, subdorsal bands are already prominent. On tergite A8 there are 2 large, dark pinacula; each pinaculum with seta D1 (Figs 1, *a*; 15, *a*). Setae long, brown, located on pinacula. Pinacula are large, black or greyish-green, clearly distinguished. Small chalaza is expressed in middle part of pinaculum (Fig. 3, *a*). Pinacula of setae D1 and SD1 are largest. Prothoracic shield is distinct, dark brown or black, with large tubercles of setae XD1 and XD2 (Figs 3, *b*; 15, *a*). Anal shield distinct, dark brown or black, broad, inverted trapezoid. Chaetotaxy. On T1, setae SD1 and SD2, L1 and L2, SV1 and SV2 — on common pinacula. On T2–T3, setae D1, D2 — on common pinaculum (Fig. 1, *a*). Thoracic legs with dark brown or black, shiny shields. Lateral shields of abdominal prolegs are dark brown, wide, with 2 setae located at upper edge of shield and row of setae along the lower edge.

L2. Larva length 0.62–0.68 mm, width 0.07–0.09 mm, cephalic capsule width 0.09–0.11 mm. Head is light brown or light green, with large, black or brown spot on each hemisphere (Fig. 15, *b*). Main colour is light green. Dorsal field is wide, sharply

expressed in area of T1–T3 and A1. Dorsal band is clearly defined, narrow, green or gray-green, darker than main body colour. Subdorsal and stigmal bands are lemon. Subdorsal band is wide, and stigmal one is narrow (Fig. 15, *b*). On A8, 2 lemon tubercles are clearly distinguished, which are crimson in apical part; 8 setae are developed on each (Fig. 15, *b*). Pinacula are small, clearly visible. Setae are long, brown. Unlike L1, located on small chalazae. Chaetotaxy is as in L1. Seta D1 is larger than others. Sometimes seta SD2 is visible, which is on common chalaza with SD1 and is located postero-dorsally to latter.

L3–L5. L3. Larva length 0.85–1.2 mm, width 0.10–0.14 mm, cephalic capsule width 0.17–0.18 mm. L4. Larva length 1.9–2.2 mm, width 0.22–0.3 mm, cephalic capsule width 0.22–0.25 mm. L5. Larva length 3.4–3.6 mm, width 0.37–0.6 mm, cephalic capsule width 0.32–0.34 mm. Head of L3 is greenish-yellow, plain, or with brown spot on each hemisphere. In L4–L5 head is green, light green or ochre, shiny; it is plain or with spot (Fig. 15, *c–f*). Body colouration and pattern of L3 are same as in L2. Subdorsal and stigmal bands are more distinct. In L5, colour polymorphism is observed. We observed three colour forms in larvae: head is green or light green. Head may have slightly prominent brown spots, which are present in larvae of previous instars. Tergites and pleurites up to stigmal band are whitish with greenish tinge or light green. Mediodorsal band is bluish-gray or dark green. Subdorsal band is light gray. Rest of body is green (Fig. 15, *c–e*). Head is sandy yellow. Tergites and pleurites up to stigmal band are whitish with yellow tinge. Rest of body is dirty yellow (Fig. 15, *f*). Head ochreous with whitish-ochreous spots. Tergites and pleurites up to stigmal band are ochreous-pink with greenish tinge or greenish-yellow. Mediodorsal band is purple. Rest of body is brown. Subdorsal band is distinct, pinkish-brown or light purple. In all colour forms, stigmal band is sharply pronounced, lemon-yellow with crimson, more or less clearly defined spots in stigmal area. Stigmal band covers anal shield at edges. Subdorsal band is thin, intermittent, weakly distinguished. On A8, 2 bright crimson tubercles are clearly distinguished, in apical part black, with 8–9 black setae on each (Figs 11, *a*; 15, *c–f*). Pinacula weakly marked, like cuticle. Setae clearly distinguished, with shades, depending on colour form of larvae. Setae both long and short. Long setae darker and stronger, tapering towards apex. They reach 1/3 of width of the segment. Prothoracic shield is short and wide, occupying entire surface of tergite. One is distinctly sclerotized. Setae are in typical arrangement. XD1 and XD2 are long and strong, while D1 and D2 are short and weak (Fig. 8, *a*). Anal shield is distinctly sclerotized, semi-oval in shape, with typical arrangement of setae; setae are long and strong (Fig. 10, *b*). Stigmas are black with white trim. Thoracic legs are in L3 in tone of main colour. In L4–L5 they are ochreous with crimson streaks. Abdominal prolegs are in tone of main colour. Lateral shields of abdominal prolegs are brown or carrot with numerous light setae.

Ecology. Period of embryonic development of larvae lasts 5–6 days, and development of larvae (from moment of hatching from egg to pupation) — 28 days.

Foodplants. *Populus* L. (preferable), *Salix* L., *Quercus* L., *Fagus* L., *Betula* L., *Alnus* L., *Corylus* L., *Tilia* L., *Rosa canina* L, *Prunus* L.

Distribution. Trans-Eurasian temperate species. One is expanded from Europe to Japan, Turkey, Caucasus, Siberia, North Mongolia, North China, Kamchatka, Sakhalin, Korea (Schintlmeister, 2008).

Ptilodon cucullina (Denis & Schiffermüller, 1775)

L1. Larva length 0.20–0.21 mm, width 0.03–0.04 mm, cephalic capsule width 0.06–0.07 mm. Head is sandy in colour and has brown, clearly defined, strong setae. Grown larvae, already has brown, longitudinal bands on its head. Thoracic and abdominal tergites of larvae are with small tuberculate protrusions of cuticle, on which D1 setae are mainly located (Fig. 1, *b*). Larva is white with a yellowish tinge, then becomes white-green. Prothoracic and anal shields, chalazae, abdominal and thoracic legs are the same colour as body (Fig. 1, *b*). There is tubercle on A8. Setae are brown, sharply defined, located on clearly defined, large, chalazae concolorous with body (Fig. 1, *b*). Chaetotaxy. On T1, setae SD1 and SD2, L1 and L2, SV1 and SV2 are located on separate chalazae. On T2–T3, setae D1, D2 are on separate chalazae (Fig. 1, *b*). Thoracic legs and abdominal prolegs are the same colour as the body. Lateral shields of abdominal prolegs are not distinguished, with 7–9 thin, small setae.

L2. Larva length 0.60–0.70 mm, width 0.07–0.09 mm, cephalic capsule width 0.10–0.12 mm. Head is light brown, with brown longitudinal band on each hemisphere. Thoracic and abdominal tergites of larvae are the same as in L1. Larval body has long, brown setae. Chalazae are large, the same colour as body (as in L1). On A8, light crimson tubercle is clearly visible, which is divided in two in apical part, and with 4 setae on each part. Main colour of larvae is light green, may have a brown tint. Dorsal band is especially clearly distinguished. It is light crimson, may have brown tint. Subdorsal, stigmal and basal bands are light green-yellow, thin; the latter is very weakly expressed. Ventral side is the same colour as body. Chaetotaxy is clearly expressed, with long, dark setae on light background. Chaetotaxy is the same as in larvae L3–L5 (see Fig. 7).

L3–L5. L3. Larva length 0.9–1.1 mm, width 0.11–0.18 mm, cephalic capsule width 0.14–0.15 mm. L4. Larva length 1.7–2.2 mm, width 0.21–0.22 mm, cephalic capsule width 0.21–0.23 mm. L5. Larva length 3.2–3.5 mm, width 0.40–0.45 mm, cephalic capsule width 0.32–0.33 mm. Head of L3, like that of L2, is light brown with brown longitudinal bands. In L4–L5 head is whitish-green, whitish-brown or gray-yellow with two submedial bands on each hemisphere. One band is brown or dark brown (cuticular colour), the second is like main (hypodermal) colour (Fig. 16, *a–d*). On dry cephalic capsule that remains after larvae molts, only dark, cuticular band is preserved and there are also dark spots around setae (Figs 3, *f, z*; 16, *d*). Body colouration in L3–L4 is as in previous instar. Clearly defined dorsal field appears (Fig. 16, *b*). In L5, larvae are darker at beginning of instar, then becomes lighter. Colour polymorphism is observed in larvae. Three colour forms are observed in larvae: head is whitish-green. Main colour is greenish-white with pronounced, wide white-green dorsal field on thoracic segments and A1. Dorsal band is narrow, looks like dorsal field. Subdorsal band is narrow, greenish-gray (Fig. 16, *a*). Head is whitish-brown. Main colour is pinkish-white with grayish-pink dorsal field. Dorsal band looks like dorsal field. Subdorsal band is pinkish-gray (Fig. 16, *b–c*). Head is gray-yellow. Main colour is whitish-yellow with dark brown dorsal field and brown dorsal band. Subdorsal and stigmal bands are brown, weakly marked or not expressed. Large tubercle is clearly distinguished on A8. Tubercle in apical part is crimson or orange (Fig. 16, *a*, *c*). Pinacula are small, weakly expressed. Setae are brown, distinctly expressed, with black ridges, moderately elongated. Chalazae are not visible. Prothoracic shield is not prominent, wide, short, convex, with clearly marked setae, which occupy typical position. Anal shield is not prominent, concolorous with body, with tuberculate sculpture and with dark border along posterior edge.

Shield is inverted trapezoidal shape. Setae are brown, strong, clearly distinguished, with typical arrangement. Chaetotaxy of body is mostly normal (Fig. 7, *a–c*), but there are some peculiarities. On T2–T3, setae SD1 and SD2 are located on separate shields. SD2 is very poorly visible (Fig. 7, *a*). On tergite A8, one tubercle is developed, slightly bifurcated in apical part and with 8 strong setae (4 are on each part, Fig. 11, *b*). On pleurite A8, in region of seta L1, two setae are developed, located on common pinaculum (Fig. 7, *c*). On A9, L2 seta is developed, which occupies the same position as on previous segments (Fig. 7, *c*). On A10, on outer side of anal proleg, there are 9 setae. Setae SV4, L1, L2 and L3 are longer and stronger (Fig. 7, *c*). Stigmas with black peritremes and yellow-white border. Thoracic legs and abdominal prolegs are the same colour as body.

Ecology. Flight period of imago is from May to early August. Period of embryonic development of larvae lasts 8 days, and development of larvae (from egg to pupation) is 25 days.

Foodplants. *Acer* L., *Corylus* L., *Sorbus* L.

Distribution. European species. From Europe to Stavropol Territory and North Ossetia.

Ptilodon hoegei (Graeser, 1888)

L1. Larva length 0.19–0.20 mm, width 0.03–0.04 mm, cephalic capsule width 0.05–0.06 mm. Head is black, shiny. Thoracic and abdominal tergites of larvae are flat. Anal shield is lighter than prothoracic one, dark gray. Pinacula, setae, thoracic legs are black. Abdominal prolegs are in tone of main colour, with dark gray lateral shields. Pinacula are large, clearly defined. Setae are black or brown, long; exceed width of segment by 1.5–2 times. At base of setae there are small, well-defined chalazae. Prothoracic and anal shields are the same as in adult larvae; only on prothoracic shield setae are located on large, sharply expressed chalazae. Chaetotaxy is the same as in L3–L5, but only primary setae are developed (see Figs 12–14). Unlike larvae L3–L5, on T2–T3 pinacula of setae D1–D2 is sharply distinguished, large, raised. On A9 seta D1 is on large chalaza.

L2. Larva length 0.52–0.65 mm, width 0.05–0.06 mm, cephalic capsule width 0.08–0.09 mm. Head is black, shiny. Thoracic and abdominal tergites of larvae are the same as in L1. Body colouration is light green. Longitudinal bands are already weakly expressed — dorsal, subdorsal and suprastigmal. Pinacula, setae, prothoracic and anal shields, chaetotaxy as in L1. Only subprimary seta L3 has appeared. On A8, 2 oval tubercles with 4 setae on each are developed, as in adult larvae.

L3–L5. L3. Larva length 0.9–1.35 mm, width 0.18–0.22 mm, cephalic capsule width 0.14–0.16 mm. L4–L5. Larva length 1.93–1.98 mm, width 0.27–0.3 mm, cephalic capsule width 0.24–0.25 mm. Head is black, shiny (Fig. 16, *f*). In L3–L4 body colouration is green. Longitudinal bands are greenish-lemon, clearly expressed on abdominal segments. Dorsal side is green. Subdorsal band is smooth. Suprastigmal band is wavy, covers the setae of SD1. Stigmal band is slightly lighter than previous ones, blurred. In L5 pattern consists of alternating, clearly expressed, longitudinal gray-black and light green bands. Stigmal band is wider than previous ones, lemon-yellow. T1 segment, unlike the other segments, is clearly expressed, lemon-yellow, monochromatic (Fig. 16, *e*). Two bright orange-red tubercles are clearly visible on A8 (Fig. 16, *e*). Pinacula are large, clearly defined, dark brown, with small chalaza in middle part. Setae are not clearly defined. They are whitish, long, hair-like, reaching half width of segments (Figs 12–14). Prothoracic shield is short and

wide, occupies entire surface of tergite, clearly sclerotized. Shield is black or dark brown, light brown in central part. Setae XD1, XD2 and D2 are long, located on dark part of shield. D1 are short, located on light part of shield (Fig. 12, *a*). Anal shield is large, occupies entire surface of tergite. Shield is 1.0–1.5 times as wide as it is long. Shield is semi-oval, clearly sclerotized, black or dark brown. Setae are long and strong, in typical position (Fig. 14, *b*). Chaetotaxy. On A8, 2 oval tubercles with 4 long, hair-like setae on each are clearly visible (Fig. 14, *b*). On A9, pinacula of setae D1–D1 touch each other, creating impression that they are located on common pinaculum (Fig. 14, *b*). On A10, anal prolegs have 7 setae along outer edge proleg (Fig. 14, *a*).

Ecology. Author noted time of imago flight — July. Life period of female, in laboratory conditions, lasted 3–5 days. Eggs in cages were laid in single-layer, compact groups, from 60 to 180 eggs. Thus female, caught by author, laid about 200 eggs in a dense group, and two days later, in several groups, another 100 eggs. Period of embryonic development lasted 6–7 days. Development of larvae lasted 33 days (from July 15 to August 17). On August 17, larvae began to burrow into the soil for pupation. Larvae L1–L3 are located in group on underside of leaves, and larvae L4–L5 live alone on underside of the leaf.

Foodplants: *Acer* L.

Comparative notes. Larvae are arranged in groups on leaves, as in *Phalera* Hübner, 1819. Oviposition is similar to *Clostera* Samouelle, 1819, *Pygaera* Ochsenheimer, 1810, *Micromelalopha* Nagano, 1916.

Distribution. East-Palaearctic species. Russia, Primorye and Korea, Shuotsu (Schintlmeister, 2013).

Transformation of the main structures and features of the larvae by the instars

During the growth of the larvae and their transition from one instar to another, many characters do not remain constant, but are transformed. In the species under consideration, the transformation occurs as follows.

The head colouration and pattern. The colouration in L1 is uniform. In L2, the pattern appears on the head, which is clearly developed in L3–L5.

The microsculpture of the head in L1–L2 is smooth, in L3–L5, small and medium granules appear.

The anteclypeus in L1 is wide, with transverse grooves. In L2–L5, the anteclypeus is arched in the middle part, which becomes sharply swollen and large. As result, it is divided into three parts.

The labrum. In L1, the notch of outer edge reaches 1/4–1/3 of the length of the lip. The setae M1 and M2 are located on the same level. In L2–L5, outer edge of the labrum is with an acute-angled notch, reaching 1/3–2/3 of the length of the lip. The setae M1 and M2 are shifted downwards and are located along a notch.

The mandibles. In L1, the mandibular edge is with 6 acute-angled teeth. In L2–L5, the mandibular edge is smooth. The carina is clearly developed, with a tooth in L3–L5.

The tubercles on A8. The larvae of L1 has a small tubercle on A8, on which one seta D1 is located. In L2–L5 on A8, 1–2 tubercles are clearly visible, on which there are from 4 to 8 setae.

The hooks on the planta of the abdominal prolegs in L1–L2 are arranged in uniordinal lateral penellipse. In L3–L5 they are arranged in single-tiered, normal, medial row.

The size of the cephalic capsule increases with each instar and can be used to determine instar of the larva.

Discussion

Based on the above, the following conclusions can be made.

The genus *Ptilodon* is characterized by the presence of 1–2 tubercles on A8 in L2–L5. *P. capucina* and *P. hoegei* have two small, narrow, acute-angled or wide, oval tubercles. *P. cucullina* has one large tubercle, divided in two in the apical part. The tubercles in the genus *Ptilodon* have from 4 to 8 setae on each. The intersegmental seta X in L2–L5 is located on a common shield with 1–2 small setae. The hypopharynx in L3–L5 is coarsely granulated in the distal part, and in the proximal part it is with hair-like setae.

Similar to the genus *Ptilodon*, setae located on clearly defined tubercles in L1, are also characteristic of some genera of the subfamilies Pygaerinae (*Pygaera*, *Clostera*), Spataliinae (*Spatalia*, *Pterostoma*), Notodontinae (*Allodona*, *Hexafrenum*, *Fusapteryx*, etc.). The coarsely granulated hypopharynx in L3–L5 is also typical of some species of the genus *Notodonta* Ochsenheimer, 1810 and *Peridea* Stephens, 1828 (Notodontinae).

In addition to general characters for the genus, there are characteristic characters for each of the studied species of the genus *Ptilodon*.

Ptilodon hoegei of L1–L5 are characterized by sharply defined, black or dark brown head, pinacula, setae, prothoracic and anal shields. On T9, the pinacula of setae D1–D1 are closely touching. In L2–L5 on tergite A8 there are 2 oval tubercles with 4 long, hair-like setae on each.

Ptilodon cucullina of L1–L5 are characterized by the arrangement of setae SD1 and SD2 on separate chalazae or pinacula on T2–T3. In L2–L5 on tergite A8 there is one tubercle developed, divided in the apical part, and with 4 setae on each part. On A8, in the area of seta L1, two setae developed, located on a common pinaculum.

Ptilodon capucina of L2–L5 are characterized by the presence on tergite A8 of two small, acute-angled humps with 8 setae on each.

It should be noted that in the genus *Ptilodon*, except for *P. capucina* the two small, acute-angled tubercles on A8, are also characteristic (according to Nakatomi, 1987) of the eastern-palaearctic species *Ptilodon jezoensis*, *P. kuwayamae*, *P. robusta* and *Fusapteryx ladislai* (Oberthür, 1879). Only one large tubercle on A8 in L3–L5 larvae (except *P. cucullina*) is also found in the series of genera of the Notodontidae family – the circum-temperate genus *Pheosia* Hübner, 1819 and the East-Palaearctic-Oriental genus *Lophocosma* Staudinger, 1887 and others.

As a result of our comparative morphological analysis, we identified both diagnostic and taxonomic characters for both the genus *Ptilodon* and the studied species of the genus. We identified common features that are characteristic of some taxa within the family.

Acknowledgements. I express my sincere gratitude to Dr. Paolo Mazzei (Italy) for his kind permission to use colour photos of larvae from the web-site Moths and Butterflies of Europe and North Africa (Mazzei et al., 2025). I am deeply indebted to Dr. Andriy Babytskiy and Dmytro Dolynskiy (Ukraine) for their help in preparing this paper.

REFERENCES

Dolinskaya, I. V. 1984. Chrysalid morphology of certain notodontid moth species (Lepidoptera, Notodontidae). *Vestnik Zoologii*, 4, 54–60 [In Russian].

Dolinskaya, I. V. 1987 a. Morphology of the eggs of the Notodontidae (Lepidoptera) of the fauna of the USSR. Communication 1. *Vestnik Zoologii*, 1, 65–74 [In Russian].

Dolinskaya, I. V. 1987 b. Morphology of the eggs of certain Notodontid moth species (Lepidoptera, Notodontidae). In: Savchenko E. N. (Ed.). *Fauna i biocenoticheskie svjazi nasekomykh Ukrainy*. Naukova dumka, Kiev, 40–42 [In Russian; English summary]

Dolinskaya, I. V. 2008. Taxonomic variation in larval mandibular structure in Palaearctic Notodontidae (Noctuoidea). *Nota lepidopterologica*, **31** (2), 165–177.

Dolinskaya, I. V. 2009. Formation of Pattern and Diagnostic Instar Features of the Head in Caterpillars from Genus *Peridea* (Lepidoptera, Notodontidae). *Vestnik Zoologii*, **43** (1), 15–24.

Dolinskaya, I. V. 2011. Larval head microsculpture in Palaearctic Notodontidae (Noctuoidea) and its significance for the systematics of the family. *Nota lepidopterologica*, **34** (1), 11–28.

Dolinskaya, I. V. 2013. Diversity of the larval cranial setae in palearctic Notodontidae (Noctuidae) and their taxonomic distribution. *Vestnik Zoologii*, **47** (1), 27–37.

Dolinskaya, I. V. & Pljushch, I. G. 2003. Review of the main morphological characters of the palaearctic notodontid larvae (Lepidoptera, Notodontidae). Communication 1. *Lambillionea*, 103 (4), 607–624.

Döring, E. 1955. *Zur Morphologie der Schmetterlingseier*. Akademie-Verlag, Berlin, 1–154.

Fenili, G. 1956. Contributo alia conoscenza morfobiologica della *Dicranura vinula* L. (Lepidoptera, Notodontidae). *Redia*, 41, 343–510.

Garcia Conde, M. R., Schmidt, G. H. 1994. Das Borsten-und Porenmuster der Raupenstadien des Pinienprozessionsspinners Thaumetopoea pityocampa (Den. & Schiff.) (Insecta: Lepidoptera: Thaumetopoeidae) aus Südgriechenland. *Zoologische Jahrbücher*, 121, 374–406.

Gardner, J. C. M. 1943. Immature stages of Indian Lepidoptera. *Indian Journal of Entomology*, 5, 89–102.

Gardner, J. C. M. 1946. Immature stages of Indian Lepidoptera. *Indian Journal of Entomology*, 7, 139–144.

Gerasimov, A. M. 1952. [*Larvae of Lepidoptera of the U.S.S.R.* Zoolicheskiy institut Akademii nauk SSSR, Leningrad–Moskva], 1–338. (Fauna U.S.S.R., Insecta: Lepidoptera. Vol. 1, is. 2. (n. ser.)) [In Russian].

Godfrey, G. L. & Appleby, J. E. 1987. Notodontidae (Noctuoidea): the notodontids and prominents. *In*: Stehr, F. W., ed. *Immature insects*. Kendall Hunt, Dubuque, Iowa, 524–533.

Godfrey, G. L., Miller, J. S. & Carter, D. J. 1989. Two mouthpart modifications in larval Notodontidae (Lepidoptera): their taxonomic distributions and putative functions. *Journal of the New York Entomological Society*, 97, 455–470.

Hinton, H. E. 1946. On the homology and nomenclature of the setae of lepidopterous larvae, with some notes on the phylogeny of the Lepidoptera. *Transactions of the Royal Entomological Society of London*, **97** (1), 1–37.

Kobayashi, H., Nonaka, M. 2016. Molecular phylogeny of the Notodontidae: Subfamilies inferred from 28S rRNA sequences (Lepidoptera, Noctuoidea, Notodontidae). *In*: *Tinea*, 23 (Supplement 1), 1–83.

Lepiforum eV. 2025. Ptilodon capucina. *In*: *Bestimmung von Schmetterlingen und ihren Präimaginalstadien*. Available from: https://lepiforum.org/wiki/page/Ptilodon_capucina (access data: 26.04.2025).

Liu, J. X. & Jiang, L. 2023. Comparative morphology of the larval mouthparts among six species of Notodontidae (Insecta, Lepidoptera), with discussions on their feeding habits and pupation sited. *Deutsche Entomologische Zeitschrift*, **70** (2), 357–368.

Liu, J. X., Zhao, D., Hu, H. R., Liu, Y. Y., Zhao, S. C. & Jiang, L. 2023. Biology and morphology of the larvae of *Uropyia meticulodina* (Lepidoptera: Notodontidae), with discussion on their feeding and defensive strategies. *Zoomorphology*, 142, 453–463.

Mazzei, P., Morel, D. & Panfili, R. 2025. *Moths and Butterflies of Europe and North Africa*. Available from https://www.leps.it/indexjs.htm?thlContNotod.htm (access data: 26.04.2025).

Miller, J. S. 1991. Cladistics and classification of the Notodontidae (Lepidoptera: Noctuoidea) based on larval and adult morphology. *In*: *Bulletin of the American Museum of Natural History*, 204, 1–230.

Nakamura, M. 2007. Pupae of Japanese Notodontidae (Lepidoptera). *Tinea*, 19, 293–328.

Nakatomi, K. 1987. Notodontidae. In: Sugi, S., ed. *Larvae of Larger Moths in Japan*. Kodansha, Tokyo, 1–453. + 120 pls. [In Japanese with English summary].

Patoĉka, J. 1990. über die Puppen der Mitteleuropäischen Schmetterlinge. Die familien Drepanidae und Notodontidae (Lepidoptera). *Zborník Slovenského Národného Múzea / Prírodné vedy*, 36, 61–105.

Schintlmeister, A. 2008. *Notodontidae. Palaearctic Macrolepidoptera*, Vol. 1. Apollo Books, Stenstrup, 1–482, 40 pls.

Schintlmeister, A. 2013. Notodontidae and Oenosandridae (Lepidoptera). *In*: *World Catalogue of Insect*, 11. Brill, Leiden, 1–605.

Sugi, S., Nakamura, M. 1988. Taxonomic and biological notes on *Periergos magnus* (Matsumura) (Notodontidae), with descriptions of its larva and pupa. *Japan Heterocerists Journal*, 150, 385–389 [Japanese with English summary].

Received 3 June 2025
Accepted 23 February 2026

Appendix

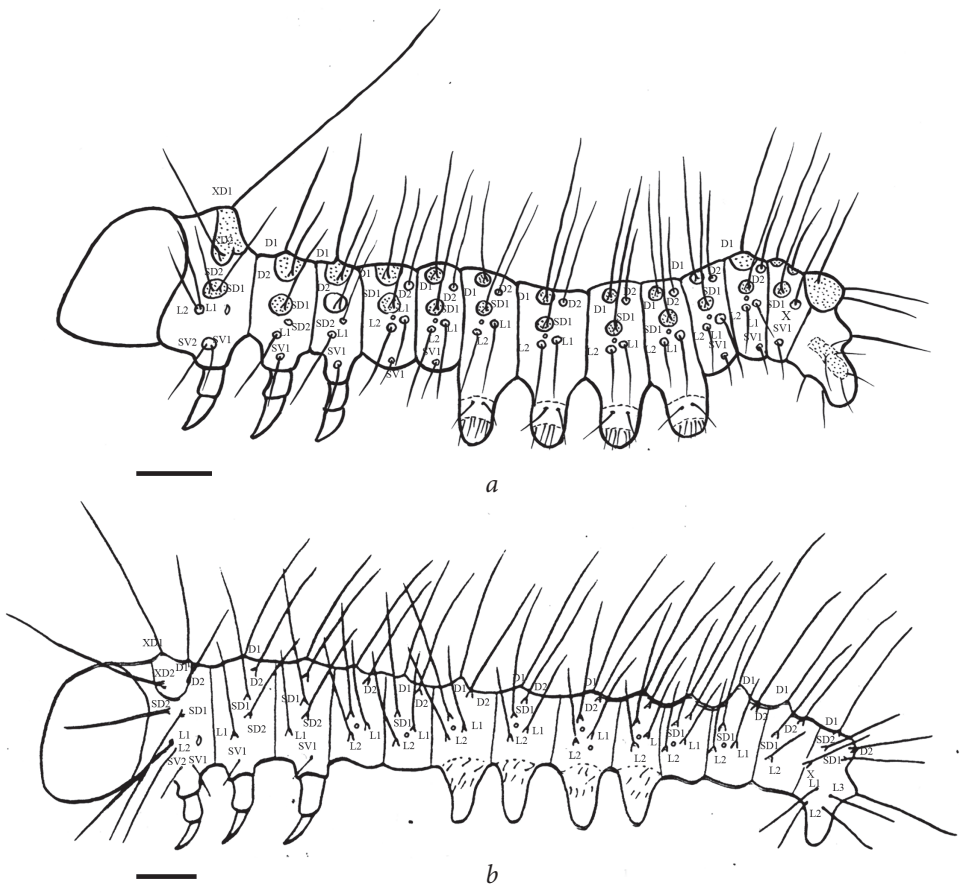

Fig.1. *Ptilodon*. Larvae. L1: *a — Ptilodon capucina*; *b — P. cucullina*. Scale line 0.25 mm

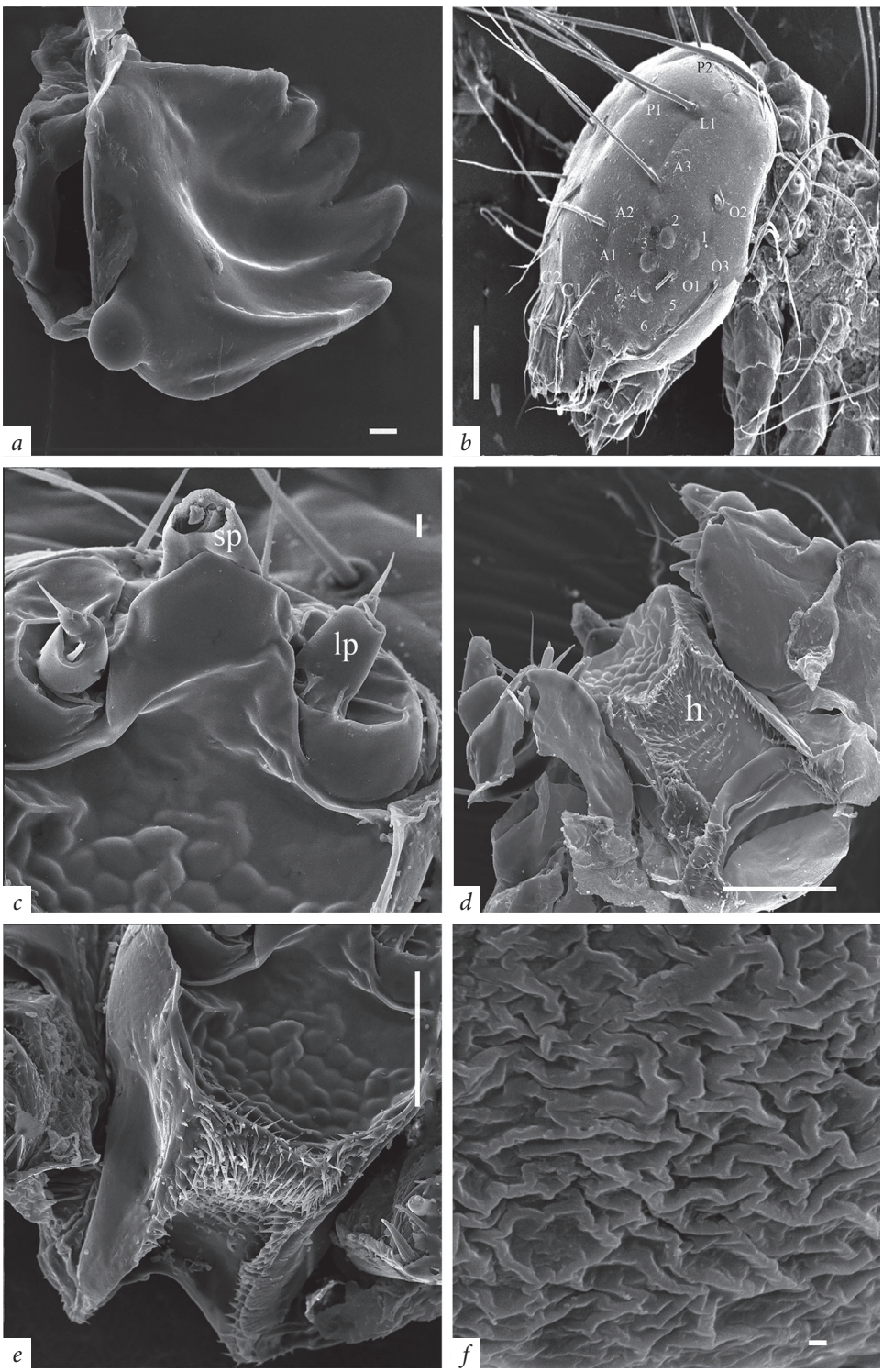

Fig. 2. *Ptilodon hoegei*. Larvae. L1: *a* — left mandible, inside view; *b* — head, side view; *c* — spinneret and labium palpi, outside view (sp — spinneret; lp — labium palpus)*; d* — *l*abium and maxillary palpi, outside view, *(h* — hypopharynx*); e* — hypopharynx, top view; *f* — cuticle. Scale line: *b, d, e* (100 μ), *a, c* (10 μ), *f* (1 μ)

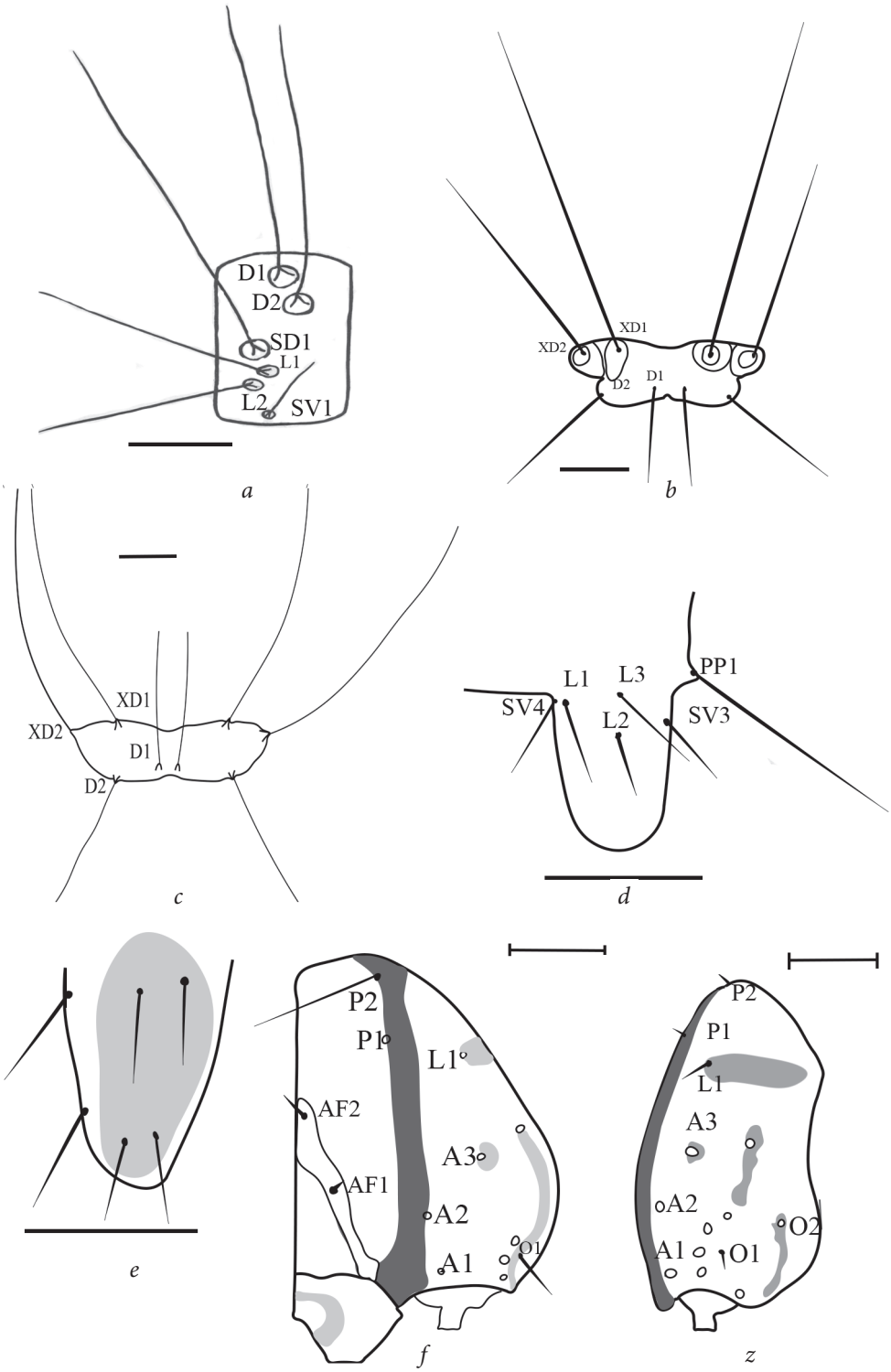

Fig. 3. *Ptilodon*. Larvae: *a* — chaetotaxy A1, *P. capucina*, L1; *b* — prothoracic shield, *P. capucina*, L1; *c* — prothoracic shield, *P. cucullina*, L1; *d* —anal proleg, outside view, *P. cucullina*, L1; *e* — anal proleg, inside view, *P. capucina*, L1; *f* — head, frontal view, *P. cucullina*, L4; *z* — head, lateral view, *P. cucullina*, L4. Scale line: 9–13 (0.15 mm), 14, 15 (0.5 mm)

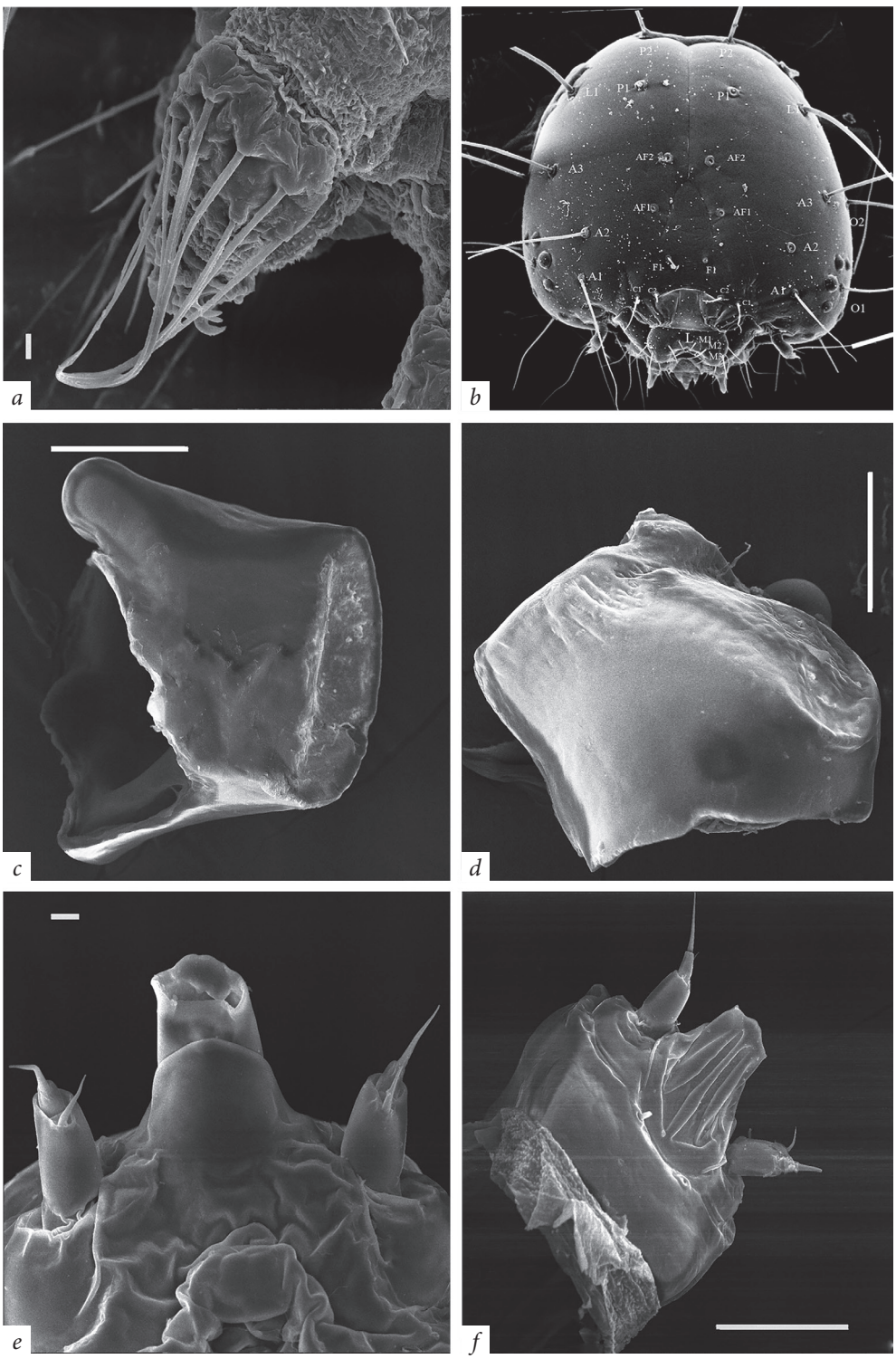

Fig. 4. *Ptilodon*. Larvae: *a* — lateral shield of abdominal proleg, *P. hoegei*, L1*; b* — head, frontal view, *P. hoegei*, L2; *c* —left mandible, inside view, *P. capucina*, L2*; d* — left mandible, outside view, *P. capucina*, L2*; e* — spinneret and labium palpi, outside view, *P. capucina*, L2*; f* —spinneret and labium palpi, *P. capucina,* inside view, L2. Scale line: *a*, *e* (10 μ), *b–d*, *f* (100 μ)

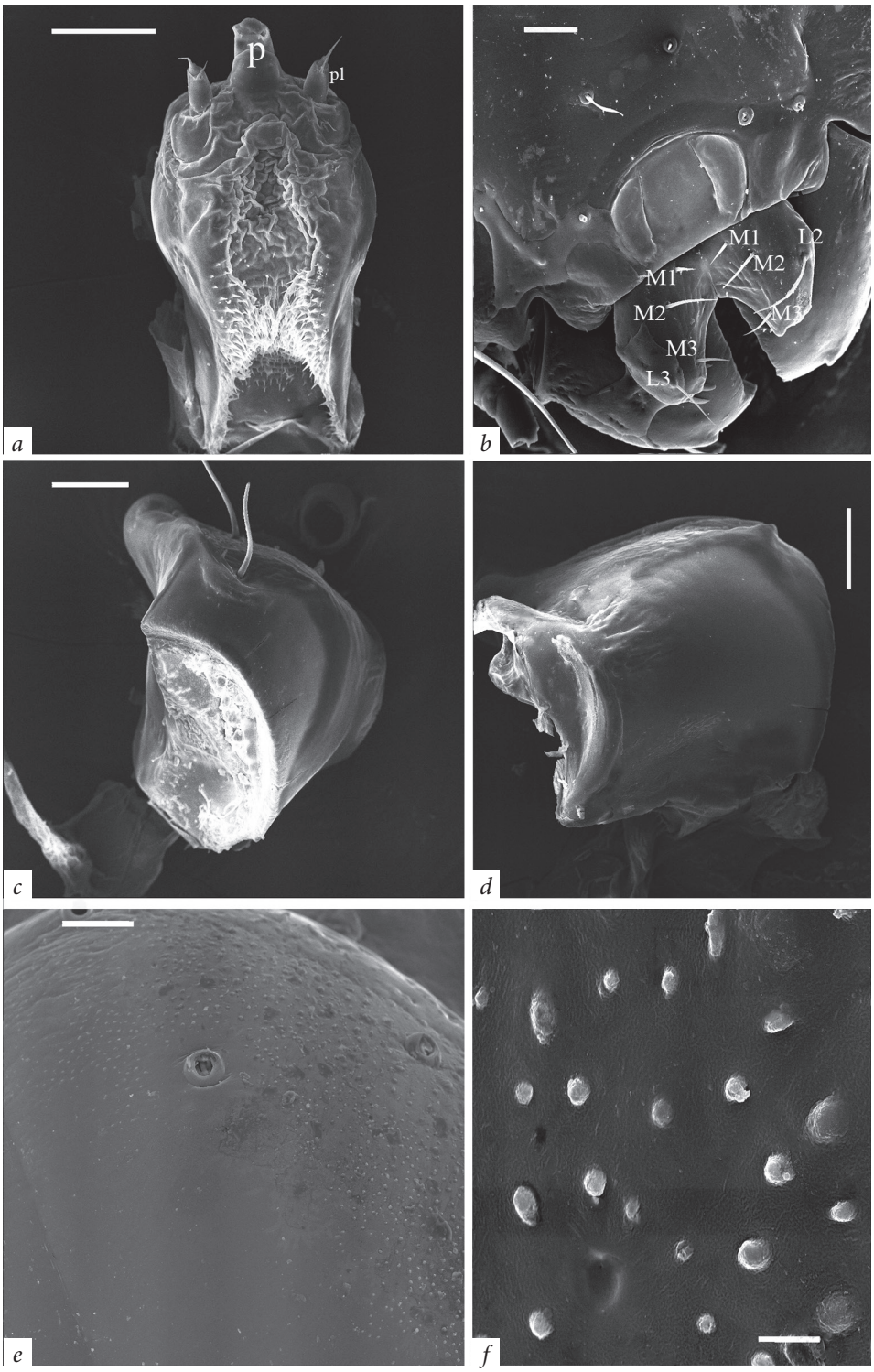

Fig. 5. *Ptilodon*. Larvae: *a* — labium, outside view, *P. capucina*, L2 (p — spinneret; pl — labium palpus)*; b* — anteclypeus and labrumz, *P. cucullina*, L4*;* c — left mandible, lateral view, *P. capucina*, L4*; d* — mandible, outside view, *P. capucina*, L4; *e–f* — microsculpture of head, *P. cucullina*, L4. Scale line: *b*, *f* (10 μ), *a*, *c–e* (100 μ)

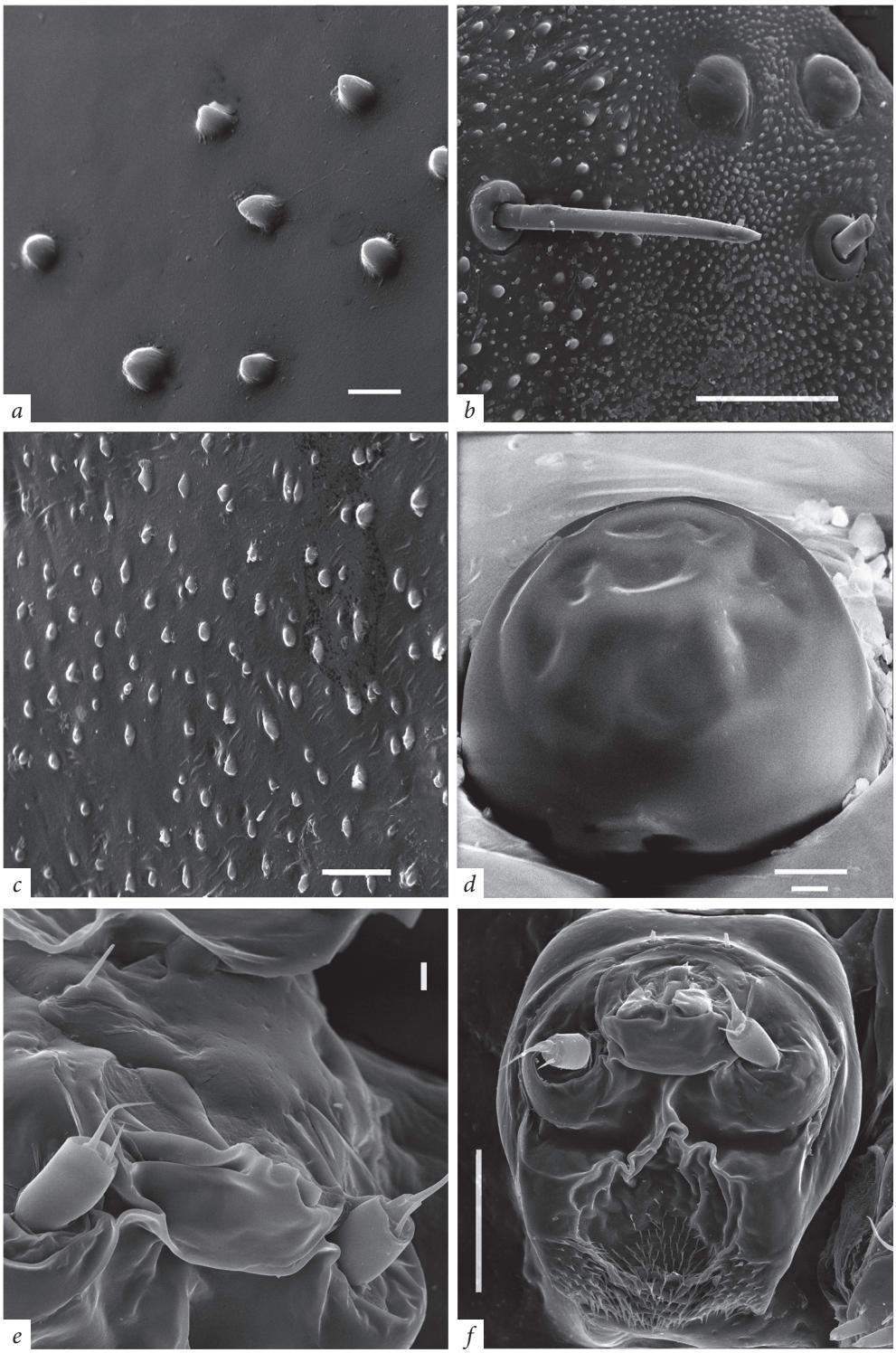

Fig. 6. *Ptilodon*. Larvae: *a* — microsculpture of head, *P. hoegei*, L3*; b–c* — stemmata area, *P. cucullina*, L4; *d* — third stemma, *P. capucina*, L4*; e* — spinneret and labium palpi, ventral-dorsal view, *P. cucullina*, L4*; f* — labium, top view, *P. cucullina*, L4. Scale line: *a–f* (10 μ)

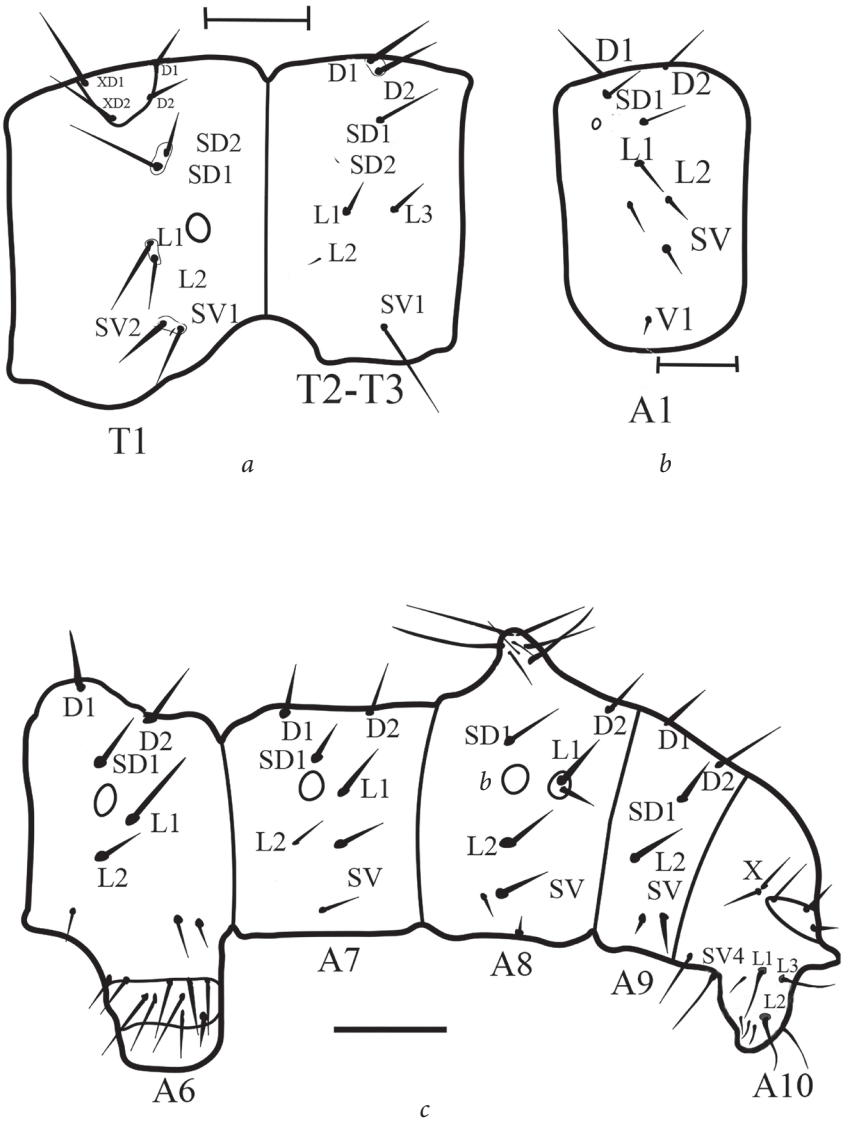

Fig. 7. *P. cucullina*: a–*b*. Chaetotaxy: *a* —T1–T3, L4*; b* — A1, L4*; c* — A6–A10, L4. Scale line: *a*, *c* (1.0 мм)*; b* (0.5 мм)

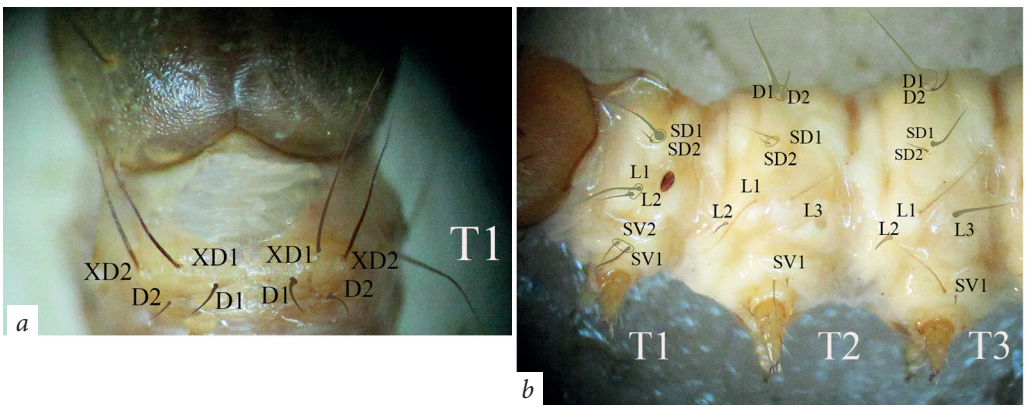

Fig. 8. *P. capucina*. Chaetotaxy: *a* — prothoracic shield, L4–L5*; b* — T1–T3, L4–L5

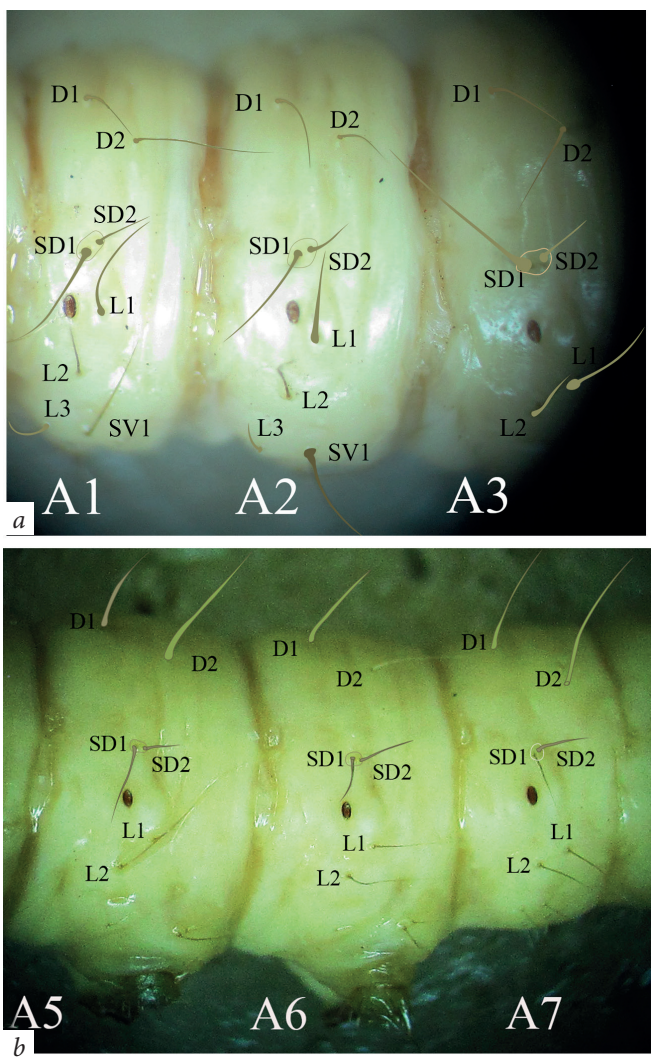

Fig. 9. *P. capucina*. Chaetotaxy: *a* —A1–A3, L4–L5*; b* —A5–A7, L4–L5

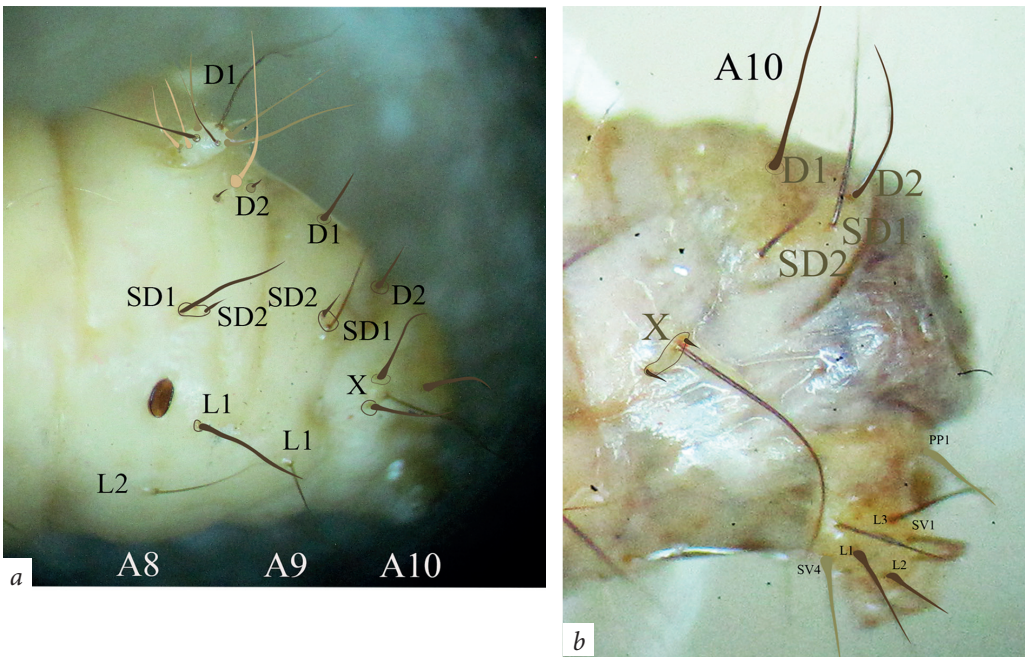

Fig. 10. *P. capucina*. Chaetotaxy: *a* — A8–A10, L4–L5*; b* —A10, L4–L5

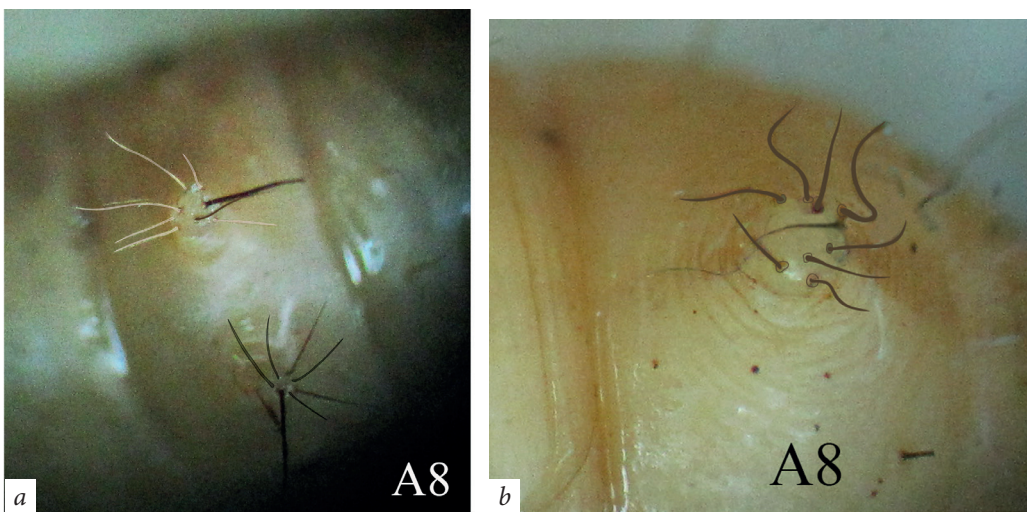

Fig. 11. Larvae. A8, tergit: *a* — *P. capucina*, L4–L5*; b* — *P. cucullina*, L4–L5

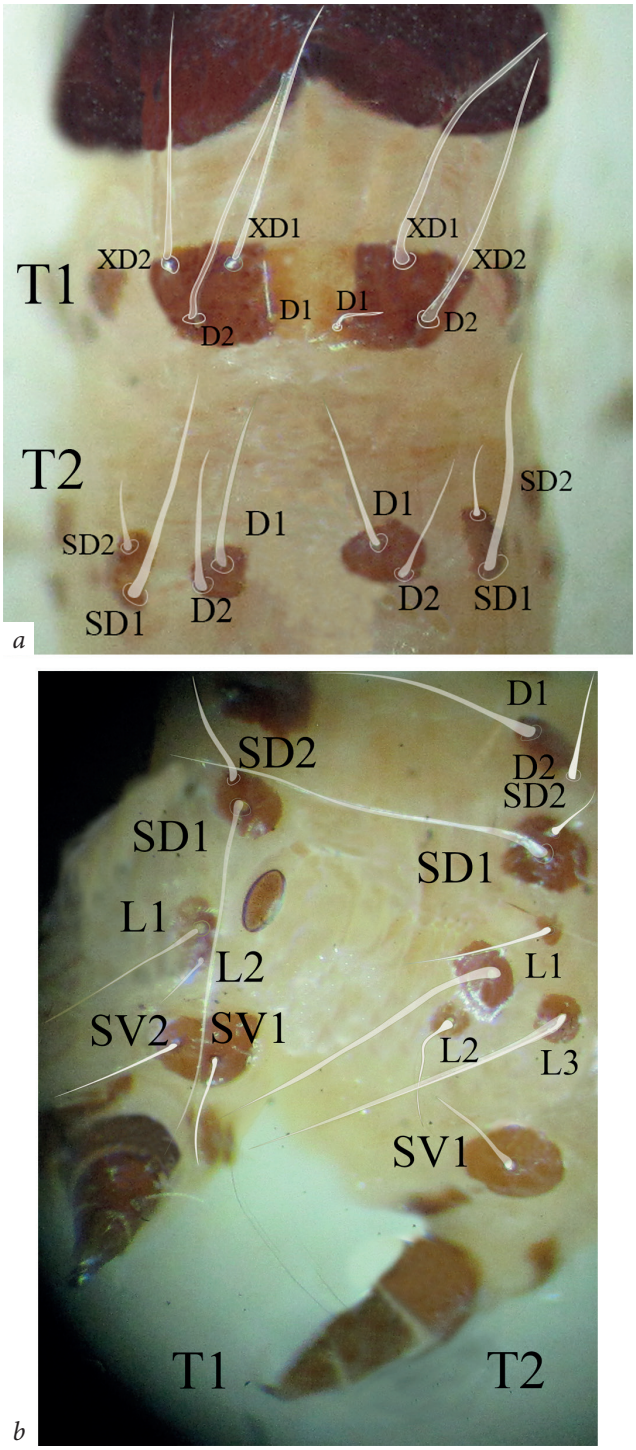

Fig. 12. *P. hoegei*. Chaetotaxy: *a* — prothoracic shield, T1, tergit, L4–L5*; b* — T1–T2, L4–L5

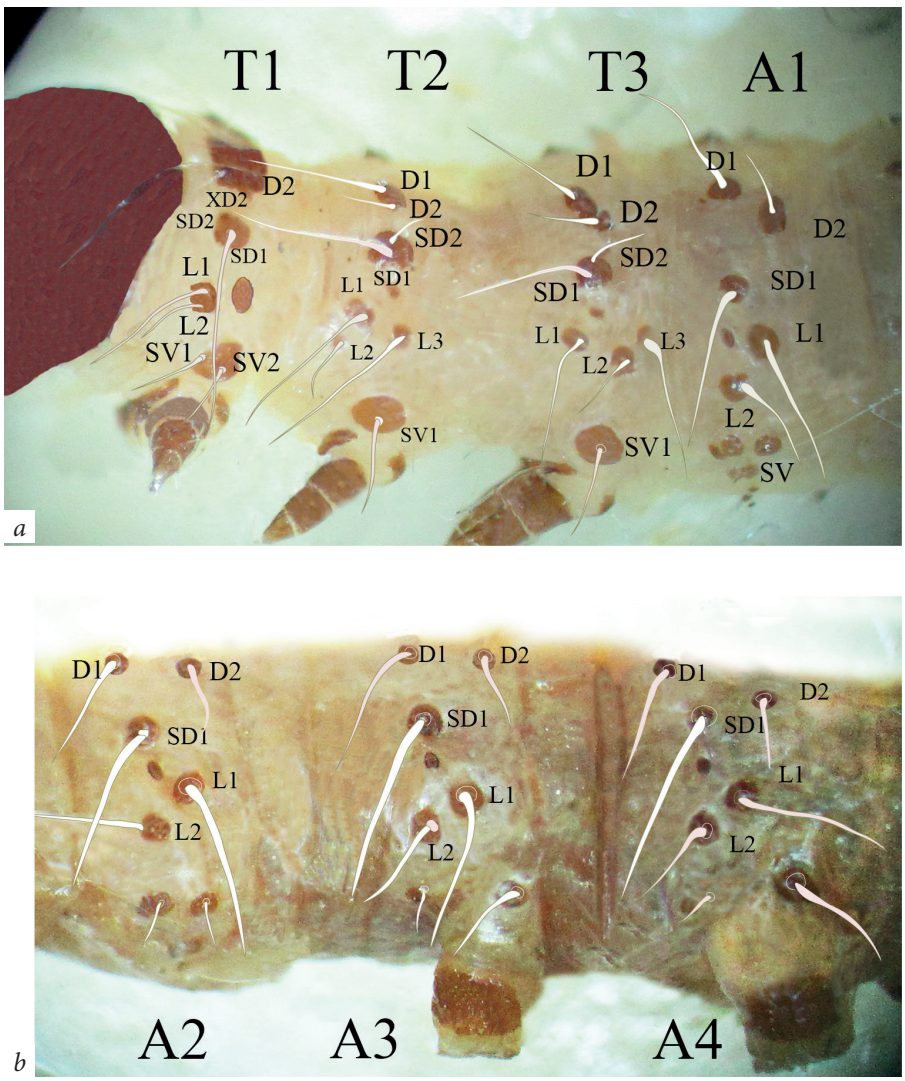

Fig. 13. *P. hoegei* Chaetotaxy: *a* — T1–T3, A1, L4–L5; *b* —A2–A4, L4–L5

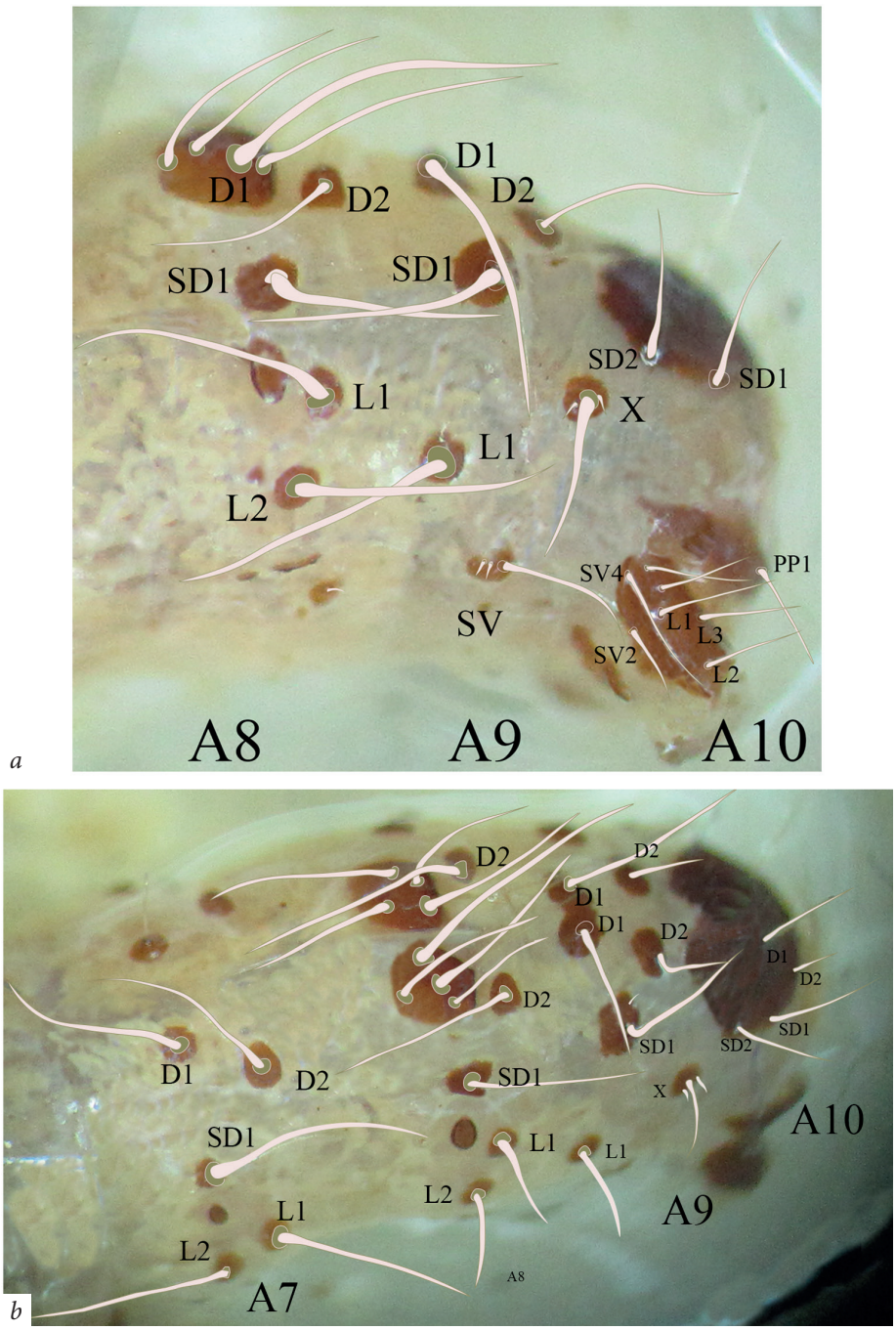

Fig. 14. *P. hoegei*. Chaetotaxy: *a* — A8–A10, L4–L5; *b* — A7–A10, L4–L5

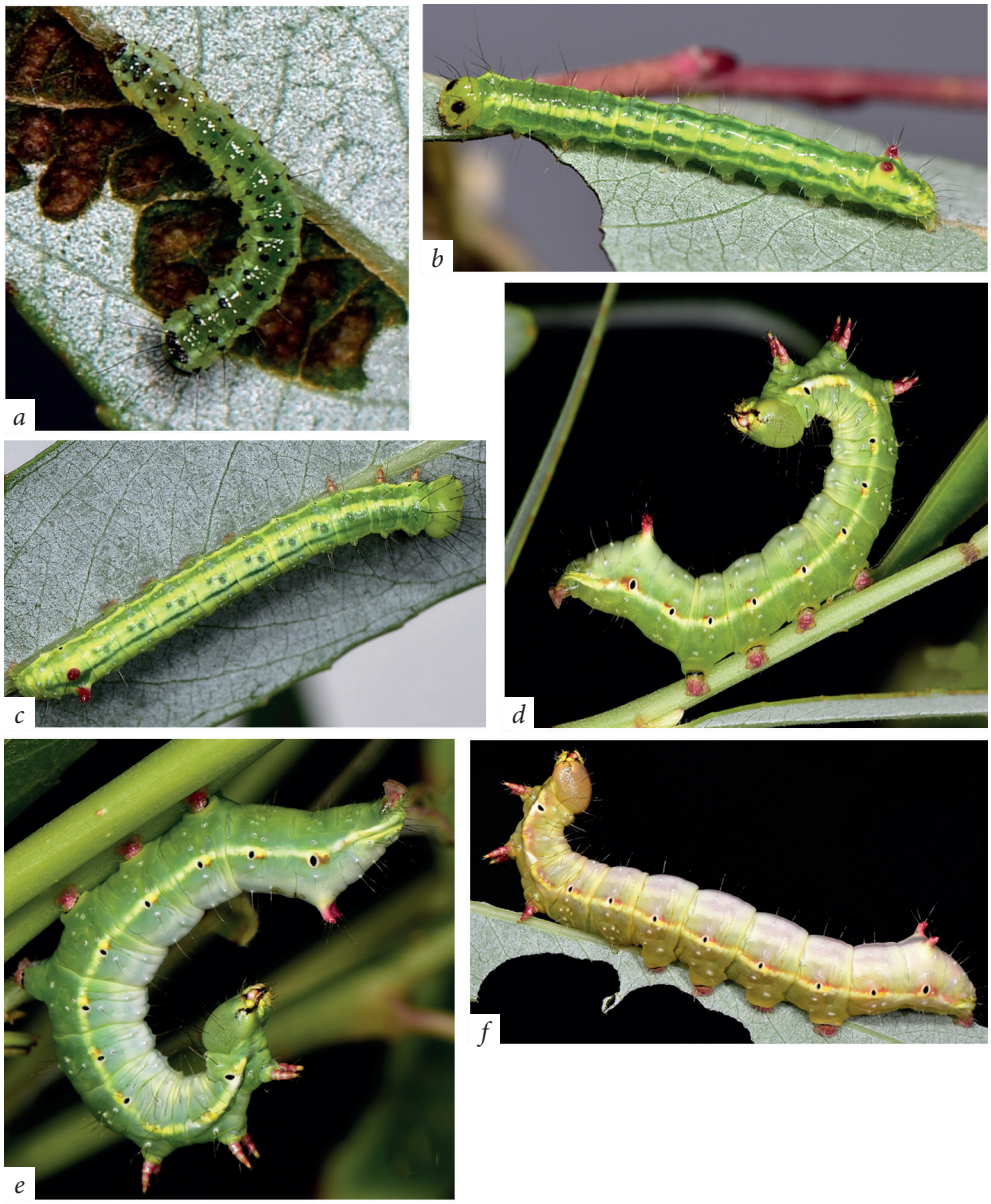

Fig. 15. *P. capucina*. Larvae: *a* — L1*; b* — L2*; c–f*. L4–L5 (Photos by Paolo Mazzei, Italy). All photos by Paolo Mazzei (https://www.leps.it/indexjs.htm?thlContNotod.htm), with permission. Accessed 04/26/2025.

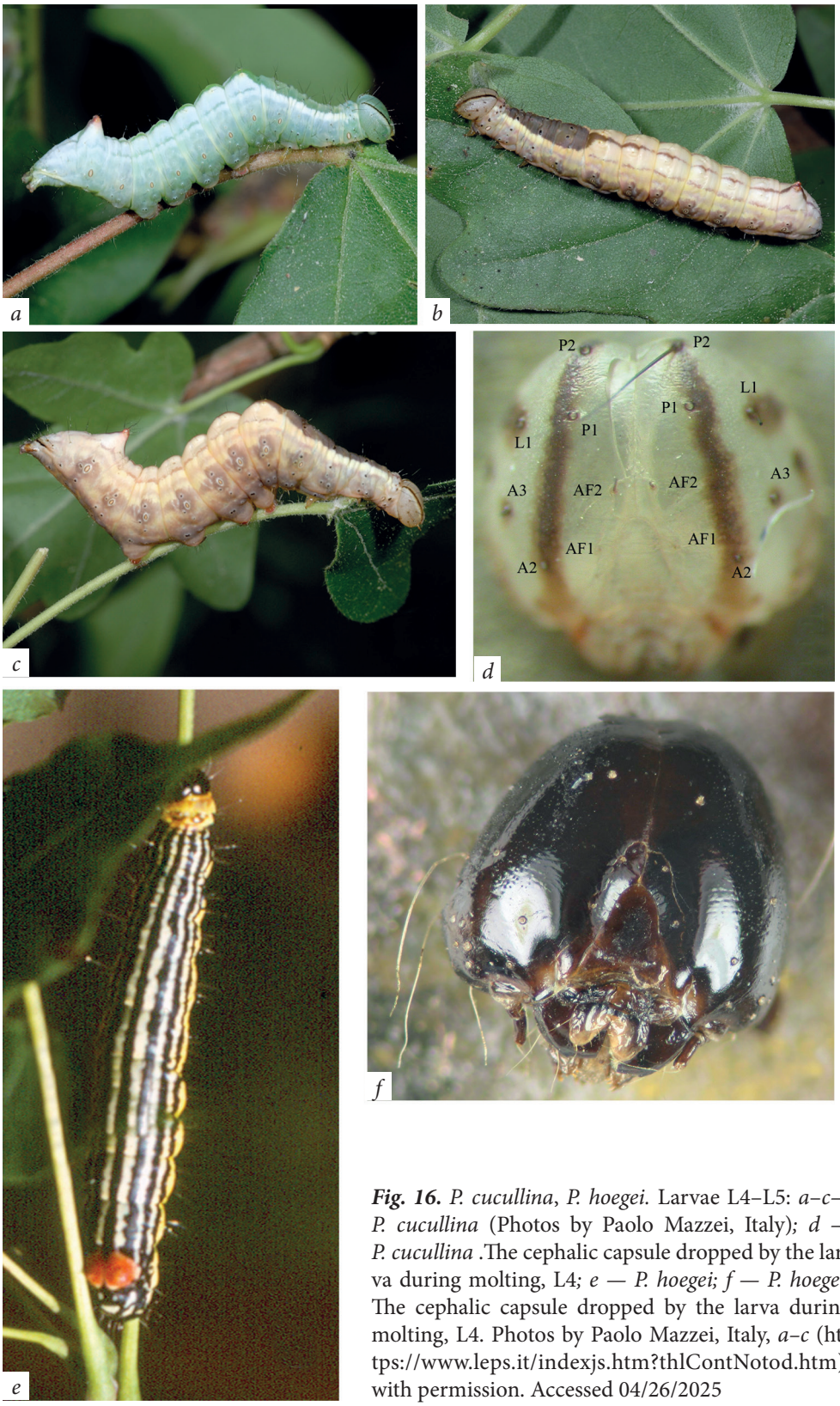

Fig. 16. *P. cucullina*, *P. hoegei*. Larvae L4–L5: *a–c*— *P. cucullina* (Photos by Paolo Mazzei, Italy); *d* — *P. cucullina* .The cephalic capsule dropped by the larva during molting, L4; *e* — *P. hoegei*; *f* — *P. hoegei*. The cephalic capsule dropped by the larva during molting, L4. Photos by Paolo Mazzei, Italy, *a–c* (https://www.leps.it/indexjs.htm?thlContNotod.htm), with permission. Accessed 04/26/2025