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Developmental stages of *Platystethus nitens* (C.R. SAHLBERG, 1832) (*Coleoptera: Staphylinidae*)

BERNARD STANIEC

Department of Zoology, Maria-Curie Skłodowska University,
Akademicka 19, 20-033 Lublin, Poland
e-mail: bledius@wp.pl

ABSTRACT. The egg, larva and pupa of *Platystethus nitens* have been described for the first time. The illustrations of structural features are provided. The habitus of adult and penis are illustrated. The key to the known Polish *Platystethus* immature stages is given.

Key words: Entomology, morphology, egg, larva, *Coleoptera*, *Staphylinidae*, *Platystethus nitens*.

INTRODUCTION

Platystethus nitens is distributed in Azores, Madeira, The Canary Islands, Morocco, Algeria, Egypt, Turkey, Europe, Russia, Uzbekistan, Iran, Afghanistan, Mongolia and China (BURAKOWSKI et al. 1979, LUCHT 1987, HERMAN 2001). In Poland the mentioned staphylinid is rather a common species, known from a dozen or so localities. KOCH (1989) defined it as eurytopic, thermophilous and phytodetriticolous species. *P. nitens* usually occurs in warm places with tightly compact soil, especially on lake shores, river banks, in fields and gardens. It is found in detritus, compost, horse and cattle dung (BURAKOWSKI et al. 1979, KOCH 1989).

The egg, larva and pupa of *P. nitens* have not been described yet. Apart from *P. nitens*, the other Polish members of the genus *Platystethus* are: *P. arenarius* (FOURCROY), *P. alutaceus* (THOMSON), *P. capito* (HEER), *P. cornutus* (GRAVENHORST) and *P. nodifrons* (C. R. SAHLBERG). In the case of *P. arenarius* the larva and pupa

were described by HINTON (1944) and STANIEC (1993a) respectively. PIERRE (1944) and STANIEC (1993b) provided the description of the developmental stages of *P. cornutus*. Recently STANIEC (2003) has worked out the morphology of the egg, larva and pupa of *P. alutaceus* and provided the diagnostic characters of the larva and pupa of the genus *Platystethus*. The morphology of the preimaginal stages of other *Platystethus* species and closely related genera were also described by KASULE (1968), LEGNER & MOORE (1977), PAULIAN (1941), POTOCKAYA (1965, 1967), STANIEC (1992, 1997 a, 1997 b, 1999, 2001) and TOPP (1978).

MATERIAL AND METHODS

All preimaginal stages of *P. nitens* were obtained by rearing adults previously identified by the author. They were collected in Milejów, Łańcuchów and Ciechanki Łańcuchowskie near Łęczna (CE Poland) from 15 to 21 April 1999. The adults were found on field-paths with tightly compact, moist soil in the Wieprz River valley, together with a few dozens of adults of *Platystethus alutaceus* and *P. cornutus*. The imagines of *P. nitens* were kept in Petri dishes (10 cm in diameter, 2 cm high), filled with very compact and moist soil (about 4/5 of their height) taken from the collecting area, and green algae (*Pleurococcus vulgaris* Menegh) scraped off the tree bark as food. The soil was wetted every couple of days with several drops of distilled water. The preimaginal stages were preserved in a 1:1 solution of glycerine and alcohol. For microscopic slides the punctured larvae and pupae were rinsed in distilled water and cleared in chloralphenol and finally placed in Berlesy's liquid. The drawings were made using camera lucida.

Material examined: 10 eggs, 3 first instar larvae (L_1), 10 second instar larvae (L_2), 12 last instars larvae (L_3), 11 pupae and about 10 adults.

DESCRIPTION

Egg:

Length 0.43-0.52 mm ($x = 0.49$, $SD = \pm 0.03$), width 0.27-0.34 mm ($x = 0.32$, ± 0.02), shape oval, colour white or light yellow, chorion thin, micropyle absent. Eggs occur in more or less regular clusters of four (Fig. 1).

Larva

Length: L_1 - 1.15-1.30 mm, L_2 - 1.37-1.96 mm ($x = 1.74$ mm, $SD = \pm 0.21$), L_3 - 2.38-2.98 mm (2.65 mm, $SD = \pm 0.17$); head width: L_1 - 0.24-0.25 mm, L_2 - 0.34-0.35 mm ($x = 0.35$ mm, $SD = \pm 0.05$), L_3 - 0.43-0.46 mm ($x = 0.44$ mm, $SD = \pm 0.01$); L_1 - pronotum width: 0.22-0.24 mm, L_2 - 0.31-0.34 mm ($x = 0.32$ mm, $SD = \pm 0.01$); L_3 - 0.41-0.45 mm ($x = 0.43$ mm, $SD = \pm 0.01$).

Mature larva (L_3)

Body elongated, cylindrical, weakly sclerotized, head light brown, mandibles brown, body yellow, urogomphi, antennae, light yellow, all sclerites almost colourless, with simple, light yellow setae of different length (Fig. 2). Head rounded, with 1 black stemma on each side; chaetotaxy identical to the head of *Platysthetus*

alutaceus larva (STANIEC 2003). Antenna (Fig. 3); segments I-III length ratio 2 : 2.3 : 1; segment I with 4 pores, 1.6 x as long as wide; segment II with 3 setae, 1 pore and 3 sensory appendages of various size and shape (Sa) latero-apically, 2.1 x longer than wide in the widest places; segment III with 3 long setae and 4 short solenidia (So) apically, twice as long as wide. Labrum approximately trapeziform (Fig. 4), with 10 setae dorsally, 2 pores dorso-anteriorly, a pair of long setae, 2 pairs of short, thick and blunt setae and 2 pairs of pores ventro-anteriorly. Adoral surface of labrum (epipharynx) as in Fig. 5. Mandible (Fig. 6) very short and relatively stout, with 3 apical teeth wide and obtuse, 3 pores (2 dorsally, 1 ventrally) and 2 short setae dorsally. Mala (Fig. 7) with 3 setae (2 ventrally, 1 at the outer margin), 3 pores and a few cuticular processes at the inner margin. Adoral margin of mala with several spines and ctenidium of 12 denticles. Maxillary palp 3-segmented (Fig. 8), length ratio 2.9 : 1 : 1.8 respectively. Segment I with 1 short seta basally, 2 pores (1 ventrally, 1 dorso-laterally) and several triangular cuticular processes apically; segment II with 2 setae and 1 pore dorsally and several cuticular processes apically; segment III with 1 digital sensory appendage, 1 pore, 1 micro setae near apex and several sensillae apically. Hypopharynx as in Fig. 9. Labium (Fig. 10) consists of ligula (Lg) fused with prementum (Pmnt), mentum (Mnt) fused with submentum (Smt) and labial palps (Lp). Submentum with 2 long setae, mentum with 4 long setae and reticulate basal area, prementum with 2 pairs of micro setae posteriorly, 2 macro setae and a few triangular cuticular processes in the anterior part, ligula distinctly narrowed towards anterior margin, slightly sinuate anteriorly with 2 pairs of pores and 2 spine-shaped setae anteriorly. Labial palps 2-segmented, segments I-II length ratio 2.3 : 1 respectively, each about twice as long as wide, with 1 pore. Leg (Fig. 11): coxa (Cx) with 8 setae, triangular trochanter (Tr) with 6 setae and a few campaniform sensillae, femur (Fm) with 8 setae and 1 pore, tibia (Tb) with 9 setae. Fore tibia with 8 spine-shaped and 1 thin and long setae, mid and hind tibia with 7 spine-shape and 2 thin and long setae each. Trochanter, femur, tibia and tarsungulus length ratio 2.3 : 3.3 : 3.8 : 1. Tarsungulus (Tu) relatively short, slightly curved with 2 micro setae (Fig. 12).

Urogomphus 3.7 x as long as wide at the base (Fig 13), narrowed to the apex, with 8 setae (6 macro setae, 2 micro setae) and 2 pores (1 dorsally, 1 dorso-apically). Urogomphus with 1 long seta apically.

The larva of *P. nitens* belongs to peripneustic type. Of 9 pairs of spiracles, the first occurs on forepleurites of thorax (Fig. 2), the second located on the lateral parts of the first abdominal tergite, the remaining ones on the sides of the abdominal segments II-VIII, between their tergites and pleurites.

Pupa:

Body length: 2.30-2.52 mm ($x = 2.38$ mm, ± 0.09), body width in the widest places (between middle knees): 0.88-0.95mm ($x = 0.92$ mm, ± 0.03), head width: 0.53-0.57 mm ($x = 0.55$ mm, ± 0.04), pronotum width: 0.56-0.62 mm ($x = 0.59$

mm, ± 0.03). Pupa of exarata type, body moderately elongate, lightly sclerotized, colour light yellow (Figs 14, 15). Head directed downwards with 4 pairs of setae (Fig. 14). Pronotum clypeate, posterior angles not marked, lateral margins distinctly rounded, with 18 setae (Fig. 15). Meso- and metanotum, each with 4 setae. Both elytra and wings clearly separate, hind margin of shortened elytra well visible. Wings reaching anterior margin of abdominal sternite II. Tibiae and tarsi (except for fore tarsi) directed obliquely to the middle of the body. Hind tarsi almost reaching posterior margin of abdominal sternite II. Abdomen with 9 tergites and 8 visible sternites. Abdomen with segments I-V almost equally wide, and then gradually narrowed to the terminal segment (Fig. 15). Last segments extended laterally into two, short, darkened, minutely spiculate projections (Fig. 20 A). Chaetotaxy of abdomen (Figs 14, 15): ventral side – segments II and VI, each with 8 setae, segments III-V, each with 10 setae; dorsal side - segment I usually with 6 dorsal setae, segments II-VII each with 10 setae, segment VIII with 2 setae laterally. Spiracles (Figs 16-18): 3 functional pairs on abdominal segment I-III and 5 atrophied pairs on abdominal segments IV-VIII (Fig. 15). Atrophied spiracles on segment IV constructed differently from atrophied spiracles on segments V-VIII (Figs 17, 18). Terminal segments with sexual dimorphism as in Figs 19, 20.

Adult: total habitus and penis as in Figs 21-23.

CONCLUDING REMARKS

The key to the known preimaginal stages of the Polish *Platysthetus* species (HINTON 1944, STANIEC 1993 a, 1993 b, 2003) including egg, mature larva and pupa of *Platysthetus nitens* (C.R. SAHLBERG) is given below.

KEY TO KNOWN PREIMAGINAL STAGES OF THE POLISH *PLATYSTHETUS* SPECIES

Eggs

1. In each egg-chamber more than 4 eggs (8-90 eggs, 24 average). Length: 0.43-0.52 mm, width: 0.25-0.32 mm. Eggs usually occur in cattle-dung, rarely in plant remains. *P. arenarius* (FOURCROY).
- . In each egg-chamber always 4 eggs. Eggs usually occur in moist soil, sometimes in plant remains 2.
2. Length: 0.43-0.52 mm, width: 0.27-0.34 mm. *P. nitens* (C. R. SAHLBERG).
- . Length: 0.62-0.71 mm, width: 0.31-0.45 mm 3.
3. Length: 0.62-0.71 mm, width: 0.34-0.45 mm *P. alutaceus* (THOMSON).
- . Length: 0.62-0.66 mm, width: 0.31-0.42 mm *P. cornutus* (GRAVENHORST).

Larvae (mature – L₃)

1. Head width: 0.43-0.46 mm. Length ratio of antennal segments I-III: 2 : 2.3 : 1 respectively. Antenna and labium as in Figs 3, 4. Mandible relatively very short, slightly curved (Fig. 6). Mala, maxilla palp, ligula and prementum as in Figs 7, 8, 10. Length ratio of maxillary palp I-III: 2.9 : 1 : 1.8 respectively.

- Urogomphus 3.7 x as long as wide at the base (Fig 13). Body length: 2.40-3.00 mm *P. nitens* (C. R. SAHLBERG).
- . Head width: 0.50-0.73 mm 2.
2. Head width: 0.50-0.56 mm. Larvae occur in cattle-dung or plant remains. Length ratio of antennal segments I-III: 1.6 : 2.3 : 1. Antenna, labium, adoral margin of mala, maxillary palp, ligula and prementum as in Figs 12, 15, 22, 26, 31 (STANIEC 2003). Length ratio of maxillary palps I-III: 3.1 : 1 : 1.9. Mandible distinctly curved (Fig. 8, 9; HINTON 1944). Urogomphus 2.7 x as long as wide at the base (Fig 12; HINTON 1944). Body length: 2.40-4.40 mm. *P. arenarius* (FOURCROY).
- . Head width: 0.56-0.73 mm. Larvae usually occur in moist soil 3.
3. Head width: 0.56-0.62 mm. Denticles of adoral margin of mala not divided in two groups by denticle-free edge (Fig. 23; STANIEC 2003). Length ratio of antennal segments I-III: 2.1 : 2.4 : 1. Antenna, maxillary palp, ligula and prementum as in Figs 13, 25, 30 (STANIEC 2003). Length ratio of maxillary palps I-III: 3.4 : 1 : 1.8. Body length: 2.53-4.00 mm *P. cornutus* (GRAVENHORST).
- . Head width: 0.69-0.73 mm. Denticles of adoral margin of mala divided in two groups by denticle-free edge (Fig. 21; STANIEC 2003). Length ratio of antennal segments I-III: 2.4 : 3 : 1. Antenna, labrum, mandible, maxillary palp, ligula and prementum as in Figs 9, 14, 18, 24, 29. Length ratio of maxillary palp I-III: 3 : 1 : 1.5. Body length: 3.60-4.63 mm *P. alutaceus* (THOMSON).

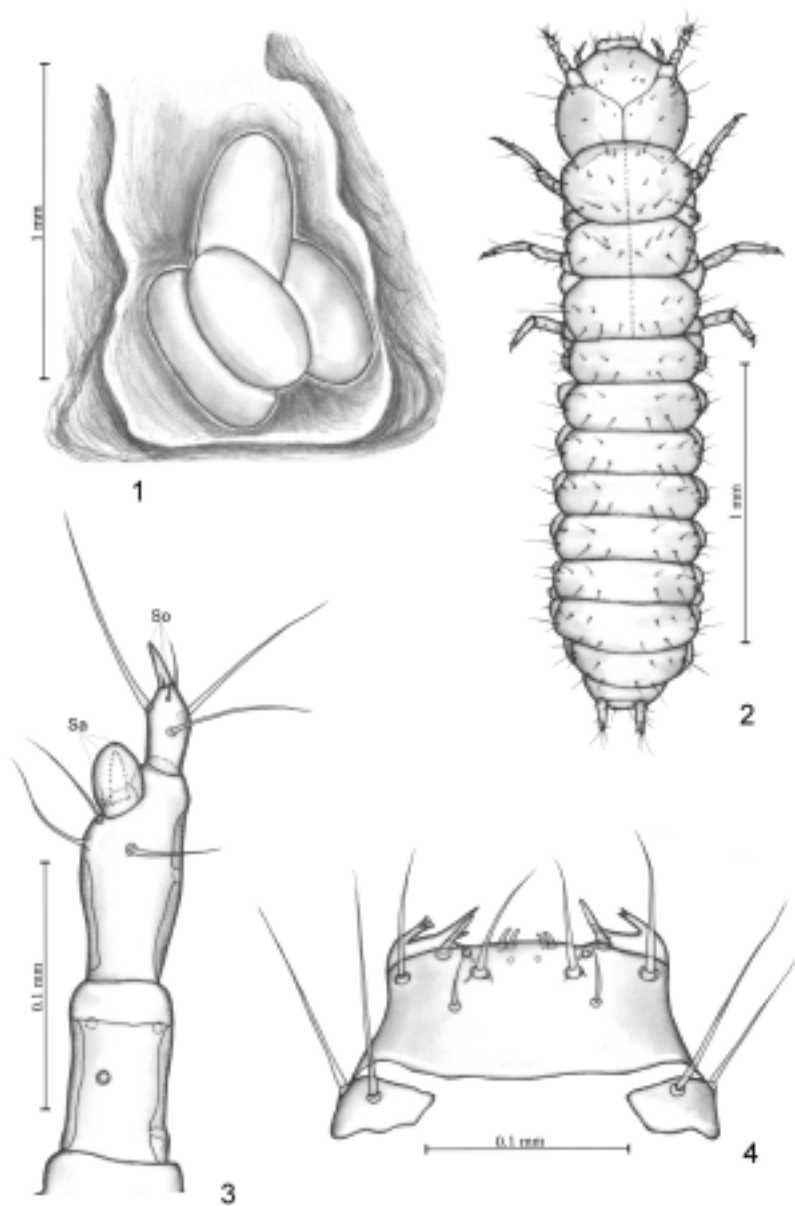
Pupae

1. Pronotum (beside short setae) with a pair of very long, stocky setae anteriorly, slightly shorter than pronotum (Fig. 5; STANIEC 1993 a). Pupae occur in cattle-dung or plant remains. Abdominal segments I-VII on ventral side, pronotum, mesonotum and partly metanotum with strongly marked, median longitudinal streak of microstructure. Structure of distal abdominal segment and spiracles as in Figs 7 a, b, 8 c, d (Staniec 1993 a). Body length: 2.70-3.35, epicranium width: 0.60-0.95 mm *P. arenarius* (FOURCROY).
- . Long, stocky setae on pronotum anteriorly absent; pronotum with 18 short setae, at least 3 x shorter than pronotum (Fig. 15). Pupae usually occur in moist soil 2.
2. Length: 2.30-2.52 mm, head width: 0.53-0.57 mm, pronotum width: 0.56-0.62 mm. Body moderately elongate, wings reaching anterior margin of abdominal sternite II. Hind tarsi almost reaching posterior margin of abdominal sternite II. Structure of spiracles and terminal segment in both sexes as in Figs 16-20 *P. nitens* (C. R. SAHLBERG).
- . Length: 2.63-3.53 mm, head width: 0.59-0.91 mm, pronotum width: 0.66-0.90 mm 3.
3. Length: 2.88-3.53 mm, head width: 0.62-0.91 mm, pronotum width: 0.70-0.90 mm. Structure of spiracles and terminal segments in both sexes as in Figs 50-52, 54, 55 (STANIEC 2003) *P. alutaceus* (THOMSON).

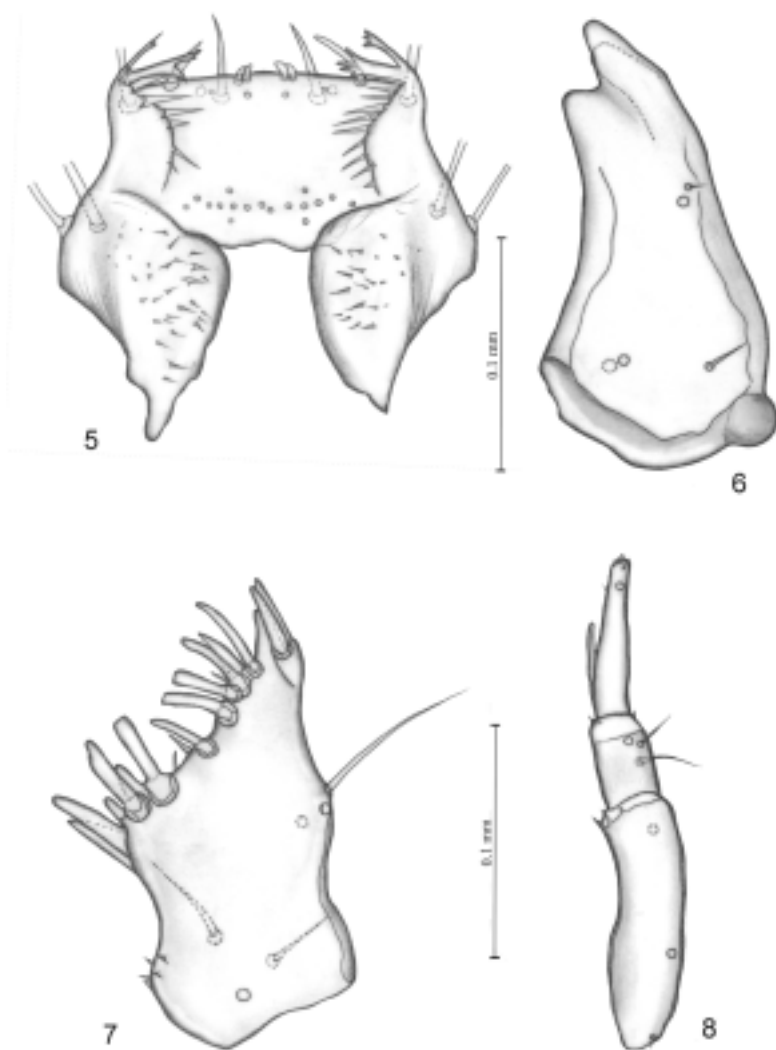
- . Length: 2.63-3.28 mm, head width: 0.59-0.74 mm, pronotum width: 0.66-0.83 mm. Structure of spiracles and terminal segments unknown, but probably different from that in *P. alutaceus* *P. cornutus* (GRAVENHORST).

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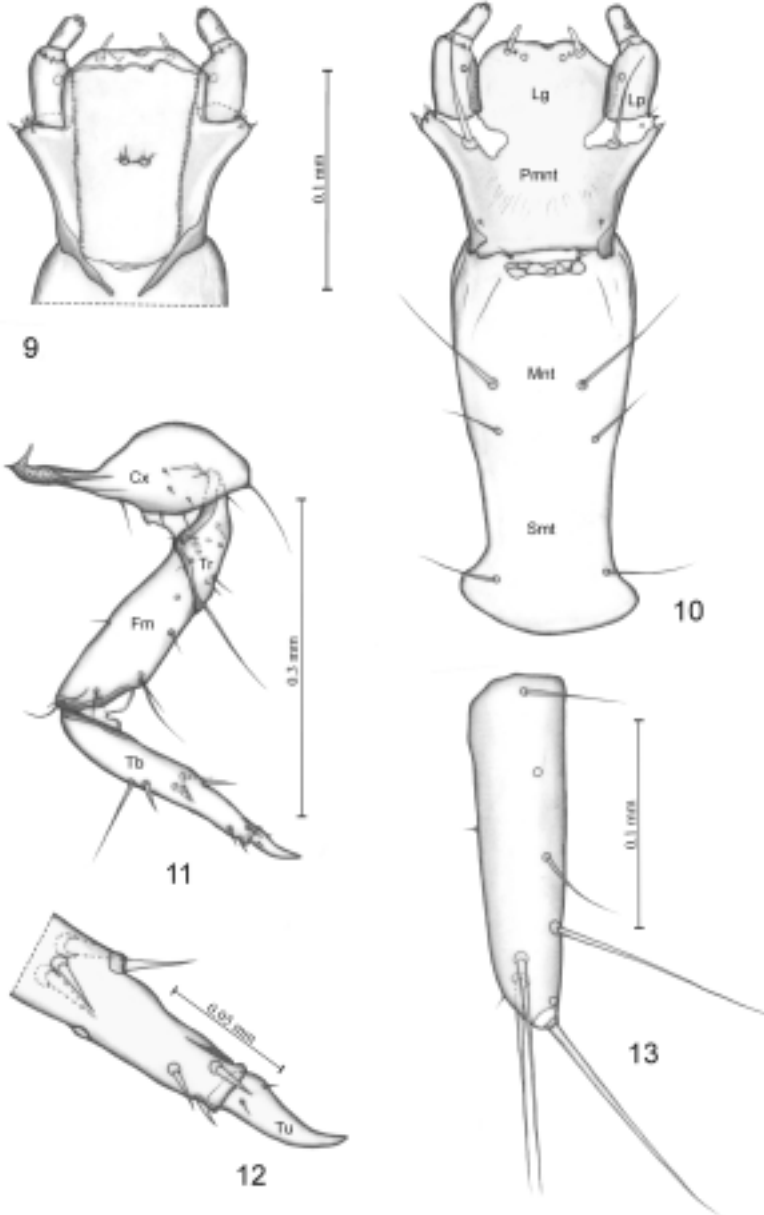
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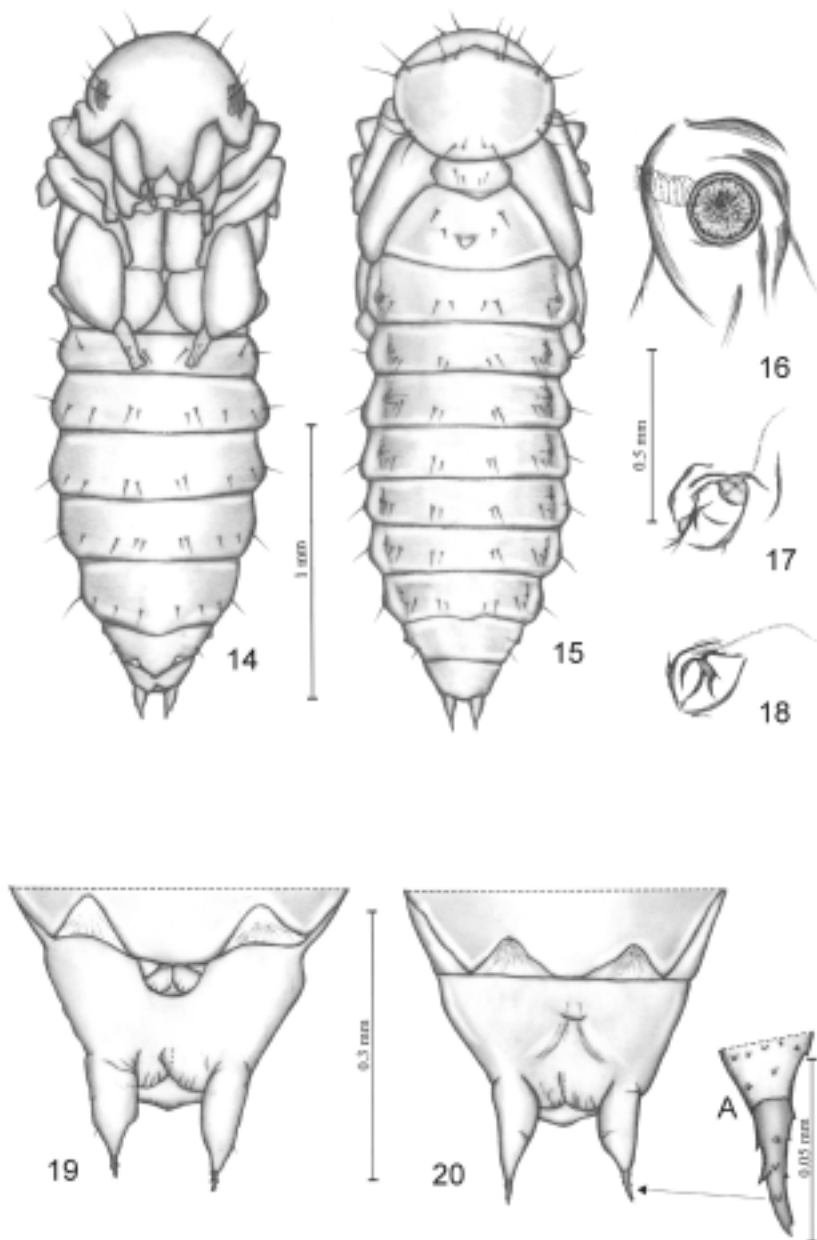
1-4. *Platystethus nitens*: 1.- egg chamber with cluster of four eggs; 2-4 - mature larva (L₃), 2 - general view; 3 - right antenna, dorsal view (So – solenidia, Sa – sensory appendages); 4 - labrum, dorsal view



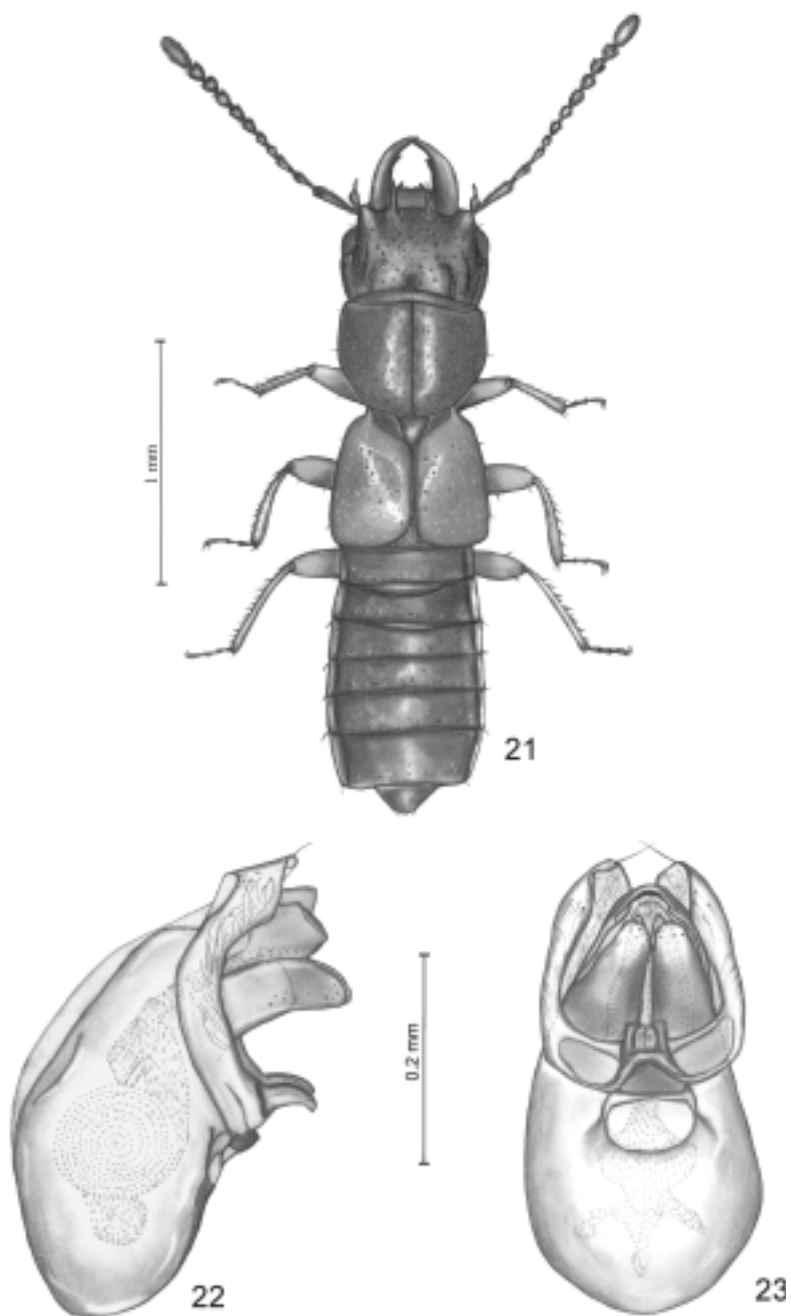
5-8. *Platystethus nitens*, mature larva. 5 – epipharynx, ventral view; 6 – right mandible, dorsal view; 7 – right mala, dorsal view 8 - right maxillary palp, dorsal view



9-13. *Platystethus nitens*, mature larva. 9 - hypopharynx, dorsal view, 10 - labium, ventral view (Lg - ligula, Pmnt - prementum, Mnt - mentum, Smnt - submentum); 11 - right foreleg, anterior view (Cx - coxa, Tr - trochanter, Fm - femur, Tb - tibia); 12 - apical part of foretibia with tarsungulus (Tu), anterior view; 13 - right urogomphus, dorsal view



14-20. *Platystethus nitens*, pupa. 14 - ventral view; 15 - dorsal view; 16- functional spiracles (first pair); 17 - atrophied spiracles (fourth pair); 18 - atrophied spiracles (sixth pair); 19 - terminal segment of female, ventral view; 20 - terminal segment of male with terminal process (A)



21-23. *Platystethus nitens*, adult. 21 - habitus of male; 22 - penis, lateral view; 23 - penis, ventral view