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## The egg and mature larva of *Anotylus insecatus* (GRAVENHORST, 1806) (Coleoptera: Staphylinidae)

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**ABSTRACT.** This paper presents a morphological description of the egg and mature larva (L<sub>3</sub>) of *Anotylus insecatus* (GRAVENHORST, 1806) with the detailed illustrations. Larvae are compared with well known larvae of closely related genera: *Oxytelus* (*O. fulvipes* and *O. piceus*) and *Platystethus* (*P. alutaceus*, *P. arenarius*, *P. cornutus* and *P. nitens*). Morphological larval characters show close relationship of the genera *Anotylus* (= *Oxytelus*) and *Oxytelus*.

**Key words:** entomology, morphology, Coleoptera, Staphylinidae, *Anotylus*, Oxytelini, egg, larva.

Immature stages of *Anotylus* THOMSON, 1859 are poorly known. Among 356 species (1 doubtful), described in the world, some information on only 8 larvae of the species of *Anotylus* have been provided so far. However, existing descriptions are often fragmentary and require detailed supplementations. The morphology of the larvae of *Oxytelus* and *Platystethus*, genera closely related to *Anotylus*, is described for 4 and 6 species, respectively (HAFEZ 1939, PAULIAN 1941, HINTON 1944, PALOMINO and DALE 1989, PIERRE 1944, POTOTSAKAYA 1965, 1967, LEGNER and MOORE 1977, STANIEC 1992, 1993, 1997, 2003, 2003a).

*Anotylus insecatus* (GRAVENHORST, 1806) is a widely distributed species known from almost whole Europe, Russia and Canada. In Poland it is recorded from a dozen or so localities. It is defined as eurytopic and phytodetríticol species. It most often occurs in gardens and fields, under stones and fragments of fallen trees, inhabiting rotten plant debris, compost heaps and leaf-litter (BURAKOWSKI et al. 1979, KOCH 1989, HERMAN 2001). This paper it is the first report on the preimaginal stages of *A. insecatus*, and includes the description of egg and mature larva (L<sub>3</sub>).

## MATERIAL AND METHODS

Material examined: 10 eggs, 9 mature larvae ( $L_3$ ).

The eggs and larvae of *Anotylus insecatus* were obtained by rearing adults ( $T=20^{\circ}\text{C} \pm 2$ ) identified by the second author. They were collected (2♂, 3♀) in Milejów (UTM-FB37; SE Poland, Wyżyna Lubelska Upland) on 29 May 2004 by sifting a compost heap in the garden. The imagines of *A. insecatus* were kept in Petri dishes (10 cm in diameter, 2 cm high), filled with rotten plant remains. The reared eggs and mature larvae were preserved in a 1:1 solution of glycerine and alcohol on June 16th 2004. For microscopic slides the punctured larvae were rinsed in distilled water, cleared in KOH and finally placed in glycerine. The surface sculpture of the egg chorion was observed on slides with glycerine. The drawings were made using camera lucida.

Abbreviations: Ll - length of larval body, Lh - length of larval head, La - antenna length, Lmn - mandible length, n - the number of specimens or samples.

## DESCRIPTION

## Egg (Fig. 1)

Length: 0.67-0.87 mm (mean 0.78 mm, n-9); width: 0.35-0.49 mm (mean 0.43 mm, n-10). Macroscopic aspect (Fig. 1): colour white, shape elongated oval; chorion thin with matt surface. Microscopic aspect: microstructure of chorion surface as in Fig. 1A, B; micropyle invisible. Under laboratory conditions the eggs were present in clusters of six (n-4) from 19 VI 2005.

## Third instar larva (Figs 2-35)

Body length (from anterior margin of labrum to the end of pygopod): 3.78-4.25 mm (mean 4.17 mm); head width (between stemmata): 0.56-0.59 mm (mean 0.58 mm); pronotum width: 0.55-0.59 mm (mean 0.56 mm).

Colour: body lemon yellow, head yellowish brown with brown or dark brown stemma, mandibles and maxillae light brown, antennae and legs yellowish brown, urogomphi brown at the base and darker apically (blackish brown or black).

Body elongate, moderately flattened, head as wide as prothorax; meso-, and metathorax almost equal of width, shorter than prothorax (Figs 2, 19, 20). Macro- and micro setae of all body simple.

Head: almost as long as wide, side margins rounded; dorsal ecdysial lines bifurcate behind half of head length (Fig. 3). Chaetotaxy of epicranial (E) part with 22-24 setae: 14-16 macro and 8 micro and 2-4 pores (Fig. 3); microstructure of head as in Fig. 3A. Each side of head with 1 pale stemma (Fig. 4, 4A). Frons (Fr) in broad outline triangular, with 16 setae and 2 pores (Figs 2, 3).

Antenna 3-segmented (Figs 5, 6), length ratio of segments I-III 1.7:2.5:1 respectively (Fig. 5); segment I almost 1.4 times as long as wide, with 4 pores; one ventro-basally, one dorsally and two apically; segment II twice as long as wide with 3 macro setae (1 ventrally, 1 dorsally and 1 on inner margin); 3 sensory appendages of various size: two semispherical (Sa1 - biggest with ring, latero-apically, Sa3 - smaller, ventro-apically)

and one tiny, dome shaped ventrally - Sa2; one, tiny solenidium; segment III 1.8 times as long as wide, with 3 setae and 4 solenidia (So1-4) apically (one solenidium wider at the base, finger shaped), length ratio of sensory appendage Sa1 and segment III: 1:2.

Labrum trapeziform, distinctly narrowed anteriorly, with 4 more sclerotized areas (Sca), its base about 2.6 times wider than anterior margin; with 12 setae (2 near anterior margin), 2 pores anteriorly and two bunches of appendages in the anterior corners (Fig. 7).

Epipharynx (Fig. 8) with 4 pores, tiny appendages arranged in 2 rows vertically and two groups posteriorly, microtrichia in two rows vertically. Mandible (Figs 9, 10) rather short and stout; almost 2 times as long as wide at the base; with 3 teeth apically, two setae, two pores dorsally; surface especially between setae with distinct protuberances dorso-laterally.

Maxilla (Fig. 11): cardo triangular, divided into two parts, 1.5 times as long as wide, bearing 1 seta ventrally; stipes almost as long as wide (in the widest place) with 2 setae (1 on outer margin, 1 dorsally) length ratio of cardo (Cd) and stipes (St) 1:1.2. Mala (Ma) (Figs 11-14) elongated, separated from stipes, partially at least, 3 times as long as wide, with 3 setae (one on the inner and outer margins, and one ventrally) and 2 pores; adoral margin with about 22-28 articulated spines and non-articulated, usually blunt, denticles and bunch of setae apically, sporadically the second bunch of a few setae below the lowest denticle or spine visible. Palpifer (Pf) (Fig. 11) with 1 seta ventrally. Maxillary palp (Pm) 3-segmented (Fig. 11); length ratio of segments I-III: 1.7:1:2.3 respectively; segment I 1.8 times as long as wide, with 1 micro setae basallo-laterally, one pore and about 6 tiny appendages apically; segment II 1.4 times as long as wide, with 2 setae and 2 pores; segment III 5.8 times as long as wide, with 1 digitiform sensory appendage basally on outer margin, one pore and a few micro sensory appendages on the apex, the length ratio of segment III and digitiform sensory appendage 4.3:1 respectively.

Hypopharynx: with scale-like microstructure anteriorly, 4 pores and numerous microtrichia apically (Fig. 15). Labium (Figs 16, 17): submentum (Smnt) trapeziform with 2 setae; mentum (Mt) with 4 setae, prementum (Pmnt) with 4 setae, 2 pores and a pair of few tiny appendages at the upper corners. Ligula (Lg) domed; separated from prementum by membranous band, 1.2 times as wide as long, with 2 setae and a few micro appendages at broadly rounded apex; the length ratio of prementum and ligula 1.4:1. Labial palps (Pl) (Figs 16, 18) 2-segmented; length ratio of segments I and II 1.8:1; segment I with one pore ventrally and a row of appendages in a curved line dorsally; segment II with a few micro sensory appendages apically, the ratio length of labial palps and ligula: 1.5:1.

Thorax: pro-, meso-, and metanotum (Figs 19, 20) with mid-longitudinal ecdysial line, chaetotaxy of meso- and metathorax similar; pronotum with 28-32 (14-16×2) setae and 10 pores; mesonotum with 20-24 setae and 6 pores. Ventral side of pronotum with 12 setae (Fig. 21); mesosternal areas with 10 setae (4 micro) (Fig. 22). The area between pro- and mesothorax with a pair of functional spiracles (Sp); 1 macro setae above each spiracle (Figs 19, 23). Each mesothoracic pleurite (Pl) with 1 seta and 1 sensillum; episternum (Es) of prothorax and mesothorax with 3 and 2 setae respecti-

vely, epimerum (Em) of prothorax and mesothorax each with one seta and two sensilla (Figs 19A, 23).

Foreleg (Figs 24, 25): coxa (Cx) with 7 setae, trochanter (Tr) with 7 setae and a few sensilla medially, femur (Fe) with 7 setae and 2 pores, tibia (Tb) with 9 setae (8 spine-shaped), one pore and 2 tiny cuticular processes anteriorly; tarsungulus (Tu) slightly curved with 2 spine-shaped setae. Length ratio of profemur, protibia and protarsungulus about 2.2:2.5:1 respectively.

Abdomen: segment I (Figs 26-28): tergite with 24 setae (2 tiny, weekly visible, anteriorly), 6 pores and 4 sensilla; paratergite (Pt) and parasternite (Ps) with 2 and 1 setae, respectively, one sensillum on parasternite; sternite with 12 setae (2 tiny, weekly visible, anteriorly). Segments II-VIII (Figs 29-30): tergites as on segment I; paratergite with 1 macro seta; sternite with 20 setae (2 tiny, weekly visible, anteriorly) and 2 sensilla. Abdominal segments I-VIII each with a pair of spiracles (Sp) between tergite and paratergite (Figs 26A, 27, 29). Microstructure of tergites of segments I-VIII as in Fig. 31A. Tergite and sternite of segment IX fused into uniform ring with 4 setae, 4 pores and 12 setae (2 tiny, anteriorly) respectively (Figs 31, 33); microstructure of segment IX and X as in Figs 31B, 33A.

Segment IX with a pair of one-segmented urogomphi (Figs 31, 32, 35). Urogomphus broadest at the base and distally narrowed, 4.6 times longer than broad, with 8 setae: 5 dorsally (three of them very long) and one apically and 2 pores.

Pygopod (segment X) short (Figs 31, 32, 34), ratio width to length 1.4; dorsal side of pygopod with 2 long setae posteriorly and a pair of sensillum; ventral side with 10 setae and two pores. Urogomphi longer than pygopod, length ratio of urogomphus (without seta apically) and pygopod 1.1-1.3:1.

#### TAXONOMIC REMARKS

Eggs analysis. In the whole Oxytelini the egg of only five species of a single genus *Platystethus* are known from literature. With respect to size and number of egg deposited in each egg-chamber *A. insecatus* (length: 0.67-0.87 mm; width: 0.35-0.49 mm) is the most similar to *P. alutaceus* (length: 0.62-0.71 mm; width: 0.34-0.45 mm). Female of both species lay eggs in cluster containing a few, 6 and 4 eggs, respectively.

Larval analysis. The combination of morphological characters that allows to distinguish the larvae of the genus *Anotylus* from known larvae of other genera of Oxytelinae is as follow: 1. body lightly sclerotized, urogomphi with dark (blackish brown or black) apexes; 2. antenna: length ratio of segments I-III 1.7:2.5:1 respectively, segment I, II and III as long as wide: almost 1.4, 2 and 1.8 times respectively, length ratio of sensory appendage Sa1 and segment III: 1.2; 3. labrum distinctly narrowed anteriorly, side margins strongly incised, with 4 more sclerotized areas; 4. epipharynx as in Fig. 8; 5. mandible rather short and stout; almost 2 times as long as wide at the base, with 3 teeth apically, surface especially between setae with distinct protuberances; 6. mala elongated, separated from stipes partially at least, adoral margin with one or two bunches of setae; 7. maxillary palp: length ratio of segments I-III: 1.7:1:2.3 respectively, segment

I, II and III as long as wide: 1.8, 1.4 and 5.8 times; 8. hypopharynx: with scale-like microstructure anteriorly; 9. labium: submentum separated from mentum; 10. ligula domed, separated from prementum, 1.2 times as wide as long, apex broadly rounded; 11. labial palps: length ratio of segments I and II 1.8:1; the ratio length of labial palps and ligula: 1.5:1; 12. urogomphi straight, broadest at the base and distally narrowed, 4.6 times longer than broad, slightly longer than pygopod, length ratio of urogomphus (without seta apically) and pygopod 1.1-1.3:1; 13. pygopod (segment X) short, ratio width to length 1.4; 14. body length: 3.78-4.25 mm, head width: 0.56-0.59 mm.

Table 1. Contribution to the knowledge of morphology of immature stages of species of tribe Oxytelini, genera: *Anotylus*, *Oxytelus* and *Platystethus*; E - egg, L - larva, P – pupa

species	references	stages
<i>Anotylus hybridus</i> (EPPELSHEIM, 1878)	POTOTSAKAYA 1967	L
<i>A. insecatus</i> (GRAVENHORST, 1806)	present study	E, L
<i>A. inustus</i> (GRAVENHORST, 1806)	PAULIAN 1941; POTOTSAKAYA 1967	L
<i>A. latiusculus</i> KRAATZ, 1859	HAFAZ 1939	L
<i>A. micans</i> KRAATZ, 1859	PAULIAN 1941	L
<i>A. rugosus</i> (FABRICIUS, 1775)	PAULIAN 1941; POTOTSAKAYA 1967; KASULE 1968; TOPP 1978	L
<i>A. sculpturatus</i> (GRAVENHORST, 1806)	MULSANT & REY 1878; PAULIAN 1941; POTOTSAKAYA 1967	L
<i>A. tetracarinatus</i> (BLOCK, 1799)	POTOTSAKAYA 1967	L
<i>Oxytelus bengalensis</i> ERICHSON, 1840	PAULIAN, 1941	L
<i>O. fulvipes</i> ERICHSON, 1839	STANIEC 1997	L
<i>O. incisus</i> MOTSCHULSKY, 1857	PAULIAN 1941	L
<i>O. piceus</i> (LINNAEUS, 1767)	STANIEC 1992	L
	STANIEC 1993	P
<i>Platystethus alutaceus</i> (THOMSON, 1861)	STANIEC 2003	E, L, P
<i>P. americanus</i> ERICHSON, 1840	HU & FRANK 1995	E, P
	PAULIAN 1941; POTOTSAKAYA 1965; HU & FRANK 1995	L
<i>P. arenarius</i> (GEOFFROY, 1785)	WESTWOOD 1838; HINTON 1944; POTOTSAKAYA 1967; KASULE 1968; TOPP 1978; STANIEC 2003	L
	WESTWOOD 1838; STANIEC 1993	P
<i>P. cornutus</i> (GRAVENHORST, 1802)	STANIEC 1993	E, P
	PIERRE 1944; POTOTSAKAYA 1965, 1967; STANIEC 1993; STANIEC 2003	L
<i>P. nitens</i> (C. SAHLBERG, 1832)	STANIEC 2003a	E, L, P
<i>P. spiculus</i> ERICHSON, 1840	LEGNER and MOORE 1977; PALOMINO & DALE 1989	L
	PALOMINO & DALE 1989	P

At the generic level within the tribe Oxytelini, descriptions hitherto published allow for comparisons of characters between *Oxytelus* and *Platystethus* only, represented by two and four species, respectively (STANIEC 1992, 1997, 2003, 2003a). The other studies of immature stages, concerning mainly *Anotylus*, prepared mainly by PAULIAN, 1941, POTOTSAKAYA, 1967, KASULE, 1968, contain poor diagnoses and are too superficially illustrated to be useful in comparative analysis (Tab. 1).

The several larval differences found between species from *Anotylus*, *Oxytelus* and *Platystethus* are summarised in Tab. 2. *Anotylus insecatus* shares most of designated characters with species of *Oxytelus*. Larvae of studied species of *Anotylus* and *Oxytelus* differ in the following characters of the structure of labrum: character 2. number of sclerotized areas (four in *Anotylus*), char. 3. shape of anterior margin (concave in *Anotylus*), char. 4. shape of appendages in corners on anterior margin (branched in *Anotylus*) and colour of urogomphi, character 14 (contrasting in *Anotylus*). *Anotylus* and *Platystethus* differ in all 14 characters listed in Tab. 2. According to the present study, morphological larval characters show far closer relationship of the genus *Anotylus* (= *Oxytelus*) with *Oxytelus*, than with *Platystethus*. The generic divisions in the tribe Oxytelini are based on characters of adults, but to study the phylogenetic relationships using larval morphology is premature as more such data is essential.

Larval characters:

1. *Labrum, shape*: (0) distinctly narrowed to anterior margin, basal part two or more times broader than anterior margin; (1) slightly narrowed to anterior margin, basal part less than 1.5 times broader than anterior margin.
2. *Labrum, number of sclerotized area*: (0) 3; (1) 4.
3. *Labrum, shape of anterior margin*: (0) concave; (1) at least slightly convex.
4. *Labrum, shape of appendages in corners on anterior margin*: (0) thin, not branched; (1) thin, some of them branched; (2) thick, branched.
5. *Epipharynx, four, thick micro setae on anterior margin*: (0) absent; (1) present.
6. *Mandible, microstructure on dorso-basally surface*: (0) absent; (1) present.
7. *Labium, mentum and submentum*: (0) separated; (1) fused.
8. *Labium, prementum and ligula*: (0) separated; (1) fused.
9. *Ligula, shape of anterior margin*: (0) rounded; (1) concaved.
10. *Maxilla, digitiform appendage on maxillary palp segment III*: (0) distinctly long, maxillary palp segment III not more than 3 times longer than digitiform appendage; (1) distinctly short, maxillary palp segment III more than 3.5 times longer than digitiform appendage.
11. *Maxilla, length ratio of maxillary palp segment III:II*: (0) less than 2; (1) more than 2.
12. *Mala, bunch of setae on adoral margin*: (0) absent; (1) present.
13. *Mala, number of spines and denticles on inner margin*: (0) less than 20; (1) more than 21.
14. *Urogomphi, colour*: (0) homogenous, without contrast between basal and apical part; (1) contrasting, light at base and distinctly darker apically.

Table 2. Differences among some known larvae of *Anotylus*, *Oxytelus* and *Platystethus*.

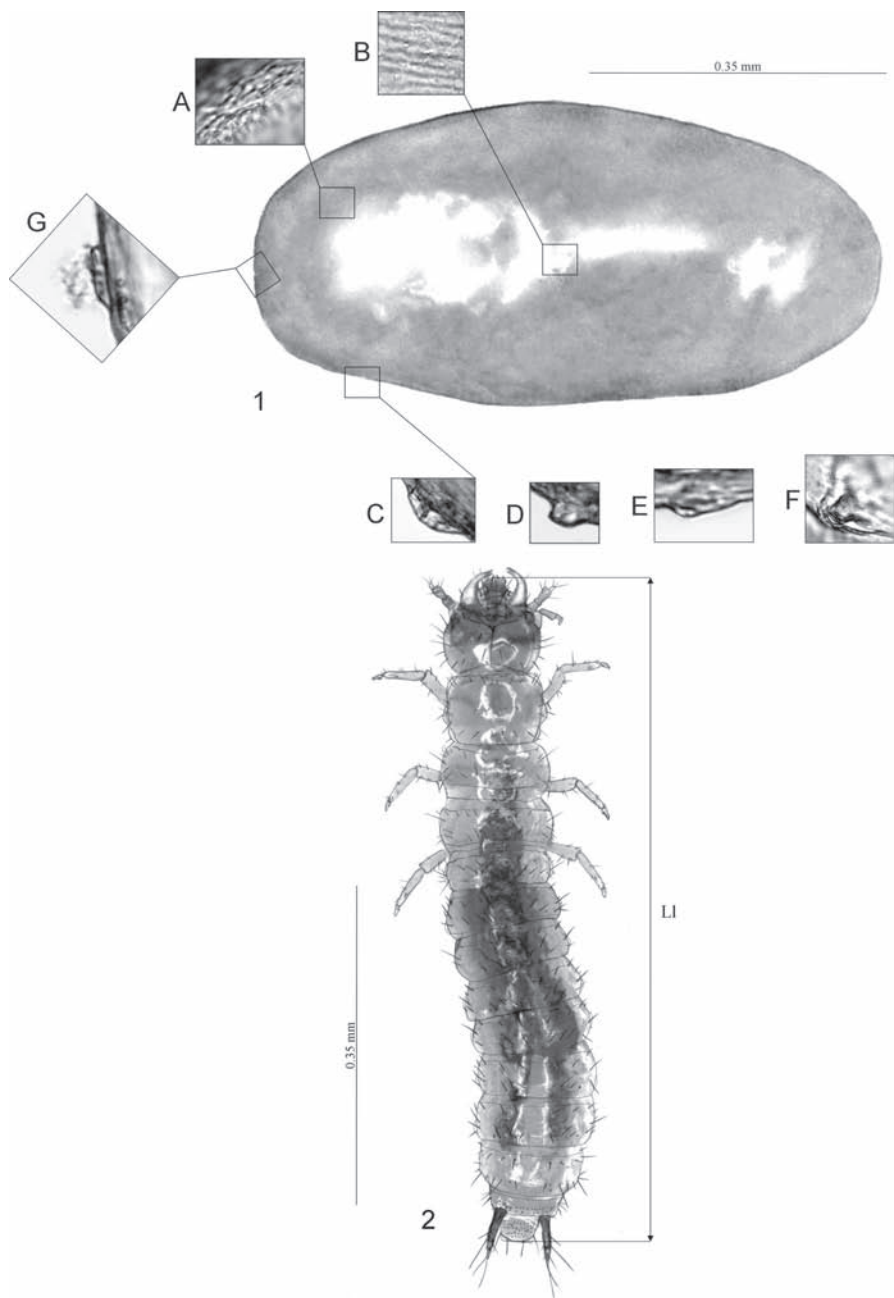
Taxon/node	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Anotylus insecatus</i>	0	1	0	1	0	1	0	0	0	1	1	1	1	1
<i>Oxytelus (Oxytelus) fulvipes</i>	0	0	1	0	0	1	0	0	0	1	?	1	1	0
<i>O. (Oxytelus) piceus</i>	0	0	1	0	0	?	0	0	0	1	1	1	1	?
<i>Platystethus (Craetopycrus) alutaceus</i>	1	0	1	2	1	0	1	1	1	0	0	0	0	0
<i>P. (Platystethus) arenarius</i>	1	0	1	2	1	0	1	1	?	0	0	0	0	0
<i>P. (Craetopycrus) cornutus</i>	?	0	1	2	1	0	?	1	1	0	0	0	0	0
<i>P. (Craetopycrus) nitens</i>	1	0	1	2	1	0	1	1	1	0	0	0	0	0

## REFERENCES

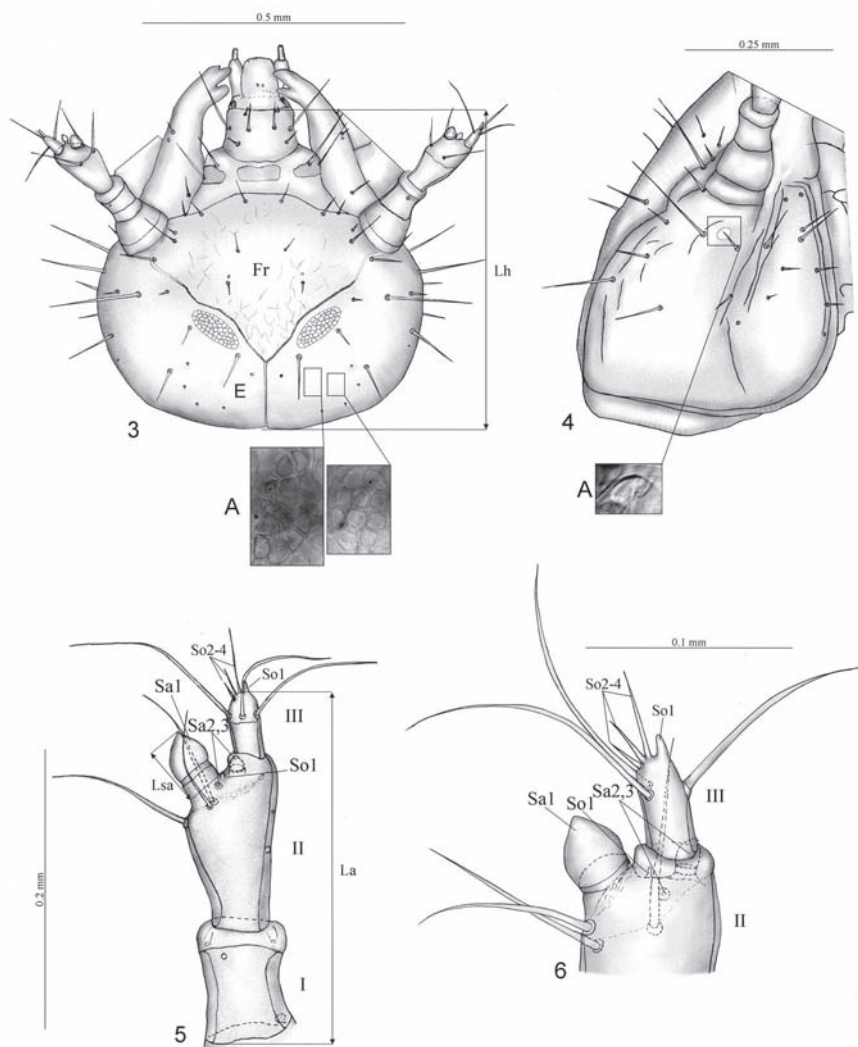
- BURAKOWSKI, B., MROCZKOWSKI, M., STEFAŃSKA, J., 1979. Katalog Fauny Polski. Chrząszcze (Coleoptera). Kusakowate (Staphylinidae). Część 1. Polska Akademia Nauk. Warszawa, **30**: 1-310.
- HAFEZ, M., 1939. The external morphology of the full grown larva of *Oxytelus latiusculus* KR. Bull. Soc. Fouad Entomol., **1939**: 333-338.
- HERMAN, L. H., 2001. Catalog of the Staphylinidae (Insecta: Coleoptera) 1758 to the end of the second Millennium. VI. Staphylininae group (Part 3). Bull. Amer. Mus. Nat. Hist., **265**: 3021-3839.
- HINTON, H. E., 1944. Some general remarks on sub-social beetles, with notes on the biology of the Staphylinid, *Platystethus arenarius* (Fourcroy). Proc. Roy. Entomol. Soc. London (A), **19**: 115-128.
- HU, G. Y., & FRANK J. H., 1995. New distributional Records for *Platystethus* (Coleoptera: Staphylinidae: Oxytelinae) with Notes on the Biology of *P. americanus*. Florida Entomol., **78** (1): 137-144.
- KASULE, F. K., 1968. The larval characters of some subfamilies of British Staphylinidae (Coleoptera) with keys to the known genera. Trans. Roy. Entomol. Soc. London, **120** (4): 115-138.
- KOCH, K., 1989. Die Käfer Mitteleuropas. Ökologie. 1. Goecke & Evers. Krefeld, 1: 1- 440.
- MULSANT, E., REY, C., 1878. Tribu des brévipennes. Cinquième famille: Oxyporiens. Sixième famille: Oxyteliens. Ann. Soc. Agr. Hist. Nat. Arts Lyon, **4**: 443-850.
- LEGNER, E. F., MOORE, J., 1977. The larva of *Platystethus spiculus* ERICHSON (Coleoptera; Staphylinidae) and its occurrence in bovine feces in irrigated pastures. Psyche, **84**: 158-164.
- PALOMINO, F. L., DALE L. W. E., 1989. *Platystethus spiculus* (Coleoptera; Staphylinidae) predator de huevos de mosca doméstica. Rev Peruana Entomol., **31**: 39:45.
- PAULIAN, R., 1941. Les premiers états des Staphylinoides (Coleoptera) étude de morphologie comparée. Mém. Mus. Nat. Hist., **15**: 1-361.
- PIERRE, F., 1944. Description de la larve de *Platystethus cornutus* GRAV. et aperç de sa Biologie. Rev. Fr. Entomol., **10**: 170-174.
- POTOTSKAYA, V. A., 1965. Lichinki zi rodov *Coprophilus* LATREILLE i *Platystethus* MANNERHEIM (Coleoptera; Staphylinidae). Zool. Zh., **44**: 877-882.
- , 1967. Opređelitel' lichinok korotkonadkrylykh zhukov evropeiskoi chasti SSSR. Akademiya Nauk SSSR, Izdatel'stvo Nauka, Moskva. 120 pp.
- STANIEC, B., 1992. The morphology of the Larva of *Oxytelus piceus* (LINNAEUS, 1767) (Coleoptera, Staphylinidae). Annales UMCS, C, **47** (3): 31-39.
- , 1993. Morphology of the preimaginal instars of *Platystethus cornutus* (GRAVENHORST, 1802) (Coleoptera, Staphylinidae), with remarks on its bionomics and ecology. Pol. Pismo Entomol., **62**: 13-23.
- , 1997. A description of the matura larva of *Oxytelus fulvipes* ERICHSON, 1839 (Coleoptera: Staphylinidae). Genus, Wrocław, **8**: 611-620.
- , 2003. Description of the egg, larva and pupa of *Platystethus alutaceus* (THOMSON, 1861) (Coleoptera; Staphylinidae). Genus, Wrocław, **14**: 27-41.
- , 2003a. Developmental stages of *Platystethus nitens* (C. SAHLBERG, 1832) (Coleoptera; Staphylinidae). Genus, Wrocław, **14**: 345-355.

- TOPP, W., 1978. Bestimmungstabelle für die Larven der *Staphylinidae*, pp. 304–334. In: B. KLAUSNITZER (ed.). Ordnung Coleoptera (Larven). Dr. W. Junk Publishers, The Hague.
- WESTWOOD, J. O., 1838. An introduction to the modern classification of insects; founded on the natural habits and corresponding organisation of the different families. xii + 1–462. London: Longman, Orme, Brown, Green, and Longmans.

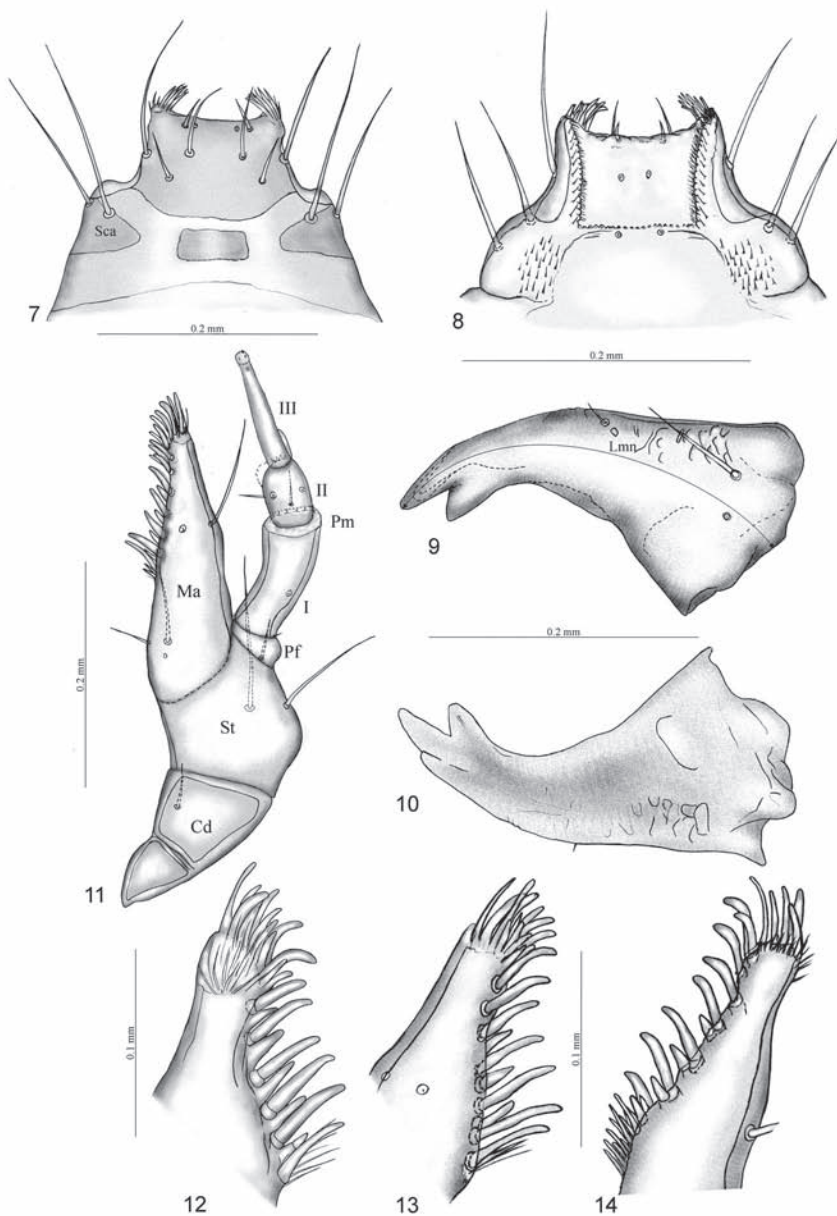




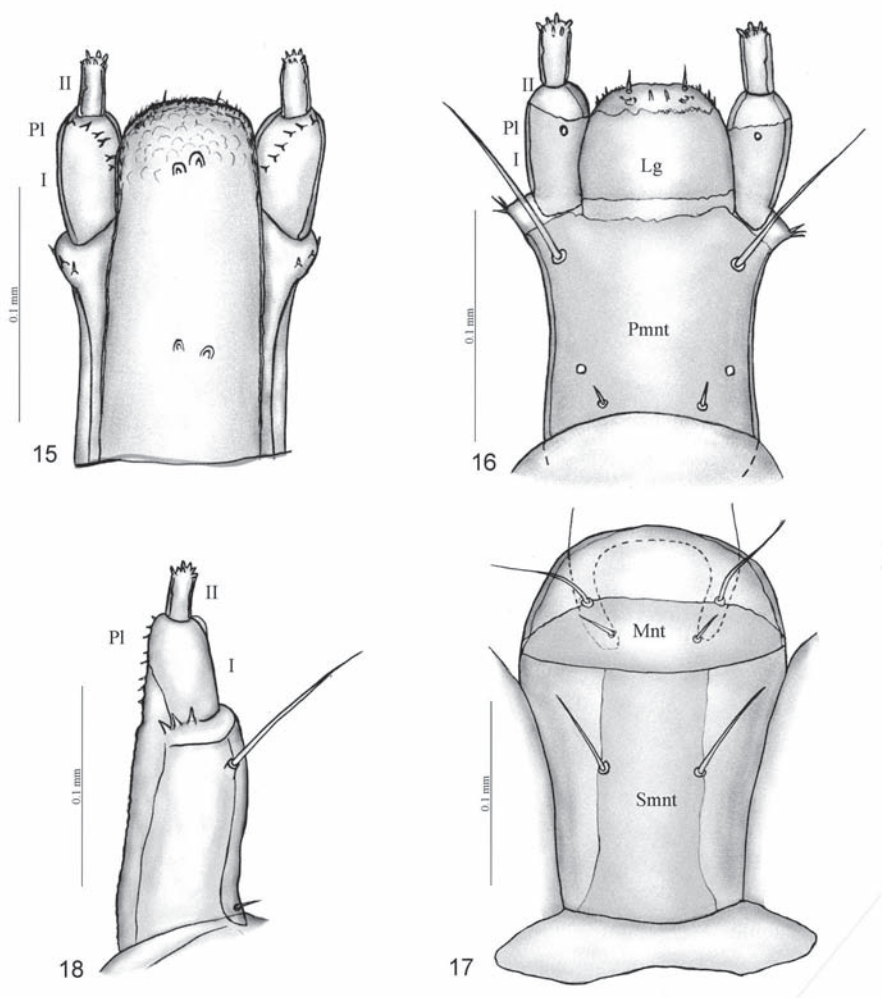
1, 2. *Anotylus insecatus*. 1, egg; 2, mature larva (habitus); 2A-G, microstructure of egg



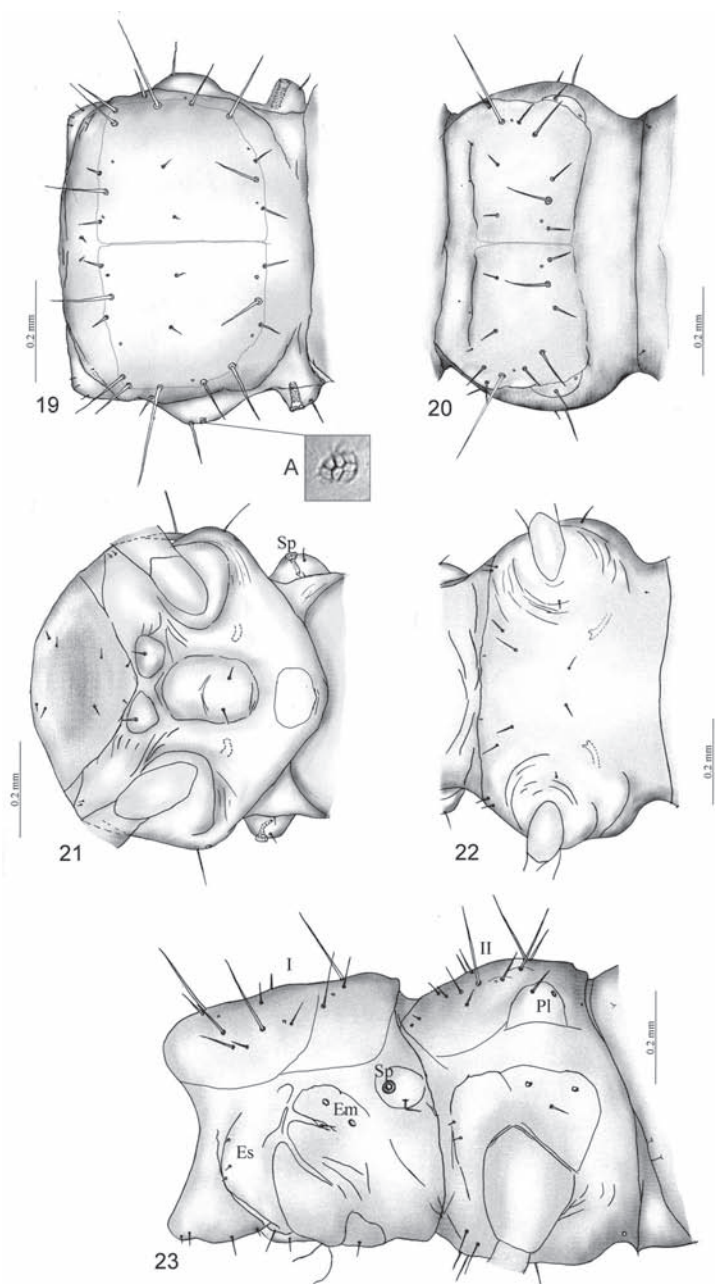
3-6. *A. insecatus*, mature larva, head. 3, dorsal view with microstructure (3A); 4, lateral view with stemma (4A); 5, right antenna in dorsal aspect; 6, apical part of right antenna in dorsal aspect. Abbreviations: Fr, frons; E, epicranium; I-III, antennal segments; Sa, sensory appendage; So, solenidia



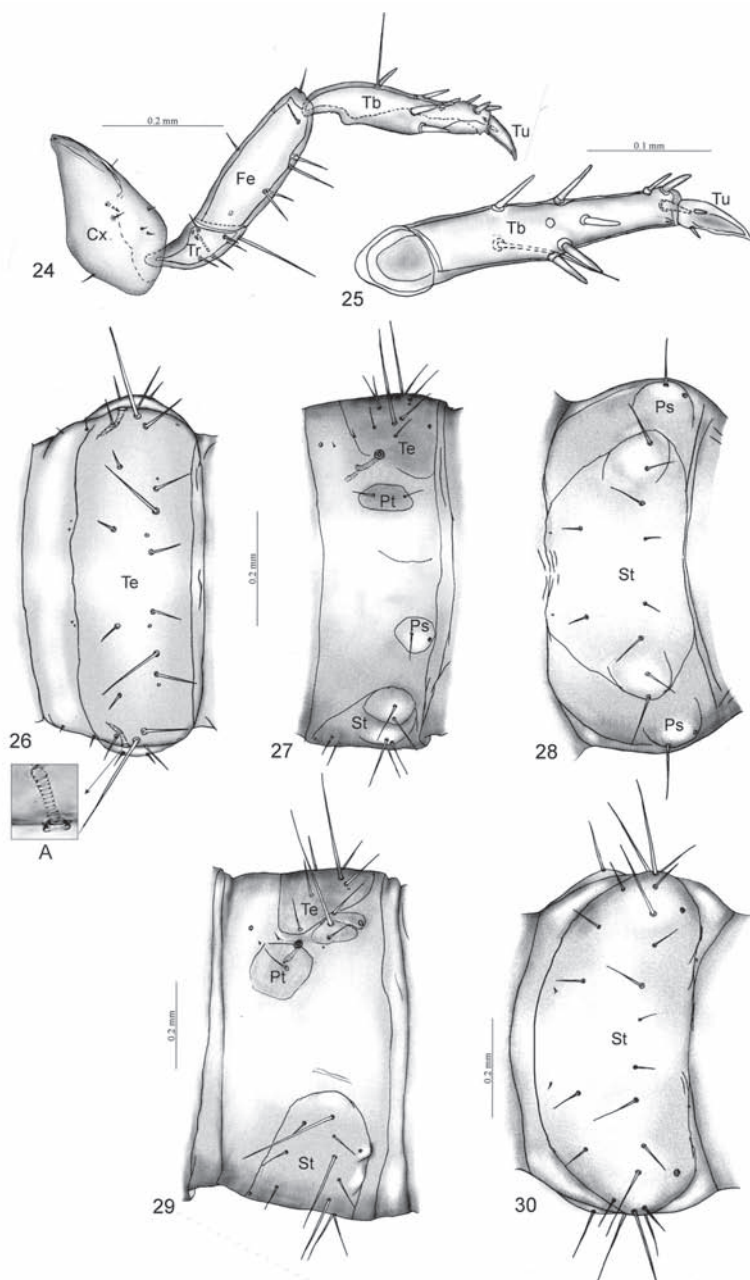
7-14. *A. insecatus*, mature larva. 7, labrum, dorsal view; 8, epipharynx; 9, 10 right mandible dorsal view (9) and ventral view (10); 11, right maxilla dorsal view; 12-14, adoral margin of mala; left, dorsal view (12, 13); left, ventral-lateral view (14). Abbreviations: Sa, sclerotized areas; Cdo, cardo; Stp, stipes; Ma, mala; Pf, palpifer, Pm, maxillary palp; I-III, segments of maxillary palp



15-18. *A. insecatus*, mature larva. 15, hypopharynx; 16, 17, labium, ventral view; 18, labial palp. Abbreviations: Lg, ligula; Pl, labial palp; Pmnt, prementum; Mnt, mentum; Smnt, submentum; I-II, segments of labial palp

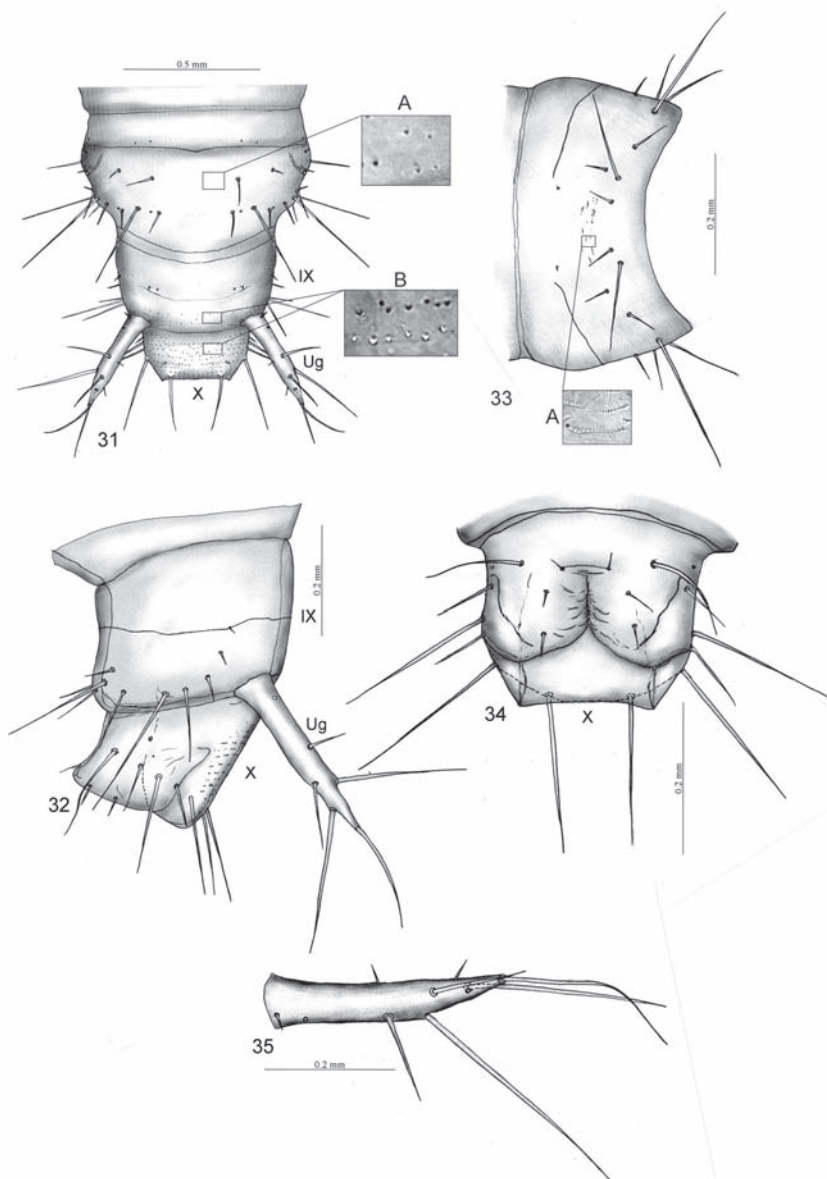


19-23. *A. insecatus*, mature larva. 19, 20, thorax segment I (19) and segment II (20) with sensilla (19A), dorsal view; 21, 22, thorax segment I (21) and segment II (22) ventral view; 23, thorax lateral view. Abbreviations: Pl, pleurite; Es, episternum; Em, epimerum; Sp, spiracle



24-30. *A. insecatus*, mature larva. 24, 25, fore leg; 26-28, abdominal segments I, dorsal view (26), lateral view (27), ventral view (28) with spiracle (26A); 29, 30, abdominal segments II, lateral view (29), ventral view (30). Abbreviations: Cx, coxa; Tr, trochanter; Fe, femur; Tb, tibia; Ts, tarsungulus; Te, tergite; Pt, paratergite; St, sternite; Ps, parasternite





31-35. *A. insecatus*, mature larva. 31, abdominal segments VIII, IX and X, dorsal view with microstructure on segment VIII (31A) and segment IX, X (31B); 32, abdominal segments IX and X, lateral view; 33, abdominal segment IX, ventral view with microstructure (33A); 34, abdominal segment X, ventral view; 35, right urogomphus, dorsal view. Abbreviations: Ug, urogomphus