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Morphology of the mature larva and pupa of *Bagous subcarinatus* GYLLENHAL, 1836 (Coleoptera: Curculionidae)

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ABSTRACT. The mature larva and pupa of *Bagous subcarinatus* GYLL. have been described for the first time. Diagnostic characters of the *Bagous* larva and *Bagous subcarinatus* larva are given.

Key words. *Coleoptera*, *Curculionidae*, *Bagous subcarinatus,* morphology, larva, pupa.

Seventy two species of the genus *Bagous* GERMAR have been described from Palearctic so far, 21 of which have been recorded from Poland (BURAKOWSKI et al. 1995). The insects under discussion are tiny, rarely medium sized beetles (2-6 mm long). Except for a few species they are associated with aquatic plants in lakes, ponds, old river-beds and slow-flowing waters, according to SCHERF (1964), do not often enter below water-surface. Within the above-mentioned genus, some information on the morphology of larvae of only 6 species (*B. collignensis* HERBST, *B. nigritarsis* THOMSON, *B. nodulosus* GYLLENHAL*, B. binodulus* HERBST, *B. glabrirostris* HERBST and *B. australasiae* BLACKBURN) and pupae of 5 species has been provided so far. However, only the descriptions of the larvae of *B. collignensis* and *B. australasiae* are illustrated. In the remaining cases the descriptions of the *Bagous* preimaginal stages are very fragmentary and without illustrations (SCHERF 1964, MAY 1994).

Bagous subcarinatus GYLL. is recorded from North and Central Europe, and also from Morocco, Caucasus and Central Asia. In Poland it is known from a few

regions, but rather rare and locally collected (BURAKOWSKI et al., 1995). The weevil in comparison with other species of this genus is easily distinguishable by relatively very slender tarsi and always small, well separated whitish spots in the back of elytra. Its biology is rather well-known. As the host plant of adults *Ceratophyllum submersum* L. is mentioned (SHERF 1964, SMRECZYŃSKI 1972). In laboratory condition the feeding larvae of *B. subcarinatus* on this plant have also been observed (authors' data). According to DIECKMANN (1961) the trophic connection of the beetles with *Glyceria maxima* (HARTM.) is also possible. Like the greater majority of the *Bagous* species, *B. subcarinatus* leads a subaqueous mode of life, and consequently, its full development takes place under water-surface. However, in the late summer (August, September), the adults often leave water biotopes. During this period they have been repeatedly collected on coastal plants out of water (BURAKOWSKI et al., 1995). Adults overwinter in plant remains on the banks of water bodies. In spite of the well recognized life-cycle, the morphology of the preimaginal stages of *B. subcarinatus* has not been described yet.

MATERIAL AND METHODS

Mature larvae and pupae of *B. subcarinatus* were collected in Gródek near Hrubieszów (CE Poland) on the 19th of August 2002. They were obtained by sifting heap of hornwort (*Ceratophyllum demersum* L.) extracted from water of old river-bed of the River Bug. In order to determine the development stages of *B. subcarinatus* correctly, 2 larvae and 3 pupae were kept alive until pupation (larvae), and in the case of the pupae until the emergence of adults. They were determined by the first author. The preimaginal stages were preserved in a 1:1 solution of glycerine and alcohol. For microscopic slides punctured larvae and pupae were rinsed in distilled water and cleared in chloralphenol and finally placed in Berlese's liquid. The drawings were made using camera lucida. In the morphological description of the larva and pupa the terminologies of SCHERF (1964) and MAY (1994) were applied.

Material examined: 6 mature larval instars (L_3 probably), 9 pupae.

RESULTS

Larva of the genus *Bagous*

DIAGNOSIS. 1 – body moderately slender, 2 – setal numbers greatly reduced (Fig. 1), 3 – abdominal segments VIII, IX forming a dorsally concave disc with several long setae marginally, 3 – head and pronotum pigmented, 4 – head with frontal suture distinct (Fig. 2), 5 – dorsal epicranial setae des_2 located in frontal suture, 6 – antennae broadly conical, short (Fig. 4), 7 – ocelli present or absent, 8 – labrum more or less truncate, with 4 or 6 macro setae (Fig. 5), 9 – mandibles sharply bifid, short and broad (Fig. 7), 10 – labial palp one-segmented, 11 – ligula concave (Figs 10, 11), 12 – spiracles bicameral, those of abdominal segment VIII dorsal (Figs 1f, 1g), 13 – anus ventral (Fig. 13).

Larva (Figs 1-13)

Length: 4.10-5.00 mm, head width: 0.52-0.57 mm; body slightly curved, light yellow, head light brown, pronotum grayish-brown, setae brown (Fig. 1). Cuticule minutely spiculate. Head subglobose with macro, micro setae, setal sensillae, pores and one ocellus (oc) on each side latero-posteriorly (Figs 2, 3). Macro setae of head: 6 dorsal epicranial setae (2 des_1, 2 des_2, 2 des_4), 2 frontal setae (fes_2), 2 lateral epicranial setae (les_2). Front with 3 pairs of setal sensillae and 2 pairs of micro setae. Distribution of micro setae, setal sensillae and pores of remaining part of head as in Fig. 3. Antenna (Fig 4): basal membranous area with 3 setal sensillae and 1 pore. Clypeus and labrum (Fig. 5): clypeus (cl) 2.6 x as wide as long with 6 setal sensillae; labrum (lrm) about 4.6 x as wide as long with 6 labial setae (lrms) and 1 setal sensilla postero-medially. Epipharynx (Fig. 6) with 4 short, thick, blunt antero-median setae (ams), 6 antero-lateral setae (als), 4 median setae (mes) and 2 pairs of pores medially; torma (t) as in Fig. 6. Mandible (Fig. 7) with 1 micro seta, 3 setal sensillae and 1 pore; teeth almost of equal height, slightly truncate. Maxilla (Fig. 8) consists of triangular cardo (cd), stipes (st), mala (ma) and maxillary palp. Stipes and mala fused, stipes with 1 seta ventrally and 1 pore dorsally. Mala with 1 seta and pore on outer margin, 1 seta and 2 setal sensillae ventrally, 2 setae and 1 pore dorso-apically, 3 setae ventro-apically and ctenidium of 6 slightly curved, thick macro setae on adoral margin. Maxillary palp 2-segmented; segment I slightly longer and distinctly wider than segment II, segment I and II with 2 and 1 pore respectively. Hypopharynx membranous (Fig. 9), with mid-longitudinal, deep line, 4 micro setae and 4 pores. Labium (Figs 10, 11): praelabium (plb) with 2 setae and 2 pores, postlabium (pslb) with 3 pairs setae. Chaetotaxy of the body and structure of the spiracles as in Figs 1 a-g, 12. Structure of abdominal segments VIII and IX as in Fig. 13.

Pupa (Figs 14-20)

Body length: 3.25-3.70 mm, width in widest place (between middle knees) 1.85-2.13 mm. Body relatively stocky, widest between middle knees, white; setae rather short, set on protuberances (Figs 14-16). Head with 2 vertical setae (vs), 4 super orbital setae (2 sos_1, 2 sos_2), 4 orbital setae (os_1, os_2) and 2 post antennal setae (pas); rostrum rather short, about twice as long as wide, reaching apexes of fore tibiae, with 4 rostral setae (2 rs_1, 2 rs_2); antennae short and stocky relatively. Pronotum almost as long as wide at the base with 4 apical setae (2 as_1, 2 as_2), 6 lateral setae (2 ls_1, 2 ls_2, 2 ls_3), 4 discal setae (2 ds_1, 2 ds_2) and 4 posterolateral setae (2 psl_1, 2 psl_2). Metanotum 1.5 longer than mesonotum, meso- and metanotum each with 6 setae. Knee each with a pair of femoral setae (fs). Hind tarsi protrude beyond posterior margin of the abdominal segment VI (Figs 14, 16). Abdomen with segments I-III almost equal width, and then narrowed below segment III to the terminal parts of the body. Chaetotaxy of abdomen (Figs15-18): tergites I-VII each with 8-10 setae (8 setae well visible, 2 micro setae near spiracles sometimes absent); tergite VIII with 2 setae, sternites VIII and IX each with 2 long setae and

0-4 micro setae laterally. Pseudocerci (pc) thorn-like, slightly curved to inside; sexual dimorphism in structure of IX sternite well-marked (Figs 17, 18). Spiracles (Figs 15, 16, 19, 20): 5 pairs functional on abdominal segment I-V and 3 pairs atrophied on abdominal segments VI-VIII dorso-laterally.

CONCLUSION

The larva of *B. subcarinatus* possesses all the essential generic characters described by previous authors (SCHERF 1964, MAY 1994). The combination of characters that distinguish the larva of this species from known larvae of the genus *Bagous* is as follows: (1) body length 4.10-5.00 mm, head width: 0.52-0.57 mm, (2) head light brown, ocelli present [in *B. collignesis* (HERBST) ocelli absent], (3) head without setae des_3 [in *B. collignesis* setae des_3 present], (4) labrum with 6 setae lrms [in *B. australasiae* BLACKBURN 4 setae lrms present], (5) structure of epipharnyx as in Fig. 6., (6) mandibles teeth slightly truncate (Fig. 7), (7) mala with ctenidium of 6 thick macro setae (Fig. 8), (8) chaetotaxy of pronotum as in Fig. 12., (9) chaetotaxy of the remaining parts of the body and structure spiracles as in Figs 1 a-g.

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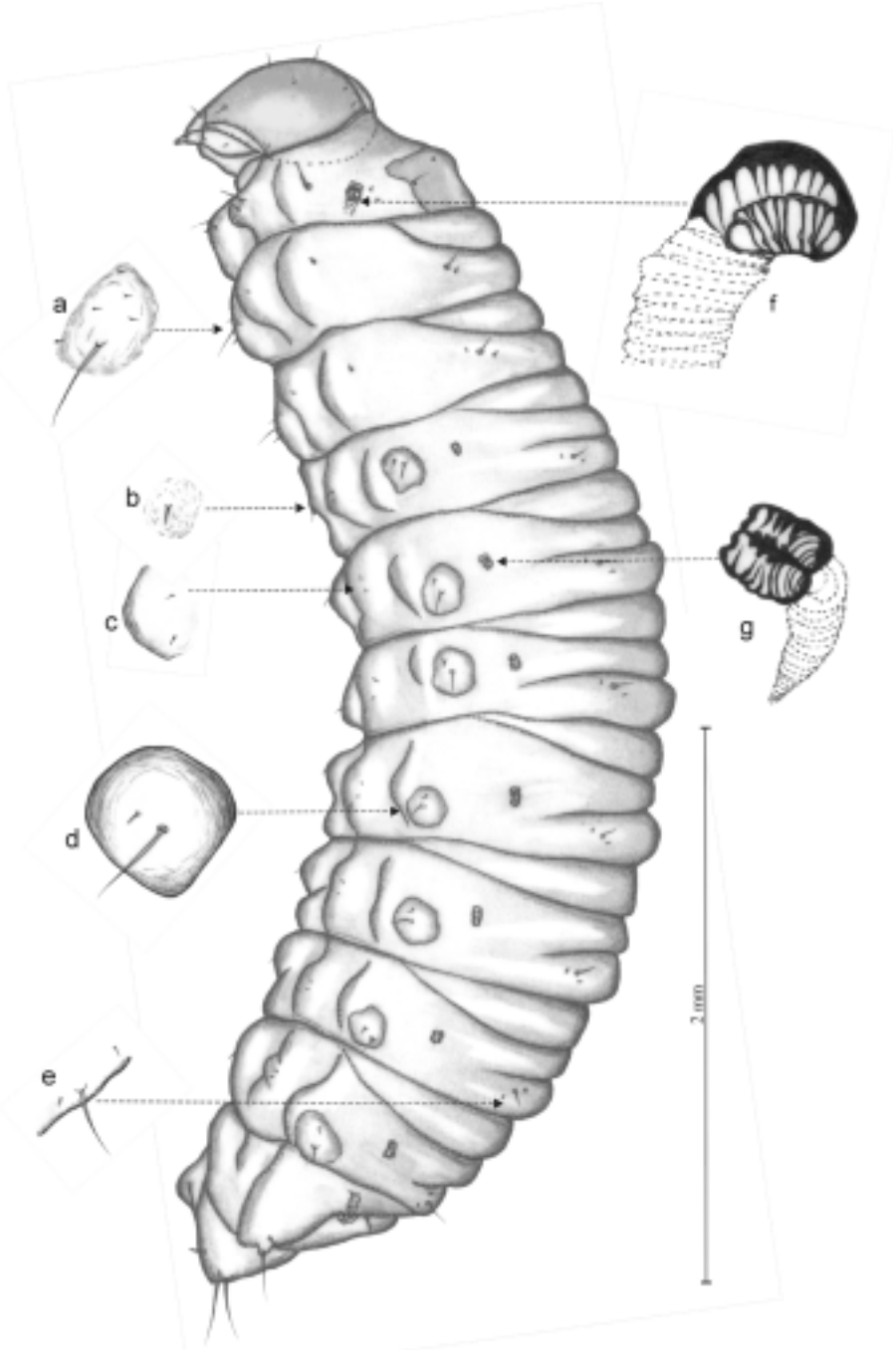
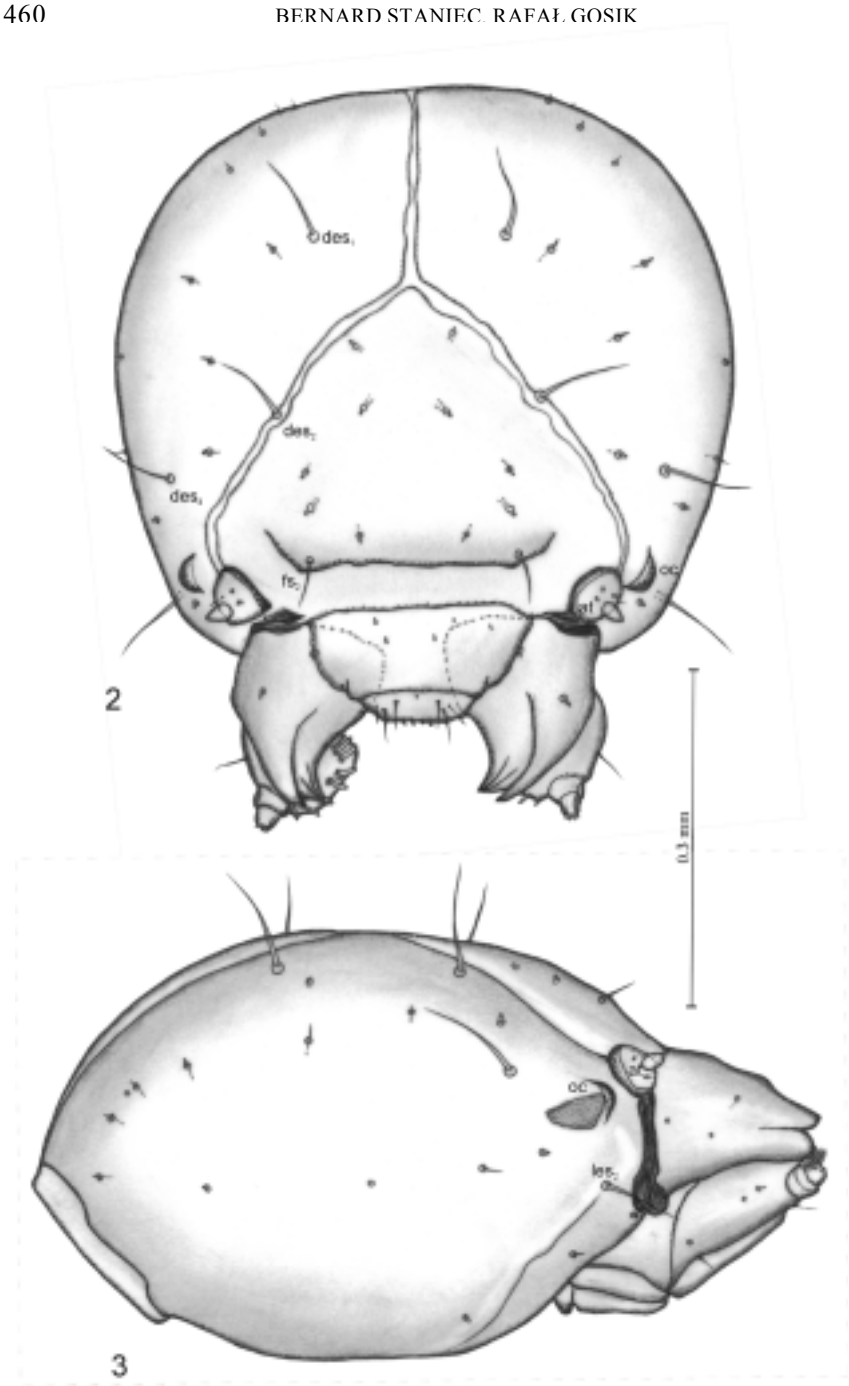
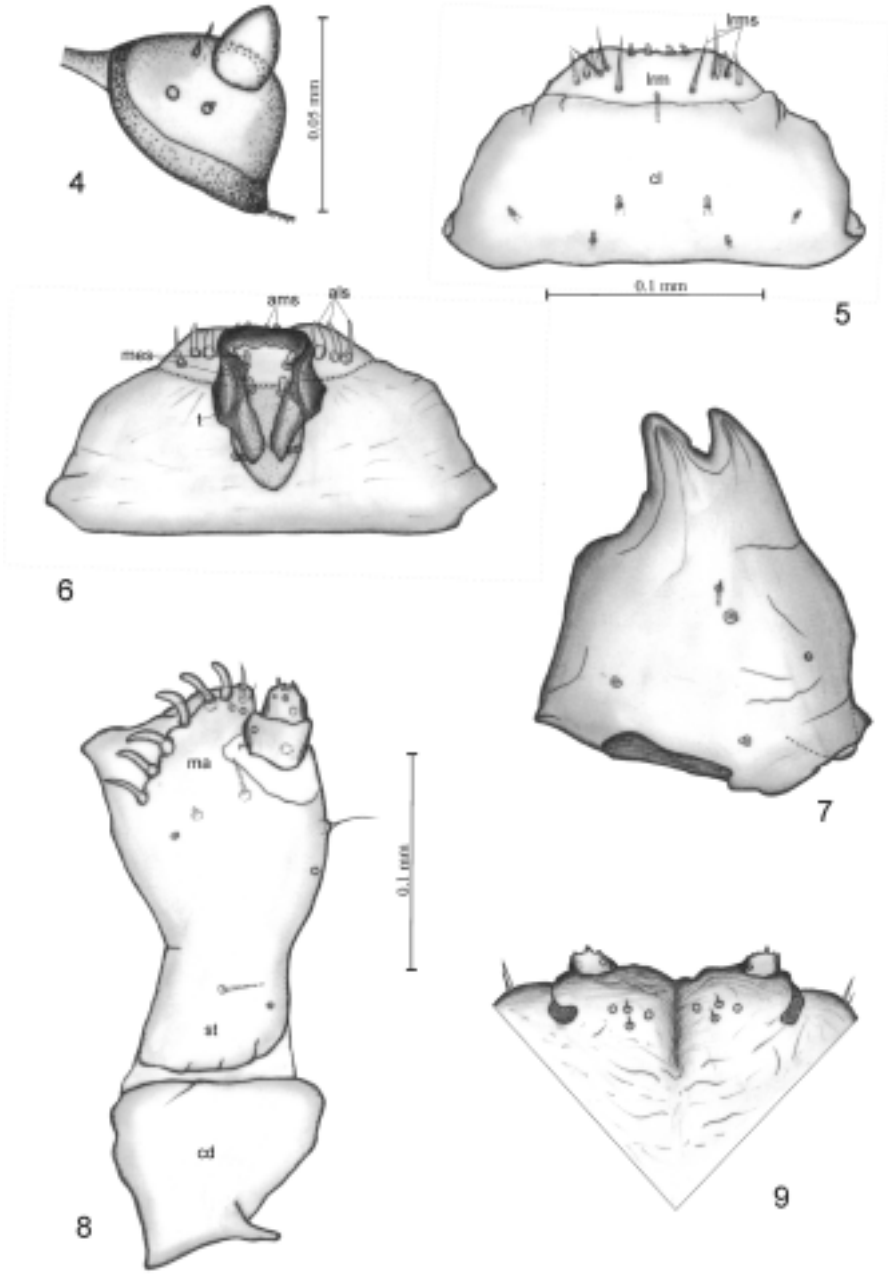


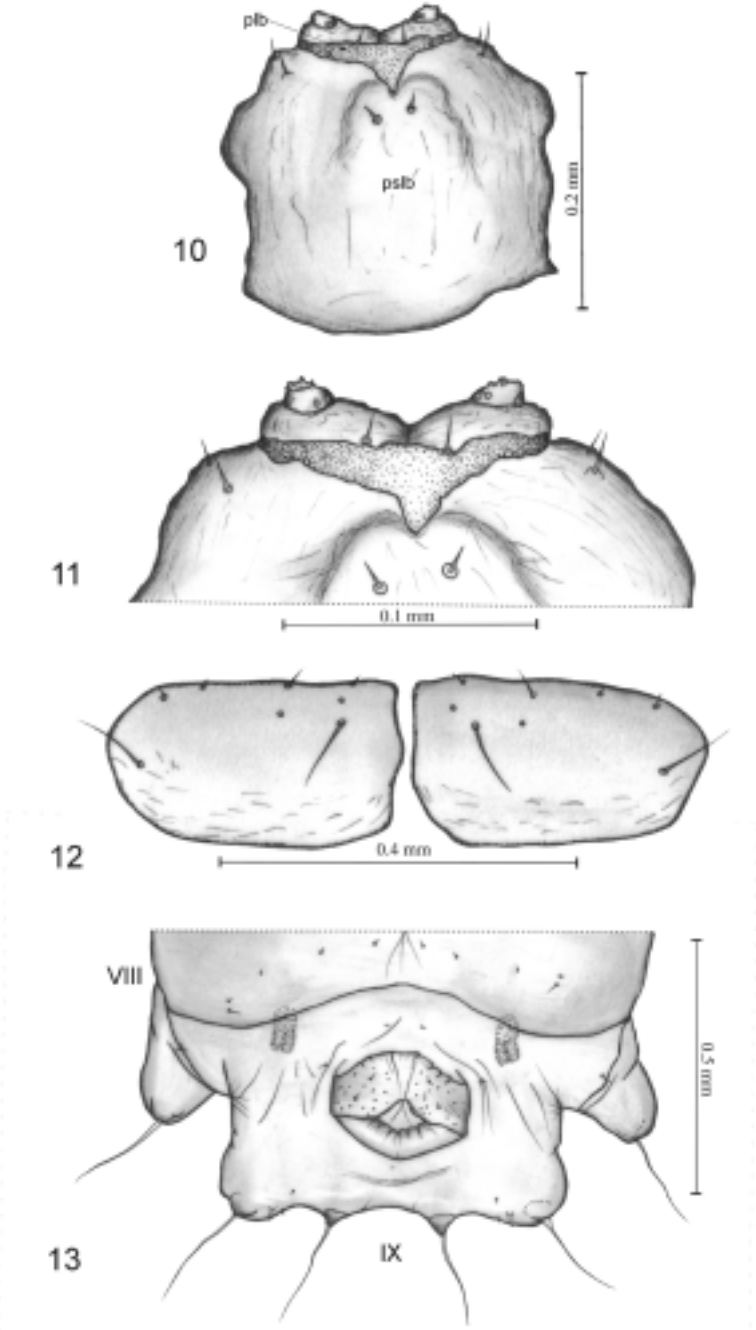
1. *Bagous subcarinatus*, mature larva, habitus (lateral aspect) with setae (a-e) and spiracles of first and third pair (f, g)



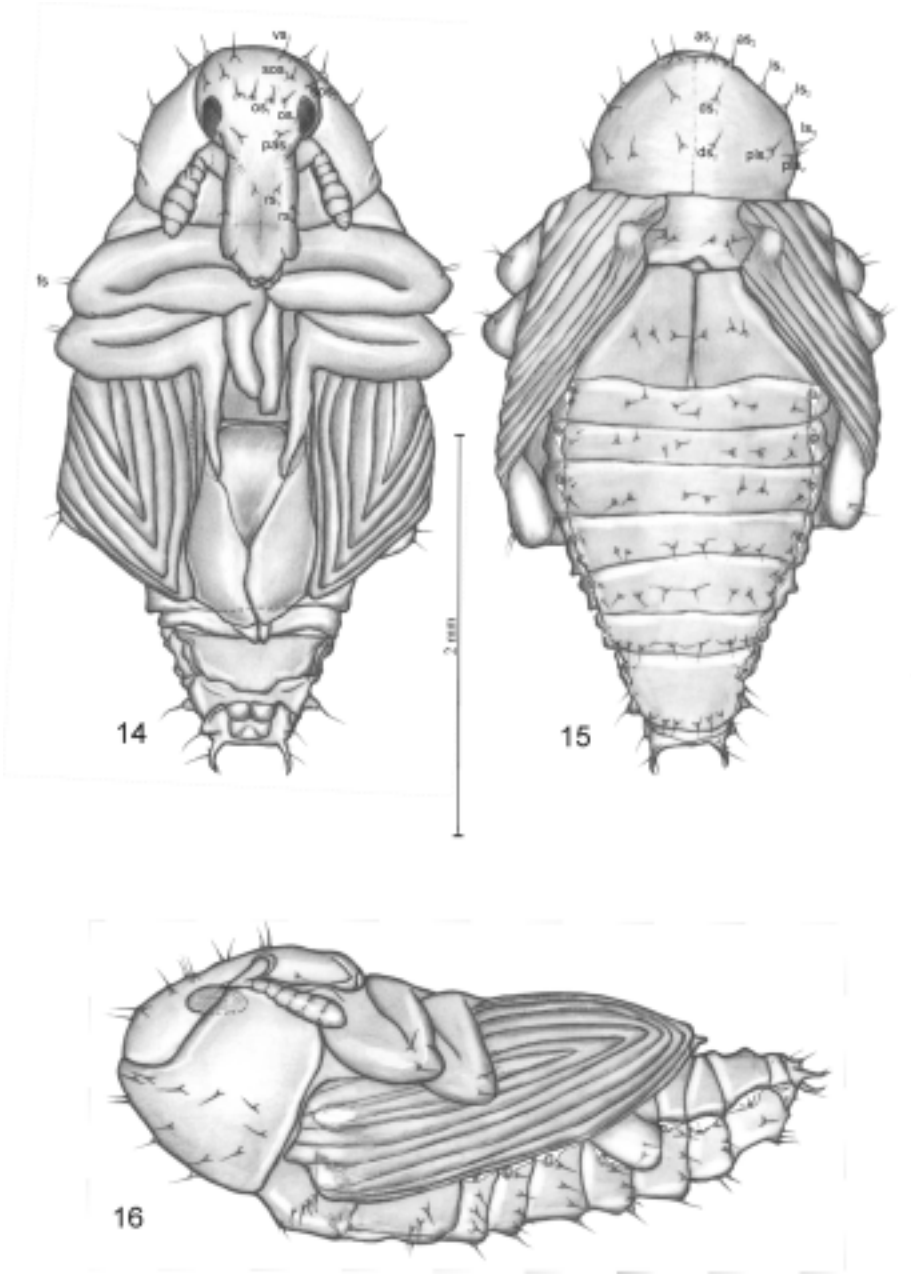
2, 3. *Bagous subcarinatus*, mature larva, head. 2 – dorsal aspect (des - dorsal epicranial setae, fs – frontal seta), 3 – lateral aspect (les – lateral epicranial seta, oc – ocellus, at – antenna)



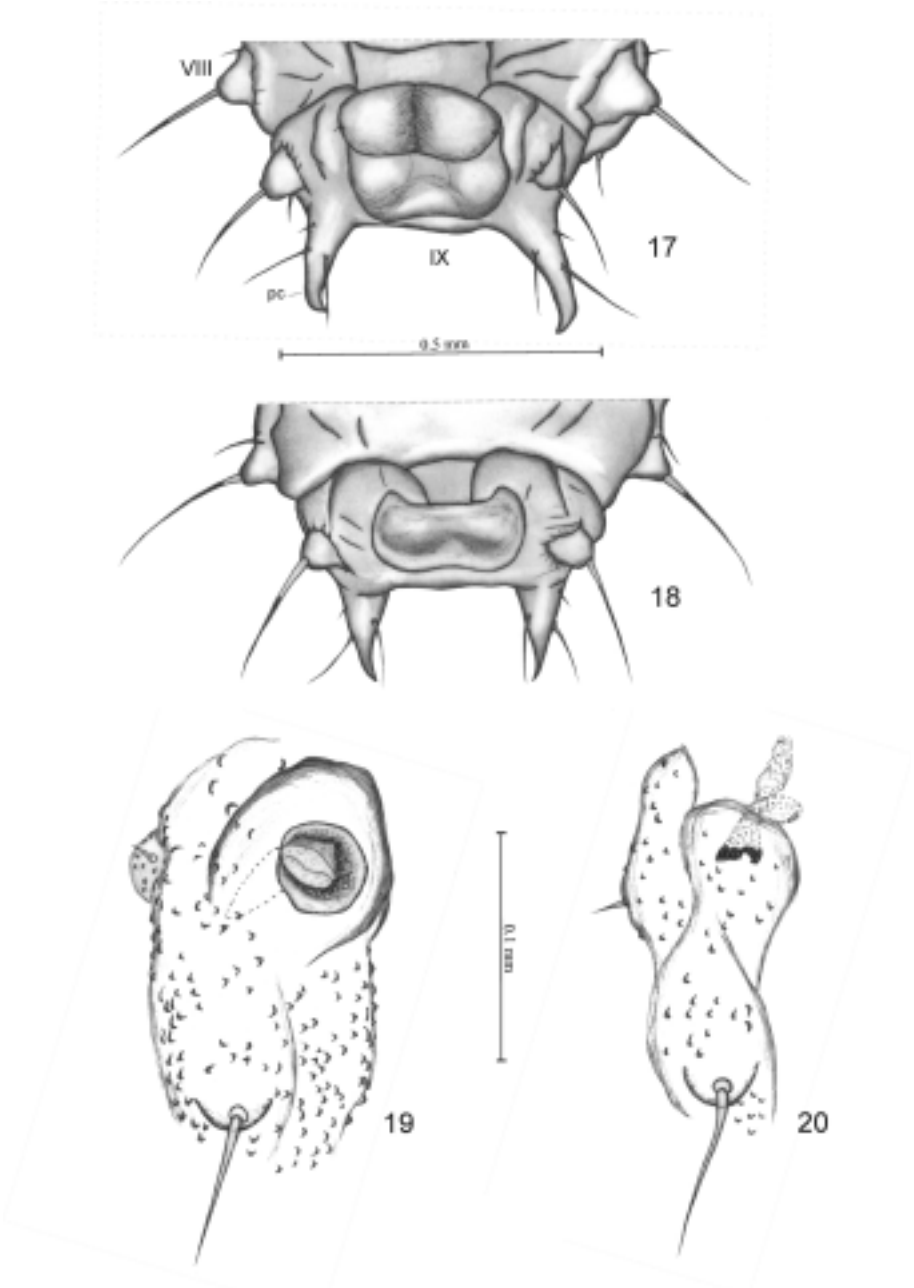
4-9. *Bagous subcarinatus*, mature larva. 4 – right antenna (dorsal aspect), 5 – labrum (lrm) and clypeus (cl) (lrms – labial setae), 6 – epipharynx (ams – anteromedial setae, als – anteriolateral setae, mes – median setae, t – torma, 7 – right mandible (dorsal aspect), 8 – right maxilla, dorsal aspect (cd – cardo, st – stipes, ma – mala), 9 – hypopharynx



10-13. *Bagous subcarinatus*, mature larva. 10 – labium, ventral aspect (plb – praelabium, pslb – postlabium), 11 – apex of labium, 12 – chaetotaxy of pronotum, 13 – terminal segment of abdomen, ventral aspect (segments VIII and IX)



14-16. *Bagous subcarinatus*, pupa, habitus. 14 – ventral aspect (vs – vertical seta, sos – super orbital setae, os – orbital setae, pas – post antennal setae, rs – rostral setae, fs – femoral setae), 15 – dorsal aspect (as – apical setae, ls – lateral setae, ds – discal setae, psl – posterolateral setae), 16 – lateral aspect



17-20. *Bagous subcarinatus*, pupa. 17 – terminal segment of female, ventral aspect (pc – pseudocerci, segments VIII and IX), 18 – terminl segment of male (ventral aspect). 19 – functional spiracle of abdominal segment I, 20 – atrophied spiracle of abdominal segments VI