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Larvae of net-winged beetles (Lycidae: Coleoptera) of the European part of Russia and the Caucasus

Личинки жуков-краснокрылов (Coleoptera: Lycidae) европейской части России и Кавказа

S.V. Kazantsev¹, N.B. Nikitsky²
С.В. Казанцев¹, Н.Б. Никитский²

¹Donetskaya str., 13–326, Moscow 109651 Russia. E-mail: kazantss@mail.ru

²Zoological Museum of Moscow State University, Bolshaya Nikitskaya str., 6, Moscow 125009 Russia. E-mail: NNikitsky@mail.ru

¹Ул. Донецкая 13–326, Москва 109651 Россия

²Зоологический музей МГУ им. Ломоносова, ул. Большая Никитская, 6, Москва 125009 Россия

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Abstract. The larvae of net-winged beetles *Dictyoptera aurora* (Herbst, 1784), *Erotides nasutus* (Kiesenwetter, 1874) and *E. schneideri* (Kiesenwetter, 1878) are described for the first time. Larvae of *Pyropterus nigroruber* (DeGeer, 1774) and *Xylobanellus erythropterus* (Baudi, 1872) are redescribed. An identification key to larvae of seven species of the European part of Russia and the Caucasus is provided.

Резюме. Впервые описываются личинки жуков-краснокрылов *Dictyoptera aurora* (Herbst, 1784), *Erotides nasutus* (Kiesenwetter, 1874) и *E. schneideri* (Kiesenwetter, 1878). Приводится переописание *Pyropterus nigroruber* (DeGeer, 1774) и *Xylobanellus erythropterus* (Baudi, 1872). Представляется определительная таблица личинок семи видов семейства Lycidae европейской части России и Кавказа.

Introduction

The family Lycidae of the European part of Russia and the Caucasus includes ten species. The preimaginal stages have so far been studied only in four of them, *Pyropterus nigroruber* (DeGeer, 1774) [Bourgeois, 1882; Bocák, Matsuda, 2003], *Aplatopterus rubens* (Gyllenhal, 1817) [Perris, 1877], *Xylobanellus erythropterus* (Baudi, 1872) [Burakowski, 1988; Bocák, Matsuda, 2003] and *Lygistorpterus sanguineus* (Linnaeus, 1758) [Perris, 1846; Bourgeois, 1882; Korschefsky, 1951; Kazantsev, 2005].

The possibility to study the larvae of another three species, *Dictyoptera aurora* (Herbst, 1784), *Erotides nasutus* (Kiesenwetter, 1874) and *E. schneideri* (Kiesenwetter, 1878), collected and, in case of *Dictyoptera aurora*, reared by one of the authors allows describing them for the first time. Their description is given below. The preimaginal morphological characteristics of other lycids from Western Russia are complemented and an identification key to all seven known larvae of the territory is provided.

The following acronyms are used in the paper: ICCM – Insect Center Collection, Moscow; ZMMU – Zoological Museum of Moscow University.

Descriptions

Dictyoptera aurora (Herbst, 1784)
(Color plate 2: fig. 1–4)

Pyrochroa aurora Herbst, 1784: 105.

Material. 4 larvae, Moscow Oblast, Prioksko-Terrassnyj Biosphere Reserve, in soil near pine stump, 28.08.1997, N.B. Nikitsky leg. (ZMMU); 3 larvae, Moscow Oblast, Orekhovo-Zuevskij distr., near vill. Shevliagino, in brown rot of fir stump, 5.08.1998, N.B. Nikitsky leg. (ZMMU).

Description. Last instar. Body almost parallel-sided or slightly widening at mid-abdomen; head and terga brown, underside sclerites lighter brown; cuticle uniformly finely alveolate. Length: 6–16.5 mm; width (at dorsum): 2.2–3.5 mm.

Head strongly transverse, dorsally triangularly produced forward; head capsule open ventrally; lateral sclerites completely fused to cranium, with three lateral setae; cranium with two anterior and two discal setae; ventral plate transverse, heart-shaped, posteriorly attached to lateral sclerites. Stemmata absent. Antennae located antero-laterally, relatively small, retractable, one-segmented, scapus elongate, 1.3–1.5 times longer than wide; antennifer represented by narrow annuliform sclerite; scapus with relatively small apical membranous bilobed slit and two short distal setae (fig. 1).

Mandibular structures tripartite, consisting of sheath (ventral part), stiletto (narrow central part) and shutter (dorsal part). Sheath narrow, free; stiletto very narrow, distally attached to shutter; shutter one-segmented, narrow, with prominent seta near base; sheath/shutter (fossa/condyle) joint approximate to base. Sheath posteriorly hinged with long mandibular rod (hypothetically, stipes of mandible – see Kazantsev [2005, 2006], but referred to as "hypostomal margin" in, e.g., Böving and Craighead [1930–1931], Lawrence [1991]). Mandibular rod prominent, relatively broad, posteriorly prolonged to posterior edge of lateral sclerite, fused thereto at its ventral margin; part of mandibular rod anterior of lateral sclerite free. Hypopharynx elongate, bottle-shaped.

Maxillary stipites fused to each other, and possibly to postlabial structures, forming ventral plate, with a pair of setae at antero-lateral corner and two seta at anterior margin. Mala relatively small, basally fused with palpiger, located, with respect to palps, intero-dorsally-dorsally, with three setae. Palps three-segmented; palpiger well developed, of approximately equal length and width, or slightly transverse, somewhat longer than two proximal palpomeres taken together, with numerous apical setae; palpomeres 1 and 2 of approximately equal length and width, but palpomere 1 often slightly longer than palpomere 2, and palpomere 3 conspicuously narrower than palpomere 2, but ca. equal in length to palpomere 1. Labial prementum narrow, undivided, without

median suture; palps two-segmented; ligula absent (fig. 3).

Thoracic terga not wider than abdominal tergites, with transverse sclerites, divided medially into two parts (fig. 1). Thoracic pleura consisting of two sclerites, roundish (spiracle bearing in mesothorax) anterior epipleurite and elongate posterior hypopleurite; in prothorax epipleurite absent, hypopleurite semi-fused to tergum. Sclerites of sterna heart-shaped, more elongate in prothorax, in meso- and metasternal sterna with two discal setae. Metathoracic spiracles absent. Mesothoracic spiracle small, annular-biforous, similar to abdominal spiracles in structure, but larger.

Coxa transverse, bulging; trochanter divided by narrow membranous/less sclerotised stripe into two parts, trochanter 1 and trochanter 2 (fig. 4). Coxae, closer to inner side, typically with one seta; trochanters and femurs with, typically, three well-developed setae. Tibiae of middle and hind legs slightly longer than femurs. Claws elongate, but considerably shorter than tibiae, with one well-developed seta on conspicuously widened basis at inner margin.

Sclerites of abdominal tergites 1–8 transverse, rectangular, with rounded corners, divided medially into two parts. Tergite 9 transverse, with rounded posterior margin, at most divided medially at anterior margin, with six setae at posterior edge, two dorsally and four ventrally (fig. 2). Abdominal pleura consisting of two elongate sclerites, epipleurite (more dorsal) and sternopleurite (more ventral). Eight pairs of abdominal spiracles small, annular-biforous, located at antero-dorsal edge of epipleurite. Sclerites of sternites transverse, with rounded corners, with two setae at posterior margin.

Biology. Four larvae of *Dictyoptera aurora* were collected in soil near rotten pine stump on August 28, 1997 ca. 100 km south of Moscow. Two of them were fixed in alcohol, two remaining ones pupated on August 28, 1997 and turned into mature adults on September 10, 1997. Another three larva were collected in brown rot of fir stump, also in August.

Diagnosis. *Dictyoptera aurora* is easily distinguishable from *Pyropterus nigroruber* (DeGeer, 1774), by the fused to cranium lateral sclerites of the head capsule (fig. 4), ventral plate with a pair of setae at antero-lateral corner and two seta at anterior margin (fig. 3) and undivided medially (at most, divided only at anterior margin) tergite 9 (fig. 2).

Remarks. The larva of *Dictyoptera aurora* was first "described" in the mid-XIX century [Laporte, 1840]; however, this description was not based on reared material, but on the larvae found together with *D. aurora*, and, as correctly noted already by Bourgeois [1882], had too much in common with *Lygistoropterus sanguineus* (e.g., yellow-orange terminal tergite with black urogomphi) to be taken for anything else. Korschefsky [1951], presenting a general view of *D. aurora* in his identification keys to German lycid larvae, referred to it as just *Dictyoptera* and included in this genus two species, currently classified as *D. aurora* and *Aplatopterus rubens*, without any further differential diagnosis.

Pyropterus nigroruber (DeGeer, 1774)

(Color plate 2: fig. 5–7)

Lampyrus nigroruber DeGeer, 1774: 46.

Material. 1 larvae, Moscow Oblast, Prioksko-Terrassnyj Biosphere Reserve, in brown rot of lying thin pine, 24.10.1997, N.B. Nikitsky leg. (ZMMU); 1 larva, Moscow Oblast, Orehovo-Zuevskij distr., near vill. Shevliagino, in brown rot of fur stump, 18.08.1998, N.B. Nikitsky leg. (ZMMU).

Redescription. Last instar. Body slightly widening at mid-abdomen. Head and terga light brown, underside sclerites yellowish-brown; cuticle uniformly finely alveolate. Length: 10.5–12.5 mm; width (at dorsum): 1.9–2.2 mm.

Head strongly transverse; head capsule open ventrally; lateral sclerites not fused to cranium, with two anterior setae; cranium with two anterior and two discal setae, as well as a seta at each side; ventral plate subquadrate or slightly transverse. Stemmata absent. Antennae relatively small, retractable, one-segmented, located antero-laterally; antennifer represented by narrow annuliform sclerite; scapus elongate, ca. 3–3.5 times longer than antennifer, with relatively small apical membranous bilobed slit and several short distal setae (fig. 5).

Mandibular structures similar to preceding species. Hypopharynx elongate, slightly widening posteriorly.

Maxillary stipites fused to each other, forming ventral plate, with a seta near antero-lateral corner. Mala relatively small, located, with respect to palps, intero-dorsally-dorsally, with several short intero-dorsal setae. Palps three-segmented; palpiger large, typically transverse, with several apical setae, conspicuously longer than usually transverse palpomere 1, longer than palpomere 2 and subequal in length to narrow palpomere 3. Labial prementum narrow, undivided, without median suture; palps two-segmented, approximate; palpomere 1 usually shorter than palpomere 2; ligula absent (fig. 5).

Sclerites of thoracic terga not wider than abdominal tergites, transverse, slightly rounded at sides, divided medially into two parts. Thoracic pleura consisting of two oval sclerites, (spiracle bearing in mesothorax) anterior epipleurite and posterior hypopleurite; in prothorax epipleurite absent, hypopleurite little sclerotised. Sclerites of sterna triangular-oval, more transverse in meso- and metathorax, with two discal setae (fig. 7). Metathoracic spiracles absent. Mesothoracic spiracle small, annular-biforous, similar to abdominal spiracles in structure and size.

Coxa transverse, bulging; trochanter undivided, trochanters and femurs with one seta before apex of inner margin (fig. 7). Claws with one well-developed seta at basis of inner margin.

Sclerites of abdominal tergites 1–9 transverse, with rounded corners, divided medially into two parts. Tergite 9 slightly emarginate posteriorly, with six setae at posterior margin: two dorsally and four ventrally (fig. 6). Abdominal pleura consisting of two elongate sclerites, epipleurite (more dorsal) and sternopleurite (more ventral). Eight pairs of abdominal spiracles small, annular-biforous, located at anterodorsal edge of epipleurite. Sclerites of sterna transverse, rectangular, with two setae at posterior margin (fig. 7).

Biology. One larva of *Pyropterus nigroruber* was collected in brown rot of lying thin pine in October ca. 100 km south of Moscow, another one in brown rot of a fur stump, about 65–70 km east of Moscow; also collected in other regions of Moscow Oblast.

Diagnosis. *Pyropterus nigroruber* may be differentiated from *Dictyoptera aurora* by the not fused to cranium lateral sclerites of the head capsule, ventral plate with a single seta near antero-lateral corner (fig. 5) and divided medially tergite 9 (fig. 6).

Remarks. The available descriptions of the larva of *Pyropterus nigroruber* [Bourgeois, 1882; Bocák, Matsuda, 2003] do not contain certain data on such characters, as the structure of mandibles, head, spiracles and legs.

Erotides nasutus (Kiesenwetter, 1874)

(Color plate 2: fig. 8–12)

Eros nasutus Kiesenwetter, 1874: 255.

Material. 1 larva (hypothetically referred to this species), Moscow Oblast, Prioksko-Terrassnyj Biosphere Reserve, under rotten tree trunk of *Populus tremulae*, 16.07.1994, N.B. Nikitsky leg. (ZMMU).

Description. Last instar. Body slightly widening at mid-

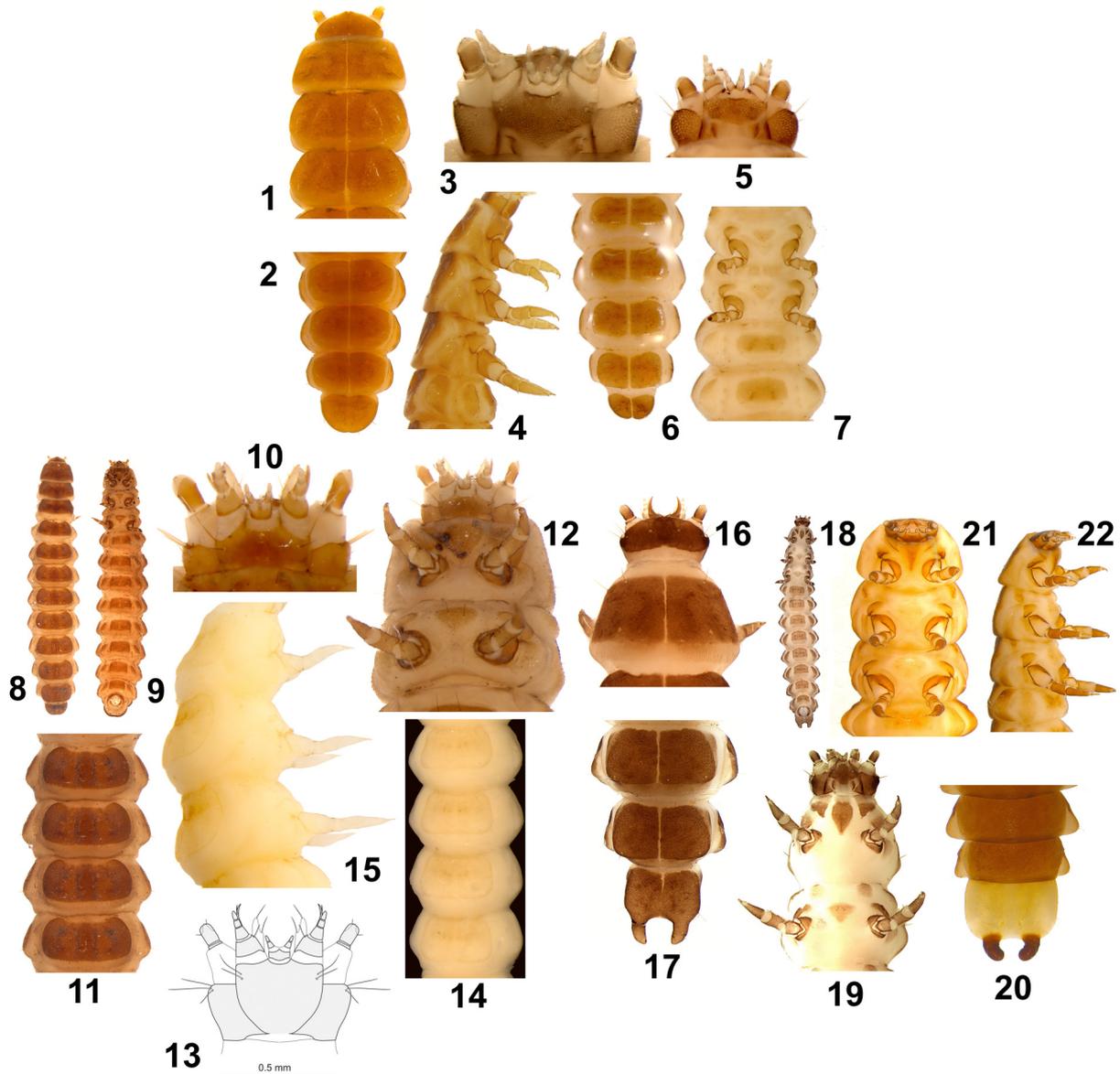


Fig. 1–7. Details of larvae of Lycidae spp.: 1–4 – *Dictyopectera aurora* (Herbst, 1784); 5–7 – *Pyropterus nigroruber* (DeGeer, 1774).
1 – head and thoracic terga; 2, 6 – terminal abdominal terga; 3, 5 – head; 4 – thoracic segments; 7 – thoracic and abdominal segments; 1–2, 6 – dorsally; 3, 5, 7 – ventrally; 4 – laterally.

Рис. 1–7. Детали строения личинок Lycidae spp.: 1–4 – *Dictyopectera aurora* (Herbst, 1784); 5–7 – *Pyropterus nigroruber* (DeGeer, 1774).
1 – голова и грудные тергиты; 2, 6 – вершинные брюшные тергиты; 3, 5 – голова; 4 – грудные сегменты; 7 – грудные и брюшные сегменты; 1–2, 6 – сверху; 3, 5, 7 – снизу; 4 – сбоку.

Fig. 8–15. General view and details of larvae of *Erotides* spp.: 8–12 – *E. nasutus* (Kiesenwetter, 1874); 13–15 – *E. schneideri* (Kiesenwetter, 1878).
8–9 – general view; 10, 13 – head; 11, 14 – basal abdominal terga; 12 – head and thoracic segments; 15 – thoracic segments; 8, 11, 14 – dorsally; 9–10, 12–13 – ventrally; 15 – laterally.

Рис. 8–15. Общий вид и детали строения личинок *Erotides* spp.: 8–12 – *E. nasutus* (Kiesenwetter, 1874); 13–15 – *E. schneideri* (Kiesenwetter, 1878).
8–9 – общий вид; 10, 13 – голова; 11, 14 – базальные брюшные тергиты; 12 – голова и грудные сегменты; 15 – грудные сегменты; 8, 11, 14 – сверху; 9–10, 12–13 – снизу; 15 – сбоку.

Fig. 16–22. General view and details of larvae of Lycidae spp.: 16–19 – *Xylobanellus erythropterus* (Baudi, 1872); 20–22 – *Lygistopecterus sanguineus* (Linnaeus, 1758).

16 – head and thoracic segment; 17, 20 – terminal abdominal terga; 18 – general view; 19, 21–22 – head and thoracic segments; 16–17, 20 – dorsally; 18–19, 21 – ventrally; 22 – laterally.

Рис. 16–22. Общий вид и детали строения личинок Lycidae spp.: 16–19 – *Xylobanellus erythropterus* (Baudi, 1872); 20–22 – *Lygistopecterus sanguineus* (Linnaeus, 1758).

16 – голова и грудной сегмент; 17, 20 – вершинные брюшные тергиты; 18 – общий вид; 19, 21–22 – голова и грудные сегменты; 16–17, 20 – сверху; 18–19, 21 – снизу; 22 – сбоку.

abdomen. Head and sclerites of terga brown, underside sclerites light brown. Sclerites of thoracic and abdominal terga with two dark longitudinal marking medially and two dark obscure lateral markings. Cuticle non-alveolate. Length: 13 mm; width (at dorsum): 2.1 mm.

Head strongly transverse, dorsally triangularly produced forward; head capsule open ventrally; lateral sclerites fused to cranium, but separated by triangular stripe of lesser degree of sclerotization; lateral sclerites with two long and numerous smaller setae; cranium with a pair of setae at anterior margin, a pair of setae at each anterior-lateral angle and a pair of small discal setae; ventral plate transverse. Stemmata absent (fig. 10). Antennae relatively small, retractable, one-segmented, located antero-laterally; antennifer represented by narrow annuliform sclerite; scapus large, elongate, with relatively large apical membranous bilobed slit and several short distal setae.

Mandibular structures similar to preceding species. Hypopharynx elongate, narrow, bottle-shaped.

Maxillary stipites fused to each other, forming ventral plate, with a pair of setae at antero-lateral corner. Mala large, as long as palps, located, with respect to palps, intero-dorsally, with six setae on inner surface, two of which inconspicuous. Palps three-segmented; palpiger prominent, subquadrate, with several conspicuous apical seta; palpomere 1 elongate, shorter than palpiger, but longer than palpomere 2. Labial prementum relatively long, undivided, without median suture, bearing a pair of setae; ligula absent (fig. 10).

Thoracic terga not wider than abdominal tergites, their sclerites transverse, undivided, without sutures, but with two obscure median longitudinal lines; tergum 1 longer than terga 2 and 3 (fig. 8); protergum with six long setae: four at anterior margin and two at posterior corners; meso- and metatergum with four long setae at sides. Thoracic pleura consisting of two roundish sclerites, spiracle bearing anterior epipleurite and posterior hypopleurite; in prothorax epipleurite absent, hypopleurite semi-fused to tergum. Thoracic sterna with heart-shaped sclerites, more elongate in prothorax, more transverse in meso- and metathorax; with two prominent and numerous smaller discal setae (fig. 12). Metathoracic spiracles absent. Mesothoracic spiracle small, annular-biforous, similar to abdominal spiracles in structure.

Coxa transverse; trochanter undivided (fig. 12).

Sclerites of abdominal tergites 1–8 transverse, undivided, with rounded corners, broadly emarginate anteriorly, without sutures, but with two dark median longitudinal lines (fig. 11). Tergite 9 less transverse, with rounded posterior margin (fig. 8–9) bearing ten setae. Abdominal pleura consisting of two elongate sclerites, each bearing seta in posterior half, epipleurite (more dorsal) and sternopleurite (more ventral). Eight pairs of abdominal spiracles small, annular-biforous, located at centre of epipleurite, near dorsal margin. Sclerites of sternites transverse, with four setae at posterior margin (fig. 9).

Biology. One larva of *Erotides nasutus* was collected under a rotten *Populus tremulae* trunk in July ca. 100 km south of Moscow.

Diagnosis. *Erotides nasutus* is quite similar to *Erotides sculptilis* (Say, 1835), the only other representative of the genus with described larva, but may be differentiated by a pair of dark median longitudinal lines on thoracic and abdominal terga (fig. 9, 11) and by the larger galea (fig. 10).

Remarks. The studied material was not reared. Nevertheless, taking into account the great similarity of the larva to that of *Erotides sculptilis* [McCabe, Johnson, 1979], and occurrence of only one *Erotides* species in the Moscow area, we find it appropriate to

consider the discovered lycid larva to be *Erotides nasutus*.

Erotides schneideri (Kiesenwetter, 1878)

(Color plate 2: fig. 13–15)

Eros schneideri Kiesenwetter, 1878: 206.

Material. 4 larvae (hypothetically referred to this species), Azerbaidzhan, Talysh, road to Bilyasar, in brown rot of *Carpinus*, 19.07.1978, N.B. Nikitsky leg. (ZMMU).

Description. Last (?) instar. Body whitish, sclerites very weakly sclerotised, borders of sclerites vaguely defined. Cuticle non-alveolate. Length: 8–10 mm; width (at dorsum): 1.1–1.3 mm.

Head transverse; head capsule open ventrally; lateral sclerites seemingly fused to cranium, with three lateral setae on each side; cranium with a pair of discal setae; ventral plate elongate. Stemmata absent (in one of the four larvae small stemmata present). Antennae relatively small, retractable, one-segmented, located antero-laterally; antennifer represented by narrow annuliform sclerite; scapus well developed and more or less elongate, with relatively large apical membranous bilobed slit and a pair of short distal setae.

Mandibular structures similar to preceding species.

Maxillary stipites fused to each other, forming ventral plate, with a pair of setae at anterolateral corner. Mala relatively small, located, with respect to palps, intero-dorsally, with two setae. Palps three-segmented; palpiger transverse, well developed, with apical seta; palpomere 1 conspicuously shorter than palpiger, but noticeably longer than palpomere 2; in its turn, palpomere 2 longer than narrow palpomere 3. Labial prementum undivided, without median suture; palpomere 2 somewhat shorter than palpomere 1; ligula absent (fig. 13).

Thoracic terga not wider than abdominal tergites, their sclerites transverse, rounded at sides, undivided, without any longitudinal lines; sclerites of terga 2 and 3 with two small roundish markings in anterior half and a pair of smaller roundish markings in between; sclerite of prothoracic tergum with 2 to 4 setae at anterior margin (fig. 14). Thoracic pleura and sterna vaguely delineated (fig. 15). Metathoracic spiracles absent. Mesothoracic spiracle small, annular-biforous, similar to abdominal spiracles in structure, but slightly larger.

Coxa transverse; trochanter undivided, trochanter and femur with elongate seta near apex of inner margin; claw elongate, with a seta at base (fig. 15).

Abdominal tergites 1–8 transverse, rectangular, their sclerites undivided, with rounded corners, without any longitudinal sutures or lines. Tergite 9 subquadrate, with rounded posterior margin bearing eight setae ventrally and two setae dorsally; terga 1–8 with two small roundish markings in the middle and a pair of smaller roundish markings in between. Abdominal pleura with more or less noticeable sclerite in posterior half; sclerites of sternites barely noticeable, with vague borders, each bearing four setae in transverse line approximate to posterior margin. Eight pairs of abdominal spiracles small, annular-biforous, located laterally, presumably on epipleurite.

Biology. Several larvae of *Erotides schneideri* were collected in brown rot of a *Carpinus* tree in the Talysh montane forest.

Diagnosis. *Erotides schneideri* may be differentiated from *E. nasutus* by the uniformly whitish and little-sclerotised body, with two small roundish markings and a pair of yet smaller roundish markings in between on tergites (fig. 14–15). Another character that may possibly distinguish the two species is the occasional occurrence of stemmata in *E. schneideri* (present in one of the four studied larvae). Both of them differ from other lycid larvae of the area by the undivided sclerites of dorsal and abdominal terga and by the non-alveolate cuticle.

Remarks. The studied material was not reared. Nevertheless, taking into account the occurrence of only two lycid species in Talysh (*Benibotarus arnoldii* (Barovskij, 1932) and *Erotides schneideri*) and the similarity of the studied larvae to that of *Erotides sculptilis* [McCabe, Johnson, 1979], as well as to the hereby described *E. nasutus*, we find it plausible to consider the discovered lycid larvae to be *E. schneideri*.

Xylobanellus erythropterus (Baudi di Selve, 1871)
(Color plate 2: fig. 16–19)

Eros erythropterus Baudi a Selve, 1871: 93.

Material. 6 larvae, Moscow Oblast, Prioksko-Terrassnyj Biosphere Reserve, in brown rot of birch, 07.1994, N.B. Nikitsky leg. (ICCM and ZMMU); 6 larvae, Moscow Oblast, Prioksko-Terrassnyj Biosphere Reserve, in brown rot of Alnus, 8.05.1991, N.B. Nikitsky leg. (ZMMU); 1 larva, Moscow Oblast, Prioksko-Terrassnyj Biosphere Reserve, under rotten pine trunk, 17.05.1998, N.B. Nikitsky leg. (ZMMU).

Redescription. Last instar. Body mostly brownish dorsally, light brown ventrally, membrane between sclerites whitish yellow. Cuticle finely alveolate. Length: 10–13 mm; width (at dorsum): 1.9–2.5 mm.

Head strongly transverse, dorsally semicircularly produced forward; head capsule open ventrally; lateral sclerites narrowly fused to cranium, with membranous incision occupying posterior two thirds; with two lateral setae; cranium with one lateral seta, two anterior and two discal setae; ventral plate subquadrate. Stemmata present (fig. 16). Antennae small, retractable, one-segmented, located antero-laterally; antennifer represented by narrow annuliform sclerite; scapus elongate, with bilobed apical membranous slit and several distal setae.

Mandibular structures similar to preceding species. Hypopharynx elongate, nearly parallel-sided.

Maxillary stipites fused, forming ventral plate, with a pair of setae at anterolateral corner. Mala relatively small, located, with respect to palps, intero-dorsally, with several setae. Palps three-segmented; palpiger prominent, subquadrate or slightly transverse, with two apical setae; palpomeres 1 and 2 together shorter than palpiger, palpomeres 1 more or less transverse, noticeably wider than palpomere 2; palpomere 3 narrow and rather short. Labial prementum relatively long, undivided, without median suture; palpomeres short; ligula absent (fig. 19).

Thoracic tergite not wider than abdominal tergites, their sclerites transverse, rectangular, divided by fine longitudinal line, with three setae at each side near lateral margin. Thoracic pleura consisting of two sclerites, roundish (spiracle bearing in mesothorax) anterior epipleurite and elongate posterior hypopleurite; in prothorax epipleurite and hypopleurite absent. Sclerites of sterna elongate and bullet-shaped in prosternum, transverse and heart-shaped in meso- and metasternum, with pair of lateral sternopleurites; sclerites of mesosternum and metasternum with two discal setae (fig. 18). Mesothoracic spiracle biforous, elliptical, markedly larger than abdominal spiracle; metathoracic spiracle vestigial, minute.

Coxae transverse, with 2 conspicuous setae; trochanter undivided, but with narrow non-pigmented band close to base; femurs with three conspicuous setae; tibiae elongate; claw narrow, with two setae (fig. 19).

Abdominal tergites 1–8 transverse, rectangular, divided by narrow longitudinal line, with 2 setae at posterior corners of sclerites. Abdominal pleura consisting of two elongate sclerites, epipleurite (more dorsal) and sternopleurite (more ventral). Eight pairs of abdominal spiracles small, annular-biforous, located at antero-dorsal edge of epipleurite, postero-dorsal edge bearing seta. Sclerites of sterna transverse, with rounded corners, with four setae at posterior margin. Segment 9 transverse, divided dorsally by longitudinal line in anterior third (rarely by complete line), with a pair of urogomphi at distal margin and four setae at each side (fig. 17–18).

Biology. Several larvae of *Xylobanellus erythropterus* were collected in brown rot of a birch, Alnus and under a rotten pine trunk in a mixed forest 100 km south of Moscow.

Diagnosis. *Xylobanellus erythropterus* may be easily differentiated from *Lygistoapterus sanguineus*, the only other lycid from the regarded territory with urogomphi, by the light brown body and concolourous with other tergites tergite 9 and by the divided sclerites of abdominal terga (fig. 17).

Remarks. The available descriptions of the larva of *Xylobanellus erythropterus* [Burakowski, 1988; Bocák, Matsuda, 2003], though detailed and generally accurate, do not contain certain data on such characters, as the structure of mandibles, head, spiracles and legs.

Lygistoapterus sanguineus (Linnaeus, 1758)
(Color plate 2: fig. 20–22)

Cantharis sanguineus Linnaeus, 1758: 401.

Material. 6 larvae, Moscow Oblast, Prioksko-Terrassnyj Biosphere Reserve, in brown rot of birch, 07.1994, N.B. Nikitsky leg. (ZMMU); 2 larvae, Moscow Oblast, Kolomenskij distr., Konev Bor, under bark of poplar, 15.05.1983, N.B. Nikitsky leg. (ZMMU).

Biology. The larvae of *Lygistoapterus sanguineus* are the most common lycids of the regarded region found in preimaginal stage. They are often come across in the rot of broad- or small-leaved trees. In the Moscow area some larvae of *Lygistoapterus sanguineus* were collected in brown rot of a birch in mixed forest 100 km south of Moscow and under bark of a dead fallen poplar ca. 100 km. SE of Moscow. Larvae of this species, unlike the rest studied Lycidae, are infrequently found not only under bark of dead trees, but also on the surface of dry dead trunks already without bark.

Diagnosis. Apart from orange with black urogomphi tergite 9 (fig. 20) *Lygistoapterus sanguineus* may be distinguished from most other lycid larvae of the area, except *Xylobanellus erythropterus*, by the presence of stemmata (fig. 22) and from *X. erythropterus* – by the small mala (fig. 21). It may also be distinguished by the longitudinal division of thoracic terga and at the same time undivided abdominal terga, as well as by the presence of rudimentary non-functional metathoracic spiracles.

Remarks. The larva of *Lygistoapterus sanguineus* has explicitly been described in previous works [Perris, 1846; Bourgeois, 1882; Korschefsky, 1951; Kazantsev, 2005].

Key to lycid larvae of European part of Russia and the Caucasus

1. – Tergite 9 with urogomphi (fig. 17, 20). Stemmata present (fig. 16, 21) 2
- Tergite 9 without urogomphi (fig. 2, 6, 8–9). Stemmata typically absent 3
2. – Body light brown; tergite 9 concolourous with other tergites; abdominal terga divided (fig. 17). Galea relatively large *Xylobanellus erythropterus*
- Body above brown to black; tergite 9 orange with black urogomphi; abdominal terga undivided (fig. 20). Galea small (fig. 21) *Lygistoapterus sanguineus*
3. – Dorsal and abdominal terga divided by median line (fig. 1–2, 6)

- 4
 – Dorsal and abdominal terga undivided (fig. 8, 11, 14). Sclerites of abdominal sterna with four setae at posterior margin (fig. 9). Cuticle non-alveolate 6
 4. – Tergite 9 clearly emarginate medially at distal margin *Aplatopterus rubens*
 – Tergite 9 rounded distally or only feebly sinuated (fig. 2, 6) 5
 5 Lateral sclerites of head capsule fused to cranium (fig. 4). Ventral plate of head with a pair of setae at antero-lateral corner and two seta at anterior margin (fig. 3). Thoracic and abdominal terga divided by narrow median line (fig. 1–2). Tergite 9 undivided (fig. 2) *Dictyoptera aurora*
 – Lateral sclerites of head capsule not fused to cranium. Ventral plate with single seta near antero-lateral corner (fig. 5). Thoracic and abdominal terga divided by relatively broad median line (fig. 6). Tergite 9 divided by median line (fig. 6) *Pyropterus nigroruber*
 6. – Terga brown (fig. 8). Sclerites of thoracic and abdominal terga with two dark longitudinal marking medially and two dark obscure lateral markings. Stemmata absent *Erotides nasutus*
 – Terga whitish-yellow (fig. 14–15). Sclerites of thoracic and abdominal terga with two small roundish markings in anterior half and a pair of smaller roundish markings in between. Stemmata may be present *Erotides schneideri*

Discussion

The antennae of lycid larvae have typically been considered two-segmented [e.g., Bøving, Craighead, 1930–1931; Korschefsky, 1951, etc.]. The scape (the first antennomere) was thought to be represented by the very short annuliform sclerite located at the base of the membranous retractable tube and the pedicel – by the elongate sclerite with a membranous slit on top. However, it is the second, elongate, sclerite that has muscles attached to its walls. And as the insects are characterized by the attachment of antennal muscles to the scape [i.e., Snodgrass, 1935; Kluge, 2000], it is evident that the terminal elongate sclerite of the larval antennae in the Lycidae is nothing but the scape and, consequently, their antennae are one-segmented. The annuliform sclerite located at the base, which has no muscles attached to it, is then just the antennifer.

One lycid larva remains undiscovered in Central Russia. It is *Platycis minutus* (Fabricius, 1787), a relatively common and widespread European species. The brief and unclear description of the larva of this species published by a prominent Polish field coleopterist [Burakowski, 2003] does not allow including the taxon in the key, but his short description in accordance with Burakowski adduce below. According to the work of Burakowski [2003] the larva of *Platycis minutus* (not present in our material), have next characters: body yellowish-white, weakly sclerotised and weakly hairy, with very short chaetae; abdominal sclerite microsculpture consists of dense reticulation and sparse spots on tergites and sternites; 9th abdominal tergite without urogomphi and without notch at the tip, in the posterior part without setal pores; body length: 12 mm.

The second Central Russian taxon that we could not study either is *Aplatopterus rubens*, another widespread

European species whose larva has successfully been avoiding entomologists since Perris [1877] very briefly described it over 130 years ago. Immature stages of two of the three Caucasian species also remain unknown. It is *Benobotarus arnoldii* (Barovskij, 1932) and *B. longicornis* (Reiche, 1878).

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References

- Baudi a Selve F. 1871. Europeae et circummediterraneae Faunae Dascillidum et Malacodermatum specierum, quae Comes Dejean in suo Catalogo ed. 3 consignavit, ex ejusdem collectione in R. Taurinensi Musaeo asservata, cum auctorum hodiernae recepta denominatione, collation // Berliner Entomologische Zeitschrift. 15: 89–130.
 Bocák L., Matsuda K. 2003. Review of the immature stages of the family Lycidae (Insecta: Coleoptera) // Journal of Natural History. 37: 1463–1507.
 Bourgeois J. 1882. Monographie des Lycides de l'Ancient-Monde // L'Abeille. 20: 1–120.
 Bøving A.G., Craighead F.C. 1930–1931. An illustrated synopsis of the principal larval forms of the order Coleoptera // Entomologica Americana. 11(1–4): 1–351.
 Burakowski B. 1988. Notes on the biology of *Xylobanellus erythropterus* (Baudi a Selve) (Coleoptera, Lycidae) with description of the immature stages // Polskie pismo entomologiczne. 58: 575–585.
 Burakowski B. 2003. Karmazynkowate – Lycidae, Swietlikowate – Lampyridae // Klucze do oznaczania owadów polski. Chrząszcze – Coleoptera. 29, 30. Torun: Polskie Towarzystwo Entomologiczne. 49 p.
 DeGeer C. De. 1774. Mémoires pour servir à l'histoire des insectes. T. 4. Stockholm: P. Hesselberg, xii + 456 + [1] pp. + 19 pls.
 Herbst J.F.G. 1784. Kritisches Verzeichniss meiner Insektenammlung // Archiv der Insectengeschichte (Zurich: J.C. Fuessly). 5: 73–151, pls. 24–30.
 Kazantsev S.V. 2005. Morphology of Lycidae with some considerations on evolution of the Coleoptera // Elytron. 17–18 (2004) et Coleopterological Monographs. 3: 73–248.
 Kazantsev S.V. 2006. Comparative morphology of mandibular structures in lycid larvae and its phylogenetic implications (Polyphaga, Hexapoda) // Acta Zoologica. 87: 229–238.
 Kiesenwetter H. von. 1874. Die Malacodermen Japans (nach dem Ergebnisse der Sammlungen des Herrn G. Lewis während der Jahre 1869–1871) // Berliner Entomologische Zeitschrift. 18: 241–288.
 Kiesenwetter H. von. 1878. [Descriptions]. In: Schneider O., Leder H. Beiträge zur Kenntniss der kaukasischen Käferfauna // Verhandlungen des naturforschenden Vereines in Bruenn. 1877. 16: 206–207.
 Kluge N.Yu. 2000. Modern systematics of insects. Part I. St-Petersburg: Lan' 336 p. (in Russian).
 Korschefsky R. 1951. Bestimmungstabelle der bekanntesten deutschen Lyciden-, Lampyriden- und Drilidenlarven (Coleoptera) // Beiträge zur Entomologie. 1(1): 60–64, 1 Tf.
 Laporte F.L.N. Caumont de [= de Castelnau]. 1840. Histoire naturelle des insectes Coléoptères. Avec une introduction renfermant l'anatomie et la physiologie des animaux articulés par M. Brullé. Tome 1. Paris: P. Dumenil. i-cxiv + 324 p. + [1], 19 pls.
 Lawrence J.F. 1991. Order Coleoptera. P. 144–184 // Immature insects. 2. (Stehr F.W. ed.). Dubuque, Iowa: Kendall Hunt Publishers. XVI + 975 p.
 Linnaeus C. 1758. Systema naturae, sive regna naturae systematice proposita, per classes ordines, genera et species, ed. X. Holmiae, Tinea: 823 p.
 McCabe T.L., Johnson L.M. 1979. The biology of *Platycis sculptilis* (Say) (Coleoptera, Lycidae) // The Coleopterists' Bulletin. 33(3): 297–302.
 Perris E. 1846. Note pour servir à l'histoire du *Lygistopterus sanguineus*, Dej., *Lycus sanguineus*, Fabr., *Dictyopterus sanguineus*, Latr. // Annales de

la Société entomologique de France (2^{me} Série). 4: 343–346.
Perris J.P. 1877. Larves de Coléoptères // Annales de la Société linnéenne de
Lyon. 1876. 23: 28–32, Pl. 7.

Snodgrass R.E. 1935. Principles of insect morphology. New York – London:
McGraw-Hill Book Co. 667 p.

References

- Baudi a Selve F. 1871. Europeae et circummediterraneae Faunae Dascillidum et Malacodermatum specierum, quae Comes Dejean in suo Catalogo ed. 3 consignavit, ex ejusdem collectione in R. Taurinensi Musaeo asservata, cum auctorum hodiernae recepta denominatione, collation. *Berliner Entomologische Zeitschrift*. 15: 89–130.
- Bocak L., Matsuda K. 2003. Review of the immature stages of the family Lycidae (Insecta: Coleoptera). *Journal of Natural History*. 37: 1463–1507.
- Bourgeois J. 1882. Monographie des Lycides de l'Ancient-Monde. *L'Abeille*. 20: 1–120.
- Boving A.G., Craighead F.C. 1930–1931. An illustrated synopsis of the principal larval forms of the order Coleoptera. *Entomologica Americana*. 11(1–4): 1–351.
- Burakowski B. 1988. Notes on the biology of *Xylobanellus erythropterus* (Baudi a Selve) (Coleoptera, Lycidae) with description of the immature stages. *Polskie pismo entomologiczne*. 58: 575–585.
- Burakowski B. 2003. Karmazynkowate – Lycidae, Swietlikowate – Lampyridae. (Klucze do oznaczania owadów polski. Chrząszcze – Coleoptera. 29, 30). Torun: Polskie Towarzystwo Entomologiczne. 49 p.
- DeGeer C. 1774. Memoires pour servir a l'histoire des insectes. T. 4. Stockholm: P. Hesselberg: xii + 456 + [1] pp. + 19 pls.
- Herbst J.F.G. 1784. Kritisches Verzeichniss meiner Insektenammlung. In: Archiv der Insectengeschichte. Vol. 5. Zurich: J.C. Fuessly: 73–151, pls. 24–30.
- Kazantsev S.V. 2005. Morphology of Lycidae with some considerations on evolution of the Coleoptera. *Elytron*. 2004. 17–18: 73–248.
- Kazantsev S.V. 2006. Comparative morphology of mandibular structures in lycid larvae and its phylogenetic implications (Polyphaga, Hexapoda). *Acta Zoologica*. 87: 229–238.
- Kiesenwetter H. von. 1874. Die Malacodermen Japans (nach dem Ergebnisse der Sammlungen des Herrn G. Lewis während der Jahre 1869–1871). *Berliner Entomologische Zeitschrift*. 18: 241–288.
- Kiesenwetter H. von. 1878. [Descriptions]. In: Schneider O., Leder H. Beiträge zur Kenntniss der kaukasischen Kaferfauna. *Verhandlungen des naturforschenden Vereines in Bruenn*. 1877. 16: 206–207.
- Kluge N.Yu. 2000. Sovremennaya sistematika nasekomykh [Modern systematics of insects]. Part I. St. Petersburg: Lan'. 336 p. (in Russian).
- Korschefsky R. 1951. Bestimmungstabelle der bekanntesten deutschen Lyciden-, Lampyriden- und Drilidenlarven (Coleoptera). *Beitrage zur Entomologie*. 1(1): 60–64, 1 Tf.
- Laporte F.L.N. Caumont de [= de Castelnau]. 1840. Histoire naturelle des insectes Coleopteres. Avec une introduction renfermant l'anatomie et la physiologie des animaux articles par M. Brulle. Tome 1. Paris: P. Dumenil. i-cxiv + 324 p. + [1], 19 pls.
- Lawrence J.F. 1991. Order Coleoptera. In: Immature insects. 2. Dubuque, Iowa: Kendall Hunt Publishers: 144–184.
- Linnaeus C. 1758. Systema naturae, sive regna naturae systematice proposita, per classes ordines, genera et species. Tinea: 823 p.
- McCabe T.L., Johnson L.M. 1979. The biology of *Platycis sculptilis* (Say) (Coleoptera, Lycidae). *The Coleopterists' Bulletin*. 33(3): 297–302.
- Perris E. 1846. Note pour servir a l'histoire du *Lygistopectus sanguineus*, Dej., *Lycus sanguineus*, Fabr., *Dictyopectus sanguineus*, Latr. *Annales dela Societe entomologique de France (2^{me} Serie)*. 4: 343–346.
- Perris J.P. 1877. Larves de Coleopteres. *Annales de la Societe linneenne de Lyon*. 1876. 23: 28–32, Pl. 7.
- Snodgrass R.E. 1935. Principles of insect morphology. New York – London: McGraw-Hill Book Co. 667 p.