

Description of the larva of *Lygisterus anorachilus* Ragusa, 1883 (Coleoptera: Lycidae)

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It is presented here, for the first time, the description of the larva of *Lygisterus anorachilus* Ragusa, 1883. The larva is compared with the other European species and, particularly, with the very similar *Lygisterus sanguineus* (Linnaeus, 1758) from which it differs for the different colouration of the urogomphi and last abdominal tergite (A9). Furthermore, the last tergite is shorter and rounder on the sides and the urogomphi are more robust and rounded and less curved.

Key words: Coleoptera, Lycidae, *Lygisterus anorachilus*, Italian endemism, larva

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INTRODUCTION

The Lycidae, very common in tropical regions, count only 13 species in Europe (Bocáková & Bocák 2007; Kazantsev 2011; Calmont et al. 2017), plus other taxa that we find in border areas such as Caucasus (Bocáková & Bocák 2007; Kazantsev 2011; Kazantsev & Nikitsky 2011; Terzani et al. 2015). Generally, not much studied by naturalists, we can however find more or less comprehensive and accurate information or descriptions of larvae, sometimes including

the description of the pupa, for many European species: *Pyropterus nigroruber* (De Geer, 1774) (Beling 1877; Bourgeois 1882; Hansen 1938; Korschefsky 1951; Ghilarov 1964; Klausnitzer 1994; Allemand et al. 1999; Bocák & Matsuda 2003; Burakowski 2003; Kazantsev 2005; Kazantsev & Nikitsky 2011; Calmont et al. 2017), *Lopheros rubens* (Gyllenhal, 1817) (Perris 1877; Bourgeois 1882; Korschefsky 1951; Kazantsev & Nikitsky 2011), *Lopheros lineatus* (Gorham, 1883) (Burakowski 1990, 2003; Klausnitzer 1994; Bocák & Matsuda

2003), *Xylobanellus erythropterus* (Baudi, 1871) (Burakowski 1988, 2003; Klausnitzer 1994; Bocák & Matsuda 2003; Kazantsev & Nikitsky 2011), *Dictyoptera aurora* (Herbst, 1784) (Laporte de Castelnau 1840; Motschulsky 1854; Beling 1877; Bourgeois 1882; Korschefsky 1951; Ghilarov 1964; Burakowski 2003; Levkanicova & Bocák 2009; Kazantsev & Nikitsky 2011; Calmont et al. 2017), *Platycis minuta* (Fabricius, 1787) (Burakowski 2003; Kazantsev & Nikitsky 2011), *Erotides nasutus* (Kiesenwetter, 1874) (Kazantsev & Nikitsky 2011) and *Lygistorus sanguineus* (Linnaeus, 1758) (Latreille 1829; Erichson 1841; Perris 1846, 1877; Chapuis & Candèze 1853; Motschulsky 1854; Bourgeois 1882; Hansen 1938; Korschefsky 1951; Ghilarov 1964; Burakowski 1988, 2003; Klausnitzer 1994; Allemand et al. 1999; Bocák & Matsuda 2003; Kazantsev 2005; Kazantsev & Nikitsky 2011; Calmont et al. 2017), and also descriptions of species with range in border areas as for *Erotides schneideri* (Kiesenwetter, 1878) (Kazantsev & Nikitsky 2011). The larval stage of *Lygistorus anorachilus* was not described so far, and it is the purpose of this note.

MATERIALS AND METHODS

Medium instar larvae:

1 specimen, 12 IX 2016, Italy, Umbria, Scheggia and Pascelupo, Eremo of San Girolamo (PG), 670 m, F. Angelini & M. Bocci *leg.*, coll. F. Fanti, in leaf litter of *Castanea*. Body length: 9 mm. Dried, mounted on label.

1 specimen, 28 XI 2017, Italy, Abruzzo, Borrello, Baronessa (CH), 41°56'00.49"N 14°19'50.25"E, 422 m, Di Taddeo *leg.*, coll. F. Fanti, under bark of a small *Quercus* in decomposition but still standing. Body length: 7.2 mm. Preserved in alcohol (95%).

Mature larva:

1 specimen, 23 XI 2017, Italy, Abruzzo, Borrello, Baronessa (CH), 41°55'59.15"N 14°19'57.04"E, 430 m, Di Taddeo *leg.*, coll. F. Fanti, wandering on a wall at 22:30. Body length: 10 mm. Preserved in alcohol (95%).

Observations:

1 specimen 10 VIII 2013 and 1 specimen 12 VIII 2013: Italy, Abruzzo, Borrello, Baronessa (CH), 500 m.

The technical terms follow Bocák & Matsuda (2003) and Kazantsev (2005), while the photos were taken using a Nikon D7200 with lens Nikon 105mm f/2.8 plus an additional macrolens Raynox DCR-250 and after processed with PhotoImpact. The specimens observed in 2013 were photographed with a photo camera Nikon D7100 and subsequently released in the natural habitat, while the other specimens were mounted on a label or preserved in alcohol and examined with a Carton stereoscopic microscope 0.8-40x.

RESULTS

Lygistorus anorachilus Ragusa, 1883

(Figs. 1-5)

Lygistorus anorachilus Ragusa, 1883: 251

Description

Campodeiform, body slender, almost cylindrical, parallel-sided with thoracic terga slightly wider than abdominal terga except when the spiracles plates are extended. Cuticle finely alveolate particularly on peripheral regions of the head and thoracic-abdominal terga and also ventrally. Head and dorsal segments black-dark brown (head white near the antennae, maxillary-

labial pals and marginally at sides); antennae black and apically white-reddish; abdominal segment A8 black-dark brown with little and roundish orange spot at apical corners; abdominal segment A9 (both dorsal and ventral view) basally black for about the first third / half of length and bright yellowish-orange in the central-apical part, with the black that protudes medially in a small lobe or wedge; urogomphi orange; intersegmental membranes white with orange shadings in the middle; thoracic sterna medially brown and laterally matt white with darkened edges; ventral part of abdominal segments blackish in the middle, white laterally with black edges; legs white and black with traces of brown-orange. Length of the mature larvae: (9)10-13 mm, with some specimens that could reach 18 mm like the similar *Lygistopterus sanguineus* (Bocák & Matsuda 2003); width (at dorsum): 2.4 mm.

Head small, transverse, very slightly rounded anteriorly, about 1.5 times wider than long, with two discal setae, two lateral setae near the eyes (anteriorly and posteriorly) and others anteriorly and ventrally, frontal sutures absent, lateral gnathal sclerites fused to the cranium, pleural part of epicranium sclerotized, ventral plate large and pentagonal. Stemmata (one pair) present, small, bulbous, laterally in the head. Antennae short, stout, retractable, 2-segmented, located antero-laterally, apical membranous slit of the pedicel small and two short distal setae, antennomere 1 transverse, robust and short, antennomere 2 almost as wide as antennomere 1, elongated and not transverse, robust.

Mandibles brown, slender, smooth and without denticles, falciform, without setae and with the apical part of stiletto fused with the shutter, surpassing the palpifer and reaching the half of the first maxillary palpus. Maxillary palps 3-segmented (4-segmented with the palpifer), globular-elongated; palpifer sclerotized ventrally and membranous (matt white in color) dorsally, wide at base; mala sclerotized, very

small and inserted to the inner dorsal margin of palpifer; first maxillary palpomere long less than half of the palpifer and about 1.3-1.5 longer than second, third palpomere subequal in length at the second and narrower and thinner. Labial prementum undivided, without median suture, slightly concave at apex; labial palps 2-segmented, globular and elongated with the last palpomere narrower and thinner; ligula absent.

Thoracic terga very slightly wider than abdominal terga, divided by a thin complete longitudinal suture in the middle (in the tergum T1 the suture is very nuanced and not evident at apex); pronotum with few scattered setae, transverse, roundish at sides and narrower than mesonotum; meso- and metanotum strongly transverse, equipped by some setae; prosternum large, prolonged, triangular-shaped and feebly sclerotized; meso- and metasternum slightly sclerotized, divided in two parts which the first roundish (basisternum) and second triangular shaped with the narrow part anteriorly (sternellum); pro- meso- and metasternum all with setae; coxopleurite of two sclerites; metathoracic spiracles rudimentary.

Sclerites of abdominal terga A1-A8 transverse, narrowed anteriorly, undivided; spiracular plates large, triangular but rounded at apex, each with setae; tergum A9 narrower and longer than the others, strongly curved at sides, with a pair of processes (urogomphi) and ventrally with tuft of four setae lateral (near the half of length) and other four setae more internal, near the apex; urogomphi short, fixed, very robust, not curved, roundish and each with a ventral seta near the apex; A10 and A11 small and positioned on the ventral surface of A9; abdominal pleura without hypopleurite; eight pairs of abdominal spiracles, which are roundish, evident and with a peritreme; sclerites of sternites transverse with straight margins and with tuft of setae at base.

Legs short and stout; coxa large, robust; trochanter undivided, elongated, slightly

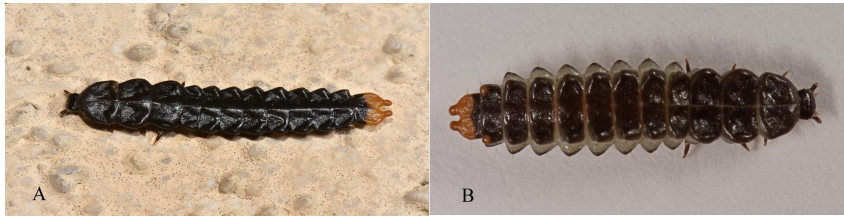


Fig. 1. *Lygisterus anorachilus* Ragusa, 1883 larvae. Dorsal views: A. specimen of 28 XI 2017; B. specimen of 23 XI 2017.



Fig. 2. *Lygisterus anorachilus* Ragusa, 1883 larva. Ventral view (specimen of 23 XI 2017)



Fig. 3. *Lygisterus anorachilus* Ragusa, 1883 larva. A. lateral view; B. ventro-lateral view; C. detail of head and thoracic terga; D. detail of thoracic terga and first abdominal segments.

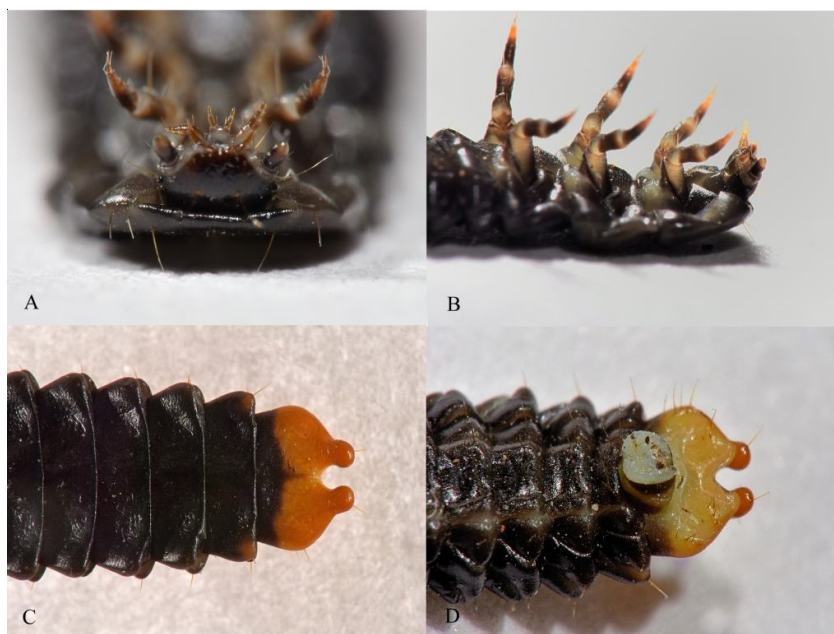


Fig. 4. *Lygisterus anorachilus* Ragusa, 1883 larva. A. detail of head, antennae, mandibles and palps; B. detail of legs; C. detail of urogomphi (dorsal view); D. detail of urogomphi (ventral view)



Fig. 5. *Lygisterus sanguineus* (Linnaeus, 1758) larva. Dorsal view (specimen of Jyväskylä, Finland), photo courtesy of Raimo Peltonen, Finland.

roundish, larger at base, and with few ventral setae; femur elongated, robust, with ventral setae; tibia (tibiotalarsus) elongated and thinner

than femur equipped with scattered setae; tarsungulus (pretarsus) thin, pointed and with two long setae.

Biology

The larvae are predators and/or mycetophagous (see under Discussion), with larval development that may take some years. They are found on the litter or more often under barks in the tunnels of old rotting trees, but they also clearly have good motility having been repeatedly found walking on buildings walls, often at night, most likely looking for other barks and food, but we can not completely exclude an anthropic disturbance to the burrows in which they had developed. The larval stages simply increase in size up to maturity and apparently there is no sexual dimorphism in the macroscopic characters. In the event of a disturbance, larvae have the ability to roll up and remain motionless as a means of defense. The pupa remains unknown.

Diagnosis

The keys of various European species can be found in Klausnitzer (1994), in Burakowski (2003) and Kazantsev & Nikitsky (2011), and *Xylobanellus erythropterus* and the two species of *Lygisterus* (*L. sanguineus* and *L. anorachilus*) can be easily distinguished for tergite 9 with urogomphi (missing in the other species) and for the presence of stemmata, which are almost always absent in the other species. Furthermore, *X. erythropterus* has tergite 9 light brown, concolorous with the other tergites, abdominal terga divided and relatively large galea, while the two species of *Lygisterus* have tergite 9 of two colors, abdominal terga undivided, rudimentary non-functional metathoracic spiracles and small galea (Kazantsev & Nikitsky 2011). The larva of *Lygisterus anorachilus* can easily be distinguished from the more closely related species, *L. sanguineus*, for tergite 9 basally black (also ventral) and with orange apex and urogomphi, while the latter has tergite 9 orange and urogomphi black. Furthermore, last tergite

is shorter and more strongly rounded on the sides in *L. anorachilus* and the urogomphi are sturdier, shorter and less curved than in *L. sanguineus*.

DISCUSSION

The larvae of Lycidae are considered carnivorous able to prey on various insects (*e.g.* Perris 1846; Palm 1951) and / or micetophagous (*e.g.* Morelli et al. 2014; Muscarella & Fanti 2015; Calmont et al. 2017) in fact, they are found under bark of rotting trees feeding on mixomycetes (*e.g.* Audisio et al. 1995; Sparacio 1997; Fanti & Giovagnoli 2013; Gatti et al. 2016). *Lygisterus anorachilus* is an Italian endemism, present in Central and Southern Italy, including Sicily (Fanti & Giovagnoli 2013; Fanti & Vitali 2013; Ceccolini et al. 2014; Terzani et al. 2015). Mazzei et al. (2016) inform us that the larvae occur in the dead wood, especially in vertical trunks of *Alnus glutinosa* (L.) Gaertner, 1790, where they live as predators, perhaps at the expense of gasteropods or larvae of other insects, but the description and figure refer to the larva of the related *Lygisterus sanguineus*. However, it is possible to hypothesise that the same biology can be referred to *Lygisterus anorachilus*, given that Aliquò & Mignani (1970) tell us that specimens of *L. anorachilus* can be found in cells within the trunks waiting to flicker, with the larvae that feed, evidently, of living organisms in the tunnels dug into old pine logs. Currently, all the larvae of the 6 (7 with *Erotides cosnardi*) Italian species (Ceccolini et al. 2014) are known, while for Europe are still unknown: *Erotides cosnardi* (Chevrolat, 1831), *Benibotarus alternatus* (Fairmaire, 1856), *Benibotarus longicornis* (Reiche, 1878), and *Benibotarus taygetanus* (Pic, 1905) (Merkl & Kondorosy 2004; Kazantsev & Nikitsky 2011).

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