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DESCRIPTION OF THE MATURE LARVAE OF TWO SPECIES OF *LIRIS* WITH NOTES ON THE IMMATURE STAGES OF *L. NIGER* (HYMENOPTERA: CRABRONIDAE)

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ABSTRACT

The preimaginal stages of 2 species of *Liris*, including the egg, 2 mature and 1 immature larvae are described. The mature larva of *L. niger* (Fabricius) described is very similar to the previously known immature one. The mature larva of *L. festinans praetermissus* (Richards) differs only in minor details from that of *L. niger*, with the presence in the first one of parietal bands being outstanding. To date, the last larval stage of subtribe Larrina can be defined by the following character states: (a) head no higher than wide, (b) mandible with 4 or more teeth, (c) epipharynx with a large number of slender spinules, which tend to converge toward the midline, and (d) labrum rounded apically. Within the Larrina, the mature larva of *Liris* is characterized by the autapomorphy "epipharynx spinulose, with a bare area in the center".

Key Words: Crabronidae, *Liris*, larvae, egg

RESUMEN

Se describen diferentes estados (un huevo, dos larvas maduras y una larva inmadura) de las fases preimaginales de dos especies de *Liris*. La larva madura de *L. niger* (Fabricius) es muy similar a su larva inmadura, ya descrita, distinguiéndose de la larva madura de *L. festinans praetermissus* (Richards) por la presencia en esta última de bandas parietales bien diferenciadas. Actualmente, el último estado larvario de Larrina se puede definir a partir de los siguientes estados de carácter: (a) cabeza no más alta que ancha, (b) mandíbulas con cuatro o más dientes, (c) epifaringe con muchas espínulas, delgadas, que tienden a converger en el centro, y (d) labro redondeado en su zona apical. Dentro de los Larrina, la larva madura de *Liris* se caracteriza por presentar la autapomorfía: epifaringe espinulosa, aunque con un área central desnuda.

Translation provided by the authors.

Sphecid wasps of the genus *Liris* Fabricius commonly nest in preexisting cavities and provision their nests with gryllids (Bohart & Menke 1976). Of the 314 species included in the genus (Pulawski 2010), only a 4-d-old larva of *Liris niger* (Fabricius, 1775) (Grandi 1928, 1961; Evans 1964) and the mature larvae of *L. aurulentus* (Fabricius, 1787) (Iida 1971) and *L. magnificus* Kohl, 1884 (Williams 1928; Evans 1958) have been described. A brief description of the egg of *L. niger* was provided by Grandi (1928). The aim of this paper is to describe the full-grown larvae of *L. niger* and *L. festinans praetermissus* (Richards, 1928) and to present some notes on preimaginal stages of *L. niger*, and compare these stages with those previously studied in the genus.

MATERIALS AND METHODS

The preimaginal stages were obtained from 4 nests of *Liris niger* and 1 nest of *L. festinans praetermissus* established in a sandy area located in Rabanera del Campo (Soria, Spain), in Jun 2007. One of the nests of *L. niger* was opened 4 d after it had been closed by the female, and included 2 cells (C2: 9.2 cm, and C1: 13.5 cm depth), each with a prey and an egg (C2) or the immature larva (C1) of the wasp. The content of 1 of the cells (C1) was placed on a Petri dish with sand from the nest and kept at room temperature so that the larva could continue its development. The egg and prey of the other cell were fixed and preserved in 70% alcohol for later study and description. The second nest of this species was opened 7 d after its completion

and closure by the female, and had only 1 cell (7.0 cm depth) including a mature larva with remains of prey. The 2 other nests had 1 cell each (9.2 cm depth, 2 prey and the egg; 6.0 cm depth, 1 prey and the egg). The nests of *L. niger* contained nymphs of *Nemobius sylvestris* (Bosc, 1792), and 3 of 5 specimens were obtained with 1 of the forelegs mutilated. The nest of *L. festinans praetermissus* had only 1 cell (3 cm depth, 1 prey) with an immature larva that was allowed to develop to maturity, after which it was fixed and preserved in 70% alcohol for later study and description.

The method employed to prepare the larval specimens, as well as the terminology of larval morphology and format used in the descriptions, follows Tormos et al. (2008). In the description, the following abbreviations are employed: d = diameter, h = height, l = length, w = width. Voucher specimens are deposited at the "Torres-Sala" Entomological Foundation (Valencia, Spain).

Results and Conclusions

Liris niger (Fabricius)

Description of Mature Larva (Figs. 1-7).

The description is based on 2 larvae that were 6 d of age, obtained at Rabanera del Campo, Soria (Spain), in Jun 2007.

Body (Fig. 1). (l = 11-12 mm, maximum w = 3.4-3.5 mm) whitish, subcylindrical tending to fusiform (Fig. 1a), curved at the level of the third thoracic segment and thinning at the anterior part. Anus ventral, preapical (Fig. 1b). Thoracic pleural lobes developed (Fig. 1c). Integument

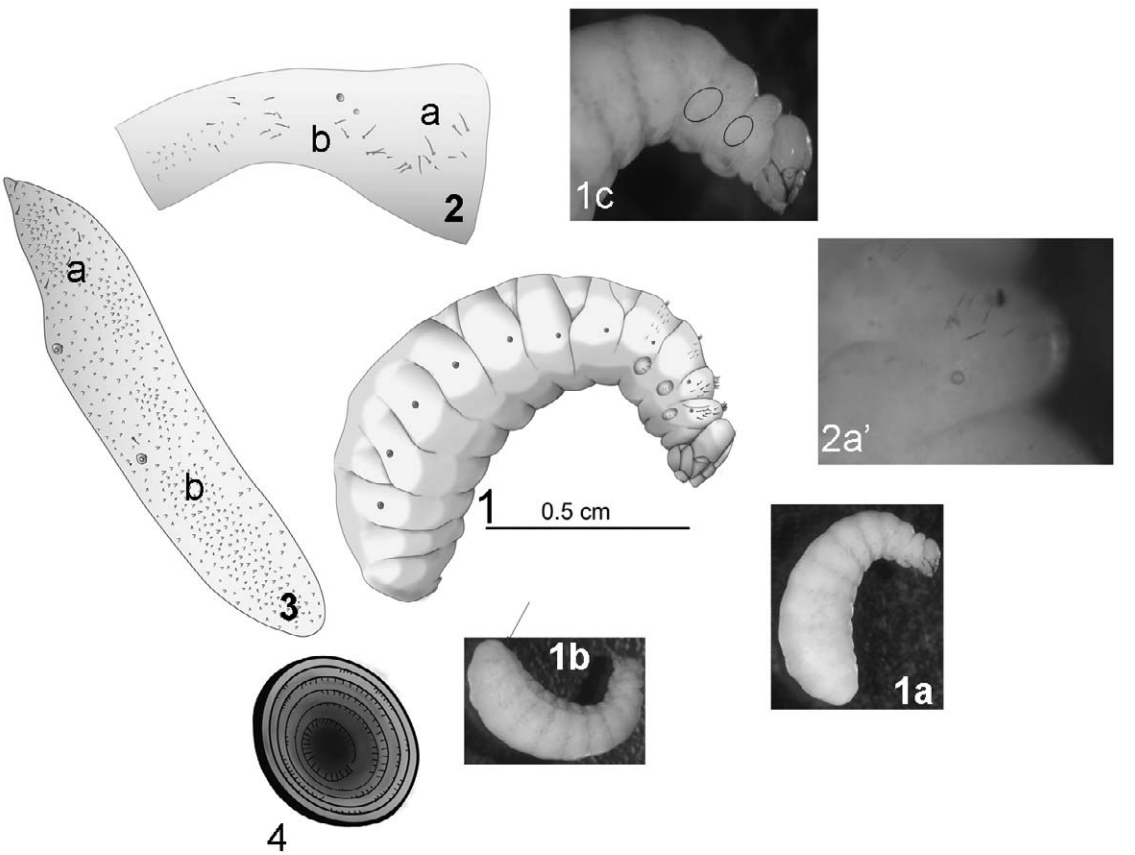


Fig. 1-4. *Liris niger* (Fabricius): Mature larva. 1. Body, lateral view. The figures 1a, 1b, and 1c, show a detail of color, anus, and pleural lobes, respectively; 2. Detail of mesothoracic segment: distribution of setae (a), Detail: a' and microtrichiae (b); 3. Detail of third abdominal segment: distribution of setae (a) and microtrichiae (b); 4. Prothoracic spiracle;

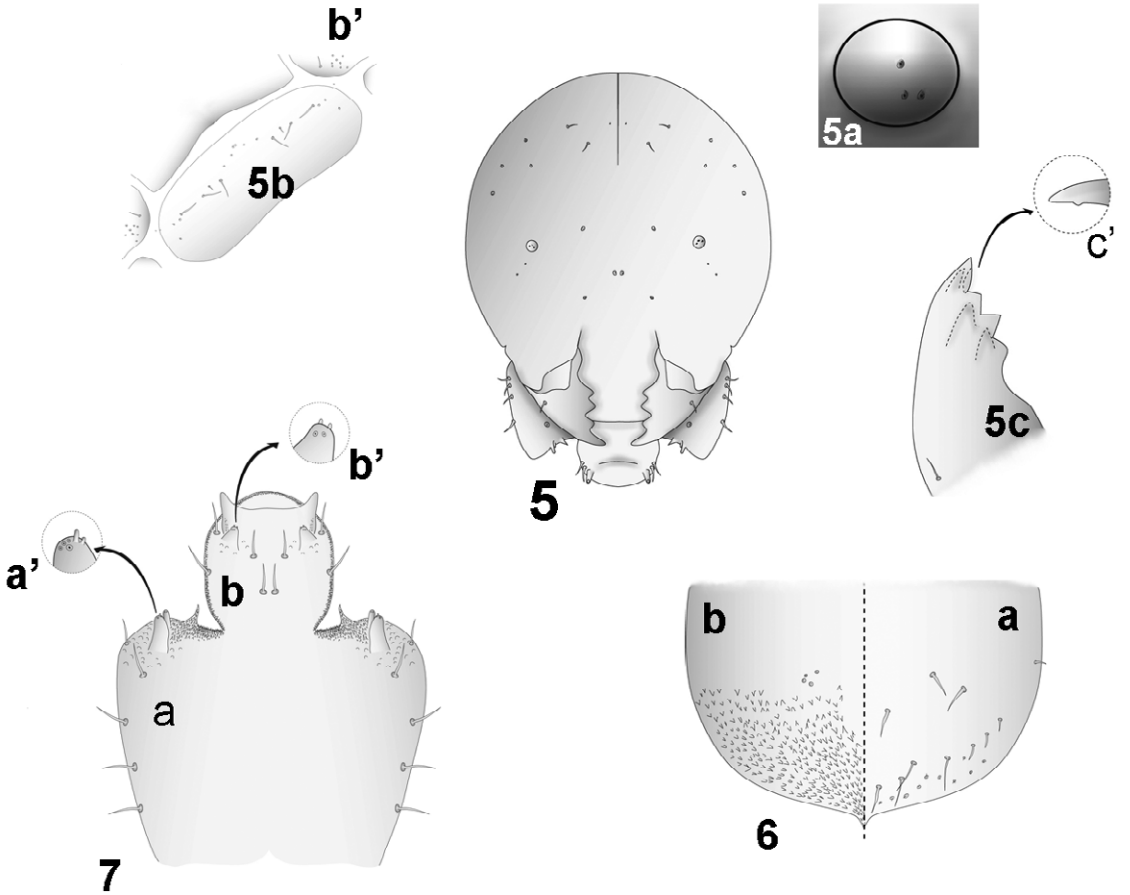


Fig. 5-7. *Liris niger* Mature larva. 5. Cranium: antenna (a), clypeus (b), group of sensorial structures (8 sensilla and a seta) in each part of clypeus (b'), mandible in ventral view (c) with detail of inner margin of first tooth (c'); 6. Labrum (a), epipharynx (b); 7. Maxilla (a) with detail of maxillary palpus (a') and labium (b) with detail of labial palpus (b').

with setae (Figs. 2a, a', 3a) (l = 44-133 µm) and microtrichiae (Fig. 2b, 3b) (l = 7-14 µm). Spiracles (Fig. 4) (d = 40-50 µm, × (mean) = 48 µm, *n* = 10) with peritreme; walls of atrium with ridges and asperities; opening into subatrium spinulose.

Cranium (Fig. 5). (w = 1.43-1.45 mm, h (exclusive of labrum) = 1.44-1.46 mm) with setae (l = 45-91 µm), punctures and sensilla (d = 6-8 µm). Coronal suture present and parietal bands absent. Antenna (Fig. 5a) (d = 61-63 µm) with antennal orbit developed, and with antennal papilla very slightly convex, almost flat, circular, with 3 sensilla (d = 4 µm). Clypeus (Fig. 5b) with around 10 setae (l = 23-69 µm) and 14 sensilla (d = 4-8 µm). Labrum (Fig. 6a) (w = 692-695 µm), with around 20 sensilla (w = 6-7 µm) and 22 setae (l = 19-57 µm). Epipharynx (Fig. 6b) spinulose (length of spinules = 6-22 µm), with 8 sensilla (d = 3 × 5 µm) in the middle-internal zone.

Mouthparts. Mandible (Fig. 5) (l = 461-464 µm, w = 215-217 µm) quatridentate in dorsal view (although ventrally more than 4 teeth can be seen, Fig. 5c, c') with a seta close to the basal external margin (l = 65-70 µm). Maxilla (Fig. 7a) (l = 534-538, w = 230-235 µm) with 5 setae (l = 70-76 µm) on external part and papillose on the apex, surrounding the maxillary palpus; lacinial area spinulose. Maxillary palpus (Fig. 7a') (h = 76-79 µm, w = 42-45 µm) with 6 apical sensilla; galea (h = 38-43 µm, w = 15-18 µm) with 2 apical sensilla. Labium (Fig. 7b) (w = 381-386 µm) papillose on oral face and spinulose and with 1 seta (l = 72-74 µm) on ventral face; labial palpus (Fig. 7b') (l = 43-45 µm, w = 44-47 µm) with 4 apical sensilla; spin-

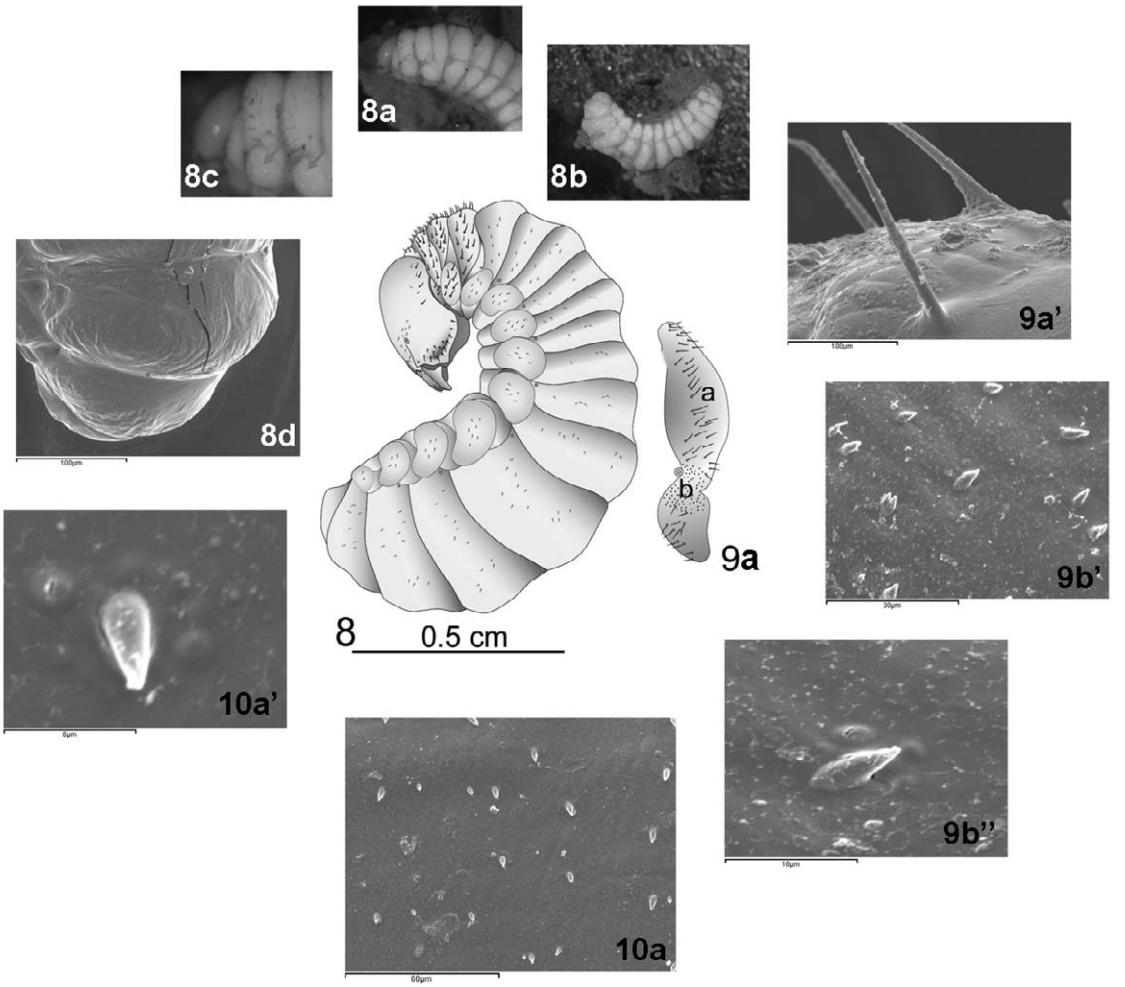


Fig. 8-10. *Liris niger* larva 4 d of age. 8. Body, lateral view. The figures 8a, 8b, 8c, and 8d, show a detail of color, general morphology, pleural lobes, and 2 last abdominal segments, including the last spiracle; 9. Detail of mesothoracic segment: distribution of setae (a) (detail: a') and microtrichiae (b) Detail: b', b"; 10a. Detail of abdominal segment: distribution of microtrichiae. 10a'. Detail of microtrichia.

neret with the projections (l = 77-80 µm) longer than the labial palpi.

Description of Immature Larva and Egg (Figs. 8-15)

The description is based on a 4-d-old larva and an egg of 24 h, obtained at Rabanera del Campo, Soria (Spain) in Jun 2007.

This larva is very similar to the full-grown larva, being differentiated by the overall body morphology and by a greater profusion of sensorial structures (setae and sensilla). The body is yellowish (Fig. 8a), subcylindrical (Fig. 8b), robust, and with well developed pleural lobes (Fig. 8c). The morphology of this larva (Figs. 8-14), as well as that of the egg (Fig. 15), is consistent with the descriptions provided by Grandi (1928).

Liris festinans praetermissus (Richards)

Description of Mature Larva (Fig. 16)

The description is based on 1 mature larva, obtained at Rabanera del Campo, Soria (Spain), in Jun 2007.

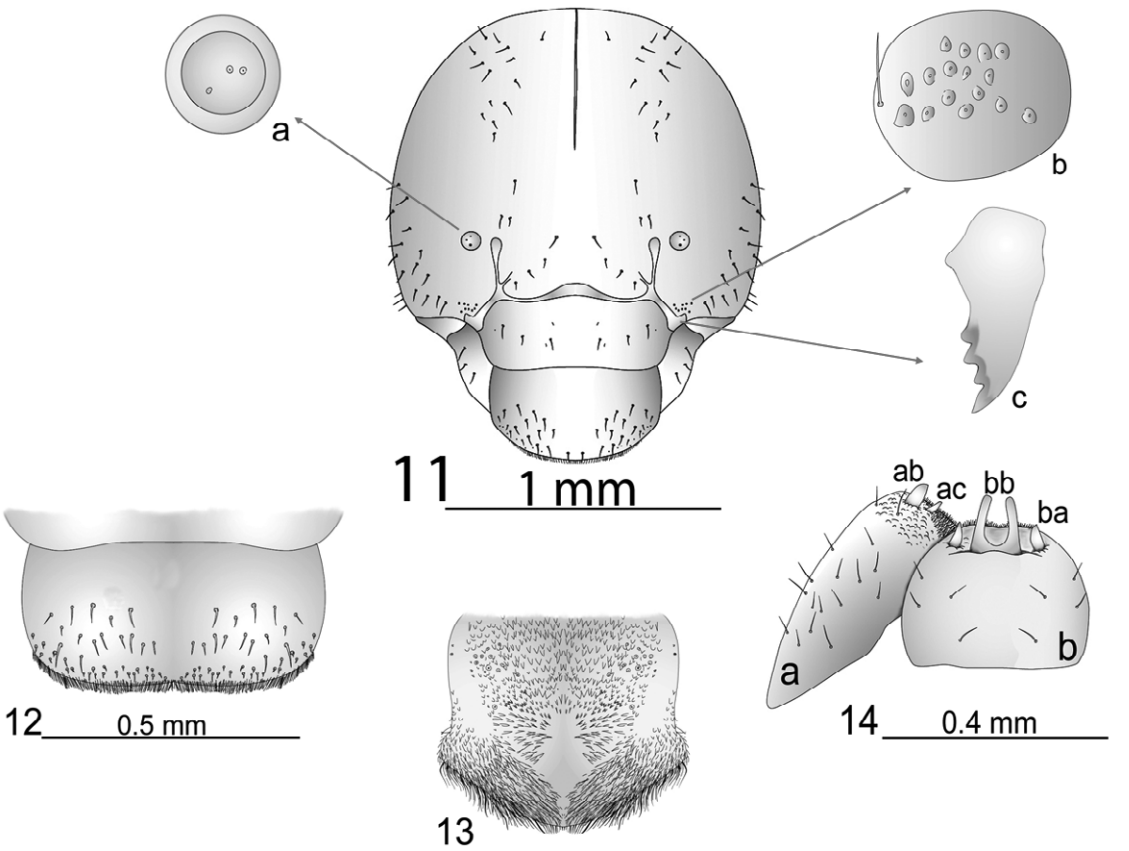


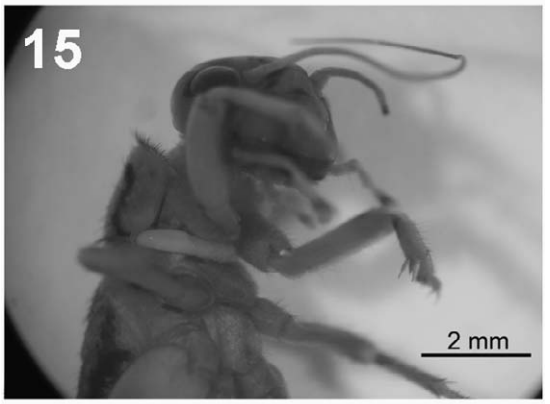
Fig. 11-14. *Liris niger* Larva 4 d of age. 11. Cranium: antenna (a), group of sensorial structures (16 sensilla + 1 seta) in each part of clypeus (b), mandible in dorsal view (c); 12. Labrum; 13. Epipharynx; 14. Maxilla (a) with detail of maxillary palpus (ab) and galea (ac) and labium (b) with detail of labial palpus (ba) and spinneret (bb).

In general the description agrees with that reported previously for *L. niger*, but the following differences should be noted:

Body. (l = 6-5.5 mm, maximum w = 2 mm; this difference in size involves a proportional reduction in the dimensions of all the structures of the larva). Cranium with setae generally shorter than the diameter of the antennal orbit. Coronal suture present, although less developed than in *L. niger*, and parietal bands present, well visible (Fig. 16). Clypeus with a group of sensorial structures in each part, although this group is only composed of sensilla, with no seta, as is the case in *L. niger*. Epipharynx with 10 sensilla in the middle-internal zone.

Discussion

The description of the mature larvae of *L. niger* and *Liris festinans praetermissus* are in reasonable agreement with the descriptions of the mature larvae of the other known species of *Liris*: *L. aurulentus* (described by Iida 1971) and *L. magnificus* (studied by Williams 1928; Evans 1958). The mature larva of these species shares 2 character states with the mature larvae of the above described species in the genus as follow: (a) epipharynx with a large number of slender spinules, which tend to converge toward the midline, but with a bare area at the centre; and (b) mandibles with a seta close to the external base.



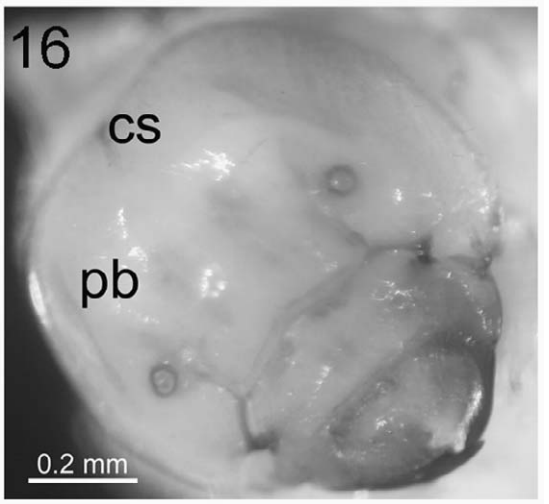


Fig. 15-16. *Liris niger* Egg: 15. Prey with the egg on the prey body; 16. *Liris festinans praetermissus* (Richards): Cranium of mature larva showing the coronal suture (cs) and parietal bands (pb).

However, they can be differentiated from each other, as well as from the mature larva of those species that have been described, by several peculiar character states, presented in Table 1.

Currently, the last larval stage of Larrina can be defined by the combination of the following character states: (a) head not higher than wide, (b) mandible with 4 or more teeth, (c) epipharynx with a large number of slender spinules, which tend to converge toward the midline, and (d) labrum rounded apically. Within the Larrina, the mature larva of *Liris* is characterized by the autapomorphy "epipharynx spinulose but with a bare area in the centre".

TABLE 1. CHARACTER STATES SHOWED BY THE MATURE LARVA OF *LIRIS*: (1) PARIETAL BANDS: STRONG (+); WEAK OR ABSENT (-). (2) HEAD SETAE: LONG, THE LONGEST ONES ABOUT EQUAL TO THE DIAMETER OF THE ANTENNAL ORBIT (+); SHORT, THE LONGEST ONES NOT EQUAL TO THE DIAMETER OF THE ANTENNAL ORBIT (-). (3) EPIPHARYNX: WITH 5 PAIRS OF SENSILLA (+); WITH FEWER SENSILLA: *L. AURULENTUS* (FABRICIUS) (3), *L. MAGNIFICUS* (KOHL) (0, WITHOUT SENSILLA), L. NIGER (FABRICIUS) (4). (4) THORACIC DORSUM WITH: NUMEROUS STRONG SETAE (+); INCONSPICOUS SETAE (-).

	1	2	3	4
Liris aurulentus (Fabricius)	+		3	—
L. magnificus (Kohl)	+	—	0	—
L. festinans praetermissus (Richards)	+		5	+
L. niger (Fabricius).	—	+	4	+

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