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A DESCRIPTION OF THE FINAL LARVAL INSTAR OF
SPECULARIUS IMPRESSITHORAX
(COLEOPTERA: BRUCHIDAE: BRUCHINAE)

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ABSTRACT

The final instar of *Specularius impressithorax* is illustrated and described. Structures illustrated include head capsule, antenna, clypeolabrum, epipharynx, mandible, maxilla, labium, thoracic leg, mesosternum chaetotaxy, thoracic and abdominal spiracles. A short discussion on phylogenetic similarities is presented.

In 1985a, Pfaffenberger published a checklist of larvae of bruchid species which had been, or were being, described. Since that time, Hassan *et al.* (1985) published descriptions of five final instars, four of which had previously been described (Pfaffenberger 1985a). Thus, the only species of larvae whose descriptions have been published since 1985 are *Bruchus trifolii* (Hassan *et al.* 1985) and *Gibbobruchus mimus* (Pfaffenberger 1986).

Behavior, morphology and physiology of larval forms are essential components to a valid system of classification (Pfaffenberger *et al.* 1984). On one previous occasion larval characters were used to clarify the taxonomic status of adults (Pfaffenberger 1984), thus confirming the value of larval traits.

The larval description presented here, the first from the genus *Specularius*, will help to elucidate the taxonomic placement of the genus within the large subfamily Bruchinae. The biology, including host plants, of this species has been described (Bridwell 1938; Decelle 1975, 1987; Kingsolver and Decelle 1979; Southgate 1976).

Specularius impressithorax (Pic)

Names and assumed functions of sensillar structures referred to in the following description were defined by Pfaffenberger 1985b.

DESCRIPTION. *Final instar.* Habitus as in figure 1 of Pfaffenberger (1977). Length 2.5-3.5 mm, width 1.5-2.5 mm; C-shaped; robust; thorax increasing in width from prothoracic metathoracic segments; meso- and metathoracic segments with single, dorsal plica; diameter of abdominal segments 1-5 subequal, but narrower than metathorax and wider than abdominal segment 6; abdominal segments progressively tapering to minute 10th segment; color white to yellowish-white; integument barbed with minute, short, pointed, posteriorly directed projections with occasional elongate sensilla trichodea (see figure 2C, Pfaffenberger 1974).

Head (cf. Fig. 1 with figures 3, 4 of Pfaffenberger 1977): Oval-shaped with noticeable posterior taper; lightly sclerotized, with heavier pigmentation near mouthparts; retractable head capsule with goblet-shaped epicranial suture; epicranium with medial, elongate pair of sensilla trichodea; medial pair flanked laterally by triad of shorter sensilla trichodea; single, short sensillum trichodeum located lateral to antenna on gena.

Ocellus: Absent.

Antenna (Figs. 1, 2): Single, telescopic segment located anterolaterally on epicranium; periphery of distal margin supporting single row of pointed microtrichia; single, enlarged sensillum basiconicum bordered dorsomedially by elongate sensillum chaeticum; three sensilla ampullacea present, two in sutural base, one on dorsolateral surface of antennal sclerite.

Clypeolabrum (Fig. 3): Vaguely sclerotized. Clypeal portion transversely elongate with rounded lateral and straight anterior margins; single sensillum trichodeum near lateral margin, subtended by medial sensillum ampullaceum. Labral portion rounded distally, with peripheral arc of eight sensilla trichodea (sensilla A–E, see Pfaffenberger 1983); pair of sensilla trichodea located distomedially behind peripheral arc; all but two proximal sensilla trichodea concealed in dense mat of microtrichia.

Epipharynx (Fig. 4): Epipharyngeal groove bordered laterally by pair of decurved sensilla trichodea; occasionally with three sensilla trichodea on left side; sensilla trichodea flanked laterally by dense mat of microtrichia.

Mandible (Fig. 5): Heavily sclerotized; transversely elongate; monocondylic, with awl-shaped chewing surface.

Maxilla (cf. Fig. 6 and figure 45 in Pfaffenberger 1985b): Cardo trapezoid-shaped, vaguely sclerotized; membranous stipes with 12 sensilla trichodea, sclerite weakly sclerotized with single sensillum trichodeum located proximodorsally; palpifer with six sensilla trichodea, one located on ventral surface of sclerite, one lateral and one ventral to base of palpus, remaining sensilla trichodea located on ventral membranous region, one sensilla ampullacea located lateral to palpus in membranous area, another located ventrolaterally on sclerite, dorsal surface with row of stout microtrichia; lacinia terminating in five truncate, spatula-like setae; palpus with dorsolateral, elongate sensillum placodeum, sensillum ampullaceum ventral to latter sensillum, border of fine microtrichia located dorsally, apical end with nine sensilla basiconica.

Labium (Fig. 7): Submentum canoe-shaped, bowing anteriorly toward lateral margins, vaguely sclerotized, with two medial sensilla trichodea; mentum with paired sensilla trichodea located posterolaterally; glossa unsclerotized, with paired proximal and distal sensilla trichodea and subtending sensilla ampullacea, arms of glossa originating at basal pair of sensilla trichodea.

Leg (Fig. 8): Four fleshy segments, ultimate segment nipple-like; basal segment of mesothoracic appendage armed medially with longitudinal row of five spines; V-shaped cluster of short, sensilla trichodea (Fig. 9) on mesosternite with V opening toward anterior end.

Spiracles (Figs. 10, 11): Thoracic (Fig. 10) peritreme present, armed with numerous sclerotized projections; atrium oval-shaped, sclerotized, armed with many pointed, sclerotized projections; abdominal spiracle (Fig. 11) without well-defined peritreme, atrium armed with numerous pointed, sclerotized projections.

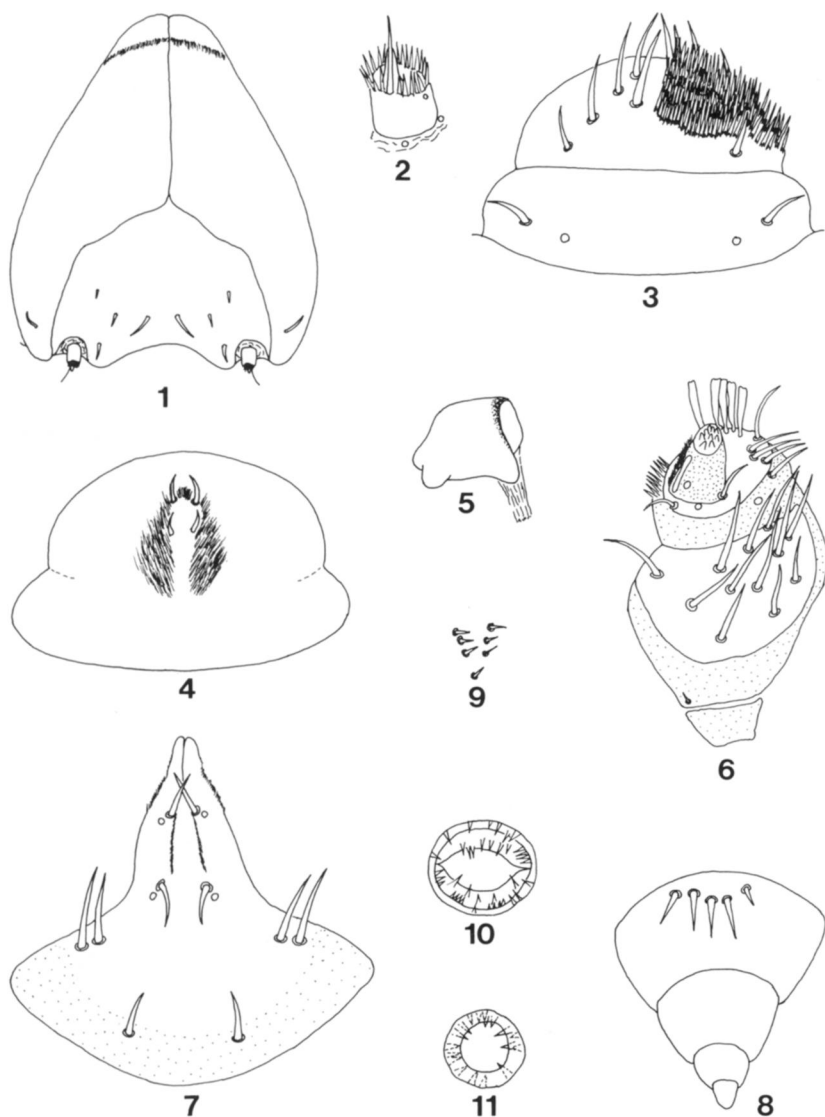
Anus (see figure 28, Pfaffenberger 1985b): Transverse.

SPECIMENS EXAMINED. Six final instar larvae from Natal, South Africa, 1977, from seeds of *Erythrina abyssinica*; collector Th. Muller. Larvae furnished by J. M. Kingsolver.

SIGNIFICANT CHARACTERS. Absence of ocelli; occasional presence of three sensilla trichodea along left side of epipharyngeal groove; horizontally elongated mandible; presence of cluster of four sensilla trichodea on distoventral surface of palpifer; longitudinal row of five spines mesad on mesothoracic appendage; and V-shaped alignment of seven sensilla trichodea.

DISCUSSION

Specularius impressithorax (= *S. erythrinae*) was placed in the Bruchidae, subfamily Bruchinae by Bridwell (1938). In an attempt to delineate its origin, Bridwell expressed the opinion that the apparent African origin, and the femoral, pygidial, scutellar and antennal characters were sufficient to distinguish *Specularius* from the closely allied American genus *Gibbobruchus*. He con-



Figs. 1–11. *Specularius impressithorax*, final larval instar. 1, head capsule. 2, single-segmented antenna. 3, clypeolabrum showing dense mat of microtrichia on right side (microtrichia tend to obscure presence of sensilla trichodea). 4, epipharynx showing paired sensilla trichodea and neighboring patches of microtrichia. 5, transversely elongate, monocondylic mandible. 6, maxilla. 7, labium showing vaguely sclerotized prementum and absence of sclerotized mentum. 8, four-segmented mesothoracic leg showing longitudinally row of heavy spines mesally. 9, mesosternum with distinctive V-shaped cluster of sensilla trichodea. 10, thoracic spiracle. 11, abdominal spiracle.

Table 1. Comparative list of taxonomic characters of final instar larvae of three bruchid genera.

Taxonomic characters	Bruchid genera**		
	Gibbo	Spec	Callo
<i>Ocelli present*</i>	—	—	+
<i>Antenna</i>			
No. of segments*	1	1	2
No. of large sensilla basiconica	1	1	1
No. of small sensilla basiconica	2	0	2
Sensillum chaeticum present	+	+	+
<i>Clypeus</i>			
Sclerite evident*	+	vague	+
No. of sensilla trichodea	2	2	2
No. of sensilla ampullacea	2	2	2
<i>Labrum</i>			
Sclerite evident*	+	vague	+
Sensilla trichodea formula	8 + 2	8 + 2	6 + 0
<i>Epipharynx</i>			
Sensilla trichodea formula*	2 + 2	2 + 3	1 + 1
Brush border of microtrichia*	+	+	—
<i>Maxilla</i>			
Cardo present	+	+	+
No. sensilla trichodea on membranous stipes*	11–13	12	5–13
No. sensilla trichodea near base of five spatulate setae	9	7	7
No. sensilla basiconica on palpus*	13	9	11
<i>Labium</i>			
Sclerite evident*	+	vague	vague
Sensilla trichodea formula on mentum	2 + 2 + 2	2 + 2 + 2	2 + 2 + 2
Pear-shaped mentum*	+	—	+
Mentum islet with s. trichodeum	+	—	+
Ligula with pair of s. trichodea and s. ampullacea	+	+	+
<i>Spiracle</i>			
Sclerotized projections lining atrium*	+	+	—
<i>Leg</i>			
No. of segments*	4	4	4
Ultimate segment finger-like	+	+	—
<i>Anal aperature transverse</i>	+	+	+

* Primitive characters.

** Gibbo = *Gibbobruchus*, Spec = *Specularius*, Callo = *Callosobruchus*.

cluded, on the basis of African origin and femoral and tarsal characters, that *Specularius* was most closely allied to *Callosobruchus*. From the discussion presented by Bridwell (1938), it is apparent that adults of these three genera appear quite similar.

The remainder of the discussion section will be devoted to an assessment of similarities and differences among *Gibbobruchus*, *Callosobruchus* and *Specularius* as determined by 25 randomly selected characters (Table 1) from described larval forms within these genera. Characters were obtained from Pfaffenberger (in press), Prevett (1971), Vats (1974) and my unpublished data. It is hoped that such a discussion will add clarity to probable evolutionary relationships among these taxa.

The assemblage of primitive and derived characters included in Table 1 confer a measure of objectivity. When comparing *Gibbobruchus* with *Specularius* 15 of the 25 characters are shared, compared to 14 of 25 for *Gibbobruchus* and *Callosobruchus*, and 11 of 25 for *Specularius* and *Callosobruchus*. Numbers of shared characters therefore seem to indicate that *Gibbobruchus* and *Specularius* are more closely related than either is to *Callosobruchus*. Secondly, *Gibbobruchus* and *Callosobruchus* share more similarities than do *Specularius* and *Callosobruchus*.

By using only primitive characters (see * in Table 1) *Gibbobruchus* and *Specularius* again shared more in common (5 of 13 characters) than did *Gibbobruchus* and *Callosobruchus* or *Specularius* and *Callosobruchus*. However, *Gibbobruchus* and *Callosobruchus* shared 4 of 13 characters. The most noticeable advantage in using only primitive characters as a basis of comparison was observed between *Specularius* and *Callosobruchus*. They shared only 2 of 13 characters. Hence, once again *Gibbobruchus* appears to occupy an intermediate position between *Specularius* and *Callosobruchus*, while sharing more in common with *Specularius*.

Some primitive characters, listed in Table 1, are certainly more relevant than others when trying to establish phylogenetic relationships. For example, presence or absence of ocelli, numbers of antennal segments and presence or shape of sclerites seem to reflect more antiquity. Among these, my personal preference is to place more intuitive emphasis on the first two for two reasons. First, during specimen preparation sclerotized parts are easily decolorized and are therefore difficult to see, and secondly, if optics and lighting are not suitable then it is oftentimes difficult to distinguish parts in apposition.

Close examination of described bruchid larvae reveals a trend of 'reduction in parts,' where the more primitive species have more segments and parts per segment than derived forms (Pfaffenberger and Johnson 1976). Using the 'reduction in parts' trend it appears as though *Gibbobruchus* and *Specularius*, which have no ocelli and one antennal segment, shared a more recent ancestor also devoid of ocelli and possessing only a single antennal segment. This ancestor probably shared a common ancestor, one with ocelli and multiple antennal segments, with *Callosobruchus*.

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