hole jagged, usually with pieces of cocoon adhering to it (Fig. 15). Hole situated apically or subapically. Parasite cocoon thin, laid down as a layer on inside of host cocoon; host remains are walled off outside parasite cocoon. Parasite final-instar remains are closely associated with the meconium.

Final-instar cephalic structure (Fig. 6) similar to *Mastrus* spp. (Fig. 2), but larger; width of labial sclerite in *O. tsugae tsugae* ca. 0.20 mm (0.17-0.22 mm). Stalk of spiracle shorter than diameter of atrium (Fig. 12).

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FINAL-INSTAR LARVAE OF TWO HYMENOPTEROUS PARASITES OF A WOOD-BORING BEETLE, *TETROPIUM VELUTINUM* LECONTE (COLEOPTERA: CERAMBYCIDAE)

THELMA FINLAYSON[1]

ABSTRACT

Characteristics of the cephalic structures, spiracles and skin of final-instar larvae of two hymenopterous parasites, **Helconidea occidentalis** (Cress.) and **Rhimphoctona atrocoxalis** (Ashm.), whose cocoons were found in galleries of the wood-boring beetle, **Tetropium velutinum** LeConte, are described and illustrated.

The species of wood-infesting Coleoptera of economic importance to western larch, *Larix occidentalis* Nuttall in British Columbia were investigated by Dr. D. A. Ross, Forest Entomology Laboratory, Canada Department of Forestry, Vernon, B.C. (Ross 1967 a, b). During the course of that investigation two species of parasites were reared, and subsequently a section of log from which they emerged was made available to the author for study. As specific information on wood-boring beetles and their parasites is scarce this log from which both beetles and parasites had

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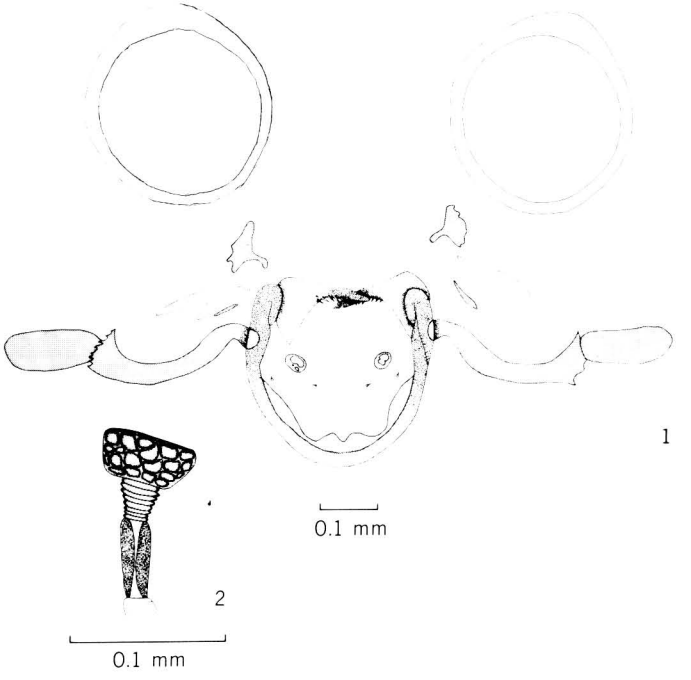
emerged provided an opportunity to establish positive host-parasite relationships.

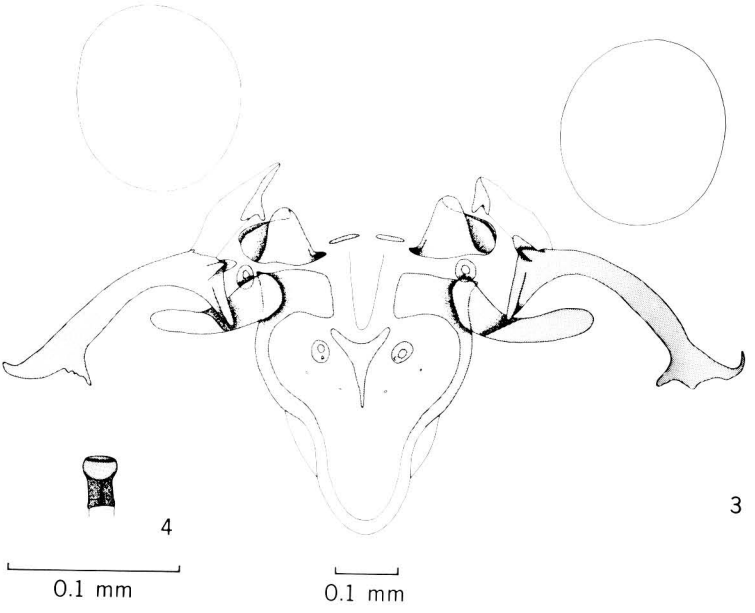
The 2.5-foot section examined was part of a log felled on June 16th, 1965, at Houser Ridge, near Lardeau, north of Kootenay Lake, B.C. Adults of *Tetropium velutinum* LeConte (Coleoptera: Cerambycidae) emerged between May 9th and June 8th, 1966, and September 3rd, 1966, and of *Serropalpus* sp. (Coleoptera: Melandryidae) between June 29th and September 3rd, 1966, and between June 13th and 16th, 1967 (D. A. Ross, in litt.). The parasite species *Helconidea occidentalis* (Cress.) (Hymenoptera: Braconidae) emerged from May 29th to June 10th, 1966, and *Rhimphoctona atrocoxalis* (Ashm.) (Hymenoptera: Ichneumonidae) from May 19th to 30th, 1966 (D. A. Ross, in litt.).

The log was cut into three-inch sections, and each section was then quartered. The sections and quarters were labelled so that each beetle gallery could be followed throughout its entire course. Each section of log was chipped apart and 3-dimensional drawings were made so that the length and type of burrows could be determined. The larval entrance holes of *T. velutinum* are elliptical (Ross 1967 b) and the galleries examined in this work extended horizontally from one-eighth to one inch inward, then usually turned at almost a right-angle and extended vertically for three-quarters to one inch. *Serropalpus* sp. has round larval entrance holes (D. A. Ross, in litt.) and the galleries examined extended horizontally into the wood, curving gently, if at all, and extended for a distance of up to three inches, with occasional branching.

The cocoons from which parasites had emerged were found only at the



Figs. 1-2. Final-instar larva of **Helconidea occidentalis** (Cress.): 1, cephalic structure; 2, spiracle.



Figs. 3-4. Final-instar larva of **Rhimphoctona atrocoxalis** (Ashm.): 3, cephalic structure; 4, spiracle.

ends of the *Tetropium* galleries and in every case were filled with fine wood chips or wood powder. None was found in the *Serropalpus* galleries. The cocoons of both parasite species contained meconium and final-instar larval skins. The methods of preparing slides of the final-instar cast skins and the terminology used are similar to those described by Finlayson (1960).

Braconidae
Helconinae: Helconini
Helconidea occidentalis (Cress.)
(Figs. 1, 2)

The cocoon of this species is about 10 mm long by 3 mm wide, buff-coloured and fairly transparent, and thin, but mica-like in texture. The large exit hole on the end of the cocoon is ragged in outline.

Only one specimen was suitable for study of the cephalic structure and some of the relationships of the sclerites in this single preparation were difficult to determine. Cephalic structure of final-instar larva (Fig. 1) lacks epistoma; superior mandibular processes are present; inferior mandibular processes, pleurostoma and hypostoma are indistinct although showing traces; hypostomal spur entirely lacking. Stipital sclerite long and curved with bulbous appendage on lateral end; medial end touches labial sclerite on dorsal third. Labial sclerite U-shaped with dorsal part of lateral arms enlarged and slightly twisted. Mandibles with long, slightly-curved blade with what appears to be two rows of teeth. Maxillary palpi are not visible but the labial palpi are well defined, each with one large and two or three small sensoria. Antennal socket characterized by slightly sclerotized band with one sensorium. Spiracle (Fig. 2) has large atrium with more or less circular reticulations and opens into stalk with about

eight narrow annulations and strong closing apparatus. Skin densely covered with fine spines and occasional short setae. Of those final-instar cephalic structures of Braconidae illustrated in the literature, the cephalic structure of *Helconidea* most closely resembles those of the Cheloninae (see e.g. Finlayson 1967, Short 1952).

Ichneumonidae: Porizontinae
Rhimphoctona atrocoxalis (Ashm.)
(Figs. 3, 4)

Cocoon of *Rhimphoctona atrocoxalis* (Ashm.) about 10.5 mm long by 3.2 mm wide; light beige in colour; thin and weak but mica-like in texture. Remains of final-instar larva are in meconium at end of cocoon opposite exit hole. Exit hole is on tip of cocoon, jagged in outline, and about 3.2 mm in diameter.

Cephalic structure of final-instar larva (Fig. 3) with incomplete epistoma; superior mandibular process sclerotized, inferior mandibular process with two struts, the posterior one slightly longer than the anterior; pleurostoma unsclerotized. Hypostoma long and strongly curved ventrally. Heavy-based hypostomal spur meets stipital sclerite at about midpoint. Stipital sclerite meets labial sclerite at dorsal end of lateral arm. Labial sclerite with dorsal arms well sclerotized, each widened medially and with lateral projection; ventral part visible but unsclerotized. Prelabial sclerite Y-shaped. Silk press visible but unsclerotized. Mandibles each heavy-based with very short blade without teeth meeting base at almost a right-angle. Labial and maxillary palpi each with one larger and one smaller sensorium. Antennal socket visible. Spiracle (Fig. 4) small with cup-shaped atrium about 0.012 mm deep by 0.008 mm wide opening into closing apparatus about 0.014 mm long and 0.006 mm wide. Skin densely covered with very small rounded protuberances and a few small spines.

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