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DESCRIPTION OF THE LARVA OF AN UNIDENTIFIED SPECIES OF *CERATOPUS* SCHOENHERR, WITH COMMENTS ON PLANT ASSOCIATIONS IN CERATOPODINAE (COLEOPTERA: CURCULIONIDAE)

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Abstract.—The larva of an unidentified species of *Ceratopus* Schoenherr is described, and important structural features are illustrated. Larvae of *Ceratopus* have been collected repeatedly, and reared, from the fruits of species of *Ficus* (Moraceae) in Middle America. This represents the first larval description for a member of the subfamily Ceratopodinae. Known plant associations for this subfamily are summarized.

The Ceratopodinae (Ceratopinae *auct.*) are one of the smaller subfamilies of Curculionidae. In the most recent world catalog (Klima, 1935), eight genera and 22 species were recognized. Since that time a number of genera have been transferred to other subfamilies and a number of new species have been described. It appears that six genera (*Aetiomerus* Pascoe, *Anthomelus* Hustache, *Catiline* Champion, *Ceratopus* Schoenherr, *Coenochira* Pascoe, and *Stelechodes* Faust) are considered valid. It is clear, from our cursory review of the literature on this group, that a comprehensive study of the world ceratopodines is needed. Little is known about the biology or hosts for species in this subfamily, and until now, the larvae were undescribed.

The genus *Ceratopus* includes about 17 valid species from the neotropics (O'Brien and Wibmer, 1982; Wibmer and O'Brien, 1986). All of the larval specimens examined for this study were associated with or reared from figs (Moraceae). We examined label data for adult specimens of *Ceratopus* in the National Museum of Natural History, Washington, and discovered a number of individuals with host data. *Ceratopus bisignatus* Boheman was reared from the fruits of *Ficus crassiusculus* and *F. glabrata.* Seven or eight unidentified species were bred from one or more species of *Ficus.* In addition to the two species of *Ficus* mentioned previously, other hosts for these unidentified species were *Ficus continifolia, F. radulina,* and *F. goldmanii.*

There are few published host associations for ceratopodines, and these are all for species of *Ceratopus.* Most of these were summarized in Lima (1956) or Silva et al. (1968). Günther (1935) noted that *Ceratopus bisignatus* and *C. tessellatus* Champion develop in the fruits of *Ficus crassiusculus*; Bondar (1947) reported that *C. bondari* (Voss) and *C. sampsoni* Bondar develop in the fruits of *Ficus* sp.; and Hustache (1940) described a new species, *C. fici,* whose larva was found in the fruits of *Ficus.* The only recorded non-*Ficus* host association involves another genus of Moraceae; Hustache (1940) described a new species, *C. helicostylis,* whose larva was found developing in the fruits of *Helicostylus poeppigiana.*

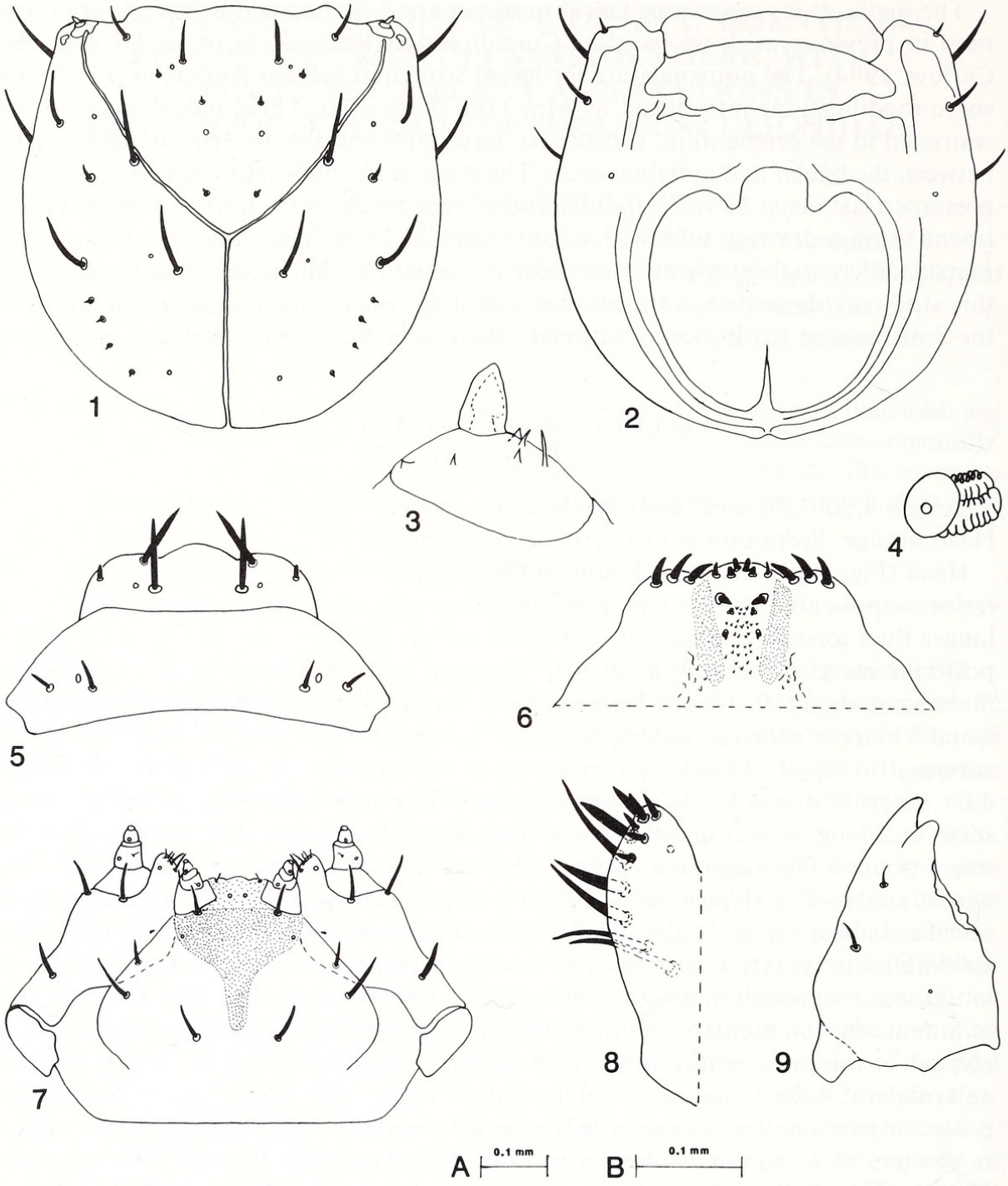
The methods for examining larval specimens and preparing illustrations are those used in previous work on baridine Curculionidae (Pakaluk, in press; Pakaluk and Carlow, 1994). The nomenclature for larval structures follows Anderson (1947), but some modifications introduced by May (1967) are used. These modified terms are restricted to the prementum, because Anderson did not denote terms to differentiate between the ligular and prelabial setae. The range for body length was measured from presumed last instar larvae. All illustrations were prepared from slide-mounted specimens using a drawing tube with a Leitz Diaplan compound microscope with Nomarski differential-interference contrast illumination. All specimens examined for this study are deposited in the alcohol and slide collections of Coleoptera larvae in the Smithsonian Institution's National Museum of Natural History, Washington.

Description of late instar larva of *Ceratopus* sp. (Figs. 1–9)

Length 4.50–4.90 mm. Body moderately slender, strongly curved, subcylindrical. Head orange. Pronotum with sclerite divided medially.

Head (Figs. 1, 2) free, length and width subequal. Anterior stemma present; posterior stemma absent. Antenna (Fig. 3) with sensory appendage conical, about 2.0× longer than longest conical rod. Epicranial suture distinct; coronal suture reaching posterior margin of cranium, slightly less than 0.5× length of head; frontal arms meeting at about 105° angle. Endocarina indistinct. Frontal setae 1–5 present, setae 4 and 5 longest, subequal in length, about 6.0× longer than seta 3, setae 1, 2, 3 short, subequal in length. Dorsal epicranial setae 1–3 longest, subequal in length, about 4.0× longer than seta 4, seta 4 shortest, about 0.33× length of seta 5. Lateral epicranial setae 1, 2 long, seta 2 slightly longer than seta 1. Ventral epicranial setae present, seta 1 about 3.0× longer than seta 2. Clypeus (Fig. 5) about 3.8× wider than long, widest subbasally, clypeal seta 1 slightly longer than seta 2, with distinct clypeal sensilla. Labrum (Fig. 5) about 3.7× wider than long, widest at base, lateral edges subparallel to weakly convergent, with anterior edge distinctly produced medially, labral seta 1 subequal in length to seta 2, seta 2 6.0× longer than seta 3, with a pair of lateral sensilla, median sensillum absent. Labral rods (Fig. 6) slightly longer than clypeus at midline, weakly convergent basally. Epipharynx (Fig. 6) with 3 pairs of anterolateral setae, 3 pairs of anteromedian setae, and 2 pairs of median setae, posterior pair smaller, shorter, slightly closer together, with a pair of sensory pores in clusters of 3, minute asperities mesally. Mandible (Fig. 9) with 2 apical teeth. Maxilla (Figs. 7, 8) with palp 2-segmented, basal segment with 1 seta, 1 pore, apical segment with 1 pore; mala (Fig. 8) with 5 ventral setae, 7 dorsal setae. Labium (Fig. 7) with palp 2-segmented, each with a single pore; prementum with 2 pairs of setae, sclerite as in Figure 7, anterior process broad, biemarginate apically, extending to apex of ligula, posterior process elongate, rounded apically, with 2 pairs of setae, ligular seta short, prelabial seta long, about 3.0× longer than ligular setae, with a pair of pores; postmental seta 2 longest, slightly longer than seta 1, about 2.0× longer than seta 3.

Pronotum with 11 setae, 5 moderately long, subequal, others shorter. Spiracle bicameral, with air tube subequal in length to diameter of peritreme. Prodorsum of meso- and metathorax without setae; postdorsum of each segment with 4 setae, setae



Figs. 1–9. *Ceratopus* sp., larva. 1. Cranium, dorsal. 2. Cranium, ventral. 3. Antenna, ventral. 4. Abdominal spiracle, lateral. 5. Clypeus and labrum, dorsal. 6. Epipharynx, ventral. 7. Ventral mouthparts, ventral. 8. Apex of mala, ventral. 9. Mandible, dorsal. Scale line A for Figures 7, 9; scale line B for Figures 1–6, 8.

1 and 2 short, subequal in length, setae 3 and 4 moderately long, subequal in length. Alar area with 1 short seta. Spiracular area of mesothorax with 3 setae, short to minute. Pedal area with 7 setae, 2 distinctly longer, others shorter. Sternal setae distinctly longer than eusternal setae of abdomen.

Abdomen with 8 pairs of bicameral spiracles laterally, with air tubes subequal to slightly shorter than diameter of peritreme (Fig. 4). Dorsal fold 1 absent. Sternellum absent. Prodorsal seta present on VIII. Segments I–VII with 5 postdorsal setae, VIII with 3 setae, IX with 2 setae, abdominal segments usually with setae 1, 2, 4 short, 3 and 5 long. Spiracular area with 2 setae, one seta short, the other minute. Epipleurum with 2 setae, one seta short, the other long. Pleurum with 2 setae, one seta short, the other long. Pedal and eusternal area with setae short, subequal in length. Anus terminal, with 7 lobes, bilobate dorsally, trilobate ventrally. Asperities fine, inconspicuous, generally distributed over body, slightly less dense laterally.

The description and illustrations were based upon a single, slide-mounted specimen that was with material reared to adults from San Juan, Honduras. Other larval specimens were compared to assess variation and to incorporate character data from alcohol-preserved specimens, such as for body length or color. The specimens examined (listed below) represent at least two different species of *Ceratopus,* although there appears to be little if any variation between them.

Material examined. Fifty-five specimens (4 slides, 51 in alcohol) were examined with the following collecting data: HONDURAS. Progresso, from fig fruit, W. M. Mann; same data except 1029, from large wild fig fruit; same data except 14 March 1920, from fig; San Juan, 23 March 1920, from large fruited fig, W. M. Mann. MEXICO. No specific locality, 6 August 1951, in seed capsule of *Ficus* sp., w-1496, USDA #51-6990; Atlixco Puebla, 23 May 1937, in wild fig, A. Stone; near Tampico, October and November 1913, found abundantly attacking wild figs, D. L. Crawford. PANAMA. No specific locality, intercepted 7 April 1972 at Miami, Florida #003970, *Ficus* sp. fruit, USDA #72-6074.

A single slide is labelled "Progress. Honolulu". We interpret this as a lapsus for Progresso, Honduras, since the other label data are consistent with other specimens from this locality. Some larvae were associated with specimens ultimately reared to adults, while the remaining specimens were identified by comparing them to these reared lots.

Although the Ceratapodinae have historically been treated as a separate subfamily, Kuschel (1982, and in Wibmer and O'Brien, 1986:205) suggested that this group should be incorporated into an expanded Curculioninae (Curculionini of Kuschel's (in press) latest classification, and followed by May (1993)). The larva of *Ceratopus* described above differs from the curculionine diagnosis presented by May (1993) by having an indistinct endocarina and a broad, enlarged premental sclerite. Most other curculionines have a distinctly trident-shaped premental sclerite, except for leaf-mining forms, such as species of *Geochus* Broun and *Neomycta* Pascoe. Perrin (1992a, b) discussed the ecology of species of *Curculio* developing on species of *Ficus* and Fagales. She suggested that there were two independent radiations on host plants within this genus. These host plant data may support a close relationship between ceratopodines and *Curculio* and its relatives.

It is beyond the scope of this paper to elucidate the systematic placement of this subfamily based upon larval data. We intend only to make these morphological data available to others studying the immature stages of Curculionoidea, with the hope that the description and illustrations of this *Ceratopus* larva will eventually contribute to clarifying the relationship of ceratapodines to other weevils.

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