IDENTIFICATION OF MATURE LARVAE OF *HYDATICUS CINCTIPENNIS* AND *H. BIMARGINATUS* (COLEOPTERA: DYTISCIDAE) BASED ON MORPHOLOGY AND BREEDING SEASONS

E. H. BARMAN[1], B. P. WHITE[2], R. JACKSON[1] AND G. W. WOLFE[1]
[1]Department of Biological & Environmental Sciences, Georgia College & State University, Milledgeville, GA 31061

[2]Natural Sciences, Georgia Military College, Warner Robins, GA 31093

The cosmopolitan genus *Hydaticus* is represented in the southeastern United States by only 2 species, *H. (Hydaticus) cinctipennis* Aubé and *H. (Guignotites) bimarginatus* (Say). Southeastern records for *H. (H.) cinctipennis* are from Virginia, South Carolina, Georgia, Florida, Mississippi, and Tennessee. The U.S.A. range of *H. (G.) bimarginatus* includes the states of the Atlantic and Gulf Coastal Plains with additional records from Arkansas (Roughley & Pengelly 1981). Young (1954) tentatively included *H. rimosus* in the Florida fauna based on 3 specimens taken in Broward County; however, Roughley & Pengelly (1981) concluded that the range of this species does not extend into Florida and that its distribution is the Caribbean Islands, the Bahamas, and Mexico.

Larvae of *Hydaticus* are superficially similar to those of *Dytiscus*. The taxa are distinguished by the (1) smaller size of specimens of *Hydaticus* and (2) presence of 2 or 3 lobes on the distal margin of the prementum (labium) of *Hydaticus* (Fig. 1). These lobes are not present on the smooth and convex premental margin of *Dytiscus* (e.g., Merritt & Cummins 1996; Epler 1996). Dettner (1984) described the prementum of second and third instars of *Guignotites* as trilobite and that of *Hydaticus* s. str. as bilobed. Although the prementum of an immature larva of a South American species of *Guignotites* is bilobed (Michat and Torres 2006), Jackson et al. (2008) confirmed the presence of 3 lobes on the prementum of the mature larva *H. (G.) bimarginatus*. Because distribution records (Roughley & Pengelly 1981; Turnbow & Smith 1983) indicate that there are only 2 species of *Hydaticus*, *H. (H.) cinctipennis* and *H. (G.) bimarginatus*, in Georgia and the presence of 2 premental lobes, second and third instars collected from a lower Piedmont marsh habitat in Talboton County, Georgia, U.S.A., were identified as *H. (H.) cinctipennis*.

Jackson et al. (2007) noted that the median lobe of *H. (G.) bimarginatus* was often small and difficult to observe on some specimens, requiring removal of the prementum and a careful examination of its dorsal surface in order to confirm the presence (or absence) of a third lobe. Consequently, if the number of lobes is used as an exclusive diagnostic character, larvae of *H. (G.) bimarginatus* may be misidentified as *H. (H.) cinctipennis*. A comparison of labial anatomy of both species indicated that a more obvious, convenient, and reliable character is available for identification of at least mature larvae of the 2 species in the southeast. The proximal labial palpomere of *H. cinctipennis* had a mean length of 0.29 mm (n = 4) that is less than the distance between outside width ($\bar{x}$ = 0.43 mm, n = 4) of the prementum at the origins of the palpomeres (Fig. 1A; line a). In contrast, the proximal palpomeres of *H. bimarginatus* are longer ($\bar{x}$ = 0.51 mm; Jackson et al. 2007) than the width ($\bar{x}$ = 0.41 mm, n = 9) of the prementum at the same location (Fig. 1B). An examination of second instars of *H. bimarginatus* (n = 4) and *H. cinctipennis* (n = 2 exuviae) indicated that this character may be used to identify these larvae as well. Thus, if an examination of dytiscinine third or second instars reveals the presence of lobes on or near the anterior margin of the labial prementum, an analysis of the length of the proximal palpomere relative to the width of the prementum at the origin of the palpomeres will permit identification of mature *Hydaticus* larvae as either *H. cinctipennis* (shorter palpomere) or *H. bimarginatus* (longer palpomere). First instars of *H. cinctipennis* were not available for examination.

Differences in the breeding seasons also may aide in the identification of *H. bimarginatus* and *H. cinctipennis*. Second and third instars of *H. cinctipennis* were collected 19 and 23 III 1997 from a lower Piedmont marsh in Talboton County,

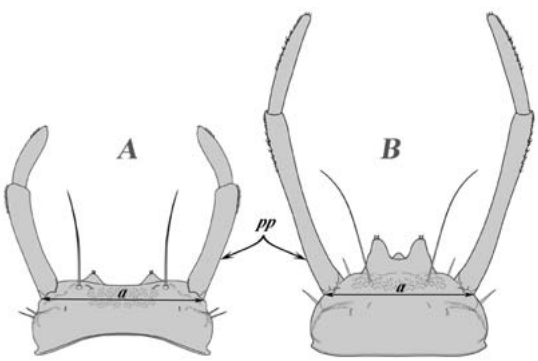

Fig. 1. Labia of third instar of *Hydaticus cinctipennis* (A) and *H. bimarginatus* (B). Premental width, *a* and proximal palpomere, *pp*.

Georgia (USA), indicating that adult dispersal to and oviposition in this habitat occurred before early Mar. Average temperatures for this County in Feb and Mar 1997 were 9.5 and 13.6°C, respectively (Anon. 2007). Jackson et al. (2007) concluded that oviposition for the population of *H. bimarginatus* occurred as early as Jun in 2004 when the average monthly temperature was 26.1°C (Anon. 2007). These data are consistent with and supportive of a zoogeographic hypothesis by Roughley & Pengelly (1981) that *H. cinctipennis* entered northern North America from western Eurasia and that *H. bimarginatus* represents a northern extension of a Neotropical fauna. Given this zoogeographic history, it would be expected that *H. bimarginatus* would be less tolerant of even the relatively mild winter and spring temperatures of the Georgia lower Piedmont than *H. cinctipennis* and would breed later in the year.

SUMMARY

Relative lengths of the basal segments of the labial palmomeres may be used to identify the third and second instars of the 2 southeastern species of *Hydaticus*. These segments are longer on *H. bimarginatus* than on *H. cinctipennis*. In Georgia, *H. cinctipennis* breeds in late Apr and early Mar with oviposition for *H. bimarginatus* beginning in late Jun and continuing into the Fall.

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