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Dytiscidae or Predaceous Diving Beetles (Insecta: Coleoptera) of Plummers Island, Maryland

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Abstract.—Based on historical records in the collection of National Museum of Natural History, Smithsonian Institution, Washington, D.C., 18 species of Dytiscidae have been collected on Plummers Island, Maryland. This represents 21.4% of the known Maryland dytiscid fauna. From 1903–1932 to 1960–1970, collection records show a turnover of 50% in the species composition of dytiscid beetles of the site. *Agabetes acuductus* (Harris), a species of special concern, has been collected twice on the Island.

Key words.—Inventory, species turnover, aquatic invertebrates, species of special concern, Chesapeake and Ohio Canal National Historical Park.

The family Dytiscidae (predaceous diving beetles) are found in lentic and lotic habitats. Both larval and adult dytiscids are predators and scavengers and are extremely well-adapted to aquatic life. Many are strong swimmers. Larger species often feed on fish, anuran larvae, or other small vertebrates. Smaller species are effective predators on invertebrates, especially mosquito larvae. Many species are good fliers and are able to quickly colonize new bodies of water or disperse when their habitat dries up. Oviposition occurs terrestrially usually in either moss, debris, or cracks in wood. There are three larval instars and each is aquatic. Larvae, as well as adults, generally must surface for oxygen, though there is circumstantial evidence that some species do not, e.g., the larvae of *Coptotomus* have abdominal gills. Pupation occurs on land near the water in a small earthen cell.

Dytiscids are encountered frequently and are fairly easy to identify. The North American fauna of 475 species is well-studied (Larson et al. 2000, Roughley & Larson 2001); there are 84 species reported from Maryland (Staines 1986).

According to the Maryland Natural Heritage Program (Anonymous 2003), the following species are candidates for listing as endangered or threatened in the state: *Agabetes acuductus* (Harris), *Hoperius planatus* Fall, *Hydrocolus deflatus* (Fall), and *Laccophilus schwarzi* (Fall).

The insect collection at the National Museum of Natural History (USNM), Smithsonian Institution, Washington, D.C., was examined for specimens collected on Plummers Island, Maryland. Formerly owned by the Washington Biologists' Field Club (WBFC), the Island is now part of the Chesapeake and Ohio Canal National Historical Park. The USNM collection is the major repository for specimens from Plummers Island since many of the entomologists who worked on the Island were members of the WBFC and affiliated with the USNM. Species identifications were confirmed, and label data were recorded for specimens. In addition, literature on various genera was examined for Plummers Island records.

There are 186 specimens of dytiscids in the USNM collection from Plummers Island, representing 18 species or 21.4% of the Maryland fauna. Specimens have been collected from January to November. Owing to the considerable number of historical specimens from the early part of the 20th century and intensive field work by Paul Spangler in the 1960s and 1970s, the dytiscid fauna from these two periods can be compared. Species turnover was calculated using $T = (e + c)/(b + d)$, where e is the number of apparent extirpations, c the number of apparent colonizations, b the number of species present at the first date, and d the number of species present at the last date. Species turnover between 1903–1932 and 1960–1970 is 50% for the dytiscids of the site. A shortcoming of this simple analysis is that not all Plummers Island specimens may be deposited in the USNM, i.e., material may be present in other collections.

Species Accounts

Acilius mediatus (Say) is found in creeks, ditches, and forest pools (Larson et al. 2000). One specimen was collected on 18 April 1913.

Agabetes acuductus (Harris) is a woodland pool species (Spangler & Gordon 1973) and a species of special concern according to the Maryland Natural Heritage Program (Anonymous 2003). Two specimens were collected 23 October 1965 and one on 29 June 1960 by P. J. Spangler.

Agabus gagates Aubé is most commonly found in woodland pools, as well as beaver ponds, flooded pastures, and stream margins; adults can be taken at lights (Michael & Matta 1977). There are 37 specimens of this species, collected from March 1907 to October 1965.

Agabus punctatus Melsheimer is collected in lakes, ponds, and vernal pools; adults are attracted to lights (Larson et al. 2000). Seven specimens of this species were collected in 1960 (no further label data) and May 1965.

Bidessonotus inconspicuus (LeConte) is found in ditches, ponds, streams, woodland pools; adults can be taken at light (Larson et al. 2000). Four specimens were collected in June 1960.

Copelatus glyphicus (Say) is collected in pools, ponds, puddles, hollow trees, and leaf litter (Young 1963). This is the second most abundant species with 36 specimens collected from March to October. It is interesting that there are no specimens in the USNM collected after 1919 even though Spangler (1962) described the larva and pupa from material he collected on the Island, presumably in the 1960s.

Heterosternuta pulcher (LeConte) is found above clay, sand, or gravel along the margins of streams (Matta & Wolfe 1981). One specimen was collected 3 August 1913.

Hydroporus effeminatus Fall has an unknown biology. Five specimens were collected 27 September 1960.

Hydroporus niger Say is found among emergent vegetation of sunny ponds (Larson et al. 2000). Six specimens were collected 11 June 1921 ($n = 4$) and 21 January 1960 ($n = 2$).

Ilybius biguttatus (Germar) is found in lakes; it is attracted to lights (Larson 1987). Thirteen specimens were collected from September 1906 to August 1960.

Laccornis difformis (LeConte) is found in swamps, hollow trees, and flood plains along rivers; it is attracted to lights (Wolfe & Spangler 1985). Eight specimens were collected in March and May 1961.

Matus bicarinatus (Say) is found in ponds and streams (Young 1953). Seven specimens were examined: four from August 1913 and three from June 1921.

Matus ovatus ovatus Leech is found in woodland pools (Wolfe & Roughley 1985). Five specimens were collected from April 1910 to November 1921.

Neoporus undulatus (Say) is found in rivers and ponds; it also is attracted to light (Larson et al. 2000). A total of 42 specimens were collected on 9 October 1904, 13 January 1906, 11 September 1906, 23 September 1906, 3 August 1913, 13 September 1913, and 27 September 1960.

Rhantus calidus (Fabricius) is found in woodland pools, open grassy marshes, ponds, and muddy pools at stream margins (Zimmerman & Smith 1975). One specimen was collected on 29 March 1907.

Stictotarsus griseostriatus (DeGeer) is found in disturbed situations (Larson et al. 2000). One specimen was collected on 24 March 1907.

Thermonectus basillaris basillaris (Harris) is found most commonly in temporary pools with clear water and no vegetation; it is considered a pioneer species; adults are attracted to lights (Michael & Matta 1977). Four specimens were collected on 27 April 1913, 3 August 1913, 13 September 1913, and 7 June 1961.

Uvarus lacustris (Say) is often common in small muddy or clay-bottomed pools and in shallow, sun-warmed water along the edges of large ponds (Larson et al. 2000). Four specimens were collected on 24 and 29 March 1907 and one on 1 September 1960.

Discussion

The USNM records represent two periods of activity: 1903–1932 and 1960–1970. Early investigators left few records of their collecting methods or the amount of time spent on the Island, which makes comparisons with the results of Spangler's work from the 1960s less precise.

Ten of the dytiscids recorded from Plummers Island are habitat generalists. These species were found in the early years of work on the Island, and many were still present in the 1960s. Four species from the site are woodland pool specialists. Woodland pools have been well studied for amphibians, but the invertebrate communities of these microhabitats are only beginning to be examined. Many of the woodland pool specialists have spotty distributions, but this may be an artifact of under-sampling.

The Dytiscidae is an excellent family to continue to monitor on Plummers Island. The presence of historical material in the USNM collection, from the early part of the 20th century and from the 1960s, suggests that trends in the faunal composition of the site can be documented by additional sampling.

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