

## Aquatic Beetles of a Northern Indiana Lake<sup>1</sup>

MICHAEL E. MONTGOMERY and GERTRUDE L. WARD, Earlham College

Several studies have been made of the beetle fauna of ponds (1, 2, 3, 4), but this fauna in lakes has been largely neglected. A lake differs from a pond in being larger and deeper, in being less subject to depth changes and in possessing a variety of habitats. This variety represents a diversity of specialized situations which may be inhabited by aquatic beetles resulting in a greater richness of beetle fauna.

By investigating several different minor habitats of a lake, a determination of the characteristic beetle fauna is possible. Analysis of the differences in various habitats gives information on the preferences and requirements of many beetle species.

This study was conducted at Dewart Lake, located in Kosciusko County, Indiana. The lake comprises 551 acres and has a maximum depth of 83 feet. Being the highest lake in its drainage, Dewart is subject to fluctuations of water level. Its water is supplied mainly by seepage through underground strata. There is only one small feeder stream.

After thorough examination of the entire lake margin, six areas were selected to represent the different minor habitats of the lake. The selection of these areas is admittedly biased. The areas chosen are places where density of the aquatic beetle population was high. Aside from areas very similar to the ones selected, the lake margin harbored surprisingly few beetles, and these beetles were the ones most common in the six areas studied intensively.

### Habitat Descriptions

The following brief descriptions of the areas are largely subjective and attempt to compare what are believed to be the primary parameters. Area 1 was a three-year-old dredged channel having a bottom of soft muck that supported a thick growth of *Myriophyllum*. Its bottom, which had a steep slope, was only slightly covered by detritus. The area was never in shade. Area 2 was removed from the main body of the lake and was marked by succession toward swamp conditions. It was the most shaded area. The bottom had a layer of decaying tree leaves, measuring 4 to 11 inches thick. There was no rooted vegetation, only masses of floating *Lemna*. The area was similar to the typical woods pond. Area 3 was unique in having a clean sandy bottom. It supported a moderate growth of *Myriophyllum* which had been washed up and had rerooted. It was fully exposed to the sun. This was the only area in which beetles were readily observed. Many could be seen, especially *Tropisternus* spp., at all times except during stormy weather when they were found only beneath the gravel and mats of *Myriophyllum*. In all the other areas, beetles were seldom observed except when disturbed by the collecting net.

---

1. This study was aided by National Science Foundation Grant for Undergraduate Research Participation No. GY-964.

Area 4 could be called a transition area between Areas 2 and 3, being located between the two and having aspects of both. The bottom consisted of sandy gravel and was covered by up to 2 inches of detritus. A dense growth of *Myriophyllum* was rooted weakly in it. It was shaded in the morning by *Salix interior*. Area 5 was unique in having a growth of *Decodon demersum* which was surrounded by *Typha*. The bottom material was flocculent and consisted of 9 inches of decaying aquatic plants. Only a little shading was provided by the growth near the shoreline. Area 6 was similar to Area 2 in being covered with dead oak and willow leaves which had accumulated on the bottom to a depth of 14 inches and was very odoriferous. The area was in shade half of each day. A small amount of *Typha* near the edge of the area was the only plant growth.

All areas were sheltered from rough water by dense stands of *Myriophyllum*. Only Area 3 was affected by waves, and these were no more than 2 inches high. Areas similar to the ones investigated but unprotected from waves contained no Coleoptera. The depth of the water above the detritus was no more than 6 inches and usually 2 to 3 inches. Except for *Peltodytes* and two *Enochrus ochraceus*, no beetles were found in open water more than 6 inches deep.

### Method

The collecting was done with a minnow dip net to gather the debris from a measured area. Later, the beetles were separated from the debris by allowing them to move through a ½-inch wire mesh on which the debris was placed. The beetles fell through the mesh into a container of water.

### Results

From a total of 39 collections made during the period July 3 to August 12, 1966, 1,207 specimens were gathered representing 43 species, 27 genera, and three families, Haliplidae, Dytiscidae and Hydrophilidae. In addition, the gyrenids, *Dineutes hornii* (Say) and *Gyrinus analis* Say, were sparsely scattered along the lake margin. Semi-aquatic Coleoptera were also encountered. Three species of *Donacia* adults were very numerous on the leaves of *Nuphar odorata* and *Nymphaea advena*. The larvae of the chrysomelid, *Scriptes tibialis* (Say), were abundant. Three species of adult Curculionidae were found crawling on vegetation beneath the water surface.

Table 1 shows the distribution of beetles in each of the habitats. Identification has been checked by Dr. Frank Young of Indiana University.

The list of species compiled from all of the areas studied was used to determine the representative beetle fauna of Dewart Lake. The determination of characteristic species is based on frequency of occurrence and abundance of beetles in the minor-habitat areas studied. A beetle was considered characteristic if it had at least an 80 percent frequency of occurrence and a numerical abundance of at least 7 individuals. The two species of *Hydrochus* are an exception. They were observed in all habitats except Area 1. Because of their habit of

TABLE 1. Distribution of Aquatic Beetles of Dewart Lake.

Species	Habitat Area					
	1	2	3	4	5	6
<b>HALIPLIDAE</b>						
<i>Peltodytes edentulus</i> (Lec.)	19	1	3	4	3	2
<i>Haliphus immaculicollis</i> Harris		1		2	1	
<b>DYTISCIDAE</b>						
<i>Laccophilus maculosus</i> Say	12	7	8	21	5	4
<i>Hydrovatus pustulatus</i> Melsh.	1	1	4	1	2	1
<i>Desmopachria convexa</i> (Aubé)		1	4	1		
<i>Liodessus affinis</i> (Say)	8		93	47	11	2
<i>L. lacustris</i> (Say)			2	4		
<i>Hygrotus sayi</i> Balfour-Browne		3	21	15	35	9
<i>H. nubilus</i> Lec.			1			
<i>H. impressopunctatus</i> (Schall.)			1	1		
<i>H. sp.</i>		1				
<i>H. sp.</i>		1				
<i>Uvarus granarius</i> (Say)	1					
<i>Hydroporus consimilis</i> Lec.	1	2	3	10	41	
<i>H. signatus</i> Mann.		1			1	
<i>H. striola</i> Gyll.		1	1	1	2	
<i>H. laetus</i> Leech		1				
<i>H. dentiger</i> Fall		1	8	3	8	3
<i>H. niger</i> Say	5	12	39	48	9	1
<i>Ilybius biguttulus</i> (Germ.)				1		
<i>Agabetes aceductes</i> (Harris)	1	1				
<i>Coptotomus interrogatus</i> (Fab.)	3	1	6	11	14	2
<i>Colymbetes sculptilis</i> Harris		1			1	1
<i>Dytiscus fasciventris</i> Say		1		1		1
<i>Acilius semisulcatus</i> Aubé	2		1			
<i>Hygrotus laccophilinus</i> (Lec.)		1				
<b>HYDROPHILIDAE</b>						
<i>Helophrus lineatus</i> Say		2	3	1	3	2
<i>Hydrochus sp.</i>		4	2	2		1
<i>Hydrochus sp.</i>		3	1	2	1	
<i>Tropisternus mixtus</i> (Lec.)	12	2	10	57	17	3
<i>T. glaber</i> (Herbst.)	16	2	13	17	18	8
<i>T. lateralis</i> (Fab.)	5		8	11	7	4
<i>Hydrochara obtusata</i> (Say)	1	3		1	2	1
<i>Laccobius agilis</i> Randall			1			
<i>Berosus striatus</i> (Say)	19		8	4	1	7
<i>Hydrobius fuscipes</i> Linne		2	1	3		1
<i>Paracymus subcupreus</i> (Say)	6	3	40	11	2	4
<i>Anacaena limbata</i> Fab.			2	1		
<i>Hydraena pensylvanicus</i> Melsh.		5	1		3	
<i>Enochrus cinctus</i> (Say)	3	2	11	19	7	
<i>E. hamiltonii</i> (Horn)		1	13	17	1	2
<i>E. ochraceus</i> (Melsh.)	7	8	22	39	14	8
Number of collections in area	5	5	7	5	7	5

crawling on and clinging to debris, the method of sampling caused them to be omitted.

Some comments are in order about the following species, which, unless otherwise noted, are considered as characteristic of the aquatic beetles of Dewart Lake.

Most striking is the abundance of *Liodesus affinis* in Area 3 and its scarcity in Areas 2 and 6. The beetle apparently prefers sandy situations. It was always encountered close to shore in water less than 1 inch deep, and it crawled or burrowed in the sand. It is doubtful if any other species found in greater numbers in Area 3 depended on the sandy situation. Many of these could be transients from the adjacent Area 4. A large portion of Area 3 was completely cleared experimentally of vegetation and beetles. The vegetation was then replaced as naturally as possible. A collection a week later showed the population near normal except for the scarcity of *Liodesus*.

*Peltodytes edentulus* and *Berosus striatus* were found crawling on the *Myriophyllum* that grew in profusion in Area 1. The upright *Myriophyllum* probably made the habitat more suitable although this is not certain. *Peltodytes* is usually very common in any body of permanent water and is not restricted to upright aquatics, but apparently here the plant does provide a suitable substrate for the species.

The presence or absence of detritus plays a dominant role in regulation of the lake population, with the probable exception of *Liodesus affinis*, *Peltodytes edentulus* and *Berosus striatus*. A lake such as Dewart, being a permanent body of water existing over a long period, has large amounts of detritus fostering the presence of detritus dwelling species. Detritus is probably the most important determinant of the characteristic population as exemplified by the following species.

*Tropisternus glaber*, *T. lateralis*, *T. mixtus*, *Enochrus cinctus*, *E. hamiltoni* and *E. ochraceus* were the most common and widespread species indicating that they have wide limits of tolerance. They are found wherever there are heavy accumulations of detritus. *Laccophilus maculosus*, *Hydrovatus pustulatus*, *Hygrotus sayi*, *Hydroporus dentiger*, *Hydroporus niger*, *Coptotomus interrogatus*, *Paracymus subcupreus* and the two species of *Hydrochus* were abundant, detritophilic species showing no specialized requirements as to type of detritus.

A few species exhibited a preference. *Hydrochara obtusata* and *Helophorus lineatus* were abundant in Areas 2 and 6 which contain large amounts of decaying tree leaves. These are species probably common in typical woods ponds.

*Hydroporus consimilis* was associated with *Typha*. Apparently, the decaying debris of the plant satisfied the special requirements of the beetle. The beetle was numerous in the debris of the plant, which was of an unusually fine texture, and was not observed crawling on the living plant. The beetle was found in the amassed debris of other areas, where *Typha* was not present, but was notably lacking in the foul smelling matter of Area 6 even though *Typha* was adjacent to it. The niche of the organism needs to be determined to discover whether

it is the *Typha* or the amount and consistency of the debris that is a limiting factor for the beetle.

Of the remaining species collected, *Desmopachria convexa*, *Haliphus immaculicollis*, *Hydroporus striola*, *Ilybius biguttulus*, *Colymbetes sculptilis*, *Acilius semisulcatus*, *Hydrobius fuscipes*, and *Hydraena pensylvanicus* are probably typical inhabitants but were not present in sufficient numbers to be considered common and characteristic. *Agabetes acuductes*, *Copelatus glyphicus* and *Dytiscus fasciventris* made their appearance at the end of the study and apparently have their population density peak later in the fall.

The remaining species occurred only once or twice and are considered rare. One, *Laccobius agilis*, is known to be a stream inhabiting species and was a stray.

Comparing the aquatic Coleoptera population of Dewart Lake with investigations of the beetle population from ponds within a 200 mile radius of Dewart showed that the lake harbored a more diverse population. Kenk (1) obtained 35 species from four ponds. Needham (2) collected 29 species of dytiscids from a permanent pond. Scott (3) found 11 species. Young (4), who investigated thoroughly a temporary pond, listed 39 species. Comparing these lists of beetles from ponds with our list, only 10, 4, 17, and 14 beetles, respectively, were common to Dewart Lake. The investigations of the ponds lasted at least a year and, except for one, were not exclusively for Coleoptera.

### Summary

A midsummer survey of Dewart Lake, located in northern Indiana, showed 43 species of aquatic Coleoptera representing the families Haliplidae, Dytiscidae and Hydrophilidae to be present. Twenty-one of these species are considered to be characteristic species. Examination of six minor habitats of the beetles evidenced most species to be detritophilic. Except for three species, accumulation of organic debris was the determining parameter for their presence.

### Literature Cited

1. KENK, ROMAN. 1949. The animal life of temporary and permanent ponds in southern Michigan. Univ. Mich. Mus. Zool. Misc. Publ. **71**:1-66.
2. NEEDHAM, J. G. and HELEN V. WILLIAMSON. 1907. Observations on the natural history of diving beetles. Amer. Nat. **41**:477-494.
3. SCOTT, WILL. 1910. The fauna of a solution pond. Proc. Ind. Acad. Sci. **26**:395-442.
4. YOUNG, F. N. 1959. The water beetles of a temporary pond in southern Indiana. Proc. Ind. Acad. Sci. **69**:154-164.