

**BENTHIC MACROINVERTEBRATES FOUND ON THE  
FRESHWATER SPONGE *SPONGILLA LACUSTRIS***James D. Matteson and Gerald Z. Jacobi<sup>1</sup>

## ABSTRACT

Benthic macroinvertebrates were quantitatively collected from sponge and natural substrate in the Plover River, Wisconsin. A total of 37 taxa of invertebrates including several families and genera of Trichoptera, Plecoptera, Ephemeroptera, Coleoptera, and Diptera was present on sponge. Those occurring in significant numbers included Chironomidae, *Hydropsyche*, *Cheumatopsyche*, *Chimarra*, *Baetis*, and *Climacia areolaris*.

Symbiotic relationships between marine and freshwater sponges and other invertebrates have been observed by Hyman (1940), Pennak (1953), and Steffan (1976). Brown (1952), Roback (1968), and Lehmkuhl (1970) have identified specific faunal parasites or predators on freshwater sponge. To our knowledge, no studies have quantitatively assessed benthic macroinvertebrates which utilize sponge as a substrate. Freshwater sponges, contributing to the standing biomass in ponds (up to 652 g wet weight/m<sup>2</sup> [Frost 1978]) and up to 5% of the bottom coverage in streams (Jacobi, unpubl. data), could support a high density of benthic macroinvertebrates. The purpose of this study was to investigate macroinvertebrate composition and density on natural substrate and different sized sponge colonies (i.e., surface area covered and volumetric displacement).

## METHODS AND MATERIALS

An area 25 m below Jordan Pond Dam on the Plover River, a tributary of the Wisconsin River, 6 km northeast of Stevens Point, Portage County, Wisconsin, was selected as the study site. This well-aerated stream section supported a large assemblage of freshwater sponge *Spongilla lacustris* L. on and within the interstices of rubble and boulder-sized granite rock. Physical and chemical parameters in the collection area on 20 October 1974 were: water temperature 7°C, ambient current velocity 0.5 m/sec., water depth 0.25 to 0.75 m, dissolved oxygen 15.4 mg/litre, total CaCO<sub>3</sub> hardness 190 mg/litre, and pH 8.5.

Specimen collections were on the following: (1) Natural substrate (230 cm<sup>2</sup>) lacking sponge but adjacent to a sponge colony (No. 2); (2) Sponge approximately 0.6 cm high covering an area of 230 cm<sup>2</sup>, many developed gemmules present; (3) Sponge composite approximately 2.5 cm high covering an area of 160 cm<sup>2</sup>, volumetric displacement 200 cm<sup>3</sup>, few gemmules present; (4) Sponge composite approximately 2.5 cm high covering an area of 260 cm<sup>2</sup>, volumetric displacement of 350 cm<sup>3</sup>, many developed gemmules present; (5) Composite sample of several sponge colonies ranging between 0.6–3.0 cm high and 6.3–116.2 cm<sup>2</sup> with a total displacement of 500 cm<sup>3</sup>, few gemmules present.

A 6.35 mm (0.25 inch) wire mesh screen was used to measure the natural substrate area and basal area covered by each sponge colony. Macroinvertebrates and sponge, after being carefully scraped and lifted from the substrate, were preserved in 70% alcohol. Volumetric measurements of sponge were estimated by water displacement in a graduated cylinder.

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In the laboratory, the sponge was washed on a USA Standard Testing Sieve No. 80 (0.177 mm aperture). Water pressure from a faucet forced sponge tissue, silt, and fine particles through the sieve with only spicules and macroinvertebrates remaining.

*S. lacustris* was identified by the spicules which were prepared by the concentrated nitric acid method suggested for the preparation of diatoms (Patrick and Reimer 1966). Jewell (1939) reported *lacustris* as common to this and adjacent Wisconsin watersheds.

### RESULTS AND DISCUSSION

Commensal algae, some of which gave the sponge a green color, included *Cladophora*, *Spirogyra*, *Gomphonema*, *Cocconeis*, *Navicula*, *Fragilaria*, *Cymbella*, *Rhopalodia*, and *Hantzschia*. It is not known whether algae were intertwined in the spicules and surface detritus or were on sponge epithelium; studies by Frost (1976) indicated the former. We also did not investigate macroinvertebrate gut contents to see if algae, sponge tissue, or both were selected as food items.

A total of 37 taxa of macroinvertebrates was found on sponge; 30 were insects representing seven orders. Eight taxa, in four orders of aquatic insects, were found on the adjacent natural substrate and were common to sponge (Table 1). Sponge harbored a diverse fauna ( $H=2.68$ ) as well as a high density of organisms (78,500/m<sup>2</sup> in collection No. 4).

Table 1. Taxa and numbers of benthic macroinvertebrates collected on natural substrate and sponge (*Spongilla lacustris* L.) below Jordan Pond, on the Plover River, Portage County, Wisconsin.

Taxa	Collection				
	natural		on sponge		
	1	2	3	4	5
<b>Trichoptera</b>					
Hydropsychidae					
<i>Hydropsyche</i>	171	93	60	325	141
<i>Cheumatopsyche</i>	14	18	34	314	67
Philopotamidae					
<i>Chimarra</i>	2	4	54	27	397
<b>Limnephilidae</b>					
<i>Limnephilus</i>	0	0	0	2	1
Brachycentridae					
<i>Brachycentrus</i>	0	0	0	0	2
Helicopsychidae					
<i>Helicopsyche borealis</i>	0	0	0	0	2
Hydroptilidae					
<i>Hydroptila</i>	1	0	0	3	0
Molannidae					
<i>Molanna</i>	0	0	0	7	3
<b>Plecoptera</b>					
Perlodidae					
<i>Isoperla</i>	1	0	0	0	1
Perlidae					
<i>Paragnetina</i>	0	0	0	2	3
<i>Acroneuria</i>	0	0	0	1	0
Taeniopterygidae					
<i>Taeniopteryx</i>	0	1	0	3	0
Chloroperlidae					

Table 1. Continued

<i>Hastaperla</i>	0	0	0	0	1
Nemouridae					
<i>Nemoura</i>	0	0	0	0	1
Pteronarcidae					
<i>Pteronarcys</i>	0	0	0	0	1
Emphemeroptera					
Ephemerellidae					
<i>Ephemerella</i>	2	0	0	18	1
Heptageniidae					
<i>Heptagenia</i>	0	0	0	12	0
<i>Stenonema</i>	0	8	0	8	10
Baetidae					
<i>Baetis</i>	0	3	60	43	116
Leptophlebiidae					
<i>Paraleptophlebia</i>	0	0	0	1	0
Neuroptera					
Sisyridae					
<i>Climacia areolaris</i>	0	2	13	35	50
Megaloptera					
Corydalidae					
<i>Corydalus cornutus</i>	0	0	2	1	0
Coleoptera					
Elmidae					
<i>Stenelmis</i> (adult)	0	0	0	1	0
<i>Stenelmis</i> (larvae)	0	1	10	8	8
<i>Dubiraphia</i> (adult)	0	0	0	1	0
Dytiscidae					
<i>Agabus</i> (adult)	0	0	0	1	0
Diptera					
Chironomidae	10	23	111	1167	659
Simuliidae					
<i>Simulium</i>	0	0	0	2	0
Rhagionidae					
<i>Atherix variegata</i>	3	0	8	41	4
Tipulidae					
<i>Tipula</i>	0	0	0	2	1
Bryozoa					
<i>Plumatella</i>	0	0	C <sup>a</sup>	A <sup>a</sup>	A
Amphipoda					
<i>Gammarus</i>	0	0	0	4	2
Gastropoda					
<i>Physa</i>	0	0	0	2	2
Pelecypoda					
<i>Sphaerium</i>	0	0	1	2	2
<i>Musculium</i>	0	0	2	5	2

Table 1. Continued

Turbellaria	0	0	UC <sup>a</sup>	UC	UC
Oligochaeta	0	UC	A	3	A
Total Numbers	204	153	355	2041	1477
Total Taxa	8	10	14	31	27
Diversity Index ( $H = -\sum p_i \log_2 p_i$ )	0.99	1.86 <sup>b</sup>	2.68 <sup>c</sup>	2.08 <sup>d</sup>	2.29 <sup>c</sup>

<sup>a</sup>C=common, A=abundant, UC=uncommon, relative abundance not counted.

<sup>b</sup>One other taxon present but not represented numerically.

<sup>c</sup>Three other taxa present but not represented numerically.

<sup>d</sup>Two other taxa present but not represented numerically.

Significant occurrences on sponge were noted for Trichoptera: *Hydropsyche*, *Cheumatopsyche*, and *Chimarra*; Ephemeroptera: *Ephemerella*, *Heptagenia*, *Stenonema*, and *Baetis*; Neuroptera: *Climacia aerolaris*; Coleoptera: *Stenelmis* (L.); and Diptera: *Atherix*. A dominant group, the family Chironomidae, was not keyed further but probably included numerous species as indicated in Roback (1968). In addition, other organisms (Bryozoa, Turbellaria, and Oligochaeta) were present but not counted on the sponge.

Sponge itself may be acknowledged as being present in invertebrate surveys but its role as a significant substrate for other benthic macroinvertebrates should not be overlooked.

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