A Quantitative Sampling Method For Hydrilla-Inhabiting Macroinvertebrates[1]

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ABSTRACT

Aquatic macroinvertebrates were collected from Lake Wales, Polk County, Florida, in May, June, and September of 1975. A Plexiglas box sampler with a stainless steel blade was operated from a boat to obtain organisms from hydrilla (*Hydrilla verticillata* Royle), the dominant macrophyte in the lake. The organisms were very similar in taxa and order of abundance to those collected in hydrilla in Lake Inglis in western Florida in another study of invertebrates in hydrilla. Chironomid larvae and pupae accounted for 80% of the total of about 20 taxa in Lake Wales, with gastropods (10%), mayfly nymphs (3%), amphipods (1.5%), and caddisfly larvae (1.3%) next in order of abundance. The Plexiglas sampler has advantages over other macrophyte samplers which must be used on the substrate and other techniques of sampling macrophytes, such as the use of Self Contained Underwater Breathing Apparatus (SCUBA) divers.

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INTRODUCTION

Lake Wales, a 133-ha lake in Polk County, Florida, has had an aquatic weed problem since the late 1950's. The weed causing the problem was identified as hydrilla, which occurs in over 80% of the lake area and has become a serious detriment to water recreation.

A review of the literature indicated that an adequate sampler was not available for obtaining quantitative samples of hydrilla. Other macrophyte samplers are available (2,3,4) but are not designed for sampling thick growths of vegetation near the water surface. Sweep nets are commonly used for obtaining organisms living in aquatic vegetation, and have been used in hydrilla, but in that instance, SCUBA divers were needed to cut the hydrilla and manually place samples into the nets (3). Thus, one

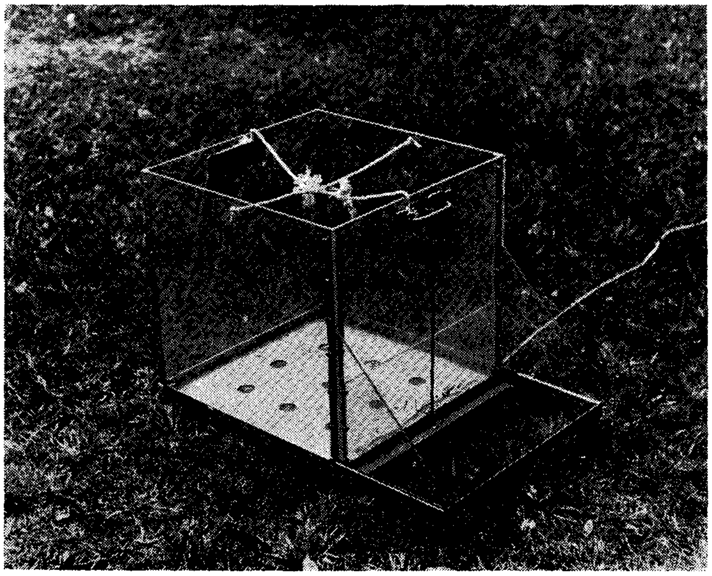

Figure 1. Macrophyte sampler in unloaded position.

aspect of this study was to devise an efficient, quantitative method of sampling macroinvertebrates living in hydrilla.

METHODS AND MATERIALS

The sampler devised for obtaining hydrilla in Lake Wales is a 0.5-m^3 box constructed of 3 mm thick Plexiglas with a 0.5-m^2 stainless steel blade set in grooves at one end of the box (Figure 1). The sampler is loaded by pulling the blade until the box is open at both ends. A rod inserted into a hole in the blade "cocks" the sampler (Figure 2). Two pieces of surgical rubber tubing attached to the underside of the blade are tightly stretched when the sampler is loaded. The sampler in this position is lowered to the desired water depth. The rope tied to the rod (Figure 2) is used to release the blade which snaps shut forcefully, shearing the vegetation.

The sampler weighs 18.14 kg when empty; however, because the sampler is essentially water tight, except for screened holes in the blade (Figure 1), considerable weight is added by trapped water as the sampler is hoisted. Thus, a hand-operated winch is used to raise the sampler.

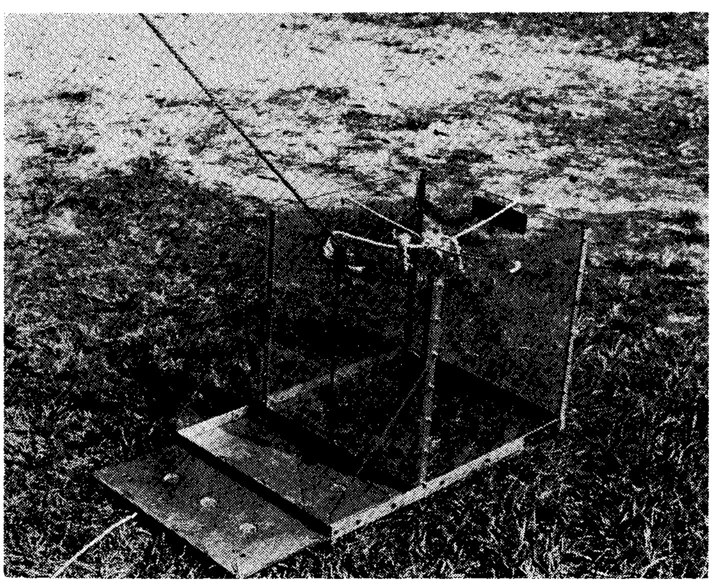

Figure 2. Macrophyte sampler in loaded position.

Hydrilla samples were taken in May, June, and September of 1975. When possible, two samples were collected from each of six arbitrarily selected stations in the lake. The samples were placed in plastic bags and transported to the laboratory where they were washed. Organisms were removed from the wash water and also hand picked from the hydrilla. All organisms were preserved in 70% ethyl alcohol and later identified and counted.

Because vegetation density differed among stations, the amount of vegetation collected in each sample varied. For this reason the hydrilla in each sample was weighed to 0.1 g. Each sample was drained of excess water and a wet weight was recorded. These weights were used to determine the mean number of organisms per kg of vegetation.

RESULTS AND DISCUSSION

Of the organisms collected from hydrilla, Diptera, Gastropoda, Ephemeroptera, Crustacea, and Trichoptera were most abundant, while other organisms were relatively rare (Figure 3). Chironomid larvae and pupae were the predominant dipterans in the samples taken. Their numbers increased throughout the summer attaining a mean of 865 individuals per kg of vegetation in September (Table 1). This represented an increase of about 500% over the May figure, and constituted 80.7% of the total number of organisms for all samples (Figure 3).

The planorbid gastropod *Gyraulus* sp. was second in abundance. The numbers of *Gyraulus* per kg of hydrilla were identical for May and June, while a sevenfold in-

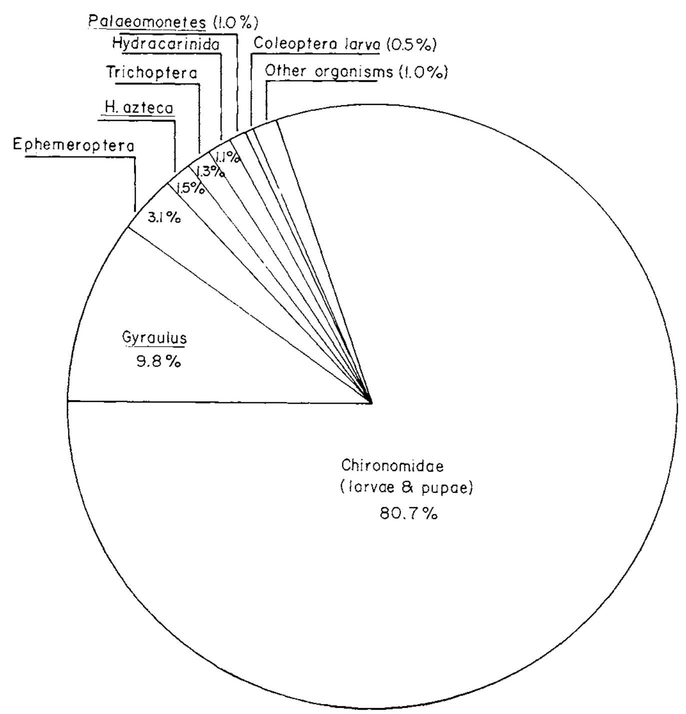

Figure 3. The percentage distribution of invertebrates collected from Hydrilla.

TABLE 1. MEAN NUMBER OF ORGANISMS COLLECTED FROM HYDRILLA PER KG OF VEGETATION.

	Organism	Months May (n=12)	June (n=7)	Sept. (n=11)
Annelida	Oligochaeta	3.4	0	0
	Hirudinea	0.5	0	0
Decapoda	*Palaemonetes* sp.	1.4	3.4	1.0
	Hyalella azteca	15.4	2.7	1.6
Ephemeroptera nymphs	*Callibaetis floridanus* & other may-flies	4.3	25.7	29.2
Odonata nymphs	Anisoptera (Libellulidae)	0	0	0.8
	Zygoptera (*Enallagma civile* & *E. concisum*)	0.5	0	1.4
Trichoptera larvae	Leptoceridae *Leptocella* sp.	0	0	0.4
	Psychomyiidae *Polycentropus* sp.	2.3	3.4	5.2
	Hydroptilidae *Oxyethira* sp. & other hydroptilids	1.8	1.4	8.5
Coleoptera larvae	Dytiscidae (*Bidessus* sp.)	5.9	1.4	4.2
Coleoptera adults	Noteridae *Notomicrus* sp.	0.2	0	0.6
Lepidoptera larvae	*Nymphula* sp.	0.2	0	0.6
Diptera larvae, pupae	*Pseudochironomus* sp. *Dicrotendipes lobus* & other chironomids	142.2	355.8	865.2
	Anthomyiidae	0	0.7	0
	Ceratopogonidae *Probezzia* sp.	1.4	3.4	1.4
Diptera adults	Chironomidae	0	0	1.0
Acari	"hydracarinids"	2.7	4.7	4.2
Mollusca	*Gyraulus* sp.	30.1	29.7	209.5
	Other gastropods	0.2	0	0
Vegetation mean weight		368.5g (95.5)	211.6g (68.1)	451.2g (304.6)

crease was noted from June to September (Table 1). *Gyraulus* represented 9.8% of the total number of organisms (Figure 3).

Mayfly nymphs, consisting of several genera including *Callibaetis floridanus,* were next in abundance. Mayfly numbers per kg of vegetation were highest in September although not much higher than the June value (Table 1). They represented 3.1% of the total number of organisms (Figure 3). The amphipod *Hyalella azteca* was fourth in order of abundance and was most numerous in May (Table 1).

Caddisfly larvae representing three families were rather sparse except for one September sample which contained 60 individuals. This one sample caused abundance to be highest in September (Table 1); the increase over the May value was about four-fold. Caddisfly larvae accounted for 1.3% of the total number of organisms (Figure 3).

The remaining organisms comprising 15 groups in Table 1 were collected sporadically and collectively represent only 3.6% of the total number of organisms (Figure 3).

When our taxonomic groups are compared with the groups collected in hydrilla with sweep nets (5) the results are remarkably similar both in taxa represented and in order of abundance. Generic overlap occurred in the Decapoda (*Palaemonetes* sp. and *Hyalella azteca*), Ephemeroptera (*Callibaetis floridanus*), Odonata (*Enallagma* sp.), Trichoptera (*Leptocella* sp. and *Oxyethira* sp.) Ceratopogonidae (*Probezzia* sp.), and Gastropoda (*Gyraulus* sp.). Only our beetle larva (*Bidessus* sp.) was different than that reported by May et al (5). Although certain genera of Cladocera (*Simocephalus* and *Sida*) were collected with sweep nets, our sampler was not designed to retain small organisms such as these.

Nymphula, a larval lepidopteran, and a larval member of the dipteran family Anthomyiidae were also collected in Lake Wales, whereas these organisms were not collected from sweep net samples (5).

Variation in the number of organisms collected existed among the samples. Explanations for this variability might be: (i) organisms are not randomly distributed within the vegetation; (ii) the vegetation is not randomly distributed (as indicated by sample weights); and (iii) the existence of sample error. May et al (5) also found extreme variability among their sweep net samples, which negated statistical analysis of part of their data.

The data presented here and elsewhere (5) indicate that many invertebrates, most of which are important food organisms for juvenile and certain adult fish species (1, 6, and 7) inhabit hydrilla. These organisms become increasingly important in lakes such as Lake Wales which have few benthic organisms[2]. Extreme amounts of hydrilla, however, are not beneficial to the fishery. Small fish are able to find hiding places and are not preyed upon, the end result being lakes containing stunted sunfish (*Lepomis* spp.) populations. These fish are not utilized by the fisherman because of their small size. Although large bass (*Micropterus salmoides*) are present in the lake they are unfishable because of copious amounts of vegetation.

In summary, the organisms collected from hydrilla in Lake Wales appear to represent a "typical" hydrilla invertebrate community for central Florida lakes. The organisms collected with our sampler were similar in taxa (to genus in most cases) and order of abundance to those collected in sweep net samples employing divers (5). Utilization of a mechanical sampler as described in this study is advantageous because samples can be collected from a boat without divers.

ACKNOWLEDGMENTS

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[2]Shireman, J. V. 1976. Ecological study of Lake Wales, Florida after introduction of grass carp (*Ctenopharyngodon idella*). Annual Report submitted to Florida Dept. of Natural Resources. 63 pp.

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