Sled for Sampling Benthic Fish Larvae

Traditional sampling gear for plankton and benthos proved to be inadequate for collection of demersal fish larvae from the inshore waters of southeastern Lake Michigan. Conical plankton nets (0.5 m in diameter) did not effectively sample near-bottom (within 0.5 m) water. Plankton nets mounted on sleds have been used to collect epibenthic plankton; Calhoun (1953) was one of the first to sample fish larvae with a sled, and Chadwick (1964) and Dovel (1964) used sleds to collect estuarine macroplankton. Incorporating features of a macrobenthos sled developed at Great Lakes Research Division, we evolved a sled design of simple construction and light weight, that was easy to handle and protected sample jars from breakage. Our design alleviated near-bottom sampling problems associated with conical plankton nets and enabled capture of demersal and shallow-water fish larvae. We later learned that a similar sled had been developed by Topp (1967).

We required a sled that would be easy to handle in shallow water or from a small boat, that would incorporate an existing nylon plankton net 0.5 m in diameter, and that would position the net mouth near the bottom for efficient filtering. A lightweight, negatively buoyant frame was constructed from aluminum tubing with 19-mm (0.75 in. nominal) OD and 3.2-mm (0.13 in. nominal) wall thickness connected with proprietary, cast aluminum sleeve-type rail fittings (Fig. 1). The sled consisted of two rectangular frames connecting a pair of runners and a pair of upper longitudinal stringers. A crosspiece in front of the forward frame provided stiffening and an attachment point for a bottom tickler. Two ropes tied to the towing bridle enabled us to pull the sled without walking directly in front of it.

Because large quantities of sand were trapped in the 0.5-mm diameter (0.36-mm aperture) net when the net mouth was within 2.5 cm of the lake bottom, we constructed a rectangular net frame 20 × 57.5 cm from stainless steel tubing, laced the plankton net to the net frame, and suspended it from the forward sled frame by small coil springs attached to each corner (Fig. 1). This arrangement held the net mouth 5 cm above lake bottom and eliminated the sand-trapping problem. A flowmeter mounted in the center of the frame enabled quantification of sample volume.

A large plastic bottle tied with twine to the back frame (Fig. 1) positioned the collecting bucket (widemouth Mason jar) and protected it from breakage. After rinsing the contents of the net into the jar, the jar was removed from the net, each sample was formalinized, and the jar was labeled and capped. Samples were collected at a depth of 1 m about 25 m from the shore of southeastern Lake Michigan near the Donald C. Cook Nuclear Plant, about 17 km south of the mouth of the St. Joseph River. Along the southeastern shore surficial sediments are fine to coarse sand, typical of sand dune beaches (Seibel et al. 1974).

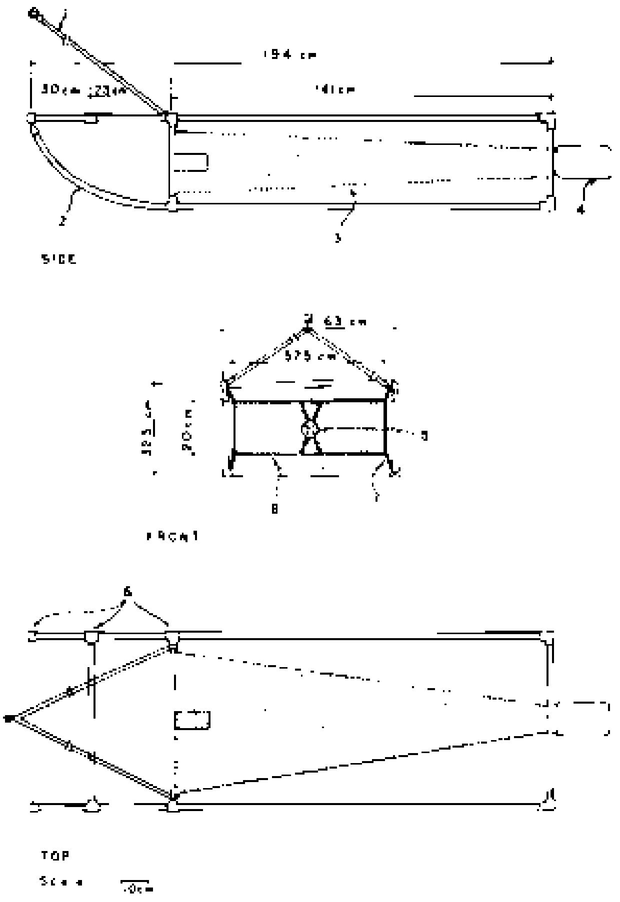

Fig. 1. Sled for collecting benthic fish larvae and eggs. 1, towing bridle; 2, runner; 3, plankton net; 4, plastic bottle; 5, flowmeter in rigid mount; 6, rail fittings; 7, coil spring; and 8, rectangular net frame.

The light weight of the sled for benthic fish larvae enabled us to tow it by hand or from a small boat. Longitudinal and lateral stability of the sled kept the mouth of the net oriented near bottom for fishing efficiency. At depths of 6 and 9 m a towing-line ratio of 1:5 (depth:length) was necessary.

The sled collected larval alewives (*Alosa pseudoharengus*) and spottail shiners (*Notropis hudsonius*) as did plankton nets, but generally, more alewife larvae were caught by plankton nets and more spottail shiners by the sled (Table 1). We believe these catch differences can be attributed to the behavior of these two larval species and to sampling gear characteristics.

Plankton-net samples from shallow and deep stations (Jude et al. 1975) revealed that alewives were distributed throughout the water column, and plankton nets alone could be used to estimate the abundance of larval alewives in the inshore waters of southeastern Lake Michigan.

Samples collected with plankton nets in 1973 showed few spottail shiner larvae, although many ripe adult spottail shiners were caught in beach seines (Jude et al. 1975) and scuba divers observed spawning spottail shiners in the area (Dorr 1974). Plankton-net collections in 1974 were again small, but sled collections contained many spottail shiner larvae, confirming their demersal habit and inshore abundance.

Fish eggs (not identified, but presumably predominantly alewife and spottail shiner eggs) were consistently collected in greater numbers by the sled than by plankton nets (Table 1).

Table 1. Number (per 10 m^3 of water) of alewife and spottail shiner larvae and fish eggs collected by duplicate plankton-net tows and single benthic-sled tows from a shallow (1 m) beach station in southeastern Lake Michigan during summer 1974. Gears were towed by wading parallel to shore for about 60 m; the plankton net was held just under the water surface and the sled was dragged on the bottom.

	Species		
Date and method	Alewife	Spottail shiner	Fish eggs (No.)
11 June			
Plankton net	38	0	1,240
Plankton net	57	2	1,500
Benthic sled	43	4	118,000
11 July			
Plankton net	25	12	3
Plankton net	3	32	4
Benthic sled	8	125	247
5 August			
Plankton net	8	0	0
Plankton net	8	2	2
Benthic sled	2	11	52
14 August			
Plankton net	8	0	3
Plankton net	12	0	4
Benthic sled	7	1	6

Results of sampling with plankton nets may indicate which larval fish species are present in lakes and large rivers, but abundance estimates for demersal species may be low. The use of a sled may provide more reliable abundance estimates of demersal species and of fish eggs.

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