MINNOW TRAP BAIT

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For several years, I have conducted fish surveys in Minnesota state parks and national wildlife refuges. Most of this data has been compiled using active sampling gears (e.g., electroshockers, kick nets, and seines) which I "actively" wield to capture fish. However, fishes exhibited a wide range of vulnerability to different gear types and there is no single gear which works well on all species. To make a thorough effort at sampling the entire fish community, I also use several minnow traps which is one example of passive gear. Traps are usually baited, set overnight and work on the assumption scent from the bait will attract fish which will eventually swim down a funnel and become trapped.

Minnow traps rarely catch a great diversity, but the sheer numbers of one or two species can be very impressive. I have lifted traps packed solid with a writhing mass of fish which show their displeasure by showering me with fish slime. Species commonly taken in abundance include pearl dace *(Margariscus margarita)*, finescale dace *(Phoxinus neogaeus)*, northern redbelly dace *(Phoxinus eos)*, southern redbelly dace *(Phoxinus erythrogaster)*, fathead minnow *(Pimephales promelas)*, and brook stickleback *(Culaea inconstans)*. Through trial and error, I now know where to set traps and also habitats to skip. Generally, bogs, swamps, and shallow, slow headwater streams produce the best results, while large rivers would often be mistaken for biological deserts.

Selecting the best bait(s), has been far more elusive. I began minnow trapping with bread crumbs which were clean, cheap, and provided emergency rations when I found myself too far from town. Large creek chubs *(Semotilus atromaculatus)* gobbled up every crumb and a few always managed to eviscerate themselves squeezing through the minnow trap's narrow throat. However, other species such as brook sticklebacks and both northern and southern redbelly dace would find unbaited traps irresistible.

In 1994, I decided to test several baits and compare the results. My "menu" consisted of beef liver, chicken liver, brine shrimp, krill (Euphasiids), glass worms (phantom midge larvae), bread crumbs, Ivory soap, and a control with no bait. These items were selected based on suggestions from anglers who sometimes use liver or Ivory soap as bait for catfish. Frozen brine shrimp, krill, and glass worms were added based on my experience with feeding native and tropical fishes.

The study site was a small tributary to the Mississippi River near St. Paul, MN at Dakota County Road 45 (See Map). A concrete culvert creates a sand bottom scour pool about 30 feet long and 10 feet wide with a maximum depth of 3 feet. With the exception of recent heavy rains, stream flows were slow and water was clear to the bottom. From April through July, Over 8 consecutive days each month, two minnow traps were set with the same bait on each side of the pool and lifted approximately 24 hours later. Brine shrimp, krill, and glass worms required wrapping in nylon socks to keep bait in the trap. Fish were sorted, tallied, and released before setting traps with another bait.

Results

Overall, 184 samples collected 5221 fish representing 17 species in 7 families (Table 1). Beef liver was the best bait which collected 875 fish representing 12 species in 7 families. Brine shrimp and Ivory soap had the worst diversity at 9 species, and krill and bread had the smallest total catches at 439 and 447 fish respectively. Fathead minnows and green sunfish *(Lepomis cyanellus)* were the most frequently sampled species at 32 and 29 times respectively. Glass worms and Ivory soap collected the most fatheads at 352 and 315 fish respectively. The green sunfish edged out the seven baits showing a slight preference for the empty control. Brook sticklebacks and fathead minnows were the most abundant species with total catches of 2818 and 1837 fish respectively. Brook sticklebacks distinctly favored beef liver and brine shrimp which collected 600 and 450 fish respectively. Other species exhibiting some vulnerability to minnow traps included brassy minnows *(Hybognathus hankinsoni)*, northern redbelly dace, and white suckers *(Catostomus commersoni)*. The brassy minnow had the best showing on Ivory soap at 70 fish and collected every month of the study. Northern redbelly dace were most frequently sampled with bread crumbs, but the beef liver caught the largest catch at 26 fish. The white sucker was also collected all four months on beef liver and brine shrimp, but the largest catch of 9 fish occurred on the control.

Finally, I also looked at feeding groups for any preferences. Herbivores favored Ivory soap at 11.5%. Omnivores in species and composition choose Ivory soap (3 fishes and 49.9%). However, glassworms were a close second in preference at 49.4%. Insectivores selected beef liver as a favorite at 7 species and 72.8%. However, in composition, brine shrimp and krill were runners up.

Table 1. Minnow trap bait results. The first number represents the times sampled and the second is the total catch. However, the feeding groups section numbers represent the species total and percent composition of the total catch.

FAMILY species	BEEF LIVER	CHICKEN LIVER	BRINE SHRIMP	KRILL	GLASS WORMS	BREAD CRUMBS	IVORY SOAP	CONTROL (NO BAIT)	OVERALL RESULTS
MINNOWS									
common carp	-	1-3	-	-	-	1-1	-	1-12	3-16
brassy minnow	2-17	3-21	2-9	1-13	4-7	3-8	4-70	3-36	22-181
hornyhead chub	-	-	-	1-1	-	-	-	-	1-1
golden shiner	-	-	-	-	-	-	1-1	-	1-1
northern redbelly dace	1-26	3-6	1-4	2-5	2-16	3-18	2-4	2-7	16-86
fathead minnow	4-185	4-253	4-193	4-122	4-352	4-178	4-315	4-239	32-1837
creek chub	1-1	-	1-1	1-1	1-1	-	-	-	4-4
SUCKERS									
white sucker	4-4	1-2	4-5	2-3	2-3	2-6	2-6	3-9	20-38
BULLHEAD CATFISHES									
black bullhead	2-6	2-5	-	1-1	1-3	2-5	1-2	1-5	10-27
yellow bullhead	1-1	-	-	-	-	-	-	-	1-1
MUDMINNOWS									
central mudminnow	1-1	1-4	2-2	-	-	2-2	-	1-3	7-12
STICKLEBACKS									
brook stickleback	3-600	2-391	2-450	2-262	3-307	2-215	2-230	3-363	19-2818
SUNFISHES									
green sunfish	3-26	4-12	3-8	3-28	4-25	4-13	4-15	4-34	29-161
pumpkinseed	-	1-2	-	-	-	-	-	1-3	2-5
orangespotted sunfish	-	-	-	-	1-1	-	-	-	1-1
hybrid sunfish	2-5	1-2	1-1	-	2-3	-	-	2-8	8-19
PERCHES									
Iowa darter	2-2	-	1-2	-	-	-	1-3	-	4-7
yellow perch	1-1	-	-	1-3	1-1	1-1	-	-	4-6
OVERALL RESULTS									
total catch	875	701	675	439	719	447	646	719	5221
species	12	10	9	10	10	10	9	10	17
samples	27	23	21	18	25	24	21	25	184
FEEDING GROUPS									
filter feeders	-	-	-	-	-	-	-	-	-
herbivores	2-4.9%	2-3.9%	2-1.9%	2-4.1%	2-3.2%	2-5.8%	2-11.5%	2-6.0%	2-5.1%
generalist feeders	1-0.1%	-	1-0.2%	1-0.2%	1-0.1%	-	-	-	1-0.1%
omnivores	2-21.6%	3-36.8%	2-29.3%	2-28.5%	2-49.4%	3-41.4%	3-49.9%	3-36.2%	4-36.2%
insectivores	7-72.8%	5-59.1%	5-68.4%	5-67.2%	5-46.9%	5-52.8%	4-38.7%	5-56.8%	10-58.2%
parasites	-	-	-	-	-	-	-	-	-
top carnivores	-	-	-	-	-	-	-	-	-

Recommendations

I would like to see results from additional surveys using fewer baits, but definitely beef liver and the control in other streams containing different habitats and species. Headwater creeks and bogs and small warmwater streams would likely be the best candidates.

I would also encourage a study on gear modifications which would include affixing funnel leads to "herd" fish, larger funnel throats to catch larger fish, and smaller mesh sizes to sample young of the year fish. Leads made of seining material with floats and weights could be stretched across the width of a pool with the traps on both sides. Fish would hit the mesh wall and follow it either way down into a minnow trap funnel. In lakes and swamps, one minnow trap could be placed 10 or more feet from shore and the lead staked into the bank. However, there must be sufficient floats and weights to prevent fish from going over or under the lead. When using minnow traps with large throats, I have experienced one problem posed by black bullheads. Their always distended bellies indicate some of my data has been eaten! Finally, fine meshed minnow traps have been available in the past from Nylon Net Company (800) 238-7529. These traps also have narrower throats which prevent larger fish from getting in for a free meal. My most noteworthy catch with these traps was 408 young of the year Iowa darters from a lake too choked with submerged plants to seine. By the way, the bait of the day was bread crumbs.