Minnow Trap Surveys for Deepwater (*Myoxocephalus thompsonii*) and Slimy (*Cottus cognatus*) Sculpin in Northeastern Minnesota Lakes

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Saganaga Lake Introduction

In 1989, I collected my first Deepwater Sculpins (*Myoxocephalus thompsonii*) with Dave (Ets) Etnier (University of Tennessee-Knoxville - retired) using gillnets in Saganaga (Sag) Lake along the Minnesota-Ontario border. Dave had been researching the cisco community in the lake and would infrequently collect one or two Deepwater Sculpins in his gillnets. We were lifting nets every six hours around the clock to minimize Lake Trout (*Salvelinus namaycush*) mortality. Four days of this intense effort yielded a mere three sculpins. Deepwaters were either extremely rare or gillnets were not the most effective gear to sample this species. Nevertheless, I was elated to have live specimens to photograph for my budding 35-mm slide collection.

I kept in touch with Ets for regular updates on his cisco work, and in early 2004 he had very fascinating news from Dave Neely who had recently collected Deepwater Sculpins in Lake Nipigon, Ontario, using minnow traps "baited" with glow sticks. Ets was excited to give it a try it in Sag and I shamelessly volunteered to assist.

Twelve minnow traps with glow sticks of different colors (blue, green, pink, and yellow) were set at depths of 70 to 75 feet overnight in Jocks Narrows on 10 September 2004, lifted on the morning of 11 September, and reset. One set out of 24 had no fish, but the rest had collected a cumulative total of 14 Deepwater Sculpins, 57 Slimy Sculpins (*Cottus cognatus*) and one Rainbow Smelt (*Osmerus mordax*). Two additional traps set at another locality in depths of 175 to 185 feet caught no fish. Both sculpin species exhibited a similar and interesting preference to glow stick colors. The Slimy Sculpin tally by color was blue (24), green (17), pink (12), and yellow (4). The Deepwater Sculpin tally was blue (6), green (4), pink (3), and yellow (1). Definitely more research is needed here!

Another nagging question then and still today is, "Why do glow sticks attract sculpins into minnow traps?" I have seen advertisements for submersible lights anglers use to attract fish claiming the products initially attract plankton and aquatic insects which in turn draw in fish. We have only anecdotal observations that may support this. When specimens were preserved in formalin, several sculpins regurgitated very profuse clouds of fresh phantom midge larvae (*Chaoborus* sp.).

Survey Results

From 2004-2011, minnow traps were used in 40 lakes, including Ontario waters of Northern Light and Lake of the Woods (Figure 1). This was accomplished with the assistance of several agencies, and by loaning traps to friends, Corey Geving and Tyler Winter, who were embarking on canoe trips into the Boundary Waters Canoe Area Wilderness. The collaborating agencies included the Minnesota Department of Natural Resources (DNR), Ontario Ministry of Natural Resources, Superior National Forest, and Voyageurs National Park. Slimy Sculpins were found in 32 lakes, Deepwaters in 5, and no sculpins in 11. Both species

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Setting Minnow Trap "Baited" with a Glow Stick

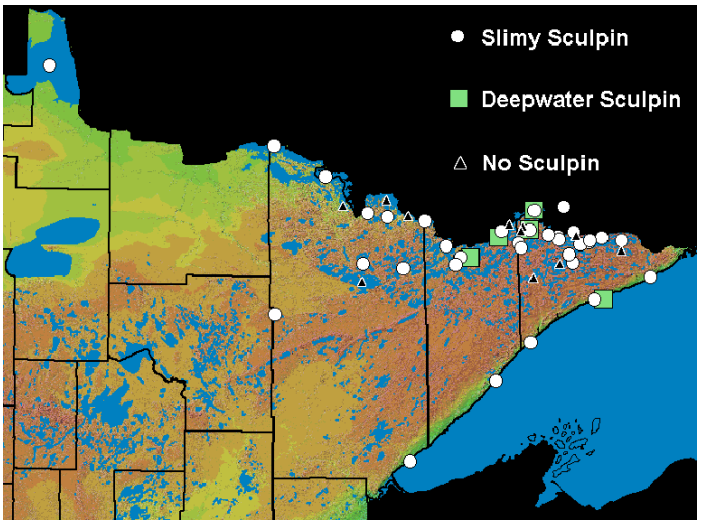

Figure 1. Minnow-trapped Lakes and Species Occurrence

were sympatric in three lakes: Saganaga, Sea Gull, and Superior. Deepwaters had been reported before 2004 from these same lakes and there is also a 1988 record (no extant specimen) from Canadian waters of Lake of the Woods. Sheldon et al. (2008) reported Deepwater Sculpins from 20 of 35 lakes across the species' range in Canada, and also listed three occurrences from other sources in three St. Louis County, MN Lakes: Sturgeon, Vermilion, and Dry. I only found Slimy Sculpins in Sturgeon and DNR surveys reported the same results from Vermillion. The DNR has also sampled Slimys from Basswood, Burntside, Gunflint, Lac la Croix, South, and Superior.

Traps were set at depths from 30 to 300 feet. Slimys were found from 40 to 215 feet in inland lakes and 50 to 300 feet in Lake Superior. The pressure at 300 feet burst the glow sticks, leaving a green, gooey mess! The maximum sample depth of Slimy Sculpins in 21 inland lakes did not exceed 100 feet. Deepwaters ranged from 55 to 89 feet in inland lakes and 300 feet in Lake Superior (Table 1, p. 22). However, it is important to note that the maximum depth of Lake Superior is 1,332 feet and the greatest sampling depths of DNR stations were less than half this. Excluding the Saganaga catch reported above, six other species were trapped, including Rainbow Smelt in Burnside Lake (16 specimens), Yellow Perch (*Perca flavescens*) in Moose (1) and Vermilion (1), Ninespine Stickleback (*Pungitius pungitius*) in Pine (1), Burbot (*Lota lota*) in Rainy (2), Cisco (*Coregonus artedi*) in Sea Gull (1), Trout-perch (*Percopsis omiscomaycus*) in Iron (1), and Iowa Darter (*Etheostoma exile*) in Trout (1).

Abundance and Habitat

Based on the average catch per minnow trap, Slimy Sculpins were most abundant in Trout (9.3 fish/trap), Clearwater (8.3), Lake of the Woods (4.4), and Loon – Cook Co. (3.7). The smallest catch rates occurred in 14 lakes where the average was less than one per trap. Slimys were sampled in inland lakes as small as 233 acres (Vernon) and maximum depths as shallow as 65 feet (Moose). ***Presence is always easier to prove than absence*** and applies to all species, but must be emphasized with the Deepwater Sculpin. These "needle in a haystack" surveys suggest Deepwater Sculpins are rare in the inland lakes and Sag has the greatest abundance at 0.5 per trap. This species has so far been restricted to large (>4000 acres) and deep (>140 feet) lakes where Lake Trout are also present.

Future Survey Efforts

Loosely following the above lake criteria, additional Deepwater Sculpin surveys should continue in 11 lakes highlighted in darker gray (Table 1, Page 22). However, six of these lakes do deviate from the guideline parameters in maximum depth and/or presence of Lake Trout. Motorized use is permitted on 10 of the 11 lakes where Missouri trawls could be used

(see Herzog et al. 2005 and 2009). This gear has proven effective in Sag and Superior for Deepwater Sculpins and greatly enhances sampling effort in the number of sites, area, and depths surveyed. Crooked Lake will be the most difficult to adequately sample. Due to a ban on outboards, survey gear will be restricted to minnow traps and require numerous and long canoe portages. There just isn't enough fire left in my belly to tackle this one! However, I'll be happy to "outfit" anyone looking for very little fame and certainly no fortune with ample minnow traps and glow sticks to canvass this 17-mile long lake.

Literature Cited

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Deepwater Sculpin

Slimy Sculpin

Table 1. Minnow Trapping Results of Northeastern Minnesota Lakes

Lake Name	NID	Trap Ave	Date	Latitude	Longitude	Acres	Littoral Acres	Max Depth (ft)	Traps	Depth Range (ft)	Sculpins Sampled (ft)	Collector
Deepwater Sculpin												
Knife*	1	0.2	8/9/2011	48.098	-91.185	4920	1037	179	6	61-78	61	Schmidt
Saganaga*	14	0.5	9/12/2004	48.244	-90.884	13832	N/A	280	26	70-185	70-75	Schmidt
Sea Gull*	2 1	0.3 0.1	7/8/2009 6/2/2010	48.132	-90.927	4032	927	145	6 16	51-93 43-92	75-89 66	Schmidt
Snowbank*	5 1	N/A 0.1	7/29/2005 4/17/2010	47.988	-91.419	4655	879	150	N/A 10	N/A 55-79	N/A 55	DNR Schmidt
Superior*	1	N/A	7/14/2009	47.738	-90.328	N/A	N/A	1332	N/A	300	300	DNR
Total	25											
Slimy Sculpin												
Basswood	7	0.7	7/28/2010	48.056	-91.621	22722	7034	111	10	65-85	65-69	Schmidt
Burntside*	58	2.9	9/12/2010	47.936	-91.983	7314	1478	126	20	50-96	50-96	Schmidt
Clearwater*	18 33	N/A 8.3	7/22/2005 7/9/2009	48.082	-90.326	1325	260	130	N/A 4	N/A 75-105	N/A 75-100	DNR Schmidt
Crooked*	2	0.3	8/10/2010	48.317	-92.117	10359	1898	165	8	N/A	N/A	SNF
Daniels*	2	0.2	5/29/2009	48.080	-90.407	509	86	90	12	30-95	40-42	Schmidt
Gabimichi-gami*	16	3.2	9/23/2005	48.062	-91.020	1198	144	209	5	51-80	N/A	DNR
Gunflint*	25	1.9	7/13/2009	48.096	-90.695	4009	674	200	13	67-200	67-200	Schmidt
Hungry Jack*	1	0.3	5/29/2009	48.058	-90.436	468	187	71	4	40-71	40	Schmidt
Little Knife*	3	0.3	6/24/2010	48.136	-91.157	701	91	184	12	50-87	63-87	Schmidt
Little Saga-naga*	13	N/A	9/16/2011	48.034	-91.001	1575	428	150	N/A	N/A	N/A	DNR
Loon (Cook)*	33	3.7	7/8/2009	48.077	-90.685	1096	137	202?	9	68-215	68-215	Schmidt
Loon (St. Louis)*	3	0.3	8/4/2010	48.247	-92.273	2498	N/A	76?	10	53-83	53-70	Schmidt
Magnetic*	5	1	7/13/2009	48.106	-90.770	431	95	90	5	60-85	75-85	Schmidt
Moose	1	0.1	5/12/2010	47.993	-91.505	1211	262	65	8	54-63	60	Schmidt
Namakan	1 1	N/A 0.1	9/28/2005 8/11/2010	48.450	-92.622	24066	5026	150	N/A 7	66 54-92	N/A 78	DNR Schmidt
North*	13	1.4	9/10/2009	48.115	-90.562	2695	477	125	9	75-117	81-117	Schmidt
Northern Light*	12	2.4	7/6/2011	48.258	-90.641	N/A	N/A	N/A	5	60-85	N/A	Schmidt
Ojibway*	16	1.5	5/6/2011	47.949	-91.547	367	134	115	11	49-106	60-95	Schmidt
Oyster*	3	0.4	2/23/2009	48.224	-92.106	714	234	130	8	41-88	41-44	Winter
Pine*	17	1.1	9/15/2009	48.062	-90.164	2257	366	113	16	65-99	70-99	Schmidt
Poplar*	1	0.2	7/10/2009	48.047	-90.509	764	290	73	6	45-72	53	Schmidt
Rainy	2	0.2	8/24/2004	48.621	-93.059	N/A	18949	160	10	75-100	75-100	Schmidt
Saganaga*	57	2.2	9/12/2004	48.244	-90.884	13832	N/A	280	26	70-185	70-75	Schmidt
Sand Point	2	N/A	10/12/2005	48.378	-92.474	8526	2847	184	N/A	66-99	N/A	VNP
Sea Gull*	8 23	1.3 1.4	7/8/2009 6/12/2010	48.132	-90.927	4032	927	145	6 16	51-93 43-92	51-89 43-92	Schmidt
Sturgeon	5	0.5	5/26/2010	47.681	-93.049	1585	667	80	11	48-80	55-73	Schmidt
Superior 1*	1	0.2	7/15/2009	47.849	-89.935	N/A	N/A	N/A	6	40-50	50	Schmidt
Superior 2*	1	N/A	7/14/2009	47.736	-90.405	N/A	N/A	N/A	N/A	300	300	DNR
Superior 3*	1	N/A	7/20/2009	47.509	-90.942	N/A	N/A	N/A	N/A	100	100	DNR
Superior 4*	1	N/A	7/27/2009	47.297	-91.232	N/A	N/A	N/A	N/A	200	200	DNR
Superior 5*	17	N/A	8/10/2009	46.857	-91.950	N/A	N/A	N/A	N/A	100-125	100-125	DNR
Trout*	74	9.3	6/21/2010	47.965	-92.317	7425	1613	98	8	55-85	55-85	Schmidt
Vernon	7	N/A	7/1/2009	47.943	-90.578	233	70	101	N/A	N/A	N/A	Geving
West Bear-skin*	12	3	5/29/2009	48.066	-90.429	493	94	78	4	40-69	40-69	Schmidt
Winchell*	1	0.1	6/11/2011	47.992	-90.604	826	233	160	9	55-87	N/A	Schmidt
Woods*	61	4.4	6/15/2010	47.870	-90.908	N/A	N/A	N/A	14	66-170	71-103	MNR
Total	544											
No Sculpin												
Alpine*	N/A	N/A	6/1/2009	48.131	-90.994	839	403	65	9	35-65	N/A	Schmidt
Alton*	N/A	N/A	6/10/2010	47.870	-90.908	969	320	72	11	53-65	N/A	Schmidt
Brule*	N/A	N/A	9/12/2009	47.941	-90.682	4617	1431	78	12	55-63	N/A	Schmidt
Crane*	N/A	N/A	8/3/2010	48.289	-92.476	2291	618	80	9	65-72	N/A	Schmidt
Greenwood*	N/A	N/A	7/14/2009	48.002	-90.173	2021	537	112	12	62-104	N/A	Schmidt
Iron	N/A	N/A	8/9/2010	48.229	-91.937	1851	N/A	60	10	N/A	N/A	SNF
Lac la Croix*	N/A	N/A	7/9/2010 8/23/2011	48.317	-92.117	34070	8500	168	9 5	52-57 54-56	N/A	Schmidt
Ottertrack*	N/A	N/A	6/23/2010	48.171	-91.096	1104	251	116	14	53-89	N/A	Schmidt
Red Rock	N/A	N/A	6/2/2009	48.159	-90.979	353	146	64	6	40-65	N/A	Schmidt
South*	N/A	N/A	5/11/2011	48.095	-90.547	1190	167	140	10	66-70	N/A	Schmidt
Vermilion	N/A	N/A	8/31/2010	47.865	-92.329	39272	15006	76	9	52-67	N/A	Schmidt

*Lake Trout