Upper Great Lakes Management Unit
Lake Huron Office

Ontario Ministry of Natural Resources

Moon River Delta Muskellunge Population Assessment Survey, 2008

Nearshore Program

Introduction

The Upper Great Lakes Management Unit (UGLMU), of the Ontario Ministry of Natural Resources (OMNR), with funding support from the Wisconsin Department of Natural Resources (WDNR), conducted a muskellunge population assessment survey in the Moon River delta of eastern Georgian Bay in the spring of 2008. This project was conducted in support of efforts aimed at restoring native fish populations including muskellunge to the Great Lakes basin.

Both WDNR and the United States Fish and Wildlife Service (USFWS) have been involved with initiatives aimed at improving the status of fish communities in the lower Green Bay Area of Concern, Lake Michigan, since the 1970s (Kapuscinski et al. 2005). Part of these rehabilitation efforts involve the re-establishment of predator populations, of which muskellunge where a prominent component up until the 1930s (Lake Michigan Fisheries Team 2004). Since the late 1980s muskellunge of Great Lakes origin have been stocked into the area with some success but concerns have lingered over the long term success of these efforts due to the limited amount of genetic diversity available in the original muskellunge stocks used (Kapuscinski et al. 2005).

To improve the genetic health of recently established muskellunge in the Green Bay area, a Great Lakes source of muskellunge, such as that found in the Georgian Bay area of Lake Huron, was being considered. The UGLMU has been assessing muskellunge populations in eastern Georgian Bay and the North Channel of Lake Huron since 1996. These surveys have confirmed the widespread distribution and presence of mature muskellunge throughout this area (UGLMU unpublished reports). Two recent population assessment surveys conducted in Severn Sound and the Moon River (Liskauskas 2005) and the Pointe au Baril area of Georgian Bay (Liskauskas 2006) also confirmed the presence of spawning populations of muskellunge.

The objectives of this study were to determine the feasibility of collecting gametes from wild populations of muskellunge in the Moon River delta area of Georgian Bay in order to support the restoration of muskellunge in Green Bay, Lake Michigan. In addition, the survey was to build upon information on muskellunge distribution, biological characteristics and fish health assessments collected from previous surveys in the area.

Project Description

The UGLMU has been involved with the assessment of muskellunge populations in Georgian Bay and the North Channel since 1996 and has developed a Spring Muskellunge Index Netting (SMIN) protocol that utilizes live capture trap net gear set in areas of known or presumed muskellunge spawning habitat (Liskauskas 2000). This roving design involves moving nets on a regular basis depending on muskellunge catches. This allows a large number of sites and areas to be surveyed in a relatively short period of time. This approach is necessary due to the relatively low abundance of adult muskellunge and because they are accessible to nearshore assessment gear for a short period of time during the spring spawning runs.

Four 6 foot, live-capture trap nets were used during the 2008 survey. Low water levels experienced on Lake Huron since 1998 have necessitated the use of alternative capture gear particularly in nearshore coastal wetland areas. A total of four, 4 foot hoop nets, were also used on an experimental basis to determine their effectiveness in capturing spawning muskellunge. An Early Spring Trap Netting (ESTN) survey (Skinner and Ball 2004), using similar nets to assess nearshore fish community composition at randomly chosen net sites, was scheduled for the survey area in 2008. Incidentally captured muskellunge from this survey were included in the biological assessment of SMIN captured muskellunge.

Captured muskellunge were biologically sampled (length, weight, girth, sex) and affixed with an external floy tag (anterior dorsal fin) to monitor future movements and survival. In addition to the floy tag, muskellunge captured in 2008 were also tagged with a pit tag (Biomark Inc., http://www.biomark.com/index.htm), inserted in the opercular musculature. A non-lethal tissue collection protocol, developed by the WDNR, was used for the fish health assessment component of this survey (Lassee 2005). Tissue samples were collected according to the protocol and were sent to the Fish Health laboratory at the University of Guelph for processing. Sexually mature muskellunge were further sampled with gametes (milt, eggs) collected and fertilizations conducted using previously developed techniques (Liskauskas 2006).

Results

The Moon River delta netting began on May 1st and continued until May 28th. Water temperatures varied from approximately 10 °C to 14.0 °C over this period and muskellunge daily catch varied from 0 to 4 individuals (Figure 1). Catch rates for muskellunge from SMIN trap nets averaged 0.23 fish per net night compared to 0.21 fish per net night in hoop nets and 0.39 fish per net night from ESTN trap nets. Muskellunge were captured from 6 of 13 (46%) SMIN trap net locations and 6 out of 14 (43%) hoop net locations (Figure 2). The Number of muskellunge captured at each netting location varied from 0 to 10 fish.

A total of 43 muskellunge were captured, of which 38 were biologically sampled including 18 females and 20 males (Table 1). Female muskellunge averaged a total length of 1231 mm (range 1095-1375 mm) whereas males averaged 1005 mm (range 709-1180 mm) (Figure 3). A total of 13 (30%) muskellunge captured had some evidence of external lesions and 19% had evidence of lamprey wounds or scars. Recaptured muskellunge, both within year and previous years, accounted for just 5% of the catch with two individuals having been tagged in surveys conducted in 2000 and 2005 (Table 1).

Gametes were collected from a total of 9 individuals resulting in the production of 4 lots of potentially fertilized eggs. The earliest ripe female was captured on the fourth day of netting (May 4th) and a ripe female was captured on the second last day of netting (May 27th). Fish Health assessments of fingerling muskellunge resulting from wild donor parents revealed the absence of VHS virus in any of the individuals tested (personal communication, Stephen Lord, Molecular and Cell biology, University of Guelph, slord@uoguelph.ca).

A diversity of nearshore fish species were captured in addition to muskellunge during the SMIN survey. A total of 7,360 fish (82 per trap net set) representing 18 species were captured in trap nets whereas hoop nets captured a total of 2,394 fish (34 per trap net night) with representation from 15 species (Table 2). The ESTN portion of the survey yielded a total catch of 3,420 fish (114 per trap net set) representing 14 species (Table 3). In both capture gear bullheads where by far the most abundant species captured with pumpkinseed, rock bass and smallmouth bass featuring prominently.

Summary

The 2008 muskellunge spawning survey in the Moon River delta, Georgian Bay, succeeded in providing biological information on the resident muskellunge population and afforded an opportunity to collect tissue samples and gametes in support of muskellunge restoration efforts in Green Bay, Wisconsin. Spawning muskellunge were captured effectively in both trap nets and hoop nets set in shallow spawning areas. Muskellunge catch rates were similar to those found at other locations sampled in Georgian Bay and the North Channel of Lake Huron (Fielder et al. 2005).

The wide range in size classes of mature muskellunge, the widespread distribution of potential spawning habitat and catch rates comparable to other locations sampled with this methodology suggests that the Moon River delta muskellunge populations are well established in the area. The feasibility of using muskellunge populations of Georgian Bay as brood sources for muskellunge recovery efforts in other Great Lakes jurisdictions was established at least on a short term basis as a result of this survey.

References:

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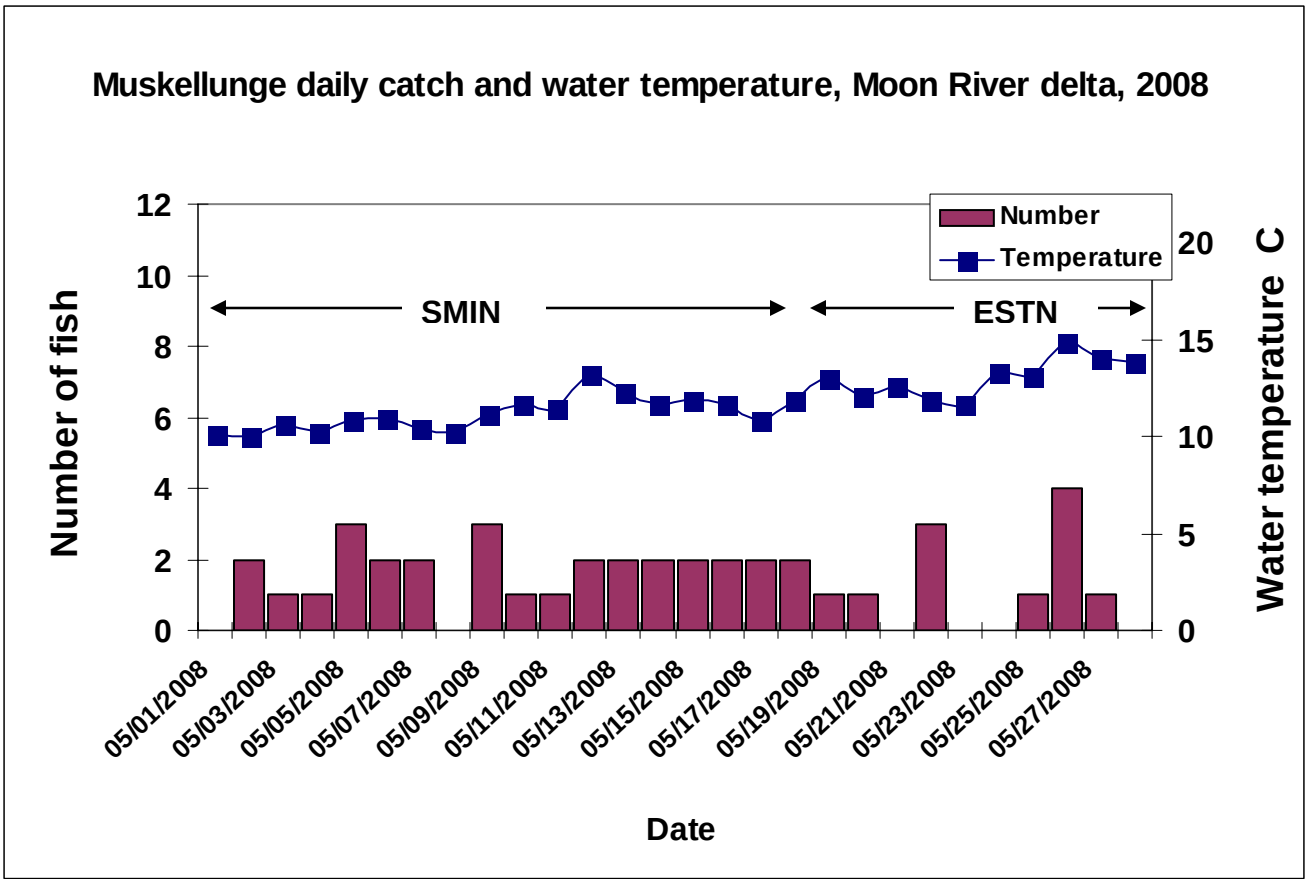

Figure 1. Daily muskellunge catch and water temperature in the Moon River delta, Georgian Bay, 2008. SMIN refers to results from the roving Spring Muskellunge Index Netting and ESTN refers to results from the End of Spring Trap Netting survey. Bars represent number of fish captured.

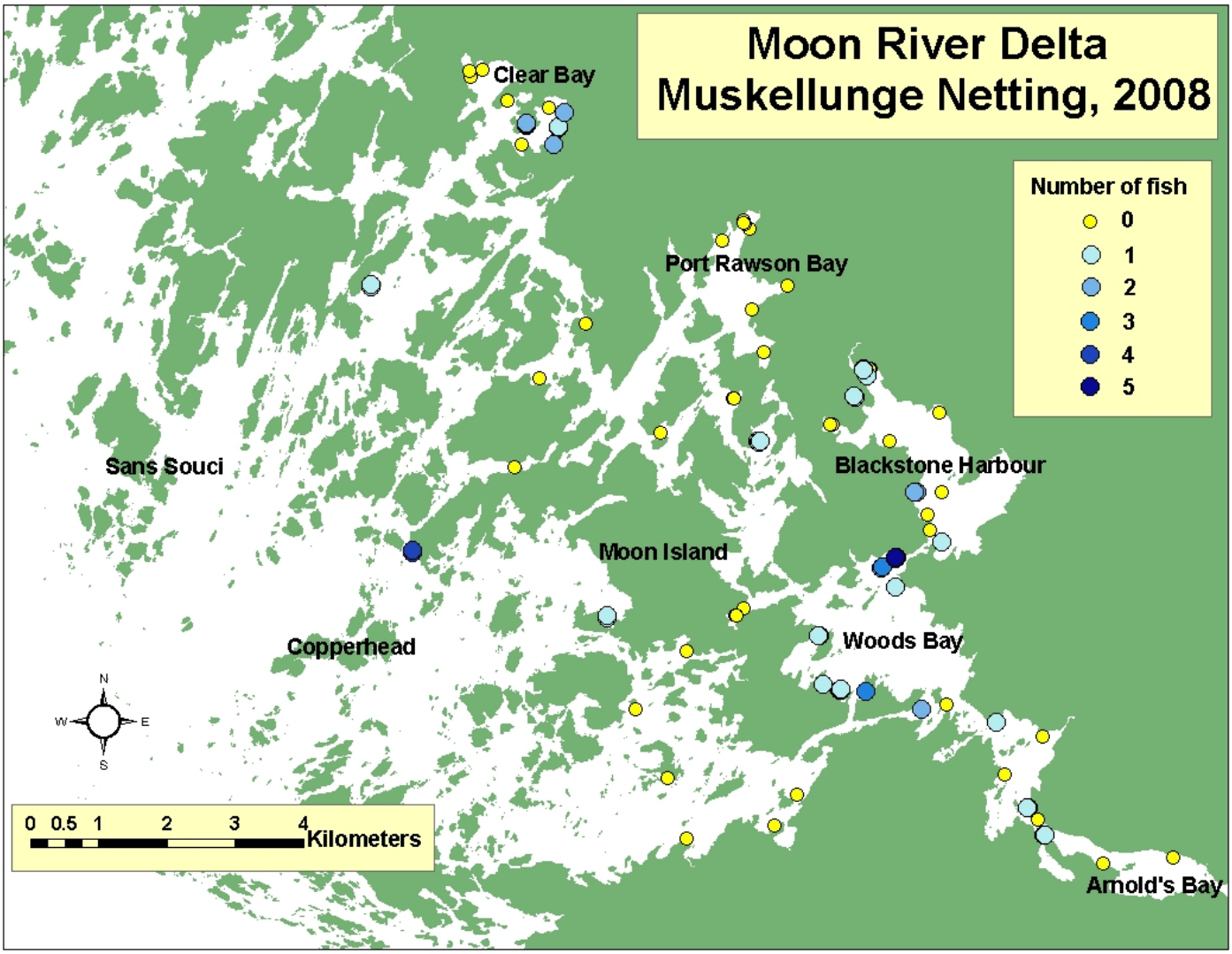

Figure 2. Muskellunge capture locations from the Moon River delta, Georgian Bay, 2008.

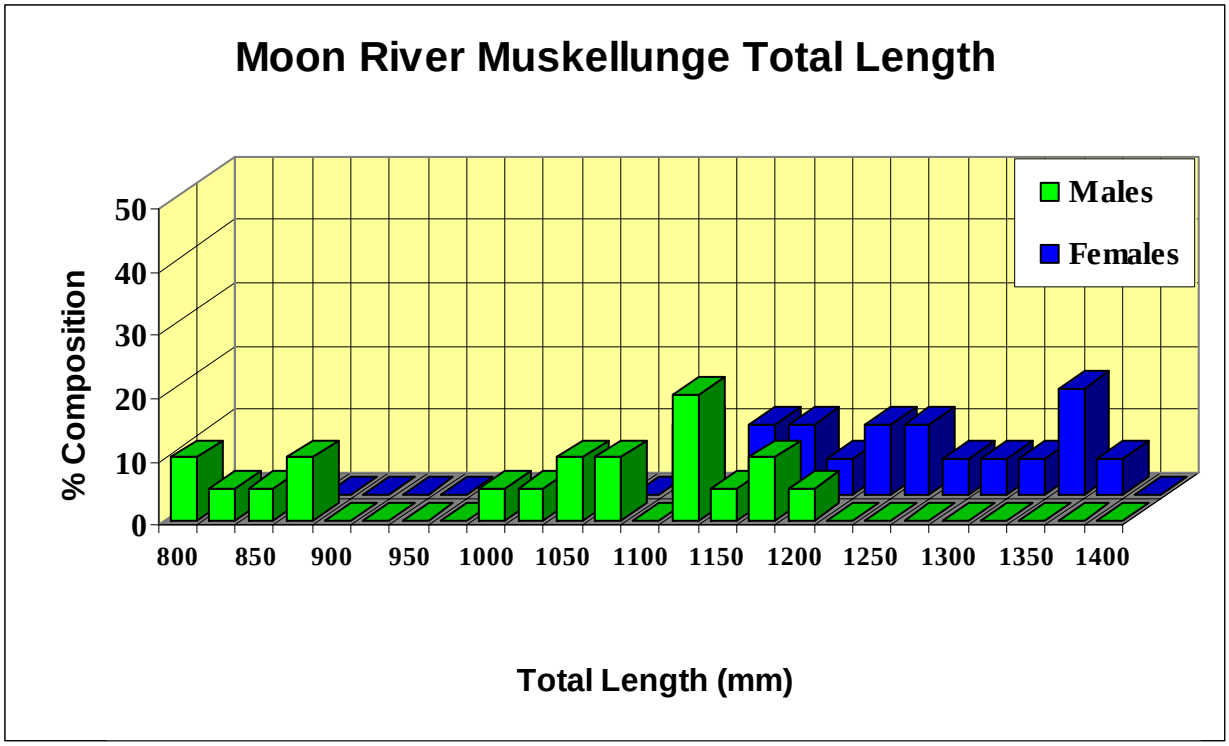

Figure 3. Total length frequency distribution of male and female muskellunge from the Moon River delta, Georgian Bay, 2008.

Table 1. Summary of catch and biological information collected from muskellunge from the Moon River delta, Georgian Bay, 2008.

Project Type	Date of Capture	Total Length (mm)	Round Weight (g)	Sex	Gonad Condition	Tag Number	Year Tagged	Lesions	Gametes Collected
SMIN	02-May-08	992	6750	Male	Ripe	22043	2008	No	
SMIN	02-May-08	1040	6750	Male	Ripe	22042	2008	No	
SMIN	03-May-08	1375	19750	Female	Green	22047	2008	No	
SMIN	04-May-08	1330	17000	Female	Green	22049	2008	No	
SMIN	05-May-08	1235	13250	Female	Green	22050	2008	No	
SMIN	05-May-08	1170	13250	Female	Ripe	17758	**2005**	No	
SMIN	05-May-08	548	880	Unknown	Unknown	20951	2008	No	
SMIN	06-May-08	709	2250	Male	Ripe	20954	2008	No	
SMIN	06-May-08	1160	11250	Female	Green	20952	2008	No	
SMIN	07-May-08	1350	21750	Female	Ripe	20955	2008	No	Yes
SMIN	07-May-08	1048	8250	Male	Ripe	20956	2008	No	Yes
SMIN	09-May-08	1118	11750	Male	Ripe	20958	2008	Yes	Yes
SMIN	09-May-08	1128	18250	Female	Ripe	20960	2008	Yes	Yes
SMIN	09-May-08	1104		Male	Ripe	20957	2008	No	
SMIN	10-May-08	1180	14250	Male	Ripe	20961	2008	No	
SMIN	11-May-08	814	3000	Male	Ripe	20962	2008	No	
SMIN	12-May-08	1129	10250	Male	Ripe	20963	2008	Yes	
SMIN	13-May-08	1053	7250	Male	Spent	20964	2008	No	
SMIN	13-May-08	1253	17750	Female	Green	20965	2008	No	
SMIN	13-May-08	1061	8750	Male	Green	20966	2008	No	
SMIN	14-May-08	1150	14000	Female	Ripe	20967	2008	No	Yes
SMIN	14-May-08	1120	13250	Male	Ripe	10362	**2000**	Yes	Yes
SMIN	15-May-08	733	3250	Male	Ripe	20968	2008	No	
SMIN	15-May-08	1152	13250	Male	Ripe	20969	2008	No	
SMIN	17-May-08	1315	16750	Female	Ripe	20972	2008	Yes	Yes
SMIN	17-May-08	1173	9750	Male	Ripe	20975	2008	No	Yes
SMIN	17-May-08	1200	16250	Female	Ripe	20970	2008	Yes	Yes
SMIN	17-May-08	1095	10250	Female	Ripe	20971	2008	No	
SMIN	18-May-08	1233	16250	Female	Green	20977	2008	Yes	
SMIN	18-May-08	1295	15250	Female	Ripe	20976	2008	Yes	
ESTN	19-May-08	846	4050	Unknown	Unknown	20980	2008	No	
SMIN	19-May-08	826	4250	Male	Ripe	20978	2008	No	
SMIN	19-May-08	1098	9250	Female	Ripe	20979	2008	No	
ESTN	20-May-08	1205	15750	Female	Unknown	20981	2008	Yes	
ESTN	22-May-08	1022	5750	Unknown	Unknown	20983	2008	No	
ESTN	22-May-08	862	4750	Male	Ripe	20985	2008	No	
ESTN	22-May-08	899	5250	Unknown	Unknown	20986	2008	No	
ESTN	25-May-08	855	4250	Male	Ripe	20987	2008	No	
ESTN	26-May-08	1347	16750	Unknown	Unknown	20989	2008	Yes	
ESTN	26-May-08	1102	10750	Unknown	Unknown	20990	2008	Yes	
ESTN	26-May-08	1105	9750	Male	Ripe	20991	2008	Yes	
ESTN	26-May-08	1025	8250	Male	Ripe	20992	2008	Yes	
ESTN	27-May-08	1211	12750	Female	Ripe	20993	2008	No	

Trap nets Species	Total catch	Mean number/ set	% of total
Brown Bullhead	5155	55.8	70.0
Pumpkinseed	649	7.6	8.8
Smallmouth Bass	359	4.3	4.9
Northern Pike	307	3.7	4.2
Rock Bass	304	3.6	4.1
Largemouth Bass	251	3.1	3.4
Longnose Gar	121	1.4	1.6
Bowfin	57	0.7	0.8
Black Crappie	49	0.6	0.7
Channel Catfish	36	0.4	0.5
Walleye	23	0.3	0.3
Muskellunge	19	0.2	0.3
Yellow Perch	13	0.2	0.2
White Sucker	11	0.1	0.1
Lake Herring	2	0.0	0.0
White Bass	2	0.0	0.0
Moxostoma sp.	1	0.0	0.0
Common Carp	1	0.0	0.0
Total	**7360**	**81.9**	**100**

Hoop nets Species	Total catch	Mean number/ set	% of total
Brown Bullhead	865	11.9	36.1
Pumpkinseed	838	12.0	35.0
Rock Bass	177	2.5	7.4
Largemouth Bass	141	2.0	5.9
Northern Pike	121	1.8	5.1
Bowfin	81	1.2	3.4
Smallmouth Bass	78	1.2	3.3
Longnose Gar	42	0.7	1.8
Black Crappie	16	0.2	0.7
Muskellunge	13	0.2	0.5
Yellow Perch	13	0.2	0.5
Channel Catfish	4	0.0	0.2
White Sucker	2	0.0	0.1
Common Carp	2	0.0	0.1
Rainbow Trout	1	0.0	0.0
Total	**2394**	**33.9**	**100**

Table 2. SMIN trap net and hoop net catch summaries from the Moon River delta, Georgian Bay, 2008.

Trap nets Species	Total catch	Mean number/ set	% of total
Brown Bullhead	2827	93.2	82.7
Rock Bass	165	5.6	4.8
Smallmouth Bass	162	5.7	4.7
Northern Pike	96	3.4	2.8
Pumpkinseed	49	1.7	1.4
Largemouth Bass	45	1.6	1.3
Channel Catfish	23	0.8	0.7
Walleye	15	0.5	0.4
Bowfin	12	0.4	0.4
Muskellunge	11	0.4	0.3
White Sucker	7	0.3	0.2
Black Crappie	4	0.1	0.1
Longnose Gar	3	0.1	0.1
Yellow Perch	1	0.0	0.0
Total	**3420**	**113.8**	**100**

Table 3. ESTN Trap net catch summary from the Moon River delta, Georgian Bay, 2008.