Targeted Sampling for Channel Darter (*Percina copelandi)* in the Lower Ottawa River and Little Rideau Creek, Ontario, 2010 and 2011

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ABSTRACT

Barnucz, J. and Reid, S.M. 2023. Targeted Sampling for Channel Darter (Percina copelandi) in the Lower Ottawa River and Little Rideau Creek, Ontario, 2010 and 2011. Can. Data Rep. Fish. Aquat. Sci. 1357: vi + 25 p.

In July 2010, October 2010, and August 2011 surveys were completed to determine the distribution of Channel Darter (*Percina copelandi*) in Little Rideau Creek and the Ottawa River. A combination of gears was used for these surveys including backpack electrofishing, seining, and trawling. In July 2010 three sites were sampled in Little Rideau Creek with a backpack electrofisher. Sampling effort ranged from 1172 to 2348 seconds. Twelve fish species were captured in including Cutlip Minnow (*Exoglossum maxillingua*) (98 specimens). In October 2010 two sites from July 2010 were resampled with backpack electrofishing and seining. Eleven species were detected during resampling, including Cutlip Minnow (16 specimens) and Channel Darter (2 specimens). In August 2011 15 sites were sampled along the Ottawa River between Voyageur Provincial Park and the City of Ottawa. Fishes were collected using three consecutive passes of a mini-Missouri trawl over a 100 m transect. Eighteen species (662 individuals) were detected including Channel Darter (135 individuals). Channel Darter was collected from 14 of 15 sampling sites.

RÉSUMÉ

Barnucz, J. and Reid, S.M. 2023. Targeted Sampling for Channel Darter (Percina copelandi) in the Lower Ottawa River and Little Rideau Creek, Ontario, 2010 and 2011. Can. Data Rep. Fish. Aquat. Sci. 1357: vi + 25 p.

En juillet 2010, octobre 2010 et août 2011, on a mené des relevés pour déterminer la répartition du fouille-roche gris (*Percina copelandi*) dans le ruisseau Little Rideau et la rivière Ottawa. Pour ce faire, on a utilisé une combinaison d'engins de pêche, notamment un appareil portatif de pêche à l'électricité, une senne et un chalut. En juillet 2010, trois sites du ruisseau Little Rideau ont été échantillonnés à l'aide d'un appareil portatif de pêche à l'électricité. La durée des activités d'échantillonnage a varié de 1 172 à 2 348 secondes. On a capturé des individus de 12 espèces de poissons, y compris le bec-de-lièvre (*Exoglossum maxillingua*) (98 spécimens). En octobre 2010, deux sites ciblés lors du relevé de juillet 2010 ont été rééchantillonnés à l'aide d'un appareil portatif de pêche à l'électricité et d'une senne. Lors de ce rééchantillonnage, 11 espèces ont été détectées, y compris le bec-de-lièvre (16 spécimens) et le fouille-roche gris (2 spécimens). En août 2011, 15 sites ont été échantillonnés le long de la rivière Ottawa, entre le parc provincial Voyageur et la ville d'Ottawa. Pour capturer des individus, on a effectué trois traits consécutifs le long d'un transect de 100 m à l'aide d'un mini chalut Missouri. On a détecté 18 espèces (662 individus), y compris le fouille-roche gris (135 individus). On a capturé des fouille-roches gris à 14 des 15 sites échantillonnés.

INTRODUCTION

Fisheries and Oceans Canada (DFO) has the responsibility to provide for the protection and recovery of fishes listed under the *Species at Risk Act* (SARA). To inform scientific aspects of the recovery process, DFO regularly conducts field sampling to satisfy research objectives for SARA-listed fishes, such as: evaluating the distribution and abundance of species; determining species-habitat relationships; and understanding the influence of threats and recovery actions. DFO data reports are published to support the Species at Risk Program by providing an overview of field activities and to provide a medium for archiving data associated with sampling SARA-listed fishes and their habitat.

Channel Darter (*Percina copelandi*) has a disjunct distribution in Canada, which is largely restricted to Ontario in the Lake Erie and Huron-Erie corridor, Bay of Quinte drainage, and the Ottawa River drainage (COSEWIC 2016). Based on this distribution, COSEWIC has identified three designatable units in Canada: Lake Erie populations; Lake Ontario populations; and St. Lawrence populations. The St. Lawrence River designatable unit includes localities found along Ottawa River, St. Lawrence River, and St. Lawrence River drainages (COSEWIC 2016). Most of these localities are in the province of Quebec (COSEWIC 2016).

This data report summarizes targeted field sampling by Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry (NDMNRF) in 2010 and DFO in 2011 to better understand the distribution of Channel Darter along the lower Ottawa River and Little Rideau Creek, Ontario. The 2010 NDMNRF study used a targeted sampling approach with a backpack electrofishing unit and seine net to sample wadeable habitats along Little Rideau Creek, a tributary of the lower Ottawa River. Backpack electrofishing units and seine nets have been proven successful for capturing Channel Darter (LeBaron and Reid 2021; LeBaron et al. 2020; Dextrase and Reid 2004). In 2011, DFO conducted targeted sampling with small-mesh benthic trawls to sample non-wadeable habitats (>1.5 m) for Channel Darter in the lower Ottawa River. The use of trawl nets in river systems is a relatively new sampling technique, especially in lotic systems in southern Ontario. Trawls are often large, bulky gears that require large vessels for deployment and retrieval (Guy et al. 2009); however, contemporary design changes have allowed researchers to scale the size of the trawl to the vessel and habitat features of interest (Guy et al. 2009; Barnucz and Drake 2021).

In July and October of 2010, NDMNRF staff sampled five sites along the lower reaches of Little Rideau Creek. Three sites were sampled in July, with two of these sites being resampled in October. Sites were sampled with either a backpack electrofishing unit or a bag seine. In 2011, DFO sampled the lower Ottawa River between Voyageur Provincial Park and the City of Ottawa (Ontario) using a small benthic trawl. Fifteen sites were selected based on the habitat features suspected to support Channel Darter. Objectives of these sampling efforts were to:

1) inform status update assessments of Channel Darter by COSEWIC (see COSEWIC 2016),

2) delineate the spatial extent of occupied habitats,

3) describe the composition of fish assemblages in habitats along reaches occupied by Channel Darter, and

4) collect tissue samples for the characterization of the genetic population structure of Canadian Channel Darter populations (see Reid et al. 2013).

Data presented in this report supports the following high priority conservation measure identified in the Management Plan for the Channel Darter (*Percina copelandi*), St. Lawrence populations, in Canada [Draft] (DFO 2021):

1) conduct extensive surveys on Little Rideau Creek and the Ottawa River (and tributaries) to determine whether a resident population exists in Little Rideau Creek. Surveys in the Ottawa River (and tributaries) to be informed through distribution of Channel Darter on Quebec side of the river.

METHODS

STUDY AREA AND SITE SELECTION

2010 Surveys – Little Rideau Creek

Little Rideau Creek is a tributary that flows into the Ottawa River approximately 1 km west of the Voyageur Provincial Park boundary (Figure 1a). Two Channel Darter records (1989, 2004) exist near the creek's confluence with the Ottawa River (Dextrase and Reid 2004). However, further sampling at and upstream of this locality was needed to determine the extent and viability of any Little Rideau Creek sub-population. Sampling sites were located along a 1.5 km reach upstream of the Ottawa River. Site selection was based on access, the presence of riffle-type habitats, and prior detections of Channel Darter (Dextrase and Reid 2004).

2011 Trawling Survey – Ottawa River

The lower Ottawa River between Voyageur Provincial Park, Ontario and the City of Ottawa, Ontario was the focal area of 2011 sampling (Figure 1a; Figure 1b; Figure 1c). The area was selected as there were known populations of Channel Darter within tributaries of the Ottawa River along this reach. The most westerly known population of Channel Darter in this reach is in the Gatineau River, across from the City of Ottawa. The most easterly known population of Channel Darter in this reach is in Little Rideau Creek, just east of Voyageur Provincial Park (Figure 1a). Sampling sites were selected if they satisfied at least one of the following inclusion criteria: 1) contained clean sand and/or gravel substrate; and 2) river depths >1 m average depth. In addition to these criteria, sites were only sampled if they were mostly free of large physical obstructions (e.g., large woody debris, large boulders near the water's surface). This approach was developed based on previous sampling detections of Channel Darter in similar habitats within the Detroit River and St. Clair River by DFO Science (Kindree and Mandrak 2020). Potential hazards and substrate assessment within sampling sites were evaluated using a Humminbird® 998c SI Sonar Unit, equipped with GPS receiver and side scan technology. When sites contained minor navigation or trawling hazards, such obstructions were identified and marked using the Humminbird® GPS unit prior to trawling. This strategy allowed the trawl and vessel to be navigated safely. Trawling sites were selected to be approximately 100 m in length.

FISH ASSEMBLAGE SAMPLING

2010 Surveys – Little Rideau Creek

In July, three sites along the lower reach of Little Rideau Creek were sampled. Two of these sites were re-sampled in October. Sampling sites LRC-4 and LRC-5 were resampling events of sites LRC-1 and LRC-2. Fishes from all July sampling sites, and one October site were collected using a Smith-Root™ Model 12 backpack electrofisher. All sites sampled with backpack electrofishing involved a habitat sampling approach with approximately 5 sec/m^2 of shocking effort (Stanfield 2010). Total seconds of effort was recorded for each electrofishing site. Electrofishing effort ranged from 1172 to 2348 seconds. A bag seine (4 hauls) was used to collect fishes from the second October sampling site. The bag seine was 8 metres in length, 1.5 m in height and was made entirely of a 3 mm mesh. The dimensions of the bag were 1.5m x 1.5m and was also made of 3mm mesh. Riffle, pool and bedrock ledge habitats were targeted.

Fishes were held in buckets of clean water until processing. Numbers of Channel Darter and Cutlip Minnow (*Exoglossum maxillingua*) captured were recorded and total length was measured. For other species, only presence at the site was recorded. Photo vouchers were taken to confirm species identity. All fishes were released into the creek after processing. At LRC-5, only counts of Channel Darter and Cutlip Minnow were recorded. Tissue samples were collected for genetic analysis from all Channel Darter specimens. Tissue samples were collected similar to procedures in Kidd et al. (2014).

2011 Trawling Survey – Ottawa River

Field sampling was conducted between 13–17 August, 2011. A Missouri Trawl with two 7 m tow ropes and two 50 cm x 30 cm otter doors (weighing approximately 6 kg each) was used to sample fishes. The trawl dimensions were 2.4 m wide by 4.3 m long (head rope to cod-end) with a single 2.4 m foot rope. A 2.4 m length of chain was attached to the foot rope to weight the trawl opening and help maintain bottom contact. The 2.4 m head rope was lined with small plastic floats that opened the trawl vertically while towing. The exterior of the trawl was constructed of a 3 mm polyester square mesh while the interior of the trawl was lined with a 30 mm polyester mesh. Both the 3 mm outer mesh and 30 mm inner mesh had their own separate cod ends that were approximately 50 cm apart when tied. The inner mesh served two purposes. First, it provided safe passage of smaller fishes through the trawl and into the 3 mm mesh cod. Second, it provided separation of captured fishes from potentially harmful objects that were occasionally captured in the trawl (e.g. rocks, large fish, tires). Tow rope length was adjusted at each site based on river depth. Appropriate tow rope length was calculated at 2.1 m of tow rope for each 0.3 m of depth [i.e. water depth (m) x 7 = towline length (m)] (Guy et al. 2009). The trawl was fished from the bow of a 5 m fiberglass center console vessel powered by a 90 hp outboard. During fishing, the boat was operated in reverse and moved in the downstream direction. Site length, speed, and location were monitored by GPS during trawling, with trawling speed maintained at approximately 2 km/hr. Sampling effort was recorded as distance travelled (100 m was the targeted length) and elapsed time (seconds).

Three repeated trawling passes were completed over the same habitat area at a single site. If Channel Darter were detected in one of the first three passes one additional pass was completed. Fishes captured in the trawl were carefully removed and placed into bins of fresh water for counting and identification. Fishes were processed separately by trawling pass (e.g.,

pass 1, pass 2, pass 3, pass 4). Total length (TL; mm) was measured for captured COSEWIC-assessed and SARA-listed fishes. Both photo and physical vouchers were taken for a subset of captured fishes to confirm species identity. Physical vouchers were preserved in 10% buffered Formalin and species identification was confirmed in the laboratory. Additionally, specimens that could not be identified to species in situ, and other sampling mortalities, were retained for laboratory identification. Additionally, tissue samples were collected for genetic analysis from all Channel Darter specimens. Tissue samples were collected similar to procedures in Kidd et al. (2014).

HABITAT SAMPLING

2010 Habitat Sampling – Little Rideau Creek

Sites were sampled with a Hanna Instruments™ conductivity meter to determine water temperature (°C) and water conductivity (µS/cm).

2011 Habitat Sampling – Ottawa River

Habitat sampling occurred at the midpoint of the sampling site after fishes were processed and released. The midpoint of the site was determined by measuring 50 linear m from the starting point of the trawling transect using the Humminbird® sonar unit. Water temperature (°C), conductivity (µS), turbidity (NTU), and dissolved oxygen (mg/L) were measured approximately 0.1 m beneath the water's surface using a YSI® multiparameter sonde, which was deployed and allowed to stabilize for approximately 1 minute before measurements were recorded. Air temperature (°C) was measured using a Kestrel® wind meter. Substrate composition within the site was assessed using a combination of a Petite Ponar® petite Ponar sampler and the Humminbird® sonar unit. Substrate within the site was assessed based on the following categories and median particle diameters: clay (0–0.002 mm), silt (0.002–0.02 mm), sand (0.02–2 mm), gravel (2–40 mm), cobble (40–256 mm), and boulder (>256 mm excluding bedrock). The percent coverage of each substrate category was assessed and recorded up to an aggregate total coverage of 100%. River depth was measured at the start, midpoint, and end of each trawling site using the Humminbird® sonar unit. River velocity (m/s) was measured at the same locations using a Swoffer® 2100 velocity meter, deployed at approximately 50% of water depth.

SAMPLING PERMITS AND DATA ARCHIVING

Sampling for this project was conducted under the authority of SARA Permit Number SECT 73 SARA C&A 11-025. Trawling activities were conducted under Standard Operating Protocol GWACC-113, approved by the Environment and Climate Change Canada and DFO Animal Care Committee (operated under the approval of the Canadian Council on Animal Care). Data associated with these collections is housed under the project code "CHD-OTR-2011" in the Biodiversity Science database within the Great Lakes Laboratory for Fisheries and Aquatic Sciences. Every effort has been made to ensure the accuracy of data contained in this report; however, species identities and other sampling results may be revised as part of a long-term data archiving process. Raw data associated with this data report may be obtained by contacting the Great Lakes Laboratory for Fisheries and Aquatic Sciences.

RESULTS

FISH ASSEMBLAGE SAMPLING

2010 Fish Assemblage Sampling – Little Rideau Creek

Channel Darter was only detected at one site (LRC-4), which is the same locality as the 2004 collection (Table 1; Figure 1a). Cutlip Minnow, a species designated as Threatened under the Ontario Endangered Species Act, was detected at all sites. Between 2 and 10 species were detected from Little Rideau Creek sites (Table 2a). The most widespread species were Creek Chub (*Semotilus atromaculatus*), Cutlip Minnow, Longnose Dace (*Rhinichthys cataractae*), and White Sucker (*Catostomus commersonii*). Species only detected from a single site included Burbot (*Lota lota*), Bluntnose Minnow (*Pimephales notatus*), Brook Stickleback (*Culaea inconstans*), Eastern Silvery Minnow (*Hybognathus regius*), Fathead Minnow (*Pimephales promelas*), and Mottled Sculpin (*Cottus bairdii*). Two Channel Darters were electrofished from LRC-4 and the TL of each specimen was 46 mm and 58 mm respectively (Table 3a; Figure 2). One hundred-fourteen Cutlip Minnow were collected from Little Rideau Creek. The number of Cutlip Minnow collected from each site ranged from 7 to 77 individuals. The TL of 16 Cutlip Minnow (from LRC-4 and LRC-5 only) ranged from 48 mm to 106 mm with a mean of 68 mm (Table 3a; Figure 2).

2011 Fish Assemblage Sampling – Ottawa River

Fifteen sampling sites, consisting of 47 trawls in total, were sampled along the lower Ottawa River (Table 1; Figure 1a; Figure 1c; Figure 1d). A total of 662 fishes representing 18 species were detected (Table 2b; Figure 3). Based on pooled catch data the most abundant species in the survey were Tessellated Darter (*Etheostoma olmstedi*), Logperch (*Percina caprodes*), Channel Darter, Yellow Perch (*Perca flavescens*) and Smallmouth Bass (*Micropterus dolomieu*) (Table 2b; Figure 3). A total of 135 Channel Darter were detected from 14 of 15 sampling sites. The TL of these specimens ranged from 18 mm to 57 mm with a mean of 35.2 mm (Table 3b; Figure 4). Cutlip Minnow was not detected during the 2011 trawling survey. The number of individuals trawled from Ottawa River sites tended to be greater during the second and third passes than the first (Figure 5). Alternatively, the number of species detected during the first trawl was slightly higher than during subsequent trawls (Figure 5). Most species were detected during the first two passes at a site (Figure 5).

2011 – Tissue Sample Analysis

Channel Darter tissue samples were collected and analyzed to characterize Channel Darter designatable units in support of COSEWIC review of this species in Canada. Results from this review are summarized in Reid et al. (2013).

HABITAT SAMPLING

2010 Habitat Sampling – Little Rideau Creek

In July, water temperatures in Little Rideau Creek ranged from 21.3 to 24.1°C. Conductivity ranged from 549 to 566 µS/cm. In October, water temperature was 8.5°C and conductivity was 520 µS/cm.

2011 Habitat Sampling – Ottawa River

Water temperature of sampling sites in the Ottawa River ranged from 23.5 to 25.3 °C with a mean of 24.4 °C (Table 4). Conductivity ranged from 70 to 92 µS with a mean 79.5 µS (Table 4). Dissolved oxygen ranged from 7.4 to 9 mg/L with a mean of 8.3 mg/L (Table 4). Turbidity ranged from 1.5 to 10.4 NTU with a mean of 3.8 NTU (Table 4). The mean site depth ranged from 1.9 to 6.7 m with a mean depth of 3.2 m (Table 4). The mean surface water velocity ranged from 0.0 to 0.1 m/s with a mean 0.1 m/s (Table 4). Substrate composition was variable among the Ottawa River sampling sites (Table 5). Clay was the most common substrate type that occurred among sites in the Ottawa River ranging from 40 to 90%, with a mean of 59.4% (Table 5). Sand ranged from 5 to 80%, with a mean of 35.5 % (Table 5). Silt ranged from 10 to 40% with a mean of 23.6% (Table 5). Organic matter ranged from 10 to 25% with a mean of 18.3 % (Table 5). Boulder ranged from 25 to 50% with a mean of 33.3% (Table 5). Cobble was observed at three sites each with 50% coverage. Gravel was observed at two sites each with 25% coverage.

Sampling in 2010 and 2011 has provided new insight into the distribution of Channel Darter in the Ottawa River and their associated habitats. Future sampling to detect Channel Darter may involve targeted sampling both upstream of Ottawa and downstream of Voyageur Provincial Park. This would include both the Ottawa River and tributaries.

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Table 1. Summary of site locations during targeted sampling for sites in the Lower Ottawa River (2011) and Little Rideau Creek (2010).

Site ID	Date	Sampling Gear	Sampling Effort	Quantification of Effort	Start Latitude	Start Longitude
OTT-1	13-Aug-2011	TRL	3	tow	45.58687	-75.08205
OTT-2	13-Aug-2011	TRL	3	tow	45.58957	-75.07393
OTT-3	13-Aug-2011	TRL	3	tow	45.58296	-75.20128
OTT-4	13-Aug-2011	TRL	3	tow	45.58774	-75.07962
OTT-5	13-Aug-2011	TRL	3	tow	45.58660	-75.08315
OTT-6	15-Aug-2011	TRL	3	tow	45.58576	-74.51776
OTT-7	15-Aug-2011	TRL	3	tow	45.57462	-74.45073
OTT-8	15-Aug-2011	TRL	3	tow	45.56689	-74.43293
OTT-9	16-Aug-2011	TRL	3	tow	45.61455	-74.5947
OTT-10	16-Aug-2011	TRL	3	tow	45.63669	-74.64625
OTT-11	16-Aug-2011	TRL	3	tow	45.63683	-74.64679
OTT-12	17-Aug-2011	TRL	4	tow	45.45721	-75.68304
OTT-13	17-Aug-2011	TRL	4	tow	45.45710	-75.68339
OTT-14	17-Aug-2011	TRL	3	tow	45.45072	-75.69066
OTT-15	17-Aug-2011	TRL	3	tow	45.45316	-75.68906
LRC-1	22, 23-July-2010	BEF	2306	seconds	45.58451	-74.51717
LRC-2	22, 23-July-2010	BEF	1172	seconds	45.58234	-74.51545
LRC-3	22, 23-July-2010	BEF	1413	seconds	45.57760	-74.51932
LRC-4	28-Oct-11	BEF	2348	seconds	45.58451	-74.51717
LRC-5	28-Oct-11	SN	4	hauls	45.57760	-74.51932

TRL: Trawl, BEF: Backpack Electrofisher, SN: Seine Net

Table 2a. Fish assemblage results from targeted sampling for Channel Darter in Little Rideau Creek 2010. Total catch data is summarized for Channel Darter (*Percina copelandi*) and Cutlip Minnow (*Exoglossum maxillingua*). Catch data for additional fish species is summarized as presence (x) and absence for all sampling sites.

Species	LRC-1	LRC-2	LRC-3	LRC-4	LRC-5
Percina copelandi	0	0	0	2	0
Exoglossum maxillingua	9	12	77	9	7
Ambloplites rupestris	X	X		X	
Catostomus commersonii	X	X	X	X	
Cottus bairdii				X	
Culaea inconstans			X		
Cyprinid species					
Etheostoma nigrum	X	X	X		
Etheostoma nigrum x *Etheostoma olmstedi*				X	
Hybognathus regius				X	
Lota lota				X	
Luxilus cornutus	X		X		
Micropterus dolomieu	X			X	
Percina caprodes	X			X	
Pimephales notatus			X		
Pimephales promelas			X		
Rhinichthys cataractae	X	X	X	X	
Semotilus atromaculatus	X	X	X	X	
Total Species	**10**	**7**	**10**	**11**	**2***

**sampling bycatch not recorded*

Table 2b. Fish assemblage results from targeted sampling for Channel Darter in the Lower Ottawa River in 2011. Values are aggregate catch (raw abundance) for each site.

Species	CHD-OTT-01	CHD-OTT-02	CHD-OTT-03	CHD-OTT-04	CHD-OTT-05	CHD-OTT-06	CHD-OTT-07	CHD-OTT-08	CHD-OTT-09	CHD-OTT-10	CHD-OTT-11	CHD-OTT-12	CHD-OTT-13	CHD-OTT-14	CHD-OTT-15	Total Catch
Ambloplites rupestris												2		1		**3**
Etheostoma flabellare												2	2			**4**
Etheostoma nigrum	4															**4**
Etheostoma olmstedi		18	3	4	8	24	32	20	27	10	11	42	26	3	3	**231**
Ictalurus punctatus											2					**2**
Lepomis gibbosus					1									2		**3**
Lepomis macrochirus		1						4				14	1	1		**21**
Micropterus dolomieu				1			3	2				7	3		6	**22**
Micropterus salmoides								1								**1**
Notropis hudsonius						8										**8**
Notropis volucellus									1				1			**2**
Perca flavescens		1						40	1				1			**43**
Percina caprodes	8	4	6	6	3	6	24	76	3		15	10	14	1	2	**178**
Percina copelandi	16	2	4	16	15		2	1	5	10	37	14	9	1	3	**135**
Percopsis omiscomaycus											1					**1**
Pimephales notatus						1										**1**
Pomoxis nigromaculatus								1								**1**
Sander vitreus						1			1							**2**
Total	**28**	**26**	**13**	**27**	**27**	**40**	**61**	**##**	**38**	**20**	**66**	**91**	**57**	**9**	**14**	**662**

Table 3a. Summary of Channel Darter (n=2) and Cutlip Minnow (n=16) captured in Little Rideau Creek, October 2010.

Site ID	Species	Date	Total Length (mm)	Start Latitude	Start Longitude
LRC-4	*Percina copelandi*	28-Oct-2010	46	45.58451	-74.51717
LRC-4	*Percina copelandi*	28-Oct-2010	58	45.58451	-74.51717
LRC-4	*Exoglossum maxillingua*	28-Oct-2010	48	45.58451	-74.51717
LRC-4	*Exoglossum maxillingua*	28-Oct-2010	50	45.58451	-74.51717
LRC-4	*Exoglossum maxillingua*	28-Oct-2010	50	45.58451	-74.51717
LRC-4	*Exoglossum maxillingua*	28-Oct-2010	51	45.58451	-74.51717
LRC-4	*Exoglossum maxillingua*	28-Oct-2010	51	45.58451	-74.51717
LRC-4	*Exoglossum maxillingua*	28-Oct-2010	54	45.58451	-74.51717
LRC-4	*Exoglossum maxillingua*	28-Oct-2010	54	45.58451	-74.51717
LRC-4	*Exoglossum maxillingua*	28-Oct-2010	55	45.58451	-74.51717
LRC-4	*Exoglossum maxillingua*	28-Oct-2010	79	45.58451	-74.51717
LRC-5	*Exoglossum maxillingua*	28-Oct-2010	53	45.57760	-74.51932
LRC-5	*Exoglossum maxillingua*	28-Oct-2010	82	45.57760	-74.51932
LRC-5	*Exoglossum maxillingua*	28-Oct-2010	70	45.57760	-74.51932
LRC-5	*Exoglossum maxillingua*	28-Oct-2010	91	45.57760	-74.51932
LRC-5	*Exoglossum maxillingua*	28-Oct-2010	94	45.57760	-74.51932
LRC-5	*Exoglossum maxillingua*	28-Oct-2010	106	45.57760	-74.51932
LRC-5	*Exoglossum maxillingua*	28-Oct-2010	106	45.57760	-74.51932

Table 3b. Summary of Channel Darter (Percina copelandi) captured during targeted sampling for Channel Darter in the Lower Ottawa River, 2011.

Site ID	Species	Date	Total Length (mm)	Start Latitude	Start Longitude
OTT-1	*Percina copelandi*	13-Aug-11	32	45.58687	-75.08205
OTT-1	*Percina copelandi*	13-Aug-11	29	45.58687	-75.08205
OTT-1	*Percina copelandi*	13-Aug-11	34	45.58687	-75.08205
OTT-1	*Percina copelandi*	13-Aug-11	27	45.58687	-75.08205
OTT-1	*Percina copelandi*	13-Aug-11	30	45.58687	-75.08205
OTT-1	*Percina copelandi*	13-Aug-11	32	45.58687	-75.08205
OTT-1	*Percina copelandi*	13-Aug-11	26	45.58687	-75.08205
OTT-1	*Percina copelandi*	13-Aug-11	27	45.58687	-75.08205
OTT-1	*Percina copelandi*	13-Aug-11	32	45.58687	-75.08205
OTT-1	*Percina copelandi*	13-Aug-11	25	45.58687	-75.08205
OTT-1	*Percina copelandi*	13-Aug-11	34	45.58687	-75.08205
OTT-1	*Percina copelandi*	13-Aug-11	34	45.58687	-75.08205
OTT-1	*Percina copelandi*	13-Aug-11	31	45.58687	-75.08205
OTT-1	*Percina copelandi*	13-Aug-11	34	45.58687	-75.08205
OTT-1	*Percina copelandi*	13-Aug-11	34	45.58687	-75.08205
OTT-1	*Percina copelandi*	13-Aug-11	34	45.58687	-75.08205
OTT-2	*Percina copelandi*	13-Aug-11	33	45.58957	-75.07393
OTT-2	*Percina copelandi*	13-Aug-11	36	45.58957	-75.07393
OTT-3	*Percina copelandi*	13-Aug-11	28	45.58296	-75.20128
OTT-3	*Percina copelandi*	13-Aug-11	32	45.58296	-75.20128
OTT-3	*Percina copelandi*	13-Aug-11	29	45.58296	-75.20128
OTT-3	*Percina copelandi*	13-Aug-11	31	45.58296	-75.20128
OTT-4	*Percina copelandi*	13-Aug-11	31	45.58774	-75.07962
OTT-4	*Percina copelandi*	13-Aug-11	34	45.58774	-75.07962
OTT-4	*Percina copelandi*	13-Aug-11	35	45.58774	-75.07962
OTT-4	*Percina copelandi*	13-Aug-11	28	45.58774	-75.07962
OTT-4	*Percina copelandi*	13-Aug-11	25	45.58774	-75.07962

Site ID	Species	Date	Total Length (mm)	Start Latitude	Start Longitude
OTT-4	*Percina copelandi*	13-Aug-11	34	45.58774	-75.07962
OTT-4	*Percina copelandi*	13-Aug-11	27	45.58774	-75.07962
OTT-4	*Percina copelandi*	13-Aug-11	27	45.58774	-75.07962
OTT-4	*Percina copelandi*	13-Aug-11	30	45.58774	-75.07962
OTT-4	*Percina copelandi*	13-Aug-11	31	45.58774	-75.07962
OTT-4	*Percina copelandi*	13-Aug-11	27	45.58774	-75.07962
OTT-4	*Percina copelandi*	13-Aug-11	29	45.58774	-75.07962
OTT-4	*Percina copelandi*	13-Aug-11	25	45.58774	-75.07962
OTT-4	*Percina copelandi*	13-Aug-11	27	45.58774	-75.07962
OTT-4	*Percina copelandi*	13-Aug-11	33	45.58774	-75.07962
OTT-4	*Percina copelandi*	13-Aug-11	25	45.58774	-75.07962
OTT-5	*Percina copelandi*	13-Aug-11	28	45.5866	-75.08315
OTT-5	*Percina copelandi*	13-Aug-11	30	45.5866	-75.08315
OTT-5	*Percina copelandi*	13-Aug-11	32	45.5866	-75.08315
OTT-5	*Percina copelandi*	13-Aug-11	29	45.5866	-75.08315
OTT-5	*Percina copelandi*	13-Aug-11	29	45.5866	-75.08315
OTT-5	*Percina copelandi*	13-Aug-11	27	45.5866	-75.08315
OTT-5	*Percina copelandi*	13-Aug-11	29	45.5866	-75.08315
OTT-5	*Percina copelandi*	13-Aug-11	25	45.5866	-75.08315
OTT-5	*Percina copelandi*	13-Aug-11	24	45.5866	-75.08315
OTT-5	*Percina copelandi*	13-Aug-11	26	45.5866	-75.08315
OTT-5	*Percina copelandi*	13-Aug-11	30	45.5866	-75.08315
OTT-5	*Percina copelandi*	13-Aug-11	34	45.5866	-75.08315
OTT-5	*Percina copelandi*	13-Aug-11	30	45.5866	-75.08315
OTT-5	*Percina copelandi*	13-Aug-11	32	45.5866	-75.08315
OTT-5	*Percina copelandi*	13-Aug-11	27	45.5866	-75.08315
OTT-7	*Percina copelandi*	15-Aug-11	26	45.57462	-74.45073
OTT-7	*Percina copelandi*	15-Aug-11	28	45.57462	-74.45073
OTT-8	*Percina copelandi*	15-Aug-11	29	45.56689	-74.43293

Site ID	Species	Date	Total Length (mm)	Start Latitude	Start Longitude
OTT-9	*Percina copelandi*	16-Aug-11	26	45.61455	-74.5947
OTT-9	*Percina copelandi*	16-Aug-11	29	45.61455	-74.5947
OTT-9	*Percina copelandi*	16-Aug-11	33	45.61455	-74.5947
OTT-9	*Percina copelandi*	16-Aug-11	25	45.61455	-74.5947
OTT-9	*Percina copelandi*	16-Aug-11	47	45.61455	-74.5947
OTT-10	*Percina copelandi*	16-Aug-11	30	45.63669	-74.64625
OTT-10	*Percina copelandi*	16-Aug-11	33	45.63669	-74.64625
OTT-10	*Percina copelandi*	16-Aug-11	22	45.63669	-74.64625
OTT-10	*Percina copelandi*	16-Aug-11	25	45.63669	-74.64625
OTT-10	*Percina copelandi*	16-Aug-11	34	45.63669	-74.64625
OTT-10	*Percina copelandi*	16-Aug-11	34	45.63669	-74.64625
OTT-10	*Percina copelandi*	16-Aug-11	30	45.63669	-74.64625
OTT-10	*Percina copelandi*	16-Aug-11	24	45.63669	-74.64625
OTT-10	*Percina copelandi*	16-Aug-11	18	45.63669	-74.64625
OTT-10	*Percina copelandi*	16-Aug-11	19	45.63669	-74.64625
OTT-11	*Percina copelandi*	16-Aug-11	26	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	24	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	29	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	28	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	33	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	29	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	33	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	35	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	27	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	32	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	28	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	31	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	32	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	26	45.63683	-74.64679

Site ID	Species	Date	Total Length (mm)	Start Latitude	Start Longitude
OTT-11	*Percina copelandi*	16-Aug-11	27	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	33	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	32	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	34	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	35	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	28	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	29	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	30	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	34	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	34	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	27	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	32	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	36	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	32	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	31	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	31	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	33	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	24	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	51	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	30	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	27	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	33	45.63683	-74.64679
OTT-11	*Percina copelandi*	16-Aug-11	31	45.63683	-74.64679
OTT-12	*Percina copelandi*	17-Aug-11	47	45.45721	-75.68304
OTT-12	*Percina copelandi*	17-Aug-11	52	45.45721	-75.68304
OTT-12	*Percina copelandi*	17-Aug-11	47	45.45721	-75.68304
OTT-12	*Percina copelandi*	17-Aug-11	55	45.45721	-75.68304
OTT-12	*Percina copelandi*	17-Aug-11	55	45.45721	-75.68304
OTT-12	*Percina copelandi*	17-Aug-11	53	45.45721	-75.68304

Site ID	Species	Date	Total Length (mm)	Start Latitude	Start Longitude
OTT-12	*Percina copelandi*	17-Aug-11	48	45.45721	-75.68304
OTT-12	*Percina copelandi*	17-Aug-11	52	45.45721	-75.68304
OTT-12	*Percina copelandi*	17-Aug-11	52	45.45721	-75.68304
OTT-12	*Percina copelandi*	17-Aug-11	53	45.45721	-75.68304
OTT-12	*Percina copelandi*	17-Aug-11	52	45.45721	-75.68304
OTT-12	*Percina copelandi*	17-Aug-11	53	45.45721	-75.68304
OTT-12	*Percina copelandi*	17-Aug-11	50	45.45721	-75.68304
OTT-12	*Percina copelandi*	17-Aug-11	50	45.45721	-75.68304
OTT-13	*Percina copelandi*	17-Aug-11	48	45.4571	-75.68339
OTT-13	*Percina copelandi*	17-Aug-11	45	45.4571	-75.68339
OTT-13	*Percina copelandi*	17-Aug-11	57	45.4571	-75.68339
OTT-13	*Percina copelandi*	17-Aug-11	53	45.4571	-75.68339
OTT-13	*Percina copelandi*	17-Aug-11	53	45.4571	-75.68339
OTT-13	*Percina copelandi*	17-Aug-11	56	45.4571	-75.68339
OTT-13	*Percina copelandi*	17-Aug-11	52	45.4571	-75.68339
OTT-13	*Percina copelandi*	17-Aug-11	51	45.4571	-75.68339
OTT-13	*Percina copelandi*	17-Aug-11	45	45.4571	-75.68339
OTT-14	*Percina copelandi*	17-Aug-11	53	45.45072	-75.69066
OTT-15	*Percina copelandi*	17-Aug-11	48	45.45316	-75.68906
OTT-15	*Percina copelandi*	17-Aug-11	52	45.45316	-75.68906
OTT-15	*Percina copelandi*	17-Aug-11	52	45.45316	-75.68906

Table 4. Habitat results from targeted sampling for Channel Darter in the Lower Ottawa River, 2011. Depth and velocity values are presented as the mean values from each of three measurements within a site. A value of "-" indicates no measurement was taken.

Site ID	Air Temperature (°C)	Water Temperature (°C)	Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Mean Depth (m)	Mean Water Velocity (m/s)
OTT-1	26.8	24.5	84.0	8.1	3.0	2.2	0.1
OTT-2	26.3	25.0	90.0	8.0	2.9	2.4	0.1
OTT-3	27.1	25.3	78.0	8.7	2.7	3.4	0.1
OTT-4	26.8	25.1	88.0	8.7	2.8	3.2	
OTT-5	27.2	24.5	85.0	8.8	7.8	3.2	0.1
OTT-6	23.2	24.5	92.0	8.5	2.4	1.9	
OTT-7	23.0	24.6	76.0	9.0	5.7	3.6	
OTT-8	23.2	24.5	76.0	8.2	10.4	2.8	
OTT-9	19.2	23.5	80.0	7.5	3.4	3.6	0.1
OTT-10	22.8	24.1	78.0	7.4	3.5	3.6	0.1
OTT-11	28.1	24.2	78.0	8.0	2.3	6.7	0.1
OTT-12	23.2	23.7	70.0	8.2	2.9	2.5	0.1
OTT-13	23.2	23.7	70.0	8.2	2.9	2.7	0.1
OTT-14	26.9	24.5	75.0	8.6	1.5	3.6	0.0
OTT-15	25.0	24.9	73.0	7.9	3.0	2.4	0.1
Min	19.2	23.5	70.0	7.4	1.5	1.9	0.0
Mean	24.8	24.4	79.5	8.3	3.8	3.2	0.1
Max	**28.1**	**25.3**	**92.0**	**9.0**	**10.4**	**6.7**	**0.1**

Table 5. Substrate results from targeted sampling for Channel Darter in the Lower Ottawa River, 2011. Values represent percent composition within the site based on Ponar samples of small substrates (organic, clay, silt, sand, gravel, cobble) and sonar assessment of large substrates (large cobble, boulder).

Site ID	Organic	Clay	Silt	Sand	Gravel	Cobble	Boulder
OTT-1	20	70	10				
OTT-2		50	25	25			
OTT-3		40	30	30			
OTT-4		70	25	5			
OTT-5	25	45	15	15			
OTT-6	20		40	40			
OTT-7		40	40	20			
OTT-8			20	80			
OTT-9			20	80			
OTT-10	10	90					
OTT-11	10	70	10	10			
OTT-12					25	50	25
OTT-13					25	50	25
OTT-14	25		25	50			
OTT-15						50	50
Min	**10.0**	**40.0**	**10.0**	**5.0**	**25.0**	**50.0**	**25.0**
Mean	**18.3**	**59.4**	**23.6**	**35.5**	**25.0**	**50.0**	**33.3**
Max	**25.0**	**90.0**	**40.0**	**80.0**	**25.0**	**50.0**	**50.0**

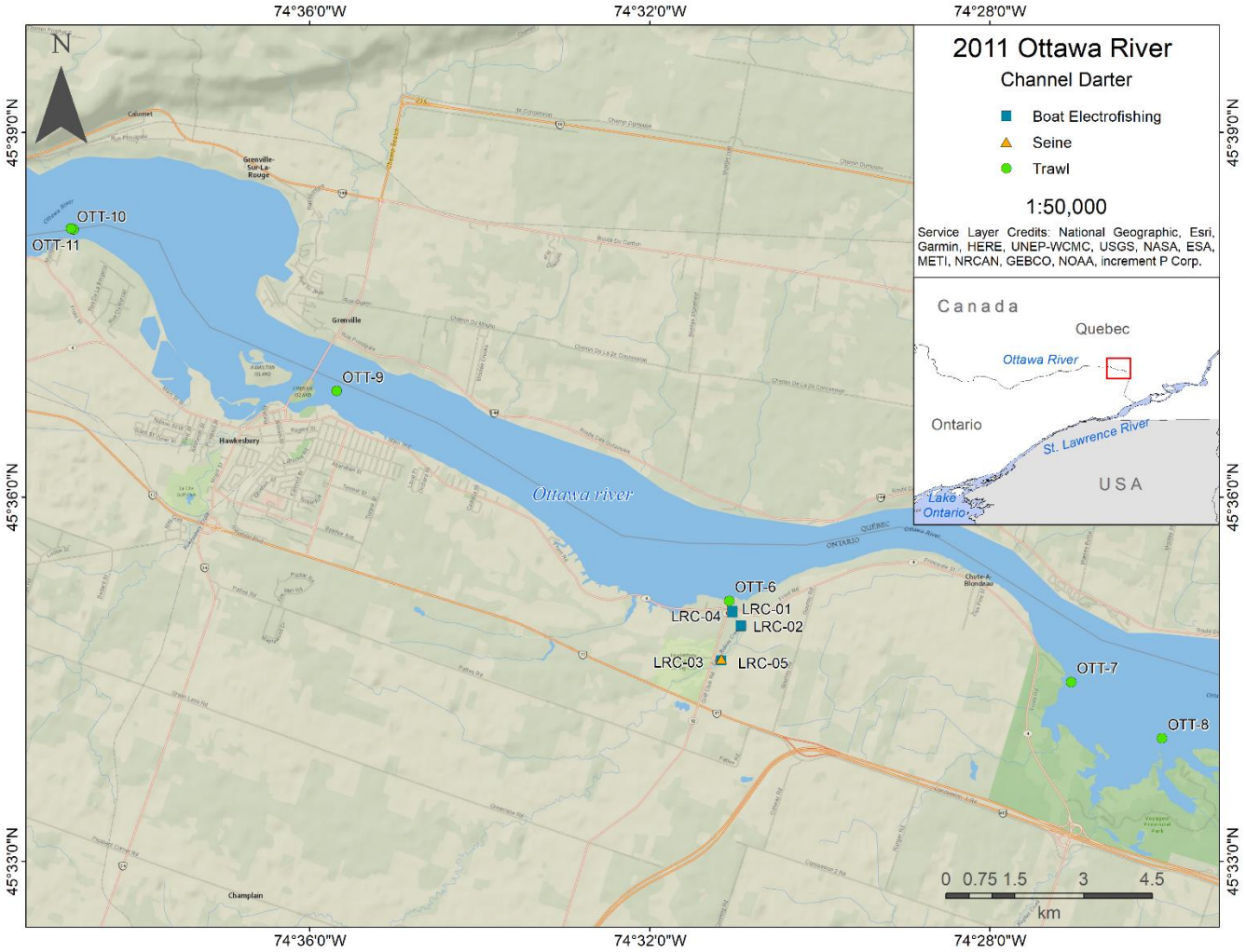

Figure 1a. Targeted sampling locations for Channel Darter in the Ottawa River near Hawkesbury, Ontario (2011) and Little Rideau Creek (2010, 2011).

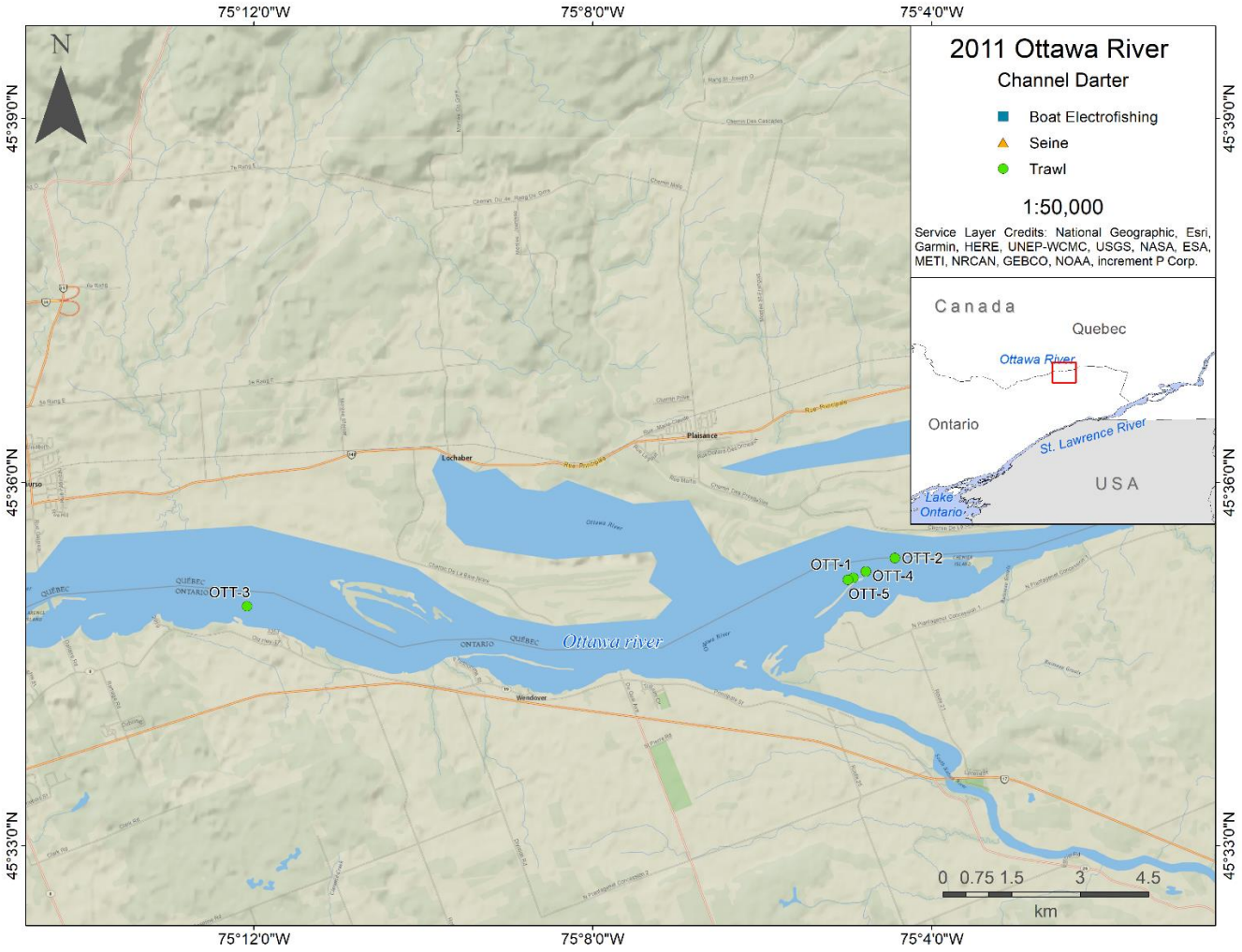

Figure 1b. Targeted sampling locations for Channel Darter in the Ottawa River near Wendover, Ontario (2011).

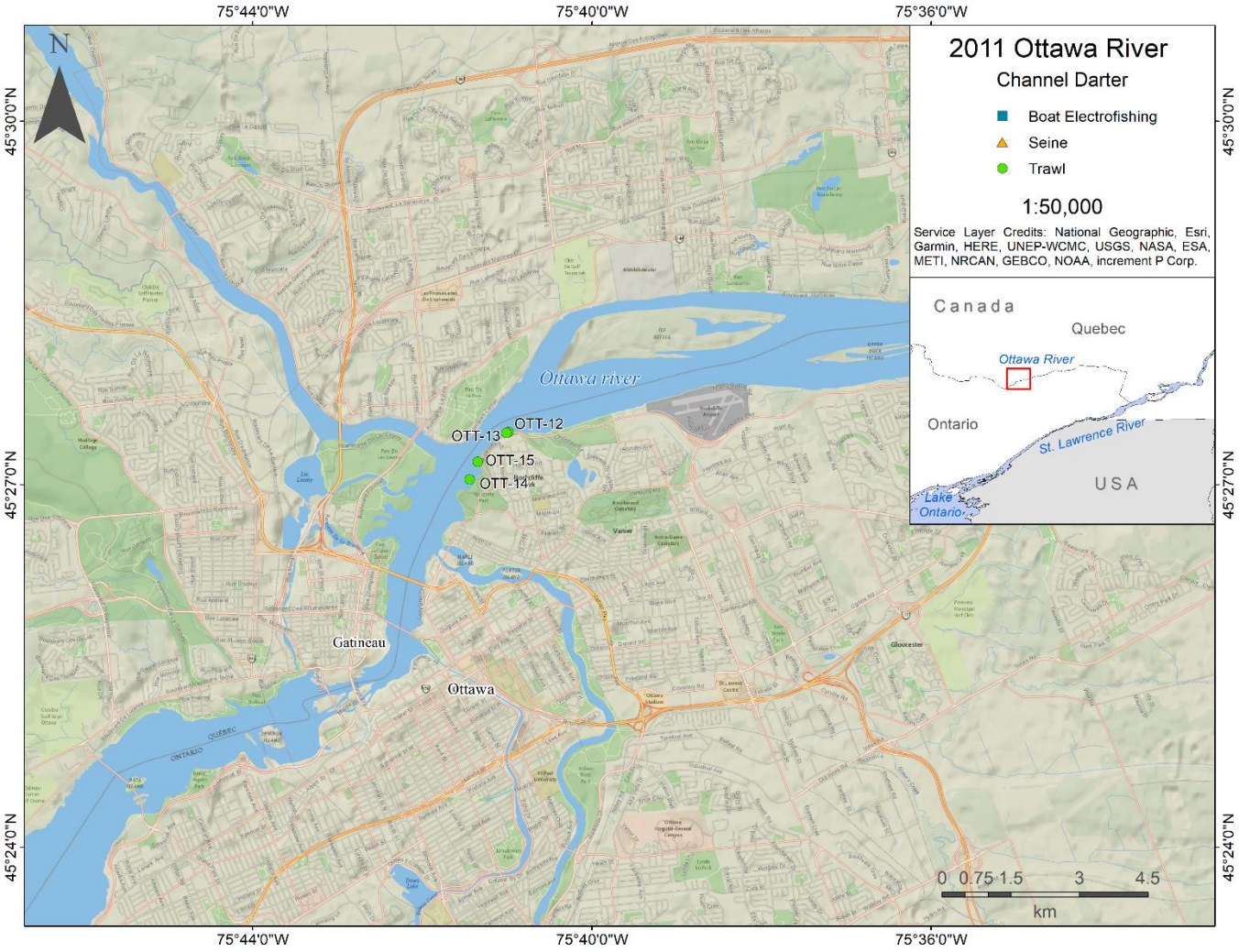

Figure 1c. Targeted sampling locations for Channel Darter near the City of Ottawa in the Ottawa River (2011).

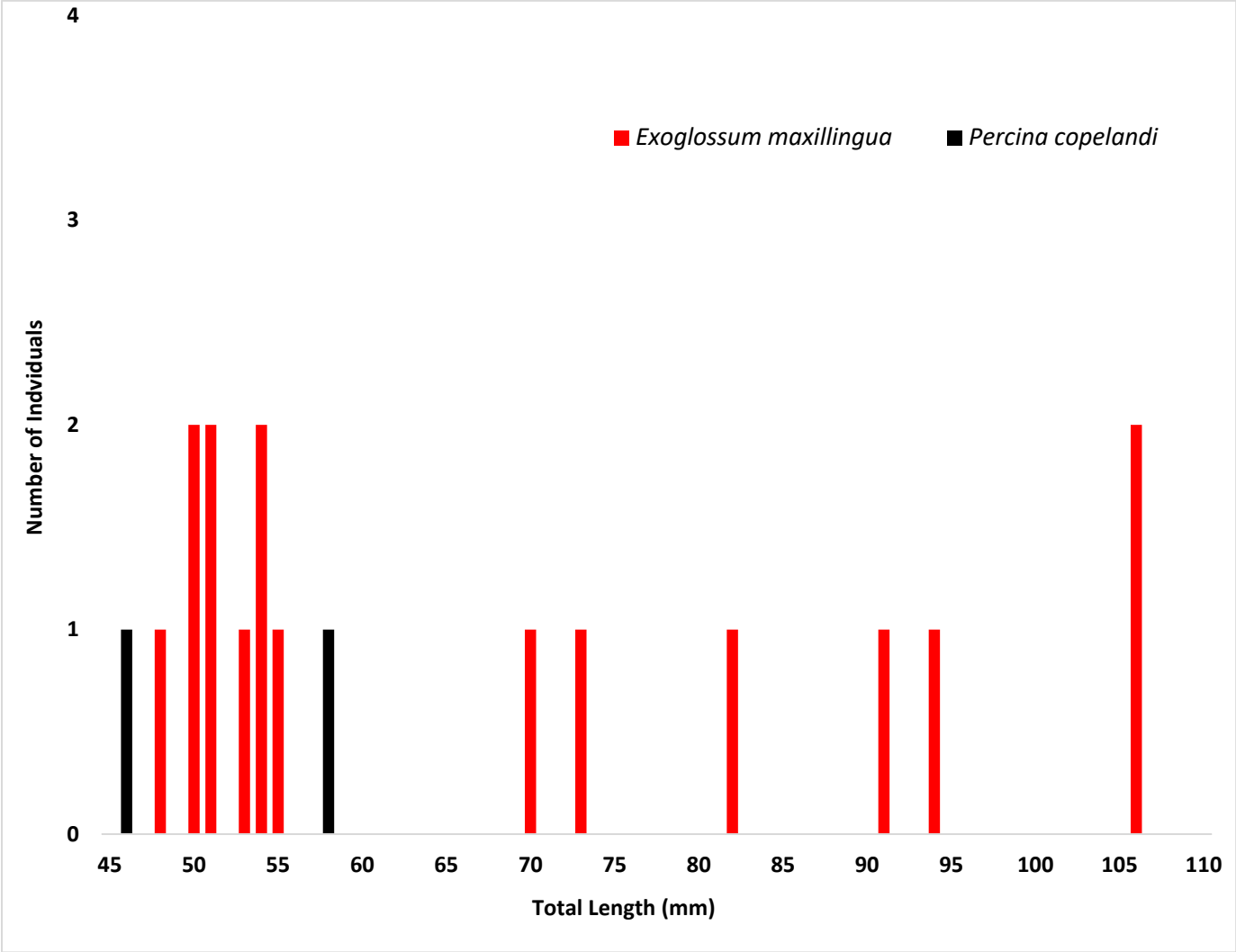

Figure 2. Length-frequency distribution of Channel Darter (n=2) and Cutlip Minnow (n=16) in Little Rideau Creek, October 2010.

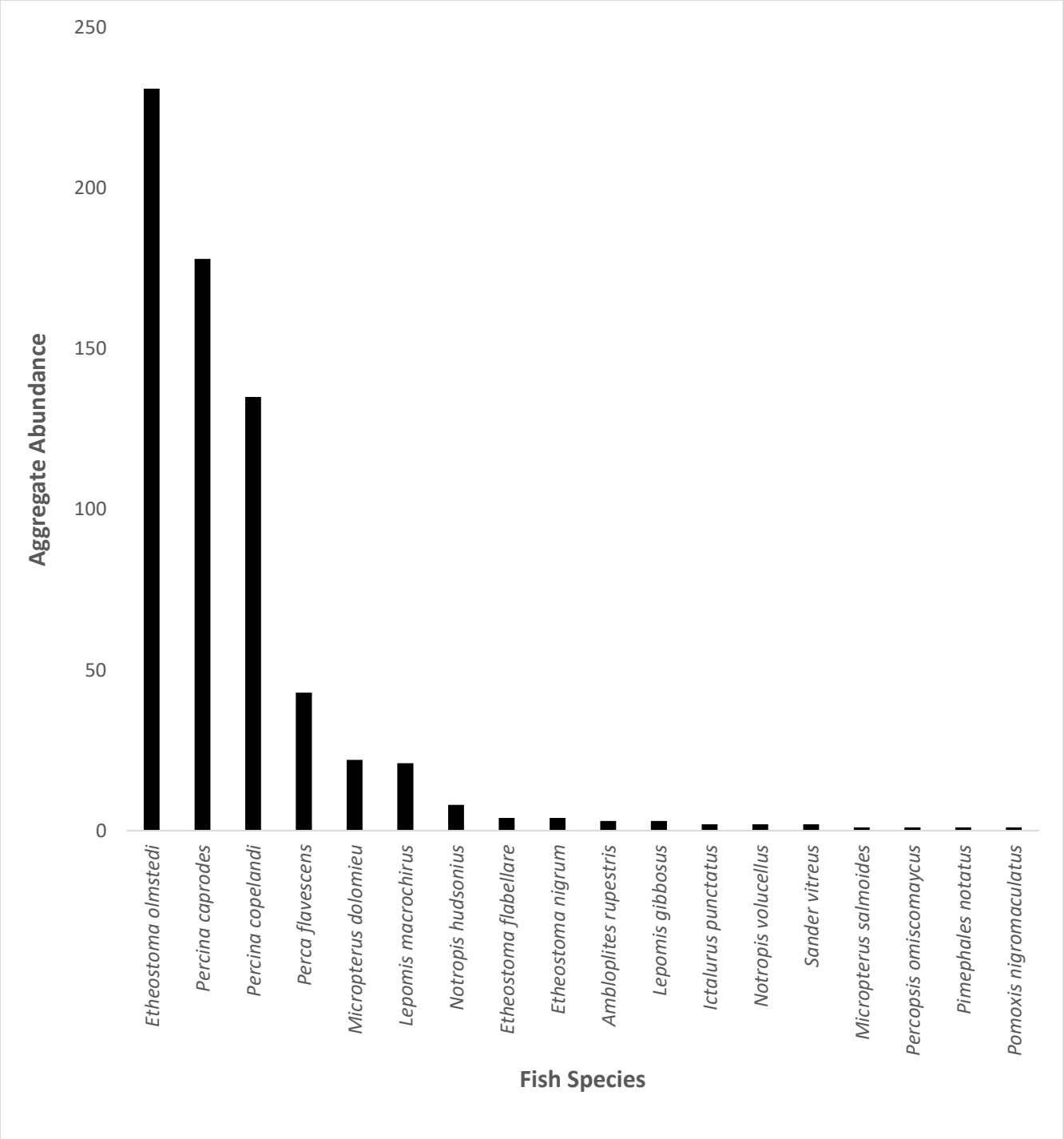

Figure 3. Rank-abundance of catch data (raw abundance) of all species detected during targeted sampling for Channel Darter in the Lower Ottawa River, 2011.

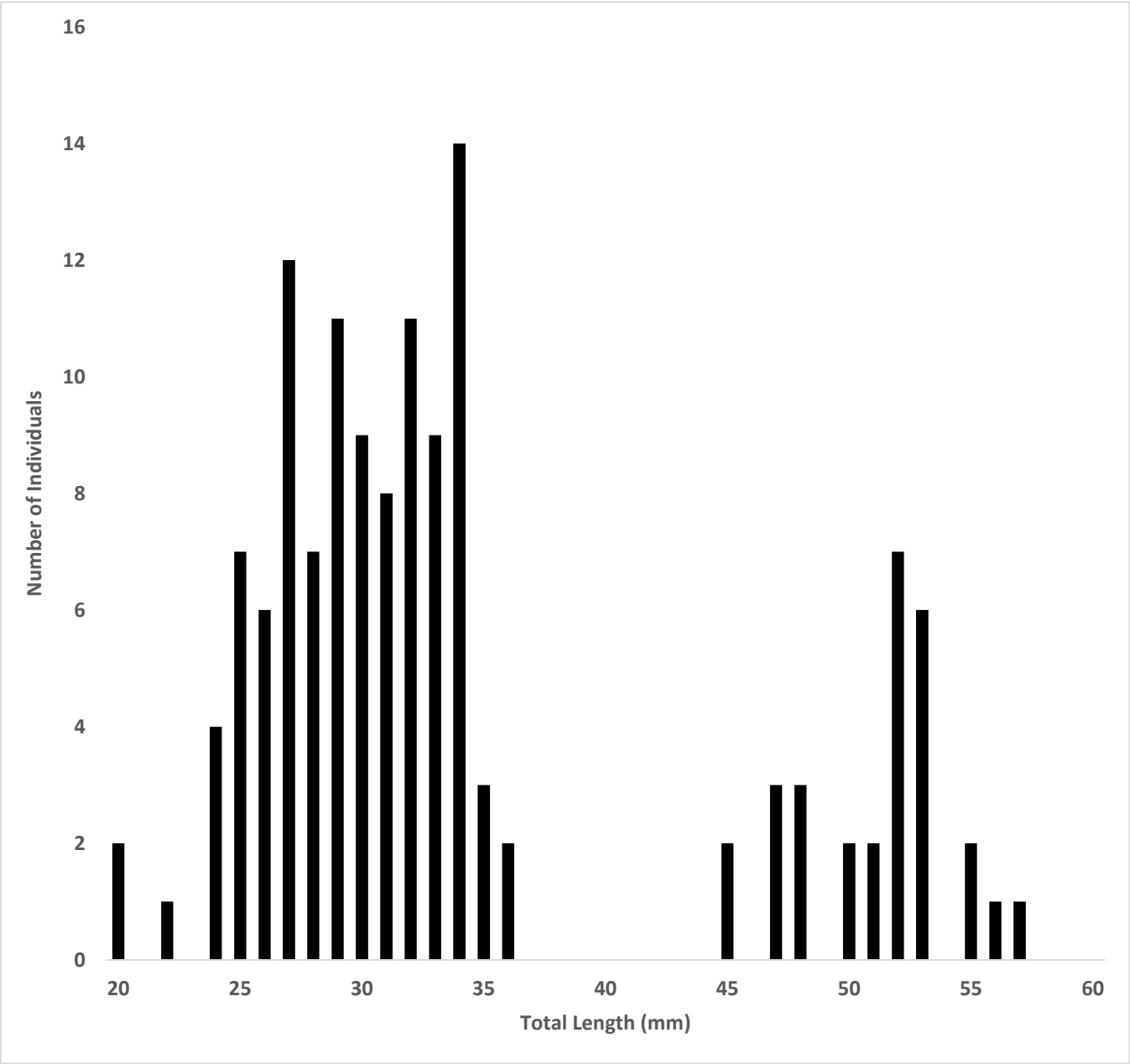

Figure 4.. Length-frequency distribution of Channel Darter (*Percina copelandi*) captured in the Lower Ottawa River, 2011. (n = 135).

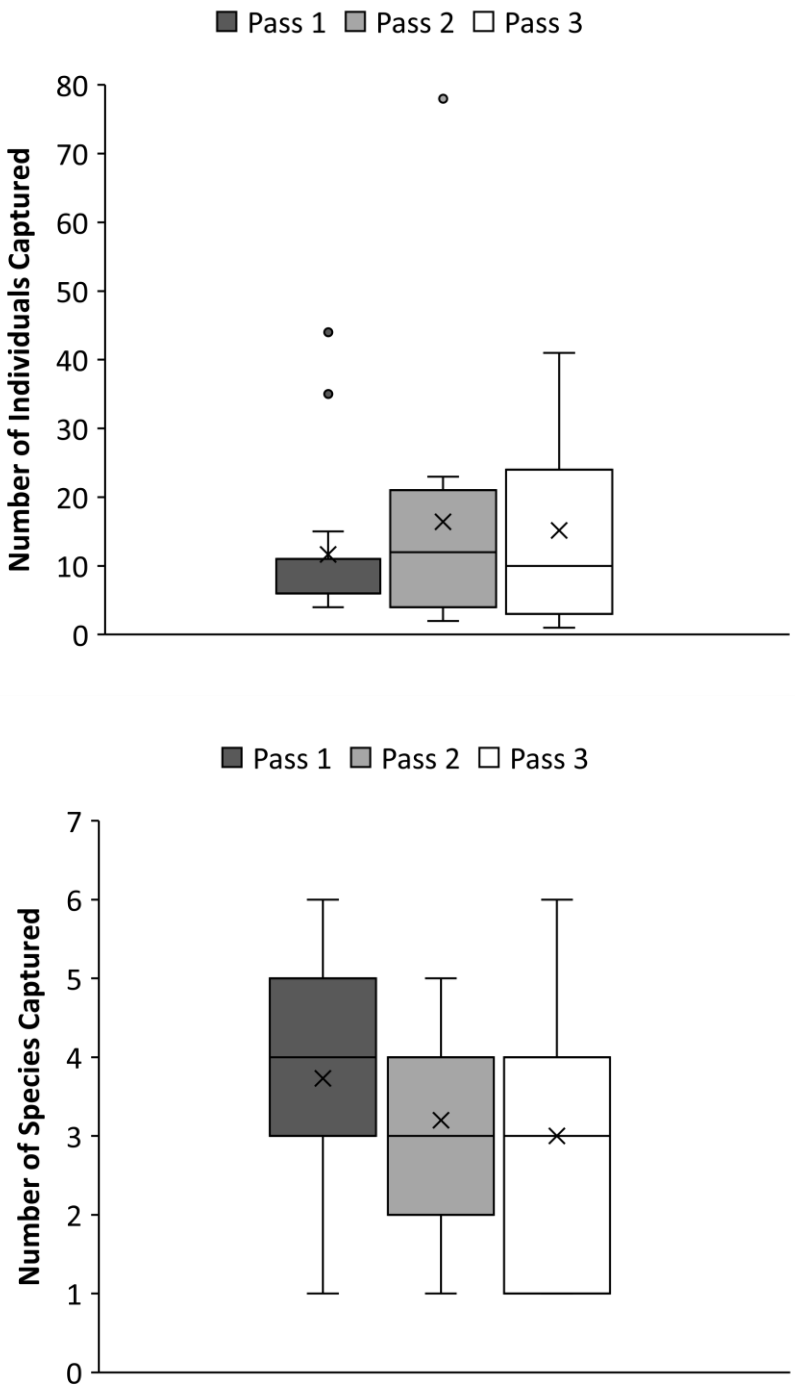

Figure 5. Box-plot comparison of number of individuals collected (upper panel) and number of species detected (lower panel) across three successive trawls at Ottawa River sites.