

# Summary of Targeted Sampling for Eastern Sand Darter (*Ammocrypta pellucida*) in the Thames River, Ontario, 2020

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2022

**Canadian Data Report of  
Fisheries and Aquatic Sciences 1339**



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Cat. No. Fs97-13/1339E-PDF

ISBN 978-0-660-38298-2

ISSN 1488-5395

Correct citation for this publication:

Barnucz, J., Gáspárdy, R.C., Colm, J.E., and Drake, D.A.R. 2022. Summary of Targeted Sampling for Eastern Sand Darter (*Ammocrypta pellucida*) in the Thames River, Ontario, 2020. Can. Data Rep. Fish. Aquat. Sci. 1339: vi + 15 p.

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## ABSTRACT

Barnucz, J., Gáspárdy, R.C., Colm, J.E., and Drake, D.A.R. 2022. Summary of Targeted Sampling for Eastern Sand Darter (*Ammocrypta pellucida*) in the Thames River, Ontario, 2020. Can. Data Rep. Fish. Aquat. Sci. 1339: vi + 15 p.

Targeted sampling for Eastern Sand Darter (*Ammocrypta pellucida*), a Threatened species under Canada's *Species at Risk Act* (SARA), was undertaken in the Thames River, Ontario in 2020. Sampling was conducted to carry out streamside experiments on the physiological tolerances of Eastern Sand Darter. This data report summarizes field collections of Eastern Sand Darter; the physiological experiments are described in separate publications. Sampling was conducted near Glencoe over six days between August 5<sup>th</sup> -12<sup>th</sup> 2020. A bag seine was used initially but was ineffective due to high water levels. A benthic Gerken Siamese trawl was used for the remainder of sampling. Overall, 59 Eastern Sand Darter were captured, ranging from 31-64 mm total length. Seining (one sampling day, ten total hauls) captured one individual, while trawling (five sampling days, 52 total tows) captured 58 individuals. One Eastern Sand Darter that was tagged and released was subsequently recaptured with the trawl. A subset of captured fish species included Greenside Darter (*Etheostoma blennioides*), Johnny Darter (*Etheostoma nigrum*), Channel Catfish (*Ictalurus punctatus*), Longnose Gar (*Lepisosteus osseus*), Round Goby (*Neogobius melanostomus*), Stonecat (*Noturus flavus*), Logperch (*Percina caprodes*), and Blackside Darter (*Percina maculata*). Nine Northern Madtom (*Noturus stigmosus*; SARA Endangered) were also captured, ranging from 32-82 mm total length.

## RÉSUMÉ

Barnucz, J., Gáspárdy, R.C., Colm, J.E., and Drake, D.A.R. 2022. Summary of Targeted Sampling for Eastern Sand Darter (*Ammocrypta pellucida*) in the Thames River, Ontario, 2020. Can. Data Rep. Fish. Aquat. Sci. 1339: vi + 15 p.

En 2020, on a mené des activités d'échantillonnage ciblant le dard de sable (*Ammocrypta pellucida*), une espèce menacée en vertu de la *Loi sur les espèces en péril du Canada* (LEP), dans la rivière Thames, en Ontario. On a effectué un échantillonnage en vue de réaliser des expériences en milieux riverains sur les tolérances physiologiques du dard de sable. Ce rapport de données résume les collectes sur le terrain du dard de sable; les expériences physiologiques sont décrites dans des publications distinctes. On a réalisé l'échantillonnage près de Glencoe pendant 6 jours, soit entre le 5 et le 12 août 2020. Au départ, on a utilisé une senne avec poche, mais celle-ci s'est avérée inefficace en raison des niveaux d'eau élevés. On a utilisé un chalut siamois benthique Gerken pour le reste de l'échantillonnage. Au total, on a capturé 59 dards de sable, dont la longueur totale était de 31 à 64 mm. La pêche à la senne (un jour d'échantillonnage, dix traits au total) a permis de capturer un individu, tandis que la pêche au chalut (cinq jours d'échantillonnage, 52 traits au total) a permis de capturer 58 individus. Un dard de sable qui a été étiqueté et relâché a été recapturé subséquemment avec le chalut. Un sous-ensemble d'espèces de poissons capturés comprenait le dard vert (*Etheostoma blennioides*), le raseux-de-terre noir (*Etheostoma nigrum*), la barbue de rivière (*Ictalurus punctatus*), le lépisosté osseux (*Lepisosteus osseus*), le gobie à taches noires (*Neogobius melanostomus*), la barbotte des rapides (*Noturus flavus*), le fouille-roche zébré (*Percina caprodes*) et le dard noir (*Percina maculata*). Neuf chats-fous du nord (*Noturus stigmosus*; espèce en voie de disparition en vertu de la LEP) ont également été capturés, dont la longueur totale était de 32 à 82 mm.



## 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* of 2002 (SARA). To inform scientific aspects of the recovery process, DFO regularly conducts field sampling to satisfy various research objectives for SARA-listed fishes, such as evaluating the distribution and abundance of species, determining species-habitat relationships, and better 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.

Eastern Sand Darter (*Ammocrypta pellucida*) is a small, elongate, translucent darter in the family *Percidae*. The Ontario designatable unit of Eastern Sand Darter is listed as Threatened, owing to its small and fragmented distribution and sensitivity to turbidity, contamination, and invasive species [Committee on the Status of Endangered Wildlife in Canada (COSEWIC) 2009; DFO 2011]. Like most SARA-listed freshwater fishes, relatively little information exists about the physiological tolerances of Eastern Sand Darter. To address this knowledge gap, DFO, in partnership with the University of Waterloo, conducted streamside experiments in 2019 along the Grand River near Brantford, Ontario to evaluate the thermal and dissolved oxygen requirements of the species (see Gáspárdy and Drake 2021 for an overview of 2019 field sampling). Additional sampling was conducted in the Thames River in 2020 to determine whether physiological responses differed among waterbodies. This data report summarizes field collections of Eastern Sand Darter in the Thames River between August 5-12<sup>th</sup> 2020. The results of thermal physiological experiments have been described separately (Firth et al. 2021).

## METHODS

### STUDY SYSTEM AND SITE SELECTION

Eastern Sand Darter has been detected previously by DFO within the Thames River, Ontario (Drake et al. 2008, Finch et al. 2013). The Big Bend Conservation Area near Glencoe (access point coordinates: 42.64282 N, 81.70741 W) was selected as the field base for collecting Eastern Sand Darter as it provided operational benefits for field sampling and bankside experiments. Sites close to the Big Bend Conservation Area were the focus of sampling based on previous detections of Eastern Sand Darter in the area (Drake et al. 2008, Finch et al. 2013). The purpose of sampling was to capture Eastern Sand Darter for daily physiology experiments with minimal sampling effort. A targeted, opportunistic sampling approach was utilized, similar to Gáspárdy and Drake (2021). Each sampling period was approximately 3 to 7 hours per day, with effort depending on the number of Eastern Sand Darter captured (Table 1).

### EASTERN SAND DARTER SAMPLING

Field sampling was conducted between August 5<sup>th</sup>-12<sup>th</sup> 2020. During the first day of sampling, seining failed to produce a sufficient number of Eastern Sand Darter for daily trials owing to high water levels. On the second day of sampling, a Gerken Siamese trawl was deployed and utilized for the remainder of the sampling period. Benthic trawling has been used previously to capture Eastern Sand Darter in non-wadeable habitats (Barnucz and Drake 2021, Gáspárdy and Drake 2021). The trawling methods, including a description of trawl dimensions, follows Gáspárdy and Drake (2021). In brief, trawling sites were only sampled if they were mostly free of large physical obstructions (e.g., large woody debris, boulders). Obstructions were identified and evaluated using a Garmin® Echomap™ Plus 95 SV sonar unit, equipped with GPS receiver, Garmin® ClearVü™ and SideVü™ technology. Any obstructions that were found within the

selected trawling pass were identified and marked using the Garmin® GPS unit prior to sampling, which allowed the vessel operator to safely navigate around obstructions during trawling. Once the trawl was in contact with the river bed and the tow lines were taught, the trawl was towed for approximately 50 to 100 m before retrieval into the vessel. The total number of trawl tows was recorded for each sampling site. Other effort statistics, such as trawl distance and duration, were not recorded for each individual trawl tow given the opportunistic sampling approach.

### **Enumeration of Fishes**

Following capture, fishes were quickly removed from the trawl and immediately placed in aquaria with fresh river water, refreshed each pass, to allow for species sorting. Due to personnel and time constraints, it was not possible to identify and enumerate all fishes captured. Instead, non-target species were released immediately following capture, with some observations made and recorded of the identity of certain released fish species, as well as mussel species that were incidentally captured with the trawl. All SARA-listed fishes [Eastern Sand Darter and Northern Madtom (*Noturus stigmosus*)] were held in a bucket of fresh river water on the vessel and transferred to the streamside experimental area. Each Eastern Sand Darter was measured for total length (TL; mm), and mass (g) was recorded using a Ohaus® Valor® 3000 Xtreme Compact Washdown scale (300 g capacity). Northern Madtom specimens were only measured for TL (mm). Eastern Sand Darter required for the physiology experiments were retained each day on an as-needed basis. Holding and recovery tanks within the experimental area consisted of two 94.6L insulated marine coolers with fresh, aerated river water. Due to their small body size and the turbidity of the water, Eastern Sand Darter were held in a 26 x 15 x 15 cm fine-mesh breeding box within the tanks to allow monitoring, and to minimize stress induced by searching for and netting individuals for each trial or for release. Aeration was achieved using a four-channel Danner Aqua-Supreme Air Pump (AP-8) and two 150 mm air stone bubble discs placed into each tank. Water temperature and dissolved oxygen inside the holding and recovery tanks were monitored hourly using a YSI EXO2 multi-parameter sonde to maintain consistency with river water and refreshed as needed or at minimum every two hours.

Eastern Sand Darter selected for physiology experiments were tagged using Northwest Marine Technology Visible Implant Elastomer (VIE) tags after each experimental trial was complete and once fish demonstrated signs of recovery (e.g., normalized swimming). The tags were used to mark individual fish to ensure fish were not used on multiple occasions for physiology experiments. Tags were inserted on the ventral surface of each fish near the anal fin. Tagging numbers are recorded in Appendix 1. Tagged Eastern Sand Darter were held in the aerated recovery tank for a minimum of 30 minutes prior to release to assess tagging mortality.

Eastern Sand Darter and Northern Madtom specimens that were in good condition were released alive after processing and (or) physiological trials were complete. Specimens not in good condition were recorded for animal use reporting, and retained as mortalities or released upon recovery. Recaptures of tagged specimens were recorded throughout the sampling period.

### **HABITAT SAMPLING**

Minimal habitat sampling was conducted for this study. Surface water temperature (°C), conductivity (µS), dissolved oxygen (mg/L), pH, and turbidity (NTU) were measured approximately 0.2 m beneath the water's surface using a YSI EX02 multiparameter sonde. The sonde was deployed and allowed to stabilize for approximately one minute before measurements were recorded. Turbidity (m) and air temperature (°C) were measured using a turbidity tube and Kestrel 2000 pocket wind meter, respectively. These water quality and habitat

parameters were taken once per sampling day after sampling was completed, near the center of the sampling site. River depth was measured at the start, mid-point, and end of each trawling site using the Garmin® 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 SARA Permit Number 20-PCAA-00029. Seining, trawling, tagging and physiological experiments were conducted under Animal Use Protocol AUP 2068 and Standard Operating Protocols GWACC-116, GWACC-113, GWACC-105, and GWACC-130, approved by the DFO and Environment and Climate Change Canada Animal Care Committee (operated under approval of the Canadian Council on Animal Care). Data associated with the collections in this report are housed under the project code “2020-ESDPT” 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, results may be updated as part of ongoing data verification procedures. Data associated with this report may be obtained by contacting the Great Lakes Laboratory for Fisheries and Aquatic Sciences.

## **RESULTS**

### **FISH ASSEMBLAGE SAMPLING**

Sampling occurred at eight sites over six days (Table 1). Eastern Sand Darter was captured at two sampling areas near Big Bend Conservation Area. The first sampling area was located across from the Big Bend Conservation Area boat ramp (Sites 1, 3, 4 and 6; Figure 1). The second sampling area was approximately 1.5 km upstream of the Big Bend Conservation Area boat ramp (Sites 2, 5, 7 and 8; Figure 1). Total seining effort was 10 hauls at one site (Table 2). Trawling effort averaged 7.4 tows per sampling site with a total effort of 52 tows across seven sampling sites (Table 2). Sampling resulted in the capture of 59 Eastern Sand Darter across all sites and both sampling gears, including one fish that was recaptured following tagging (59 captures, 58 individuals; Table 2, Appendix 1). A single Eastern Sand Darter was captured by seining on August 5<sup>th</sup> (Table 2). An additional 58 Eastern Sand Darter were captured using the benthic trawl from seven sampling sites between August 6<sup>th</sup>-12<sup>th</sup> (Table 2). The mean length of Eastern Sand Darter across all sites was 44.3 mm TL and ranged from 31-64 mm (Table 2, Figure 2). The mean mass of Eastern Sand Darter across all sites was 0.50 g with a range of 0.1-1.3 g (Table 2, Figure 3).

A total of nine Northern Madtom were captured during sampling; one during seining and eight during trawling (Table 2). The mean length of Northern Madtom captured during trawling was 47.9 mm TL and ranged from 32-82 mm (Table 2, Appendix 2). The single Northern Madtom captured during seining was not measured (Table 2). Five *Noturus* sp. juveniles were captured across all sampling sites but identification to species level was not possible (Table 2, Appendix 2). Other species encountered during sampling were Greenside Darter (*Etheostoma blennioides*), Johnny Darter (*Etheostoma nigrum*), Channel Catfish (*Ictalurus punctatus*), Longnose Gar (*Lepisosteus osseus*), Round Goby (*Neogobius melanostomus*), Stonecat (*Noturus flavus*), Logperch (*Percina caprodes*) and Blackside Darter (*Percina maculata*) as shown in Table 3.

## FISH TAGGING

In total, 31 Eastern Sand Darter were tagged (Appendix **Error! Reference source not found.**1). Based on observations during the recovery period, there were two mortalities of tagged individuals (Appendix 1). One Eastern Sand Darter that was tagged was subsequently re-captured during trawling (Appendix 1). This fish was originally captured at Site 3 on August 6<sup>th</sup> and was used for an experimental trial. The fish was then tagged and released in the same location as where it was captured, and was recaptured in the trawl at Site 6 on August 10<sup>th</sup> (Figure 1).

## HABITAT SAMPLING

Habitat parameters were assessed at each sampling site. Air temperature ranged from 22.4-33.1 °C with a mean of 25.6 °C (Table 4). Water temperature ranged from 22-26.1 °C with a mean of 23.7 °C (Table 4). Conductivity ranged from 428.4-749.0 µS with a mean of 592.9 µS (Table 4). Dissolved oxygen ranged from 6.98-10.40 mg/L with a mean of 7.92 mg/L (Table 4). The pH ranged from 7.84-8.54 with a mean of 8.13 (Table 4). Turbidity tube ranged from 0.05-0.10 m with a mean of 0.07 m (Table 4). Turbidity ranged from 64.57-137.83 NTU with a mean of 94.4 NTU (Table 4). Mean depth ranged from 0.30-1.4 m with an overall mean of 0.80 m (Table 4). Mean water velocity ranged from 0.297-0.503 m/s with an overall mean of 0.4 m/s (Table 4). The dominant substrate across all sites was sand (7 sites) followed by gravel (1 site), see Table 5. Sand was the most common substrate that occurred among all sampling sites ranging from 20-80% with an overall mean of 58% (Table 5). Gravel ranged from 0-60% with an overall mean of 27% (Table 5). Silt ranged from 0-30% with an overall mean of 12% (Table 5). Cobble ranged from 0-20% with an overall mean of 3% (Table 5). Organic matter ranged from 0-10% with an overall mean of 1% (Table 5).

## Mussel Detections

On August 7<sup>th</sup> 2020, seven mussel species were captured incidentally at sampling site 7 (Field Number: 2020-ESDPT-110820-001A) over eleven trawl tows (Table 6). These included Mapleleaf (*Quadrula quadrula*; 41 specimens; SARA-listed Special Concern), Mucket (*Actinonaias ligamentina*; 16 specimens), Pimpleback (*Cyclonaias pustulosa*; 7 specimens), White Heelsplitter (*Lasmigona complanata*; 3 specimens), Fragile Papershell (*Leptodea fragilis*; 1 specimen), Fawnsfoot (*Truncilla doncaciformis*; 1 specimen; SARA-listed Endangered) and Deertoe (*Truncilla truncata*; 1 specimen) as shown in Table 6. Captured mussels were identified, counted, photographed and returned to point of capture.

## ACKNOWLEDGEMENTS

We thank Kurtis Smith (DFO) and Britney Firth (University of Waterloo) for their assistance with field sampling, and Kelly McNichols-O'Rourke for mussel identification. We also thank Alexandra Leclair and Jessica Epp-Martindale for their helpful reviews. Funding for this project was provided by DFO's Species at Risk Program.

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*Table 1. Summary of sampling locations and methods to collect Eastern Sand Darter for physiology experiments in the Thames River, Ontario in August 2020. Sampling gears used were seine net (SN) and trawl net (TRL).*

<b>Site ID</b>	<b>Field Number</b>	<b>Date</b>	<b>Sampling Gear</b>	<b>Sampling Effort</b>	<b>Quantification of Effort</b>	<b>Latitude</b>	<b>Longitude</b>
1	2020-ESDPT-050820-001A	05-Aug-20	SN	10	haul	42.64190	-81.70792
2	2020-ESDPT-060820-001A	06-Aug-20	TRL	4	tow	42.64118	-81.70358
3	2020-ESDPT-060820-002A	06-Aug-20	TRL	7	tow	42.64104	-81.70593
4	2020-ESDPT-070820-001A	07-Aug-20	TRL	6	tow	42.64160	-81.70667
5	2020-ESDPT-070820-002A	07-Aug-20	TRL	8	tow	42.64143	-81.70381
6	2020-ESDPT-100820-001A	10-Aug-20	TRL	9	tow	42.64113	-81.70609
7	2020-ESDPT-110820-001A	11-Aug-20	TRL	11	tow	42.64212	-81.70409
8	2020-ESDPT-120820-001A	12-Aug-20	TRL	7	tow	42.64202	-81.70388

Table 2. Summary of sampling effort and catch data for Eastern Sand Darter (ESD; *Ammocrypta pellucida*) and Northern Madtom (NMT; *Noturus stigmosus*) captured during Eastern Sand Darter physiological tolerance research in the Thames River, Ontario, August 2020. Sampling gears used were seine net (SN) and trawl net (TRL).

	SN	TRL	Overall
No. Sites	1	7	<b>8</b>
Total effort	10 hauls	52 tows	-
Mean effort (hauls/tows)/site	10 hauls	7.4 tows	-
No. Eastern Sand Darter captured	1	58*	<b>59*</b>
Mean ESD TL (mm) [range]	43.0	44.3 [31-64]	<b>44.3 [31-64]</b>
Mean ESD mass (g) [range]	0.5	0.50 [0.1-1.3]	<b>0.50 [0.1-1.3]</b>
No. Northern Madtom captured	1	8	<b>9</b>
Mean NMT TL (mm) [range]	-	47.9 [32-82]	<b>47.9 [32-82]</b>
No. <i>Noturus</i> sp. juveniles captured	3	2	<b>5</b>

\*including one re-captured individual

Table 3. Partial list of non-target fish species detected during targeted sampling for Eastern Sand Darter, based on seining and trawling in the Thames River, Ontario (August 2020).

Common name	Scientific name
Greenside Darter	<i>Etheostoma blennioides</i>
Johnny Darter	<i>Etheostoma nigrum</i>
Channel Catfish	<i>Ictalurus punctatus</i>
Longnose Gar	<i>Lepisosteus osseus</i>
Round Goby	<i>Neogobius melanostomus</i>
Stonecat	<i>Noturus flavus</i>
Madtom sp.	<i>Noturus</i> sp.
Northern Madtom	<i>Noturus stigmosus</i>
Logperch	<i>Percina caprodes</i>
Blackside Darter	<i>Percina maculata</i>

Table 4. Summary of abiotic habitat values measured at sites where targeted sampling for Eastern Sand Darter was conducted in the Thames River, Ontario (August 2020).

Site ID	Air Temperature (°C)	Water Temperature (°C)	Conductivity (µS)	Dissolved Oxygen (mg/L)	pH	Turbidity Tube (m)	Turbidity (NTU)	Mean Depth (m)	Mean Water Velocity (m/s)
1	22.4	22.0	428.4	6.98	7.84	0.05	137.83	0.87	-
2	24.1	22.9	513.0	7.24	7.95	0.06	90.65	0.89	0.503
3	25.2	22.8	539.0	7.19	8.00	0.06	93.42	1.13	0.297
4	25.5	22.9	584.0	8.13	8.16	0.07	82.47	0.87	0.438
5	27.5	22.9	585.0	8.05	8.13	0.07	90.25	0.43	0.441
6	31.1	25.7	682.0	10.40	8.54	0.10	64.57	1.03	0.345
7	25.6	26.1	749.0	8.04	8.29	0.07	77.32	0.47	0.376
8	23.3	24.6	663.0	7.29	8.15	0.07	118.70	0.67	0.398
<b>Min</b>	<b>22.4</b>	<b>22.0</b>	<b>428.4</b>	<b>6.98</b>	<b>7.84</b>	<b>0.05</b>	<b>64.57</b>	<b>0.30</b>	<b>0.297</b>
<b>Mean</b>	<b>25.6</b>	<b>23.7</b>	<b>592.9</b>	<b>7.92</b>	<b>8.13</b>	<b>0.07</b>	<b>94.40</b>	<b>0.80</b>	<b>0.400</b>
<b>Max</b>	<b>31.1</b>	<b>26.1</b>	<b>749.0</b>	<b>10.40</b>	<b>8.54</b>	<b>0.10</b>	<b>137.83</b>	<b>1.40</b>	<b>0.503</b>



Table 5. Summary of substrate values measured at sites where targeted sampling for Eastern Sand Darter was conducted in the Thames River, Ontario (August 2020).

Site ID	Organic (%)	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Cobble (%)	Boulder (%)	Dominant Substrate
1	0	0	30	40	30	0	0	Sand
2	0	0	0	80	20	0	0	Sand
3	10	0	25	65	0	0	0	Sand
4	0	0	10	70	20	0	0	Sand
5	0	0	10	60	30	0	0	Sand
6	0	0	10	65	25	0	0	Sand
7	0	0	0	20	60	20	0	Gravel
8	0	0	10	60	30	0	0	Sand
<b>Min</b>	0	0	0	20	0	0	0	
<b>Mean</b>	1	0	12	58	27	3	0	
<b>Max</b>	10	0	30	80	60	20	0	

Table 6. Summary of mussel species captured during trawl sampling for Eastern Sand Darter at site 7 on August 11 2020 in the Thames River, Ontario.

Common Name	Scientific name	Total
Mapleleaf**	<i>Quadrula quadrula</i>	41
Mucket	<i>Actinonaias ligamentina</i>	16
Pimpleback	<i>Cyclonaias pustulosa</i>	7
White Heelsplitter	<i>Lasmigona complanata</i>	3
Fragile Papershell	<i>Leptodea fragilis</i>	1
Fawnsfoot*	<i>Truncilla doncaciformis</i>	1
Deertoe	<i>Truncilla truncata</i>	1

\*SARA Endangered species

\*\*SARA Special Concern species



Figure 1. Sites sampled for Eastern Sand Darter in August 2020, located near the Big Bend Conservation Area, Thames River, Ontario.

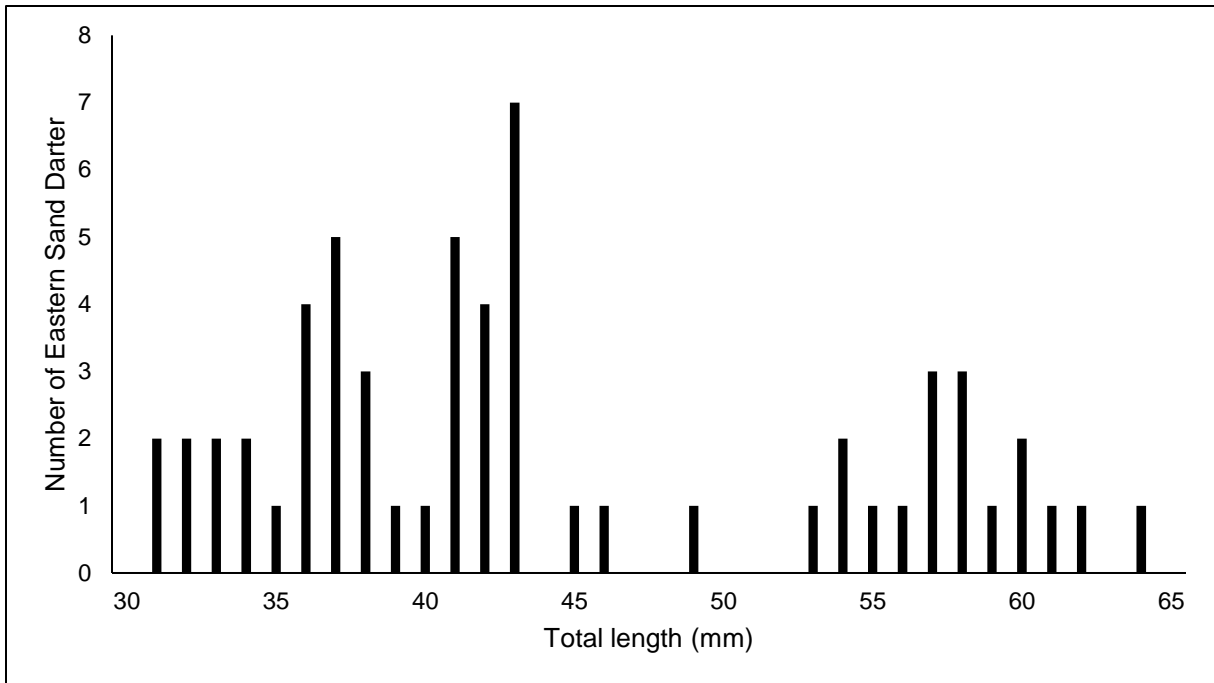


Figure 2. Length-frequency distribution of Eastern Sand Darter captured in the Thames River, Ontario between August 5<sup>th</sup> and August 12<sup>th</sup>, 2020 (n = 58; recaptured fish excluded).

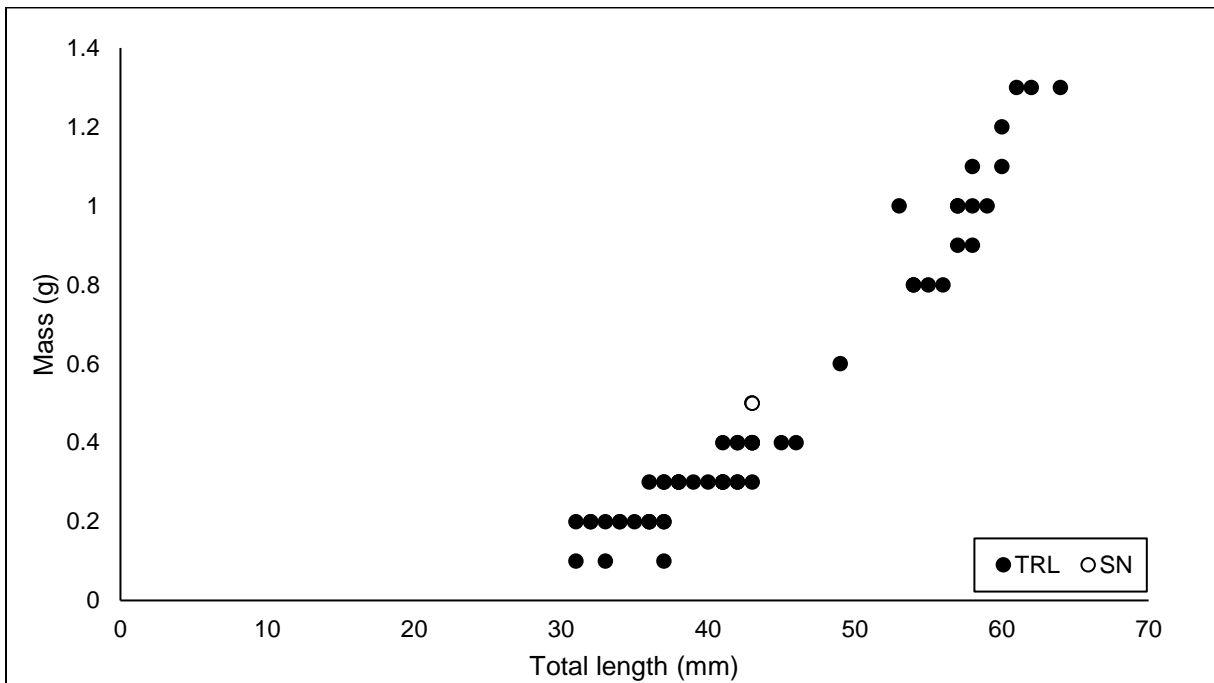


Figure 3. Relationship between total length (mm) and mass (g) of Eastern Sand Darter captured in the Thames River, Ontario between August 5<sup>th</sup> and August 12<sup>th</sup> 2020 in the trawl (TRL) and in the seine net (SN) (n = 58; recaptured fish excluded).

Appendix 1. Summary of Site ID, Field Number, Date Captured, Unique Individual Code (ESDID), Total Length (TL; mm), Mass (M; g), physiological trial (CTmax = critical thermal maximum, p-crit = dissolved oxygen trial), and tagging and recapture data for individual Eastern Sand Darter captured at Big Bend Conservation Area, Thames River, Ontario (August 2020). Whether the fish was released, kept, tagged that day, and recaptured (RECAP) are noted (Y = yes, N = no). All fish were tagged on the ventral surface to the left of the anal fin. Tag codes refer to Visible Implant Elastomer (colour: blue) and position in relation to the anal fin.

Site ID	Field Number	Date Captured	Unique Individual Code (ESDID)	Trial Code	TL (mm)	M (g)	CT max	p-crit	COMPLETED	RECOVERED	RELEASED	KEPT	TAGGED	Tag Code (colour-position)	RECAP
1	2020-ESDPT-050820-001A	05-08-20	050820-01	CTmax-01	43	0.5	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
2	2020-ESDPT-060820-001A	06-08-20	060820-01	CTmax-02	40	0.3	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
3	2020-ESDPT-060820-002A	06-08-20	060820-02	CTmax-03	37	0.2	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
3	2020-ESDPT-060820-002A	06-08-20	060820-04	CTmax-05	37	0.1	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
3	2020-ESDPT-060820-002A	06-08-20	060820-03	CTmax-04	43	0.4	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
4	2020-ESDPT-070820-001A	07-08-20	070820-03	CTmax-08	41	0.3	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
4	2020-ESDPT-070820-001A	07-08-20	070820-02	CTmax-07	49	0.6	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
4	2020-ESDPT-070820-001A	07-08-20	070820-01	CTmax-06	57	0.9	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
5	2020-ESDPT-070820-002A	07-08-20	070820-13	CTmax-15	31	0.2	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
5	2020-ESDPT-070820-002A	07-08-20	070820-17	NA	36	0.2	N	N	N	N	N	Y	N	NA	N
5	2020-ESDPT-070820-002A	07-08-20	070820-05	NA	37	0.3	N	Y	Y	Y	Y	N	Y	Blue - left of anal	N
5	2020-ESDPT-070820-002A	07-08-20	070820-04	NA	39	0.3	N	Y	Y	Y	Y	N	Y	Blue - left of anal	N
5	2020-ESDPT-070820-002A	07-08-20	070820-06	NA	43	0.4	N	Y	Y	Y	Y	N	Y	Blue - left of anal	N
5	2020-ESDPT-070820-002A	07-08-20	070820-14	CTmax-16	54	0.8	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
5	2020-ESDPT-070820-002A	07-08-20	070820-11	CTmax-13	55	0.8	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
5	2020-ESDPT-070820-002A	07-08-20	070820-15	CTmax-17	56	0.8	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
5	2020-ESDPT-070820-002A	07-08-20	070820-16	NA	57	1.0	N	N	N	N	N	Y	N	NA	N
5	2020-ESDPT-070820-002A	07-08-20	070820-10	CTmax-12	58	1.1	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
5	2020-ESDPT-070820-002A	07-08-20	070820-12	CTmax-14	58	1.0	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
5	2020-ESDPT-070820-002A	07-08-20	070820-08	CTmax-10	60	1.2	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
5	2020-ESDPT-070820-002A	07-08-20	070820-09	CTmax-11	62	1.3	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
5	2020-ESDPT-070820-002A	07-08-20	070820-07	CTmax-09	64	1.3	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
6	2020-ESDPT-100820-001A	10-08-20	100820-11	NA	31	0.1	N	N	N	N	N	Y	N	NA	N
6	2020-ESDPT-100820-001A	10-08-20	100820-12	NA	33	0.2	N	N	N	N	N	Y	N	NA	N
6	2020-ESDPT-100820-001A	10-08-20	100820-13	NA	33	0.1	N	N	N	N	N	Y	N	NA	N
6	2020-ESDPT-100820-001A	10-08-20	100820-14	NA	34	0.2	N	N	N	N	N	Y	N	NA	N
6	2020-ESDPT-100820-001A	10-08-20	100820-02	CTmax-18	35	0.2	Y	N	Y	Y	N	Y	Y	Blue - left of anal	N
6	2020-ESDPT-100820-001A	10-08-20	100820-01	NA	36	0.2	N	N	N	N	Y	N	N	Blue - left of anal	Y

Site ID	Field Number	Date Captured	Unique Individual Code (ESDID)	Trial Code	TL (mm)	M (g)	CT max	p-crit	COMPLETED	RECOVERED	RELEASED	KEPT	TAGGED	Tag Code (colour-position)	RECAP
6	2020-ESDPT-100820-001A	10-08-20	100820-15	NA	36	0.2	N	N	N	N	N	Y	N	NA	N
6	2020-ESDPT-100820-001A	10-08-20	100820-06	NA	38	0.3	N	Y	Y	Y	Y	N	Y	Blue - left of anal	N
6	2020-ESDPT-100820-001A	10-08-20	100820-03	CTmax-19	41	0.3	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
6	2020-ESDPT-100820-001A	10-08-20	100820-09	CTmax-22	41	0.3	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
6	2020-ESDPT-100820-001A	10-08-20	100820-04	NA	42	0.3	N	Y	Y	Y	Y	N	Y	Blue - left of anal	N
6	2020-ESDPT-100820-001A	10-08-20	100820-05	NA	42	0.3	N	Y	Y	Y	Y	N	Y	Blue - left of anal	N
6	2020-ESDPT-100820-001A	10-08-20	100820-08	CTmax-21	42	0.4	Y	N	Y	Y	N	Y	Y	Blue - left of anal	N
6	2020-ESDPT-100820-001A	10-08-20	100820-10	CTmax-23	43	0.4	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
6	2020-ESDPT-100820-001A	10-08-20	100820-07	CTmax-20	57	1.0	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
7	2020-ESDPT-110820-001A	11-08-20	110820-07	CTmax-27	32	0.2	Y	N	Y	N	N	Y	N	NA	N
7	2020-ESDPT-110820-001A	11-08-20	110820-01	CTmax-24	34	0.2	Y	N	Y	Y	Y	N	N	NA	N
7	2020-ESDPT-110820-001A	11-08-20	110820-08	CTmax-28	36	0.3	Y	N	Y	Y	Y	N	N	NA	N
7	2020-ESDPT-110820-001A	11-08-20	110820-10	CTmax-30	38	0.3	Y	N	Y	Y	Y	N	N	NA	N
7	2020-ESDPT-110820-001A	11-08-20	110820-13	NA	41	0.4	N	N	N	N	N	Y	N	NA	N
7	2020-ESDPT-110820-001A	11-08-20	110820-09	CTmax-29	42	0.4	Y	N	Y	Y	Y	N	N	NA	N
7	2020-ESDPT-110820-001A	11-08-20	110820-06	CTmax-26	43	0.4	Y	N	Y	Y	N	N	Y	Blue - left of anal	N
7	2020-ESDPT-110820-001A	11-08-20	110820-11	NA	43	0.5	N	Y	Y	Y	Y	N	N	NA	N
7	2020-ESDPT-110820-001A	11-08-20	110820-02	CTmax-25	45	0.4	Y	N	Y	Y	Y	N	Y	Blue - left of anal	N
7	2020-ESDPT-110820-001A	11-08-20	110820-05	NA	53	1.0	N	Y	Y	N	N	Y	N	NA	N
7	2020-ESDPT-110820-001A	11-08-20	110820-04	NA	54	0.8	N	Y	Y	Y	Y	N	N	NA	N
7	2020-ESDPT-110820-001A	11-08-20	110820-12	NA	59	1.0	N	Y	Y	Y	Y	N	N	NA	N
7	2020-ESDPT-110820-001A	11-08-20	110820-03	NA	61	1.3	N	Y	Y	Y	Y	N	N	NA	N
8	2020-ESDPT-120820-001A	12-08-20	120820-09	NA	32	0.2	N	N	N	N	N	Y	N	NA	N
8	2020-ESDPT-120820-001A	12-08-20	120820-05	NA	37	0.2	N	N	N	N	Y	N	N	NA	N
8	2020-ESDPT-120820-001A	12-08-20	120820-07	NA	37	0.3	N	N	N	N	Y	N	N	NA	N
8	2020-ESDPT-120820-001A	12-08-20	120820-08	NA	38	0.3	N	N	N	N	Y	N	N	NA	N
8	2020-ESDPT-120820-001A	12-08-20	120820-03	NA	41	0.3	N	Y	Y	Y	Y	N	N	NA	N
8	2020-ESDPT-120820-001A	12-08-20	120820-06	NA	43	0.3	N	N	N	N	N	Y	N	NA	N
8	2020-ESDPT-120820-001A	12-08-20	120820-04	NA	46	0.4	N	N	N	N	N	Y	N	NA	N
8	2020-ESDPT-120820-001A	12-08-20	120820-02	NA	58	0.9	N	Y	Y	Y	Y	N	N	NA	N
8	2020-ESDPT-120820-001A	12-08-20	120820-01	NA	60	1.1	N	Y	Y	Y	Y	N	N	NA	N

Appendix 2. Total length (TL, mm) of individual Northern Madtom (*Noturus stigmosus*) and juvenile madtom (*Noturus* sp.) captured at Big Bend Conservation Area, Thames River, Ontario (August 2020). An asterisk (\*) indicates that the individual was not measured.

<b>SiteID</b>	<b>Species</b>	<b>TL (mm)</b>
1	<i>Noturus</i> sp.	*
1	<i>Noturus</i> sp.	*
1	<i>Noturus</i> sp.	*
3	<i>Noturus</i> sp.	18
3	<i>Noturus</i> sp.	19
1	<i>Noturus stigmosus</i>	*
2	<i>Noturus stigmosus</i>	82
3	<i>Noturus stigmosus</i>	39
3	<i>Noturus stigmosus</i>	35
4	<i>Noturus stigmosus</i>	40
4	<i>Noturus stigmosus</i>	72
4	<i>Noturus stigmosus</i>	40
5	<i>Noturus stigmosus</i>	32
7	<i>Noturus stigmosus</i>	43
<b>Min</b>	<b><i>Noturus stigmosus</i></b>	<b>32</b>
<b>Mean</b>	<b><i>Noturus stigmosus</i></b>	<b>47.9</b>
<b>Max</b>	<b><i>Noturus stigmosus</i></b>	<b>82</b>