

# Targeted Sampling for Pugnose Minnow (*Opsopoeodus emiliae*) in the St. Clair River and Lower Sydenham River, Ontario, 2019

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**Canadian Data Report of  
Fisheries and Aquatic Sciences 1318**



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## ABSTRACT

Barnucz, J., and Drake, D.A.R. 2021. Targeted Sampling for Pugnose Minnow (*Opsopoeodus emiliae*) in the St. Clair River and Lower Sydenham River, Ontario, 2019. Can. Data Rep. Fish. Aquat. Sci. 1318: viii + 44 p.

Targeted sampling for Pugnose Minnow (*Opsopoeodus emiliae*), a species listed as Threatened under Canada's *Species at Risk Act*, was conducted in the East Sydenham River, North Sydenham River, lower Sydenham River, Chenail Ecarte, Little Bear Creek, and Maxwell Creek in Southwestern Ontario between July 30<sup>th</sup> and August 22<sup>nd</sup> 2019. Sampling occurred at sites where Pugnose Minnow had been collected previously, as well as adjacent sites with habitat features preferred by the species. Sixty-one sites (consisting of 183 trawl tows) were sampled using a Mamou trawl. A total of 21,442 fishes representing 39 species were captured. Pugnose Minnow was not detected. Pugnose Shiner (*Notropis anogenus*), a species also listed as Threatened, was captured from the Chenail Ecarte (n = 255 individuals), Maxwell Creek (n = 53), and Little Bear Creek (n = 38; n = 346 in total during 2019 sampling). Blackstripe Topminnow (*Fundulus diaphanus*), a species listed as Special Concern, was captured from the North Sydenham River (n = 3 individuals), East Sydenham River (n = 2), and Chenail Ecarte (n = 1; n = 6 in total during 2019 sampling). The most abundant species across all waterbodies were Ghost Shiner (*Notropis buchmanii*; n = 12,685), Gizzard Shad (*Dorosoma cepedianum*; n = 3,407), Brook Silverside (*Labidesthes sicculus*; n = 1,010), *Lepomis* sp. (n = 901), and Bluegill (*Lepomis macrochirus*; n = 649). Aquatic vegetation did not occur frequently in sites in the East Sydenham, North Sydenham and lower Sydenham Rivers; when vegetation occurred, the most frequently occurring plants included Pondweed (*Potamogeton* sp.), *Phragmites* sp., Water Celery (*Vallisneria* sp.), White Water Lily (*Nymphaea* sp.) and Yellow Water Lily (*Nuphar* sp.). Submerged aquatic vegetation was common at sites in the Chenail Ecarte, Little Bear Creek, and Maxwell Creek; submerged plants commonly observed at these locations were Water Celery (*Vallisneria* sp.) and Milfoil (*Myriophyllum* sp.).

## RÉSUMÉ

Barnucz, J., and Drake, D.A.R. 2021. Targeted Sampling for Pugnose Minnow (*Opsopoeodus emiliae*) in the St. Clair River and Lower Sydenham River, Ontario, 2019. Can. Data. Rep. Fish. Aquat. Sci. 1318: viii + 44 p.

Du 30 juillet au 22 août 2019, on a mené des activités d'échantillonnage ciblant le petit-bec (*Opsopoeodus emiliae*), une espèce menacée en vertu de la *Loi sur les espèces en péril* (LEP) du Canada, dans la rivière Sydenham Est, la rivière Sydenham Nord, le cours inférieur de la rivière Sydenham, la rivière Chenail Ecarté, le ruisseau Little Bear et le ruisseau Maxwell, situés dans le sud-ouest de l'Ontario. On a réalisé ces activités dans des sites où le petit-bec avait déjà été capturé et des sites adjacents présentant des caractéristiques d'habitat privilégiées par l'espèce. On a échantillonné 61 sites (ce qui représente 183 traits de chalut) au moyen d'un chalut Mamou. On a capturé un total de 21 442 poissons de 39 espèces différentes. Cependant, aucun petit-bec n'a été capturé. On a capturé des ménés camus (*Notropis anogenus*), une espèce désignée menacée en vertu de la LEP, dans la rivière Chenail Ecarté (n = 255 individus), le ruisseau Maxwell (n = 53) et le ruisseau Little Bear (n = 38; total de n = 346 individus lors des activités d'échantillonnage de 2019). On a aussi capturé des fondules rayés (*Fundulus diaphanus*), une espèce préoccupante en vertu de la LEP, dans la rivière Sydenham Nord (n = 3 individus), la rivière Sydenham Est (n = 2) et la rivière Chenail Ecarté (n = 1; total de n = 6 individus lors des activités d'échantillonnage de 2019). Voici les espèces les plus abondantes capturées à l'échelle des cours d'eau échantillonnés : méné fantôme (*Notropis buchanaui*) (n = 12 685 individus); alose à gésier (*Dorosoma cepedianum*) (n = 3 407); crayon d'argent (*Labidesthes sicculus*) (n = 1 010); espèces du genre *Lepomis* (n = 901); crapet arlequin (*Lepomis macrochirus*) (n = 649). Dans les sites de la rivière Sydenham Est, de la rivière Sydenham Nord et du cours inférieur de la rivière Sydenham, il n'était pas fréquent d'observer de la végétation aquatique. Lorsqu'il y avait de la végétation, il s'agissait le plus souvent de plantes, y compris des potamots (espèces du genre *Potamogeton*), des espèces du genre *Phragmites*, des vallisnériés (espèces du genre *Vallisneria*), des nymphéas (espèces du genre *Nymphaea*) et des nénuphars (espèces du genre *Nuphar*). La végétation aquatique submergée était courante dans les sites de la rivière Chenail Ecarté, du ruisseau Little Bear et du ruisseau Maxwell, où on retrouvait principalement des vallisnériés (espèces du genre *Vallisneria*) et des myriophylles (espèces du genre *Myriophyllum*).

## 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) of 2002. 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 a description of field activities and to provide a medium for archiving data associated with sampling SARA-listed fishes and their habitat.

This data report summarizes targeted field sampling by DFO in 2019 to better understand the distribution of Pugnose Minnow (*Opsopoeodus emiliae*) in the St. Clair River and lower Sydenham River, Ontario. Pugnose Minnow, a species listed as Threatened under SARA, exhibits a severely restricted range in Canada and is found only in the Detroit River, Lake St. Clair, and tributaries of Lake St. Clair including the delta of the St. Clair River [Committee on the Status of Endangered Wildlife in Canada (COSEWIC) 2012; Fisheries and Oceans Canada (DFO) 2013]. In 2018, DFO conducted targeted sampling for Pugnose Minnow in the Canard River, a tributary of the Detroit River. Sampling in 2018 yielded 295 Pugnose Minnow from 26 of 74 sampling sites (Gáspárdy et al. 2020; Lamothe and Drake 2020), representing the largest known collection of the species in Canada. Gáspárdy et al. (2020) detected Pugnose Minnow with both a bag seine and Mamou trawl, indicating that future targeted sampling in deep waters outside of the Canard River population could be aided by deployment of a Mamou trawl. Based on these findings, sampling of the St. Clair River and lower Sydenham River in 2019 utilized a Mamou trawl. Sampling sites included areas known to support past collections of Pugnose Minnow, as well as new sites likely to contain Pugnose Minnow based on the availability of preferred habitat features.

## METHODS

### SITE SELECTION

Sampling occurred within the Chenail Ecarte, which flows from Port Lambton south to Mitchell's Bay and is part of the St. Clair River delta, and the lower Sydenham River, a tributary of Lake St. Clair (Figure 1). Both the North and East branches of the Sydenham River were sampled, as well as the mainstem of the lower Sydenham River, along with Maxwell Creek and Little Bear Creek.

Sites were selected based on three criteria, resulting in three site classes (historical, paired, targeted). Historical sites ( $n = 11$ ) were defined as locations where Pugnose Minnow had previously been detected (between 1979 and 2010) based on collection records from the Royal Ontario Museum. Paired sites ( $n = 11$ ), defined as sites  $< 1$  km from historical sites, were designed to increase the detection of the species in areas close to historical sites. Targeted sites ( $n = 40$ ) were  $> 1$  km and  $< 3$  km from either paired or historical sites, and were also designed to increase detections of Pugnose Minnow in waterbodies known to support the species. For all site classes (historical, paired, targeted), the trawl was deployed near preferred habitat features (submerged vegetation, when present) of Pugnose Minnow.

### FISH ASSEMBLAGE SAMPLING

Fishes were sampled with a Mamou trawl (Reid et al. 2016; Gáspárdy et al. 2020). The forward sections of the trawl were constructed of 38 mm high-density, polyethylene stretched mesh, which runs from the head rope (float line) to 2 m back into the body of the trawl. The remainder

of the trawl consisted of 4 mm polyester knotless mesh. During operation, the net was opened by a pair of floating doors (0.6 m long x 0.3 m wide). Prior to sampling, sites were surveyed visually or with a Garmin Echomap Plus 95 SV sonar unit to identify navigation hazards (e.g., large woody debris). Sampling with the Mamou trawl involved operating the research vessel in a backwards direction, travelling downstream, with the trawl deployed off the bow of the vessel. Once fully deployed, the operator travelled for a distance of 50 m. During the tow, the operator ensured that the trawl was fishing close to submerged aquatic vegetation. Trawling speed was maintained at approximately 2 km/hr for all tows. Trawls were retrieved at the end of each transect over the bow of the boat (Figure 2). Trawling was repeated three times, in close succession, over the same fished area within each site. Individual trawl times were recorded to ensure consistency and for later use in effort calculations. Captured fishes were removed from the cod end of the trawl and placed in bins of fresh, oxygenated water until processing was completed.

Fishes were processed separately based on the order of each tow, which allowed species composition and abundance to be partitioned into the first, second, or third tow at each sampling site. Captured fishes were identified to species level (where possible), enumerated, and the minimum and maximum total length (TL; mm), per species, was recorded per tow. In addition, individual TL was measured for a subset of SARA-listed fishes. At least one representative specimen of each species at each tow was retained as a voucher, either by digital photograph or as a physical voucher. Physical vouchers were preserved in 10% buffered Formalin and species identification was confirmed in the laboratory based on Holm et al. (2019 a,b) and Holm and Burrige (2019). Additionally, specimens that could not be identified to species *in situ*, and other sampling mortalities, were retained for laboratory identification.

## **AQUATIC HABITAT SAMPLING**

Aquatic habitat was characterized at the midpoint of the sampling site after fishes were processed and released. Surface water temperature (°C), conductivity (µS), turbidity (NTU), and dissolved oxygen (mg/L) were measured approximately 0.2 m beneath the water's surface using a YSI EX02 Multiparameter Sonde, which was deployed and allowed to stabilize for approximately 1 minute before measurements were recorded. Water clarity (cm) was measured using a 120 cm Fieldmaster turbidity tube. Air temperature (°C) was measured using a Kestrel 3000 wind meter. Substrate composition within the centre of the trawled transect was analyzed with a Petite Ponar dredge. The percent composition of the dredged substrate sample was based on 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 presence of rubble was also noted, defined as broken man-made material (e.g., broken concrete, rip rap). As the dredge does not effectively sample larger substrates (cobble, boulder), substrate measurements were effectively limited to the smaller substrate size classes. Channel depth (m) was measured in three representative locations within the boundaries of the trawling pass using either a Laylin Speedtech SM-5 Depthmate portable depth sounder or Garmin® Echomap™ Plus 95 SV sonar unit. Site velocity (m/s) was measured using a Swiffer 2100 current velocity metre; however, there were instances where no flow was encountered. Wetted stream channel width (m) was measured at the midpoint of the site perpendicular to the bank using a Nikon Laser 1200S waterproof laser range finder. Site location (latitude, longitude) was determined using a Garmin Montana 600 handheld GPS unit. Aquatic macrophytes were classified using a visual assessment in which the field crew assessed the percent composition of the following vegetation classes within the sample area to a total of 100%: open water, emergent vegetation, submerged vegetation, and floating vegetation. The dominant taxa of aquatic vegetation were identified and recorded. A visual representation of aquatic habitat from each river system is provided in Figure 3.

## RESULTS

### FISH ASSEMBLAGE SAMPLING

Pugnose Minnow was not detected at any of the 2019 sampling sites. However, Pugnose Shiner (*Notropis anogenus*; SARA *Threatened*) (Figure 4a) and Blackstripe Topminnow (*Fundulus notatus*; SARA *Special Concern*) (Figure 4b) were detected. The most abundant species across all waterbodies were Ghost Shiner (*Notropis buchanani*) (Figure 4c), Gizzard Shad (*Dorosoma cepedianum*) (Figure 4d), Brook Silverside (*Labidesthes sicculus*) (Figure 4e), *Lepomis* sp. (primarily young of the year), and Bluegill (*Lepomis macrochirus*) (Figure 4f). Details of fish assemblage sampling results are provided below.

#### *East Sydenham River*

Sixteen sites (n = 5 historical; n = 5 paired; n = 6 targeted), consisting of 48 trawls in total, were sampled along the East Sydenham River between Dresden and Wallaceburg (Figure 1a, Figure 3a, Table 1). A total of 3,570 fishes representing 30 species were captured (Table 2a). Based on pooled catch data the most abundant species were Ghost Shiner, Gizzard Shad, *Lepomis* sp. (primarily young of year), Bluegill, and Brook Silverside (Table 2a, Figure 5a). Two Blackstripe Topminnow were captured in the East Sydenham River; measuring 42 and 43 mm TL (Table 3).

#### *North Sydenham River*

Eighteen sites (n = 3 historical; n = 2 paired; n = 13 targeted), consisting of 54 trawls in total, were sampled along the North Sydenham River between Wilkesport and Wallaceburg (Figure 1b, Figure 3b, Table 1). A total of 10,503 fishes representing 16 species were captured (Table 2b). Based on pooled catch data the most abundant species were Ghost Shiner, Gizzard Shad, Brook Silverside, *Lepomis* sp. (primarily young of year), and Black Crappie (*Pomoxis nigromaculatus*) (Table 2b, Figure 5b). Three Blackstripe Topminnow were caught in the North Sydenham River ranging from 27 to 33 mm TL (Table 3).

#### *Chenail Ecarte*

Twenty sites (n = 3 historical; n = 3 paired; n = 14 targeted), consisting of 60 trawls in total, were sampled in the Chenail Ecarte between Port Lambton and Mitchell's Bay (Figure 1c, Figure 3c, Table 1). A total of 4,188 fishes representing 32 species were captured (Table 2c). Based on pooled catch data the most abundant species were Ghost Shiner, Yellow Perch (*Perca flavescens*), Brook Silverside, Pugnose Shiner, and Spottail Shiner (*Notropis hudsonius*) (Table 2c, Figure 5c). A total of 255 Pugnose Shiner were captured at 13 of the 20 sites in the Chenail Ecarte (Table 3), ranging from 17 to 64 mm TL (Table 3). A single Blackstripe Topminnow, 64 mm TL, was also captured (Table 3).

#### *Lower Sydenham River*

Four targeted sites, consisting of 12 trawls in total, were sampled in the lower Sydenham River between Wallaceburg and the confluence of the Sydenham River with the Chenail Ecarte (Figure 1c, Figure 3d, Table 1). A total of 2,445 fishes representing 15 species were captured (Table 2d). Based on pooled catch data the most abundant species were Ghost Shiner, Gizzard Shad, *Lepomis* sp. (primarily young of year), *Cyprinidae* sp. (primarily young of the year) and Brook Silverside (Table 2d, Figure 5d). No SARA-listed species were caught in the lower Sydenham River.

### *Maxwell Creek*

Two sites, both targeted consisting of six trawls in total, were sampled along Maxwell Creek near the confluence with the Chenail Ecarte (Figure 1c, Figure 3e, Table 1). A total of 484 fishes representing 16 species were captured (Table 2d). Based on pooled catch data the most abundant species were Bluegill, Brook Silverside, Pugnose Shiner, Spottail Shiner, and Bluntnose Minnow (*Pimephales notatus*) (Table 2d, Figure 5e). A total of 53 Pugnose Shiner were captured in Maxwell Creek ranging in size from 23 to 54mm TL (Table 3).

### *Little Bear Creek*

One targeted site, consisting of three trawls in total, was sampled along Little Bear Creek near the confluence with the Chenail Ecarte (Figure 1c, Table 1). A total of 252 fishes representing 14 species were captured (Table 2d). Based on pooled catch data the most abundant species were Bluegill, Brook Silverside, Pugnose Shiner, Gizzard Shad, and Yellow Perch (Table 2d, Figure 5f). A total of 38 Pugnose Shiner were captured in Little Bear Creek ranging from 35 to 53 mm TL (Table 3).

## **HABITAT SAMPLING**

The North Sydenham River was the most turbid of the sampled systems (mean 149.20 NTU) and contained very little aquatic vegetation (dominant vegetation class of open water at all sites). Turbidity in the East Sydenham River (mean 21.88 NTU) and the lower Sydenham River (mean 22.12 NTU) was lower than the North Sydenham River, but aquatic vegetation was also infrequent, with the majority of sites dominated by open water. The turbidity of the Chenail Ecarte varied upstream (mean 4.87 NTU) and downstream (mean 40.67 NTU) of the Sydenham River confluence, with submerged vegetation as the dominant vegetation class at the majority of sampling sites. Turbidity in Little Bear Creek (14.70 NTU) and Maxwell Creek (mean 15.66 NTU) was generally low and submerged vegetation was dominant. Silt was the dominant substrate type at most sampling sites across waterbodies. Specific habitat measurements for each system are provided below.

### **EAST SYDENHAM RIVER**

Air temperature at sites within the East Sydenham River ranged from 20.5 °C to 32.7 °C with a mean of 27.9 °C (Table 4a). Water temperature ranged from 24.6 °C to 27.6 °C with a mean of 26.1 °C (Table 4a). Conductivity ranged from 5.03 µS to 586 µS with a mean of 494.51 µS (Table 4a). Dissolved oxygen ranged from 5.47 mg/L to 9.46 mg/L with a mean of 8.05 mg/L (Table 4a). Turbidity tube values ranged from 0.11 m to 0.41 m with a mean of 0.31 m (Table 4a). Turbidity ranged from 9.85 NTU to 53.22 NTU with a mean of 21.88 NTU (Table 4a). Mean water depth ranged from 1.21 m to 2.70 m with a grand mean depth across all sites of 1.97 m (Table 4a). The mean surface water velocity across all sites ranged from 0 m/s to 0.020 m/s with an overall mean of 0.003 m/s (Table 4a). Silt was the most common substrate type among sites in the East Sydenham River. Silt ranged from 20% to 90% with an overall mean of 53.44% (Table 5a). Organic substrate ranged from 0% to 40% with an overall mean of 16.88% (Table 5a). Clay substrate ranged from 0% to 70% with an overall mean of 20.94% (Table 5a). Sand ranged from 0% to 40% with an overall mean of 5% (Table 5a). Gravel ranged from 0% to 50% with an overall mean of 3.75% (Table 5a). Emergent vegetation coverage ranged from 0% to 40% with an overall mean of 4.69% (Table 6a). Floating vegetation coverage ranged from 0% to 40% with an overall mean of 13.75% (Table 6a). Submerged vegetation coverage ranged from 0% to 60% with an overall mean of 11.88% (Table 6a). Open water coverage ranged from 30% to 100% with a mean of 69.69% (Table 6a). The dominant aquatic vegetation classes (Table 6a) were open water (16 sites), emergent (1 site), and submerged (1 site). When vegetation

occurred, the dominant groups were *Nuphar* sp. (4 sites), *Nymphaea* sp. (3 sites), *Vallisneria* sp. (2 sites) and *Potamogeton* sp. (2 sites) as shown in Table 5a. The dominant genera of aquatic vegetation was not measured at 5 sites.

## **NORTH SYDENHAM RIVER**

Air temperature at sites within the North Sydenham River ranged from 21.4°C to 34.2°C with a mean of 26.3 °C (Table 4b). Water temperature ranged from 22.3 °C to 26.3 °C with a mean of 24.3 °C (Table 4b). Conductivity ranged from 217.60 µS to 446.40 µS with a mean of 328.77 µS (Table 4b). Dissolved oxygen ranged from 2.37 mg/L to 9.35 mg/L with a mean of 6.03 mg/L (Table 4b). Turbidity tube values ranged from 0.03 m to 0.32 m with a mean of 0.15 m (Table 4b). Turbidity values ranged from 18.56 NTU to 442.06 NTU with a mean value of 149.20 NTU (Table 4b). Mean water depth ranged from 1.13 m to 1.90 m with a grand mean depth across all sites of 1.54 m (Table 4b). Mean surface velocity ranged from 0 m/s to 0.47 m/s with a grand mean of 0.118 m/s (Table 4b). Silt was the most common substrate type that occurred among sites in the North Sydenham River, ranging from 20% to 95% with an overall mean of 67.78% (Table 5b). Organic substrate ranged from 0% to 40% with an overall mean of 13.89% (Table 5b). Clay substrate ranged from 0% to 50% with an overall mean of 15.28% (Table 5b). Gravel ranged from 0% to 10% with an overall mean of 1.67% (Table 5b). Rubble was observed at one site, NSYD02, amounting to 5% coverage (Table 5b). Sand was not observed at any of the sampling sites (Table 5b). Emergent vegetation coverage ranged from 0% to 10% with an overall mean of 3.06% (Table 6b). Floating vegetation coverage ranged from 0% to 30% with an overall mean of 7.5% (Table 6b). Submerged vegetation coverage ranged from 0% to 30% with a mean of 7.5% (Table 5b). Open water coverage ranged from 60% to 100% with a mean of 81.94% (Table 6b). The dominant aquatic vegetation class for all 18 North Sydenham River sites was open water (Table 6b). When aquatic vegetation occurred, the dominant groups were *Potamogeton* sp. (5 sites), *Nymphaea* sp. (5 sites), *Phragmites* sp. (4 sites), *Nuphar* sp. (2 sites), *Ceratophyllum* sp. (1 site), *Lemna* sp. (1 site) as shown in Table 6b.

## **CHENAIL ECARTE**

Air temperature at sites within the Chenail Ecarte ranged from 22.1 °C to 36.9 °C with a mean of 28.4 °C (Table 4c). Water temperature ranged from 22.4 °C to 25.8 °C with a mean of 24.3 °C (Table 4c). Conductivity ranged from 210.20 µS to 315.70 µS with a mean of 242.33 µS (Table 4c). Dissolved oxygen ranged from 5.46 mg/L to 9.34 mg/L with a mean of 7.41 mg/L (Table 4c). Turbidity tube values ranged from 0.10 m to 1.05 m with a mean of 0.59 m (Table 4c). Turbidity values ranged from 1.76 NTU to 95.34 NTU with a mean value of 22.77 NTU (Table 4c). Mean water depth ranged from 0.73 m to 1.57 m with a grand mean depth across all sites of 1.11 m (Table 4c). Mean surface velocity ranged from 0 m/s to 0.15 m/s with a grand mean of 0.034 m/s (Table 4c). Silt was the most common substrate type that occurred among sites in the Chenail Ecarte. Silt ranged from 50% to 95% with an overall mean of 80% (Table 5c). Organic substrate ranged from 0% to 30% with an overall mean of 8% (Table 5c). Clay substrate ranged from 0% to 20% with an overall mean of 2% (Table 5c). Sand substrate ranged from 0% to 40% with an overall mean of 8.75% (Table 5c). Boulder ranged from 0% to 10% with an overall mean of 1.25% (Table 5c). Emergent vegetation coverage ranged from 0% to 30% with an overall mean of 10.25% (Table 6c). Floating vegetation coverage ranged from 0% to 10% with an overall mean of 1.25% (Table 6c). Submergent vegetation coverage ranged from 20% to 100% with a mean of 63.25% (Table 6c). Open water coverage ranged from 0% to 60% with a mean of 24.75% (Table 6c). The dominant aquatic vegetation classes (Table 6c) (Table 6c) were submerged (17 sites) and open water (3 sites). When aquatic vegetation occurred, the dominant groups were *Vallisneria* sp. (14 sites), *Myriophyllum* sp. (3 sites), *Elodea* sp. (2 sites), and *Potamogeton* sp. (1 site) as shown in Table 6c.

## LOWER SYDENHAM RIVER

Air temperature at sites within the lower Sydenham River ranged from 26.1 °C to 31.6 °C with a mean of 27.9 °C (Table 4d). Water temperature ranged from 26.5 °C to 27.4 °C with a mean of 27 °C (Table 4d). Conductivity ranged from 306.40 µS to 438.40 µS with a mean of 374.18 µS (Table 4d). Dissolved oxygen ranged from 4.67 mg/L to 9.32 mg/L with a mean of 6.26 mg/L (Table 4d). Turbidity tube values ranged from 0.09 m to 0.37 m with a mean of 0.26 m (Table 4d). Turbidity values ranged from 18.04 NTU to 26.90 NTU with a mean value of 22.12 NTU (Table 4d). Mean water depth ranged from 1.2 m to 1.87 m with a grand mean across all sites of 1.42 m (Table 4d). Mean surface velocity ranged from 0 m/s to 0.077 m/s with a grand mean of 0.019 m/s (Table 4d). Silt was the most common substrate type that occurred among sites in the Sydenham River (Table 5d). Silt ranged from 0% to 95% with an overall mean of 57.50% (Table 5d). Organic substrate ranged from 0% to 50% with an overall mean of 13.75% (Table 5d). Sand substrate ranged from 0% to 5% with an overall mean of 1.25% (Table 5d). Substrate was not determined at site SYD-02 as the ponar would not deploy properly. Emergent vegetation ranged from 0% to 20% with an overall mean of 5% (Table 6d). Floating vegetation coverage ranged from 0% to 10% with a mean of 2.5% (Table 6d). Submerged vegetation coverage ranged from 20% to 60% with a mean of 35% (Table 6d). Open water coverage ranged from 20% to 80% with a mean of 57.5% (Table 6d). Dominant aquatic vegetation classes observed at lower Sydenham River sites (Table 6d) included open water (3 sites) and submerged (1 site). When aquatic vegetation occurred, the dominant groups were *Vallisneria* sp. (2 sites) and *Nymphaea* sp. (1 site) as shown in as shown in Table 6d. The dominant group of aquatic vegetation was not determined at site SYD02 (Table 6d).

## MAXWELL CREEK

Air temperature at sites within Maxwell Creek ranged from 25.4 °C to 25.9 °C with a mean of 25.7 °C (Table 4e). Water temperature was 25.2 °C (Table 4e). Conductivity ranged from 269.80 µS to 271.10 µS with a mean of 270.45 µS (Table 4e). Dissolved oxygen ranged from 5.49 mg/L to 6.53 mg/L with a mean of 6.01 mg/L (Table 4e). Turbidity tube values ranged from 0.35 m to 0.40 m with a mean of 0.38 m (Table 5e). Turbidity values ranged from 13.98 NTU to 17.34 NTU with a mean value of 15.66 NTU (Table 4e). Mean water depth ranged from 1 m to 1.05 m with a grand mean of 1.03 m (Table 4e). All sites had measured surface velocity of zero m/s (Table 4e). Silt substrate was 50% at one site and 40% at the other site (Table 5e). Organic substrate was 50% at one site and 55% at the other site (Table 5e). Sand was 0% at one site and 5% at the other site. Emergent vegetation was 0% (Table 6e). Floating vegetation was 5% at one site and 15% at the other site (Table 6e). Submerged vegetation was 60% at one site and 75% at the other site (Table 6e). Open water was 20% at one site and 25% at the other site (Table 6e). The dominant aquatic vegetation class from Maxwell Creek (Table 6e) was submerged vegetation (2 sites) and the dominant group was *Vallisneria* sp. (2 sites).

## LITTLE BEAR CREEK

Air temperature at Little Bear Creek was 30.7 °C (Table 4e). Water temperature was 26 °C (Table 4e). Conductivity was 357µS (Table 4e). Dissolved oxygen was 7.87 mg/L (Table 4e). Turbidity tube was 0.38 m (Table 4e). Turbidity was 14.7 NTU (Table 4e). The mean water depth was 1.0m (Table 4e). Surface velocity was zero (Table 4e). The substrate classes observed at the sampling site were organic (20%), silt (40%) and sand (40%) (Table 5e). The macrophyte classes observed at the sampling site were 75% submerged (75%), open water (20%), and emergent (5%) (Table 6e). The dominant aquatic vegetation class was submerged vegetation (Table 6e) and the dominant aquatic vegetation was *Vallisneria* sp. (1 site).



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Table 1. Summary of sampling sites during targeted sampling for Pugnose Minnow in the St. Clair River and lower Sydenham River in 2019. Site Classification (Class): Historical [H], Paired [P], Targeted [T].

Site Code	Site Class	Field Number	Date	Waterbody Name	Start Latitude	Start Longitude
CH01	T	2019-PNM-PDAH-200819-001B	20-08-19	Chenail Ecarte	42.48834	-82.43476
CH02	T	2019-PNM-PDAH-200819-002B	20-08-19	Chenail Ecarte	42.49953	-82.44081
CH03	T	2019-PNM-PDAH-200819-003B	20-08-19	Chenail Ecarte	42.50774	-82.43584
CH04	H	2019-PNM-PDAH-140819-001A	14-08-19	Chenail Ecarte	42.51510	-82.41716
CH05	T	2019-PNM-PDAH-200819-004B	20-08-19	Chenail Ecarte	42.51529	-82.43163
CH06	P	2019-PNM-PDAH-140819-002A	14-08-19	Chenail Ecarte	42.51805	-82.41393
CH07	T	2019-PNM-PDAH-200819-005B	20-08-19	Chenail Ecarte	42.52860	-82.40342
CH08	T	2019-PNM-PDAH-210819-004B	21-08-19	Chenail Ecarte	42.54071	-82.4156
CH09	T	2019-PNM-PDAH-210819-005B	21-08-19	Chenail Ecarte	42.55186	-82.41935
CH10	H	2019-PNM-PDAH-140819-003A	14-08-19	Chenail Ecarte	42.55922	-82.41794
CH11	T	2019-PNM-PDAH-190819-001B	19-08-19	Chenail Ecarte	42.55937	-82.41126
CH12	P	2019-PNM-PDAH-140819-004A	14-08-19	Chenail Ecarte	42.55995	-82.41992
CH13	H	2019-PNM-PDAH-130819-003A	13-08-19	Chenail Ecarte	42.57367	-82.42911
CH14	T	2019-PNM-PDAH-140819-005A	14-08-19	Chenail Ecarte	42.57395	-82.42220
CH15	P	2019-PNM-PDAH-130819-004A	13-08-19	Chenail Ecarte	42.57557	-82.43127
CH16	T	2019-PNM-PDAH-130819-005A	13-08-19	Chenail Ecarte	42.58421	-82.45490
CH17	T	2019-PNM-PDAH-150819-001A	15-08-19	Chenail Ecarte	42.59460	-82.47581
CH18	T	2019-PNM-PDAH-150819-002A	15-08-19	Chenail Ecarte	42.61440	-82.47662
CH19	T	2019-PNM-PDAH-130819-002A	13-08-19	Chenail Ecarte	42.62356	-82.48006
CH20	T	2019-PNM-PDAH-130819-001A	13-08-19	Chenail Ecarte	42.63420	-82.49059
ESYD0	T	2019-PNM-PDAH-200819-006A	20-08-19	East Sydenham	42.58565	-82.23992
ESYD0	T	2019-PNM-PDAH-200819-005A	20-08-19	East Sydenham	42.58700	-82.25096
ESYD0	H	2019-PNM-PDAH-200819-007A	20-08-19	East Sydenham	42.58771	-82.23127
ESYD0	P	2019-PNM-PDAH-200819-008A	20-08-19	East Sydenham	42.58781	-82.23047
ESYD0	T	2019-PNM-PDAH-200819-004A	20-08-19	East Sydenham	42.58854	-82.25446
ESYD0	P	2019-PNM-PDAH-200819-003A	20-08-19	East Sydenham	42.58951	-82.26504
ESYD0	H	2019-PNM-PDAH-200819-002A	20-08-19	East Sydenham	42.59042	-82.26707
ESYD0	P	2019-PNM-PDAH-220819-002A	22-08-19	East Sydenham	42.59156	-82.19894
ESYD0	H	2019-PNM-PDAH-220819-001A	22-08-19	East Sydenham	42.59167	-82.20006
ESYD1	H	2019-PNM-PDAH-290719-001A	29-07-19	East Sydenham	42.59637	-82.36658
ESYD1	H	2019-PNM-PDAH-300719-002A	30-07-19	East Sydenham	42.59679	-82.32019
ESYD1	T	2019-PNM-PDAH-300719-005A	30-07-19	East Sydenham	42.59722	-82.34285
ESYD1	P	2019-PNM-PDAH-300719-001A	30-07-19	East Sydenham	42.59739	-82.36530
ESYD1	P	2019-PNM-PDAH-300719-003A	30-07-19	East Sydenham	42.59801	-82.32050
ESYD1	T	2019-PNM-PDAH-300719-004A	30-07-19	East Sydenham	42.59858	-82.32294
ESYD1	T	2019-PNM-PDAH-200819-001A	20-08-19	East Sydenham	42.60061	-82.27927

Table 1. continued, Summary of sampling sites during targeted sampling for Pugnose Minnow in the St. Clair River and lower Sydenham River in 2019. Site Classification (Class): Historical [H], Paired [P], Targeted [T].

Site Code	Site Class	Field Number	Sampling Date	Waterbody Name	Start Latitude	Start Longitude
LBC01	T	2019-PNM-PDAH-210819-003B	21-08-19	Little Bear Creek	42.53135	-82.40004
MXC01	T	2019-PNM-PDAH-210819-002B	21-08-19	Maxwell Creek	42.53226	-82.40009
MXC02	T	2019-PNM-PDAH-210819-001B	21-08-19	Maxwell Creek	42.53400	-82.39613
NSYD0	P	2019-PNM-PDAH-310719-006A	31-07-19	North Sydenham	42.62076	-82.38067
NSYD0	H	2019-PNM-PDAH-310719-005A	31-07-19	North Sydenham	42.62092	-82.37738
NSYD0	T	2019-PNM-PDAH-310719-004A	31-07-19	North Sydenham	42.63013	-82.37435
NSYD0	T	2019-PNM-PDAH-310719-002A	31-07-19	North Sydenham	42.63443	-82.37464
NSYD0	T	2019-PNM-PDAH-310719-001A	31-07-19	North Sydenham	42.64195	-82.37723
NSYD0	H	2019-PNM-PDAH-310719-003A	31-07-19	North Sydenham	42.64886	-82.37365
NSYD0	T	2019-PNM-PDAH-210819-005A	21-08-19	North Sydenham	42.65777	-82.38094
NSYD0	T	2019-PNM-PDAH-210819-004A	21-08-19	North Sydenham	42.66395	-82.39246
NSYD0	T	2019-PNM-PDAH-210819-003A	21-08-19	North Sydenham	42.67427	-82.40599
NSYD1	T	2019-PNM-PDAH-210819-002A	21-08-19	North Sydenham	42.67717	-82.39946
NSYD1	T	2019-PNM-PDAH-210819-001A	21-08-19	North Sydenham	42.68452	-82.40358
NSYD1	H	2019-PNM-PDAH-010819-001A	01-08-19	North Sydenham	42.69175	-82.40227
NSYD1	P	2019-PNM-PDAH-010819-002A	01-08-19	North Sydenham	42.69232	-82.40293
NSYD1	T	2019-PNM-PDAH-010819-003A	01-08-19	North Sydenham	42.69808	-82.38754
NSYD1	T	2019-PNM-PDAH-190819-001A	19-08-19	North Sydenham	42.70479	-82.39117
NSYD1	T	2019-PNM-PDAH-190819-002A	19-08-19	North Sydenham	42.71138	-82.38414
NSYD1	T	2019-PNM-PDAH-190819-003A	19-08-19	North Sydenham	42.72179	-82.37593
NSYD1	T	2019-PNM-PDAH-190819-004A	19-08-19	North Sydenham	42.72752	-82.35247
SYD01	T	2019-PNM-PDAH-210819-006B	21-08-19	Sydenham River	42.56603	-82.40454
SYD02	T	2019-PNM-PDAH-190819-002B	19-08-19	Sydenham River	42.56953	-82.39983
SYD03	T	2019-PNM-PDAH-190819-003B	19-08-19	Sydenham River	42.57560	-82.39606
SYD04	T	2019-PNM-PDAH-300719-006A	30-07-19	Sydenham River	42.58329	-82.39461

Table 2a. Fish assemblage results from the East Sydenham River (ESYD) obtained during targeted sampling for Pugnose Minnow in 2019 (Sites ESYD-01 to ESYD-09). Values are aggregate catch (raw abundance) from three consecutive trawls at each site. Species are listed in order from most to least abundant.

Species	ESYD01	ESYD02	ESYD03	ESYD04	ESYD05	ESYD06	ESYD07	ESYD08	ESYD09
<i>Notropis buchanaui</i>	110	1	10	0	3	0	0	870	395
<i>Dorosoma cepedianum</i>	2	0	0	0	2	3	0	76	85
<i>Lepomis</i> sp.	7	0	0	1	0	1	0	3	3
<i>Lepomis macrochirus</i>	43	0	3	4	2	7	0	86	60
<i>Labidesthes sicculus</i>	9	18	2	2	20	35	8	22	4
<i>Notropis hudsonius</i>	3	0	11	8	10	4	0	9	8
<i>Pimephales notatus</i>	5	0	0	0	10	1	0	9	1
<i>Cyprinella spiloptera</i>	10	3	1	2	7	7	14	18	4
<i>Notropis atherinoides</i>	5	1	3	0	2	1	4	7	7
<i>Micropterus salmoides</i>	6	0	2	5	2	0	1	7	5
<i>Pomoxis nigromaculatus</i>	0	0	0	0	0	0	0	12	7
<i>Percina caprodes</i>	0	0	0	0	0	0	0	8	1
<i>Pomoxis</i> sp.	0	0	0	0	0	0	0	15	0
Cyprinidae	0	0	0	0	0	0	0	0	2
<i>Ambloplites rupestris</i>	0	0	0	0	0	0	0	4	1
<i>Neogobius melanostomus</i>	2	0	0	0	0	0	0	4	0
<i>Notropis</i> sp.	0	0	0	0	0	0	0	1	0
<i>Pomoxis annularis</i>	1	0	0	0	0	0	0	2	1
<i>Notropis volucellus</i>	0	0	0	0	0	0	0	0	4
<i>Percopsis omiscomaycus</i>	0	0	0	0	0	0	0	4	0
<i>Morone americana</i>	0	0	0	0	0	0	0	0	0
<i>Moxostoma erythrurum</i>	0	0	0	0	0	0	0	1	0
<i>Perca flavescens</i>	0	0	0	0	0	0	0	1	1
<i>Percina maculata</i>	0	0	0	0	0	0	0	0	0
<i>Fundulus notatus</i>	1	0	0	0	0	0	0	1	0
<i>Moxostoma macrolepidotum</i>	0	0	0	0	0	0	0	1	0
<i>Noturus gyrinus</i>	0	0	0	0	0	0	0	0	0
<i>Amia calva</i>	0	0	0	0	0	0	0	0	1
<i>Etheostoma blennioides</i>	0	0	0	0	0	0	0	0	0
<i>Ictalurus punctatus</i>	0	0	0	0	0	0	0	1	0
<i>Lepomis gibbosus</i>	0	0	0	0	0	0	0	1	0
<i>Lepomis</i> hybrid	1	0	0	0	0	0	0	0	0
<i>Morone chrysops</i>	0	0	0	0	0	0	0	0	0
<i>Morone</i> sp.	0	0	0	0	0	0	0	0	0
<i>Moxostoma</i> sp.	0	0	0	0	0	0	0	0	0
<i>Notropis heterolepis</i>	0	0	0	1	0	0	0	0	0
<b>Total</b>	<b>205</b>	<b>23</b>	<b>32</b>	<b>23</b>	<b>58</b>	<b>59</b>	<b>27</b>	<b>1163</b>	<b>590</b>

Table 2a, continued. Fish assemblage results from the East Sydenham River (ESYD) obtained during targeted sampling for Pugnose Minnow in 2019 (Sites ESYD-10 to ESYD-16). Values are aggregate catch (raw abundance) from three consecutive trawls at each site. Species are listed in order from most to least abundant.

Species	ESYD10	ESYD11	ESYD12	ESYD13	ESYD14	ESYD15	ESYD16	Total
<i>Notropis buchanani</i>	118	0	0	10	0	41	2	1560
<i>Dorosoma cepedianum</i>	70	49	6	42	5	549	0	889
<i>Lepomis</i> sp.	174	2	4	23	0	94	0	312
<i>Lepomis macrochirus</i>	3	1	1	0	0	2	5	217
<i>Labidesthes sicculus</i>	8	5	1	6	1	2	12	155
<i>Notropis hudsonius</i>	13	0	3	0	0	13	8	90
<i>Pimephales notatus</i>	42	0	0	0	0	0	0	68
<i>Cyprinella spiloptera</i>	0	0	0	0	0	0	1	67
<i>Notropis atherinoides</i>	5	12	0	0	2	1	1	51
<i>Micropterus salmoides</i>	1	1	1	2	0	7	2	42
<i>Pomoxis nigromaculatus</i>	0	0	0	2	0	0	0	21
<i>Percina caprodes</i>	3	0	0	0	2	2	0	16
<i>Pomoxis</i> sp.	0	0	0	0	0	0	0	15
Cyprinidae	0	2	0	0	0	5	0	9
<i>Ambloplites rupestris</i>	2	0	0	0	0	0	0	7
<i>Neogobius melanostomus</i>	0	0	0	0	0	0	0	6
<i>Notropis</i> sp.	2	0	0	2	0	0	0	5
<i>Pomoxis annularis</i>	0	0	0	1	0	0	0	5
<i>Notropis volucellus</i>	0	0	0	0	0	0	0	4
<i>Percopsis omiscomaycus</i>	0	0	0	0	0	0	0	4
<i>Morone americana</i>	0	0	0	0	0	3	0	3
<i>Moxostoma erythrurum</i>	2	0	0	0	0	0	0	3
<i>Perca flavescens</i>	1	0	0	0	0	0	0	3
<i>Percina maculata</i>	3	0	0	0	0	0	0	3
<i>Fundulus notatus</i>	0	0	0	0	0	0	0	2
<i>Moxostoma macrolepidotum</i>	1	0	0	0	0	0	0	2
<i>Noturus gyrinus</i>	2	0	0	0	0	0	0	2
<i>Amia calva</i>	0	0	0	0	0	0	0	1
<i>Etheostoma blennioides</i>	1	0	0	0	0	0	0	1
<i>Ictalurus punctatus</i>	0	0	0	0	0	0	0	1
<i>Lepomis gibbosus</i>	0	0	0	0	0	0	0	1
<i>Lepomis</i> hybrid	0	0	0	0	0	0	0	1
<i>Morone chrysops</i>	1	0	0	0	0	0	0	1
<i>Morone</i> sp.	1	0	0	0	0	0	0	1
<i>Moxostoma</i> sp.	0	0	0	0	0	1	0	1
<i>Notropis heterolepis</i>	0	0	0	0	0	0	0	1
<b>Total</b>	<b>453</b>	<b>72</b>	<b>16</b>	<b>88</b>	<b>10</b>	<b>720</b>	<b>31</b>	<b>3570</b>

Table 2b. Fish assemblage results from the North Sydenham River (NSYD) obtained during targeted sampling for Pugnose Minnow in 2019 (Sites NSYD-01 to NSYD-10). Values are aggregate catch (raw abundance) from three consecutive trawls at each site. Species are listed in order from most to least abundant.

Species	NSYD01	NSYD02	NSYD03	NSYD04	NSYD05	NSYD06	NSYD07	NSYD08	NSYD09	NSYD10
<i>Notropis buchanani</i>	0	0	219	119	0	1	4827	199	192	42
<i>Dorosoma cepedianum</i>	72	509	85	5	40	94	620	16	3	2
<i>Labidesthes sicculus</i>	2	15	2	3	2	21	10	18	0	0
<i>Lepomis</i> sp.	0	2	24	29	17	2	0	0	0	0
<i>Pomoxis nigromaculatus</i>	2	0	1	0	2	0	1	0	0	0
<i>Pomoxis</i> sp.	0	0	0	0	0	0	0	0	0	0
<i>Notropis atherinoides</i>	0	0	0	1	0	0	16	3	0	2
<i>Lepomis macrochirus</i>	0	1	2	2	0	0	6	3	5	0
<i>Ictalurus punctatus</i>	0	0	0	0	0	0	0	0	0	0
<i>Notropis</i> sp.	0	0	0	0	0	0	0	0	0	0
<i>Morone americana</i>	0	1	1	1	0	0	0	0	0	0
<i>Notropis hudsonius</i>	0	1	4	2	0	0	0	0	0	0
<i>Cyprinella spiloptera</i>	0	0	0	0	0	0	0	0	0	0
Cyprinidae	1	0	0	0	0	1	0	0	0	0
<i>Micropterus salmoides</i>	0	0	1	1	1	0	0	0	0	0
<i>Pomoxis annularis</i>	0	0	0	0	0	0	0	0	0	0
<i>Fundulus notatus</i>	0	0	0	0	0	0	0	0	0	0
<i>Ameiurus natalis</i>	0	0	0	0	0	0	1	0	0	0
Centrarchidae	1	0	0	0	0	0	0	0	0	0
<i>Morone chrysops</i>	0	0	0	0	0	0	1	0	0	0
<i>Neogobius melanostomus</i>	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>78</b>	<b>529</b>	<b>339</b>	<b>163</b>	<b>62</b>	<b>119</b>	<b>5482</b>	<b>239</b>	<b>200</b>	<b>46</b>

Table 2b, continued. Fish assemblage results from the North Sydenham River (NSYD) obtained during targeted sampling for Pugnose Minnow in 2019 (Sites NSYD-11 to NSYD-18). Values are aggregate catch (raw abundance) from three consecutive trawls at each site. Species are listed in order from most to least abundant.

Species	NSYD11	NSYD12	NSYD13	NSYD14	NSYD15	NSYD16	NSYD17	NSYD18	Total
<i>Notropis buchanani</i>	87	467	81	29	320	1305	27	94	<b>8009</b>
<i>Dorosoma cepedianum</i>	9	64	380	36	5	6	2	0	<b>1948</b>
<i>Labidesthes sicculus</i>	16	0	10	8	3	1	9	1	<b>121</b>
<i>Lepomis</i> sp.	0	3	1	30	5	2	0	2	<b>117</b>
<i>Pomoxis nigromaculatus</i>	0	5	23	51	0	0	0	0	<b>85</b>
<i>Pomoxis</i> sp.	0	29	2	45	0	0	0	0	<b>76</b>
<i>Notropis atherinoides</i>	3	0	2	0	11	2	2	1	<b>43</b>
<i>Lepomis macrochirus</i>	0	1	1	4	0	4	1	1	<b>31</b>
<i>Ictalurus punctatus</i>	2	1	0	0	0	8	0	1	<b>12</b>
<i>Notropis</i> sp.	0	11	1	0	0	0	0	0	<b>12</b>
<i>Morone americana</i>	0	5	2	0	0	0	0	0	<b>10</b>
<i>Notropis hudsonius</i>	0	0	2	0	0	0	0	0	<b>9</b>
<i>Cyprinella spiloptera</i>	2	1	0	0	0	2	0	1	<b>6</b>
Cyprinidae	0	0	0	1	0	0	0	3	<b>6</b>
<i>Micropterus salmoides</i>	0	0	2	1	0	0	0	0	<b>6</b>
<i>Pomoxis annularis</i>	0	2	0	1	0	1	0	0	<b>4</b>
<i>Fundulus notatus</i>	0	0	1	2	0	0	0	0	<b>3</b>
<i>Ameiurus natalis</i>	0	0	0	0	0	1	0	0	<b>2</b>
Centrarchidae	0	0	0	0	0	0	0	0	<b>1</b>
<i>Morone chrysops</i>	0	0	0	0	0	0	0	0	<b>1</b>
<i>Neogobius melanostomus</i>	0	0	1	0	0	0	0	0	<b>1</b>
<b>Total</b>	<b>119</b>	<b>589</b>	<b>509</b>	<b>208</b>	<b>344</b>	<b>1332</b>	<b>41</b>	<b>104</b>	<b>10503</b>

Table 2c. Fish assemblage results from the Chenail Ecarte (CH) obtained during targeted sampling for Pugnose Minnow in 2019 (Sites CH-01 to CH-10). Values are aggregate catch (raw abundance) from three consecutive trawls at each site. Species are listed in order from most to least abundant.

Species	CH01	CH02	CH03	CH04	CH05	CH06	CH07	CH08	CH09	CH10
<i>Notropis buchanani</i>	4	0	1	0	11	0	19	35	1746	0
<i>Perca flavescens</i>	68	10	45	95	59	49	19	21	88	12
<i>Labidesthes sicculus</i>	0	4	10	44	34	61	33	42	86	51
<i>Notropis anogenus</i>	20	21	45	43	15	2	13	0	3	1
<i>Notropis hudsonius</i>	20	0	8	29	39	0	8	17	12	34
<i>Ambloplites rupestris</i>	2	2	0	13	8	0	18	0	67	0
<i>Lepomis</i> sp.	2	5	11	12	39	0	18	0	9	0
<i>Notropis atherinoides</i>	0	0	0	3	27	4	20	4	16	40
<i>Lepomis macrochirus</i>	4	24	22	8	5	2	10	0	4	0
<i>Proterorhinus semilunaris</i>	1	10	0	5	2	1	8	0	38	0
<i>Micropterus salmoides</i>	2	15	12	3	6	0	2	0	1	0
<i>Dorosoma cepedianum</i>	3	1	1	8	13	0	10	27	4	0
<i>Pimephales notatus</i>	0	0	1	0	1	0	0	0	0	0
Cyprinidae	0	0	0	0	16	0	0	0	0	0
<i>Notropis</i> sp.	0	0	12	0	0	0	0	0	1	0
<i>Notemigonus crysoleucas</i>	3	8	0	0	0	0	0	0	0	0
<i>Notropis heterolepis</i>	9	0	0	0	0	0	0	0	0	0
<i>Pomoxis nigromaculatus</i>	0	0	0	0	0	0	0	0	0	0
<i>Ameiurus nebulosus</i>	0	0	3	0	0	0	0	0	0	0
<i>Esox lucius</i>	1	0	0	0	2	0	0	0	3	0
<i>Ameiurus</i> sp.	0	0	4	0	0	0	0	0	0	0
<i>Notropis volucellus</i>	0	0	0	0	0	0	0	0	0	0
Centrarchidae	0	0	0	0	0	0	0	0	0	0
<i>Micropterus dolomieu</i>	1	0	0	1	0	0	1	0	1	0
<i>Lepomis cyanellus</i>	0	0	0	0	0	0	0	0	0	0
<i>Percina caprodes</i>	0	0	0	0	0	0	1	0	2	0
<i>Cyprinella spiloptera</i>	0	0	0	0	0	0	0	0	0	0
<i>Ictalurus punctatus</i>	0	0	0	0	0	0	0	2	0	0
<i>Morone americana</i>	0	0	0	0	0	0	1	0	1	0
<i>Nocomis biguttatus</i>	0	0	0	0	0	0	0	0	0	0
<i>Noturus gyrinus</i>	0	0	0	0	0	0	2	0	0	0
<i>Percina maculata</i>	0	0	0	0	0	0	0	1	1	0
<i>Fundulus notatus</i>	1	0	0	0	0	0	0	0	0	0
<i>Lepomis gibbosus</i>	0	0	0	0	1	0	0	0	0	0
<i>Lepomis</i> hybrid	0	0	0	0	0	0	0	0	0	0
<i>Morone chrysops</i>	0	0	0	0	0	0	0	1	0	0
<i>Neogobius melanostomus</i>	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>141</b>	<b>100</b>	<b>175</b>	<b>264</b>	<b>278</b>	<b>119</b>	<b>183</b>	<b>150</b>	<b>2083</b>	<b>138</b>



Table 2c, continued. Fish assemblage results from the Chenail Ecarte (CH) obtained during targeted sampling for Pugnose Minnow in 2019 (Sites CH-11 to CH-20). Values are aggregate catch (raw abundance) from three consecutive trawls at each site. Species are listed in order from most to least abundant.

Species	CH11	CH12	CH13	CH14	CH15	CH16	CH17	CH18	CH19	CH20	Total
<i>Notropis buchanani</i>	0	0	0	0	0	0	0	0	0	0	1816
<i>Perca flavescens</i>	0	38	33	3	0	0	13	3	19	0	575
<i>Labidesthes sicculus</i>	48	19	7	1	5	15	0	4	0	0	464
<i>Notropis anogenus</i>	0	29	2	0	0	0	2	0	59	0	255
<i>Notropis hudsonius</i>	0	16	6	0	0	0	0	1	9	0	199
<i>Ambloplites rupestris</i>	0	0	17	0	0	0	9	4	3	0	143
<i>Lepomis</i> sp.	0	12	0	0	0	0	0	0	18	1	127
<i>Notropis atherinoides</i>	8	0	0	0	1	0	0	0	0	0	123
<i>Lepomis macrochirus</i>	0	2	0	0	0	0	0	0	29	0	110
<i>Proterorhinus</i>	0	0	16	1	0	0	2	2	3	5	94
<i>Micropterus salmoides</i>	0	11	3	1	0	0	2	1	13	0	72
<i>Dorosoma cepedianum</i>	2	0	0	0	0	0	0	0	0	0	69
<i>Pimephales notatus</i>	0	0	0	0	0	0	3	5	13	0	23
Cyprinidae	0	0	0	0	0	1	0	0	0	0	17
<i>Notropis</i> sp.	0	0	0	0	0	0	0	0	0	0	13
<i>Notemigonus</i>	0	0	0	0	0	0	0	0	1	0	12
<i>Notropis heterolepis</i>	0	0	0	0	0	0	0	0	0	0	9
<i>Pomoxis nigromaculatus</i>	0	0	0	0	0	0	0	0	9	0	9
<i>Ameiurus nebulosus</i>	0	0	5	0	0	0	0	0	0	0	8
<i>Esox lucius</i>	0	0	0	0	0	0	1	0	0	0	7
<i>Ameiurus</i> sp.	0	0	2	0	0	0	0	0	0	0	6
<i>Notropis volucellus</i>	0	0	0	0	0	0	0	0	6	0	6
Centrarchidae	0	0	4	0	0	0	0	0	0	0	4
<i>Micropterus dolomieu</i>	0	0	0	0	0	0	0	0	0	0	4
<i>Lepomis cyanellus</i>	0	0	1	0	0	0	0	0	2	0	3
<i>Percina caprodes</i>	0	0	0	0	0	0	0	0	0	0	3
<i>Cyprinella spiloptera</i>	2	0	0	0	0	0	0	0	0	0	2
<i>Ictalurus punctatus</i>	0	0	0	0	0	0	0	0	0	0	2
<i>Morone americana</i>	0	0	0	0	0	0	0	0	0	0	2
<i>Nocomis biguttatus</i>	0	0	0	0	0	0	0	2	0	0	2
<i>Noturus gyrinus</i>	0	0	0	0	0	0	0	0	0	0	2
<i>Percina maculata</i>	0	0	0	0	0	0	0	0	0	0	2
<i>Fundulus notatus</i>	0	0	0	0	0	0	0	0	0	0	1
<i>Lepomis gibbosus</i>	0	0	0	0	0	0	0	0	0	0	1
<i>Lepomis</i> hybrid	0	0	0	0	0	0	0	0	1	0	1
<i>Morone chrysops</i>	0	0	0	0	0	0	0	0	0	0	1
<i>Neogobius</i>	0	0	0	0	0	0	0	0	1	0	1
<b>Total</b>	<b>60</b>	<b>127</b>	<b>96</b>	<b>6</b>	<b>6</b>	<b>16</b>	<b>32</b>	<b>22</b>	<b>186</b>	<b>6</b>	<b>4188</b>

Table 2d. Fish assemblage results from Little Bear Creek (LBC), Maxwell Creek (MXC) and the lower Sydenham River (SYD) obtained during targeted sampling for Pugnose Minnow in 2019. Values are aggregate catch (raw abundance) from three consecutive trawls at each site. Species are listed in order from most to least abundant.

Species	MXC01	MXC02	LBC01	SYD01	SYD02	SYD03	SYD04	Total
<i>Notropis buchanaui</i>	16	0	2	1261	6	15	0	1300
<i>Dorosoma cepedianum</i>	14	2	33	255	34	0	163	501
<i>Lepomis</i> sp.	4	3	7	0	0	15	316	345
<i>Lepomis macrochirus</i>	95	86	81	17	1	3	8	291
<i>Labidesthes sicculus</i>	89	31	53	49	9	39	0	270
Cyprinidae	0	0	0	1	0	132	0	133
<i>Notropis anogenus</i>	52	1	38	0	0	0	0	91
<i>Notropis hudsonius</i>	16	7	7	0	5	4	26	65
<i>Micropterus salmoides</i>	7	4	7	4	2	0	27	51
<i>Perca flavescens</i>	17	4	13	1	0	0	5	40
<i>Pimephales notatus</i>	20	2	2	1	0	0	0	25
<i>Notropis atherinoides</i>	5	0	2	12	1	4	0	24
<i>Pomoxis nigromaculatus</i>	1	2	3	0	1	0	13	20
<i>Percina caprodes</i>	0	0	1	0	1	0	6	8
<i>Lepomis gibbosus</i>	0	1	2	0	0	0	0	3
<i>Notemigonus crysoleucas</i>	2	0	1	0	0	0	0	3
<i>Ambloplites rupestris</i>	0	0	0	0	0	0	2	2
<i>Morone americana</i>	0	0	0	1	0	0	1	2
<i>Proterorhinus semilunaris</i>	0	0	0	2	0	0	0	2
<i>Cyprinella spiloptera</i>	0	1	0	0	0	0	0	1
<i>Morone</i> sp.	0	0	0	1	0	0	0	1
<i>Moxostoma macrolepidotum</i>	1	0	0	0	0	0	0	1
<i>Noturus gyrinus</i>	0	1	0	0	0	0	0	1
<i>Pomoxis annularis</i>	0	0	0	1	0	0	0	1
<b>Total</b>	<b>339</b>	<b>145</b>	<b>252</b>	<b>1606</b>	<b>60</b>	<b>212</b>	<b>567</b>	<b>3181</b>

Table 3. Summary of Blackstripe Topminnow (*Fundulus diaphanus*) and Pugnose Shiner (*Notropis anogenus*) captures from targeted sampling of Pugnose Minnow in the St. Clair River and lower Sydenham River in 2019.

Site Code	Sampling Date	Species	Waterbody Name	Latitude	Longitude	Number Captured	Minimum TL (mm)	Maximum TL (mm)
CH01	20-08-19	<i>Notropis anogenus</i>	Chenail Ecarte	42.48834	-82.43476	20	23	64
CH02	20-08-19	<i>Notropis anogenus</i>	Chenail Ecarte	42.49953	-82.44081	21	47	56
CH03	20-08-19	<i>Notropis anogenus</i>	Chenail Ecarte	42.50774	-82.43584	45	24	30
CH04	14-08-19	<i>Notropis anogenus</i>	Chenail Ecarte	42.51510	-82.41716	43	25	58
CH05	20-08-19	<i>Notropis anogenus</i>	Chenail Ecarte	42.51529	-82.43163	15	25	55
CH06	14-08-19	<i>Notropis anogenus</i>	Chenail Ecarte	42.51805	-82.41393	2	52	57
CH07	20-08-19	<i>Notropis anogenus</i>	Chenail Ecarte	42.52860	-82.40342	13	29	55
CH09	21-08-19	<i>Notropis anogenus</i>	Chenail Ecarte	42.55186	-82.41935	3	27	57
CH10	14-08-19	<i>Notropis anogenus</i>	Chenail Ecarte	42.55922	-82.41794	1	*	54
CH12	14-08-19	<i>Notropis anogenus</i>	Chenail Ecarte	42.55995	-82.41992	29	17	48
CH13	13-08-19	<i>Notropis anogenus</i>	Chenail Ecarte	42.57367	-82.42911	2	45	50
CH17	15-08-19	<i>Notropis anogenus</i>	Chenail Ecarte	42.59460	-82.47581	2	20	52
CH19	13-08-19	<i>Notropis anogenus</i>	Chenail Ecarte	42.62356	-82.48006	59	43	57
LBC01	21-08-19	<i>Notropis anogenus</i>	Little Bear Creek	42.53135	-82.40004	38	35	53
MXC01	21-08-19	<i>Notropis anogenus</i>	Maxwell Creek	42.53226	-82.40009	52	28	54
MXC02	21-08-19	<i>Notropis anogenus</i>	Maxwell Creek	42.53400	-82.39613	1	*	23
CH01	20-08-19	<i>Fundulus notatus</i>	Chenail Ecarte	42.48834	-82.43476	1	*	64
ESYD0	20-08-19	<i>Fundulus notatus</i>	East Sydenham River	42.58565	-82.23992	1	*	42
ESYD0	22-08-19	<i>Fundulus notatus</i>	East Sydenham River	42.59156	-82.19894	1	*	43
NSYD1	01-08-19	<i>Fundulus notatus</i>	North Sydenham River	42.69232	-82.40293	1	*	28
NSYD1	01-08-19	<i>Fundulus notatus</i>	North Sydenham River	42.69808	-82.38754	2	27	33

\*Not measured

Table 4a. Summary of aquatic habitat data for the East Sydenham River (ESYD) obtained during targeted sampling for Pugnose Minnow in 2019.

Site Code	Air Temp (°C)	Water Temp (°C)	Conductivity (µS)	Dissolved Oxygen (mg/L)	Secchi Tube (m)	Turbidity (NTU)	Mean Depth (m)	Mean Velocity (m/sec)
ESYD01	29.7	26.2	586.00	8.49	0.35	18.75	1.27	0.000
ESYD02	30.0	25.8	572.00	9.46	0.33	13.95	1.93	0.000
ESYD03	30.0	25.7	580.00	7.14	0.39	19.07	2.17	0.000
ESYD04	29.8	26.0	585.00	7.73	0.30	20.89	2.00	0.000
ESYD05	31.7	26.0	571.00	8.71	0.34	14.12	1.93	0.000
ESYD06	27.8	25.7	565.00	9.10	0.37	11.76	1.50	0.000
ESYD07	26.5	25.5	564.00	8.24	0.40	10.95	2.60	0.000
ESYD08	21.9	24.7	438.80	5.47	0.12	53.22	1.93	0.000
ESYD09	20.5	24.6	439.60	5.57	0.11	52.94	1.37	0.000
ESYD10	30.5	27.1	492.20	8.30	0.27	51.17	1.21	0.007
ESYD11	26.5	26.9	498.30	8.48	0.26	13.40	2.58	0.010
ESYD12	29.4	27.6	5.03	8.18	0.39	12.60	2.70	*
ESYD13	23.6	26.0	459.30	6.93	0.26	15.06	2.23	0.020
ESYD14	31.0	27.0	498.00	8.70	0.22	14.72	2.47	0.010
ESYD15	32.7	27.6	505.00	9.02	0.39	17.70	1.93	*
ESYD16	24.4	25.7	553.00	9.28	0.41	9.85	1.77	0.000
<b>Min</b>	<b>20.5</b>	<b>24.6</b>	<b>5.03</b>	<b>5.47</b>	<b>0.11</b>	<b>9.85</b>	<b>1.21</b>	<b>0.000</b>
<b>Mean</b>	<b>27.9</b>	<b>26.1</b>	<b>494.51</b>	<b>8.05</b>	<b>0.31</b>	<b>21.88</b>	<b>1.97</b>	<b>0.003</b>
<b>Max</b>	<b>32.7</b>	<b>27.6</b>	<b>586.00</b>	<b>9.46</b>	<b>0.41</b>	<b>53.22</b>	<b>2.70</b>	<b>0.020</b>

\*Not Measured

Table 4b. Summary of aquatic habitat data for the North Sydenham River (NSYD) obtained during targeted sampling for Pugnose Minnow in 2019.

Site Code	Air Temp (°C)	Water Temp (°C)	Conductivity (µS)	Dissolved Oxygen (mg/L)	Secchi Tube (m)	Turbidity (NTU)	Mean Depth (m)	Mean Velocity (m/sec)
NSYD01	26.6	26.1	377.90	6.96	0.28	29.94	1.60	0.000
NSYD02	23.3	26.0	378.00	6.55	0.25	23.74	1.87	*
NSYD03	25.9	26.3	406.30	6.80	0.20	34.12	1.43	*
NSYD04	22.3	26.0	406.10	6.33	0.20	30.66	1.37	*
NSYD05	24.5	25.3	409.90	4.78	0.32	23.17	1.30	*
NSYD06	25.1	26.1	425.90	5.51	0.27	18.56	1.50	*
NSYD07	27.3	24.1	290.10	2.37	0.07	93.85	1.67	0.000
NSYD08	31.3	23.3	221.00	4.95	0.07	163.36	1.13	0.000
NSYD09	27.6	23.1	219.80	4.94	0.10	143.22	1.67	0.000
NSYD10	25.3	23.0	219.60	4.99	0.14	144.67	1.90	0.120
NSYD11	21.8	23.0	217.60	5.20	0.08	152.00	1.77	0.337
NSYD12	21.4	24.6	439.00	9.29	0.20	38.70	1.33	0.140
NSYD13	29.7	25.0	446.40	8.43	0.18	49.30	1.60	*
NSYD14	27.2	25.3	431.30	9.35	0.17	45.60	1.37	*
NSYD15	25.5	22.4	254.70	5.63	0.03	420.61	1.57	0.095
NSYD16	26.4	22.5	275.90	5.51	0.07	406.91	1.53	0.470
NSYD17	34.2	22.7	279.50	5.60	0.05	442.06	1.37	0.077
NSYD18	28.4	22.3	218.80	5.39	0.03	425.21	1.80	0.063
<b>Min</b>	<b>21.4</b>	<b>22.3</b>	<b>217.60</b>	<b>2.37</b>	<b>0.03</b>	<b>18.56</b>	<b>1.13</b>	<b>0.000</b>
<b>Mean</b>	<b>26.3</b>	<b>24.3</b>	<b>328.77</b>	<b>6.03</b>	<b>0.15</b>	<b>149.20</b>	<b>1.54</b>	<b>0.118</b>
<b>Max</b>	<b>34.2</b>	<b>26.3</b>	<b>446.40</b>	<b>9.35</b>	<b>0.32</b>	<b>442.06</b>	<b>1.90</b>	<b>0.470</b>

\*Not measured

Table 4c. Summary of aquatic habitat data for the Chenail Ecarte (CH) obtained during targeted sampling for Pugnose Minnow in 2019.

Site Code	Air Temp. (°C)	Water Temp. (°C)	Conductivity (µS)	Dissolved Oxygen (mg/L)	Secchi Tube (m)	Turbidity (ntu)	Mean Depth (m)	Mean Velocity (m/sec)
CH01	28.8	24.7	299.50	5.94	0.28	16.35	1.20	0.000
CH02	31.7	25.1	291.10	5.89	0.45	8.16	1.07	0.000
CH03	30.4	25.8	301.90	7.00	0.41	16.89	0.73	0.000
CH04	23.6	23.5	221.50	7.85	0.65	8.13	0.90	0.033
CH05	36.9	25.5	315.70	5.48	0.14	58.59	0.83	0.020
CH06	23.4	23.9	219.00	9.14	0.49	6.23	1.23	0.027
CH07	35.6	25.0	277.50	5.47	0.15	94.00	0.90	0.040
CH08	28.5	24.9	261.50	5.46	0.10	86.20	0.90	0.000
CH09	27.6	24.7	256.10	5.99	0.10	95.34	0.90	0.000
CH10	33.7	23.9	213.30	8.20	0.64	6.54	1.40	0.000
CH11	28.6	24.9	276.20	6.50	0.40	20.98	1.47	0.025
CH12	29.6	24.7	214.70	9.34	0.79	5.56	0.87	0.063
CH13	28.8	24.0	211.50	8.94	0.85	10.26	0.77	0.080
CH14	28.9	24.0	213.10	8.45	0.90	4.65	1.17	0.150
CH15	29.0	24.7	214.20	8.99	0.90	5.56	1.57	0.133
CH16	29.1	24.1	212.40	8.61	0.97	2.18	1.55	0.047
CH17	22.1	23.0	211.00	7.44	0.76	1.76	1.33	0.000
CH18	23.4	23.1	210.50	8.57	0.76	3.25	1.30	0.000
CH19	24.3	23.4	210.20	8.70	1.05	1.76	0.97	0.030
CH20	24.4	22.4	215.60	6.18	0.97	2.98	1.10	0.037
<b>Min</b>	<b>22.1</b>	<b>22.4</b>	<b>210.20</b>	<b>5.46</b>	<b>0.10</b>	<b>1.76</b>	<b>0.73</b>	<b>0.000</b>
<b>Mean</b>	<b>28.4</b>	<b>24.3</b>	<b>242.33</b>	<b>7.41</b>	<b>0.59</b>	<b>22.77</b>	<b>1.11</b>	<b>0.034</b>
<b>Max</b>	<b>36.9</b>	<b>25.8</b>	<b>315.70</b>	<b>9.34</b>	<b>1.05</b>	<b>95.34</b>	<b>1.57</b>	<b>0.150</b>

Table 4d. Summary of aquatic habitat data for the lower Sydenham River (SYD) obtained during targeted sampling for Pugnose Minnow in 2019.

Site Code	Air Temp. (°C)	Water Temp. (°C)	Conductivity (µS)	Dissolved Oxygen (mg/L)	Secchi Tube (m)	Turbidity (ntu)	Mean Depth (m)	Mean Velocity (m/sec)
SYD01	27.2	26.5	306.4	4.67	0.09	26.9	1.20	0.077
SYD02	26.1	27.1	403.7	5.26	0.35	21.72	1.20	0.000
SYD03	26.7	27.4	438.4	5.77	0.23	21.8	1.40	0.000
SYD04	31.6	26.8	348.2	9.32	0.37	18.04	1.87	0.000
<b>Min</b>	<b>26.1</b>	<b>26.5</b>	<b>306.40</b>	<b>4.67</b>	<b>0.09</b>	<b>18.04</b>	<b>1.20</b>	<b>0.000</b>
<b>Mean</b>	<b>27.9</b>	<b>27</b>	<b>374.18</b>	<b>6.26</b>	<b>0.26</b>	<b>22.12</b>	<b>1.42</b>	<b>0.019</b>
<b>Max</b>	<b>31.6</b>	<b>27.4</b>	<b>438.40</b>	<b>9.32</b>	<b>0.37</b>	<b>26.90</b>	<b>1.87</b>	<b>0.077</b>

Table 4e. Summary of aquatic habitat data for Little Bear Creek (LBC) and Maxwell Creek (MXC) obtained during targeted sampling for Pugnose Minnow in 2019.

Site Code	Air Temp. (°C)	Water Temp. (°C)	Conductivity (µS)	Dissolved Oxygen (mg/L)	Secchi Tube (m)	Turbidity (ntu)	Mean Depth (m)	Mean Velocity (m/sec)
LBC01	30.7	26.0	357.00	7.87	0.38	14.70	1.00	0.00
MXC01	25.9	25.2	271.10	6.53	0.36	13.98	1.00	0.00
MXC02	25.4	25.2	269.80	5.49	0.40	17.34	1.05	0.00

Table 5a. Summary of substrate data (% composition by category) for the East Sydenham River (ESYD) obtained during targeted sampling for Pugnose Minnow in 2019.

Site Code	Organic	Clay	Silt	Sand	Gravel
ESYD01	20	40	40	0	0
ESYD02	15	50	35	0	0
ESYD03	10	10	80	0	0
ESYD04	40	35	25	0	0
ESYD05	10	20	60	0	10
ESYD06	0	10	30	10	50
ESYD07	10	5	85	0	0
ESYD08	20	0	40	40	0
ESYD09	40	0	30	30	0
ESYD10	40	0	60	0	0
ESYD11	10	70	20	0	0
ESYD12	10	30	60	0	0
ESYD13	5	5	90	0	0
ESYD14	5	5	90	0	0
ESYD15	5	5	90	0	0
ESYD16	30	50	20	0	0
<b>Min</b>	<b>0.00</b>	<b>0.00</b>	<b>20.00</b>	<b>0.00</b>	<b>0.00</b>
<b>Mean</b>	<b>16.88</b>	<b>20.94</b>	<b>53.44</b>	<b>5.00</b>	<b>3.75</b>
<b>Max</b>	<b>40.00</b>	<b>70.00</b>	<b>90.00</b>	<b>40.00</b>	<b>50.00</b>



*Table 5b. Summary of substrate data (% composition by category) for the North Sydenham River (NSYD) obtained during targeted sampling for Pugnose Minnow in 2019.*

<b>Site Code</b>	<b>Organic</b>	<b>Clay</b>	<b>Silt</b>	<b>Sand</b>	<b>Gravel</b>	<b>Rubble</b>
NSYD01	10	20	65	0	5	0
NSYD02	15	10	65	0	5	5
NSYD03	20	5	70	0	5	0
NSYD04	40	20	20	0	0	0
NSYD05	0	5	95	0	0	0
NSYD06	10	5	80	0	5	0
NSYD07	10	0	90	0	0	0
NSYD08	35	0	65	0	0	0
NSYD09	5	0	95	0	0	0
NSYD10	10	5	75	0	10	0
NSYD11	20	40	40	0	0	0
NSYD12	0	20	80	0	0	0
NSYD13	5	45	50	0	0	0
NSYD14	10	0	90	0	0	0
NSYD15	10	10	80	0	0	0
NSYD16	10	50	40	0	0	0
NSYD17	20	20	60	0	0	0
NSYD18	20	20	60	0	0	0
<b>Min</b>	<b>0.00</b>	<b>0.00</b>	<b>20.00</b>	<b>0.00</b>	<b>0.00</b>	<b>-</b>
<b>Mean</b>	<b>13.89</b>	<b>15.28</b>	<b>67.78</b>	<b>0.00</b>	<b>1.67</b>	<b>-</b>
<b>Max</b>	<b>40.00</b>	<b>50.00</b>	<b>95.00</b>	<b>0.00</b>	<b>10.00</b>	<b>-</b>

Table 5c. Summary of substrate data (% composition by category) for the Chenail Ecarte (CH) obtained during targeted sampling for Pugnose Minnow in 2019.

Site Code	Organic	Clay	Silt	Sand	Boulder
CH01	30	0	70	0	0
CH02	10	5	85	0	0
CH03	10	0	85	5	0
CH04	0	0	80	20	0
CH05	10	10	80	0	0
CH06	5	0	95	0	0
CH07	10	0	50	40	0
CH08	10	0	90	0	0
CH09	30	0	70	0	0
CH10	5	0	95	0	0
CH11	20	0	80	0	0
CH12	0	5	95	0	0
CH13	0	0	90	0	10
CH14	0	0	90	10	0
CH15	0	0	80	20	0
CH16	5	20	65	0	10
CH17	0	0	60	40	0
CH18	10	0	60	30	0
CH19	0	0	90	5	5
CH20	5	0	90	5	0
<b>Min</b>	<b>0.00</b>	<b>0.00</b>	<b>50.00</b>	<b>0.00</b>	<b>0.00</b>
<b>Mean</b>	<b>8.00</b>	<b>2.00</b>	<b>80.00</b>	<b>8.75</b>	<b>1.25</b>
<b>Max</b>	<b>30.00</b>	<b>20.00</b>	<b>95.00</b>	<b>40.00</b>	<b>10.00</b>

*Table 5d. Summary of substrate data (% composition by category) for the lower Sydenham River (SYD) obtained during targeted sampling for Pugnose Minnow in 2019.*

<b>Site Code</b>	<b>Organic</b>	<b>Clay</b>	<b>Silt</b>	<b>Sand</b>	<b>Gravel</b>	<b>Unknown</b>
SYD01	50	0	50	0	0	0
SYD02	0	0	0	0	0	100
SYD03	0	0	95	5	0	0
SYD04	5	5	85	0	5	0
<b>Min</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
<b>Mean</b>	<b>13.75</b>	<b>1.25</b>	<b>57.50</b>	<b>1.25</b>	<b>1.25</b>	<b>25.00</b>
<b>Max</b>	<b>50.00</b>	<b>5.00</b>	<b>95.00</b>	<b>5.00</b>	<b>5.00</b>	<b>100.00</b>

*Table 5e. Summary of substrate habitat data (% composition by category) for Little Bear Creek (LBC) and Maxwell Creek (MXC) obtained during targeted sampling for Pugnose Minnow in 2019.*

<b>Site Code</b>	<b>Organic</b>	<b>Clay</b>	<b>Silt</b>	<b>Sand</b>
LBC01	20	0	40	40
MXC01	50	0	50	0
MXC02	55	0	40	5

Table 6a. Summary of aquatic macrophyte classification data (% composition by category) and dominant aquatic macrophyte genera from the East Sydenham River (ESYD) obtained during targeted sampling for Pugnose Minnow in 2019.

Site Code	Emergent	Floating	Submerged	Open Water	Dominant Class	Dominant Genera
ESYD01	40	30	0	30	Emergent	<i>Nuphar</i> sp.
ESYD02	0	0	0	100	Open Water	Undetermined
ESYD03	0	20	0	80	Open Water	Undetermined
ESYD04	10	15	0	75	Open Water	<i>Nymphaea</i> sp.
ESYD05	0	40	0	60	Open Water	<i>Nuphar</i> sp.
ESYD06	0	30	0	70	Open Water	<i>Nymphaea</i> sp.
ESYD07	0	0	0	100	Open Water	Undetermined
ESYD08	10	0	60	30	Submerged	<i>Potamogeton</i> sp.
ESYD09	5	0	40	55	Open Water	<i>Potamogeton</i> sp.
ESYD10	0	0	40	60	Open Water	<i>Vallisneria</i> sp.
ESYD11	0	0	0	100	Open Water	Undetermined
ESYD12	0	35	10	55	Open Water	<i>Nuphar</i> sp.
ESYD13	5	5	30	60	Open Water	<i>Vallisneria</i> sp.
ESYD14	0	0	0	100	Open Water	Undetermined
ESYD15	5	15	10	70	Open Water	<i>Nuphar</i> sp.
ESYD16	0	30	0	70	Open Water	<i>Nymphaea</i> sp.
<b>Min</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>30.00</b>		
<b>Mean</b>	<b>4.69</b>	<b>13.75</b>	<b>11.88</b>	<b>69.69</b>		
<b>Max</b>	<b>40.00</b>	<b>40.00</b>	<b>60.00</b>	<b>100.00</b>		

Table 6b. Summary of aquatic macrophyte classification data (% composition by category) and dominant aquatic macrophyte genera from the North Sydenham River (NSYD) obtained during targeted sampling for Pugnose Minnow in 2019.

Site Code	Emergent	Floating	Submerged	Open Water	Dominant Class	Dominant Genera
NSYD01	5	5	5	85	Open Water	<i>Potamogeton</i> sp.
NSYD02	5	0	5	90	Open Water	<i>Potamogeton</i> sp.
NSYD03	10	15	15	60	Open Water	<i>Nymphaea</i> sp.
NSYD04	10	0	20	70	Open Water	<i>Potamogeton</i> sp.
NSYD05	10	10	20	60	Open Water	<i>Phragmites</i> sp.
NSYD06	0	0	5	95	Open Water	<i>Potamogeton</i> sp.
NSYD07	0	10	0	90	Open Water	<i>Nymphaea</i> sp.
NSYD08	0	0	0	100	Open Water	<i>Phragmites</i> sp.
NSYD09	0	10	0	90	Open Water	<i>Nymphaea</i> sp.
NSYD10	5	0	0	95	Open Water	<i>Phragmites</i> sp.
NSYD11	0	5	10	85	Open Water	<i>Phragmites</i> sp.
NSYD12	5	5	30	60	Open Water	<i>Ceratophyllum</i> sp.
NSYD13	0	5	10	85	Open Water	<i>Nymphaea</i> sp.
NSYD14	0	30	0	70	Open Water	<i>Nuphar</i> sp.
NSYD15	0	20	0	80	Open Water	<i>Lemna</i> sp.
NSYD16	0	10	0	90	Open Water	<i>Nuphar</i> sp.
NSYD17	5	0	5	90	Open Water	<i>Potamogeton</i> sp.
NSYD18	0	10	10	80	Open Water	<i>Nymphaea</i> sp.
<b>Min</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>60.00</b>		
<b>Mean</b>	<b>3.06</b>	<b>7.50</b>	<b>7.50</b>	<b>81.94</b>		
<b>Max</b>	<b>10.00</b>	<b>30.00</b>	<b>30.00</b>	<b>100.00</b>		

Table 6c. Summary of aquatic macrophyte classification data (% composition by category) and dominant aquatic macrophyte genera for the Chenail Ecarte (CH) obtained during targeted sampling for Pugnose Minnow in 2019.

Site Code	Emergent	Floating	Submerged	Open Water	Dominant Class	Dominant Genera
CH01	0	0	60	40	Submerged	<i>Vallisneria</i> sp.
CH02	10	0	80	10	Submerged	<i>Myriophyllum</i> sp.
CH03	0	0	90	10	Submerged	<i>Myriophyllum</i> sp.
CH04	10	5	50	35	Submerged	<i>Vallisneria</i> sp.
CH05	0	0	75	25	Submerged	<i>Myriophyllum</i> sp.
CH06	5	10	45	40	Submerged	<i>Vallisneria</i> sp.
CH07	30	0	40	30	Submerged	<i>Vallisneria</i> sp.
CH08	5	0	95	0	Submerged	<i>Vallisneria</i> sp.
CH09	0	0	100	0	Submerged	<i>Vallisneria</i> sp.
CH10	5	0	30	55	Open Water	<i>Vallisneria</i> sp.
CH11	0	0	40	60	Open Water	<i>Vallisneria</i> sp.
CH12	5	0	60	35	Submerged	<i>Vallisneria</i> sp.
CH13	30	0	60	10	Submerged	<i>Elodea</i> sp.
CH14	20	0	75	5	Submerged	<i>Elodea</i> sp.
CH15	10	0	50	40	Submerged	<i>Vallisneria</i> sp.
CH16	30	0	20	50	Open Water	<i>Potamogeton</i> sp.
CH17	10	0	90	0	Submerged	<i>Vallisneria</i> sp.
CH18	5	5	80	10	Submerged	<i>Vallisneria</i> sp.
CH19	20	0	75	5	Submerged	<i>Vallisneria</i> sp.
CH20	10	5	50	35	Submerged	<i>Vallisneria</i> sp.
<b>Min</b>	<b>0.00</b>	<b>0.00</b>	<b>20.00</b>	<b>0.00</b>		
<b>Mean</b>	<b>10.25</b>	<b>1.25</b>	<b>63.25</b>	<b>24.75</b>		
<b>Max</b>	<b>30.00</b>	<b>10.00</b>	<b>100.00</b>	<b>60.00</b>		

Table 6d. Summary of aquatic macrophyte classification data (% composition by category) and dominant aquatic macrophyte genera for the lower Sydenham River (SYD) obtained during targeted sampling for Pugnose Minnow in 2019.

Site Code	Emergent	Floating	Submerged	Open Water	Dominant Class	Dominant Genera
SYD01	20	0	60	20	Submerged	<i>Vallisneria</i> sp.
SYD02	0	0	20	80	Open Water	Undetermined
SYD03	0	10	20	70	Open Water	<i>Nymphaea</i> sp.
SYD04	0	0	40	60	Open Water	<i>Vallisneria</i> sp.
<b>Min</b>	<b>0.00</b>	<b>0.00</b>	<b>20.00</b>	<b>20.00</b>		
<b>Mean</b>	<b>5.00</b>	<b>2.50</b>	<b>35.00</b>	<b>57.50</b>		
<b>Max</b>	<b>20.00</b>	<b>10.00</b>	<b>60.00</b>	<b>80.00</b>		

Table 6e. Summary of aquatic macrophyte classification data (% composition by category) and dominant aquatic macrophyte genera for Little Bear Creek (LBC) and Maxwell Creek (MXC) obtained during targeted sampling for Pugnose Minnow in 2019.

Site Code	Emergent	Floating	Submerged	Open Water	Dominant Class	Dominant Genera
MXC01	0	15	60	25	Submerged	<i>Vallisneria</i> sp.
MXC02	0	5	75	20	Submerged	<i>Vallisneria</i> sp.
LBC01	5	0	75	20	Submerged	<i>Vallisneria</i> sp.

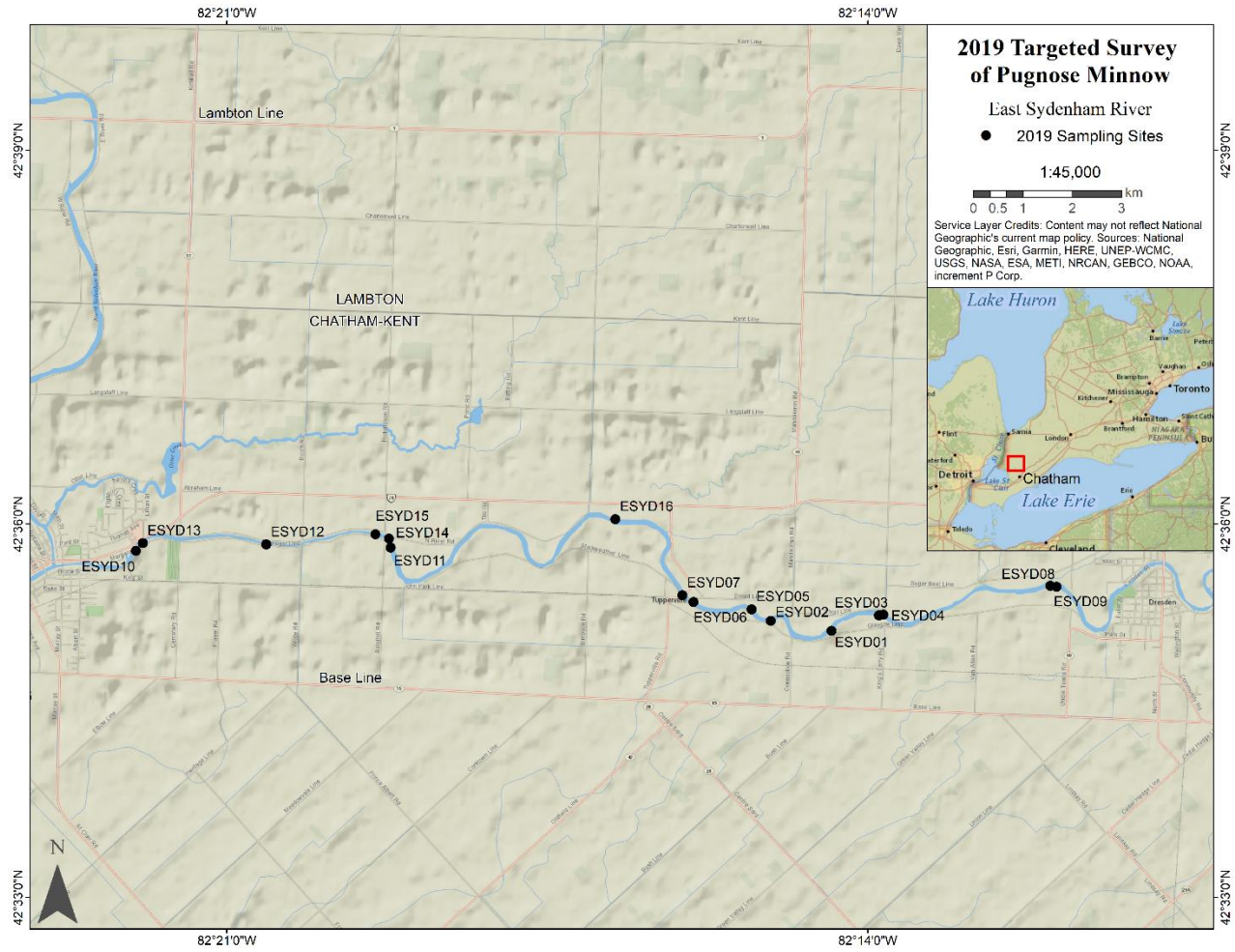


Figure 1a. East Sydenham River targeted sampling sites for Pugnose Minnow, 2019.





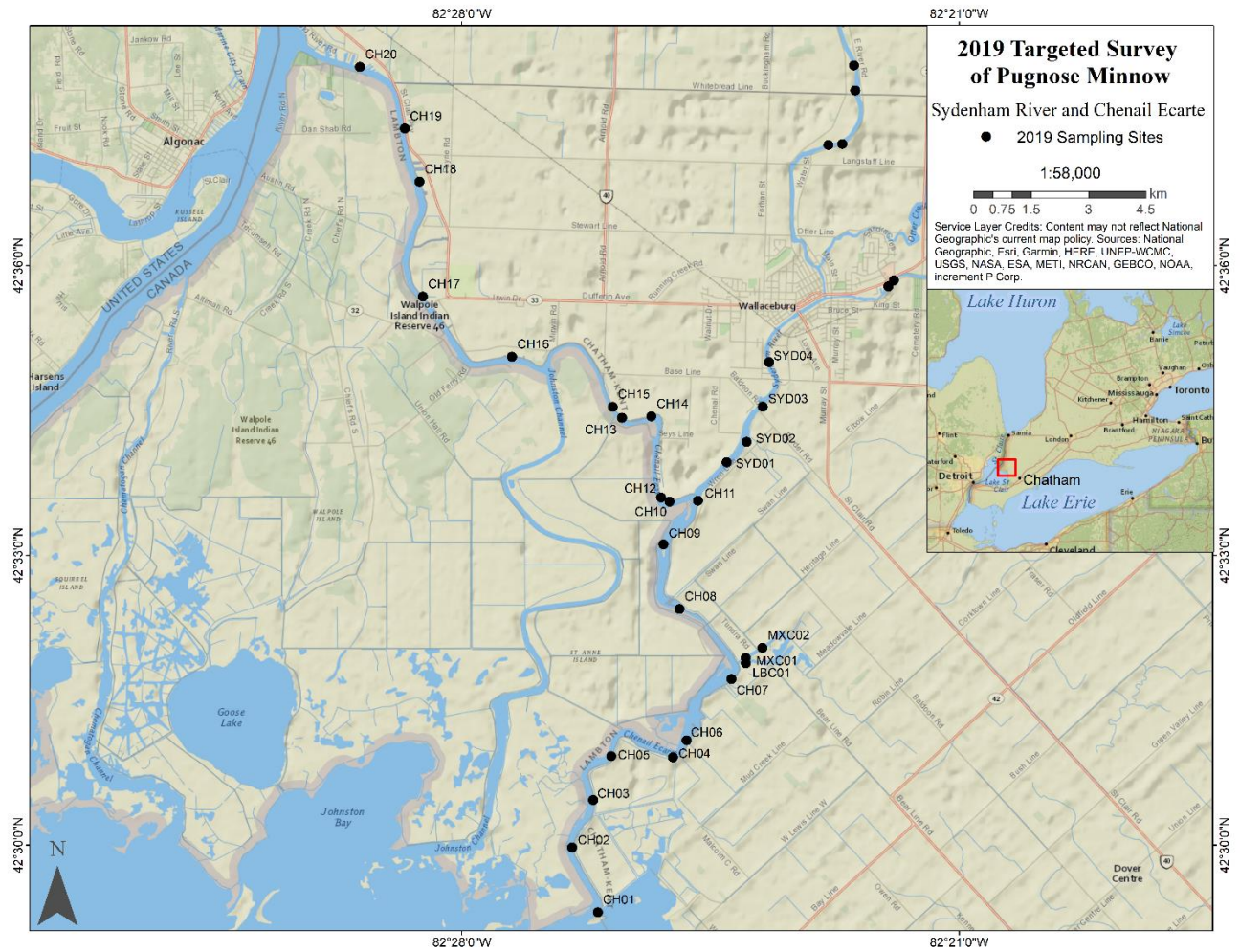


Figure 1c. Chenaill Ecarte, lower Sydenham River, Maxwell Creek and Little Bear Creek targeted sampling sites, 2019.



**Source: Fisheries and Oceans Canada**



*Figure 2. Retrieving a Mamou trawl on the East Sydenham River (August 20th, 2019)*



**Source: Fisheries and Oceans Canada**

*Figure 3a. East Sydenham River trawling site (Site: ESYD08)*



*Figure 3b. North Sydenham River trawling site (Site: NSYD08)*



*Figure 3c. Chenail Ecarte trawling site at the Whitebread Drain confluence (Site: CH19)*





*Figure 3d. Lower Sydenham River trawling site (Site: SYD01)*



*Figure 3e. Maxwell Creek trawling site (Site: MXC02)*



Source: Fisheries and Oceans Canada

Figure 4a. Pugnose Shiner (*Notropis anogenus*)



Source: Fisheries and Oceans Canada

Figure 4b Blackstripe Topminnow (*Fundulus notatus*)



Figure 4c. Ghost Shiner (*Notropis buchanani*)



Figure 4d. Gizzard Shad (*Dorosoma cepedianum*)





Figure 4e. Brook Silverside (*Labidesthes sicculus*)

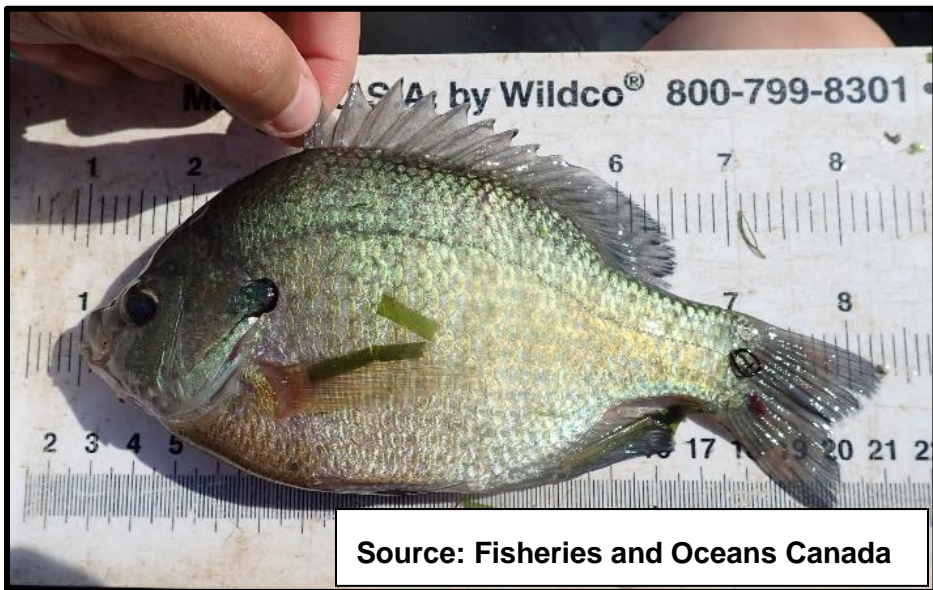


Figure 4f. Bluegill (*Lepomis macrochirus*)



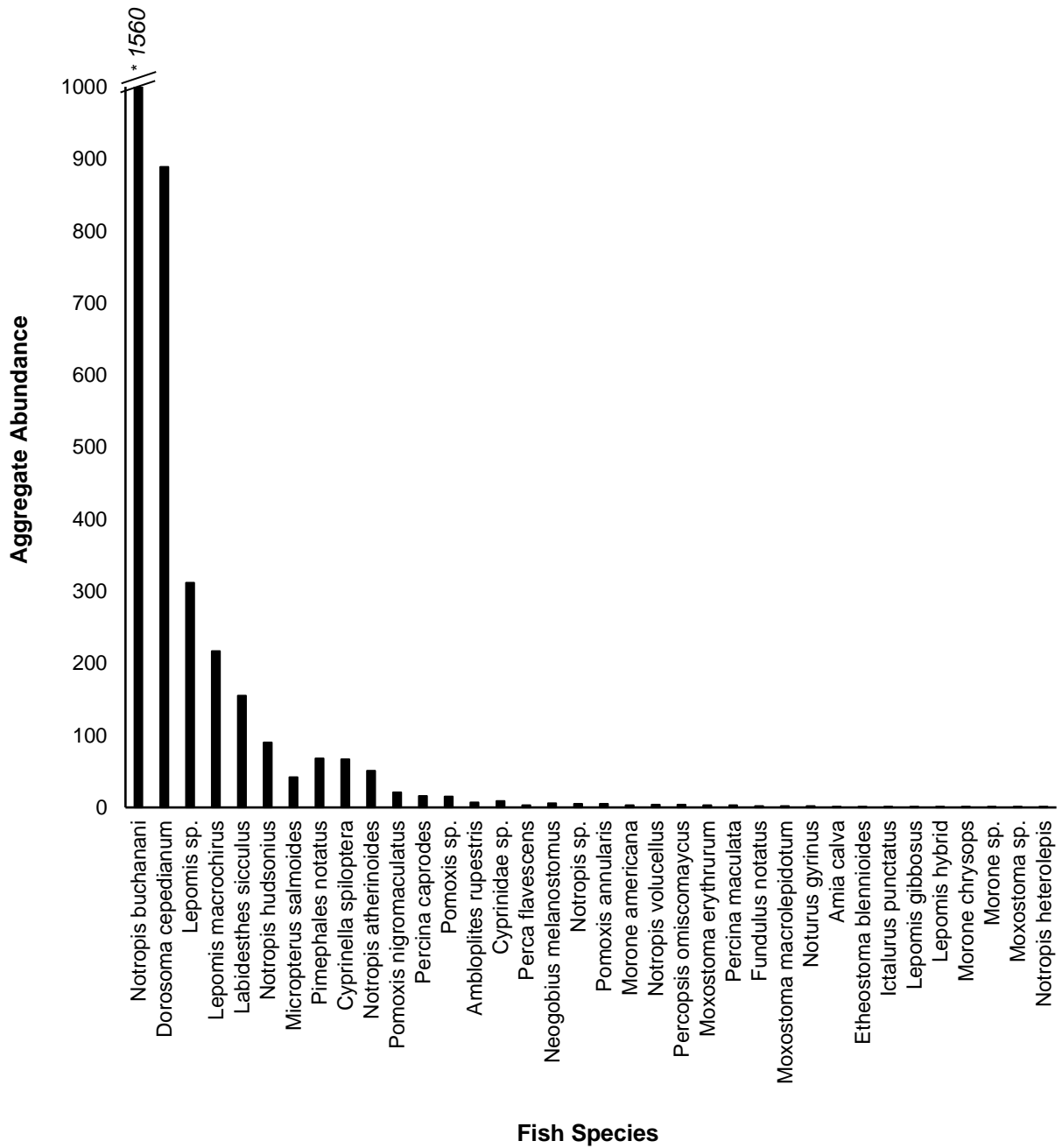


Figure 5a. Rank-abundance of catch data (raw abundance) by fish species in the East Sydenham River (ESYD) in 2019.

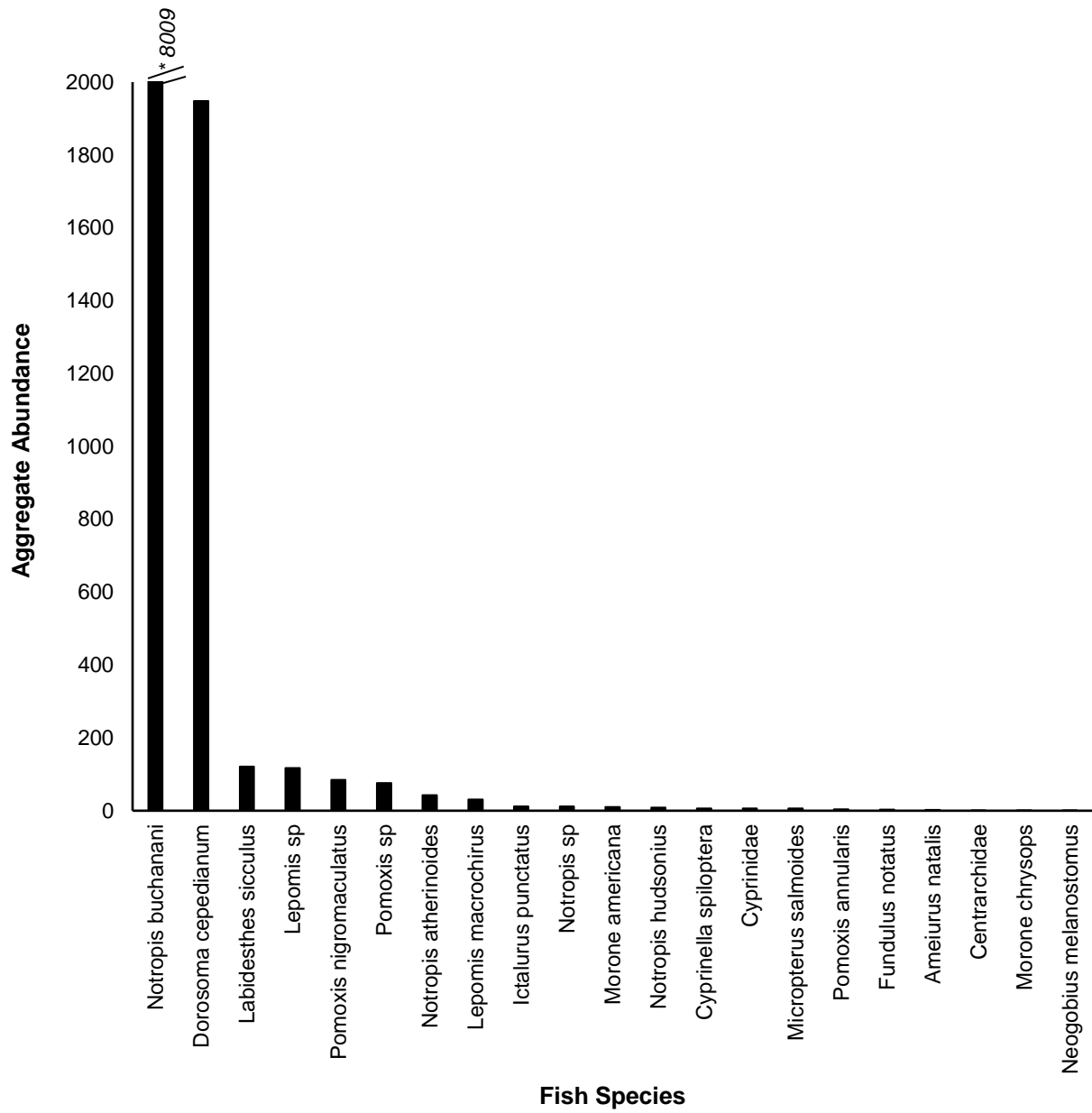


Figure 5b. Rank-abundance of catch data (raw abundance) by fish species in the North Sydney River (NSYD) in 2019.

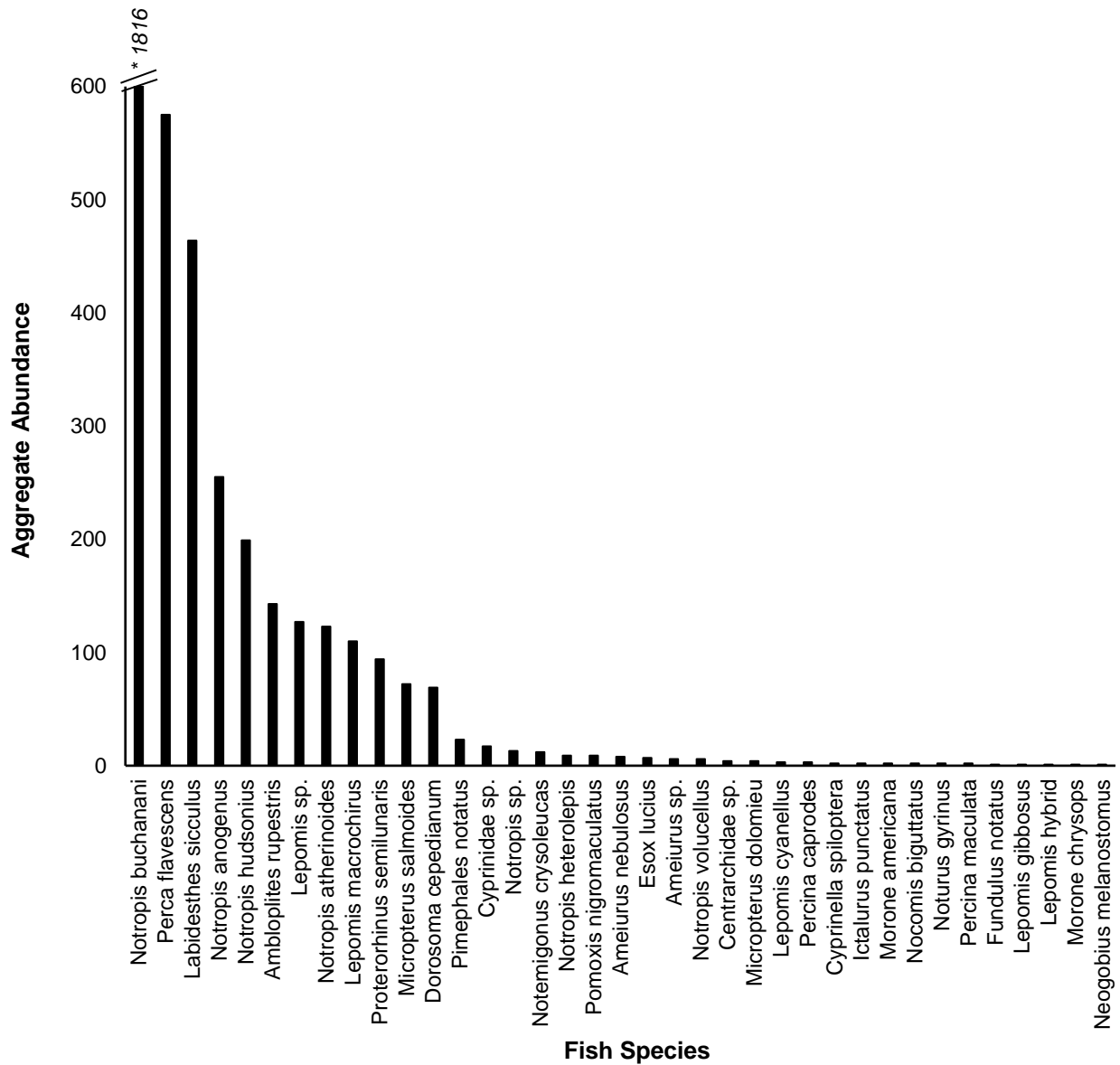


Figure 5c. Rank-abundance of catch data (raw abundance) by fish species in the Chenail Ecarte (CH) in 2019.

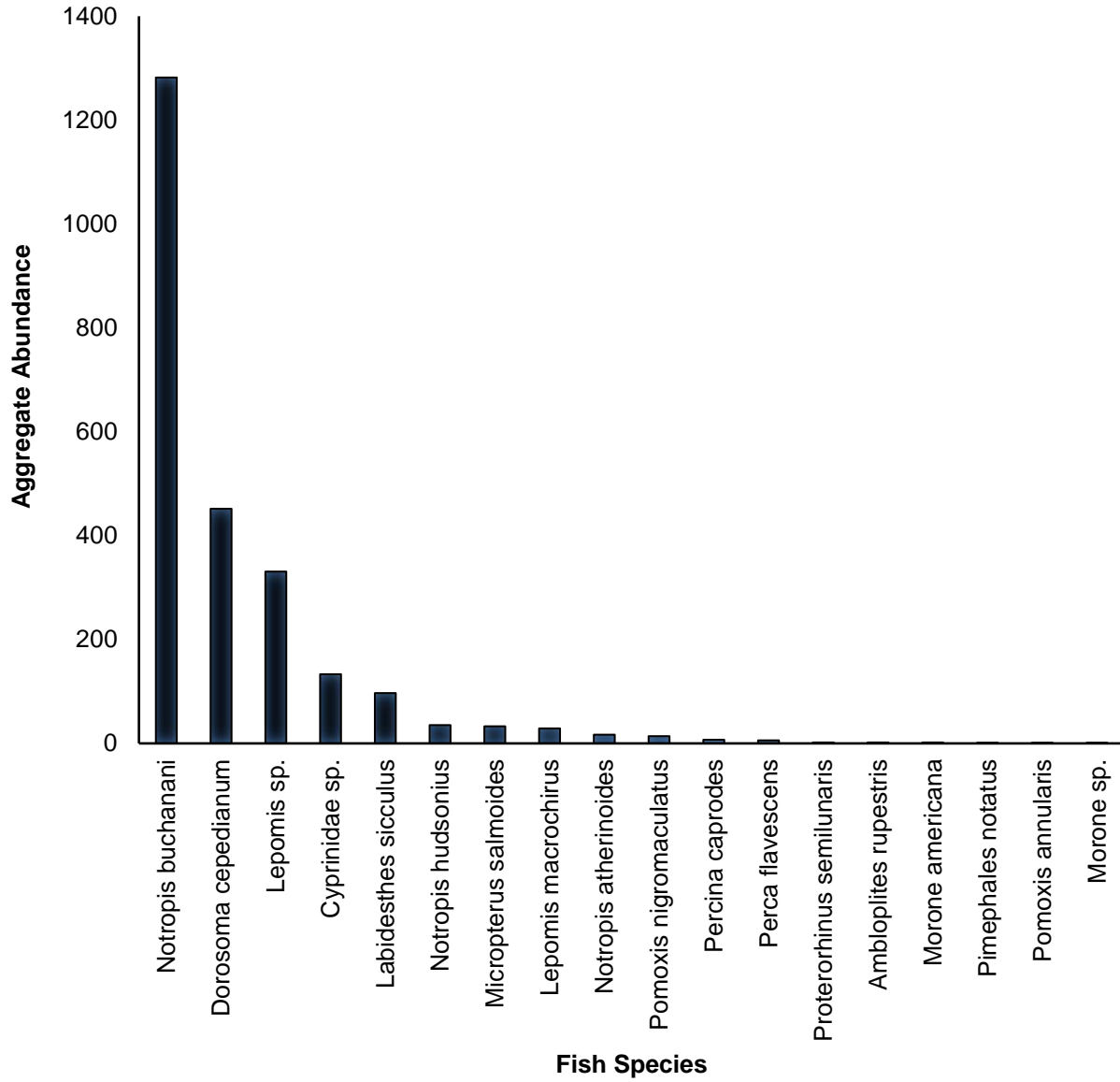


Figure 5d. Rank-abundance of catch data (raw abundance) by fish species in the Lower Sydenham River (SYD) in 2019.

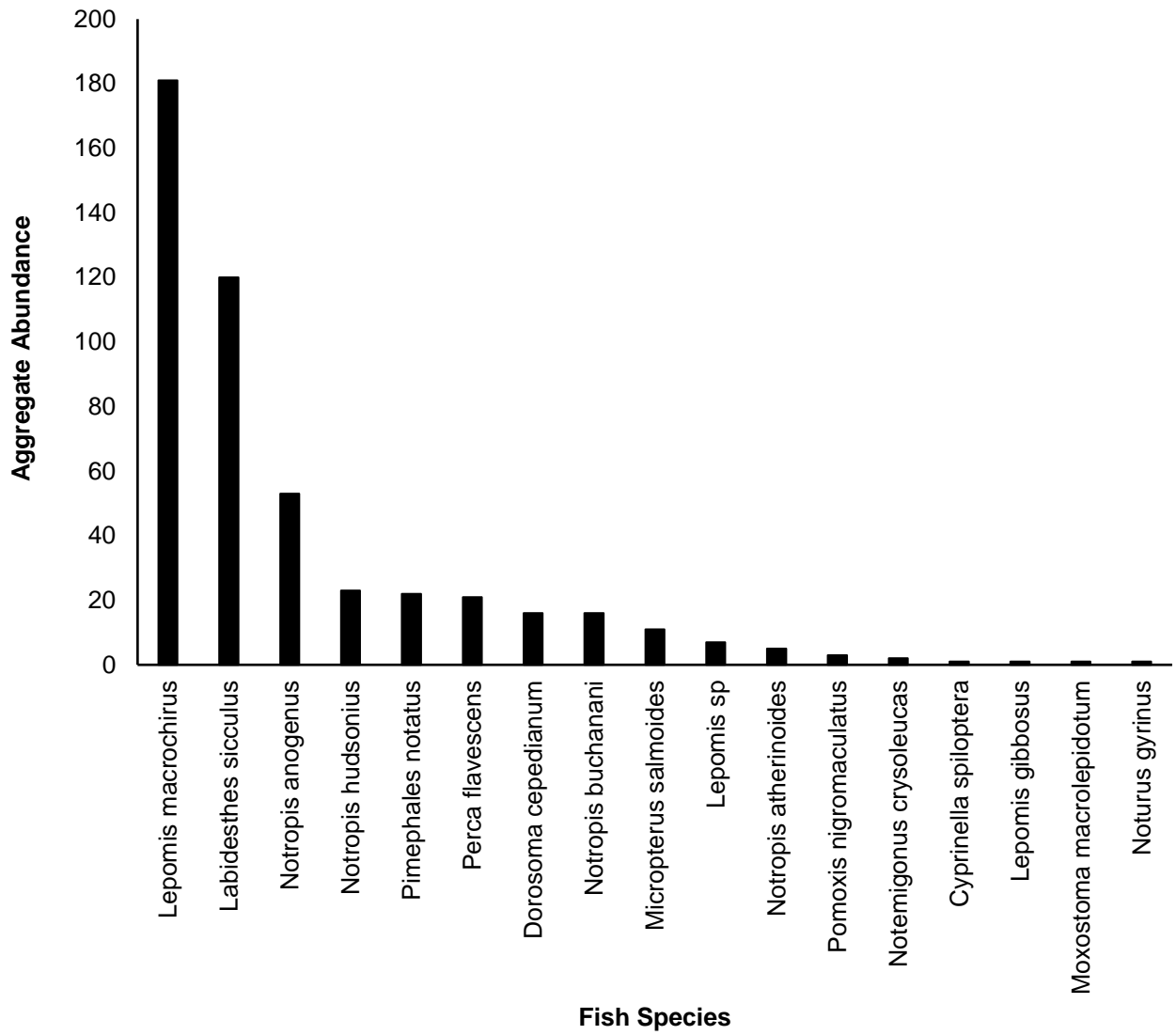


Figure 5e. Rank-abundance of catch data (raw abundance) by fish species in Maxwell Creek (MXC) in 2019

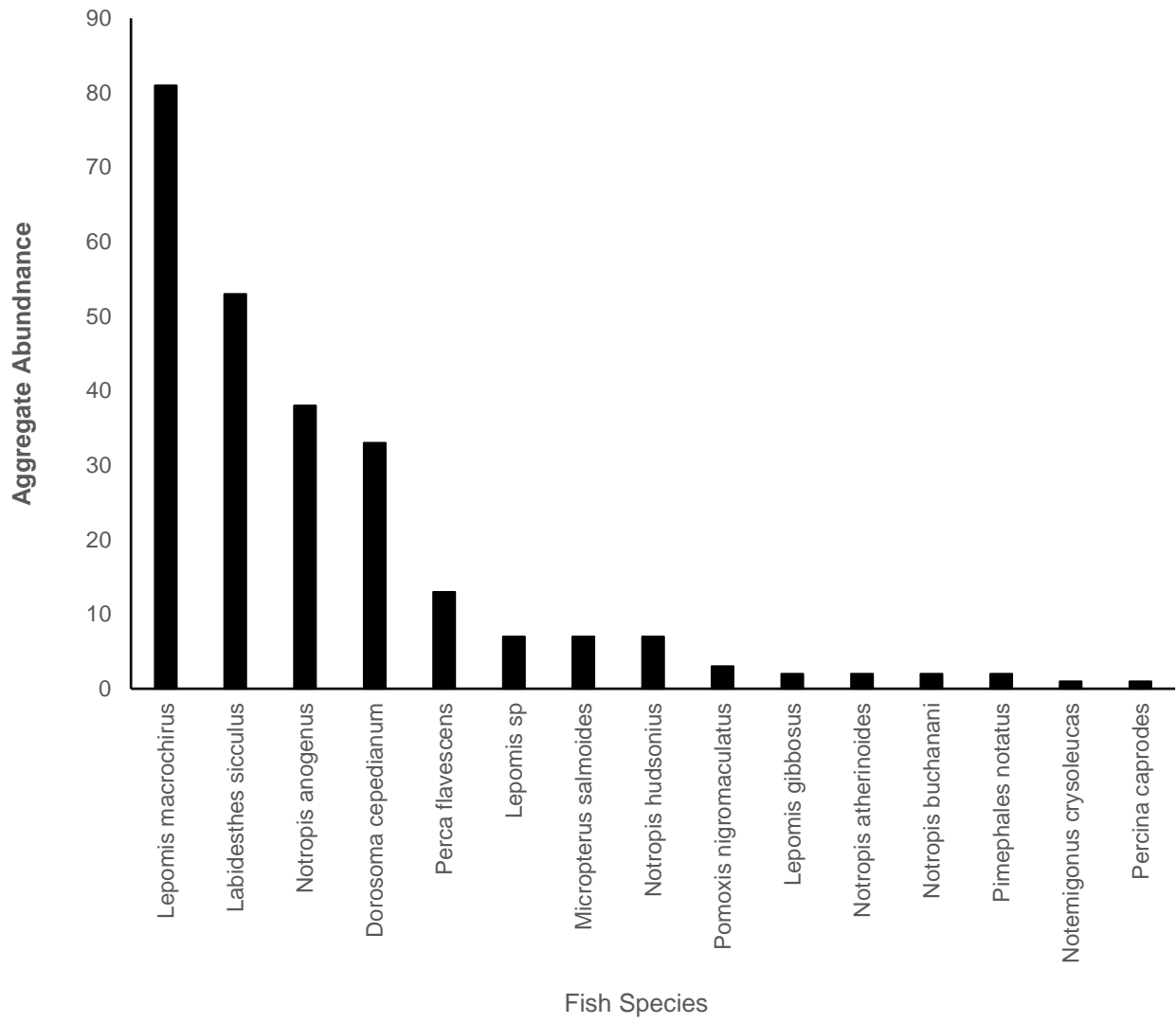


Figure 5f. Rank-abundance of catch data (raw abundance) by fish species in Little Bear Creek (LBC) in 2019