



Commercial Eel Harvest Monitoring

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Introduction

Monitoring of the commercial eel harvest is an opportunistic practice that has been employed by Qalipu Mi'kmaq First Nation Band for a number of years to collect, document or to track temporal variation/changes in the population dynamics of population information of the American eel (*Anguilla rostrata*). This includes individual weight, length, life stage ratio, and abnormalities such as red mouth and skin lesions. The American eel is a very culturally significant species for the Mi'kmaq people of Newfoundland. Along with being an important food source the American eel is also used for ceremonial and medicinal purposes. It is for these reasons that we are studying the local population in Muddy Hole, Western Newfoundland, and Little Horwood Brook, Central Newfoundland.

This project involves cooperating with local fish harvester's in Western and Central Newfoundland and recording a number of biological characteristics of the eels captured by the harvester. Work was done through collaborating with local fish harvesters as to satisfy the community engagement portion of our Aboriginal Fisheries Strategy agreement. This opportunistic monitoring was beneficial to Qalipu, local harvesters and the eel population as additional nets were not set in the study areas. This reduced the amount of working hours required to complete the study, competition for catch with local harvesters, and stress on the eel population. Parks Canada employees also took part in monitoring at the western field site.

Methods and Materials

Qalipu staff cooperated with commercial eel harvesters to quantify biological characteristics of eels caught in their nets. There was one net per site with four monitoring events at each as well. The net in central was checked every 7 days consistently, while the net in western was checked between every 1 and 3 days. Once brought to shore the eels were stored in a crate or cooler until they were weighed with Rapala hanging digital fish scales, measured with a meter stick, and examined for abnormalities such as skin lesions or red mouth. Life stage (yellow or silver) was also recorded in this study. Data collection sites took place in two locations. Muddy Hole, which is in the Flat Bay Brook estuary ($48^{\circ} 24' 16.8''$ N $58^{\circ} 34' 50''$ W), is a tidal estuary consisting of a semi enclosed harbour and a significant amount of eel grass in the semi enclosed harbour portion. Little Horwood Brook in the Gander Bay Area ($49^{\circ} 25' 17.3''$ N $54^{\circ} 34' 07.1''$) is a small freshwater stream environment approx. 200m from an estuarine environment. Information was also gathered pertaining to the duration of time the nets were soaked to calculate the catch per unit effort (number of eels caught divided by number of days the net has been soaked multiplied by the number of nets used).

Results

Table 1: Biological characteristics and total catch for both Central and Western field locations

Region	Location	Life stage	Number	Avg. Weight (g)	Avg. Length (cm)	Number with abnormalities	Percent with abnormalities
Central	Little Horwood Brook	Yellow	98	658.16	65.68	1	1
		Silver	78	925.47	72.04	0	0
		Total	176	718.84	68.5	1	0.6
Western	Muddy Hole	Yellow	175	148.75	39.96	18	10.3
		Silver	0	0	0	0	0
		Total	175	148.75	39.96	18	10.3

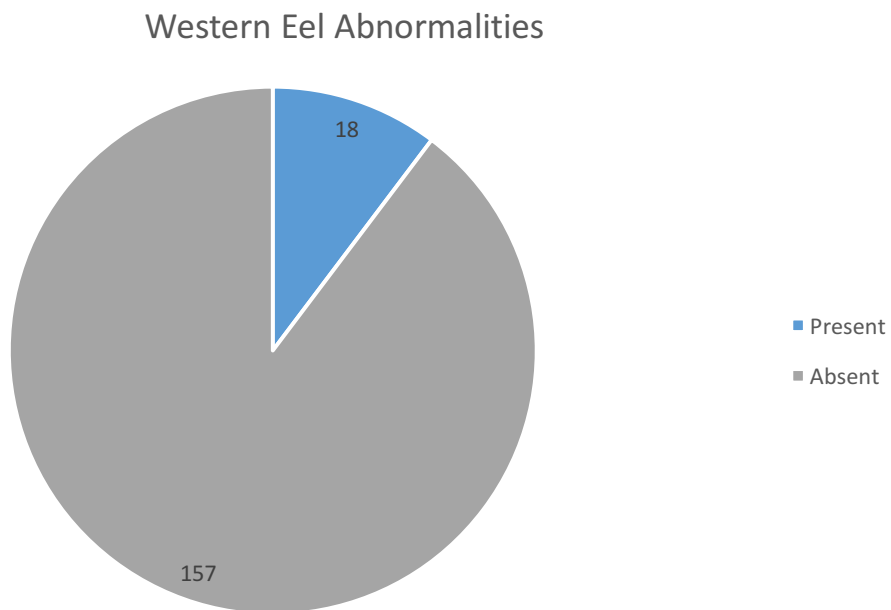


Figure 1: Number of abnormalities present and absent in Yellow eels from Muddy Hole, NL

Central Eel Abnormalities

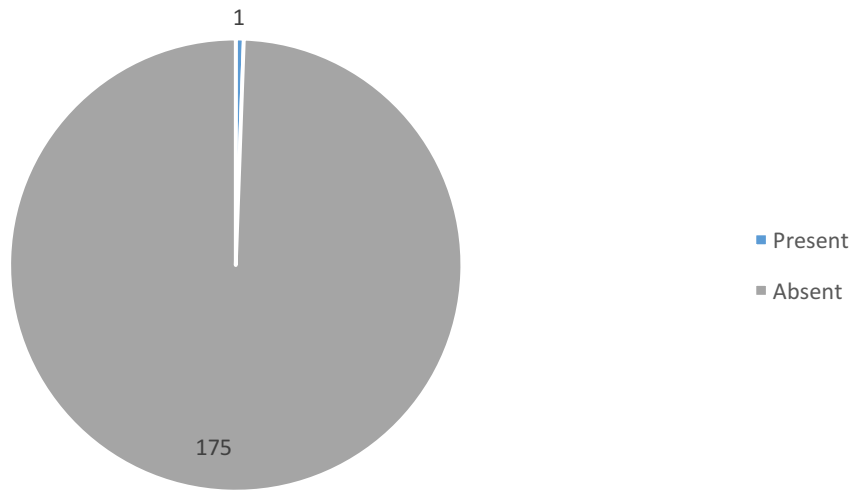


Figure 2: Number of abnormalities present and absent in all eels from Little Horwood Brook, NL

Central Eel Age Distribution

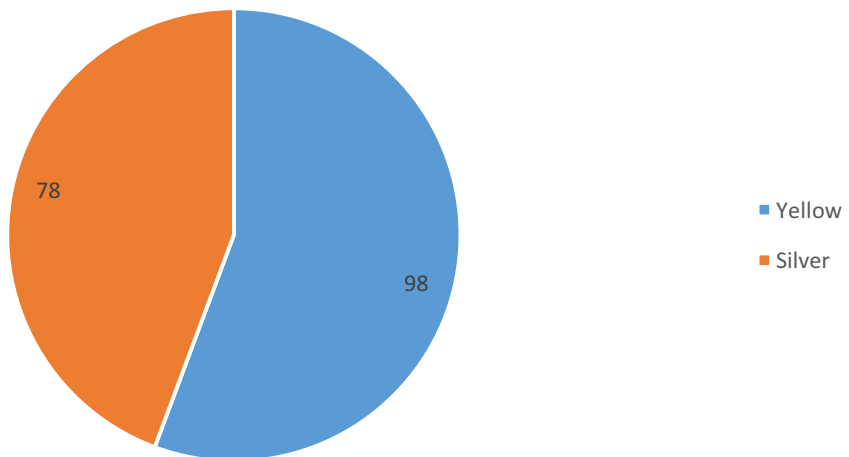


Figure 3: Comparison of Yellow to Silver Eels in Gander Bay area, NL

Table 2: Catch Per Unit Effort data and calculation for each sampling event at both Central and Western Newfoundland locations

Location	Date	Number of eels Caught	Days soaked	Catch Per Unit Effort (#/days*nets)
Little Horwood Brook	10-Sept-14	25	7	3.57
	17-Sept-14	21	7	3
	24-Sept-14	68	7	9.71
	01-Oct-14	62	7	8.86
Muddy Hole	09-Sept-14	15	3	5
	10-Sept-14	1	1	1
	25-Sept-14	110	2	55
	02-Oct-14	49	1	49

A total of four sampling events took place in both locations between September 9th 2014 and October 2nd 2014 (Table 2). A total of 176 and 175 eels were caught in central and western specifically (Table 1). While the total number of eel caught were similar, the ratio of yellow to silver eels between sites was significantly different with only yellow eels being caught in Western and 78 of 176 (44%) being silver in Central (Table 1, Figure 3). The Central field site also had significantly less abnormalities in eels captured (1 of 176) compared to Western (18 of 175) (refer to Figure 1 and Figure 2). The Central site also had a growing increase of silver eels being caught as time progressed, shifting the ratio of life stage caught from being weighted from yellow to silver.

Discussion

The difference in life stage ratios between locations may be due to a number of factors. The Western location is in an estuarine environment while the Central location is in a purely freshwater environment. However, there may be other factors unstudied or accounted for that

could be the cause of this trend. These could include, but are not limited to, migration time of resident population, various physical or chemical characteristics that may be suited for certain life stages, or distance from salt water. These population demographic results are congruent with those of other studies where a significant more yellow eels were caught in an estuarine environment compared to silver eels and more silver eels were caught in freshwater environments compared to yellow (Morrison & Secor 2003)

Conclusion

Catch results are in agreement with other population demographic observations between freshwater and estuarine environments. Total catch in both areas are very similar with Central having 176 and Western 175 eels. Average catch per unit effort (CPUE) in Central is lower than Western, but also has a lower variance among calculated CPUE for that site. More abnormalities were found in eels from Western (18) than Central (1). Future studies will contribute to the data for completing a temporal analysis on population dynamics in the two areas, also taking into account more physical parameters to see if we can determine the reason for the differentiation in population trends between the two environment types.

Works Cited

Morrison W. E., and D. H. Secor. 2003. Demographic attributes of yellow-phase American eels (*Anguilla restrata*) in the Hudson River estuary. Canadian Journal of Fisheries and Aquatic Sciences 60:1487-1501.