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**Status of American Eel in
Newfoundland and Labrador Region:
Prepared for the Pre-COSEWIC and Eel
Zonal Advisory Process (ZAP), Ottawa,
August 31 to Sept 3, 2010**

**État de l'anguille d'Amérique dans la
région de Terre-Neuve-et-
Labrador : document préparé en vue des
réunions pré-COSEPAC et du processus
de consultation scientifique zonal
(PCSZ) sur l'anguille, tenues à Ottawa,
du 31 août au 3 septembre 2010**

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ABSTRACT

Severe declines in several abundance indicators of American Eel in the Great Lakes-St. Lawrence River region of Canada as well as international concern over declines in other *Anguilla* species has resulted in a need for the Department of Fisheries and Oceans to examine the status of eels in Canada. In the Newfoundland and Labrador Region, American Eel are found throughout insular Newfoundland and as far north as Postville in Labrador. Adult and juvenile eel occupy fresh and estuarine waters throughout the region. There was evidence of a reduction of eel abundances from the 1980's to the 1990's in Newfoundland but more recent fisheries independent data is lacking. Indications from salmonid counting fences and the commercial catch data suggest abundances are either stable or improving.

RÉSUMÉ

Les baisses marquées de plusieurs indicateurs de l'abondance de l'anguille d'Amérique dans la région des Grands Lacs et du fleuve Saint-Laurent au Canada, ainsi que la préoccupation à l'échelle internationale concernant les déclinés d'autres espèces d'anguilles ont poussé le ministère des Pêches et des Océans (MPO) à examiner l'état de l'anguille au Canada. Dans la région de Terre-Neuve-et-Labrador, on trouve l'anguille d'Amérique partout sur l'île de Terre-Neuve jusqu'à Postville, au nord du Labrador. Les adultes et les jeunes anguilles occupent les plans d'eau douce et les eaux d'estuaire de toute la région. Des années 1980 à 1990, on disposait de données sur la diminution de l'abondance des anguilles à Terre-Neuve, mais on manque aujourd'hui de données autres que celles provenant des pêches. Les indications provenant des barrières de dénombrement des salmonidés et les données sur les prises commerciales suggèrent que l'abondance est soit stable ou en voie d'amélioration.

INTRODUCTION

Severe declines in several abundance indicators of American Eel in the Great Lakes-St. Lawrence River region of Canada as well as international concern over declines in other *Anguilla* species (Cairns et al. 2008) has resulted in a need for the Department of Fisheries and Oceans to examine the status of eels in Canada. In the Newfoundland and Labrador Region, American Eel are found throughout insular Newfoundland and as far north as Postville in Labrador. Adult and juvenile eel occupy fresh and estuarine waters throughout the region.

Most of the available data on eel in the Newfoundland and Labrador Region comes from the commercial fisheries logs. Fisheries independent data on eels are generally the result of eels being caught during surveys or sampling for other species. Nevertheless the purpose of this document is to report the data that are available from the Newfoundland and Labrador Region and to examine those data for indicators of the status of American Eel in the region

LIFE HISTORY AND HABITAT USE

The American Eel occurs throughout Newfoundland and Labrador (Figure 1). Figure 1 depicts locations where eels have been captured via the commercial fishery or through scientific sampling. While this collection of sites is by no means exhaustive it illustrates the extensive distribution of eel habitat around the island of Newfoundland and the known extent of eel along the coast of Labrador. The most northern location where eels have been captured is in English River (54° 58' N 59° 45' W; D. Redden unpublished data). This site is north of Lake Melville which was long considered the northern extent of the American Eel's range.

American Eel utilize all available habitats within the Newfoundland and Labrador region from purely freshwater to marine. Captures of eels have occurred in Headwater Pond (NE) which, as its name suggests, is a small pond located at the top of the Gander River watershed, which is approximately 155 km from the sea. Eels are also known to inhabit brackish waters such as salt marshes (Gray and Andrews 1971), barachois ponds and estuaries (Jessop et al 2009). These areas can be highly productive and are quite common throughout coastal Newfoundland (Jessop et al. 2009). There have also been sporadic captures of eels in completely marine habitats in Newman Sound (C.Morris pers comm) but it is not know to what extent they use these areas for growth.

Within freshwater habitats utilized by American Eel, lacustrine habitats appear to be important for the production of Silver (female) Eels. This observation is similar to previous published reports from the Northeast United States (Oliveira et al 2001). The length frequency distribution of eels captured in the summer and thus considered resident to their habitat of capture, within Stoney River from 2000-04 indicated a higher proportion of eels greater than 400 mm in length in lake habitats as compared to stream habitats (Figure 2). Previous work has determined that once an eel has attained a length greater than 400 mm there is a 95% chance that it is a female (Oliveria et al. 2001).

This importance of lacustrine habitats in the production of female eels is also observed in the commercial fishery, with areas having high percentages of lacustrine habitats, such as the River of Ponds, producing mostly female eels and watersheds with mostly fluvial habitat, such as the Bay St. George area, producing mostly male eels (those < 400 mm). This pattern is also borne out in the limited biological information for Newfoundland. As pointed out above Stoney River

which has a large proportion of lacustrine habitat had 53% of the resident eel population greater than 400 mm in length, a similar trend was observed in Renew's River where 47 eels that were sexed in 2007, were all female and all above 400 mm in length (Table 1). This is compared to two watersheds with mostly fluvial habitats, Northeast Brook Trepassey and Highlands River, where only 26 % and 21%, of eels captured respectively were greater than 400 mm in length (Figure 3).

Limited biological data on eels from Newfoundland have been published (e.g. Gray and Andrews 1970; Gray and Andrews 1971; Bouillion and Haedrich 1985; Jessop 2009). Table 1 provides unpublished length and weight data for 47 eels taken from Renew's River in 2007 and Figure 4 shows the weight length relationship for the same eels. Based on a Squash Test all 47 eels were determined to be female (oocytes visible). Table 2 presents descriptive statistics for length and weights of eels captured in Highlands River in 1980 and Stoney River in the period from 2001-2004.

TRENDS

Elvers

An elver fishery has been carried out on the South-West portion of the island since 2006. Details of the annual harvest are sparse (8Kg in 2006 and 5Kg in 2009) but the most recent licence quota was for 150 Kg of elvers.

Adult Eels

Commercial Fishery: Landings from the commercial fishery in NL have been reported in several publications (Cairns et al. 2008; Fisheries Management Branch 1999; Fletcher and Anderson 1973). Table 1 summarizes the available data for the commercial fishery and Figure 5 shows the trend in commercial catch with time. The catch increased in steps with a peak catch in 1990 of 147 Mt. Since 1990 the reported landings have been declining. However, average landings for the past 5 years (59 Mt) are only 5% lower than the 1997-2002 average reported landings. The 1997-2002 time period is the baseline from which the draft eel management plan is asking for a 50% reduction in anthropogenic mortality. Since the commercial harvest is the largest known source of anthropogenic mortality of eels in the NL Region it is the most likely target of future cuts.

There is a discrepancy between the landings reported by Fletcher and Anderson (1973) and Cairns et al. (2008) for 1971 and 1972. Fletcher reported the landings in those years as 44,000 and 79,000 lbs respectively, whereas Cairns reported the landings at 44 and 79 metric tonnes for the same years. It is not clear if this is a reporting error or a transcription error.

The number of commercial licences issued has only declined slightly over the last decade (Fig. 6). Given the decline in reported landings this suggests a decline in CPUE, where effort is the number of licences issued. However, licences can be held without the requirement of fishing, and this is known to happen. When CPUE is calculated from log book data, which would only include active licence holders, then the trend shows increased CPUE from 1993 to 2005 (Fig. 3). A stable or increasing CPUE is generally interpreted as an indication of a stable or increasing biomass.

More recent data are not available as the recent log book data are not available in an electronic format. As well, the log books consistently have a lower reported catch compared to the commercial landing slips (Figure 7). Part of this discrepancy is because log books were not a

condition of the licence from 2001-04. The lack of log book data does not explain the discrepancy in the remaining years. It suggests that the fishers are underestimating the weight of their catch. The sudden increase in CPUE in 2003 is likely owing to the small sample size.

During the years when fishers were required to report the number of Silver Eels caught (1997-2000, 2005), the average annual reported harvest was over 16000 (Figure 8). CPUE on Silver Eels followed a similar trend as the CPUE for total harvest (Figure 8).

Recreational Fishery: There are no data available on the recreational eel fishery.

Fisheries Independent: While there are several fisheries independent indicators of eel abundance for the NL Region they have generally be limited in scope or temporal coverage. Salmonid counting fences have consistently recorded the number of eels trapped by the facility. However, counting facilities are not designed nor operated with the purpose of capturing eels. Counting facilities with over 5 years of data are presented in Figure 9. Highlands and Sandhill suggest dramatic declines in the annual eel count, but more recent and more continuous data sets (e.g. Conne and WAB) suggest a cyclic pattern in annual returns. Monthly counts (all years combined) (Figure 10) show (with the exception of Campbellton River) increased counts in the spring. It is likely that the counting facilities are missing any fall run of eel as they are either open to fish passage or removed from the river in late summer.

Continuous sampling programs within freshwater habitats in the Newfoundland and Labrador region are rare. Three such programs did exist in the past, two employed stream electrofishing, Highlands River and Northeast Brook Trepassey, and the other employed Fyke net captures within ponds of the Experimental Ponds Area (EPA) (see Figure 11). The EPA captures were very sporadic as these ponds are located in the headwaters of the Gander River and were not considered a good indicator of long term abundance trends. The electrofishing data covers the period from the early to mid 1980's until the end of the 1990's but no additional data has been collected at these sites since (Figure 12 and 13). Generally this data showed a decline of eel abundance from the 1980 catches as compared to those through the 1990's (Figure 12 and 13).

THREATS

The two main potential threats to American Eel within the Newfoundland and Labrador region are directed removals via fisheries and habitat fragmentation. Directed removals occur through both commercial and aboriginal fisheries (see details above) but there are significant management strategies in place to reduce there affect on the overall abundance of eel. These strategies include a zone along the south coast of the island from Port aux Basques to the Burin Peninsula where no commercial harvesting is allowed and the reduction of licenses through retirement, as no new licenses are currently being released.

Habitat fragmentation can occur either by restricting the movement of elvers upstream or Silver Eels downstream. The two main potential anthropogenic influences within the Newfoundland and Labrador on habitat connectivity would be the forest industry through the development of resource roads and hydroelectric development. There is no information on the effects resource road development may have on eel movement in Newfoundland but there is some information with regard to the hydroelectric industry.

Newfoundland has a long history of hydroelectric development and many of these sites where developed without the provision of fish passage. Many of the older hydro sites also included

extensive water diversions which may have also reduced available habitat (e.g. the Bay d'Espoir and Deer Lake generating systems, Figure 14). In some cases eels still may migrate into these systems but no information is available about the downstream passage of Silver Eels (e.g. Exploit's and Avalon systems). Even the newer sites (e.g. Rose Blanche) have been developed without the provision for the passage of eel. This is an area that requires more work to document areas potential effects and to potentially investigate where passage could be restored.

SUMMARY

American Eel are panmictic, having one spawning population. There is no genetic evidence that the species can be sub divided based on biology. Thus, from a scientific perspective the entire population is the proper unit on which to base an assessment. There was evidence of a reduction of eel abundances from the 1980's to the 1990's in Newfoundland but recent fisheries independent data is lacking and indications from the commercial catch is abundances are either stable or improving. While data continues to be collected within the Newfoundland and Labrador region on eel abundance there is not enough data to assess this species on the decline criteria, which requires information on abundance for at least three generations. The listing of the American Eel as a species of Special Concern seems consistent with the scientific evidence collected and reviewed to date.

Table 1. Length weight data for eels from Renews River, NL.

Specimen#	Length (mm)	Wt (g)	Specimen#	Length (mm)	Wt (g)
RR07-301	648	491	RR07-325	668	517
RR07-302	940	1923	RR07-326	746	758
RR07-303	541	300	RR07-327	735	646
RR07-304	676	571	RR07-328	778	804
RR07-305	776	770	RR07-329	695	673
RR07-306	713	644	RR07-330	691	488
RR07-307	592	426	RR07-331	707	695
RR07-308	681	531	RR07-332	670	570
RR07-309	671	620	RR07-333	657	415
RR07-310	605	414	RR07-334	758	827
RR07-311	586	385	RR07-335	631	498
RR07-312	842	1261	RR07-336	650	501
RR07-313	785	662	RR07-337	742	773
RR07-314	670	595	RR07-338	711	548
RR07-315	626	447	RR07-339	832	965
RR07-316	645	483	RR07-340	660	571
RR07-317	633	468	RR07-341	767	778
RR07-318	687	685	RR07-342	670	533
RR07-319	685	543	RR07-343	598	387
RR07-320	665	471	RR07-344	696	579
RR07-321	661	514	RR07-345	805	768
RR07-322	720	684	RR07-346	746	684
RR07-323	655	497	RR07-347	734	630
RR07-324	676	583			

Table 2. Descriptive statistics for eels captured in Highland River and Stoney River, NL.

Highlands (n = 108)		Stoney (n = 565)	
Length (mm) (range)	Weight (g) (range)	Length (mm) (range)	Weight (g) (range)
462 (60-830)	271 (1-1481)	284 (86-516)	44 (1-219)

Table 3. Commercial eel landings in the Newfoundland Region from various sources. All values are in metric tonnes.

Year	Dept. Fisheries and Oceans 1999	Cairns et al. 2008	DFO Quota Report*	Fletcher Anderson 1973	# of Licences
1961					
1962		24		21	
1963		37		34	
1964		13		12	
1965		3		3	
1966		0		0	
1967		0		0	
1968		0		0	
1969		0		0	
1970		0		0	
1971		44		20	
1972		79		36	
1973		31			
1974		21			
1975		8			
1976		11			
1977		19			
1978	16	16			
1979	23	23			
1980	82	83			
1981	41	42			
1982	37	37			
1983	28	28			
1984	14	14			
1985	25	21			
1986	27	27			
1987	31	31			
1988	61	61			
1989	83	83			74
1990	147	147			105
1991	134	134			131
1992	90	90			124
1993	116	116			105
1994	111	111			
1995	85	85			
1996	67	94			
1997	72	72			138
1998		73			229
1999		55			190

Table 3 (Cont'd.)

2000	70		167
2001	37		168
2002	65		169
2003	65		167
2004	64		171
2005	71		161
2006	74	80	160
2007		66	155
2008		45	154
2009		33	144

* DFO Quota Reports are available from DFO Fisheries and Aquaculture management Branch.

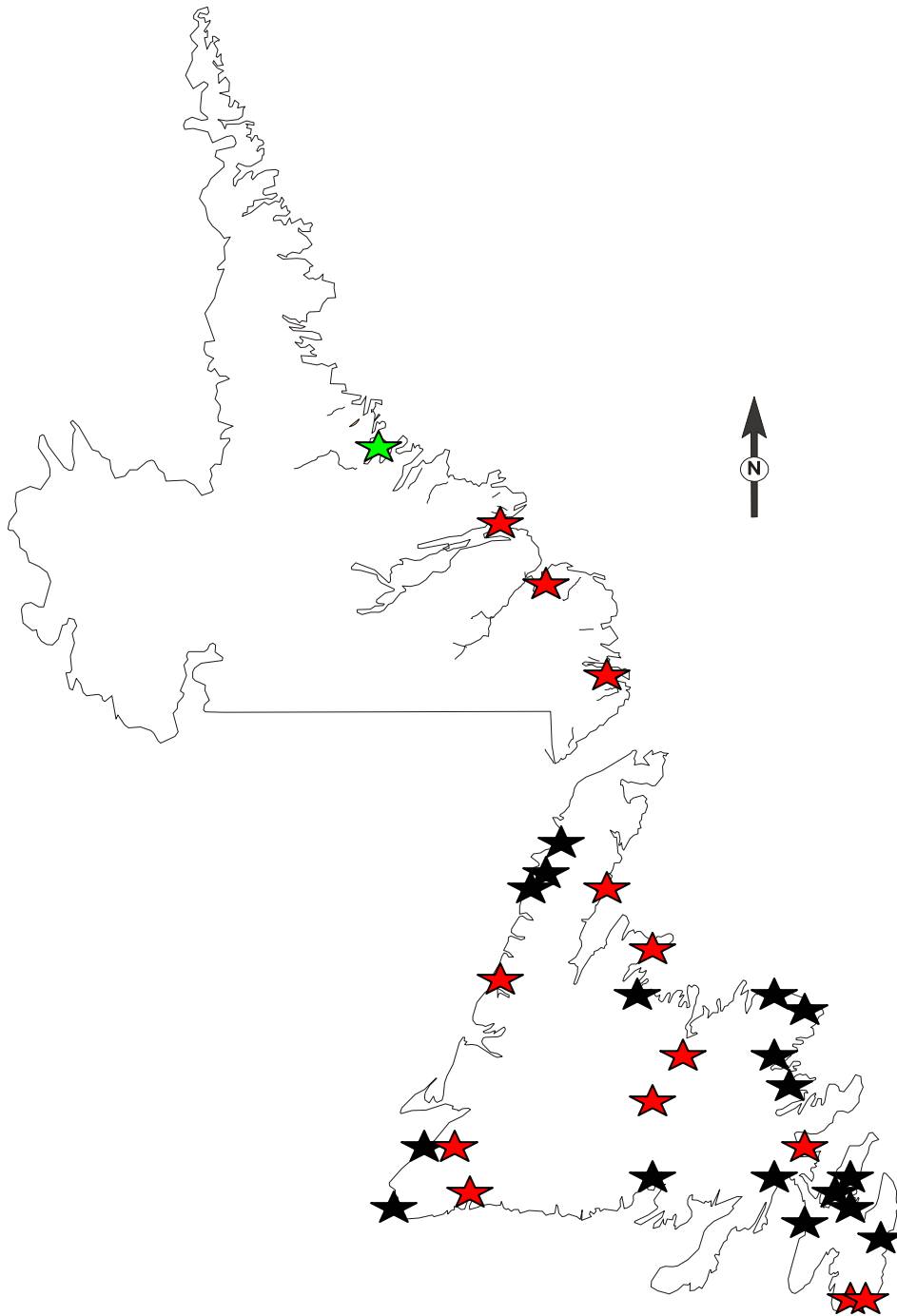


Figure 1. Distribution of American Eel captures in the NL Region, Black stars are commercial harvests with red stars scientific sampling, green is English River.

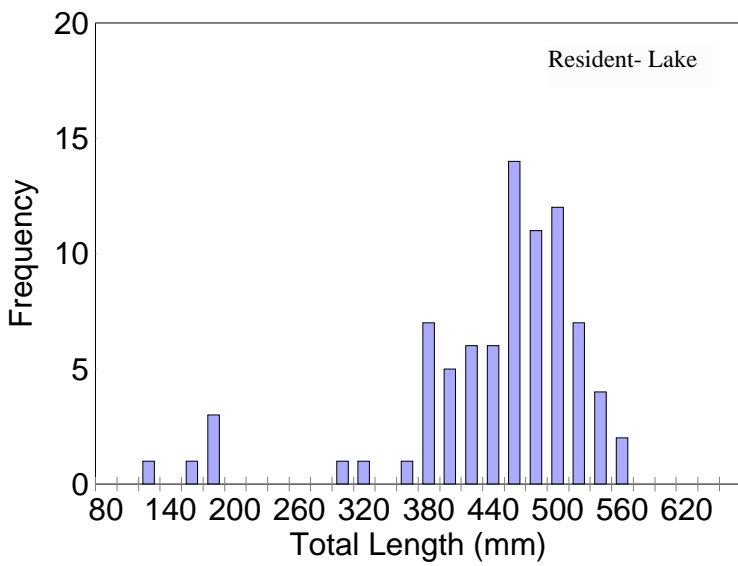
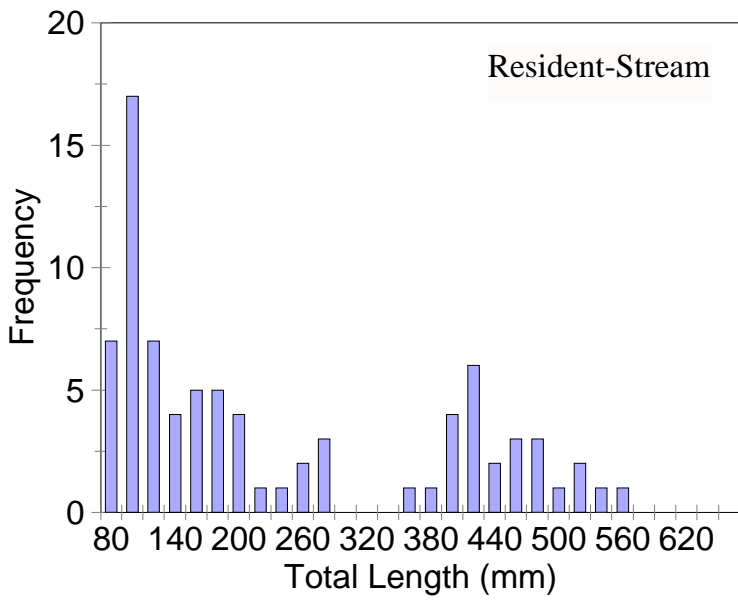


Figure 2. Length frequencies of resident eels capture in Stoney River.

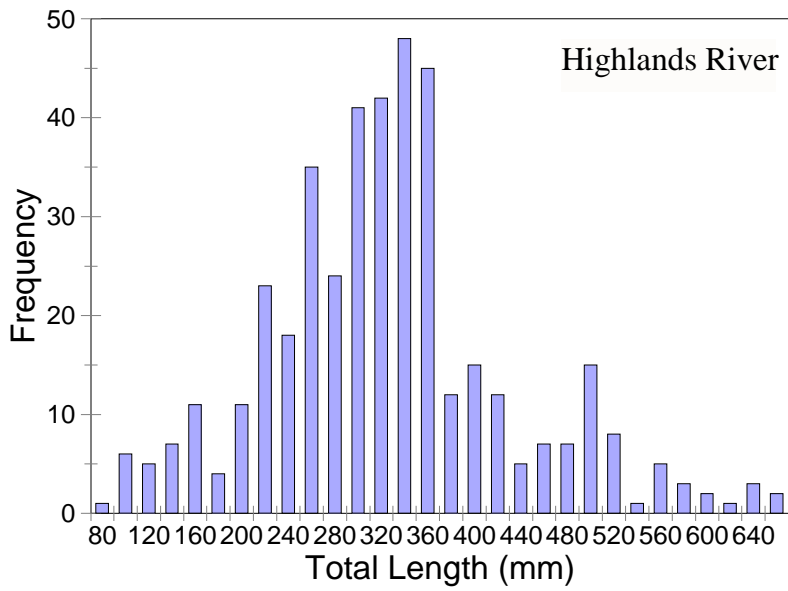
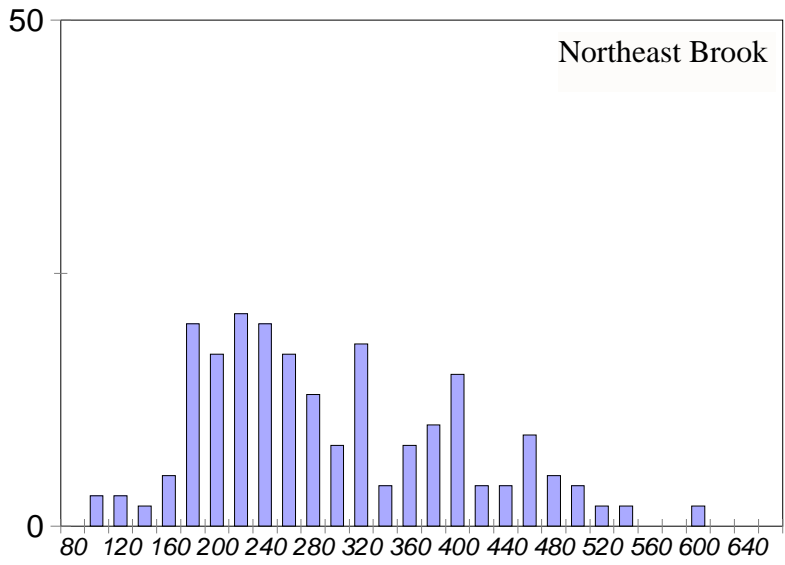


Figure 3. Length frequency distributions of eels captured in Northeast Brook, Trepassey and Highlands River.

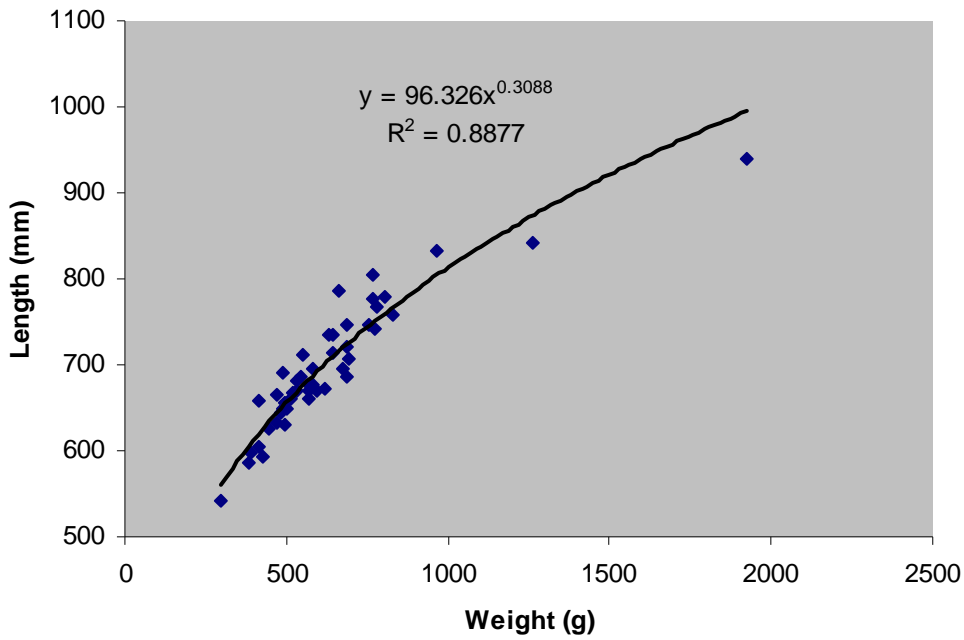


Figure 4. Relationship between weight and length for 47 eels from the Renewes River, NL.

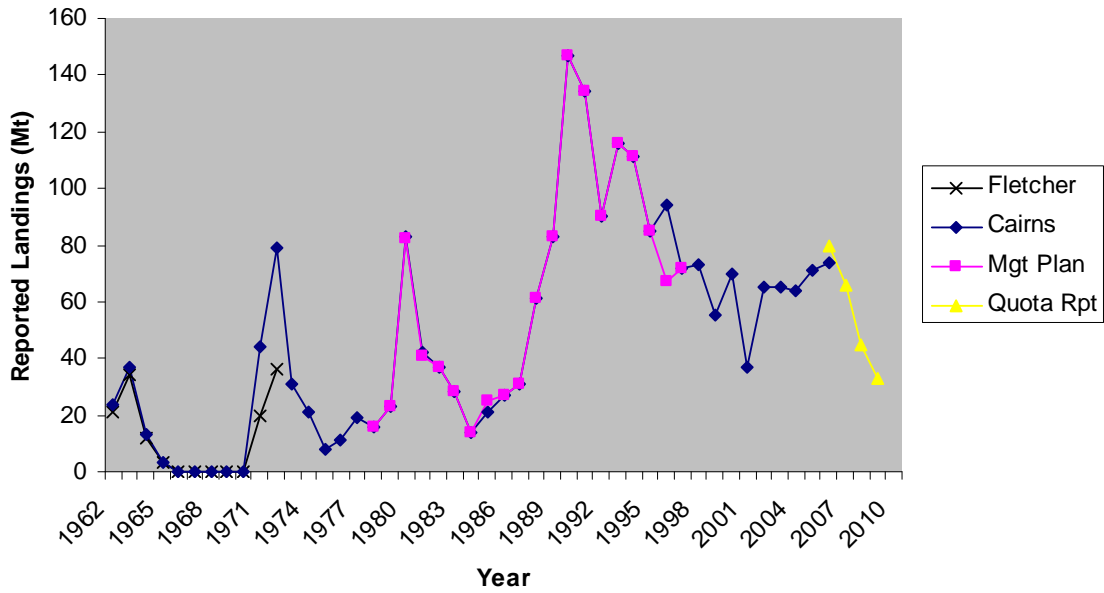


Figure 5. Trends in reported commercial eel landings for NL Region.

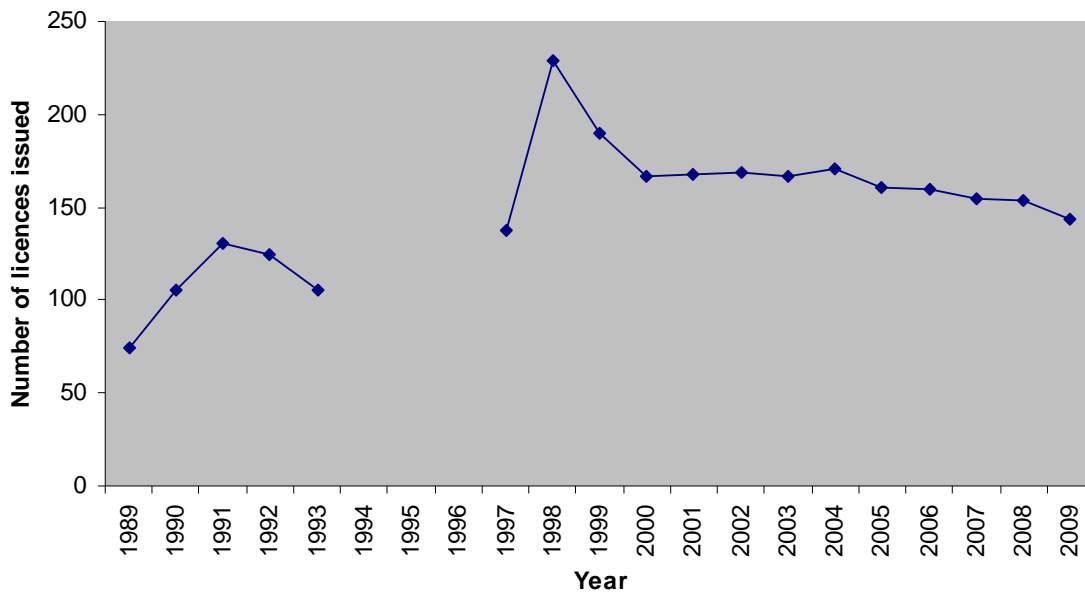


Figure 6. Trend in number of commercial eel licences issued in NL Region.

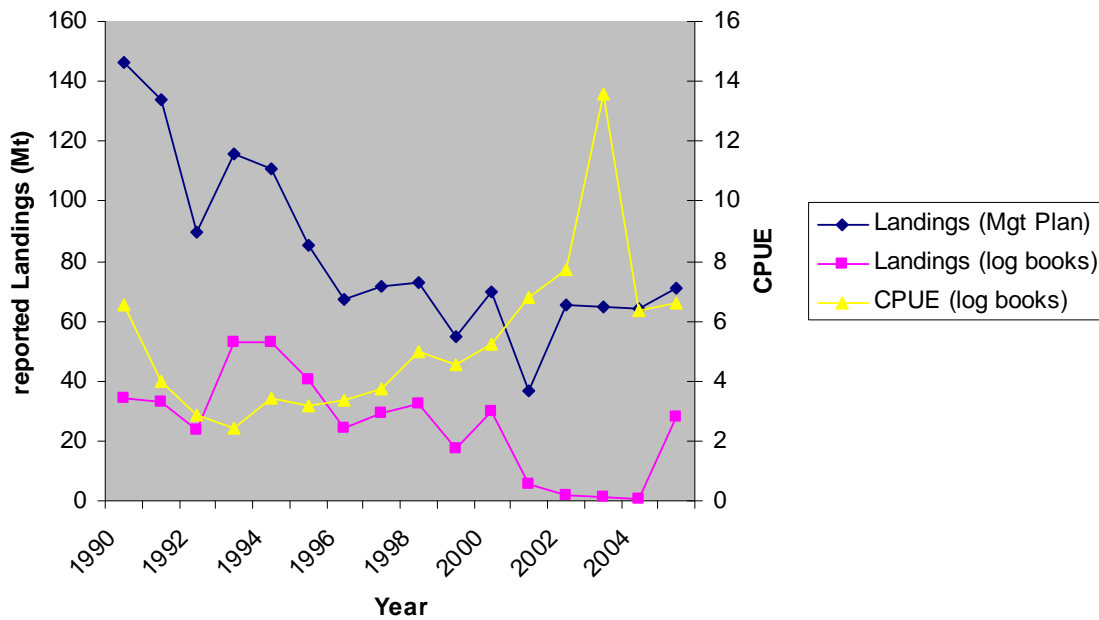


Figure 7. Comparison between reported landings from log books and DFO management plan, and trend in CPUE from log book data.

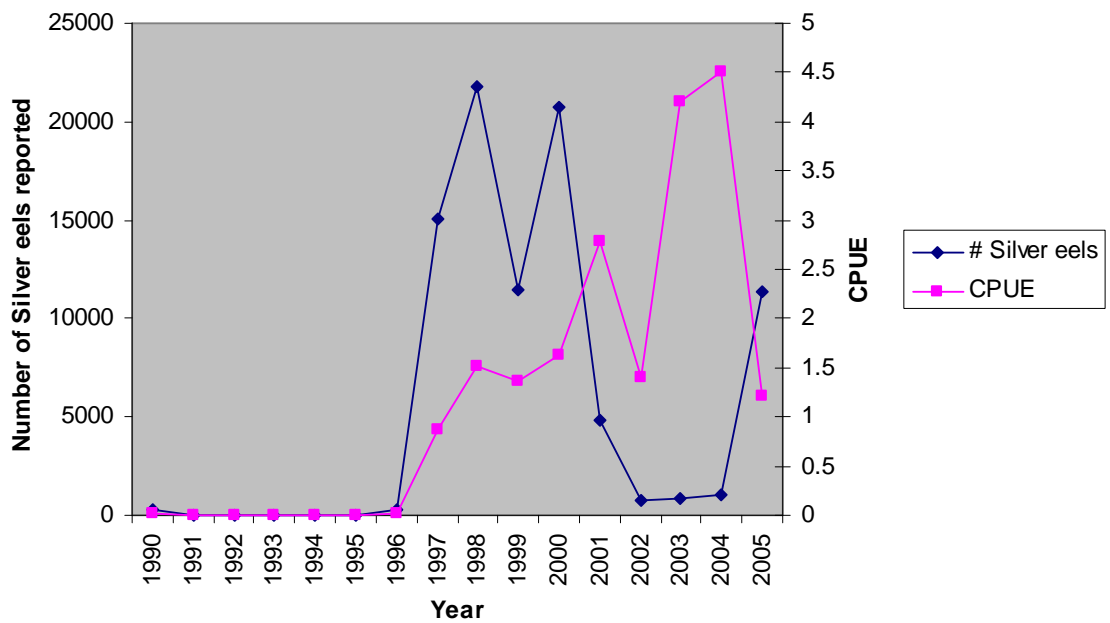


Figure 8. Trend in number of Silver Eels reported harvested in log books and CPUE.

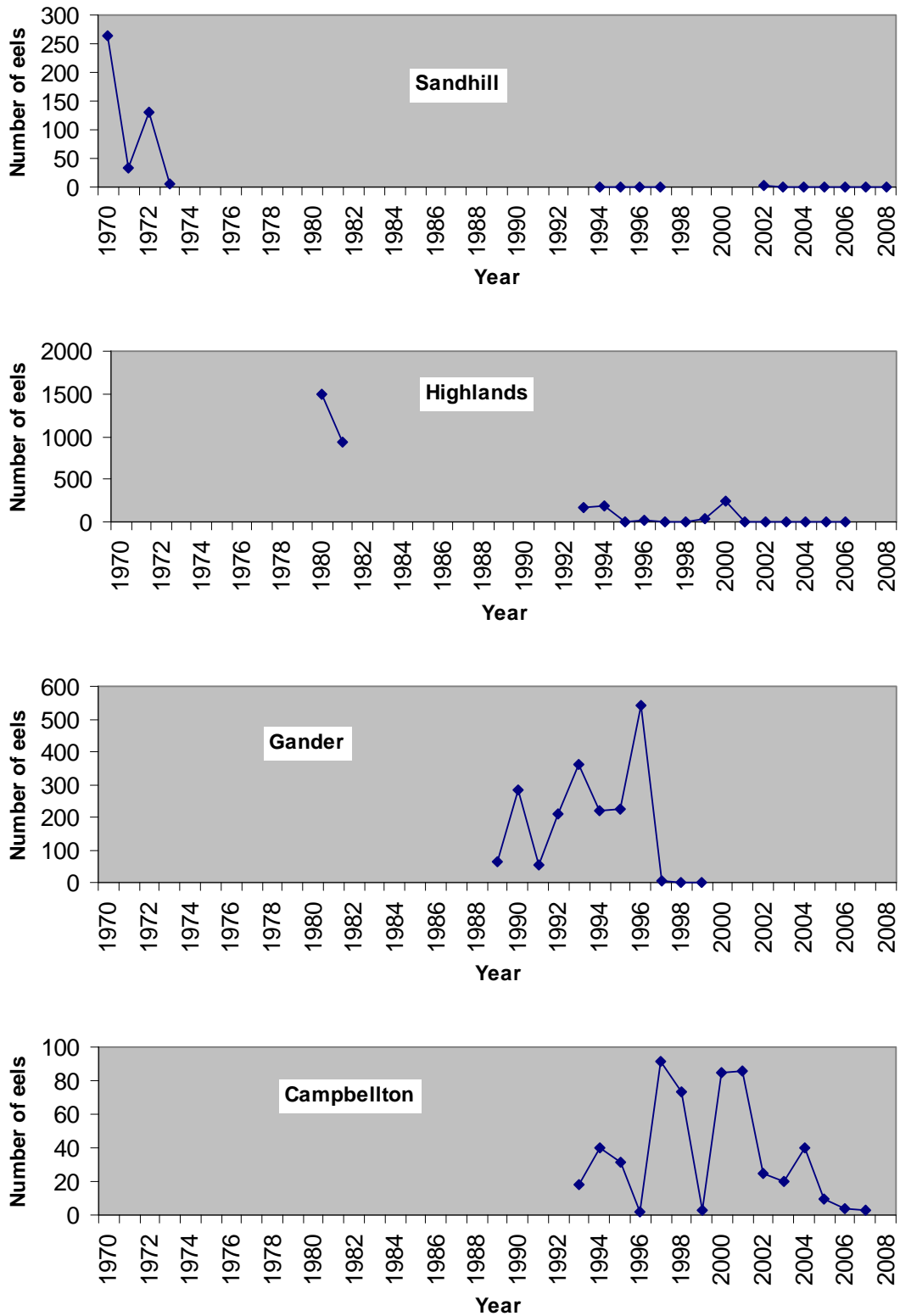


Figure 9. Annual eel count at selected salmon counting facilities in NL Region.

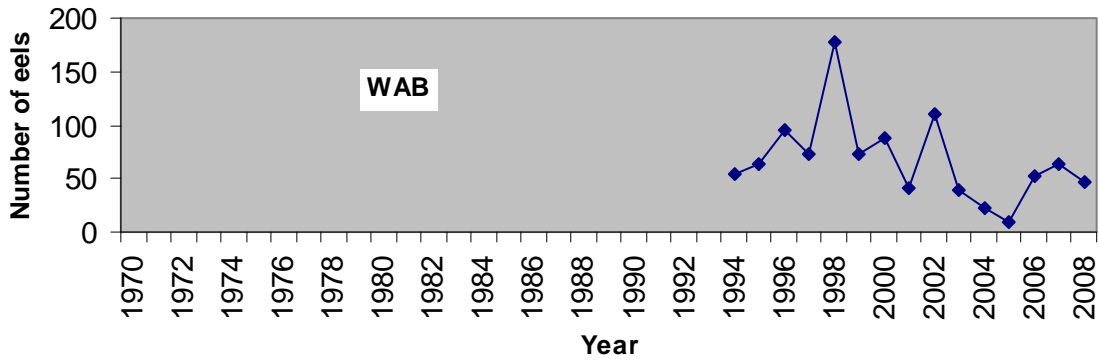
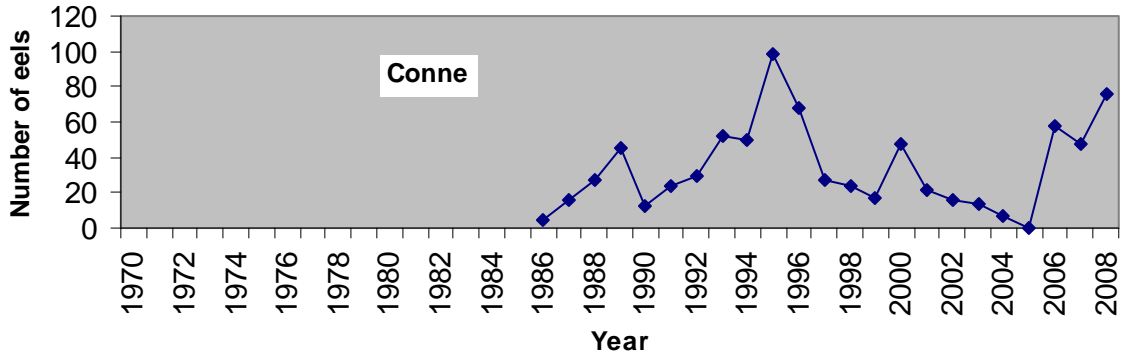


Figure 9. (Cont'd.)

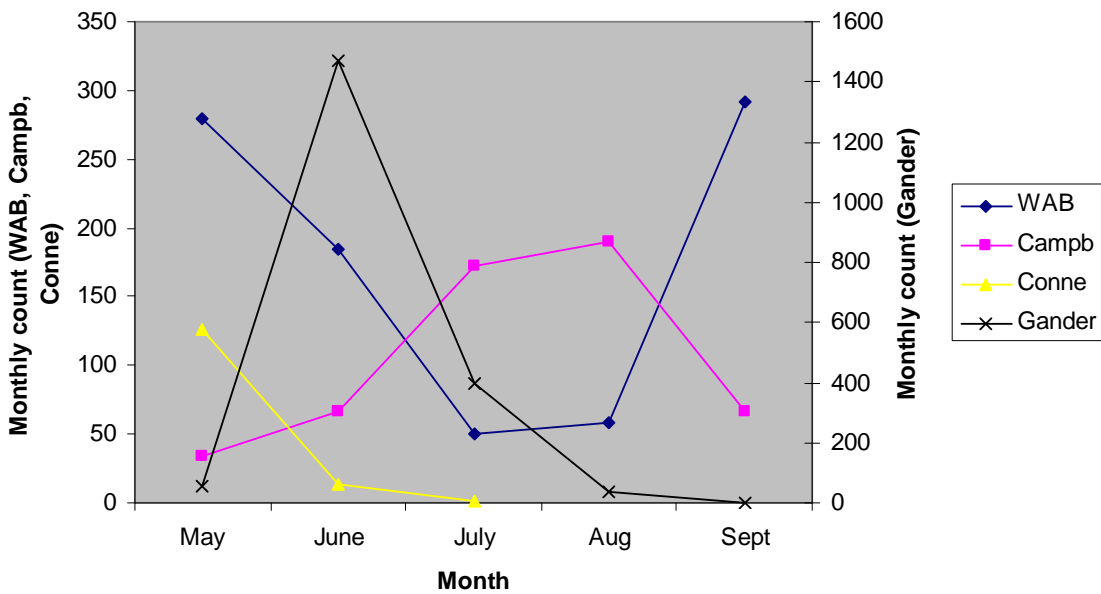


Figure 10. Monthly counts of eels at selected salmon counting facilities in NL Region

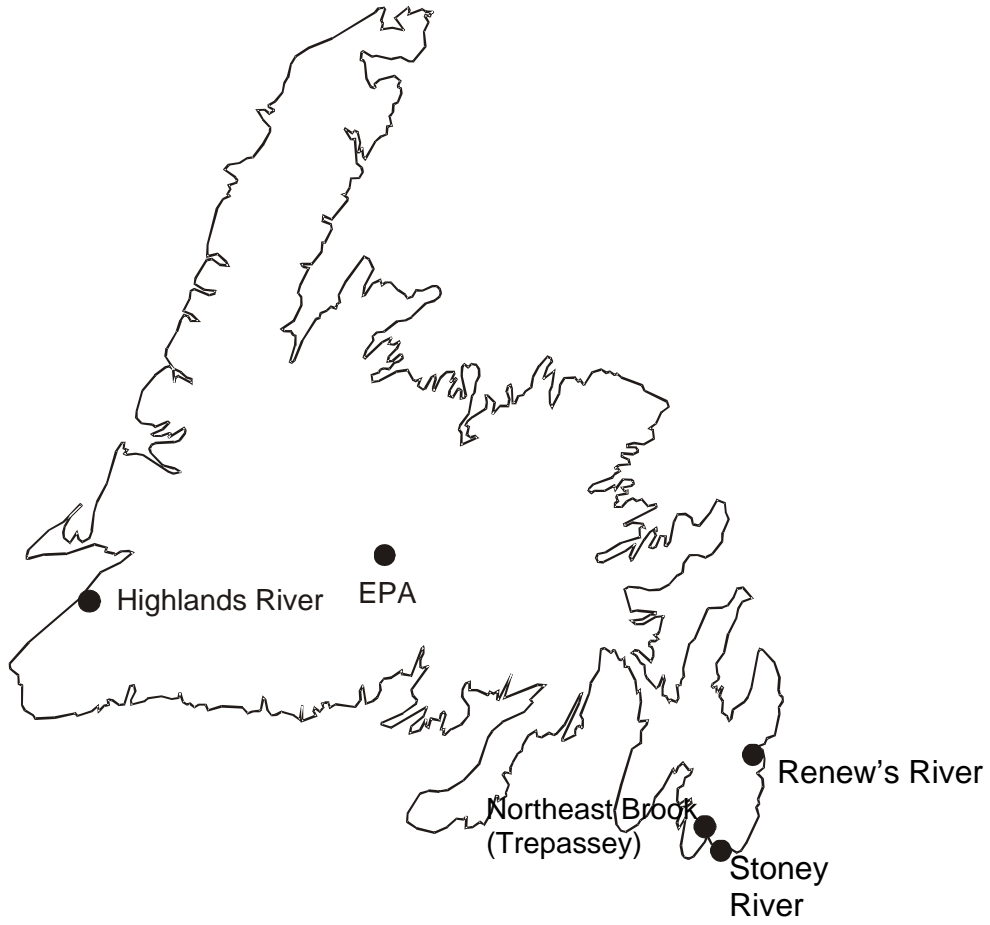


Figure 11. Approximate locations of systems where biological data has been collected on eel.

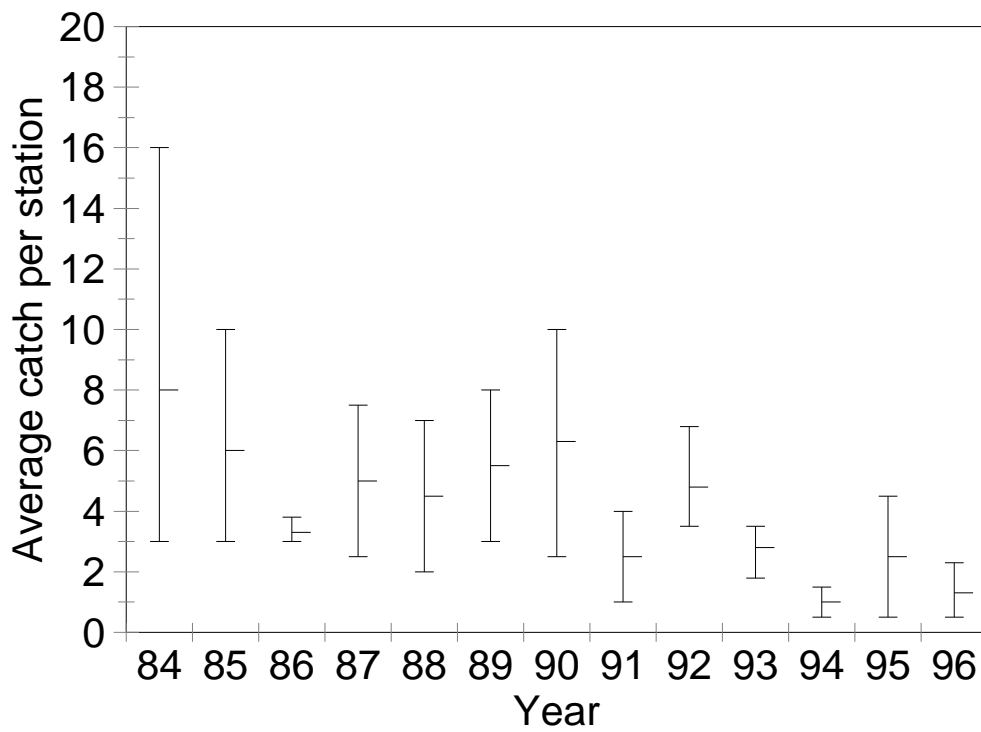


Figure 12. Average catch per electrofishing station in Northeast Brook, Trepassey. Bars are 95% confidence intervals of the mean.

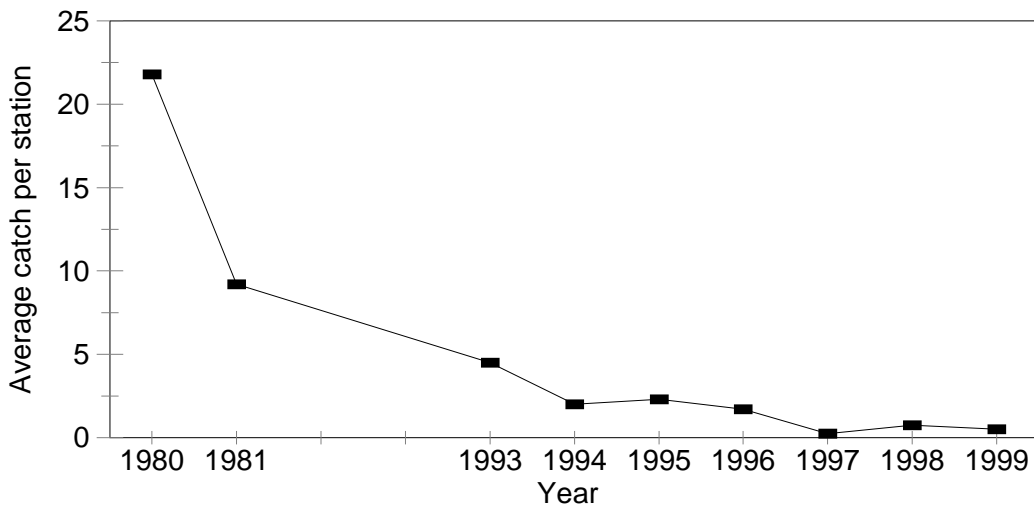


Figure 13. Average catch per electrofishing station in Highlands River.

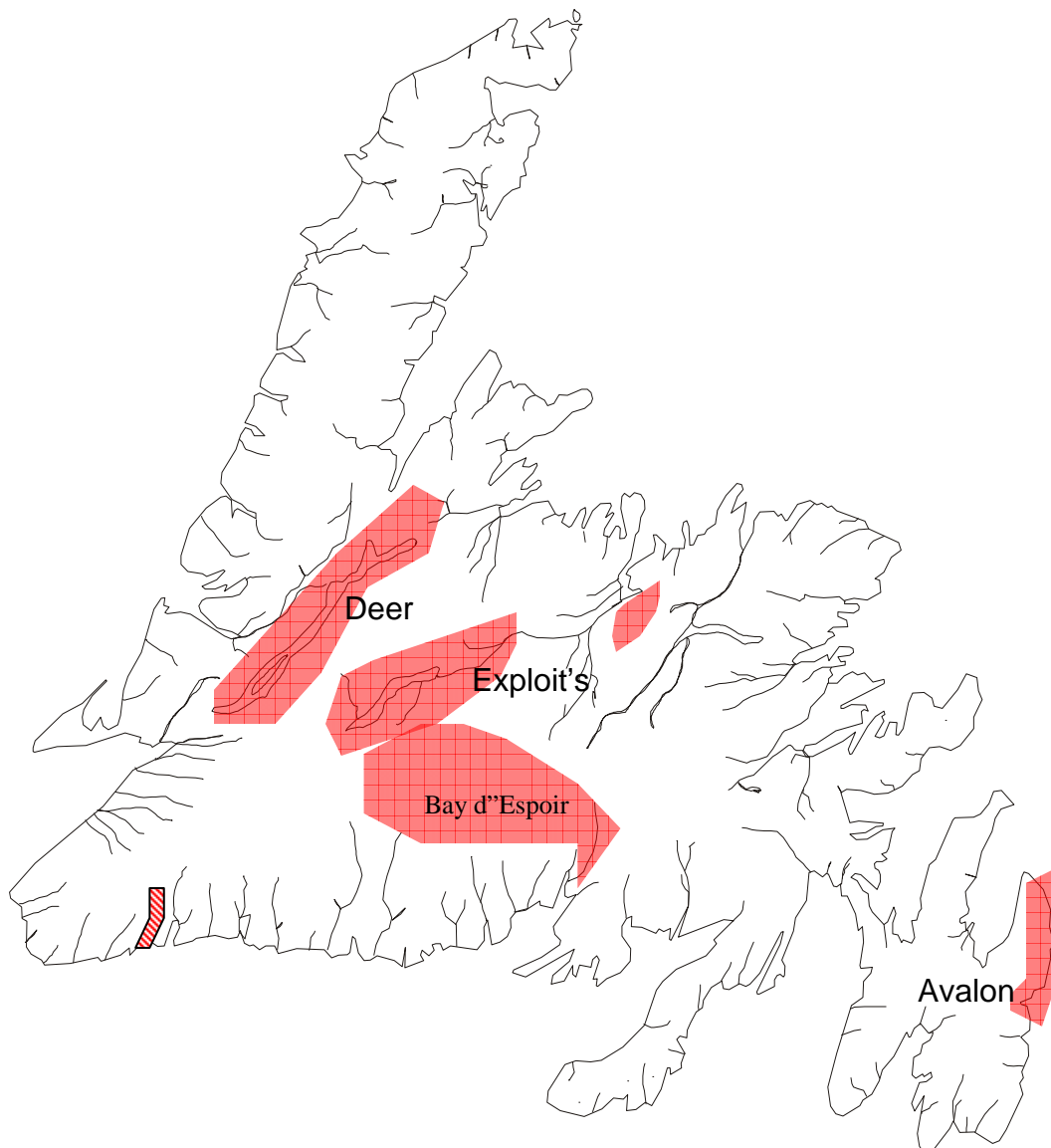


Figure 14. Hydroelectric developments which may have impacts eel habitat.

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