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Status of the Margaree River Gaspereau Fishery (1983)

by

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ABSTRACT

The commercial gaspereau fishery of the Margaree is limited to the Southwest Branch of the river and currently operates seven days per week. Most of the harvest is salted and exported for human consumption. In the 1950's, landings averaged 732t, but decreased to 452t in the 1960's. Since 1970, average catch has increased to record high levels of 1,174t. Effective fishing effort can not be measured but is known to have increased because of increasing licence sales and because of the introduction of mechanized tip-traps between 1975 and 1978. The fishery harvests some bluebacks but is primarily dependent on alewives (approximately 90%) with most fish (approximately 85%) at age 3 and/or age 4. Counts of spawning escapement to Lake Ainslie declined from 3.4 million in 1979 to 300,000 in 1983. Current levels of exploitation appear to be excessive. Several options to reduce the rate of exploitation are discussed.

RESUME

La pêche commerciale du gaspereau dans la rivière Margaree est limitée à l'embranchement sud-ouest de la rivière; actuellement, elle est pratiquée sept jours par semaine. La plus grande partie de la récolte est salée et exportée pour consommation humaine. Dans les années 1950, les débarquements atteignaient en moyenne 732 t, mais dans les années 1960, ils passaient à 452 t. Depuis 1970, les prises moyennes ont augmenté pour atteindre des niveaux record de 1 174 t. L'effort de pêche réel ne peut pas être précise mais on sait qu'il a augmenté, à cause de la vente d'un plus grand nombre de permis et aussi, à cause de l'introduction de trappes basculantes mécaniques entre 1975 et 1978. La pêche récolte une certaine quantité d'aloise d'été, mais elle repose avant tout sur le gaspereau (environ 90%), la plupart des poissons (environ 85 %) se situant à l'âge 3 et/ou à l'âge 4. Le nombre estimé de géniteurs ayant atteint le lac Ainslie a diminué de 3,4 millions en 1979 à 300 000 en 1983. Les niveaux d'exploitation actuels semblent être trop élevés. On expose plusieurs possibilités visant à réduire le taux d'exploitation.

INTRODUCTION

The Margaree River in Nova Scotia supports an important commercial gaspereau fishery. Landings in the 1950's averaged 732 tonnes per year compared to 4,786 tonnes on the Miramichi (Table 1). In the 1960's annual catches from the two rivers were nearly equal, averaging between 450 and 460 tonnes. Since 1970, the average landing on the Margaree has increased to 1,174 tonnes compared to 1,297 tonnes on the Miramichi. Although Miramichi landings remain low, relative to historical levels, the Margaree catch has increased to record high levels (Fig. 1).

Many fishermen on the Margaree River have expressed concern that high catches, particularly those since 1978 (Table 1) have resulted in over-exploitation of the gaspereau. Some fishermen believe that insufficient fish are reaching Lake Ainslie to meet minimum spawning requirements of the stock. This is an important fishery in an economically depressed area of Nova Scotia and is particularly valuable because the quality of the product from this river commands a high price on the market. Over-exploitation will be followed by reduced annual landings and must be avoided through judicious fisheries management.

This report summarizes, in a preliminary form, available information to assist in the management of Margaree gaspereau.

BACKGROUND

The Margaree gaspereau fishery is restricted to an area between Margaree Forks and Lake Ainslie, covering a distance of approximately 21 km on the Southwest Branch of the river (Fig. 2). Fishermen are allowed to operate their weirs from dawn till dusk seven days each week. The season legally opens March 15th and closes July 11. However, because of environmental conditions and run timing, fishing usually does not begin until the first week of May and ends in late June. Fish are salted immediately upon capture (live) and placed in fiber-glass vats of brine to cure. This high quality product is shipped in plastic pails, largely to Haiti, for human consumption and therefore sells at a higher price than fish used for bait or for fish meal.

Traditionally the fishery employed wire or brush weirs which diverted fish moving upstream into a trap area where they were removed by dip-net. However, beginning in 1975, wire mesh tip-traps were introduced in place of dip-nets. By 1978 virtually all fishermen had converted to weirs with tip-traps. The fishery is being increasingly mechanized. Many fishermen now use electric winches to tip their traps, conveyor belts to move fish from trap landings to salt bins and electric augers to dispense salt. Individual fishermen using these techniques are now able to take more fish in less time with less physical effort. Recent increases in catch may be a response to this increase in effective effort and not to any increase in fish

abundance. Fishermen in the most up-river locations complain that the more heavily mechanized fishermen in down-river sites are harvesting most fish before they can reach upstream locations including the spawning habitat of Lake Ainslie. Because of this developing conflict among fishermen, personnel in the Research and Resource Allocation branches, Department of Fisheries and Oceans, have taken a number of actions including:

- 1) Operation of a fish counting fence in 1979 and again in 1983 to monitor spawning escapement to Lake Ainslie.
- 2) Sampling of the catch during 1983 in order to examine age structure, species composition, length-weight relationships, sex ratios and other biological characteristics of the population.
- 3) Implementation in 1983 of a new management policy limiting gaspereau weir length to one-half the stream width instead of two-thirds the width as allowed in previous years.

METHODS

The results from several previous studies of gaspereau in the Margaree River have been reviewed.

O'Neil (1980) sampled gaspereau on the Margaree in 1978 and 1979. In that study, species composition and age structure of the sample were described although this may not provide a true description of the total river population because changes in these parameters with time during the spawning migration were not considered in relation to changes in daily magnitude of the run. O'Neil examined scales to determine age of his specimens.

Crawford (1983) sampled gaspereau from the fishery in 1981 and 1982. He used otoliths for age determination. Samples may not be totally representative of the fishery for the same reason as in O'Neil's study.

In 1979, personnel of the Resource Branch, under the direction of B. Jessop, operated a fish counting fence approximately two kilometers downstream from Lake Ainslie in order to enumerate spawning escapement. All commercial weirs were located downstream from the fence and counts can therefore be regarded as escapement to the spawning grounds in Lake Ainslie.

In 1983, a fish fence was again operated to determine spawning escapement to Lake Ainslie. Fence location was the same as in 1979 and design was similar. The fence was constructed using spruce and maple posts driven into the stream bottom in pairs at two meter intervals running diagonally across the stream. A board walk was constructed across the stream attached to connectors joining each pair of posts. This framework was installed in the typical "V" formation necessary to lead fish in the upstream direction. Frames built from 2 X 4 lumber covered with 2.5 cm by 3.8 cm or 2.5 cm by 5.0 cm

electro-weld screening were placed against the fence framework to prevent passage of fish except at a counting gate positioned in the main channel. Concrete patio stones, painted white, were placed on the stream bottom at the gate opening to facilitate counting of fish by personnel positioned above the opening. This gate was closed during darkness.

Because insufficient manpower was available within the Research Branch to operate the fence, assistance was solicited from Job Creation personnel working on other fisheries projects in the area. For part of the time, students were provided by the Provincial Department of Fisheries through their Summer Employment Program. Several gaspereau fishermen also assisted in installation of the fence.

In 1983, Research Branch personnel collected fish samples from the fence site and from the commercial fishery. Samples were taken throughout the run, but since good information on daily commercial catch was not available these may not be totally representative of the fishery. Most samples were processed fresh but some were frozen for subsequent processing in the lab. After thawing, each specimen was measured to the nearest mm fork length and weighed to the nearest gram. Sex and state of maturity were determined by examining gonads and species was identified by examining the colour of the peritoneal lining. The peritoneum in alewives was considered to vary from pink to pearly-grey while it was sooty-black in blueback (Scott and Crossman, 1983). In the few cases where species identification remained uncertain, species was later determined, by examination of scales using criteria described by MacLellan et al. (1981). For species confirmation and age determination, a sample consisting of 6 - 8 non-regenerated scales was collected from an area below the dorsal fin and extending above and below the lateral line; these were mounted on acetate slides. Regenerated scales could usually be identified by visual inspection. Age of each specimen was subsequently determined in two independent readings by examining scales at a magnification of 25X and applying the criteria established by Cating (1953) and reviewed by Rothschild (1963). Where there was disagreement between the two age determinations, a third reading was made and the age common to two readings was accepted.

RESULTS AND DISCUSSION

In 1978 and 1979 the alewife run preceded bluebacks by about three weeks with little overlap between the two (O'Neil, 1980). The fishery was found to be largely dependent on alewives. In 1981 and 1982 the harvest was more precisely estimated to be 92% alewives and only 8% bluebacks (Crawford, 1983). In 1983, samples from the counting fence were 100% alewives (N=293). The sample from the commercial fishery downstream (N=314) included only four bluebacks (1.3%).

In 1978, alewives were primarily age 4 (Table 2). In 1979, the 1974 year-class again contributed heavily at age 5. Apparently there were no fish at age 3. By 1981, most alewives were age 3 (1978 year-class) although Crawford (1983) suggests that there was a sample bias in favour of these younger fish. Nevertheless, it appears that the 1978 year-class was strong, contributing heavily to the fishery again in 1982. In 1983 there was again a strong contribution from fish age 3 (Table 2). Care must be taken in the interpretation of these values. Since the figures are reported as a percentage of the catch, high values merely indicate high numbers of fish relative to other age-groups. A weak year-class can appear to be strong because other year-classes are especially weak. Because the 1983 catch was poor, the 1980 year-class (age 3) may be much weaker than these figures would suggest. The decline in fish age between 1979 and 1981 may be real but there is a strong possibility that O'Neil (1980) interpreted fish to be one year older than did subsequent investigators. Nevertheless, it is apparent that the fishery is heavily dependent on fish in only two age-classes. This is similar to the age structure of the exploited gaspereau stock in the Miramichi but is in sharp contrast to the relatively unexploited stock of West River, Antigonish county, in which substantial numbers are found at ages up to 12 years (Table 3).

Operation of the fish fence near Lake Ainslie in 1979 indicated that large numbers of gaspereau were reaching the lake. At the peak of the run, fish were observed to be crowded behind the fence across the entire stream and for a distance of 200 to 300 meters downstream (Morantz, unpublished data). Escapement through the fence was estimated at 3.4 million fish although accuracy of the count was impossible to determine. Although optimum spawning escapement of alewives to Lake Ainslie is not known there can be little doubt that 3.4 million fish greatly exceeds the minimum requirement.

Operation of the fish fence in 1983 was less than satisfactory because of personnel problems, wash-outs, etc. However, on only a few days between May 5 and June 15 was there ever any substantial number of gaspereau held-up behind the fence. At no time did this accumulation equal that described for 1979. The total number of fish counted through the fence was about 148,000. Because of the number of holes which developed and the occasions on which one or more screens were washed away for short periods, observations suggest that the count could be at least doubled. A spawning escapement of approximately 300,000 alewives to Lake Ainslie may still exceed the minimum spawning requirements. Nevertheless, this is a substantial reduction from 1979 and it suggests that very small numbers of repeat spawners will be available to the fishery in 1984.

The small number of year-classes contributing to the fishery and the decline in spawning escapement from 1979 to 1983 suggest that fishing exploitation is high and may be increasing. Recent decreases

in annual landings also indicate that the stock may have been over-harvested. This is not fully supported by Crawford's studies. He estimated (1983) on the basis of tags applied in 1981 and recovered in 1982 that exploitation in the fishery was only 36%. In that year, the harvest of 5.2 million alewives was taken from a population of 14.6 million. However, this estimate may be subject to large error. In his review of the 1983 fishery, Crawford (1984) estimated total annual mortality rate to be 85% for male and 83% for female fish. Using catch trends and environmental data, Crawford (1983) predicted a decline in harvest to about 736 tonnes in 1983 followed by a record high catch of 1839 tonnes in 1984.

CONCLUSION

Observations by some fishermen indicate that gaspereau stocks on the Margaree River are being over-harvested. The majority of the available data examined tend to confirm that current levels of exploitation are excessive. If the number of fish available in 1984 is small, then reduced exploitation may be necessary to achieve adequate spawning escapement. If the number of fish available increases to record high levels, then the harvest should be reasonable even if the rate of exploitation is reduced. In either case a reduced rate of exploitation is in the best interests of the fishermen. This will lead to a more stable fishery, harvesting a greater number of year-classes and thus taking older, larger fish in subsequent years.

Fisheries managers can consider various options to reduce the rate of exploitation. These options include:

- 1) Reduce the number of weirs fishing. Unfortunately the required level of reduction can not be readily quantified because of variable weir efficiency and other factors. However, it is apparent that no new licences should be issued.
- 2) Delayed opening of the season to allow a portion of the run to reach Lake Ainslie prior to commencement of the fishing season. This action has limited application because run timing is variable from year-to-year and there is no facility to estimate the level of escapement following which harvest would be permitted.
- 3) A short-term closure of the fishery at some point near the peak of the run. Although this would likely be the most effective method of ensuring good escapement there would again be difficulty in determining when the closure should be implemented and how long it should continue. A successful fishery might also be jeopardized regardless of run strength since the bulk of the run can pass any given point on the river in a matter of only a few days. This is demonstrated by the daily count of gaspereau passing through the fence in 1983 (Fig 3.).

- 4) Application of a pre-defined weekly closed time on the fishery. The Nova Scotia fishery regulations currently specify a weekly closed time "From 8 a.m. of each Friday to 8 a.m. of the Sunday immediately following" but the regulation has been waived on the Margaree River. Unfortunately, detailed information on daily landings in the fishery is not available for use in determining the impact of such a closure. Also, factors such as the length of time required for individual fish to move through the fishing zone are unknown. If this time is greater than the period of closure, then fish escaping weirs in the lower fishing zone would be harvested further upriver when fishing resumes. Nevertheless, escapement would still be increased since fish in the upriver zones at the time of the closure could be expected to reach spawning areas in the lake. If daily counts of gaspereau at the fish fence in 1983 are considered to be representative of the fishery, and if it is assumed that all fish harvested would have escaped if closure was in force, then a two-consecutive day per-week closure in 1983 would have resulted in a harvest reduction of between 17 and 50%. Because of delays in fish movement, true harvest reduction would likely be less than these figures suggest. It appears that the two-day per-week closure would be the least controversial and most easily applied method of reducing exploitation.

RECOMMENDATIONS

It is recommended that:

- 1) No additional gaspereau fishing licences be issued on the Margaree River.
- 2) The level of fishing exploitation be reduced by one of the methods discussed or by alternative measures.
- 3) Biological studies of this population be continued and if possible, expanded by personnel of the Research Branch, DFO in order to provide the scientific basis for the provision of sound biological advice on the management of this stock.

ACKNOWLEDGEMENT

Operation of the fish fence in 1983 by personnel of the Department of Fisheries and Oceans was implemented on short notice and with minimal resources. Albert Vromans was largely responsible for organizing day-to-day operations and undertook much of the biological sampling, age determinations and data compilation. Perry Swan assisted with many aspects of the project. Bruce Hendsbee, Area Director, provided financial assistance from Field Services budget and arranged for personnel from a separate Job Creation project to assist in operation of the fence. Réjean Hébert, statistical officer with the Resource Allocation and Development Branch supplied historical catch and effort information. Dr. S. Campbell and R. Gray reviewed this manuscript.

Several commercial gaspereau fishermen assisted in installation of the fish fence and I am grateful to Mr. C. McLean for relocating his gaspereau weir so that we could use his traditional location for the fish counting fence.

Murray Hill, Nova Scotia Department of Fisheries, provided student assistants at critical periods for operation of the fence and Bob Crawford of the same department provided manuscript reports summarizing his unpublished study results for 1981 to 1983.

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Table 1. Summary of gaspereau (alewife and blueback herring) landings and potential fishing effort (number of licenced weirs) on the Margaree River. Price per kilogram is shown for selected years. Some data are shown for the Miramichi River for comparison.

Year	Catch (tonnes)		No. of Weirs	Price/kg (\$)	
	Margaree	Miramichi		Margaree	Miramichi
1950	713	4952			
1951	755	8014			
1952	964	11381			
1953	638	8026			
1954	1275	4649			
1955	1163	3413			
1956	859	3009			
1957	58	884			
1958	395	816			
1959	496	1596			
1960	531	716			
1961	423	161			
1962	558	733			
1963	551	543			
1964	640	119			
1965	875	425			
1966	320	746			
1967	185	532			
1968	188	436			
1969	251	175			
1970	408	874			
1971	620	469	21		
1972	965	468	25		
1973	1113	967	27		
1974	1681	271	37		
1975	1238	141	61		
1976	497	406	44		
1977	1202	2240	39		
1978	1713	1434	62	0.10	0.06
1979	1776	3343	81	0.09	0.09
1980	1069	3767	82	0.11	--*
1981	1369	1410	75	0.13	0.11
1982	1445	1278	67	0.22	0.13
1983	580	1088	69	0.33	0.17

* Value of \$0.29/kg reported by Statistics Branch is assumed to be in error.

Table 2. Approximate percentage of biological samples in each age group from gaspereau (primarily alewives) collected from the Margaree River in 1978, 1979, 1981, 1982 and 1983.

Year	Sample size (no.)	Age								
		3	4	5	6	7	8	9	10	
1978*	302		48	31	13	5	2	1	1	
1979*	2009		11	57	20	9	3	1	1	
1981**	419	85	8	5	3	1	-	-	-	
1982**	537	33	48	7	6	5	1	-	-	
1983	314	52	33	12	2	1	0	1	-	

* Source: O'Neil, J.T. 1980.

** Source: Crawford, R.H., 1983.

Table 3. Percentage at each age in samples of gaspereau collected from the relatively unexploited population in West River, and from the heavily exploited population in Margaree River, Nova Scotia (1983) and from the Miramichi River, New Brunswick (1983).

Age	N	3	4	5	6	7	8	9	10	11	12
% West River (251)		1	6	6	20	17	20	11	10	6	2
% Margaree River (314)		52	33	12	2	1					
% Miramichi River (1766)		17	49	18	7	2	5	1			

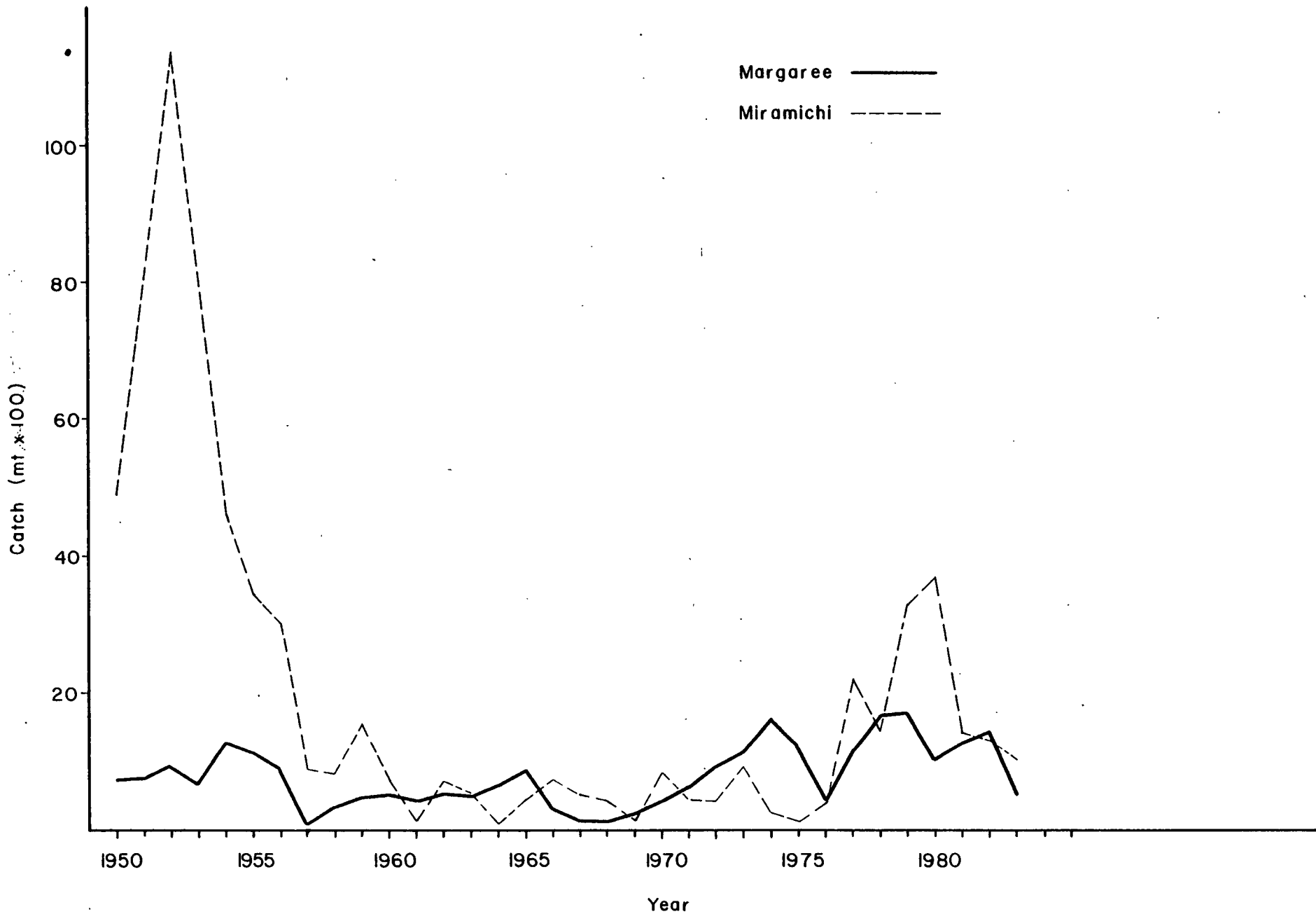


Fig. 1 Graph showing annual landing of gaspereau from the Margaree River, Nova Scotia. (Landings from the Miramichi River are shown for comparison)

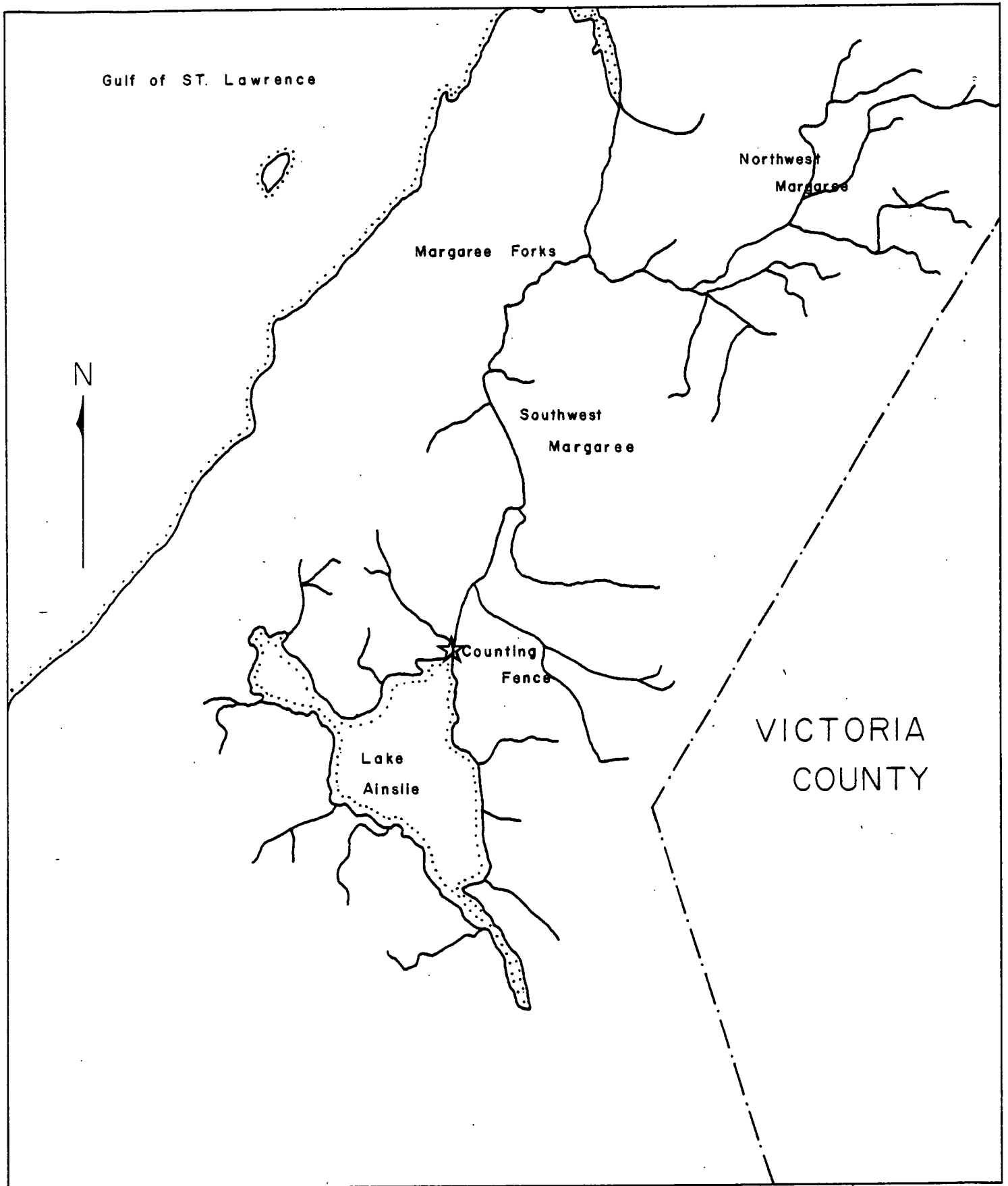


Fig. 2 Map showing Margaree River, Nova Scotia, and the location of the fish fence installed on the S.W. Margaree in 1979 and 1983.

