

Miramichi Smelt (*Osmerus mordax*)**Miramichi Smelt**

*Anadromous rainbow smelt (*Osmerus mordax*) have been extensively fished commercially and recreationally throughout the southern Gulf of St. Lawrence since at least the turn of the century. The Gulf New Brunswick fishery was reviewed in 1995 (Anonymous 1995).*

*The fishery from the Miramichi River estuary is the largest in eastern Canada with landings since 1989 averaging 300 t annually. The fall open-water fishery typically accounted for 20% of the total landings for the period October 15 to the end of March of the following calendar year. The deployed fishing gear is broadly similar in the fall and winter fisheries but with the gear in the fall set to bottom, whereas gear in the winter is suspended from ice cover. The principal fishing gear (box and bag nets) is non-selective and current concerns regarding by-catch are for three species in particular: striped bass (*Morone saxatilis*), white hake (*Urophycis tenuis*) and winter flounder (*Pleuronectes americanus*). Striped bass are a recreational fish currently under conservation management due to low spawner abundance. White hake were fished commercially throughout the southern Gulf but the species is currently at its lowest biomass since the introduction of quota management in 1982 and the fisheries were under moratoria in 1995. Winter flounder occur as a shallow water, inshore species and the abundance indices for this species are indicative of reduced abundance relative to previous years.*

General description

Because of the status of these groundfish and recreational fish species and their incidence as by-catch in the open-water smelt fishery, a study was conducted to estimate and describe the catch of these fish in the context of their stock status and magnitude relative to the targeted species. Sampling of by-catch of striped bass, white hake and winter flounder in the open-water smelt fishery was initiated in 1994 and repeated in 1995. The purpose of the 1995 study was: 1) to estimate the absolute and relative magnitude of the by-catch for the three species of concern, 2) to document the size composition of the by-catch, and 3) to assess possible remedial action to reduce the by-

catch. Sampling was conducted twice per week at two locations in Miramichi Bay, an upper area around Chatham and a lower area in the vicinity of Loggieville.

Results

Average catch and relative catch: The average abundance (catch per unit of effort) by weight was highest for tomcod (*Microgadus tomcod*) at 26 kg per net per day followed by white hake (23 kg per net per day), smelt (13 kg per net per day) and winter flounder (3 kg per net per day). Numerically, young-of-the-year striped bass were the most abundant, averaging 312 fish per net per day during 1994 and 1995. There were important differences in the size composition of the by-catch between years. In 1994, about 8 kg of white hake were caught for every kg of smelt. In 1995, the relative catches of hake and smelt were similar. The 1994 catches included a large proportion of hake greater than 25 cm total length while in 1995, these larger fish were essentially absent from the catches. Small winter flounder (< 25 cm total length) were more abundant in the 1995 catches relative to 1994.

Magnitude of the by-catch: Weekly average CPUEs were scaled to total effort and summed for the entire season as an estimate of the total by-catch for the year.

Year	Catch	White hake	Winter flounder	Rainbow smelt	Atlantic tomcod	Striped bass
1994	CPUE	33.2 kg	2.2 kg	8.4 kg	25.4 kg	-
	CPUE	217 fish	10 fish	-	-	98 fish
	Catch	44 t	3 t	11 t	34 t	131,000 fish
1995	CPUE	16.5 kg	3.7 kg	16.6 kg	26.0 kg	-
	CPUE	282 fish	45 fish	-	-	475 fish
	Catch	17 t	4 t	17 t	27 t	501,000 fish

Interception of non-targeted fish is not synonymous with mortality. Catches were generally culled on the water and variable quantities of the by-catch were returned to the water within a few minutes of being boarded. Live hake experienced difficulty descending into the water column when culled and predation by gulls appeared to be substantial on this species. Live culled fish tended to be the larger members of the by-catch. Young-of-the-year striped bass are smaller but tended to aggressively work their way to the top of the catch and were sorted easily. The estimates of by-catch magnitude may be biased upward by recapture of previously released fish. The

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exploitation rates for white hake, winter flounder and striped bass in the smelt fishing gear are not known.

Timing of occurrence of catch: By-catch of young-of-the-year bass tended to increase with season in the upstream section of Miramichi Bay but declined with time in the lower bay. By-catch of bass could be reduced in the lower bay by delaying the season two weeks. This action would not be effective in the upper bay.

White hake catches tended to decline with season in the bay but reduced by-catch would not have been realized until about mid-November. There was no trend with season in the by-catch of winter flounder.

Catches of smelt were relatively uniform through the open-water season whereas tomcod catches increased from the lower bay to the upper bay during the season.

Size and weight profiles: Young-of-the-year were the dominant by-catch age group of bass. Significant reduction in bass by-catch, in terms of numbers and weight, could only be accomplished by eliminating or severely reducing the smelt fishery.

White hake catches were not weighted to a particular size group but small hake (<25 cm total length) were the most abundant in terms of numbers and biomass. Elimination of hake less than 20 cm total length would have reduced by 70% the catch in numbers and by 60% the catch in weight.

Winter flounder of market size (>18 cm total length) accounted for 75% of the catch weight but less than 30% of the catch number. Current regulations which require smelt fishers to release by-catch of flounder, particularly those of market size, is highly effective in reducing by-catch weight but not by-catch number.

Public consultation

A Science workshop was conducted in January 1996 with members of the fishing industry and Department of Fisheries and Oceans Fisheries Management to review the results of the 1994 and 1995 by-catch studies. The methods were described and the data were interpreted. The data tabled at the meeting and discussions related to the analysis and interpretation were included in the draft assessment prepared by the team leader which was subsequently peer reviewed in February 1996.

Management considerations

The magnitude of the by-catch varies among years in terms of the quantity and size groups of the different species intercepted. The impact of this by-catch is unknown because the actual mortality is unquantified (i.e., many of the juvenile bass are released and the magnitude of the by-catch relative to population abundance is unknown).

The objective is to minimize the by-catch quantities of non-targeted species. Delaying the season is not expected to reduce the magnitude of the by-catch.

Procedures to reduce by-catch need to be considered in the context of their potential impact on the landings of the targeted species, smelt. An increase in mesh size could reduce the by-catch but is likely to impact negatively on landings of smelt and tomcod. Current net configurations represent a compromise between the problem of fish entanglement in larger mesh and retention of smelt of commercial size.

The 2.4 cm stretched mesh configuration effectively retains commercial sized smelt (> 12 cm fork length) while avoiding the retention and entanglement of the smaller and more numerous 0-group smelt. Saleable smelt in the total catch of this species account for about 90% by weight and 85% by number.

Tomcod are also frequently targeted in the smelt fishery. In 1994, market size tomcod were those larger than 15 cm. However, in 1995, the size was increased to 18 cm. As a result of this change, the 1995 catches of market size tomcod accounted for 70% by weight but only 30% by number. The assessment of the impact of smelt gear on this species rests largely with the criterion for evaluation, by weight or by number of fish. One option may be to re-target the open-water fishery to larger tomcod. Larger mesh nets could then be used which would reduce the by-catch of juvenile bass, hake and tomcod.

Even though by-catch is an obvious problem in this small fishery, closure is not advocated in view of the uncertainty as to the actual impact that the fishery is having on the other fisheries resources.

The study did not assess the entire open-water fishery. A proper assessment would require that the results reported here for a portion of the fishery be related to the entire fishery.

Research recommendations

- The mortality rate on fish taken as by-catch and culled from the catches should be estimated. Without this information, it is not possible to estimate the impact on subsequent recruitment.

Reference

Anonymous. 1995. 1995 Gulf Region stock status report for diadromous stocks. Edited by Science Branch, Gulf Fisheries Centre, Department of Fisheries and Oceans, Moncton, New Brunswick, Canada. Can. Man. Rep. Fish. Aquat. Sci. No. 2286, 343 p.

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