

Not to be cited without
permission of the authors¹

DFO Atlantic Fisheries
Research Document 93/9

Ne pas citer sans
autorisation des auteurs¹

MPO Document de recherche sur
les pêches dans l'Atlantique 93/9

**The status of alewife and blueback herring stocks in Scotia-Fundy Region as
indicated by catch-effort statistics**

by

B.M. Jessop
Freshwater and Anadromous Division
Biological Sciences Branch
Department of Fisheries and Oceans
Scotia-Fundy Region
P.O. Box 550, Halifax, Nova Scotia B3J 2S7

¹This series documents the scientific basis for the evaluation of fisheries resources in Atlantic Canada. As such, it addresses the issues of the day in the time frames required and the documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

Research documents are produced in the official language in which they are provided to the secretariat.

¹La présente série documente les bases scientifiques des évaluations des ressources halieutiques sur la côte atlantique du Canada. Elle traite des problèmes courants selon les échéanciers dictés. Les documents qu'elle contient ne doivent pas être considérés comme des énoncés définitifs sur les sujets traités, mais plutôt comme des rapports d'étape sur les études en cours.

Les Documents de recherche sont publiés dans la langue officielle utilisée dans le manuscrit envoyé au secrétariat.

Abstract

The status of alewife (Alosa pseudoharengus) and blueback herring (A. aestivalis) stocks in Scotia-Fundy Region, from the perspective of available data on reported fisheries landings and licences issued, is one of substantial intraregional and annual variability in abundance. Alewives occur in more rivers and in higher proportion than do blueback herring. The largest single source of alewives is the Saint John River. High intraregional variability exists in the choice of gear type - gill net (set and drift), dip net, and trap net - with gill net fisheries most active in the mouths of larger rivers, dip nets most frequent near the mouths of small-to-moderately-large rivers, and trap nets confined primarily to the inland waters of the large Saint John River. A transition during the mid-1980s from the use of sales slips and Supplementary B catch estimate reports to the use of logbooks by individual fishermen and the unenforceable nature of the requirement (until 1993) resulted in substantial underestimate of true catches during this period. In recent years, there has been a general decline in reported landings, large fluctuation in effort, and decline in catch-per-unit-of-effort.

Résumé

Si l'on se fonde sur les données dont on dispose au sujet des débarquements déclarés et des permis délivrés, l'abondance des stocks de gaspareau (Alosa pseudoharengus) et d'alose d'été (A. aestivalis) dans la région de Scotia-Fundy fait l'objet d'importantes variations annuelles et intrarégionales. Le gaspareau est présent dans plus de rivières et en plus grand nombre que l'alose d'été. La plus grosse source de gaspareau est le fleuve Saint-Jean. Il existe aussi d'importantes variations intrarégionales quant aux engins de pêche utilisés (filets maillants fixes ou dérivants, haveneaux et parcs en filet), les filets maillants étant surtout employés dans l'embouchure des grandes rivières, les haveneaux le plus souvent dans l'embouchure des petites et moyennes rivières, et les parcs en filet essentiellement dans les eaux intérieures du grand fleuve Saint-Jean. L'abandon, vers le milieu des années 80, des récépissés de vente et des rapports d'estimation de prises au profit des journaux de pêche établis par chacun des pêcheurs, ainsi que la difficulté de forcer ces derniers à utiliser les journaux en question (jusqu'en 1993) se sont traduits par une sous-estimation importante des prises réelles durant la période considérée. Ces dernières années, on a constaté un fléchissement général des débarquements déclarés, de grandes fluctuations dans l'effort et une baisse des prises par unité d'effort.

Introduction

Alewives (*Alosa pseudoharengus*) and blueback herring (*A. aestivalis*), jointly and commonly termed gaspereau, river herring or simply alewives, support important commercial fisheries in Scotia-Fundy Region. Biological and catch-effort information is insufficient to evaluate the status of more than a few stocks of alewives and blueback herring. This paper examines the status of alewife and blueback herring stocks (hereafter termed alewives unless specifically differentiated) in Scotia-Fundy Region from the perspective of available data on fisheries landings and licenses issued.

Historical Perspective

The present abundance of alewives was greatly exceeded by their colonial abundance but even then their abundance markedly declined in response to industrial development (Perley 1852; Knight 1867). Perley (1852) commented that "...the gaspereau fishery has been considered of so much importance, that various Acts of Assembly have, from time to time, been passed for its regulation and protection. But these laws have either been neglected, or not properly enforced, and this fishery is rapidly declining. Very slight obstructions suffice to prevent the gaspereaux from ascending streams to their old haunts; the dams for mills, or for driving timber, have shut them out in numerous instances from their best spawning grounds, and the greatest injury has in this way been inflicted on the fishery." Most such dams have long since been removed and fish passage provided at most remaining dams, although downstream passage at hydroelectric dams remains a problem. The creation of large headponds has enhanced the production of alewives in some cases, e.g., Mactaquac Dam headpond (Jessop 1990), Gaspereau Lake (Jessop and Parker 1988). Environmental degradation, including acid precipitation in geologically sensitive areas such as south-western Nova Scotia (Watt et al. 1983; Klauda et al. 1991), is now of major concern.

Biology

Anadromous alewives occur in virtually all suitably-sized and accessible rivers in Scotia-Fundy Region; blueback herring occur in fewer rivers, most notably in the Saint John and Tusket rivers, and are less abundant than alewives where both species co-occur, e.g., about 30-40% of the run in the Saint John River (Messieh 1977; Jessop et al. 1983), and about 20% of the run in the Tusket River (Stone et al. 1992). Spawning migrations of alewives typically begin in late April or early May, depending upon geographic area and water temperature, peak in late May or early June and are completed by mid-July. Blueback herring enter the river 2-3 weeks later than do alewives. Both species return with substantial fidelity to a home river (Messieh 1977; Jessop 1990) and return to sea soon after spawning.

Alewives and blueback herring recruit by platoons to the spawning stock and to the fishery over 2-4 years. Spawning occurs first in both species at age 3 and virtually all fish have spawned by age 6. The mean age at first spawning is older for alewives than for blueback herring and usually older for females than for males of each species. Repeat spawners may form a high proportion (35-90%) of the stocks of both species, with higher proportions of repeat spawners where exploitation is low.

Catch and License Statistics

Catch (landings) statistics (more properly sales statistics) for alewives are available from 1960 onwards for each Fishery Statistical District (FSD) in Scotia-Fundy Region (Table 1; Figure 1). Inaccuracies in these statistics occur because catches may be landed or sold in an FSD different from the one where capture occurred, and records were maintained with variable thoroughness. The mid-1980s saw a transition from the use of sales slips and Supplementary B report estimates of landings to the use of logbooks by individual fishermen so that effort as well as catch statistics could be obtained. Introduction of the

logbook varied among FSD's; the Saint John River area began use of a logbook in 1980, with the remainder of Scotia-Fundy Region starting in 1983. Unfortunately, the quality of implementation varied among FSD's and logbook use was not legally enforceable until 1992, resulting in returns that varied in completion rate from poor to mediocre. During this transition period, the sales slip system was being phased out. With neither system fully operational, the catch statistics of this period undoubtedly underestimate true catches substantially and should be used with caution.

Catch Trends

Reported landings of alewives in Scotia-Fundy Region fluctuated from 1,559 to 6,649 t between 1960 and 1992 (Table 1, Figure 1). Recent catches have declined below the 30-yr mean of 3752 t but are within the historical range. Total catch of alewives in Scotia-Fundy Region is apportioned 35:65% to Nova Scotia:New Brunswick. From 1960-1992, Nova Scotia catches ranged between 263-2,858 t. Recent catches have, with the exception of high catches in 1989, been relatively stable and below the long term mean of 1,312 t. New Brunswick catches during 1960-1992 ranged from 819-6,455 t. Catches have trended downward since 1971, were low during the early 1980s then increased moderately during the late 1980s before declining again, such that recent catches have been below the 30-yr mean of 2,440 t. Catch statistics for 1992 were substantially lower than in 1991 in many rivers.

Landings reported by FSD typically include several rivers; catches for a single river can rarely be obtained. However, commercial landings within one or several adjacent FSDs may be dominated by landings from a single large river, permitting the examination of catch trends in certain major rivers.

The annual pattern of alewife landings varied greatly among rivers, as might be expected of stocks which home to a natal river. Within Nova Scotia, catches since the early 1980s have increased then declined in the LaHave, Mersey and Medway (combined), and Gaspereau rivers while catches in the Tusket and Shubenacadie rivers have generally increased (Table 1, Figures 2 and 3). Within New Brunswick (and Scotia-Fundy Region), the most important alewife fishery is in the Saint John River, where the fishery can be divided into three parts: the harbour drift and set gill-net fishery, the trap-net fishery in the mainstem tributaries, and the fishery at the Mactaquac Dam. Since the late 1960s, the harbour fishery has usually composed about 5% of the total river fishery but this contribution increased sharply in the late 1980s (Table 1, Figure 4) due to increases in harbour catch and decreases in upriver catch since the early 1970s. The upriver trap-net fishery has been relatively stable during the 1980s at a level below the long-term mean of 1818 t. The Mactaquac Dam fishery contributes, on average, about 23% of the total river catch.

License and Catch/effort Trends

Total numbers of licenses for various gear types (gill net, fixed and drift; trap net, including square net; dip net) have been relatively stable during the period 1988-1992 (chosen so that catch/effort data from logbooks could also be examined) (Table 2). Gill net licenses outnumber all others in each province and in the Region, followed by dip and trap net licenses. The pattern of gear use varies among individual rivers such that dip nets are most used on the LaHave and Mersey-Medway rivers, gill nets and dip nets are about equally abundant and trap nets are not used on the Tusket River, trap (square) nets dominate on the Gaspereau River, gill nets are most used on the Shubenacadie River and in Saint John River harbour, while gill nets outnumber trap nets in the upriver fishery on the Saint John River (Table 3). The large number and active use of dip nets resulted in catch/hour rates that match or exceed those for trap nets but total catches by trap nets were usually much larger than for dip nets in Scotia-Fundy Region because effort (h) was much greater (Table 4). Reported gill net effort was much greater than for all other gear types but catch/hr was much less. Within Nova Scotia, dip and gill net catches dominate the fishery; in New Brunswick, trap net catches dominate the fishery. The alewife fishery in

the Scotia-Fundy portion of New Brunswick is dominated by the Saint John River fishery, which in turn is driven by the upriver trap net fishery. Trap net catch/hr rates in the Saint John River declined about 45% between 1988 and 1992. The low logbook response rate in earlier years results in substantial underestimation of the total catch and effort in those years relative to later years when response rate was much higher; the catch/hr relations between gear types may be more reliable.

The catch trends in certain large fisheries further illustrate the variability in catches among different gear types and the general decline in catch/effort between 1988 and 1992 (Tables 5 and 6). Thus, in the LaHave River, dip-netters consistently harvested the major portion of the catch while catch/effort declined from about 152 kg/hr in 1988 to 10 kg/hr in 1992. In the Mersey-Medway rivers, gillnet catch declined from over 40 t in 1988 to less than 3 t in 1992 while effort increased to about 20,000 hr until 1991 then declined sharply to 600 hr. Dipnet catches in the Mersey-Medway rivers declined overall, except for the large catch in 1991, while catch/effort steadily declined. In the Tusket River, gillnet catches and effort increased between 1988 and 1991 while catch/effort declined steadily while in 1992, catch declined despite high effort and resulted in a very low catch/effort rate. Dipnet catches and effort have varied widely in the Tusket River but catch/effort remained moderate in 1992. In the Saint John River, the harbour (FSDs 48,49) gillnet fishery catch fluctuated between about 223 t (1988) and 544 t (1990) but effort increased steadily while catch/effort increased to a peak in 1990 then declined. The reporting rate increased from 38% to 94% during this time. In the upriver fishery (FSDs 55,56,57), the reported catch of the trapnet fishery declined from 1026 t to 777 t, effort increased from about 20,000 hr to over 30,000 hr (reflecting an increase in reporting rate from 33% to over 90%), and catch/effort declined from almost 45 kg/hr to 25 kg/hr.

Conclusions

Substantial variability in alewife catch occurs annually within Scotia-Fundy Region; the trend in recent years has been downward although within historical limits. The continuing decline in catch to 1992 may have become sufficiently severe that remedial action may be necessary in some rivers. The statistical base is inadequate to conduct intensive analyses of catch/effort but perceptions of general trends is probably reliable. The fishing power available in most, if not all, rivers seems sufficient to fully exploit the resource (in many rivers less gear is being fished than is authorized) and further license issue is unwise, with possible specific exception. Improvements in the completeness of logbook catch/effort data offer hope that a more reliable time series of data may be developed.

References

- Jessop, B. M. 1990. Stock-recruitment relationships of alewives and blueback herring returning to the Mactaquac Dam, Saint John River, New Brunswick. *N. Am. J. Fish. Mgmt* 10:19-32.
- Jessop, B. M., W. E. Anderson, and A. H. Vromans. 1983. Life-history data on the alewife and blueback herring of the Saint John River, New Brunswick, 1981. *Can. Data Rep. Fish. Aquat. Sci.* No. 426.
- Jessop, B. M., and H. A. Parker. 1988. The alewife in the Gaspereau River, Kings County, Nova Scotia, 1982-1984. *Can. Man. Rep. Fish. Aquat. Sci.* No. 1992.
- Klauda, R. J., S. A. Fischer, L. W. Hall, Jr., and J. A. Sullivan. 1991. Alewife and blueback herring. pp.10.1-10.12. *In* Funderburn, S. L., J. A. Mihursky, S. J. Jordan, and D. Riley (Eds.) *Habitat requirements for Chesapeake Bay Living Resources*, 2nd Edition. Living Resources Subcommittee, Chesapeake Bay Program. Annapolis, MD.
- Knight, T. F. 1867. Report on the Fisheries of Nova Scotia. A. Grant. Queen's Printer, Halifax.
- Messieh, S. N. 1977. Population structure and biology of alewives (*Alosa pseudoharengus*) and blueback herring (*A. aestivalis*) in the Saint John River, New Brunswick. *Env. Biol. Fish.* 2:195-210.
- Perley, M. H. 1852. Reports on the sea and river fisheries of New Brunswick, 2nd Edition. J. Simpson, Queen's Printer, Fredericton.
- Stone, H. H., B. M. Jessop, and H. A. Parker. 1992. Life history characteristics of alewives and blueback herring from five Nova Scotia rivers, 1985. *Can. Man. Rep. Fish. Aquat. Sci.* No. 2136.
- Watt, W. D., C. D. Scott, and W. J. White. 1983. Evidence of acidification of some Nova Scotia rivers and its impact on Atlantic salmon, *Salmo salar*. *Can. J. Fish. Aquat. Sci.* 4:462-473.

Table 1. continued.

		Fisheries Statistical District																			
Year	33	34	35	36	37	39	40	41	42	43	48	49	51	52	53	55	56	57	**58	79	81
1960	290	3	-	-	-	-	-	49	153	-	-	341	-	-	-	44	1540	389	-	<1	11
1961	146	8	-	2	-	-	-	188	156	-	612	654	1	15	-	100	959	454	-	2	12
1962	92	19	-	-	-	-	-	187	86	-	1070	9	-	-	-	141	939	708	-	2	12
1963	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	66	663	127	-	-	-
1964	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	261	590	196	-	-	-
1965	114	46	-	4	-	-	-	166	45	-	562	166	-	-	-	120	1528	916	-	3	10
1966	81	20	-	5	-	-	-	168	30	-	78	8	-	-	-	261	1105	321	-	3	11
1967	110	33	-	4	-	-	-	71	6	<1	98	<1	-	-	-	204	417	975	-	3	17
1968	154	2	-	6	-	-	-	144	59	-	18	18	-	-	-	221	980	931	-	3	11
1969	185	-	-	16	-	-	-	141	51	<1	13	1	-	-	-	178	1080	717	-	4	11
1970	250	-	-	13	-	-	-	143	50	<1	80	2	<1	<1	30	210	1749	1464	-	5	11
1971	291	5	-	10	-	-	-	206	32	-	52	98	-	-	-	114	4769	1386	-	5	<1
1972	441	12	-	16	-	-	-	176	51	-	16	-	-	14	-	250	2569	1195	-	6	-
1973	772	12	-	10	-	-	-	301	146	-	34	19	1	<1	-	231	1287	698	-	201	-
1974	700	25	-	-	-	-	-	374	97	26	6	6	-	6	-	264	1515	1337	157	8	-
1975	504	16	-	-	-	-	<1	458	177	<1	19	12	1	16	-	153	955	764	322	8	-
1976	484	158	-	-	-	-	-	643	311	-	29	4	-	11	496	149	949	972	572	782	-
1977	502	26	-	-	-	41	<1	551	318	366	31	<1	-	-	222	156	1612	650	877	10	-
1978	-	4	-	-	2	-	-	606	424	28	58	-	-	83	-	179	1323	719	991	11	-
1979	<1	36	49	2	4	-	-	248	5	500	-	-	-	11	-	143	886	644	610	-	-
1980	36	49	2	4	-	-	81	134	218	32	525	72	-	-	-	88	288	146	846	-	-
1981	-	-	-	-	-	-	-	53	4	1	16	88	-	-	-	22	760	88	466	-	-
1982	86	8	<1	-	-	-	<1	52	109	-	16	42	-	28	-	13	565	277	258	-	-
1983	30	3	-	-	-	-	<1	53	7	17	31	48	-	-	-	30	508	349	172	-	-
1984	198	92	7	-	-	-	-	62	-	-	2	109	-	-	-	17	583	105	281	-	-
1985	25	31	-	-	-	-	-	350	11	-	85	46	-	3	-	22	636	61	398	2	2
1986	48	9	-	2	-	-	-	272	16	10	217	37	-	10	-	18	519	150	0	-	-
1987	141	22	-	-	-	-	-	337	159	12	217	72	-	11	-	116	590	319	611	1	-
1988	220	30	-	2	-	-	-	73	93	13	20	291	82	10	1	159	709	321	615	1	-
1989	437	77	-	68	-	-	-	200	65	10	90	285	-	6	-	560	438	2	969	1	2
1990	235	42	-	6	-	-	-	432	220	11	218	632	-	62	-	322	256	288	123	5	11
1991	403	162	-	-	-	-	-	198	92	8	233	61	-	88	-	198	743	197	217	1	1
1992	221	92	-	<1	-	-	-	45	125	12	336	16	-	12	<1	54	333	405	277	2	-

Table 2. Number of commercial alewife fishing licences by gear type for Nova Scotia, New Brunswick and the Scotia-Fundy Region (1988-1992). GN - gill net (set and drift); TN - trap net (including square net); DN - dip net.

Year	Scotia-Fundy				Nova Scotia				New Brunswick			
	GN	TN	DN	total	GN	TN	DN	total	GN	TN	DN	total
1988	389	63	217	559	262	47	211	415	127	16	6	144
1989	391	67	252	578	266	47	247	437	125	20	5	141
1990	397	66	256	575	275	47	250	438	122	19	6	137
1991	389	64	238	551	268	45	230	413	121	19	8	138
1992 ^a	337	57	260	555	262	48	256	426	115	19	4	129

^aPreliminary data.

Table 3. Number of commercial alewife fishing licences by gear type for major river systems in Scotia-Fundy Region (1988-1991).
 GN - gill net (set and drift); TN - trap net (including square net); DN - dip net; tot - total; FSD- Fisheries
 Statistical District. Dash indicates either gear type not used or no data. The total number of licenses issued to
 individual fishermen may be less than the sum of licenses issued for each gear type because individuals may be licensed
 for more than one gear type.

River system																						
Year	LaHave (FSD 26,27)			Mersey-Medway (FSD 28)			Tusket (FSD 33,34)			Gaspereau (FSD 41)			Shubenacadie (FSD 42,43)			Saint John Har. (FSD 48,49)			Upper Saint John (FSD 55,56,57)			
	GN	TN	DN Tot	GN	TN	DN Tot	GN	TN	DN Tot	GN	TN	DN Tot	GN	TN	DN Tot	GN	TN	DN Tot	GN	TN	DN Tot	
1988	2	-	27 28	13	-	34 41	66	-	50 70	6	15	1 21	60	-	5 66	71	2	1 71	43	15	-	53
1989	3	-	9 12	15	-	48 51	69	-	82 93	6	16	- 21	64	-	6 70	70	2	1 71	41	15	-	51
1990	3	-	12 12	15	-	40 43	66	-	70 83	6	14	1 20	63	-	5 67	68	2	1 69	41	14	-	50
1991	3	-	10 13	14	-	39 42	64	-	67 76	6	14	1 21	63	-	5 67	68	2	1 69	38	14	-	37
1992 ^a	3	-	10 12	14	-	32 35	61	-	93 106	6	13	- 18	61	-	5 66	62	2	- 63	39	14	-	48

^aPreliminary data.

Table 4. Alewife catch and effort values, by commercial gear type, for Nova Scotia, New Brunswick and the Scotia-Fundy region based on logbook returns (1988-1992).

Year	Net type	Total catch (kg)	Effort (h)	Catch/hour (kg/h)	Number of fishermen reporting	Total response rate(%)
Scotia-Fundy						
1988	gill	587,180	100,708	5.83	156	40
	trap	1,244,481	25,672	48.48	20	
	dip	441,411	5,495	80.33	30	
1989	gill	774,175	141,264	5.48	136	37
	trap	1,014,057	21,405	47.37	20	
	dip	2,207,150	5,845	377.61	41	
1990	gill	927,840	149,460	6.21	155	46
	trap	1,213,219	42,251	28.71	29	
	dip	497,923	6,355	78.35	46	
1991	gill	1,086,939	261,817	4.15	208	75
	trap	1,360,912	35,190	38.67	38	
	dip	391,989	8,365	43.27	60	
1992	gill	615,203	257,912	2.39	217	83
	trap	869,359	35,952	24.18	36	
	dip	355,474	12,927	27.50	67	
Nova Scotia						
1988	gill	332,191	59,092	5.62	81	32
	trap	207,624	2,631	78.82	13	
	dip	433,026	5,223	82.91	29	
1989	gill	382,447	100,932	3.79	97	39
	trap	199,805	2,819	70.88	14	
	dip	2,201,390	5,617	391.92	40	
1990	gill	350,543	97,760	3.59	98	40
	trap	177,160	5,393	32.85	22	
	dip	492,559	7,126	80.40	44	
1991	gill	590,668	182,943	3.23	132	70
	trap	142,889	5,016	28.49	25	
	dip	337,956	7,799	43.33	57	
1992	gill	244,477	158,219	1.55	143	80
	trap	84,867	3,534	24.01	24	
	dip	352,526	12,318	28.62	66	
New Brunswick						
1988	gill	254,989	41,616	6.13	75	65
	trap	1,025,857	23,038	44.53	7	
	dip	8,385	272	30.83	1	
1989	gill	391,728	40,332	9.71	38	33
	trap	814,252	18,586	43.81	6	
	dip	5,760	228	25.26	1	
1990	gill	577,297	51,700	11.17	57	64
	trap	1,036,059	36,858	28.11	7	
	dip	5,364	229	23.42	2	
1991	gill	496,271	78,874	6.29	76	90
	trap	1,218,023	30,174	31.09	13	
	dip	24,032	566	42.46	3	
1992	gill	370,726	99,693	3.72	74	95
	trap	784,492	32,418	24.30	12	
	dip	2,948	609	4.84	1	

Table 5. Alewife catch and effort values, by gear type, for the LaHave (FSD26, 27), Mersey-Medway (FSD 28), and Tusknet river systems (FSD 33, 34), based on logbook returns (1988-1992). Dash indicates either gear not used or no data.

Year	Net type	Total catch (kg)	Effort (h)	Catch/hour (kg/h)	Total	
					Licensed fishermen	Response rate (%)
LaHave River						
1988	gill	1,876	480	3.91	9	32
	trap	71,022	396	179.35		
	dip	255,278	1,681	151.86		
1989	gill	-	-	-	4	80
	trap	-	-	-		
	dip	36,530	933	39.15		
1990	gill	3,944	528	7.47	6	46
	trap	21,472	502	42.77		
	dip	66,321	982	67.54		
1991	gill	-	-	-	7	70
	trap	20,820	420	49.57		
	dip	39,423	662	59.55		
1992	gill	2,795	590	4.74	8	73
	trap	8,165	496	16.46		
	dip	14,310	1,374	10.41		
Mersey-Medway						
1988	gill	40,284	13,828	2.91	22	54
	trap	-	-	-		
	dip	135,154	1,528	89.11		
1989	gill	38,770	16,712	2.32	27	54
	trap	-	-	-		
	dip	38,095	942	40.44		
1990	gill	47,429	20,944	2.26	29	67
	trap	-	-	-		
	dip	10,606	2,375	44.66		
1991	gill	16,246	21,273	0.76	36	90
	trap	1,677	40	41.92		
	dip	320,807	1,784	18.39		
1992	gill	8,501	11,679	0.73	34	97
	trap	-	-	-		
	dip	36,937	1,437	25.70		
Tusknet						
1988	gill	236,523	39,069	6.05	28	41
	trap	-	-	-		
	dip	14,062	56	251.10		
1989	gill	284,341	68,989	4.12	34	39
	trap	-	-	-		
	dip	229,976	2,153	106.82		
1990	gill	244,881	64,840	3.78	31	39
	trap	-	-	-		
	dip	31,558	864	36.53		
1991	gill	512,519	137,028	3.74	59	82
	trap	-	-	-		
	dip	53,246	941	56.58		
1992	gill	163,473	125,460	1.30	81	75
	trap	12,055	230	52.41		
	dip	137,110	1,954	70.17		

Table 6. Alewife catch and effort values, by commercial gear type, for Saint John Harbour (FSDs 48,49) and the upper Saint John River (FSDs 55,56,57), based on logbook returns (1988-1992). Dash indicates either gear not used or no data.

Year	Net type	Total catch (kg)	Effort (h)	Catch/hour (kg/h)	Total	
					Licensed fishermen	Response rate (%)
Saint John Harbour						
1988	gill	223,616	27,539	8.12	72	38
	trap	-	-	-		
	dip	-	-	-		
1989	gill	363,257	29,787	12.20	69	36
	trap	-	-	-		
	dip	-	-	-		
1990	gill	544,322	42,010	12.96	69	83
	trap	-	-	-		
	dip	124	29	4.28		
1991	gill	293,609	45,831	6.41	71	93
	trap	-	-	-		
	dip	-	-	-		
1992	gill	345,547	89,376	3.87	60	94
	trap	6,077	945	6.43		
	dip	-	-	-		
Upper Saint John River						
1988	gill	29,010	13,252	2.19	50	33
	trap	1,025,857	23,038	44.53		
	dip	-	-	-		
1989	gill	28,351	9,918	2.86	45	33
	trap	814,252	18,586	43.81		
	dip	-	-	-		
1990	gill	21,943	8,850	2.48	55	56
	trap	856,159	36,858	23.23		
	dip	-	-	-		
1991	gill	199,720	31,993	6.24	49	94
	trap	937,389	30,150	31.09		
	dip	-	-	-		
1992	gill	15,510	9,173	1.69	43	93
	trap	776,647	31,443	24.70		
	dip	-	-	-		

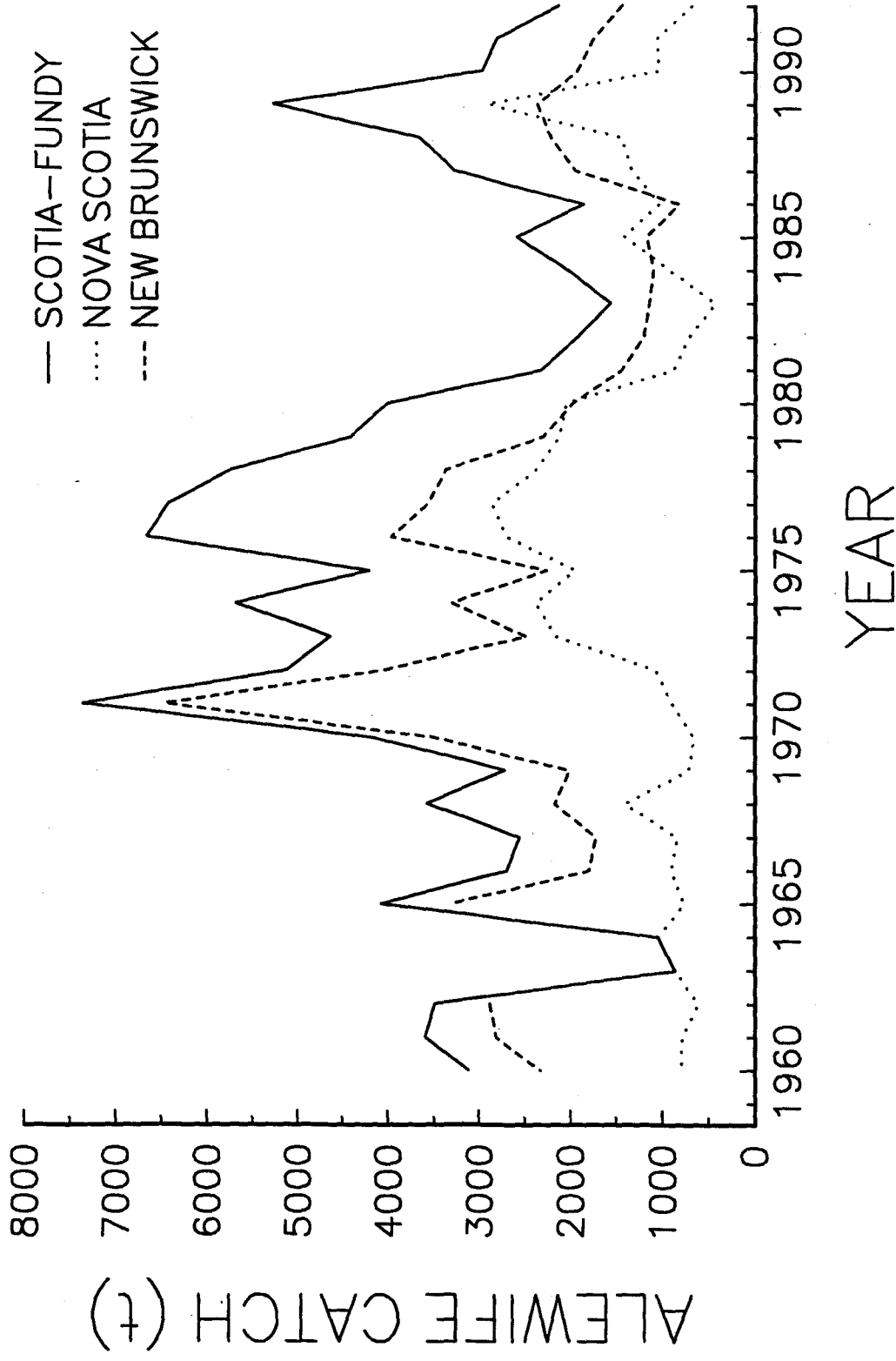


Figure 1. Alewife (and blueback herring) catch (t) in Scotia-Fundy Region and by province within the Region, 1960-1992.

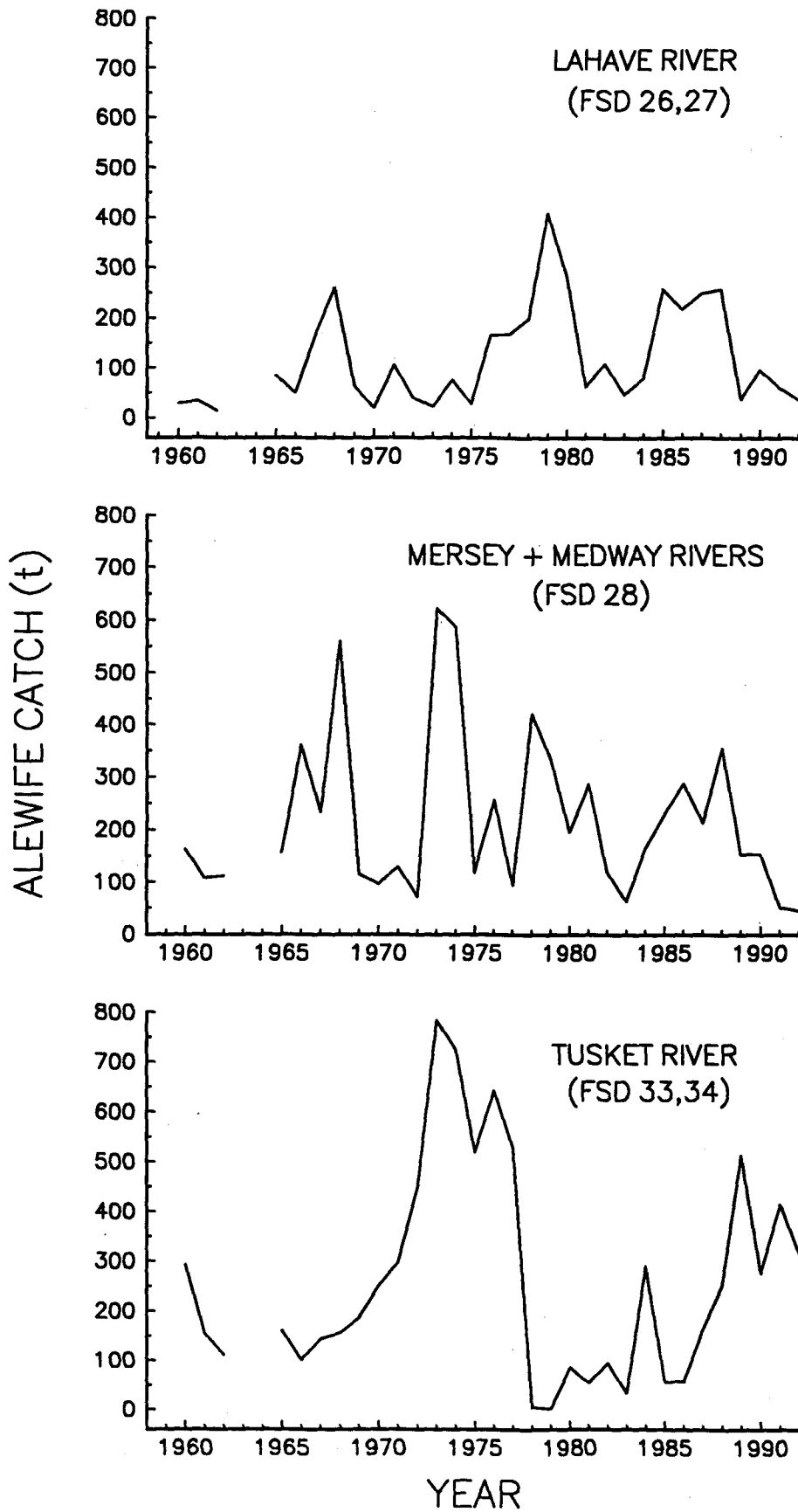


Figure 2. Alewife (and blueback herring) catch (t) in the LaHave, Medway-Mersey, and Tuskent rivers, 1960-1992.

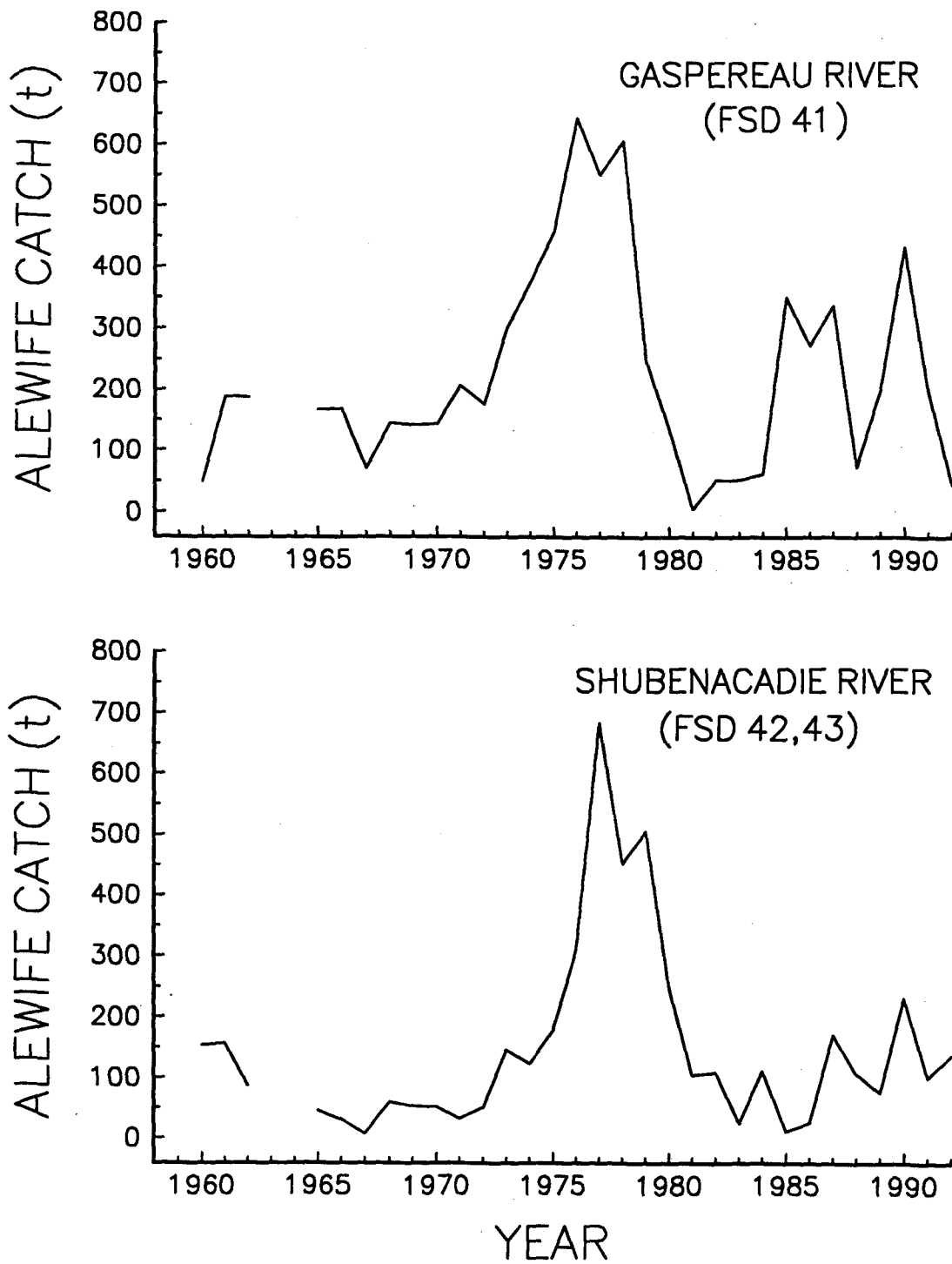


Figure 3. Alewife (and blueback herring) catch (t) in the Gaspereau and Shubenacadie rivers, 1960-1992.

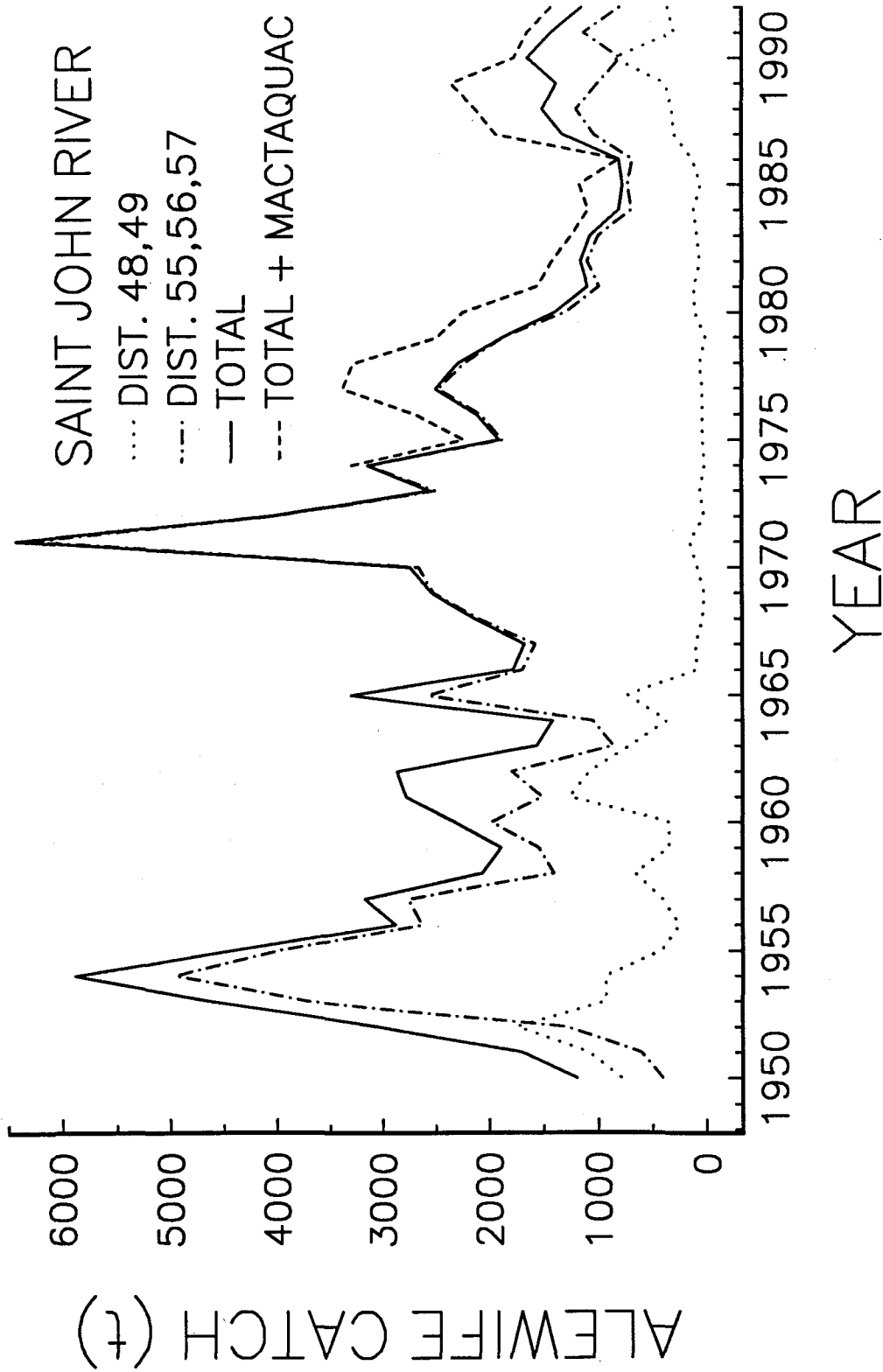


Figure 4. Alewife (and blueback herring) catch (t) in the Saint John River, grouped by fishery: harbour, upriver, and Mactaquac Dam, 1950-1992.