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Status of the Margaree River gaspereau fishery (1985)

by

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Research Documents are produced in the official language in which they are provided to the Secretariat by the author. 1Cette série documente les bases scientifiques des conseils de gestion des pêches sur la côte atlantique du Canada. Comme telle, elle couvre les problèmes actuels selon les échéanciers voulus et les recherche Documents de qu'elle ne pas être contient doivent considérés comme des énoncés finals 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 par les auteurs dans le manuscrit envoyé au secrétariat.

ABSTRACT

The gaspereau fishery on the Margaree River, Nova Scotia, harvested 1,223 tonnes in 1985 compared to 883 tonnes in 1984 and 823 tonnes average over 36 years. Much of the improved catch was attributable to the strong 1981 year-class which comprised 80% of the total. Average fishing mortality over three years of study was estimated at 1.07 compared to $F_{0.1}$ of 0.42 determined from yield per recruit analysis. Consequently, it is recommended that exploitation be reduced. Fishing at the $F_{0.1}$ level could be expected to harvest only 490 tonnes in 1986. It was estimated that one-, two- and three-day closures would reduce harvest by 9, 19 and 35%, respectively. A minimum closure of two consecutive days per week appears prudent.

RE SUME

Les prises de gaspareau dans la rivière Margaree (Nouvelle-Ecosse) se sont chiffrées à 1 223 tonnes en 1985, marquant une hausse par rapport aux prises de 1984 (883 tonnes) et à la moyenne de 823 tonnes établie sur 36 ans. Cette augmentation s'explique en grande partie par l'abondance du gaspareau de la classe d'âge 1981, qui représentait 80 % des prises totales. On estime que la moyenne de la mortalité due à la pêche sur trois ans est de 1,07, comparativement à une valeur $F_{0,1}$ de 0,42 établie d'après l'analyse du rendement par recrutement. On recommande donc de réduire l'exploitation. Au taux de pêche $F_{0,1}$, les prises pourraient ne pas dépasser les 490 tonnes en 1986. On estime que des fermetures de un, deux et trois jours permettraient de réduire les prises de 9, 19 et 35 % respectivement. Il apparaît prudent de fermer la pêche pendant au moins deux jours consécutifs par semaine.

INTRODUCTION

Following the 1983 gaspereau season, a review of the commercial tip-trap fishery on the Southwest Margaree River (Alexander 1984) indicated that this population was being over-exploited. A reduced rate of exploitation was recommended. Consequently, in 1984, fishermen and fisheries managers elected to close the fishery on Saturdays in the lower portion of the river and on Sundays further upstream. An assessment of the 1984 fishery (Alexander and Vromans 1985) concluded that this staggered closure may have resulted in increased escapement relative to 1983, but fishing mortality remained excessive. Although further reduction in the rate of exploitation was recommended for 1985, no new restrictions were imposed. This paper reviews the characteristics of the 1985 fishery and provides new insight into the potential of the fishery using sequential population analysis.

METHODS

Samples, ranging from 20 to 40 fish, were collected daily from the commercial tip-trap operated by Martin Cameron in 1985. Determination of species, sex, state of maturity, age, length and weight was similar to that for 1984 (Alexander and Vromans 1985). Biological data were weighted using catch-effort data collected through voluntary logbooks in order to more accurately reflect the characteristics of the catch. These statistics were generated from programs written in-house and run on a Zenith 100 microcomputer. The data base was extended back to 1983 by using biological samples collected at the fish fence and in the commercial fishery (Alexander 1984) in that year in combination with catch-effort information which has recently been obtained for a sample of fishermen.

Age at full recruitment was taken as the age prior to the age when the number of virgin spawners, as determined from scales, was reduced to negligible levels. Total mortality between years was estimated by comparing the catch rate for fully-recruited age groups in one year to the catch rate of those same year-classes in the next year. This total mortality estimate was reduced by an assumed natural mortality rate of 0.2 to approximate between year fishing mortality. Partial recruitment was estimated from the catch matrix and the proportion of virgins at each age by comparing the cumulative catch of virgins from a cohort, adjusted for mortality and escapement, to the initial catch of virgins from the cohort, also adjusted for fishing mortality. For sequential population analysis, mortality of the oldest age groups in all years and for all age groups in the most recent year was taken as the mean annual Paloheimo fishing mortality rate (Ricker 1975) for fully-recruited fish. For age groups not fully recruited, this value was multiplied by the estimated partial recruitment value. Sequential population analysis (SPA) was run using APL programs described by Rivard (1982).

In each instance where catch reductions, as a result of closure, were estimated, it was assumed that all fish caught during the subject interval would have escaped if fishing had not taken place. Similarly, where the fishing was partially closed, it was assumed that catch would have been equal to the average of that for the first preceeding and succeeding interval if the fishery had been open.

RESULTS AND DISCUSSION

Gaspereau landings in 1985 increased over that of 1983 and 1984 (Table 1). Unfortunately, the market has been weak and many fish remained unsold in late 1985. Consequently, final harvest figures, recorded at the time of inspection, were not available for this assessment. Harvest was estimated by the area statistical coordinator to be approximately 1,233 tonnes (P. George, pers. comm.). This exceeds the 36-year average of 823 tonnes (Table 1).

Logbooks were submitted for only 18 active traps in 1985 compared to 42 in 1984. Harvest by these traps totalled 505,311 kg. A factor of 2.4197 was used to convert logbook data to represent the fishery as a whole. The conversion factor for 1983 was 5.1622 (Table 2) and 1.3722 for 1984 as previously reported (Alexander and Vromans 1985).

The 1985 fishery took place nearly two weeks later than in 1984, commencing May 13 and ending June 21. Within that period, fishing was concentrated into a shorter interval with about 80% of the effort expended (Table 3) and 90% of the catch taken (Table 4) between May 20 and June 7. The effects of closure can be seen in the daily effort figures but, in contrast to 1984, reduced catch during closed times was not conspicuous (Fig. 1, Table 4) and catch was actually higher during the partial closure on May 19 than on fully open days immediately before and after. Net reduction in catch as a result of closed times was estimated at 107,589 kg or 458,563 fish.

Overall catch per unit effort for 1985 was 147.6 kg/hr. compared to 83.1 for 1984. The logbook effort of 3,423 hours corresponds to an effective effort of 8,283 hours which is lower than in either 1983 or 1984 (Table 2). This may reflect early indications that it would be difficult to sell the catch. The peak single day catch of 274,608 kg occurred on May 30 (Table 4) and exceeds that for 1984 by a factor of 2.

The 1985 fish sample of 741 specimens consisted of 87% alewives (<u>Alosa</u> <u>pseudoharengus</u>) and 13% blueback herring (<u>Alosa aestivalis</u>). When the sample was weighted by daily catch, however, the total landing was estimated to include 99% alewife and only 1% blueback. As in other years, the alewife appeared in the fishery several weeks earlier than blueback with blueback making only a minor contribution late in the harvest (Table 4). Only alewives were considered for the balance of this assessment.

Mean weight of alewife in 1985 was 258 g compared to 277 g and 245 g in 1983 and 1984, respectively.

The age structure of the 1985 sample was 23% age 3, 61% age 4 and 8% age 5 with small representation from other ages (Table 5). However, when these samples were weighted by daily catch, the harvest was estimated to contain 12% age 3, 80% age 4, 6% age 5 and negligible proportions at other This difference after weighting is consistent with previous ages. observations and weighting is considered to be essential for more detailed analysis such as sequential population analysis (Alexander and Vromans Using logbook data recently obtained, the 1983 sample was also 1985). weighted and new proportions at each age were estimated (Table 5). Α catch-at-age matrix for the three years studied was generated (Table 6). These figures clearly show great strength in the 1981 year-class which made a strong contribution to harvest at age 3 in 1984 and age 4 in 1985.

Mean length at age was determined from the biological samples in each year (Table 7). A weight at age for each year was then determined from log length-log weight regression since this matrix (Table 7) is also required for yield per recruit analysis. The average weight-at-age was determined by weighting the value for each year.

Partial recruitment of alewives was estimated to be 0.0 at age 2, 0.4 at age 3 and 1.0 at age 4 and older. Estimates of cumulative catch per hour for fully-recruited age groups (Table 8) indicated that annual between year mortality was 1.33 in 1983-84 and 0.86 in 1984-85. Average between year fishing mortality was therefore estimated at 0.89 for use in sequential population analysis.

Yield per recruit analysis using the method of Thompson and Bell (Rivard 1982) showed that $F_{0.1}$ was 0.4196 at a yield per recruit of 0.170 kg. Using the Paloheimo fishing mortality rate of 0.89, weighted fishing mortality estimates from SPA converged within three runs. These mortality rates (Table 9) ranged from 0.890 to 1.349 and greatly exceeded the $F_{0.1}$ value. A further reduction in rate of exploitation is therefore recommended.

Population numbers generated by cohort analysis were input into the projection program in order to forecast future catch. In this exercise, number of fish at age 3 is unknown, but the mean value of the three years studied, 5,222,000, was used here. Fishing mortality was input at the F_{0.1} value of 0.42. These projections (Table 10) indicate that catch in 1986 would drop to 490 tonnes, but then increase in each of the next six years projected, reaching 889 tonnes by 1992. Unfortunately, there is currently no method of predicting the strength of new year-classes although there is promise that environmental variables in Lake Ainslie may be used for this purpose (R. Crawford, pers. comm., Nova Scotia Department of Fisheries). If fishing in 1985 had been at the F_{0.1} level, catch would have been 675 tonnes, a reduction of 44%.

It was estimated that the 1985 staggered closure may have reduced harvest by 107.6 tonnes. Examination of the catch on Saturdays, Sundays and Mondays (Table 11) indicated that complete closure on one day per week would reduce catch by 9% on average while 18.9% and 35.2% would have been the average reduction for two- and three-day closures, respectively. These or alternate measures may be required to achieve $F_{\Omega-1}$.

CONCLUSION

Weighted fishing mortality for the three years greatly exceeds the calculated $F_{0\cdot1}$ value. The good catch in 1985 can be largely attributed to the strong 1981 year-class. Although new year-classes of exceptional strength may support better than average fisheries in the future, recruitment at average levels observed necessitates a reduction in exploitation to achieve a more stable fishery. Management action to reduce exploitation should include a full two-day-per-week closure at minimum.

Available data on the Margaree gaspereau fishery are minimal for use in sequential population analysis and data collection should be continued. In order to increase the reliability of catch effort data, it is suggested that completion of logbooks again be made a condition of licence for 1986.

ACKNOWLEDGEMENT

Martin Cameron and Darlene Cameron again provided the biological specimens critical to the conduct of this assessment. COSEP students Heather Mayhew and Monique Niles processed most of the fish samples with assistance from Bill Gorman and Perry Swan. Provincial student Colleen MacLean under the supervision of Bob Crawford also assisted in processing fish samples. We are grateful to those fishermen who provided voluntary logbook data and look forward to improved reporting in 1986.

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Year	Catch (tonnes)
1950	713
1951	755
1952	964
1953	638
1954	1,275
1955	1,163
1956	859
1957	58
1958	395
1959	496
1960	531
1961	423
1962	558
1963	551
1964	640
1965	875
1966	320
1967	185
1968	188
1969	251
1970	408
1971	620
1972	965
1973	1,113
1974	1.681
1975	1,238
1976	497
1977	1,202
1978	1.713
1979	1,776
1980	1,069
1981	1,369
1982	1.445
1983	580
1984	883
1985	1,223
	· ,

Table 1. Summary of gaspereau (alewife and blueback herring) landings on the Margaree River.

Table	2.	Logbook	catch	and	effor	t,	total	repor	ted	catc	:h, (estimat	ed	total
effort	and	convers	ion fa	ctors	used	in	asses	ssment	of	the	Sout	thwest	Mar	garee
gasper	eau f	fishery (1983-8	5).										

		Year		
	1983	1984	1985	
Logbook effort (hrs.)	2,457	7,749	3,423	
Logbook catch (kg)	112,319	643 , 770	505,311	
Total reported catch (kg)	579 , 816	883,409	1,222,698	
Expansion factor	5.1622	1.3722	2.4197	
Expanded effort (hrs.)	12,684	10,634	8,283	

Table 3. Daily catch (kg), effort (hours) and catch per unit effort (kg/hr) in the 1985 Southwest Margaree River gaspereau fishery, District 2, as reported through gaspereau catch and effort logbooks.

	Mon	Tue	Wed	Thur	Fri	Sat	Sun	Total
May 6-May 12								· · · ·
Catch (kg)	0	0	0	0	0	0	0	0
Effort (hr)	0	0	0	0	0	0	0	0
CPUE (kg/hr)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
May 13-May 19								
Catch (kg)	816	1,361	1,724	2,858	3,221	0	36,832	46,811
Effort (hr)	35	37	37	37	31	9	20	206
CPUE (kg/hr)	23.33	36.78	46.59	77.23	103.89	0.00	1,841.58	227.24
May 20-May 26								
Catch (kg)	1,413	2,359	3,806	10,954	40,211	22,702	33,384	114,829
Effort (hr)	91	129	127	183	201	100	109	940
CPUE (kg/hr)	15.53	18.28	29.97	59.86	200.05	227.02	306.28	122.16
May 27-June 2								
Catch (kg)	52,503	21,205	39,678	113,489	47,446	17,055	7,366	298,743
Effort (hr)	214	212	210	224	209	94	. 85	1,248
CPUE (kg/hr)	245.34	100.03	188.94	506.65	227.01	181.44	86.66	239.38
June 3-June 9								
Catch (kg)	14,016	7,099	4,354	3,084	2,427	1,588	227	32,795
Effort (hr)	188	163	135	117	89	55	18	765
CPUE (kg/hr)	74.55	43.55	32.26	26.36	27.27	28.86	12.60	42.87
June 10-June 16								
Catch (kg)	2,472	2,563	2,631	2,858	431	0	635	11,589
Effort (hr)	50	59	43	44	14	0	19	229
CPUE (kg/hr)	49.44	43.44	61.18	64.95	30.78	0.00	33.42	50.61
June 17-June 23								
Catch (kg)	113	159	45	136	91	0	0	544
Effort (hr)	7	6	6	7	7	0	0	35
CPUE (kg/hr)	16.20	19.84	7.56	19.44	12.96	0.00	0.00	15.55
June 24-June 30								
Catch (kg)	0	0	0	0	0	0	0	0
Effort (hr)	0	0	0	0	0	0	0	0
CPUE (kg/hr)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS								
Catch (kg)	71,334	34,745	52,238	133,379	93,826	41,345	78,444	505,311
Effort (hr)	585	608	558	612	551	258	251	3,423
CPUE (kg/hr)	121.94	57.15	93.62	217.94	170.28	160.25	312.53	147.62

Table Distri	4. Es .ct 2.	timated	daily ca	tch of	gaspereau	10 the 198	55 5.W. Mar	garee Kive	r gaspereau	risnery,
<u>ب</u> ها چله ها ها ها ها بر ی	Alewife		ife Blueback							
	Mean		Mean			Catch (kg)			Number	
Date	(kg)	Ň	(kg)	%	Alewife	Blueback	Combined	Alewife	Blueback	Combined
 Ma 13	.2953	100.0	.0000	0.0	1,974	0	1,974	6,686	0	6,686
Ma 14	.3081	100.0	.0000	0.0	3,293	0	3,293	10,689	0	1,0,689
Ma 15	.3188	100.0	.0000	0.0	4,171	0	4,172	13,085	0	13,085
Ma 16	.3248	100.0	.0000	0.0	6,915	0	6,915	21,291	0	21,291
Ma 17	.3313	100.0	.0000	0.0	7,794	0	7,794	23,525	0	23,525
Ma 18	.2950	100.0	.0000	0.0	0	0	0	0	0	0
Ma 19	.2877	100.0	.0000	0.0	89,122	0	89,122	309,774	0	309,774
Ma 20	.2769	100.0	.0000	0.0	3,419	0	3,419	12,347	0	12,347
Ma 21	.2817	100.0	.0000	0.0	5,708	0	5,708	20,263	0	20,263

Table 4. Estimated daily catch of in the 1985 S.W. Ma Riv gas pereau fishery, District 2.

Ma 13	.2953	100.0	.0000	0.0	1,974	0	1,974	6,686	0	6,686
1a 14	.3081	100.0	.0000	0.0	3,293	0	3,293	10,689	0	1,0,689
Ma 15	.3188	100.0	.0000	0.0	4,171	0	4,172	13,085	0	13,085
1 a 16	.3248	100.0	.0000	0.0	6,915	0	6,915	21,291	0	21,291
Ma 17	.3313	100.0	.0000	0.0	7,794	0	7,794	23,525	0	23,525
1a 18	.2950	100.0	.0000	0.0	0	0	0	0	0	0
Ma 19	.2877	100.0	.0000	0.0	89,122	0	89,122	309,774	0	309,774
4a 20	.2769	100.0	.0000	0.0	3,419	0	3,419	12,347	0	12,347
Ma 21	.2817	100.0	.0000	0.0	5,708	0	5,708	20,263	0	20,263
4a 22	.2576	100.0	.0000	0.0	9,209	0	9,209	35,751	0	35,751
Ma 23	.2616	100.0	.0000	0.0	26,505	0	26,505	101,320	0	101,320
4a 24	.2655	100.0	.0000	0.0	97,298	0	97,298	366,471	0	366,471
Ma 25	.2670	100.0	.0000	0.0	54,932	0	54,932	205,737	0	205,737
4a 26	.2684	100.0	.0000	0.0	80,779	0	80,779	300,965	0	300,965
Ma 27	.2638	100.0	.0000	0.0	127,041	0	127,041	481,581	0	. 481, 581
Ma 28	.2660	100.0	.0000	0.0	51,310	0	51,310	192,893	0	192,893
Ma 29	.2509	100.0	.0000	0.0	96,008	0	96,008	382,656	0	382,656
4a 30	.2525	100.0	.0000	0.0	274,608	0	274,608	1,087,557	0	1,087,557
Ma 31	.2475	100.0	.0000	0.0	114,805	0	114,805	463,857	0	463,857
Jn 1	.2400	100.0	.0000	0.0	41,268	0	41,268	171,949	0	171,949
Jn 2	.2324	100.0	.0000	0.0	17,823	0	17,823	76,693	0	76,693
Jn 3	.2319	100.0	.0000	0.0	33,914	0	33,914	146,246	0	146,246
Jn 4	.2243	100.0	.0000	0.0	17,177	0	17,177	76,582	0	76,582
Jn 5	.2651	97.4	.1960	2.6	10,334	201	10,535	38,982	1,026	40,008
Jn 6	.2369	100.0	.0000	0.0	7,462	0	7,462	31,500	0	31,500
Jn 7	.2428	100.0	.0000	0.0	5,873	0	5,873	24,187	0	24,187
Jn 8	.2384	90.0	.2560	10.0	3,433	410	3,842	14,400	1,600	16,000
Jn 9	.2330	80.0	.2710	20.0	425	124	549	1,826	457	2,283
Jn 10	.2380	60.0	.2474	40.0	3,533	2,448	5,981	14,845	9,896	24,741
Jn 11	.2429	85.0	.2433	15.0	5,270	932	6,202	21,696	3,829	25,525
Jn 12	.2150	60.0	.2544	40.0	3,559	2,807	6,366	16,553	11,035	27,588
Jn 13	.2125	65.0	.2300	35.0	4,369	2,546	6,915	20,561	11,071	31,632
Jn 14	.2227	100.0	.0000	0.0	1,043	, 0	1,043	4,683	0	4,683
Jn 15	.2157	87.5	.2412	12.5	, O	0	, O	, 0	0	, 0
Jn 16	.2063	75.0	.2568	25.0	1,086	451	1,537	5,264	1,755	7,018
Jn 17	.2050	70.0	.1997	30.0	193	80	273	941	403	1,344
Jn 18	.2116	80.0	.2135	20.0	307	78	385	1.452	363	1,815
Jn 19	.2070	70.0	.2372	30.0	73	36	109		151	504
Jn 20	.2196	70.0	.2465	30.0	222	107	329	1.011	434	1,445
Jn 21	.1998	90.0	.2275	10.0	195	25	220	978	109	1,087
	.2576		.2432		1,212,454	10,244	1,222,698	4,707,150	42,129	4,749,278
% of To	otal				99.20	0.8		99.10	0.9	

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Table 5. Approximate percentage of biological samples in each age group from gaspereau (primarily alewives) collected from the Margaree River in 1978, 1979 and 1981-1985. The percentage in each age group in the 1983, 1984 and 1985 fisheries after weighting samples to reflect the harvest are shown for comparison.

	Sample		Age								
Year	size (no.)	3	4	5	6	7	8	9	10		
1978*	302	_	48	31	13	5	2	1	1		
1979*	2,009	_	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	< 1	1	-		
1983	Weighted	24	43	25	4	3	< 1	< 1	-		
1984	1,131	53	25	16	3	1	< 1	< 1	< 1		
1984	Weighted	68	22	7	1	1	< 1	< 1	< 1		
1985	741	23	61	8	3	1	< 1	< 1	-		
1985	Weighted	12	80	6	< 1	< 1	< 1	< 1	-		

* Source: O'Neil, J.T. 1980 ** Source: Crawford, R.H. 1983

	1983	1984	1985
ae		Number	
2			16,280
3	502,731	2,450,383	564,476
4	898,317	787,409	3,752,712
5	515,812	262,518	296,677
6	89,514	32,906	30,837
7	52,185	19,863	21,145
8	9,821	13,208	2,724
9	4,465	20,241	22, 297
10		43	

Table 6. Number of fish caught at each age, each year (1983-85) in the Southwest Margaree River gaspereau fishery.

Table 7. Mean weight at age matrix determined from length-weight regression equation for alewives in the Southwest Margaree River gaspereau fishery (values in parenthesis are actual sample values).

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Weight (g)

Age	1983	1984	1985	Mean
2			161(164)	161
3	222(220)	205(210)	213(210)	209
4	283(289)	289 (288)	247(251)	259
5	308(308)	356(349)	310(321)	321
6	325(322)	382(376)	374(377)	351
7	356(352)	428(394)	408(405)	398
8	382(375)	443(356)	421(397)	421
9	378(356)	478(446)	466(455)	453
10		500(478)		500
Mean	(277)	(245)	(258)	

=======================================	:582252222222222222	Catch/hr.				
Аде	1983	1984	1985			
2						
3	39.64	230.43	68.15			
4	70.82	74.05	453.06			
5	40.67	24.69	35.82			
6	7.06	3.09	3.72			
7	4.11	1.87	2.55			

0.77

0.35

Z 4+ 1983-84 = 123.78/32.80 = 3.774Ln = 1.328

Z 4+ 1984-85 = 106.85/45.11 = 2.369Ln = 0.86

8

9

10

Table 8. Estimates of catch per hour at age (based on logbook data) for alewife in the Southwest Margaree River gaspereau fishery (1983-85).

Table	9.	Estimated	instantaneous	fishing	mortality	at	each	age,	in	each	of
three	year	s of fishir	ng on the South	nwest Mai	rgaree Rive	er.					
=====	====	=======================================	==========================	===========	=============	====	:====:	=====	====	=====	===

	Fis			
Age	1983	1984	1985	
3	0.259	0.278	0.356	
4	1.182	0.834	0.890	
5	1.880	1.644	0.890	
6 7	1. <i>3</i> 57 0.685	U.567 1 521	0.890 0.890	
8	0.310	0.363	0.890	•
9	1.349	0.963	0.890	
4+	1.349	0.963	0.890	
	·····	- <u></u>		

1.24

1.90

0.01

0.33

2.69

-14-

Table 10. Projection of population numbers, population biomass and catch biomass from the Southwest Margaree River gaspereau fishery assuming the available number of fish at age three to be constant at 5,222,000 and fishing at the $F_{0.1}$ level of 0.42.

Year	1983	1984	1985
Population numbers	4,835,131	13,282,644	9,424,418
Population biomass (kg)	777,847	2,190,032	1,507,141
Catch (kg)	561,657	897,277	1,212,454
F or quota	• 561,657	897,277	1,212,454
	1986	1987	1988
Population numbers	8,771,493	10,745,117	11,805,818
Population biomass (kg)	1,716,239	2,101,363	2,369,740
Catch (kg)	490,233	651,831	764,442
F or quota	0.42	0.42	0.42
	1989	1990	1991
Population numbers	12,373,072	12,670,030	12,748,422
Population biomass (kg)	2,518,656	2,608,916	2,630,492
Catch (kg)	826,928	864,800	873,854
F or quota	0.42	0.42	0.42
	1992	······································	·
Population numbers	12,858,844		
Population biomass (kg)	2,667,777		
Catch (kg)	889,498		
F or quota	0.42		

Table 11. Estimated potential reduction in catch (in percent of total catch) of alewives due to one-day (Saturday), two-day (Saturday and Sunday) and three-day (Saturday, Sunday and Monday) per week closures of the Southwest Margaree gaspereau fishery.

Closure period	1983	1984	1985	Years combined
One-day	5.0	13.0	8.0	9.0
Two-day	13.0	17.0	23.0	18.9
Three-day	35.0	33.0	37.0	35.2



Fig.1 NUMBER OF GASPEREAU CAUGHT PER DAY IN THE 1985 MARGAREE RIVER GASPEREAU FISHERY. DAILY CATCHES ON SATURDAYS AND SUNDAYS ARE SHADED FOR CONTRAST.