DFO Atlantic Fisheries
Research Document 95/64

MPO Pêches de l'Atlantique
Document de recherche 95/64

STATUS OF GASPEREAU IN THE MARGAREE RIVER 1993 AND 1994

by

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ABSTRACT

Current fishing levels are above target fishing mortalities. Exploitation rates in 1993 and 1994 ranged from 73% to 96% compared to a target of 65%. The management plan initiated in 1993 which consisted of alternating open mornings, open full-days, and open afternoons did not appear to reduce fishing mortality compared to the old system (staggered weekend closures). The reason for this lack of reduction in fishing mortality was that afternoon fishing periods in the lower zone were equivalent to fishing a full day in the lower zone. Several management scenarios based on 1993 and 1994 catch rates could reduce fishing mortality. A method of investigating these scenarios is presented.

RÉSUMÉ

Les niveaux de pêche actuels se situent au-dessus des cibles de mortalité par pêche. En 1993 et 1994, les taux d'exploitation ont varié de 73 à 96 % , alors que la cible était de 65 %. Le plan de gestion adopté en 1993, qui fixait en alternance des matinées d'ouverture, des journées entières d'ouverture et des après-midi d'ouverture, ne semble pas avoir réduit la mortalité par pêche par rapport à l'ancien système (fermetures étalées le week-end). Cela est dû au fait que dans la basse zone les après-midi de pêche équivalaient à une journée entière de pêche. Plusieurs régimes de gestion fondés sur les taux de prises de 1993 et 1994 pourraient réduire la mortalité par pêche. On présente ici une méthode pour les évaluer.

SUMMARY SHEET
Gaspereau in Margaree River

Year	88	89	90	91	92	93	94	Min	Mean	Max
Catch (t)	1666	1123	1016	450	553	736	498	450	905	1666
Population (t)				519	621	867	680	519	672	867
Spawning Esc. (t)				69	68	132	182	68	113	182
Exploitation Rate				87%	89%	85%	73%	73%	84%	89%

Catch min, max, and mean apply to 1984 to 1994. Population, Spawning Escapement and Exploitation rate min, mean, and max apply to 1991 to 1994.

Description of Fishery: Gear consists of tip-traps. Fishery is regulated by effort restrictions not quota. New management regulations initiated in 1993 consisted of alternating open mornings, open full days, and open afternoons. These regulations differed from previous years in which one day per week closures were in effect.

Target: Exploitation rate = 65%.

Fishery Data: Logbooks are used to estimate catch timing, catch per unit effort, and spatial distribution of catch and effort. Daily sampling of the fishery is used to determine catch- and weight-at age.

Research Data: None.

Estimation of stock parameters: Stock size was estimated using Leslie depletion methods based on declines in catch rates in lower and upper parts of the river.

Assessment results: Fishing mortalities since 1991 range from 73% to 96% and are above target levels.

Ecological considerations: River discharge and temperature affect each trap differently. Trapnetters feel that on average these balance out in affecting catch among years.

Future prospects: No forecast is available.

Management considerations: The new management plan did not appear to reduce fishing mortality. Various scenarios can be investigated using catch rate information obtained in 1993 and 1994.

INTRODUCTION

The objective of this assessment is to determine the effect of current levels of fishing on the Margaree gaspereau stock by comparing recent fishing mortalities with target fishing mortalities. The major issue is whether or not management plan changes, inititiated in 1993, met the objective of reducing fishing mortality. The Margaree gaspereau fishery consists of two management zones. The lower zone includes all the Southwest Margaree below the Nova Scotia Highway #19 bridge and the Main Margaree River and the upper zone includes the Southwest Margaree River above the Highway #19 bridge to Lake Ainslie (Fig. 1). Beginning in 1984 and ending in 1992 staggered one day closures per week were applied to each zone. The lower zone was closed from Friday 18:00 to Sunday 8:00 and the upper zone from Saturday 18:00 to Monday 8:00 with the fishing season closing on June 30. In 1993 and 1994, in an effort to reduce fishing mortality, a series of half-day closures were implemented in each zone (Table 1). The season ended June 30 in 1993 and 1994.

Methodologies, in this assessment which differ from past assessments, include the use of a Leslie depletion estimator as described in Ricker (1975) and Hilborn and Walters (1992) to estimate population size and exploitation rate. This methodology differs from past assessments which have attempted to estimate stock size using virtual population analysis (VPA). These VPA methods have generally been unsatisfactory as parameter fits are often not significant.

Assessments have been completed for the Margaree River gaspereau population since 1983 (Alexander 1984; Alexander and Vromans 1985, 1986, 1987, 1988; Chaput and LeBlanc 1989, 1990; Chaput et al. 1991; and Chaput 1993).

DESCRIPTION OF FISHERIES

Gear used in this fishery consists of tip-traps operated in the Main Margaree River below the Southwest Margaree and throughout the Southwest Margaree River system to Lake Ainslie (Fig. 1). Regulations require that traps plus leaders and all walkways or other conveyances over the river allow one-half the width of the river to be open at all times. The combined length of trap and leader may not be more than 15m and no trap may be set within 55m of another trap.

The fishery is restricted by a freeze on new entrants and license or site transfers are permitted only to immediate family members and effort restrictions but not by quota. Active licenses ranged from 25 to 45 from 1983 to 1994, while potential licenses varied from 59 to 69 over this time period (Table 2).

Total landings for Margaree in 1993 and 1994, as from 1984 to 1992, were obtained by a phone survey of all active licenses in each year. Fishers were asked for the number of pails packaged and the number of pounds of bait sold in the year. Pails were converted to pounds of whole fresh fish by multiplying by a conversion factor of 1.408. These estimates were used for reported catch for Margaree and for Nova Scotia Statistical District 2 when the Purchase Slip estimates were less than the phone survey.

The Margaree River gaspereau fishery makes up 75% to 100% of the District 2 landings and 42% to 96% of the Nova Scotia gaspereau fishery (Table 3). Landings in 1994 in all areas were below 89-93 mean landings in all areas (Table 3). Landings in Margaree were half 1993 and 89-93 mean landings (Table 3). Mean landings from 89-93 in Nova Scotia and Prince Edward Island are below 10 and 15 year means, 89-93 means in New Brunswick are similar to long-term means (Table 3).

TARGET

Target fishing mortalities at $F_{0.1}$ were estimated by LeBlanc et al. (1991) to be 1.05 or a target exploitation rate of 65%.

FISHERY DATA

Fishery logbooks are used to make inferences on timing of catch, catch per unit effort, and distribution of effort in the fishery. In 1993 and 1994, 46% to 50% of the active licenses kept logbooks (Table 2). Logbook participation was higher from people fishing in the lower compared to the upper zone. Logbook catches from the lower zone accounted for 78% to 87% of the total catch in that area in 1993 and 1994. Logbook catches in the upper zone accounted for 33% to 37% of the total catch in that area in 1993 and 1994 (Table 4).

Timing of catches in 1993 was similar between the lower and upper sections. Peak catches occurred in both areas during the week ending May 27. Effort was highest in both zones from May 14 to June 9 (Fig. 2). Distribution of catch was different in 1994 between the lower and upper zones. Peak catches in the lower zone occurred during weeks ending May 20 and June 3, while peak catches in the upper zone occurred during the week ending June 3. Effort was highest in the lower section during weeks May 14 to June 3 and in the upper zone from May 21 to June 10 (Fig. 3). Run-timing was similar from 1990 to 1994. Dates of 50% of catch are about 10 days later than they were from 1983 to 1989 (Table 5).

Catch per unit effort (CUE) was estimated by two methods. The first (AVE CUE) was calculated as the sum of the average daily CUE for all fishers fishing in an area. A daily CUE was calculated for each fisher and the mean for each day was calculated by dividing the sum of the CUEs by the number of fishers active that day. The CUE for the season was then obtained by summing the daily averages for the area and/or time of interest. This method was shown by Chaput (1993) to be superior to other methods for comparing CUE among years.

The second method (SUM CUE) was used to estimate CUE was simply summing the catch and dividing it by the sum of the effort in time-periods for each section. This method was used because it was easier to apply to various management scenarios and a comparison with the AVE CUE method showed that at least in three simple examples there was no reason for choosing one method over the other (Appendix 1). Each of these catch rates was calculated based on catch per time period. A time period was a half day fishing, so that open morning and open afternoon days were one time period, but a full fishing day had two time periods.

Fishing patterns did not seem to be altered because of the management plan or expected catch rates in either zone. Most of the catch occurred on full open days in lower and upper zones in 1993 and 1994. In the lower zones the catches during open afternoons were about twice those during the open morning days. In the upper zone, however, catches during open mornings and open afternoons were about equal in 1993 and 1994 (Table 6). Catch rates indicate that fishing in the afternoon in the lower zone was as successful, in terms of catch expected in a day, as fishing for a full day in the lower zone. Lower zone open afternoon catch rates were twice those of open full-day catch rates. Open afternoons allowed one time period of fishing, while full fishing days allowed two time periods. Catch rates in the lower zone were higher than those in the upper zone in 1993 and 1994 (Table 6). In spite of these differences in open and closed days and different expected catch rates among these days, the average number of traps fished during each day type was very similar in lower and upper zones within each year. Average traps fished each day were, however, slightly lower in 1994 compared to 1993 (Table 6). These catch rate similarities and differences were consistent between 1993 and 1994, in spite of major differences in run-timing distribution between the two zones in 1994 (Fig. 3). This consistency indicates that either fish movement is different within each of the zones or that fishing methods on half-open days are different within each of the zones.

Commercial sampling followed a similar procedure to the one used from 1990 to 1992 (Chaput 1993). Sampling occurred daily within each zone. For full fishing days sampling in the morning or afternoon was randomly selected. The order of traps to be sampled in each zone was also randomly selected. The objective was to measure 200 to 250 fish from each zone. If this number could

not be obtained from the first trap the next trap selected would be visited for sampling. The usual procedure, however, was to proceed to the next trap where fish were known to have been caught in sufficient numbers to provide the sample required (Table 7). Detailed samples for aging were collected by keeping 3 fish for every 5 mm up to 280 mm and then keeping 5 fish for every 5 mm group (Table 7). Length frequency samples collected in the field were made from fresh fish. Fish collected for detailed sampling were measured fresh or frozen. Lengths taken from frozen fish were converted to fresh fish lengths using the formula determined from previous assessments (Chaput 1993) as follows:

$$(1) \quad adjustedlength(mm) = 4.557 + 1.1043 \times frozenlength(mm)$$

Scales were used for aging and were collected from the left side of the fish in the region midway between the dorsal fin and ventral scutes. Species were distinguished on the basis of the external appearance and peritoneum colour (Scott and Crossman 1973). The body cavity of alewife being pale to dusky and bluebacks sooty to black.

The catch-at-age of alewife and blueback was obtained using AGELEN (Wright 1990). Separate keys were formed for each management zone. Keys within each zone were formed on the basis of run-timing in each year. For 1993, two keys were formed for each zone separated at May 27. One key included the first part of the catch including the peak week, and the second the remainder of the catch for each year (Fig. 2). For 1994, three keys were formed for each management zone. In the lower zone, the first included the first part of the season up to May 20; the first peak in the lower zone. The second, included the trough in catch between the peaks (Fig. 3), (May 21 to May 27), and the third included the remainder of the season. In the upper zone, the first key included catch up to the peak week (up to May 27), the second included the week of peak catch (May 28 to June 3), and the third the remainder of the season (Table 7). Approximately 1000 fish were collected each year for aging (Table 8).

The catch-at-age for each key period was expanded by the logbook catch for that period. The catch-at-age for each key period was then summed and expanded by multiplying by the ratio of total catch:logbook catch.

This fishery is usually supported by one year-class of alewife (Fig. 4). During 1993 and 1994 the 1990 year class was the major alewife year-class and accounted for 75% to 90% of the fish caught (Table 9). Mean weight-at-age of 3 and 4 year old first time spawning alewife show a slight increase from 1991 levels in the last three years (Table 10). Bluebacks are a small part of the fishery but are also usually dominated by one year-class (Table 11).

ESTIMATION OF STOCK PARAMETERS

Stock size was estimated using the depletion estimation procedure derived by Leslie and described by Ricker (1975) and Hilborn and Walters (1992). The use of this method on Margaree gaspereau fishery makes an analogy to electrofishing surveys for juvenile stream dwelling salmonids which commonly use depletion estimators. Gaspereau pass through a gauntlet of nets on their way to Lake Ainslie (Fig. 1). As they encounter these nets in various sections of the river the population is depleted. Each section of the river is analogous to an electrofishing sweep which removes part of the population available to the next sweep or in this case, up-river section, and the decline in CUE from the lower to the upper section can be used to estimate stock size. In this type of depletion estimator the cumulative catch that must occur to drive the CUE to zero is the population.

This procedure requires a relationship between fishing success and catch already taken (Ricker 1975). If stock size is proportional to fishing success

or catch per unit effort, then stock size can be estimated by the following relationship:

$$(2) \qquad \frac{C_t}{E_t} \quad q \times N_t$$

where C_t / E_t is the catch per unit effort during the time interval t, **q** is the catchability coefficient or the proportion of the population caught by one unit of effort, and N_t is the population at time t.
The stock size at any time t is the original population minus the catch up to the time interval:

$$(3) \qquad N_t \quad N_0 \; K_t$$

where N_0 is the original population and K_t is the cumulative catch prior to the time interval.

Substituting equation (3) into equation (2) gives:

$$(4) \qquad \frac{C_t}{E_t} \quad q \times N_0 \quad q \times K_t$$

Equation (4) is then in the form of a linear regression model with the slope equal to **q** and the intercept equal to **q x N**. The dependent (y) variable is C_t/E_t and the independent (x) variable is cumulative catch K_t.

The assumptions of this model are that the population is completely closed, so that it gains no new recruits or immigrants and loses no animals to natural mortality or emigration, and that all fish are equally vulnerable or that the catchability coefficient **q** is constant throughout time in the fishery.

In this analysis the population is measured over intervals of space rather than time. The population during the fishery (about six weeks) is assumed to be closed because there is no recruitment and natural mortality is small relative to fishing mortality.

In order to most closely approximate the assumption of constant catchability or equal catchability among sites it was decided to group together traps from within well defined regions of the river. This grouping would have the effect of smoothing individual differences in catchability among traps. The river was divided into six areas for this procedure (Fig. 1). The CUEs from the main (M) portion of the Margaree below the confluence of the Southwest and Northeast branches were not included. The river is much wider in this section and the gaspereau would probably have a lower probability of being caught by these traps or lower catchability coefficient than those located in the Southwest Margaree River. The CUEs from this section were always much lower than adjacent sections (Table 12).

The model was applied to data for 1994 and 1993 using the five sections (Lower 1 (L1), Lower 2 (L2), Upper 1 (U1), Upper 2 (U2), and Upper 3 (U3); Fig. 1, Table 12, 13) with no adjustments and regressions of CUE against cumulative catch were significant in both cases (Table 14, Fig. 5). For 1992, no logbooks were returned from the Upper 2 section. This lack of logbooks meant that the catch from that area had to be combined with those from either Upper 1 or Upper

3. They were combined with Upper 1 in the analysis used to estimate population size (Fig. 5). In 1991, the CUEs from the Lower 1 and Lower 2 sections were lower than the Upper 1 section. A regression using the five sections was not significant because of these data in 1991. The CUEs were recalculated using logbooks from Lower 1, Lower 2, and Upper 1 as coming from one combined section. This revised data set was used to estimate population size for 1991 (Fig. 5). This method was then tested on 1993 and 1994, 1992 could not be used to test this method, as it would leave only two sections. Regressions of CUE against cumulative catch had p-values between 0.13 and 0.19 for these analyses. Population sizes were similar for 1994 (680 compared to 637) but not for 1993 (867 compared to 1,212) with these sections combined (Table 15).

There were some differences between population estimates using the different CUE estimates but these were not large enough to affect the conclusion that current fishing levels are above target levels (Table 15). In cases where both estimates had p-values less than 0.1 (1993 and 1994), the differences in population size were less than 15% (Table 15). The range in exploitation rates from estimates with p-values less than 0.1 was 73% to 96% for 1991 to 1994 (Table 15). Confidence limits were calculated for the population estimates using the method described by Ricker (1975, pg. 150, equation 6.4). The catch in the Main Margaree was added to the lower and upper limits of the confidence interval to obtain the limits for the entire population. Lower limits were always below the catch estimates for the year. As a result, the catch estimates are more representative of the lowest possible population size (Table 15).

ASSESSMENT RESULTS

Fishing mortalities have been above the target since 1991. The fishery is currently supported by one year-class. The change in management plan does not seem to have lowered exploitation rates (Table 15). Previous assessments attempted to estimate population size using ADAPT formulations but these models were not statistically significant. Simple cohort analysis with age-aggregated abundance indices was also attempted but regression parameters were not statistically significant. Exploitation rates estimated from these methods were 60% for 1991 and 45% for 1992 (Chaput 1993).

ECOLOGICAL CONSIDERATIONS

Temperature and stream discharge affect each trap differently. Trapnetters on the Margaree River feel that on average there is little effect on exploitation rate for the system because of river conditions.

FORECAST/PROSPECTS

The fishery in 1995 will be dependent on the strength of the 1992 year-class which will be entering this fishery as three year-olds. At present there is no method for predicting the strength of this year-class. The 1993 and 1994 fisheries were supported almost exclusively by the 1990 year-class as three and four year-olds. This year-class can be expected to make a minimal contribution to the 1995 fishery. Natural mortality of five year-olds is high because they are primarily repeat spawners and few five year-olds have been present in the fishery since 1984 (Fig. 4).

MANAGEMENT CONSIDERATIONS

Population estimates and catches indicate that current fishing mortalities are above target mortalities and that the management plan implemented in 1993 did not reduce fishing mortality (Table 15). Under the old management system (staggered weekend closures) there were two fishing periods per day for a potential of 122 fishing periods per license. Under the new management system there were a potential 92 fishing periods per license (Table 1). If catch rates were equal in all fishing periods a 25% reduction in fishing mortality might have been expected. There were, however, differences among the time periods with

afternoon catch rates in the lower zone double those for open-morning and open-full days in this zone (Table 6). In the lower zone fishing an afternoon was equivalent to fishing a full-day. Catch rates were also twice as high in the lower zone in 1993 compared to the upper zone but only slightly higher in the lower zone compared to the upper zone in 1994 (Table 6). Fishing mortality probably was reduced in the upper zone because the catch rates per period were equivalent among the three types of fishing days in that zone (Table 6). These differences made the new management system ineffective in reducing fishing mortality.

To reduce fishing mortality to the target level of 65%, the 1993 catch would have had to have been 564 tonnes with a population size of 867 tonnes and the 1994 catch would have had to have been 442 tonnes with a population size of 680 tonnes (Table 15). There are many possible ways to look back at 1993 and 1994 and test various other management systems to determine if they would have reduced fishing mortality. Two of these scenarios are presented below and represent an approach that could be taken in developing a management plan for the coming years.

In each of these scenarios the total number of days fished in 1993 and 1994 are estimated by expanding the days fished by logbook fishers in each zone by the percentage of landings accounted for by logbooks in each zone of each year (Table 4). Each half-day of fishing represents one time period and each full day two time periods. Potential catches were estimated for each type of fishing day using the estimated catch rates per time period (SUM CUE) (Table 6) for each year.

Under Scenario 1, all fishing is restricted either to open mornings, open afternoons, or full-days. The open morning strategy would have under-harvested in each year, the full-day over-harvested but the open afternoon strategy would have been near the target (Table 16). Scenario 2, also presents a strategy that would have approached the target. It consisted of moving 50% of the full fishing days in 1993 and 1994 to open mornings and keeping the rest as full fishing days. There would be no open afternoons in this scenario as they would become open mornings. The total catches for each year would have produced a fishing mortality near the target (Table 16).

A case is not being made for one of these scenarios over the other but merely to provide a framework for investigating possible scenarios that might be investigated to reduce fishing mortality.

RESEARCH RECOMMENDATIONS

(1) Examine the effect of varying run-timing and catchability on the depletion estimator.

(2) Mark-recapture experiments may provide an independent estimator of spawning escapement. This experiment could be done by tagging at the last few traps just downstream from Lake Ainslie.

ACKNOWLEDGEMENTS

The authours would like to thank the Fishery Officers of Margaree Forks for their assistance and support with assessment activities and the gaspereau fishers that kept the voluntary logbooks. Their participation in this program provides much of the information used in this assessment and greatly strengthens the advice that can be provided.

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Appendix 1. A comparison of the two catch rate estimation methods and their affect on population estimates using the Leslie depletion estimator on Margaree River gaspereau. The three examples (Scenario 1, 2, and 3) differ in fishing pattern. There are four days in the fishery, each day sees 250 fish enter the river and pass through the fishery for a true population size of **1000**. Catchability is constant for each fisher (**q**=0.1) and effort is either 1 or 2 time-periods in a day. Catch is calculated as C = q x eff x N, with N as in equation 3 in the text (page 10).

day	1	2	3	4
pop	250	250	250	250
q	0.1			
eff	1	2	2	1

SCENARIO 1

CATCH	DAY			sum
FISHER	1	2	3	4 TOTAL
1	25.0	50.0	50.0	25.0 150.0
2	22.5	40.0	40.0	22.5 125.0
3	20.3	32.0	32.0	20.3 104.5
4	18.2	25.6	25.6	18.2 87.7
5	16.4	20.5	20.5	16.4 73.8
6	14.8	16.4	16.4	14.8 62.3
7	13.3	13.1	13.1	13.3 52.8
8	12.0	10.5	10.5	12.0 44.9
9	10.8	8.4	8.4	10.8 38.3

SCENARIO 2

CATCH	DAY			
fish	1	2	3	4 TOTAL
1	25.0	50.0		75.0
2	22.5	40.0	50.0	112.5
3	20.3	32.0	40.0	25.0 117.3
4	18.2	25.6		43.8
5	16.4	20.5		36.9
6	14.8	16.4	32.0	22.5 85.6
7	13.3	13.1	25.6	52.0
8	12.0	10.5	20.5	20.3 63.2
9	10.8	8.4		19.2

SCENARIO 3

CATCH	DAY			
fish	1	2	3	4 TOTAL
1		50.0	50.0	25.0 125.0
2		40.0	40.0	22.5 102.5
3		32.0	32.0	64.0
4	25.0		25.6	20.3 70.9
5	22.5		20.5	18.2 61.2
6	20.3		16.4	36.6
7	18.2	25.6		16.4 60.2
8	16.4	20.5		14.8 51.6
9	14.8	16.4		0.0 31.1

SCENARIO 1

CAT/EFF	DAY			
FISHER	1	2	3	4
1	25.0	25.0	25.0	25.0
2	22.5	20.0	20.0	22.5
3	20.3	16.0	16.0	20.3
4	18.2	12.8	12.8	18.2
5	16.4	10.2	10.2	16.4
6	14.8	8.2	8.2	14.8
7	13.3	6.6	6.6	13.3
8	12.0	5.2	5.2	12.0
9	10.8	4.2	4.2	10.8

SCENARIO 2

CATCH	cat/eff				
fish		1.0	2.0	3.0	4.0
	1	25.0	25.0		
	2	22.5	20.0	25.0	
	3	20.3	16.0	20.0	25.0
	4	18.2	12.8		
	5	16.4	10.2		
	6	14.8	8.2	16.0	22.5
	7	13.3	6.6	12.8	
	8	12.0	5.2	10.2	20.3
	9	10.8	4.2		

SCENARIO 3

CATCH	cat/eff				
fish		1.0	2.0	3.0	4.0
	1		25.0	25.0	25.0
	2		20.0	20.0	22.5
	3		16.0	16.0	
	4	25.0		12.8	20.3
	5	22.5		10.2	18.2
	6	20.3		8.2	
	7	18.2	12.8		16.4
	8	16.4	10.2		14.8
	9	14.8	8.2		

SCENARIO 1

SECTION	SUM CAT/ SUM EFF	AVE CUE	CATCH	CUMULATIVE CATCH
1	21.1	85.8	379.5	0.0
2	12.4	53.7	223.7	379.5
3	7.6	34.7	136.0	603.2
			739.2	

SCENARIO 2

SECTION	SUM CAT/ SUM EFF	AVE CUE	CATCH	CUMULATIVE CATCH
1	21.8	90.4	304.8	0.0
2	11.9	65.4	166.4	304.8
3	9.6	49.1	134.3	471.1
			605.4	

SCENARIO 3

SECTION	SUM CAT/ SUM EFF	AVE CUE	CATCH	CUMULATIVE CATCH
1	20.8	64.4	291.5	0.0
2	15.3	52.2	168.7	291.5
3	13.0	42.5	143.0	460.2
			603.2	

Population estimates for three scenarios. A * indicates estimate had a p-value less than 0.05.

	Population Estimate	
Scenario	SUM CUE	AVE CUE
1	937*	1013*
2	799	1043*
3	1024*	1377*

STOCK STATUS WORKSHOP NOTES
Margaree River Gaspereau
Stock Status Workshop
December 13, 1994

Participants:

Cameron MacKenzie	Trapnetter
Guy Saindon	DFO - Cheticamp
Frank Jesty	Native Council of Nova Scotia
Bob Peters	Margaree Gaspereau Fisherman's Association
Margaret Gillis	Margaree Gaspereau Fisherman's Association
John MacLellan	Margaree Gaspereau Fisherman's Association
Donald Gillis	Trapnetter
Pierre Chiasson	Margaree Gaspereau Fisherman's Association
Allan Alexander	Trapnetter
Peter MacLellan	Trapnetter
Wes Barrington	DFO - Margaree
Ross Jones	DFO - Science
Leroy MacEachern	DFO - Antigonish
Martin Cameron	Trapnetter
Tad Hombek	DFO - Antigonish
Ross Claytor	DFO - Science
Paul LeBlanc	DFO - Science
John Chisholm	Trapnetter
John MacInnes	Nova Scotia Dept. of Fisheries
Mac Gillis	Trapnetter

Landings and Effort:

- Catches should be broken down into upper and lower sections by type of fishing days, for example, full, morning, or afternoon openings
- Small gaspereau were caught at the end of the season, these were likely bluebacks but detailed samples would have to be examined to determine if they were immature or mature
- Logbooks are an important part of the data collection for this fishery and simplifying them will increase the number of participants. A sample of the revised form is attached for comments. It was concluded that salted vs. unsalted weights need to be kept separate to provide adequate catch statistics for the assessment
- Conservation and Protection needs the catch statistics by mid-July. To simplify the collection of statistics and reduce duplication of effort within DFO, C and P will obtain information from logbooks sent in early
- Effort was constant as someone is at the trap locations throughout the day
- There is a great deal of variation in how each trap fishes depending on weather, discharge, and number of traps below a trap.

Surveys:

- Larval samples from 1993 and 1994 have not been processed. Leroy MacEachern and Pierre Chiasson would look into hiring someone through the TAGS program to do this work
- A method of determining annual escapement would be a useful area for future work.

Abundance:

- Most agreed the stock was in decline. Representatives from St. Georges Bay agreed that this was happening in their area as well. Overfishing was thought to be the reason.
- Annual catches off Cape North could be included in the assessment
- Fewer larvae were observed in the eel catches the last two years. This change could be due to changes in the eel season.
- The effect of the algal bloom in Lake Ainslie during 1991 on gaspereau hatching should be investigated.

Other Concerns:

- It was suggested that a gaspereau escape mechanism be tried in the salmon trapnet when in usually goes in on June 15. If this was successful it might be possible to consider putting the trapnet in earlier with the agreement of the gaspereau trapnetters.

- It was suggested that DFO buy back unused licenses.

Minutes of Peer Review
Diadromous Stocks
February 7-10, 1995

Review Committee:

Chadwick, Mike (Chair), Chief, Marine and Anadromous Fish Division, Gulf Region

1. Caron, François, Biologiste, Ministère de l'Environnement et de la faune, Direction de la faune et des habitats, 150, boul. René-Lévesque Est, Québec, Québec
2. Chiasson, Alyre, doyen, Faculté des sciences, Université de Moncton, Moncton, NB
3. Clay, Doug, Canadian Heritage, Fundy National Park, Alma, NB
4. Cunjak, Rick, Research Scientist, Habitat Ecology Section, Environmental Studies, DFO, Gulf Region
5. Davis, Anthony, Professor, Department of Sociology and Anthropology, St. Francis Xavier University, Antigonish, NS
6. Dempson, Brian, Northwest Atlantic Fisheries Centre, DFO, Newfoundland Region, St. John's, Nfld
7. Hutchings, Jeff, Northwest Atlantic Fisheries Centre, DFO, Newfoundland Region, St. John's Nfld
8. Myles, Wes, NB Sportfishery Board, Doaktown, NB
9. O'Neil, Shane, Biologist, Freshwater and Anadromous Division, DFO, S-F Region
10. Simon, Vincent, Chief, Big Cove First Nation, Big Cove, NB
11. Wheaton, Fred, New Brunswick Wildlife Federation, Moncton, NB
12. Whoriskey, Fred, Atlantic Salmon Federation, St. Andrews, NB

A. Margaree gaspereau

1. Description of fishery
(a) Include some reference to past assessments to provide a basis for why the assessment methods have changed.

2. Target
(a)

3. Inputs
(a) The logbook returns have diminished. Are the fishers that return logs today different from those who do not? The return rate could improve if the logbooks were simplified.
(b) Mean weights at age have declined.

4. Model
(a) The assumptions of the population being closed should be explored. Would the pattern of grouping sites influence the results of the analysis? Do fish arrive before and after the fishery is operating?
(b) Is the assumption of constant catchability being met? Variations in run timing may affect catchability.
(c) Confidence intervals should be included with the population estimates.

5. Synopsis
(a) Are there reasons for the decline in weights at age.
(b) Stronger statements should be made regarding the likelihood that exploitation rates are excessive.
(c) Is there any information on expected returns for 1995?

6. Research recommendations
(a) A mark recapture experiment could be used to test some of the assumptions of the depletion model.
(b) It may be possible to calculate individual variation in trap catchability.

7. Other issues
(a) Gaspereau may move during periods of cloud cover.

Participants

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2. Amiro, Peter, Biologist, Salmon Assessment and Enhancement Research, S-F Region
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6. Claytor, Ross, Section Head, Pelagics, Gulf Region
7. Cutting, Dick, Section Head, Stock Assessment and Enhancement, S-F Region
8. Harvie, Carolyn, Computer Services Coordinator, S-F Region
8. Jessop, Brian, Biologist, Non-Salmon Assessment
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10. LeBlanc, Paul, Technician, Anadromous Fishes, Gulf NS, Gulf Region
11. Locke, Andrea, Scientist, Anadromous Fishes, Chaleur Bay & Southern NB, Gulf R.
12. Lutzac, Tim, Biologist, Aboriginal Fisheries, Gulf Region
13. Marshall, Dr. Larry, Biologist, Salmon Assessment, S-F Region
14. Moore, Dave, Technician, Anadromous Fishes, Miramichi River, Gulf Region
15. Mowbray, Fran, Technician, Anadromous Fishes, Chaleur Bay, Gulf Region
16. Pickard, Russell, Technician, Anadromous Fishes, Chaleur Bay, Gulf Region
17. Ritter, John, Division Chief, Freshwater and Anadromous Division, S-F Region

Table 1. Dates of morning and afternoon closures for Margaree River gaspereau fishery in 1993 and 1994. Morning fisheries open at sunrise and close at 13:00 the same day. Afternoon fisheries open at 13:00 and close at dusk. Full-Day open fisheries are open from sunrise to dusk.

	Lower Zone			Upper Zone		
	Morning Open	Afternoon Open	Full-Day Open	Morning Open	Afternoon Open	Full-Day Open
May	3	1	2	2	4	1,3
	7	5	4,6	6	8	5,7
	11	9	8,10	10	12	9,11
	15	13	12,14	14	16	13,15
	19	17	16,18	18	20	17,19
	23	21	20,22	22	24	21,23
	27	25	24,26	26	28	25,27
	31	29	28,30	30		29,31
June	4	2	1,3	3	1	2,4
	8	5	6,7	7	5	6,8
	12	10	9,11	11	9	10,12
	16	14	13,15	15	13	14,16
	20	18	17,19	19	17	18,20
	24	22	21,23	23	21	22,24
	28	26	25,27	27	25	26,28
		30	29		29	30
Total Days	15	16	30(61)	15	15	31(61)
Total Periods	15	16	60(91)	15	15	62(92)

Table 2. Number of active and potential licenses and number of logbooks received each year from 1983 to 1994 in the Margaree River gaspereau fishery.

Year	Potential Licenses	Active Licenses	Logbooks Returned
83	69	44	9
84	68	45	42
85	68	25	18
86	68	33	13
87	68	33	23
88	69	38	35
89	59	41	32
90	62	41	30
91	62	32	20
92	62	27	14
93	60	37	17
94	59	36	18

Table 3. Gaspereau landings from Margaree River, Nova Scotia Statistical Districts, New Brunswick, and PEI from 1978 to 1994. Data are summarized from Purchase Slip and Supplementary B slips compiled by Statistics Branch. Landings for Statistical District 2 from 1950 to 1978 are given in Chaput (1993). A * indicates estimate obtained from Science Branch phone survey. When Purchase Slip estimates for Statistical District 2 were less than Science Branch estimate for Margaree, the Science Branch estimate was used. A zero entry indicates landings less than 0.5 t, a dash indicates no landings reported.

		Nova Scotia Statistical District							Total Landings (metric tonnes)			
Year	Margaree	2	3	11	12	13	45	46	NS	NB	PEI	GULF
78		1713	5	36	7	32	118	0	1911	3084	104	5100
79		1776	0	114	9	49	74	0	2023	4409	405	6837
80		1069	0	910	21	80	76	12	2167	4676	253	7096
81		1369	1	61	13	78	103	30	1654	2708	259	4621
82		1445	0	29	18	34	115	21	1664	1994	133	3790
83		580	0	144	27	16	10	3	780	1901	36	2717
84	883 *	883 *	0	78	7	85	0	0	1052	1717	88	2857
85	1223 *	1223 *	0	0	1854	99	26	0	3202	3569	238	7010
86	545 *	545 *	0	161	32	236	0	0	974	2160	464	3598
87	1259 *	1259 *	0	848	59	127	122	144	2558	4388	364	7310
88	1666 *	1912	-	570	120	225	-	8	2835	3714	233	6782
89	1123 *	1506	-	245	148	130	75	12	2116	3682	131	5929
90	1016 *	1016 *	-	226	1	202	33	26	1504	3196	84	4773
91	450 *	641	0	218	60	110	1	40	1070	3554	87	4711
92	553 *	617	-	101	20	23	-	11	772	3454	318	4544
93	736 *	814	-	73	40	24	0	12	963	3573	198	4734
94	498 *	498 *	-	77	21	10	-	11	616	3246	95	3957
Mean 78-93	-	1147	1	238	152	97	63	24	1702	3236	212	5151
Mean 84-93	944	1040	-	252	234	126	43	28	1704	3301	221	5225
Mean 89-93	773	916	-	173	54	98	36	20	1283	3492	164	4938

Table 4. Number of logbooks returned and active licenses in 1993 and 1994 for the lower and upper zones of the Margaree gaspereau fishery.

Year	Area	Number of Logbooks	Active Licenses	Logbook Catch (t)	Total Catch (t)	Percent Logbook Catch
1991	Lower	14	16	156	170	92
	Upper	6	16	52	280	19
1992	Lower	10	13	274	357	77
	Upper	4	14	85	196	43
1993	Lower	8	18	318	367	87
	Upper	9	19	121	369	33
1994	Lower	10	16	171	219	78
	Upper	8	20	102	279	37

Table 5. Dates of maximum and cumulative landings for Margaree gaspereau fishery, 1983 to 1994.

Date	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Maximum Catch	May 17	May 17	May 30	May 17	May 13	May 22	May 18	June 4	May 31	June 2	May 23	May 19
Cumulative 10%	May 10	May 16	May 21	May 9	May 12	May 17	May 14	May 13	May 18	May 24	May 18	May 19
Cumulative 50%	May 17	May 21	May 28	May 17	May 16	May 23	May 19	May 29	May 28	June 1	May 27	May 29
Cumulative 90%	May 24	May 28	June 2	May 26	May 26	May 29	May 23	June 4	May 31	June 4	June 5	June 5
Total days for 10% to 90%	15	12	12	15	15	13	10	22	13	12	19	18

Table 6. Logbook catch, average effort, and catch per unit effort (CUE sum of kg/trap-period) for Margaree gaspereau fishery for days when the fishery was open during the morning, afternoon, and full fishing days in 1993 and 1994. Numbers in parentheses for trap-periods are the number of days fishing these periods represent.

	1993			1994		
	Open Mornings	Open Afternoons	Open Full-Day	Open Mornings	Open Afternoons	Open Full-Day
Catch (t) Lower	43	81	195	22	48	102
Catch (t) Upper	19	17	85	21	20	62
Trap-periods Lower	58	60	244(122)	53	56	240(120)
Trap-periods Upper	52	51	212(106)	45	52	202(101)
SUM CUE Lower (t/per)	0.74	1.35	0.79	0.42	0.86	0.43
SUM CUE Upper (t/per)	0.37	0.33	0.40	0.47	0.38	0.31
AVE CUE Lower	6331	11239	6483	3144	6569	3601
AVE CUE Upper	2746	2436	2996	3733	4181	2787
Average Traps/Day Lower	5.8	6.7	6.1	5.3	4.7	5.2
Average Traps/Day Upper	5.8	5.7	6.2	3.8	4.3	4.6

Table 7. Dates, sites, periods and numbers of fish sampled in 1993 and 1994 for the Margaree gaspereau fishery. Horizontal lines within the table indicate time strata for age keys.

	1993							1994						
	Lower			Upper					Lower			Upper		
	Site	Period	No.	Site	Period	No.	Meas.		Site	Period	No.	Site	Period	No.
May 4								May 4						
5								5	12	AM	65			
6								6	12	AM	64			
7								7	5	PM	38			
8								8	12	AM	98	48	AM	6
9								9				33	PM	202
10	1	PM	39					10	12,17	PM	172			
11	5	PM	149					11	15,17	PM	237	49,33	AM	225
12	17	AM	262	33	AM	198		12	5	PM	226	60	AM	42
13	17	AM	224	33	PM	210		13	26	AM	234	33	AM	228
14	26	PM	224	37	PM	222		14	12	AM	236	38,41	PM	206
15				49	AM	234		15	5	PM	249			
16	7	PM	229	52	AM	237		16	17,12,5	AM	226	48,38,37	AM	242
17	26	AM	232	52	AM	206		17	26	AM	223	37,60	PM	80
18	1	PM	227	33	PM	227		18	17	AM	223	38	PM	238
19	7	PM	214	33	AM	131		19	17	PM	251	33	AM	248
20	11	AM	245	60,52	AM	259		20	12	PM	262	60	AM	238
21	5	AM	261	41	AM	261		21	17	AM	245	38	PM	228
22	5	AM	247	52	PM	215		22	5	PM	234	35	PM	237
23	1,8	PM	213	60	AM	200		23				60,52	AM	223
24	17	AM	219	37,38,35	AM	217		24	5	PM	202			
25	5	AM	214	38	PM	264		25	17	AM	47	38,52	PM	219
26	5	PM	214	60,52	PM	252		26	17,5	AM	210	52	PM	231
27	1,8	PM	239	37	AM	214		27	26,1	PM	199	41,60,33	AM	269
28	15	AM	198	60	AM	202		28	1,8	PM	249			
29	5	AM	96	52	AM	291		29	5	AM	209	41	PM	214
30	11	AM	211	37	PM	197		30	1,8	AM	266	33	PM	232
31	26	PM	198	60	PM	206		31	1,8	PM	226	60,35	AM	239
June 1	8	PM	217	33	AM	263		June 1	26	AM	232	41	AM	242
2	7	AM	214	52	PM	255		2	27	AM	118	49	PM	224
3	5,8	AM	231	60,52	PM	220		3						
4	26	PM	213	41	PM	246		4	15,17	PM	261	35	PM	228
5	8	AM	210					5						
6				33	AM	243		6	5	AM	226	37	PM	218
7								7	17	AM	227	35,37	PM	226
8								8						
9				33	AM	220		9						
10				41	AM	219		10						
11								11						
12								12						
13								13				33	AM	223
			5440			6109					5955			5408

Table 8. Number of gaspereau aged from the sampling program on the Margaree River during 1993 and 1994. The first number of the age refers to total age (age) and the second number refers to the age at first spawning (fsp).

	1993			1994		
Species age.fsp	Lower	Upper	Combined	Lower	Upper	Combined
Alewife						
2.2						
3.2				1		1
3.3	358	359	717	41	27	68
4.2	1					
4.3				127	125	252
4.4				420	341	761
5.3	13	23	36	17	14	31
5.4				10	6	16
5.5				7	1	8
6.3	6	7	13		3	3
6.4				2	3	5
6.5				1		1
7.4		1	1			
8.4		1	1			
Blueback						
3.3	8	13	21	1		1
4.3	2	2	4	1	3	4
4.4				1	4	5
5.3		1	1			
5.4						
5.5					2	2
6.3						
6.4						
6.5						
7.4						
7.5						
Total	388	407	794	629	529	1158

Table 9. Alewife catch-at-age for the Margaree gaspereau fishery. First number in age indicates total age, second number indicates age at first spawning. Numbers are in 1000s of fish. PS=Previous spawners; YC=year-class.

Age	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
2.2	0	0	25	2	0	0	1	0	6	5	0	0
3.3	713	2601	447	1262	4400	2479	120	2806	422	1774	2460	19
3.2	2	0	107	16	0	0	0	0	0	3	0	2
Total 3	715	2601	554	1278	4400	2479	120	2806	422	1776	2460	20
4.4	371	428	3070	235	434	1431	2444	281	1283	188	565	1448
4.3	397	258	920	159	429	2355	1236	54	41	133	151	240
4.2	0	0	0	0	10	0	0	0	0	0	6	0
Total 4	768	687	3990	394	873	3786	3680	335	1324	321	722	1688
5.5	0	0	0	0	0	0	1	36	35	0	8	17
5.4	157	35	205	372	131	267	186	628	56	47	40	63
5.3	334	185	41	129	19	160	181	244	55	97	21	82
Total 5	491	221	245	501	149	428	368	908	146	144	69	162
6.5	5	1	1	7	0	0	0	1	0	0	0	1
6.4	45	20	6	11	181	0	11	23	19	1	7	7
6.3	52	4	27	6	5	7	6	55	20	2	7	4
Total 6	103	26	34	23	186	7	17	79	39	3	14	11
7.5	0	0	0	0	0	0	0	0	1	0	0	0
7.4	0	4	0	4	0	0	0	4	1	0	0	0
7.3	18	1	3	0	0	0	0	3	1	0	0	0
Total 7	18	5	3	4	0	0	0	7	3	0	0	0
8.4	3	4	1	0	0	0	0	0	0	0	0	0
8.3	3	1	0	0	0	0	0	0	0	0	0	0
Total 8	5	5	1	0	0	0	0	0	0	0	0	0
9.4	0	43	0	0	0	0	0	0	0	0	0	0
9.3	5	0	0	0	0	0	0	0	0	0	0	0
Total 9	5	43	0	0	0	0	0	0	0	0	0	0
Total	2105	3587	4853	2202	5608	6700	4186	4135	1940	2249	3265	1882
% PS	49	16	27	32	14	42	39	24	10	13	7	21
Major YC	79	81	81	83	84	84	85	87	87	89	90	90
% of total	36	72	82	58	78	57	88	68	68	79	75	90

Table 10. Weight-at-age for alewife portion of Margaree gaspereau catch from 1983 to 1994. First age indicates total age, second age indicates age at first spawning. Weight-at-age by age at first spawning was not available for 1983 to 1989. A blank indicates either no fish in the designated age group for 1991 to 1994. Ages older than 9 have not been included because of small sample sizes.

Age	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
2.2			164	152			137		145	162		
3.3									185	203	212	203
3.2												225
Total 3	220	210	210	215	211	214	188	220	185	203	212	205
4.4									225	255	248	263
4.3									233	224	259	255
4.2											211	
Total 4	289	288	250	264	252	261	265	258	225	227	250	261
5.5									230	259	265	263
5.4									272	275	275	295
5.3									249	258	286	284
Total 5	308	349	321	303	294	336	310	296	253	263	277	286
6.5												374
6.4									301	332	278	284
6.3									269	338	291	315
Total 6	322	376	348	358	347	339	357	313	284	334	284	299
7.5									261			
7.4									307		356	
7.3										319		
Total 7	352	407	405	412		411	406	362	295	319	356	
8.4												
8.3												
Total 8	375	403	397									
9.4												
9.3												
Total 9	356	446	455									
Total	273	238	249	246	224	246	267	220	220	233	222	263

Table 11. Blueback catch-at-age for the Margaree gaspereau fishery. First number in age indicates total age, second number indicates age at first spawning. Numbers are as given. PS = previous spawners; YC=year-class.

Age	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1.1	0	42	0	0	0	0	0	0	0	0	0	0
3.3	0	51	138	169	675	2152	0	13264	49289	93562	39717	190
3.2	0	1093	1419	0	0	0	0	0	0	0	0	0
Total 3	0	1144	1557	169	675	2152	0	13264	49289	93562	39717	190
4.4	0	0	7115	668	1946	24956	5176	0	39447	11641	3487	2988
4.3	0	4229	10919	87	0	5475	341	0	10148	0	4711	3656
4.2	0	716	2943	0	0	0	0	0	0	0	0	0
Total 4	0	4945	20977	755	1946	30431	5517	0	49595	11641	8198	6644
5.5	0	0	0	0	0	0	14201	793	9939	0	0	4582
5.4	0	16	1775	1499	77	1765	35141	45520	416	1073	872	4674
5.3	0	3012	3619	237	0	0	597	1099	0	2310	0	0
5.2	0	666	72	0	0	0	0	0	0	0	0	0
Total 5	0	3694	5466	1736	77	1765	49939	47412	10355	3383	872	9256
6.5	0	0	0	0	0	0	654	1673	416	0	0	0
6.4	6290	28	7165	699	1814	0	1244	3786	5678	0	0	0
6.3	6290	1501	0	614	52	0	0	0	0	0	0	0
Total 6	12580	1529	7165	1313	1866	0	1898	5459	6094	0	0	0
7.5	0	0	0	0	0	0	28	0	1050	0	0	0
7.4	0	0	0	248	103	0	114	535	1605	0	0	0
7.3	0	0	0	105	597	0	0	0	0	0	0	0
Total 7	0	0	0	353	700	0	142	535	2655	0	0	0
8.4	0	0	0	0	597	0	0	0	0	0	0	0
8.3	0	0	1353	0	0	0	0	0	0	0	0	0
Total 8	0	0	1353	0	597	0	0	0	0	0	0	0
9.4	164	446	0	0	0	0	0	0	0	0	0	0
10.4	164	0	0	0	0	0	0	0	0	0	0	0
Total	12908	11800	36518	4326	5861	34348	57496	66670	117988	108586	48787	16089
% PS	100	99	80	81	55	21	66	79	16	3	11	52
Major YC	77	80	81	81	83	84	84	85	87	89	90	89
% of Total	97	42	57	40	33	89	87	71	42	86	81	58

Table 12. Catch per unit effort (kg/trap-period) for the five sections of the river used in the population estimate and the Main Margaree River which was not used. M. Margaree is the section of the river in the Main Margaree River below Forks Pool. Numbers in parentheses for 1991 are combined values used for population estimate.

	1991		1992		1993		1994	
Section	CUE	Cumulative Catch	CUE	Cumulative Catch	CUE	Cumulative Catch	CUE	Cumulative Catch
M. Margaree	8083		7014		22409		10561	
Lower 1	7320	0	22261	0	43765	0	19504	0
Lower 2	7640	101109	10273	273633	24652	210316	13000	130599
Upper 1	10299(12259)	141144(0)	8108	311368	12196	277202	15667	187750
Upper 2	4068	309384			12022	534028	10107	368960
Upper 3	3935	350027	11455	453365	6925	581644	5264	411488

Table 13. Catch per unit effort (sum kg/sum trap-period) for the five sections of the river used in the population estimate and the Main Margaree River which was not used. M. Margaree is the section of the river in the Main Margaree River below Forks Pool. Numbers in parentheses for 1991 are combined values used for population estimate.

	1991		1992		1993		1994	
Section	CUE	Cumulative Catch	CUE	Cumulative Catch	CUE	Cumulative Catch	CUE	Cumulative Catch
M. Margaree	338		437		658		287	
Lower 1	389	0	1144	0	1136	0	600	0
Lower 2	438	101109	734	273633	704	210316	681	130599
Upper 1	605(419)	141144(0)	298	311368	425	277202	424	187750
Upper 2	238	309384			402	534028	301	368960
Upper 3	273	350027	309	453365	292	581644	214	411488

Table 14. Regression statistics for Leslie population estimate method using sum of average (AVE) CUE and sum of catch/sum of effort CUE (SUM).

	AVE			SUM		
Year	p	Intercept	Slope (q)	p	Intercept	Slope (q)
1991	0.0588	12205	-0.02480	0.1850	416	-0.000481
1992	0.1657	20236	-0.02778	0.0785	1130	-0.001962
1993	0.0344	37867	-0.05599	0.0299	1007	-0.001295
1994	0.0225	19189	-0.02949	0.0387	671	-0.001034

Table 15. Population estimates, catch, and exploitation rates for Margaree gaspereau from 1991 to 1994 using the Leslie method. A * indicates estimate with p-value less than 0.10. Numbers in parentheses are 95% confidence limits of population estimates.

Year	Population Estimate (tonnes)			Exploitation Rate		Spawning Escapement	
	AVE	SUM	Catch (tonnes)	AVE	SUM	AVE	SUM
1991	519*	892	450	87%		69	
1992	774	621*	553		89%		68
1993	766*	867*	736	96%	85%	30	132
	(547-3032)	(621-2941)					
1994	682*	680*	498	73%	73%	184	182
	(480-1879)	(452-4688)					

Table 16. Catches that might have occurred in the Margaree gaspereau fishery in 1993 and 1994 under different management scenarios. Population sizes used to calculate exploitation rates (Ex. Rate) were 867 for 1993 and 680 for 1994.

Scenario 1

All days fished either as open morning, open afternoon, or open full-day

Year	Zone	Days Fished	Catch		
			Open Morning	Open Afternoon	Open Full-Day
1993	Lower	276	205	372	441
	Upper	633	231	211	508
	Total	909	436	583	949
	Ex. Rate		50%	67%	109%
1994	Lower	294	122	252	250
	Upper	535	250	206	328
	Total	829	372	458	578
	Ex. Rate		55%	67%	85%

Scenario 2

50% of the current open full-days are changed to open morning days and all current half fishing days are open in the morning

Year	Zone	Half-Days	Full-Days	Catch		
				Open Morning	Open Full-Days	Total
1993	Lower	170	140	178	112	290
	Upper	312	321	173	129	302
	Total			351	241	592
	Ex. Rate					68%
1994	Lower	140	154	90	65	155
	Upper	262	273	186	84	270
	Total			276	149	425
	Ex. Rate					63%

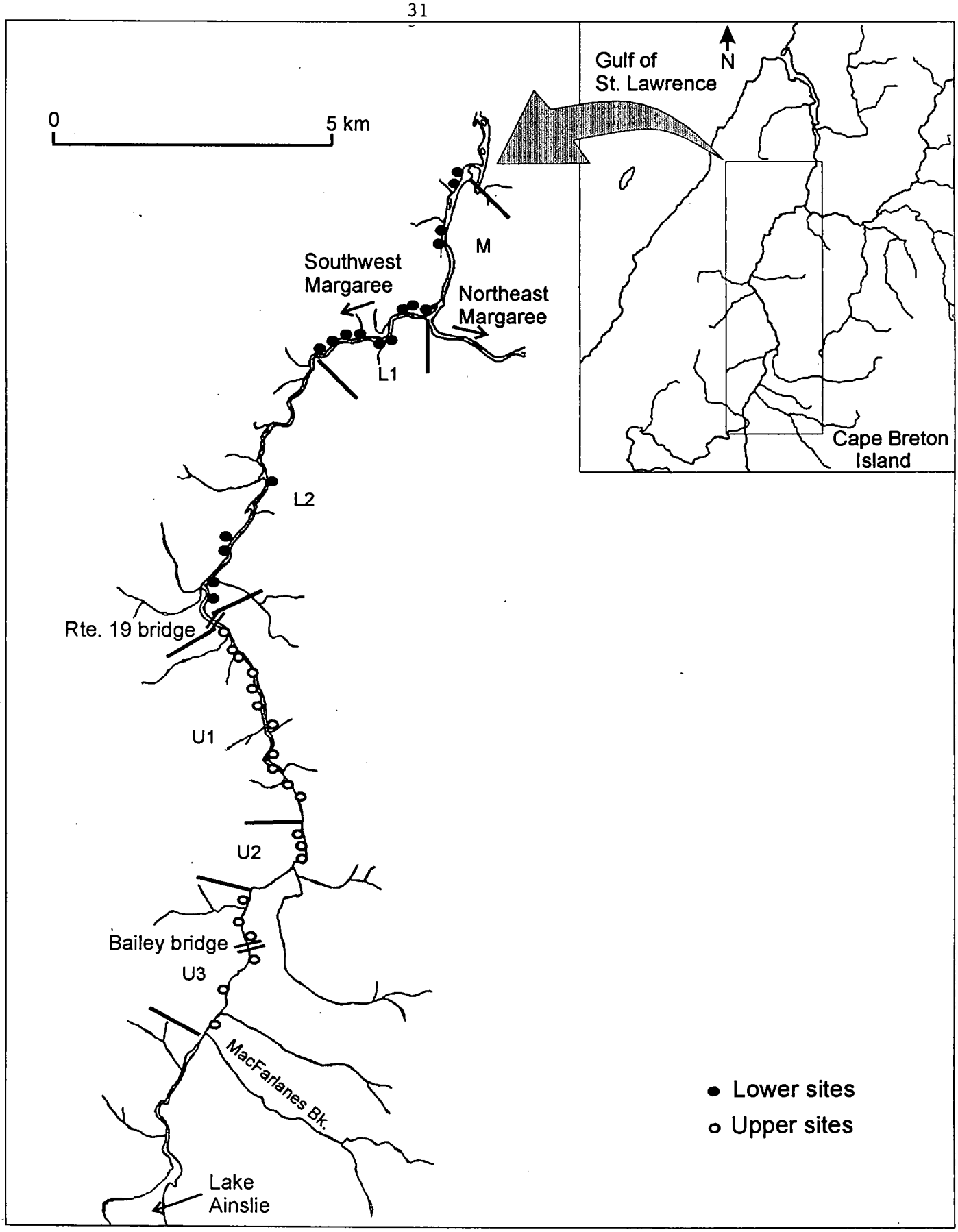

Figure 1. Gaspereau trap site locations active during the 1993 and 1994 season. Areas used for population estimate are designated by letters M, L1, L2, U1, U2, AND U3. Divisions between areas are designated by bold straight lines.

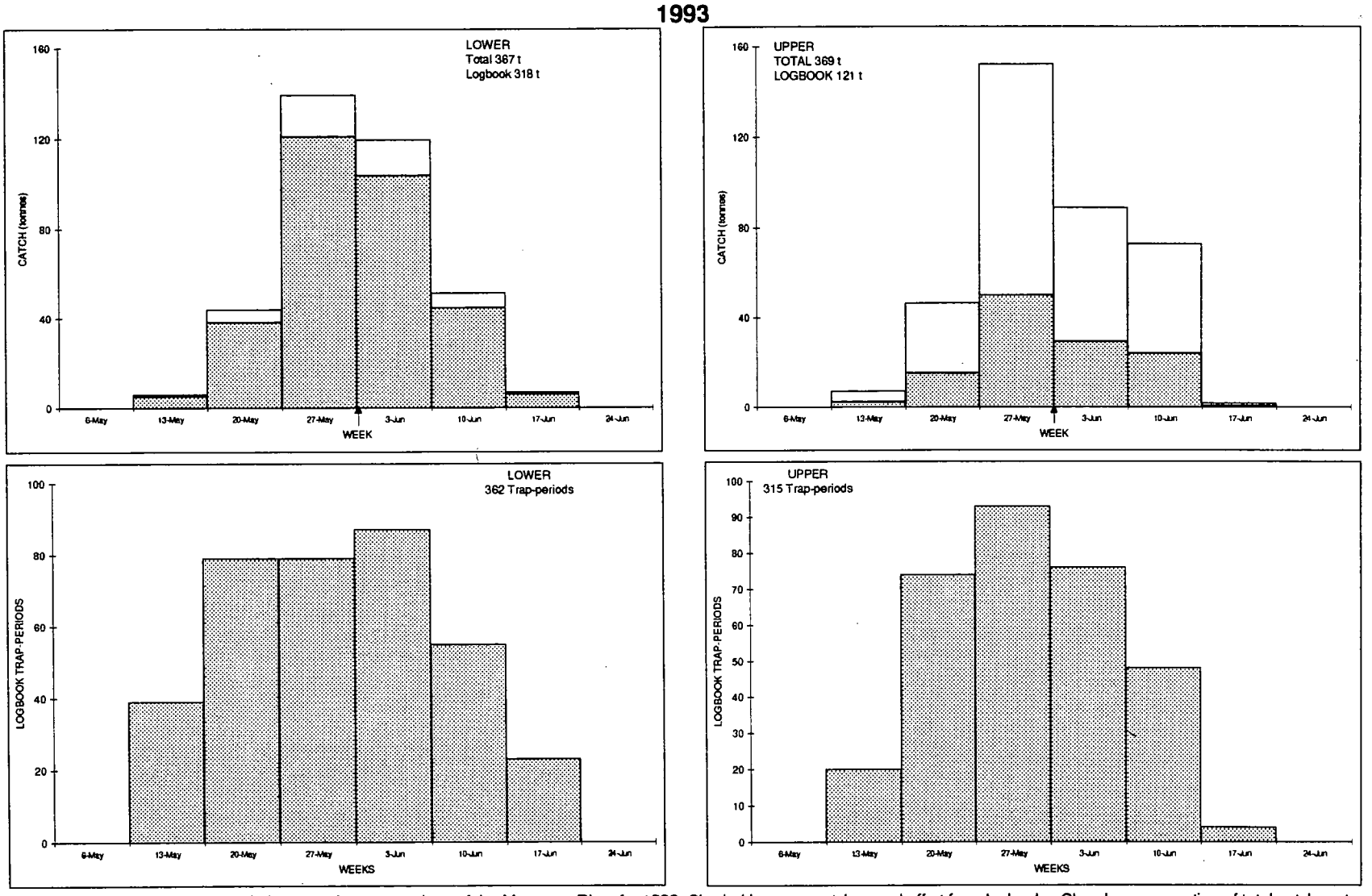

Fig. 2. Catch and effort timing in lower and upper sections of the Margaree River for 1993. Shaded bars are catches and effort from logbooks. Clear bars are portion of total catch, not reported on logbooks, partitioned into weeks using logbook data. Dates are the last day of the standardized week. Arrows indicate separate periods for catch-at-age.

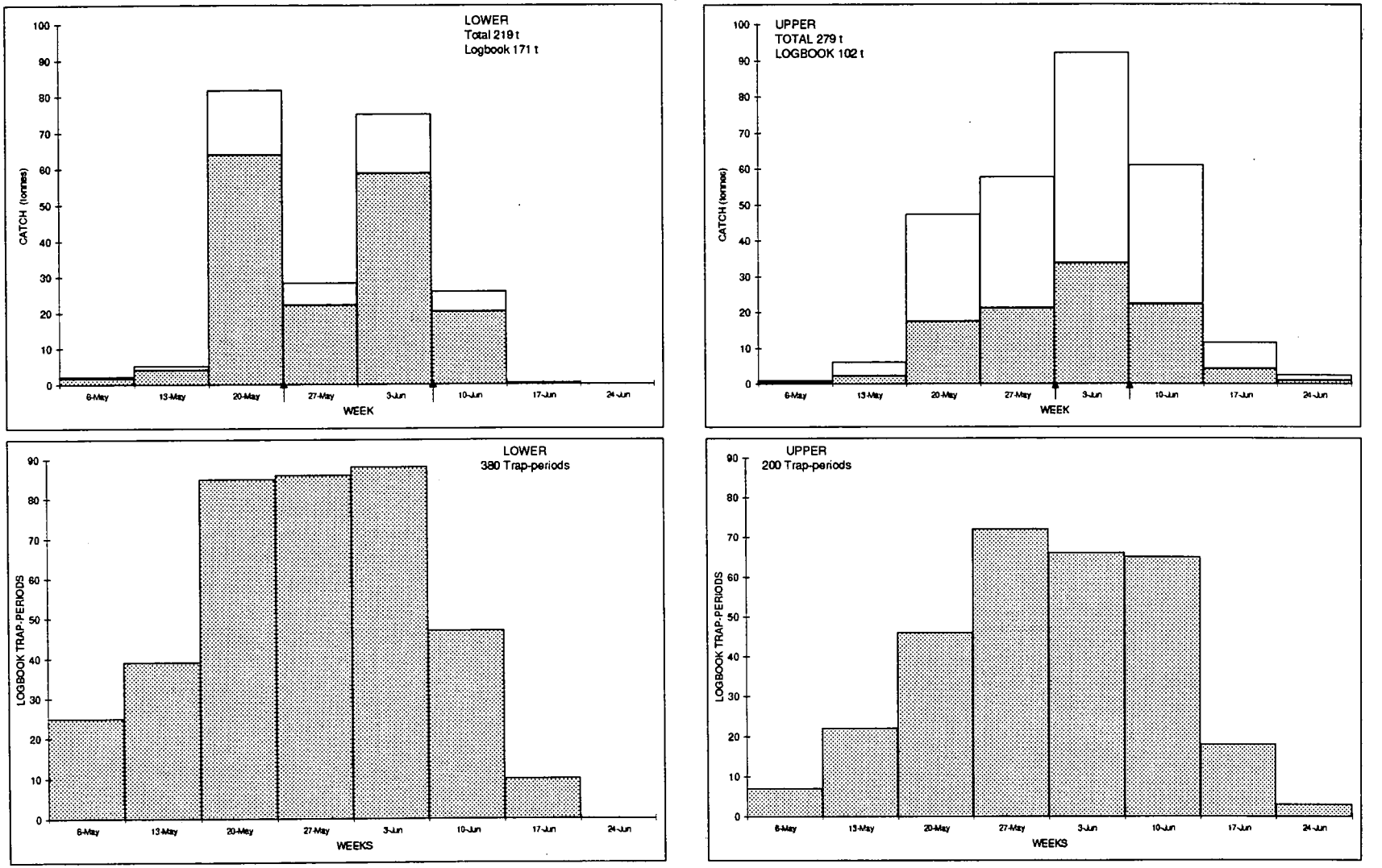

Fig. 3. Catch and effort timing in lower and upper sections of the Margaree River. Shaded bars are catches and effort from logbooks. Clear bars are portion of total catch, not reported on logbooks, partitioned into weeks using logbook data. Dates are the last day of the standardized week. Arrows indicate separate periods for catch-at-age.

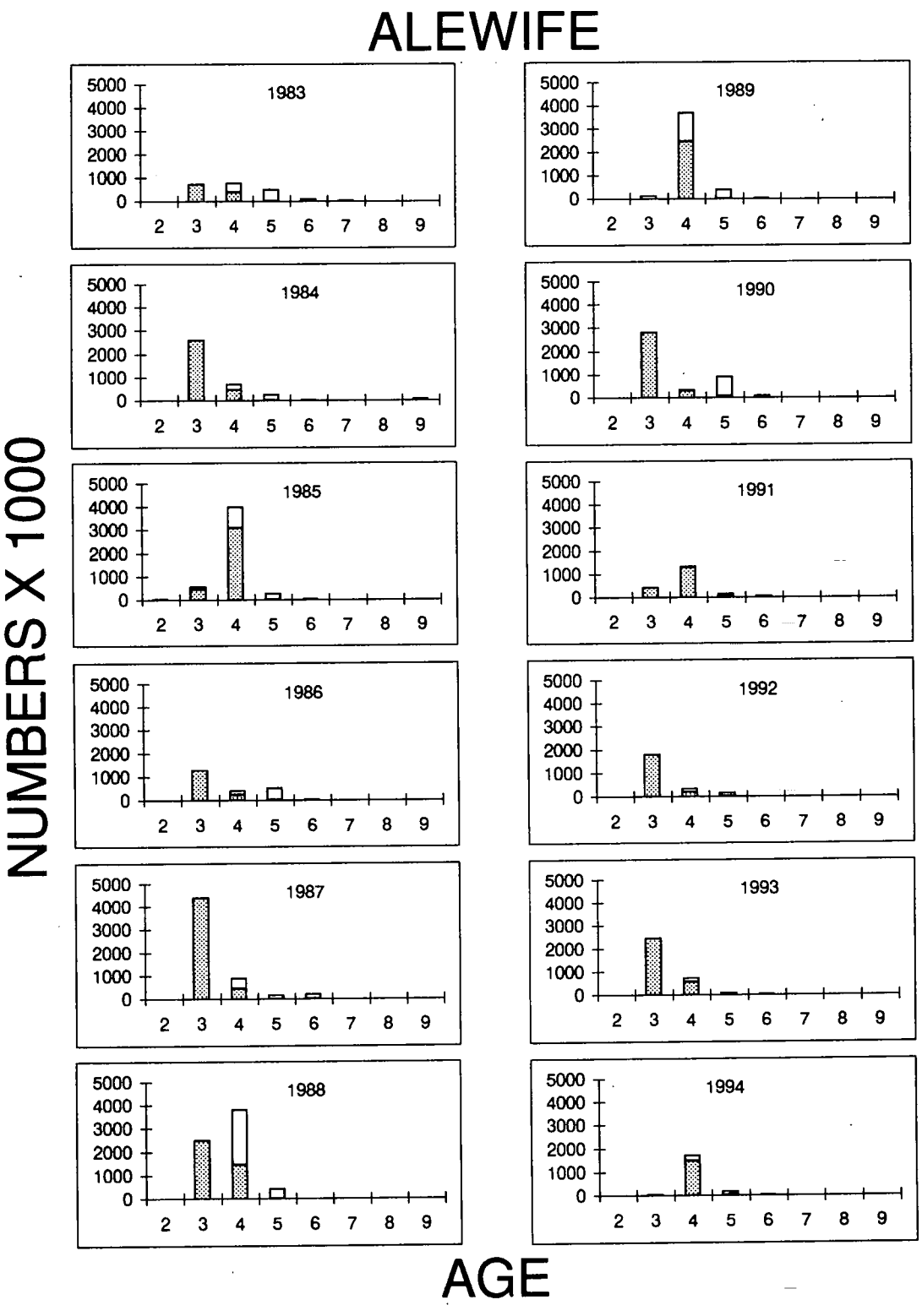

Fig. 4. Alewife catch-at-age for Margaree gaspereau fishery from 1983 to 1994. Shaded bars are first time spawners. Open bars are previous spawners.

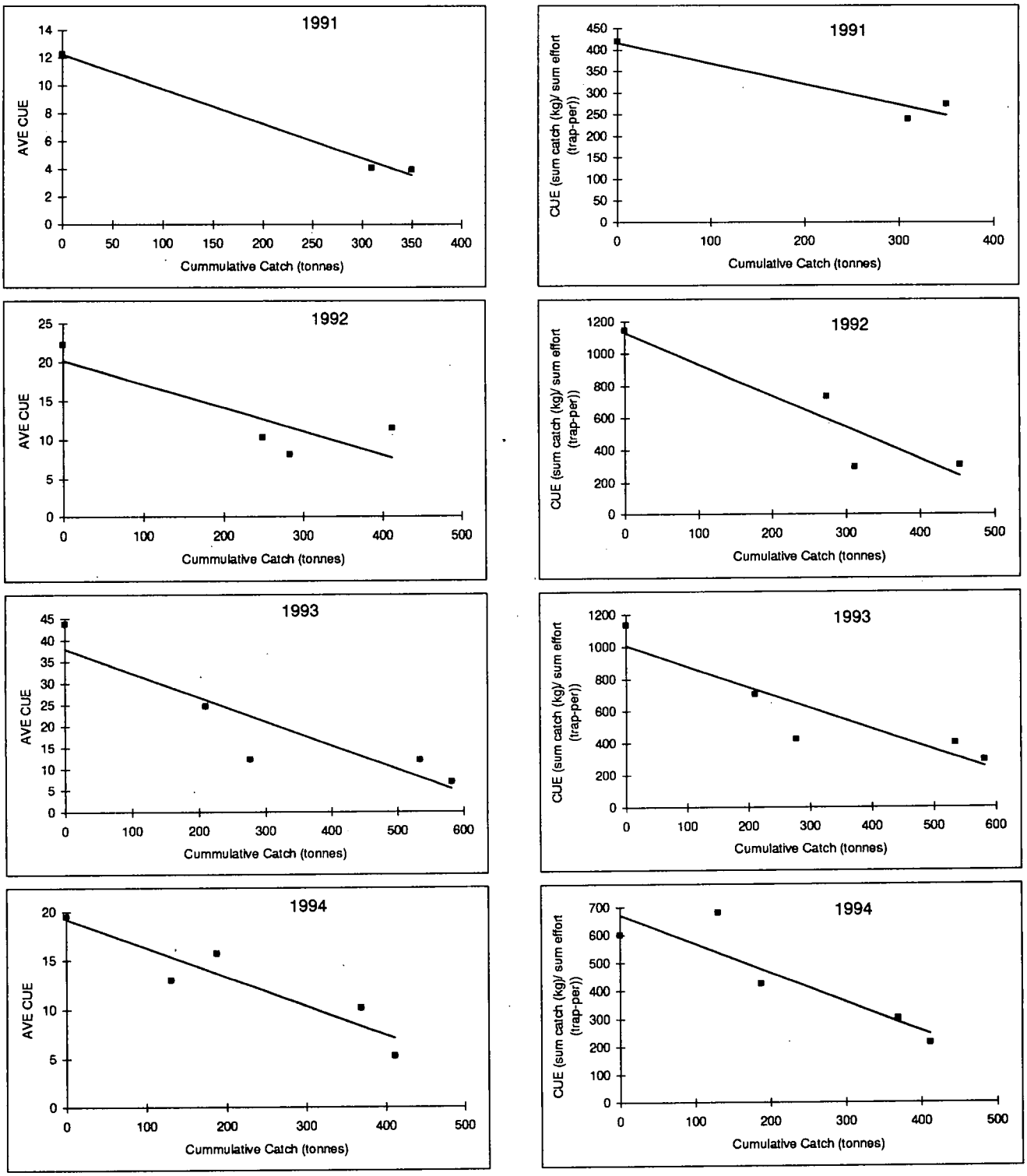

Fig. 5. Scatter-plots for population estimates using Leslie estimator for Margaree gaspereau population from 1991 to 1994 for the two different catch rate estimators. AVE CUE (left hand side) is the catch rate designated as AVE in the text, the sum of the average catch (tonnes)/trap-period. CUE (right hand side) is the catch rate designated as SUM in the text and estimated as indicated in the axes.