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Status of Striped Bass (*Morone saxatilis*) in the Gulf of St. Lawrence in 1998

R.G. Bradford

Department of Fisheries & Oceans
Science Branch, Maritimes Region
P.O. Box 1006
Dartmouth, Nova Scotia, B2Y 4A2

and

G. Chaput, S. Douglas, and J. Hayward

Department of Fisheries & Oceans
Science Branch, Maritimes Region
P.O. Box 5030
Moncton, New Brunswick, E1C 9B6

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Stock Status Summary Sheet: Southern Gulf of St. Lawrence Striped Bass

Year	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
ADULT STRIPED BASS						
CATCH DATA						
Stratum (Days)	16	19	20	18	13	25
Traps per Stratum	13	13	13	13	13	13
Traps Sampled	46	50	64	72	62	83
Total Trap Days	208	247	260	212	156	248
Stratified Mean Catch/Trap/Day	3.58	68.69	36.83	8.85	3.45	5.71
POPULATION ESTIMATES (BAYESIAN)						
All Spawners						
Number of Spawners (mode)	5500	29000	50000	8090	8000	3400
0.025 quantile	4550	23000	35000	6275	5800	2900
0.975 quantile	7300	47000	175000	13370	17500	4800
By Sex						
Proportion (Mature Males)	0.94	0.92	0.63	0.37	0.69	0.83
Mature Males	5170	26680	31500	2993	5500	2822
Mature Females (maximum)	330	2320	18500	5097	2500	578
Mature Females (% conservation requirement)	7	46	370	102	50	12
Stratified CPUE Abundance Indices						
Arithmetic Mean	3.6	85.5	55.6	12.7	6.20	15.6
Arithmetic Standard Deviation	0.3	25.3	8.3	1.2	0.6	1.0
Geometric Mean	1.1	294.6	24.9	9.4	2.8	9.7
Geometric Standard Deviation	1.0	4.2	1.0	1.0	1.1	1.0
JUVENILE STRIPED BASS						
Median Catch per Trap per Day	17	7	255	452	10	44

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ABSTRACT

Spawner abundance for 1998 was estimated as a minimum at about 3,400 fish (575 females; 2,825 males) and as a maximum, about 4,150 fish (700 females; 3450 males). The latter estimate assumes that 22% of the adults had spawned before population estimates were logistically feasible on the Northwest Miramichi. The spawning population has not recovered from the precipitous decline from 1995 when spawners, dominated by the 1991 yearclass, were estimated to be 50,000 fish. The 1991 yearclass now appears to number no more than 1000 fish. Combined losses from natural factors and human activities during 1997-1998 exceeded recruitment (males at age 3, females at age 4) by at least a factor of two. The 1995 yearclass is poor (age 3^+ males numbered ~3,000 fish), a result contrary to earlier expectations that a combination of high abundance at age 0^+ and above average body size leading to high first winter survivorship would yield a strong yearclass in 1998. Available data indicates the 1995 yearclass experienced high mortality during their second winter (1996-1997). Female spawner abundance could increase in 1999 to 2,000-2,500 fish with full recruitment of age 4^+ females (1995 yearclass). Although this would represent an improvement over 1998 levels, the provisional conservation requirement for this population of 5,000 females would not be met, for the third consecutive year. The juvenile abundance index obtained by sampling of the bycatch in the autumn smelt fishery corresponded to the low number of females in the spawning population in 1998. The yearclass is, however, large bodied (modal length = 13 cm FL), possibly due to a protracted growth season realized by an unusually-early-for-this-population onset of spawning (~20 May). Their prospects for winter survival are correspondingly good. Production of Miramichi striped bass through to the year 2000, will likely depend on the weak 1995 yearclass, with only marginal further contributions from the once strong 1991 yearclass. The decline in abundance of southern Gulf of St. Lawrence striped bass that was precipitated by unregulated commercial fishing from July, 1994 to March, 1996 has continued through to 1998. The likelihood that this population will meet conservation spawning requirements in either 1999 or 2000 is low. Tolerances within the current management framework for mortalities incurred through hook-and-release recreational angling and First Nation food fisheries can no longer be justified.

RÉSUMÉ

En 1998, l'abondance des géniteurs a été estimée au moins à environ 3400 poissons (575 femelles et 2825 mâles) et au plus à environ 4150 poissons (700 femelles et 3450 mâles). Pour cette dernière estimation, on a supposé que 22 % des adultes avaient frayé avant qu'il ne soit possible, d'un point de vue logistique, de réaliser les estimations dans la rivière Miramichi Nord-Ouest. La population de géniteurs ne s'est pas rétablie du déclin brutal qui s'est produit depuis 1995, année où l'effectif de géniteurs, dominé par la classe d'âge de 1991, était estimé à 50 000 poissons. La classe d'âge de 1991 semble maintenant ne pas compter plus de 1000 poissons. En 1997-1998, les pertes dues aux facteurs naturels et aux activités humaines étaient au moins deux fois plus élevées que le recrutement (mâles de trois ans et femelles de quatre ans). La classe d'âge de 1995 est faible (~3000 mâles de 3^+ ans), contrairement aux attentes antérieures selon lesquelles la combinaison d'une grande abondance de ces poissons à l'âge 0^+ et de leur survie élevée durant leur premier hiver découlant de leur taille supérieure à la moyenne devait produire une forte classe d'âge en 1998. Les données disponibles indiquent que la classe d'âge de 1995 a subi une mortalité élevée lors de son deuxième hiver (1996-1997). L'abondance des génitrices pourrait atteindre 2000 à 2500 individus en 1999 si le recrutement des femelles de 4^+ ans (classe d'âge de 1995) est complet. Bien que cela représenterait une amélioration par rapport aux chiffres de 1998, l'impératif de conservation provisoire pour cette population, soit de 5000 femelles, ne serait pas atteint pour la troisième année consécutive. Obtenu en échantillonnant les prises accessoires de la pêche d'automne de l'éperlan, l'indice d'abondance des juvéniles correspondait au nombre peu élevé de génitrices en 1998. Toutefois, les poissons de cette classe d'âge sont de grande taille (longueur modale à la fourche = 13 cm), peut-être en raison d'une longue saison de croissance attribuable au fait que la fraie a débuté plus tôt que d'habitude pour cette population, soit autour du 20 mai. Ils ont donc de bonnes chances de survivre à l'hiver. La production du bar rayé de la Miramichi jusqu'à l'an 2000 dépendra sans doute de la faible classe d'âge de 1995, car la classe d'âge de 1991, jadis forte, n'y contribuera pas beaucoup. Précipité par la pêche commerciale non réglementée qui s'est déroulée de juillet 1994 à mars 1996, le déclin du nombre de bars rayés dans le sud du golfe du Saint-Laurent s'est poursuivi jusqu'en 1998. La probabilité que le nombre de géniteurs nécessaires pour assurer la conservation de cette population soit atteint en 1999 ou en 2000 est faible. On ne peut plus justifier les écarts permis par le cadre de gestion actuel en ce qui concerne les mortalités liées à la pêche récréative avec remise à l'eau et aux pêches de subsistance des Premières nations.

INTRODUCTION

The southern Gulf of St. Lawrence (southern Gulf; Fig.1) is the principal area of wild striped bass production in New Brunswick (Bradford et al. 1995a,b; Anon. 1996). Southern Gulf striped bass are genetically distinct from Bay of Fundy fish (Wirgin et al. 1993) and are considered to comprise a single biological unit (Bradford and Chaput 1996). Southern Gulf of St. Lawrence striped bass, which spawn predominantly in the Northwest Miramichi River estuary, are also highly migratory (Bradford and Chaput 1996; Hogans and Melvin 1984). The known summer range of Miramichi spawning fish extends from Percé, Québec to Margaree River, Nova Scotia (Bradford and Chaput 1996).

The 1998 assessment represents the third census of spawner abundance since the permanent closure of the commercial fishery in March, 1996. As such, current levels of spawner abundance will provide both the basis for monitoring the response of this population to conservation management and to measure the effectiveness of the conservation measures themselves. Since 1990, southern Gulf striped bass have been categorized as either reduced or declining (Chaput and Randall 1990). Reduced abundance was empirically defined as 5,500 spawners in 1993 (Bradford et al. 1995a). A fortuitous recovery to ~50,000 spawners was reported for 1994 and 1995, a consequence of recruitment of the numerically strong 1991 yearclass (Bradford et al. 1995a; Bradford and Chaput 1996). Unregulated commercial fishing from July 1994 through to March 1996 had reduced spawner abundance to 8,000 fish by 1996 (Bradford and Chaput 1997). No change in spawner abundance was measured during 1997 (8,000 fish; Bradford and Chaput 1998), thereby indicating that losses of adults from all sources were being replaced by recruitment of virgin spawners at age 3^+. However, the provisional conservation spawning requirement of 5,000 females for this population (Bradford and Chaput 1996) was not met in 1997 (Bradford and Chaput 1998).

Forecasts for 1998 (Bradford and Chaput 1998) included:
1) no change from the 1990 categorization of the stock as reduced or declining.
2) female abundance will remain below provisional conservation requirements because of poor recruitment and mortality from natural factors, poaching, removals in native food fisheries as well as the hook-and-release angling fishery.
3) verification that the once numerically-abundant-at-age-0^+ 1995 yearclass had suffered an exceptionally high level of natural mortality at an older age than previously observed for this population. Recruitment of age 3^+ males was predicted to be poor.

The study area for the years 1993 to 1998 is the Miramichi River estuary (Fig.1) which remains the principle site of spawning for striped bass within the southern Gulf (Bradford and Chaput 1998). It also corresponds to the location of well-developed fixed-gear commercial fisheries for smelt and gaspereau (Chaput 1995). Direct, systematic sampling of bycatch in these fisheries was initiated in 1991 (Hanson and Courtenay 1995) and has continued into 1998. A summary of the Science workshop held on November 24, 1998 to gather additional information from user groups and other government agencies regarding striped bass from the southern Gulf is presented in Appendix 1.

DESCRIPTION OF FISHERIES

Commercial

Commercial fisheries for striped bass were permanently closed in March 1996 through an amendment of the Canada Fisheries Act. The sale of wild-caught striped bass is no longer permitted. Commercial fishers are required to release all striped bass that are intercepted in commercial fishing gear that targets other species (i.e., a bycatch). There were no tolerances for striped bass bycatch in any of the commercial fisheries within the southern Gulf of St. Lawrence during 1998. This represented a departure from the 1996-1997 policy of granting an exception (through condition of license) for gaspereau and smelt fisheries where a bycatch tolerance for fish <35 cm total length (TL) was in effect.

Season:	None
Harvest:	None
Size Restriction:	None

Striped bass bycatch is not restricted to the estuarial fixed-gear fisheries. Two striped bass tags were returned from coastal nets off Escuminac by fishery observers, in the spring of 1997 (Bradford and Chaput 1998).

A summary of the commercial harvest, by statistical district and by month for the years 1917 to 1995 was presented by Bradford and Chaput (1996). Reported striped bass harvests for 1996 were reported in Bradford and Chaput (1998).

Recreational

Recreational fishing data are not collected on a regular basis. There is no new information to report beyond that summarized in Bradford et al. (1995a) and Bradford and Chaput (1996). Recreational fisheries regulations were changed for 1998. The opening date for the angling season was changed from 1 May to 15 April in order to maintain consistency with the trout angling season:

Season:	15 April to 31 October
Bag Limit:	hook and release only
Size Restriction:	no fish may be kept

First Nation Fisheries

First Nations harvest striped bass for food, social and ceremonial purposes. Harvest levels are based on communal needs. Prior to 1996, harvests were restricted to striped bass larger than 68cm TL. However, size restrictions proved to be impractical because gillnets, a common food fishing gear, also intercept smaller sized bass which could not always be released alive. Therefore, the size restrictions were lifted for 1996 and the harvest managed on the basis of total catch.

Season:	July 1 - October 31
Harvest:	based on communal needs of individual First Nations (Table 1)
Size Restriction:	none

None of the First Nations reported a harvest in 1998 (Table 1).

CONSERVATION REQUIREMENTS

Data compiled on southern Gulf striped bass since 1993 indicate that the striped bass population of the Miramichi benefits when there are more than 5,000 females spawners. However, there are insufficient data to determine the precise relationship between spawner abundance and recruitment. Protection of both spawners and potential spawners is the interim target specified in the 1993 New Brunswick Striped Bass Management Plan (Dept. of Fisheries and Oceans 1993). The major elements of the Plan are:

· arrest the decline in abundance,
· increase abundance, and
· sustain abundance at levels correspondent to supporting habitat.

The goal of the management plan is to increase spawning escapement through reductions in fishing-induced mortality of adult and juvenile fish in commercial, recreational and Aboriginal food fisheries. The major elements of the 1993 New Brunswick Striped Bass Management Plan in combination with the restrictions on removals by anglers, as bycatch in commercial fisheries, and food fish have served as the basis for conservation management for these fish since March, 1996.

ESTIMATION OF STOCK PARAMETERS

1998 Spawner Abundance

Mark-Recapture

The 1998 estimate of spawner abundance was obtained by separating the marking and recapture sites both in time and in location. Logbook data returned by gaspereau fishers in previous years (Bradford et al. 1995a) indicated that adult striped bass were available for capture in the Napan River one to two weeks before their arrival on the spawning grounds in the Northwest Miramichi. Tagging was initiated in the Napan River (Fig. 1) prior to the opening of the gaspereau fishery. Early marking had been shown during several previous occasions (Bradford and Chaput 1997, 1998) to yield precise, stable-with-time estimates of spawner abundance. Recaptures in the Northwest Miramichi of fish tagged in Napan River would be possible from the day of arrival of the fish in the spawning area. There would also be less need to tag continuously through the season in order to secure a sufficient pool of marked fish.

Tagging in the Napan River took place between 10-22 May, 1998. The trapnets, which operated continuously over this time period, were fished every 48h. The total catch of striped bass was counted, measured to length (fork length, FL; total length, TL to the nearest 0.1cm) and scale sampled for later aging. Fish ≥35 cm TL were tagged with individually numbered, yellow T-bar tags (length 3.2 cm) inserted between the first two spines of the anterior dorsal fin, and then released. Recaptured fish carrying current year tags were noted and the fish released. Fish carrying tags applied in previous years were noted and added to the marked pool for 1997.

The recapture phase of the experiment began with the first day of commercial gaspereau fishing on the Northwest Miramichi River (21 May) with traps located on this river used as recapture sites. A total of 13 traps are fished within this section of the river, but not all are necessarily fished every day. The 1998 gaspereau fishery began early on the Northwest Miramichi with a majority of the traps set by 22 May. Nets were fished every 48 hours until landings of gaspereau became commercially viable on about 4-6 June, whereupon the nets were fished daily. The total number of traps operated on any given day of sampling and hours fished were recorded. As many traps as possible (one to nine in 1998) were visited daily during the fishing season (May 20 to June 20). The total catch of striped bass was counted, measured to length and scale sampled for later aging. Marked fish recaptured when the sampler was present were released after first recording the tag number and date of capture. Fishers whose traps were not sampled kept recaptured tags separated for each day fished. For the purposes of the mark-recapture experiment these tags were subtracted from the total pool of tags available for recapture in subsequent days.

A Bayes estimator (Gazey and Staley 1986) was used to calculate total returns of striped bass ≥35cm TL, both sequentially for each day of fishing and as a single census estimate for the season. Tag loss was assumed to be negligible over the duration of the experiment. The reporting rate for recaptures from the gaspereau fishery was assumed to be 100% (near-daily contact with fishers on the NW Miramichi). Estimates of marked fish available per day were corrected for removals reported from the previous day of fishing.

The day for termination of the recapture phase of the experiment was defined on the basis of change with time in 1) the catch rate, 2) the reproductive state of intercepted fish, and 3) the cumulative recapture profiles on the NW Miramichi of striped bass tagged in Napan River. Inspection of the cumulative recapture profiles indicated that spawning fish were in the NW Miramichi up to 4 June but left the area after that time. Direct observations of spent males and females (both Napan and NW Miramichi) indicated that spawning was initiated before the first sample was obtained from the NW Miramichi on 20 May. No spent fish were captured on the NW Miramichi after 4 June. The cumulative exploitation rate on the NW Miramichi was 43% by 4 June and 51% for the duration of the gaspereau fishery (Table 2). These represent average interception rates of six% per day (Table 2).

<u>Indices of Abundance - CPUE</u>

Gaspereau season

Stratified mean catch of striped bass (fish•trap^{-1}•day^{-1}) was calculated following Cochran (1977) and as detailed in Bradford and Chaput (1996). These data provide an index of year-to-year change in average catch during the gaspereau fishery in the Northwest Miramichi; i.e., the catch of mature, spawning and spent fish and therefore is not necessarily a precise measure of spawner abundance. Geometric mean CPUE and median CPUE for 1993 to 1997 were also calculated as additional indicators of change in abundance among years.

Spawning season

Stratified arithmetic and geometric mean catches of striped bass (fish•trap^{-1}•day^{-1}) during the main spawning run were similarly calculated for the years 1993-1998. The purpose was to use these data, in combination with the mark-recapture based estimates of spawner abundance, to identify alternative methods to monitor year-to-year change in adult abundance. The periods of observation for each year were as follows:

Year	Date Begin	Date End	Duration
1993	28 May	18 June	22d
1994	24 May	12 June	19d
1995	24 May	9 June	16d
1996	24 May	10 June	17d
1997	4 June	10 June	6d
1998	21 May	4 June	15d

Spawner Success

In 1998, smelt fishers operating in the vicinity of Loggieville (Fig. 1) were visited twice weekly between 16 October and 10 December. During each visit striped bass were sorted from at least two smelt nets, usually a shallow set (depth <5m) and a deep set (depth >5m). The total number of bass in each sampled net was counted and measured (fork length FL). Those less than 18cm FL (maximum observed age 0^+ FL; Years 1993-1998) were considered to be young-of-the-year (age-0^+) and their count expressed as fish•trap^{-1}•day^{-1} was used to estimate spawner success in 1998.

Monitoring for Change in the Geographic Distribution of Spawning Activity

Since 1993 striped bass have been marked opportunistically from several sites within the southern Gulf of St. Lawrence and during the summer-autumn migration period. Recapture as adults exclusively on the NW Miramchi of these migrant fish has justified the management of southern Gulf striped bass as a single stock (Bradford et al. 1995a; Bradford and Chaput 1996). The single stock concept continues to meet with resistance among several communities where local knowledge and perceptions foster a belief in the existence of localized spawning stocks.

The hypothesis that the spawning-site affinity of all southern Gulf striped bass is with the NW Miramichi was tested using the mark-recapture data for striped bass marked outside the confines of the Miramichi Estuary. Two pools of marked striped bass were selected on the basis that they had not been subjected to unreported losses within the July, 1994-March, 1996 commercial fisheries; those marked on the Kouchibouguac River (Fig. 1) during October-November, 1993 (n =36) before resumption of commercial fishing and those marked during October-November, 1996 on the Tabusintac River (n =56) after the permanent closure of the fishery.

The reported returns from the subsequent May-June gaspereau fishery on the NW Miramichi for each pool of marked fish were then compared to the expected number of returns from the NW Miramichi based on the exploitation rate of the gaspereau fishery for that year. Exploitation rates on marked fish (e_M) were calculated from the stock-assessment-related mark-recapture experiments of May-June, 1994 (e_M =0.320) and 1997 (e_M =0.115) and were therefore derived completely independent of the migration studies of the Tabusintac- and Kouchibouguac-marked fish. The method assumes that there is only one spawning population in the southern Gulf of St. Lawrence, and that both winter mortality and tag loss are negligible. The normalized binomial probability distributions for the NW Miramichi returns for each pool were constructed with marks available (M), total recaptures (R), and the exploitation rate (e_M)for striped bass intercepted as a bycatch in the NW Miramichi gaspereau fisheries for the years 1994 and 1997.

FISHING MORTALITY UNDER CONSERVATION MANAGEMENT

Fishing-related mortality occurs legally on southern Gulf striped bass within the current provisions of the management plan. Potential sources include hook and release angling, interception (bycatch) and subsequent release in commercial fixed-gear fisheries, and both directed and non-directed capture of striped bass in First Nation food fisheries. Striped bass harvested as food fish are reported under the Aboriginal Fishery Strategy (Table 1). Interception rates by gear-type are not reported either by recreational anglers, or commercial or Aboriginal food fishers (the exception being the trapnet components of the First Nations fisheries).

"Bycatch loss rates" are a regular element of striped bass stock assessments in the United States of America (Northeast Fisheries Science Center 1998). These were adopted as reference points for assessment of the potential influence on southern Gulf striped bass abundance of non-targeted interceptions (see Estimates of Fishing Mortality).

ASSESSMENT RESULTS

Spawner Abundance Estimates

Sequential Bayesian estimates of population size (20 May-4 June; Fig. 2) indicated that the 1998 spawning run on the Northwest Miramichi consisted of about 3400 fish (M =219, C =825, R =50). The abundance index (catch-per-unit of effort, CPUE) declined from a high of 83.0 (n=1) on 21 May to 9.6 (average; n =8) at the cessation of substantive spawning on 4 June and to 2.7 (average; n =6) by 17 June (Fig. 3). Mature and spent females were observed from the onset of sampling on the 20 May through to 4 June when the bulk of the spawning was considered to be complete.

For the first time since the inception of annual stock assessments for southern Gulf striped bass, spent males and females were observed in the Napan River before first estimates of spawner abundance on the NW Miramichi were possible (21 May; Table 3). Eight percent and 22 percent of the fish captured on the Napan River for the dates of 20 May and 22 May respectively were spent. The end of season estimate of 3,400 fish reported above may therefore be an underestimate, perhaps by 22 percent or more. Therefore, spawner abundance could conceivably have been higher than 4,150 fish, although spawning by fish stressed by capture on Napan River cannot be discounted. The 20 May-4 June sequential estimate was close to the single end of season estimate (17 June; M =223, C =1,706, R =99) of 3,850 spawners (Table 4;Fig. 2). The length frequency distributions of striped bass sampled on the Napan and NW Miramichi (20 May-4 June) rivers were highly similar (Fig. 4) thus indicating that any underestimate of spawner abundance was a consequence of proportional losses within all age components of the adult population. Fish <47 cm FL, an approximate upper limit for age 3^+ males, represented about 75% of the total adult catch for both locations (Figs. 4 and 5).

Trends in Spawner Abundance

The approximately 3,400-4,200 spawners in the Northwest Miramichi in 1998 represents a substantive and important decline from the 8,000 fish estimate for 1997. Losses from the existing stock exceeded recruitment. There were estimated to have been no more than about 3,500 males and 700 females on the spawning grounds in 1998. Female abundance is now in the range of 12% of the provisional conservation requirement of 5,000 females for this population (see stock status summary sheet). Identifiable males (ripe and running) comprised 83% of the sampled catch in 1998. Most of these were of the 1995 yearclass (Fig. 5).

Spawner Success

The median CPUE of young-of-the-year (age-0^+) striped bass in the 1998 open-water smelt fishery of the Miramichi was 44 fish (Table 5; Fig. 6). The low abundance of age 0^+ bass in 1998 corresponds to an estimated female abundance of probably no more than 700 spawners.

Juvenile Mortality (Age 0^+ and Age 1^+)

Striped bass which enter their first winter at a fork length ≤10cm were shown previously to be less likely to survive the winter than those which are > 10cm (Bernier 1996, Bradford and Chaput 1997). Variability among years in the average pre-winter lengths of young bass (Fig. 7) combined with differences in spawner success will profoundly affect the recruitment to the spawning population. In this regard it may be significant that the 1998 yearclass is large bodied (modal fork length = 13 cm; Fig.7), a factor that may compensate to a significant degree for their low abundance (Table 5; Fig. 6). The important 1991 yearclass, a cohort of low numerical abundance at age 0^+, was also large bodied entering their first winter (modal fork length = 13 cm; Fig. 7).

Poor recruitment of the 1995 yearclass in 1998 cannot be attributed to first winter mortality. These fish were both numerically abundant (Table 5; Fig. 6) and relatively large bodied (Fig. 7) at age 0^+. This yearclass dominated the summer-autumn 1996 catches of striped bass both at DFO trapnet index sites on the Miramichi River and elsewhere within the southern Gulf of St. Lawrence, Tabusintac River for example (Fig. 8). Bradford and Chaput (1998) reported on incidences of striped bass mortalities throughout the southern Gulf region during the early spring of 1997. Losses from the 1996 yearclass may have occurred at that time. Age 2^+ were subsequently shown to be only a very minor component of the total sampled catch from the 1997 NW Miramichi gaspereau fishery (Fig. 5).

The hypothesis that second winter-early spring mortality was a factor in the lower than anticipated recruitment of the 1995 yearclass was tested using the 1998 recapture data for 317 age 1^+ (1995 yearclass) fish marked during October-November, 1996 on the Tabusintac River. The approach is as detailed previously in the section "Monitoring for Change in the Geographic Distribution of Spawning Activity", but with important variants. First, only male fish would be expected to recruit to the adult population in 1998 at age 3^+. The number of marked fish available was therefore reduced to one-half, with the assumption of a 1:1 sex ratio. Second, an annual natural mortality (m) rate of 0.2 was applied to the pool of marked 'males' to reflect losses between time of tagging and first opportunity for recapture as an adult (t =1.5 years). Tag loss was assumed to be negligible. Input parameters were therefore, as follows:

Marks Available-Male = 117
Number of Recaptures (May-June, 1998) =13
Exploitation Rate NW Miramichi Gaspereau Fishery =0.513

The predicted number of recaptures was 60 fish (Fig. 9). An uppermost estimate of mortality between times of marking and recapture would therefore be 78%. The proportion of fish that may have shed their tags during the intervening period between mark and recapture is not known and is to be regarded a potentially significant bias.

Monitoring for Change in the Geographic Distribution of Spawning Activity

Observed recaptures from the Kouchibouguac, 1993 (n =10; Fig. 10) and Tabusintac, 1996 (n =6; Fig. 10) pools of autumn-marked adult fish are consistent with predicted returns to the NW Miramichi the following spring, with the assumption that all adult southern Gulf striped bass reproduce on the Miramichi. These examples indicate that changes with time in the stock composition (e.g., spawning activity expands into other estuaries) could be detected at a very early stage.

Estimates of Fishing Mortality

All of the factors responsible for the continuing decline of spawner abundance into 1998 are not known. The wide-ranging behaviour of these fish - their home range comprises the entire southern Gulf of St. Lawrence- negates any credible effort to account for the loss of spawners between censuses. Natural mortality and human activities are undoubtedly both involved.

Losses within the existing conservation management framework could be substantial under any or all of the following conditions[2]:
1) high participation rate and/or high angler success within the recreational angling fishery,
2) high interception rate in fixed gear commercial fisheries,
3) moderate interception rate in the gillnet-based, First Nation food fisheries,

The by-catch loss rates utilized by U.S.A. striped bass fisheries managers (Northeast Fisheries Science Center 1998) are:

1) five% mortality for of all fish trapnetted and returned to the wild
2) eight% mortality for fish hooked (angled) and released,
3) eight% mortality for fish intercepted in drift gillnets, and
4) 42% mortality for fish intercepted in anchored gillnets (individual estimates range between 38.5% and 47%).

No concerted effort has been made to acquire empirical information on the interception rate by gear-type and fishing sector of adult southern Gulf striped bass. Consequently, whether or not the harvest rate from set gillnets reported by Aboriginal food fishers is representative of the interception rate is not known. Also, the high interception rate of striped bass within the 1998 NW Miramichi gaspereau fishery (Table 2) suggests that striped bass catchability (q) is not constant and instead varies inversely with population size. The possibility that the by-catch loss of striped bass is higher at reduced levels of abundance cannot be discounted.

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[2] Note: Interception rate here refers to the cumulative capture of fish and the proportion of the adult population this would represent.

FORECAST/PROSPECTS

The 1990 categorization (Chaput and Randall 1990) of the stock as reduced or declining remains appropriate. There are no indications that females of the 1995 yearclass will number more than a few thousand fish. Conservation requirements are not likely to be met in 1998, although an improvement from the 1997 level is possible. Only a remnant of the once abundant 1991 yearclass remains.

The prospects for substantive recruitment by age 3^+ males in 1999 (and by extension an indication of female recruitment in 2000) are not resolvable at this time, but are likely to be poor. Although numerically abundant (Table 5), the members of this yearclass were small bodied (modal fork length =11 cm; Fig. 7) entering their first winter. The fact that the winter of 1996-1997 appears to have been a more stressful period than usual for southern Gulf striped bass may have further reduced yearclass survival.

This population is unlikely to meet conservation requirements for the forseeable future.

ECOLOGICAL CONSIDERATIONS

The accumulated evidence indicates that southern Gulf striped bass are, in some years, susceptible to high mortality during their second winter. The mechanisms responsible for large scale losses of older juveniles are not known, but may include osmotic stress and/or reduced starvation endurance during years when ‘winter’ conditions persist into the early spring period. Dead and moribund striped bass sampled on the Napan River during early May, 1997 were emaciated in appearance, devoid of visceral fat deposits, and exhibited atrophied digestive tracts, all suggesting that the fish had starved. Verification that second winter mortality is high in some years would introduce a new element of uncertainty into the ability to forecast recruitment in southern Gulf striped bass.

MANAGEMENT CONSIDERATIONS

Southern Gulf striped bass are not likely to meet conservation requirements in 1999. There are no indications that recruitment will rebuild this population beyond conservation requirements before 2000. Existing spawners require the maximum possible degree of protection through measures that would include:

- deterence of poaching

and, since there is no longer a harvestable surplus of fish:

- closure of the directed hook-and-release recreational angling fishery. This can no longer be sanctioned as an adequate conservation measure.
- closure of directed First Nations fisheries for striped bass.
- reduce or eliminate interception of striped bass in gillnet based First Nation fisheries for other species of food fish.

and:

- communicate to all parties (First Nations, commercial fishers, recreational fisheries; provincial governments) the need for improved collaboration in order to realize effective conservation.

Southern Gulf striped bass have predictable seasonal distibutions, and only rarely appear to range beyond the coastal nearshore. They are continuously exposed to a variety of human activities that extend beyond fishing. Industrial and municipal activities occur within several estuaries utilized by these fish for spawning, rearing, and overwintering. Within the Miramichi estuary, the sole spawning site for the stock, several large point sources now discharge effluents (both domestic and industrial wastewaters) into potentially ecologically sensitive fish habitat. Additional similar human activities are scheduled to proceed to construction or operation over the next few years. There has never been an attempt to identify the potential consequences of these activities, either individually or collectively, for southern Gulf striped bass. These issues can no longer be avoided or ignored, if we are to have certainty that 1) population viability in the long term is not at substantive risk, and 2) that the natural processes governing striped bass production at northern latitudes are not being undermined through alterations to habitat.

RESEARCH RECOMMENDATIONS FOR 1999

Repeat Miramichi Sampling, Mark-Recapture Experiments: May-June, 1999

Objectives:

1) estimate spawner abundance for 1999,
2) estimate the strength of the 1996 yearclass (age 3^+ males),
3) complete age-growth studies for the years 1993-1999 in order to generate numbers at age/length that will allow for estimation of recruitment for each spawning year.

Sample Miramichi Smelt Bycatch: October-December, 1999

Objectives:

1) continue the assessment of striped bass spawning success in the Miramichi in 1999 given the expectation that female abundance will not meet conservation requirements,
2) acquire pre-winter estimates of size-at-age for continuation of winter mortality studies.

Size-dependent Winter Survival

Objectives:

1) Extend the back-calculation analysis to the 1994 to 1997 yearclasses to determine if size-selective mortality contributed to the apparent low survival of the 1995 yearclass.

ACKNOWLEDGEMENTS

We thank the commercial fishers of the Miramichi River estuary for their co-operation during the course of this study and for sharing in their knowledge of the river and its fisheries. The interest shown and effort expended in sampling by Eel Ground First Nation is greatly appreciated. Dave Moore and Joe Shaesgreen provided greatly needed assistance in the field.

REFERENCES

Anon. 1996. Miramichi Striped Bass (*Morone saxatilis*). DFO Atlantic Fisheries Stock Status Report 96/12E.

Bernier, R. 1996. Relation entre la taille automnale et la survie hivernale de bar rayé (*Morone saxatilis*) de la rivière Miramichi. Thèse d'Initiation à la Recherche. Université de Moncton, Moncton, N-B.

Bradford, R.G., G. Chaput, and E. Tremblay 1995a. Status of striped bass (*Morone saxatilis*) in the Gulf of St. Lawrence. Dept. of Fisheries and Oceans Atl. Fish. Res. Doc. 95/119. 43 p.

Bradford, R.G., K.A. Robichaud, and S.C. Courtenay. 1995b. By-catch in commercial fisheries as an indicator and regulator of striped bass (*Morone saxatilis*) abundance in the Miramichi River estuary, p. 249-259. *In* E.M.P. Chadwick [*ed.*]. Water, science, and the public: the Miramichi ecosystem. Can. Spec. Publ. Fish. Aquat. Sci. 123.

Bradford, R.G. and G. Chaput. 1996. Status of striped bass (*Morone saxatilis*) in the Southern Gulf of St. Lawrence in 1995. DFO Atl. Fish. Res. Doc. 96/62.

Bradford, R.G. and G. Chaput. 1997. Status of striped bass (*Morone saxatilis*) in the Gulf of St. Lawrence in 1996 and revised estimates of spawner abundance for 1994 and 1995. DFO Atl. Fish. Res. Doc. 97/16.

Bradford, R.G. and G. Chaput. 1998. Status of striped bass (*Morone saxatilis*) in the Gulf of St. Lawrence in 1997. DFO Can. Stock Asses. Secr. Res. Doc. 98/35.

Chaput, G.J. 1995. Temporal distribution, spatial distribution, and abundance of diadromous fish in the Miramichi River watershed, p. 121-139. *In* E.M.P. Chadwick [ed.]. Water, science, and the public: the Miramichi ecosystem. Can. Spec. Publ. Fish. Aquat. Sci. 123.

Chaput, G.J., and R.G. Randall. 1990. Striped bass (*Morone saxatilis*) from the Gulf of St. Lawrence. CAFSAC Res. Doc. 90/71, 29 p.

Cochran, W.G. 1977. Sampling Techniques. Third Edition. John Wiley & Sons. New York. 428 p.

Dept. of Fisheries and Oceans. 1993. Striped bass management plan for New Brunswick: major elements. 5 p.

Gazey,W.J., and M.J. Staley. 1986. Population estimation from mark-recapture experiments using a sequential Bayes algorithm. Ecology 67: 941-951.

Hanson, J.M., and S.C. Courtenay. 1995. Seasonal abundance and distribution of fishes in the Miramichi Estuary, p.141-160. *In* E.M.P. Chadwick [ed.]. Water, science, and the public: the Miramichi ecosystem. Can. Spec. Publ. Fish. Aquat. Sci. 123.

Hogans, W., and G. Melvin. 1984. Kouchibouguac National Park Striped Bass (*Morone saxatilis*) Fishery Survey. Aquatic Industries Limited, St. Andrews, N.B.

Northeast Fisheries Science Center. 1998. Report of the 26th Northeast Regional Stock Assessment Workshop (26th SAW): Stock Assessment Review Committee (SARC) consensus summary of assessments. Northeast Fish. Sci. Cent. Ref. Doc. 98-03; 283 p., Woods Hole, MA.

Wirgin, I.I., T.-L. Ong, L. Maceda, J.R. Waldman, D. Moore, and S. Courtenay. 1993. Mitochondrial DNA variation in striped bass (*Morone saxatilis*) from Canadian rivers. Can. J. Fish. Aquat. Sci. 50: 80-87.

TABLES/FIGURES/APPENDICES

Table 1. First Nations harvest agreement levels and reported harvests of striped bass for 1997.

First Nation	Agreement Allocation	Reported Harvest in 1997
Burnt Church[1] (Tabusintac River and Miramichi Bay)	40[2]	58
Eel Ground (Northwest Miramichi)	150	
Red Bank (Northwest Miramichi)	100	
Indian Island (Richibucto River)	500	
Big Cove[1] (Richibucto River)		NA
Buctouche (Buctouche River)	172	
Millbrook (River Philip, NS)		

[1] No agreement in 1997
[2] 1996 agreement level

Table 2. Summary of recapture information for the Miramichi River gaspereau fisheries (all sites) and the NW Miramichi gaspereau fishery.

Marking Information		Recapture Information														
Date	n	18-May	20-May	21-May	23-May	25-May	27-May	29-May	02-Jun	03-Jun	04-Jun	05-Jun	20-Jun			
Total Reported Recaptures																
14-May	46	0	1	5	9	0	1	2	2	2	0	**2**	7			
16-May	51	0	2	5	7	1	4	2	1	1	1	**0**	2			
18-May	75		9	7	3	0	5	4	2	4	1	**2**	6			
20-May	42			1	6	0	3	5	1	1	2	**0**	3			
22-May	34				3	0	4	3	5	0	0	**0**	1			
Cumulative Total Recaptures																
14-May		0	1	6	15	15	16	18	20	22	22	**24**	31			
16-May		0	2	7	14	15	19	21	22	23	24	**24**	26			
18-May			9	16	19	19	24	28	30	34	35	**37**	43			
20-May				1	7	7	10	15	16	17	19	**19**	22			
22-May					3	3	7	10	15	15	15	**15**	16			
Removals Outside of NW Miramichi																
14-May			1		1								1			
16-May			2				1									
18-May			9	2												
20-May					3	1										
22-May					3											
Tags Removed on NW Miramichi																
14-May		0	0	5	8	0	1	2	2	2	0	**2**	6			
16-May		0	0	5	7	1	3	2	1	1	1	**0**	2			
18-May			0	5	3	0	5	4	2	4	1	**2**	6			
20-May				1	3	0	3	5	1	1	2	**0**	3			
22-May					0	0	4	3	5	0	0	**0**	1			
Cumulative Tags Removed on NW Miramichi																
14-May		0	0	5	13	13	14	16	18	20	20	**22**	29			
16-May		0	0	5	12	13	16	18	19	20	21	**21**	22			
18-May			0	5	8	8	13	17	19	23	24	**26**	32			
20-May				1	4	4	7	12	13	14	16	**16**	19			
22-May					0	0	4	7	12	12	12	**12**	13			
Daily Exploitation Rate on NW Miramichi																
14-May		0.00	0.00	0.12	0.21	0.00	0.03	0.07	0.07	0.08	0.00	**0.09**		0.05		
16-May		0.00	0.00	0.10	0.16	0.03	0.09	0.06	0.03	0.03	0.04	**0.00**		0.06		
18-May			0.00	0.08	0.05	0.00	0.09	0.08	0.04	0.09	0.02	**0.05**				
20-May				0.03	0.08	0.00	0.09	0.16	0.04	0.04	0.08	**0.00**				
22-May					0.00	0.00	0.13	0.11	0.21	0.00	0.00	**0.00**				
Cumulative Exploitation Rate on NW Miramichi																
14-May		0.00	0.00	0.12	0.30	0.30	0.33	0.37	0.42	0.47	0.47	**0.51**	0.67	43	22	29
16-May		0.00	0.00	0.10	0.25	0.27	0.33	0.38	0.40	0.42	0.44	**0.44**	0.46	48	21	22
18-May			0.00	0.08	0.13	0.13	0.20	0.27	0.30	0.36	0.38	**0.41**	0.50	64	26	32
20-May				0.03	0.11	0.11	0.18	0.32	0.34	0.37	0.42	**0.42**	0.50	38	16	19
22-May					0.00	0.00	0.13	0.23	0.39	0.39	0.39	**0.39**	0.42	31	12	13
															0.43	0.51

Table 3. Total observed catch, and the number of observed males and spent fish for each day of sampling on Napan River, 1998 (n =number of fish, p =proportion of total catch).

	Total	Males		Spent Fish	
Date	Catch	(n)	(p)	(n)	(p)
12-May-98	7	1	0.14	0	0.00
14-May-98	45	22	0.49	0	0.00
16-May-98	63	31	0.49	0	0.00
18-May-98	78	45	0.58	1	0.01
20-May-98	48	31	0.65	4	0.08
22-May-98	37	19	0.51	8	0.22

Table 4. Summary of sequential and single census spawner population size estimates for 1994 to 1998. The mode and 95% confidence intervals are also shown.

				Number of Spawners		
Year	**Duration**	**Model**	**Marks**	**Mode**	**95% Confidence Interval**	
1994	1 June – 12 June	Single	430	27775	21475	40550
		Sequential	485	29000	23000	47000
1995	1 June – 9 June	Single	275	47800	31000	138100
		Sequential	289	50000	35000	175000
1996	29 May – 10 June	Single	417	8050	6150	12000
		Sequential	452	8090	6275	13370
1997	4 June – 10 June	Sequential	177[1]	9400	6400	25000
			156[2]	4300	2950	11050
			139[3]	2900	1900	9600
	4 June – 20 June	Sequential	177[1]	7900	5800	17500
			156[2]	4900	3400	11200
			139[3]	2500	1800	5900
1998	20 June - 4 June	Single	223	3850	3300	4575
		Sequential	223	3400	2900	4800

[1] Napan River tag group
[2] June 4 Northwest Miramichi tag group
[3] June 6 Northwest Miramichi tag group

Table 5. Summary of abundance indices expressed as the catch of fish per net per day of fishing effort (median, 5th to 95th percentiles) by age class for striped bass from the Miramichi River estuary. Age-0 and age-1 bass adundance estimates are from sampling the bycatch in the October to November open water smelt fishery. The age-2 and spawners abundance estimates are from sampling the bycatch in the May and June gaspereau fishery of the Northwest Miramichi. NS means not sampled.

	Median	5th ; 95th percentiles	Median	5th ; 95th percentiles	Sample size
Abundance indices from the open-water smelt fishery (downstream traps only)					
	Age-0		Age-1		
1991	18	[15 ; 227]	0	[0 ; 3]	3
1992	50	[0 ; 191]	0	[0 ; 0]	16
1993	17	[2 ; 62]	0.1	[0 ; 18]	8
1994	7	[2 ; 21]	0	[0 ; 0]	10
1995	255	[132 ; 671]	0	[0 ; 0]	11
1996	452	[159 ; 2964]	NS		11
1997	10	[1 ; 59]	NS		22
1998	44				
Abundance indices from the gaspereau fishery in the Northwest Miramichi (stratified mean and standard deviation)					
	Age-2		Spawners		
1991	0.02		1.5		23
1992					NS
1993	5.6	0.3	3.6	0.25	46
1994	8.0	3.2	68.7	17.4	50
1995	0.3	0.01	36.8	5.0	64
1996	5.8	0.5	8.8	0.6	72
1997	0.3	0.7	4.9	5.8	60
1998	0.23	0.4	5.7	0.3	83

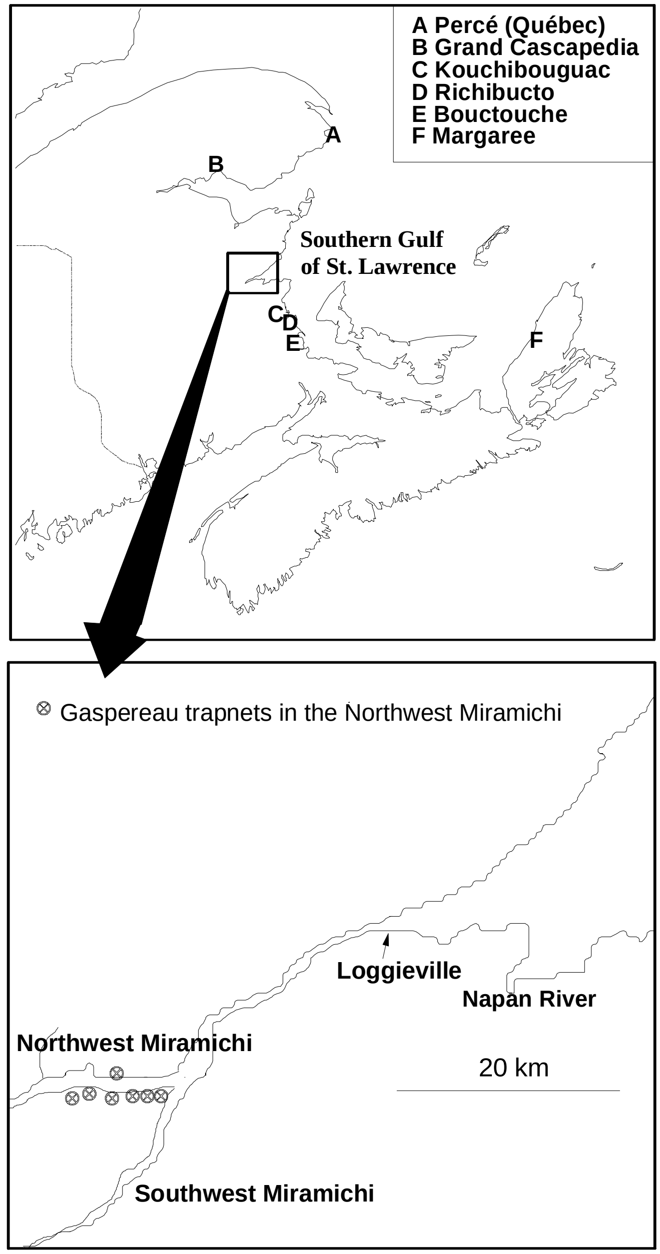


Figure 1. Place names and locations sampled for assessing the status of the striped bass stock of the southern Gulf of St. Lawrence.

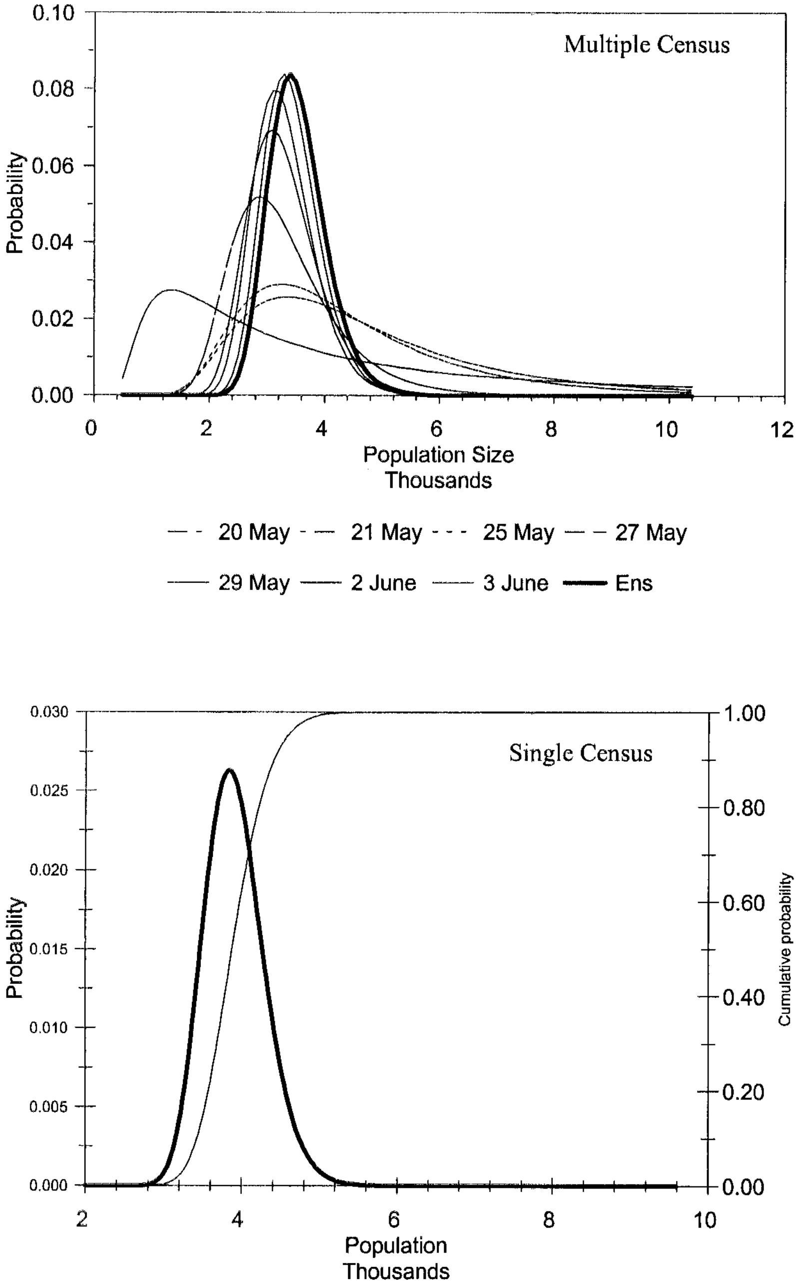
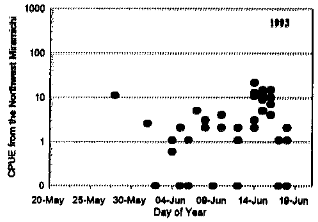
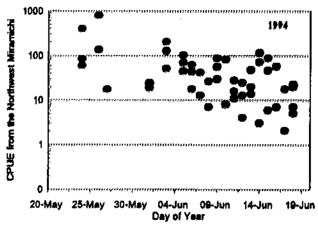


Figure 2. Estimates of spawner abundance obtained using a sequential (upper panel) and single census (lower panel) Bayesian algorithm. End of season estimate (4 June) from the multiple census is shown with a heavy line. The cumulative distribution of estimates obtained using the single census method is shown.

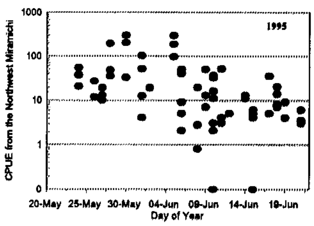
CPUE



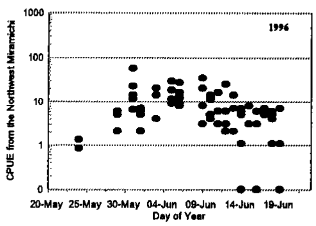
Stratified arithmetic mean	3.6
Geometric mean	0.3
Median	2.0
Number of observations with no striped bass catch	13 of 46



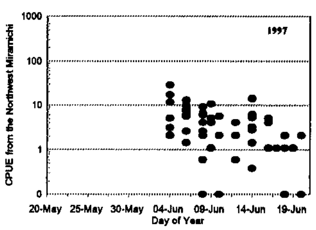
Stratified arithmetic mean	68.7
Geometric mean	30.3
Median	27.5
Number of observations with no striped bass catch	0 of 50



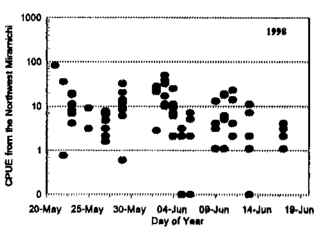
Stratified arithmetic mean	36.8
Geometric mean	10.6
Median	12.0
Number of observations with no striped bass catch	2 of 64



Stratified arithmetic mean	8.8
Geometric mean	4.4
Median	6.0
Number of observations with no striped bass catch	3 of 72

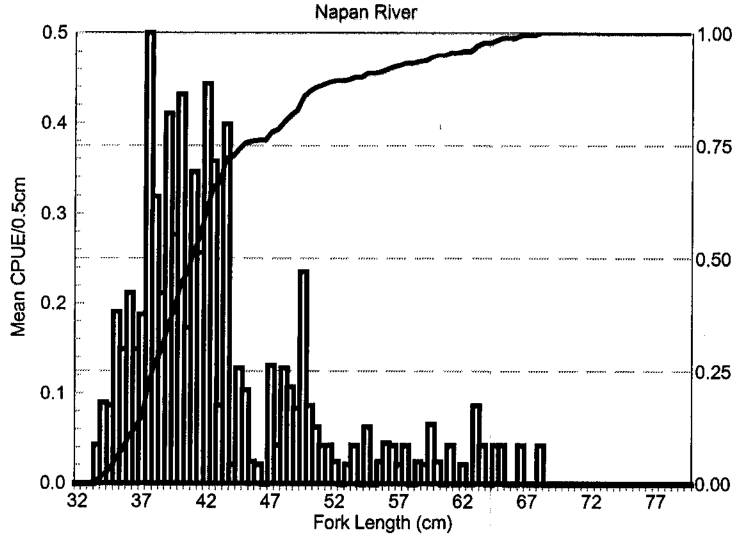


Stratified arithmetic mean	3.5
Geometric mean	1.4
Median	2.7
Number of observations with no striped bass catch	7 of 60



Stratified arithmetic mean	5.7
Geometric mean	4.0
Median	6.1
Number of observations with no striped bass catch	4 of 83

Figure 3. CPUE (fish per trap per 24 h) of adult striped bass versus date of capture in the NW Miramichi gaspereau fishery for the years 1993 to 1998. Individual points may represent more than one sample.



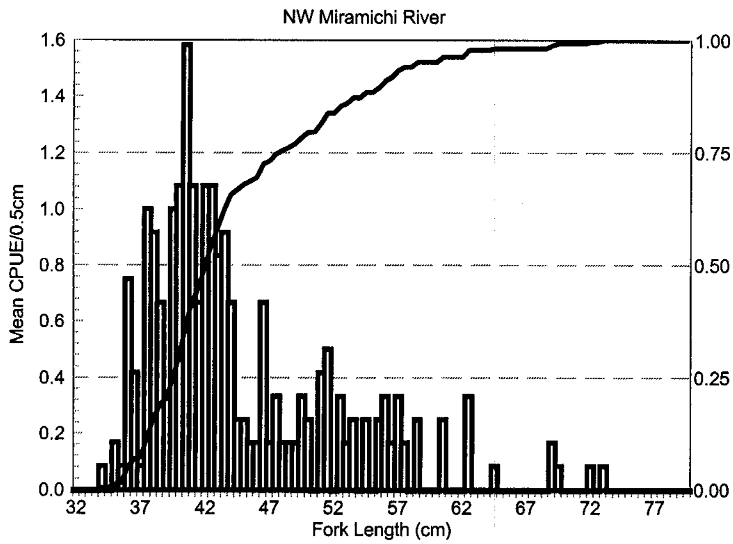


Figure 4. Length frequency distributions and cumulative length frequency distributions of adult striped bass sampled on the Napan (upper panel) and NW Miramichi (lower panel) rivers. The Napan River sample does not include spent fish.

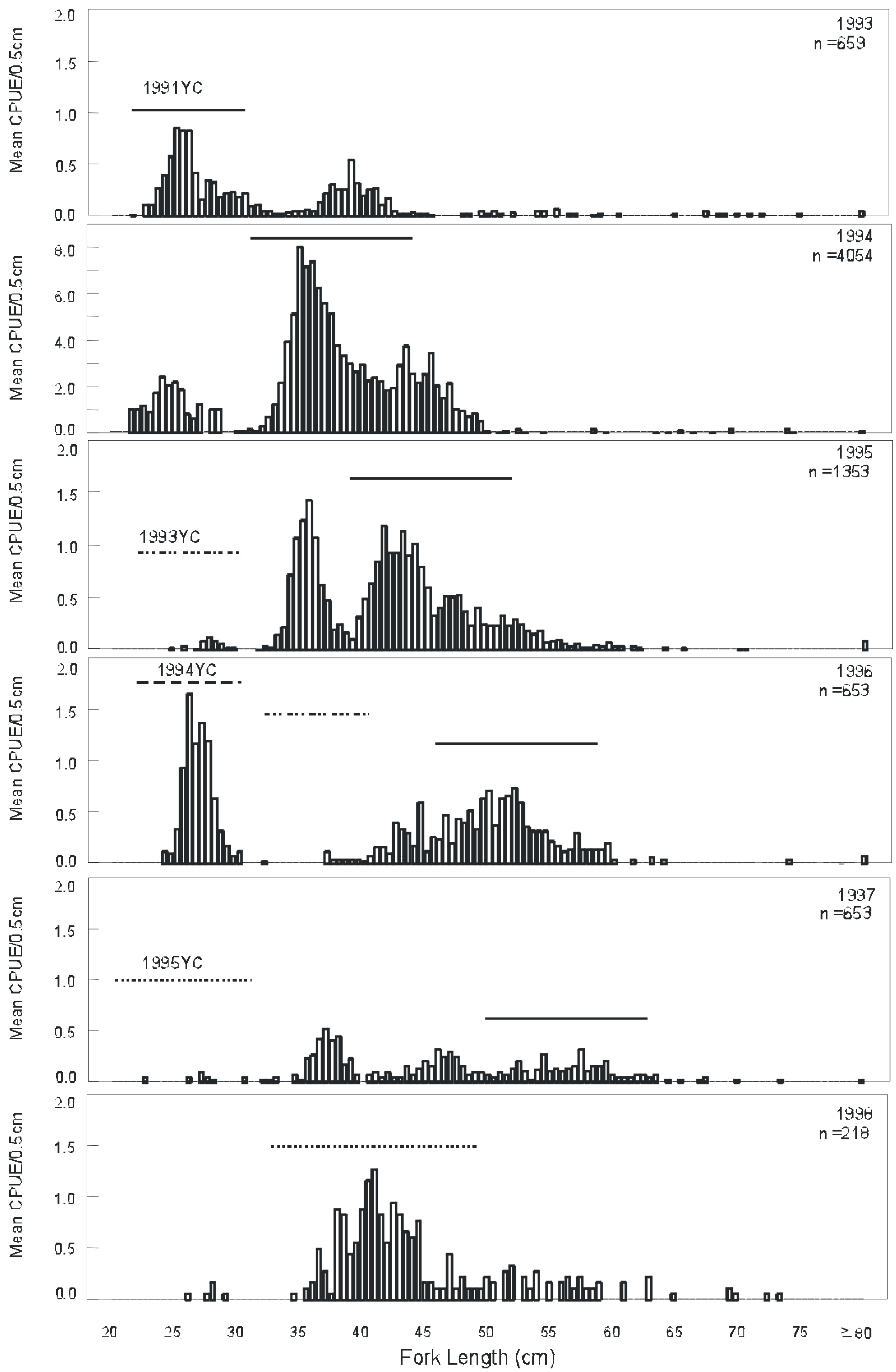


Figure 5. Length frequency distribution of striped bass captured on the NW Miramichi during May-June, 1993-1998.

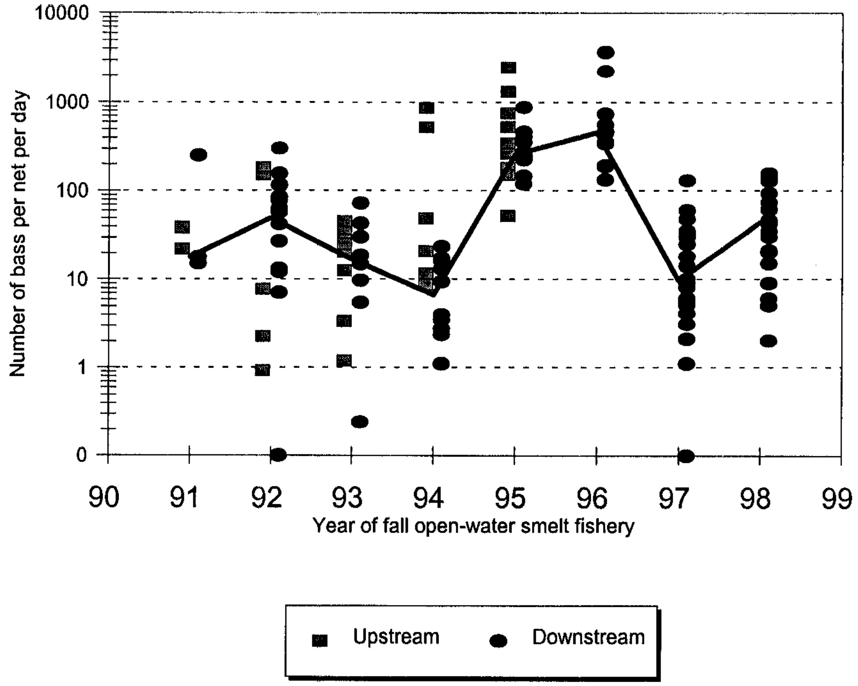


Figure 6. Catch per unit of effort (fish per net per 24 hr period) of striped bass in the open water smelt fishery of the Miramichi River at upstream (Chatham) and downstream (Loggieville) locations, 1991 to 1998. Solid line is the annual geometric mean at the downstream sampling location. Individual points may represent several observations.

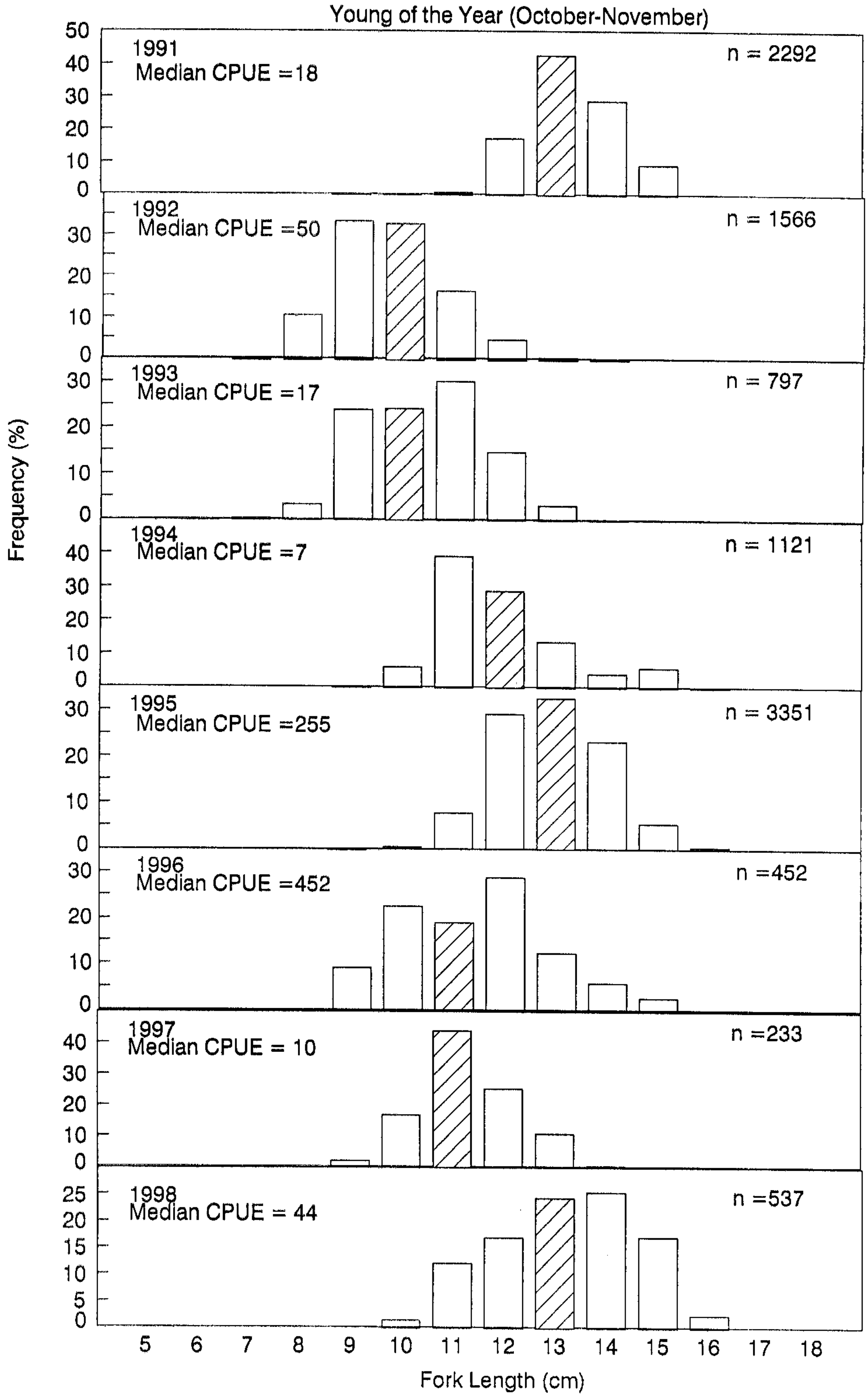


Figure 7. Length frequency distributions of age 0-plus striped bass sampled from the fall smelt fishery (Oct.-Nov.) in the Miramichi Estuary (shaded bar =median length interval; n =sample size; CPUE =fish per trap per 24h.)

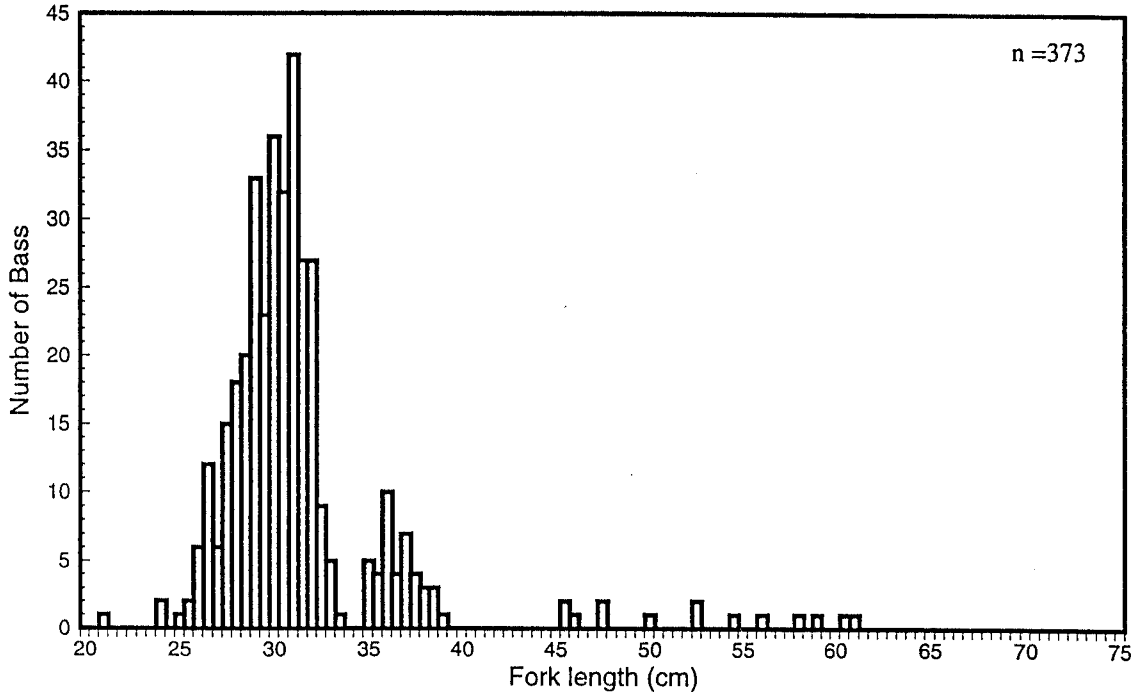


Figure 8. Length frequency (fork, cm) distribution of striped bass sampled during October-November, 1996 on the Tabusintac River.

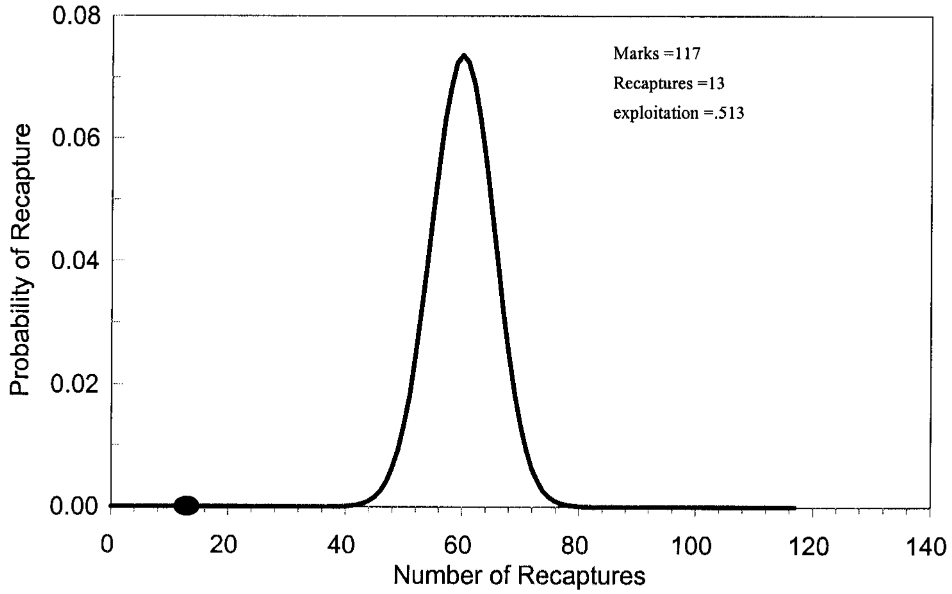
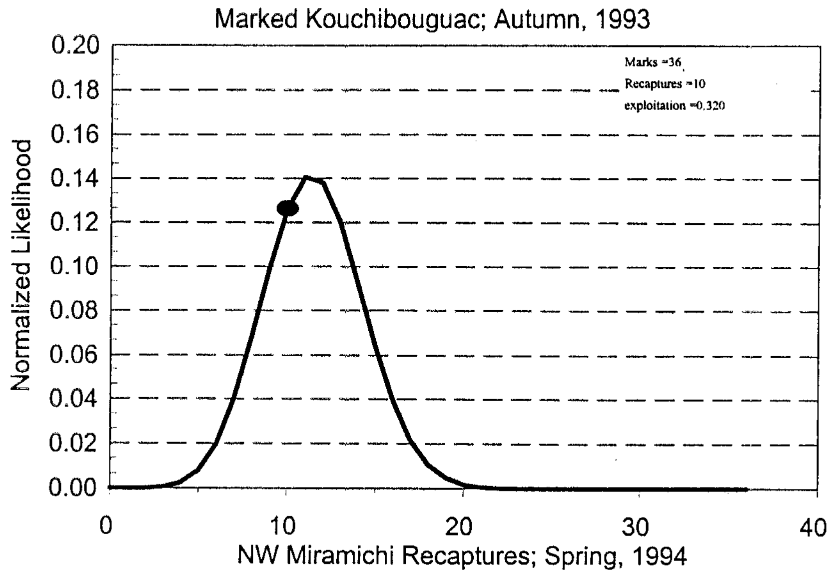


Figure 9. Observed (dot) versus predicted (line) normalized frequency distribution of recaptures from juveniles marked on the Tabusintac River during autumn, 1996 and recaptured as adult males on the NW Miramichi, May-June, 1998.



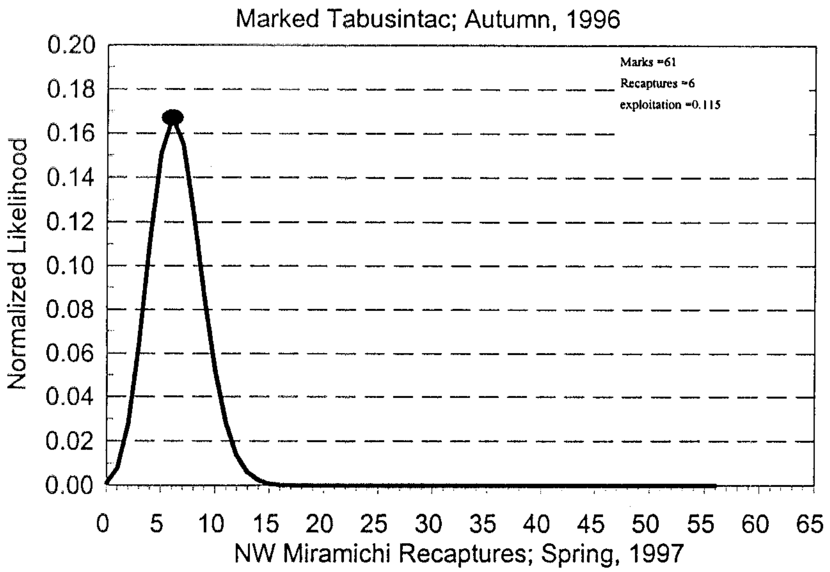


Figure 10. Observed (dot) and normalized probability distribution of May-June recaptures on the NW Miramichi of adult fish marked during autumn either on the Kouchibouguac during 1993 or on the Tabusintac during 1996. The exploitation rate was calculated independently using recapture information from fish marked on the Miramichi during the spawning runs of 1994 and 1997.

Appendix 1. RECORD OF CLIENT CONSULTATION

1. **SPECIES / STOCK:**
- **Striped bass Miramichi River/Southern Gulf of St. Lawrence**

2. **ARRANGEMENTS:**
   DATE: November 24, 1998
   TIME: 10:00 TO 13:00
   LOCATION: Dept. of Natural Resources and Energy, Newcastle, New Brunswick

3. **FORM OF CONSULTATION (Science Workshop, ZMAC, ETC..)**
- **Science Workshop**

4. **PARTICIPANTS (Name and Affiliation)**
- **Robert Allain, DFO, Area Manager, Tracadie-Sheila**
- **Rheal Boucher, MPO, Tracadie-Sheila, N.B.**
- **Rod Bradford, DFO Science, Maritimes Region, Halifax, N.S.**
- **Gerald Chaput, DFO Science, Maritimes Region, Moncton, N.B.**
- **Scott Douglas, Acadia University**
- **Berniee Dubee, DNRE, Miramichi, N.B.**
- **Lee Farrell, Tabusintac Watershed, Tabusintac, N.B.**
- **Reg Furlong, DFO Science, Miramichi, N.B.**
- **Richard Godin, Fisher, Riviere du Portage, N.B.**
- **Mark Hambrook, Miramichi Fish Hatchery, South Esk, N.B.**
- **Eugène Richard, Gaspereau fisher, (Northwest Miramichi), Richibouctou Village**
- **Daryl Trevors, commercial fisher, Miramichi, N.B.**
- **James P. Ward, Beaver Enterprises / NSMDC, Eel Ground, N.B.**
- **Kenneth Williston, UMF, Bay du Vin, N.B.**

5. **NEW INFORMATION BROUGHT FORWARD (what? By who?)-(Only a brief description is required)**

6. **CONCERNS RAISED BY CLIENTS (include concerns, plus follow-up action/response made or committed)-(Only a brief description is required)**
- **Still do not know what the impact of the fall openwater fishery has on the young-of-the-year bass. It is a small proportion of the total population – if so, may not be a major concern.**
- **Similar, discussion focussed on the bycatch and subsequent mortality of striped bass in commercial, recreational angling, and First Nation food fisheries. Bycatch mortality rates utilized by American striped bass fisheries managers indicates that gillnet based food fisheries may be disproportionately lethal for striped bass relative to the other gear types deployed in the inshore regions of the southern Gulf of St. Lawrence.**
- **It was felt that measures were required in order to address the problem of the continued loss of adult fish under the current conservation management plan.**
- **General concern was express regarding the impact of industrial and municipal activities on fish habitat within the Miramichi estuary.**

RECOMMENDATIONS: (Only a brief description is required)

(a) Pertaining to Assessment

- **Directed fisheries should be closed. This measure would close the hook and release recreational angling fishery and eliminate communal allocations of striped bass to the First Nations until such time that the population meets conservation requirements.**

(b) Pertaining to next year's workplans

- **Issues of habitat are not being addressed / considered by licensing agencies. Concerns raised regarding spawning areas, overwintering areas have been ignored to date.**

Rod Bradford	**Gérald Chaput**
NAME OF PRESENTOR	**NAME OF RAPPORTEUR**