Fisheries and Oceans / Pêches et Océans

Maritimes Region

DFO Science
Stock Status Report D3-17

Bon Harriott
Leim & Scott 1966

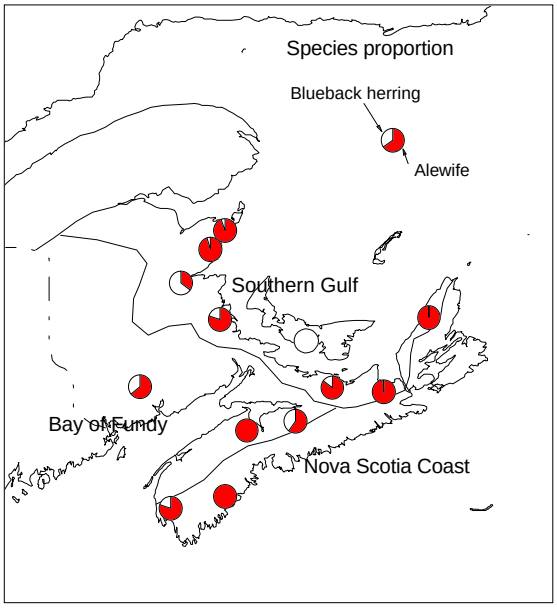
# Gaspereau
# Maritimes Region
# Overview

## *Background*

*Alewife (Alosa pseudoharengus) and blueback herring (Alosa aestivalis) are anadromous clupeids that frequent the rivers of the Maritimes. They are collectively referred to as gaspereau. Blueback herring occur in fewer rivers and are generally less abundant than alewives where both species co-occur. Spawning migrations of alewives typically begin in late April or early May, depending upon geographic area and water temperature, peak in late May or early June and are completed by late June or early July. Blueback herring enter the river about 2 weeks later than do alewives. Both species return to sea soon after spawning. Young-of-the-year gaspereau spend, at most, the first summer and fall in fresh water before migrating to the sea. Both species recruit to the spawning stock over 2-4 years. Spawning occurs first in both species at age 3 and virtually all fish have spawned by age 6. The mean age at first spawning is usually older for females than for males. Repeat spawners may form a high proportion (35-90%) of the stocks of both species, with higher proportions of repeat spawners where exploitation is low.*

*Gaspereau are harvested by gill, trap, and dip nets depending upon the river and location within the river system, e.g., gill net in the river mouth, dip net in the lower river, and trap net in lake areas. Special tip-traps are used in the Margaree River and square-nets are used in the Gaspereau River.*

*In the absence of specific biological and fisheries information, the management target is to maintain harvests at about long-term mean levels. Some stocks are assessed in greater detail and the management target is defined on the basis of a fishing mortality level which does not exceed the natural mortality rate (equivalent to exploitation rates of 0.33 to 0.39). The Saint John River stock at Mactaquac is managed on the basis of a fixed escapement target derived from analysis of stock and recruitment data.*




## *The Fishery*

Landings (t)

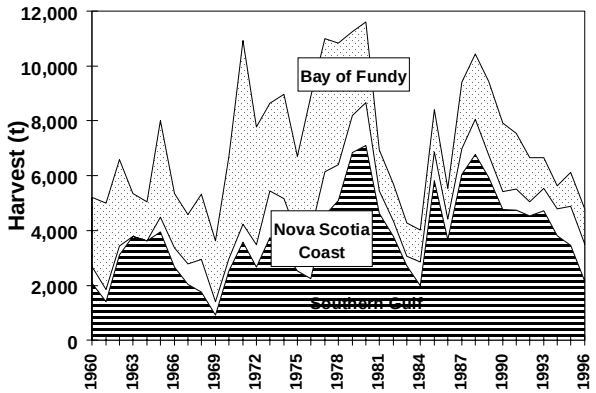
| Year | 70-79 Avg. | 80-89 Avg. | 1992 | 1993 | 1994 | 1995 | 1996 |
|---|---|---|---|---|---|---|---|
| S.Gulf | 3704 | 4848 | 4544 | 4722 | 3806 | 3452 | 2150 |
| NS.Coast | 1279 | 893 | 497 | 803 | 973 | 1439 | 1365 |
| B. of F. | 4184 | 1836 | 1618 | 1137 | 863 | 1230 | 1275 |
| TOTAL | 9167 | 7578 | 6659 | 6662 | 5642 | 6120 | 4790 |

The gaspereau fisheries are **regulated** by season, gear, and license restrictions. Few new licenses have been issued since 1993. Individual licenses may be for multiple and variable units of gear. The primary measures restricting exploitation rates are a limiting of licenses to existing levels in all areas and a two-day per week closure. Variations from the general closures and restrictions are instituted under river-specific management plans. The potential for bycatch of Atlantic salmon and striped bass is of concern, particularly in the Miramichi and Saint John rivers, where various restrictions, e.g. fishing season adjustments, and minimum fish length

limits, are implemented. Logbooks are issued to fishers in the Bay of Fundy and Nova Scotia Coast areas as a condition of license, but are not issued in the Southern Gulf area of New Brunswick.

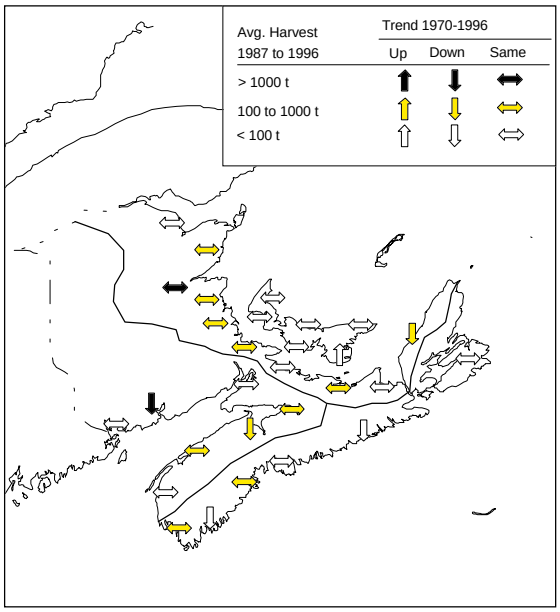
Gaspereau fisheries in the Maritimes are geographically and economically diverse. Reliable harvest information is available only for a few of the larger fisheries. In many areas, gaspereau used locally as bait for other fisheries may not be registered in the purchase slip database. Logbook programs may record a large portion of the catch; the participation rate is generally between 75% and 90%.

Reported **landings** from the Maritimes peaked in 1980 at just under 11,600 t. A second peak in 1988 of just under 10,500 t has been followed by a continuous decline to less than 5,000 t in 1996. In the last ten years, the Southern Gulf harvests have represented between 45% and 71% of the total Maritime harvest.




The most important fisheries occur in the Saint John River (Bay of Fundy, NB) and the Miramichi River (Southern Gulf NB). In most parts of the Maritimes, gaspereau fisheries are relatively small (less than 100 t annually).

There are large variations in annual landings but few statistically significant trends. Exceptions to this are the Saint John River, Margaree River, Gaspereau River, Mersey-Medway area and the eastern shore of Nova Scotia where landings have declined. Landings in the Tusket River have increased recently.



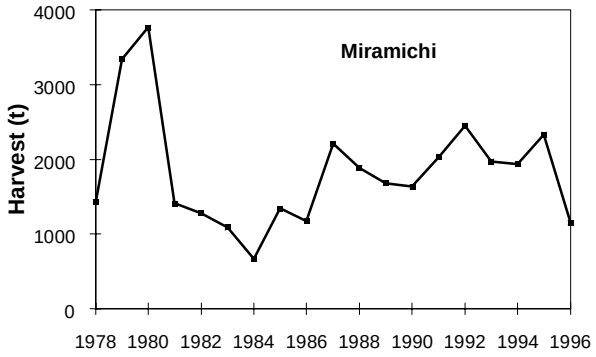

## *Resource Status*

### Southern Gulf

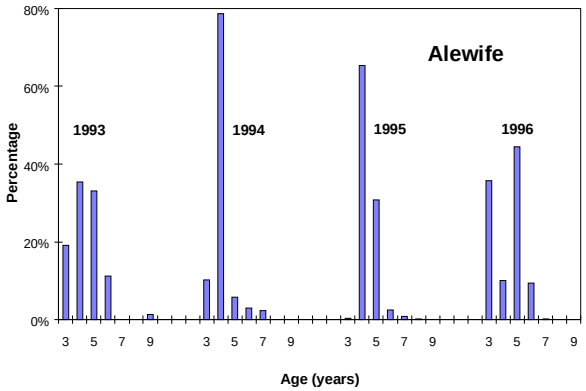
Two major fisheries of the southern Gulf have been monitored annually since 1983: the Miramichi River in New Brunswick and the Margaree River in Cape Breton, Nova Scotia. Less intensive and generally opportunistic sampling has been conducted on three other fisheries in New Brunswick: Richibucto, Tracadie and Pokemouche rivers.

In the Miramichi River fishery, gaspereau catch composition varies annually between 24% and 77% alewife by number. The current 36 licensed trapnets in this fishery

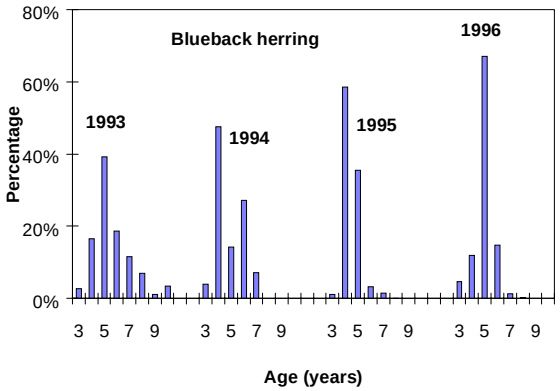
has remained relatively constant in number since 1970. The reported harvest of gaspereau has increased slightly since the early 1980s and has averaged about 2000 t in the last five years.



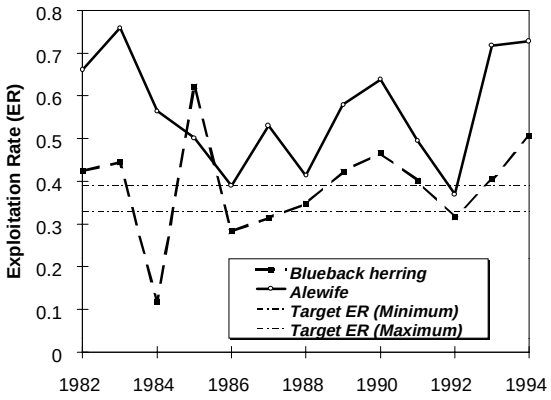

First-time-spawners (FSP) have comprised between 37% and 87% of the alewife catches (median 72% between 1982 and 1996). Alewife are predominantly harvested as 4-year olds and these make up 35% to 79% of the annual harvest. Fewer than four cohorts generally contribute to the alewife harvest, with few alewife older than six years in the fishery in recent years. Few three or four year olds of the 1992 year-class have been caught, and the year-class is considered to be very weak.




FSP in the blueback herring catches have generally been lower than for alewife, varying between 17% and 71% (median 48% during 1982 to 1996). Blueback herring catches are also dominated by single year-classes, either as 4-year olds or 5-year olds, making up between 34% and 77% of the total annual catch. Blueback herring have a wider distribution than do alewife, with ages ranging between three and ten years old. The 1992 year-class of blueback herring is weak, as evidenced by the low catches of three-year olds and four-year olds in the fisheries of 1995 and 1996.

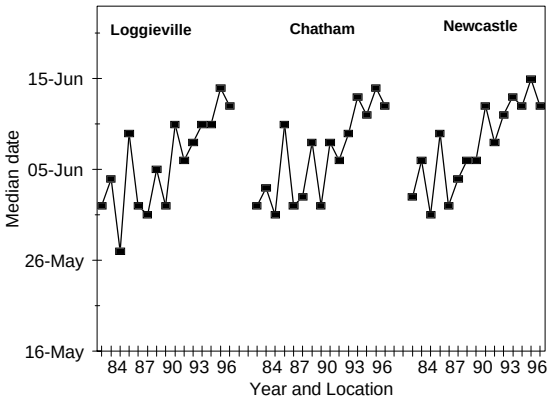



The fewer age-classes in the alewife spawning run compared to blueback herring is indicative of a higher mortality rate for alewife. **Exploitation rates** for alewife and blueback herring were estimated after assuming a natural mortality rate of 0.4. The assumption of equal natural mortality rates for both species implies that differences between species in total mortality are due to different exploitation rates. Annual exploitation rates on alewife have varied between 0.39 and 0.76, above the target exploitation rates of 0.33 to 0.39. Blueback herring exploitation rates have generally been lower than on alewife, varing between 0.12 and 0.62 and frequently less than the target exploitation rates.



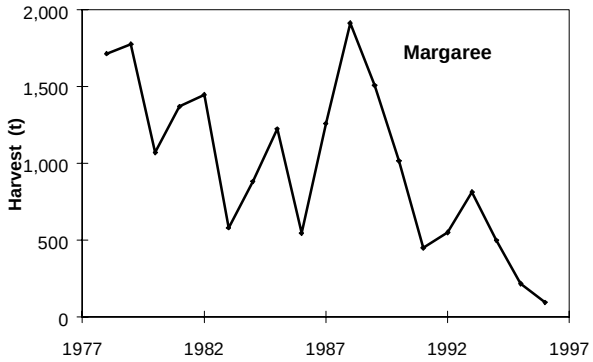

The lower exploitation rate on blueback herring is a consequence of the later spawning migration of blueback herring relative to alewife (about two weeks) and the closure of the fishery in mid-June when only a portion of the blueback herring stock is available to the fishery.

Since 1990, the fisheries as described by the date when 50% of the annual catch was taken, have occured later than in the 1980s.

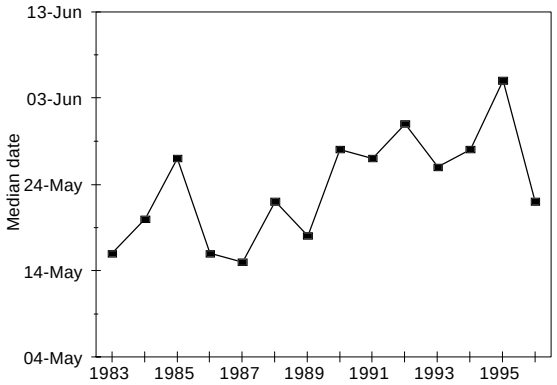



In 1995 and 1996, a later timing of the fishery was expected because of the delay of the season from May 15-June 15 to May 20-June 20. But the run of gaspereau in 1995 and 1996 was also later than in the 1980s as observed at the DFO **index trapnets** in the Southwest and Northwest branches of the Miramichi. In 1995, about half the gaspereau were counted at the index trapnets after June 20, the regular closing date of the fishery. In 1996, about 25% of the total gaspereau catch for the year at the index trapnet occurred after June 20.

In the Margaree River, alewife make up more than 95% of the garpereau harvest. Alewife have returned to the river as early as mid-April but the major run occurs in the second to fourth weeks of May. Historically, the harvest peaked in 1988, and has declined precipitously since, largely due to the decreased abundance of gaspereau. The reported harvest of 94 t in 1996 is the lowest since 1957.



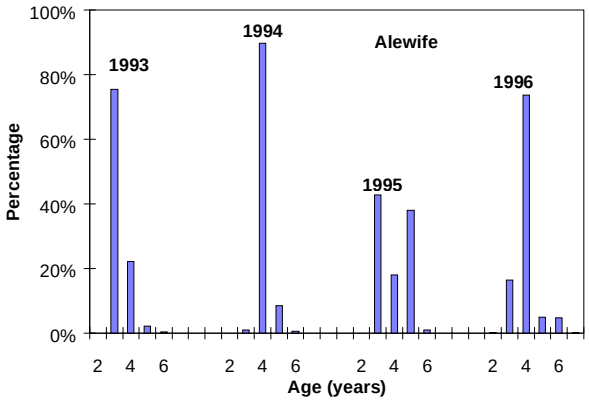

Since 1990, the fishery has occurred mostly in the latter part of May and beginning of June in contrast to the 1980s when a large portion of the fishery occurred in May. The fishery in 1995 was the latest on record with a median date of harvest of June 6.



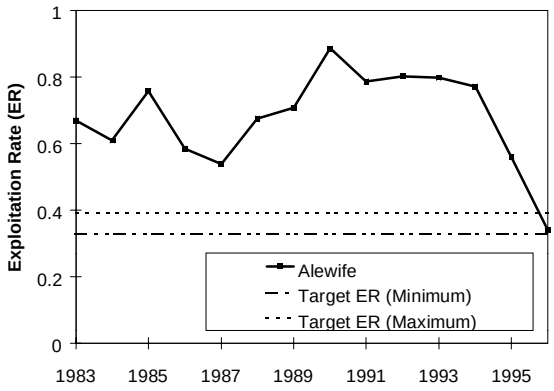

The 1996 fishery was comparatively earlier than in 1995 although a more restrictive management plan and overall reduced effort

may have biased the observed timing of the harvest.

The 1995 and 1996 harvests contained high percentages of first-time-spawners (FSP), 58% and 72% respectively. Since 1983, the percentage FSP in the annual harvests has varied between 51% (in 1983) and 93% (in 1993). There are generally less than three age groups in the spawning run and the fishery. One year-class has generally comprised between 36% and 90% of the annual harvests. The 1992 year-class was the major component of the 1995 and 1996 fisheries. The 1991 year-class is very weak.




The spawning escapement was estimated for the years 1983 to 1994. The relationship between the spawning escapement and a larval index (based on weekly samples of larvae at four index stations in Lake Ainslie, the spawning area for alewives) was used to estimate the spawning escapement and the exploitation rates in the 1995 and 1996 fisheries. **Exploitation rates** (under the assumption of a constant natural mortality rate) have exceeded the target levels every year since 1983 and were excessively high during 1990 to 1994. The more restrictive management measures in place in 1996 as well as the fewer active fishers reduced the estimated exploitation rate to the target level.



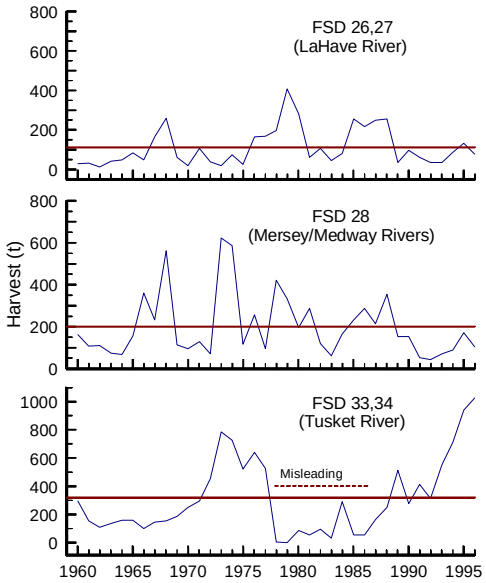

Gaspereau fisheries of the other monitored Gulf NB rivers have historically been smaller than the Miramichi and Margaree fisheries. Harvests declined in these fisheries in 1996 relative to the recent ten-year average levels. In the Richibucto River, Tracadie River and Pokemouche River, there were generally less than four age classes in the fishery with no alewife older than six years of age. Blueback herring comprise less than 25% of the harvests in the Richibucto River and less than 5% of the harvests in the other rivers. First-time-spawners (FSP) make up important proportions of the harvests annually in all the rivers. The restricted age distribution in the catches, the absence of alewife older than six years of age and the high proportion (60% to 98%) of first-time-spawners in the harvests are indicative of heavily exploited stocks. Based on the information from the Miramichi River assessment, the exploitation rates in these rivers probably exceed the target levels.

The status of the gaspereau resource on Prince Edward Island is poorly known. Landings data are of little value because most catches are used as bait and are not recorded by official statistics. There are anecdotal reports of rivers where gaspereau runs have disappeared after periods of intensive fishing, but the extent to which overfishing may have caused local extirpations is unknown.

## Nova Scotia Coast

The major fisheries for gaspereau along the **Alantic coast of Nova Scotia** occur in rivers south of Halifax, such as the LaHave, Mersey, Medway, Tusket and Annis rivers. Minor fisheries occur along the Eastern Shore north of Halifax. Annual mean harvests tend to decline from south to north along the Atlantic coast, from highest in the Tusket River area, lower in the Mersey-Medway rivers, low in the LaHave River, and least along the Eastern Shore. Harvests are reported by Fishery Statistical District (FSD), which may share a large river with another FSD or contain more than one river. Harvests attributed to a specific river actually refer to the Fisheries Statistical District(s) in which that river occurs and will include harvests from other rivers in that FSD.

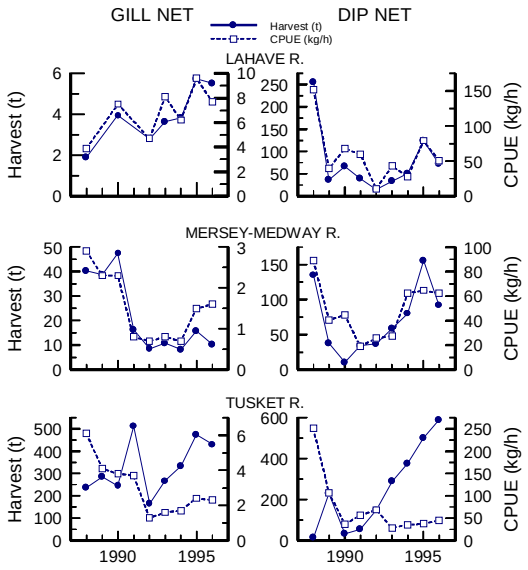
**Reported harvests** from the Atlantic coast of Nova Scotia varied from 337 t to 1,882 t between 1960 and 1996. Recent increases beyond the 1960-1996 mean harvest of 952 t result from higher catches in the Tusket River, perhaps due to increased production of gaspereau in the Carlton River tributary following opening of the new fishway in 1989.

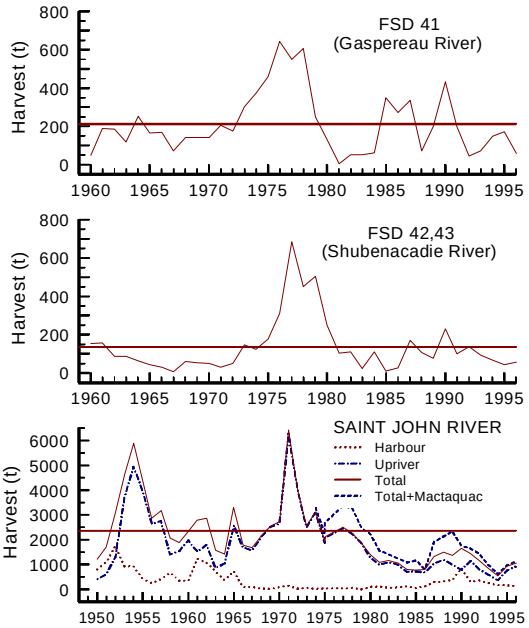



Recent harvests exceed the 1960-1996 mean of 319 t in the Tusket River, are near or slightly below the mean of 111 t in the LaHave River, and are below the mean of 201 t in the Mersey-Medway rivers. The apparent low harvests in the Tusket River between 1978 and 1988 are misleading because of incomplete reporting.

Logbook data indicate that annual gaspereau harvests and catch per unit of fishing effort (**CPUE**) vary among gear types within a river and among rivers.

Dip nets take most of the catch in the LaHave and Mersey-Medway rivers while in the Tusket River, dip-net catches have recently exceeded those by gill net. In the LaHave and Mersey-Medway rivers, the similarity of catch and CPUE trends for a given gear type suggest that catch level depends on run size. Gill net catches have recently increased in the LaHave River and declined in the Mersey-Medway River. In the Tusket River, a large increase in fishing effort was required to achieve the high catches of recent years.



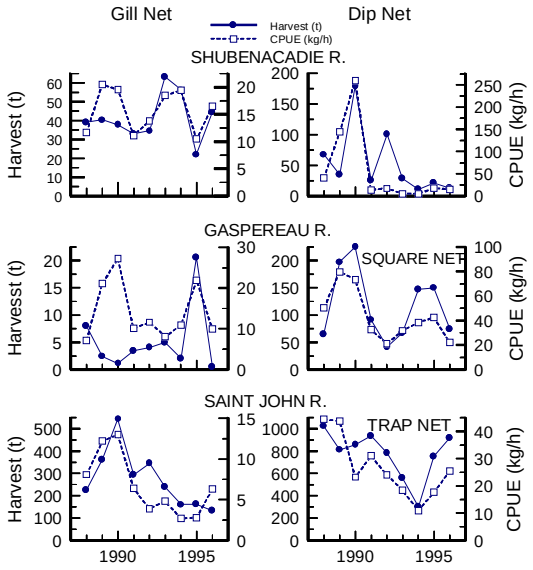




## Bay of Fundy

Within the **Bay of Fundy**, the largest gaspereau fishery occurs in the Saint John River, New Brunswick, followed by moderate fisheries in the Shubenacadie and Gaspereau rivers of Nova Scotia. A moderately-sized gaspereau stock occurs in the Annapolis River but no commercial fishery is permitted there. In the Saint John River, the fishery in the harbour uses drift and set gill nets while the upriver fishery primarily uses trap nets. A harvest also occurs at the Mactaquac Dam on the Saint John River. Drift gill nets and dip nets at weirs are used in the Shubenacadie River while the square net is unique to the Gaspereau River.

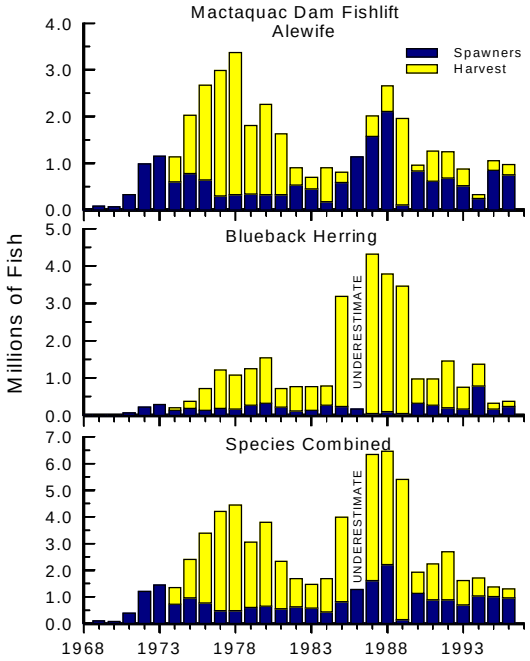
**Reported harvests** from the Bay of Fundy area varied from about 860 t to 6,700 t between 1960 and 1996. Harvests have usually been lower than the 1960-1996 mean of 2,556 t since 1980 and in recent years have been less than 50% of the mean. Although catches in all major fisheries (Saint John, Shubenacadie, and Gaspereau rivers) are presently below their long term means, the greatest quantitative decline has occurred in the Saint John River where the 1996 harvest was 48% of the 1950-1996 mean of 2,350 t. Nonetheless, gaspereau harvests in the Saint John River continue to exceed those in other Maritime rivers, except the Miramichi River.

For the years 1988-1996, wide annual variability but no significant trends occur in catch and CPUE for several gear types, except for declining trap net CPUE in the Saint John River. Catches by the commonly used gill net increase with increasing river size.




For the Bay of Fundy area and Saint John River, recent **biological data** are available only from the gaspereau stock returning to the Mactaquac Dam. Annual runs to the Mactaquac Dam of both alewives and blueback herring have varied widely since completion of the dam in 1968. The proportion of alewives in the run varied from 19% to 85% (mean 59%) between 1972 and 1996.

The alewife run (spawners + harvest) to the Mactaquac Dam and, to a lesser degree, the blueback herring run first peaked in the late 1970s, 4-5 years after rising spawning escapements of the early 1970s (most fish first spawn at ages 4 or 5).




Prior to 1974, all gaspereau arriving at the Mactaquac Dam fishlift were trucked upriver. As the run of gaspereau grew, delays in clearing the large numbers of gaspereau from the fishlift were perceived as delaying the entrance of early run Atlantic salmon and of increasing unacceptably the cost of upriver transport. In 1974, a fishery was established to reduce fishway use conflicts between gaspereau and early run Atlantic salmon and to reduce costs of fish transport upriver.

The Mactaquac Dam gaspereau stock is managed on a constant escapement basis. This stock presently has a management plan requiring an annual spawning escapement of 800,000 alewives and 200,000 blueback herring. Fish surplus to the required spawning escapement are harvested.

Since 1974 when the commercial fishery at the Mactaquac Dam began, **exploitation rates** have ranged from 14% to 90% (mean 52%) for alewives and from 33% to 99% (mean 73%) for blueback herring. Since 1990, the exploitation rate has averaged 31%

for alewives and 62% for blueback herring. The wide range of exploitation rates results from manipulation in earlier years of the spawning escapement for scientific purposes and implementation of a plan to reduce the proportion of later-running blueback herring.

In 1996, the alewife run to the Mactaquac Dam included seven year classes (ages 2-8). Over 98% were ages 3-6, with 44% at age 4 and 35% at age 5. The blueback herring run contained five year classes (ages 3-7). Over 96% of blueback herring were ages 3-6, with ages 3-5 each comprising about 25% of the run. First time spawners comprised about 65% of the alewife and 51% of the blueback herring components of the run.

High returns of both alewives and blueback herring occurred during the late 1980s from moderate spawning escapements. The absence of a fishery in 1986 resulted in an unknown total return; fish unharvested in 1986 contributed to the return in subsequent years. High numbers of spawners during the late 1980s did not produce high returns during the early and mid-1990s, possibly because of adverse freshwater or marine environmental conditions.

## *Outlook*

### Southern Gulf

In the Miramichi River, the 1991 year-class appears to be strong but the 1992 year-class is weak. The incoming 1993 year-class of alewife appears average. Exploitation rates in this fishery are at or above target levels. Alewife abundance has been increasing but blueback herring abundance has declined. No important increases in harvest levels are expected in the next few years.

The gaspereau stock of the Margaree River is currently at low levels. There is a greater chance that recruitment will be low to average rather than high given the low spawning escapements of the last five years which have been among the lowest observed since 1983. The long-term prospects for the stock and the fishery depend upon the achievement of spawning escapements to Lake Ainslie in excess of one million spawners, a level not achieved in the last five years.

In the other Gulf NB rivers, exploitation rates have been high and harvests are expected to remain low relative to historical levels until such time as the exploitation rate is reduced and spawning escapement is increased.

There is no basis for predicting trends in PEI's gaspereau stocks.

### Nova Scotia Coast

Reported catches of gaspereau in the Nova Scotia Coast area are expected to remain near current levels except in the Tusket River where recent high catches may not be sustainable and could decline in the next few years. Harvests are expected to remain below historical mean levels until reduced exploitation rates permit increased spawning escapements.

### Bay of Fundy

Gaspereau catches in the major rivers of the Bay of Fundy are expected to remain near current levels and below the long-term mean catch for the forseeable future. A reduction in exploitation rate and an increase in spawning escapement are required to increase individual river stock sizes and, ultimately, to permit catches near the long-term mean catch level. Required spawning escapments for alewives and blueback herring at the Mactaquac Dam will be met,

thereby permitting a fishery on those fish surplus to spawning requirements.

## *Management Considerations*

The freeze since 1993 on the issuance of new commercial fishing licenses has capped potential fishing effort. Since fewer licenses are fished than are issued, there is concern about an influx of fishing effort in response to favourable market or stock conditions. Additional management measures may be required to address this situation.

The incomplete harvest data records and the absence of biological data for most of the gaspereau stocks make precautionary management advisable for the gaspereau fisheries of the Maritimes. Under this approach there should be no increase, and preferably a decrease, in the level of exploitation, thereby minimizing the risk to the resource.

The appropriate management objective is to rebuild stocks so that future harvests can be maintained near the long-term level. Where detailed assessments are conducted, the management objective is to ensure that annual fishing exploitation rates do not exceed the target levels of 33% to 39% of the spawning stock.

River-specific management plans which have been implemented as a result of stock assessement information should be given priority over general management initiatives.

For the Margaree River, the exploitation rates since 1983 have greatly exceeded the target levels. Restrictive management measures in 1996 combined with reduced effort in the fishery resulted in exploitation rates which were closer to target levels. Until such time as the recruitment improves, the restrictive measures should be maintained with the long-term objective of ensuring that exploitation levels do not exceed the target levels as occurred in the past.

For the Miramichi River, all licensed gear are currently active and the resource is exploited at or just above target levels. There are several bycatch considerations in this fishery which constrain the options available for season adjustment: spawning striped bass are intercepted at the beginning of the fishery and bright Atlantic salmon at the end of the fishery.

## *For more Information:*

Contact: John Ritter
Science Branch
Dept. of Fisheries and Oceans
P.O. Box 5030
Moncton, N.B.
E1C 9B6

Tel: 506 851 2945
Fax:506 851 2147
E-Mail:Ritterja@dfo-mpo.gc.ca

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Maritimes Regional Advisory Process
Department of Fisheries and Oceans
P.O. Box 1006, Stn. B105
Dartmouth, Nova Scotia
Canada B2Y 4A2

Phone number: 902-426-7070
e-mail address: myrav@mar.dfo-mpo.gc.ca

Internet address: http://csas.meds.dfo.ca

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