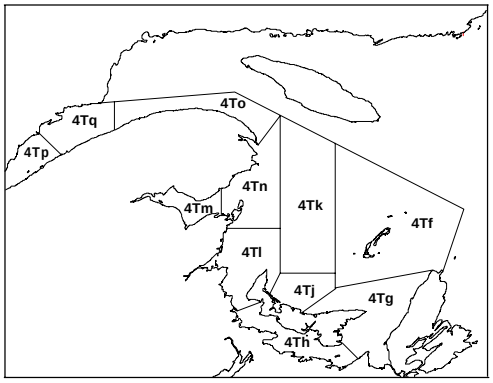
Fisheries and Oceans / Pêches et Océans
Maritimes Region

DFO Science
Stock Status Report A3-26(1998)

American Plaice in the Southern Gulf of St. Lawrence



Background

American plaice are widely distributed throughout the Northwest Atlantic, from West Greenland to the Gulf of Maine. Throughout their range, they are associated with intermediate depths (about 80-250 m) and cold waters (usually from below 0°C to 1.5°C). Male and female plaice differ in their life-history traits: females grow faster and attain larger sizes than males; male plaice have shorter lives than females. Sexual maturity is reached at 7-15 years of age for females and between 5 and 7 years of age for males. Spawning occurs from early spring to summer with each female releasing hundreds of thousands of eggs. The fertilized eggs float near the water surface for several days. After hatching, plaice are pelagic until they reach a minimum length of 18 mm, when metamorphosis occurs and they become benthic. Plaice consume a wide range of organisms throughout their life cycle: young plaice consume bottom organisms such as mysid shrimp, amphipods, polychaetes, echinoderms and mollusks; older plaice consume other small fish species and invertebrates.

In the southern Gulf of St. Lawrence (NAFO Division 4T), American plaice has been under quota management since 1977. The resource was exploited mainly by longlines in the 1930s, but by the 1960s most landings were made by seines and otter trawls. Plaice are now caught by a diverse fishery of fixed and mobile gear, with the dominant sector being seines operated by vessels less than 45 feet. With the growth of mobile gear sectors during the 1960s, a large component of plaice catches in 4T (30-40% by weight) was commercially undersized and discarded at sea. Recent measures, including increased mesh sizes and mandatory landing of all catches, have reduced discarding; however, the practice persists in 4T. The uncertainty in plaice landings caused by discarding has been central to management of the stock. Discarding has made it difficult to estimate the level of fishing mortality in relation to a target of $F_{0.1}$.

The Fishery

The quota for 4T American plaice was 2500 tonnes in 1997. Most gear sectors landed less than their quota allocation, for total **landings** of 1,900 tonnes. Minimum mesh sizes in 4T groundfish fisheries increased with regulations imposed in 1993. In 1997, most areas of 4T were required to use a minimum 155-mm square mesh in the codends of seines and trawls directing for plaice, but many fishers reported using 160 and 165-mm meshes. The minimum mesh size for gillnet fisheries directing for 4T plaice was 150 mm. The legal minimum size remained 30 cm.

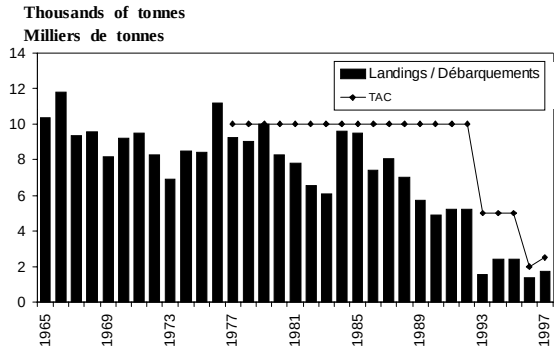
In 1997, 460 tonnes of cod bycatch were allocated to vessels directing for 4T plaice. The fishery was closed to individual vessels when cod bycatch exceeded 25% of the total catch weight. From 1993 to 1996, fisheries were closed to all fleet sectors when cod bycatch exceeded 10% of the catch weight. The regulations adopted in 1997 reduced the number of fishery closures and may have contributed to an increase in fishing activity and landings. In contrast, cod bycatches in

1996 caused most of the 80 closures affecting the 4T plaice fishery. In 1996 and 1997, all vessels were required to hail their arrival at port and before departing for sea. Bycatch and size composition of 20% of catches landed by competitive mobile gear and fixed gear vessels were verified at port by catch monitors. Dockside monitoring was required on all catches of the ITQ mobile fleet.

Landings in thousands of tonnes.

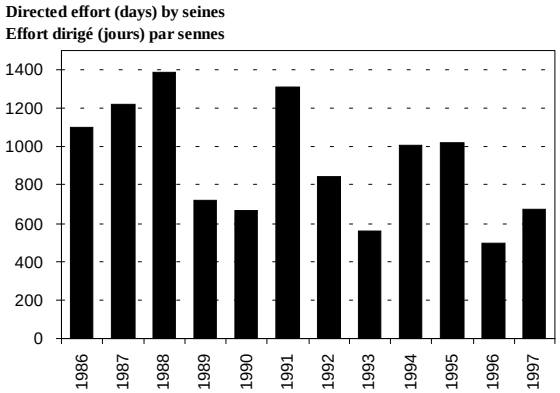
	70-79	80-89	90-93				
Year	Avg	Avg	Avg	1994	1995	1996	1997
TAC	10.0[1]	10.0	8.8	5.0	5.0	2.0	2.5
Total	9.0	7.6	4.2	2.4	2.4	1.4	1.9[2]

[1] TAC was first established in 1977.
[2] Preliminary



Annual **landings** since 1965 have averaged 7284 t, with a maximum in 1966 (11,780 t). Plaice landings reached their lowest observed level in 1996. Seines have been the dominant gear in most years since 1981, contributing roughly 75% of landings in 1997. The closure of the 4T cod fishery in 1993 caused the American plaice fishery to become a mainly directed activity. Before 1993, roughly 40-60% of annual plaice landings were caught as bycatch of cod fishing. Since 1993, plaice fishing has concentrated in eastern 4T (unit areas 4Tf and 4Tg).

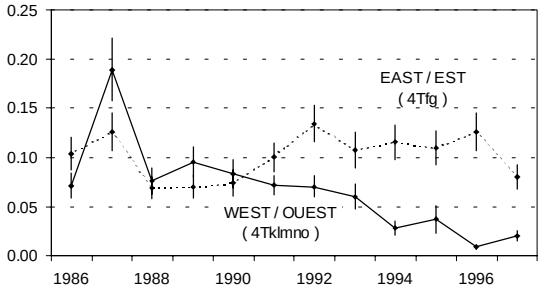
Trends in **nominal effort** in the plaice fishery, recorded in vessel logbooks as the number of days spent fishing, are monitored to detect changes in fishing pressure since closure of the cod fishery. In 1996, effort by seines directing for plaice dropped to its lowest level (500 fishing days) since the mid 1980s. Seines fished plaice for 675 days in 1997. Trawling effort was at its lowest in 1993, at 116 fishing days, in the plaice-directed fishery. Effort by trawls increased yearly to 497 days in 1995, but declined to 290 days in 1997. Although directed fishing effort declined sharply for both gear types in 1993 with closure of the cod fishery, the most striking decline was in directed effort by trawlers in western areas of 4T (Chaleur Bay, the Gaspé coast and the area northeast of Prince Edward Island).



The exploitation of plaice has shifted towards eastern parts of 4T in the 1990s. In **consultations with industry**, fishers from Caraquet and Grande Rivière (Gaspé) considered the resource to be at a low level of abundance in Chaleur Bay, in spite of low fishing effort over the past five years. Some fishers felt that it is difficult for them to assess the abundance of the resource because of the decline in fishing effort in this sector. Magdalen Islands fishers considered the resource to be at low abundance in western and northern parts of 4T, but abundant off the coast of Cape Breton. This view was supported by fishers in Port Hawkesbury.

Commercial catch rates of plaice in eastern (4Tfg) and western (4Tklmno) sectors reflect these views: catch rates have declined progressively in western 4T, but have maintained a relatively high level through most of the 1990s in eastern 4T.

Commercial catch rates (tonnes / hour)*
Taux de captures commerciales (tonnes par heure)*



*** ± one standard error / ± erreur type**

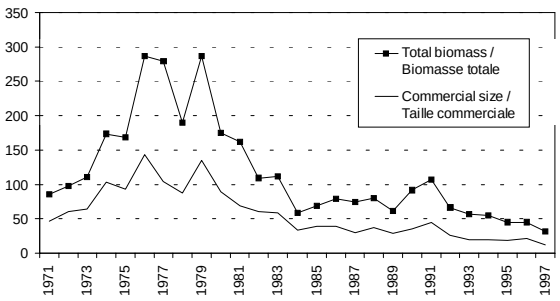
The 1987 year-class appeared as a dominant age-class in the 1994, 1995 and 1997 fisheries. An increase in the number of plaice aged less than 9 years of age was noted in 1994 and interpreted as an increase in landings of plaice less than 30 cm in length, the result of management measures to reduce discarding. However, the proportion of plaice under 9 years of age has declined in 1997 to the level that was observed between 1989 and 1992, before current regulations on minimum size were imposed. Although recent improvements have been made to fishing practices to reduce the capture of undersized plaice, it appears that some discarding persists in the fishery. When the length composition of plaice catches measured by observers at sea is compared with landed catches measured at port, the landed catches tend to have fewer plaice less than 30 cm (comparisons made for 1994-1996 fisheries).

Resource Status

Stock status evaluation was based on commercial landings and effort, the age composition of commercial catches, and abundance trends in research surveys conducted annually since 1971. A sequential population analysis was attempted in 1998, but was unreliable due to uncertainties in catch-at-age data caused by past variable levels of discarding in the fishery.

The abundance of plaice in the **research survey** has declined to its lowest level for the third consecutive year. In 1997, catches averaged 131 plaice per tow, a decline of 23% since 1996. The plaice catch was highest in 1977 at an average of 1127 plaice per tow, but declined in the late 1970s and early 1980s. Survey catches have averaged 376 plaice per tow since 1971. Confidence intervals for the survey estimates of plaice abundance have been narrow for most of the 1980s and 1990s, including 1997.

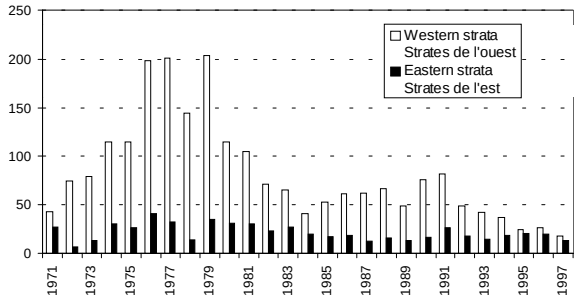
Survey trawlable biomass (thousands of tonnes)
Biomasse chalutable du relevé (milliers de tonnes)



The minimum **trawlable biomass**, based on research surveys and unadjusted for catchability, was approximately 31,000 tonnes in 1997, of which commercially-sized plaice (minimum 30 cm) contributed 13,000 tonnes. Both trawlable biomass and the biomass of exploitable plaice reached their lowest level in the survey time series in 1997. Research surveys and commercial catch rates indicate that a shift in **plaice distribution** has occurred recently in 4T. Plaice abundance has varied more widely in western parts of the 4T survey. Survey data indicate that the decline in biomass through the 1990s has been continuous in western 4T, whereas

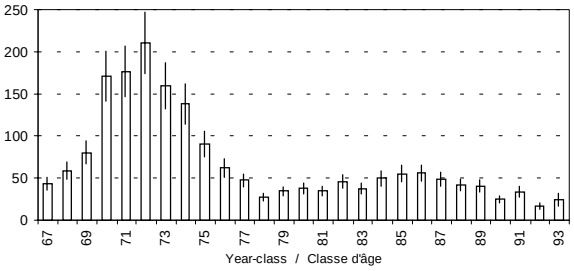
plaice biomass has been relatively stable in the east. This pattern is consistent with catch rates of commercial vessels in eastern and western 4T.

Survey trawlable biomass (thousands of tonnes)
Biomasse chalutable du relevé (milliers de tonnes)



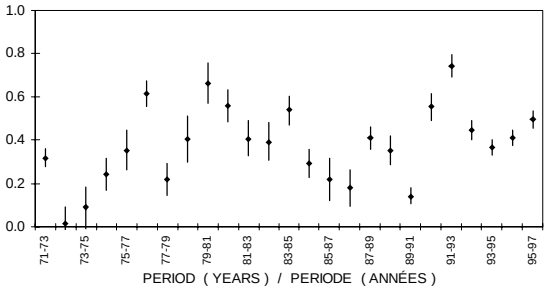
Estimates of **year-class strength** were based on survey catch-at-age for plaice not fully recruited into the commercial fishery (ages 4-7). Results indicate exceptionally strong year-classes born in the early 1970s. Year-class strength has declined through most of the period since the mid 1980s. The two most recent year-classes for which estimates are available, plaice born in 1992 and 1993 (aged 4 and 5 years in the 1997 fishery) appear to be among the weakest year-classes since the late 1960s.

Mean number per tow at age-5
Nombre moyen par trait à l'âge de 5 ans



Total mortality has increased in the 1990s to 0.49 in the period 1995-97. Mortality is currently at a level that is intermediate to estimates since 1971.

Total mortality*
Mortalité totale*



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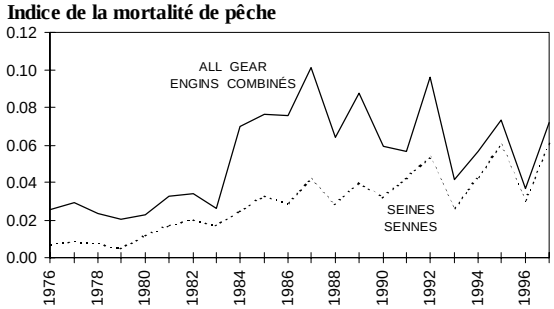
Uncertainty in the landings of 4T plaice, due mainly to discarding of catches, makes it difficult to define targets corresponding to $F_{0.1}$. Trends in **exploitation rate** were examined from an index (Relative F) based on the ratio of commercial catches to survey catches. The index was size-based, including only non-discarded plaice (lengths of 30 cm and greater). Fishing mortality for all gear increased sharply in the mid-1980s and has fluctuated widely since then. The sharpest decline occurred between 1992 and 1993 when fishing effort on plaice dropped with closure of the 4T cod fishery. Fishing mortality by the dominant gear contributing to plaice landings (seines) has increased with a more regular trend over time. In spite of lower fishing effort and catches of plaice in recent years, fishing mortality is currently in the upper range of estimates since 1976.

Index of fishing mortality
Indice de la mortalité de pêche



Outlook

Projections are not possible for this stock, but recent levels of harvest have not resulted in rebuilding and it appears that the stock continues to decline. At current stock size, the index of fishing mortality (relative F) suggests that fishing mortality is high relative to historical levels. Other factors indicate the need for a cautious approach to harvesting: total mortalities have not declined and year-class strength has been poor for several years and continues to decline. Similar conditions of declining stock size and poor recuitment exist in other plaice stocks in the Northwest Atlantic at low levels of exploitation.

The 4T research survey provides a reliable index of plaice abundance, corroborated by trends in commercial catch rates. These data sources indicate that the geographic distribution of 4T plaice has shifted recently to the east. The causes of this shift remain unknown. Studies of plaice genetics indicate that 4T plaice constitute a stock unit. Analyses of mortality, year-class abundance and body growth indicate that plaice in eastern and western 4T are highly similar, further suggesting that they compose a single stock. The concentration of 4T plaice in a limited sector may render the stock vulnerable to excessive exploitation.

Management Considerations

Declining stock abundance, the changing distribution of the resource, poor recruitment and high mortalities suggest that landings during the latest period of decline (1994-97), which averaged about 2,000 tonnes, were too high. Chances for stock conservation would improve if catches were kept well below this level in 1998.

Discarding has been a central issue in the management of 4T plaice and has limited our ability to set appropriate targets for the fishery. The fishing industry has adopted progressive measures to reduce the capture of undersized plaice, through increases in mesh size and catch monitoring. However, it has not been possible to detect the effects of these measures and it appears that some discarding persists in the fishery.

Nominal effort on plaice increased in 1997 with measures permitting the incidental capture of 4T cod and fewer closures. Increases in the number of mobile vessels directing for plaice suggest a trend of increasing participation in the fishery.

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