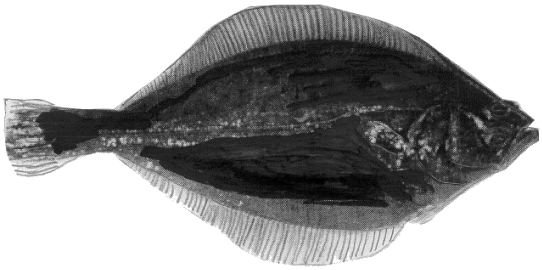
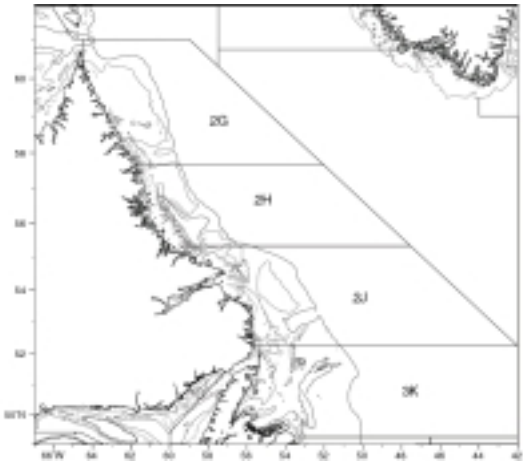
Fisheries and Oceans Science / Pêches et Océans Science
Newfoundland and Labrador Region
Stock Status Report 2003/044



American plaice in Subarea 2 and Division 3K



Background

American plaice, which occurs on both sides of the North Atlantic, is a bottom dwelling flatfish. In the western Atlantic, the species ranges from U.S.A. waters to the Arctic, with the largest population occurring on the Grand Bank off Newfoundland. American plaice are found over a wide range of depths and temperatures.

Tagging studies and analyses of morphometric data indicate that American plaice in Subarea 2 + Division 3K are a separate population from Div. 3LNO. Within SA 2 and Div. 3K, the bulk of the stock has always been in Div. 2J and 3K.

In recent years, female American plaice in Divisions 2J and 3K mature at about age 8 and 30 cm while male plaice mature at about age 4 and 16 cm. This is a relatively slow growing species with fish not reaching 40 cm until nearly age 10.

Catches from this stock were highest from 1968 to 1972, during which time they averaged about 10,000 t per year. Since 1981, catches have exceeded 2000 t only twice. Through the 1980's the majority of this fishery occurred in the offshore, by otter trawl, although inshore catches, mainly by gillnets, were higher than offshore catches in some years. The stock has been under moratorium since the beginning of 1994, and catches averaged just 13 t per year from 1994-99. However, catches have increased since 1999, averaging 100 t per year from 2000-02, due mainly to by-catch in the Greenland halibut fishery.

Summary

- Stock biomass has remained very low since 1992 and has declined since the last assessment (2000). Stock biomass is currently estimated to be about 3% of the 1980-84 average.
- Reported by-catch averaged about 100 t per year from 2000 to 2002, compared to an average of 13 t per year from 1994-99.
- Median age at 50% maturity for females declined from about age 11 during the 1960s to age 8 in the 1990s.
- Survey data for 1978 to 2002 indicated that there have been no good year classes since the mid- 1980s.
- Estimates of total mortality indicate that for ages 5-10, average mortality over the last five years has been high (0.76).
- The stock continues to decline despite low levels of catch. There is extreme concern for this stock.

Canada

Species biology

Male American plaice mature substantially younger and smaller than females. **Age at maturity**, calculated for each year-class, declined since the early 1970's. It has stabilized since the 1990 cohort and the age at 50% maturity is age 8 for females and 4 for males. **Length at maturity** has also shown a decline since the early 1970's but again has leveled off. For males length at 50% maturity has declined from around 25 cm to 15 cm and for females it has declined from 40 cm to 38 cm (Figure 1). The length at 50% maturity is poorly estimated for the last cohort for females and the sharp increase may not be real.

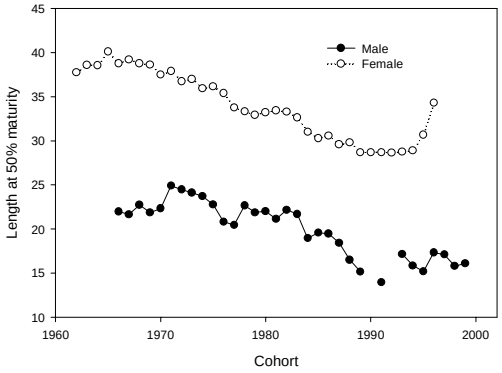


Figure 1. Length at 50% maturity for male and female American plaice in Div. 2J3K.

Based on the surveys, the distribution of American plaice in SA 2+ Div. 3K has changed in recent years. Up until the late 1980's most American plaice were found on and around the shallower areas such as Hamilton Bank. Since then most fish have been found in the deeper channels between the Banks (Brodie and Morgan, 2000). In 2002, there were no significant concentrations of American plaice and the number of survey sets with no plaice catch has increased (37% sets with zero plaice catch in 2002, compared to 27% sets with zero plaice catch in 1999).

The Fishery

Catches from this stock were highest from 1968 to 1972, peaking at almost 13,000 t in 1970 (Figure 2). Catches by non-Canadian vessels were substantial up to 1977, and were taken mainly by vessels from USSR and Poland. Since 1991 only Canada has been involved in this fishery. Catches averaged about 2700 t during the 1980's but rapidly declined after 1991. Based on a recommendation by the FRCC the directed fishery was closed at the start of 1994. There has been no directed fishing since that time but by-catch in the Greenland halibut fishery has seen the catch increase from an average of 13 t per year in 1994-99 to an average of 100 t per year from 2000 to 2002. The 2003 reported catch, as of October 6, was 34 t.

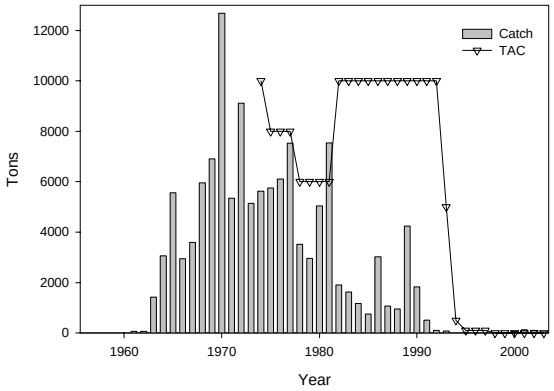


Figure 2. Reported catch and Total Allowable Catch for American plaice in SA 2 + Div. 3K.

By-catch from the Greenland halibut fishery in 2001 and 2002 was composed primarily of sexually mature females, mostly in the range 8-11 years of age. Estimated by-catch in the shrimp fisheries during 2000-2002 in SA 2 + Div. 3K were in the range of 7-11 t per year, comprised mainly of fish aged 2 and 3 years. By-catches of plaice in the shrimp fishery have declined since the introduction of Nordmore grates.

Catches were generally taken in deepwater offshore areas by otter trawls and in the

inshore areas by gillnets. Almost 90% of the catch in 2002 occurred as by-catch in the otter trawl fishery for Greenland halibut, near the boundary between Div. 3K and 3L.

Industry perspective

There is concern from industry whether plaice in Div. 3L form part of the same stock as found in Subarea 2 + Div. 3K. It was noted that most of the by-catch of plaice in the Greenland halibut fishery occurs in the winter with by-catch decreasing substantially in April-May.

Resource Status

DFO bottom trawl surveys of Subarea 2 and Div. 3K from 1978 to 2002 were used to evaluate resource status. The data from 1978 to 1994, which were collected by a different vessel and gear, were converted into values comparable with those in surveys from 1995 to the present. From the mid 1980's to 1992 there was a large decline in the biomass indices (Figure 3). Since 1992 stock size has remained very low. Current biomass is only 3% of the average from 1980-84. Abundance at all ages is low compared to the mid 1980's, and there are currently no fish at the oldest age groups which were found in the stock in the late 1970's and early 1980's (14+ years). Surveys in Div. 2GH, although not conducted annually, also indicate a substantial decline in biomass and abundance from the late 1970's to the present.

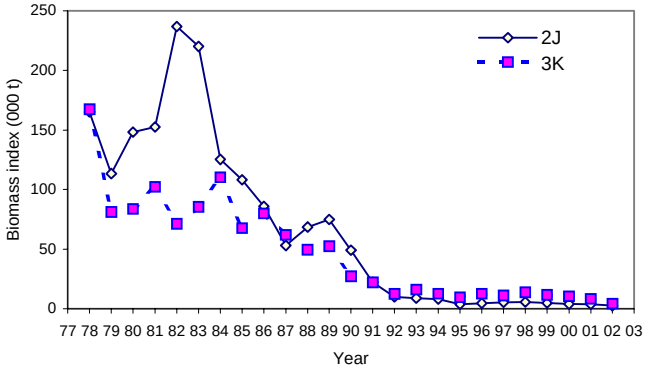


Figure 3. Biomass index of American plaice from research vessel surveys in Div. 2J+3K from 1978-2002. Data from 1978-94 are converted to Campelen equivalents from the Engel data.

Estimates of total mortality from survey data have shown an almost continual increase especially during the first half of the 1990's despite very low catches. The average mortality on ages 5-10 over the last 5 years (1997-2002) has been very high at 0.76. This may indicate an increase in natural mortality over that time period.

Spawning stock biomass (SSB) estimated from surveys has decreased since the 1980's and continues to decline. The current estimate of SSB, only 5% of the average of the 1980-84 period.

Analyses of **recruitment** from 1978-2002 survey data indicated there have been no good year classes since the mid- 1980's (Figure 4).

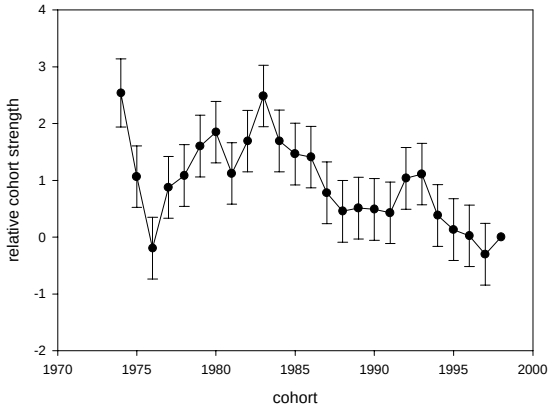


Figure 4. Estimates of recruitment (cohort strength) of American plaice from research vessel surveys in Division 2J and 3K.

At present the current SSB index is estimated to be at about 5% of the level above which large numbers of recruits would be expected (Figure 5).

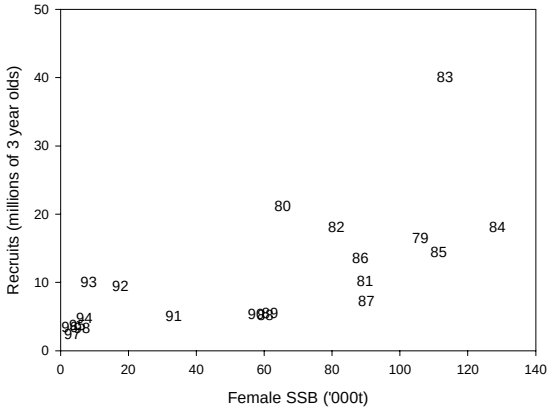


Figure 5. Recruitment and female spawning stock biomass for American plaice in Div. 2J3K.

The ratio of reported catch to research vessel biomass (C/B ratio), which gives a proxy for fishing mortality, increased after 1999, as catch increased and survey biomass declined, but still remained low, relative to total mortality.

Sources of uncertainty

This assessment is based solely on analyses of survey indices and trends in catch. There has been insufficient sampling of the commercial catch in many years, mainly due to the very small catches, to construct a catch at age. Thus it is not possible to use standard age-structured models to estimate total population size.

There has been some debate on the extent that fishing contributed to the decline of this stock. Morgan et al. (2000) looked at various sources of data, including observer estimates of catch and discards from fisheries in the 1980's and overlap in the distributions of cod and American plaice. Their analyses supported the conclusion that fishing was not the cause of the decline of this population of American plaice.

Possible causes of the high mortality estimates for this stock are diverse and uncertain. For example, there are no estimates of predation by seals available at present. The last available information on predation by seals, which was for the year 1996, came from Hammill and Stenson (2000), which indicates seal predation on American plaice may be significant.

Outlook

Given the current extremely low stock size, the lack of recruitment and high estimates of total mortality indicated by the surveys, and the slow growing nature of American plaice, there is little prospect of significant rebuilding in the short to medium term. The stock did not show signs of recovery during a period of very low by-catch. The stock continues to decline and there is extreme concern for the future of the stock.

Management Considerations

Since the imposition of the moratorium, catch of American plaice has consisted of by-catch from other fisheries such as shrimp, cod, Greenland halibut, and winter flounder. Catches of American plaice will increase as catches of other species increase. This is

occurring in the Greenland halibut gillnet fishery. With restrictions on by-catch of American plaice in Conservation Harvesting Plans there is a potential for substantial discarding such that landings may significantly underestimate catch. These two factors will result in an increase in fishing mortality. Increased monitoring of catches and landings would result in better estimates of removals and may result in less discarding. In addition, it has been reported that the by-catch of American plaice in the Greenland halibut fishery drops off substantially after spring, there may be some seasonal component to decreasing the by-catch in this fishery.

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References

Brodie, W.B. and M.J Morgan. 2000. An assessment of the American plaice stock in NAFO Subarea 2 and Division 3K. DFO CSAS Res. Doc. 00/130.

Dwyer, K. S., W. B. Brodie and M. J. Morgan. 2003. An assessment of the American plaice stock in NAFO Subarea 2 and Division 3K. DFO CSAS Res. Doc. 03/095.

Hammill, M.O. and G. B. Stenson. 2000. Estimated prey consumption by harp seals (*Phoca groenlandica*), hooded seals (*Halichoerus grypus*) and harbour seals (*Phoca vitulina*) in Atlantic Canada. J. NW. Atl. Fish. Sci. Vol. 26: 1-23.

Morgan, M.J., W.B. Brodie, and D.W. Kulka. 2000. Was overexploitation the cause of the decline of the American plaice stock off Labrador and northeast Newfoundland? Fish. Res. 57: 39-49.

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