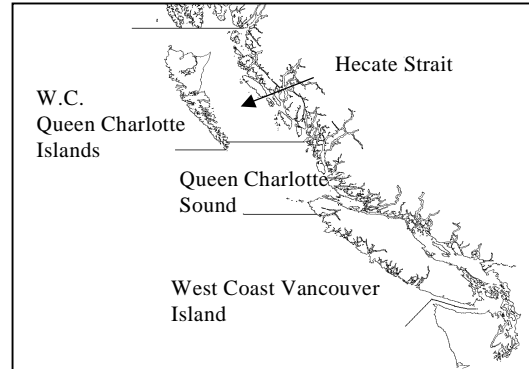
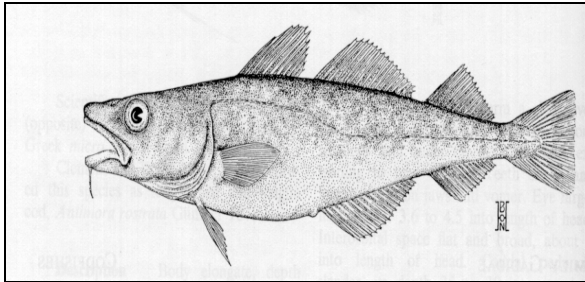


Pacific Region



Pacific Cod in Hecate Strait

Background

Pacific cod (Gadus macrocephalus) are widely distributed in the coastal north Pacific, from the Bearing Sea south to Santa Monica, California, in the east, and to the Sea of Japan in the west.

Four stocks of Pacific cod are defined for management purposes on the BC coast: Strait of Georgia, west coast Vancouver Island, Queen Charlotte Sound, and Hecate Strait. Tagging studies indicate there is very little movement of cod among areas. The depth distribution of landings indicates that there is a seasonal migration between shallow waters in spring and summer and deeper waters in fall and winter. Spawning occurs mainly from February to March. Although it is difficult to age Pacific cod, they appear to grow relatively quickly, reaching about 30 cm in the first year of life and sexual maturity by 2-3 years of age.

Pacific cod are opportunistic feeders, preying on invertebrates (amphipods, euphausiids, shrimp, and crabs) and fish (herring, sandlance, and flatfish).

This assessment considers only the Hecate Strait stock of Pacific cod.

Summary

- The assessment indicates that stock biomass was at historically low levels in 1994-96 and that there has been a slight increase in the past 2 years.
- Recruitment estimates are low, with the last 9 year-classes falling below the long-term average. This is the longest run of below-average year-classes in the time series, which goes back to 1956.
- Projections indicate that the stock will decline in the next 2 years. Given these forecasts, it is prudent to consider lower fishing mortality rates in 1999-2000.

The Fishery

Pacific cod in Hecate Strait are fished mainly with trawls. The species is a significant component of the multi-species groundfish fishery in the area. Annual yields have varied between a high of 8,870 t in 1987 to a low of 403 t in 1996. The trawl fishery has undergone a number of significant changes in recent years that may influence the quality and comparability of data collected from the fisheries.

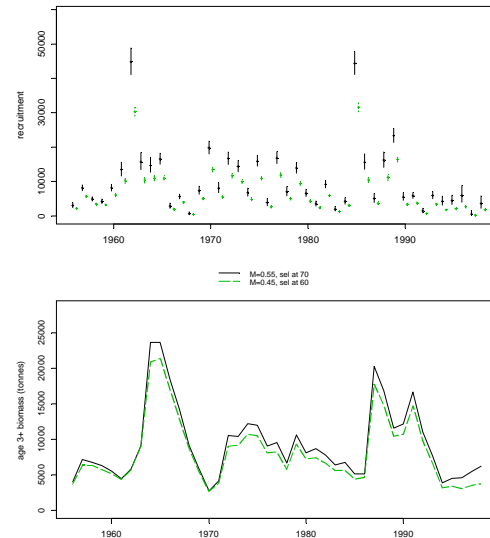
Prior to 1992, the total catch of Pacific cod was unrestricted and the main management measures were area/season closures. Total allowable catches were introduced in the Hecate Strait area in 1992. Trip limits were also introduced in the same year and these decreased steadily until 1995. For the 1996 season, trawl catches were limited to by-catch only because of stock concerns. An individual vessel quota system was introduced for the B.C. trawl fishery in 1996 and the fishing season was changed from a calendar year to April-March.

A voluntary 140-mm minimum codend mesh size was suggested in the 1991 Pacific Groundfish Trawl Management Plan for the Hecate Strait area, compared with a coast-wide regulation for 76 mm. The new minimum was legislated for the Hecate Strait in 1995.

Resource Status

Reconstructions of the Hecate Strait Pacific cod stock were conducted using a catch-at-length model, as in previous assessments. The major modification to this year's assessment was the inclusion of data from the multi-species Hecate Strait survey. While abundance estimates from this survey are not precise, the survey has been conducted in a consistent manner since 1984, and should provide information on the general trends in relative abundance. Stock analyses were conducted under two different assumptions. The first was that selectivity for 60-cm fish was constant among commercial fisheries. The other assumes a constant selectivity for 70-cm fish. The 60-cm assumption is more restrictive. Stock trends and estimates of the recruitment time series are shown (see Figure) for the two analyses. Both analyses suggest that stock abundance remains near historic lows, that recruitment of the last 9 year-classes is

below the median level, and that the 1998 year-class is the smallest ever. The last result is largely dependent on the length structure observed in the 1998 Hecate Strait survey.



Estimates of the 1956-1998 time series of recruitment and spawning stock biomass from MULTIFAN CL analyses of Hecate Strait Pacific cod assuming either $M=0.45$ and common fishery selectivity at 60 cm or $M=0.55$ and common fishery selectivity at 70 cm.

Outlook

Stock projections were conducted for the years 1999 through 2002 using stochastic simulations, where the stochastic elements were the 1998 number-at-age and the 1999 through 2002 recruitment levels. These stock projections suggest that the spawning stock biomass will continue to decrease through 2001 with a small probability of increase in 2002. Potential yield in 1999, based on target age-5 fishing mortality rates from 0.30 to 0.50, were 600 to 890 tonnes for the common selectivity at the 60-cm assumption and 1,090 to 1,560 tonnes for the common selectivity at the 70-cm assumption. Given that biomass declined in all cases, PSARC recommends that it is

prudent to consider lower fishing mortality rates.

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