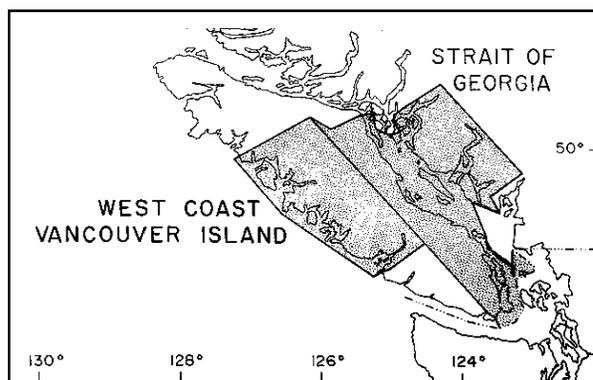


West Coast Vancouver Island Herring



Background

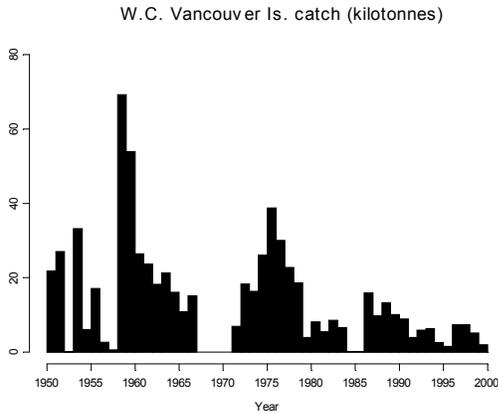
Pacific herring is a pelagic species which occurs in inshore and offshore waters of the North Pacific. In the eastern Pacific it ranges from California to the Beaufort Sea. Herring mature and recruit to the spawning stock predominantly between ages 2 and 5. Within this range, age-at-recruitment tends to increase with latitude. The west coast of Vancouver Island (WCVI) herring stock is one of five major B.C. herring stocks. The fishery began here at the turn of the century but did not become extensive until the expansion of the dry-salted fishery in the 1920s and reduction fishery in the 1940s. Between 1918 and 1966 the catch from this stock averaged 18,000 t. This stock declined as part of the coastwide collapse from overfishing in the early 1960s, and the commercial reduction fishery was closed in 1967. Following a combination of favourable environmental conditions and a low harvest rate, the stock recovered by the mid-1970s. The current roe fishery began in 1972. Unfavourable oceanic conditions returned in 1978, and the stock has been in a low productivity state since then. The target harvest rate of roe herring is fixed at 20% of the forecast mature stock biomass, when the stock size is sufficiently above the threshold or minimum spawning stock biomass (Cutoff). The current assessment indicates that the forecast mature herring biomass is less than the fishing threshold (18,800 t), and so this stock will be unable to sustain a fishery in 2001.

The Fishery

Average WCVI Catch (ktonnes)

1951-60	1961-70	1971-80	1981-90	1991-00
23.2	13.2	18.2	7.8	4.7

All herring spawning within Statistical Areas 23 to 25 are assumed to belong to the west coast of Vancouver Island (WCVI) stock that migrates inshore in the late fall and leaves, after spawning, in late March and April. From the mid-1940s until the late 1960s, these herring were harvested and processed (reduced) into relatively low value products such as fish meal and oil. The largest catch, 70,000 t was taken in the WCVI in 1959. Catches increased dramatically in the early 1960s but were unsustainable. By 1965, most of the older fish had been removed from the spawning population by a combination of overfishing, and a sequence of weak year-classes, attributed to unfavourable environmental conditions and a low spawning biomass. As a result, the commercial fishery collapsed in 1967, and was closed by the federal government to rebuild the stock.



Following the closure, a series of above average year-classes occurred in the early 1970s rebuilding the stock quickly and providing opportunities for a new fishery. During the closure, the small traditional fisheries continued locally for food and bait (Hourston 1980). At this time there was a growing interest to harvest roe herring for export to Japan as their stocks became decimated. A small experimental roe harvest began in 1971, and expanded rapidly until 1983, when fixed quotas were introduced to regulate the catch. A significant quantity of WCVI herring is also utilized for spawn-on-kelp, and aboriginal food fish.

The objective of the current herring fishery is to obtain a low volume, high-quality product that is economically profitable and ecologically sustainable. The fishery is managed by setting a fixed quota based on a harvest rate of 20% of the forecast mature stock biomass. To meet conservation objectives, the management strategy also enforces a minimum spawning stock biomass. If the forecast biomass falls below the Cutoff threshold (18,800 t) the commercial fishery is closed to allow for stock recovery. In response to reduced stock levels the WCVI fishery was closed in 1985 and 1986. Subsequently, the stock has rebuilt and sustained an average catch of 4,700 t over the past decade. Recent catches from this stock have been:

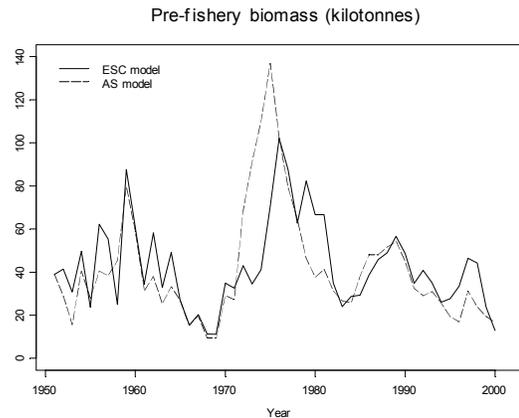
WCVI Catch (ktonnes)

1996	1997	1998	1999	2000
0.8	6.8	7.0	4.4	1.3

Resource Status

Herring stock assessments utilize information from biological samples for determining the population age composition and average weight-at-age, historical catch data, and an assessment of the distribution and intensity of egg deposition in the stock assessment area (Schweigert et al. 1998). The forecast of the pre-fishery biomass of mature herring is estimated by two assessment models: a catch-at-age and an escapement model. The catch-at-age model relies on data on population age-structure and total catch to estimate stock abundance while the escapement model determines total spawning escapement from an estimate of the total egg deposition.

Since 1970 the two assessment models have displayed very different estimates of stock abundance although the trends have remained consistent. The PSARC Pelagic Subcommittee uses decision criteria to assess each model and thereby determines the current stock level, projected future run size, and recommended allowable catch. For 2001, the assessment and forecast based on the escapement model was adopted by the Subcommittee.



Assuming a poor recruitment of about 729 tonnes, the projected stock biomass for 2001 is about 14,500 tonnes with no harvestable surplus based on the 18,800 tonne Cutoff threshold.

Climatic Factors

Research has shown that the growth and survival of WCVI herring are sensitive to natural

variations in ocean climate. These recurring climatic changes, which last for a decade or two, cause significant shifts in the structure and productivity of the coastal ecosystem where the herring live. Specifically, the productivity of the WCVI herring stock changes in response to interannual and decadal time scale variations in the climate of the coastal ocean (indexed by water temperature), and spawning biomass. Recruitment is the most important process determining the productivity of B.C. herring populations. Long-term research has shown that both recruitment and adult survival tend to be below average in warm years, particularly when migratory herring-predators (like Pacific hake and mackerel) are abundant off the west coast of Vancouver Island. The coastal ocean has been in a protracted warm state since 1978. When this occurs the productivity of the copepod and krill populations that herring feed on appear to decline. Also, more Pacific hake migrate for the summer to the WCVI stock assessment area, where they eat a lot of herring. Pacific mackerel and hake tend to be particularly abundant during warm El Niño summers.

Stock reconstructions indicate that herring cohorts born in cool years are twice as large, on average, as those born in warm years. Surplus production calculations indicate that the unfished carrying capacity of the WCVI population is about 111,000 t when the environment and ecosystem are in a cool climate state, but is less than half as large (about 49,000 t) during a warm climate state. Retrospective stock production analyses indicate that the WCVI stock can sustain catches exceeding 20,000 tonnes during cool climate states. However, the sustainable catch is less than 8,000 t during warm climate states.

Outlook

The biomass of the WCVI stock in 2000 prior to the fishery was estimated at only 12,500 t. Based on an offshore survey of the stock in August 2000 the abundance of the recruiting 1998 year-class is forecast to be low and overall stock levels continue to be reduced. The recent pattern of a generally below average recruitment to the stock

is not expected to improve until the current warm climate moderates, and returns to an average, or cool state.

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References

- Hourston, A.S. 1980. The decline and recovery of Canada's Pacific herring stocks. Rapp. P.-v. Reun. Cons. Int. Explor. Mer, 177: 143-153.
- Schweigert, J.F., C. Fort, and R. Tanasichuk. 1998. Stock assessments for British Columbia herring in 1997 and forecasts of the potential catch in 1998. Can. Tech. Rep. Fish. Aquat. Sci. 2217: 64p.

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