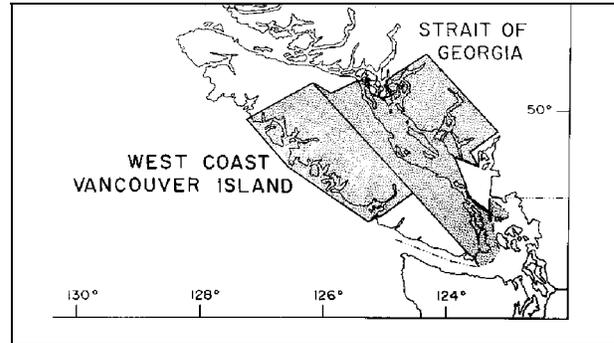


West Coast Vancouver Island Herring

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 above the fishing threshold (18,800 t), but given the recent depressed level of this stock a modest fishery is anticipated in 2003.



Summary

- 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 fishing Cutoff threshold (18,800 t), the commercial fishery is closed to allow for stock recovery.
- For the current assessment a revised catch-at-age model was adopted as the best predictor of stock abundance.
- Assuming a poor recruitment in 2003, the abundance forecast for 2003 is for a run of 30,030 tonnes and a harvestable surplus of 6,010 tonnes.

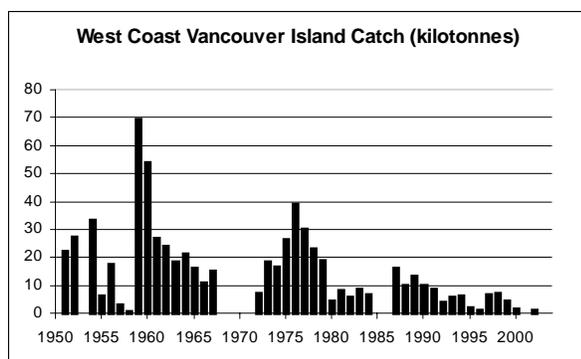
The Fishery

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. This was 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 (18,800t) 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 3,900 t over the past decade¹. Recent catches from this stock have been:

WCVI Catch (ktonnes)

1998	1999	2000	2001	2002
7.0	4.4	1.6	0.0	0.8

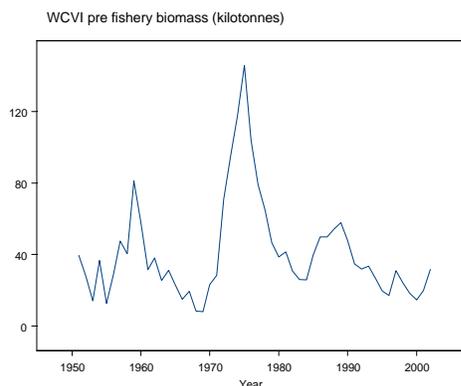
Resource Status

Herring stock assessments utilize information from biological samples for determining the population age

¹ Excluding years where commercial fisheries were closed.

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 2001). Prior to the 2002 assessment, the forecast of the pre-fishery biomass of mature herring was estimated by two assessment models: a catch-at-age and an escapement model. For the current assessment a revised catch-at-age model with two spawn conversion parameters (RASM-2q) was adopted as the best predictor of stock abundance (Schweigert 2001).

The Pelagic's Assessment Subcommittee annually reviews decision criteria to provide advice on a recommended allowable catch. The RASM-2q models indicates that the WCVI herring stock increased in 2002 but remains at reduced levels relative to the 1970s. Recent trends indicate that the WCVI herring stock declined from 1993 to 1996 and 1998 to 2000, increasing in 1997, 2001 and 2002 with the appearance of stronger than average 1994, 1998 and 1999 year-classes. Indications from the offshore recruitment survey conducted in 2002 are that the 1999 year-class will be poor. Assuming a poor recruitment in 2003, the abundance forecast for 2003 is for a run of 30,030 tonnes and a harvestable surplus of 6,010 tonnes based on a 20% harvest rate.



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 prey on 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 2002 prior to the fishery was estimated at 31,808 t. Based on an offshore survey of the stock in August 2002 the abundance of the recruiting 2000 year-class is forecast to be poor 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.

For more Information

Contact: Jake Schweigert
Pacific Biological Station
Nanaimo, B.C.
V9T 6N7

Tel: (250) 756-7203
Fax: (250) 756-7138
E-Mail: schweigertj@pac.dfo-mpo.gc.ca

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. 2001. Stock assessments for British Columbia herring in 2001 and forecasts of the potential catch in 2002. Can. Sci. Adv. Secr. Res. Doc. 2001/140: 84p.

This report is available from the:

PSARC Secretariat
Pacific Biological Station
Nanaimo, B.C. V9T 6N7

ISSN 1480-4913 (for English series)
ISSN 1480-4921 (for French series)

Phone: (250) 756-7208
Fax: (250) 756-7209
Email: psarc@pac.dfo-mpo.gc.ca
<http://www.dfo-mpo.gc.ca/csas>

La version française est disponible à l'adresse ci-dessus.



Correct citation for this publication

DFO, 2002. West Coast Vancouver Island Herring. DFO Science Stock Status Report B6-04 (2002).