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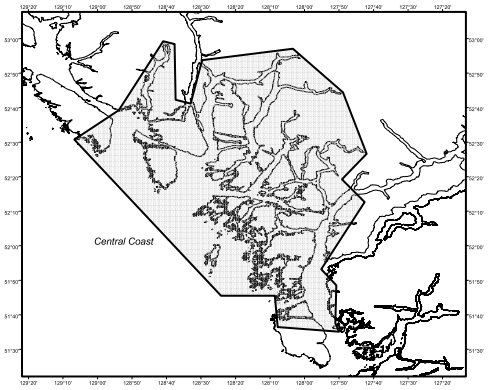
Pacific Region
Canadian Science Advisory Secretariat
Science Advisory Report 2005/065

STOCK ASSESSMENT REPORT ON CENTRAL COAST HERRING

Source: Fisheries & Oceans Canada



Map of Central Coast

Context

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 Central Coast (CC) herring stock is one of five major B.C. herring stocks. The fishery began here at the turn of the century, mainly for bait, but did not become extensive until the expansion of the dry-salted fishery in the late 1930s and reduction fishery in the 1940s. 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 favorable environmental conditions and a low harvest rate, the stock recovered by the mid-1970s. The current roe fishery began in 1972. 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). Recent assessments indicate that the mature herring biomass remains well above the fishing threshold (17,600 t), and should continue to sustain commercial and aboriginal fisheries.

SUMMARY

- All Pacific herring spawning in Kitasu Bay (Statistical Area 6), those in Statistical Area 7, and most of Area 8 are assumed to be part of a single Central Coast stock that migrates inshore in the late fall and leaves, after spawning, in late March and early April.

- The roe herring seine total allowable catch (TAC) in 2005 was 3,175 tonnes or 12% of the coastal total and the validated catch 3282 tonnes. No gillnet fishery occurred in this area in 2005. An additional catch of 497 tonnes was taken to offset the cost of test fishery and spawn assessment programs.

Canada

- The forecast mature stock biomass for 2006 is 31,630 tonnes with an allowable harvest of 6,330 tonnes.

DESCRIPTION OF THE ISSUE

From the mid-1940s until the late 1960s, herring were harvested and processed (reduced) into relatively low value products such as fishmeal and oil. 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 (Fig. 1), and was closed by the federal government to rebuild the stock.

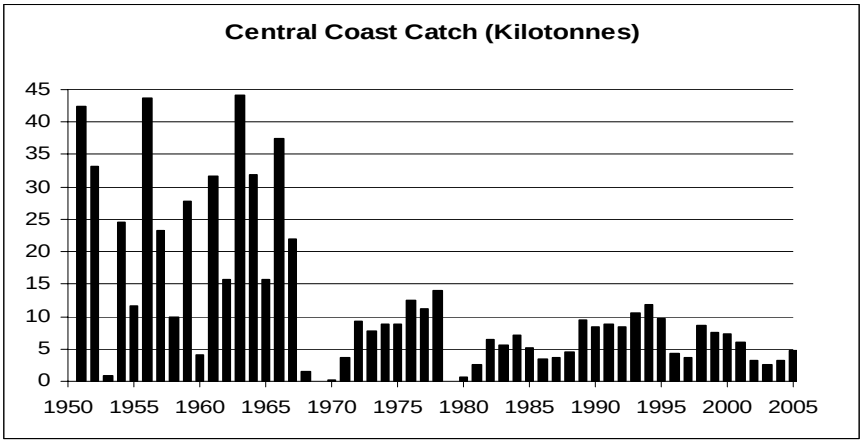


Figure 1. Total Pacific herring catch in the Central Coast from 1951-2005.

Following the fishery closure, a series of above average year-classes occurred in the early 1970s rapidly rebuilding the stock and providing new fishing opportunities.

During the closure from 1967-1973, 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 Central Coast 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 management objectives, the harvest strategy also enforces a minimum spawning stock biomass. If the forecast biomass falls below the fishing Cutoff threshold (17,600 t) managers have chosen to close the commercial fishery to allow for stock recovery. The harvest strategy is designed to minimize the number of years of commercial fishery closures. In response to reduced stock levels the Central Coast fishery was closed in 1979. Subsequently, the stock has rebuilt to a peak in abundance in 1992 and has sustained an average roe catch of 5,610 t over the past decade[1].

Recent removals from this stock have been:

Central Coast catch (ktonnes)

2001	2002	2003	2004	2005	
6.1	3.3	2.6	3.2	3.8	
0.5	*0.6*	*0.6*	*0.6*	*0.6*	*SOK Allocation*

[1] Excluding years where commercial fisheries were closed. Only anecdotal reports of food, social, and ceremonial harvests are available and so are not included here. Spawn-on-kelp (SOK) allocation (short tons) refers to live fish impounded to develop product.

ASSESSMENT

Assessment of current abundance for 2005 is obtained using an age-structured model (ASM). The analysis is based on the 55-year time series of total catch, spawn abundance, weight-at-age, and age structure data and the model is tuned used information on the total spawn deposition from egg surveys. Forecasts of abundance for the upcoming season are based on projections of current biomass assuming average levels of growth and natural mortality.

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. Prior to the 2002 assessment, the forecast of the pre-fishery biomass of mature herring was estimated by two assessment models: an age-structured and an escapement model. For the current assessment only the age-structured model assuming two spawn conversion parameters was adopted as the best estimator of stock abundance (Schweigert 2004).

The ASM model indicates that the Central Coast assessment region decreased in abundance from 1998 through 2002 and increased slightly through to 2005 (Fig. 2). The pre-fishery biomass for the area is estimated at 29,580t in 2005, an increase of 4,580 t, or 18% above the 2004 level. During the past decade seven year-classes were average or better. The 1994, 1995, 2000 and 2002 year-classes have been good while the 1996, 1998 and 2001 year-classes were poor. The 2000 year-class was abundant accounting for 32% of the total run, while the recruiting 2002 year-class contributed 36% to the stock.

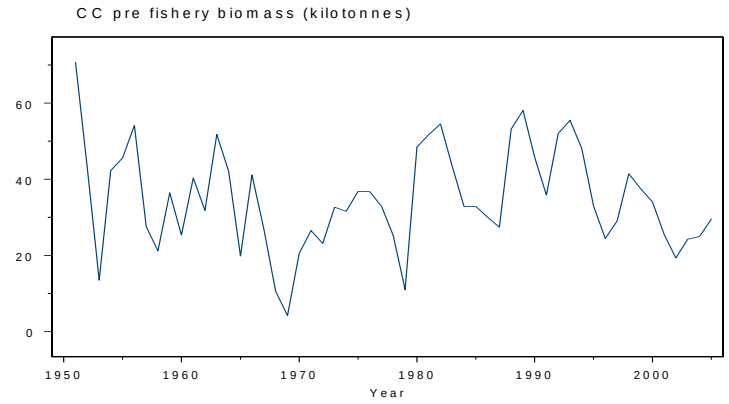


Figure 2. Estimated mature pre-fishery herring biomass from 1951 to 2005.

As with other areas, forecasting recruitment to the stock remains a significant challenge. For the 2006 assessment an average recruitment is expected and assumed for the stock forecast.

CONCLUSIONS AND ADVICE

Herring stocks are managed with a fixed 20% harvest rate, in conjunction with a fishing threshold or Cutoff level. A decision rule has been adopted by management to close off all commercial herring fisheries when the stock is forecast to be below the Cutoff level. The Cutoff levels are established at 25% of the estimated unfished average mature biomass.

On the Central Coast, an average recruitment assumption was adopted for 2006 resulting in a pre-fishery biomass forecast of 31,600 t and a potential harvest of 6,330 t. Seven of the past ten year-classes have been average or better maintaining the stock at a healthy level.

OTHER CONSIDERATIONS

Since relatively little is known about the factors that affect recruitment in this stock, it is difficult to forecast future stock trends. However, the health of the stock is directly correlated with the recruitment of strong year-classes and these have occurred at regular intervals over the past two decades. The recent increase in abundance was due to the strong 1994 and 1995 year-classes that are disappearing with increasing age. The low abundance of the 1996, 1998 and 2001 year-classes accounts for the decline in abundance of the last few years. Abundance of the 2000 year-class is high and should produce an increase in abundance in the short term.

SOURCES OF INFORMATION

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. 2004. Stock assessments for British Columbia herring in 2004 and forecasts of the potential catch in 2005. Can. Sci. Adv. Secr. Res. Doc. 2004/081: 95p.

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