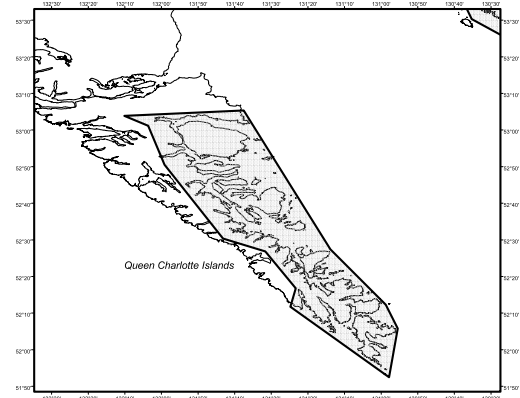




# STOCK ASSESSMENT REPORT ON QUEEN CHARLOTTE ISLANDS PACIFIC HERRING



Source: Fisheries & Oceans Canada



Map of Queen Charlotte Islands

## 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 Queen Charlotte Islands (QCI) herring stock is one of five major B.C. herring stocks. Catches were first reported from this area in 1937. Because of its remote location, QCI herring were fished intermittently until the early 1950's. This stock declined as part of the coastwide collapse from overfishing in the early 1960s, and the commercial roe 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. 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 1977 year-class was the largest in the last 50 years and supported the fishery until the late 1980's. Since then, recruitment has been generally poor and the stock has declined. Because of conservation concerns, the commercial roe herring fishery was closed from 1994 to 1996, 2001, and 2003 to 2005. A small aboriginal food fishery, and a limited spawn-on-kelp fishery were permitted in 1997, 2001, 2003 and 2004. In 1998, 1999 and 2002, small roe fisheries occurred while the stock continued to rebuild. However, the most recent assessment indicates that the mature herring biomass remains below the fishing threshold (10,700 t).*

## SUMMARY

- All Pacific herring spawning from Cumshewa Inlet in the north to Louscoone Inlet in the south are assumed to be part of a single Queen Charlotte Islands stock that migrates inshore in the late fall and leaves, after spawning, in late March and early April.
- No herring roe seine, gillnet, or spawn on kelp fishery occurred in this area in 2005.

- The forecast mature stock biomass for 2006 is 7,120 tonnes, which is below the fishing threshold (10,700 t), and only food, social, or ceremonial harvest is anticipated for 2006.

## 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. The largest catch, 77,500 tonnes, was taken in the QCI in 1956. The fishery was closed in 1953 and 1958 due to industrial disputes. Catches increased dramatically and by the late 1950s were unsustainable. Although the stock was not fished commercially in 1960, 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 (1954 to 1957), attributed to unfavourable environmental conditions and a low spawning biomass. As a result, the commercial fishery collapsed (Fig. 1), and was closed by the federal government in 1967 to rebuild the stock.

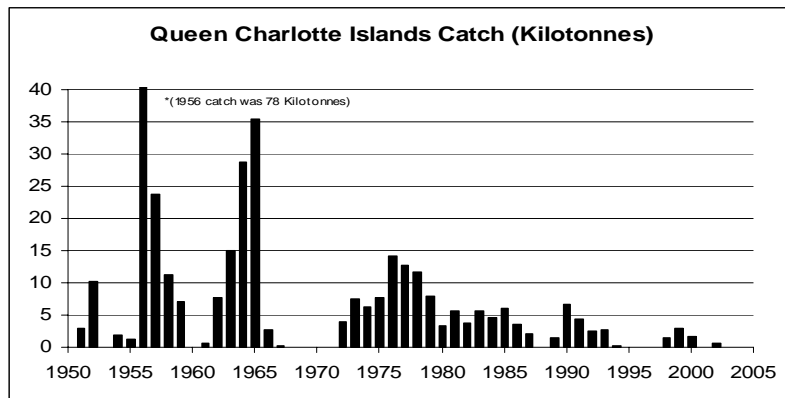


Figure 1. Total catch in the Queen Charlotte Islands from 1951-2005.

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

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 QCI 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 (10,700 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. Low stock levels resulted in the closure of the QCI roe fishery in 1988. In 1994, 2001, 2003 and 2004, the forecast run was close to the Cutoff, so fishing was restricted to aboriginal food fish and commercial spawn-on-kelp while in 1995, 1996, and 2005 only aboriginal food fishing was permitted. Abundance rebounded in 1997 but a cautious approach was taken to resuming harvest of the stock and only a

limited spawn-on-kelp fishery was permitted, while 1998 to 2000 and 2002 saw small roe fisheries take place. An average roe catch of 680 t has occurred over the past decade<sup>1</sup>.

Recent removals from this stock have been:

Queen Charlotte Islands catch (ktonnes)					
2001	2002	2003	2004	2005	
0.0	0.7	0.0	0.0	0.0	
0.4	1.0	0.5	1.0	0.0	SOK allocation

## 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 using 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 age-structured (ASM) model indicates that the Queen Charlotte Islands assessment region herring population decreased in abundance from 1990 through 1995, increased through 1998, but has slowly decreased to the current reduced level through 2005 (Fig. 2). Pre-fishery spawning biomass for the area is estimated at 5,980 t in 2005, a decrease of 717 t, or 11% below the 2004 level. Except for the 1995 year class which was good, recruitment has been generally poor for the last decade, contributing to the continuing low level of abundance. The recruitment of the 2001 year-class in 2004 appears to be one of the poorest in the time series and the recruiting 2002 year-class appears average. The 2002 year-class was dominant accounting for 46% of the total run, while the 2000 year-class contributed another 29% to the total.

<sup>1</sup> 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.

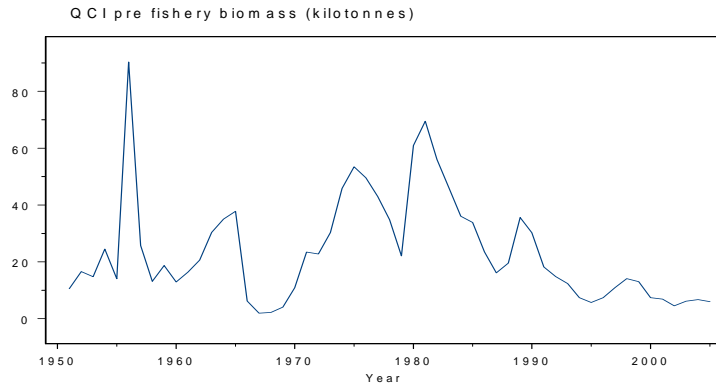


Figure 2. Estimated mature pre-fishery herring biomass from 1951 to 2005.

As with other areas, forecasting recruitment to the stock remains a significant challenge. For the 2006 assessment a poor 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 Queen Charlotte Islands, a poor recruitment option was adopted for 2006 resulting in a pre-fishery biomass forecast of 7,120 t and projects abundance well below the fishery threshold or Cutoff level. Any harvest below the Cutoff is expected to reduce the rate of stock rebuilding.

## OTHER CONSIDERATIONS

Since relatively little is known about the factors that affect recruitment in this stock, it is difficult to forecast future stock trends. The recent increase in abundance was due to the strong 1994 and 1995 year-classes but they are rapidly declining in abundance with increasing age. They had maintained the stock at healthy levels for several years. The low abundance of the 1996, 1998 and 2001 year-classes accounts for the decline in abundance of the last few years. However, abundance of the 2000 year class is high and may produce an increase in abundance in the short term.

Various studies have suggested that herring recruitment is determined by variations in the size of the parent stock, and environmental conditions during the first year of life. Recruitment variability in the QCI stock has been correlated with March sea surface salinities and sea levels in the stock area during the year of birth. Although there is a risk that these correlations might be spurious (i.e. not meaningful), they could have a biological basis. For example, variations in sea surface salinity and sea level reflect differences in wind induced upwelling and mixing, freshwater runoff and nutrient supply. These factors could directly affect the planktonic food supply of the young herring, and indirectly alter juvenile herring losses to predators. Research on these factors is being pursued.

## SOURCES OF INFORMATION

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ISSN 1480-4913 (Printed)

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## CORRECT CITATION FOR THIS PUBLICATION

DFO, 2005. Stock Assessment Report On Queen Charlotte Islands Pacific Herring. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2005/067.