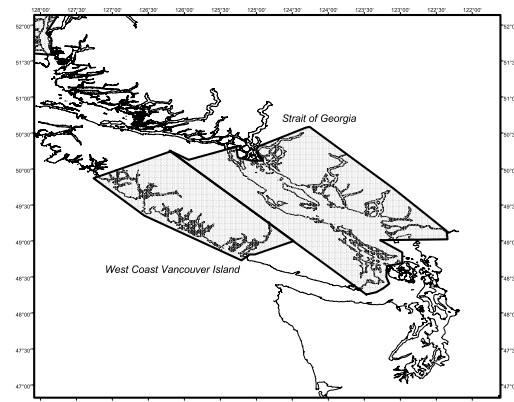




## STOCK ASSESSMENT REPORT ON STRAIT OF GEORGIA PACIFIC HERRING



Source: Fisheries & Oceans Canada



Map of Strait of Georgia

### 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 Strait of Georgia (SG) 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 late 1920s 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 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). Recent assessments indicate that the mature herring biomass remains well above the fishing threshold (21,200 t), and should continue to sustain both commercial and aboriginal fisheries. The stock achieved recent high abundance levels in the late 1970s, declined until the mid-1980s, and is now near the historical high abundance in 1955.*

### SUMMARY

- All herring spawning within the Strait of Georgia are assumed to belong to a single stock that migrates into the SG in the late fall and leaves, after spawning, in March. A few areas in the Strait also contain what appear to be resident or non-migratory herring throughout the summer. For stock assessment purposes these fish are considered as part of the Strait of Georgia herring stock.
- The roe herring seine total allowable catch (TAC) in 2005 was 6,808 tonnes or 27% of the coastal total and the validated catch 6,994 tonnes. The roe herring gillnet TAC in 2005 was 8,573 tonnes or 34% of the coastal total and the validated catch 8,761 tonnes. Additional

seine catches of 934 tonnes and gillnet catches of 193 tonnes were taken to offset the cost of test fishery and spawn assessment programs.

- The forecast stock biomass for 2006 is 97,300 tonnes with a recommended harvest of 19,460 tonnes.

## DESCRIPTION OF THE ISSUE

From the mid-1940s until the late 1960s, these herring were harvested and processed (reduced) into relatively low value products such as fishmeal and oil. The largest catch, 72,000 t was taken in the Strait of Georgia in 1956 and the fishery was curtailed in 1953 due to industrial disputes. 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 (Fig. 1), and was closed by the federal government in 1967 to rebuild the stock.

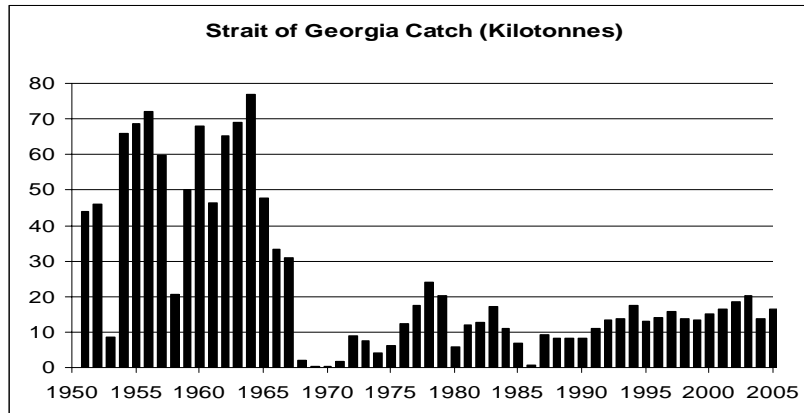


Figure 1. Total herring catch in the Strait of Georgia from 1951-2005.

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.

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 (21,200 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 Strait of Georgia fishery was closed in 1986 to allow for rebuilding. Subsequently, the stock has recovered and sustained an average catch of 15,750 t over the past decade.

Recent removals (all fisheries) from this stock have been:

Strait of Georgia catch (ktonnes)				
2001	2002	2003	2004	2005
16.4	18.6	20.4	13.6	18.2

## 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 ASM model indicates that abundance in the Strait of Georgia assessment region has increased dramatically since the fishery closure in 1986 to a historical high in 2003. Abundance has declined slightly during the past two years (Fig. 2). The pre-fishery biomass for the area is estimated at 121,970 t in 2005, a decrease of 6,030 t, or 5% below the 2004 level. The recruitment during the past decade has been average or better in all years with the 1996 year-class being the weakest in this period. The 1999 and 2000 year-classes appear to be the largest observed in the past 55 years accounting for 9 and 28% of the total run respectively. The following 2001 year-class contributed another 32% while the recruiting 2002 year-class added 24% of the 2005 run. The pre-recruit 2003 year-class was 4% of the 2005 run and is forecast to be average based on an annual offshore survey of recruitment.

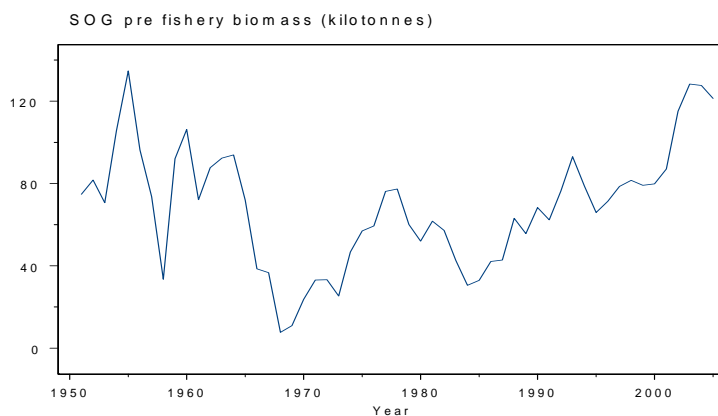


Figure 2. Estimated mature pre-fishery herring biomass from 1951 to 2005.

As with other areas, forecasting recruitment to the stock remains a significant challenge. Recently, recruitment forecasts based on an offshore survey have been implemented for this

stock and appear to be quite accurate. For the 2006 assessment an average recruitment is 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 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.

In the Strait of Georgia, an average recruitment option was adopted for 2006 resulting in a pre-fishery biomass forecast of 97,300 t and a potential harvest of 19,460 t. Recruitment during the past decade has been average or better maintaining the current high level of abundance.

## OTHER CONSIDERATIONS

Since very little is known about the factors that affect recruitment in this stock, it is difficult to forecast future stock trends. However, the Strait of Georgia has enjoyed an extended period of good herring recruitment with all but the 1992 year-classes since 1990 being of average or above average abundance. The 1999 and 2000 year-classes appear to be among the largest observed since 1954. Given the current large biomass, the stock should continue to support substantial fisheries over the next several years.

## 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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