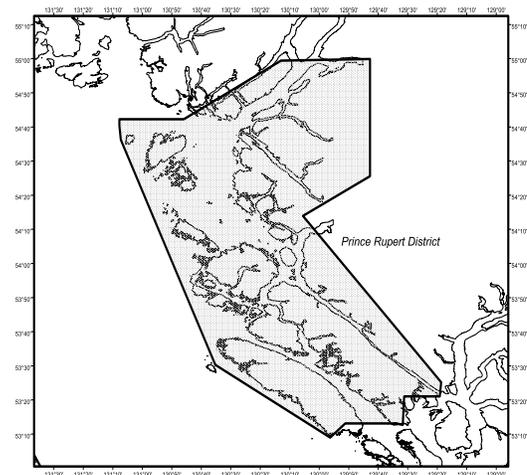




## STOCK ASSESSMENT REPORT ON PRINCE RUPERT DISTRICT PACIFIC HERRING



Source: Fisheries & Oceans Canada



Map of Prince Rupert District

### Context

*Pacific herring is a pelagic species that 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 Prince Rupert District (PRD) herring stock is one of five major migratory 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 market in the mid-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 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 stock has been fairly stable since the early 1980s. Recent assessments indicate that the mature herring biomass remains well above the fishing threshold (12,100 t), and could support both commercial and aboriginal fisheries in 2006.*

### SUMMARY

- All herring spawning within Statistical Areas 3 to 5 are assumed to belong to the Prince Rupert District stock that migrates inshore from Hecate Strait 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 1,361 tonnes or 5% of the coastal total and the validated catch 1,422 tonnes. The roe herring gillnet TAC in 2005 was 1,814 tonnes or 7% of the coastal total and the validated catch 1,943 tonnes. Additional

seine catches of 329 tonnes and gillnet catches of 107 tonnes were taken to offset the cost of test fishery and spawn assessment programs.

- The forecast mature stock biomass for 2006 is forecast at 32,030 tonnes with an allowable harvest of 6,410 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. The largest catch was taken in the PRD in 1952 and the fishery was closed in 1953 and 1958 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.

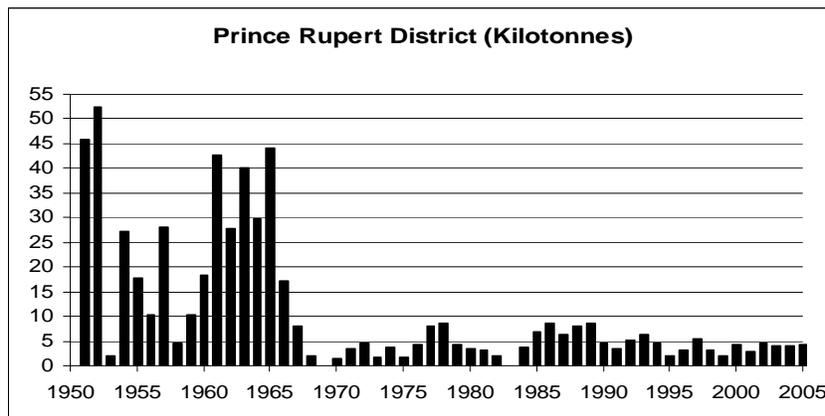


Figure 1. Total herring catch in the Prince Rupert District from 1951-2005.

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 PRD 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 (12,100 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 PRD fishery was closed in 1983. Subsequently, the stock has rebuilt and sustained an average roe catch of 3,820 t over the past decade<sup>1</sup>.

Recent removals from this stock have been:

Prince Rupert District catch (ktonnes)				
2001	2002	2003	2004	2005
2.9	4.5	4.0	4.1	3.8
1.1	1.2	1.0	1.0	1.0
<i>SOK Allocation</i>				

<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.

## 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 Prince Rupert District assessment region herring population decreased in abundance from 1992 through 1995, increasing slowly through 2005 (Fig. 2). The pre-fishery biomass for the area is estimated at 31,515 t in 2005, an increase of 509 t, or 2% above the 2004 level. During the past decade most year-classes have been average. The 1993 and 2000 year-classes were good while those in 1996 and 2001 were poor. The 2000 year-class was dominant accounting for 46% of the total run, while the recruiting 2002 year-class contributed 27% to the total spawning run.



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.

In the Prince Rupert District, an average recruitment option was adopted for 2006 resulting in a pre-fishery biomass forecast of 32,000 t and a potential harvest of 6,410 t. The stock is well above the Cutoff level of 12,100 tonnes and roe and spawn-on-kelp fisheries are anticipated.

## 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 recent history of recruitment to the stock has indicated a good year-class occurring about every fourth year, a pattern similar to that in southeastern Alaska. If this pattern continues it will result in increased stock stability and resource levels that should sustain current levels of harvest. The 1993 through 1999 year-classes have been average or better, except for the poor 1996 and good 2000 year-classes, which should maintain the stock at healthy levels for the next few 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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