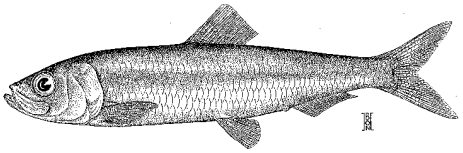
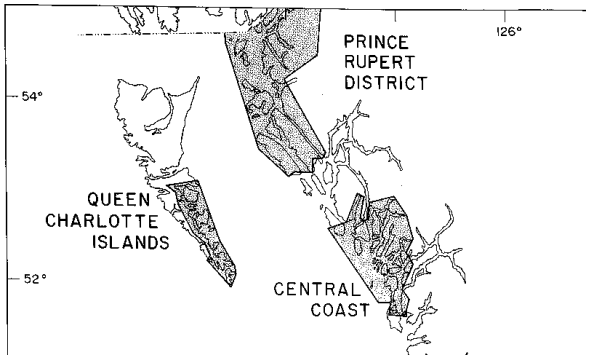
Fisheries and Oceans / Pêches et Océans
Pacific Region

DFO Science
Stock Status Report B6-03 (1998)





Queen Charlotte Islands Herring

Background

Pacific herring is a pelagic species which occurs in inshore and offshore waters on both sides 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 two to five. Within this range, recruitment tends to occur at younger ages in the south, and older ages in northern waters. The Queen Charlotte Islands (QCI) 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-1950s, as the B.C. commercial herring fishery approached its historical peak. By the mid-1960s, the stock had collapsed from overfishing, and the commercial fishery was closed in 1967. Following a combination of low harvest rates, and favourable environmental conditions, 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 percent 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 40 years, and supported the fishery until the late-1980s. Since then, recruitment has been generally poor and the stock has declined. Because of conservation concerns, the commercial roe herring fishery was closed from 1994-1996. A small aboriginal food fishery and a limited spawn-on-kelp fishery were permitted in 1997, and in addition, a small roe fishery in 1998 as the stock continues to rapidly rebuild.

The Fishery

Average QCI catch (kilotonnes)

1951-60	1961-70	1971-80	1981-90
13.2	9.0	7.5	4.1

The QCI assessment region extends from Cumshewa Inlet in the north to Louscoone Inlet in the south. All herring spawning within this area are assumed to belong to a single stock that migrates inshore in the late fall and leaves, after spawning, in late April. From the mid-1940s until the late-1960s, B.C. herring were harvested and primarily reduced into fish meal and oil. As the fishery expanded, commercial harvest rates increased sharply and were unsustainable by the late 1950s. A record high catch of 77,500 tonnes (t) was removed from the QCI assessment region in 1956. This fishery was closed in 1953, and was disrupted by labour disputes in 1958. Although the stock wasn't fished com-mercially in 1960, when it was fished it was harvested as heavily as the other major stocks. By 1965, most of the older fish had been removed from the spawning population by a combination of overfishing, and a run of poor year-classes (born between 1954 to 1957). Consequently, the commercial fishery collapsed in 1967, and the fishery

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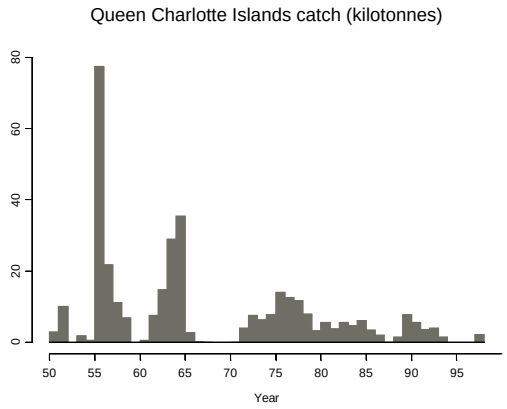
was closed by the federal government to allow the stock to rebuild.



The commercial fishery remained closed for four years. During this period, only small, traditional harvests for local food and bait were permitted (Hourston 1980). Fortuitously, while the fishery was closed, there was a run of five above-average strength recruitments, which enabled the stock to recover, and the fishery to reopen in 1972. At that time, there was a growing interest in harvesting B.C. roe herring for export to Japan. Small quantities of herring were also utilized for spawn-on-kelp, and aboriginal food and ceremonial fish. The objective of the modern roe herring fishery is to obtain a low volume, high-quality product that is economically profitable and ecologically sustainable.

The fishery is currently managed by setting a fixed target harvest rate of 20% of the forecast mature stock biomass. To meet conservation objectives, the management strategy also enforces a minimum spawning stock biomass (Cutoff). If the forecast biomass falls below the Cutoff threshold (10,700 t) the commercial fishery is closed until the stock rebuilds. Low stock levels caused the QCI roe fishery to be closed in 1988. In 1994 the forecast run was close to the Cutoff, so fishing was restricted to aboriginal food fish and commercial spawn on kelp while in 1995 and 1996, only 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 was permitted while 1998 saw a small roe fishery take place.

Recent catches from this stock have been:

QCI catch (kilotonnes)

1994	1995	1996	1997	1998
0.3	0.0	0.0	0.0	1.4

Climatic Factors

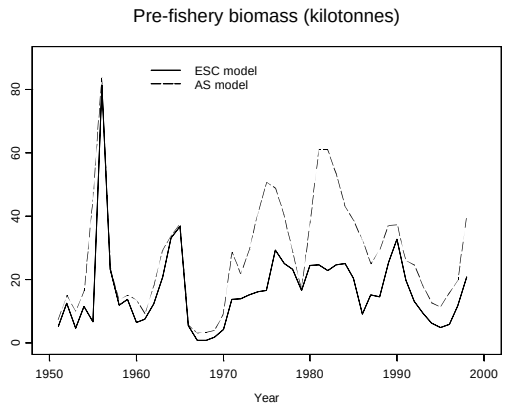
Various studies have suggested that herring recruitment is determined by variations in the size of the parent stock, and environmental conditions during the first year of life. Recruitment variability in the QCI stock has been correlated with March sea surface salinities and sea levels in the stock area during the year of birth (Schweigert and Noakes 1990). 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 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.

Resource Status

Herring stock assessments are based on biological samples of the population age composition, historical catch data, average weight-at-age, and assessments of spawn distribution and intensity in the stock assessment area. The pre-fishery biomass of mature adult herring is estimated by two models: an age-structured model and an escapement model (Schweigert et al. 1998).

The latter relies predominantly on the spawn data. The average of the estimates from both models is used to assess the current stock level, project future run size, and establish an allowable catch

Historically, the 1977 year-class was exceptional. It produced the largest recruitment to the QCI stock in the last 40 years. The 1951 year-class was also very strong. However, since 1980, nine of the last 18 year-classes have been of below average strength. The last three year-classes, 1993-95 have been above average resulting in the rapid recovery of stock abundance following the fishery closure from 1994-1996.



The estimated spawning biomass in 1998 was 21,000 t based solely on the escapement model placing the stock well above the harvesting threshold and supporting the decision to resume the roe fishery. As the rebuilding of the stock appears to be continuing, a modest fishery is anticipated for 1999.

Outlook

Due to some uncertainty in the age-structured model performance, the forecast for 1999 is based solely on the escapement model.

Assuming another average recruitment, the projected biomass for 1999 is 28,210 t based on the escapement model. This places the stock well above the Cutoff threshold, and at a target harvest rate of 20 percent, in a position to support a 5,642 t fishery.

Since very little is known about the factors that affect recruitment to this stock, it is not possible to forecast the stock biomass trend more than a year in advance.

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