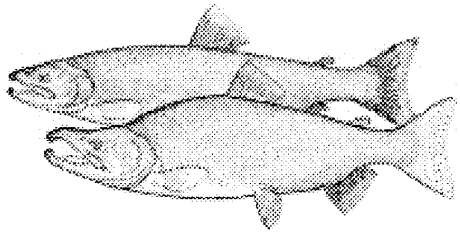
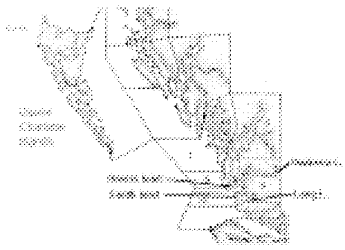




Rivers and Smith Inlet Sockeye

Background

Anadromous sockeye salmon occur throughout the temperate North Pacific Ocean. They spawn in rivers and lakes from the southern Kuril Islands north to Kamchatka on the Asian coast, and from the Columbia River north to Alaska on the North American coast. Sockeye salmon can exhibit remarkable variation in life history. However, they typically emerge from nests in gravel as free-swimming fry in the spring, spend one to two years rearing in a freshwater nursery lake, and then migrate to the ocean where they spend another two or three years before returning to their natal stream to spawn and die.

Sockeye salmon production from Smith Inlet (Statistical Area 10) is managed as a single stock. Spawning occurs in tributaries to a clear nursery lake with a surface area of 21 km^2 (Long Lake). As in most coastal sockeye salmon stocks, natural productivity is limited by the availability of nutrients in the nursery lake. Long Lake has been fertilized artificially in most years since 1976 to enhance production. Concomitantly, spawning escapements and juvenile recruitment have been monitored more intensively there than elsewhere on the central coast. Total adult returns have averaged 333,000 fish annually since 1972 when reliable counts began.

Sockeye salmon production from Rivers Inlet (Statistical Area 9) is also managed as a single stock. Spawning occurs in at least 12 tributaries to glacially- turbid Owikeno Lake. This nursery lake is large by coastal standards (96 km^2) but its productivity is very low because poor light penetration rather than the availability of nutrients. The glacial turbidity of the lake and its major spawning streams also precludes reliable estimation of spawning escapements by visual survey. Nevertheless, sockeye salmon returns are estimated to have averaged 924,000 fish since 1948.

The Fishery

Average Sockeye Salmon Catches

Smith Inlet (Area 10)

1956-1965	1966-1975	1976-1985	1986-1995
223,000	206,000	136,000	265,000

Rivers Inlet (Area 9)

1916-1925	1926-1935	1936-1945	1946-1955
848,000	864,000	726,000	946,000

1956-1965	1966-1975	1976-1985	1986-1995
743,000	781,000	229,000	225,000

The sockeye salmon fishery on Smith Inlet and Rivers Inlet stocks began in the late 19th century and increased rapidly during the first decade of the 20th century. As boats became faster and more mechanized the fishery moved out of the inlets and farther offshore. Starting in the early 1970's, fishing boundaries were moved progressively

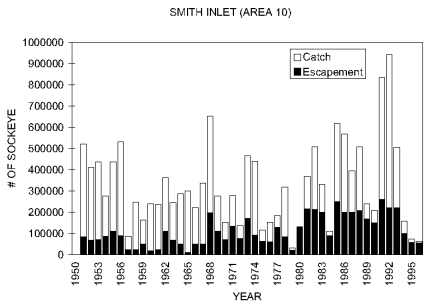
shoreward creating a more terminal fishery. Since 1985, all net fishing has occurred inside the inlets.

Prior to 1972, annual catches of Smith Inlet sockeye salmon averaged 248,000 fish. The installation of the Docee Fence in 1972 allowed reliable in-season enumeration of escapements to Long Lake, and this provided a basis for managing the sockeye fishery in-season. Annual catches averaged 162,000 sockeye from 1972 to 1978. Returns from the lake fertilization program were evaluated in 1979 and the escapement target was increased to 200,000 sockeye. Annual catches from 1979 to 1996 have averaged 202,000 sockeye. Sockeye catches in Smith Inlet during the 1995 and 1996 fishing season were unusually low due to poor marine survival of the 1990 and 1991 brood years.

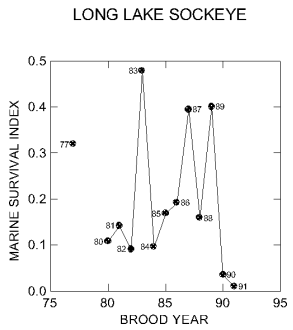
Annual catches in Rivers Inlet averaged 808,000 sockeye prior to the implementation of an adaptive management plan in 1979. This plan restricted fishing effort and average annual catch decreased to 150,000 from 1979 to 1996. Prior to 1979, the Rivers Inlet sockeye stock was managed to various target escapements. Since 1979, managers have adopted harvest rate targets that vary with stock size and a minimum escapement target of 200,000 sockeye. Harvest rates and subsequent escapements are regulated by a series of weekly commercial openings, with the number of days open determined by a combination of pre-season forecasts and in-season adjustments based on catch rate information from the commercial fishery. Because recent declines are attributed to poor marine survival experienced by stocks in both Rivers and Smith inlets, the Docee Fence (Smith Inlet) count has been used as a trigger for initiating the Area 9 fishery. As a result, no commercial gillnet fishery was permitted in Area 9 in 1996; this closure was appropriate given that the total return to Rivers Inlet was less than half the target escapement.

Resource Status

Spawning escapements to Long Lake (Smith Inlet) have been enumerated reliably since 1972. After the target was increased in 1979, spawning escapements roughly doubled from the average recorded in previous years. Total sockeye salmon returns generally increased over the same period, setting records of over 800,000 and 900,000 fish as recently as 1991 and 1992, respectively.



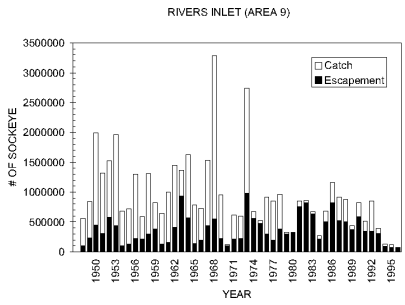
However, total returns declined dramatically in 1994, and have not been sufficient to meet the escapement target since. This decline was caused by poor marine survival of the 1990 and 1991 brood years which migrated to sea in 1992 and 1993.



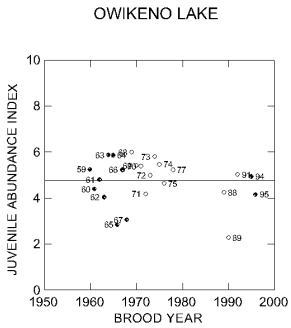
In fact, hydroacoustic surveys of juvenile abundance reveal that these brood years experienced above average survival in

freshwater, and produced above average recruitment of pre-smolts.

The total spawning escapement to Owikeno Lake (Rivers Inlet) cannot be enumerated reliably by visual survey. Thus, historical estimates should be considered only as rough indices that may greatly underestimate (or overestimate) actual escapements. Even so, these estimates indicate that escapements generally increased as a result of fishery restrictions imposed in 1979, and that the new escapement target was achieved every year thereafter until 1994.



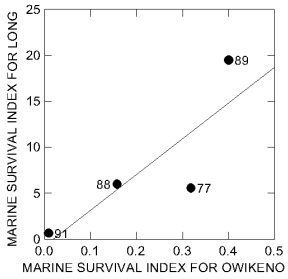
Increased spawning escapements did not lead to a demonstrable increase in total adult returns (Walters et al. 1993). In fact, total returns appear to have decreased since the decision to increase escapements by reducing catch. Existing data are inadequate to determine whether the decline prior to 1994 was real or simply an artifact of reducing the catch:escapement ratio given that catch is known reliably but escapement may be underestimated. In any case, there can be little doubt that total returns declined dramatically in 1994 and since then, have not been sufficient to achieve the target escapement. Juvenile abundance indices, based on sporadic trawl surveys (closed circles) or inferred from pre-smolt size data (open circles), show no overall decline in freshwater survival or pre-smolt production (Rutherford et al. 1995).



As in Long Lake, pre-smolt production from the 1991 brood year was above the long-term average, implying that this brood suffered high mortality during or after seaward migration.

Outlook

The coincidence of declining returns to both Smith Inlet and Rivers Inlet suggests that both stocks have experienced the same unfavourable marine conditions (Rutherford and Wood 1995). Marine survival indices for the two stocks were highly correlated in the four brood years for which data are available from both lakes.



Recent marine conditions are generally considered to be anomalies from the long-term average, and are expected to moderate in the near future. However, prudence demands that these stocks be managed to rebuild escapements, and that management

plans be developed assuming that poor marine survival may continue.

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La version française est disponible à l'adresse ci-dessus.

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