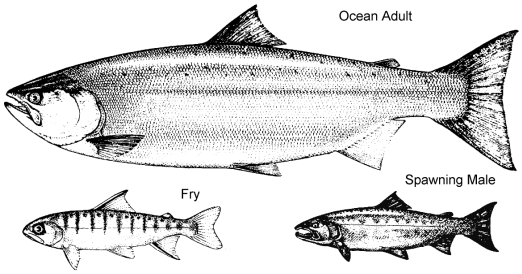


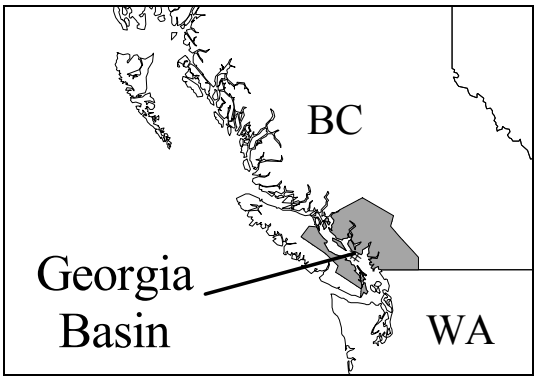
Coho Salmon in Georgia Basin

Background

Coho salmon (Oncorhynchus kisutch), is one of six species of salmon found in British Columbia. Juvenile coho live in streams, lakes, beaver ponds and sloughs. In streams, they prefer pools, where they are aggressive and territorial, and in lakes they inhabit the near-shore zone. Juvenile coho may be difficult to distinguish from chinook but usually they are more vibrantly coloured with a large orange anal fin edged in black and white. They feed on aquatic and aerial insects, plankton, and occasionally small fish. Young coho rear in streams and lakes for one and sometimes two years in this area (coastal waters feeding into the Strait of Georgia or the "Georgia Basin").

Migrating to sea in the spring, some males will mature and return to their birthplace to spawn in the fall of the same year. These males are called jacks. The rest continue to grow rapidly, usually within a thousand kilometres of their home stream. Coho feed at first on euphausiids, crab larvae and other plankton. Squid, herring, sand-lance and other small fishes are included in the diet as the fish grow. They return the following summer and fall and spawn in their natal streams primarily from October to December. All die after spawning.

Coho occur in over 350 streams in the Georgia Basin, including the lower Fraser drainage as far upstream as Hope (there are more in the upper Fraser system but they are not part of this report). With losses of habitat and fishing in the last century, the



Summary

- Marine survival of coho from the Georgia Basin is expected to be less than 3.5% in 2002, which is poor and no better than 2001.
- Planning should be cautious for fisheries that may impact this group of stocks.
- We forecast that most coho returning to Georgia Basin streams in 2002 will not enter the Strait until their spawning migration in the fall. Therefore, fisheries on the west coast of Vancouver Island and in the entrances to the Strait of Georgia will have greater potential impact than if most coho were to occupy the Strait this year.

The Fishery

Coho are netted and angled in aboriginal, recreational and commercial fisheries. Initially due to declining abundance and now the result of severe conservation measures, catches in south coastal B.C. have declined since the mid-1980's. Catches declined from 1.55 million to

virtually zero from 1995 to 1998 and have remained low since.

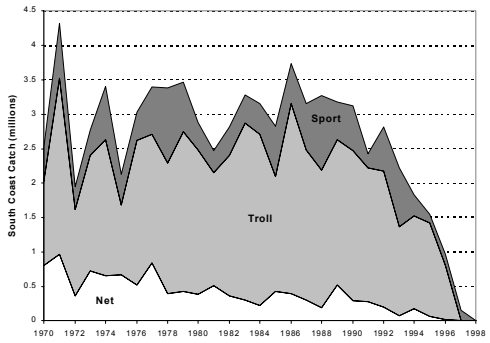


Figure 1. Commercial and recreational catch of hatchery and wild-origin coho in southern BC waters, 1970 to 1998. Fishing mortality from 1999 to 2001 was similar to 1998.

Strait of Georgia coho comprised a significant portion of these catches, with the rest coming from the west coast of Vancouver Island (WCVI), the United States and the upper Fraser R. drainage.

In addition to declining catches, coho harvest distribution has changed. In eight of the past 11 years unusually high proportions of coho have been off the WCVI rather than in the Strait during their last year of ocean life (when coho are of fishable size). For the first time since 1994, most probably occupied the Strait in 2001 but many are predicted to be off WCVI again in 2002 (Figure 2).

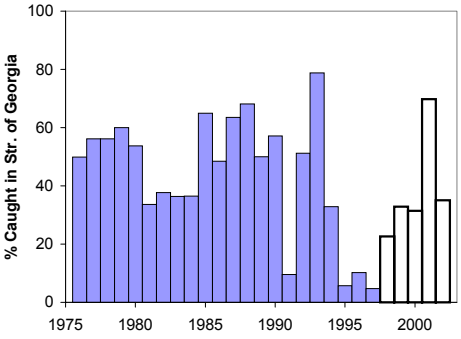


Figure 2. Average catch in the Strait of Georgia of several Georgia Basin stocks, expressed as a percentage of total catch. Percentages after 1997 are estimates of what the percentage would have been had there been fisheries.

While the aboriginal harvest of coho is small compared to their catch of other salmon species, Bands rely on coho for some food, social and ceremonial purposes. Coho are caught in or near their local streams.

Until 1997 when major restrictions were imposed, 89% of the commercial coho catch on the south coast of BC was taken by the troll fleets and the remainder by net fisheries. The WCVI troll fishery was the single largest commercial harvester, taking an average of 1.51 million coho in the 10 year period before 1997. This fishery was controlled by a Pacific Salmon Treaty catch ceiling which served to limit the catch in many years. Coho caught in this fishery came from the southern U.S., Strait of Georgia and WCVI. The troll fishery inside the Strait of Georgia has not been permitted to retain coho since 1995. Catches were much smaller than the WCVI troll fishery and mostly consisted of Strait of Georgia fish.

Net fisheries for sockeye, pink and chum salmon in Johnstone Strait, Juan de Fuca Strait and the Strait of Georgia also catch coho. Strait of Georgia coho are predominant in the Johnstone Strait and Strait of Georgia net fisheries while U.S. origin coho are an important component of catches in the Juan de Fuca net fishery. The fishing mortality of coho in net fisheries is now very low due to curtailment of net fisheries in recent years in response to low returns of target species and also to prohibitions on retention of coho, new practices to avoid coho, and better handling methods before release.

Recreational fishing in the tidal waters of BC is very important to many residents and visitors. Until the recent distribution shifts by coho and severe fishing restrictions, about 70% of the tidal recreational fishing in BC took place within the Strait of Georgia. Chinook and coho are the main target species of this fishery. While chinook are the glamour fish, until recent years coho have been the mainstay of this fishery because they were more abundant than chinook.

The recreational fishery is a significant harvester of coho from Georgia Basin streams in 'inside' years when a high proportion these fish are in the Strait of Georgia. During 'outside' years the impact of the recreational fishery is reduced. From 1988 to 1997 and excluding 1994, which was an intermediate year for catch distribution, the average catch in the Strait of Georgia recreational fishery in 'inside' years (1988-90, 1992-93) was 0.75 million coho. In 'outside' years (1991, 1995-97) it was 0.16 million. Overall, including 1994, the average catch was 0.47 million. Up to 1996, the average sport catch of Georgia Basin coho elsewhere on the south coast was estimated to be 0.06 million.

Frequent distribution shifts out of the Strait of Georgia, combined with regulations prohibiting retention of caught coho and generally poor chinook fishing, has resulted lower fishing effort in the Strait in recent years.

Stock Status

The conservation of Georgia Basin coho has been an issue since at least 1989 when PSARC (Pacific Scientific Advice Review Committee) first identified a need to reduce total fishery exploitation rates, from a range of 75% to 80% to a range of 65% to 70%. However, marine survival rates began to decline soon after, to the point where this lower target range was judged by PSARC to be still too high. Fishery management achieved its reduced target of 60% exploitation in 1995 and 1996 and lowered it further to about 37% in 1997. Exploitations have been only about 5% since then.

Responding to the much-reduced exploitation, spawners generally increased between 1997 and 1999 from the very poor runs prior to that. 1999 coho were the progeny of the poor 1996 return and, although we saw an improvement over the 1996 runs, there were generally fewer spawners in 1999 than in 1998. Runs in 2000 were about the same as 1999 overall, even though the parental escapement in 1997 was larger and fishing restrictions were almost as stringent. Runs in 2001 were generally the strongest seen in many years, which was a response to the relatively strong brood year (1998), good freshwater survival, low exploitation and better marine survival.

Declining abundances before 2001 were in large part due to much reduced survivals of Georgia Basin coho at sea (and exploitations which were too high for those survival conditions). Survival rates of 8% to 18% in the 1980's declined to 1% or less in many stocks by 1998.

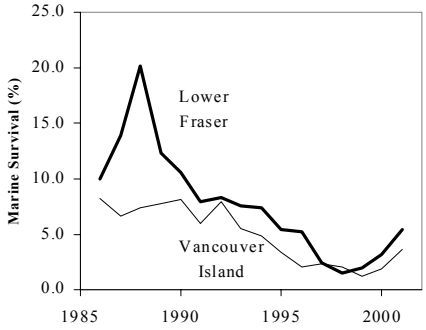


Figure 3. Average marine survival of one wild stock and two hatchery stocks of coho on each side of the Georgia Basin.

After steadily declining since 1992, the survival of hatchery stocks stabilised in 1999. The next year wild and hatchery survivals improved a little more. In 2001 there was a significant increase in the lower Fraser River area but survivals remained the same at hatcheries in the central and northern Strait. The picture was further complicated by a large increase in survival of the wild stock that is monitored in the northern Strait, Black Creek. Even where survivals have increased, they are still not at 1980 levels and, although it is difficult to estimate optimum escapements, spawners are still fewer than historic levels. Clearly, we cannot assume stability and exploitation rates will have to accommodate changing ocean conditions to prevent insufficient escapements and permit future rebuilding.

Habitat Status

The other major concern in the decline of coho is the loss and degradation of freshwater habitat due to increasing economic and development pressures in the Strait of Georgia. The loss of habitat is associated with the increased numbers of people living in the area and the ever-increasing intensity of resource use. Low gradient streams within a hundred kilometres of the coast make up a significant proportion of the freshwater habitat for coho in British Columbia. These, of course, are the same areas where much of our activities occur. Logging, agriculture and urbanisation have resulted in stream degradation. Coho habitat is threatened throughout the Basin.

DFO and the Province of British Columbia have a number of initiatives to involve communities in the protection and augmentation of streams and wetlands. This will be critical if we are to identify, protect and rehabilitate coho habitat within the south coast area.

Outlook

Conservation concerns for Georgia Basin coho have been expressed by Fisheries and Oceans Canada (DFO) since the late 1980's. Habitat degradation and high exploitation rates relative to the numbers surviving at sea are the two factors under our control that have contributed to low abundances. We have seen a positive response by the populations to extraordinary efforts in these areas.

Scientists study the impact of climate on fish stocks in the Strait of Georgia Basin, as well as globally. One hypothesis proposes that global climates exist in 'regimes': decadal-scale persistent trends in climate and associated ocean patterns. A 'regime-shift' in 1998 has produced new conditions in the Strait, which appear to favour coho survival, in stark contrast to conditions in the 1990's. This regime could persist for a decade or longer. A second hypothesis contends

that climate/oceans oscillate in a cycle between two states, and that we are now seeing a return to cooler conditions in southern BC, as observed 15 years ago when survivals were higher. Regardless, it is clear that a recent shift in environmental conditions improved survival at sea of some Georgia Basin stocks.

Unfortunately, the forecasts for 2002 predict that survival will decrease or remain the same, depending on location and the forecast method. Even if an increase occurs survivals are unlikely to approach long-term average levels.

Management Considerations

Present survivals are still near levels below which wild stocks cannot sustain themselves even under minimal exploitation. With these low survivals, the harvest management principle of being risk-averse especially applies, meaning when we are not sure we must err on the side of caution. Fishing mortality should remain low to sustain the recovery from low abundances (the best case scenario) and to protect against the risk of sub-replacement survivals.

Maximum exploitations in the future should be less than historic maximums, which exceeded 80% at times. With goals of maximum or near-maximum utilisation comes an increasing need for stock assessments and forecasts and more volatility in fishing regimes as managers adjust fisheries to the constantly changing situation. Uncertainties in the migration pattern of Georgia Basin coho will demand that harvest management actions encompass not only the Strait of Georgia but also the approach routes (Johnstone Strait and Juan de Fuca Strait) and the west coast of Vancouver Island, with the importance of each area varying from year to year. With a forecasted 'outside' distribution this year, WCVI, Johnstone Strait and Juan de Fuca Strait fisheries will have a greater potential impact on Georgia Basin coho.

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