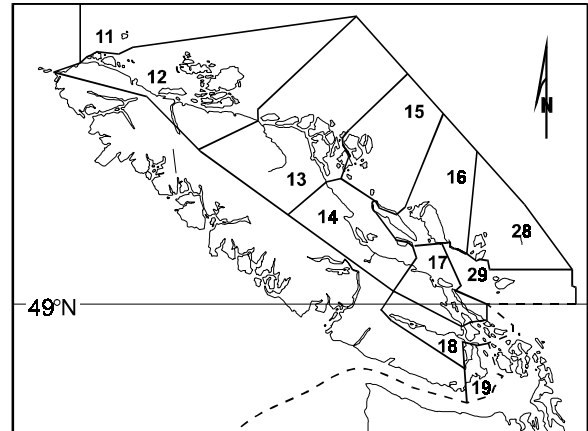


## INNER SOUTH COAST CHUM SALMON



Statistical Areas (11 -19, 28, 29) for Inner South Coast Chum Salmon

### Background

Chum salmon have the most extensive geographic distribution of all the salmon species. In North America, chum are found in the coastal streams of northern California, Oregon, Washington, British Columbia, and Alaska (including the Aleutian Islands), as well as the Yukon and Mackenzie rivers in the Arctic. Chum fry migrate to the ocean shortly after emerging from the gravel but spend time rearing in estuaries before migrating to offshore feeding grounds in the northeast Pacific Ocean. Adults return along coastal routes to their natal rivers to spawn after 2 to 7 years at sea, with ages 3 to 5 predominating.

More than 400 populations of chum salmon originate from the Inner South Coast of B.C., in Johnstone Strait, Strait of Georgia and Fraser River. Forty-five of these populations are responsible for 85 % of total production, with Fraser River stocks being the largest producers.

Chum salmon are important to many First Nations for food, ceremonial, and cultural purposes. In the late 1800s and early 1900s, commercial fishermen considered chum less desirable than the other salmon species. Chum did not assume commercial importance in B.C. until the First World War. Catch statistics for the 31-year period between 1917 and 1947 show an increase in chum catches coincident with declining sockeye catches resulting from the 1914 rockslide that

blocked fish passage at Hell's Gate on the Fraser River. Declines in chum abundance were recorded in the early 1940s and it seems highly probable that total returns were low in the early 1920s and 1930s. From 1939 to the early 1950s the chum salmon catches steadily increased but were reduced to low levels from the mid-1950s through the 1960s, primarily due to high exploitation rates. To address this problem, exploitation rates were drastically reduced in the 1960s, a "Clockwork" management plan was implemented in 1983, and major enhancement efforts initiated in 1980. During the 1985-94 period, total returns increased but were less than average in 1995-97.

### The Fishery

Chum returning to spawn in their natal streams in Johnstone Strait, the Strait of Georgia, and Fraser River watersheds migrate primarily through Johnstone Strait. Because of their overlapping timing and migration route, chums from these areas are grouped into a single unit commonly known as the Inner South Coast (ISC) chum stock.

ISC chum stocks are divided into two groups based on run timing: summer run and fall run. The summer chum migrate in June, July and August and spawn in September and early

October. The fall chum migrate in September, October and November, spawning from October to January. Only the fall run stocks are actively managed in mixed stock fisheries. The summer run stocks are managed in terminal areas where local surpluses are harvested. The major inside summer run stocks are in Bute and Knight inlets.

Fall chum salmon migrating to their spawning grounds through Johnstone Strait and the Strait of Georgia encounter several fisheries, beginning with the 110-km long Johnstone Strait fishery in Statistical Areas 12 and 13. Here chum are concentrated during their inshore migration and are subjected to seine, gillnet, and troll fisheries. The catch in this fishery has averaged about 68% of the total ISC commercial catch, or 800,000 chum per year, between 1990 and 1998.

The terminal fall chum fishery at Qualicum Bay harvests predominately enhanced chum stocks from the Big Qualicum, Little Qualicum and Puntledge River hatcheries. The catch in the Qualicum fishery has averaged 240,000 chum annually between 1990 and 1998. Other areas that have terminal fall chum fisheries are the Cowichan, Goldstream, Nanaimo and the Nimpkish rivers, and Jervis and Bute inlets. These fisheries target mainly local stocks. The Fraser River fishery (Statistical Area 29) includes the 80 km of the Fraser River downstream from Mission, the estuary and the adjacent waters of the southern portion of Georgia Strait. The Fraser River fishery harvests predominately enhanced chum salmon from the Harrison, Chehalis, Inch, Stave, and Chilliwack/Vedder systems. Canadian chum (primarily of Fraser River origin) are also harvested in U.S. fishing areas.

**Average Inner South Coast Chum Catch**

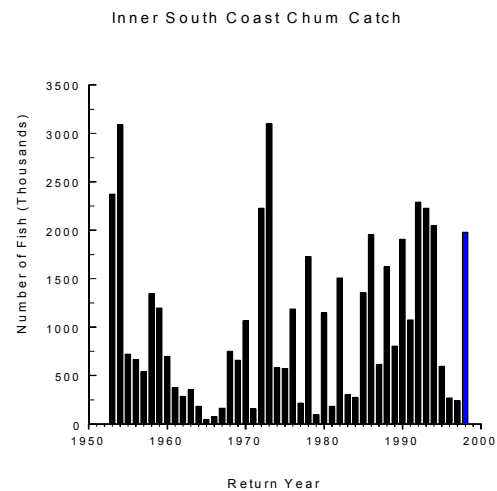
FISHERY	AVERAGE CATCH				
	1952-1959	1960-1969	1970-1979	1980-1989	1990-1998
JOHNSTONE STRAIT (AREAS 11-13)	922,483	273,959	755,795	600,298	800,445
QUALICUM (AREA 14)	51,823	3,459	56,463	201,299	239,876
JERVIS AND BUTE INLETS (AREAS 15-16)	102,398	12,239	29,070	875	16,106
NANAIMO (AREA 17)	93,171	2,846	16,180	7,302	7,470
COWICHAN -GOLDSTREAM (AREA 18)	36,385	10,779	8,362	7,670	41,012
VICTORIA (AREA 19)	624	86	0	0	8,747
HOWE SOUND (AREA 28)	51,257	172	16	37	62
FRASER RIVER (AREA 29)	254,788	64,196	113,514	43,280	59,471
<b>TOTAL</b>	<b>1,512,927</b>	<b>367,735</b>	<b>979,400</b>	<b>860,761</b>	<b>1,173,190</b>

In the early 1990s, Fisheries and Oceans Canada offered First Nations greater access to the salmon resource through the Aboriginal Fisheries Strategy. This initiative resulted in greater participation by First Nations in ISC chum fisheries.

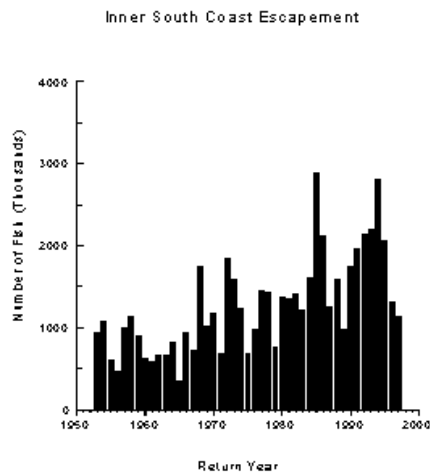
**Resource Status**

ISC chum stock assessments are based on catch data from test, commercial and First Nations fisheries, biological samples for age composition and genetic stock identification, mark-recovery program finclips, and escapement estimates from wild and enhanced systems.

Catch of ISC chum stocks declined sharply between the early 1950s and the mid-1960s. Escapements remained low, but stable, during this period. The rapid decline in stock size in the early 1960s prompted the complete closure of commercial chum fisheries in 1965 and 1966. The stock recovered, and by 1973 the chum catch reached nearly 3 million, with an escapement of nearly 2 million.



Catches declined between 1974 and 1981, with higher catches in even-numbered years than in odd-numbered years.



The exploitation rate on ISC chum generally exceeded 50 % in the 1950s, but declined in the 1960s as the stock size declined. Between 1975 and 1983, exploitation rates were less than 20 % in odd years but exceeded 40 % in even years. More recently the exploitation rate has averaged 37 % (1983-1993).

### ***Enhancement***

Increases in total ISC chum salmon stock size after 1985 resulted partially from the development of major enhancement facilities and comprehensive management plans.

Major enhancement projects for ISC chum started in 1980. There are now 7 major facilities: 3 on Vancouver Island, at Big Qualicum, Little Qualicum, and Puntledge, and 4 in the Fraser River, on the Chilliwack, Inch Creek, Stave, and Chehalis. Major returns of enhanced chum from these facilities were first recorded in 1985. In addition, numerous small facilities and habitat restoration projects are operating within the ISC management area. Enhancement may be an important strategy for both rebuilding chum stocks in the short term and providing consistent terminal fishing opportunities in the long term. The production potential for the major facilities throughout the ISC is 1.3 million chum at favourable marine survival rates.

### ***Clockwork Management***

The Johnstone Strait Clockwork Management Strategy was first implemented in 1983. The primary objective of the Clockwork was to rebuild ISC wild chum stocks within 12 to 15 years to a target escapement level of 2.5 million chum (including 700,000 Fraser River chum) by controlling the overall harvest rate. The plan also allows for limited fishing at low abundance levels, thereby stabilizing the annual catch. Incremental harvest rates for the marine fisheries are set at 10, 20, 30 or 40 % depending upon the run size. A pre-season forecast of abundance is used to determine the expected rate, which is adjusted with in-season information from test and commercial. The Clockwork plan allows both catch and escapement to increase with increasing total run size up to a maximum harvest of 40 %.

A Fraser River Clockwork management plan was introduced in 1987 to provide management goals and fishing limits for the harvest of Fraser River chum, independent of the Johnstone Strait fishery. Under these management plans, the overall exploitation rate on ISC chum stocks averaged 41 % (ranging from 17 to 51 %) during the 1990-97 period. Since the initiation of the Clockwork program in 1983 and increased enhanced production from 1985 onwards, there has been an increase in overall returns. The total wild average production from 1968-82 was 2.1 million and from 1983-97 it was 2.4 million. All of the increase in ISC production is due to the Fraser River component. The average return in Fraser River chum salmon rose from 800,000 during the 1968-82 period to 1.3 million during the 1983-96 period, an increase of 63 %. In contrast, there was a slight decrease for the ISC non-Fraser wild chum of 15 %. The average return for this group was 1.3 million during 1968-82 and 1.1 million for the years 1983-96.

In 1998, the pre-season forecast for ISC chum

stocks was 3.7 million chum (3.2 million wild and 500,000 enhanced). Based on an estimated in-season run size of 5.5 million, the allowable Clockwork harvest rate was 40 %. The post-season total Clockwork stock size was not available as spawning ground estimates for 1998 were still being compiled. The interim escapement target for wild ISC chum stocks is 2 million. Preliminary indications for 1998 escapement indicate a wild escapement much greater than 2 million. Total escapement (wild and enhanced) for the Fraser River alone is estimated at 3.4 million.

### Outlook

Less than average total returns during 1995-97 suggest that ISC chum stocks suffered from lower than expected marine survival rates. Declines in salmon survival could be related to changes in the marine ecosystem caused by the general warming of the North Pacific in recent years. Increased catch and preliminary escape estimates for 1998, however, suggest that marine survival rates may have improved for chum salmon.

The 1999 forecast for combined wild and enhanced ISC chum is 2.5 million. However, accurate pre-season forecasts of chum returns require determining sources of variation in survival rates and the effects of fluctuating environments on survival, particularly rainfall, freshwater temperatures and oceanic conditions. Forecasting is further complicated by varying age at maturity in chum salmon and difficulty in estimating the size of escapements. Factors such as intra- and interspecific competition may also affect juvenile size, age at maturity, and marine survival. As a result, the 1999 forecasts for both wild and enhanced ISC chum stocks are highly uncertain at this time.

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