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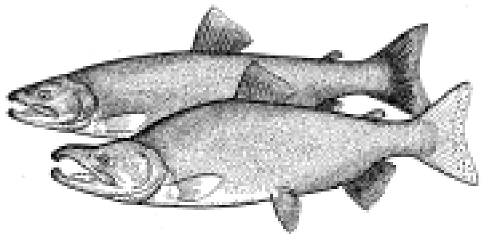
Pacific Region **Stock Status Report D6-13(2002)**



SAKINAW LAKE SOCKEYE SALMON

Background

Sockeye salmon (<u>Oncorhynchus</u> <u>nerka</u>) are one of seven species of the genus Oncorhynchus native to North America. Anadromous sockeye salmon spend portions of their life cycle in freshwater and marine environments (rivers, lakes, ocean habitats) 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 exhibit great life history variation but generally spend their first 1 to 3 years in freshwater lakes, after which they migrate seaward to spend another 1-3 years rearing in the North Pacific. Adult sockeye enter coastal fisheries and typically return to spawn in their rivers and lakes of origin between ages 3 and 6. Sakinaw sockeye salmon mature and spawn mainly at age 4. Most juveniles rear for one year in a lake before migrating to sea.

Sakinaw Lake or "Sauchenauch" Lake is located on the Sechelt Peninsula in DFO management Area 16 (Figure 1). It is the largest lake on the Sechelt Peninsula (Figure 2) and lies within the Sechelt Indian Band's traditional territory. Historically, Sakinaw Lake and the surrounding watershed provided the Sechelt people with abundant returns of both sockeye and coho (O. kisutch).

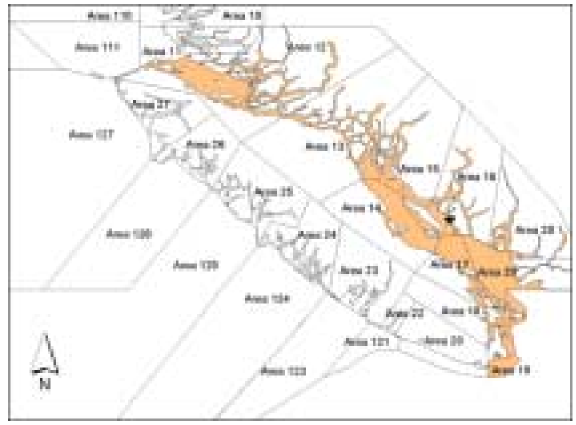


Figure 1. Important Statistical Areas (11-13 and 16) for Sakinaw Lake sockeye. Note Sakinaw Lake(*) is located in Area 16.

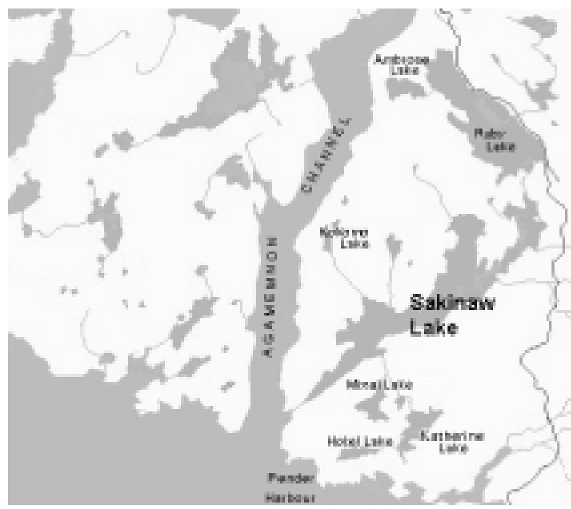


Figure 2. Location of Sakinaw Lake and its tributaries on the Sechelt Peninsula near Pender Harbour, BC.

Summary

- Sakinaw Lake sockeye abundance appeared stable from 1955 to 1985 with escapements averaging 4886 (maximum 16,000 in 1975).
- Sakinaw Lake sockeye abundance has declined by 98% over the past 12 years (3 generations); mean escapement

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since1996 is only about 80 sockeye.

- Causes of the decline are thought to include spawning habitat degradation, changes in lake levels, poor ocean survival and fishing.
- The stock is likely to be extirpated if present conditions continue and a recovery plan is needed urgently.

The Fisheries

Sakinaw Lake sockeye are harvested incidentally in purse seine and gillnet fisheries in Johnstone and Georgia straits. They migrate through Johnstone Strait in mid-June to late July at the same time as Fraser River Early Stuart sockeye and other “non-Fraser” sockeye populations from Nimpkish, Fulmore, Phillips and Heydon lakes. Escapements to Sakinaw Lake and the other non-Fraser sockeye stocks are not managed individually to targets but they are monitored.

The first major fishery encountered by Sakinaw sockeye is in Johnstone Strait (Statistical Areas 11, 12 and 13), approximately 110 km in length, where sockeye become concentrated during their inshore migration and are available to commercial seine, gillnet and troll fisheries. Management of this mixed-stock fishery is based on the abundance and composition of Fraser River sockeye. Catch rates and scale samples from a test fishery or commercial fishery catches are used to estimate the abundance of Fraser River sockeye stocks and their diversion rate (proportion using Johnstone Strait as opposed to Juan de Fuca Strait). The proportion of Non-Fraser sockeye present in Johnstone Strait is also reported in aggregate.

Sakinaw sockeye are also harvested subsequently in Sabine Channel (Area 16). As in Johnstone Strait, commercial fishing opportunities in Sabine Channel typically depend on the abundance and composition of Fraser River sockeye. Small First Nations fisheries for food, social and ceremonial needs also occur in Sabine Channel. Sakinaw Lake sockeye have profound social and ceremonial importance to the Sechelt Indian Band.

Sport catches are not estimated but they are presumed to be small. Illegal fishing and poaching are reported to have had a significant impact on Sakinaw sockeye but the extent and magnitude of the illegal activities is unknown.

Catch statistics for Sakinaw Lake sockeye are mostly unreliable or non-existent because of difficulties in allocating catch from mixed-stock fisheries to specific stocks. However, Sakinaw contributions have been estimated in some years using scale racial analysis (Gable and Cox Rogers 1993). In 1975, the proportion of Sakinaw sockeye in sockeye catches was estimated at 8% in Areas 11 and 12, 20% in Area 13, and 40% in Area 16; these estimates imply harvest rates of 0.4%, 29.1%, 7.4% and 4.3% in Area 11, 12, 13 and 16, respectively (J. Woodey, pers. comm.). Starr et al. (1984) estimated an average total catch of 50,550 Sakinaw sockeye from Areas 11, 12, 13 and 16 between 1970 and 1982 using run reconstruction methods and an estimated average total exploitation rate of 41%, (Table 1). Murray and Wood (2002) provide a summary of the best available estimates of harvest and exploitation rates. They report that Sakinaw sockeye harvest rates range from 37 to 65% for Johnstone Strait (Areas 11, 12 and 13) and 4 to 29% for Area 16 and exploitation rates range from 1 to 67%. The lack of stock specific catch data contribute to the uncertainty of the estimates.

Table 1. Estimated Sakinaw sockeye catches in Areas 11, 12, 13 and 16 for the years 1970 to 1982. Data from Starr et al. 1984

	Sakinaw				CATCH			
YEAR	Run	Catch	Escapement	Exploitation	Area 11	Area 12	Area 13	Area 16
1970	9355	4355	5000	0.466	17	3827	237	274
1971	16118	8118	8000	0.504	1	4820	1085	2211
1972	7465	2965	4500	0.397	20	1955	592	397
1973	2102	602	1500	0.286	9	420	77	96
1974	11608	5608	6000	0.483	74	3378	762	1394
1975	24801	8801	16000	0.355	33	6573	1771	424
1976	8925	2925	6000	0.328	36	2451	394	44
1977	3596	2396	1200	0.666	36	1840	448	71
1978	9239	5239	4000	0.567	85	4155	956	43
1979	13775	2775	11000	0.201	59	1993	565	158
1980	3710	910	2800	0.245	17	777	109	7
1981	4269	1269	3000	0.297	11	680	564	13
1982	7987	4587	3400	0.574	35	2916	1524	111
Total	122950	50550	72400	0.411	435	35787	9084	5245

Resource Status

Inferences about trends in the status of Sakinaw Lake sockeye rely heavily upon spawner escapement data (Murray and Wood 2002). A time series of spawner escapement estimates from BC16 reports has been used because these reports are based on fishway counts with reasonably consistent monitoring since 1953. Additional data from local fisheries offices, Sechelt First Nation, and dive surveys of the spawning grounds have been used when BC16 reports were unavailable, especially in recent years.

Escapements appeared stable from 1955 to 1985 averaging 4886 (maximum escapement of 16,000 in 1975) but have decreased rapidly in the last 12 years. The 5-year average annual escapement for 1996 to 2001 is only about 80 sockeye (Figure 3).

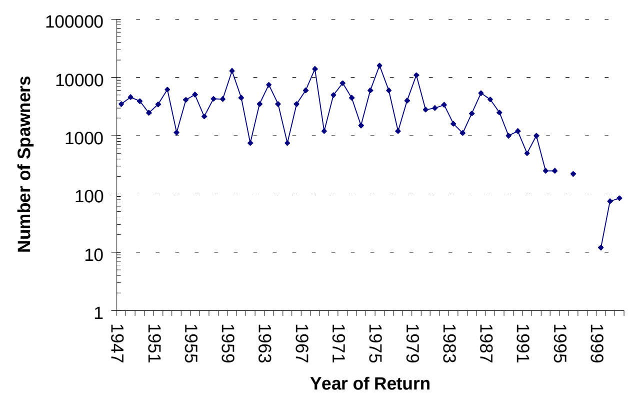

Figure 3. Sakinaw Lake sockeye escapement estimates for 1947 to 2001. No data for 1995, 97 and 98.

Outlook

If present conditions continue, sockeye are likely to be extirpated from Sakinaw Lake in the foreseeable future (Murray and Wood 2002). Evidentially, passive management and limited enhancement efforts have been inadequate to date. Further changes to the Johnstone Strait sockeye and pink fisheries will be necessary to promote recovery.

Although overfishing is almost certainly the proximate cause of the decline of Sakinaw sockeye, other factors probably contribute by eroding the population's productivity. Sakinaw Lake is subject to wide fluctuations in flow because of long hot summers with little precipitation and winter floods that result from rain and snowmelt at lower elevations. Forestry and urbanization have been the major development activities in the Sakinaw drainage. Logging can alter hydrologic and sediment transport systems in watersheds. Such alterations can reduce fish habitat productivity by affecting the amount and quality of flowing water, gravel substrates, cover, and food required by fish for survival (Chamberlin et al. 1991). Past logging practices exaggerated the natural fluctuations in river flow, changed temperature regimes, and contributed to the instability in the Sakinaw system (DFO 1988). Erosion of stream banks and transport of fine sediment and logging debris caused a decline in the quality and stability of spawning gravel, a decline in egg to fry survival, and a reduction in fry size. Poor logging practices contributed to the degradation of the spawning beaches where lake and spawning beaches were used as a dump, mill pond, or booming ground. Early logging dammed the lake at the outlet to provide a means of transporting logs to the ocean. Log storage off the outlet of Sakinaw Lake has blocked the adult salmon migration.

During development of residential lots along the shore of Sakinaw Lake, stream flows were diverted to prevent flooding and this has affected the spawning beaches. The increasing human population has required more access to the lake for recreation and domestic water use. A boat ramp was constructed through the middle of one of the major spawning beaches in the lake. Lake shore residents often complain about storage of water for sockeye migration because high lake levels affect the use of their docks and beaches. Water use in the whole drainage contributes to reduced summer flows and low flows impact sockeye migration. Delayed migration out of the ocean exposes Sakinaw sockeye to increased predation.

Sakinaw sockeye are a candidate for listing under the new Species at Risk Act. Protein electrophoresis, microsatellite and mitochondrial DNA analyses indicate that Sakinaw sockeye are substantially reproductively isolated from other sockeye populations. Their distinctive life history characteristics (early river-entry timing, protracted adult run timing, extended lake residence prior to spawning, small body size, low fecundity and large smolts) suggest that they are also evolutionarily distinct from other sockeye populations in the Pacific Northwest and Alaska. The evidence for restricted gene flow between Sakinaw and other populations and the distance to the nearest extant sockeye population both confirm that there is virtually no possibility of natural rescue from neighbouring sockeye populations. Moreover, the failure of previous attempts to transplant sockeye to Sakinaw (and other lakes, Withler 1982; Wood 1995) demonstrate that Sakinaw sockeye are likely irreplaceable.

However, opportunities still exist to

restore Sakinaw Lake sockeye by reducing incidental fishing mortality to increase escapements, bolstering natural fry recruitment with short-term hatchery supplementation, improving natural spawning habitat, and by reducing the impact of competitors or predators. A comprehensive recovery plan is needed to explore all the options, to ensure that the proposed measures address the recovery of Sakinaw sockeye, address local and regional concerns, and do not contribute to further harm.

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