Canada's Pacific Marine Fisheries
Past Performance and Future Prospects
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insuperable obstacle both to the ascent of adult salmon and safe descent of their young.

THIS IS A KEY PAPER FOR ANYONE FISHERIES BIOLOGIST TO GET INTO ESPECIALLY MANAGER TYPES BECAUSE ITS ASSEMBLED BY THE BEST MINDS AVAILABLE IN THE BUSINESS

LARKIN + RICKER

Skeena River Sockeye

History

The vast majority of the Skeena River sockeye mature at either 4 or 5 years of age. Over the past 50 years, the 4's and 5's have been represented in approximately equal numbers, although in any particular year one age-class may greatly exceed the other. Because there are two major age-classes, the phenomenon of consistent 4-year-dominance has not occurred on the Skeena, though this does not *necessarily* mean that there is no competition or other interaction between successive broods in some nursery lakes. The 5-year-old fish of the Skeena had big broods maturing in 1914, 1919 and 1924, while a series of large 4-year-old broods occurred in the period 1936 - 1952, thus producing temporary 5-year and 4-year cycles.

The 5-year average catches are shown below in thousands of fish, pounds and cases. Weights through 1950 are estimated from the number of cases packed, at the rate of one 48-lb case = 72 lb of raw fish. This figure applies best to the past 25 years or so. In the early years of canning, 80 lb or more of raw fish were required to yield one case, but the fixed conversion factor is sufficient for our purposes.

RICKERS RETENTION IS SLOW IN SOME AREAS.

Years	*Fish*	*Pounds*	*Cases*	*Boats (estimated)*	*Year*	*Fish*	*Pounds*	*Cases*
1906-10	—	8800	122	980	1956	149	880	12
1911-15	—	7600	105	1050	1957	282	1625	23
1916-20	—	7600	105	1130	1958	602	3860	54
1921-25	—	7100	99	1190	1959	196	1200	17
1926-30	—	5900	82	1250	1960	186	1021	14
1931-35	—	4000	56	1240	1961	895	5252	73
1936-40	—	5100	71	1080	1962	484	3048	42
1941-45	—	4500	62	830				
1946-50	—	4300	60	(820)				
1951-55	675	4254	59					
1956-60	283	1717	24					

The catch was at its highest in the early 1900's. In the late 1920's and early 1930's it declined rapidly between 50 and 60 per cent of the early peak level, where it remained through the 1940's.

Spawning ground surveys indicate that in recent years the run to the largest lake in the system, Babine Lake (174 sq. mi.), comprises 80 to 90 per cent of the total escapement to the watershed. The remainder of the run is spread among about 12 smaller lakes having a combined area of about 90 square miles.

Milne (1955) assembled statistics on the number of boats fishing on the Skeena and their relative efficiency. The amount of effort expended in fishing (expressed as an adjusted number of boats fishing, in the table above) increased up to the late 1920's, remained high until 1935, then gradually decreased until 1941 when the war-time suspension of fishing by Japanese-Canadians caused a sudden drop. Fishing effort remained at this reduced level throughout the war; since that time, changes in gear and patterns of fishing make it difficult to get a comparable measure of fishing effort.

Comparison of size of catch and number of boats fishing, as shown above, suggests that overfishing was one factor contributing to the decline in Skeena catches. Remembering that the effects of any year's fishing show up in the progeny of that spawning when they return as adults 4 and 5 years later, the period of high effort (1915 - 1935) was one which produced declining catches, while the late 1940's and early 1950's showed some improvement: the average catch for 1951 - 54 was 70,000 cases. x 72 = 504,000 SOCKEYE

Another possible cause of the decline in catches during the late 1920's were the extensive forest fires in the Babine watershed in 1921 - 22. These fires promoted a more rapid run-off during flood times and reduced the minimum flow in the low-water season, hence reduced the capacity of the spawning grounds.

During the late 1940's average exploitation of Skeena sockeye was about 50 per cent. The commercial fishery took about 45 per cent of the stock, and the Indian fishery about 6 per cent.

Early in 1951 a large rock slide occurred at a remote point on the Babine River. This was first discovered after it held up the salmon runs that summer. It was removed during the winter of 1952 - 53, but meantime it had prevented about two-thirds of the Babine runs of 1951 and 1952 from reaching their spawning grounds (Godfrey *et al.*, 1954, 1956). In addition to those blocked, many of the fish that did manage to pass had been injured and delayed, and many died unspawned. This not only reduced the production of these years, whose fish returned mostly in 1955 - 57, but of those that did return, it was necessary to catch a smaller percentage than usual, so that the stock would be quickly re-established.

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Partly as a result of these special circumstances, and to achieve maximum co-ordination between research and management, since 1955 the Skeena sockeye and other salmon have been managed by the Skeena Salmon Management Committee, consisting of the Director of Fisheries for the Pacific Area and the Director of the Fisheries Research Board of Canada Biological Station, Nanaimo.

Present Status and Future Prospects

Even at its peak, the sockeye production from the Skeena, and from Babine Lake in particular, did not approach what is obtained from certain other major nursery lakes of British Columbia. While lakes such as Shuswap Lake and Fraser Lake in the Fraser River drainage provide catches averaging some 15,000 fish per square mile of lake surface area per year, and Owikeno Lake at Rivers Inlet provides 27,000 sockeye per square mile, Babine Lake just before the Slide was providing an average catch of only 3200 sockeye per square mile, and during its best 5 years (1906 - 10) it averaged no more than 6000 per square mile.

Comparison of the temperatures and dissolved chemicals of Babine Lake with other large sockeye lakes does not bring to light any characteristics that are known to be unfavourable. However, the lake is not well shaped in relation to the best sockeye spawning areas, which are in the outlet. Recent studies have shown that young sockeye do not distribute themselves uniformly throughout the lake (Johnson, 1956). They are crowded and grow slowly in the north arm, which is separated from the main lake by a rather shallow "narrows" and is, in effect, a separate lake. The main body of the lake has a much sparser and faster-growing population of young salmon. Consequently recent management policy has aimed at relatively larger escapements to the upper lake's spawning tributaries, which can be accomplished because these fish pass through the fishery several weeks earlier in the season, on the average, than do the outlet spawners. It remains to be seen whether the quantity and quality of spawning beds tributary to the main lake will be sufficient to provide it with the needed number of fry. There are no really large streams there with first-class spawning gravels. If experiments now under way do develop a fool-proof routine for hatching and releasing completely hardy salmon fry, upper Babine Lake is one place where it may be of greatest service.

Morice Lake (50 sq. mi.), the second-largest lake in the Skeena system, has supported only a small stock in recent years, but a hatchery built there in 1960 is expected to supplement its natural reproduction facilities. Among the other lakes, Lakelse (5.2 sq. mi.) now has an experimental hatchery which should increase its sockeye production while pointing the way to generally applicable procedures.

While Babine Lake's early spawning stocks are being built up to the level of maximum yield, about 50 per cent of the Skeena stock must be reserved for spawners. Presumably the *natural* productivity of the system as a whole is somewhat less than 7 or 8 million pounds per year, or about 1,200,000 sockeye—because catches of this magnitude early in the century quickly reduced the stock size and yield. However, artificial supplementation of up-lake spawning at Babine, if it proves feasible, might raise the level of production by 50 per cent or more.

Nass River Sockeye

History

Four major growth types occur in the Nass River sockeye stocks, 4- and 5-year-old fish with a 1-year freshwater phase, and 5-and 6-year-old fish that spend two years in the lake before they migrate seaward. The proportions of these types vary considerably from year to year, although almost invariably the 5-year fish with two years in the lake predominate.

Until recent years the history of the sockeye fishery on the Nass paralleled that on the Skeena. The period of most intensive fishing was from 1915 to 1935. Formerly, Nass catches were packed in canneries located near the river mouth, but more recently they have been taken to the Prince Rupert area on the Skeena River. The decrease from the early peak production on the Nass to the low packs of 1926 - 30 suggests too great a rate of utilization; as with the Skeena, this decline occurred during the period 1915 - 1925. During the 1940's, fishing effort was reduced because of circumstances related to