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Status of the Pemaquid River salmon experiments

by

George A. Rounsefell

The experiment with king salmon in the Pemaquid River arose through fortuitous circumstances. The State of Maine planted young king salmon in Biscay Pond in the headwaters of the Pemaquid River to furnish fresh-water angling. Screens prevented these fish from leaving the lake, but during the floods of 1936 the screens were washed out and an undetermined number of young kings gained access to the river and thence made their way to the ocean.

On August 27, 1940, a 33½ pound king salmon was caught in a pound net at Pemaquid Point a few miles from the Pemaquid River. On September 18 a school of large fish was observed at the mouth of the Pemaquid River and one was caught and proved to be a 40-pound king salmon. Since Mr. Chester Poole, the owner of the mill at the mouth of the river, had reported the capture of two smaller salmon ascending the river in the fall of 1939 it was surmised that these kings would likewise attempt the ascent. At the request of Mr. Arthur Greenleaf, Commissioner of Sea and Shore Fisheries, Mr. Leslie Scattergood and I examined the five miles of the Pemaquid River between the mouth and the dam at Bristol, to discover if the river contained any suitable spawning grounds. Just below the dam at Bristol we found several hundred yards of river where the bottom is covered with clean coarse gravel and small rubble, and where the depth and current are favorable for spawning. A shorter

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stretch of gravel beds was found about half a mile above the dam at the mouth of the river.

Upon learning that the river contained suitable spawning beds, Mr. Greenleaf had the alewife fishway over Poole's mill dam hastily repaired and modified to accommodate these large fish. No count was made of the number of salmon ascending the ladder during the first few days, but the ladder was later barricaded and a record kept of ascending salmon. This incomplete count by Mr. Poole and Mr. Fred Duplissey, the Sea and Shore Fisheries warden, showed that at least 20 salmon passed over the dam. In addition one male and two female salmon were stripped on October 12 and the resulting 14,000 eggs placed in the hatchery of the Department of Inland Fisheries and Game at Auburn.

The return of these salmon to the Pemaquid aroused a tremendous interest in the possibilities of maintaining a run of king salmon. At the request of Mr. Herrington, a meeting was held in Augusta, Maine, attended by Mr. George Stobie, Commissioner of Inland Fisheries and Game, Mr. Arthur Greenleaf, Commissioner of Sea and Shore Fisheries, and Mr. Herrington and Dr. Rounsefell of the Fish and Wildlife Service. The Maine representatives agreed to cooperate with the Fish and Wildlife Service in experiments to determine the feasibility of maintaining a king salmon run in the Pemaquid.

The general program proposed included the determination of the success of natural spawning through stream observations and wier counts of seaward migrants, the evaluation of the merits of stocking with fry or with yearlings by marking and planting half of the hatchery kings the first spring and half the second spring and obtaining wier counts at the time of their seaward migration. Wier counts in later years of returning

adults would provide an estimate of the survival in the sea. From these various observations it would be possible to determine whether the maintenance of a run of kings in the Pemaquid was practical.

Observations made during the winter showed several redds where the adult salmon had actually spawned within the two areas in the river shown by our survey as furnishing suitable gravel beds. Later, on May 20 I went down the river with Mr. Duplisey in an attempt to discover if the spawning had been successful. Although the river is difficult to seine on account of the lack of suitable bottom, we caught nine young kings in one haul a few hundred yards above Poole's mill.

Since the young of the fall-run kings leave the rivers early in the first year in their native habitat, we expected that the same would probably be true in this case, and so preparations were made early in 1941 to determine the results of this spawning by means of counting the downstream migrants. To do this fine-meshed screening was placed on a wier and a counting trap was installed just above Poole's mill, near the mouth of the river.

As an additional check on the downstream migration and also to obtain some indication of the mortality of the young during this period, 5,000 of the young kings held at the Auburn hatchery were marked by fin clipping and released in the Pemaquid on May 19, between the dam at Bristol and the highway bridge over the abandoned dam at Hatch's mill.

The wier and counting trap have been in continuous operation since April 10, 1941. Mr. Duplisey made daily observations of the water temperatures and counts of fish migrating downstream.

The downstream migration of young kings has been almost negligible to date. The first young, four with the yolk sac still unabsorbed, were taken in the trap on April 19 and the last one was taken on June 9. Altogether only 15 were caught. There are three possible explanations for the absence of an appreciable downstream migration of young kings during the past spring and summer:

1. Natural spawning may have failed to produce any young.

2. Predators may have caused an extremely heavy mortality of the young.

3. The young may be remaining in the river for an extra year before migrating to the sea.

The first possible explanation of the failure to take more downstream migrants in the trap, that there was a failure of natural spawning does not seem likely. Since the spot where we seined the nine young kings on May 20 was only a few hundred yards above the counting trap and only two were taken in the trap after May 20 (one a newly hatched fish with the yolk sac unabsorbed), it is clear that the catch in the trap apparently gave no indication of the extent of the natural hatch.

The second possible explanation is an extremely heavy mortality due to predators. This explanation cannot be ruled out, although we have not observed any heavy population of predators in the river, and it is difficult to conceive of the loss of all of the 5,000 marked kings by this means if they had migrated directly down the river.

The third possible explanation of the failure of the downstream migration to materialize, namely, that the young kings in the Pemaquid are remaining an extra year in fresh water, has some logical basis. Mr. Gerry Wade, superintendent of state hatcheries, informed us that the original stock of eggs used for planting Biscay Pond was obtained from the fall run of king salmon of the Pacific coast, and the adults returning to the Pemaquid ascended the river in early October. On the Pacific coast the young of the fall-run kings (chinooks) usually leave the river and enter salt water soon after hatching in the spring. Thus Rich and Holmes (1939, p. 262) state,

> "The fall chinooks normally enter the ocean early in their first year, whereas the spring chinooks remain in the streams for an entire year before going to the ocean."

A sample of fall-run kings taken on June 12 in the Columbia River (See Rich and Holmes, 1939, p. 249) that were approximately 8 months old from the time of spawning (and therefore the same age as these young Pemaquid River kings) averaged 52.2 millimeters (2 inches) in length, whereas the Pemaquid kings, hatching in April and May were barely over an inch in length at this time. Even the young kings held at the Auburn hatchery, which hatched in January in the warmer water of the hatchery, showed an average length on May 9 of only 38.25 mm. (1½ inches) in a sample of 15 fish.

It may well be that the more severe winter conditions in Maine have slowed up development sufficiently to prevent these fish from migrating at the normal time. That this explanation has some basis in fact is indicated by Gilbert's observations on the Yukon River (Gilbert, 1922).

He says,

"Another striking peculiarity of the Yukon king salmon is found in their early history as fry and fingerlings. . . . . .the central areas of the adult scales contain records of the early history and show conclusively in every instance that the young remained in fresh water for a full year's growth before descending to the sea.

"This habit of the Yukon kings is in striking contrast to what is observed in streams farther south. In the Fraser River, the Columbia, the Sacramento, and all other streams thus far examined a considerable proportion of the adult salmon are developed from fry that passed to sea during their first year and completed only a small portion of their first year's growth in fresh water . . . . . The absence of the "sea type" in the Yukon may well be related to the severity of the fall and winter, the lateness of the spring, and the shortness of the summer season. It would seem that the hatching of the eggs, the absorption of the yolk, and the emergence of the fry from the gravels must be correspondingly retarded."

We do not suggest that the conditions in Maine are as severe as on the Yukon, but they are certainly much more severe than conditions met with by the fall-run king salmon of the Pacific coast states.

If any number of these young kings have survived in the river they will probably migrate downstream in the spring. On August 14, I seined at several points along the river without taking any young kings. However, owing to the difficulty of catching such an active fish under poor conditions for seining I do not feel that this indicated their absence. Young fish about three inches in length were observed at several points in the river which might have been kings. During the past summer the Pemaquid River has maintained a good flow in spite of the extreme drought conditions in Maine, and the daily water temperatures taken at 8 a.m. have not exceeded 72 F., so that I do not believe that the conditions have been unsuitable.

Unfortunately the remainder of the young kings held in the hatchery for planting next spring died of disease, possible enhanced by the extreme drought conditions at Maine hatcheries during this past summer. This important phase of the experiment has thus been abruptly terminated.

Since there have been no satisfactorily designed and adequately followed up experiments in introducing desirable species of Pacific coast salmon into Atlantic coast waters, we believe that it is important to continue this experiment until it is discovered whether or not Pacific salmon can be established in North Atlantic streams. It is already known that the young of Pacific coast salmon when planted in Atlantic streams, will descend to the sea, mature there, and return as adults to the stream in which they were planted. The present problem is to discover whether they can successfully spawn and pass their fresh-water existence in these streams in sufficient numbers to maintain themselves.

As stated above, the use of king salmon in the small-scale experiment in progress was due to fortuitous circumstances. In selecting the most promising species of Pacific salmon for introduction into the smaller coastal streams of Maine I favor trying the coho or silver salmon. In their native habitat the king salmon is found chiefly in the larger rivers, whereas the silver salmon is found in streams of every size and type. This suggests that the size of the stream may have some influence on the success of the king salmon. The silver salmon is a splendid sport fish and provides the great bulk of the catch in the famous sport fishery in Puget Sound, where it is far more numerous than the king.

The silver salmon is smaller than the king, which would be an advantage in these smaller streams. In Puget Sound the silver salmon mature at 3 years of age instead of the usual 4 or more for the king salmon. Thus the use of the silver salmon would be of advantage in experiments since it would provide a more rapid turnover, cutting down the time and thus the cost of the experiments.

The establishment of a sport species of Pacific salmon in Maine streams, in addition to providing a great attraction to sport fishermen and vacationists, would be of great aid in solving the problem of unemployment among the fishermen of the smaller coastal towns. In Puget Sound there has arisen a large marine salmon sport fishery in the coastal waters among the islands and in the estuaries of the rivers, that furnishes employment to hundreds in the renting of boats and equipment.

In view of the above I strongly urge that the experiment be continued with silver salmon. To do this it will be necessary to obtain at least 50,000 silver salmon eggs, preferably from Puget Sound stock, and to make arrangements to hatch and rear them at a federal or state hatchery.

Citations:

Rich, Willis H. and Harlan B. Holmes. Experiments in marking young chinook salmon on the Columbia River, 1914 to 1927. Bulletin, U. S. Bureau of Fisheries, Vol. XLIV, 1928 (1929)pp. 216-264.

Gilbert, Charles H. The salmon of the Yukon River. Bulletin U. S. Bureau of Fisheries, Vol. XXXVIII; 1921-22 (1922)pp. 517-532.