SALMON TROLL INVESTIGATION - MONTHLY REPORTS

January, February and March, 1949

This period has been mostly spent in an analysis of the age of troll chinook salmon by the reading of their scales. About 650 scales taken in 1948 have been read and are now being checked. Also some taken during 1946 and 1947 are being studied. A report will be forthcoming on this phase of the work.

Considerable time has also been spent on the length-weight relationship of troll silvers and chinooks. This work is summarized here.

There has been practically no trolling during this period, due to the inclement weather and lack of fish. At Depoe Bay, the first salmon was caught on March 10, but the fishing has evidently been very poor along the coast. On March 24, five chinooks were landed at Astoria, and since then trolling at the mouth of the Columbia has been fair.

The Length-Weight Relationship of Troll Chinook Salmon

During last summer's sampling, many fish were measured and weighed. Dressed weights were taken to the nearest tenth of a pound. The lengths were fork lengths to the nearest centimeter. The weights taken for each length were averaged, and when plotted on log-log paper they were found to form a straight line. This indicated the data could best be fitted by a parabolic curve of the type, $W = aL^b$ where "W" is weight, "L" is length, "a" is a constant and "b" is a power closely approximating 3. This is the formula used by all previous investigators to express the length-weight relationship of many fishes. The formula in this case was calculated to be: $W = .00001434 \times L^{3.1416}$. From the formula the curve in Figure 1 was drawn and found to fit the points very closely.

The 1947 data were also worked up, although the results are not directly comparable to the 1948 results due to the fact that total lengths were taken in 1947. Nevertheless the two years agreed very closely, the fish averaging only two tenths of a pound heavier in 1947. This is quite possibly a difference in the heaviness of the fish between the two years, as the average weights of the fish taken in 1947 also were considerably heavier than in 1948.

The length-weights taken at Coos Bay and Astoria in 1948 were compared and found to be almost identical.

Also the months of June and September were compared, and there was found to be no seasonal change in the length-weight ratios.

The Length-Weight Relationship of Troll Silver Salmon

The silver data were treated in the same manner as the chinooks, but the results were found to be very different. The silver data were found to form a straight line on both log-log and semi-log paper, although the semi-log was a better fit. The conventional length-weight formula, calculated by least squares, was $W = .00001688 \times L^{3.0808}$. However this curve did not fit the data very well. Therefore the exponential type of curve, $W = z \times 10^{bL}$, was decided upon and found to fit the points very closely. This formula was calculated to be $W = .2762 \times 10^{.0209 L}$, and Figure 2 shows the curves, the solid line being the semi-log or exponential curve and the broken line the log-log or parabolic curve. This is in conflict with all published work on the length-weight relationship of fishes, including Marr's work on silver and chum salmon of the Columbia River, in that the weight has always been considered roughly as a function of the cube of the length.

The silver data for 1947 were also examined and showed the same characteristics, although not as conspicuously. However there was a considerable difference in that the 1947 fish averaged from two tenths to a half pound heavier, for the

same length, than did the 1948 fish. This again may be a sampling or converting error, but there is a good possibility that the fish last year were actually heavier, inasmuch as the average weights were two tenths of a pound heavier in 1947 than in 1948.

The length-weight data from the three areas and different seasons were also compared and there were found to be some interesting differences, although they have not been tested for significance. Upon computing regression lines for the ratios from Astoria, Newport and Coos Bay, it appears that the fish from Coos Bay are relatively heavier than the fish from Astoria, while the Newport fish are in between. This is opposite from what Marr found in a comparison of Columbia River and British Columbia silvers, in which he concluded that the B. C. fish were relatively heavier.

The months of July, August and September were also compared and there was also found to be some difference there. The silvers taken during July were heavier than the fish taken in September, while August was in between.

These phenomena are probably tied in with the approaching sexual maturity of the silver salmon, and it is hoped that more information will be secured during this summer's work.

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Figure One

Length-weight Relationship of Troll Chinook Salmon

1948

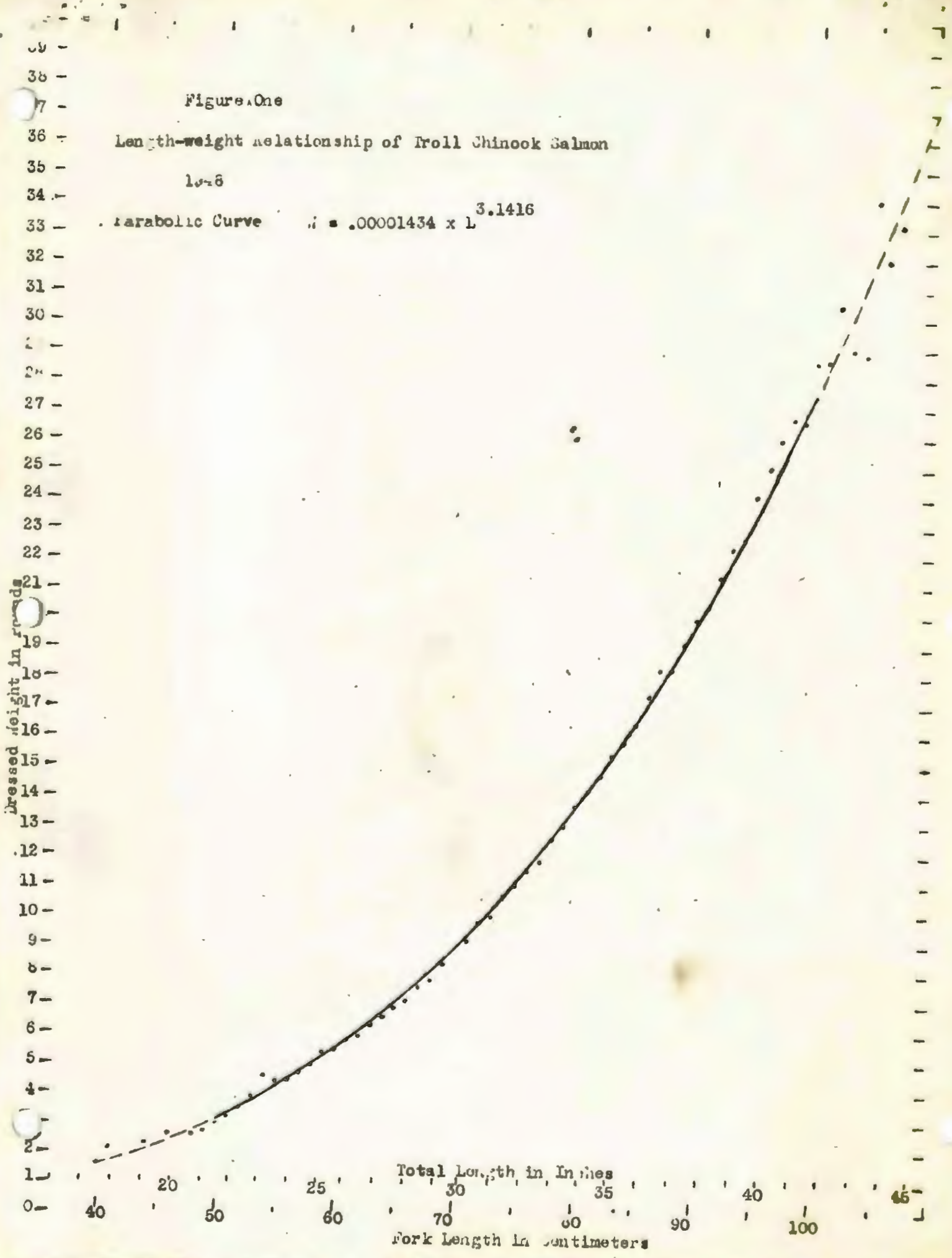Parabolic Curve $W = .00001434 \times L^{3.1416}$

Dressed Weight in Pounds

39 —
38 —
37 —
36 —
35 —
34 —
33 —
32 —
31 —
30 —
29 —
28 —
27 —
26 —
25 —
24 —
23 —
22 —
21 —
20 —
19 —
18 —
17 —
16 —
15 —
14 —
13 —
12 —
11 —
10 —
9 —
8 —
7 —
6 —
5 —
4 —
3 —
2 —
1 —
0 —

Total Length in Inches

20   25   30   35   40   45

40   50   60   70   80   90   100

Fork Length in Centimeters

Figure ...

Length-weight Relationship of Troll Silver Salmon

.1940

Logarithmic Curve ——————   = ... x 10^{.0209 L}

Parabolic Curve — — — $\hat{w} = .0001606 \times L^{3.0308}$

Total Length in Inches

Fork Length in Centimeters