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Length-Weight Relation in Labrador Cod

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Fish length-weight relationships are usually described by the "isometric" formula

$$W = k L^3,$$

or the more general "allometric" formula

$$W = k L^n$$

$$\text{i.e.} \quad \log W = \log k + n \log L,$$

where W = weight, L = length, and k and n are constant. Plots of log weight versus log length should fall on a straight line if the allometric formula holds throughout life.

Whole fresh weights and weights with viscera and gills removed have been obtained for almost 10,000 specimens in Subarea 2 since 1950. More than 9,000 of these were taken in the July-September period; the remainder in April-June. More than 8,000 were collected inshore (Divisions 2G, 2H and 2J) from 1959-64.

Average weights were calculated for each centimetre length (fork length). Preliminary log-log plots revealed that the points for average weight at length were not distributed on a single straight line, but instead on two straight lines, with the change occurring at 60 cm (Fig. 1). Two separate allometric functions were fitted to the unweighted averages of each series (Fig. 2), giving the following constants:

	n	k
Whole weight to 60 cm	2.83	.00003864
above 60 cm	3.12	.00001225
Gutted-gilled weight to 60 cm	2.77	.00003939
above 60 cm	3.16	.0007874

Only 1 or 2 specimens were available for occasional lengths above 100 cm, and these were not included in fitting the curves.

The change at 60 cm is considered to be a real description of an actual change in the length-weight relation, since it occurs in both curves and since the averages in the area of change (40-70 cm) are each based on weights of more than 100 specimens. Preliminary examination of the material

revealed no area or time anomalies. The reason for the change is not easy to postulate. Possibly it is related to a metabolic change (more efficient food utilization per unit body weight) in large and old fish.

The equations fitted to lengths up to 60 cm do not seriously underestimate average weights for lengths to about 80 cm (<10%), and can probably be used as representative of length-weight for practical purposes. Fish larger than 80 cm are uncommon in the area.

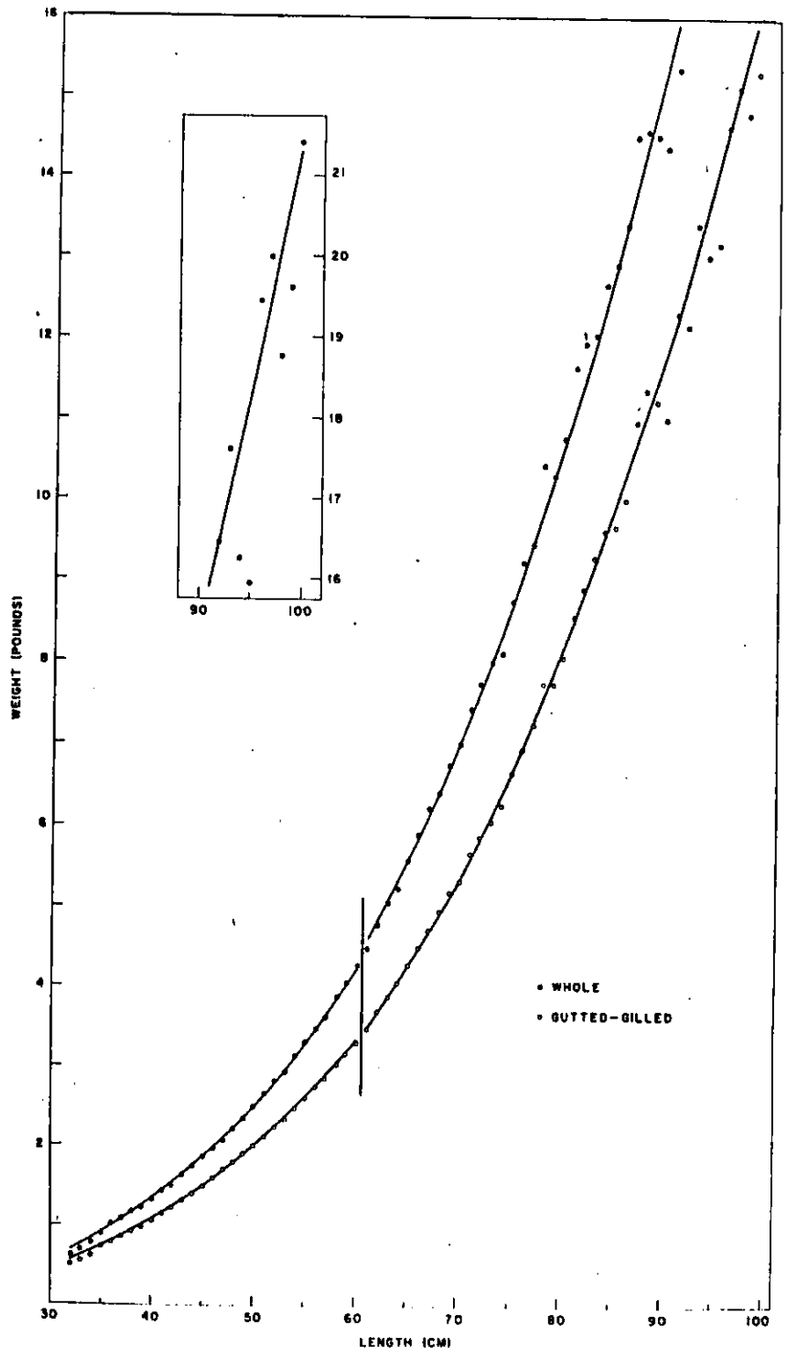

Fig. 2. Average whole and gutted-gilled weights at each length, with fitted curves. Inset shows the upper portion of the whole weight curve.

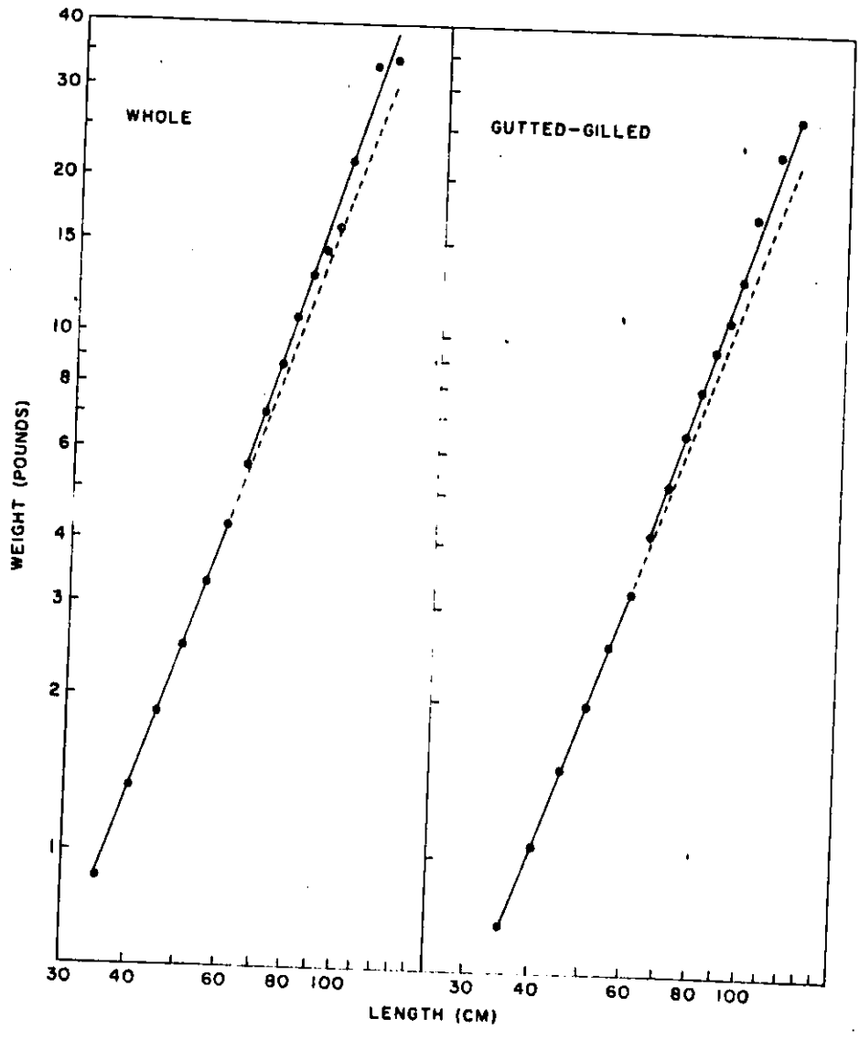

Fig. 1. Length versus whole and gutted-gilled weights. Plots of every fifth average value to show distribution in each case along two log-log straight lines.