Manual of Fisheries Survey Methods II: with periodic updates

Chapter 13: The Coefficient of Condition of Fish

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The relative robustness, or degree of well-being, of a fish is expressed by "coefficient of condition" (also known as condition factor, or length-weight factor). Variations in a fish's coefficient of condition primarily reflect state of sexual maturity and degree of nourishment. Condition values may also vary with fish age, and in some species, with sex.

The coefficient of condition has usually been represented by the letter *K* when the fish is measured and weighed in the metric system. The formula most often used is:

$$K = \frac{100{,}000\,W}{L^3}$$

where: W = the weight of the fish in grams;

L = the standard length of the fish in millimeters.

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In the English system, coefficient of condition is expressed as *C*, and the formula is:

$$C = \frac{100{,}000\,W}{L^3}$$

where: W = the weight of the fish in pounds;

L = the total length (maximum) of the fish in inches

To best compare the coefficient of condition of fish from different waters, data should be from fish of the same species, length, age, and sex; and should have been collected on the same date (or at least in the same season). If comparison is made between individuals from the same water, the fish must have been collected on the same date. For any comparison, be aware that gear selectivity may also be a confounding factor.

The metric coefficient of condition *K* may be converted into the English *C* by the following formula (devised by Hile and published by Beckman 1949):

$$C = 36.1\, r^3 K$$

where: r = the standard length divided by the total length;

K = the coefficient of condition in the metric system.

Klak (1941) devised conversion factors for changing from *K* to *C* and from *C* to *K*. His factor is 0.02768 and is used as follows:

$$C = \frac{K}{0.02768}$$

$$K = 0.02768\,C$$

Klak's factor has been found to be applicable to trouts and ciscoes, but not to species that are of other shapes.

Carlander (1977) summarized information from nearly all published works on condition factor of American fishes. It has very helpful alignment charts from which both *K* and *C* can be read with the use of a ruler.

As an alternative to calculating *C* or *K*, when ample data on lengths and weights are available, the relative robustness of a population of fish can be detected from a length-weight regression. Simply plot the length-weight regression for the population on graph paper and compare it to a similar plot for the Michigan average (see Chapter 17). Relatively robust fish will exceed the Michigan average weight at a given length, and relatively skinny fish will weigh less than average.

In recent years, relative weight indices (Wr) were developed for many species (Murphy et al. 1991). These indices are based on samples from populations across the United States. For most uses, Wr should be used in lieu of the traditional coefficients of condition described above.

References

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