

What is the Optimum Interval Class Size for Length-Frequency Analysis?

PER SPARRE

*Marine Resources Service, FAO
Via delle Terme di Caracalla
00100 Rome, Italy*

In Fishbyte Vol. 7(1), Matthias Wolff points out that the choice of length class size may heavily influence the results of length-frequency analysis. ELEFAN I and other length-frequency methods may give quite different results depending on whether you use, say, 1 cm or 2 cm length groups. He suggests a method to determine the best cases. Thus, I will not advise against Matthias Wolff's method, but I will advise against using only one criterion (in his or any other reasonable method) for the following reasons:

All methods for length-frequency analysis (using only length-frequency data) are subjective, i.e., the results (e.g., growth parameters) depend on the person who carries out the analysis. The degree of subjectivity depends on the data. If a time series shows a clear modal progression of well separated modes, all methods run by any reasonably skilled person will give approximately the same results. This type of "nice" data, unfortunately, are rare. There are nearly always bias and/or random fluctuations which make the data ambiguous, so that they have to be analyzed using personal judgement. I believe, that it is dangerous to conceal the element of subjectivity by introduction of "generally valid rules". Rather than trying to solve a problem which has no solution I suggest that we learn to live with it. In principle, trying to solve the length class size problem is the same as trying to solve two equations with three unknown variables.

In addition to Matthias Wolff's method (and any other reasonable rule of thumb) I suggest the following methods:

a) When measuring lengths, always use the smallest practical class interval size. If you are in doubt whether to use half or full centimeter groups, use half cm. Use 50 or 100 length groups if you can, rather than 25. You can always convert 100 half cm groups into 50 one or 25 two cm groups, but you cannot convert backwards, e.g., from 2 cm groups into smaller classes.

b) perform the length-frequency analysis with a suite of alternative groupings. Groupings can refer both to the length class interval size and the length

of the time period represented by each sample (the time step). With computer packages such as the ELEFAN and LFSA it is no major problem to re-analyze a data set five or more times. It is my experience that there is most often one combination of length class size and time step which provides a clearer picture than the other combinations. That is, there is often one combination, which gives the most convincing estimation of the modal progression, (if one exists for the data in question).

c) do not trust results unless you feel that you can see a structure in the original data, i.e. that you can see the modes and the modal progression. This judgement is a purely subjective one, which may be assisted by various statistical tests (ESP/ASP, chi-squared or maximum likelihood tests), but cannot be replaced by any "objective method".

It requires a certain skill to judge the result of a length-frequency analysis. One way of achieving this skill is to analyze data for which the results are known, and subsequently compare your results to the correct ones. Each time you repeat the exercise you learn from the mistakes you made. Such data may be real data, where ages are known from alternative methods (for example otolith readings) or it may be fake data simulated by a computer. The MS-DOS version of the LFSA package contains a number of routines for simulation of fake length-frequency data (including biased data), by which you can train yourself in the analysis assessment of length frequency.

LFSA Update

Version 1.1 of FAO's Length-based Fish Stock Assessment (LFSA) package is now available. The software is documented in FAO Fisheries Technical Paper No. 101, Supplement 2, by Per Sparre. Copies of the diskettes and documentation may be requested from Mr. Felimon "Nonong" Gayanilo, Jr. of ICLARM.