COMPUTER PROGRAM FOR ANALYSIS OF THE HOMOGENEITY AND GOODNESS OF FIT OF FREQUENCY DISTRIBUTIONS, FORTRAN IV

Routinely, in the study of the dynamics of a fish population, one of the initial steps is the examination of length measurements, viz, the frequency distribution of lengths, average length at age, and differential length distribution by gender. Often, length measurements are the only information available from which to estimate the age structure of the population. Standard statistical techniques such as chi-square tests are often used to analyze length-frequency distributions before pooling data, e.g., to estimate the age structure of the population (Yong and Skillman 1975).

I have developed a computer program which forms frequency distributions from length measurements and then calculates a chi-square statistic which is used to test the homogeneity of the frequencies for the purpose of pooling. Theoretical frequencies from a normal distribution based upon the sample mean and variance of each length-frequency distribution are used in calculating chi-square tests of goodness of fit (Li 1959). The program does not partition the chi-square test of homogeneity but does pool adjacent class frequencies when expected frequencies are small in the case of the test of goodness of fit. Observed adjacent class frequencies are pooled if their expected frequencies are too small and then the test of goodness of fit is calculated. The usual caution against using small samples and expected frequencies less than five in chi-square tests of goodness of fit should be followed (Sokal and Rohlf 1969).

Data required are either individual length measurements in millimeters (from 1 to 1,000 mm) or pairs of length class midpoint and frequency for each of up to five length-frequency distributions per data set; maximum frequency must be less than 1 million. Program storage could be increased to accommodate more than five length-frequency distributions, depending on the capacity of the computer being used. Class interval width must be specified; lengths are then tallied by up to 100 classes which are identified by midpoint on the output. Multiple data sets are processed sequentially without limit.

Output includes listings of arithmetic mean, variance, standard deviation, standard error of the mean, total sample size, and chi-square statistic of goodness of fit for individual groups and for the pooled frequency distribution. The chi-square value for the test of homogeneity is printed with its degrees of freedom; appropriate tables should be consulted for critical values used in testing hypotheses. The goodness of fit test for the pooled data would not apply to the situation where the distribution is clearly multinomial. Histograms of all frequency distributions are produced as full-page printer charts, scaled if necessary to 50 units by up to 100 class intervals. The pooled frequencies and class midpoints are punched on cards to facilitate additional analyses.

The program was developed on an IBM 360/65 OS System[1] and required 56,811 bytes of storage. A copy of the FORTRAN IV source program listing, example input and output, and an instruction manual are available from the author.

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[1]Reference to trade name does not imply endorsement by the National Marine Fisheries Service, NOAA.

PORTABLE TRIPOD DROP NET FOR ESTUARINE FISH STUDIES[1]

Since the introduction of a portable drop net system by Jones et al. (1963) several designs have been utilized for freshwater and estuarine fish studies (Moseley and Copeland 1969; Kjelson and Johnson 1973; Kushlan 1974; Adams 1976). The value of these sampling systems in estimating the density and biomass of certain fish species has been well documented by these authors (Table 1).

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