SCIENTIA gerundensis, 11: 61-64, (1985)

A COMPUTER PROGRAM FOR GUT-CONTENTS ANALYSES

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RESUM

Es presenta un programa d'ordinador per l'anàlisi de dades provinents d'anàlisis de continguts estomacals en estudis de règims alimentaris de peixos. El sistema organitza les dades segons classes definides per l'usuari, i calcula els índexs i coeficients alimentaris modernament utilitzats en aquests tipus d'estudis.

RESUMEN

Se presenta un programa de ordenador para el análisis de datos provenientes de análisis de contenidos estomacales en estudios de regímenes alimentarios de peces. El sistema organiza los datos según clases definidas por el usuario, y calcula los índices y coeficientes alimentarios modernamente utilizados en este tipo de estudios.

ABSTRACT

A computer program for analysis of feeding data of gut-content analyses of fishes is described. The system organizes data into functional classes with ranges defined by the user, and calculates a recently used series of indices and feeding coefficients in those kinds of studies.

Key words: computer program, gut-contents analysis, feeding ecology.

INTRODUCTION

A computer program, REGIM, has been developed to interpret large data sets of guts analyses. REGIM organizes data with measures of central tendency and calculates simultaneously a series of indices for feeding studies.

Study of diet based upon analysis of estomach contents is now standard practice in fish ecology but exists diferents methods which may be employed. There are several review papers by Hynes (1950), Pillay (1952),

and Langler (1956) which discribe the methods of analysis in use at those times. More recently Hyslop (1980) reviews the methods of dietary analysis in use at present and examine each of them, illustrating its advantages and disadvantages.

Hynes (1950) have stated that important items in the diet will be obvious irrespective of the method of stomach analysis employed. This statement hinges on the definition of «important items in the diet» and each method will show items important in the diet according to the attribute it was designed to measure (ocurrence, number, weight, volume, points, etc.).

It seems realistic to base assessment of dietary importance upon these unrelated methods (Hyslop, 1980), and Windell (1971) has stated that indices combining values from different sources are more representative.

The indices calculated by REGIM have been selected from occurrence, numerical and gravimetric (or volumetric) methods, as well as indices combining these values. Also includes global descriptors of diet as feeding intensity, feeding diversity, index of emptyness, etc. and a descriptor of diet overlap between groups. All of these indices are listed in table 1.

Table 1. Measures of feeding ecology calculated by REGIM.

GLOBAL DESCRIPTORS
Mean number of specimens per gut.
Biomass ingered pergut
Mean weight of preys.
Index of emptyness: rate of empty guts.
Index of mean feeding intensity, K (Aoyama, in YASUDA, 1960).
Index of feeding diversity: Shannon's index (SHANNON & WEAVER, 1963).
IMPORTANCE OF PREY
Percentage by number.
Percentage by weight.
Percentage of occurrence.
Mean number of specimem pergut.
Mean weight of prey.
Main food, Q (HUREAU, 1969).
Index of relative importance, IRI, PINKAS et al. (1971).
DIET OVERLAP
Schoener's index (SCHOENER, 1970).

DATA INPUT

REGIM accepts only gut-contents data for one species of predator. The data set is a list of the quantities of prey types found in each gut. Each prey type is identified by a number code and measured as count and weight.

Individual prey types may be combined into broad groups representing a multi-leveled hierarchy e.g. plankton, benthos or crustacean, isopod, amphipod, etc.

To aid data manipulation further, each gut can be coded with values designating specimen, sample, date (month), size (total length), body weight (total weight) and total gut-contents weight. These values allow grouping of samples into functional classes with ranges defined by the user.

To help the user to enter correctly the data in a computer sequential file, a program is also available to write the data in the format needed by REGIM. This litle program, ENTRY, request the data set in logical order, although it is not necessary to repeat every time the common information of each sample group (e.g. sample code, date). ENTRY permits also to correct entered data.

OUTPUT

The output summarizes in two sections the contents of those guts analized.

The first displays the total number of guts analized. Also the number of specimens of prey found in these guts and the total weight of these specimens are given in absolute number and as mean number per gut; and the number of empty stomachs, in absolute number and as rate of occurrence of empty stomach (Index of Emptyness). Besides the Shannon's index (Shannon & Weaver, 1963), as index of feeding diversity, and the average of Index of Feeding Intensity, K, are given. This last index was proposed by Aoyama (Yasuda, 1960) and represents the amount of food eaten: the weight of the gut-contents as percentage of the total weight of predator.

Section two is a summary table arranged by prey type. The summary table displays the mean weight, and frequency of ocurrence, total count and weight as percentages of the total. Also calculated for each prey type are the Index of Relative Importance, IRI, (Pinkas et al., 1971) and Main Food, Q, (Hureau, 1969).

All percentages are calculated in relation to the total number of guts which were not empty.

The prey type is displayed by its specific name which will be entered in a direct access file through the litle program ENCODE.

There is an output for each group defined by size and date of sampling. Normally, the size is a size class with ranges defined by the user, and the date is the month or a superior period of time (season, year).

Finally, two output matrices show the acrors values of Schoener's index (Schoener, 1970). In the first matrix this index is a measure of diet overlap between rize classes and in the second it represents a measure of affinity between periods of time.

COMMENT

REGIM, ENTRY and ENCODE are written in FORTRAN 77. These programs are now running on VAX/VMS environment and they were used successfully by the author in the analysis of diet of *Lepidotrigla cavillone* (Moreno and Matallanas, 1983). The program package is available from the author as a print-off copy or on magnetic tape at cost.

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