THE FEEDING NICHE OF MERLUCCIUS MERLUCCIUS L. AND ITS INFLUENCE ON THE LENGTH-WEIGHT RELATIONSHIP

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SUMMARY. The length-weight relationship of Merluccius merluccius L. is given by the equation, log W = -2.388 + 3.153 log L, with a correlation, r=0.89, based on measurements of 504 specimens ranging from 10 to 53 cm of length. When only the smaller than 30 cm specimens were considered the coefficient of correlation was much better, r=0.97, but the specimens longer than 30 cm presented a very low r value (r=0.77).

RESUME. La relation entre longeur total-poids humide, des 504 specimens de M. merluccius L., peut se présenter par l'équation, log P = -2.388 + 3.153 log L, avec une corrélation r=0.89. Pour speciments plus petits de 30 cm le coefficient de corrélation était r=0.97, mais pour les individus de longeur au dessus de 30 cm la valeur de r n'etait pas du tout suffisante (r=0.77).

Aspects on the biology of the hake, Merluccius merluccius L., have been studied in relation with the feeding behaviour and its biometry from the hellenic waters; 504 individuals were obtained after special arrangment with a trawling boat during 1973 and 1974 at four periods each year, that is, in November, January, April and July. Their study was completed within 10 hours of the specimens being caught; 151 individuals were found with empty stomachs, 147 contained food fully or partly digested and they have not been taken in consideration for the quantitative analysis because the stomach contents were not suitable, and 206 specimens were with food in good condition.

The qualitative analysis of the stomach contents from all individuals agreed completely with the information already known from the literature, especially with the important role of crustaceans as diet of the smaller hake, that is for lengths less than 30 cm; hakes above this size fed on fish exclusively. It should be mentioned that the few differences must be attributed to the seasonal and local availability of their prey.

The quantitative analysis of the stomach contents from the 206 specimens is given in table 1. The table gives also the percentage of empty stomachs, as it comes from the examination of the whole set of the 504 specimens, for each subclass and for the classes A and B.

TABLE I.

length of specimens (cm)	number of specimens	dry weight of stomach contents (g, m ± SE*)	empty stomachs %		
10-15	36	0.073 ± 0.038	28.46		
15-20	32	0.127 ± 0.073	47.94		
20-25	34	0.068 ± 0.043	35.33	33.78	A
25-30	46	0.112 ± 0.023	23.39		
30-35	32	3.352 ± 2.651	15.66		
35-40	20	4.084 ± 3.026	11.28	14.28	B
40-53	6	(5.089 ± 3.690)	15.90		

* Standard Error of the mean at the 95 % confidence interval.

It is noticeable that for fish lengths, from 10 to 30 cm, the amount of food, expressed in grams of dry weight, obtained from their stomachs was within the same range, not exceeding the one eighth of the gram. On the contrary, for fish lengths above 30 cm there is an abrupt increase in the weight of the stomach contents; the minimum amount of food, found in the subclass of 30 to 35 cm of length was five times greater than the maximum amount for the 25 to 30 cm subclass.

A double logarithmic regression analysis was applied to estimate the parameters of the length-weight relationship; the equation fitted can be expressed as follows:

$$\log W = -2.388 + 3.153 \log L$$

with a coefficient of correlation of r=0.89, when the whole set of the 504 W/L pairs were considered. However, the correlation was much better when the regression analysis was applied to pairs corresponding to all fish lengths less than 30 cm; in this case r = 0.97. These significant differences in correlation may be attributed to the maturation of gonads (Daan, 1974), but in our study it seems that stomach contents have the most important contribution because none of the specimens presented mature gonads.

An even better correlation has been obtained when other parts of their body, such as the length of the sagitta otolith (Lo) over the length of the fish (Lf), were considered, signifying a normal and almost isometric growth through the two years of observations. For the example given above the equation fitted, based on 504 pairs was:

$$Lf = -2.888 + 2.233\ Lo$$

with a coefficient of correlation r=0.98. The correlation was same when the specimens of class A and B were taken separately.

Summarizing the data available from the literature and from the present study, the following conclusions can be drawn:

1. At the size of about 30 cm, M. merluccius reaches its first maturity stage (Zupanovic, 1968).
2. This size coincides with a major change of the feeding behaviour of the species, because its diet turns to be fishes exclusively (Karlovac, 1959, and others).
3. The amount of food ingested increases significantly for specimens above 30 cm of length (this paper).
4. The coefficient of correlation of the length-weight relationship was a very good one when only specimens smaller than 30 cm were considered (this paper).
5. The percentage of empty stomachs signifies that hakes, above 30 cm of length are more successfull in chasing and sizing their prey which has always been swallowed from the tail (this paper).

Due to the forementioned information we may conclude that the feeding niche of M. merluccius changes at the critical length of 30 cm and at this size, more essential alterations of their behavioural patterns should occur.

LITERATURE.

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