NOTES ON THE ROLE OF CEPHALOPODS IN THE BATHYAL FOOD-WEBS OF THE LIGURIAN SEA

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RÉSUMÉ. Les données disponibles sur l'alimentation des especes bathyales ont été examinées pour mettre en évidence le rôle des Céphalopodes. Les Céphalopodes pélagiques sont aussi les plus importants dans l'alimentation des espèces benthiques.

The feeding habits of deep-living species in the Ligurian Sea (350 - 780 m) have been investigated in several works (1-12, 15, 16). Summing up their results and considerations, the examined species have been grouped according their feeding ecology: Bentho-pelagic feeder (Galeus melastomus, Etmopterus spinax, Mora mora); Benthic feeder (Phycis blennioides, Conger conger, Helicolenus dactylopterus, Aristeus antennatus and Bathypolypus sponsalis) and Scavenger (Geryon longipes).

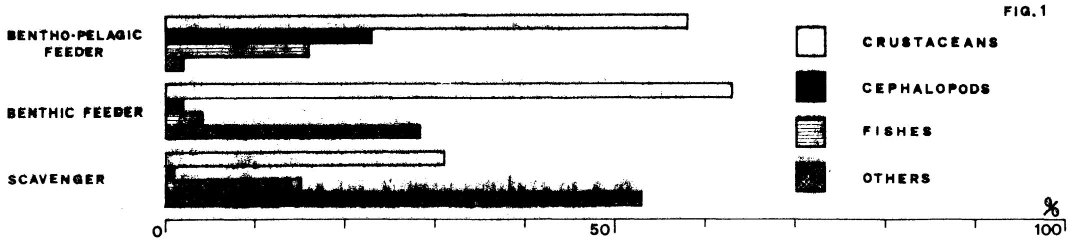
The stomach contents data have been pooled into the three preceding groups and assessed by the following indexes, to point out the role of Cephalopods in the bathyal food-webs.

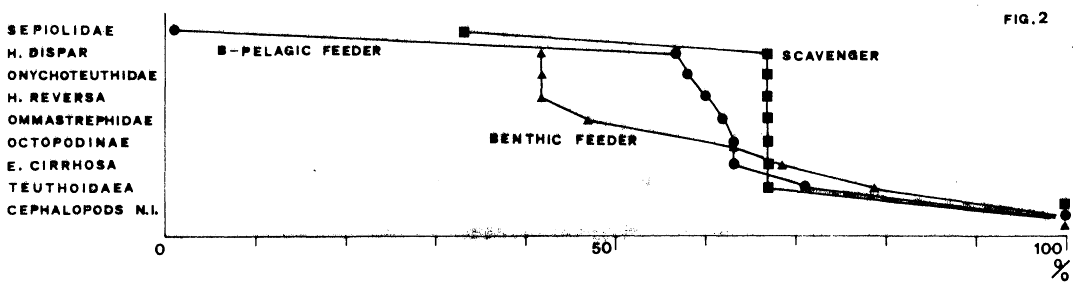
- Percentage occurrence of the main food categories (fig.1): Occurrence = ns/Ns*100, where ns = number of stomachs in which each prey was found, Ns = total number of stomachs examined within the feeding group.
- Relative percentage occurrence of Cephalopod species or family (fig.2): Rel. Occurrence = nc/Nc*100, where nc = number of stomachs in which the Cephalopod species or family were identified, Nc = total number of stomachs which contain Cephalopods within the three groups.

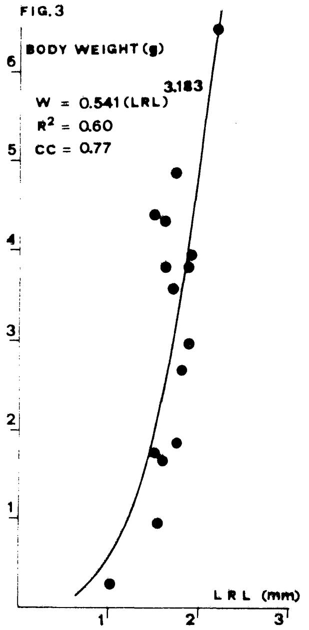
Cephalopod remains (mostly beaks) were identified by methods described by Clarke (2) and Mangold & Fioroni (3) or compared with locally caught specimens.

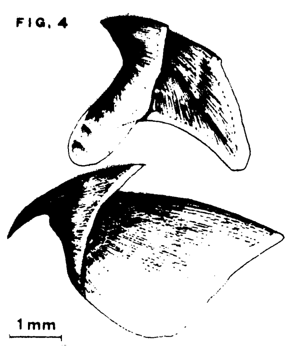
Cephalopods occur in more than 23% of the bentho-pelagic feeders, while they are less than 2% in the other two groups (fig.1).

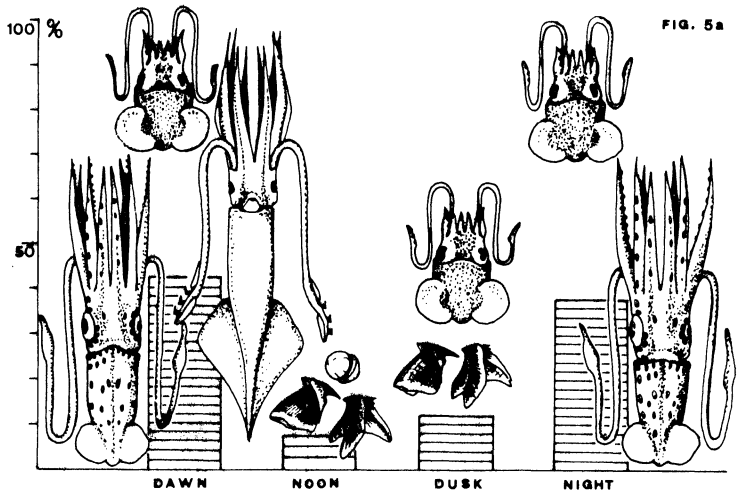
Pelagic squids gave the highest percentage (fig.2) among the identified Cephalopods. Heteroteuthis dispar was recorded in the three groups and in five species at least (G.melastomus, E. spinax, M.mora, H. dactylopterus and G. longipes) in variable percentage from 33% (G. longipes) to to 76% (G. melastomus, adult specimens). The estimated mean number of specimens was 0.4, and the observed maximum was 10 specimens per stomach their estimated mean weight was 3.05 g. per stomach. The relationship











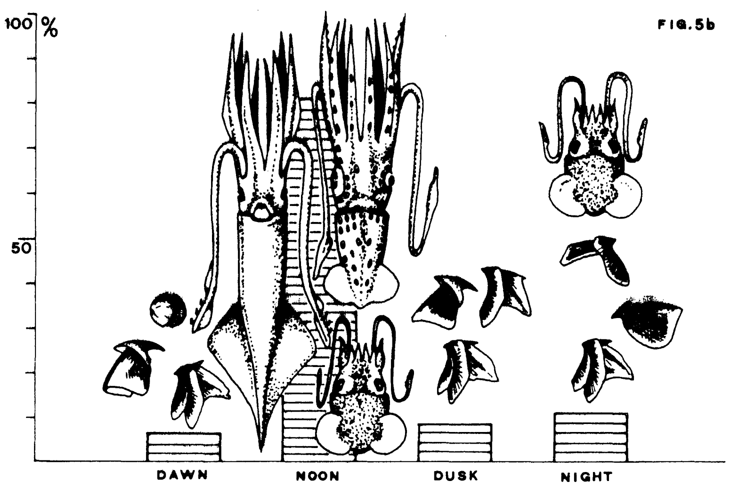


FIG. 1 - PERCENTAGE OCCURRENCE OF MAIN FOOD CATEGORIES IN THE THREE GROUPS.
FIG. 2 - CUMULATIVE PERCENTAGE OF THE IDENTIFIED CEPHALOPOD OCCURRENCE IN THE THREE GROUPS.
FIG. 3 - H. DISPAR: RELATIONSHIP BETWEEN LOWER ROSTRAL LENGHT (LRL) AND WET BODY WEIGHT IN MALES AND FEMALES.
FIG. 4 - H. DISPAR: LOWER AND UPPER BEAKS OF A FEMALE SPECIMEN (BODY WEIGHT = 1.7 g; LRL = 1.6 mm).
FIG. 5 - CEPHALOPOD REMAINS IN THE STOMACH CONTENTS OF G.MELASTOMUS (a) AND E.SPINAX (b). COLUMNS REPRESENT THE PERCENTAGE OF THE WEIGHT OF CEPHALOPOD ITEMS.

between lower rostral lenght (LRL) of the beak and total body weight (W) was defined as $W = 0.541(LRL)^{3.133}$ (fig.3). The equation was computed from a sample of H. dispar specimens both from stomach contents and from the net. The lower and upper beaks characteristics are illustrated in fig. 4. Onychoteuthids, Histioteuthids and Ommastrephids were identified only in G. melastomus, E. spinax and the last group also in C. conger. The estimated numbers of specimens was 0.1, and the observed maximum was 1 specimen per stomach. The mean weight of Histioteuthis reversa was 43.3 g. The comparison with only two locally caught specimens of Ancistroteuthis lichtensteini gave for Onychoteuthids an average weight of 72.79 g. Ommastrephid remains, belonged to relatively small specimens were not identified as species then not weighted.

Octopods represent more than 50% of identified Cepahalopods in C. conger while they amount to 21% in all benthic feeders and less than 2% in the bentho-pelagic feeders (fig.2). Alimentary rhythms have been studied in G. melastomus, E. spinax (14) and G. longipes (4) caught in a day and night series of trawling hauls from 500 to 700 m depht (fig.5). A high occurrence of Heteroteuthis specimens was observed during the night. As reported by Roper (13), the distribution of juveniles H. dispar(5-12 mm) extends from 50 to 300 m at night and below 200 m at daytime. The tendency of large specimens to occur at deeper dephts was not verified because of their absence in these samples. In our night samples the presence of several feebly digested specimens (10-29 mm ML, sketches of whole specimens in fig.5) suggests the same distribution (400-600 m) with the dogfishes when these have been caught. Squids such as Histioteuthids, Ommmastrephids and Onychoteuthids are mostly eaten by E.spinax during light hours, while G. melastomus catch them during the dawn and the night. These Cephalopod species represent from 5% to 80% of the total weight of food items and from 3% to 19% of the total number of the counted prey in the stomach cotents. To evaluate these results we must point out that several remains belonging to a single squid were recognized in the stomachs of specimens fished in the same haul. Nevertheless the identification is not always possible and the computation of the prey number shows some weakness. Because of the prevailing qualitative viewpoint of these studies and the lack of knowledge about the importance of Cephalopods in the diet of these species living at upper levels, their potential trophic biomass cannot yet be estimated in the Ligurian sea. Now we must suppose that pelagic squids play a role more important than benthic Cephalopods, also in the diet of bottom living species. Only in few cases Octopods have been found more abundant. Squids are voracious carnivores and, for their wide vertical distribution, together with euribathic Crustacea and Fishes represent a vehicle of active energy exchange from surface to deep bottoms.

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