

TROPHIC RELATIONSHIPS OF TWO MACROURIDS FROM THE BALEARIC BASIN (WESTERN MEDITERRANEAN): TEMPORAL CHANGES IN DIETS AND IN TROPHIC LEVELS

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Abstract

Seasonal changes in dietary habits and resource partitioning of *Hymenocephalus italicus* and *Nezumia aequalis*, two dominant macrourids co-existing at mid-slope depths (between 550 and 750 m) off Cabrera Archipelago (Balearic Basin, Western Mediterranean), were analysed. *H. italicus* and *N. aequalis* prey mainly on mobile prey (suprabenthos), with a dominance of polychaetes and infaunal amphipods in its diet. Dietary overlap was very low (0,28). Changes in $\delta^{15}\text{N}$ signature also occurred with the highest values observed in spring. *N. aequalis* occupied a higher trophic level (4,4) than *H. italicus* (3,8).

Keywords : *Deep Sea Ecology, Fishes, Trophic Relations, Western Mediterranean.*

Introduction

Macrourids are a widely diversified family of deep-sea fish, distributed worldwide, and dominant at bathyal and abyssal depths [5]. Because several macrourids coexist at similar habitats and depths, these *taxa* have been the object of different comparative multi-specific studies: some studies regard resource partitioning among these coexisting species [4, 1] but only few investigations aimed to temporal variations in diets [3]. In this context feeding habits of *H. italicus* and *N. aequalis* from Cabrera archipelago were analyzed at a temporal scale, focusing on changes of $\delta^{15}\text{N}$ signatures.

Materials and Methods

224 specimens of *H. italicus* and 258 of *N. aequalis* were collected off Cabrera archipelago (Western Mediterranean), within the framework of the project IDEA. Samples were caught during six trawl survey carried out from August 2003 to June 2004, at middle-slope depths (580-750 m). All the specimens were measured, weighted and dissected for stomach contents analysis. From three specimens of each species per month, a portion of white dorsal muscle was collected, dried to constant weight at 60°C, and ground to a fine powder to be processed for stable isotopes analysis [6]. Prey in the stomachs were identified to the lowest taxonomic level, then analysed by means of trophic indices (e.g. %W; %N and %IRI) [2], univariate and multivariate techniques. Month variation of fullness, mean prey weight and mean prey number of each species was tested by one-way ANOVA. In order to detect spatio-temporal changes in diet, nMDS analysis were performed for each species separately; a PERMANOVA design was created on two factors (month fixed 6 levels; depth random 3 levels, nested in month). Secondly both nMDS and PERMANOVA techniques were used in order to examine the overlap pattern within the two macrourids. In addition the overlap degree within species was calculated by Schoener index [8]. Temporal differences in stable isotopes signature were tested by one-way ANOVA. The trophic level (TL) of macrourids was estimated based on their $\delta^{15}\text{N}$ data and using copepods as reference material. $\delta^{15}\text{N}$ values were converted to trophic level gone upon the assumption that there was a fractionation of 3 permil per trophic level [6] and that the base material (copepods) had a trophic level of 2. All the univariate and multivariate analyses were performed using STATISTICA and PRIMER 6 plus PERMANOVA packages.

Results and discussion

From 162 stomachs of *H. italicus* containing food, 52 categories of prey items were identified. Mysids were dominant throughout the year, particularly in August (80,98% IRI) and February (66,39% IRI), whereas isopods were dominant in February and April (28,71 and 18,44 % IRI respectively). Changes in diet were observed in September-November and February-April. Symmetrical PERMANOVA provided evidence for significant differences among months ($F_{5,156}=1,53$; $p=0,023$) and mainly for the interaction between months and depth ($F_{5,156}=1,49$; $p=0,004$). A total of 185 stomachs of *N. aequalis* were analyzed for diet composition and 75 prey items were identified. Polychaetes and amphipods were the main prey items ingested in all seasons; however the ingestion of polychaetes increased gradually from August to February and dominated the species' diet. Isopods were abundant throughout the year but mainly in April. Mysids were consumed mainly in April and June (30 and 40% IRI respectively). NMDS analysis delineated a partial seasonal trend (stress: 0,23): April seemed to be period of change in trophic habits, also evi-

denced by the low value of overlap of Schoener index between February and April. Symmetrical PERMANOVA provided evidence for significant difference both for factor month ($F_{5,120}=1,86$; $p=0,01$) and depth ($F_{5,120}=1,58$; $p=0,004$).

Overall, dietary overlap based on Schoener index revealed a very low dietary affinities (0,28), nMDS evidenced a good separation between the diets of the two macrourids (stress: 0,16).

In *H. italicus* the most enriched $\delta^{15}\text{N}$ value was observed in April and the most depleted in September ($F: 3,85$; $p: 0,026$). Differences of $\delta^{15}\text{N}$ values were not significant in *N. aequalis*, though there was a progressive increase from September to June. The estimated trophic levels were 4.47 in *N. aequalis* and 3.85 in *H. italicus*.

The two macrourids inhabiting mid-bathyal depths in the Balearic basin showed very diverse diets, based mainly on suprabenthic prey and infauna. According to [4] *H. italicus* preyed mainly on fauna inhabiting the Benthic Boundary Layer (BBL) than on mesopelagic resources (i.e. copepods and euphausiids). Low levels of dietary overlap was observed in this study, implying high resource partitioning and probably low levels of competition between coexisting species. The patterns of variability in ^{15}N signatures, with highest values in spring-summer and lower in autumn-winter agreed with other findings [7] according to which temporal changes were found between October and May in a bathyal community off Ibiza (Balearic islands), with highest values in May.

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