MICRONEKTON GROUPS CONTRIBUTING TO THE NIGHT SCATTERING LAYERS IN THE WESTERN MEDITERRANEAN

M. P. Olivar [1]*, P. Abelló [1], A. Quetglas [2], A. Castellón [1], A. Bernal [1], B. Molí [1], A. Sabatés [1], M. Iglesias [2], D. Simao [1] and E. Massutí [2]

[1] Institut de Ciències del Mar (CSIC) - polivar@icm.csic.es

[2] Instituto Español de Oceanografía, Centre Oceanogràfic de les Balears.

Abstract

In the present study the biomass and numerical contribution of micronekton organisms responsible of the night Scattering Layers of the upper water column were investigated. Relative abundance in weight and number of individuals of the different groups collected using midwater trawls performed concurrently with the detection of the scattering layers by echosounders are presented.

Keywords: Vertical migration, Open sea, Pelagic, North-Western Mediterranean

Vertical nyctimeral migrations of the different mesopelagic fishes, decapods and cephalopods of the shelf-break and slope zone off the Mallorca Island (western Mediterranean) were already analysed in previous documents (1, 2, 3), showing upper displacement of many species during the night and very low concentrations in the upper layers during day time. Here we investigate the overall relative contribution of the several micronekton groups to the Epipelagic and Deep Scattering layers (DSL) detected with acoustic methods. To this aim the night micronekton samples obtained on the slope region off Mallorca Island in two cruises (December 2009 and July 2010) were analysed. Samples were collected by means of modified Pelagic Trawls (PT, with mouth opening of 200 and 100 m2 for the December and July, respectively) with a cod-end of 10 mm. Complementary information on the presence of the smallest fishes was obtained with an Issaks-Kidd midwater trawl (IKMT of 3 m2) and mesh size of 3 mm to collect smaller specimens.

The nets were placed at the denser scatter layers detected during night time with the Simrad EK60 echosounder at 18, 38, 70, 120 and 200 kHz. Hauls were carried out in the epipelagic layers (hauls from 40 to 80 m) and at the 400 m deep scattering layer (DSL).

Night collections obtained with the PT showed that crustaceans and fish were the most diverse groups contributing to the scattering layers, with crustaceans represented by 14 decapods, 5 amphipods, 3 euphausiids and 1 lophogastrid, and fish represented by 13 species of myctophiforms, 7 stomiiforms and 1 aulopiform.

Most of the biomass in the upper 400 m was due to fishes and crustaceans in winter, and fishes and gelatinous plankton (shiphonophora and jellyfish) in summer (Fig. 1). Molluscs and tunicata accounted for less than 20% of the overall weight obtained in these midwater hauls. In winter all groups showed higher biomasses at the epipelagic levels than at the DSL, but in summer differences were less pronounced. Among fish, those that rendered the highest biomass were species of the family Myctophidae, and particularly Ceratoscopelus maderensis, being higher in summer. Most mesopelagic fishes reach the epipelagic layer during the nyctimeral migration, except for Argyropelecus hemigymnus and the Cyclothone braueri and C. pygmaea, which do not migrate to the near surface layers (these last two species were seldom caught with PT, but their vertical location could be established through the IKMT hauls). Therefore myctophiforms and stomiiforms contributed to the night DSL, and myctophiforms were the main fish responsible for the Epipelagic scattering layers. Crustaceans biomasses were mainly due to the eufausiids and decapod concentrations, with the euphausiid Meganyctiphanes norvegica being the main contributor (both at the epipelagic and DSL), although more abundant in the epipelagic layers. The decapods Sergestes arcticus and Pasiphaea multidentata were the next species of this group in terms of weight. Mollusca were represented by cephalopods, with the main biomass due to Todarodes sagittatus, and the pterpod Cymbulia peroni, whose collections during the winter period accounted for most of the mollusc biomass, particularly at the epipelagic layers. The tunicata Pyrosoma atlanticum showed higher concentrations in winter, and in both periods the highest concentrations were found in epipelagic samples. In summer, however, the contribution of Salpa maxima in the DSL made that higher tunicate biomasses appeared at the DSL. The patterns showed some differences when considering the number of organisms, mostly due to the number of euphausiids, which enhanced the importance of the crustacean group. This was particularly relevant in the winter period, when large concentrations of M. norvegica were collected, at the near surface and DSL, making this group the first in numerical abundance, nevertheless collections of Cyclothone braueri with the IKMT net indicated that these are numerically the most abundant mesopelagic fish in hauls performed with this net at the DSL (1). Although we are aware that the values presented here are strongly dependent on the type of nets and hauls performed and that they can not be taken as the actual biomasses, we think that the results presented offer a clear insight into the main groups responsible for the upper column scattering layers detected with echosounds at night. In summary, myctophid fishes, eufausiids and some invertebrates, particularly Cymbulia peroni and Pyrosoma atlanticum, in winter, and medusae in summer, are the most common and abundant (both in weight and number of individuals) organism encountered in the epipelagic and DSL acoustically detected. Interestingly, other very abundant mesopelagic fishes, such as Cyclothone spp and Argyropelecus hemigymnus, are also important contributors, but just to the DSL.

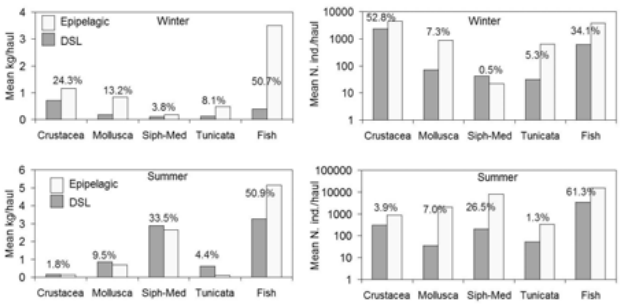

Fig. 1. Contribution of the different micronekton groups to the night Epipelagic and Deep Scattering Layers. Left graphs show mean weight per haul and right graphs indicate mean number of individuals per haul in logarithmic scale.

Acknowledgements: This research was funded by Spanish program CTM2008-04489-C03-01-02.

References

1 - Olivar M.P., Bernal A., Molí B, Peña M., Balbín R., Castellón A., Miquel J. and Massutí E. 2012. Vertical distribution, diversity and assemblages of mesopelagic fishes in the western Mediterranean. Deep-Sea Res. Part I 62:53-69.

2 - Simão D.S., A.P. Torres, M.P. Olivar and P. Abelló.- Vertical and seasonal distribution of pelagic decapod crustaceans over the shelf-break and middle slope in two contrasting zones around Mallorca (western Mediterranean Sea). J. Mar. Syst (summitted)

3 - Quetglas A., M. Valls, F. Ordines, A. de Mesa. M.P. Olivar, S. Keller and E. Massutí.- Are pelagic cephalopods in the Mediterranean as abundant as the stomach contents of their predators suggest? J. Mar. Syst (summitted)

4 - Hopkins, T.L. and T.T. Sutton. 1998. Mid-water fishes and shrimps as competitors and resource partitioning in low latitude oligotrophic ecosystems. Mar. Ecol. Prog. Ser. 164:37-45.