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Maria Valls, Lucía Rueda, Antoni Quetglas

PII: S0967-0637(17)30048-1
DOI: http://dx.doi.org/10.1016/j.dsr.2017.09.002
Reference: DSRI2834

To appear in: *Deep-Sea Research Part I*

Received date: 5 February 2017
Revised date: 29 August 2017
Accepted date: 1 September 2017

Cite this article as: Maria Valls, Lucía Rueda and Antoni Quetglas, Feeding strategies and resource partitioning among elasmobranchs and cephalopods in Mediterranean deep-sea ecosystems, *Deep-Sea Research Part I,* http://dx.doi.org/10.1016/j.dsr.2017.09.002

Feeding strategies and resource partitioning among elasmobranchs and cephalopods in Mediterranean deep-sea ecosystems

Maria Valls*, Lucía Rueda, Antoni Quetglas

Instituto Español de Oceanografía, Centre Oceanogràfic de les Balears, Moll de Ponent s/n, Apdo. 291, 07015 Palma, Spain

*Corresponding author, tel: +34971401561; fax: +34971404945; maria.valls@ba.ieo.es

Abstract

Cephalopods and elasmobranchs are important components of marine ecosystems, whereby knowing the ecological role they play in the structure and dynamics of trophic networks is paramount. With this aim, stomach contents and stable isotopes of the most abundant elasmobranch and cephalopod species (5 and 18 species, respectively) inhabiting deep-sea ecosystems from the western Mediterranean were analysed. The predators investigated encompassed different taxonomic groups, such as rays and sharks within elasmobranchs, and squids, octopuses and cuttlefishes within cephalopods. Specifically, we investigated ontogenetic shifts in diet, feeding strategies and prey consumption, trophic structure and potential dietary overlap between and within both taxonomical groups. Stable isotope analysis revealed ontogenetic shifts in diet in three elasmobranch (rays and sharks) and two cephalopod (octopuses and squids) species. Isotopic data showed a contrasting food source gradient ($\delta^{13}C$), from pelagic (squids and cuttlefishes) to benthic (octopuses and elasmobranchs). Stomach data highlighted a great variety of trophic guilds which could be further aggregated into three broad categories: benthic, benthopelagic and pelagic feeders. The combination of both stomach content and stable isotope analyses revealed a clear food partitioning among species. Mesopelagic prey were found to be an important food resource for deep-sea elasmobranchs and cephalopods, which could be related to the strong oligotrophic conditions in the area. The observed differences in feeding strategies within cephalopods and elasmobranchs should be taken into account when defining functional groups in trophodynamic models from the western Mediterranean. Our results also revealed that cephalopods play a key role for the benthopelagic coupling, whereas demersal elasmobranchs contribute primarily to a one-way flux accumulating energy resources into deep-sea ecosystems.

Keywords: Elasmobranchs, cephalopods, resource partitioning, feeding strategies, stomach contents, stable isotopes