EVENT ABSTRACT

Back to Event

Exploring diversity and distribution of demersal fish species from the Northern Alboran Sea and Gulf of Vera (Western Mediterranean Sea)

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The Alboran Sea is a transition region between the Mediterranean basin and the Atlantic Ocean containing a mix of Mediterranean and Atlantic species. The Strait of Gibraltar, at the west end of the Alboran Sea, connects the Mediterranean with the Atlantic Ocean. The Gulf of Vera also occupies a strategic location in the Western Mediterranean, representing a transition zone between the Alboran Sea and the rest of the basins with a more distinctive Mediterranean character. The Alboran Sea is one of the most productive areas of the Mediterranean, in contrast to the Gulf of Vera that displays a more oligotrophic character. Despite of the interest of the study area the information about the distribution of demersal fishes is scarce. In the present study, the main aim is to analyse diversity and distribution of demersal fish species of circalittoral and bathyal soft bottoms of the Alboran Sea (with a higher Atlantic influence and primary production) and the Gulf of Vera (with a higher Mediterranean influence and lower primary production). Sampling was carried out in the scientific trawl survey MEDITS (International bottom trawl survey in the Mediterranean) between 30 and 800 m depth. All samples were taken from Estepona and Cabo de Palos between 1994-2015 in the Alboran Sea and between 1995-2008 and 2014-2015 in the Gulf of Vera. (Figure 1).

A total of 818 samples (687 from Alboran and 131 from Vera) were considered for this study. For each haul, the abundance and weight of individuals per fish species were standardised to 1 hour towing in order to calculate both species abundance (number of individuals per 1 hour towing) (ind•h−1) and biomass (g•h−1). In order to identify fish assemblages, ordination and classification multivariate methods using fish species abundance and biomass per haul matrices were applied. Prior to analyses, all data were logarithmically transformed using log(x + 1) to minimise the weighting of extreme abundance or biomass values of certain species. An analysis of similarities (ANOSIM) was carried out for statistical comparisons of groups of samples according to the different factors considered (depth, Alboran vs. Vera). Species rarefaction curves were used to compare the species richness values of each fish assemblage. In addition, for each group, Shannon-Wiener (H') and Taxonomic distinctness (Δ*) diversity indices were calculated. For comparisons of the mean values of the considered variables (abundance, biomass and diversity indices) across the identified assemblages and years, we used a non-parametric Kruskal–Wallis test.

A total of 231 fish species have been identified considering all samples, with 215 spp. collected from Alboran (3 classes, 25 orders and 75 families) and 160 spp.. from Vera (2 classes, 21 orders and 67 families), probably because the number of samples in the latter were lower. The number of occasional species, considering those that were captured only in 1 or 2 samples, were 56 in Alboran and 44 in Vera.

The multivariate analyses (nMDS) indicated that depth is the main factor that determines the distribution of species in both areas, with four groups of samples displaying significant differences between them (ANOSIM-Alboran: R=0.85, p=0.001; ANOSIM-Vera: R=0.81, p=0.001). These groups were similar in both areas: Inner continental shelf (30-100 m), Outer continental shelf (101-200 m), Upper continental slope (201-500 m) and Middle continental slope (501-800 m) (Figures 2 and 3).

Regarding the faunistic comparison between Alboran and Vera, the most acute differences were found between those samples from the Middle continental slope. These differences were evident for abundance (ANOSIM: R=0.81, p=0.001), biomass (ANOSIM: R=0.78, p=0.001) and species composition (presence-absence data) (ANOSIM: R=0.61, p=0.001).

The trends for species rarefaction curves with depth was similar in both areas, with similar curves for the Inner and Outer continental shelf , a decrease of the species number for the Upper slope and finally the lowest number of species for the Middle slope. Likewise, the mean values of abundance, Shannon and Taxonomic indices also showed a similar pattern in both areas. Mean abundances differed significantly between assemblages increasing from the Inner shelf to Outer shelf and decreasing abruptly to the Upper and Lower slope (.minimum values). The Shannon diversity index showed significant differences in Alboran, but not in Vera, with minima in the Outer shelf in both areas. The taxonomic index also displayed significant differences in Alboran and Vera, with low values in the Inner shelf that increased abruptly to the Outer shelf and Upper slope, with a further acute increase in the Middle slope. Unlike for the other indexes, trends for mean the biomass values with depth were different in both areas. In Alboran biomass decreased from the Inner shelf to the Upper slope and increased to the Middle slope. Nevertheless, in Vera the biomass decreased with depth, with significant differences. In two sectors were evident significant differences.

Regarding the interannual changes, the differences between years in Alboran were significant respect to species richness, abundance, biomass and Shannon diversity index. No clear increase or decrease trend was detected interannually. Unlike Alboran, in Vera, no significant interannual differences were detected.

In conclusion: 1) Four main fish assemblages were detected on the continental shelf and slope in both areas that seem to be strongly linked to the depth gradient. 2) The middle slope showed the higher differences between both areas for abundance, biomass and presence-abundance data. 3) The species rarefaction curves, abundance, Shannon and Taxonomic diversity indices showed similar patterns with depth in both areas. Biomass index showed a different pattern, with maximum values in the Middle slope in Alboran

and minimum ones in Vera.

Figure 1

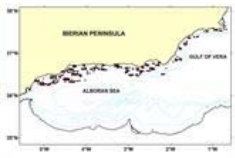


Figure 2

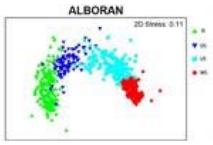
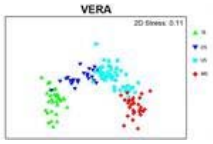


Figure 3



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Keywords: Alboran Sea, Gulf of Vera, Western Mediterranean, Biodiversity, distribution, demersal fish species

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