ROLE OF MIXED AND FRAGMENTATED HABITATS IN FISH HABITAT PREFERENCE

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Abstract

Fish species composition, abundance, diversity and niche breath of mediterranean littoral communities have been assessed by visual census at rocky bottoms versus mixed meadows of *Posidonia oceanica* and boulders. Labridae and Sparidae species show differences in habitat preference, although fish assemblages are very similar in abundance and there are not significant differences in niche breath of both habitats. Physical structure is one of the main factors affecting the general characteristics of the associated fish assemblages -fish abundance, species richness The data highlights the benefit of fragmented habitats in the littoral fish communities.

Key-words: fish, niche, preference, Mediterranean

Rocky habitats constitute an optimal habitat for some fish species and Mediterranean littoral fish communities have been traditionally studied on rocky bottoms (1). However, studies carried out on vegetated ecosystems highlight the rule of the seagrass beds as spawning areas, recruitment and nursery zones, refuge zones for many nocturnal species (2) and feeding areas (3). In fact, *Posidonia oceanica* seagrass beds provide an habitat with a large spatial heterogeneity for the fish communities.

The objective of this study is to compare the rocky habitat with the mixed meadows of rock and *Posidonia.* Previous studies are mainly centred in rocky bottoms (4) or vegetated habitats (5). In the Mediterranean, most of the sublittoral seafloor is covered by rocky areas mixed with seagrass patches. However, there is an evident lack of studies concerning the comparison of both habitats (6). Niche breath in mixed meadows is expected to be larger than in rocky bottoms due to the higher species diversity.

Material and Methods

Underwater visual census were performed at shallow depths (10-20m) over rocky bottoms and mixed meadows (rocky reefs and *Posidonia oceanica*) during the 9th- 20th July 2002, between 9:00 - 14:00 GMT. 9 sampling sites were settled along the perimeter of Dragonera Natural Park (W Mediterranean). 52 replicates were performed: 21 transects for rocky bottoms and 21 transects for mixed habitats.

Mobile fishes were quantified along a transect (50 m long x 5m wide) while cryptic species were counted in 20m x 5m transect. Fish density (n indiv/250m^2) was calculated by taking into account the mid point of each abundance class (7).

Coverage seagrass *Posidonia oceanica*/transect was quantified along a 50 m strip with transects >30% seagrass coverage considered as mixed habitats and transects < 30% classified as rocky bottoms.

Differences among fish abundance at each type of habitat were tested with ANOVA for 3 Sparidae species and 7 Labridae species. Density data (n° of fishes/250m^2) were log (x+1) transformed after Cochran's test.

Habitat preference of each species was calculated with the Affinity Index of Habitat Preference that links the abundance and the occurrence of each specie in relation to the total abundance and the total occurrence:

$$IA=(A_h \cdot O_h)/(A_t \cdot O_t)$$

A_h =relative abundance of the species in the habitat; A_t = relative abundance of species in all habitats; O_h = occurrence of the species in the habitat; O_t = occurrence of the species in all habitats.

Niche breath was calculated by $B=1/\Sigma p_i^2$ as used in fish trophic ecology.

Species richness (S), number of individuals (N), equitativity (J') and the Shannon-Weaver diversity Index (H') were calculated with the *Primer*.

Results and Discussion

A total of 10273 individuals were censused, with 4909 fishes among rocky bottoms and 5364 over mixed habitats. Sparidae, Apogonidae and Labridae are the most relatively abundant families in both habitats, but relative abundance of Serranidae, Sparidae, Trypterigiidae, Muraenidae and Scorpaenidae are higher in rocky habitats than in mixed habitats.

Species richness (S), Equitativity (J') and Shannon-Weaver index (H') were very similar at both habitats with no significant differences among them (ANOVA, p>0.05). The highest variability was exhibited by the mean density of fishes per transect (N) with 45,2% at rocky habitats and 34,29% at mixed meadows.

Values of fish abundance at mixed meadows and rocky bottoms are very similar. Fish assemblages in physically "structured environments" tended to be more similar to each other than to those in unvegetated sand habitats[5].

Habitat preference and ecological niche breath

Habitat distribution patterns at both habitats varied throughout the species. Generally, labrids preferred mixed meadows while sparids were commonly associated to rocky bottoms. *D. annularis* (6,7), *S. rostratus, S. tinca, S. doderleini* and *S. mediterraneus* showed higher affinity for mixed habitats, probably due to the food resources provided by rocky bottoms along the use of *Posidonia* seagrass beds as refuge areas against predation (3) or as nursery areas (4,7). Generally, fish species associated with vegetated habitats are likely to be responding to needs for food and shelter. *D. sargus* (4) and *S. ocellatus* prefer the rocky habitat, and *S. doderleini* and *D. vulgaris* have similar affinity for both types of habitats (Fig. 1).

Niche breath of the mixed habitat (B= 5.6) is slightly higher than the one in rocky bottoms (B=5.1) although not statistically significant (ANOVA, p>0.05).

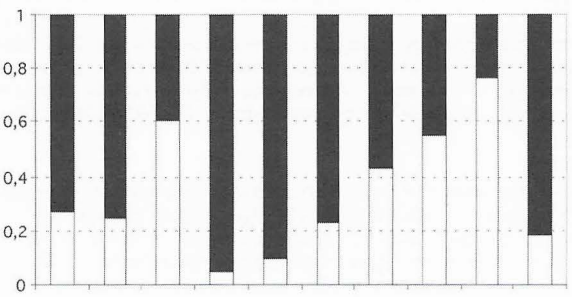

Fig. 1. Affinity index values for the *Symphodus* spp. and *Diplodus* spp. species at the mixed habitat (black bars) and at the rocky habitat (white bars).

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