EFFECT OF DEPTH AND CANOPY HEIGHT ON THE NURSERY VALUE OF CYSTOSEIRA BALEARICA FORESTS FOR MEDITERRANEAN ROCKY REEF FISHES

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Abstract
We studied effects of depth and Cystoseira balearica forests canopy height on coastal juvenile fish assemblages of Minorca Island. Results showed a clear differentiation of juvenile fish assemblages due to depth: assemblage in the shallowest range (3-4m) was characterized by higher densities of Thalassoma pavo, deeper ones (6-8, 10-12 m) by higher densities of Coris julis. Smallest juveniles of both species were more abundant within forests displaying the highest canopy height; meanwhile largest juveniles were more abundant within low Cystoseira forests. Also, both species showed predominantly a cryptic behavior on forest of higher canopy height, and a temporal one when canopy was lower. This study supports the importance of preserving healthy Cystoseira forests in order to preserve their nursery value for these two Labrid species.

Keywords: Teleostei, Algae, Life cycles, Bathymetry, North-Western Mediterranean

Introduction
Many fish species of the Mediterranean present at least some disjunction between adult and juvenile habitats. Usually adults occupy a broader range of depth and habitats, while juveniles appear in litoral waters in specific habitats [1], called juvenile habitats. For a given species, among juvenile habitats, nursery habitats are characterized by higher nursery value (i.e. contribution per unit area of individuals to adult populations). Nursery value can vary spatially according to factors that create site-specific variation. These factors may be biotic (such as structural complexity) or abiotic (such as water depth) [2]. Along the Mediterranean coasts, Cystoseira forests display a high nursery value for some Labidæ species [3] but simultaneously are threatened by human pressures, and tend to regress [4]. It is important to understand site-specific factors molding suitability of this nursery habitat in order to design management actions that assure the replenishment of adult fish populations. We aim to study the effect of depth and micro-habitat characteristics (canopy height) on the nursery value of Cystoseira forests along Minorca Island coasts.

Material and Methods
In September 2012 we sampled 3 sites of 2 separated localities containing Cystoseira balearica forests of similar cover (>70%), at three depth ranges (3-4, 6-8, 10-12 m). In each depth range, a diver haphazardly selected 8 sampling points within the forest. The diver recorded canopy height and cover, as well as abundance, size and behavior of juvenile fishes during 5 minutes within a quadrat area of 1m² [3]. Other habitat parameters (slope, etc.) were kept constant. Analysis of data made by multivariate and univariate exploratory and inferential approaches, using R and Primer/Permanova+ softwares [3].

Results and Discussion
Assemblages of juveniles significantly differed according to depth (Fig 1; PERMANOVA, F=10.6, p=0.004). Assemblages at shallow depth were characterized by higher densities of Thallassoma pavo, and deeper assemblages by higher densities of Coris julis. Additionally, we found for juveniles of C. julis, that different juvenile size classes showed contrasted abundances patterns according to depth, which was not the case for T. pavo. For both species, smallest juveniles were more abundant within forests displaying the highest canopy height (~13 cm); meanwhile largest juveniles were more abundant within Cystoseira forests displaying the lowest canopy height (~5 cm). Furthermore, both species showed more cryptic behavior in forests of higher canopy height, and a rather temporal behavior when canopy was lower. Results are consistent with previous studies investigating the range of depth distribution of juveniles of C. julis and T. pavo [1]. It has been previously demonstrated for C. julis a clear disjunction between adults and juveniles distribution. Not for T. pavo [1].

This study may support that when adults are well segregated from juveniles by depth, migration of juveniles to a broader range of depth occurs gradually as they grow and gain maturity. Also this study supports the importance of preserving healthy Cystoseira forests (with dense and high canopy) in order to guarantee their nursery value for these two Labrid species.

References