DIEL FLUCTUATIONS IN JUVENILE DOMINATED FISH ASSEMBLAGES ASSOCIATED WITH SHALLOW SEAGRASS AND BARE SAND IN SOUTHERN ADRIATIC SEA, CROATIA

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Abstract

Diel changes were investigated in fish assemblages associated with shallow seagras (*Posidonia oceanica*) and bare sand in two southern Adriatic Sea coves. Habitat related differences in assemblages were strong day and night, and were greater than diel changes. The seagrass associated assemblages remained similar day and night and consistently differed from sand associated. In contrast, the assemblages over sand varied on a diel basis as larger individuals of several species (e.g. *Atherina boyeri, Sarpa salpa, Conger conger*) that resided over other habitats during the day, were caught at night. Both habitats were utilized by newly recruited juveniles of economically important species and their habitat associations generally did not differ on a diel basis. Hence, both habitats are considered important to the fisheries of southern Adriatic.

Keywords: Fishes, Biodiversity, Adriatic Sea

Introduction

The shallow-water vegetated inshore areas generally support different and more diverse and abundant fish assemblages than non-vegetated habitats, as well as being considered more important as nursery areas for juveniles of many economically important species [1]. This phenomenon is classically explained by considering the high structural complexity of such vegetated (mainly seagrasses) systems, which are able to fulfill the role of nursery areas in providing shelter and food to a great number of littoral fish species [2]. These conclusions have primarly been based on daytime sampling programmes, even though many littoral species of fish display strong diel rhythms of activity and diel changes in habitat-usage by fishes have been documented [3]. Thus, decision about the relative importance of different habitats to fishes based solely on daytime sampling are often equivocal. The objective of this study was to examine diel changes in the fish assemblages associated with the shallow seagrass (*Posidonia oceanica*) and unvegetated (bare sand) habitats.

Material and methods

Monthly samples of the shallow-water fish assemblage were collected with a small beach seine (mesh size 8 mm at outer wings and 4 mm at the bag end, knot to knot) between May 2007 and April 2008, every 4-h over 24-h period (daily samples were taken at 08.00, 12.00, 16.00h; while night samples at 20.00, 24.00, and 04.00h) in the two different areas; Donji Molunat (N 42° 27'27,5"; E 18°25'34,5") and Prapratna (N 42°48'58.1"; E 17°40'50.6") coves, southern Adriatic Sea. The substratum in Donji Molunat is shallow seagrass (*Posidonia oceanica*) while in Prapratna cove is clean sand. Sampling depth ranged from 4.0 to 0 m. The fish data were analysed using the PRIMER software package. Data were transformed for presence/absence and the Bray-Curtis similarity matrix was used to generate 2-dimensional ordination plots with the non-metric multidimensional scaling (nMDS) technique [4].

Results

A total of 64231 fishes comprising 83 species was caught; 12429 fishes (67 species), occurred over seagrass, whereas 51802 fishes (58 species), occurred over sand. Most fish were juveniles, mainly young-of-the-year, amounting a total of 89%. The dominant species of Donji Molunat, *Boops boops* (48,85%), *Coris julis* (7,65%), *Pagellus bogaraveo* (6,64%), *Sardina pilchardus* (5,72%) and Prapratna cove, *Boops boops* (57,21%), *Atherina boyeri* (19,70%), *Sardina pilchardus* (19,70%) and *Sarpa salpa* (6,60%) were caught in consistently higher numbers and biomass in different time of diel period. A greater number of species was caught over seagrass than over sand, day (52 *vs*. 48) and night (55 *vs*. 50). However, more individuals tended to occur over seagrass (9467) than sand (4627) during the day. At the assemblage level, slightly more individuals over seagrass were caught during daytime, whereas in Prapratna Bay dominated nighttime assemblage in both terms. Non-parametric Spearman's correlation test showed no signifficant correlation on composition and abuundance between these coves (r_S=0,210, p=0,187). The nMDS plot shows clear separation of the investigated areas (Fig. 1).

Discussion

The ichthyofauna was generally more diverse over seagrass than over sand both day and night, and more fish generally occurred over seagrass than over sand during the day, as reported elsewere [5]. The habitat-related differences in the fish assemblages were because many species consistently occurred in only one habitat, or were predominantly caught in one habitat, both day and night. Different types of fishes were generally associated with the two habitats, as discussed by [5,6]. The structure of the seagrass-associated assemblages did not differ substantially between day and night, as observed in other parts of the world [7]. However, significant diel change in the structure of the sand-associated assemblages was evident, which was primarly due to the influx of several species over sand at night. Changes in assemblage structure observed were caused by shifts in abundance of a particular species rather than by their presence and/or absence. In spite of diel changes in some species occurrence in both coves, no strong evidence for the existence of distinct day and/or night communities was detected. The predominance of juveniles in the catches indicate that these coves serve as nursery and feeding grounds.

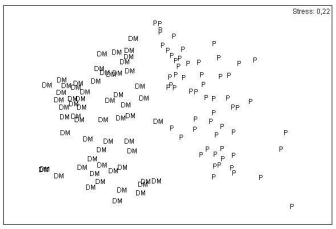

Fig. 1. Non-Metric Multidimensional Scaling (nMDS) ordination plot for fish assemblages in Donji Molunat (DM) and Prapratna (P) cove among day and night sampling

References

1 - Bell J.D. and Pollard D.A., 1989. Ecology of fish assemblages and fisheries associated with seagrass. *In:* Larkum A.W.D., McComb A.J. and Shepherd S.A. (eds.), Biology of Seagrasses. Elsevier, Amsterdam, pp 565-609.

2 - Guidetti P., 2000. Differences among fish assemblages associated with nearshore *Posidonia oceanica* seagrass beds, rocky-algal reefs and unvegetated sand habitats in the Adriatic sea. *Estuar. Coast. Shelf S.*, 50: 515-529.

3 - Rountree R.A. and Able K.W., 1997. Nocturnal fish use of New Jersey marsh creek and adjacent bay shoal habitats. *Estuar. Coast. Shelf S.*, 44: 703-711.

4 - Clarke K.R. and Warwick R.M., 2001. Change in marine communities: an approach to statistical analysis and interpretation. 2nd edit Plymouth: PRIMER-E Ltd.

5 - Gray C.A., Chick R.C. and McElligott D.J., 1998. Diel changes in assemblages of fishes associated with shallow seagrass and bare sand. *Estuar. Coast. Shelf S.*, 46: 849-859.

6 - Jenkins G.P., May H.M.A., Wheatley M.J. and Holloway M.G., 1997. Comparison of fish assemblages associated with seagrass and adjacent unvegetated habitats of Port Phillip Bay and Corner Inlet, Victoria, Australia, with emphasis on commercial species. *Estuar. Coast. Shelf S.*, 44: 569-588.

7 - Bell J.D. and Harmelin-Vivien M.L., 1982. Fish fauna of French Mediterranean *Posidonia oceanica* seagrass meadows. 1. Community structure. *Tethys* 10: 337-347.