DIVERSITY, STRUCTURE AND FUNCTION OF FISH ASSEMBLAGES ASSOCIATED WITH POSIDONIA OCEANICA MEADOWS IN EASTERN MEDITERRANEAN

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Abstract
Temporal and spatial variation in density, biomass and size of littoral fish associated with *Posidonia oceanica* meadows were studied throughout an annual cycle. Approximately 109350 littoral fish were collected, belonging to 34 families and 88 species. Highest values of density were observed during August due to high densities of juveniles. Four functional guilds were created in order to describe the habitat use for each species encountered including juvenile migrants, seagrass residents, seasonal migrants and occasional visitors. Among the species encountered, eleven were found to be non-indigenous.
Keywords: Fishes, Posidonia, Aegean Sea, Levantine Basin, Biodiversity

Introduction
The ecological importance of *Posidonia oceanica* meadows, for the littoral zone of the Mediterranean, is from various aspects well sustained. *P. oceanica* meadows are highly productive and diverse communities and considered the high spot of soft bottom substrata [1]. They promote sediment stability [1], and their high complexity provides a habitat for food, shelter and nursery for several fish populations [4, 6]. This is the first study with the aim to quantitatively assess the fish assemblage associated with *Posidonia oceanica* meadows in eastern Mediterranean. We investigated the temporal and spatial dynamic, assemblage structure and functional guilds of the fish fauna. In addition, the role of newly and former non-indigenous species of Indo-Pacific origin was studied in this habitat.

Materials and Methods
In order to study temporal and spatial variations in fish assemblages, day samples were taken at five shallow (5-35 m) locations around the coasts of Rhodes Island with boat seining on four occasions over the year 2008: February (winter), May (spring), August (summer) and December (autumn). Fish species density, biomass and average size was seasonally recorded during an annual cycle and used to create functional groups. The functional guilds defined in this study consisted of similar to those described by Elliot and Dewailly [3], although modified depending on own data and observations. The definitions we use here are: SR – Truly seagrass residents, species which are stationary on *Posidonia oceanica* meadows and are highly dependent on them; JM – juvenile migrants, species which use seagrasses primarily as a nursery ground, but often returns as adults for spawning or feeding; SM – seasonal migrants, species which have seasonal visits to seagrasses, usually as adults for spawning or feeding and OV – occasional visitors, species that appear irregularly on seagrasses but have no apparent seagrass requirements.

Results
Our study showed that *Posidonia oceanica* meadows from eastern Mediterranean sustain a diverse fish community including 88 species within 34 families a number that accounts for 19% of the total number of species inhabiting eastern Mediterranean [7, 5). Density showed significant seasonal seasonal differences ($p<0.01$) which was as revealed from Tukey's HSD attributed to significant higher values during summer compared to all other seasons ($p<0.01$). Mean fish density showed approximately three times higher values in summer compared to any other season, while species richness showed slightly higher average values in spring and summer. Native planktivorous school forming species (e.g. *B. boops*, *S. smaris*, *S. maena*, *C. chromis*), were dominant in terms of abundance. Labridae and Sparidae families were found to be the two most diverse fish families, which is in accordance to previous studies from western Mediterranean [1, 2, 4]. The fish assemblage consisted of 24 seagrass resident, 17 juvenile migrants, two seasonal migrants and 45 occasional visitor species.Several species within seagrass resident guild were of commercial value (e.g. *Spicara smaris*, *Spicara maena*) and showed high contribution to total abundance (Table 1). Several species in the juvenile migrant guild were of commercial importance (Table 1). Most of the species within the diverse and dominating family Sparidae, were classified as juvenile migrants, indicating a habitat use mainly during their early life stages.

Tab. 1. Ranking of the 10 dominant species in terms of total biomass and density on *P. oceanica* meadows. Family, origin and ecological guild are indicated. * denotes species of commercial value

Rank	Species	Family	Origin	Ecological guild	Biomass (kg)
1	*Boops boops**	Sparidae	I	SR	527·69
2	*Spicara smaris**	Centracanthidae	I	SR	231·75
3	*Chromis chromis*	Pomacentridae	I	SM	148·48
4	*Spicara maena**	Centracanthidae	I	SR	80·62
5	*Oblada melanura**	Sparidae	I	JM	33·41
6	*Sphyraena viridensis**	Sphyraenidae	I	SR	32·79
7	*Lagocephalus sceleratus*	Tetraodontidae	NI	SR	27·27
8	*Sparisoma cretense**	Scaridae	I	JM	22·08
9	*Coris julis*	Labridae	I	SR	16·78
10	*Pagrus pagrus**	Sparidae	I	JM	12·17

	Species	Family	Origin	Ecological guild	Density
1	*Spicara smaris**	Centracanthidae	I	SR	40056
2	*Boops boops**	Sparidae	I	SR	31202
3	*Chromis chromis**	Pomacentridae	I	SM	16646
4	*Sardina pilchardus**	Clupeidae	I	JM	2845
5	*Spicara maena**	Centracanthidae	I	SR	2148
6	*Coris julis*	Labridae	I	SR	2103
7	*Siganus rivulatus**	Siganidae	NI	JM	2055
8	*Sphyraena chrysotaenia**	Sphyraenidae	NI	JM	1325
9	*Mullus surmuletus**	Mullidae	I	JM	1312
10	*Sparisoma cretense**	Scaridae	I	JM	1077

Discussion
Seagrass resident species were widely represented within the dominant families of the fish assemblage (e.g. Centracanthidae, Labridae, Mullidae, Sphyraenidae and Syngnathidae). All juvenile migrants were found to use seagrass meadows during samplings in August and usually occurred in high densities. Spring was found to be the main season in seagrass for *Chromis chromis* and *Thalassoma pavo*, and due to their occurrence only as reproductive adults, they were classified as seasonal migrants.

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