FISH COMMUNITY STRUCTURE ON ARTIFICIAL REEFS IN THE NORTHERN AEGEAN SEA, TURKEY

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Abstract

The aim of study is to determine fish community structure around the artificial reefs deployed on Gulf of Edremit in the Northern Aegean Sea, from June 2013 to July 2015. Underwater visual census technique was used to determine fish species, number of individual and size estimation. A total of 46 species from 21 families were recorded; among the most abundant species were: *Diplodus vulgaris* (98,7 kg)*, Chromis chromis* (2,9kg), and *Sciaena umbra* (145,2 kg).

Keywords: Artificial reefs, Biodiversity, Fisheries, Edremit Bay, Aegean Sea

An artificial reef is a submerged structure deliberately placed on the seabed to mimic some functions of a natural reef, such as protecting, regenerating, concentrating and/or enhancing populations of living marine resources [1]. Artificial reefs have been deployed along the coast of Aegean Sea, Turkey since 1990 to enhance artisanal fisheries, protect marine biodiversity and also diving tourism. This study focused on the description of composition, abundance and seasonality of fishes associated with artificial reefs in the Gulf of Edremit in the northern Aegean Sea. Artificial reef area was created in 2009 by The Ministry of Food, Agriculture and Livestock, and consists of 215 sites each of 30 concrete blocks in seven different fields, with the aim to promote small-scale fisheries and protect marine biodiversity (Fig. 1).
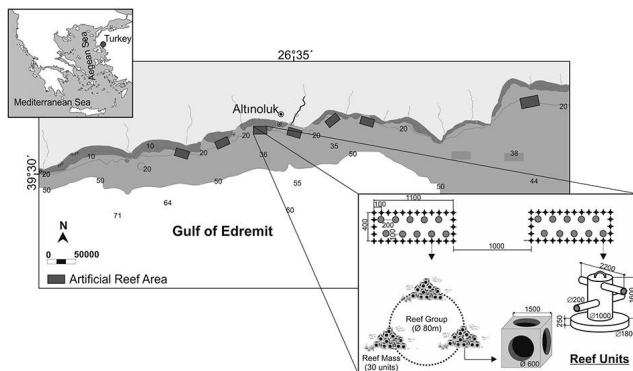

Fig. 1. Study site and Design of Artificial Reefs Area

Fish communities were sampled by scuba divers. The same divers undertook censuses of all fish at the same time of day, identified the species and estimated individual sizes using visual census methods. The three artificial reef sets were visited monthly during all the observations. Differences between seasons, species composition and abundance were determined by the Mann-Whitney U test. Species' diversities for the seasons were calculated by the Shannon–Wiener index (H′).

During the study period a total 5578 fish comprising of 21 family and 46 species were recorded. By far the most abundant observed families were Sparidae, Labridae and Serranidae. Thirty five species were classified as of commercial value and carnivores were clearly dominant (Table 1). Diversity index (H′) values changed between 2.54 and 3.56 according to seasons. While the highest value H′ was in the summer, the lowest value was in the autumn. Bray-Curtis similarity analysis observed the highest similarity (86.3%) between spring and winter.

Recorded number of species in this study was higher than other artificial reefs in the Mediterranean; 44 species in Italy [2] 21 species in Spain [3], 40 species in France [4]. Although some species and families are similar to those by the above, most of them were found to be different, the reason for which is that there are variable oceanographic characteristics between the seas [4]. Those results will be of importance to the success of artificial reef projects, especially as regards their use as a tool for fisheries management.

Tab. 1. List of species and total number recorded on the artificial reef (*Economic value, C: Carnivore, O: Omnivore, H: Herbivore).

Family	Species	Trophic Tendency	Abundance	Biomass (g)	Length (cm)
Scombridae	*Scomber japonicus**	C	100	260.0	5.0
Clupeidae	*Sardina pilchardus**	C	100	157.0	5.0-8.0
Carangidae	*Trachurus trachurus**	C	1	8.7	12.0
Sparidae	*Dendex dentex**	C	38	14411.4	15.0-45.0
	*Oblada melanura**	C	133	23931.5	10.0-30.0
	*Boobs boops**	O	173	4054.9	5.0-20.0
	*Diplodus puntazzo**	O	119	1967.1	10.0-30.0
	*Diplodus sargus**	C	261	59375.2	8.0-40.0
	*Diplodus annularis**	C	287	11957.5	5.0-20.0
	*Diplodus vulgaris**	C	1626	98649.7	5.0-40.0
	*Spondyliosoma cantharus**	C	341	20509.5	10.0-25.0
	*Pagellus erythrinus**	C	16	1150.4	10.0-40.0
	*Sparus aurata**	C	68	14625.4	15.0-45.0
	*Pagrus pagrus**	C	2	67.3	10.0-14.0
	*Sarpa salpa**	H	10	3252.0	30.0-35.0
Centracanthidae	*Spicara maena**	O	355	27611.9	10.0-30.0
Scorpaenidae	*Scorpaena scrofa**	C	24	2208.5	10.0-30.0
	*Scorpaena porcus**	C	32	2624.7	5.0-30.0
	*Scorpaena notata**	C	22	1054.0	5.0-15.0
Triglidae	*Trigla lucerna**	C	1	127.2	25.0
Mugillidae	*Liza aurata**	O	10	3652.3	20.0-25.0
Balistidae	*Balistes capriscus**	C	8	1442.3	20.0-30.0
Pomacentridae	*Chromis chromis*	C	845	2844.2	5.0-10.0
Gadidae	*Physic physic**	C	10	2228.7	10.0-45.0
	*Merluccius merluccius**	O	54	4292.1	20.0-25.0
Sciaenidae	*Sciaena umbra**	O	316	145184.5	20.0-40.0
Labridae	*Labrus merula*	O	6	407.7	13.0-20.0
	Symphodus mediterraneus	O	3	542.6	15.0
	Symphodus tinca	C	9	851.9	15.0-30.0
	Labrus viridis	O	6	788.1	10.0-15.0
	Coris julis	O	1	52.3	17.0
Blennidae	*Blennius ocellaris*	O	1	16.6	10.0
	Parablennius rouxi	O	4	19.1	4.0-5.0
Zeidae	*Zeus faber**	C	1	3.2	5.0
Mullidae	*Mullus barbatus**	O	7	395.3	8.0-20.0
	*Mullus surmuletus**	O	8	1492.4	10.0-35.0
Serranidae	*Serranus cabrilla**	C	38	2416.6	10.0-30.0
	*Serranus scriba**	C	29	4192.3	5.0-40.0
	Serranus hepatus	C	12	269.8	4.0-12.0
	*Epinephelus costae**	C	1	18.8	7.0
Blenniidae	*Parablennius rouxi*	O	20	68.0	5.0-8.0
Congridae	*Conger conger*	C	5	2519.9	50.0-100.0
Rajidae	*Myliobatis aquila**	C	1	1300.0	40.0
Crustacea	*Palinurus vulgaris**	C	1	15.0	6.0
	*Homarus gammarus**	C	2	2800.0	40.0-45.0
Cephalopoda	*Octopus vulgaris**	C	4	7650.0	
	Total		**5578**	**541902.4**	

References

1 - Seaman, W., 2000. Artificial Reef Evaluation with Application to Natural Marine Habitats. CRC Press, Boca Raton, USA.

2 - Relini, G., Relini, M., Torchia, G., Palandri, G., 2002. Ten years of censuses of fish fauna on the Loano artificial reef. *ICES J Mar Sci*, 59, 132–137.

3 - Bayle-Sempere, J. T., Ramos-Espla ´, A. A., and Charton, G. 1994. Intra-annual variability of an artificial reef fish assem- blage in the marine reserve of Tabarca (Alicante, Spain, SW Mediterranean). *Bull. Mar. Sci.,* 55: 824–835.

4 - Charbonnel, E., Serre, C., Ruitton, S., Harmelin, J.G. and Jensen, A. 2002. Effects of increased habitat complexity on fish assemblages associated with large artificial units (French Mediterranean coast). *ICES J Mar Sci,* 59: 208-213.