EFFECTS OF FISH FARMING ON THE DISTRIBUTION OF POLYCHAETES IN THE AEGEAN SEA

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Abstract

The distributional patterns of polychaetes in the vicinity of fish cage farms were studied at 6 stations in the Aegean Sea. A total of 256 species belonging to 43 families were identified. Samples collected under the fish cages had relatively low diversity, but high densities of some opportunistic species such as *Capitella capitata* and *Lumbrineris gracilis*.

Keywords: Cage farming, Polychaeta, Aegean Sea

Introduction

Dense aquaculture activities in the coastal zone have resulted in decreasing the quality of sea-water and bottom sediments, creating many problems to human health, tourism and to the farmers. Polychaetes are often used as bioindicators of changes in the marine environmental conditions, mainly due to human activities [1].

The aim of this study is to investigate the polychaete communities in the vicinity of fish cage farms, and to determine the impacts of fish farming activities on their distribution.

Material and methods

Benthic samples were collected at six stations in the Aegean Sea (Fig. 1). At each station three samples were taken; one under cages, one at the vicinity of cages and one at a control site. Stations 2 and 4 were seasonally sampled, but only one season was considered in the comparison between sites. The samples were washed through 0.5 mm mesh size sieve, fixed with 10% formalin and preserved in 70% ethanol. Sampling and community data of samples were given in Table 1.
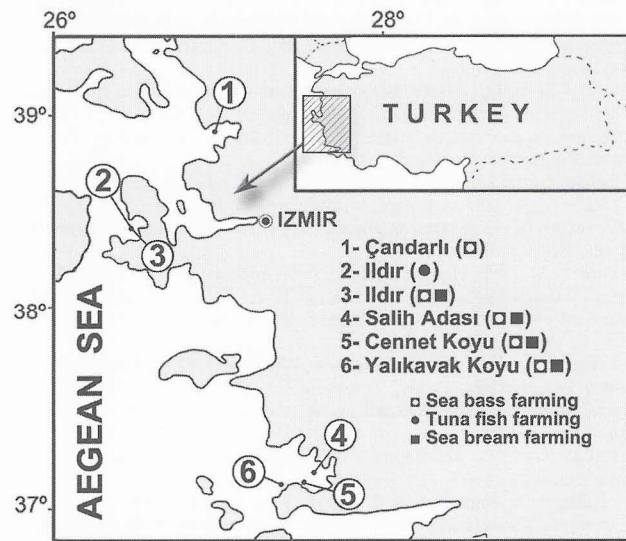

Fig. 1. Sampling sites in the Aegean Sea.

Results and discussion

A total of 256 species and 2795 individuals belonging to 43 families were identified. Syllidae were the most diverse family with 48 species (19%), followed by Sabellidae (6%), Cirratulidae (6%) and Phyllodocidae (6%). The Orbiniidae, Sphaerodoridae, Goniadidae, Scalibregmidae and Acrocirridae were not collected under the fish cages at all stations. The Syllidae dominated the *Posidonia oceanica* meadows and coralligenous substrate, and their diversity was greatest in the control sites whereas, Sabellidae and Cirratulidae were abundant under the cages.

The samples collected under cages included dense populations of *Capitella capitata* (30 ind.m⁻² at sta. 1), *Protodorvillea kefersteini* (3060 ind.m⁻² at sta. 3), *Nereis zonata* (30 ind.m⁻² at sta. 4) and *Lumbrineris gracilis* (180 ind.m⁻² at sta. 5; 110 ind.m⁻² at sta.6), these species considered indicators of polluted or semi-polluted zones (Table 1). The sample from the cage farming of tuna fish at station 2

was exceptionally represented by high populations of *Paralacydonia paradoxa* (230 ind. m⁻²) and *Macrochaeta clavicornis* (Sars) (230 ind.m⁻²), which are indicators of clean waters. This is attributed to the recent date of the installation of the cages (June 2002), and to their location at the opening of the bay where the currents are relatively strong.

Table 1. Sampling and community data of samples collected under cages (A), at the vicinity of cages (B) and at a control site (C) of each station. R: Samples, D: Depth (meter), T: Sampling device (G: Grab, A: Dredge, S: Scuba-diving), B: Biotopes (M: Mud, Sm: Sandy mud, Ms: Mudy sand, C: Coralligenous substrate, P: *Posidonia oceanica* Delile, Sa: Sand), S: Number of Species, N: Number of Individuals.

S	R	Date	T	D	B	S	N	Dominant species
1	A	11/02	G	50	M	24	34	*Capitella capitata* (Fabricius)
	B		D	50	C	105	402	*Arichlidon reyssi* (Kat. Lau.& Ram)
	C		D	35	Sm	52	209	*Piromis eruca* (Claparède)
2	A	02/03	G	25	P	64	234	*Paralacydonia paradoxa* (Fauvel)
	B		D	45	M	56	334	*P. paradoxa*
	C		D	45	Sa	44	440	*Cirrophorus branchiatus* Ehlers
3	A	07/96	S	12	Ms	30	572	*Protodorvillea kefersteini* (McIntosh)
	B		S	12	P	40	75	*Paradoneis lyra* (Southern)
	C		S	12	P	18	27	*Kefersteinia cirrata* (Keferstein)
4	A	09/02	D	25	M	12	17	*Nereis zonata* Malmgren
	B		D	9	P	14	37	*Lumbrineris latreillii* (A&M Edwar.)
	C		D	14	P	7	13	*Eunice vittata* (Chiaje)
5	A	09/99	G	32	M	25	95	*Lumbrineris gracilis* (Ehlers)
	B		G	8	P	20	68	*Eunice vittata*
	C		G	30	Sa	30	96	*Nephthys hombergii* Savigny
6	A	11/99	G	31	Ms	30	70	*L. gracilis*
	B		G	31	Ms	15	20	*Cirriformia* sp.
	C		G	31	Ms	26	51	*Nematonereis unicornis* (Grube)

Shannon-Weaver's diversity index value ranges from 1.7 (A, Sta. 3) to 4.3 (C, Sta. 6). Pielou's evenness index value shows a similar trend, being higher at control sites, lower in samples collected under cages. High population densities of opportunistic species dominating organically polluted-sediment under cages diminished diversity and evenness values. The other samples collected under cages at stations had a diversity index value around 3. The samples collected near cages and far from cages presented diversified polychaete assemblages that appeared to be structured mainly by the habitat type and depth. At four stations, dense *Posidonia oceanica* meadows, very sensitive to pollution, exist at the vicinity of cages and control sites, showing undisturbed sediment structure. However, the disappearance of this phanerogam under cages at station 3 is obvious.

The ordination analyses of pooled abundance data of stations showed high similarities among stations, except station 1, where, contrary to other stations, a coralligenous substrate was sampled at the vicinity of cages that possessed a different faunal composition that was dominated by *Arichlidon reyssi* and *Syllis garciai*.

The present paper establishes that cage farming along the Aegean coast of Turkey affect the distribution of the polychaete assemblages, eliminating sensitive species and favouring opportunistic species.

References

1 - Pearson T. H., Rosenberg R., 1978. Macrobenthic succession in relation to enrichment and pollution of the marine environment. *Ocean. Mar. Biol. Ann. Rev.*, 16: 229-311.