

THE IMPACT OF HARBOR USE ON ZOOBENTHOS

Yaprak Gürkan ^{1*}, Ahsen Yüksek ¹, Leyla Tolun ² and Süleyman Tugrul ³

¹ Istanbul University - yaprakgurkann@gmail.com

² TÜBITAK-MRC, Earth and Marine Sciences Research Institute

³ Middle East Technical University, Institute of Marine Sciences

Abstract

In 7 different region which represent most used harbors, ports and fishing shelters in the Sea of Marmara and Black Sea in Turkey coasts. Ecological Quality Status was assessed by sampling soft-bottom macrozoobenthos from 22 stations in 2014.

Keywords: *Zoobenthos, Pollution, Black Sea, Marmara Sea, Bio-indicators*

Introduction

Human pressure on the seafloor in coastal marine environments is particularly intense in harbors, fishing shelters and ports. These environments share some characteristics in common such as; highly stratified water column, limited water circulation and high amounts of organic and chemical pollutants. The impacts of those human-induced pressures on the environment will be generally represented by indicators of biotic attributes of the seafloor integrity (e.g: species composition). Principally the response of some zoobenthic species (such as; polychaeta, crustaceans etc.), to pressures, indicate ecosystem shifts or the level of degradation from healthy status.

Material and Methods

In order to assess the Ecological Quality Status (EcoQS), 22 samples were collected from soft sediment in 7 distinct regions (Fig.1): Kumpört, TUPRAS Oil Refinery, Tuzla Shipyard harbors, Bostanci Fishing Shelter (BBB) in the Sea of Marmara and; Rize Port, Samsun Harbor and Yakakent Fishing Port (YKB) in the Black Sea by using Van Veen grab (0,1 m²) while measuring some physicochemical parameters of water column. The macrozoobenthic data was estimated statistically by using; Shannon-Weiner Diversity ($H'(\log_2)$), Pielou Evenness (J'), Margalef (d) and Bray-Curtis Dissimilarity Indexes with the use of Primer 6. As Marine Strategy Framework Directive (MSFD) require [1], EcoQS of the benthos was assessed by using BENTIX, AMBI and M-AMBI classification indices.

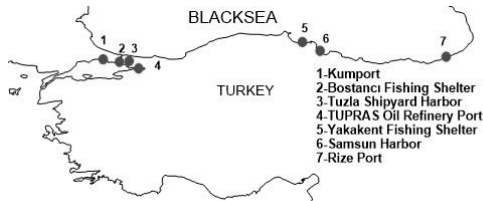


Fig. 1. Sampling Regions

Results and Discussion

In all stations, 128 species belonging to 9 taxa were identified. Among all taxonomic groups and at every region polychaeta present dominance except for Rize Port where polychaeta and mollusca share equal percentages. Kumpört stations were characterized by tolerant species thus M-AMBI values range from 0,33 to 0,87 at station KP14 where the diversity reaches its highest number among all the sampling regions within the Sea of Marmara (Table 1).

Despite the water quality is in acceptable limits in BBB according to MSFD [1], the percentage of sensitive species is 22,4% as maximum. Biological diversity achieves maximum 2,34 (Table 1) at Tuzla Shipyard and the region was dominated by second-order opportunistic species as the EcoQS changes between "MODERATE" and "POOR" indicates high level of human impact on marine environment.

Yet TUPRAS Oil Refinery is located in a highly used narrow bay where saturated oxygen level can be lower than 30% at the bottom layer, the stations of refinery TRF8 and TRF9 are polluted and present an unbalanced benthic community, dominated by second-order (85,71%) and first order

(85,51%) opportunistic species, respectively. Besides the biodiversity is at minimum levels such as; 0,59 to 0,76 in these stations and TRF9 is dominated by a first-order opportunistic genus with a great individual number of *Capitella* sp. M-AMBI values for Samsun Port ranges from 0,61 to 0,24 indicate an affected area by port activities. YKB is not an extremely used area, where lowest index value is 0,39.

Tab. 1. Results of diversity and quality indexes according to regions

	Sample	d	J'	H'(log2)	BENTIX	AMBI	M-AMBI	Status
KUMPORT	KP 1	1.59	0.13	0.479	2.08	3	0.3331	POOR
	KP 7	2.25	0.32	1.298	2.08	3.17	0.4487	MODERATE
	KP 8	2.95	0.57	2.339	2.49	2.99	0.5612	GOOD
	KP14	5.38	0.59	3.128	2.43	2.8	0.868	HIGH
BOSTANCI FISHING SHELTER	BBB 01	1.62	0.49	1.631	2.08	3.58	0.3896	POOR
	BBB 03	3.08	0.75	2.793	3.39	3.67	0.5317	GOOD
	BBB 05	1.62	0.58	1.839	2.60	4.33	0.3618	POOR
TUZLA SHIPYARD HARBOR	TZ 03	2.89	0.35	1.507	3.46	2.84	0.5148	MODERATE
	TZ 17	1.89	0.74	2.341	2.52	3.78	0.4406	MODERATE
	TZ28	1.29	0.48	1.234	2.00	4.71	0.2508	POOR
TUPRAS OIL REFINERY HARBOR	TRF 8	0.38	0.59	0.592	2.00	4.29	0.1685	BAD
	TRF 9	1.23	0.23	0.755	2.02	5.56	0.1982	BAD
	YKB 2	0.91	0.85	1.352	3.78	1.67	0.3909	MODERATE
YAKAKENT FISHING SHELTER	YKB 3	4	0.71	3.140	2.67	2.97	0.6827	GOOD
	YKB 6	3.03	0.55	2.287	2.41	3.57	0.5358	GOOD
	YKB 8	3.02	0.58	2.435	2.65	3.08	0.5759	GOOD
SAMSUN HARBOR	SL 01	1.26	0.47	1.329	2.00	5.36	0.2369	POOR
	SL 06	2.64	0.71	2.708	2.12	3.43	0.5452	GOOD
	SL 15	3.49	0.75	3.054	2.67	3.03	0.6127	GOOD
RIZE PORT	SL-34	1.23	0.7	1.816	2.27	3.36	0.38	POOR
	RL - 01	1.67	0.82	2.109	5.00	1.2	0.5213	MODERATE
	RL 18	1.53	0.68	1.905	3.28	3.15	0.9992	HIGH

As the Sea of Marmara and the Black Sea represent high eutrofication [2], the BENTIX which was proposed for oligotrophic Mediterranean Sea, was not applicable for our study area. On the other hand M-AMBI is suitable for indicating EcoQS significantly

Acknowledgements

This work is financially supported by the TÜBITAK 1007 Program [DIPTAR, Project No. 111G153]. The authors wish to thank Ministries of Environment and Urbanization and the crew of R/V Alemdar II for their valuable aid during cruise.

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