EPIFAUNAL ASSEMBLAGES AND THEIR VULNERABLITY TO TRAWLING IN A COASTAL ECOSYSTEM (SOUTHERN BLACK SEA)

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Abstract
The epifaunal species composition was determined in a coastal ecosystem (Samsun Shelf Area). The community was categorized into functional groups according to their level of vulnerability to trawling. The relative abundance of functional groups were investigated for any significant difference among stations and correlated with the trawling intensity. It is found that the species with low vulnerability scores widely distributed along the shelf area and dominated other species in community. <\/div>

Keywords: Biodiversity, Coastal waters, Trawl surveys, Zoobenthos, Black Sea

Introduction
The trawling disturbance and its impact on benthic habitats had always been a major concern in understanding marine ecosystem degradation [1,2]. Benthic epifaunal communities are frequently used as a measure of ecosystem response to trawling disturbance both in temporal and spatial scale [3]. Several studies have been realized by using the biological traits of epifaunal organisms revealing their vulnerability to trawling [4]. In this study, we proposed the biological traits of epifaunal species as a measure of vulnerability to trawling and attempted to define the community distribution along Samsun Shelf Area (SSA) which is a major fishing ground exposed to high trawling disturbance for long periods in southern Black Sea.

Material and Method
The sampling was done with a beam trawl of 2.75 m and net in 12 mm mesh size at six stations. Depth range was 4-50 m along the sampling site. The hauls (2500 samplings at 185 operations) were standardized to 30 min. Five functional traits (position, feeding type, motility, size, and life span) indicating vulnerability to trawling were selected and scores were assigned to each trait with a gradient of 0-low vulnerability to 3-high vulnerability. Total scores ranging from 2 to 15 were assigned to five groups. The abundance of epifaunal species (57 species except *Rapana venosa* that is excluded from all analysis because of its strong domination on community) were normalized with log(x+1) transformation. The relative abundance of functional traits in five groups were analyzed by correspondence analysis (PAST 3.10) to reveal the ordination of samples correlated with six stations.

Results and Discussion
The analysis indicated that most of the species (52.6%) appeared in the groups (G1 and G2) with low vulnerability scores including fishes, crustaceans, gastropods, swimming crabs and burrowing bivalves all small in size, having short life spans, mostly scavenger and motile representatives of their own taxonomic groups. G4 and G5 as a measure of a healthier community had very few representatives (Table 1)

Tab. 1. Functional groups, assigned range of scores for vulnerability and representative taxa.

Groups	Scores	Organism groups	(e.g.)
G1	0-3	Small fishes	*Pomatotischus marmoratus, Arnoglossus kessleri, Callionymus sp.*
		Small crustaceans	*Brachynotus sexdentatus, Diogenes pugilator, Flimnus hirtellus*
		Small gastropods	*Cyclope neritea, Nassarius reticulatus*
G2	4-6	Small fishes	*Gobius niger, Hippocampus hippocampus, Syngnathus sp.*
		Swimming crabs and small crustaceans	*Liocarcinus depurator, L. navigator, Orangon crangon, Palaemon elegans*
		Small burrowing bivalves	*Chamalea gallina, Spisula subtruncata, Abra sp., Donax trunculus*
G3	7-9	Fishes	*Uranoscopus scaber, Parablennius tentacularis, Pegusa nasuta*
		Large crabs	*Carcinus aestuani, Eriphia verrucosa*
		Small ascidians	*Ascidia sp., Botryllus schlosseri*
		Small barnacles	*Balanus sp.*
G4	10-12	Large bivalves	*Anadara cornea, Mytilus galloprovincialis*
		Ascidians	*Corella eumyota*
G5	13-15	Sponges	Porifera

Correspondence analysis showed that axis 1 explaining 66.3% of the variance differentiated the functional groups from S6 and all the other stations (S1-S5) (Figure 1).

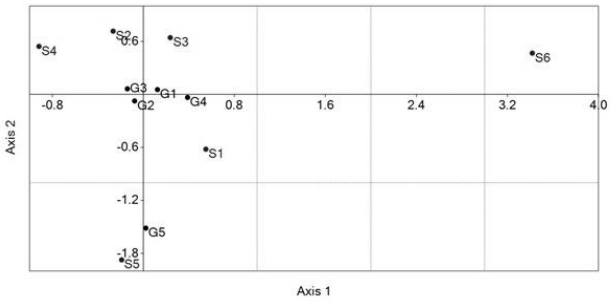

Fig. 1. Correspondance analysis based on the relative abundance of functional groups (G1-G5) within each sampling site (S1-S6).

Axis 2 responsible from 26.5% of variance indicated that S5 is characterized by G5. S1, S2, S3 and S4 are known as the fishing grounds highly trawled by both beam and bottom trawls and seemed to be positively correlated by the distribution of communities having low vulnerability scores (G1, G2 and G3). S5 and S6 having a patchy type of hard substratum and irregular depths especially on river mouth (S5) limits the trawling area to some extent and decreases the trawling pressure. This is reflected by the community structure (G5) with higher vulnerability scores. However, as a general outline, SSA can be assigned as a typical coastal area under high trawling impact showing a species composition of low vulnerability. It is obvious that large sessiles, emergent filter feeders, long live species and large predators disappear along this trawled area. The main query is that we still further to know that whether SSA is altered to the point which recovery of the ecosystem is no longer possible.

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