A COMPARISON OF BIOTIC INDICES IN ASSESSING ECOLOGICAL QUALITY AT THE NE AEGEAN SEA (MYTILENE STRAIT, LESVOS ISLAND)

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Abstract
The performance of three biotic indices (AMBI, Bentix, M-AMBI) has been compared in communities of soft sediment habitats (mostly covered by *Posidonia oceanica* meadows) at a coastal area of the NE Aegean Sea. AMBI and Bentix had similar trends, but M-AMBI's dependence to Shannon diversity rendered a more degraded state, possibly due to the dominance of species related to HP communities.
Keywords: Zoobenthos, Coastal Systems, Bio-Indicators, Aegean Sea

Introduction
The implementation of the Water Framework Directive (2000/60/EC) requires the development of new biotic indices that would be capable of (a) responding to anthropogenic disturbance, (b) distinguishing different levels of ecological quality and (c) being applicable in any geographical area. The past years, a number of such biotic indices have been developed and tested. Although robustness seems to be a common merit in these indices, this study aims to evaluate their suitability in the ecological attributes at a particular regional scale. In order to accomplish sufficient index performance comparisons, the influence of local and regional natural variability and the nature of the habitat and ecosystem element on index accuracy and stability must be investigated [1].

Study Area and Methods
The coastal area of Mytilene Strait (NE Aegean Sea) is considered to have low urban development; however tourism and population seem to have increased over the last decade. In a baseline study during 2007, the local human pressures and the suitability of indices (classifying the ecological status) were investigated. The first sampling station was located in an area where no significant human activity was identified and the rest four stations were selected according to possible sources of environmental degradation (waste treatment plant-Station 2, port-Station 3, aquaculture units- Station 4 and 5). Quantitative samples were collected, by a Van Veen grab, from soft sediments mostly covered by *Posidonia oceanica* meadows. Species Richness (S) and the Index of Shannon Diversity (H') were calculated. Bray-Curtis similarity analysis was also applied. The biotic indices Bentix [2], AMBI [3] and M-AMBI [4] were used to classify the ecological status. For the application of M-AMBI, the reference conditions of mixed sediments (H'=6, S=120, AMBI=0) were used, as suggested by Simboura and Reizopoulou [5].

Results
A total of 6574 individuals belonging to 247 taxa were identified. The gastropods *Bittium reticulatum*, *Jujubinus striatus*, *Alvania geryonia* and *Pusillina marginata* were the most abundant in the first three sampling stations. It is noteworthy that the individuals of *Bittium reticulatum* represented 35.85% of the total abundance. Species Richness (S) had the highest value in Station 4 (102 species), comparatively high in the previous three stations and the lowest value in Station 5 (42 species). The highest values of Shannon diversity (H') were recorded in Station 4 and 5 (4.71 and 4.48), whereas the values of Stations 1 to 3 were 3.65, 3.58 and 3.91 respectively. Through Bray-Curtis similarity analysis, three main clusters were identified; the group formed by Stations 1 to 3, Station 4 and Station 5.The application of Bentix and AMBI classified all stations to High status, except of Station 5 which was classified to Good status. M-AMBI designated only Station 4 to High status and rendered a more degraded state at the first three Stations (Good status) and at Station 5 (Moderate status). According to Bentix classification, the group of sensitive species has a percentage over 93% at all Stations apart from Station 5. Among the ecological groups of AMBI/M-AMBI classification, only Group I and II seemed to be significant at the same Stations, while Group I had a much higher percentage than Group II (between 71% and 86.1%).

Discussion
All three biotic indices seemed to be sufficiently sensitive to the level of anthropogenic disturbance caused by the aquaculture units at Station 5. The Good status is similar to what it has been found in previous research effort regarding the effects of local aquacultures to the benthic communities [6]. A large convergence of the assessment is noted for station 4 among all indices and for Stations 1 to 3 among AMBI and BENTIX, while M-AMBI seems to underestimate condition in relation to the other indices. Because of the high percentage of Group I and the ecological status shown by AMBI, the M-AMBI difference could be attributed to the apparent influence of this index by Shannon Diversity and its dependence to methodological and ecological factors rather than to anthropogenic disturbance. It is known that the dominance of certain species produces low diversity estimations, although those species are usually related to non-polluted environments [7]. In certain stations, the dominance of *Bittium reticulatum* seems to be associated to the presence of *P. oceanica* meadows [8] and therefore it could not be related to anthropogenic pressures, but to the ecological attributes of the local habitats. The non-multivariate classification to ecological groups (as applied by Bentix and AMBI) , seems to capture the ecological status sufficiently and it is also validated by the analysis of other abiotic/biotic measurements in the study area [9]. However, this conclusion could not be directly linked to the health status of *P. oceanica* meadows in the study area and it is pointed out that the successful estimation of ecological status based on macrophytes and their associated assemblages remains a priority issue.

Tab. 1. The values of Species Richness (S) , Shannon Diversity (H'), EQR and the classes of ecological quality for AMBI, Bentix and M-AMBI in the 5 sampling stations

Stations	S	H'	AMBI (EQR)	Bentix (EQR)	M-AMBI (EQR)
1	89	3,65	High (0,96)	High (0,97)	Good (0,76)
2	72	3,58	High (0,96)	High (0,97)	Good (0,72)
3	95	3,91	High (0,96)	High (0,97)	Good (0,79)
4	102	4,71	High (0,94)	High (0,95)	High (0,83)
5	42	4,48	Good (0,78)	Good (0,68)	Moderate (0,60)

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