

BENTHIC BIODIVERSITY IN FIVE COASTAL BRACKISH WATER LAGOONS OF AMVRAKIKOS GULF, HELLAS

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Abstract

Species abundance and community diversity were studied in five coastal brackish-water lagoons in Amvrakikos Gulf, Hellas. Both parameters showed statistically significant negative correlation with confinement, while diversity was positively correlated with % coarse material in the sediment.

Key-words : lagoons, biodiversity, Ionian Sea

Introduction

Amvrakikos Gulf holds one of the most important lagoonal systems in Greece, yet very little is published concerning their ecology (1,2,3). Most papers deal with populations of individuals species (4,5). The present paper attempts to relate species abundance and community diversity in five lagoons of Amvrakikos Gulf to a number of environmental parameters.

Materials and methods

The lagoons studied, Logarou, Tsoukalio/Rodia, Tsopei, Mazoma and Pogonitsa, are formed on the North coast of Amvrakikos Gulf under the influence of the rivers Louros and Arachthos (Fig.1). Their depth ranges from 0.2 to 2.5m. Environmental parameters were measured monthly, except in Pogonitsa where a one time survey took place in November. Sediment and benthic samples were collected seasonally or bimonthly, using a Ponar 0.05m² grab. The samples were sieved through a 1 mm mesh sieve. The total area sampled in each lagoon is given in Table 1. Diversity was calculated by the index of Shannon-Wiener. To obtain a quantitative estimation of confinement for use in statistical analyses, each station was assigned to a zone according to Guelorget & Perthuisot (6), with mixed stations being ordered between the respective zones. Then a number was given to each rank (Zone I=1, Zone I-II=2, Zone II=3, ...Zone V=9).

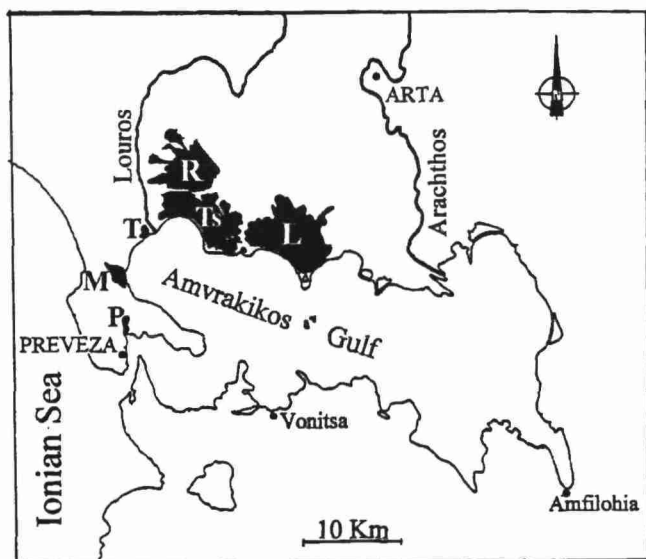


Figure 1 : Map of study area

Results

The range of temperature and salinity measured in the water, as well as the % of coarse material and the organic carbon content of the sediment in each lagoon are shown in Table 1. Tsoukalio/Rodia and Mazoma showed the wider range of both temperature and salinity. The higher values of organic matter in the sediment were approximately the same in all the lagoons except for Logarou, where it was considerably lower.

Abra ovata was one of the dominant species in all the lagoons except in Pogonitsa where it was substituted by the other bivalve, *Loripes lacteus*. The presence of the polychaete *Nephtys hombergi* was also important in almost all the lagoons. Apart from those two,

different species dominated in each lagoon. *Cerastoderma glaucum* and *Iphinoe serrata* were numerically important in Logarou and *Loripes lacteus*, *Mytilaster minimus* and *Cyclope neritea* in Tsoukalio/Rodia. In Tsopei there was dominance of *Gammarus insensibilis*, *Idotea baltica* and *Chironomidae* larvae and in Mazoma of *Mytilaster minimus*, *Nainereis laevigata*, *Tanais cavolini* and *Idotea baltica*. Finally, the dominant species in Pogonitsa were *Heteromastus filiformis*, *Microdeutopus gryllotalpa*, *Tanais cavolini* and *Cymodoce truncata*.

Confinement based on the species composition (Table 1) was highest (Zones IV-V) in Tsopei which, at the time of sampling had only one channel of communication with Amvrakikos and where water circulation was further obstructed by a number of radiating dykes. Pogonitsa, on the contrary, had the lowest confinement (Zones II and III) being small and close to the opening of Amvrakikos to the Ionian Sea (Fig.1).

Table 1 : Environmental parameters, confinement, number of species (S) and diversity (H') in the five lagoons studies.

Lagoons	Total sample area (m ²)	depth (m)	S pau	T (°C)	coarse %	org.C %	confinement zone	S	H'
Logarou	2	0.7-1.0	16-29	22-25	6.4-32.0	2.2-3.5	III-IV	49	0.3-2.3
Tsoukalio/Rodia	5.75	0.5-3.0	11-31	18-30	6.3-79.0	1.2-5.1	III-V	49	0.8-3.5
Tsopei	1.2	0.2-1.5	21-38	8-29	6.7-66.3	1.1-5.3	IV-V	82	0.9-2.5
Mazoma	2.5	1.0-1.4	14-37	9-13		2.7-5.9	II-IV	45	1.4-2.7
Pogonitsa	0.75	1.3-3.0	27-30	13-14	6.8-81.5	0.8-17	II-III	58	1.7-2.6

The number of species was highest [82] in Tsopei followed by that of Pogonitsa (58). In the latter, however, the total area of samples collected was much smaller. Highest diversity, H' = 3.5, occurred in Tsoukalio/Rodia and did not coincide with the highest number of species, obviously affected by the Evenness of distribution of individuals among species. The number of species and the diversity were regressed against depth, salinity, temperature, % organic carbon and % coarse material in the sediment at all stations and lagoons together. They were also correlated with plant biomass in Tsopei, Mazoma and Pogonitsa, for which data were available. Statistically significant correlations were obtained for diversity versus confinement and % coarse material in the sediment (Fig. 2a,b). Diversity decreased with increasing confinement and increased with increasing coarse material in the substratum. In addition, the number of species showed statistically significant negative correlation with confinement (R=-0.5285, n=49 and P=0.0038).

Discussion

Diversity in the lagoons examined was much lower than that of the shallow water areas of Amvrakikos Gulf itself (7). It was comparable, however, to the diversity of other Mediterranean lagoons (8,9,10). Low diversity is a result of the very changeable environmental conditions in lagoons, which result from their shallowness and their restricted communication with the open sea. In this sense lagoons could be considered as stressed environments. This explains the observed decrease of the number of species and diversity with increasing confinement. It is maintained (6,11) that with decreasing communication with the sea (increasing confinement) in a lagoon there is a decreasing variety of species and an increase in density. The results of the present investigation indicate that the theory could also be extended to community diversity which is a function of both species diversity and population density of individual species.

Sediment particle size was also important in controlling diversity in the lagoons studied as it is known for other benthic communities (12).