

# QUALITATIVE STUDY OF BENTHIC FORAMINIFERA IN THERMAIKOS GULF (N. AEGEAN SEA)

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## Abstract

The study of the benthic foraminifera assemblages in Thermaikos gulf (N. Aegean Sea) revealed the presence of 34 genera. The most abundant were *Ammonia*, *Quinqueloculina* and *Elphidium* which contributed to the 90% of the total 3,800 individuals. Their presence was particularly notable near the airport of Thessaloniki, where construction has disturbed the sediment and allowed the profusion of opportunistic species, though further investigation is required to confirm this assumption.

**Keywords:** Aegean Sea, Foraminifera

## Introduction

Foraminifera are the most abundant protozoa in the marine ecosystems and they play an important role in global geochemical cycles of inorganic and organic compounds [1], [2]. Due to their sensitivity to pollutants and the subsequent modification of their assemblages, they have been widely used in studies as pollution-indicators over the last decades [3]. In the present study, the composition of the benthic foraminifera communities is recorded for the first time in Thermaikos Gulf (N. Aegean Sea, Greece), which is heavily influenced by urban and construction development. This study was part of a research project (Operational Programme for Fisheries Sector 2000-2006).

**Tab. 1. List of foraminifera genera identified in Themaikos gulf (N=number of individuals, Am=mean abundance, Dmp=Partial mean dominance, P=number of samples in which genus was found, F=frequency of genus in the total of samples)**

	Foraminifera genera	N	Am	Dmp	P	F
1	<i>Adelosina</i>	122	20.33	0.03	3	0.50
2	<i>Ammonia</i>	2428	404.67	0.64	6	1.00
3	<i>Amphistegina</i>	1	0.17	0.00	1	0.17
4	<i>Aurila</i>	1	0.17	0.00	1	0.17
5	<i>Bolivina</i>	2	0.33	0.00	1	0.17
6	<i>Cytherelloidea</i>	3	0.50	0.00	2	0.33
7	<i>Discorbinella</i>	2	0.33	0.00	1	0.17
8	<i>Elphidium</i>	387	64.50	0.10	4	0.67
9	<i>Fissurina</i>	1	0.17	0.00	1	0.17
10	<i>Gavelinopsis</i>	1	0.17	0.00	1	0.17
11	<i>Globobulimina</i>	2	0.33	0.00	1	0.17
12	<i>Globulina</i>	3	0.50	0.00	2	0.33
13	<i>Haynesina</i>	24	4.00	0.01	2	0.33
14	<i>Hyalinea</i>	5	0.83	0.00	1	0.17
15	<i>Lachlanella</i>	15	2.50	0.00	2	0.33
16	<i>Lagena</i>	1	0.17	0.00	1	0.17
17	<i>Lenticulina</i>	1	0.17	0.00	1	0.17
18	<i>Loxococoncha</i>	7	1.17	0.00	2	0.33
19	<i>Miliolinella</i>	1	0.17	0.00	1	0.17
20	<i>Osangularia</i>	1	0.17	0.00	1	0.17
21	<i>Peneroplis</i>	1	0.17	0.00	1	0.17
22	<i>Planorbulina</i>	1	0.17	0.00	1	0.17
23	<i>Pyrgo</i>	3	0.50	0.00	1	0.17
24	<i>Quinqueloculina</i>	586	97.67	0.15	6	1.00
25	<i>Rosalina</i>	63	10.50	0.02	4	0.67
26	<i>Sigmolina</i>	1	0.17	0.00	1	0.17
27	<i>Siphonaperta</i>	8	1.33	0.00	3	0.50
28	<i>Spirulina</i>	1	0.17	0.00	1	0.17
29	<i>Spiroloculina</i>	11	1.83	0.00	2	0.33
30	<i>Trochoculina</i>	76	12.67	0.02	4	0.67
31	<i>Urocythereis</i>	1	0.17	0.00	1	0.17
32	<i>Xestoleberis</i>	10	1.67	0.00	5	0.83
33	unidentified 1	14	2.33	0.00	1	0.17
34	unidentified 2	16	2.67	0.00	2	0.33
	total	3800				

## Material and Methods

Six sediment cores (4 cm diameter) were collected seasonally (Autumn 2007 – Spring 2008) from 3 different sites at the inner Thermaikos Gulf [St1: Paliomana, (N 40°36,332' E 22°52,816'), St2: Airport (40°31,812' E 22°

57,740') and St3: Karabournaki (N 40° 35,001' E 22° 55,563')], at depths from 4 to 8 m. Overall, 3,800 foraminifera individuals were identified, including dead ones, which comprised about 80% of the total number. The dead assemblages were also considered, as sampling took place biannually and, therefore, the thorough study of the short life and reproduction cycles of these protozoa was hindered [4]. All individuals were identified at genus level, with the exception of the most abundant, which was *Ammonia beccarii* (Linné). Kruskal-Wallis and Fisher's LSD tests were employed to examine differences in abundance between the three stations [5].

## Results and Discussion

Overall, 32 foraminifera genera were identified from 3,800 individuals; two additional genera remained unidentified. The most abundant was *Ammonia*, represented by *A. beccarii*, which made up for the 64% of the total number of individuals. Another two genera, *Quinqueloculina* and *Elphidium* showed high frequency in the samples. These three genera contributed up to 90% of the total number (Table 1). In general, the most frequent genera in this study (>50%) are also very common in other parts of the Aegean Sea [6]. The Kruskal-Wallis test (22.81, p<0.05) and Fisher LSD showed that there is a significant difference between the abundance of foraminifera at St2 and the other two stations. This station is near the Airport of Thessaloniki where large reconstruction has been taken place and the sediment disturbance is significant. *Ammonia beccarii*, which is an opportunistic and pollutant tolerant species [1], [2], showed its largest abundance at this station, as did the other two abundant genera, *Quinqueloculina* and *Elphidium*. However, in order to utilize foraminifera as indicators of disturbance in the marine environment further investigation of their assemblages, at structural and functional level, is required [2].

## References

- 1 - Alve E., 1995. Benthic foraminiferal responses to estuarine pollution: a review. *J. Foraminiferal Res.*, 25: 190-203.
- 2 - Yanko V., Arnold A. and Parker W., 1999. Effect of marine pollution on benthic foraminifera. In: Sen Gupta B.K. (ed.), *Modern Foraminifera*. Kluwer Academic Publ., Boston, pp. 217-235.
- 3 - Armynot du Chatelet E., Debenay J.-P. and Soulard R., 2004. Foraminiferal proxies for pollution monitoring in moderately polluted harbors. *Env. Pol.*, 127: 27-40.
- 4 - Frontalini F. and Coccioni R., 2008. Benthic foraminifera for heavy metal pollution monitoring: A case study from the central Adriatic Sea coast of Italy. *Estuarine, Coastal and Shelf Science*, 76: 404-417.
- 5 - Zar J.H., 1999. *Biostatistical analysis*. 4<sup>th</sup> edition. Prentice Hall, New Jersey, USA.
- 6 - Triantafyllou M., Tsourou T, Koukousioura O. and Dermizakis M.D., 2005. Foraminiferal and ostracod ecological patterns in coastal environments of SE Andros Island (Middle Aegean Sea, Greece). *Rev. Mic.*, 48: 279-302.