SURROGATE MEASURES OF BIODIVERSITY IN MACROBENTHIC COMMUNITIES IN THERMAIKOS GULF, GREECE

Chariton-Charles Chintiroglou , Chryssanthi Antoniadou , Panagiotis Damianidis * and Evdokia Kourelea
Dept. of Zoology, School of Biology, Aristotle University of Thessaloniki, P.O. Box 134, GR-541 24, Thessaloniki, Greece - damianidis@yahoo.com

Abstract
The use of higher-taxon richness as surrogate for species was investigated in a study of macrobenthic communities in Thermaikos Gulf, north Greece. The correlation of genera and families to species richness showed that they can both be effective surrogates of biodiversity, while the use of an indicator group (Polychaeta) was sufficient, but it should be applied with caution and when the group is dominant in the area.
Keywords : Aegean Sea, Biodiversity, Zoobenthos.

Introduction
Most analyses of macrobenthic communities are based on the identification of species [1]. However, the use of higher-taxon richness as surrogate for species can also produce a reliable distribution pattern of macrobenthic fauna [1-3]. Other surrogates can be the abundance of species of certain indicator groups [4-5]. Analyses based on higher-taxon richness is often more convenient than the time-consuming and costly species identification [4-6]. The present study considered the genera and families of organisms and of polychaeta as indicator group, as regards their suitability as surrogates for species in investigations of macrobenthic fauna in Thermaikos Gulf, north Greece.

Materials and methods
The sampling period lasted three years (2003-2006). Three vertical transects along the NE coasts of Thermaikos Gulf were selected in the area around the construction site of the new air lane of Thessaloniki Airport. Six stations - two at each transect - were established for benthic macrofauna sampling with corer samplers at depths between 3 and 10 m (ST1-ST6). In total, 16,650 species were collected, classified in 181 species. Polychaeta were the dominant group in terms of presence and abundance in most of the stations. The Spearman rank correlation coefficient was employed to determine whether there was a statistically significant correlation (r values) between the species richness and the genera (Sp-Gen) and families (Sp-Fam) richness. The same was applied for Polychaeta (Sp-Pol.Sp. and Sp-Pol.Gen.), in order to investigate the suitability of an indicator group as surrogate.

Results and Discussion
Figures 1 and 2 show that genera and families richness (r=0.98 and r=0.89, respectively) is a truly effective surrogate and the use of species and genera richness of Polychaeta also provides sufficient surrogacy (r=0.75 each).

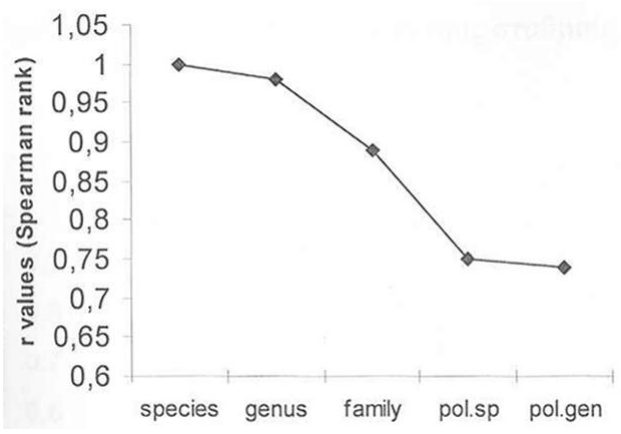

Fig. 1. Correlation between the number of species and the number of genera, families, polychaeta species and polychaets genera.

There were a couple of exceptions in the latter pattern, namely St1 and St4 where Sp-Pol.Sp και Sp-Pol.Gen. correlations are not significant (Figure 2).In a number of studies in areas with severe organic pollution [1, 3, 7] the use of families or species and families of polychaetes are often in accordance with the biocoenotic patterns that originate from the normal use of species richness. Natural selection premises that each higher taxon contains species that can only cope with small scale environmental changes. Therefore, in areas where anthropogenic impact is large, higher taxa are represented by a small number of species and their use as surrogate for species is more reliable there than in non-disturbed areas [6]. In polluted areas, more specifically, the Polychaeta can be of great advantage as a surrogate group. Their great variety of feeding guilds and reproductive strategies enable them to be abundant in a large number of habitats, disturbed or not. Our study, however, showed that the surrogacy should be applied with caution, because there are cases like St.1 and St.2, neighbouring sites with similar substrate structure, where the same surrogate (number of species of polychaetes) was not similarly distributed and, thus, not equally effective.

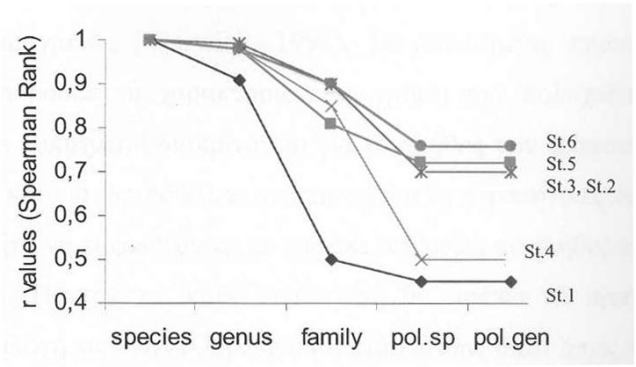

Fig. 2. Correlation between the number of species and the number of genera, families, polychaeta species and polychaets genera at each sampling station.

References
1 - Olsfrad F., Somerfield P.J., and Carr M.R., 1998. Relationships between taxonomic resolution, macrobenthic community patterns and disturbance. *Mar . Ecol . Prog . Ser.*, 172: 25-36.
2 - Gaston K.J. and Williams P.H., 1993. Mapping the world species - the highest taxon approach. *Biodiv. Letters*, 1: 2-8.
3 - Vanderklift, M.A., Ward T.J. and Jacoby C.A., 1996. Effect of reducing taxonomic resolution on ordinations to detect pollution induced gradients in macrobenthic infaunal assemblages. *Mar . Ecol . Progr . Ser.*, 136: 137-145.
4 - Williams P.H. and Gaston K.J., 1994. Measuring more of biodiversity: can higher-taxon richness predict wholesale species richness? *Biol . Conserv.*, 67: 211-217.
5 - Balmford A., Green M.J.B. and Murray M.G., 1996. Using higher-taxon richness as a surrogate for species richness. I. Regional tests. *Proceedings of the Royal Society of London*, 263: 1267-1274.
6 - Warwick R.M., 1993. Environmental impact studies on marine communities. *Aust . J . Ecol.*, 18: 63-80.
7 - Olsgard F. and Somerfield P.J., 2000. Surrogates in marine benthic investigations - which taxonomic unit to target? *Journal of Aquatic Ecosystems Stress and Recovery*, 7: 25-42.