Geophysical Research Abstracts, Vol. 8, 03977, 2006
SRef-ID: 1607-7962/gra/EGU06-A-03977

Benthic foraminifera as bio-indicators of eutrophicated environments

M. Mojtahid (1), F. Jorissen (1), J. Durrieu (2), F. Galgani (3), R. Camps (2) and L. Cazes (2)

(1) Laboratoire des Bio-Indicateurs Actuels et Fossiles (BIAF) UPRES EA 2644, University of Angers, France, and Laboratoire d'Etude des Bio-Indicateurs Marins (LEBIM), Ile D'Yeu, France, (2) Total, département Environnement Opérations, Pau, France, (3) Ifremer, Sète, France (meryem.mojtahid@etud.univ-angers.fr / Tel: +33 2 41 73 50 02 , Fax: +33 2 41 73 53 52)

Foraminifera are among the most abundant protists in marine benthic environments (*Murray, 1991*). Because of their short life cycles, high biodiversity and specific ecological requirements of individual species, foraminifera react quickly to environmental disturbance, and can be successfully employed as bio-indicators of environmental change, such as those brought about by anthropogenic pollution (as defined by *Kramer and Botterweg, 1991)*. Foraminiferal assemblages are easy to collect; foraminifera are commonly abundant, providing a highly reliable database for statistical analysis, even when only small sample volumes are available. Furthermore, many foraminiferal taxa secrete a carbonate shell, and leave an excellent fossil record, that may be used to characterise baseline conditions, and to reconstruct the state of the ecosystem prior to sampling. Studies of the effects of pollution on benthic foraminiferal assemblages, and their possible use as pollution indicators were initiated in the early 1960's by *Resig (1960) and Watkins (1961*). In the last decennia, foraminifera have been increasingly used to monitor pollution in a wide range of marine environments, such as intertidal mudflats impacted by oil spillages (*Morvan et al., 2004*), harbours affected by heavy metal pollution *(Armynot Du Châtelet et al., 2004*), or eutrophicated continental shelves (*Sharifi et al., 1991; Yanko and Flexer, 1991).* The goal of our study is to compare different types of eutrophicated environments, under anthropogenic or natural conditions: we used benthic foraminifera as bio-indicators of anthropogenic eutrophication caused by drill cutting discharges (Congo and Gabon), by sewage sludge (Firth of Clyde; Scotland) and by fish farms (Loch Etive; Scotland) and compared the faunal

patterns with those observed in the Rhone prodelta, en environment characterised by strong natural eutrophication due to important continental nutrient input.

Our best example of anthropogenic eutrophication is a drill cutting disposal sites at the outer continental shelf off Congo, where we observed a zonation of foraminiferal faunas in the 750 m around the discharge point.. In the immediate vicinity of the discharge points (within 70 m), faunas are characterised by low foraminiferal densities. Faunas between 70 m and 250 m of the disposal sites have very high foraminiferal densities, with high percentages (about 80 %) of opportunistic taxa such as *Bulimina aculeata, Buliminata marginata, Textularia sagittula, Trifarina bradyi* and *Bolivina* spp. Between 250 and 750 m, foraminiferal densities decrease, and the percentages of opportunistic species are lower (40-60% of indicator species). These results show that 4 years after the cessation of oily cutting disposal, strong environmental impact is limited to the 250 m around the disposal sites. We used these data to develop a quantitative pollution index, values of which are strongly correlated with the distance to the disposal site. This foraminiferal index offers the possibility to quantify the impact of anthropogenic eutrophication in continental shelf environments, but its validity must be tested in wider range of naturally and anthropogenetically impacted marine environments.

Armynot du Châtelet, E., Debenay, J. P., and Soulard, R., 2004. Foraminiferal proxies for pollution monitoring in moderately polluted harbors. Environmental Pollution 127, 27-40.

Kramer and Botterweg, 1991. Aquatic biological early warning systems: an overview. In: Jeffrey, D.W., Madden B. (eds) Bioindicators and environmental management. Academic press, London, 95-126.

Morvan, J., Le Cadre, V., Jorissen, F. and Debenay, J.P., 2004. Foraminifera as potential bio-indicators of the « Erika » oil spill in the Bay of Bourneuf : Field and experimental studies. Aquatic living resources, 17, 317-322.

Resig, J.M., 1960. Foraminiferal ecology around ocean outfalls off southern California. In: E. Person (Editor), Disposal in the marine environment. Pergamon Press, London, pp. 104-121.

Sharifi, A.R., Croudace, I.W. Austin, R.L., 1991. Benthic foraminiferids as pollution indicators in Southampton Water, southern England, UK. Journal of micropaleontology 10 (1), 109-113.

Watkins, J.G., 1961. Foraminiferal ecology around the Orange County, California, ocean sewer outfall. Micropaleontology 7(2), 199-206.

Yanko, V. and Flexer, A., 1991. Foraminiferal benthonic assemblages as indicators of pollution (an example of north- western shelf of the Black Sea). Third Annual Symp. on the Mediterranean Margin of Israel. Haifa-Israel, 5pp.