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Distribution of Macrobenthos in the Coastal Waters in the Gulf of Oran (Western Algeria)

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Abstract: The prospecting of about fifty stations of the continental shelf of the gulf of Oran, allowed the study of the nature of the sediments and the macrobenthic communities. Distributed according to bathymetry, the stations closest to the coast are with -30 m and most distant with -110 m. The use of multivariate statistical analyses the such TWINSPAN (two way indicator spices of analysis) and of indices of diversity, as well as the results of the grain size analysis, led to the identification of principium sedimentary facies, to establish the faunistic inventory of the macrobenthic species and to specify the biodiversity of the various sea-bottom of the gulf. Five communities were identified and characterized. The communities of the gravel sands, the communities on more or less muddy gravel sand, the communities of the muddy gravel sands, the communities of the gravel sands and the communities of fine sands.

Key words: Macrozoobenthos, diversity, Twinspan, Gulf of Oran, Western Algeria

INTRODUCTION

This present paper deals with the study of the benthic populations living on the marine deeps. In the western coast, in particular, very few works have been made (Pallary, 1900; Llabador, 1941; Vaissière and Fredj, 1963).

The analysis of the macrobenthic communities structure is a good method in the study of environmental modifications caused both by natural and anthropologenic perturbations. Some results show the response of the benthic communities to different disturbance sources in a simple way (Muxika and Borja, 2005).

The main goal is the elaboration of a sedimentary map and in a second approaches both the qualitative and the quantitative composition estimation of the benthic macrofauna in the gulf of Oran, north-western Algeria.

MATERIALS AND METHODS

Description of the study area: As the whole of the other emerged coasts, all around the Mediterranean Sea, the northern extremity of the African continent is prolonged under the sea by a submarine not very important bordure, more or less continue (Leclaire, 1972).

The gulf of Oran, on the Algerian Mediterranean coast is located between the industrial gulf of Arzew in the east and the unspoilt Andalouses Coast in the west. It is delimited, in the east by the Aiguille cape and in the west by the Falcon cape, in almost 30 miles wide.

This gulf is constituted in the western part, from the port of Oran to the Mers El Kebir end, by high and escarped cliffs, going from 10 to almost 30 m big. In the east part, the coast presents cliffs more or less high, interrupted by small and narrow beaches (Fig. 1).

The gulf of Oran is supplied by waters originated from the Atlantic Ocean (Millot, 1987). The circulation seems to be very turbulent along the African continent. These turbulences favour the dispersion of eventual pollution sources and permit a so relative important alimentary chain development (Millot *et al.*, 1989).

Sampling: According to the bathymetry of this zone, it has been used 50 stations following eight radials, going from the coast to the open water. The nearest coast station is at -30 m depth and the most far is at -110 m depth, as described (Fig. 2).

One machine type has been used, in occurrence the so called Aberdeen benne or Smith McIntyre, for the sediments and benthos sampling operations. This choice has been motivated by the nature of the present deeps.

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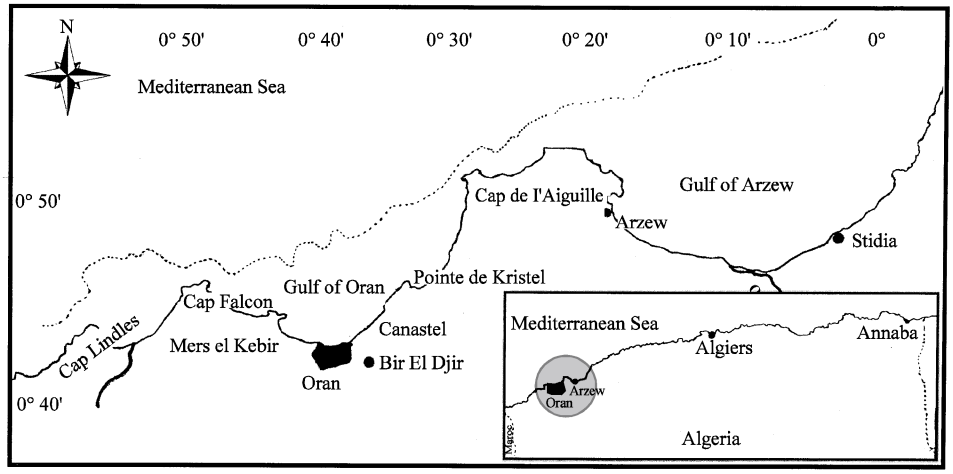

Fig. 1: Gulf of Oran: Study area

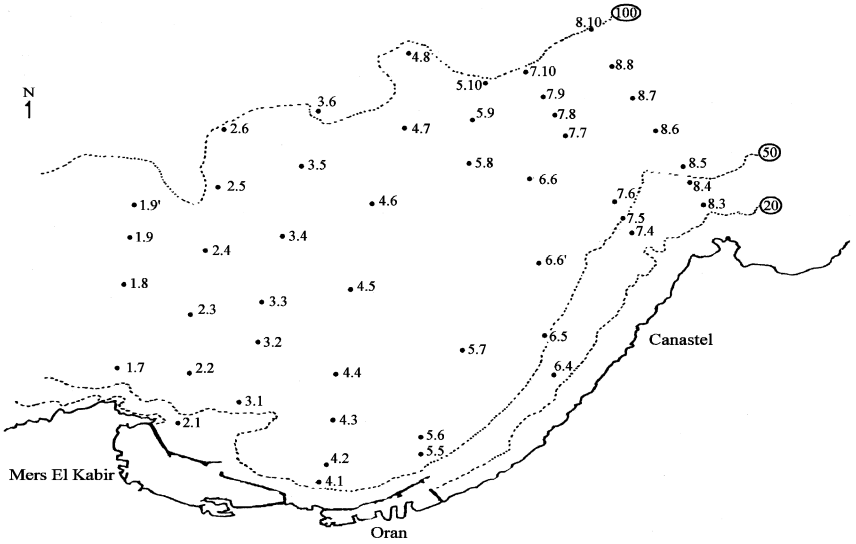

Fig. 2: Location of the fifty sampling sites distributed over eight transect in the gulf of Oran

Two Benne hits have been made for every station giving 0.2 m^2 of taken area. The sieving is realized onboard, giving remains fixed by the Formol and conserved in sight of a laboratory study.

Analysis: A first selection permits species segregation, according to their belonging to one of the great following zoological group: Molluscs, Crustaceous, Echinoderms and Annelids Polychets.

Each individual of every zoological group is identified. The number of each inventoried specie is noted, in order to make species abundances and dominances calculations (Pielou, 1966) and also the diversity index (Shannon and Weaver, 1963).

The obtained sediment is analyzed in order to determine the nature and the texture of the encountered deeps. The granulometric analysis allows the size and the distribution evaluations of the particles constituting the sediment and the design of the sedimentary map (Hilly, 1985).

The results processing using the multi-variable analysis method called TWINSPAN, for Two Way Indicator Species Analysis (Hill, 1979) and also the sedimentary study permit, finally, to define the main populations of the gulf of Oran.

Three Twinspan processes have been made (Vincx, 1987), characterizing the great populations sets sampled in the 50 stations. It has been found 204 different species.

- The Twinspan A has made a dichotomic division of the 50 stations, on the basis of 5 abundance levels or cut-levels (0 and 5, 2 and 5, 5 and 10, 10 and 20).
- The Twinspan B is based on two abundance levels 0 and 1, or on the presence or the absence of the specie.

- The Twinspan C considers only two cut-levels: specie abundance between 0 and 10 and abundance greater than 10.

RESULTS

Sedimentary cover: The sedimentary analysis showed, by importance order six sedimentary facies the mean sands, the mud-graveled mean sands, the muddy mean sands, the graveled sands, the muddy sands and the reduced mud.

Sands appear in the majority of the stations in the gulf. Pure mud is rather absent excepting a small zone close to the port of Oran (Caulet, 1972).

The absence of terrestrial materials, according to the lack of rivers (called oueds here) arriving to the gulf, explains the weakness of sediments in pelites.

The majority of the sediments are constituted by shelly fragments, in particular of gastropods and bivalves. The Benthic originated biogenic sedimentation is important and the industrial wastes (glass, plastic, iron) have been signaled in the sampled sediments in almost the whole of the stations near the coast.

Population's characterization: Seven stations sets or twins appeared from the Twinspan A (Fig. 3). The Twin 3 and 4 are, in far, the most significant. The great majority of the Twin 3 stations occupied the central gulf area and the Twin 3 is located in the west area and in the open water.

The Twinspan B (Fig. 4), revealed a new stations repartition between the Twins 3, 4 and 5. The Twin-Species of this Twinspan are identical to the preceding.

The Twinspan C (Fig. 5) permitted to show three (3) stations mains sets (Twins 3, 4 and 5). The characteristic species of these Twins are identical to those identified with the Twinspans A and B.

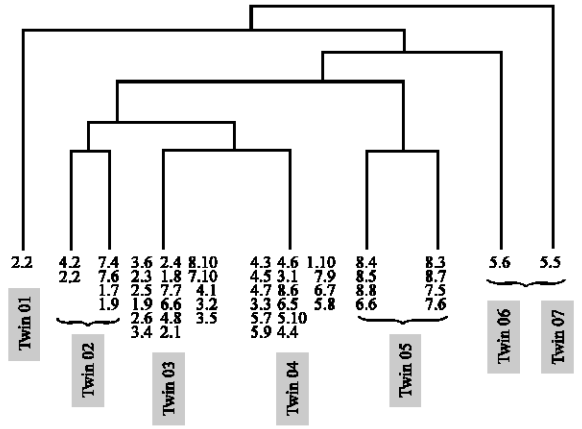

Fig. 3: Dendrogram of 50 stations of the classification Twinspan-A

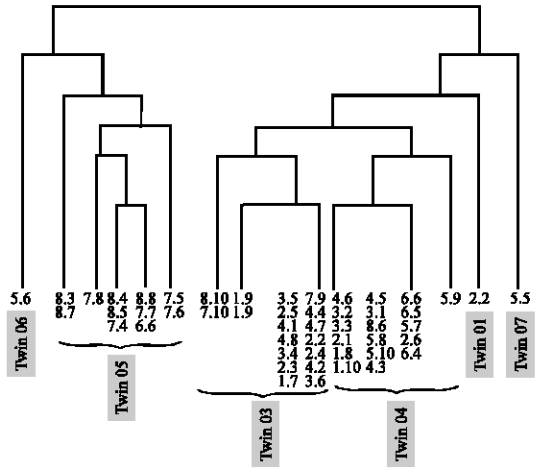

Fig. 4: Dendrogram of 50 stations of the classification Twinspan-B

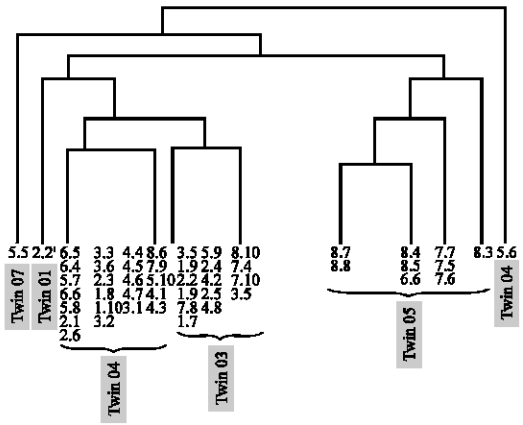

Fig. 5: Dendrogram of 50 stations of the classification Twispan-C

DISCUSSION

It has defined five (5) populations (Fig. 6) from faunistic and sedimentologic affinities (Glémarec and Grall, 2000; Hily, 1985).

The sanded fine gravels populations: This population has been defined from the eleven following stations: 8.3, 8.4, 8.5, 7.4, 7.5, 7.6, 7.7, 7.8, 6.5, 6.6 and 6.7. The sandy fine gravels population is located in the eastern sector of the gulf, between -32 m and -80 m depth. It is characterized by a so high specific diversity and a good macrobenthic individuals repartition between the counted species (Shannon index comprised between 2.91 and 4.35). In a zoological point of view, this population is widely dominated by Polychets, followed by Crustaceous, then Molluscs. The Echinoderms are not well represented.

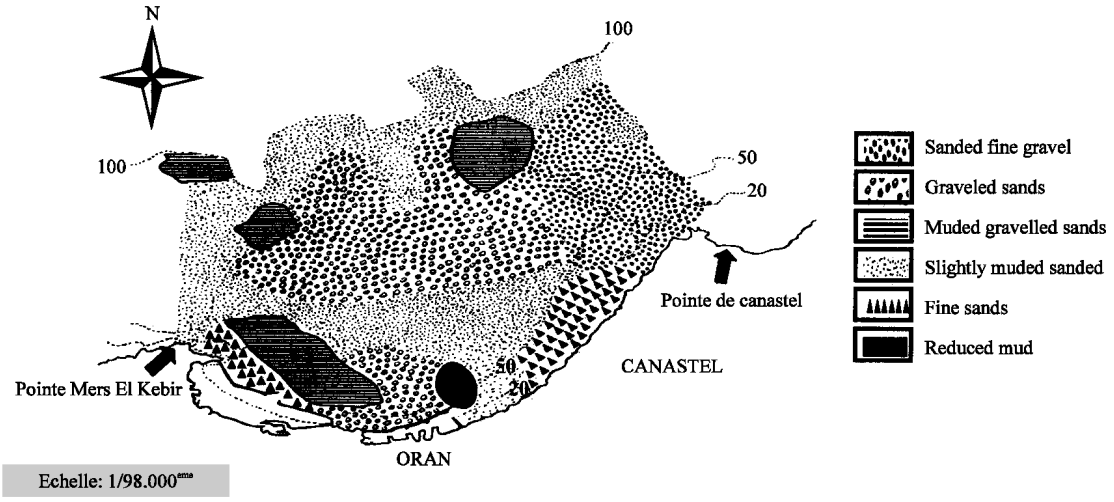

Fig. 6: Gulf of Oran: benthic communities

The most important ecological stocks composing this population is the stock of large ecological repartition species represented by *Hyalinoecia bilineata* and *Eunice vittata*, those of the exclusive gravellicoles of the coastal detritic represented by *Psammechinus microtuberculatus*, *Echinocyamus pusillus*, *Anapagurus laevis* and *Urothoe elegans* and those of Mixticoles represented by *Ampelisca diadema*. Let's note the strong dominance of the mid-littoral sandy exclusive specie: *Euridice pulchra*.

The main species composing sandy fine gravels populations are eighteen (18) whereas ten (10) specific to this population. They are: *Ophiopsila aranea*, *Maera grossimana*, *Cypridina mediterranea*, *Atylus guttatus*, *Anaparagus laevis*, *Ampelisca tenuicornis*, *Maryphysa bellii*, *Ampelisca diadema*, *Ampelisca vervecei* and *Ampelisca spinipes*.

The mudded graveled sands population: This population has been defined from the seven following stations: 1.10, 2.2, 2.4, 3.1, 4.2, 5.8 and 5.9. It is located in one part in the small coastal deeps in close proximity to the port of Mers El Kebir and in the open water in the other part.

Concerning the qualitative richness of this population, the Shannon index varies from 2.23 to 4.25, with a mean value of 3.26.

This population is dominated both quantitatively and qualitatively, in a zoological plan, by the Polychets group followed by the Crustaceous one, then the Molluscs and finally the Echinoderms.

Concerning the ecological stocks, it has been observed in this population dominance of wide ecological repartition species represented by *Hyalinoecia bilineata* and *Amphiura filiformis*, followed by the tolerant Sabulicoles group represented fairly by *Pista cristata*, *Chone duneri* and *Glycera convoluta*, those of the Mixticoles species represented by *Leda fragilis*, *amphicteis gunneri* and *Nematonereis unicornis*.

Let's note, also, the presence of a muddy sabulicole specie *Harmatoe spinifera* and of tolerant muddy species *Amphiura chiajei* and *Chloeia venusta*.

The main species cortege is composed by twelve (12) species as *Hyalinoecia bilineata*, *Chloeia venusta*, *Chone duneri* and *Glycera convoluta*.

The graveled sands population: This population has been defined form the nine (9) following stations: 2.3, 3.3, 3.4, 3.5, 4.1, 4.3, 4.5, 4.7 and 6.6. It is located in the medium zone of the gulf of Oran between -35 and -87 m deeps. It is characterized by a relative weak specific diversity (Shannon index comprised between 1.09 and 4.48). In the zoological plan, this population is dominated, also, by the Polychets, both in the quantitative and the qualitative domains, followed distantly by Crustaceous and Echinoderms. Molluscs are almost not represented.

The most important ecological stocks are the wide spread ecological repartition species represented by *Hyalinoecia bilineata* and *Eunice vittata* and the tolerant Sabulicoles represented by *Glycera convoluta*, *Clymene lumbricoïdes*, *Chone duneri* and *Hyalinoecia fauvelli*.

Let's denote, also, a detritic exclusive specie presence of open water Cirolana borealis and of a Mixticoles specie Amphicteis gunneri. The main species cortege is composed by nine (9) species as *Hyalinoecia bilineata*, *Chloeia venusta*, *Lumbrinereis fragilisi* and *Glycera convoluta*.

The slightly mudded sanded gravels population: This population was defined from the eighteen (18) following

station: 1.7, 1.8, 1.9, 1.9', 2.5, 2.6, 3.2, 3.6, 4.4, 4.6, 4.8, 5.7, 5.10, 6.5, 7.9, 7.10, 8.6 and 8.10. This population occupies the west side of the gulf of Oran and also the open water area, from the Mers El Kebir End to the Kristel End. Concerning the qualitative richness of this population, the Shannon index is comprised between 1.75 and 4.35. In the zoological plan, this population is widely dominated, on both qualitative and quantitative parts by Polychets, followed by Crustaceous and then Echinoderms. Molluscs are also not well represented.

The most important ecological stocks composing this population are the large ecological repartition species and the tolerant Sabulicoles represented by *Chone duneri*, *Hyalinoecia fauveli*, *Glycera convoluta* and *Pista cristata*. The tolerant muddy are represented by *Chloeia venusta* and *Amphiura chiajei* and the strictly muddy are represented by *Lumbrinereis fragilis*.

Fourteen main species compose this population, as principally *hyalinoecia bilineata* and *Eunice vittata*.

The fine sands population: This population is composed by two stations: 2.1 and 6.4. It is established in the fine sands coastal deeps. This population is characterized by a weak specific diversity (Shannon index comprised between 1.97 and 2.18) and an unequal individuals repartition between the observed species.

In a zoological viewpoint, this population is widely dominated by the two tolerant Sabulicoles stocks represented by *Chone duneri*, *Pista cristata* and *Glycera convoluta* and by wide ecological repartition species represented by *Hyalinoecia bilineata* and *Eunice vittata*.

The main species cortege of this population is composed by four species: *Hyalinoecia bilineata*, *Eunice vittata*, *Chone duneri* and *Lumbrinereis fragilis*. They are, therefore not exclusive species of this population.

CONCLUSION

The study of the Macrobenthic populations of the gulf of Oran has shown the five main following populations: the population of sanded fine gravels, of mudded gravels sands, of graveled sands, of slightly mudded sanded gravels and of fine sands.

In the qualitative side, the diverse populations were characterized comparatively by a so correct individuals repartition between the discovered species.

In the quantitative plan the population of the slightly mudded sanded gravels was the most important, followed by the fine sands one.

Concerning the zoological composition of the population, it has been noted the manifest dominance of the Polychets in the whole of the Macrobenthic populations of the gulf of Oran.

Qualitatively, the Polychets are, also, the most diversified zoological group in all the populations, followed by the Crustaceans one.

Comparatively, to the other Algerian coast studied: Alger, Bou Ismaïl, Arzew and Skikda (Bakalem, 2001; Amar *et al*., 1998; Rebzani-Zahaf *et al*., 1998) and to the other Mediterranean coast (Baldó *et al*., 1999; Stora *et al*., 1995) the area of Oran is the poorest both qualitatively and quantitatively, because only 204 species were discovered

The populations of the sanded fine gravels and the slightly mudded sanded gravels were described for the first time in the continental plate of the Algerian coast.

REFERENCES

Amar, Y., A. Kerfouf and A. Bakalem, 1998. Contribution to the study of the benthic community of the gulf of Arzew. International Workshop Environment, Development of the Coastal Area Protected, 1, 2 and 3 June 1998, Algiers.

Bakalem, A., 2001. Biodiversity of the benthic and nectobenthic ecosystems of the Algerian coasts: International Workshops on the Marine Biodiversity in Islamic Countries, Algiers, October 22, 23 and 24.

Baldó, F., S.F. Garcia-Martin, P. Drake and A.M. Arias, 1999. Discrimination between disturbed coastal ecosystems by using macrobenthos at different taxonomic levels. Biol. Inst. Esp. Oceanogr, 15: 489-493.

Caulet, J., 1972. Organic sediments of the Algerian pre continent. Memory of the National Museum of Natural History, Paris, Series C., 25: 1-289.

Glémarec, M. and J. Grall, 2000. Ecological and zoological groups of marine invertebrate's vis-à-vis degradations of the coastal environment. Bulletin Company Zool. France, 125: 37-48.

Hill, M.O., 1979. A FORTRAN program for arranging multivariate data in an ordered Two-Way table by classification of the individuals and attributes. Ecology and Systematic, Cornell University, Ithaca, New York, pp: 48.

Hilly, C., 1985. Ecology of the benthic macrofauna in the sediments of the Brest harbour polluted by the organic matter. Océanis, 11: 263-276.

Leclaire, L., 1972. Holocene sedimentation on the southernmost slope of the basin Algéro-Balearic Islands (Algerian precontinent). Memory of the National Natural history museum of Natural History, series. C, Tome XXIV, Paris, pp: 372-373.

Llabador, F., 1941. Echinoderm of Western Algeria, Bulletin of the Geographical Archaeological Society, Department of Oran, pp: 45-54.

Millot, C., 1987. General circulation in the Western Mediterranean: Outline of our knowledge and draft studies. Annals of Geography, XCVII: 498-515.

Millot, J.C., L. Taupier-Letage and M. Benzohra, 1989. The Algerian Eddles. Earth Sci. Rev., 27: 17.

Muxika, I. and A. Borja, 2005. The suitability of the marine biotic index (AMBI) to new impact sources along European coasts. Ecological Indicators, 5: 19-31.

Pallary, F., 1900. Echinoderm of the gulf of Oran Bulletin. Of Agricultural Station. And Fishing's, Castiglione, 3: 48-60.

Pielou, E.C., 1966. The measurement of diversity in different types of biological collections. Biol. Theor. J., 13: 131-144.

Rebzani-zahaf, C., C. Benzaid, T. Milla and S. Ourad, 1998. Macrobenthic community of the Bejaia ports and new port of Skikda, International Workshop Environment, Development of the coastal area protected, 1, 2 and 3 June 1998, Algiers.

Shannon, F.P. and W. Weaver, 1963. The mathematical theory of communication. University Illinois Press. Urbana, pp: 117.

Stora, G., A. Arnoux and M. Galas, 1995. Time and spatial dynamics of Mediterranean lagoon macrobenthos during an exceptionally prolonged interruption of freshwater inputs. Hydrobiologia, 300/301:123-132

Vaissiere, R. and G. Fredj, 1963. Contribution to the study of the benthic fauna of the continental shelf of Algeria, Bull. Oceanog. Inst. Monaco, 60: 83.

Vincx, M., 1987. Free living marine nematodes from the southern bight of the North Sea, M.Sc. Thesis State University of the Ghent, Belgium, pp: 618.