

ORIGINAL ARTICLE

Macrobenthic fauna of the coastal sea beds of Oran's Gulf (Western Algeria)

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This present work dealing with the study of the benthic community in the Oran's Gulf permits an overview of the macrobenthos encountered in this area, which seems to be more or less threatened by industrial and urban pollution. This study aimed to establish an initial reference state of coastal environments to contribute to the knowledge necessary for their sustainable management. The inventory of the macrobenthic fauna of the Gulf of Oran carried out in 2019 identified 618 macrobenthic individuals, divided into four taxa (531 polychaetes, 38 crustaceans, 31 mollusks, and 18 echinoderms), distributed in 8 sites. The taxonomic diversity included 60, 23, 15, and 9 species of polychaetes, crustaceans, mollusks, and echinoderms, respectively. All this information obtained made it possible to estimate the diversity of macrobenthic invertebrates and characterize the main communities in the coastal sea bed of the Gulf's Oran.

Keywords: macrobenthos, invertebrates, polychaetes, mollusks, crustaceans, echinoderms, Oran's Gulf, west coast Algeria.

Introduction

Most of the previous inventories of the benthic fauna of continental shelf in the west coast of Algeria have not been updated (Pallary, 1900; 1935; Labador, 1935; Maurin, 1962; Vaissiere and Fredj, 1963; Amar, 1998; Grimes, 2010; Boukhari Benamara, 2014; Meziane et al., 2018; 2020). The prospecting of about eight stations of the continental shelf of the Gulf of Oran allowed the study of the macrobenthic communities, established the faunistic inventory of the species, and specified the biodiversity of the various seabeds of the Gulf. Macroinvertebrates are fundamental elements in the functioning of aquatic ecosystems and keep an essential role in biological balance and trophic chains. The analysis and use of the inventory of identified species carried out make it possible to define the geographical zoning and priority habitat types for the conservation of the biodiversity of macroinvertebrates in these coastal areas and to understand the place of macroinvertebrates in the functioning of biological resources, to identify its ecological values and disturbances caused by human activities (Rebzani-Zahaf et al., 1997; Donga, 2021).

Materials and Methods

Study area

On the Algerian Mediterranean coast, the Gulf of Oran is located between the Gulf of Arzew to the east and Cape Falcon to the west (Leclaire, 1972). The study area is located in the Gulf region (Annex Table 1) and includes eight coastal stations (Fig. 1). The Gulf of Oran is supplied by waters that originated from the Atlantic Ocean. The circulation seems to be very turbulent along the African continent. These turbulences favor the dispersion of eventual pollution sources and permit a relatively significant alimentary chain development (Millot et al., 1989). The Gulf of Oran is exposed to pollution and other degradation resulting from the development of multiple socio-economic activities: urbanization, tourism, fishing, and commercial ports (Djad et al., 2015; Tayeb et al., 2015; Mehtougui et al., 2018; Kies et al., 2020).

Sampling

For each station, 0.2 m² area was sampled. The individuals collected are stored in formalin and identified in the laboratory using various documents and determination keys. According to their belonging to one of the greatly following zoological groups, a first selection permits species segregation: Molluscs, Crustaceans, Echinoderms, and Annelids Polychaetes. Each individual of every zoological group is identified according to several determination keys, such as Fauvel (1923 and 1927), Picard (1965), Fauchald (1977), Glémarec (1969 and 2000), Kerfouf et al., (2007) Each inventoried species is noted to make species abundances and dominance calculations (Pielou, 1966) and the diversity index (Shannon et al., 1963).

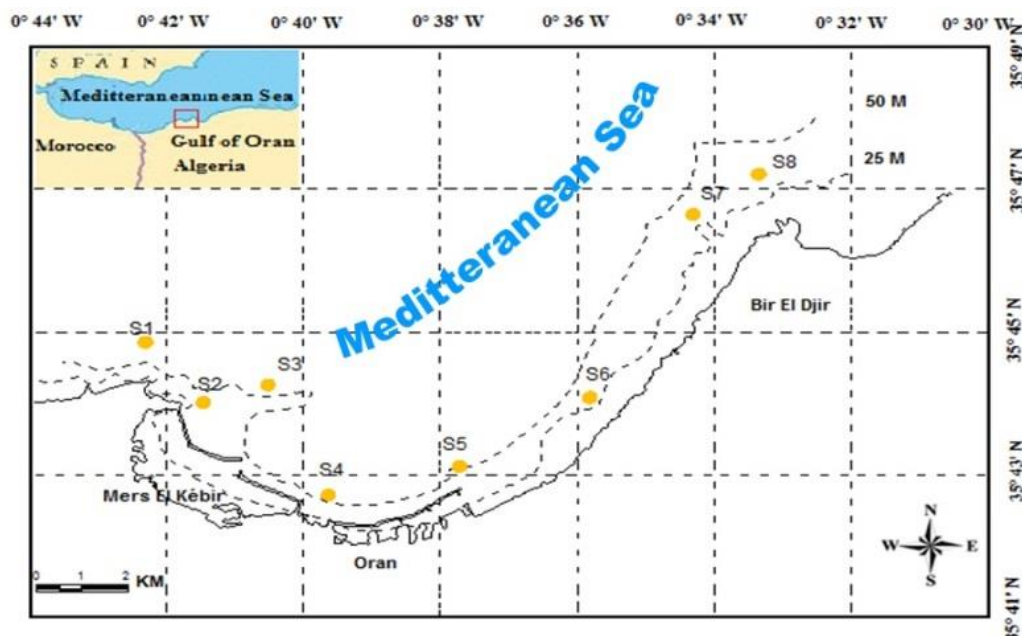


Fig. 1. Sampling area.

Only one type of sampling device was used: the Aberdeen or Smith-McIntyre grab, for the operations sediment and benthos sampling.

Results and Discussion

The particle size analysis allowed the determination of the sedimentary facies of the stations. The fine sand constitutes the substrate of the majority of the stations, except stations 7 and 8, made up of gravel. Station 5, near the central wastewater discharge of the city of Oran, contains reduced black muddy sediment. The collection of faunistic data allowed the inventory of 618 macrobenthic individuals (Annex Table 2). The inventoried macrofauna for our study area is divided into four taxa (polychaetes, mollusks, crustaceans, and echinoderms). Concerning the zoological composition of the macrobenthic fauna, we noted the significant domination of Polychaetes (531 specimens) in all macrobenthic communities of the Gulf of Oran, followed by crustaceans (38 specimens, Fig. 2).

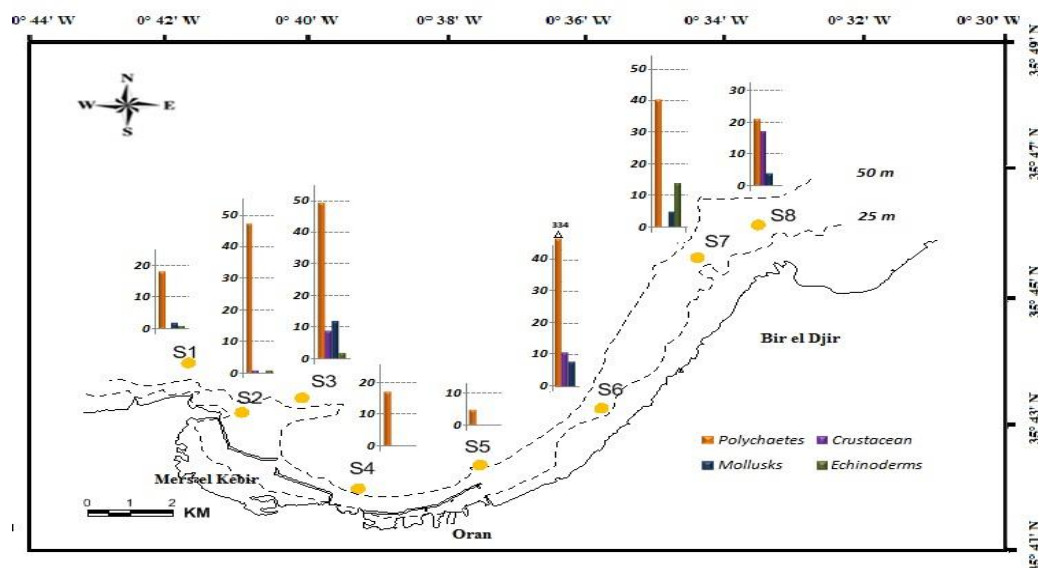


Fig. 2. The abundance of species by phylum.

Concerning the specific richness, polychaetes dominate, except for stations S7 and S8, where crustaceans are most represented (Fig. 3).

Qualitatively, macrobenthic communities are characterized by poor distribution of individuals among the inventoried species. The S6 station, near the wastewater discharge, is the most diverse. Quantitatively, the fauna of stations S4 (3 species) and S5 (one species, H' and $J'=0$) near Oran's harbor is the least important (Table 1). Only one species at station S5: *Pista* sp. (Fig. 4). Concerning the zoological composition of the population, polychaetes the manifest dominance of the Polychaetes in the whole of the macrobenthic communities of the Gulf of Oran has been noted. Qualitatively, the Polychaetes are also the most diversified zoological group in all populations, followed by the crustaceans one.

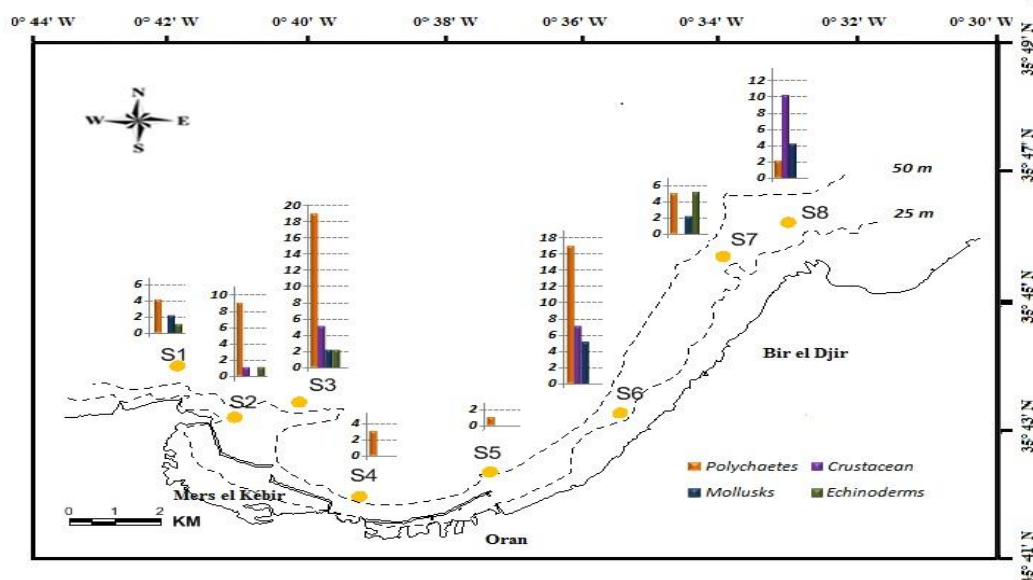


Fig. 3. Specific richness by phylum.

Table 1. Site-specific diversity.

Stations	Specific richness	Shannon index	Pielou's evenness
	S	H'	J'
S1	7	2.20	0.49
S2	11	1.97	0.43
S3	28	3.92	0.87
S4	3	1.09	0.24
S5	1	0	0
S6	29	2.18	0.48
S7	12	2.99	0.66
S8	16	2.91	0.64

According to their abundance, the classification of species is linked to environmental conditions, in particular abiotic factors: nature of the substrate, hydrodynamics, pollution (Glémarec, 2000). In the Gulf of Oran, the Polychaetes dominate the population on the sandy bottoms, both qualitatively and quantitatively. Ecologically, species with a broad ecological distribution as *Hyalinoeca bilineata* and tolerant sand as *Pista cristata* are dominant. Comparatively, on the other Algerian west coast studied (Mostaganem, Arzew, Oran), the area of Oran is the poorest both qualitatively and quantitatively (Amar, 1998; ANAT 2004; Grimes, 2010; Kies et al., 2020).

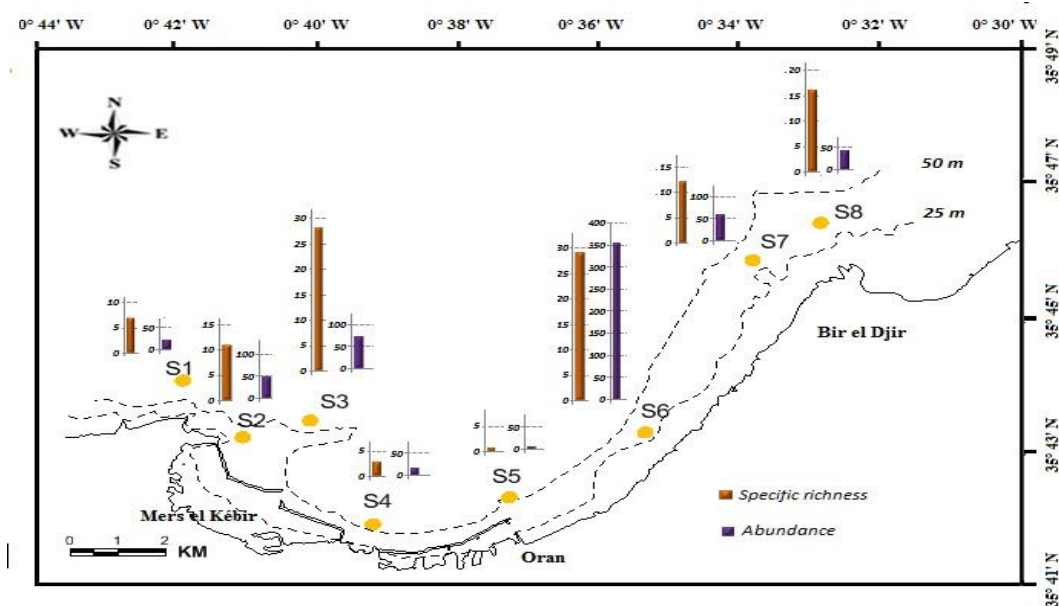


Fig. 4. Specific richness and abundance of macrobenthic invertebrates.

Conclusion

Bionomic research is rarely studied and fragmented. This study on the benthic macrofauna sampled on the Gulf of Oran constitutes an inventory of the coastal ecosystem and complements the database because bionomic research is rarely studied and fragmented. This inventory of ecological interest constitutes a database with lists of fauna and distribution maps of the macrofauna of Oran's Gulf. This study also provides a clear description of the main characteristics of macrozoobenthos communities.

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Annex Table 1: Geographic and bathymetric coordinates of sampling stations.

Stations	Latitude N	Longitude W	Depht (m)
S1	35°44'45"	00°42'15"	70
S2	35°44'03"	00°41'18"	46
S3	35°44'18"	00°40'45"	61
S4	35°42'30"	00°39'33"	42
S5	35°43'05"	00°37'45"	56
S6	35°44'08"	00°35'47"	39
S7	35°46'25"	00°34'29"	60
S8	35°47'10"	00°33'20"	32

	S1		S2		S3		S4		S5		S6		S7		S8	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
Polychètes																
<i>Amphicteis gunneri</i> (M. Sars, 1835)					1	1.39										
<i>Amphitrite gracilis</i> (Grube, 1860)					1	1.39										
<i>Chloeia venusta</i> (Quatrefages, 1866)	1	4.8	2	4			1	5.9								
<i>Chone duneri</i> (Malmgren, 1867)					1	1.39					43	12				

<i>Clymene oerstedii</i> (Claparède, 1863)	2	2.78																	
<i>Clymene lumbricoides</i> (Quatrefages, 1866)										1	0								
<i>Clymene santanderensis</i> (Rioja, 1917)	3	14								1	0								
<i>Clymene</i> sp										2	1								
<i>Eunice vittata</i> (Delle Chiaje, 1828)	10	48	1	2	6	8.33	4	24		16	5	17	29						
<i>Glycera convoluta</i> (Keferstein, 1862)					2	2.78				5	1								
<i>Glycera lapidum</i> (Quatrefages, 1866)					2	2.78													
<i>Glycera</i> sp										6	2								
<i>Goniada norvegica</i> (Örsted, 1845)					1	1.39													
<i>Harmothoe</i> sp										1	0								
<i>Harmothoe spinifera</i> (Ehlers, 1864)										2	1								
<i>Hyalinoecia bilineata</i> (Baird, 1870)	4	19	32	65	20	27.8	12	71		229	65	12	20	20	48				
<i>Hyalinoecia fauveli</i> (Rioja, 1918)			5	10	3	4.17													
<i>Hyalinoecia</i> sp			1	2															
<i>Lanice conchilega</i> (Pallas, 1766)					1	1.39													
<i>Lepidasthenia maculata</i> (Potts, 1910)																			
<i>Lumbrineris latreilli</i> (Audouin & Milne Edwards, 1833)			3	6															
<i>Lumbrineris fragilis</i> (O.F. Müller, 1776)					2	2.78				17	5								
<i>Lumbrineris funchalensis</i> (Kinberg, 1865)										1	0								
<i>Lysidice ninetta</i> (Audouin & H Milne Edwards, 1833)										1	0								
<i>Melinna palmata</i> (Grube, 1870)					1	1.39													
<i>Nematonereis unicornis</i> (Schmarda, 1861)			1	2						2	1								
<i>Nereis caudata</i> (sensu Delle Chiaje, 1827)			1	2	1	1.39						4	6.8						
<i>Notomastus lineatus</i> (Claparède, 1869)					1	1.39													
<i>Petta pusilla</i> (Malmgren, 1866)					1	1.39													
<i>Pista cristata</i> (Müller, 1776)					1	1.39				4	1								
<i>Pista</i> sp									5	#									
<i>Polynoe scolopendrina</i> (Savigny, 1822)												1	1.7						
<i>Sabella pavonina</i> (Savigny, 1822)										2	1								
<i>Sigalion squamatum</i> (Delle Chiaje, 1830)															1	3			
<i>Sthenelais boa</i> (Johnston, 1833)			1	2															
<i>Stylarioides plumosa</i> (O.F. Müller, 1776)										1	0								
<i>Syllis</i> (Typosyllis) <i>amica</i> (Quatrefages, 1866)					1	1.39						6	10						
<i>Trichobranchus glacialis</i> (Malmgren, 1866)					1	1.39													
Crustacées																			
<i>Ampelisca multispinosa</i> (Santini & Malka, 1977)															2	5			
<i>Ampelisca</i> sp									5.9										
<i>Ampelisca spinipes</i> (Boeck, 1861)															1	2			
<i>Anonyx sarsi</i> (Steele & Brunel, 1968)															1	2			
<i>Apseudes holthuisi</i> Bacescu, 1961)								24		5	1								
<i>Atylus falcatus</i> Metzger, 1871)										1	0								
<i>Bathyporeia guilliamsoniana</i> (Spence Bate, 1857)															2	5			
<i>Cirolana borealis</i> (Lilljeborg, 1851)					3	4.17				1	0								
<i>Corophium rotundirostre</i> (Stephensen, 1915)								71											
<i>Cypridina mediterranea</i> (Costa, 1845)															2	5			
<i>Ebalia edwardsi</i> (O.G. Costa, 1838)										1	0								
<i>Eurydice pulchra</i> (Leach, 1815)										1	0								
<i>Eurydice</i> sp					3	4.17				1	0								
<i>Galathea intermedia</i> (Lilljeborg, 1851)					1	1.39													
<i>Gastrosaccus sanctus</i> (Van Beneden, 1861)															1	2			
<i>Haplostylus normani</i> (G.O. Sars, 1877)															1	2			

<i>Harpinia crenulata</i> (Boeck, 1871)					1	0			
<i>Lophogaster typicus</i> (M. Sars, 1857)			1	1.39					
<i>Maera shieckei</i> (Karaman & Ruffo, 1971)								1	2
<i>Nebalia bipes</i> (Fabricius, 1780)			1	1.39					
<i>Paguristes oculatus</i> (Fabricius, 1775)		1	2						
<i>Urothoe brevicornis</i> (Spence Bate, 1862)								5	12
<i>Urothoe elegans</i> (Spence Bate, 1857)								1	2
Molluscs									
<i>Corbula gibba</i> (Olivi, 1792)								1	2
<i>Gari costulata</i> (W. Turton, 1822)								1	2
<i>Hinia reticulata</i> (Linnaeus, 1758)					1	0			
<i>Leda fragilis</i> (Chemnitz, 1784)	1	4.8		11	15.3				
<i>Limatula subauriculata</i> (Montagu, 1808)			1	1.39			1	1.7	1 2
<i>Loripes lacteus</i> (Linnaeus, 1758)						1	0		
<i>Lyonsia norvegica</i> (Chemnitz, 1788)	1	4.8							
<i>Nucula sulcata</i> (Bronn, 1831)								4	6.8
<i>Nucula turgida</i> (Gould, 1846)						3	1		
<i>Peplum clavatum</i> (Poli, 1795)						1	0		
<i>Callista chione pitaria</i> (Linnaeus, 1758)								1	2
<i>Venericardia antiquata</i> (Linnaeus, 1758)						2	1		
Echinodermes									
<i>Amphiura chiajei</i> (Forbes, 1843)	1	4.8						2	3.4
<i>Amphiura lacazei</i> (Guille, 1976)				1	1.39				
<i>Amphiura mediterranea</i> (Lyman, 1882)								3	5.7
<i>Astropecten irregularis</i> (Pennant, 1777)			1	2					
<i>Echinocyamus pusillus</i> (O.F. Müller, 1776)				1	1.39				
<i>Ophiopsila aranea</i> (Forbes, 1843)								1	1.7
<i>Ophiura albida</i> (Forbes, 1839)								1	1.7
<i>Psammechinus microtuberculatus</i> (Blainville, 1825)								7	12