Zoodiversity, **55**(4): 307–316, 2021
DOI 10.15407/zoo2021.04.307

UDC 595.142(1-15:65)

INVENTORY OF ANNELIDA POLYCHAETA IN GULF OF ORAN (WESTERN ALGERIAN COASTLINE)

A. Kerfouf[1], A. Baaloudj[2*], F. Kies[1,3], K. Belhadj Tahar[1], F. Denis[4]

[1]*Laboratory of Eco-development of Spaces, University of Djillali Liabes, Sidi Bel Abbes, 22000, Algeria*
[2]*Laboratory of Biology, Water and Environment, University of 8 May 1945, Guelma 24000, Algeria*
[3]*Earth and Environmental Sciences Department, Università Degli Studi di Milano-Bicocca, Milan, Italy*
[4]*Marine Biology Station (MNHN), UMR 7208 'BOREA', 29182, Concarneau, France*
**Corresponding author*
E-mail: bafef@yahoo.fr; baaloudj.affef@univ-guelma.dz

A. Baaloudj (https://orcid.org/0000-0002-6932-0905)

Inventory of Annelida Polychaeta in Gulf of Oran (Western Algerian Coastline). Kerfouf, A., Baaloudj, A., Kies, F., Belhadj Tahar, K. Denis, F. — Bionomical research on the continental shelf of the Oran's Gulf enabled us to study the Annelida macrofauna. Sampling sites were selected according to the bathymetry, which was divided into eight transects. Collected samples with the Aberdeen grab separated the Polychaeta Annelids from other zoological groups. 1571 Annelida Polychaeta were inventoried and determined by the species, including ten orders (Amphinomida, Capitellida, Eunicida, Flabelligerida, Ophelida, Oweniida, Phyllodocidae, Sabellida, Spionida, Terebellidae), 24 families, 84 genus and 74 species. The analyzed taxa highlighted the dominant and main species on the bottom of the Gulf, including *Hyalinoecia bilineata*, which appeared as the major species, *Eunice vittata*, *Chone duneri*, *Glycera convoluta*, *Hyalinocea fauveli*, *Pista cristata*, *Lumbrinerris fragilis* and *Chloeia venusta*.
Key words: Annelida, Polychaeta, continental shelf, Gulf of Oran., macrofauna, *Hyalinoecia bilineata*.

Introduction

The development of benthic biological indicators was able to identify the environmental status and potential anthropogenic impacts (Diaz et al., 2004). Found in abundance in all marine ecosystems, are a source of food for a great diversity of animals, vertebrates, and invertebrates, some of which are either fished or reared (Scaps, 2003). The benthic fauna of the continental shelf of the Algerian west coast has been subject to very little research. Most of the previous inventories of the benthic fauna of continental shelf in the west coast of Algeria have not been updated (Dautzenberg, 1895; Pallary, 1900; 1935; Amar, 1998; Kerfouf, 2007; Dauvin, Ruellet, 2007; Kies et al., 2020; Meziane et al., 2018; 2020; Belhadj Tahar et al., 2021).

The Polychaeta is one of the biological keys to detect any disturbance of the ecological system. Annelida an essential indicator of estuaries and coastal ecosystem health, and the absence or presence of some species can give information about the water quality status (Glémarec, 1969; Dean, 2008; Dauvin et al., 2010).

The total absence of synthesis work led us to consider identifying and updating the list of species of Annelida Polychaeta in the Gulf of Oran.

Material and methods

Gulf of Oran on the Algerian West coast between the Gulf of Arzew and Bay Andalusian is between Cape Aiguille East and Cape Falcon to the West (Leclaire, 1972). Two of the largest ports in Algeria are in this area: the ports of Oran and Mers el Kébir. Gulf of Oran is bathed by the Atlantic Ocean (Millot, 1989). These inshore zones concentrate numerous resources and opportunities, and they are exposed to the pollutions, nuisances, and other deteriorations resulting from the development of multiple economic activities (Remili, Kerfouf, 2013). The coastal water of Oran's gulf is exposed to different shapes of pollution whose origin is the urban concentration and socio-economic development (Kies, Kerfouf, 2014).

About fifty stations, distributed into eight transects, were chosen according to the bathymetry between –30 m isobath and the furthest at –100 m (table 1). Only one type of machine was used for the sample's benne Aberdeen or "Smith Mc Intyre". Two grabs for an area of 0.2 m^2. The samples are filtrated on a one 1 mm mesh sieve and carried out on the boat. An under sample of sediment was picked up in view of the granulometric analysis. After sieving the samples, the residue is fixed with formalin (N / 10) and kept for study in the laboratory.

The first sorting in the laboratory allowed to separate species according to their belonging to a zoological group. The Annelida Polychaeta branch was isolated, and each of its individuals was identified according to several determination keys, such as P. Fauvel (1923 and 1927), K. Banse, and K. D. Hobson (1974), and K. Fauchald (1977). The number of individuals of each inventoried species was noted. In our study, we assessed the importance of Polychaeta within the benthic macrofauna (Muxika et al., 2005) and their distribution at the level of the different sedimentary facies in the studied area (Baldó et al., 1999).

The collected sediment is physically analyzed to determine the nature of the substrate. The method used consists in passing the dried sediment (100 g) through a column of 16 superimposed sieves (AFNOR).

Several classical and synthetic methods were used in order to evaluate the distribution of polychaetes annelids and its faunistical structure such as abundance, species richness and species frequency.

Table 1. Geographic position and depth of stations

Stations	Position	Position	Depht, m
	Latitude N	Longitude W	
1.7	35°45′45″	00°42′65″	70
1.8	35°46′95″	00°42′75″	80
1.9	35°47′23″	00°41′55″	90
1.9′	35°37′47″	00°41′60″	92
1.10	35°47′95″	00°41′55″	102
2.1	35°44′23″	00°41′08″	46
2.2	35°44′95″	00°40′05″	73
2.2′	35°44′95″	00°40′05″	73
2.3	35°45′80″	00°40′90″	81
2.4	35°46′70″	00°40′60″	82
2.5	35°47′60″	00°40′50″	87
2.6	35°48′50″	00°40′35″	98
3.1	35°44′38″	00°40′25″	61
3.2	35°45′05″	00°40′00″	73
3.3	35°45′85″	00°39′80″	81
3.4	35°46′90″	00°39′50″	82
3.5	35°47′90″	00°39′25″	91
3.6	35°48′50″	00°38′80″	91
4.1	35°42′00″	00°39′03″	42
4.2	35°43′05″	00°39′00″	66
4.3	35°44′05″	00°39′00″	74
4.4	35°44′09″	00°38′09″	77
4.5	35°46′05″	00°38′05″	77
4.6	35°47′03″	00°78′01″	82

4.7	35°48′02″	00°73′05″	84
4.8	35°49′50″	00°37′40″	110
5.5	35°43′05″	00°37′05″	56
5.6	35°43′08″	00°37′05″	60
5.7	35°45′00″	00°37′00″	70
5.8	35°47′08″	00°36′07″	82
5.9	35°48′06″	00°36′05″	94
5.10	35°48′04″	00°36′08″	106
6.4	35°44′68″	00°35′67″	39
6.5	35°45′42″	00°35′70″	55
6.6	35°46′35″	00°35′75″	61
6.6′	35°47′55″	00°35′85″	66
7.4	35°47′10″	00°34′60″	60
7.5	35°46′77″	00°34′45″	70
7.6	35°48′96″	00°34′50″	50
7.7	35°47′10″	00°34′60″	60
7.8	35°48′15″	00°35′20″	70
7.9	35°48′50″	00°35′50″	80
7.10	35°49′15″	00°35′55″	100
8.3	35°47′10″	00°33′30″	32
8.4	35°47′40″	00°33′50″	41
8.5	35°47′60″	00°33′65″	49
8.6	35°48′20″	00°34′00″	61
8.7	35°48′70″	00°34′75″	70
8.8	35°49′20″	00°34′55″	80
8.10	35°49′78″	00°34′95″	95

Results and discussion

One thousand five hundred seventy-one individuals of Annelida Polychaeta were collected and inventoried in the Gulf of Oran, and their determination allowed us to identify ten orders, 24 families, 84 genus, and 74 species, while 11 could not be determined. Each species has an ecological status from a bibliographic synthesis based on the following works: Picard (1965), Falconetti (1970), Bourcier (1979), Falconetti (1980), Stora (1982), Salen-Picard (1982), Bellan-Santini (1980) and Glémarec, Grall (2000). This status corresponds to its affinity concerning to the substrate (the nature of the sediment fraction) and the quality of the environment (polluted, very polluted, enriched, clean, etc):

The following abbreviations are used on the list of species: G: gravel, HP: species characteristic of the Posidonia meadow, Excl DC: exclusive coastal detritus, Ip: an indicator of pollution, LRE: species with wide ecological distribution, Mix: mixticole, Mn: minuticole, S: sabulicole species, Sspr: species with no specified ecological significance, Sst: strict sabulicole, St: tolerant sabulicole, SG: gravel willulicole, SV: sabulicole — vasicole, Vst: strict vasicole, Vt: tolerant vasicole). The nomenclature follows the Worm Register of Marine Species (WoRMS, 2021) databases.

Order Amphinomida
Family Amphinomidae
Chloeia venusta Quatrefages, 1865 — Vt
Chloenopsis atlantica (McIntosh, 1885) — Sspr
Notopygos megalops McIntosh, 1885 — Sspr

Order Capitellida
Family Arenicolidae
Arenicola branchialis (Audouin & Milne Edwards, 1833) — Sspr

Family Capitellidae
Capitella capitata (Fabricius, 1780) — Ip
Heteromastus filiformis (Claparède, 1864) — Vt
Notomastus latericeus Sars, 1851 — Sspr
Notomastus lineatus Claparède, 1869 — Sspr
Notomastus profundus Eisig, 1887 — Sspr
Notomastus sp.
Pseudocapitella incerta Fauvel, 1913 — Sspr
Family Maldanidae
Chirimia biceps biceps (Sars, 1861) — Sspr
Euclymene lombricoides (Quatrefages, 1866) — St / HP
Euclymene oerstedii (Claparède, 1863) — St
Macroclymene santanderensis (Rioja, 1917) — St

Order Eunicida
Family Eunicidae
Eunice oerstedii Stimpson, 1853 — S
Nereis pinnata Müller, 1776) — Sspr
Eunice vittata (*Delle Chiaje*, 1828) — LRE
Lysidice ninetta Audouin & Milne Edwards, 1833 — Sspr
Paucibranchia bellii (Audouin & Milne Edwards, 1833) — Vt
Marphysa sanguinea (Montagu, 1813) — Mn
Lysidice unicornis (Grube, 1840) — Mix
Family Lumbrineridae
Scoletoma fragilis (O.F. Müller, 1776) — Vst
Scoletoma funchalensis (*Kinberg*, 1865) — LRE
Hilbigneris gracilis (Ehlers, 1868) — LRE
Scoletoma laurentiana (Grube, 1863) — LRE
Lumbrineris latreilli Audouin & Milne Edwards, 1833 — LRE
Lumbrineris sp.
Lumbrineriopsis paradoxa (Saint-Joseph, 1888) — HP
Family Onuphidae
Aponuphis bilineata (Baird, 1870) — LRE
Aponuphis brementi (Fauvel, 1916) — St
Nothria conchylega (Sars, 1835) — Mix
Onuphis eremita Audouin & Milne Edwards, 1833 — Sst

Order Flabelligerida
Family Flabelligeridae
Pherusa plumosa (Müller, 1776) — Mix

Order Ophelida
Family Ophelidae
Armandia polyophthalma Kükenthal, 1887 — SG
Family Scalibregmidae
Sclerocheilus minutus Grube, 1863 — Sspr

Order Oweniida
Family Oweniidae
Owenia fusiformis Delle Chiaje, 1844 — St

Order Phyllodocidae
Family Glyceridae
Glycera capitata Örsted, 1842 — Sspr
Glycera tridactyla Schmarda, 1861 — St
Glycera lapidum Quatrefages, 1866 — G
Glycera unicornis Lamarck, 1818 — Vt
Glycera sp.
Family Goniadidae
Goniada norvegica Örsted, 1845 — Sspr
Family Nereidae
Neanthes acuminata (Ehlers, 1868) — Ip
Family Phyllodocidae
Mysta picta (Quatrefages, 1866) — St
Phyllodoce laminosa Savigny in Lamarck, 1818 — Vt
Phyllodoce lineata (Claparède, 1870) — Vst
Phyllodoce sp.
Family Polynoidae
Harmothoe glabra (Malmgren, 1865) — Sspr
Malmgrenia lunulata (Delle Chiaje, 1830) — LRE
Harmothoe spinifera (Ehlers, 1864) — SV
Harmathoe sp.
Lepidasthenia maculata Potts, 1910 — Vt
Polynoe scolopendrina Savigny, 1822 — Sspr
Polynoe sp.
Family Sigalionidae
Leanira hystricis Ehlers, 1874 — Ip
Sigalion squamosus Delle Chiaje, 1830 — G
Sthenelais boa (Johnston, 1833) — St
Family Syllida
Sthenelais boa (Johnston, 1833) — Sspr
Nudisyllis pulligera (Krohn, 1852) — Sspr

Order Sabellida
Family Sabellidae
Chone duneri Malmgren, 1867 — St
Myxicola infundibulum (Montagu, 1808) — Sspr
Sabella pavonina Savigny, 1822 — Sspr

Order Spionida
Family Cirratulidae
Cirriformia tentaculata (Montagu, 1808) — Ip

Order Terebellidae
Family Ampharetidae
Ampharete acutifrons (Grube, 1860) — Vst
Ampharete acutifrons (Grube, 1860) — Mix
Melinna palmata Grube, 1870 — Mn
Family Pectinariidae
Pectinaria auricoma (Muller, 1776) — Vt
Petta pusilla Malmgren, 1866 — Excl DC
Family Terebellidae
Neoamphitrite edwardsii (Quatrefages, 1866) — Sspr
Amphitritides gracilis (Grube, 1860) — Sspr

Amphitrite sp.
Eupolymnia nebulosa (Montagu, 1819) — Sspr
Lanice conchilega (Pallas, 1766) — Sspr
Nicolea venustula (Montagu, 1819) — Sspr
Pista cretacea (Grube, 1860) — Sspr
Pista cristata (Müller, 1776) — St
Pista elongata Moore, 1909 — Sspr
Pista sp.
Family Trichobranchidae
Terebellides stroemii Sars, 1835 — Vt
Trichobranchus glacialis Malmgren, 1866 — Sspr

The abundance of Polychaetes varies from one site to another, depending on the nature of the substrate and the quality of the environment. There is a high abundance in coastal stations of pollution indicator species especially those located at the level of wastewater discharges (fig. 1). Generally, the abundance of Polychaetes is high in polluted port environments (Bakalem , Romano, 1988; Rebzani-Zahaf, 2003). Bellan (1980) is based on polychaetes, for the IP index which corresponds to the ratio: dominance of polychaetes tolerant to pollution / dominance of species indicative of cleanliness (purity) considering that this ratio is directly linked to the quantity of material organic.

The specific richness is high in the coastal stations, particularly in the east of the Gulf of Oran, that is in the port of Oran, in a little disturbed area without any anthopic activities. Specific richness is low in the port areas (fig. 2). The stations near the port of Oran are the least diversified, due to the dominance of two species: Hyalinocea bilineata et Eunice vittata.

The comparison of the Annelida fauna of the Gulf of Oran with other areas in the Algerian coast (Gulf of Arzew, Algiers' Bight), confirmed the superiority of species with

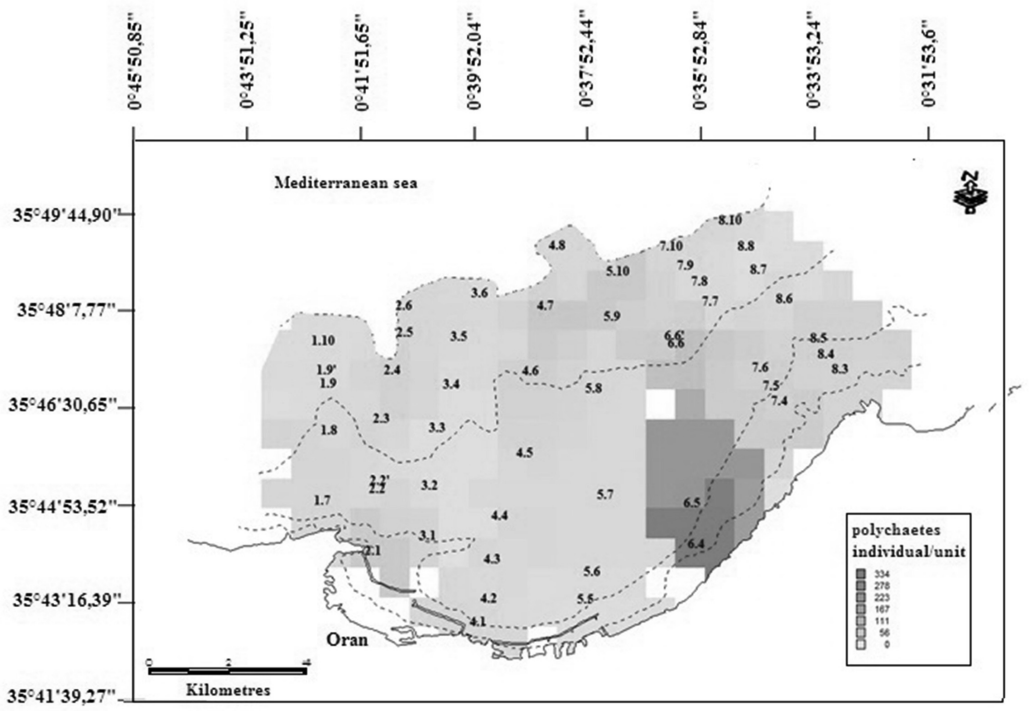

Fig. 1. Abundance of polychaetes by station.

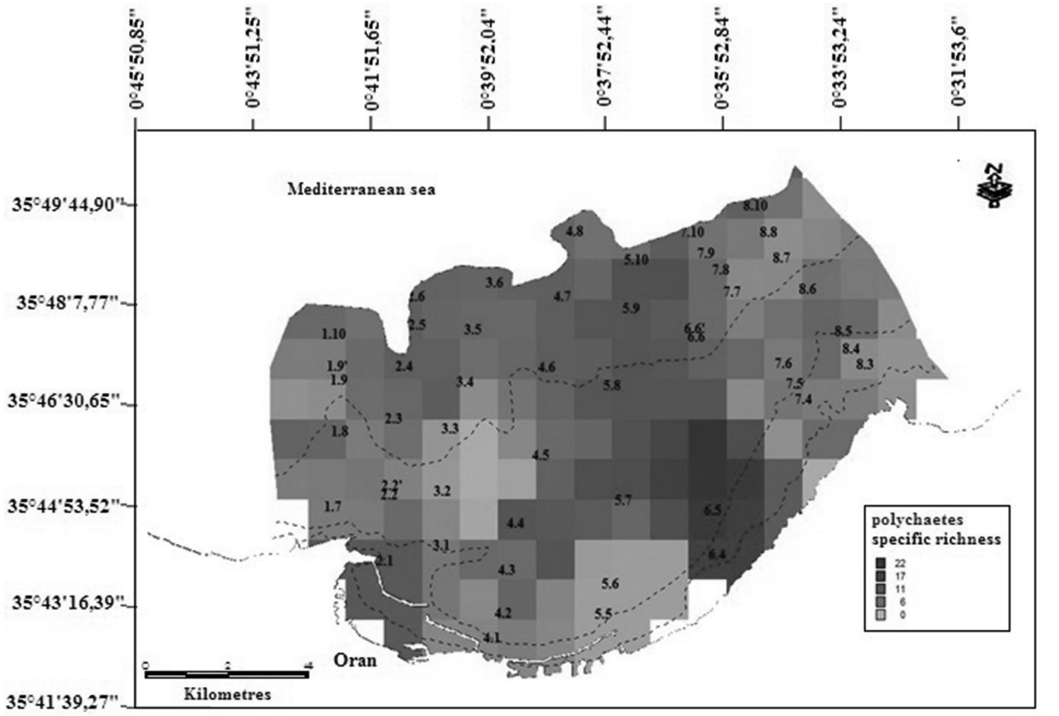

Fig. 2. Specific richness of polychaetes by station.

a wide ecological distribution. Hyalinoecia bilineata, a species with a wide ecological distribution, has a clear quantitative dominance in Bou-Ismail bay (Hassam, 1991; Oulmi, 1991). In contrast, there is also a high abundance of *Ampharete qrubeï,* and *Pista cristata* in the Gulf of Arzew (Amar, 1998).

In the Gulfs of Oran and Arzew, Polychaeta dominates the other zoological groups both quantitatively and qualitatively. The major ecological stocks are species with a wide ecological distribution, and *Hyalinoecia bilineata* is the leader one (fig. 3).

The distribution of Polychaetes annelids in the Gulf of Oran depends on the nature of the substrate, its composition in organism matter, and the quality of the environment, as reported by the work in the Mediterranean (Mosbahi et al., 2017; Bakalem et al., 2020). The analysis of the macrobenthic communities structure is a good method in the study of environmental modifications caused both by natural and anthropologenic perturbations.

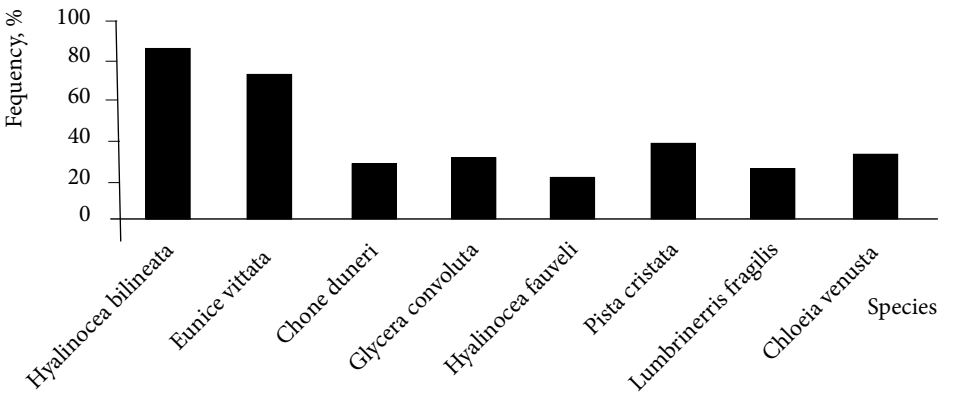

Fig. 3. The frequency of the most abundant species.

Reish (1973) was the first to establish a classification of the benthic marine ecosystem in relation to the degree of pollution. It was mainly based on the distribution of polychaetes tolerant to pollution, in order to establish a pollution mapping through the use of a species as an ecological indicator.

Conclusion

The analysis of the faunistic composition of the sampled stations in the Gulf of Oran allowed us to count 1571 individuals of Annelida Polychaeta, including ten orders, 24 families, 84 genus, and 74 species Compared to the other areas studied on the Algerian coast (Gulf of Arzew, Bou-Ismail bight, Algiers bight and the Gulf of Skikda), the Gulf of Oran is the least rich both qualitatively and quantitatively (74 species inventoried in the gulf).The descriptive analysis of the annelid fauna of the Gulf of Oran revealed a fairly good diversity of species.

Ces invertébrés macrobenthiques sont bien diversifiés dans la majorité des zones lithologiques identifiés dans cette zone, à l'exception des sables fins au niveau du port, où l'on note une dominance d'une seule espèce: Hyalinoecia bilineata. The macrobenthic invertebrates identified are well diversified in the majority of the lithological zones identified in this zone, with the exception of those located near the Oran harbour, where there is a dominance of Hyalinoecia bilineata. The particle size analysis of the sediments shows that the distribution of Polychaetes annelids is a function of the edaphic factor.

The major ecological stocks are species with a wide ecological distribution and sand tolerant species. *Hyalinoecia bilineata* is the leading species at all stations. The study conducted in this group of sampled macrofauna, in the Gulf of Oran, made it possible to carry out the benthic ecosystem and to update the inventory of benthic macrofauna in the soft bottoms of these coasts.

Conflict of Interest. The authors declare no conflict of interest and no financial interest.
Ethics Statement. No permission was needed to carry out our study.
Author Contributions. AK designed the study and performed field and laboratory work. AB, AK, wrote the paper. All authors contributed to the revision of the paper and gave final approval for publication.

We thank reviewers for their comments and suggestions. We are grateful to all persons who contributed to the field and Laboratory analysis, Ministry of Higher Education (Algeria) for its support.

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Received 15 December 2020
Accepted 1 July 2021