



Inventory of marine molluscs in Gulf of Oran (Western Algerian coastline)

Kerfouf A.^{1*}; Kies F.^{1, 2}; Boucetta S.³; Denis F.⁴

Received: May 2021

Accepted: October 2021

Abstract

This present paper made it possible to update the inventory of benthic malacofauna in the soft bottoms of gulf of Oran. Samples of macrobenthic fauna were collected and separated from the Molluscs from other zoological groups. 116 Molluscs inventoried and determined by the species, including 13 orders, 20 families, 24 genuses and 29 species. Bivalvia is represented better than Gastropoda with respectively, 24 and 5 species. The analyzed taxa highlighted the dominant and main species on the bottom of the study sites, including *Nuculana commutata*, which appeared as the major species, followed by *Nucula sulcata* with respectively 23,46% and 12,34%. The present inventory indicates that the malacological fauna is less diversified than in the other zones studied of the Algerian coast.

Keywords: Malacofauna, Softbottom, Mollusc, Bivalvia, Gasteropoda, Gulf of Oran

1-Laboratory of Eco-development of Spaces, University of Djillali Liabes, Sidi Bel Abbes, 22000, Algeria

2 -Earth and Environmental Sciences Department, Università Degli Studi di Milano-Bicocca, Milan, Italy

3-Laboratory of Ecobiology of Marine and Coastal Environments (EMMAL), Annaba University, Algeria.

4-Le Mans Université- Laboratoire BOREA MNHN, CNRS 8067, SU, IRD 207, UCN, UA-Concarneau, France

*Corresponding author's Email: kerfoufahmed@yahoo.fr ; ahmed.kerfouf@univ-sba.dz

Introduction

In the west Algerian coast, few works were done on marine macrobenthic fauna. Most of the previous inventories of the benthic fauna of continental shelf in the west coast of Algeria were not updated (Dautzenberg, 1895; Pallary, 1900; Llabador, 1935; Amar, 1998, Kerfouf *et al.*, 2007; Bakalem *et al.*, 2008). The benthic fauna found in abundance in all marine ecosystems is a food source for a great diversity of animals, vertebrates, and invertebrates, some of which either fished or reared. The Molluscs are one of the biological keys to detecting any disturbance of the ecological system (Benzaoui *et al.*, 2015; Rouabhi, 2020). Molluscs are 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 (Dauvin *et al.*, 2010). The objective of this research is an

inventory and an update of the list of mollusc species of the soft bottom in the gulf of Oran.

Material and methods

Study area

Gulf of Oran is between Cap Aiguille and Cap Falcon on the Algerian West coast (Fig. 1). Two of the largest harbor in Algeria is in this area: Oran and Mers El Kébir. Waters coming from the Atlantic Ocean nourished the gulf of Oran. The circulation is very turbulent along the North African continent, which favors the dispersion of possible sources of pollution (Millot, 1989). This coastal water of the gulf of Oran exposed to different pollution whose origin is the urban concentration and socio-economic development (Remili and Kerfouf, 2013; Dilem *et al.*, 2014; Benali *et al.*, 2017).

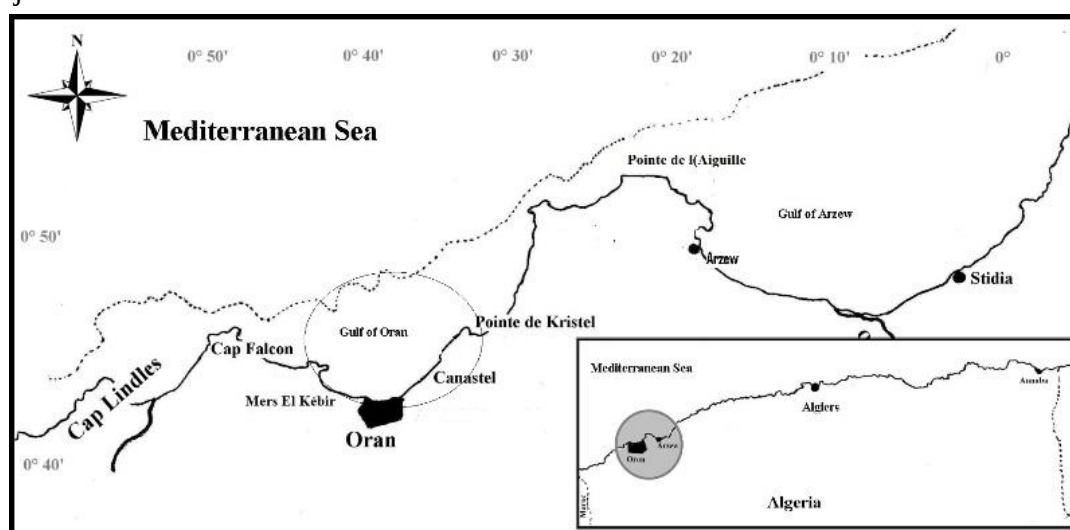


Figure 1: Study area.

Sampling

We explored Forty-nine stations in this study. Samples were taken from a depth

ranging from 30 to 106 m along the shore region and from offshore (Table 1).

Table 1: Geographic position and depth of stations.

Stations	Position Latitude N	Position Longitude W	Depht (m)
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

Sampling have been randomly selected in the coastal regions having both sandy and gravel substrates. The type of machine used for the sample was Aberdeen or "Smith Mc Intyre" grab. The residue was fixed with formalin (N/10) for laboratory study after sieving the samples. A first segregation was made, according to their belonging to one of the largest zoological groups. All molluscs were identified down to the species level, using Marsh (1964), Hinton (1972), Dance (1976), Springsteen and Leobrera (1986), Abbott (1991), Poppe (2008), Wong and Arshad (2011) and (<http://www.marinespecies.org/>) as references.

Data analysis

For each inventoried species, the frequency was noted to establish species abundance and dominance calculations.

Results

The 164 individuals of Molluscs were collected and inventoried in the Gulf of Oran. The determination of each specimen allowed us to identify 2 class, 13 orders, 20 families, 24 genus, and 29 species.

Two classes are highlighted: Bivalvia, and Gastropoda with 24 and 5 species.

Class: Bivalvia

We noted four (4) subclasses: Pteriomorpha, Heterodonta, Protobranchia, and Autobranchia.

Subclass: Pteriomorpha

Three (3) orders are identified:

Mytiloida, Pectinoida, and Limoida.

Order: Mytiloida

Super family: Mytiloidea

Family: Mytilidae

Genus: *Lioberus*

Species: *Lioberus agglutinans*

(Cantraine, 1835) synonym *Amygdalum agglutinans* (Cantraine, 1835)

Genus: *Amygdalum*

Species: *Amygdalum*

phaseolinum (Philippi, 1844)

Order: Pectinoida

Superfamily: Pectinoidea

Family: Pectinidae

Subfamily: Palliolinae

Genus: *Peplum*

Species: *Peplum clavatum* (Poli, 1795)

Order: Limoida

Superfamily: Limoidea

Family: Limidae

Genus: *Limatula*

Species: *Limatula subauriculata*

(Montagu, 1808)

Subclass: Heterodonta

Six (6) orders are identified: Carditoida, Myoida, Euheterodonta, Lucinoida, Anomalodesmata and Veneroida.

Order: Carditoida

Superfamily: Carditoidea

Family: Carditidae

Genus: *Centrocardita*

Species : *Centrocardita aculeata* (Poli, 1795) synonym *Cardita aculeata* (Poli, 1795)

Genus: *Cardites*

Species: *Venericardia antiquata* (Linné, 1758) Synonym: *Cardites antiquatus* (Linnaeus, 1758)

Superfamily: Crassatelloidea

Family: Astartidae

Genus: *Gonilia*

Species: *Gonilia calliglypta* (Dall, 1903)

Order: Myoida

Superfamily: Myoidea

Family: Corbulidae

Genus: *Corbula*

Species: *Corbula gibba* (Olivi, 1792)

Order: Euheterodonta

Superfamily: Hiatelloidea

Family: Hiatellidae

Genus: *Hiatella*

Species: *Saxicava arctica* (Linnaeus, 1767)

Order: Lucinoida

Superfamily: Lucinoidea

Family: Lucinidae

Genus: *Loripes*

Species: *Loripes lacteus* (Poli, 1791) synonym *Loripes lucinalis* (Lamarck, 1818)

Order: Anomalodesmata

Superfamily: Pandoroidea

Family: Lyonsiidae

Genus: *Lyonsia*

Species: *Lyonsia norwegica* (Gmelin, 1791)

Order: Veneroida

Superfamily: Cardioidea

Family: Cardiidae

Subfamily: Fraginae

Genus: *Papillicardium*

Species: *Papillicardium papillosum* (Poli, 1791)

Species: *Parvicardium scabrum* (Philippi, 1844)

Superfamily: Veneroidea

Family: Veneridae

Genus: *Pitar*

Species: *Pitar dione* (Linnaeus, 1758)

Species: *Pitar rudis* (Poli, 1795)
 Genus: Timoclea
 Species: *Venus ovata* (Pennant, 1777)
synonym Timoclea ovata (Pennant, 1777)
 Superfamily: Tellinoidea
Family: Tellinidae
 Genus: Moerella
 Species: *Tellina donacina* (Linnaeus, 1758) *synonym Moerella donacina* (Linnaeus, 1758)
 Superfamily: Tellinoidea
Family: Tellinidae
 Genus: Tellina
 Species: *Tellina distorta* (Poli, 1791)
 Superfamily: Tellinoidea
Family: Psammobiidae
 Genus: Gari
 Species: *Gari costulata* (Turton, 1822)
Subclass: Protobranchia
 Three (3) are identified: Nuculanoida, Nuculida, and *Cardiida*.
Order: Nuculanoida
 Superfamily: Nuculanoida
Family: Nuculanidae
 Subfamily: Nuculaninae
 Genus: Nuculana
 Species: *Nuculana commutata* (Philippi, 1844) *synonym Leda fragilis* (Chemnitz, 1784)
Order: Nuculida
 Superfamily: Nuculoidea
Family: Nuculidae
 Genus: Nucula
 Species: *Nucula turgida* (Gould, 1846)
 Species: *Nucula sulcata* (Bronn, 1831)
 Species: *Nucula nucleus* (Linnaeus, 1758)
Subclass: Autobranchia
Order: Cardiida
Family: Tellinidae

Genus: Gastrana
 Species: *Gastrana fragilis* (Linnaeus, 1758) *synonym Uncidens arupinensis* (Coen, 1933)

Class: Gastropoda

We noted one (1) subclass

Subclass: Caenogastropoda

Order: Neogastropoda

Superfamily: Buccinoidea

Family: Nassariidae

Genus: Nassarius

Species: *Nassa limata* (Philippi, 1836)
synonym Nassarius lima

(Dillwyn, 1817) **Species:** *Hinia reticulata* (Linné, 1758) *synonyme Nassarius reticulatus* (Linnaeus, 1758)

Family: Fascioliidae

Subfamily: Fusininae

Genus: Fusinus

Species: *Fusinus rostratus* (Olivi, 1792)

Family: Buccinidae

Genus: Euthria

Species: *Euthria cornea* (Linnaeus, 1758)

Superfamily: Naticoidea

Family: Naticidae

Subfamily: Naticinae

Genus: Natica

Species: *Natica Dillwyni* (Payraudeau, 1826)

Discussion

The abundance of Molluscs varies from one site to another, depending on the substrate nature and the environmental quality. There is a high abundance in coastal stations of pollution indicator species, particularly those located at the level of wastewater discharges (Fig. 2).

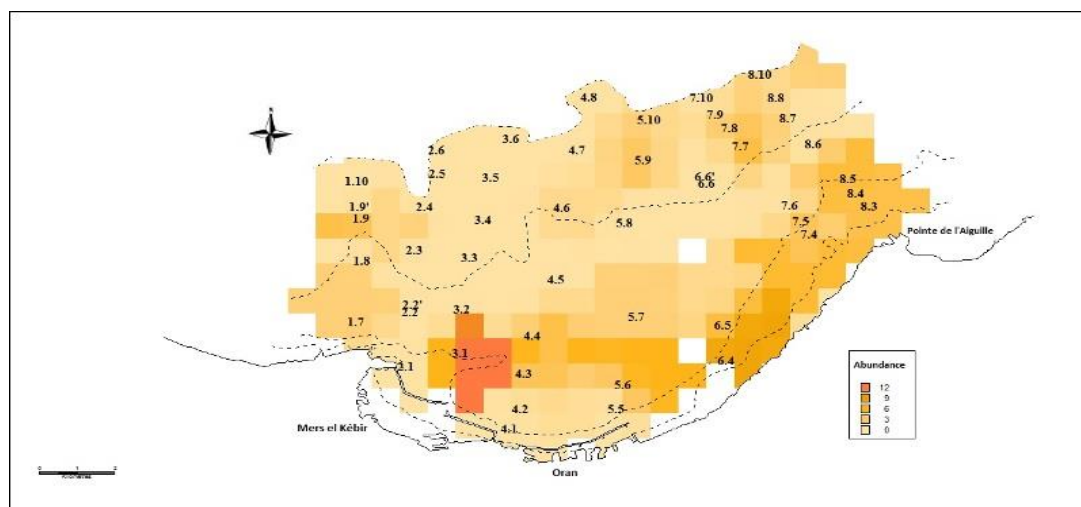


Figure 2: Abundance of Molluscs in the study area.

The specific richness is high in the coastal stations, particularly in the east of the gulf of Oran, that is in the Oran's harbour, in a little disturbed area without any anthropic activities (Fig. 3).

The specific richness is high in the coastal stations, particularly in the east of the Gulf of Oran, which is at the port of Oran, in a less disturbed area without any anthropic activities.

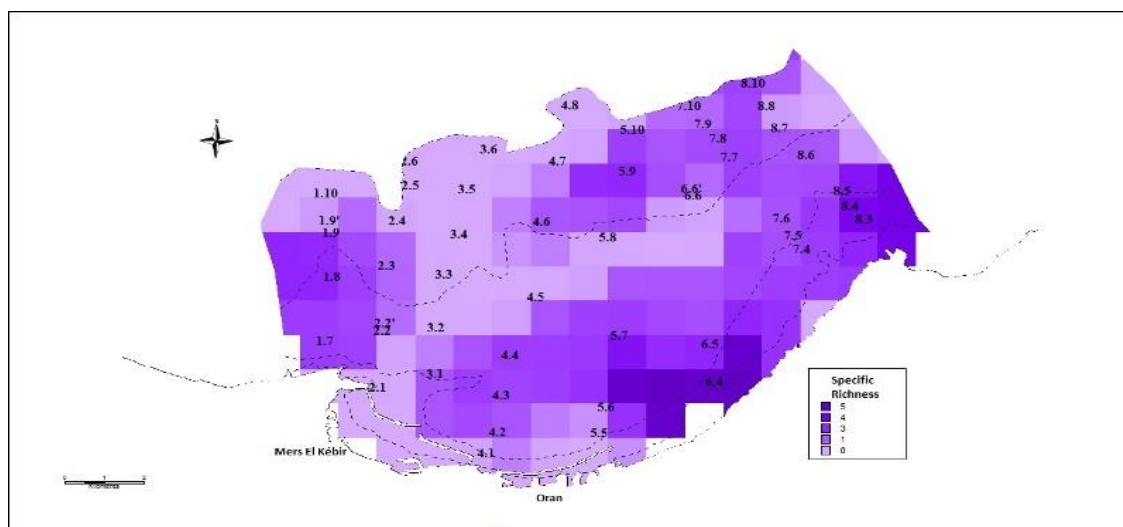


Figure 3: Specific richness of Molluscs in the study area.

Molluscs from the Gulf of Oran are all considered rare species (frequency <25%). Only five species have a frequency greater than 5%. Seven species have a frequency of 4.08% (*Corbula gibba*, *Hinia reticulata*, *Nassa limata*, *Nucula nucleus*, *Parvicardium scabrum*, *Tellina donacina*, *Venus*

ovata). The other species represent only 2.04%. *Nuculana commutata* shows the highest dominance (23.46%), followed by *Nucula sulcata* (12.34%) and *Nucula turgida* (9.87%). Most of the species sampled are represented by only one species per sample, except for the species *Lima subauriculata*

(4.93%), *Papillicardium papillosum*, and *Tellina donacina* with a dominance of (3.70%). Ecologically the mixticole (Mix) species dominate in the gulf of Oran, followed by the coastal detritus species (DC). This Gulf is distinguished from other open Algerian environments by the absence of large rivers draining terrigenous inputs to the coastal bottoms of the gulf as is the case in other bays and gulfs: Algiers, Annaba, Bejaia, and Arzew. This situation explains to a large extent the organization of the benthic fauna settlements in the Gulf of Oran. The distribution of Molluscs 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 in the Mediterranean Sea (Bakalem *et al.*, 2020).

The comparison of the marine molluscs of the gulf of Oran with other areas in the Algerian coast (Gulf of Arzew, Bou Ismail bay, and Algiers bay) confirmed the superiority of species with wide ecological distribution. In this study about of the gulf of Arzew, a total of 66 species identified which is higher than what is observed in the gulf of Oran. The distribution of molluscs showed that their ecological preference to the substratum and higher species richness may be explained to the siltation of this gulf (Amar, 1998). This difference may be linked to a temporal evolution since the data for the Gulf of Arzew date back more than 20 years and or to a difference in the ecological state of the

environment. As observed in the Gulf of Oran, molluscs have a clear quantitative dominance in Bou-Ismaïl Bay (Hassam, 1991; Oulmi, 1991) and in Algiers bay (Bakalem *et al.*, 2020). In contrast to the dominance of bivalves in the gulf of Oran, the prospecting of rocky substrates of the Algerian west coast made it possible to identify 26 species of Gastropoda molluscs divided into 11 families (Meziane *et al.*, 2020). All research work carried out on marine mollusks in the western Algerian coast is related to one species within the framework of the Biomonitoring Programs (Bendoula *et al.*, 2017; Benali *et al.*, 2017; Meziane and Kerfouf, 2018).

Conclusion

The faunistic composition analysis of the sampled stations in the Gulf of Oran allowed us to count 116 individuals of Molluscs inventoried and determined by the species, including 13 orders, 20 families, 24 genres and 29 species. The large ecological stocks are mixicole species and coastal detritus species. The malacofauna of the gulf of Oran is scarce and less diversified (29 species) due to the nature of the soft bottoms (sand and gravel) and the absence of terrigenous inputs. The present study carried out on samples of macrofauna in the gulf of Oran made it possible to update the inventory of benthic macrofauna in the soft bottoms of these coasts. Spatio-temporal monitoring will provide more information on the dynamics of these macrobenthic communities. The present list of

molluscs in Oran's gulf is the first step of an inventory which will be completed with a future article that will provide information and argumentation on each species with their references.

Acknowledgement

We thank reviewers for their comments and suggestions. We are grateful to all persons who contributed to the field and Laboratory analysis.

References

- Abbott, R.T., 1991.** Seashells of the World. Chicago: *Golden Press*. 160 p.
- Amar, Y., 1998.** Etude des peuplements macro-benthiques du golfe d'Arzew. *Thèse de Magistère, ISMAL (Alger)*, 216 P. + annexes, 70 P.
- Bakalem, A., 1979.** Contribution à l'étude des peuplements benthiques de la baie d'Alger. *Thèse de Doctorat 3^{ème} Cycle, univ. Bretagne occ. Brest*. 241P.
- Bakalem A., Hassam N., Oulmi Y., Martinez M. and Dauvin J.C., 2020.** Diversity and geographical distribution of soft-bottom macrobenthos in the bay of Bou Ismail (Algeria, Mediterranean Sea) *Regional Studies in Marine Science*, 33, 100938
- Benali I., Boutiba Z., Grandjean D., de Alencastro L.F., Rouane-Hacene O. and Chevre N., 2017.** Spatial distribution and biological effects of trace metals (Cu, Zn, Pb, Cd) and organic micropollutants (PCBs, PAHs) in mussels *Mytilus galloprovincialis* along the Algerian west coast. *Marine Pollution Bulletin*, 115(1-2), 539-550.
- Bendoula M.C. and Taibi A., 2017.** Abondance et structure démographique d'un prédateur des Patelles *Stramonita haemastoma* (Linné, 1767) à l'Ouest du littoral algérien. *Le Bulletin de la Société Zoologique de France*, 2017, 142(2), 77-85.
- Benzaoui M.Y., Bentaallah M.A., Benaoum B., Kerfouf A. and Boutiba Z., 2015.** Heavy Metals (Hg, Cd, Pb) Concentrations on *Mytilus galloprovincialis* (Lamarck, 1819) in Oran Coastal Waters (Western Algeria): New Evidences. *Journal of Applied Environmental and Biological Sciences*: 5(6), 1-9.
- Dance, P.S., 1976.** The World's Shells. New York: *McGraw Hill Book Company*, 192 P
- Dautzenberg, P.H., 1895.** Mollusques recueillis sur la côte de Tunisie et de l'Algérie (Campagne de la Melita, 1892). *Mémoires de la Société zoologique de France, France*, 8, 363 - 365; 371 - 372.
- Dauvin, J.C., Bellan, G. and Bellan-Santini, D., 2010.** Benthic indicators: from subjectivity to objectivity – Where is the line? *Marine Pollution Bulletin*, 60, 947–953.
- Dilem, Y., Bendraoua, A. and Kerfouf, A., 2014.** Assessment of the Physico-Chemical Quality and the Level of Metallic Contamination of the Dismissals of Sloppy Waters of Oran (Algerian West Coastline). *International Journal of Sciences: Basic and Applied Research*, 16(2), 124-130.

- Hassam, N., 1991.** Contribution à l'étude des peuplements macrobenthiques de la baie de Bou-Ismaïl: secteur Est. *Thèse de Magistère, ISMAL, Alger*, 146 P.
- Hinton, A., 1972.** Shells of New Guinea and the Central Indo-Pacific. *UK: Rigby Limited*, 94 P.
- Kerfouf, A., Amar, Y. and Boutiba, Z., 2007.** Distribution of Macrobenthos in the Coastal Waters in the Gulf of Oran (Western Algeria). *PJBS: Pakistan Journal of Biological Sciences*, 10(6), 899-904.
- Llabadore, F., 1935.** Les Mollusques testacés marins, terrestres et fluviatiles de l'Ouest algérien. *Alger*. 175 P
- Marsh, J.A., 1964.** Cone Shells of the World. *Brisbane: Jacaranda Press*, 185 P.
- Meziane, K. and Kerfouf, A., 2018.** Current Situation of Stramonita heamastoma (Linnaeus 1758) (Gastropod Mollusk) in the Western Coast of Algeria. *International Journal of Sciences: Basic and Applied Research (IJSBAR)*, 39(2).
- Meziane A., Kerfouf A., Baaloudj A., 2020.** Checklist of gastropod molluscs on the west coast of Algeria. *International Journal of Aquatic Biology* (ISSN: 2322-5270; P-ISSN: 2383-0956), 8(3), 224-227.
- Millot, C., 1989.** La circulation générale en Méditerranée occidentale : aperçu de nos connaissances et projets d'études. *Annales de géographie*, n° 549, XCVII, 498 -515.
- Oulmi, Y., 1991.** Contribution à l'étude des peuplements macrobenthiques de la baie de Bou-Ismaïl: secteur Ouest. *Thèse de Magistère, ISMAL, Alger*, 170 P.
- Pallary, P., 1900.** Coquilles marines du littoral du Département d'Oran. *Journal de Conchyliologie*, 48(3), 211-422, pl. 6-8.
- Poppe, G.T., 2008.** Philippine Marine Mollusks, Volume 1: Gastropoda. *Germany: Conchbooks*, 758 P.
- Rebzani-Zahaf, C., 1992.** Le peuplement macrobenthique du port d'Alger: impact de la pollution. *Hydroécologie Appliquée*, 4, 91-103.
- Remili, S. and Kerfouf, A., 2013.** Evaluation de la qualité physico-chimique et du niveau de contamination métallique (Cd, Pb, Zn) des rejets d'eaux usées d'Oran et de Mostaganem (littoral ouest algérien). *Physio-Géo - Géographie Physique et Environnement*, volume VII, 165 -182.
- Rouabhi, Y.L., 2020.** Étude comparative de la biologie et de la bioaccumulation des métaux traces chez deux Mytilidae: *Mytilus galloprovincialis* (Lamarck, 1819) et *Perna perna* (Linnaeus, 1758) de la côte ouest algérienne. *Thèse de doctorat, Université de Mons* (Belgique), 174 P.
- Springsteen, F.J. and Leobrera, F.M., 1986.** Shells of the Philippines. *Manila: Carfel Seashell Museum*, 377 P.
- Wong, N.L.W.S. and Arshad, A., 2011.** A Brief Review on Marine Shelled Mollusca (Gastropoda and Bivalvia) record in Malaysia. *Journal of Fisheries and Aquatic Science*, 6: 669-699.