The Status of the Sedimentary Benthic Broad Habitats and their Associated Communities in the Romanian Marine Area in 2020 *(Valeria Abaza, Camelia Dumitrache, Adrian Filimon)*	**"Cercetări Marine" Issue no. 51** **Pages 64 - 79**	**2021**
DOI:10.55268/CM.2021.51.64		

THE STATUS OF THE SEDIMENTARY BENTHIC BROAD HABITATS AND THEIR ASSOCIATED COMMUNITIES IN THE ROMANIAN MARINE AREA IN 2020

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ABSTRACT

The management of marine areas are guided by environmental policies, such as European Union's Marine Strategy Framework Directive (MSFD), Water Framework Directive (WFD) and Habitats Directive, all requiring periodic assessment and reporting. In 2020, the macrozoobenthos was monitored on the entire Black Sea Romanian shelf at depths ranging between 10 and 100 m. Out of the 43 sampling points of the marine monitoring network, 56 samples were collected in 22 selected stations distributed among broad sedimentary habitat types in Romanian waters in three marine reporting units (variable salinity waters, coastal waters and marine waters). Six types of sedimentary habitats were identified in the above-mentioned marine reporting units according to Marine Strategy Framework Directive (MSFD). Marine Strategy Framework Directive (MSFD) clearly specifies that assessment must take into consideration benthic broad habitat types, including their associated biological communities. To assess the ecological status according to the MSFD of macrozoobenthos from the Romanian shore, M-AMBI*(n) index was used. Following the assessment, the ecological status of the macrozoobenthic communities was determined as good in all three marine reporting units. The data collected in 2020 will contribute to the six-year assessment of the benthic broad habitats and establishment of thresholds for different sub-types.

Key-Words: Black Sea, macrozoobenthos, benthic habitat types, M-AMBI *(n) index, environmental status

AIMS AND BACKGROUND

Present paper aims to assess the status of marine macrozoobenthos under environmental policies, particularly under the Marine Strategy Framework Directive (MSFD).

In Europe, the management of marine ecosystems is guided by environmental policies, such as Marine Strategy Framework Directive

(MSFD), Water Framework Directive (WFD), Habitats Directive (HD), and all requiring periodic assessment and reporting. The MSFD includes assessment methods developed under the WFD and HD, where relevant, but also requires the assessment of broad habitat types, in our case benthic habitats adversely affected by human activities (EU, 2017).

Along with sediment type and depth, the degree pollution by organic matter plays a very important role in the distribution of benthic communities. In areas affected by organic pollution, resistant species to hypoxia and even temporary anoxia predominate. These species, with abundant trophic resources at their disposal (in the form of particulate organic matter) and in the absence of competition from other species develop very abundant populations reaching extremely high biomasses. Biological and ecological studies confirm the high heterogeneity of benthic habitats and their populations represent a sensitive tool for assessing the health of the marine environment (Dumitrache & Abaza, 2004; Teaca *et al.*, 2019, 2020). The recorded data can be used to predict future ecological changes, changes that could mainly be a result of anthropogenic activities.

In the Black Sea, especially on the Romanian coast, there is a long tradition of monitoring the macrozoobenthic communities on the sedimentary substratum. Through monitoring and the long-term biological data sets acquired, an image of environmental changes over time can be seen. However, due to the integrated approach of the state assessments, on both a temporal and spatial level, promoted by the MSFD and WFD environmental policies, new requirements in the design of the monitoring programs have been imposed.

EXPERIMENTAL

In 2020, the macrozoobenthos was monitored on the entire continental shelf near the Romanian coast. Out of the 43 stations of the monitoring network, 56 samples in 22 selected stations were collected (Fig.1). The stations were distributed on all sedimentary broad habitat types in the Romanian waters, in all three marine reporting units (waters with variable salinity, coastal waters and marine waters). Sampling and processing were done according to the methodology agreed at the regional level (Todorova & Konsulova, 2005). In most cases, three replicate samples were taken in each sampling point using a Van Veen grab with $0.1m^2$ surface. The samples prepared according to the protocol were further processed in the laboratory. Resulted data was analysed and graphed with R and a trend line was calculated for the macrozoobenthic species variation (R core team, 2013). Subsequently, the data was analysed using Primer v.7 (Clark *et al*., 2015) and AMBI. v.5 (Borja *et al*., 2012).

For the implementation MSFD, in the Romanian Black Sea waters, the ecological status of benthic invertebrates was assessed using the same

assessment method agreed between Romania and Bulgaria in the geographic intercallibration exercise under WFD. Therefore, for marine invertebrates, the normalized M-AMBI multiparametric index (M-AMBI*(n) was proposed, tested and used (Sigovini *et al*., 2013). This indicator is obtained by integrating the biotic index AMBI based on the proportion of sensitive and tolerant species to pollution, Diversity Index (H') and species richness (S), which makes it compatible with both the WFD and MSFD.

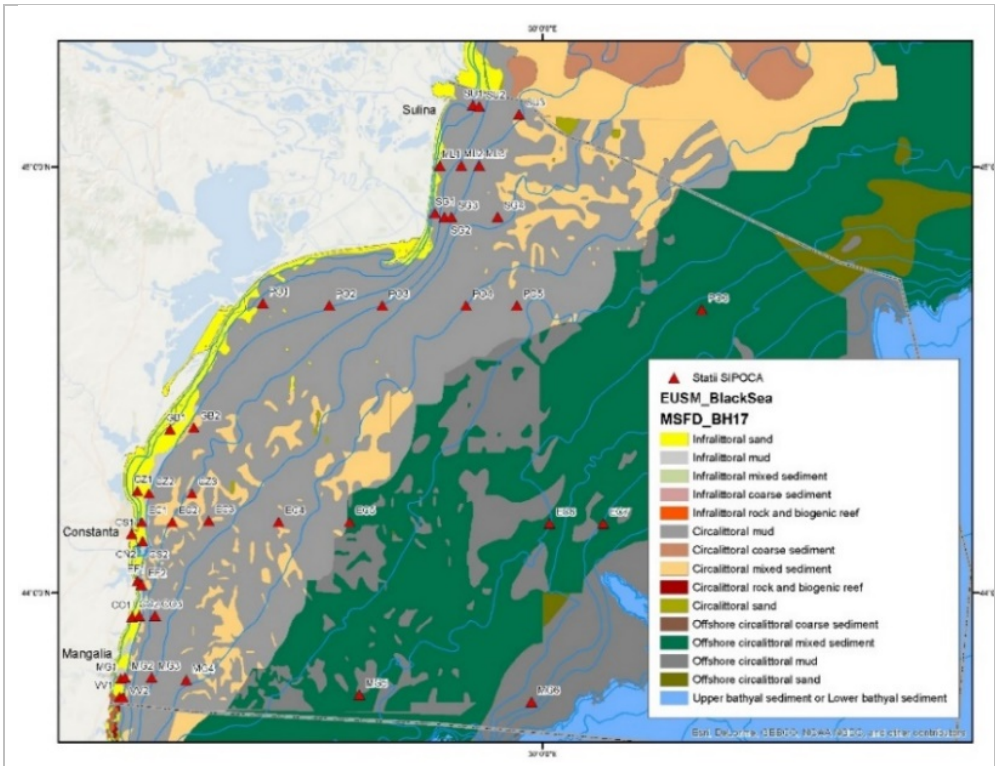

Fig. 1. Map of monitoring stations from the Romanian continental shelf overlaid over the broad habitat types according to MSFD

RESULTS AND DISCUSSION

Following the sample processing, 101 macrozoobenthic species were identified in the study area (Annex 1). The species number was almost similar to the one registered in 2019, being the highest in the period 2010-2020 (Fig.2). Analysing the species number variation over the entire decade, an increasing trend was observed ($R^2 = 0.84$).

The species distribution identified according to the marine reporting units was as follows:

- 36 species in waters with variable salinity;
- 49 species in coastal waters;

- in marine waters, there are two circalittoral subunits: the circalittoral with seasonal environmental conditions and the deep circalittoral as defined in EuSeaMap project, which aimed at defining, describing and classification of benthic habitats. For the scope of MSFD implementation, offshore circalittoral term is recommended, although for the Black Sea the term is not exactly correct according to the definition given by the European Topic Centre on Biological Diversity (Evans *et al*., 2016). The habitats occurring here are home to the most diverse benthic fauna; in the two circalittoral units, a total of 80 species were identified. The specific diversity in the circalittoral habitats was formed by 71 species and in the deep circalittoral habitats by 51 species.

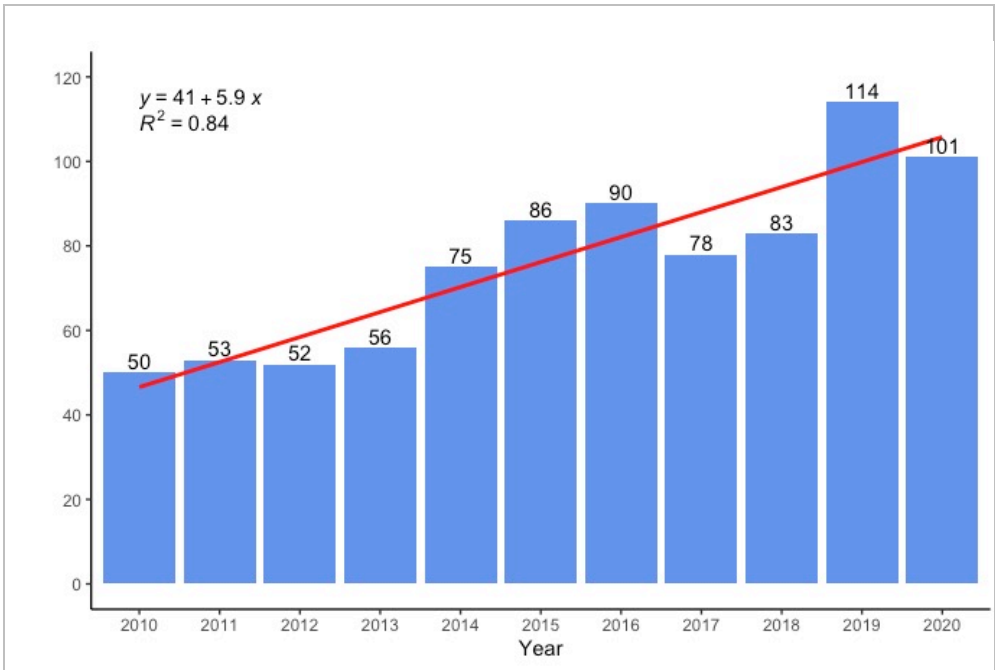

Fig. 2. Zoobenthic species variation in 2010-2020 period

Up to 20 m isobath, two broad habitat types were identified: infralittoral muds and infralittoral sands. On the infralittoral muds, present only in waters with variable salinity, macrozoobenthos densities were dominated by polychaetes *Heteromastus filiformis* and *Alitta succinea*, generally occurring on mobile sediments. Biomass was dominated by non-native molluscs *Anadara kagoshimensis* and *Mya arenaria*, although their value did not exceed 100 g/m^2. Among crustaceans, *Upogebia pusilla* was commonly found in the area.

The infralittoral sands, present in coastal waters, were dominated by various communities composed of polychaetes, amphipods and bivalves. Among them, the most common were bivalves *Lentidium mediterraneum*,

Chamelea gallina, *Spisula subtruncata*, polychaete *Micronephthys longicornis* (Annex 1). In general, the determining faunal character of this habitat, especially in the central area of the Romanian coast (Mamaia Bay), were defined by *Lentidium mediterraneum* and *Chamelea gallina*. Other species, with lower densities, but high frequency were represented by amphipods *Perioculodes longimanus* and *Ampelisca diadema.*

In the bathymetric interval of 30-54m, the broad habitat types were represented by circalittoral muds and mixed circalittoral sediments. The benthic community on the circalittoral muds was numerically dominated by polychaete *Melinna palmata*. Other species found in high densities were polychaetes *Prionospio cirrifera* and *Nephthys hombergii*, and the amphipod *Phtisica marina*. *Melinna palmata* is a defining faunal element for the circalittoral muds in front of the Danube mouths. Being an opportunistic species, it prefers areas with an increased sedimentation rate and forms small biocenoses in which it dominates. *Melinna palmata* registered the maximum density on Portita transect (3590 ind/m^2).

In Mangalia area (southern Romania), the same sedimentary habitats were mostly dominated by bivalve *Mytilus galloprovincialis* that forms biogenic structures accompanied by different smaller size species. The mixed circalittoral sediments were numerically dominated by several species of opportunistic polychaetes such as *Prionospio cirrifera*, *Heteromastus filiformis*, *Polydora cornuta* and *Micronephthys longicornis*. *Nephthys hombergii* defined as indifferent to organic pollution was also identified in all sampled stations. Although not noticeable here either, *M. galloprovincialis* dominated in terms of biomass, recording an average biomass value of 130.74 g/m^2.

In marine waters deeper than 54 m, there were two other broad habitat types: offshore circalittoral mixed sediments and offshore circalittoral muds. Offshore circalittoral mixed sediments were represented by a community generally dominated by bivalve *Modiolula phaseolina* and polychaete *Terebellides stroemii*. Besides the dominant species, the macrofauna of this habitat was characterized by the constant presence of species such as *Phtisica marina, Carinina heterosoma, Micrura fasciolata* and *Amphiura stepanovi*. Offshore circalittoral muds were identified on Mangalia transect. The benthic community was dominated by small polychaete *Prionospio cirrifera*, both in density and biomass. Important accompanying species with lower density and biomass values were: *Notomastus profundus, Ampelisca diadema, Amphiura stepanovi* and *Apseudopsis ostroumovi*. Another species occurring mostly in this particular area, identified in the samples collected from both habitat types, is the iliophilous species, *Pachycerianthus solitarius*.

Circalittoral habitats and offshore circalittoral broad habitat types are characterized by the muds inhabited by bivalves *Mytilus galloprovincialis*

(between the 30 m and 55 m isobaths) and *Modiolula phaseolina* (60-120 m), respectively. These two biocenoses extend over vast areas, along the entire Romanian coast. Based on our analysis, for the areas between 30-54 m depths, a low density of *M. galloprovincialis* was observed. This can be explained by the scattered arrangement of mussel clusters, sometimes at distances of a few meters between them. The bodengreifer does not always fall on the mussel biogenic reefs. The use of the bodengreifer showed that biogenic reefs with *M. galloprovinciallis* are determinants of the analysed area.

The distribution of macrozoobenthic species by ecological groups in the analysed area are as follows: in waters with variable salinity, both species tolerant to the content of organic matter and those tolerant to high concentrations of organic matter in sediments were dominant, except Sulina 10 m, where most species were opportunistic. The number of sensitive species to organic matter concentrations in sediments increased with depth, the largest proportions being found in the circalittoral communities (30-54m depth) and in the *Modiolula* - *Terebellides* community on mixed sediments offshore circalittoral. In this community, many species indifferent to the concentrations of organic matter were also found (Fig.3).

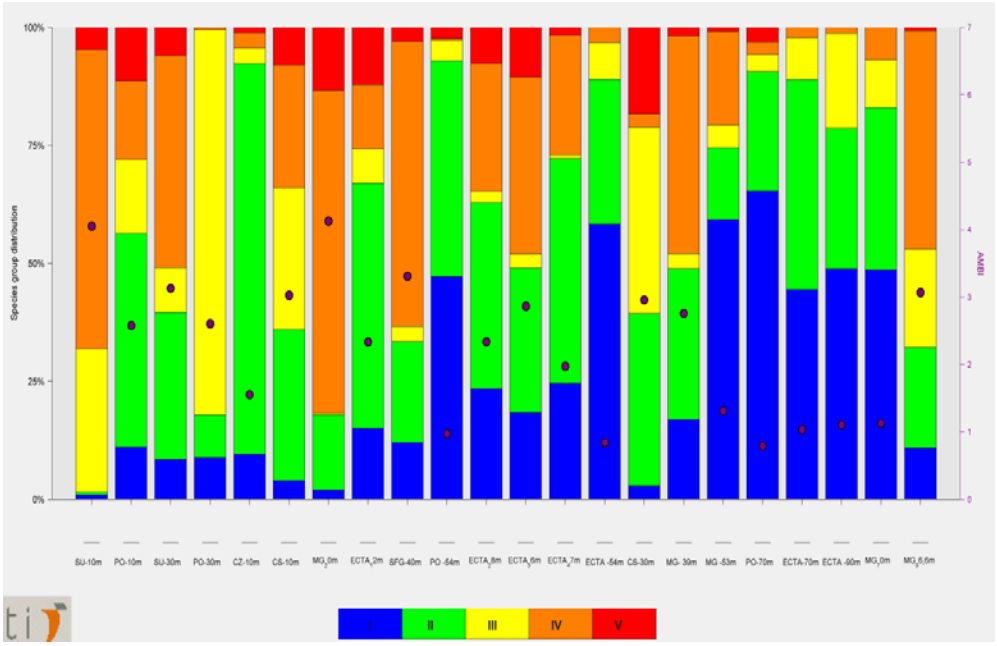

Fig. 3. Distribution by ecological groups of identified species in 2020

The ecological status of macrozoobenthos was assessed by applying the M-AMBI*(n) index (Sigovini *et al*., 2013; Todorova *et al*., 2018; Abaza *et al*., 2016, 2018).

In the northern stations, situated in waters with variable salinity, the *Heteromastus-Alitta* community was in good status. However, due to the small number of collected samples, it's difficult to assess the entire community in the area as being in good status (Table 1). Therefore, it is recommended to collect a sufficient number of samples in each broad habitat type and reporting unit.

Table 1. The assessment of benthic broad habitat types status in the Romanian marine waters based on M-AMBI*(n) index and EQR M-AMBI*(n) in 2020

MARINE REPORTING UNIT	#HABITAT	STATION	THRESHOLD VALUE	M-AMBI*(n)	EQR M-AMBI
WATERS WITH VARIABLE SALINITY	IM	SU1-10m	M-AMBI*(n) ≥0,61 EQR≥0,68	0.96	1.06
	IM	PO1-10m		1.02	1.13
COASTAL WATERS	CM	CO3-30m	M-AMBI*(n) ≥0,66 EQR≥0,68	0.89	0.91
	CM	MG2-20m		0.65	0.67
	IS	CZ1-10m		1.01	1.04
	IS	EC1-12m		0.95	0.98
	IS	CO1-10m		0.78	0.81
	CMS	EC2-28m		1.05	1.08
MARINE WATERS	CM	PO3-30m	M-AMBI*(n) ≥0,68 EQR≥0,68	0.55	0.55
	CM	PO5-54m		1.09	1.09
	CM	MG3-39m		0.93	0.93
	CM	MG4-53m		1.18	1.18
	CMS	SU3-30m		0.99	0.99
	CMS	SG4-40m		1.02	1.02
	CMS	EC3-36m		0.91	0.91
	CMS	EC4-47m		0.88	0.88
	CMS	EC5-54m		1.22	1.22
	OCM	MG6-100m	M-AMBI*(n) ≥0,64 EQR≥0,68	0.83	0.92
	OCMS	PO6-70m		1.04	1.16
	OCMS	EC6-70m		0.85	0.94
	OCMS	EC7-90m		0.88	0.98
	OCMS	MG5-70m		1.18	1.31

#IM- Infralittoral mud; IS- Infralittoral sand; CM- circalittoral mud; CMS- *circalittoral mixed sediments*; OCM- *Offshore circalittoral mud*; OCMS- *Offshore circalittoral mixed sediments*

In the central and southern area of Romanian waters in coastal waters, three broad habitat types were identified. Out of the six stations where samples were taken, only one (Mangalia- circalittoral muds) was in not good status. In all the other stations, the value of the M-AMBI*(n) index exceeded the threshold value (Table 1).

There were 14 stations sampled in marine waters, the third marine reporting unit defined in the Romanian marine area. Out of these, nine stations were distributed in the circalittoral and five in the deep circalittoral. The ecological status of benthic communities was bad on Portita transect. In the rest of the stations, the value of the M-AMBI*(n) index exceeded the threshold value (Table 1, Fig. 4).

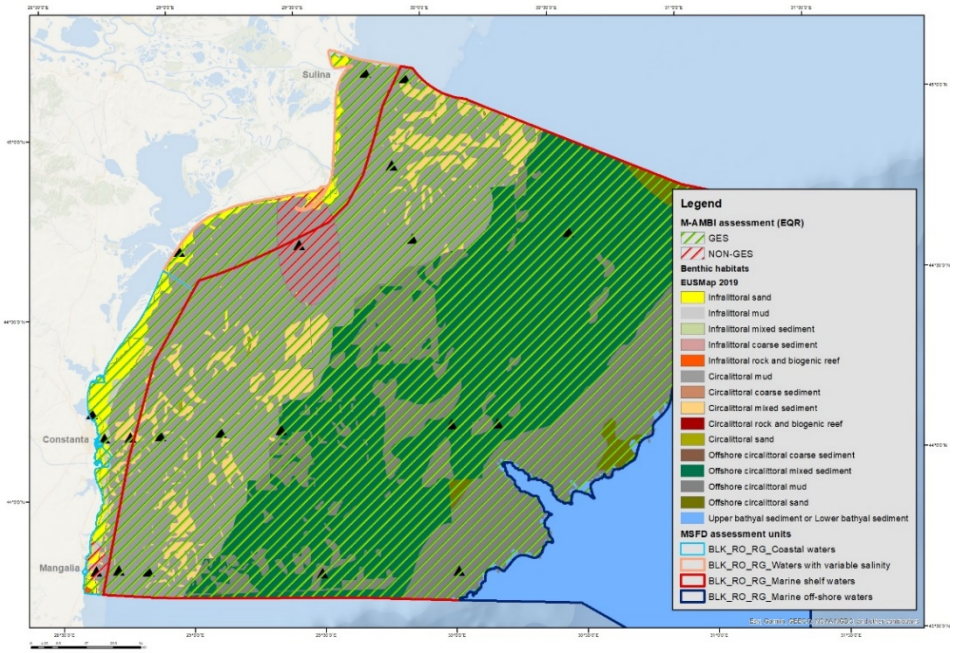

Fig.4. Assessment of the broad habitats' ecological status in the designated marine reporting units of the Romanian marine waters in 2020 based on EQR M-AMBI*(n)

CONCLUSIONS

The assessment of the macrozoobenthic communities in 2020, based on 56 samples, led to the following conclusions:

- ✓ 101 species were identified in the analysed area. The diversity in 2020 was comparable to that in 2019. An increasing trend of species diversity was observed during the period 2010-2020.
- ✓ Six sedimentary broad habitat types located in three marine reporting units were sampled and analysed, according to MSFD requirements. As there are some broad habitat types shared among the existent marine reporting units,

there is a need to define special reporting units designed in accordance to benthic habitats and specific communities.

The identified broad habitat types were dominated by diverse communities consisting mainly of bivalves, polychaetes and crustaceans.

The ecological status of macrozoobenthos was assessed by applying the M-AMBI*(n) index. Following the evaluation, at the level of marine reporting units, it can be stated that their environmental status is good. This statement should be treated with caution in the case of waters with variable salinity, due to the small number of analysed samples.

At broad habitat type level, 33% of the stations in the circalittoral muds were in not good status. If the proportion principle is applied to the assessment, result that this particular habitat type is not in good status.

The data collected in 2020 together with those in the last five years will be used to better refine the thresholds for the broad habitat types and characterise some of the most frequent sub-types. At the same time, integration of different types of pressures will better characterise the environmental status of benthic habitats.

Acknowledgement. This study has been supported by the project PN 19260202 (Ecological, ecophysiological and biotechnological research in Romanian marine ecosystems), contract 45N/2019.

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Annex 1.

Frequency and dominance of the macrozoobenthic species identified in the broad habitat types on the Romanian Black Sea shelf in 2020 based on their average abundance

SPECIES	#BROAD HABITAT TYPE											
	IM		IS		CM		CMS		OCMS		OCM	
Class/Scientific name	**F%**	**D%**	**F%**	**D%**	**F%**	**D%**	**F%**	**D%**	**F%**	**D%**	**F%**	**D%**
Calcarea												
Sycon ciliatum (Fabricius, 1780)	0	0	0	0	0	0	0	0	50	1	0	0
Anthozoa												
Cylista undata (Müller, 1778)	0	0	0	0	0	0	17	0	0	0	0	0
Pachycerianthus solitarius (Rapp, 1829)	0	0	0	0	0	0	0	0	50	1	100	1
Diadumene lineata (Verrill, 1869)	0	0	0	0	67	1	83	0	0	0	0	0
Palaeonemertea												
Carinina heterosoma Müller, 1965	0	0	0	0	50	2	83	1	100	4	0	0
Pilidiophora												
Leucocephalonemertes aurantiaca (Grube, 1855)	50	0	67	1	67	1	83	1	0	0	0	0
Micrura fasciolata Ehrenberg, 1828	50	0	0	0	67	1	50	1	75	5	100	2
Pontolineus arenarius Müller & Scripcariu, 1964	0	0	33	0	0	0	33	0	0	0	0	0
Hoplonemertea												
Amphiporus bioculatus Verrill, 1892	50	0	33	0	50	0	67	1	0	0	0	0
Nipponnemertes pulcher (Johnston, 1837)	0	0	33	0	0	0	17	0	0	0	0	0
Tetrastemma Ehrenberg, 1831	0	0	0	0	67	0	0	0	50	0	0	0
Gastropoda												
Cerithidium submammillatum (De Rayneval & Ponzi, 1854)	0	0	0	0	0	0	0	0	25	2	0	0

Tritia reticulata (Linnaeus, 1758)	0	0	100	1	17	0	17	0	0	0	0	0
Tritia neritea (Linnaeus, 1758)	0	0	33	1	0	0	0	0	0	0	0	0
Rapana venosa (Valenciennes, 1846)	50	0	0	0	0	0	17	0	0	0	0	0
Calyptraea chinensis (Linnaeus, 1758)	0	0	0	0	17	0	0	0	0	0	0	0
Bivalvia												
Anadara kagoshimensis (Tokunaga, 1906)	50	0	33	1	0	0	0	0	0	0	0	0
Mytilus galloprovincialis Lamarck, 1819	0	0	0	0	50	3	67	1	0	0	0	0
Modiolula phaseolina (Philippi, 1844)	0	0	0	0	17	0	17	0	100	16	0	0
Modiolus adriaticus Lamarck, 1819	0	0	0	0	0	0	17	0	0	0	0	0
Spisula subtruncata (da Costa, 1778)	50	0	67	5	50	1	83	1	0	0	0	0
Mya arenaria Linnaeus, 1758	50	0	0	0	17	0	0	0	0	0	0	0
Parvicardium simile (Milaschewitsch, 1909)	0	0	0	0	17	0	17	0	25	1	0	0
Acanthocardia paucicostata (G. B. Sowerby II, 1834)	0	0	0	0	33	0	33	0	0	0	0	0
Cerastoderma glaucum (Bruguière, 1789)	50	0	0	0	0	0	17	0	0	0	0	0
Abra alba (W. Wood, 1802)	0	0	0	0	17	0	17	0	25	0	0	0
Abra prismatica (Montagu, 1808)	100	0	0	0	50	5	50	2	0	0	0	0
Chamelea gallina (Linnaeus, 1758)	0	0	67	6	0	0	0	0	0	0	0	0
Lentidium mediterraneum (O. G. Costa, 1830)	0	0	33	48	0	0	0	0	0	0	0	0
Pitar rudis (Poli, 1795)	0	0	0	0	17	0	100	1	0	0	0	0
Polychaeta												
Capitella capitata (Fabricius, 1780)	100	6	100	3	83	4	83	3	25	1	100	1
Heteromastus filiformis (Claparède, 1864)	100	52	100	5	83	4	100	16	50	1	0	0

Notomastus profundus Eisig, 1887	0	0	0	0	0	0	17	0	0	0	100	10
Phyllodoce maculata Wagner, 1885	50	0	0	0	67	1	67	1	75	7	100	5
Genetyllis tuberculata (Bobretzky, 1868)	0	0	0	0	50	0	17	0	0	0	0	0
Terebellides stroemii Sars, 1835	0	0	0	0	67	2	50	5	100	12	100	4
Alitta succinea (Leuckart, 1847)	100	23	67	0	33	0	33	0	0	0	0	0
Nereis zonata Malmgren, 1867	50	0	0	0	0	0	0	0	0	0	0	0
Nephtys cirrosa Ehlers, 1868	50	0	33	0	83	2	50	1	50	0	0	0
Nephtys hombergii Savigny in Lamarck, 1818	50	0	33	0	100	6	100	6	50	2	100	3
Micronephthys longicornis (Perejaslavtseva, 1891)	100	7	100	14	83	4	100	10	25	0	0	0
Scolelepis (Scolelepis) squamata (O.F. Muller, 1806)	50	0	67	1	0	0	17	0	0	0	0	0
Hediste diversicolor (O.F. Müller, 1776)	50	0	0	0	17	0	17	0	0	0	0	0
Eulalia viridis (Linnaeus, 1767)	0	0	0	0	33	0	67	0	0	0	0	0
Melinna palmata Grube, 1870	0	0	0	0	50	33	67	1	0	0	0	0
Prionospio cirrifera Wirén, 1883	100	3	67	1	67	16	100	19	100	2	100	38
Streblospio shrubsolii (Buchanan, 1890)	50	1	0	0	0	0	0	0	0	0	0	0
Dipolydora quadrilobata (Jacobi, 1883)	0	0	0	0	0	0	0	0	0	0	100	1
Aricidea Webster, 1879	0	0	0	0	0	0	0	0	25	1	0	0
Spio filicornis (Müller, 1776)	50	0	0	0	0	0	0	0	0	0	0	0
Polydora cornuta Bosc, 1802	100	0	33	0	17	0	67	10	25	1	0	0
Sphaerosyllis bulbosa Southern, 1914	50	0	0	0	0	0	0	0	25	0	100	1
Harmothoe reticulata (Claparède, 1870)	100	0	0	0	33	0	100	3	50	2	100	2

Harmothoe impar (Johnston, 1839)	50	0	0	0	0	0	33	0	0	0	0	0
Leiochone leiopygos (Grube, 1860)	0	0	0	0	0	0	50	1	0	0	0	0
Exogone naidina Örsted, 1845	0	0	0	0	17	0	17	0	75	1	100	1
Amphicorina armandi (Claparède, 1864)	0	0	0	0	0	0	0	0	0	0	100	1
Fabricia stellaris (Müller, 1774)	0	0	0	0	17	0	17	0	0	0	0	0
Spirobranchus triqueter (Linnaeus, 1758)	0	0	0	0	17	0	50	0	0	0	0	0
Lindrilus flavocapitatus (Uljanina, 1877)	0	0	0	0	0	0	0	0	25	0	0	0
Arachnida												
Thalassarachna basteri (Johnston, 1836)	0	0	0	0	17	0	0	0	75	1	100	7
Pycnogonida												
Callipallene sagamiensis Nakamura & Child, 1983	0	0	0	0	17	0	17	0	25	0	0	0
Thecostraca												
Amphibalanus improvisus (Darwin, 1854)	50	1	0	0	17	0	0	0	0	0	0	0
Malacostraca												
Ampelisca diadema (Costa, 1853)	100	2	67	1	67	1	83	1	50	7	100	8
Ampelisca sarsi Chevreux, 1888	0	0	33	2	0	0	0	0	0	0	0	0
Dexamine spinosa (Montagu, 1813)	0	0	0	0	17	0	33	0	0	0	0	0
Microdeutopus anomalus (Rathke, 1843)	0	0	0	0	17	0	50	0	75	3	100	1
Microdeutopus damnoniensis (Spence Bate, 1856)	0	0	0	0	67	1	83	1	50	1	0	0
Microdeutopus versiculatus (Spence Bate, 1857)	0	0	0	0	0	0	0	0	25	0	0	0
Deflexilodes gibbosus (Chevreux, 1888)	0	0	0	0	17	0	0	0	0	0	0	0

Nototropis guttatus Costa, 1853	0	0	0	0	17	0	17	0	75	2	100	1
Melita palmata (Montagu, 1804)	0	0	0	0	17	0	0	0	0	0	0	0
Orchomene humilis (Costa, 1853)	0	0	0	0	33	0	33	0	75	1	0	0
Perioculodes longimanus (Spence Bate & Westwood, 1868)	100	1	67	5	33	0	67	0	50	0	0	0
Medicorophium runcicorne (Della Valle, 1893)	0	0	0	0	0	0	33	0	0	0	0	0
Bathyporeia guilliamsoniana (Spence Bate, 1857)	0	0	67	2	0	0	17	0	0	0	0	0
Apherusa bispinosa (Spence Bate, 1857)	0	0	0	0	0	0	0	0	50	2	0	0
Phtisica marina Slabber, 1769	0	0	0	0	50	7	100	8	100	11	100	2
Apseudopsis ostroumovi Bacescu & Carausu, 1947	0	0	0	0	50	0	50	0	100	1	100	5
Eudorella truncatula (Bate, 1856)	0	0	0	0	17	0	33	0	25	1	100	1
Iphinoe elisae Băcescu, 1950	0	0	0	0	50	1	67	0	25	0	0	0
Iphinoe maeotica Sowinskyi, 1893	100	0	33	0	0	0	17	0	0	0	0	0
Iphinoe tenella Sars, 1878	0	0	0	0	17	0	33	0	25	0	0	0
Stenosoma capito (Rathke, 1836)	0	0	0	0	17	0	0	0	50	1	0	0
Synchelidium maculatum Stebbing, 1906	0	0	0	0	33	0	50	0	25	0	0	0
Cumella (Cumella) pygmaea G.O. Sars, 1865	0	0	0	0	17	0	0	0	25	0	0	0
Cumella (Cumella) limicola Sars, 1879	0	0	67	0	0	0	0	0	0	0	0	0
Crangon crangon (Linnaeus, 1758)	0	0	33	0	0	0	17	0	0	0	0	0
Paramysis (Longidentia) kroyeri (Czerniavsky, 1882)	50	0	0	0	0	0	0	0	0	0	0	0
Paramysis (Pseudoparamysis) pontica Bacescu, 1940	50	0	0	0	0	0	0	0	0	0	0	0

Carcinus aestuarii Nardo, 1847	50	0	0	0	0	0	0	0	0	0	0	0
Liocarcinus holsatus (Fabricius, 1798)	50	0	33	0	0	0	0	0	0	0	0	0
Liocarcinus navigator (Herbst, 1794)	0	0	0	0	0	0	17	0	0	0	0	0
Upogebia pusilla (Petagna, 1792)	50	1	33	0	0	0	0	0	0	0	0	0
Ophiuroidea												
Amphiura stepanovi Djakonov, 1954	50	0	0	0	50	1	67	0	100	2	100	7
Holothuroidea												
Leptosynapta inhaerens (O.F. Müller, 1776)	0	0	0	0	17	0	0	0	50	3	100	1
Phoronida												
Phoronis euxinicola Selys-Longchamps, 1907	0	0	0	0	17	0	50	1	25	0	0	0
Ascidiacea												
Ciona intestinalis (Linnaeus, 1767)	0	0	0	0	17	0	0	0	0	0	0	0
Eugyra adriatica Drasche, 1884	0	0	0	0	0	0	17	0	25	5	0	0
Platyhelminthes												
Leptoplana Ehrenberg, 1831	0	0	33	0	0	0	0	0	0	0	0	0
Insecta												
Clunio marinus Haliday, 1855	0	0	0	0	0	0	0	0	25	0	0	0

[#]IM - *Infralittoral mud*; IS - *Infralittoral sand*; CM - *Circalittoral mud*; CMS - *Circalittoral mixed sediments*; OCM- *Offshore circalittoral mud*; OCMS- *Offshore circalittoral mixed sediments*