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Seasonal dynamics and quantity distribution of zoobenthos in the north-west part of the South Caspian Sea

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ABSTRACT

The article is devoted to the study of seasonal dynamics and quantity of the zoobenthos distribution in the north-west part of the South Caspian Sea. During the research covering the period from 2009 until 2010, 59 macrobenthos organisms belonging to the ten systemic groups were identified. Maximum quantity of species was identified in spring and summer (31 - 59 species), while minimum in autumn (24 - 42 species). Maximum development of organisms was identified in summer (146.27 g m^{-2}), while minimum in autumn (77.12 g m^{-2}). The key role in the benthos biomass formation belonged to shellfish, comprising 67.7 to 69.1% of total benthos biomass.

Keywords: The South Caspian Sea, zoobenthos, biomass, number, distribution.

INTRODUCTION

The South Caspian Sea plays an important role in reproducibility of the seas fish stocks, as well as represents a main pasturage for anadromous and semi-anadromous fish. Noteworthy, the sturgeons overwinter in this region (Aladin & Plotnikov 2004). The South Caspian Sea is distinguished by the largest depth of about 1,000 m; average depth 325 m; by volume, 2/3 of depth of total water reservoir (63.67%) and by surface, 35.64%. The water depth of the sea is divided by comparatively shallow crest going to the east from Apsheron and having the depth not exceeding 200 m. The temperature conditions of the sea are specific and distinguished by non-uniformity in various regions. Usually, the water temperature in the surface layer as a whole levels up. The vertical temperature stratification of this region is maintained in winter; decreases from 8-9 °C to 7 °C at the depth from 100 to 200 m; then decreases to 5.7 - 5.9 °C in depth, at the bottom level (Aladin & Plotnikov 2004: Arekhi & Jamshidi 2018). Recently, the level fluctuations and intense oil production considerably affect the ecological state of the Caspian Sea. Notably, the sea pollution with oil and other toxic substances has had negative impact on sea organisms. The coastal zone of the Caspian Sea where about 80% of biomass of certain zoobenthos groups and species live is being extensively polluted with the oil. From this point of view, the ecological monitoring is necessary in the sea oil field facilities. That is why the detailed research on seasonal fluctuations in the number and biomass of certain zoobenthos groups and species, as a whole, as well as the analysis of conditions in any region of the sea, in particular, become more important. Hence, the main objective of this study is to assess seasonal dynamics and quantity distribution of zoobenthos in the north-west part of the South Caspian Sea.

Literature data analysis and problem statement

The first data on this fauna of the South Caspian Sea was reported by Grigorovich *et al.* (2002) and Erfani (2021). In addition, the study data of the zoobenthos species diversity and quantity in the west part of the sea was reported by Grigorovich *et al.* (2002), Łapińska & Szaniawska (2005), Anderson (2010) and Mirzoev (2020). The works by Anderson (2010), Karpinsky (2010) and Alamian *et al.* (2017) are devoted to the study of the zoobenthos species composition and quantity distribution of the sea. They identified 85 species of benthic organisms in the

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west part of the sea where the benthos biomass reached 288.2 g m^{-2}. It was noted that the benthic animals were mostly developed at the depth of 10-25 m, and sometimes 50 m. Łapińska & Szaniawska (2005) indicated 68 zoobenthos species for the west part of the South Caspian Sea. Among them, 12 species belong to crustaceans, and 15 species to shellfish. The average benthos biomass was 124.0 g m^{-2}, almost half the amount reported in 1962. The works of Mirzoev & Alekperov (2017) are devoted to the study of species composition and seasonal dynamics in the coastal waters of the west part and deep-water zones in Azerbaijan sector of the South Caspian Sea identifying 55 macrobenthic species belong to 7 systematic groups. In addition, in the deep-water zones, the authors identified 118 zoobenthos species belonging to 10 systematic groups, among them, 57 species are first detected exactly in the deep-water zones. The fishery of the Caspian Sea is developed under the influence of the seal level fluctuations and anthropogenic factors having negative impact on the quality development and distribution of benthic animals. So that, particular attention was paid to comprehensive studies of species diversity and quantity of macrozoobenthos in the most polluted (Byandovan and entry of Kura) sections.

Study objective and tasks

Constitute assessing seasonal dynamics and quantity distribution of zoobenthos in the north-west part of the South Caspian Sea in terms of the integrated effect of economic and anthropogenic factors. From this point of view, the main tasks are the following: 1- Identification of zoobenthos species composition by seasons. 2- Study of quantity distribution of zoobenthos by seasons.

MATERIALS AND METHODS

The materials for this work were own bottom samples collected from two sections (Byandovan and entry of Kura) and 12 biological stations of the north-west part of the South Caspian Sea during the period from 2009 through 2010. The work covered the depth reaching 100 m. Sampling was performed using the Van Veen and Ocean grab with the area of 0.1 and 0.025 m^2 , respectively.

Three samples were collected at each station. In total, three samples were collected and selected. Totally, 108 zoobenthos samples were collected and processed. The zoobenthos samples collection and processing were performed according to the common methods (Ostapchenko 1983; Rasuly *et al.* 2010). For analysis of the species and quantity variety of zoobenthos, we used mathematical methods developed by Sorensen (1948), Simpson (1949); Vajda (1950), Pielou (1966) and Shadrin *et al.* (2019).

We selected the organisms in the laboratory where the selected organism once been externally dried with filter paper was weighed on electronic scales to an accuracy of 0.1 mg, and then the fixed organisms were identified to the species. To characterize the zoobenthos population in various depths and soils, the species number (S), the individual number (N/m^2), biomass (B, g m^{-2}), and prevalence (P, %) were taken into account.

Taxonomical processing was performed according to Atlas of Invertebrates of the Caspian Sea (Birshtein 1968), Determinant of the Fauna of the Black and Azov Seas (Seregin & Popova 2016), Identification Keys for Fish and Invertebrates of the Caspian Sea (Sattari *et al.* 2005).

RESULTS AND DISCUSSION

In the present study on the zoobenthos of the Byandovanm Kura bar in the north-west part of the South Caspian Sea in 2009-2010, in total, 59 species of macrobenthic organisms belonging to 10 systematic groups were identified dominating by mollusca (13 species, 22%) and amphipoda (13 species, 22% of the fauna). Oligochaetes took the second (19%), and polychaetes the third place (13%).

The other groups are represented by species in Tables 1-4. In 2009, the total biomass of zoobenthos in the Byandovan section was 121.09 g m^{-2}, while the total number was 918 N/m^2. Among the macrobenthic organisms, mollusca prevailed by 69.1% in total biomass of benthos, while amphipoda prevailed by 22.1% in number. Maximum development of macrobenthic organisms was recorded during the spring and summer. The biomass of these organisms in spring and summer were 127.57 g m^{-2}, and 146.27 g m^{-2} respectively; the numbers were 955-1,174 N/m^2 respectively.

The univariate statistical data on zoobenthos shows a wide range of total number of zoobenthos from 19 to 43.

According to Simpson (1949), the dominance index of benthic animals varies from 0.73 to 0.82 with the average value of 0.77. The most of values were close to the average one. However, 12 stations showed significant decrease in value (0.73) which may be due to oil contamination of benthic sediments.

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In 2010, the total biomass of zoobenthos was 101.27 g m^{-2} with the number of 816 N/m^2 in the Kura bar section. Among the macrobenthic animals, the mollusca by 67.6% of total biomass of zoobenthos were the dominating groups. Decapods by 15.9% took the second, and acorn shells by 5.2% the third places.

Maximum development of benthos was noted in summer when the biomass was 118.91 g m^{-2} with the number of 981 N/m^2. During all seasons, mollusca dominated by 69.5% of total seasonal biomass in spring, 64.2% in summer, and 77.4% in autumn. According to statistical indicators of zoobenthos in the Kura bar section, the dominance index varied from 0.68 to 0.70 with the average value of 69%. The distribution of diversity and uniformity indices was similar to that of the dominance index.

The most of the values were close to the average one, but two stations showed significantly decreased values. However, notably, there have been no new data on species diversity, quantity and distribution of zoobenthos in the north-west part of the South Caspian Sea for the last 25 years. As a result of our study in 2009 in the Byandovan section, 43 species of zoobenthos belonging to 10 systematic groups were identified (Table 1). By the number of species, amphipoda prevailed by 26.0% of the total quantity of species. Mollusca took the second place by 21%, followed by oligochaetes by 14.0% and cumacea by 7 %. The other groups are represented by species in Tables 1-5 (Fig. 1).

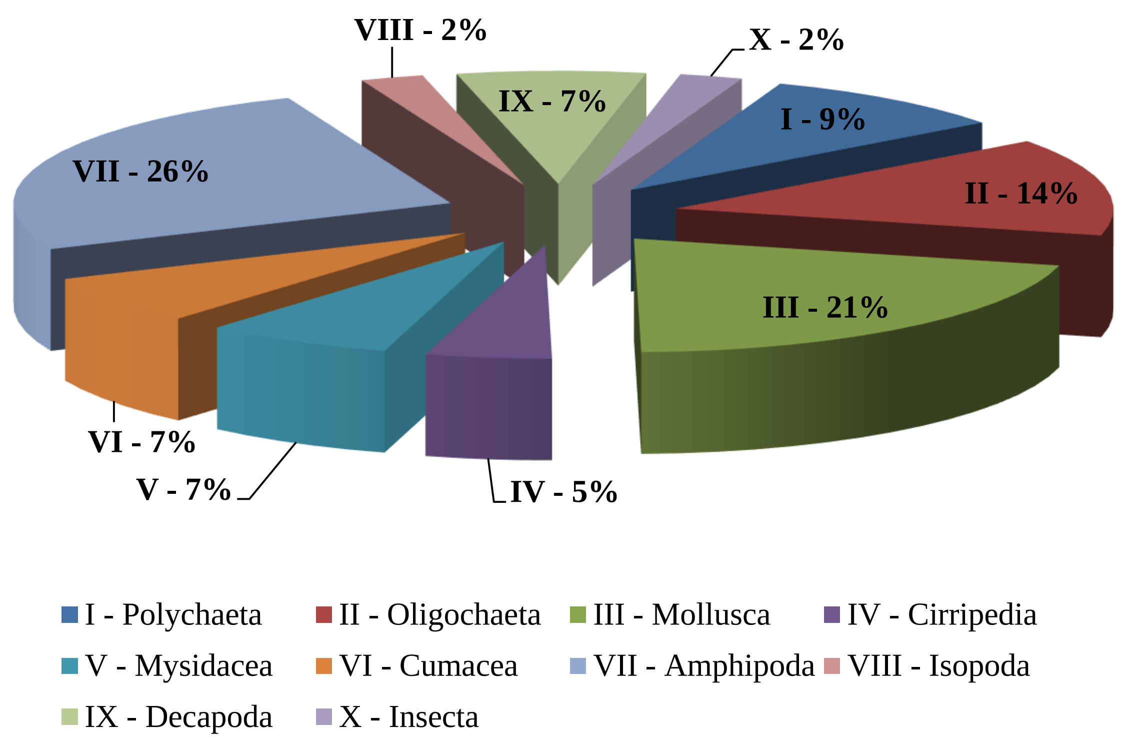

Fig. 1. Species composition of zoobenthos in the Byandovan section of the South Caspian in 2009.

The number of species in the north-west part (Byandovan section) is unstable; it varies by years and seasons. In 2009, 43 species of zoobenthos were identified in this section, among them, 31 species were recorded in spring, 43 in summer and 24 in autumn. *N. diversicolor, H. invalida, H. kowalewskii, Ps. deserticola, M. lineatus, A. ovata, D. longipes, M. amblyops, Sch. eudorelloides, N. maeoticus, N. robustoides, P. elegans,* and *C. marinus* prevailed in all seasons.

Forty-three species belonging to 10 systematic groups participated in the quality development of zoobenthos. The average annual biomass of zoobenthos during the year was 121.09 g m^{-2}, and number 918 N/m^2. Among the bottom animals, the mollusca by 69.1% of total biomass of zoobenthos were the dominating groups. Decapods by 14.7% took the second place, and acorn shells by 4.9% the third place. The lowest biomass indicators were noted in oligochaeta, i.e. 0.1% (Table 2, Fig. 2).

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Table 1. Species composition and seasonal dynamics of zoobenthos in the north-west part of the South Caspian Sea in 2009-2010.

Taxa	2009			2010		
	Spring	Summer	Autumn	Spring	Summer	Autumn
1	2	3	4	5	6	7
Polychaeta						
Nereis diversicolor Müller, 1976	+	+	+	+	+	+
N.succinea (Leucart1847)	+	+	+	+	+	+
Hypania invalida (Grube1860)	+	+	+	+	+	+
Hypaniola kowalewskii (Grimm1927)	+	+	+	+	+	+
Fabricina sabella caspica Zenkewitsch,1922	_	_	_	+	+	_
Manayunkia caspica Anninkova, 1929	-	-	-	+	+	-
Ficopomatus enigmatica (Fauvel1927)	-	-	-	-	+	-
Parhypanis brevispinis (Çrube1860)	-	-	-	+	+	-
Oligochaeta						
Psammoryctides deserticola Grimm,1877	+	+	+	+	+	+
Tubifex tubifex Müller, 1774	-	+	-	+	+	-
T.acapillatus Finogenova, 1972	-	-	-	-	+	-
Stylodrilus parvus (Hrabe et Cernosvitov 1927)	+	+	-	+	+	-
S. cernosvitovi Hrabe, 1950	+	+	-	+	+	+
İsochaetides michaelseni (Lastockin 1937)	-	+	-	+	+	+
Potamothrix grimmi (Hrabe 1950)	-	-	-	-	+	-
P. cekanovskayae Finogenova, 1972	-	+	-	+	+	-
P. caspicus Lastockin, 1937	-	-	-	+	+	-
Marionina. abberans Finogenova, 1973	-	-	-	-	+	-
Aktedrils svetlovi Finogenova,1972	-	-	-	-	+	-
Mollusca						
Mytilaster lineatus (Gmelin 1789)	+	+	+	+	+	+
Cerastoderma rhomboides Lamarck, 1812	+	+	+	+	+	+
C. isthmicum (İssel 1869)	+	+	+	+	+	+
Abra ovata (Philippi 1836)	+	+	+	+	+	+
Didacna profundicola Logvinenko et Starobagatov, 1966	-	-	-	+	+	+
D. baeri Eichwald, 1829	-	+	-	+	+	+
D. longipes (Grimm 1877)	+	+	+	+	+	+
D. puramidata Grimm, 1877	-	+	+	+	+	+
D. trigonoides praetrigonoides Nalivkin et Anisimov, 1915	-	-	-	+	-	+
Dreissena caspia Eichwald, 1855	-	+	-	+	+	+
D. rostroformis compressa Logvinenko et Starobogatov, 1966	-	-	-	+	+	-
D. elata (Andrusov 1897)	-	-	-	-	+	-
D. rostriformis pontocaspica Andrusov, 1897	-	+	-	+	-	-
Cirripedia						
Balanus improvisus Darwin, 1854	+	+	+	+	+	+
B. eberneus Gould, 1841	+	+	-	+	+	+
Mysidacea						
Mysis caspia Sars, 1895	+	+	-	+	+	+
M. amblyops Sars, 1907	+	+	+	+	+	+
Paramysis kessleri Sars, 1895	+	+	-	+	+	+
P. baeri Czerniavsky, 1882	-	-	-	-	+	-
P. lacustris (Czerniavsky 1882)	-	-	-	-	+	-
Cumacea						
Schizorhynchus eudorelloides (Sars 1894)	+	+	+	+	+	+
Pterocuma rostrata (Sars 1894)	-	+	-	+	+	+
Pt. pectinata (Sowinsky 1893)	-	-	-	+	+	+
Stenocuma diastyloides Sars, 1897	-	-	-	+	+	+
S. graciloides (Sars 1894)	-	-	-	+	+	+
S. gracilis Sars, 1894	-	+	+	-	-	-
Amphipoda						
Dikeroganmarus haemobaphes (Eichiwald 1841)	+	+	+	+	+	+
Çammaracanthus loricatus caspius (Sabine 1924)	+	+	-	+	+	-
Pseudalibratus caspius Sars, 1896	+	+	-	+	+	-

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Niphargoides grimmi Sars, 1896	-	+	-	+	+	+
N. robustoides (Grimm 1894)	+	+	+	+	+	+
N. maeoticus (Sowinskyi 1894)	+	+	+	+	+	+
N. carausui Derzhavin et Pjatakova, 1962	+	+	-	+	+	+
N. spinicaudatus Carausu, 1943	-	+	-	-	-	-
Pandorites podoceroides (Grimm 1880)	-	-	-	+	-	+
Gmelinopsis aurita Sars, 1896	+	+	-	+	+	-
Echinogammarus ischnus Stebbing, 1899	-	-	-	+	+	+
Monoporeia affinis (Lindström 1855)	-	+	-	+	+	+
Corophium chelicorne Sars, 1895	-	+	-	+	+	+
C. nobile Sars, 1895	+	-	+	+	+	+
İsopoda						
Saduria entomon caspica Sars,1897	+	+	+	+	+	+
Decapoda						
Palaemon elegans Rathke, 1884	+	+	+	+	+	+
P. adspersus Rathke, 1884	+	+	+	+	+	+
Rhiropanopeus harrisii tridentatus Maitland, 1898	+	+	+	+	+	+
İnsecta						
Chiranomus albidus Konstantinov, 1956	-	-	-	+	+	+
Clinio marinus Haliday, 1855	+	+	+	-	-	-
Sum	31	43	24	54	59	42

Table 2. Seasonal variations in biomass number of certain groups of zoobenthos in the Byandovan section in 2009 ($\frac{экз}{2}m^2$).

Groups	Quantity of species	Seasons			Average
		Spring	Summer	Autumn	
Polychaeta	4	$\frac{158}{0-31}$	$\frac{173}{0-35}$	$\frac{113}{0-21}$	$\frac{148}{0-29}$
Oligoshaeta	6	$\frac{147}{0-15}$	$\frac{155}{0-43}$	$\frac{95}{0-11}$	$\frac{132}{0-23}$
Mollusca	9	$\frac{166}{89-64}$	$\frac{210}{94-26}$	$\frac{110}{67-14}$	$\frac{162}{83-68}$
Cirripedia	2	$\frac{93}{5-58}$	$\frac{133}{9-18}$	$\frac{63}{3-30}$	$\frac{96}{6-02}$
Mysidacea	3	$\frac{45}{1-28}$	$\frac{63}{1-87}$	$\frac{28}{0-93}$	$\frac{45}{1-36}$
Cumacea	3	$\frac{59}{0-57}$	$\frac{67}{0-98}$	$\frac{39}{0-42}$	$\frac{55}{0-66}$
Amphipoda	11	$\frac{210}{5-20}$	$\frac{267}{7-34}$	$\frac{132}{3-32}$	$\frac{203}{5-29}$
Isopoda	1	$\frac{19}{3-04}$	$\frac{24}{3-84}$	$\frac{11}{1-25}$	$\frac{18}{2-71}$
Decapoda	3	$\frac{33}{18-80}$	$\frac{51}{24-31}$	$\frac{20}{10-60}$	$\frac{35}{17-90}$
Insecta	1	$\frac{25}{3-0}$	$\frac{31}{3-71}$	$\frac{15}{2-15}$	$\frac{24}{2-95}$
Total:	43	$\frac{955}{127-57}$	$\frac{1174}{146-27}$	$\frac{6268}{89-43}$	$\frac{918}{121-09}$

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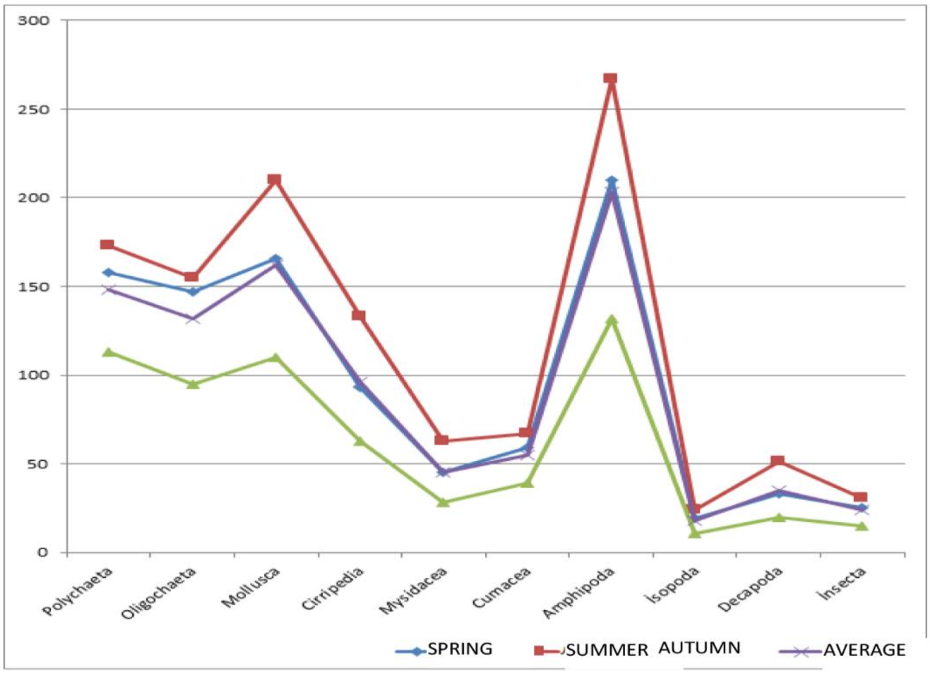

Fig. 2. Seasonal variations in number and biomass of certain groups of zoobenthos in the Byandovan section in 2009.

Maximum development of organisms was recorded during the spring and summer. The biomass of these organisms in spring was 127.57 g m^{-2} while the number was 955-1-174 N/m^2 respectively. The basis of the summer biomass of zoobenthos was formed by mollusca (64.4%). Minimum development of benthic animals was recorded in autumn by 89.43 g m^{-2} with the number of 626 N/m^2 (Table 2) which may be mainly due to the decreased environmental temperature and fading reproductive cycle of many invertebrates.

During all seasons, the biomass of zoobenthos was formed by eight species (*M. lineatus*, *C. rhomboides C. isthmicum*, *A. ovata*, *D. caspia*, *B. improvitus*, *P. elegans*, *R. harrisii tridentatus*). Among these species, the following ones prevailed during all seasons: *C. rhomboides* by 21.04 g m^{-2} (20 N/m^{-2}); *M. lineatus* by18.74 g m^{-2} (40 N/m^2); *A. ovata* by 18.04 g m^{-2} (36 N/m^2); *P. elegans* by 7.85 g m^{-2} (15 N/m^2) and *R. harrisii tridentatus* by 6.58 g m^{-2} (14 N/m^2). The univariate statistical data on zoobenthos shows a wide range of total number of zoobenthos from 123 to 420 N/m^2 and species number from 19 to 43 (Table 3).

Table 3. Univariate statistical indicators of zoobenthos in the Byandovan section in 2009.

Station	species number	Number (N/m^2)	Biomass (g m^{-2})	Dominance (Simpson)	Diversity (Shannon-Wiener)	Margalef Species Richness Index
11	19	123	21.34	0.82	0.56	0.46
12	24	152	24.82	0.73	0.57	0.44
13	43	420	38.18	0.78	0.44	0.37
14	40	282	32.37	0.79	0.54	0.39
15	37	197	29.56	0.73	0.63	0.42
Average	32	235	29.25	0.77	0.52	0.41

According to Simpson (1949) the dominance index of benthic animals varies from 0.73 to 0.82 with the average value of 0.77. The most of values were close to the average one but 12 stations showed significant decrease in value (0.73) which may be due to oil contamination of benthic sediments (Table 3). In 2010, 59 species of zoobenthos belonging to ten systematic groups were identified in the Kura bar section of the South Caspian Sea (Table 1). By the species number, mollusca (13 species, 22%) and amphipoda (13 species, 22% of the fauna) prevailed. Oligochaetes took the second place (11 species, 19%) and polychaetes the third (8 species, 13%) (Fig. 3). In 2010, the total biomass of zoobenthos was 101.27 g m^{-2} with the number of 816 N/m^2 in the Kura bar section. Among the benthic animals, mollusca by 67.6% of total benthic biomass were dominated. Decapods by 15.9% took the second place- and acorn shells with 5.2% the third one (Table 4). Maximum development of benthos was observed in summer (118.91 g m^{-2}) and minimum in autumn (77.12 g m^{-2}). During all seasons, mollusca dominated by 69.5% of total seasonal biomass in spring, 64.2% in summer and 70.4% in autumn. (Table 4, Fig. 4).

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Table 4. Seasonal variations in number and biomass of certain groups of zoobenthos in the Kura bar section in 2010 ($\frac{\text{экз}}{2}$m^2).

Groups	Quantity of species	Seasons			Average
		Spring	Summer	Autumn	
Polychaeta	8	$\frac{133}{0-28}$	$\frac{148}{0-34}$	$\frac{124}{0-16}$	$\frac{135}{0-26}$
Oligochaeta	11	$\frac{121}{0-14}$	$\frac{130}{0-16}$	$\frac{116}{0-10}$	$\frac{123}{0-14}$
Mollusca	13	$\frac{138}{74-96}$	$\frac{173}{76-38}$	$\frac{118}{54-32}$	$\frac{143}{68-55}$
Cirripedia	2	$\frac{82}{5-02}$	$\frac{92}{6-78}$	$\frac{69}{3-95}$	$\frac{81}{5-25}$
Mysidacea	3	$\frac{45}{1-28}$	$\frac{63}{1-87}$	$\frac{28}{0-93}$	$\frac{45}{1-36}$
Cumacea	4	$\frac{43}{0-45}$	$\frac{51}{0-95}$	$\frac{29}{0-31}$	$\frac{41}{0-57}$
Amphipoda	13	$\frac{193}{5-12}$	$\frac{250}{7-15}$	$\frac{151}{2-98}$	$\frac{198}{5-08}$
İsopoda	1	$\frac{13}{2-13}$	$\frac{18}{2-32}$	$\frac{8}{1-97}$	$\frac{13}{2-14}$
Decapoda	3	$\frac{27}{16-34}$	$\frac{47}{21-14}$	$\frac{18}{10-94}$	$\frac{30}{16-14}$
İnsecta	1	$\frac{19}{2-43}$	$\frac{25}{2-67}$	$\frac{10}{1-95}$	$\frac{18}{2-35}$
Total:	59	$\frac{798}{107-79}$	$\frac{981}{118-91}$	$\frac{669}{77-12}$	$\frac{816}{101-27}$

As compared to the summer period, the biomass of benthos gradually reduced in autumn which may be due to the end of development cycle of certain zoobenthos species (Table 4). In 2010, the dominating species of zoobenthos were 7 species of benthic animals in the Kura bar section, among them, *Cerastoderma* was dominated by biomass of 12.90 g m^{-2} (20 N/m^2). *Abra* by 7.87 g m^{-2} took the second place and crab by 7.33 g/m^2 was the third.

Statistical indicators of zoobenthos in the Kura bar section are given in Table 5. The Table shows that the dominance index varied from 0.68 to 0.70 with the average value of 0.69. The distributions of diversity and uniformity indices were similar to that of the dominance index. The most of the values were close to the average one but two stations showed significantly decreased values.

Table 5. Statistical indicators of zoobenthos in the Kura bar section in 2010

Station	Number of species	Number (N/m^2)	Biomass (g m^{-2})	Dominance (Simpson)	Diversity (Shannon-Wiener)	Margalef Species Richness Index
21	42	173	17.74	0.68	0.71	0.42
22	51	211	30.87	0.68	0.71	0.41
23	59	272	36.09	0.70	0.67	0.39
24	47	193	19.13	0.68	0.71	0.42
25	28	130	15.08	0.70	0.67	0.45
Average	45	195	23.78	0.69	0.69	0.42

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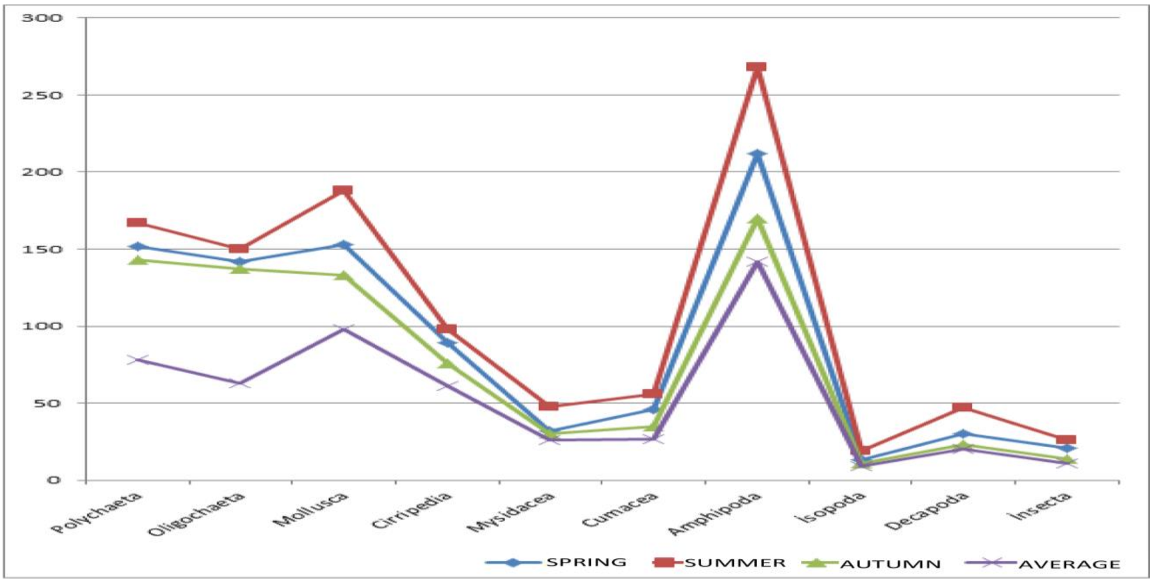

Fig. 4. Seasonal variations in number and biomass of certain groups of zoobenthos in the Kura bar section in 2010.

CONCLUSION

This study presents occasional elements and amounts of zoobenthos in the north-west part of the South Caspian Sea. During the examination covering the period from 2009 to 2010- 59 macrobenthos were distinguished by a place with the ten foundational bunches. Greatest numbers of species were found in spring and summer (from 31 to 59 species) and lowest in pre-winter (from 24 to 42 species). Most extreme improvement of life forms was distinguished in summer (146.27 g m^{-2}), while the lowest in harvest time (77.12 g m^{-2}). The vital part in the benthos biomass arrangement belonged to shellfish comprising 67.7 to 69.1% of absolute benthos biomass.

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پویایی فصلی و توزیع کمیت زئوبنتوزها در قسمت شمال غربی ناحیه جنوبی دریای خزر

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چکیده

هدف این مقاله، مطالعه‌ی پویایی فصلی و توزیع مقدار (کمیت) جانوران کف‌زی در بخش شمال غرب خزر جنوبی است. در طی تحقیق که از دوره‌ی ۲۰۰۹ تا ۲۰۱۰ طول کشید، ۵۹ ارگانیسم ماکروبنتوز متعلق به ده گروه سیستمی شناسایی شدند. حداکثر تعداد گونه‌ها در بهار و تابستان (از ۳۱ تا ۵۹ گونه) و حداقل تعداد در پاییز (از ۲۴ تا ۴۲ گونه) شناسایی شد. رشد حداکثر ارگانیسم‌ها در تابستان (۱۴۶/۲۷گرم بر مترمربع)، حداقل رشد در پاییز (۷۷/۱۲ گرم بر مترمربع) مشاهده شد. حلزون صدف دار که بیومس (زی‌توده) آن ۶۷ تا ۶۹/۱ درصد کل زیتوده جانوران کف‌زی را شامل می‌شود نقش کلیدی در تشکیل زیتوده کف دریا ایفا می‌کند.

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