

# Distribution of macrozoobenthos of Azerbaijan sector of the South Caspian Sea

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## Abstract

The article is devoted to the study of the species composition and distribution of macrozoobenthos in the coastal zones of the Azerbaijani sector of the southern Caspian Sea. The study (2008-2009) found 56 species belonging to seven systematic groups. The maximum number of species was observed in the spring and summer season (from 33 to 54 species), and the minimum - in the autumn season (from 25 to 30 species). The average annual biomass of macrozoobenthic organisms varied in the range of 63.33-67.69 g / m<sup>2</sup>, and the number of 306-323 ex/m<sup>2</sup>. The maximum development of organisms was observed in summer (81.07 g / m), the minimum-in autumn (48.10 g / m<sup>2</sup>). In terms of species and quantity, the fauna of the silt - shell biotope is the richest, where the total biomass ranges from 93.24 to 94.83 g / m<sup>2</sup>, with a population of 275-285 species/m<sup>2</sup>.

**Keywords:** South Caspian, macrozoobenthos, distribution, biomass, abundance

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## INTRODUCTION

The southern Caspian plays an important role in the reproducibility of marine fish stocks. There are the main pastures of passing and semi-passing fish. In this area of the sea the sturgeon also spend winter (Kasymov 1987, Mirzoev 2008, 2011).

In recent years, fluctuations in the level of the Caspian Sea and intensive oil production have strongly affected its environmental condition. The main causes of fluctuations in the level of the Caspian Sea are tectonic activity that changes water exchange through the sea floor and changes in solar activity, as a result of violation of atmospheric circulation. Based on the above, the increase in the level will have a positive impact on the development of fisheries and the ecology of the Caspian Sea. Therefore, conducting scientific research of macrozoobenthos developing in the new ecological conditions of the Caspian Sea is of great theoretical and practical importance, since these organisms are not only fodder for commercial fish, but also constitute an important link in the historically formed food chain in the Caspian Sea ecosystem (Kasymov 1987, 1994).

In this regard, the main purpose of this study is to study macrozoobenthos in new environmental conditions in the Western coast of the southern Caspian Sea.

## Analysis of Literature Data and Formulation of Problems

Information about the species diversity and distribution of macrozoobenthos in the coastal waters of

the southern Caspian are presented in the works of A. D. Aliyev (1), V. M. Hasanov (4), and A. G. Kasimov (Kasymov 1987, Kasymov 1994, Mirzoev and Alekperov 2017), Mirzoev (2008, 2011). The works of Aliyev (1968) are devoted to the species composition and distribution of zoobenthos in the waters of the Middle and southern Caspian. The author identifies 85 species of bottom animals living in the waters of the Western part of the southern Caspian Sea, of which mollusks accounted for 39.9%, and crustaceans - 61.9 % of the fauna. The average benthos biomass reached -288.2 g / m<sup>2</sup>.

As a result of the research conducted by Kasimov (1987, 1994) in 1976-1977, 50 species of these animals were observed in the Western part of the southern Caspian Sea. The number of species was dominated by crustaceans - 68 % of the fauna. The average benthos biomass in 1976 was 58.76 g / m<sup>2</sup>, in 1977 - 79.82 g / m<sup>2</sup>.

The works of G. S. Mirzoev (Mirzoev 2008, Mirzoev 2011, Shannon and Weaner 1963, Sorensen 1948) are devoted to the study of species composition and quantitative distribution of zoobenthos in the deep-water zones of the Azerbaijani sector of the Caspian Sea. The author pointed out 118 species of zoobenthos living in the deep-water zones of the Azerbaijani sector of the southern Caspian Sea belonging to 10 systematic

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groups, where 57 species were first discovered for the deep-water zones. The maximum number of species observed in depths of 200-300 m (118 species), and the minimum - at depths of 900-1000 m (6 species).

In the Western part of the southern Caspian Sea, oil pollution has a negative impact on the production of forage organisms, so there is a weak development of bottom animals and low catches of benthic fish. In this regard, the main attention was paid to a comprehensive study of the species and quantitative diversity of macrozoobenthic animals in the most polluted (Shikhovskiy, Alyatskiy, Byandovanskiy) sections.

**The aim and objectives of the study is** to study the species and quantitative diversity of macrozoobenthos of the Western part of the southern Caspian Sea under the conditions of complex impact of environmental and anthropogenic factors.

In accordance with the purpose of the study the following tasks are set:

- to identify species composition of macrozoobenthos in the seasons of the year;
- to study the quantitative distribution of macrozoobenthos by season;
- to consider the quantitative distribution of macrozoobenthos by biotopes.

## MATERIAL AND TECHNIQUE

The material for this study was collected by us in different periods starting from 2008 - 2009 in the coastal waters of the Azerbaijani sector of the southern Caspian Sea.

Collection and processing of benthic samples were carried out according to the generally accepted method (12, 15). The samples were recorded in a 4% solution of formalin with the addition of eosin. The material for this conclusion was its own bottom-scooping charges from the sections and 12 biological stations. Samples were taken with a Petersen-type dredger with a capture area of 0.025 m<sup>2</sup>. Three samples were taken at each station. A total of 158 samples of zoobenthos were collected.

To analyze the species and quantitative composition of macrozoobenthos diversity, we used mathematical methods developed by Vorobiov (Vorobyov 1949), Shan-Vener, Sorensok, etc.

Selection of organisms was carried out in laboratory conditions, where the selected organism after external drying with filter paper was weighed on electronic scales with an accuracy of 0.1 mg, and then the recorded organisms were identified to the species.

Taxonomic treatment was carried out according to the book "Atlas of invertebrates of the Caspian Sea" (Atlas of invertebrates of the Caspian Sea 1968), "Determinant of fauna of the Black and Azov seas" (Key to the fauna of the Black and Azov Seas 1969).

## RESULTS

As a result of our studies in the coastal waters of the Azerbaijani sector of the southern Caspian in 2008-2009, 56 species of macrozoobenthic organisms belonging to 7 different systematic groups were registered.

Of the species found, mollusks predominate in number, accounting for 42.8% of the total number of species. Second place is taken by amphipods -28.5%, followed by Cumulus 8.9%. Other groups are represented by 2-3 species.

It was found in the study of macrozoobenthos Shikhovskiy section given in that the total biomass of macrozoobenthos is 63.33 g / m<sup>2</sup>, and the number -306 species/m<sup>2</sup>. Among bottom animals on biomass the dominant position was occupied by mollusks -72.9% of all biomass of benthos, and on number of benthos – amphinodes.

The maximum development of macrobenthic organisms was observed in the spring-summer season. The biomass of these organisms in the spring season was 60.84% g / m<sup>2</sup>, in the summer season-81.07 g / m<sup>2</sup>, and the number of respectively 307-406 ex/m<sup>2</sup>.

In 2009, the total biomass of macrozoobenthos in the Alat section was 67.69 g / m<sup>2</sup>, with a population of 323 species/m<sup>2</sup>. Among the demersal species by biomass, the dominant groups are shellfish (71,94%) of the total biomass of benthos. In second place in biomass are decapods -15.04%, in third place barnacles - 6.7%.

The maximum development of macrozoobenthic organisms was noted in the summer season, where their biomass was equal-81.94 g / m<sup>2</sup>, with a population of 414 species/m<sup>2</sup>.

When studying the distribution of macrozoobenthos of the southern Caspian in 2014-2015 on biotopes, the unequal distribution of macrozoobenthos biomass on separate groups was established. (Embrandiri et al. 2019)

Comparison of macrozoobenthos of individual biotopes in the Western part of the southern Caspian shows that the fauna of the silt-shell biotope is the richest in species and quantity, where the total biomass ranges from 93.24 to 94.83 g / m<sup>2</sup>, with the number of 275-285 species/m<sup>2</sup>. In all habitats the biomass was dominated by molluscs components 71,06-77,71% of the total biomass of benthos.

## DISCUSSION

As a result of our research conducted in 2008-2009, 56 species of macrozoobenthic organisms belonging to 7 different systematic groups were registered in the coastal waters of the Azerbaijani sector of the southern Caspian Sea (**Table 1**).

According to **Table 1**, it can be seen that the number of species is dominated by mollusks, which account for 42.8% of the total number of species. The second place

**Table 1.** Species composition and seasonal distribution of macrozoobenthos of the Azerbaijani sector of the southern Caspian in 2008-2009

Taxons	2008			2009		
	Spring	Summer	Autumn	Spring	Summer	Autumn
<i>Nereis diversicolor</i> Müller	+	+	+	+	+	+
<i>N.succinea</i> (Leucart)	+	+	+	+	+	+
<i>Hypania invalida</i> (Grube)	+	+	+	+	+	+
<b>Polychaeta</b>						
<i>Mytilaster lineatus</i> (Gmel)	+	+	+	+	+	+
<i>Dreissena polymorpha</i> (Pall.)	—	+	+	—	+	—
<i>D.elata</i> (Andr.)	—	+	—	—	+	—
<i>D.caspia</i> Eichw.	—	+	—	—	+	—
<i>Cerastoderma rhomboides</i> Lamarck	+	+	+	+	+	+
<i>C.isthmicum</i> Issel	—	+	—	+	+	—
<i>Didacna trigonoides praetrigonoides</i> Nal.et Anis.	+	+	—	+	+	+
<i>D.longipes</i> (Grimm)	—	+	—	+	+	—
<i>D.barbotdermarnyi</i> (Grimm)	—	+	—	—	+	—
<i>Hypania plicata</i> Eichw.	—	+	—	—	+	—
<i>H.caspia filatovae</i> Logv.et Star.	—	+	—	—	+	—
<i>H.vitrea vitrea</i> (Eichw.)	—	+	—	+	+	+
<i>H.minima ostroumov</i> Logv.et Star.	—	+	—	+	+	—
<i>Abra ovata</i> (Phill.)	+	+	+	+	+	+
<i>Caspiohydrobia convixa</i> Long.et Star	+	—	+	—	+	+
<i>C.eichwaldiana</i> Gol.et Star.	—	+	—	+	—	—
<i>C.conica</i> Logv.et Star.	—	+	—	—	+	+
<i>C.parva</i> Long.et Star	—	+	—	—	+	+
<i>C.turrita</i> Logv.et Star.	—	—	+	—	+	—
<i>C.dubia</i> Long.et Star.	+	—	+	—	+	+
<i>C.gemmata</i> (Kol.)	+	—	+	—	+	—
<i>C.oviformis</i> Logv.et Star	+	—	—	+	+	+
<i>C.subconvexa</i> Long.et Star	+	—	—	+	+	—
<i>C.chrysopsis</i> (Kol.)	—	+	+	+	+	+
<b>Mollusca</b>						
<i>Balanus improvisus</i> Darwin	+	+	+	+	+	+
<i>B.eburneus</i> Gould	+	+	+	—	+	+
<b>Cirripedia</b>						
<i>Paramysis baeri</i> Czern.	—	+	—	+	+	+
<i>P.kessleri</i> Sars	+	—	—	—	+	—
<i>P.lacustris</i> (Cz.)	—	+	+	+	+	+
<b>Mysidacea</b>						
<i>Schizorhynchus bilamellatus</i> (Sars)	+	—	—	—	+	+
<i>Pterocuma sowinskyi</i> (Sars)	+	—	—	—	+	—
<i>Pt.pectinata</i> (Sow.)	+	+	—	+	+	—
<i>Stenocuma tenuicauda</i> (Sars)	—	+	—	—	+	—
<i>S.gracilis</i> (Sars)	—	—	+	+	+	+
<b>Cumacea</b>						
<i>Dikerogammarus haemobaphes</i> (Eichw.)	+	+	+	+	+	+
<i>D.aralensis</i> (Ulj.)	—	+	—	—	+	—
<i>Niphargoides compactus</i> Sars	—	+	—	—	+	+
<i>N.grimmi</i> Sars	+	+	+	+	+	+
<i>N.robustoides</i> (Grimm)	+	+	+	+	+	+
<i>N.crassus</i> (Grimm)	+	—	+	—	+	—
<i>N.abbreviatus</i> (Sars)	—	+	+	—	+	+
<i>N.obesus</i> (Sars)	+	+	—	+	+	—
<i>N.maoticus</i> (Sow.)	+	+	+	+	+	+
<i>N.compressus</i> (Sars)	—	+	—	—	+	—
<i>N.similis</i> (Sars)	+	+	+	+	+	+
<i>N.caspicus</i> (Grimm)	+	+	+	+	+	+
<i>N.corpulentus</i> (Sars)	+	+	—	+	+	—
<i>N.spinicaudatus</i> Car.	+	+	—	+	+	—
<i>N.derzhavini</i> Pjatakova	—	+	—	+	+	—
<i>N.sarsi</i> (Sow.)	—	+	—	+	+	—
<b>Amphipoda</b>						
<i>Palaemon elegans</i> Rathke	+	+	+	+	+	+
<i>P.adspersus</i> Rathke	+	+	+	+	+	+
<i>Rithropanopeus harrisi</i> tridentatus (Mait.)	+	+	—	+	+	—
<b>Decapoda</b>						
<b>Total:</b>	<b>31</b>	<b>45</b>	<b>25</b>	<b>33</b>	<b>56</b>	<b>30</b>

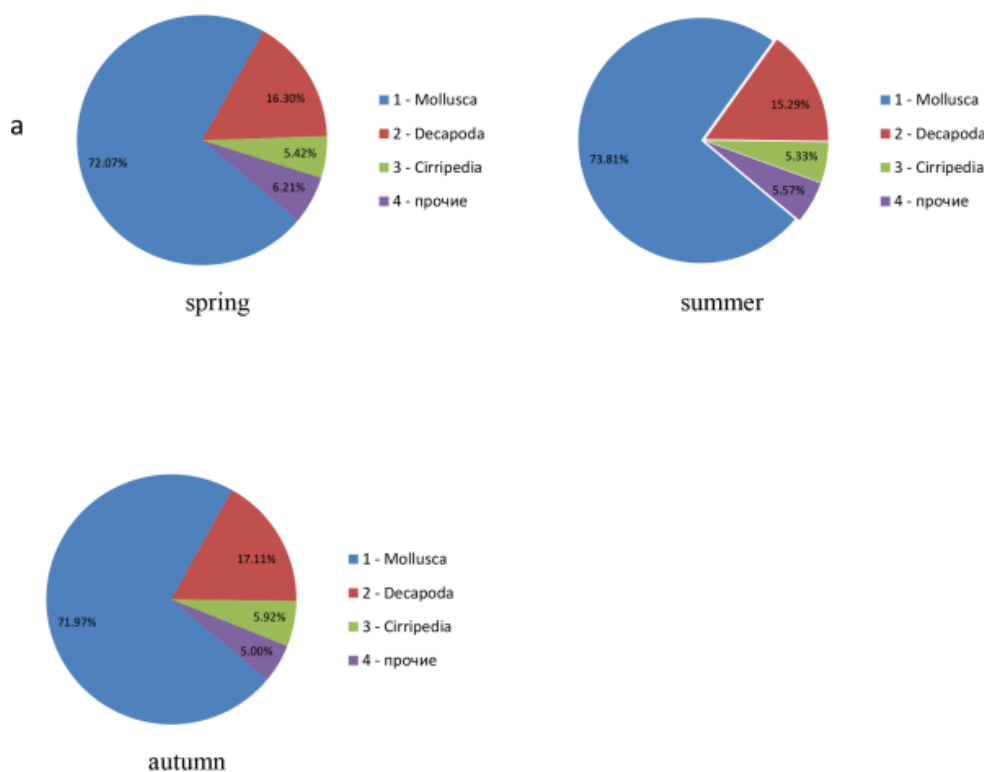
in benthos is occupied by amphipods-28.5%, followed by Cumulus-8.9%. Other groups are represented by 2-3 species.

The number of macrozoobenthos species in the coastal zones of the Azerbaijani sector of the southern Caspian is unstable and varies by year and season. In

2008, 45 species of macrozoobenthos were recorded in the Shikhov section, of which 31 species were recorded in spring, 45 species in summer and 25 species in autumn. In all seasons of the year, the main role in the enrichment of the species composition of macrozoobenthos belonged to mollusks, which

**Table 2.** Seasonal changes in the sections of Shihovskiy Alat and South of the Caspian Sea from 2008 to 2009

Years Toxons	2008				2009			
	seasons				seasons			
	spring	summer	autumn	middle	spring	summer	autumn	middle
Polychaeta	37	57	30	41	10	12	5	9
	0,53	0,64	0,36	0,51	0,18	0,20	0,10	0,16
Mollusca	67	84	44	65	77	100	48	75
	43,85	59,84	34,62	46,10	48,85	60,54	36,72	48,70
Cirripedia	16	25	13	18	24	24	44	31
	3,30	4,32	2,85	3,49	4,98	5,32	3,33	4,54
Mysidacea	13	22	10	15	26	33	18	26
	0,47	0,68	0,32	0,49	0,76	0,92	0,45	0,71
Cumacea	21	31	14	22	30	44	19	31
	0,28	0,41	0,15	0,28	0,58	0,68	0,38	0,54
Amphipoda	128	164	84	125	148	174	114	145
	2,49	2,78	1,57	2,28	3,59	1,88	2,58	2,68
Decapoda	25	23	12	20	14	20	9	14
	9,92	12,40	8,23	10,18	9,92	12,40	8,23	10,18
Total:	307	406	207	306	329	407	257	331
	60,84	81,07	48,10	63,33	68,86	81,94	52,27	67,69

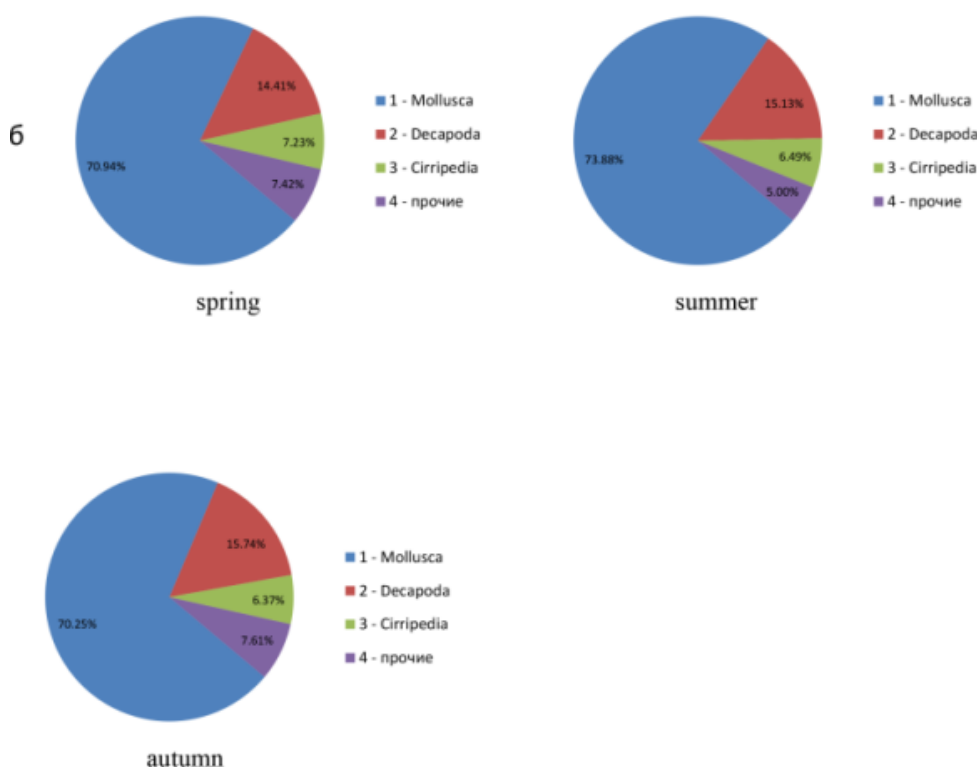
**Fig. 1.** Seasonal changes in the biomass of individual macrozoobenthos groups in the Azerbaijan sector of the South Caspian in 2008 (a) and 2009 (b)

accounted for 29% in spring, 40% in summer and 36% in autumn of the total number of species. The macrozoobenthos in all seasons of the year were dominated by species *N. diversicolor*, *M. lineatus*, *C. rhomboides*, *A. ovata*, *N. robustoides*, *N. maeticus*, *D. haemobaphes*, *N. grimmi*, *B. improvisus*, *P. elegans*. This year, the average annual biomass of macrozoobenthos at the Shikhovsky section amounted to 63.33 g / m<sup>2</sup>, and the number - 306 species/m<sup>2</sup>.

Among bottom animals on biomass the dominant position was occupied by mollusks-72,9% from all biomass of benthos, and in number are amphipods-

44,8% of all population of benthos. Decapods were in second place in biomass 16.07%, barnacles were in the third 5.51%. The lowest numbers were observed in mizids (13 specimens / m<sup>2</sup>), and in biomass-in cumin crustaceans (0.28 g / m<sup>2</sup>) (**Table 2**).

The maximum development of macrobenthic organisms was observed in the spring-summer season. The biomass of these organisms in the spring season was 60.84% g / m<sup>2</sup>, in the summer season-81.07 g / m<sup>2</sup>, and the number, respectively, 307-406 species/m<sup>2</sup> (**Table 2**, **Fig. 1**). The basis of the summer biomass of benthic animals were mollusks, which accounted for



**Fig. 1 (continued).** Seasonal changes in the biomass of individual macrozoobenthos groups in the Azerbaijan sector of the South Caspian in 2008 (a) and 2009 (b)

73.8% of the benthic biomass. The minimal development of benthic animals was observed in autumn (48.10%), with the number of 207 species/m<sup>2</sup> (**Table 2**). This is due to lower ambient temperature and attenuation of the reproductive cycle in many invertebrates.

In all seasons of macrozoobenthos biomass 7 species were formed (*C. rhomboides*, *A. ovata*, *M. lineatus*, *P. elegans*, *R. harrisii tridentatus*, *B. improvisus*, *P. adspersus*). Of these species in biomass in all seasons dominated *M. lineatus*-12.39 g / m<sup>2</sup> (13 copies / m<sup>2</sup>), *C. rhomboides*-9.52 g / m<sup>2</sup> (11ekz. / m<sup>2</sup>), *A. ovata*-10.44 g/m<sup>2</sup> (12ekz \ m<sup>2</sup>), *P. elegans*-5.58 g/m<sup>2</sup> (19 EKZ/m<sup>2</sup>) (**Table 1**).

In 2009, 56 species of macrobenthic organisms belonging to 7 systematic groups were observed in the coastal waters of the Alat section of the Azerbaijani sector of the southern Caspian Sea. The number of species is dominated by mollusks, which account for 42.8 of the total number of species. The second place is occupied by amphipods-28.5% and the third - (48.9%) cumin crustaceans (**Table 1**).

It should also be noted that in the composition of macrozoobenthos in all seasons of the year dominated species *N. diversicolor*, *H. invalida*, *M. lineatus*, *C. rhomboides*, *A. ovata*, *B. improvisus*, *P. lacustris*, *D. haemobaphes*, *N. grimmii*, *N. robustoides*, *P. elegans*, *R. harrisii tridentatus*.

This year, the total biomass of macrozoobenthos in the Alat section has amounted to 67.69g / m<sup>2</sup>, and the number-32.3 species/m<sup>2</sup>. Among macrozoobenthos dominant groups are mollusks-(71.94%) of the benthic biomass, the second place in biomass are decapods-(15.04%), and the third-barnacles (6.71%). Minimum biomass indices were observed in polychaetes (0.2%) (**Table 2**).

The maximum development of macrozoobenthic organisms was observed in the summer season, where their biomass was 81.94 g / m<sup>2</sup>, with a population of 414 species/m<sup>2</sup>. The basis of the summer biomass of benthic organisms were mollusks (73.8%), decapods (15.1%) and barnacles (6.4%). In autumn (52.27 g / m<sup>2</sup>) with the number (227 EQ/m<sup>2</sup>), compared with the summer season, in autumn there is a constant decrease in benthic biomass, which is mainly due to the end of the development cycle of individual benthic species (**Table 2, Fig. 1**).

It is also worth noting that, according to a number of scientists (Kasymov 1987, Key to the fauna of the Black and Azov Seas 1969, Mirzoev 2011) in the distribution of macrozoobenthos, the nature of the soil plays an important role. In the study of macrozoobenthos in the Western part of the southern Caspian Sea, we observed 4 biotopes: silt, silt-sand, silt-shell and sand.

In 2008 – 2009, when studying the distribution of macrozoobenthos in the Western part of the southern



**Table 3.** Seasonal changes of macrozoobenthos in the Shikhovsky and Alyat sections of the southern Caspian in 2008-2009 (species/g \* m2)

Years	Quantity of species	2008				2009			
		Biotops				Biotops			
		Silty	Silty-sandy	Silty-shelly	Sandy	Silty	Silty-sandy	Silty-shelly	Sandy
Polychaeta	3	60 0,68 71	40 0,53 67	56 0,83 98	- - 23	5 0,17 78	9 0,19 83	14 0,28 118	- - 25
Mollusca	24	51,38	53,59	67,39	12,04	55,70	55,88	72,46	15,66
Cirripedia	2	17 3,92	15 4,04	27 4,98	5 1,02	15 3,89	17 3,73	22 4,75	7 1,59
Mysidasea	3	11 0,32	14 0,51	29 1,13	-	24 0,74	40 0,90	52 1,20	-
Cumacea	5	18 0,27	22 0,30	43 0,55	-	30 0,57	35 0,57	51 1,02	-
Aphipoda	16	45 0,18	68 0,35	-	435 8,59	78 1,02	128 1,45	-	413 8,25
Decapoda	3	11 7,40	13 7,67	32 19,95	4 5,70	11 10,15	15 10,28	18 13,53	4 6,76
Total:	56	233 64,15	239 66,99	285 94,83	467 27,35	241 72,24	327 73,05	275 93,24	449 32,26

Caspian Sea by biotopes, it was found that the distribution of macrozoobenthos biomass for individual groups was unequal. **Table 3** shows that the richest in species composition and quantitative development of silt-shell soil, which found 37-40 species belonging to 7 systematic groups. The number of species is dominated by mollusks, which account for 56.7-60.0 % of the total number of species. The second place is occupied by Cumulus crustaceans-12.5-13.5 %, then decapods-7.5-8.1%, and the remaining groups are represented by 1-3 species. In this biotope, the total biomass of macrozoobenthos is 93.24-94.83 g / m2, with a population of 275-285 species/m2. Mollusks (71.0 – 77.7 %) from all benthic biomass dominate among bottom animals on biomass, on the second place on biomass of decapods (15.3-21.0%), on the third – barnacles (5.2-5.4%) (**Table 3**). It should be noted that amphipods were not found on this biotope (**Table 3**). The dominant species in this biotope are *N. diversicolor*, *H. invalida*, *M. lineatus*, *C. rhomboides*, *A. ovata*, *B. improvisus*, *P. lacustris*, *Pt. pectinata*, *P. elegans*, *R. harrisii tridentatus*.

According to the species and quantitative composition of macrozoobenthos, the second place is occupied by silty-sandy biotope. In 2008 it was established that 37 species were found on this biotope, and in 2009 – 50 species belonging to 7 groups. In all years, the number of species is dominated by mollusks, which account for 24.3-36.0 % of the total number of species. Second place is occupied by amphipods of 32.0 – 32.4 per cent, then memovie crustaceans 10,0 down 13.5%, and the remaining groups are represented by 2-3 species. The dominant species of this biotope are *N. diversicolor*, *H. invalida*, *M. lineatus*, *C. rhomboides*, *A. ovata*, *B. Improvisus*, *P. lacustris*, *Pt. pectinata*, *P. elegans*, *R. harrisii tridentatus*, *N. maeoticus*, *D. haemobaphes*, *N. grimmi*, *N. robustoides*, *S. gracilis*, *P. baeri*. In 2014, the total benthos biomass on this biotope was 66.99 C, with 239 species / m2, and in 2009 - 73.05 g / m2, with 327 species/m2.

Compared with other biotopes, the minimum abundance and biomass of macrozoobenthos were recorded on a sandy biotope. On this biotope, only 27 species belonging to 3 groups were identified. According to a study on the number of species, amphipods are the dominant groups, which account for 59.2% of the total number of species, followed by mollusks - 29.6%, then decapods - 7.4%. In this biotope, the total biomass of benthos is 32.26 g / m2, with a population of 449 ind./ m2. The macrozoobenthos biomass was based on mollusks (48.5%) and amphipods (25.5%), where the dominant species of this biotope are *M. lineatus*, *C. rhomboides*, *A. ovata*, *B. improvisus*, *P. lacustris*, *N. maeoticus*, *N. robustoides*, *D. haemobaphes*, *P. elegans*, *N. similis*.

## CONCLUSIONS

1. In macrozoobenthos in sections (Shikhovo and Alat) in the western part of the South Caspian, 56 species, bottom animals were recorded, among them the leading group by the number of species are mollusks (24 species) and amphipods (16 species).

2. The average annual biomass of macrozoobenthos in sections (Shikhovo, Alat) in the western part of the South Caspian ranged from 63.33 to 67.69 g / m2, with a population of 306-323 species/ m2. The largest biomass of macrozoobenthos is observed in summer (81.07 g / m2), and the minimum - in autumn (48.10 g / m2). The main role in the formation of benthos is played by 9 species of benthic animals, among which mollusks predominated by biomass, their biomass ranged from 71.94 to 72.39 % of the total biomass of the bottom fauna.

3. A comparison of the macrozoobenthos of individual biotopes and sections (Shikhovo and Alat) in the western part of the South Caspian shows that the species and quantitatively richest species are represented by the fauna of the torus and biotope, where the total biomass ranges from 93.24 to 94.83 g / m2, of

275–285 species/m<sup>2</sup>, this is explained by the fact that the silt – shell biotope is a favorable substrate for both attached organisms and burrowing forms. It is worth noting that this biotope is also rich in nutrients, detritus, microorganisms and algae. Shellfish dominated

biomass in all biotopes, accounting for 71.06 - 77.71% of the total benthos biomass. The minimum biomass of mollusks was noted by the sandy biotope and amounted to only 15.66 g / m<sup>2</sup>.

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