RESEARCH ARTICLE

SABRAO Journal of Breeding and Genetics
58 (1) 171-180, 2026
http://doi.org/10.54910/sabrao2026.58.1.16
http://sabraojournal.org/
pISSN 1029-7073; eISSN 2224-8978

GENETIC DIVERSITY AND DISTRIBUTION OF MACROZOOBENTHOS SPECIES IN SOUTH CASPIAN SEA SECTOR OF AZERBAIJAN

M. HUSEYNOV[1]*, G. MIRZOEV[1], R. SADIGOV[1], and A. BILGIN[2]

[1]Azerbaijan State University of Economics, UNEC, Baku, Azerbaijan
[2]Artvin Çoruh University, Artvin, Turkey
*Corresponding author's email: movlud.huseynov@unec.edu.az
Email addresses of co-authors: garay_mirzayev@unec.edu.az, ramil_sadigov@unec.edu.az, ayla.bilgin@artvin.edu.tr

SUMMARY

The following study aimed to investigate the macrozoobenthos species composition, depth distribution, and seasonal variations in the South Caspian Sea sector of Azerbaijan. During the study period of 2018 to 2019, the identified macrobenthic organisms totaled 56, representing 10 systematic groups in the Azerbaijan sector of the South Caspian Sea. The most recorded species resulted in spring and summer (48–56 species), while the lowest appeared in autumn (28 to 32 species). The average annual biomass of macrozoobenthos ranged from 166.36 to 192.10 g/m², with a density of 1,281 to 1,994 specimens/m². These organisms with peak development occurred in summer (201.29 to 239.75 g/m²), while the lowest manifested in autumn (134.17 to 138.9 g/m²). Mollusks play a primary and vital role in the formation of the benthos biomass, comprising 63.8% to 64.9% of the total biomass. Species diversity and abundance were the highest at the sea depth of 25–50 m, with a total biomass and density range from 210.96 to 259.91 g/m² and 1,774 to 1,913 specimens/m², respectively.

Keywords: Macrozoobenthos, species composition and distribution, biomass, density, quantity, sea depth, seasons, South Caspian Sea, Azerbaijan

Key findings: By investigating the macrozoobenthos species composition, depth distribution, and seasonal variability, the identified macrobenthic organisms totaled 56, with an average annual biomass and density in the South Caspian Sea sector of Azerbaijan.

Communicating Editor: Dr. Sajjad Hussain Qureshi

Manuscript received: June 25, 2025; Accepted: August 06, 2025.

Citation: Huseynov M, Mirzoev G, Sadigov R, Bilgin A (2026). Genetic diversity and distribution of macrozoobenthos species in South Caspian Sea sector of Azerbaijan. *SABRAO J. Breed. Genet. 58 (1) 171-180. http://doi.org/10.54910/sabrao2026.58.1.16*.

INTRODUCTION

The Caspian Sea is the largest natural body of water on Earth. With the natural and climatic influences, it experiences periodic variations in water level. According to observations made in the Caspian Sea over the last 400 years, the lowest water level (a drop of 29 m) achieved its record in 1977. Currently, the Caspian Sea's water level stands at 28 m below the level of the World Ocean (Mirzoev, 2019; 2021; Huseynov *et al.,* 2025; Salimov and Huseynov, 2025). Hydrologically and by bottom topography, dividing the Caspian Sea resulted in three sections—the North, Central, and South Caspian. This division has lines marked conventionally extending across the islands of Chechen-Tyub, Karagan, and Jiloy Kuuli (Mirzoev, 2021; Leroy *et al.,* 2022; Salimov *et al.,* 2025).

The soils within the Caspian Sea are diverse, showing complex topography of its seabed (Kenzhegaliev *et al.,* 2018; Seyedvalizade *et al.,* 2021; Kanbetov *et al.,* 2022). The South Caspian covers an area of 1,486,400 km², accounting for 39.3% of the sea's total area. It reaches a maximum depth of 1,025 m, with an average depth of 345 m. Most of this area (62.2%) has depths of up to 100 m, while the depth of 1.0% of the Caspian Sea's area exceeds 900 m. On the western shelf of the Southern Caspian Sea, the seabed comprises silt-sand, silt-shell, and sandy soils. In this region, the water transparency ranges from 1.5 to 18 m (Gasimov, 1987; Sadigov *et al.,* 2024; Asadullayev *et al.,* 2024).

In the surface layer of the deep-water zone of the Southern Caspian during 2018 and 2019, generally, the water temperature ranged from 6.2 °C to 11.5 °C, with seasonal variations, i.e., spring temperature (6.2 °C to 10.5 °C), summer (7.2 °C to 12.8 °C), and in autumn, it ranged from 5.7 °C to 9.0 °C. In this zone, the water salinity level ranges between 12.6% and 13.0% in spring, while in summer at the depth of 200 m, it ranges between 12.5% and 12.9%. By autumn, in the South Caspian water, the salinity varies from 12.5% to 13.0% (Gasimov, 1987). The Southern Caspian Sea is vital for sustaining fish stocks across the sea. Some regions of the South Caspian Sea contain primary pastures for both anadromous and semi-anadromous fish in particular areas.

In previous years, the decline in Caspian Sea level and intensified oil production have considerably affected its ecological balance. Consequently, the presented research, which delves into the macrozoobenthic species composition, abundance, and distribution in these new ecological conditions of the Caspian Sea, is of considerable theoretical and practical value. These organisms serve not only as a food source for commercially important fish but also as a crucial component in the Caspian Sea's historically established food web. In this context, the primary objective of this study was to examine the macrozoobenthos species composition and the depth distribution in the South Caspian Sea sector of Azerbaijan.

MATERIALS AND METHODS

The material for this study was the collection from seasons between 2018 and 2019 at depths ranging from 10 to 200 m in different areas of the South Caspian Sea sector of Azerbaijan. The collection and processing of benthic samples followed a generally accepted methodology (Romanov, 1983; Gasimov, 2000). All the samples attained fixes in a 4% formalin solution with added eosin. For this report, the derived material came from bottom-scoop collection across the five transects and 52 biological stations. Samples' collection used Van Veen and Ocean scoops, with sizes of 0.1 m² and 0.025 m², respectively. Three samples taken at each station yielded a total of 370 macrozoobenthos samples that served as collections and incurred analysis.

The analysis of macrozoobenthos species diversity and composition applied different mathematical methods (Sorensen, 1948; Shannon and Weaver, 1949; Simpson, 1949; Pielou, 1966). The organisms' selection continued under laboratory conditions, where the selected organisms, after external maintenance with the help of filter paper, entailed weighing on an electronic scale with an accuracy of 0.1 mg before recording the identified organisms per the species. Taxonomic processing ensued according to the book 'Atlas for Invertebrates of the Caspian Sea (1968)' and 'Identifier of the Fauna of the Black and Azov Seas (1969).'

RESULTS AND DISCUSSION

In the Southern Caspian Sea, the first record of the bottom fauna reached documentation by Arnoldi (1938) and Gasimov and Bagirov (1977). Additional data on the species composition and quantitative diversity of zoobenthos in the western part of the South Caspian Sea can also be evident in past studies by Aliyev and Pyatkova (1968), Gasimov (1987), Mirzoev (2011, 2017, and 2020), and Mirzoev and Alekperov (2017). However, it is noteworthy to mention that no recent data have achieved further recording on species diversity, abundance, and distribution of zoobenthos in the South Caspian Sea sector of Azerbaijan. However, in this research during 2018, the 56 macrozoobenthos species succeeded in their identification, belonging to 10 taxonomic groups in this region (Tables 1 and 2).

Amphipods were the most abundant, comprising 30.4% of the total observed species. Mollusks rank second with 21.4%, followed by oligochaetes (10.7%). The macrozoobenthos species also vary by years and seasons in the Azerbaijani sector of the South Caspian Sea. In 2018, the recorded 56 macrozoobenthos species included documenting 48 species in spring, 56 in summer, and 32 in autumn in the South Caspian Sea. However, amphipods dominated in species density and distribution across all the seasons, representing 27.1% in spring, 30.3% in summer, and 34.4% in autumn. Past studies enunciated the predominant macrozoobenthos species composition throughout the year, including *N. diversicolor*, *B. improvisus*, *M. caspia*, *Sch. euodorelloides*, *D. haemobaphes*, *N. robustoides*, *N. maeoticus*, and *Rh. harrisii tridentatus* (Aliyev and Pyatkova, 1968; Gasimov, 1987; Mirzoev, 2011).

Distinct seasonal dynamics were evident in the development of macrozoobenthos species within the Azerbaijani sector of the South Caspian Sea. These dynamics result in variations not only in species composition but also in the total biomass of specific groups and species. The obtained data on seasonal fluctuations in the abundance and biomass of macrozoobenthos species and their groups in various zones of the Azerbaijani sector of the South Caspian during 2018-2019 appear in Tables 3 and 4. Figure 1 illustrates the average annual biomass of individual groups. In 2018, the total biomass of macrozoobenthos species in the Azerbaijani sector of the South Caspian Sea reached 166.36 g/m², with a population density of 1,281 specimens/m² (Tables 1 and 2). The organisms with peak development occurred during the spring-summer seasons. The biomass of individual organism groups reached 163.62 g/m² in spring and 201.29 g/m² in summer, with population density ranging from 1,223 to 1,599 specimens/m², respectively (Tables 1 and 2).

Throughout all the seasons, the macrozoobenthos biomass composition consisted of 11 species (*N. diversicolor*, *B. improvisus*, *D. haemobaphes*, *N. robustoides*, *N. maeoticus*, *M. lineatus*, *C. rhomboides*, *A. ovata*, *P. elegans*, *P. adspersus*, and *Rh. harrisii tridentatus*). Among this macrozoobenthos population, based on the biomass, the predominant species across seasons were *C. rhomboides* (31.19 g/m² and 34 specimens/m²), *M. lineatus* (26.74 g/m² and 73 specimens/m²), *A. ovata* (17.36 g/m² and 55 specimens/m²), *B. improvisus* (6.24 g/m² and 94 specimens/m²), *P. elegans* (10.53 g/m² and 19 specimens/m²), and *Rh. harrisii tridentatus* (14.30 g/m² and 23 specimens/m²).

In total fauna during 2019, 48 species of macrobenthic organisms entailed identification in the Azerbaijani sector of the South Caspian Sea, with amphipods at 31.2% and mollusks at 20.8%. The highest species count (36–48) occurred in the spring-summer periods, while the lowest (28 species) emerged in autumn. The dominant species throughout

Table 1. Macrozoobenthos species composition during 2018–2019 (Part 1/2) in the South Caspian Sea sector of Azerbaijan.

Taxa \ Years / Seasons	2018			2019		
	Spring	Summer	Autumn	Spring	Summer	Autumn
1	*2*	*3*	*4*	*5*	*6*	*7*
Polychaeta						
Hediste diversicolor (Müller, 1776)	+	+	+	+	+	+
Alitta succinea (Leucкart, 1847)	+	+	+	-	+	-
Hypania invalida (Grube, 1860)	+	+	+	-	+	-
Hypania kowalewski (Grimm, 1927)	+	+	-	+	-	-
Oligochaeta						
Psammoryctides deserticola (Grimm, 1877)	+	+	-	-	+	-
Stulodrilus parvus (Hrabe, 1937)	+	+	-	-	+	-
Cernosvitovi (Hrabe, 1937)	+	+	-	+	+	-
İsochaetides michaelseni (Michaelsen, 1900)	-	+	+	-	+	+
Tubifex tubifex (Muller, 1774)	+	+	-	+	-	-
Potamothrix cekanovskayae (Lastockin, 1937)	+	+	-	+	+	-
Cirripedia						
Balanus improvisus (Darvin, 1854)	+	+	+	+	+	+
B. eburneus (Could, 1841)	+	+	-	+	+	+
Musidacea						
Mysis amblyops (Sars, 1895)	+	+	-	-	+	-
M. caspia (Sars, 1895)	+	+	+	+	+	+
Paramysis baeri (Gzerni, 1893)	+	+	-	-	+	-
P. lacutrus baeri (Gzerni, 1892)	+	+	-	-	+	-
P. kessleri (Sars, 1895)	-	+	+	-	+	+
Cumacea						
Schizorhamphus eudorelloides (Sars, 1894)	+	+	+	+	+	+
Pterocuma rostrata (Sars, 1894)	+	+	-	+	+	-
Pt. pectinata (Sowinskyi, 1893)	+	+	-	+	-	-
Pseuodocume gracile (Sars, 1894)	+	+	-	-	+	-
Amphipoda						
Onisimus caspius (Sars, 1896)	-	+	+	-	-	+
Gammaracanthus loricatus caspius (Sabine, 1924)	+	+	-	+	+	-
Amathillina cristata (Grimm, Sars, 1894)	+	+	-	-	+	-
A.spinoza (Grimm,1896)	+	+	-	+	+	-
Dikerogammarus haemobaphes (Eichiwald, 1841)	+	+	+	+	+	+
Niphargoides derzhavini (Sars, 1895)	+	+	-	+	+	-
N. corpulentus (Sars, 1895)	+	+	-	+	-	-
N. robustoides (Grimm, 1894)	+	+	+	+	+	+
N. maeoticus (Sowinski, 1894)	+	+	+	+	+	+
N. carausui (Derzh.et Pyat., 1962)	-	+	+	-	+	+
N. derzhawini (Pyat., 1962)	+	+	+	+	+	-
Niphargoides spinicaudatus (Carausu, 1943)	-	+	+	-	+	+
Gmelinopsis aurita (Sars, 1896)	-	+	+	-	+	+
Gmelina costata (Grimm, 1894)	+	+	-	+	+	-
Monoporeia affinis (Lindström, 1855)	+	+	+	+	+	+
Corophium chelicorne (Sars, 1895)	+	+	+	+	+	+
C. nobile (Sars, 1895)	+	+	+	+	+	+

Table 2. Macrozoobenthos species composition during 2018–2019 (Part 2/2) in the South Caspian Sea sector of Azerbaijan.

Taxa \ Years / Seasons	2018			2019		
	Spring	Summer	Autumn	Spring	Summer	Autumn
Mollusca						
Mytilaster lineatus (Gmelin, 1789)	+	+	+	+	+	+
Cerastoderma rhomboides (Lamacrk, 1812)	+	+	+	+	+	+
Abra ovata (Philippi, 1836)	+	+	+	+	+	+
Didacna longipes (Grimm, 1877)	+	+	+	-	+	-
D. baeri (Grimm, Andrusov, 1903)	+	+	+	+	-	-
Didacna pyramidata (Grimm, 1877)	+	+	-	+	+	-
D. parallella (Bogachev, 1932)	+	+	-	-	+	-
Dreissena polymorpha (Pallas, 1771)	+	+	+	+	-	+
D. elata (Andrusov, 1897)	-	+	+	-	+	+
D. caspia (Eichwald, 1855)	+	+	-	-	+	-
D. rostriformis pontocaspica (Andrusov, 1897)	-	+	+	-	+	+
Hypanis albida (Logn.et Star, 1967)	+	+	-	+	+	-
Isopoda						
Saduria entomon caspica (Sars, 1897)	+	+	-	+	-	-
Decapoda						
Palaemon elegans (Rathke, 1884)	+	+	+	+	+	+
P. adspersus (Rathke, 1884)	+	+	+	+	+	+
Rhithropanopeus harrisii (Gould, 1841)	+	+	+	+	+	+
Insecta						
Clunio marinus (Holiday, 1855)	+	+	+	+	+	+
Chironomus albidus (Konst., 1956)	+	+	+	+	+	+
Total:	48	56	32	36	48	28

Table 3. Seasonal variations in the abundance of the individual macrozoobenthos groups in 2018 (spec./g m^2) in the South Caspian Sea sector of Azerbaijan.

Groups	Number of species	Seasons			Average
		Spring	Summer	Autumn	
Polychaeta	4	196/1.05	234/1.36	182/0.92	204/1.11
Oligochaeta	6	105/1.12	159/0.16	87/0.08	117/0.12
Mollusca	12	248/116.04	280/130.60	186/98.06	238/114.90
Cirripedia	2	128/7.90	143/9.60	119/5.30	130/7.60
Cumacea	4	64/0.61	84/0.71	47/0.39	65/0.57
Mysidacea	5	95/1.12	116/1.41	71/0.71	94/1.08
Amphipoda	17	303/5.78	443/10.06	268/4.86	338/6.90
Isopoda	1	16/3.35	31/4.19	10/2.33	19/3.29
Decapoda	3	46/24.00	75/39.14	35/19.18	52/27.44
Insecta	2	22/3.65	34/4.06	16/2.34	24/3.35
Total:	56	1223/163.62	1599/201.29	1021/134.17	1281/166.36

Table 4. Seasonal variations in the abundance of individual macrozoobenthos groups in 2019 (spec./g m^2) in the South Caspian Sea sector of Azerbaijan.

Groups	Number of species	Seasons			Average
		Spring	Summer	Autumn	
Polychaeta	4	247/0.83	275/0.98	183/0.56	235/0.79
Oligochaeta	4	184/0.29	215/0.64	121/0.22	173/0.38
Mollusca	10	241/132.40	307/153.01	166/100.66	238/128.69
Cirripedia	2	135/8.78	197/13.43	86/6.08	139/9.43
Mysidacea	3	64/1.77	96/2.49	39/1.29	66/1.83
Cumacea	4	87/0.94	119/1.44	49/0.64	85/1.01
Amphipoda	15	351/7.70	435/10.39	222/5.15	336/7.75
Isopoda	1	25/5.39	37/6.89	13/2.42	25/4.90
Decapoda	3	55/35.10	93/44.38	31/18.84	60/32.77
Insecta	2	37/4.45	53/6.11	20/3.10	37/4.55
Total:	48	1426/197.65	1827/239.75	930/138.90	1394/192.10

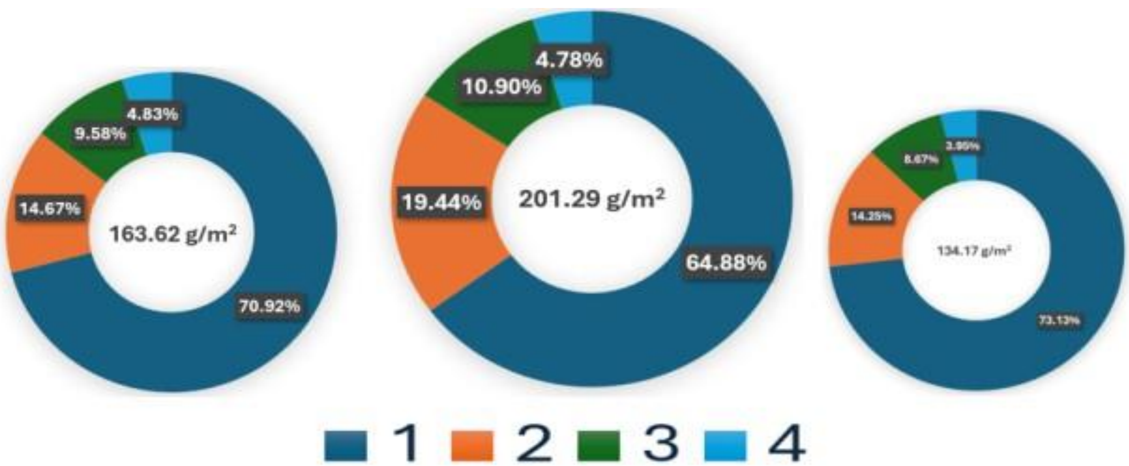

Figure 1. Seasonal variations in the biomass of individual macrozoobenthos groups in 2018 in the South Caspian Sea sector of Azerbaijan. 1-Mollusca, 2-Decapoda, 3-Cirripedia, and 4-Others.

all the seasons were the following: *N. maeoticus*, *D. haemobaphes*, *A. ovata*, *M. lineatus*, *N. diversicolor*, *P. elegans*, and *Rh. harrisii tridentatus* (Mirzoev, 2021; Leroy *et al.,* 2022). During this year, the average annual biomass of macrozoobenthos species was 192.10 g/m², with a population density of 1,394 specimens/m² in the Azerbaijani sector of the South Caspian Sea. The maximum biomass value was notable in summer (239.75 g/m²), while the minimum was evident in autumn (138.90 g/m²). This macrozoobenthic organisms' distribution seemed likely linked to their consumption by fish, as well as the completion of the developmental cycles of individual benthic species.

The obtained data on seasonal variations in the biomass of individual macrozoobenthos groups for 2019 are available in Table 3 and Figure 2. Among the environmental factors, water depth plays a crucial role in the distribution of aquatic organisms. The hydrostatic pressure, temperature, gas levels, light availability, currents, substrate composition, and food supply also vary with the different depths (Seyedvalizade *et al.,* 2021). The macrozoobenthos species distribution in the Azerbaijani sector of the South Caspian Sea varies across different depths (10–25, 25–50, 50–100, and 100–200 m), showing instability at various levels. The highest number and

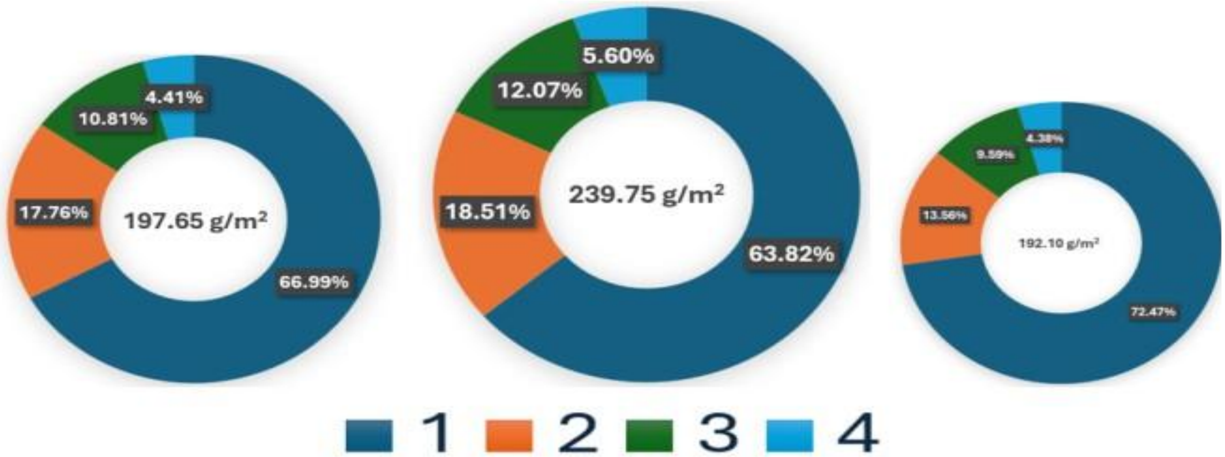

Figure 2. Seasonal variations in the biomass of individual macrozoobenthos groups in 2019 in the South Caspian Sea sector of Azerbaijan. 1-*Mollusca*, 2-*Decapoda*, 3-*Cirripedia*, and 4-Others.

biomass of macrozoobenthos species surfaced at the water depth of 25–50 m, while the lowest emerged at 100–200 m (Table 3). One should mention that these water depths revealed significant diversity in both species' composition and the quantitative terms of macrozoobenthos development. In the deeper zone (10–25 m) in 2018, 28 species across 10 groups reached detection in the Azerbaijani sector of the South Caspian Sea.

The total macrozoobenthos species population and diversity at this depth reached 1,410 specimens/m², with a biomass of 173.3 g/m². Amphipods were the most abundant, comprising 50.0% of the total population, while mollusks dominated in biomass (68.7%), followed by decapods (16.1%). However, at this depth, there was a weak development of oligochaetes (Table 4). The dominant species in this zone include *N. diversicolor*, *H. invalida*, *Ps. deserticola*, *B. improvisus*, *M. caspia*, *S. parvus*, *D. haemobaphes*, *N. maeoticus*, *N. robustoides*, *D. caspica*, and *M. lineatus* (Kenzhegaliev *et al.,* 2018; Kanbetov *et al.,* 2022).

At the water depth of 25–50 m, 56 macrozoobenthos species across 10 systematic groups obtained successful identification. The total biomass of benthos at this depth was 210.96 g/m², with a population density of 1,774 specimens/m². However, mollusks dominated in biomass, accounting for 63.3% of the total biomass and 17.6% of the benthic population. Decapods ranked second with 20.4%, while amphipods ranked third at 5.3%. The oligochaetes and isopods exhibited the lowest biomass and population at this depth (Table 4). In this zone, the dominant species were *Ps. deserticola*, *Sh. eudorelloides*, *S. rostrata*, *S. gracilis*, *C. marinus*, and *C. albidus* (Pielou, 1966; Romanov, 1983; Gasimov, 2000). At the water depth of 50–100 m, 48 macrozoobenthos species belonging to 10 different groups were distinct. The total biomass at this depth was 149.29 g/m², with a population density of 1,181 specimens/m². Mollusks dominated in biomass with 71.0% of the total benthic biomass, while amphipods held the highest abundance (26.2%) of the total population. Mollusks ranked second in abundance, accounting for 18.4%.

Polychaetes rank third in abundance with 16.8%. The lowest abundance resulted in isopods (14 specimens/m²) and insects (20 specimens/m²), with oligochaetes having the lowest biomass (Table 4). At this depth, the dominant species included *H. kowalewski*, *H. invalida*, *M. caspia*, *Ps. caspis*, *A. cristata*, *D. longipis*, *D. baeri*, *C. marinus*, *C. albidus*, and *S. entomon caspica*. At the water depth of 100–200 m in the Azerbaijani sector of the South Caspian Sea, 22 species across nine groups gained successful determination. Within this depth, the total macrozoobenthos biomass was 131.89 g/m², with a population density of 759 specimens/m². Mollusks contribute considerably to the biomass formation (76.6%) of macrozoobenthos, followed by decapods (11.8%). Amphipods were the most abundant in terms of numbers, with 214 specimens/m², followed by polychaetes at 123 specimens/m². The lowest specimen counts appeared in isopods, while oligochaetes arose with the lowest biomass (Sorensen, 1948; Shannon and Weaver, 1949; Simpson, 1949).

The results based on the 2019 data revealed the identification of 48 macrozoobenthic species across various systematic groups in the depths of the Azerbaijani sector of the South Caspian Sea. Amphipods lead in species diversity, comprising 31.2% of all the identified species, followed by mollusks (20.8%). The results also disclosed the distribution of macrozoobenthos species biomass across the different depths was uneven in the Azerbaijani sector of the South Caspian Sea. Among the four primary depth zones of the South Caspian Sea, the 25–50 m depth zone was notably rich in macrozoobenthos species and their quantitative development. In 2019, 48 species from 10 groups emerged at this depth, with a total biomass of 259.91 g/m² and a population density of 1,913 individuals/m². Mollusks were dominant by biomass, accounting for 64.9% of the total benthos biomass, while amphipods were the most numerous, representing 23.8% of total benthos numbers. Decapods held the second-highest biomass (18.6%), followed by barnacles (4.6%). However, the lowest biomass values were evident in oligochaetes (0.2%).

In terms of species diversity and quantitative development of macrozoobenthos, the 10–25 m depth zone ranks second. Within this range, 32 macrozoobenthos species identified belong to 10 groups. The total benthic biomass measured 220.64 g/m², with a population density of 1,590 specimens/m². However, the mollusks (148.16 g/m²) and decapods (38.98 g/m²) significantly contributed to the total biomass of macrozoobenthos. Regarding abundance, amphipods were the most numerous (374 specimens/m²), followed by polychaetes (350 specimens/m²). In comparison with other water depths, the minimum macrozoobenthos biomass was remarkable at the depths of 100–200 m. At this depth, 32 species belonging to 10 groups entailed detection. The total biomass of benthos was 114.80 g/m^2, with a population density of 822 specimens/m^2. The biomass mainly depended upon the mollusks (65.7%) and decapods (16.9%).

Thus, in conclusion, we may consider that as the water depth increases, a gradual decline in the macrozoobenthos species biomass, abundance, and diversity occurs. This trend was primarily ascribable to the combined influence of three factors. These are instability of the oxygen regime in deep-water basins, less favorable trophic conditions on the shelf, and the formation of the mentioned fauna under significant pressing impact of benthic-eating fish (Arnoldi, 1938; Gasimov and Bagirov, 1977). In 2018–2019, 56 macrozoobenthos species' successful identification in the Azerbaijani sector of the South Caspian Sea spanned 10 taxonomic groups. Amphipods were the most abundant (with 17 species), followed by mollusks (12 species) and oligochaetes (six species). The highest quantity of species occurred in spring-summer (48–56 species), while the lowest recorded value was in autumn (28–32 species). Of the total species, 50% were eurythermal, 12 species (21.4%) were stenothermic-thermophilic, and 10 species (17.8%) were cryophilic.

In 2018, in the Azerbaijani sector of the South Caspian Sea, the total biomass of macrozoobenthos species reached 166.36 g/m², with a population density of 1,281 specimens/m². Among macrozoobenthic organisms with total benthos biomass, mollusks were the dominant group (69.1%), followed by decapods (16.5%) and barnacles (4.6%). The peak benthos development was notable in summer, with a biomass of 201.29 g/m² and a population density of 1,599 specimens/m². Mollusks consistently dominated in biomass across all the seasons, comprising 70.9% in spring, 64.9% in summer, and 69.1% in autumn of the total seasonal biomass. In 2019, 48 species of zoobenthos, representing 10 taxonomic groups, reached detection within the macrozoobenthos of the Azerbaijani sector of the South Caspian Sea. Amphipods had the highest species representation (31.2%), followed by mollusks (20.8%). The average annual biomass of macrozoobenthos in the Azerbaijani sector of the South Caspian Sea varied, measuring 192.10 g/m², with a population density of 1,394 specimens/m². The peak biomass recording resulted in summer (239.75 g/m²), while the lowest was in autumn (138.90 g/m²). Mollusks consistently dominated biomass across all the seasons, contributing between 63.8% and 72.5% of the total fauna biomass.

CONCLUSIONS

The formation of benthos materialized primarily from 12 macrozoobenthos species, with mollusks contributing the most to biomass, comprising 69.1% and 66.9% of the total biomass in 2018 and 2019, respectively. Decapods hold the second position, making up 16.5%-17.0% of the total biomass. For the years 2018 and 2019, the highest species diversity of macrozoobenthos was evident at the water depths of 25–50 m with 48–56 species, and the lowest diversity at 100–200 m with 28–32 species. Macrozoobenthos species reached peak abundance and biomass at 25–50 m water depth, with 1,774–1,913 specimens/m² and a biomass of 210.96–259.1 g/m². The lowest abundance and biomass appeared at 100–200 m water depth, with 759–822 specimens/m² and a biomass of 114.80–131.89 g/m².

ACKNOWLEDGMENTS

The authors would like to thank the staff of the Laboratory of Environmental Engineering of the Azerbaijan State University of Economics (UNEC) and the Laboratory of Agrochemistry of the Research Institute of Viticulture and Winemaking of the Ministry of Agriculture for supporting this research.

REFERENCES

Aliyev AD, Pyatkova TM (1968). Species composition and distribution of zoobenthos of the Central and Southern Caspian Sea. *Nauka.* pp. 80–104.

Arnoldi LV (1938). Regarding the distribution of zoobenthos over the Caspian Sea. *Proc. Compr. Study Caspian Sea.* pp. 38–47.

Asadullayev RA, Salimov VS, Huseynov MA (2024). Grapes with fungal infection during long-term storage. *SABRAO J. Breed. Genet.* 56(5): 2026-2032. http://doi.org/10.54910/sabrao2024.56.5.25.

Atlas for Invertebrates of the Caspian Sea (1968). Food Ind. pp. 414 (in Russian).

Gasimov AG (1987). The animal world of the Caspian Sea. Science, pp. 156.

Gasimov AG (2000). Methods for the Caspian Sea monitoring. *GAPP-Plygraph.* pp. 35–40.

Gasimov AG, Bagirov RM (1977). Zoobenthos of the eastern part of the Central Caspian Sea. *Mar. Biol.* 2: 77–85.

Huseynov MA, Shukurov AS, Salimov VS, Adilov AA, Mirzoev GS, Sadigov RA, Nasibov HN, Guliyeva AA (2025). Quality characteristics of technical grape (*Vitis vinifera* L.) cultivars grown under environmental conditions of the mountains and sea. *SABRAO J. Breed. Genet.* 57(6): 2564-2573. http://doi.org/10.54910/sabrao2025.57.6.29.

Identifier of the fauna of the Black and Azov Seas (1969). *Crustaceans* 2: 536.

Kanbetov ASh, Kulbatyrov DK, Zhaksieva GR, Rakhymzhanov MM (2022). Ecological state of macrozoobenthos in the area of developed oil and gas fields of the Kazakhstan sector of the Caspian Sea. The latest technologies for the development of hydrocarbon deposits and ensuring the safety of ecosystems of the Caspian shelf. *ASTU*, pp. 232–236. (in Russian).

Kenzhegaliev A, Abimazyeva AA, Shakhmanova AK, Kulbatyrov DK, Urazgalieva MK, Kulynbay E (2018). The state of macrozoobenthos in the area of the Tyub-Karagan Bay of the Caspian Sea. *Unitet J.* 23: 31–35.

Leroy SAG, Gracheva R, Medvedev A (2022). Natural hazards and disasters around the Caspian Sea. *Nat Hazards* 114(3): 2435–2478.

Mirzoev GS (2011). The species composition and quantitative distribution of coastal macrozoobenthos in the Azerbaijan sector of the Southern Caspian Sea. *Proceed. Institute of Zoology* 29: 203–209.

Mirzoev GS (2017). Zoobenthos distribution patterns in the deepüatür horizon of Azerbaijan sector of the Caspian Sea. *Int. J. Zool.* 2(1): 43–48.
Mirzoev GS (2019). Quantitative distribution of the macrozoobentos of the offshore zone of the Azerbaijan Sector of the Southern Caspian Sea. *Int. J. Civ. Eng.* 10(01): 2072–2082.
Mirzoev GS (2020). Distribution of macrozoobenthos of Azerbaijan sector of the South Caspian Sea. *Eurasia J. Biosci.* 14: 275–281.
Mirzoev GS (2021). Seasonal dynamics and quantity distribution of zoobenthos in the North-West part of the South Caspian Sea. *Casp. J. Environ. Sci.* 19: 201–210.
Mirzoev GS, Alekperov LH (2017). Zoobenthos distribution on biotope in the shelf zone of the Azerbaijan sector of the South Caspian. *J. Entomol. Zool. Stud.* 5: 953–959.
Pielou E (1966). Shannon's formula as a measure of specific diversity: Its use and disuse. *Am. Nat. J.* 100: 463–465.
Romanov NN (1983). Methodological Guidelines for Studying the Benthos of the Seas of the USSR. All-Russian Research Institute of Fisheries and Oceanography. pp. 13. (in Russian).
Sadigov RA, Mustafayev MG, Azimov AM (2024). Analysis of the erosion process in undeveloped mountain gray-cinnamon (chestnut) soils in Shamkirchay water reservoir basin. *SABRAO J. Breed. Genet*. 56(5): 2067-2078.
Salimov VS and Huseynov MA (2025). Polymorphism features in grape (Vitis vinifera L.) variety Bayanshira populations. *SABRAO J. Breed. Genet.* 57(2): 516-528. http://doi.org/ 10.54910/sabrao2025.57.2.11.
Salimov VS, Huseynov MA, Huseynova AS (2025). Phenotypic variability in the vegetative generation of grape (*V. vinifera* L.) protoclones and selection with stable signs. *SABRAO J. Breed. Genet.* 57(3): 999-1008. http://doi.org/10.54910/sabrao2025. 57.3.12.
Seyedvalizade M, Alizadeh K, Lahijani H, Siadatmousavi SM (2021). South Caspian vertical circulation during rapid sea level rise and fall. *Casp. J. Environ. Sci.* 19: 19–29.
Shannon CE, Weaver W (1949). The Mathematical Theory of Communication. Urbana, IL: The University of Illinois Press, pp. 117.
Simpson E (1949). Measurement of diversity. *Nature* 163: 668.
Sorensen TA (1948). Method of establishing groups of equal amplitude in plant sociology. *Kql. Danske. Vidensk. Selsk. mat.-fys. Medd.* 4: 1–34.