Original article **DOI**: 10.29039/2413-5577-2023-1-113-123

Taxonomic Composition of Polychaete Worms in the Mussel-Oyster Farm Area (the Black Sea, Sevastopol)

E. V. Lisitskaya *, N. A. Boltachova

A.O. Kovalevsky Institute of Biology of the Southern Seas of RAS, Sevastopol, Russia
**e-mail: e.lisitskaya@gmail.com*

Abstract
Studies were conducted in 2015–2019 in the mussel and oyster farm area. Data were obtained on the species composition of polychaete worms in bottom sediments under the farm, in fouling of farm constructions, and in plankton at the larval stages of development. A total of 48 polychaete species belonging to 25 families were identified. At the same time 23 species were found on the bottom under the farm, 24 species were found in the fouling of mussel collectors and oyster cages, and larvae of 25 species of polychaete worms were found in plankton. In the benthos, *Micronephthys longicornis* dominated in terms of occurrence and abundance, while in mussel collectors and oyster cages, species of the family Nereididae (*Nereis zonata, Platynereis dumerilii, Alitta succinea*) prevailed. The species composition of polychaete taxocene inhabiting the bottom under the farm and that in the fouling of the farm constructions differed significantly (the Czekanowski – Sørensen index was 0.26). In the benthos under the farm, 66 % of the species were deposit feeders by diet type, carnivores and omnivores were much fewer, whereas filter feeders were represented by only one species. Omnivores species dominated in the fouling (44 %), deposit feeders species were four times fewer, and filter feeders species were three times more than in the benthos. *Hydroides dianthus* (25 %) and *Polydora websteri* (67 %) found on and in mussel and oyster shells were highly abundant.

Keywords: Annelida, macrozoobentos, larvae Polychaete, the Black Sea

Acknowledgments: The work was performed under state assignment of the Federal Research Center of the IBSS on topic "Regularities of formation and anthropogenic transformation of biodiversity and bioresources of the Azov-Black Sea basin and other regions of the World Ocean" (registration no. 121030100028-0) and "Research of control mechanisms of production processes in biotechnological complexes for the purpose of development of scientific bases of obtaining biologically active substances and technical products of marine genesis" (registration no. 121030300149-0). We thank S. V. Shchurov, I. Y. Eremin, V. A. Grintsov, and M. V. Makarov for their help in collecting the material.

For citation: Lisitskaya, E.V. and Boltachova, N.A., 2023. Taxonomic Composition of Polychaete Worms in the Mussel -Oyster Farm Area (the Black Sea, Sevastopol). *Ecological Safety of Coastal and Shelf Zones of Sea*, (1), pp. 113–123. doi:10.29039/2413-5577-2023-1-113-123

Таксономический состав многощетинковых червей района мидийно-устричной фермы (Черное море, Севастополь)

Е. В. Лисицкая *, Н. А. Болтачева

ФГБУН ФИЦ «Институт биологии южных морей им. А. О. Ковалевского РАН», Севастополь, Россия

**e-mail: e.lisitskaya@gmail.com*

Аннотация

В результате исследований, выполненных в 2015–2019 гг. в районе мидийно-устричного хозяйства, получены данные о видовом составе многощетинковых червей, обитающих в донных отложениях под фермой, в обрастаниях конструкций фермы, а также в планктоне на пелагической стадии развития. Всего идентифицировано 48 видов полихет, относящихся к 25 семействам. При этом на дне под фермой обнаружено 23 вида, в обрастании мидийных коллекторов и устричных садков – 24, в планктоне – личинки 25 видов многощетинковых червей. В бентосе по встречаемости и численности преобладал *Micronephthys longicornis*, а на мидийных коллекторах и устричных садках – представители семейства Nereididae: *Nereis zonata, Platynereis dumerilii, Alitta succinea*. Таксоцены полихет, обитающих на дне под фермой и в обрастании конструкций фермы, существенно различались по видовому составу (индекс Чекановского – Съеренсена составлял 0.26). По типу питания в бентосе под фермой 66 % видов относились к детритофагам, хищников и полифагов было намного меньше, а сестонофаги представлены только одним видом. В обрастании преобладали виды-полифаги – 44 %, видов-детритофагов было в четыре раза меньше, а сестонофагов – в три раза больше, чем в бентосе. Высокой встречаемостью характеризовались обнаруженные на створках и в створках мидий и устриц *Hydroides dianthus* (25 %) и *Polydora websteri* (67 %).

Ключевые слова : Annelida, макрозообентос, личинки Polychaeta, Черное море

Благодарности: работа выполнена в рамках государственного задания ФИЦ ИнБЮМ по темам: «Исследование механизмов управления продукционными процессами в биотехнологических комплексах с целью разработки научных основ получения биологически активных веществ и технических продуктов морского генезиса» (№ гос. регистрации 121030300149-0) и «Закономерности формирования и антропогенная трансформация биоразнообразия и биоресурсов Азово-Черноморского бассейна и других районов Мирового океана» (№ гос. регистрации 121030100028-0). Выражаем благодарность за помощь в сборе материала С. В. Щурову, И. Ю. Еремину, В. А. Гринцову, М. В. Макарову.

Для цитирования: *Лисицкая Е. В., Болтачева Н. А* . Таксономический состав многощетинковых червей района мидийно-устричной фермы (Черное море, Севастополь) // Экологическая безопасность прибрежной и шельфовой зон моря. 2023. № 1. С. 113–123. EDN QQGUXI. doi:10.29039/2413-5577-2023-1-113-123

Introduction

Recently, the number of marine bivalve farms off the Crimean coast has been increasing. Functioning mariculture farms have a complex and contradictory impact on the environment. Bottom communities are particularly affected. This is due to the fact that the products of the farmed molluscs are a source of large amounts of organic matter in the bottom sediments, which leads to changes in the physical-chemical and trophic conditions of invertebrates: both epifauna and infauna [1, 2].

To control the impact of mariculture farms on the environment, long-term studies are carried out of the biota and aquatic environment in the water area of mussel and oyster farms [3]. The scale of the impact can vary depending on the operation duration and production volume as well as on the characteristics of the water area. A 5-fold increase in macrozoobenthos abundance and a 3.2-fold increase in biomass were recorded off the coast of the Caucasus in the area where the mussel farms were operating for five years. In contrast, the species diversity index decreased by an average of 2.7 times [1)]. There is evidence of both a negative impact on zoobenthos under marine farms and absence of such an impact [1, 4, 5]. Thus, mussel and oyster farms are an important habitat-forming factor.

Meanwhile, farm hydraulic engineering systems and structures can be seen as a kind of analogue of artificial reefs. Artificial reefs are known to be located both on the bottom and in the water column. They serve as a substrate for larval settlement of bottom organisms, create shelters for fish and invertebrates, and can attract and concentrate various hydrobionts [1]. Artificial reefs provide conditions for the formation of highly productive communities and the preservation of aquatic biodiversity.

Most published materials on hydrobionts colonising artificial reefs include fish and molluscs [1]. For polychaetes, there is less data and it mainly refers to polychaetes-perforators and mollusc shell foulers [6–9].

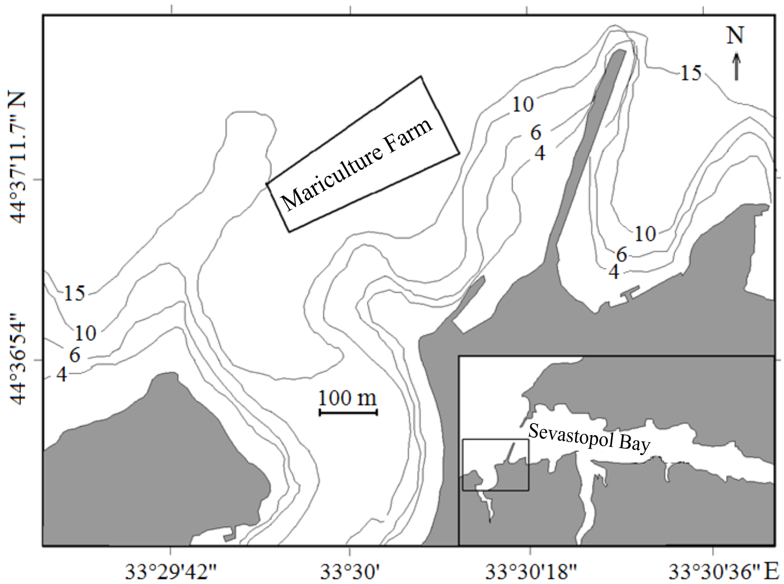
The aim of this work is to study the taxa of polychaetes inhabiting the mussel-oyster farming area, namely in the fouling of the farm structures, on the bottom under the farm and in plankton during the pelagic stage of development.

Material and methods

The mussel-oyster farm is located on the outer roadstead of Sevastopol Bay. The coordinates of the farm's outermost points are 44°37′02.2″N 33°29′53.7″E, 44°37′05.6″N 33°29′51.5″E, 44°37′13.3″N 33°30′07.1″E, 44°37′07.8″N 33°30′11.0″E (Fig. 1). The farm occupies a water area of 4 ha, and the depths in the area are 10–16 m.

---

1) Abaev, V.Yu., 2001. [*Impact of Mussel Farming on the Ecosystems of the Anapa Shelf of the Black Sea. Extended Abstract of Doctoral Dissertation*]. Krasnodar, 18 p. (in Russian).



F i g . 1 . Schematic map of the study area

The substrate is silty sand. Mussel collectors were installed in 2014, and in 2015, two lines of oyster cages were also placed in the water area of the mariculture farm. By 2018, the marine farm produced up to 100,000 oysters and 50 tonnes of mussels per year [3, 10].

Macrozoobenthos samples from the substrate were collected monthly under the plantation from April 2015 to May 2016 in duplicate using a grab sampler with a grab area of 0.04 m^2. The material was further processed in the laboratory according to the standard method: it was washed through a sieve (mesh size 0.5 mm), fixed with 4 % formaldehyde solution. Species composition of polychaetes, their density (N, ind.$\cdot m^{-2}$), biomass (B, $g \cdot m^{-2}$) and occurrence (P, %) were determined [6]. Qualitative macrozoobenthos samples (12 collections) were taken under the farm during the summer periods of 2018 and 2019. From the samples, polychaetes were selected and their species was determined. The fouling of the farm structures was also used as study material. Samples were collected four times a year (seasonally) in triplicate in 2017–2018. The fragments of the mussel collectors and oyster cages were placed in baths of fresh water for 15 min, the washes were sieved (gauze mesh size 100 μm), and polychaetes were isolated [11]. The presence of polychaetes in and on the shells of cultured molluscs was taken into account.

Meroplankton was sampled in the water area of the mussel-oyster farm on a monthly basis in 2015–2019. The material was collected with a Juday net (inlet diameter 36 cm, gauze mesh size 135 μm) in the water layer from the bottom to the surface. Polychaete larvae were selected and identified alive using MBS-9 and Mikmed-5 light microscopes [12].

Literature data were used for taxonomic identification and trophic grouping of polychaetes [13–15].

The frequency of species occurrence was calculated as a percentage of the number of samples in which the species was detected in relation to the total number of collected samples. In the polychaete taxocene, species with an occurrence rate of 50 % or more were classified as an index species [2)] (according to V. P. Vorobiov, "constant"), species with an occurrence rate of 25 % to 50 % were classified as characteristic ones, and species found at less than 25 % of stations [3)] were considered to be rare.

The Sørensen – Czekanowski index was used to assess the similarity of the species composition of polychaetes in different habitats, $I_{cs} = \frac{2c}{a+b}$ where c is the number of species shared by both lists; a and b are the number of species in each list.

Results and discussion

During the study period, 48 polychaete species belonging to 25 families were identified in macrozoobenthos, fouling and plankton samples collected from the mussel-oyster farm area (table). The most numerous species belonged to the families Spionidae (8), Nereididae and Syllidae (5 species each), Syllidae (4). The other families were represented by one or two species.

Among the macrobenthic organisms under the farm, polychaetes of 23 species were found. Twenty-four species of polychaetes were recorded in the fouling of mussel collectors and oyster cages. Larvae of 25 polychaete species were recorded in the plankton during the entire study period [12]. Only two species, *Allita succinea* and *Pholoe inornata*, were shared by all three studied habitats (benthos, fouling and plankton).

The macrozoobenthos under the farm was dominated by small errant forms of polychaetes. The leading species of this taxon (50–100 % occurrence) included *Micronephthys longicornis*, *Heteromastus filiformis*, *Aricidea claudiae*. The occurrence of most species did not exceed 25 %. This taxocene was characterized by low quantitative indices, density ranged from 38–388 ind.$\cdot$m^{-2}, biomass 0.04–3.13 g$\cdot$m^{-2}. During 13 months, the mean polychaete density was 232 ± 29 ind.$\cdot$m^{-2} and biomass was 0.57 ± 0.27 g/m^{-2}. The dominant species was *Micronephthys longicornis* with a maximum density of 260 ind.$\cdot$m^{-2} and an average density of 145 ± 21 ind.$\cdot$m^{-2}. This species is common in the Black Sea, it occurs quite often in silty substrates at depths up to 65 m and forms high-density settlements [14]. Out of the large polychaetes, *Nephtys hombergii* was recorded in quantitative collections and *Cirriformia tentaculata* and *Polycirrus jubatus* – in qualitative collections. The first of these species is eurybiontic and widespread. Due to its high settlement density it forms an independent biocenosis in the Black Sea [14]. The other two species are less common, they do not form large aggregations and prefer silty substrates and shallower waters. In general, almost all the polychaetes found in the bottom biotope, with the exception of *Syllis hyalina* and

[2)] Zenkevitch, L.A. and Brozky, V.A., 1937. Some Data on the Ecology of Dominants in the Bentos of the Barents Sea. *Uchenye Zapiski MGU*, 13, pp. 203–226 (in Russian).
[3)] Vorobiov, V.P., 1949. [*Benthos of the Sea of Azov*]. Simferopol: Krymizdat, 193 p. (in Russian).

Taxonomic composition of polychaetes in the area of mariculture

Taxonomic composition	Occurrence		In plankton
	in benthos, %	in fouling, %	
Alitta succinea (Leuckart, 1847)	8	83	+
Aricidea (Strelzovia) claudiae Laubier, 1967	62	-	-
Capitella capitata (Fabricius, 1780)	8	-	-
Capitellidae g. sp	8	-	+
Chaetozone caputesocis (Saint-Joseph, 1894)	qual.	-	-
Cirriformia tentaculata (Montagu, 1808)	qual.	-	-
Glycera sp.	8	-	-
Ctenodrilus serratus (Schmidt, 1857)	-	17	-
Dorvillea rubrovittata (Grube, 1855)	-	8	-
Eulalia viridis (Linnaeus, 1767)	-	8	-
Eunice vittata (Delle Chiaje, 1828)	qual.	-	-
Phyllodoce sp.	-	17	+
Genetyllis tuberculata (Bobretzky, 1868)	-	-	+
Harmothoe imbricata (Linnaeus, 1767)	-	92	+
Harmothoe reticulata (Claparède, 1870)	-	92	+
Hediste diversicolor (O.F. Müller, 1776)	-	-	+
Heteromastus filiformis (Claparède, 1864)	69	-	-
Hydroides dianthus (Verrill, 1873)	-	25	+
Lagis neapolitana (Claparède, 1869)	qual.	-	+
Lysidice ninetta Aud. Et H. M. Edw., 1833	-	17	+
Malacoceros fuliginosus (Claparède, 1870)	-	-	+
Magelona rosea Moore, 1907	15	-	+
Megadrilus purpureus (Schneider, 1868)	8	-	-
Melinna palmata Grube, 1870	8	-	-
Micronephthys longicornis (Perejaslavtseva, 1891)	100	-	-
Microspio mecznikowiana (Claparède, 1869)	-	-	+
Naineris laevigata (Grube, 1855)	qual.	-	-
Nephtys hombergii Savigny in Lamarck, 1818	23	-	+
Nereis zonata Malmgren, 1867	-	100	+

Continued

Taxonomic composition	Occurrence		In plankton
	in benthos, %	in fouling, %	
Nereididae g.sp.	8	-	+
Paraonidae g. sp.	8	-	-
Perinereis cultrifera (Grube, 1840)	-	33	-
Pholoe inornata Johnston, 1839	qual.	67	+
Phyllodoce mucosa Örsted, 1843	15	8	-
Platynereis dumerilii (Audouin Milne Edwards, 1834)	8	100	-
Polycirrus jubatus Bobretzky, 1868	qual.	-	-
Polydora cornuta Bosc, 1802	-	17	+
Polydora websteri Hartman in Loosanoff & Engle, 1943 *	-	67	+
Polyophthalmus pictus (Dujardin, 1839)	-	8	-
Prionospio cirrifera Wirén, 1883	8	-	-
Prionospio sp.	-	8	+
Protodorvillea kefersteini (McIntosh, 1869)	qual.	-	-
Sabellaria taurica (Rathke, 1837)	-	-	+
Salvatoria clavata (Claparède, 1863)	-	8	
Scolelepis (Scolelepis) squamata (O.F. Muller, 1806)	-	-	+
Spirobranchus triqueter (Linnaeus, 1758)	-	17	-
Spio decorata Bobretzky, 1870	-	-	+
Spionidae g. sp	23	-	+
Spirorbinae g. sp	qual.	qual.	+
Syllis hyalina Grube, 1863	8	8	-
Syllis prolifera Krohn, 1852	-	8	-
Syllidae gen. sp.	-	17	-
Trypanosyllis zebra (Grube, 1860)	-	17	-

* polychaetes found in oyster shells.

Note: “qual.” – polychaetes from quality collections; “+” – species is found; “-” – species is not found.

Spirorbinae g. sp., are characteristic of silty substrates. Such substrates predominate in the area of the mussel-oyster farm.

In the area of mussel farms off the coast of the Caucasus (near Anapa) seven polychaete species were recorded [1)], five of which were also found during our survey (*Melinna palmatata*, *Pholoe inornata*, *Platynereis dumerilii*, *Eunice vitlala*, *Nephtys hombergii*). Still, *Mellina palmata* is the dominant species under the farm in the Anapa area, whereas in the Sevastopol area it is *Micronephthys longicornis*.

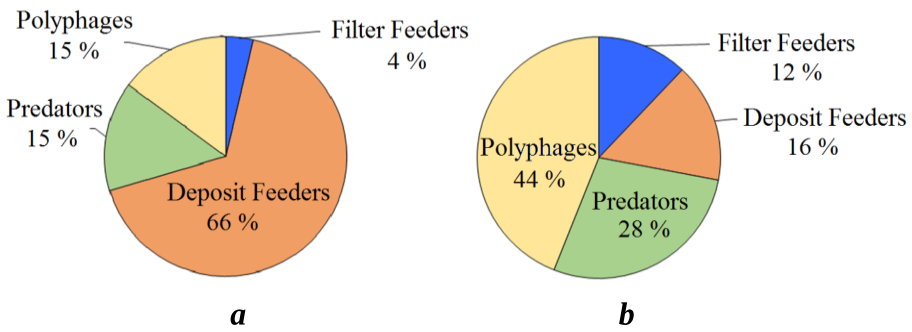
The species most frequently (50–100 % frequency) recorded in mussel collectors and oyster cages were *Nereis zonata*, *Platynereis dumerilii*, *Alitta succinea* (family Nereididae), as well as *Harmothoe imbricata*, *H. reticulata* (family Polynoidae), *Pholoe inornata* (family Sigalionidae). Characteristic species included *Hydroides dianthus* and *Polydora websteri* found on and in the shells of mussels and oysters. These polychaetes are known to cause significant damage to shellfish mariculture in many areas of the World Ocean [6–9]. These species are recent alien species to the Black Sea and their high occurrence indicates their successful acclimatisation in the Sevastopol water area. It is of interest that species considered very rare for the Black Sea were discovered: *Ctenodrilus serratus* [4)] and *Chaetozone caputexotic* [14].

At a mussel farm off the Caucasian coast of the Black Sea near Sochi, six species of polychaetes were observed in the collector fouling. As in our survey, *Alitta succinea*, *Nereis zonata*, and *Platynereis dumerilii* were common. The highest abundance was recorded for *A. succinea* [5)].

The species composition of taxocenes of polychaetes on the bottom under the farm and in the fouling of the farm structures differed significantly as indicated by the low value of the Sørensen – Czekanowski index (0.26). Out of the 24 polychaete species detected on the mariculture farm structures, 18 were not recorded in the sediments under the farm. The trophic structure of the polychaete taxa in these two habitats was represented by four trophic groupings: deposit feeders, filter feeders, predators and polyphages. However, the quantitative proportion of species in these groupings differed in the biotopes. In the benthos under the farm, the majority of species were deposit feeders. Predators and polyphages were much fewer, and filter feeders were represented by only one species (Fig. 2). The fouling was dominated by polyphagous species, with four times fewer deposit feeder species and three times more filter feeder species than in the benthos. A half of the deposit feeders in the benthos were surface deposit feeders and the other half were subsurface deposit feeders. In the fouling, the deposit feeding grouping is represented only by subsurface deposit species.

[4)] Yakubova, L.I., 1930. List of Archannelidae and Polychaeta in Sevastopol Bay of the Black Sea. *Izvestiya AN SSSR. Series 7. Otdeleniye Fiziko-Matematicheskikh Nauk*, (9), pp. 863–881 (in Russian).

[5)] Yakhontova, I.V., 2008. [*Community of Mussel Collector Fouling in the Eastern Black Sea. Extended Abstract of Ph. D. Dissertation, Biological Sciences*]. Moscow: VNIRO, 25 p. (in Russian).



F i g . 2 . Trophic structure of polychaetes taxocene in the benthos under the farm (*a*) and on the collectors (*b*)

Thus, the difference in the taxonomic composition of polychaetes in the benthos under the farm and on the collectors is due to the significant difference in these substrates as well as the trophic preferences of the species inhabiting these biotopes.

Pelagic larvae of polychaete worms were found in the mariculture area as well as in adjacent areas off the coast of southwestern Crimea during all seasons of the year [16]. Their taxonomic composition corresponded to the periods of adult reproduction. In winter, the plankton was dominated by larvae of *Harmothoe imbricata*; in spring, their diversity increased, with the appearance of *Harmothoe reticulata*, *Pholoe inornata*, *Allita succinea*, and *Nereis zonata*. In summer, the *Nephtys hombergii* nectochaetes dominated. Larvae of polychaetes of the family Spionidae (*Polydora cornuta*, *Malacoceros fuliginosus*, *Spio decorata*, *Prionospio* sp.) dominated in plankton from April to October. Larvae of polychaetes that settle on and in the shells of growing molluscs were recorded: *Polydora websteri* – from June to October, *Hydroides dianthus* – in October to November [12]. Seven species of Polychaeta were found in plankton alone, three of them – *Malacoceros fuliginosus*, *Scolepis squamata*, *Microspio mecznikowiana* – are relatively rare for the Black Sea. The polychaete *Sabellaria taurica* inhabits a peculiar biotope (sand with coarse shells) that is not represented in the study area.

Since many polychaete species have a pelagic developmental stage in their life cycle, the formation of polychaete taxa in the fouling of farm structures is mainly due to the deposition of larvae from plankton in mariculture waters. The similarity of polychaete taxa of the fouling and plankton is significantly higher than that of the fouling and benthos as indicated by the Sørensen – Czekanowski index (0.50).

Conclusion

A total of 48 polychaete species were identified from surveys carried out in 2015–2019 in the area of the mussel-oyster farm. However, 23 species were found on the bottom under the farm, 24 – in the fouling of mussel collectors and oyster cages, and the larvae of 25 polychaete species – in plankton. Recent alien species were noted: *Hydroides dianthus* and *Polydora websteri*, as well as species rare for the Black Sea: *Ctenodrilus serratus* and *Chaetozone caputexotic*. The polychaete taxocenes are distinctive in each of the studied biotopes. The species compositions of polychaete taxa on the bottom under the farm and in the farm structure fouling differed significantly (the Sørensen – Czekanowski index being 0.26). On the mariculture farm structures, 18 species of polychaete worms were found that were not recorded in the bottom sediments under the farm. In the benthos under the farm, 66 % of the species were deposit feeders. Predators and polyphages were much fewer, and filter feeders were represented by only one species. Polyphagous species predominated in the fouling with 44 %, deposit feeders were four times fewer and filter feeders were three times more than in the benthos. Thus, the creation of a mussel-oyster farm, which provides additional substrate for polychaetes and the settlement of their pelagic larvae, contributes to the species richness of Polychaeta in the study area.

REFERENCES

1. Aleksandrov, B.G., 2008. *The Hydrobiological Basis for Managing of the Black Sea Coastal Ecosystems State*. Kiev: Naukova dumka, 343 p. (in Russian).
2. Kruglikov, O.E. and Ivanov, M.V., 2008. [Effect of the Sonostrov Mussel Farm on Benthos Communities]. In: M. P. Kirpichnikov, ed., 2008. [*Proceedings of the Scienific Conference Dedicated to the 70th Anniversary of N. A. Pertsov Belomor Biological Station, 9–10 August 2008*]. Moscow: Izd. “Grif i K”, pp. 70–74 (in Russian).
3. Kapranov, S.V., Kovrigina, N.P., Troshchenko, O.A. and Rodionova, N.Yu., 2020. Long-Term Variations of Thermohaline and Hydrochemical Characteristics in the Mussel Farm Area in the Coastal Waters off Sevastopol (Black Sea) in 2001–2018. *Continental Shelf Research*, 206, 104185. doi:10.1016/j.csr.2020.104185
4. Ivanov, M.V. and Chivilev, S.M., 2007. The Long-Term Benthic Succession under the White Sea Mussel Farms. *Vestnik of Saint Petersburg University. Series 3. Biology*, (4), pp. 63–72 (in Russian).
5. Boltacheva, N.A., Makarov, M.V., Bondarenko, L.V. and Kovaleva, M.A., 2018. The Macrozoobenthos under Clam Farm (the Black Sea, Sevastopol Region). *Marine Biological Journal*, 3(1), pp. 9–22. doi:10.21072/mbj.2018.03.1.02 (in Russian).
6. Rodewald, N., Snyman, R. and Simon, C.A., 2021. Worming its Way in – *Polydora websteri* (Annelida: Spionidae) Increases the Number of Non-Indigenous Shell-Boring Polydorin Pests of Cultured Molluscs in South Africa. *Zootaxa*, 4969(2), pp. 255–279. doi:10.11646/zootaxa.4969.2.2
7. Sun, Y., Wong, E., Keppel, E., Williamson, J.E. and Kupriyanova, E.K., 2017. A Global Invader or a Complex of Regionally Distributed Species? Clarifying the Status of an Invasive Calcareous Tubeworm *Hydroides dianthus* (Verrill, 1873) (Polychaeta: Serpulidae) Using DNA Barcoding. *Marine Biology*, 164, 28. doi:10.1007/s00227-016-3058-9
8. Martinelli, J.C., Lopes, H.M., Hauser, L., Jimenez-Hidalgo, I., King, T.L., Padilla-Gamiño, J.L., Rawson, P., Spencer, L.H., Williams, J.D. et al., 2020. Confirmation of the Shell-Boring Oyster Parasite *Polydora websteri* (Polychaeta: Spionidae) in Washington State, USA. *Scientific Reports*, 10, 3961. doi:10.1038/s41598-020-60805-w
9. Waser, A.M., Lackschewitz, D., Knol, J., Reise, K., Wegner, K.M. and Thieltges, D.W., 2020. Spread of the Invasive Shell-Boring Annelid *Polydora websteri* (Polychaeta, Spionidae) into Naturalised Oyster Reefs in the European Wadden Sea. *Marine Biodiversity*, 50, 63. doi:10.1007/s12526-020-01092-6

10. Pospelova, N.V., Priimak, A.S. and Ryabushko, V.I., 2021. Chemical Composition of Mussel Mytilus galloprovincialis Cultivated at the Seashore of Sevastopol (Black Sea). *Ecological Safety of Coastal and Shelf Zones of Sea*, (4), pp. 67–80. doi:10.22449/2413-5577-2021-4-67-80 (in Russian).
11. Lisitskaya, E.V. and Shchurov, S.V., 2020. The Polychaetes Role in Fouling Community on the Mussel-Oysters Farm (Crimea, the Black Sea). *Problems of Fisheries*, 21(1), pp. 74–83 (in Russian).
12. Lisitskaya, E.V., 2017. Taxonomic Composition and Seasonal Dynamics of Meroplankton in the Area of Mussel-Oyster Farm (Sevastopol, Black Sea). *Marine Biological Journal*, 2(4), pp. 38–49. doi:10.21072/mbj.2017.02.4.04 (in Russian).
13. Kiseleva, M.I., 1981. [*Benthos of Soft Bottoms of the Black Sea*]. Kiev: Naukova dumka, 168 p. (in Russian).
14. Kiseleva, M.I., 2004. *Polychaetes (Polychaeta) of the Azov and Black Seas*. Apatity: Izd-vo Kol'skogo Nauchnogo Tsentra RAN, 409 p. (in Russian).
15. Jumars, P.A., Dorgan, K.M. and Lindsay, S.M., 2015. Diet of Worms Emended: an Update of Polychaete Feeding Guilds. *Annual Review of Marine Science*, 7, pp. 497–520. doi:10.1146/annurev-marine-010814-020007
16. Ryabushko, V.I., Shchurov, S.V., Kovrigina, N.P., Lisitskaya, E.V. and Pospelova, N.V., 2020. Comprehensive Research of the Environmental Status of Coastal Waters of Sevastopol (Western Crimea, Black Sea). *Ecological Safety of Coastal and Shelf Zones of Sea*, (1), pp. 104–119. doi:10.22449/2413-5577-2020-1-103-118 (in Russian).

Submitted 28.07.2022; accepted after review 2.12.2023;
revised 1.02.2023; published 24.03.2023

About the authors:

Elena V. Lisitskaya, Senior Research Associate, A.O. Kovalevsky Institute of Biology of the Southern Seas of RAS (2 Nakhimov Av., Sevastopol, 299011, Russian Federation), Ph.D. (Biol.), **ORCID ID: 0000-0002-8219-4616, Scopus Author ID: 6504112143, ResearcherID: T-1970-2017,** *e.lisitskaya@gmail.com*

Natalya A. Boltachova, Leading Research Associate, A.O. Kovalevsky Institute of Biology of the Southern Seas of RAS (2 Nakhimov Av., Sevastopol, 299011, Russian Federation), Ph.D. (Biol.), **ORCID ID: 0000-0003-0618-1992, Scopus Author ID: 36149089700,** *nboltacheva@mail.ru*

Contribution of the authors:

Elena V. Lisitskaya – statement of the research problem, analysis of the composition and abundance of polychaete worms in the fouling and plankton, formation of the article

Natalya A. Boltachova – analysis of the composition and abundance of polychaete worms in the bentos, preparation of graphic materials, editing of the manuscript

All the authors have read and approved the final manuscript.