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Цей збірник наукових доповідей присвячень основним підсумкам виконання Стратегічного плану дій по реабілітації і охороні Чорного моря (1996-2000 рр.), підсумкового документа першого етапу виконання Міжнародної Чорноморської Екологічної Програми ООН. У цьому зв'язку надруковані матеріали відображають основні розділи Програми, а саме: швидке реагування при надзвичайних ситуаціях, моніторинг забруднення і стандарти якості навколишнього середовища, захист біологічної різноманітності, розробка загальної методології управління прибережною зоною моря, рибальство, освіта і громадська поінформованість в природоохоронній області. В статтях представлені результати раніше не надруковані результати наукових досліджень. Подані дані, їх інтерпретація і закінчення належать авторам повідомлень і ні в коєму разі не можуть бути приписані членам організаційного комітету, які склали даний збірник.
Збірник призначень для широкого кола спеціалістів у галузі біології і екології моря, океанографії, техногенної безпеки і охорони природи.

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Present issue is devoted to the main results of Strategic Action Plan for the Rehabilitation and Protection (SAPRP) of the Black Sea (1996-2000) implementation. The SAPRP is a resulting document of the Black Sea Environmental Program (GEF/UN/UNDP) first step. The published materials have been reflected by the main Program sections: emergency response, pollution monitoring and environmental quality standards, protection of biodiversity, integrated coastal zone management, fisheries, environmental education and public awareness. These papers are the results of scientific research haven't been unpublished earlier. The findings, interpretations and conclusions expressed in papers, are in own property of the authors and should not battributed in any manner to the members of organization committee, which prepared this issue.
The issue was design for specialists in the field of marine biology and ecology, oceanology, technogenic safety and environmental protection.

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MASS DEVELOPMENT OF ANOMALOUS POLYCHAETE INDIVIDUALS *NEREIS (NEANTHES) SUCCINEA* LEUCK. IN THE NORTHWESTRN BLACK SEA

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Nereis (Neanthes) succinea Leuckart, 1847 is the most mass representative of the polychaete family Nereidae in the northwestern Black Sea (NWBS). It is widespread also in brackish and saline limans (lagoons) in this region. N.P. Annenkova (1929) was the first to register it near the Caucasian coast in the brackish relict Paleostom lake and in the Koparcha river connecting it with the sea. This species is widespread in the Sea of Azov, and beyond the Azov-Black Sea basin in estuarine areas (Annenkova, 1930).

In the 1950s-1960s *N. succinea* was encountered in the northwestern and western parts of the Black Sea at depths not exceeding 25 m, preferably at 0-10 m in estuarine zones. From the mid 1970s this species became more widespread reaching depths at 35-40 m in offshore NWBS areas in the 1980s. Frequency of *N. succinea* in the interfluve NWBS areas in 1982-1983 was close to 100%, and maximum abundance reached 3400 ind.-m"ᶜ (Losovskaya, 1988).

The first specimens of this population lacking the V-th group of paragnaths (chitin teeth) in the pharynx appeared in the late 1970s in the near Danube part of the sea. The presence of this group of paragnaths is one of the most important taxonomic characteristics of *N. succinea.* In the early 1980s the number of these individuals in the Danube-Dniester and Dnieper-Dniester interfluve areas had made up already from 10 to 100 % of the total number of the samples (Losovskaya, 1988).

The aim of this investigation is to study the present population composition of N. *succinea* evaluating the frequency and number of individuals lacking the Vth group of paragnaths in Odessa Bay and adjacent area between the estuaries of Grigoriev and Sukhoi limans at depths up to 25 m. This area is subject to the influence of water flow from the Dnieper-Bug

liman, and also to the load of industrial-houshold waste waters from Odessa, Ilyichevsk, Yuzhniy, and their ports.

We express our thanks to research associate LA. Sinegub for the samples collected in May 1998 (21 stations) and August 1998 (15 stations) at depths of 8-24 m. The contents of oil products, heavy metals (Cd, Cu, Zn, Ni) and organic carbon were identified in sampling site sediments. Salinity at the sampling sites in May was 13,35 - 16,85 %, in August - 16,6 - 17,5 %.

The structure of the pharynx was studied in 1120 individuals of *N. succinea* of 10-50 mm length. For evaluation of the influence of environmental factors on variation in the amount of anomalous polychaete specimens, the data were analyzed using analysis of variance with depth and salinity as covariates and sediment type and season as the main effects.

In the Odessa area the abundance of *N. succinea* lacking the Vth group of paragnaths even according to reduced data (it wasn't possible to examine all pharynxes) was quite high - 10-480 ind.m^{-2} in May and 40-210 ind.m^{-2} in August. The anomalous individuals were completely lacking only at one station on the western fringe of the Odessa Bank. The fraction of anomalous specimens on the rest of stations made up 28-100 % of the total studied. The average frequency in this area in May was about 58,3±23,8 and 59,0±22,6 %, correspondingly. The ratio of the amount of anomalous individuals at 11 stations according to spring and summer samples had a high correlation ($r = 0,835$; $P = 0,001$).

The amount of anomalous polychaete individuals has a significant correlation with habitat depth both in May ($r = 0,764$; $P < 0,001$) and in August ($r = 0,648$; $P < 0,05$). The influence of water salinity according to our data in both seasons was insignificant ($P > 0,05$).

Analysis of variance (Table 1) confirmed the significance of the influence of habitat depth on the amount of anomalous individuals ($P < 0,001$), and also showed a high relation to the frequency of encountered morphological changes in polychaetes to sediment type ($P < 0,001$). The later effect is observed in silty sediments where the fraction of individuals lacking the Vth group of paragnaths is 75,8±4,2%, in silty sediments with sand or mollusc shell addition, the amount of anomalous individuals declines to 52,9±29,0%o. In sandy sediment anomalous specimens have not been registered.

The influence of sediment type on the morphology variation in *N. succinea* may be directly tied with different granulometric composition of bottom sediments, and with increasing pollution of oil hydrocarbons, phenols, pesticides, and heavy metals in more silty bottom depositions, that has been observed in the Odessa coastal zone (Kravchuk et al., 1996). The latter has been confirmed by studies in the 1970s when in NWBS N. *succinea* also lived

in different sediments, but anomalous individuals appeared in this region only in the late 1990s when the anthropogenic pollution rose sharply.

Table 1. Analysis of variance for number of anomalous specimens of *Nereis succinea* lacking the Vth group of pharyngeal paragnaths from the northwestern Black Sea

Source of variation	d.f.	Mean square	F-ratio	Significance level
Covariates:	2	4717	35,33	<0,001
depth	1	9359	70,10	<0,001
salinity	1	169	1,27	0,270
Main effects:	3	1512	11,33	<0,001
sediment type	2	2137	16,01	<0,001
season	1	283	2,12	0,156
2-factor interraction:	4	123	0,92	0,464
sediment type - season	4	123	0,92	0,464
Total	35			

The data obtained (Table 2) show that at stations where polychaete samples were collected the amount of pollutants was maximum in silts. The difference between their content in sandy-silty and silty sediments is statistically significant for oil products ($P < 0,05$), Cи ($P < 0,01$), Zn ($P = 0,001$) and C^{org} ($P < 0,01$). The number of anomalous polychaete specimens increases with increase of all above-mentioned pollutants in bottom sediments. However the corresponding correlation coefficients both for spring and summer are significant only for Cu. Zn, and Ni (Table 3).

Thus the number of anomalous individuals of *N. succinea* lacking the Vth group of paragnaths in the NWBS increases in those polychaete habitats in silty sediments polluted with oil products and heavy metals.

Many authors (Berkley, Berkley, 1954; Barnes, 1978; Khlebovich et al., 1983) noted marked variations in the number of paragnaths of the pharynx in other polychaete species of the *Nereis* genus. The number of paragnaths in *Nereis* was considered as a population characteristic. R.S.Barnes (1978) regarded that disturbances in the process of paragnath formation are tied with non optimal life condition of *Nereis*.

The first anomalous specimens of *N. succinea* were discovered in the late 1970s in the near Danube area where most expressed were excessive eutrophication, hypoxia and mass mortality of bottom fauna, higher content of

pollutants. This confirms the possible link occurence and subsequent distribution of anomalous individuals of *N. succinea* with the negative changes in environmental conditions. The appearance of free ecological niches as a result of benthos mortality during hypoxia in the NWBS (Losovskaya, Rytikova, 1987) helped Л". *succinea,* as an euryhaline species withstanding the unfavourable gas regime and with a high reproductive potential, to spread in offshore areas of NWBS in new biotopes.

Table 2. The content of oil products, heavy metals, and organic carbon (mgg" ') in bottom sediments at polychaete sampling stations in the northwestern Black Sea (the numbers of samplings in parentheses)

Pollutants	M±S.E.		
	Sand (1)	Sandy-silty, shelly-silty sediments (17)	Silt (14)
Oil products	0,01	0,467±0,079	0,976±0,231
Cd	0,5	1,92±0,20	1,76±0,2
Cu	0	19,2±1,4	27,9±2,2
Zn	0	46,0±4,5	70,5±5,1
Ni	3,2	33,0±2,2	38,4±1,8
C_{org}	1,5	2,34±0,22	3,27±0,37

Table 3. The correlation coefficients of the number of anomalous specimens of the polychaete *Nereis succinea* lacking the Vth group of paragnaths and content of pollutants in bottom deposits in the northwestern Black Sea in May and August 1998 (significance level of the correlation coefficient, *: P < 0,05; **: P < 0,01; ***: P < 0,001; ns: no statistical significance)

Pollutants	May	August
Oil products	0,251 ^{ns}	0,552 *
Cd	0,315 ^{ns}	0,317 ^{ns}
Cu	0,831 ***	0,542 *
Zn	0,718 **	0,608 *
Ni	0,584 *	0,740 **
C_{org}	0,471 ^{ns}	0,492 ^{ns}

The appearance of anomalous specimens in the Black Sea was observed also in the Nematoda class. These specimens were discovered on the

Bulgagian shelf, in the Danube estuary, Sevastopol Bay and in Donuzlav lake (Sergeeva, Kolesnikova, 1996). It is assumed that the morphological anomalies in nematodes is caused, similar to polychaetes, by increasing anthropogenic influence on the Black Sea ecosystem.

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