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# Preliminary observations on the Samsun Bay splash zone biodiversity

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## Abstract

Taking into consideration the unique indicatory significance of the marine splash zone where the inhabitants of the neustal, water column and bottom are present, and continuing the investigations of the phenomenon of littoral concentration of life, samples of sand, mollusk shells and pieces of drifting wood and reed were selected. Parallel samples in the geographically opposite Odessa Gulf area were taken. During laboratory investigations living unicellular algae and fungi have been detected. There were: in Samsun samples – 21 algal species and in Odessa samples – 5 species, and correspondingly 10 and 8 fungal species. All species of fungi from the Samsun Bay were obligate marine and in the Odessa Gulf 8 species were obligate marine and 4 species – of terrigenous origin. Possible reasons of these differences are discussed. Preliminary conclusion is that the ecological status of the Samsun Bay area in autumn 2009 was more satisfactory than that in the Odessa Gulf area.

**Key words**: Samsun Bay, Odessa Gulf, microalgae, fungi.

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## Introduction

Recognizing the key role of contour biotopes of the sea in the development of ecological processes (Zaitsev 1980, 1986, 2008), formation here of the most significant ecological "hot spots" in the marine environment (Zaitsev 2008), and desiring to continue the investigations of the natural phenomenon of littoral concentration of life in the Black Sea (Zaitsev 2006), authors call attention to the southern coast of the sea. One of authors (Yu. Zaitsev) collected in Samsun Bay (Turkey) samples of sand, shells of mollusks, and flotsam. The sand was impregnate with marine water, the mollusk valves were lifted up from the bottom, and the floating pieces of wood etc. were washed by waves on the beach. The splash zone is a unique marine biotope where the organisms and nonliving particles from the sea surface, the water column and bottom are present together.

The results of biological investigations of these samples proved to be enough informative, scientifically and practically important both for the Samsun Bay area and for other Black Sea coastal waters.

## Materials and Methods

At 31, October 2009 in the splash zone of the sandy beach in front of the Omtel Hotel, Samsun, subject to wetting by splash from breaking waves, a sample of wet sand (200 $cm^3$), 10 empty valves of the invasive mollusk ark shell, *Scapharca inaequivalvis* (syn. *S. cornea*) (Bivalvia, Arcidae) and several pieces of floating wood and reeds were collected. These materials are scientifically interesting as ecological indicators because the grains of sand in normal ecological conditions are overgrown with small benthic and even planctonic organisms, the chitinous membrane covering the exterior of shells of the *S. inaequivalvis* tufted at the end by hair-like growths can be overgrown with different microorganisms, and the surface of floating pieces of wood and reed are one of the most preferred substrate on which different marine organisms such as algae, fungi, invertebrates are attached and upon which they are growing. Together with the ark shell in the splash zone some other mollusks shells

were observed – *Solen vagina, Chamelea gallina, Nassarius* et al. But the most numerous were large shells of the ark shell *Scapharca* and razor clam *Solen*, proving good living condition for these species in the Samsun Bay area. Such an abundance of these mollusks species in other Black Sea sandy beaches we have not been observed before.

In the biological laboratories of the Odessa Branch, Institute of biology of Southern Seas, National Academy of Sciences of Ukraine these samples were investigated.

***Laboratory treatment of the microalgae samples.*** Microalgae were studied by cultivation in the laboratory conditions. For this purpose samples of sand with mass of 50 grams were placed into the transparent plastic cups with a capacity of 180 ml and poured in a 100 ml of the filtered marine water (diameter of the filter pores – 0,45 μ). On the surface of sand microscope cover glasses were placed, by analogy to the method of the soil microalgae's study (Golerbach and Shtyna 1969). The cups were covered by plastic double-dish. Samples had been exposed on the window of laboratory at natural illumination, at temperature from 20 to 24°C during 21 days. Composition and amount of microalgae were counted per one $cm^2$ of microscope cover glass. The permanent preparations of the diatoms' frustules had been prepared for identification (Proshkina-Lavrenko 1974).

***Laboratory treatment of the mycological samples.*** Laboratory vessels, substrates-teasers (strips of filtering paper, oak's sawdust) and marine water, used for cultivation, were sterilized in a dry-air sterilizer at the temperature of 180°C during two hours. The solution of streptomycin in a concentration 0,03% or the penicillin and streptomycin solution's mixture (10000 un. per 1000 ml of medium) were added into the marine water just before plating for suppressing of the marine bacteria growth (Methods of experimental mycology 1982).

Bottom sediments (10 – 15 grams) were laid as a skim, substrates-teasers and 20 – 30 ml of water were added into double-dishes for the selection of filamentous marine fungi. The fragments of floating arboreal pieces were placed into the double-dishes and were filled with water. Dishes with material were exhibited in thermostat at a temperature 18-20°C

(optimum for growth of many species of marine fungi) before the ascomycetes' mycothallus or anamorphous fungi's conidia appearance on the substrates' surface. The exposition of samples was conducted during 2-18 and more months. Material was periodically looked over under a stereomicroscope with a small magnification (Biolam-9). The composition of the generative structures and mycelium, and their morphological measurements were studying at magnification of 600× (microscope Biolam-R). The micromycetes' identification was conducted according the determinant's guidance of marine and terrigenous fungi, also particular papers concerning to marine mycology were used (Abdel-Wahab and Abdel-Aziz 2009; De Hoog, Guarro et al. 2000, Kohlmeyer and Kohlmeyer 1979).

## Results and Discussion

Algal diversity in the splash zone of Samsun Bay is represented by 21 species found on/among sand grains from the splash zone in form of dormant stages, which were revived in laboratory experiments. One is the macroalga *Enteromorpha* sp. (Chlorophyta). The other algae are unicellular: *Phormidium* sp. (Cyanophyta) and 19 species of Bacillariophyta: *Amphora coffeaeformis var. coffeaeformis* (Ag.) Kutz, *Amphora* sp., *Biddulphia rostrata var. alata* Proschk.-Lavr., *Cocconeis pediculus* Ehr., *Cylindrotheca closterium* (Ehr.) Reim. et Lew., *Diploneis papula* (Schm.) Cl., *D. smithii var. pumila* (Grun.) Hust. *Fallacia forcipata* (Grev.) Stick. et Mann, *Hantzschia virgata var. virgata* (Rop.) Grun., *Haslea crucigera* (W. Sm.) Sim., *Licmophora gracilis var. gracilis* (Ehr.) Grun., *Nitzschia hydrida var. hydrida* Grun., *N. lanceolata var. minima* V.H., *N. ovalis* Arn. ex Grun., *Navicula palpebralis* Breb., *N. salinarum var. salinarum* Grun., *Striatella delicatula* (Kutz.) Grun., *Thalassiosira excentrica* (Ehr.) Cl., *Tryblionella punctata var. coarctata* Grun.

Mean number of microalgae was 4464 cells per one $cm^2$ of microscope cover glass.

During the same season, on 26 November 2009, a sample of sand in the Odessa Gulf area (Cape Langeron) was taken. The result shows one

representative of Cryptophyta, *Cryptomonas* sp., and four species of Bacillariophyta: *Cylindrotheca closterium* (Her.) Reim. Et Lew., *Navicula perminuta* Grunow in Van Heurk, *Nitzschia hybrida var. hybrida* Grun. and *Skeletonema costatum* (Grev.) Cleve. Mean number of microalgae was 1868 cells per 1 $cm^2$ of microscope cover glass.

In the sand samples of the Samsun beach such fungal species were detected: *Arenariomyces trifurcatus* Höhnk and E.B.G.Jones, *Corollospora maritima* Werdermann, and *Corollospora portsaidica* Abdel-Wahab and Nagah; in the dreef wood samples: *Arenariomyces majusculus* Kohlm. & Volkm.-Kohlm., *A. trifurcatus, Ceriosporopsis halima* Linder, *C. maritima, C. portsaidica, Halosphaeria mediosetigera var. mediosetigera* Cribb and J.W. Cribb, *Trichocladium achrasporum* (Meyers and Moore) Dixon and Shearen (obligate marine species), *Acremonium potronii* Vuill., *Alternaria dianticola* Neerg., *Al. tenuissima* (Kunze) Wiltshire (terrigenous species). On the valves of *S. Inaequivalvis*: *C. maritime* and *A. dianticola.*

In the sand samples from the splash zone of the Odessa Gulf (Cape Langeron) such species were isolated: *A. trifurcatus, C. maritima, Zalerion varium* Anastasiou (obligate marine fungi), *A. potronii,* on the wood pieces were found: *A. trifurcatus, C. halima, C. maritima, Dryosphaera navigans* J. Koch., E. B. G. Jones, *H. mediosetigera var. mediosetigera, T. achrasporum, Nia vibrissa* R. T. Moore, Meyers (obligate marine species).

In the samples from the Samsun Bay and the Odessa Gulf area 10 and 12 species of filamentous fungi were isolated. All fungi from the Samsun Bay were obligate marine species and in the Odessa Gulf 8 species were obligate marine and 4 species – of terrestrial origin. The similarity of the fungal species composition according the Bray-Curtis coefficient is 64,8 % (6 species are common). On floating wood 10 species of fungi were detected, in the splash zone sand – 5, similarity of specific composition of fungi on floating wood and in the sand is 48,5 % (4 common species).

All obligate marine species of fungi are widespread in the World Ocean, and in the Black Sea they are known in the coastal regions of the north-

western part (Odessa Gulf and Romanian shelf (Kopytina 2002, Aleem 1974, Apas and Hulea 1985). The *Corollospora portsaidica* was separated as an independent taxon on the basis of genetic researches in 2009 (Abdel-Wahab et al. 2009), previously we perceived it as a morphotype of *Corollospora maritima.*

Terrigenous species of fungi *A. potronii, Al. dianticola, Al. tenuissima* are widespread in the littoral sand, water column, bottom sediments and on the Black Sea fishes' bodies in the areas of the Danube river avandelta, in the coastal zone of Romania, Crimea and Odessa (Voronin 1984, Milko 1965, Kopytina and Tarasyuk 2010, Apas and Hulea 1985). These species are referred to the group of saprotrophic fungi, that occur in soil, water, air, on rotten plants, their presence testifies to plenty of organic matters in the environment.

The difference in species diversity and number of cells, especially concerning algae and predominance of obligate marine species can be explained by different environmental conditions in two studied areas. In the Odessa Gulf strongly subjected to the river runoff and having a large shelf zone there are lower water salinity, lower autumn water temperature, smaller size of sand grains, and especially a much higher eutrophication of coastal waters.

A preliminary conclusion is that the ecological status of the Samsun Bay area in autumn 2009 was better than that in the Odessa Gulf area. Further investigations are needed.

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