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CONTOUR COMMUNITIES OF SEAS AND OCEANS

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L'auteur souligne que la limite entre l'atmosphère et la surface de l'océan est un vaste biotope habité par le neuston: la limite entre la mer et le rivage sablonneux est habitée par le psammon; de même il considère la limite entre la mer et le rivage rocheux, entre le front d'un fleuve et la mer, ou bien entre l'océan et le fond vaseux, comme des délimitations qui ouvrent de nouvelles perspectives de recherches océaniques (aquiculture, etc.).

Because of their position in space, communities of marine organisms can be divided into two large categories: outer or contour and inner or pelagic. This chorological feature of marine (oceanic) biota to a significant degree is caused by an adequate distribution of nutrient matter, the largest concentration of which is formed at the periphery of marine biocycle.

The main reasons for the accumulation of substances and energy on the outer contour marine surfaces are known.

The upper surface of the sea which borders on the atmosphere is enriched with dead organic matter (DOM) as a result of its influx from the bottom, from water, and from the top, the air, as well. The ascending influx of DOM is bound with the process of natural flitation, as a result of which, dissolved and suspended surfactants are carried to the sea surface by air bubbles. Here, a surface organic film of different thickness is formed, which can be well observed as slicks or flakes of sea foam. The descending influx is bound with atmospheric precipitations of organic substances carried by terrestrial winds. These include pollen, spores, seeds, terrestrial insects and diverse organic remains. These substances are deposited on the surface of the water and are mostly retained here enriching it with organic matter.

As a result of the continuous action of both of these influxes the concentration of certain substances in the uppermost water layer surface of 100 mkm thickness may be of some degrees than in an equal volume of water 10—15 cm from the surface.

The accumulation of organic substances on the sea bottom occurs mainly as a result of the sedimentation of suspended particles from the water body under the force of gravity. On their way down, these particles are usually retained for a certain period of time in the picnocline, after which are deposited on the sediment. This process of sedimentation takes place most intensively in the shelf area where the amount of suspended particles in the water reaches a maximum.

Besides the upper and lower contours which are the greatest in that area — the sea also has lateral contours where the marine water masses border on the shoreline and river waters.

Depending on the type of shore, the lateral sea contour may be rocky, sandy or less frequently, muddy. The accumulation of organic substances of marine and terrestrial origin also takes place on these borders.

Marine organic matter is conveyed by currents and waves, while substances which form the surface organic film and foam are released, first of all, on the shore. These organic substances enrich not only the under water part of near shore cliffs and beaches, but also the above water surface to a distance of a number of metres from the sea level. Terrestrial organic substances enter the area of near shore marine contours with influxes of rain and melted snow water.

Dead organic matter adsorbed on the surface of rocks and cliffs, sand grains and mud particles has an important biological impact. B a i e r's investigations (1972) have shown that during a short period of time a protein film having a high degree of adhesion is adsorbed on the surface of any solid object in marine water. Thus, one of the properties of the surface of solid borders of the sea and land is that they always accumulate protein. This permits the formation of fouling on them.

The amount of organic substances on solid lateral marine contours is somewhat greater than in water. For example, the concentration of phosphates and nitrates in the Black Sea muddy contour is ten to hundred times greater than in water. (P e t r a n et all., 1977; Băcescu et all., 1971).

The border between marine and river water masses forms the least contrasting sea contour. Its position in space and its shape are subjected to fluctuations under the influence of the volume of river run-off, marine currents etc. In spite of this, however, the area of contact of fresh and salt waters, which B o l s h a k o v (1958) characterized as the river hydrological front, or water contact zone can be attributed to lateral marine contours. The accumulation of DOM of marine and river origin takes place here. A strip of foam up to one metre in width can be perceived usually on the water surface of the contact zone of marine and river waters. (Petran et al., 1977)

The above — mentioned phisico-chemical marine contours which I have suggested to name aerocontour (sea — atmosphere boundary), lithocontour (sea — rocky shore), psammocontour (sea — sandy shore), pelocontour (sea — muddy shore and bottom) and potamocontour (sea — river boundary) represent specific biotopes, inhabitated by communities of hydrobionts adapted to them. These communities, large in quantity, have a great variety of species. Nowhere in the water body of seas and oceans is there such a high amount and biomass of organisms as in contour biotopes. These communities form biological marine contours which define the boundaries of this living area of the biosphere.

The aerocontour is inhabited by communities of neuston and pleuston. Neuston is composed of organisms of different systematic levels from bacteria (bacterioneuston) to different stages in the development of fish (ichthyoneuston) inhabiting the lower (hyponeuston) or upper (epineuston) surfaces of the water — Atmosphere boundary. The larvae of many invertebrate species which in the adult stage inhabit other contour biotopes or water bodies develop in hyponeuston (Z a i t s e v, 1970). Pleuston is composed of representatives of Coelenterata, *Physalia* and *Velella*, the body of which is simultaneously water and air borne.

The lithocontour is inhabited by communities of rocks and cliffs. They cover the under water, as well as the above water part of the lithocontour reached by sprays of water enriched with DOM.

The psammocontour is the habitat of rich interstitial fauna and flora, known as psammon. Besides bacteria and unicellular algae, the biological psammocontour includes many species of Infusoria, Sarcodina, Turbellaria, Nematoda, Gastrotricha, Kinorhyncha, Polychaeta, Oligochaeta, Harpacticoida, Ostracoda, Acarina, Collembola, etc. (G o m o i u, 1976; B ă c e s c u et al., 1957).

The biological pelocontour forms a community of muddy sediments, which is more widely distributed on the lower sea surface, than on its lateral contours.

The potamocontour does not have its own communities, so to say, but the river and sea boundary serves simultaneously as the convergency zone of surface waters, and a concentration of large amounts of organisms inhabiting the aerocontour and water body takes place here (Z a i t s e v, op. cit.).

The pelagic zone, the main part of the marine biocycle in volume, is inhabited by communities of plankton and necton.

Film trophic, reproductive and other types of bonds exist between the components of pelagic and contour communities along which biomigration of substances and energy in the sea occurs.

External relations in the sea are manifested through contour biotopes, while contour communities are the first to be considerably subjected to the effect of external factors. This can be explained not only by the peripheric position of biological marine contours, but also by the fact that many allochthonic substances entering the marine environment accumulate in its contour biotopes along the same pathways as the concentration of DOM. A large amount of data has been received giving evidence for this. Thus the investigations of P a t i n (1977) near Arcachon (Bay of Biscay) showed that the concentration of diverse toxicants in the upper surface film of 60—100 mkm thickness is 100 to 1000 times greater than at a depth of 50 cm from the surface. The following accumulation factors are observed in the surface film: DDT+ DDD— 950, lindane— 630, polychlorated biphenils— 1050, mercury— 550, lead— 2200, copper— 800, zinc— 450. According to G o r t a l u m (1979) the thallus of the red alga *Phyllophora brodiaei*, floating on the surface of the Black Sea waters concentrates from 50 to 800 times more benz(a)pyrene, than algae of the same species anchored to the bottom at a depth of 3—4 m. The works of P o l i k a r p o v (1966) have shown the concentration of radionuclides on the aerocontours of the seas and oceans. These examples illustrate that inhabitants of aerocontour are influenced by the above — mentioned toxicants ten, hundred and thousand times more, than those organisms which are not bound with the sea — atmosphere boundary.

However, toxicants from the aerocontours easily enter the upper storeys of marine lateral contours as well as the bottom, where they are deposited as complex compounds or are incorporated by vertical migrants. Allochthonic substances which are introduced into the sea by river run-off, first of all, affect the whole population of the potamocontour, while those which are terrestrial in origin influence the organisms of the lithocontour and the psammocontour.

Other kinds of man-made factors such as the enlargement of beaches, shore line enforcement, a high recreational pressure, as well as the ingredients of water run-off have an impact on the biological contours of the sea.

It has been proved that the widening of beaches by refilling with sand of a different granulometric composition causes a radical change in the biological psammocontour (Vorobyova, 1977). The enforcement of the shore line from abrasion and landslides through changes in the lithocontour greatly influences the composition and quantity of algae and invertebrates attached (Eremenko, 1977, Kaminskaya, 1977). Qualitative changes in the composition of river waters led to a decrease in the number of many organisms populating the potamocontour (Zaitsev, 1978). Changes in the chemical composition of the surface film of the sea caused great alterations in the composition, quantity and distribution of neustonts (Zaitsev, 1977, Polischuk, 1977).

The fate of the corresponding peripheral communities, as well as the biocenoses arranged behind them, the whole pelagic zone, depend on the influence of external factors on the biological contours of the sea. If the contour communities resist under the external impact, then the "rear" pelagic communities will remain unchanged. Otherwise, they will be subjected to the influence of external factors. For instance, after the biological potamocontour in the north-west part of the Black Sea was almost destroyed, great quantities of DOM and biogenic matter from river were distributed on large areas of the shelf, causing abrupt changes in the phytoplancton, the appearance of "red todes" (Nesterova, 1977). Mass mortality of mollusks and of other inhabitants of the pelocontour, psammocontour and lithocontour was observed on broad areas (Salsky, 1977).

The above-stated confirms that biological monitoring can be reduced to a certain degree to watching contour communities, while the state of biological contours may be an indication of the efficiency of practical measures directed to the conservation of living resources of seas and oceans.

The conception of biological contours of the sea, concerning the microstructure of marine biota and chorology of marine organisms opens additional possibilities in performing investigations in the field of marine environmental pollution, aquaculture, relations of the sea and adjacent regions of the biosphere.

DELIMITĂRI DE COMUNITĂŢI ÎN MĂRI ŞI OCEANE

REZUMAT

După ce discută originea şi acumularea substanţelor organice în domeniul marin, autorul discută concepţia delimitărilor biologice în pelagial şi bental şi numeşte o sumă de biotopuri şi biocenoze de mase importantă pentru viaţa în mări şi oceane.

Astfel sînt: limita aer (—atmosferă) ocean, caracterizată prin asociaţia numită neuston; limita litică (mare-ţărm stîncos); psamică (mare-ţărm nisipos, ocupată de psammon); peloidică (mare — ţărm şi fund mîlos) şi potamică (mare — frontul fluvial). Se insistă puţin asupra asociaţiilor ce populează aceste biotopuri (neuston, psamon etc.).

Limitele acestor asociaţii — deci limitele biologice marine — sînt supuse factorilor externi şi intervenţiilor antropice.

Întreaga zonă pelagică este influenţată, de exemplu, de factorii numitelor limite biologice ale oceanului.

Se afirmă că această concepţie a limitelor biologice ale oceanului privind microstructura biontelor marine şi chorologia organismelor marine, deschide posibilităţi noi de cercetare în lupta contra poluărilor, în acvacultură etc. în efectele de contact între mare şi biosferă.

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