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ON THE LITTORALS OF THE CHINA SEAS

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ON THE LITTORALS OF THE CHINA SEAS

Following is the translation of an article by O. B. Mokiyevskiy in Priroda (Nature), No 6, Moscow, 1961, pages 93-97.

From time immemorial the Chinese people have been using the gifts of the sea which are left in the shore tidal belt (on the littoral); their collection does not require complicated devices and expensive implements. On the shores of the Yellow Sea, during ebb tide we as a rule observed dozens of persons gathering mollusks, crabs, trepangs, and seaweed. There are more than 60 species of food mollusks alone along the littorals of the China Seas. Here can be found various species of oysters and midia, venerupis, morskoy cherenok (sea handle), krasavets galiotis (Haliotis beauty) and others. The latter is found within the Southern limits of our Far Eastern Seas, but it is best known in our country by Vrubel's painting "The Pearl". As for Crustacea along the littorals, clumsy looking spectre crayfish are caught, as well as praying crayfish, who can pinch painfully with their thorny claws, as well as various, mostly small varieties of crabs and shrimp.

Trepangs and other holothuria, sea urchins as well as various species of seaweed are collected, not to mention fish, some species of which burrow into the silt when the tide goes out (for example, representatives of the Belonidae family), while others remain in tide pools or can be caught by nets at the edge of the water. The practice of collecting all these organisms, which has lasted throughout more than a 1000 year span, has resulted in the development of many clever methods and devices, which our expeditions studied with great interest. In order to extract spectre crayfish from their extremely deep holes, the local people push brushes made of sheep's wool into these holes. Evidently upon attempting to clear out their holes from this foul smelling object, the crayfish become caught in the wool with their claws. Gatherers of salt mollusks remove the upper layer of soil with small shovels, in order to uncover the aperture to the long underground passage, which has been washed away by the sand.

They pour a little ordinary boiled salt into the aperture, from which the mollusc immediately crawls out, and they use the shovel to cut off his retreat. They dig out the *Venerupis*, which inhabits extremely stony soil, with special three-toothed rakes. In order to move across the marshy-silty ground, local inhabitants make use of devices which are similar to our scooters, but without wheels. The gatherer stands on one leg on the plank (it is also possible to place the basket with the catch on it) and, holding on to the handle with his hands, pushes himself along the ground with the other leg. In some areas movement without this scooter is extremely tiring, and in some places it is impossible. In recent years in the CPR they have begun to make a transition to a more efficient method of making use of seaweed and sea animals, developing artificial breeding. The shores of the China Seas are covered by a network of experimental and food gathering stations, at which sea cabbage-laminaria, formerly not found in Chinese waters, oysters, *midia*, *venerupis* are bred. The increased interest on the part of our friends toward the study of the plant and animal world of the littorals and the laws of its development is understandable. They brought in for this job the representatives of two USSR scientific collectives. In 1957-1960, the joint expedition of the Zoological Institute of the Academy of Sciences USSR and the Institute of Oceanology of the Academy of Sciences CPR carried out, under the direction of Professor Ye. F. Gur'yanova and Professor Chang Hsi, detailed bionomic studies of the littorals of the Shantung Peninsula and Hainan Island.¹ Our projects (Institute of Oceanology of the Academy of Sciences USSR) were directed toward a comparative-geographical and comparative-ecological study of the littorals of typical regions of all three seas of the CPR, chiefly from a quantitative point of view. The study of the upper sublittoral was carried out with the use of light diving equipment (oxygen equipment and SCUBA equipment). We aided our Chinese comrades in mastering this equipment and underwater investigation methods. The Chinese-Soviet coastal expedition of the Institutes of Oceanology of the Academy of Sciences (AS) USSR and the AS CPR studied the regions around the cities of Talien and Tsingtao (in the Yellow Sea), Puto Shan in the Chu Shan Archipelago (East China Sea), the region of the city of Chankiang and Nao Chow Island (in the South China Sea). Joint projects were begun in Tsingtao.

Here only a comparatively small number of mass forms of flora and fauna were found to coincide with ours along our Southern littoral, and the species broadly distributed in the Temperate Zone in the region of Tsingtao are practically non-existent. The basic fauna of the Yellow Sea is made up of tropical genera and species, as is correctly noted

by Ye. F. Gur'yanova², relating this fauna to the greatly impoverished subtropical province of the Indo-Western-Pacific tropical region. Although due to an insufficient degree of independence of floral-fauna composition of the littoral of the Yellow Sea (evidently as in other subtropical seas), it is impossible to place it into a separate biogeographical region or subregion, according to quantitative indices, according to biocoenose composition and mass forms, the littoral of this sea should be separated into a distinct type, differing considerably both from the tropical and the Southern-boreal. This littoral is allied with the tropics by the similarity of the systematic fauna composition, with the Southern-boreal littoral -- by rather sharp seasonal changes. In the summer in Tsingtao, according to the data of Ye. F. Gur'yanova, J. Y. Liu and others (1958), the species of crabs *Scopimera globosa* and *Ilyoplax* (2 species) are found in abundance. Working on 14 October on the same beach (Tsangkou), we did not find these crabs, and we do not find them in October in the Yellow Sea, nor the remarkable flying fishes from the *Periophthalmidae* family. The littoral of the Liaotung Peninsula in the region of Talien is very similar to the littoral of the Tsingtao region both according to qualitative composition of flora and fauna and according to quantitative indices. However, there are certain differences. The oyster *Ostrea cucullata* which is extremely common in Tsingtao is replaced here by the larger *Ostrea talienwhanensis*, which is not to be found in such great numbers. Rather abundant are such Southern-boreal forms, not found in Tsingtao, as the sea urchin *Strongylocentrotus nudus* or the crab *Cancer amphioetus*, as well as the midia *Mytilus edulis* and the species of seaweed *Rhodomela larix* and *Sargassum Kjellmanianum*, widely distributed throughout waters in the Temperate Zone. All of this gives the littoral of the Liaotung Peninsula, in comparison with the Shantung (in the region of Tsingtao) a more Northern appearance.

We studied the littoral of the Northern part of the East China Sea on the island of Puto Shan, formerly one of the religious Buddhist centers. Here can be seen the influence of the Yangtze River, somewhat diluting the salt water and bringing a tremendous quantity of suspended particles. The murky brown water made it useless even to think of working with diving equipment. Jumping somewhat ahead, we shall mention that in the South China Sea, in the region of Chankiang and even on Nao Chow Island, dozens of kilometers from the shore, we had the same bad luck. Going down in diving equipment onto the submerged coral reefs, we could not even see them. The most transparent water throughout our itinerary was to be found in the Yellow Sea, which certainly did not receive its name due to its crystal clarity. This high

degree of transparency, sufficient for carrying out underwater investigations, was characteristic only to the regions of Tsingtao and Talien, that is, the external sections of the Yellow Sea. The littoral of the island of Puto Shan, somewhat impoverished due to the infusion of fresh water, has more characteristic warm-water features (for example, mass development of feeler-legged creatures -- the large sea acorn and sea duck (*Mitella mitella*)). The subtropical nature of the littoral of the East China Sea is manifested in sharp seasonal changes in the composition of its fauna. Working here in the second half of November together with a great expert on the island's fauna, Professor Tung Yu-mao, we were able to confirm its significant winter impoverishment. In the South China Sea, in the area of the new port of Chankiang, we were able to make a fairly detailed study along the littoral of mangrove thickets (*avicennia*, as well as *rizofora*). The trunks of these trees contain large numbers of oysters and crayfish which inhabit the stony soils. On the trunks and in the hollows of the *avicennia* we found the same crabs, molluscs and isopods which we found on rocks and stone fields. Of the material processed up to the present, only one mollusc, *Littorinopsis* sp., was found exclusively on mangrove trees. It was the same with the fauna of the silt soil mangrove thickets. It was almost identical in composition with the population of the monotype silts and silt sands, but without mangroves. The same species of crab ("beckoning crab" -- *Uca*, the crab *Macrophthalmus*, with long stick-like eyes and others), the same species of molluscs, polychaetes, nemertean, starworms, praying crayfish, silt jumpers, etc. The biomass, however, is frequently several times greater under the shelter of the mangroves (up to ten). Engaging in a quantitative count of the population of mangrove thickets, naturally we were not able to deal with the mangroves themselves. Ordinary forestry methods were, under the conditions of the mangrove swamps, extremely labor consuming. Nevertheless, we were able to obtain for the *avicennia* thickets in the Chankiang region approximate indices of their biomass, which fluctuates between 5 and 15 kg/m². The figures were rather low, less than, for example, the biomass of the laminaria seaweed clusters in our Northern seas. However, one should take into consideration that our figures are either for dense but young mangrove thickets or for communities of adult trees (up to 3 meters high), but thinned out. This region, as perhaps the entire China littoral, lacks dense thickets of adult trees, evidently due to the fact that mangroves are also used by local population: the wood -- for articles, and the leaves -- for sideral fertilizer. In certain places sections of the mangrove littoral are diked up, the trees are pulled out of these sections,