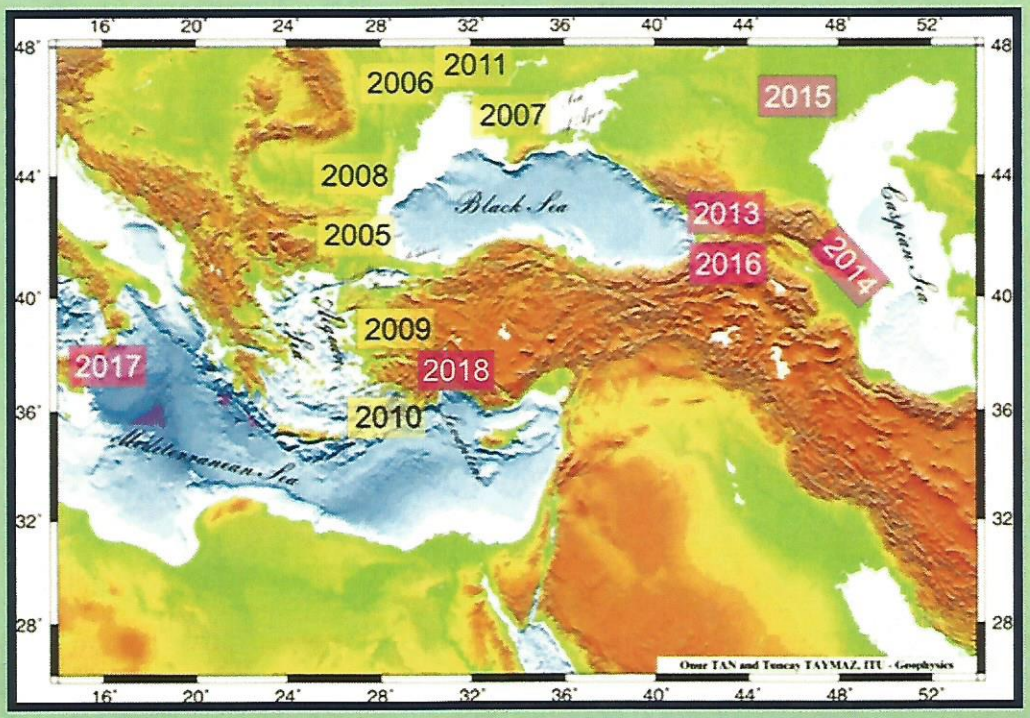
İstanbul University-Cerrahpaşa
Department of Geological Engineering
Turkey
October 14-21, 2018

INTERNATIONAL GEOSCIENCE PROGRAMME



PROCEEDINGS

IGCP 610 "From the Caspian to Mediterranean: Environmental Change and Human Response during the Quaternary" (2013 - 2018)

INQUA IFG POCAS "Ponto-Caspian Stratigraphy and Geochronology" (2017-2020)

THE CASPIAN SEA DURING THE ANTHROPOCENE

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Keywords: Holocene, human activity, biodiversity, marine species in the Caspian Sea

Anthropocene is an informal geochronological term that designates the period of intensive industrial and technological development by humanity. This name was applied in this sense for the first time by Crutzen (2002; Crutzen and Stoermer, 2000). In 2008, a working group on the Anthropocene was created within the Commission on Quarternary Stratigraphy (IUGS), and the Anthropocene was defined as the two last centuries of intensive industrial development when human activities became a powerful geological factor (Zalasiewicz et al., 2010). It has been suggested that the beginning of the Anthropocene coincides with the beginning of the 19th century, with an alternative global boundary being the start of nuclear tests in the 20th century. So far, the destiny of this term and its straton isn't clear, but as for criteria that identify the Anthropocene, obviously, the geochemical and biospheric consequences of human activity, including reduction in biodiversity and emergence of global invasive animal species and plants, can serve. In this work, we consider the influence of humans on the biodiversity of mollusks in the Caspian Sea.

The malacofaunistic analysis of the Neopleistocene and Holocene deposits of the Caspian region has shown that during the Neopleistocene, despite the transgressive and regressive rhythmics of the Caspian Sea encompassing considerable amplitude caused by climatic changes, the composition of molluscan genera remained invariable. There were evolutionary changes at the species and subspecies level of the *Didacna* genus, and each Caspian basin was populated by a unique composition of *Didacna*; this defined the stratigraphic and paleogeographical importance of the genus. Only in the Holocene Neocaspian basin is the broad movement of the marine species *Cerastoderma glaucum* noted. It is the characteristic feature of faunistic structure distinguishing this basin from all Neopleistocene basins of the Caspian Sea.

Emergence of the marine (Mediterranean) species *Cerastoderma glaucum* significantly affected the faunistic image of the basin. Malacofaunistic research of the Holocene deposits of the different regions of the Caspian Sea (the Northern Caspian, the coastal zones of Dagestan, Azerbaijan, and Iran) showed the first emergence of this species in sediments of the Neocaspian transgression, both its gradual distribution and increase in number. Convincing proof of how these mollusks penetrated from the Black Sea into the Caspian Sea is not as yet available. No geological, geomorphological, or paleontological evidence currently exists that the Manych Strait was functioning between the Pontic basin and the Caspian Sea during the post-Khvalynian epoch. We assume that *Cerastoderma glaucum* participated in the maximum development of the Neochernomorian transgression of Pontic basin, when a sea gulf occupied by these mollusks formed within the valley of the Western Manych, and in the Manych depression were a number of residual salty lakes. The first researchers in this area found shells of *Cerastoderma* in the lakes, which existed up to the moment they were flooded by waters of the reservoirs constructed in the last century. From the sea gulf through a chain of lakes, *Cerastoderma* got into the Neocaspian basin by means of ancient humans eating these mollusks as well as using them for ritual purposes (Fedorov, 1978; Yanina, 2012). Another

way this mollusk may have penetrated was by watercraft of ancient groups, about which there is mention in archaeological publications.

Thus, penetration of the marine species into the Caspian Sea was connected with an anthropogenic factor during the middle Holocene. Its influence on the Caspian fauna was essential and is explained by its euryhaline and eurybiont character. Essential changes occurred in the quantitative distribution of taxa, including a gradual increase in the number of individual *Cerastoderma glaucum* and reduction of the Caspian endemic *Didacna*. The modern faunistic composition of the Caspian Sea is characterized by the development of marine (Mediterranean) species *Mytilaster lineatus* and *Abra ovata*. The first species was brought to the Caspian Sea incidentally at the transfer of courts from the Azov-Black Sea basin at the beginning of the 20th century, and recorded for the first time in the Caspian Sea in 1928. Possessing requirements to a substratum, similar to *Dreissena*, the emergence of *Mytilaster* led to the extinction of *Dreissena caspia* and the restriction of *Dr. polymorpha andrusovi* to areas with lowered salinity, niches not available to competitors.

The euryhaline marine species *Abra ovata* was acclimatized to the Caspian Sea in 1947 for the purpose of improving the food supply for sturgeon fishes. Now in bottom biocenoses of the Caspian Sea, *Abra ovata*, *Mytilaster lineatus*, and *Cerastoderma glaucum* often dominate. All of them have a Mediterranean origin. Obviously, as a result of evolutionary development from a small number of sibling species, the Caspian autochthonus fauna began to possess universal qualities but weak species specialization. It provided stability and relative resistance for communities to changing environmental factors, but it made them noncompetitive to installed marine species. Invasive species and acclimatized species made much more essential changes to the biodiversity than was caused by natural factors.

In the Volga delta, species of Azov-Black Sea origin—*Monodacna colorata*, *Hydrobia ventrosa*, *Dreissena bugensis*—appeared thanks to anthropogenic factors during the last century. Monitoring of *Dreissena bugensis* (for the first time registered in the delta in 1994) shows that this species crowds out a polymorphic *Dreissena* (Abdurakhmanov et al., 2002). The latest invasive species is *Mytilopsis leucophaeta*, a mussel native to the Caribbean that in the past few years has invaded many ports (Heiler et al., 2010).

Natural ecosystems have undergone an anthropogenic transformation. In historical time, not only has a rapid change in biodiversity been observed, but also an irreversible change in water ecosystems. Now, the role of anthropogenic factors has become the most important in the distribution of molluscan species in the basin. The modern development of the Caspian Sea malacofauna has led to the seeming increase in molluscan biodiversity due to the emergence of new taxa. But, in fact, we currently observe a loss of biodiversity at the global level, which is turning unique ecosystems of the Caspian Sea into something similar to that of the Azov-Black Sea.

Acknowledgements

The investigations here reported are supported by the RSF Project No 16-17-10103 and RFBR Project 17-55-560012 (studying of the Iranian coast).

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