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Ostracoda of the Caspian origin in the Azov-Black seas basin

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In late Pleistocene and Holocene sediments of the Azov-Black seas basin 26 ostracod species of Caspian Sea origin are recorded, which inhabited in Neoeuxinian Sea, and of which 17 still occur alive occur in the estuarine systems of the rivers (see the Tab. 1, Fig. 1).

Species \ Regions*	1	2	3	4	5	6	7	8	9
Candona sp. A sensu Stancheva, 1989 b								†	
Fabaeformiscandona sp.								†	
Graviacypris elongata (Schweyer, 1949)		+	+	†	+	+	+	†	
Cyprideis sp. sensu Yassini et Ghahreman, 1976		+	+					†	
Amnicythere cymbula (Livental, 1929)	†	+	+	†	+	+	+	†	
Amnicythere gracilloides (Schornikov, 1964)		+	+	†	+	+		†	
Amnicythere longa (Negadaev, 1955)		+	+	†	+	+	+	†	
Amnicythere quinquetuberculata (Schweyer, 1949)		+	+	+	+	+	+	†	
Amnicythere postbissinuata (Negadaev, 1955)		+	†	†	†	†		†	
Amnicythere cf. *resupina* (Stepanaitys, 1962)		+		†	†	†		†	
Amnicythere reticulata (Schornikov, 1966)		+	+	†	†	+		†	
Amnicythere cf. *spectabilis* (Markova, 1957)		+			†	†		†	
Amnicythere stepanaitysae (Schneider, 1962)		+			+	+	+	†	
Amnicythere striatocostata (Schweyer, 1949)		+	†	†	+	†	+	†	
Amnicythere volgensis (Negadaev, 1957)		+			†			†	
Euxinocythere bacuana (Livental, 1938)		+	†	†	†	†		†	
Euxinocythere relicta (Schornikov, 1964)		+	+	†	+	+		†	
Euxinocythere virgata (Schneider, 1962)		+	+		+	+	+	†	†
Tyrrhenocythere amnicola donetziensis (Dubowsky, 1926)	†	+	+	†	+	+	+	†	†
Loxocaspia gibboides (Livental in Schweyer, 1949)		+	†	†	+			†	
Loxocaspia immodulata (Stepanaitys, 1958)	†	+	+			†		†	
Loxocaspia lepida (Stepanaitys, 1962)		+	†	†		+	+	†	
Loxocaspia sublepida (Stancheva, 1989)		+						†	
Loxocaspia edita (Schneider, 1962)		+	†		+	†		†	
Loxocaspia umbonata (Sars in Elofson, 1945)		+			+			†	
Sarmatina? cf. *azeri* (Agalarova, 1961)		+						†	

Tab. 1: Distribution of ostracods of Caspian origin (Regions: 1 - Aral Sea; 2 - Caspian Sea; 3 - basins of Don River and Taganrogsky Bay; 4 - Kuban River delta; 5 - Dneprovsko-Bugsky Liman; 6 - Dnestrovsky Liman; 7 - Danube River delta; 8 – Bottom of Black Sea; 9 - Bottom of Aegean Sea; + = alive; † = fossil, subfossil).

Their remains occur in grab samples together with Recent ostracods mainly near the southern extremity of the Crimean Peninsula at depths of 60–100 m, in the near-Bosporus area at 105–415 m, in boreholes of Quaternary deposits from the Black Sea,

and alive in the estuarine systems of the rivers. They are mostly shallow and eurybiontic species of the ostracod fauna of the Caspian Sea, which is now known to comprise more than 70 species. They invaded the Azov-Black seas basin through Manych Strait in the period of the last maximum rise of sea-level in the Caspian Sea – within the Surozh-Khvalynian time. At the same time three Caspian species invaded in the Aral Sea. They still inhabited that area in the 60s of the 20th century, but now only the holeuryhaline species *Cyprides torosa* (JONES, 1850) remains in the Aral Sea, the remaining ostracods having died out as a the result of ecological catastrophe connected with its drying and salinisation.

Caspian (Khvalynian) ostracods invading the Azov-Black seas basin initially could exist only in the low salinity Don Bay, since at that time the Surozh basin was inhabited by the fauna of Mediterranean type. During the following Neoeuxinian regression the Azov Sea dried, and Caspian fauna completely inhabited the Neoeuxinian Sea, the level of which at times was 120–130 m below that of the contemporary Black Sea. Probably in the late Pleistocene, when there was an outflow of low salinity water from the Neoeuxinian Sea to the Mediterranean region, some Caspian elements of the ostracod fauna got into the Aegean Sea basin. For example, *E. virgata* and *T. amnicola donetziensis* valves were found in two grab samples from the depths of 78 and 302 m in the north part of the Aegean Sea (39°51'3"N; 25°32'5"E and 37°07'3"N; 26°09'2"E).

As a result of the impact of salty Mediterranean waters, which later began to enter into the Black sea basin, four Neoeuxinian species, remaining within the limits of the Neoeuxinian Sea, were the first to die out, and 22 species migrated to low salinity estuarine areas. Of those, five species have already died out in the new habitats. When this fauna invaded the Kuban River estuarine system, it encountered very changeable hydrologic conditions, and 13 from 14 species died out. In order to settle in the estuarine system of the Don River, this fauna migrate from the contemporary Black Sea coasts to the mouth of Manych River. When invading the North Black Sea estuaries, this fauna found the most favourable conditions; at that time there were vast over-deep river valleys, which, being flooded, turned into limans (lagoons), and later on they were not exposed to great changes.

By the present time only 17 ostracod species of Caspian origin survive in the Azov-Black seas basin: one species in the Kuban River delta, 11 in the basins of the Don River and Taganrogsky Bay, 13 in the Dneprovsko-Bugsky Liman, 10 in the Dnestrovsky Liman, and 9 in the Danube River delta. Possibly new local living populations of Caspian species, including species considered as extinct, will be found in future, but most likely further extinctions should be expected as a result of anthropogenic pressure. Species capable of actively penetrating into freshwater habitats and to enlarging their geographical distribution can survive; among them are *T. amnicola donetziensis*, more widely distributed in freshwaters than the other species of this group, *L. immodulata*, found in the Severny Donets River, and *A. longa*, which occurs in the Volgograd Reservoir.

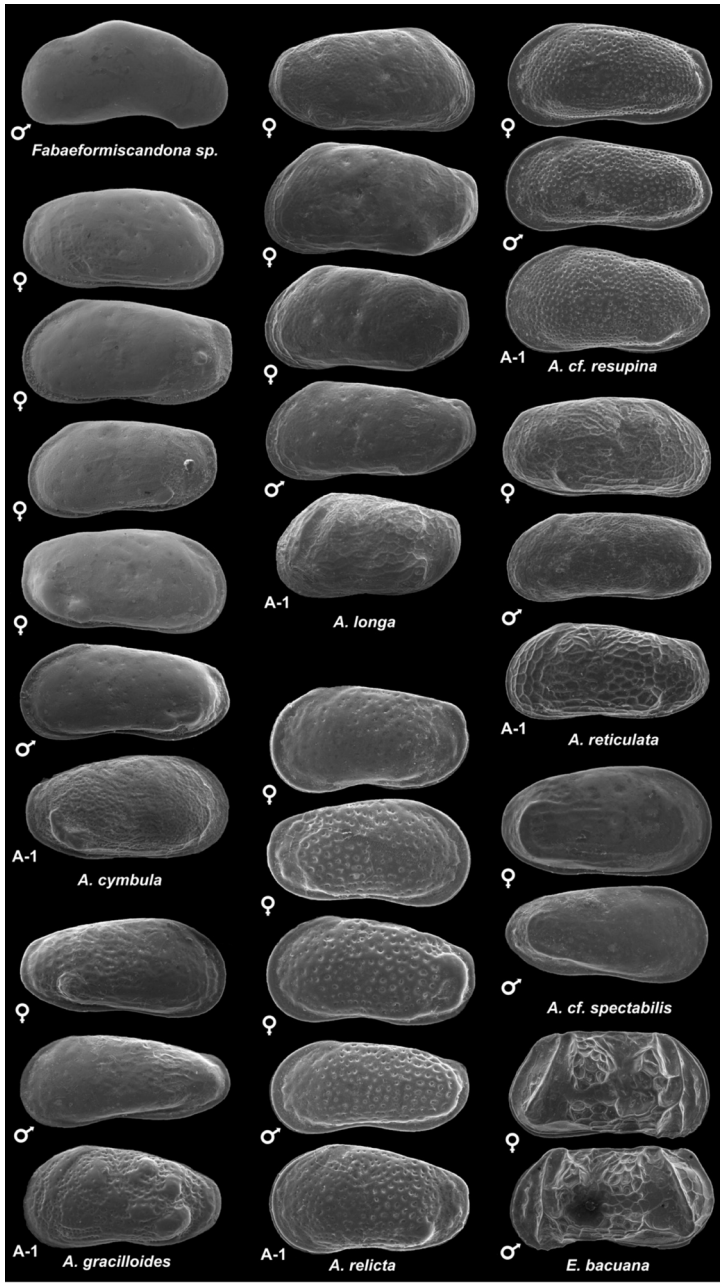

Fig. 1: Ostracods of the Azov-Black seas basin.

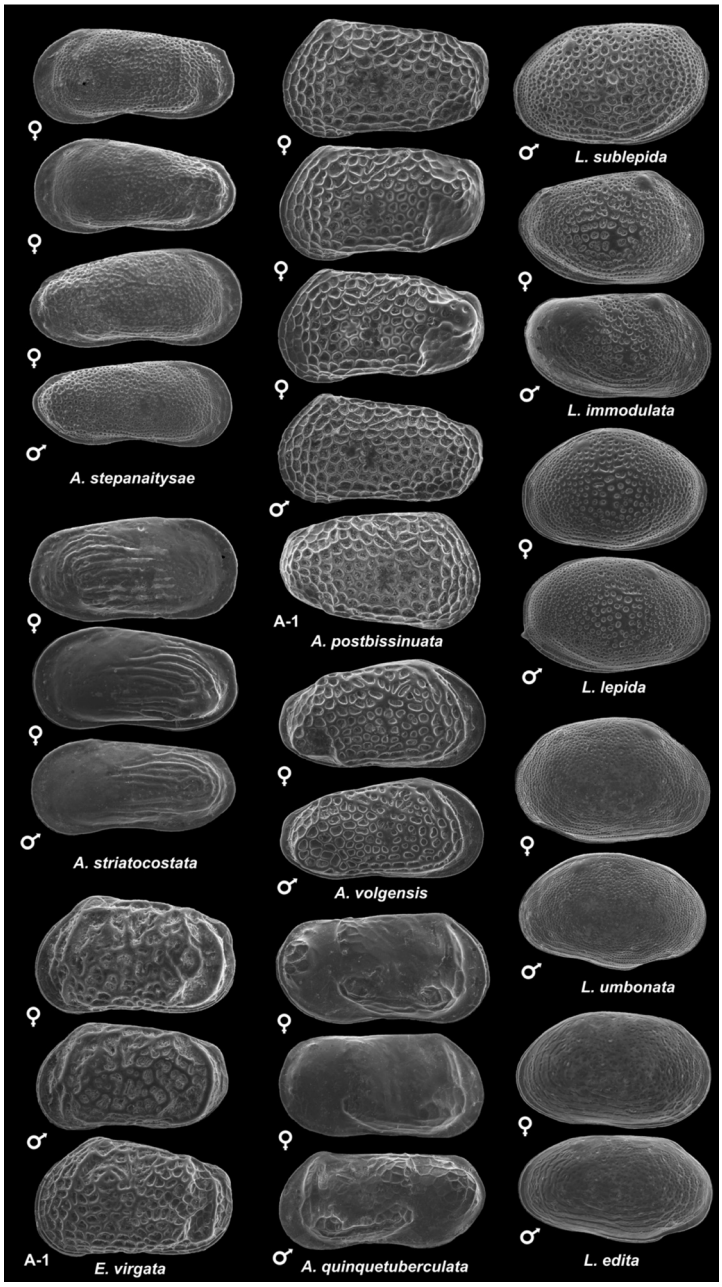

Fig. 1: Ostracods of the Azov-Black seas basin (continued).

From the point of view of zoogeography, species of the considered group cannot be regarded as Neoeuxinian relics, as they died out in their former habitat (i.e., within the Black Sea outlines). Most likely they can be considered, not as "surviving remnants" of the Neoeuxinian Basin fauna, but as invaders intruding into a new basin during Surozh-Khvalynian time and extending their habitat area despite degradation of conditions (salination). Only limited colonies of these species, occurring in the river estuaries, can be considered as relics; moreover these relics are not Neoeuxinian ones, but comparatively young Calamitian ones. In Calamitian time salty waters extended further inland than in present river estuaries (at least up to 80 km). These species were forced out to the upper areas, where they have stayed up to the present time in places protected from strong floods. Species, which occur in rivers above the limits of the greatest sea transgressions should be considered as immigrants.

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