

SEDIMENTARY CHARACTERISTICS OF BAER KNOLLS DEPOSITS IN THE VOLGA RIVER DELTA

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Baer knolls (BK) are elongated ridge and depressions often close to the sub-latitudinal orientation sometimes spatially isometric that are widespread in the entire Northern Caspian Region up to 0 m a.s.l. (the upper limit of the Late Khvalynian sea transgression). Several opinions on the origin and time of formation of BK exist. Researchers interpret the material composing a particular landform, the features of its spatial distribution and orientation very differently. The aeolian opinion is the most popular among the scientific community. The relevance of this research is in studying BK as landforms dated back to the stage of the Late Khvalynian transgression as the key to restoring the history of the Caspian Sea and environmental features that existed on its shores during the Late Pleistocene — Holocene transition. The research objective is detailed studying of the internal structure of BK and their lithological features for a more reliable interpretation of their genesis. The main problem is incomplete and often ambiguous data. This article aims to revise previous interpretations of various researchers on the proposed genesis by receiving new data based on modern methods as a supplement to an earlier publication (Badyukova, 2018). For the first time, ICP-AES analysis is performed in this article for sediments from several Baer knolls at the Volga Delta. BK consists of two lithological formations based on chocolate clay. We divided Baer knoll strata into lithofacies 1 (LF1), lithofacies 2 (LF2) strata and chocolate clays as a basement (CC) (Fig.1).

Four radiocarbon dates from Yaksatovo, Dolgiy, and Sarai-Batu knolls in the Volga Delta range from 16.4 to 13.8 ka cal B.P. Results demonstrate that deposition LF3, and LF2 correspond to the period from Oldest Dryas cold event to Bølling-Allerød warm stage.

Chocolate clay (CC) and Volga alluvium were significant sources of material for the knoll formations. Nonetheless, for lithofacies 1, it was also sandy material lying below the CC. BK have been formed during the transition of Late Khvalynian and Early Holocene time. The BK material cannot be attributed to the aeolian genesis because of lithological characteristics. According to sedimentological data, the formation of the knolls took place in brackish subaquatic conditions, where a low-energy current occurred. Simultaneously with the accumulation of sandy material and interlayers of redeposited shells, there was a background deposition of clay particles. Thus, BK are analogues of river bedforms appearing as the result of turbulent flow, like ripples and river dunes.

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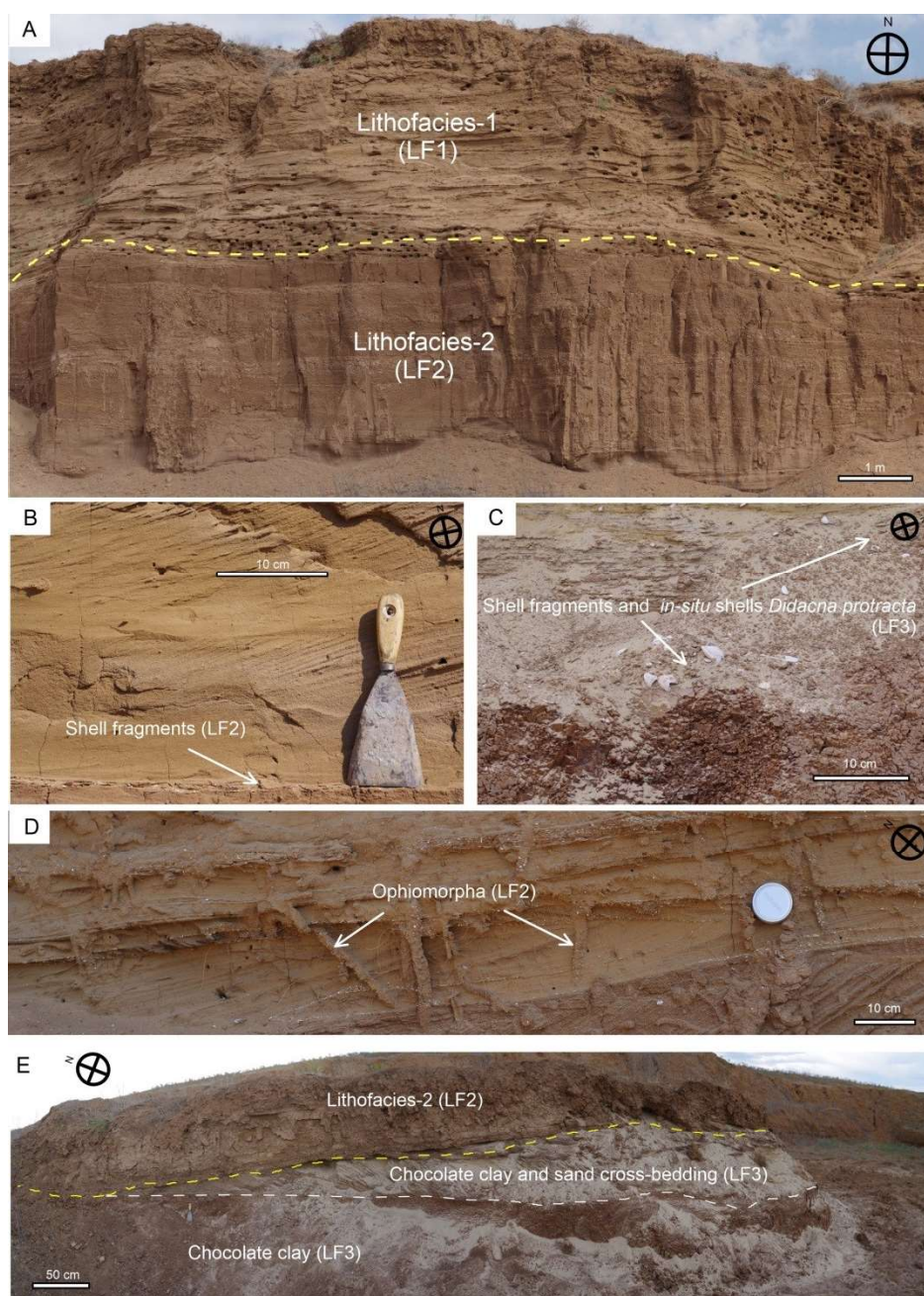


Figure 1. Sedimentary architectures and lithofacies of Baer knolls. (A) Yaksatovo knolls erosional contact between LF1 and LF2. (B) Cross-lamination sand and compacted coarse sand layer with shell detritus (LF1). (C) Mollusc shells *Didacna protracta*, *Dreissena rostriformis* in sand lenses (LF3). (D) *Ophiomorpha* burrows presented in LF2 in Nartovo knoll. (E) Dolgiy knolls cross-lamination of sand and chocolate clay and erosional contact between LF2 and LF3.

References

Badyukova, E.N., 2018. The genesis of the Baer knolls developed in the Northern Caspian Plain. *Quat. Int.* 465, 11 - 21.