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EXCURSION GUIDE AND ABSTRACTS

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ABSTRACTS

BREACHES IN COASTAL BARRIERS OF NON-TIDAL SEAS: PALEOGEOGRAPHIC ASPECTS

Aleksey Davydov

Faculty of Biology, Geography and Ecology, Department of Geography and Ecology, Kherson State University, Shevchenko str. 14, 76018 Ivano-Frankivsk, Ukraine; svobodny.polet2012@gmail.com

Coastal barriers comprise ~13% of the world's shorelines (Stutz, Pilkey 2001; Buynevich, FitzGerald 2019). In non-tidal or minimally microtidal basins, some of the largest barriers include southeast Baltic Sea, northwest Black Sea, and west-northwest shores of the Sea of Azov (**Fig. 1**). The origin and evolution of these landforms is at least partially related to large fluvial systems (Paleo-Vistula, Paleo-Pregolya, Paleo-Nemunas, Paleo-Dniester, Paleo-Dnieper, Paleo-Southern Bug, Paleo-Molochnaya, and others), in a regime of complex Holocene sea-level fluctuations and short-term wave regime and hydrocalimatic factors. The geological age of non-tidal barrier lithosomes varies from 7.0-6.0 ky in the Baltic (Damušytė, 2011; Sergeev, 2015), 3.0-2.5 ky in the Pontic basin (Inozemtsev et al., 2019), and 1.5-1.0 ky for Azov Sea (Paleogeography…, 2019).

Fig. 1. Major barrier systems along non-tidal seas: *a – Black Sea (Pontic)*: 1 – Tuzla group baymouth barriers, 2 – Kinburn-Pokrovsky-Dolgiy, 3 – Tendra-Dzharylgach; *b – Sea of Azov*: 4 – Arabat Arrow Spit; 5 – Fedotov Spit – Biryuchiy Island; *c – Baltic Sea*: 6 – Hel Spit; 7 – Vistula Spit; 8 – Curonian Spit.

Throughout their evolution, non-tidal barriers were subjected to periodic storm breaching and overwash. The former results in ephemeral inlets (prorvas) and associated geomorphic features (**Fig. 2**). Some channels may turn into permanent inlets, but all have reversing currents and sediment transport patterns, though different in origin than tidal inlets. Similar to flood-tidal deltas, many breaches have associated depositional features (fans or surge deltas) in the back-barrier.

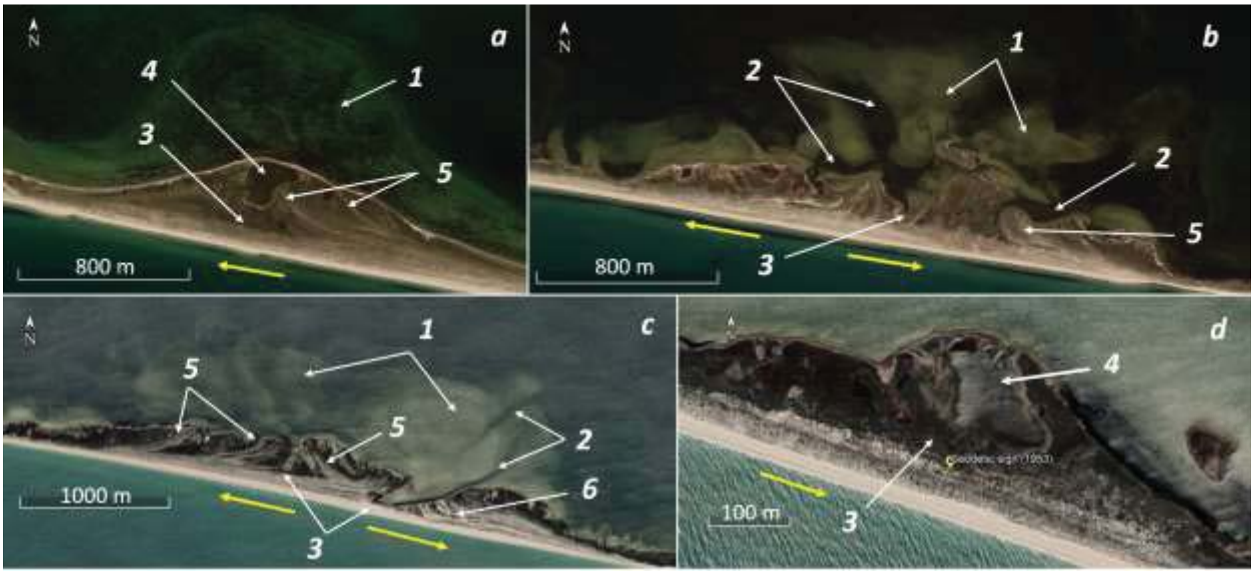

Fig. 2. A suite of morphodynamic elements of Tendra Spit: *a* – simple fan; *b* – complex fan associated with breaches of different ages; *c* – elements associated with actively migratring and re-established breach; *d* – semi-enclosed fan with a geodetic benchmark in front. Morphologic elements: 1 – relict suberged shoals; 2 – relict channels; 3 - sealed breaches; 4 – swales and remnant basins; 5 – recurved spits; 6 – ridge set truncations (yellow arrows show longshore transport direction).

These fan-like deposits and associated underwater shoals have important paleogeographic implications because their analysis allows not only to reconstruct the history of barrier evolution, but also aids in predictive models of coastal change in a regime of hydro-climatic shifts. A detailed assessment of the back-barrier flank of Tendra Spit (**Figs. 1** and **2**) shows systematic patterns of breach distribution, with a degree of morphostratigraphic variation. These are likely related to specific phases of barrier development, punctuated by storm impact. Simple widening (**Fig. 2 *a, d***) occurs along the western and eastern parts of the spit. Their morphology is likely a function of breach longevity, but with no or limited lateral migration This is the result of a dominant cross-shore transport. In contrast, complex fans (surge deltas) tend to occur in the central part of Tendra Spit (**Fig. 2 *b, c***). These openings have functioned for long periods of time and reveal substantial net alongshore migration, likely as a function of strong longshore transport.

Early researchers (Zenkovich, 1960; Pravotorov, 1966) have argued for active erosion along the seaward shoreline and landward migration (retrogradation) of barriers (cf. Buynevich, FitzGerald 2019). However, field data shed doubt on this interpretation. The average width of Tendra Spit does not exceed 70 m but can reach 400 m along its widened fan sections. Geodetic benchmarks installed in the beginning of 20th century show relative stability of these sections. One of such markers in the western section (**Fig. 2 *d***) is located 50 m from the shoreline, which differs little from its original position. This testifies to the stability of the shoreline. Analysis of satellite-based and GPS datasets aids in constraining the position of the Black Sea in the central spit segment. Shore-parallel beach ridges (**Fig. 2**), which front the recurve ridges associated with breach channels, are evidence of recent widening of the barrier (progradation; cf. Buynevich, FitzGerald 2019). These findings demonstrate that breach sites along non-tidal, wave-dominated barriers ultimately produce sediment-rich stable sections. Similar scenarios may have been common along paleo-barriers of the Baltic Sea basin, whereas modern systems are too wide and high to allow breaching and overwash.

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CLIMATIC VARIATIONS DURING THE LATE GLACIAL AND EARLY HOLOCENE IN LITHUANIA ACCORDING TO CHIRONOMIDAE RESEARCH

Neringa Gastevičienė[1], Vaida Šeirienė[1], Tomi P. Luoto[2], Miglė Stančikaitė[1]

[1] Institute of Geology and Geography, Nature Research Centre, Vilnius, Lithuania
[2] Faculty of Biological and Environmental Sciences, Ecosystems and Environment Research Programme, University of Helsinki, Lahti, Finland

The study of the postglacial climatic variations is currently an important scientific problem. Such studies using modern geochronological and climate reconstruction models are still scarce in the Eastern European region. Chironomidae - a diverse midge family, are often used for climate reconstructions as the major factor affecting their distribution is climate. Over the past decade a series chironomid based quantitative reconstructions of the mean July temperature in the south-easter Baltic region were carried out (Płociennik et al., 2011; Dzieduszyńska et al., 2014, Veski et al., 2015 etc.).

This study presents the first Chironomidae studies performed on Lieporiai (north Lithuania) and Čepkeliai (south Lithuania) sections. Mean July air temperatures were inferred using Fennoscandian calibration model (Luoto, Nevalainen, 2017).

Reconstructed Late Glacial mean July temperatures varies between 13–16 °C (Šeirienė et. al., 2021). Meanwhile in Poland reconstructed temperatures from Žabieniec bog ranges between 12–17 °C (Płociennik et al., 2011). Little lower temperatures were obtained from Kurjanovas Lake in Latvia – 1–14°C and Nakri Lake in Estonia – 10.5–13 °C (Veski et al., 2015). The highest temperatures during this period were registered in Kamyshovoye section, Kaliningrad (Druzhinina et al., 2020) and ranged from 16 °C to 19.8 °C.