



White Sea Islands: Genesis and the Holocene Palaeogeomorphology

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Abstract

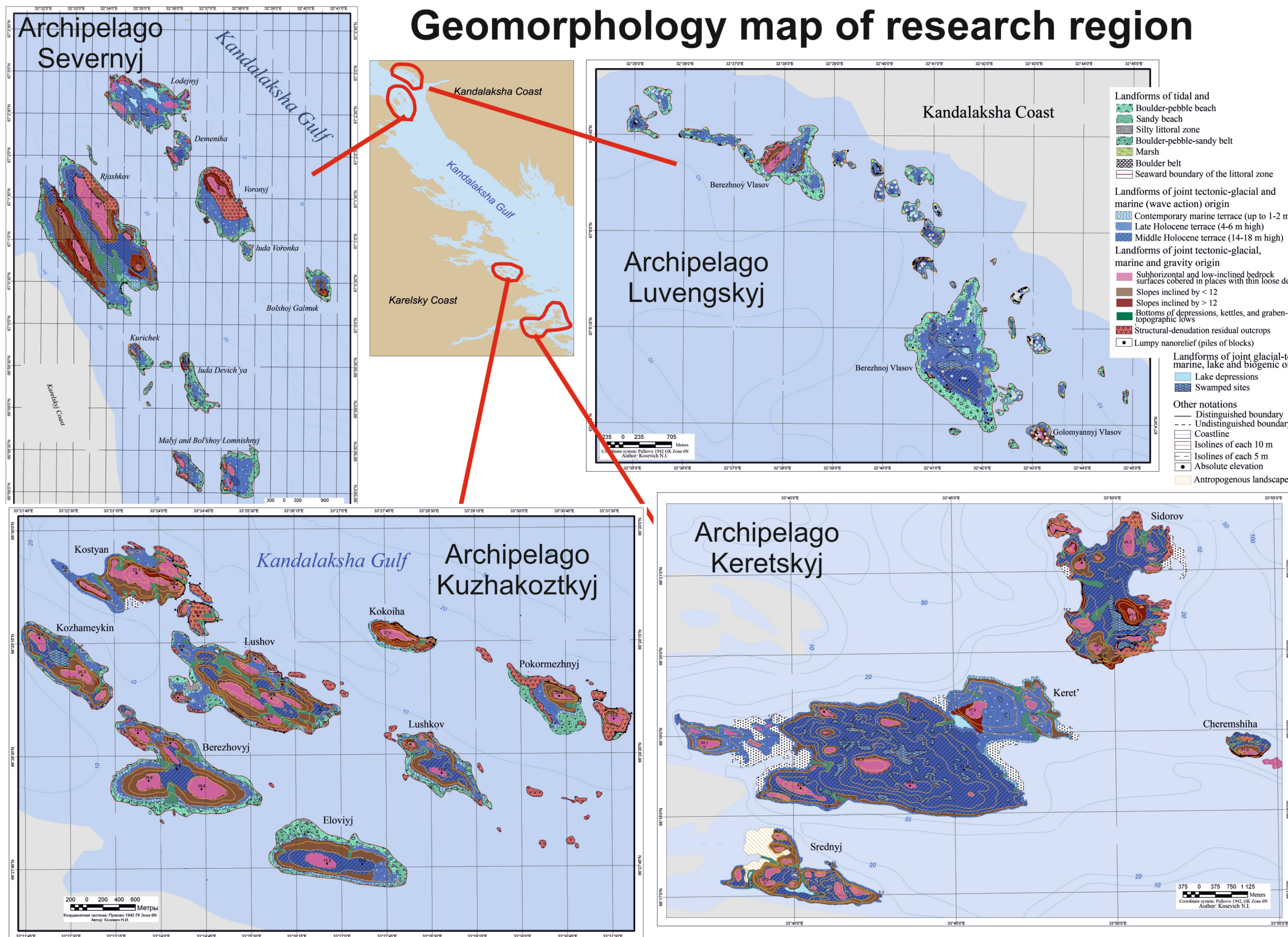
At present, the northern regions attract attention of scientists and politicians all over the world. The White Sea is characterized by the ecological diversity and complex geological history. Numerous islands of the White Sea are a good model for studying the interaction of endogenic and exogenic factors of landform (relief) formation. The irregular distribution of islands reflects also the heterogeneity of the geological and geomorphologic structure of the White Sea region. Therefore, the study of islands morphology and history of their development is one of the priorities in marine geomorphology.

The present study deals with the investigation of land formation processes. We attempt to reconstruct the natural history of islands in the Pleistocene and Holocene. The research area includes the Kandalaksha Bay of the White Sea. It is characterized by a numerous islands of various dimensions, shape, shore and internal parts relief structure, and sets of relief-forming processes.

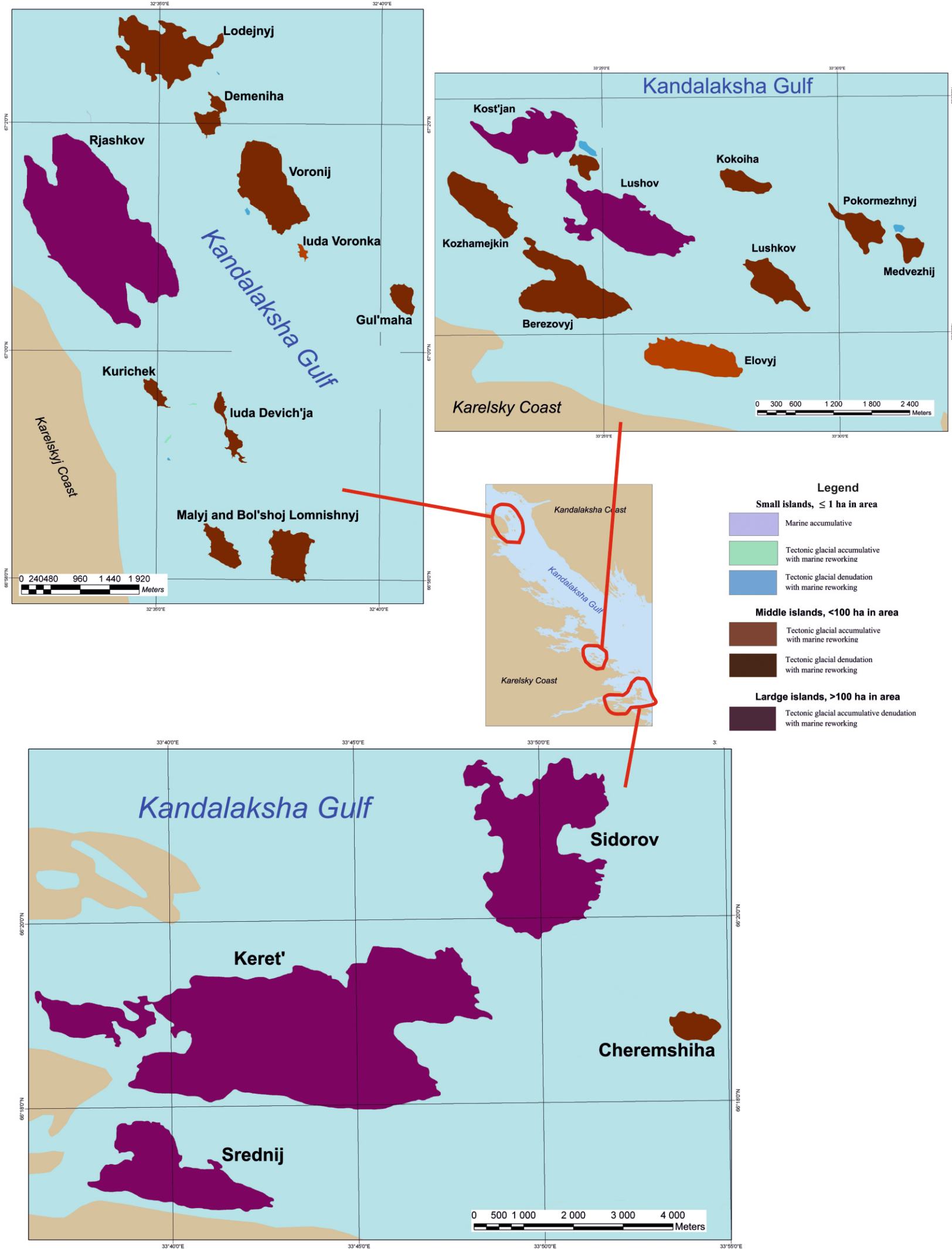
In 2011-2013 we studied Luven'gskiy, Severniy, Kuzakotskiy and Keretskiy archipelagoes. The work includes geological and geomorphological descriptions of the main points of research area, geomorphological cartography and the profiling of the shore islands using GPS, photo-documentation, interpretation of topographic, bathymetric, geological and tectonic maps (1:25 000—1:10 000 000). Also we used information on the relative elevation rate of the Earth's crust and the White Sea level in Pleistocene and Holocene.

The relief of all investigated islands is represented by forms created by the following combinations of processes: 1) glacial-tectonic and marine wave processes; 2) tidal and wind effected phenomena; 3) glacial-tectonic, marine and gravity processes, and 4) glacial-tectonic, marine, lake and biogenic processes. Tectonic rising plays the main role in the islands relief formation. During the land rising above the sea level, its area and height increases leading therefore to the relief complication.

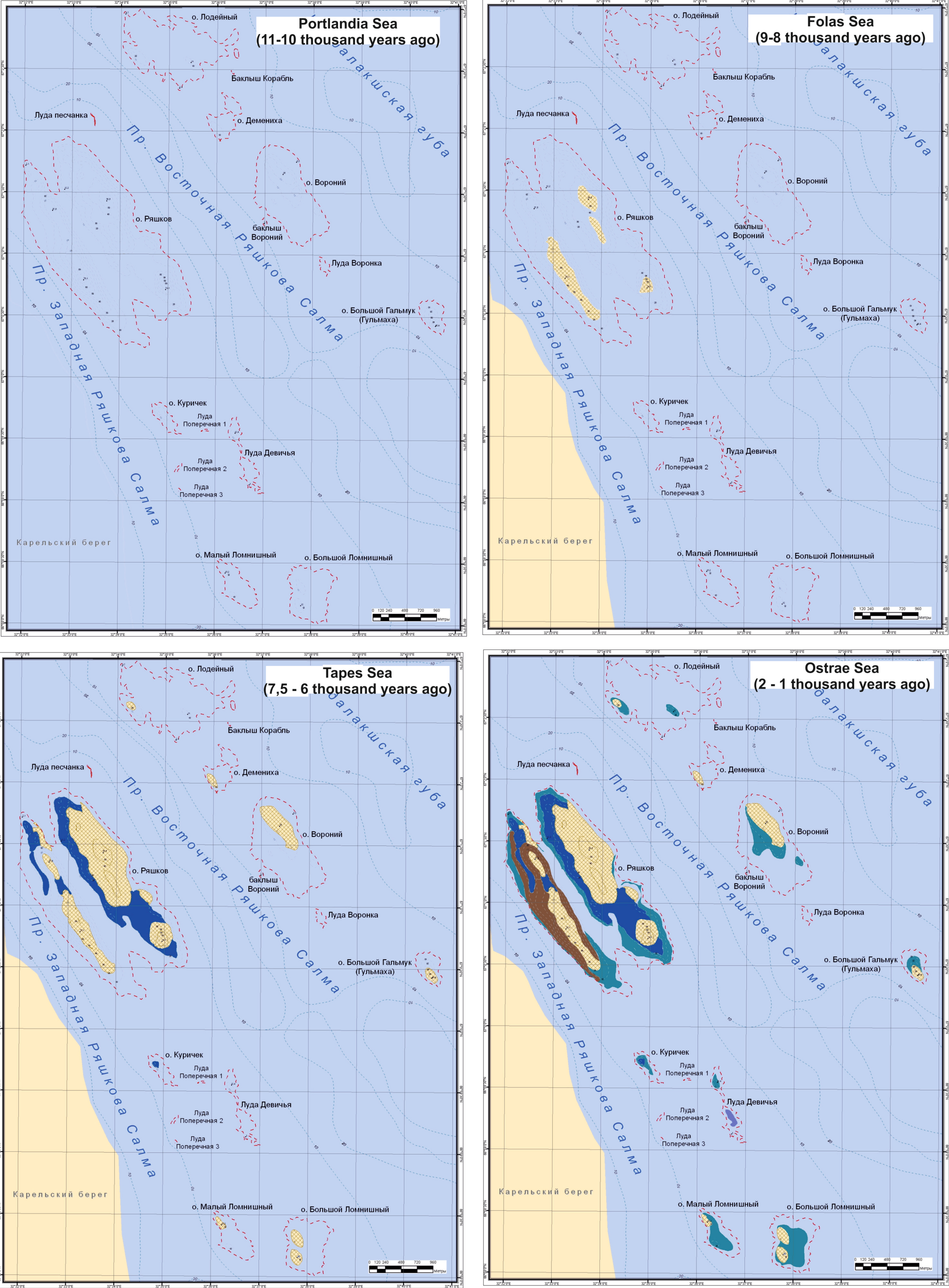
We created paleogeomorphological schemes for each of the studied sites. These schemes reflect the main elements of the islands' surface at a certain stage of the Pleistocene and Holocene periods. The main forms of the islands' relief within studied archipelagoes were formed during the last 7-8 thousand years: the Tape I transgression, the Tape II regression and the Ostrea transgression.



Distribution of the main types of Islands in the Kandalaksha Gulf



Palaeogeomorphological schemes of Severniy archipelagoes



Legend

- The marks of modern absolute heights
- Modern coastal outlines of archipelagoes
- Modern outline of the bottom of the bay
- Modern hypsometric levels
- Outcrops of bedrock
- Fragments of marine origin, 14-18 m high
- Fragments of marine origin, 5-10 m high
- Surface slopes
- Assumed boundaries
- Sea
- Land
- Fragments of marine origin, 20-25 m high

Conclusions:

The White Sea water area is very young, being located in the region of last continental ice sheet. The Kandalaksha Gulf is one of the regions that rise most intensively. That is why the islands relief evolution occurs notably here.

Intensive tectonic rise caused disappearance of numerous coast parts of Kandalaksha Gulf. For example, on the southern bank of the Great Salma Strait the small island occupied by the marine terrace up to 4 m high joins the Kindo peninsula by the low-lying bridge. Calculation of tectonic elevating speed allows estimating of coastal islands age of the south coast of Kandalaksha Gulf. We traced the sequence of the islands relief formation studying the islands of all investigated archipelagoes.

Tectonic rising plays the leading role in the islands relief formation. During the land rising above the sea level, its area and height increases, and therefore the relief becomes more complex. The islands relief forms due to the impact of gravity processes, abrasion and accumulative activity of the sea, and biogenic processes.