

## Foreword

The Baltic Sea is the largest brackish water body in the world. The hydrophysical conditions vary largely both in time and space, thus allowing only the particularly strong species to survive. It is located at relatively high latitudes with severe climate and each year a large part of it is covered by ice. Many species here live at the border of their spreading area. The described features explain why the marine environment of the Baltic Sea is particularly vulnerable with respect to any changes in external forcing.

Within the last century, the anthropogenic pressure on the Baltic Sea has drastically increased. Until now, it has mostly endangered the life in the sea. To mention just a few issues of general importance, the problems caused by DDT, widely used about 50 years ago, can be identified even now, the concentration of other dangerous substances such as dioxine is very close to the acceptable limit, and massive harmful algae blooms have occurred during the last years as a result of overall eutrophication.

Generally, it is believed that the impact of human activities is insignificant, at least, on the geology of the Baltic Sea. It is true that possible influence of irresponsible hydrotechnical construction works may result in negative changes in the beach processes nearby. To avoid such effects, a few locations where extensive changes of the coastal line have been or are being made (e.g., by constructing new harbours and waterways or renovating the old ones), are carefully examined before the work permission is granted and extensively monitored during and after the construction work. These measures prevent undesirable environmental impacts of hydrotechnical works to the remote from the construction areas.

A drastic increase of the intensity of ship traffic on Tallinn Bay within the last decade offers a great possibility to Estonia to join the pan-European transport network. It can also be considered as a part of the efforts made towards reestablishing Estonia as a marine country. The speed and comfort of new fast ferries operating since the end of 1990's have made travel on sea particularly convenient.

However, it is in the nature of things that nothing is perfect. Soon after large fast car ferries were put into operation, habitants and users of the coasts of Tallinn Bay noticed that waves excited by those ferries were in a certain way

different from the storm waves. It was discovered that ship waves frequently cause unexpected violent and dangerous plunging breakers in shallow water, make water turbid, damage fishing nets, and even cause abnormally fast beach destruction.

With the aim of identifying the real, potential, and fictional dangerous effects of the ship traffic, the Estonian Ministry of the Environment and the Estonian Marine Institute jointly initiated a targeted study “The influence of ship wakes on beaches of the Viimsi Peninsula and Naissaar and Aegna islands, and the possibilities of its neutralizing”. In order to cover possibly wide spectrum of aspects of potential wave effects, an *ad hoc* working group, headed by the Marine Systems Institute and involving highly qualified experts from other renowned research bodies, was created. The project was mostly financed by the Estonian Environmental Investment Centre.

The outcome of this study was most interesting. On the one hand, it showed that there is no need to worry about some aspects of ship wakes. For example, ship waves generally do not directly cause intense beach destructions. On the other hand, some other features that may have even larger overall influence to the ecosystem and sediment transport processes have been identified. In particular, possible intensification of sediment transport processes at certain depths, worsening of underwater light regime and potential deterioration of fish spawning conditions may seriously harm the ecosystem of Tallinn Bay and should be addressed in the nearest future.

Probably the most interesting result of the study is the possibility for remote impact of the ship traffic. When considering safety aspects of the ship transport, traditionally it is assumed that the risks are localized within a small area around the ship. Even possible oil contamination is transported relatively slowly owing to winds and currents. Waves excited by fast ferries under certain conditions are of completely different character. They resemble soft cannon balls shot in a certain direction from the sailing line, carrying a huge amount of energy. This feature has to be taken into account in the analysis of the environmental impact of harbours and associated ship traffic in the neighbourhood of vulnerable areas.

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