

### The Gulf of Finland as marine science highway

The Baltic Sea has been a bridge between many nations and countries for millennia. It was the only highway connecting the Nordic regions to the heart of Europe but also to the east of Europe and even to the Far East for a long time, being not only the key transport route but also, and much more importantly, the major channel of cultural contacts and for the spreading and transfer of competence. The role of this water body in connecting people and communities, although diminished for some time during the last century, is rapidly increasing again. In today's Europe, its role is extremely important in bringing together different fields of science and in particular marine science, and linking the north-eastern region of Europe with the countries located on the shores of the Atlantic Ocean.

The Gulf of Finland has been an intrinsic part of this bridge. It is today serving as one of the most trafficked marine highways in the world. This calls for particular attention to this water body from both marine scientists and policy-makers. The trilateral scientific cooperation of Finland, Russia and Estonia aimed at protecting the marine environment of the Gulf of Finland is approaching its 50 years celebration. The first major cooperation event that involved many Baltic Sea countries and the Gulf of Finland was the International Baltic Year (IBY) in 1969—1970. In this framework, the national marine research cruises by 12 research vessels were coordinated so that a series of 39 stations, called BY-stations, in the Baltic Sea proper and the Gulf of Finland were sampled every month by one participation ship.

Since that time, dozens of joint projects have been carried out, including two intensive complex studies of this gulf. The first year of the Gulf of Finland was organized in 1996. After the second Gulf of Finland Year in 2014 the Ministers of Environment of Estonia, Finland, and Russia signed a Memorandum of Understanding to continue the co-operation to protect the marine environment of this unique basin. On a regular basis (say, every six months) there have been meetings and conferences on trilateral cooperation, alternately held in Helsinki, Saint-Petersburg or Tallinn. As a part of the work program, high-level conferences that address both marine research and the relevant science policy are organized every year. The aim is to bring together scientists and decision-makers to discuss the topical issues of this gulf.

The Gulf of Finland Science Days 2017, organized by the Estonian Academy of Sciences, Marine Institute at the Tartu University and the Finnish Environment Institute (SYKE), was held in Tallinn, in the premises of the Estonian Academy of Sciences, on October 9—10, 2017. It gathered more than 100 participants. There were about 50 oral and 20 poster presentations on biological diversity and ecosystem health, eutrophication, pollution and monitoring, geological diversity and its physical and chemical forcing, fish and sustainable fisheries, maritime safety, and spatial planning and management. The conference was introduced by Marko Pomerants, Chair of the Constitutional Committee, Riigikogu (Parliament of Estonia) and the closing speech was presented by Mailis Reps, the Minister of Education and Research.

This special issue of "Fundamental and Applied Hydrophysics" reports a selection of research highlights that were presented at the conference. The issue starts with the paper of Pelinovsky et al. (*Pelinovsky E. N., Talipova T. G., Soomere T., Kurkina O. E., Kurkin A. A., Tyugin D. Yu.* Modelling of Internal Waves in the Baltic Sea. *Fundamentalnaya i Prikladnaya Gidrofizika*. 2018, 11, 2, 8—20) that addresses internal waves in the Baltic Sea. Together with a brief overview of research in this area, it analyses both the data of various observations of internal waves and the results of calculations of the transformation of internal solitons for several examples of hydrologic conditions in the Baltic Sea. Väli et al. (*Väli G., Zhurbas V. M., Laanemets J., Lips U.* Clustering of floating particles due to submesoscale dynamics: a simulation study for the Gulf of Finland, Baltic Sea. *Fundamentalnaya i Prikladnaya Gidrofizika*. 2018, 11, 2, 21—35) describe simulations of the velocity field by a circulation model with extremely high horizontal resolution (232×232 m) in the Gulf of Finland during the period of summer upwelling events. The model is used to calculate advection of floating Lagrangian particles and to study the behaviour of the particles and their clustering at short and large times of advection. In the paper by Ryabchenko et al. (*Ryabchenko V. A., Leontyev I. O., Ryabchuk D. V., Sergeev A. Yu., Dvornikov A. Yu., Martyanov S. D., Zhamoida V. A.* Mitigation measures of coastal erosion on the Kotlin Island's shores in the Gulf of Finland, the Baltic Sea. *Fundamentalnaya i Prikladnaya Gidrofizika*. 2018, 11, 2, 36—50) a model approach is proposed to assess the intensity of coastal erosion

on the shores of the Kotlin Island. The calculations serve as a justification for the choice of the particular method of artificial sand nourishment in order to maintain the sandy beaches.

Three publications address different assessments of the ecological status of the Gulf of Finland. Balushkina and Golubkov (*Balushkina E. V., Golubkov S. M.* Water quality and biodiversity of benthic animals in the Neva estuary under anthropogenic stress. *Fundamentalnaya i Prikladnaya Gidrofizika*. 2018, 11, 2, 51—61) analysed values of species' richness and Shannon index (the information entropy of the distribution, treating species as symbols and their relative population sizes as the probability) in the resort zone of the eastern Gulf in 1994—2015. They demonstrate that these quantities were much lower in the study area than in the Neva Bay due to not only the changes in salinity, but also the more intense pollution of the Neva Bay. Based on the national monitoring data from 2011—2016 and using nutrients, direct effects and indirect effects indicators, Stoicescu et al. (*Stoicescu S.-T., Lips U., Lips I.* Assessing the eutrophication status of Estonian marine waters. *Fundamentalnaya i Prikladnaya Gidrofizika*. 2018, 11, 2, 62—74) demonstrated that the entire Estonian marine area is affected by eutrophication. Kuznetsova et al. (*Kuznetsova T. V., Kholodkevich S. V., Kurakin A. S.* Experience on ecological status assessment based on adaptive potential diagnostics in selected invertebrates of the Baltic Sea sub-regions. *Fundamentalnaya i Prikladnaya Gidrofizika*. 2018, 11, 2, 75—85) describe an original approach to the assessment of biological effects of environmental chemical stress based on the evaluation of the adaptive potential of indigenous species of invertebrates at different anthropogenic pressure. The assessment of adaptivity was performed using the method of physiological loading on bivalve molluscs and anti-orthostatic test in crustacean, based on measuring the heart rate recovery time after removal of stress load.

We are looking forward towards the next Science Days of the trilateral co-operation that will be organized in Saint Petersburg in October 2018.

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