

# ASSESSING THE CURRENT STATUS OF BALTIC GREY SEAL POPULATION AND PREDICTING ITS FUTURE

**Jarno Vanhatalo<sup>1</sup>, Kaarina Kauhala<sup>2</sup>, Olle Karlsson<sup>3</sup>,  
Markus Ahola<sup>2</sup> and Raisa Tiilikainen<sup>3</sup>**

<sup>1</sup> University of Helsinki, Finland

<sup>2</sup> Finnish Game and Fisheries Research Institute, Finland

<sup>3</sup> Swedish Museum of Natural History, Sweden

<sup>3</sup> Metshallitus, Finland

The population size of Baltic grey seals (*Halichoerus grypus*) has substantially increased in recent years leading to a conflict between seals and coastal fisheries in the Baltic Sea. Grey seals damage fishing gear and catches and an unknown number of seals drown in fishing gear. This has led to the need for new management measures and, thus, a better understanding of the current status and future trend of the grey seal population under alternative management scenarios.

We build a biologically consistent state space model to estimate the temporal changes in the seal population and predict the development of the population under alternative management options. As the uncertainty related to the subject is high, several complementary data sets are used and specific attention is paid to model construction and prior elicitation. These include, for example, survey counts, by-catch estimates from earlier studies, fishing and hunting statistics, statistics from sampled grey seals, expert interviews and literature. The model is age-sex structured and provides estimates, among others, for the population size and total by-catch in age-sex classes. We forecast the population development under a few alternative management decisions related to hunting and by-catch, and different ice extent scenarios in the breeding areas of Baltic grey seals that are based on climate warming scenarios.

The results indicate a clear difference in the natural, hunting and by-catch mortalities between males and females. These differences have also direct effect on the expected longterm outcomes of alternative management decisions. Moreover, the sea ice extent in the Baltic has clear effect on pup survival and the worst climate warming scenarios will likely affect the Baltic grey seal population negatively.

**Keywords:** state space model, population dynamics, management, decision analysis.