

## CM-Code

ICES CS 2019/A

## Title of abstract

How major Baltic inflows (MBI) reduce the vertical overlap of predator (*Gadus morhua*) and prey (*Clupeidae*) in the Bornholm Basin (central Baltic Sea): a machine learning approach

## Name(s) of authors

Herrmann, R.

## Abstract text

The abiotic environment of the Baltic Sea is characterized by a pronounced vertical stratification, which ultimately affects the vertical distribution of the pelagic fish community and hence the co-occurrence of predator and their prey. Understanding these relations has certain implications for fisheries management, especially when hydrodynamic processes come into play. The Baltic cod (*Gadus morhua* L.) and its main prey clupeid fish (*Clupea harengus* L.; *Sprattus sprattus* L.) in the Bornholm Basin (central Baltic Sea) serve as an example. Supervised ensemble machine learning (weighted random forest) trained on a variety of hydroacoustic data was used to predict their vertical distribution. The commonly used predictor variables (e.g. temperature, salinity, oxygen) were supplemented by the underwater light regime, which was calculated using the global radiation under local weather conditions and the specific attenuation coefficient, both based on remote sensing. The importance of each independent variable (mean decrease in accuracy) for the vertical distribution of both Baltic cod and clupeid fish is examined. Furthermore, multiple measurements to evaluate a model's performance are presented, with special regard to the independency of class prevalence. Finally, the habitat models were applied to various environmental scenarios to predict (i) the diel vertical migration of Baltic cod and clupeids, and (ii) the change of the interspecific vertical overlaps during a major Baltic inflow in December 2014.

## Keywords

machine learning, random forest, Baltic cod, clupeid fish, diel vertical migration, vertical distribution, predator-prey overlap

## Contact author

Robert Herrmann, Thünen Institute of Baltic Sea Fisheries Rostock,  
Email: [robertherrmann@mail.de](mailto:robertherrmann@mail.de), Tel.: +49 (0) 172 312 978 2