**ICES CM 2017/P:377**

**Multi-decadal cod reproductive habitat variability in the Baltic Sea and its impact on reproductive success**

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**Abstract**

Cod in the Baltic Sea live in an estuarine environment whose salinity and oxygen conditions impose physiological stresses on spawning success, including egg fertilization and survival. Earlier field and laboratory studies have shown that spawning success, including egg survival is greatly reduced or inhibited at salinities < 11 and oxygen content < 2 ml·l-1. Based on these hydrographic conditions a reproductive habitat (“reproduction volume”) has been quantified. Its spatial and temporal variability in these volumes in three principal spawning sites in the Baltic Sea – Bornholm, Gdansk and Gotland Basins - during a 60-year period were evaluated in order to assess its influence on cod reproductive success and recruitment. Reproduction volume was evaluated as an environmental variable in Ricker stock recruitment models.

The mean and variance of the reproductive volume time series changed to a new regime after 1981, due primarily to a reduction in the frequency of large reproductive volume years. As a result, since 1981, the mean and range of reproduction volume has declined, making its impact on egg survival and recruitment smaller. However, some strong yearclasses have been produced since 1981, despite the relatively low reproductive volumes, probably due to relaxation of other recruitment-limiting factors. These changes in the recruitment processes over time imply that regular ecosystem monitoring and updating of models is required for quantifying cod population dynamics.

Acknowledgement: The research leading to these results has received funding from BONUS, the joint Baltic Sea research and development programme (Art 185), funded jointly from the European Union’s Seventh Programme for research, technological development and demonstration and from national funding of Latvia (Project INSPIRE).

**Keywords:** Eastern Baltic cod, reproduction volume, stock dynamics, stock-recruitment, environment

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