Stock recruitment relationships for cod (Gadus morhua L.) in the central Baltic Sea incorporating environmental variability

Recruitment of central/eastern Baltic cod critically depends on favourable oceanographic conditions in the deeper basins of the Baltic Sea creating a suitable habitat for the development of early life stages. The decline in the size of the spawning stock since the mid-1980s initiated a series of investigations on recruitment, which were continued through a partial recovery of the stock in the mid-1990s. The principal factors influencing recruitment and recognized at present are: (i) the volume of water with temperature, oxygen and salinity conditions which meet the minimum requirements for successful egg development (‘reproductive volume’); (ii) the age-structure of the spawning stock; (iii) the timing of spawning; and (iv) predation mortality on eggs due to sprat (Sprattus sprattus) and herring (Clupea harengus), as well as cod cannibalism. We relate recruitment at age 2 to parent stock size using updated time series of these variables, comprising the period 1966 to 1994. Spawning stock biomass and egg production are compared as measures of parent stock size. The influence of wind energy and zooplankton abundance on cod recruitment are discussed. A modified Ricker model is outlined explicitly accounting for environmentally-induced oscillations around the two observed levels of cod stock size.

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