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# Population dynamics of a dominant species (Pseudocalanus, Acartia and Temora) in the Gulf of Gdansk (southern Baltic Sea)

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Copepods are the most important secondary producers of the world ocean. They represent an important link between phytoplankton, microzooplankton and higher trophic levels such as fish. With regard to their role in marine food webs, it is important to know how environmental variations affect their population.
The population dynamics of a dominant species (Pseudocalanus, Acartia and Temora) in the southern Baltic Sea have been investigated within the grant which is supported by the Polish State Committee of Scientific Research. We intend to study the impact of climate changes on the development of the investigated copepods in the southern Baltic Sea through the impact of food concentration, temperature and salinity within the next few decades. Therefore, the goal within grant-Poland is developing the marine ecosystem model for Baltic Sea 3D CEMBSv2 (a coupled biological-hydrodynamic model) with a new 3D copepod model. 3D CEMBSv2 is a fully coupled model adopted for the Baltic Sea. The model is based on CESM1.0 (Community Earth System Model), in our configuration it consists of two active components (ocean and ice) driven by central coupler (CPL7). Ocean (POP version 2.1) and ice models (CICE model, version 4.0) are forced by atmospheric and land data models. Atmospheric data sets are provided by ICM-UM model from University of Warsaw. Additionally land model provides runoff of the Baltic Sea (currently 78 rivers). Ecosystem model is based on an intermediate complexity marine ecosystem model for the global domain and consists of 11 main components: zooplankton, small phytoplankton, diatoms, cyanobacteria, two detrital classes, dissolved oxygen and the nutrients nitrate, ammonium, phosphate and silicate. The copepod model consists of ten state variables with masses and numbers for each of five model stage, grouping stages to: the non feeding stages and eggs are represented by the stage – eggs–N2, following are the naupliar stages – N3–N6, then two copepodite stages – C1 – C3 and C4 – C5 and finally the adult stage – C6.
The Baltic zooplankton is composed of microzooplankton, mezozooplankton and macroplankton with characteristic ichtyoplankton forms. The structure of mezozooplankton in the Gdansk Gulf mainly consisted of four taxa: copepoda, cladocera, rotatoria and meroplankton. The most important species in the Gdansk Gulf are copepoda: Acartia spp. (i.e. A. bifilosa, A. longiremis and A. tonsa), Temora longicornis, Pseudocalanus minutus elongatus and Centropages hamatus and cladocera: Bosmina coregoni maritime and Podon polyphemoides. Copepoda dominate numerically, while in the warm season Cladocera are subdominants. The study describes numerical simulations of the seasonal dynamics of Acartia spp., Temora longicornis and Pseudocalanus minutus elongatus in the southern Baltic Sea using a three-dimensional version of the coupled ecosystem–copepod model. In the case of the Baltic Sea, food concentration and temperature are the main factors controlling copepod development, and salinity is a masking factor. The surface water salinity of the southern Baltic is constant at 7-8 PSU. It is included in the present study. The simulated population dynamics were compared with observations at the Gulf of Gdansk.
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