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Numerical Simulation of vertical migration and Selective Tidal Transport of brown shrimp *Crangon Crangon*

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While Crangon Crangon larvae inhabits the pelagial in deeper coastal waters of the German Bight, juvenile shrimps are observed within the tidal flats with a body length of about 15 mm. Therefore juvenile Crangon Crangon has to move over a distance of up to 60 km to immigrate into the tidal flats after metamorphosis at 5 mm length. For this reason and because active swimming is correlated to high metabolic costs, it is most probable that they are able to use selective tidal transport (STT). To reach the coast by using tidal streams, juvenile shrimps have to perform vertical migration if the flood stream inserts and stay on the bottom during ebb tide.

To understand the underlying processes of STT a Lagrangian particle tracking model was coupled to a 3D non-linear primitive equation model (HAMSOM). A temperature dependend growth equation for juvenile brown shrimp was also implemented into the model.

For the individual behaviour as well as for the tidal indicating signal assumptions were made, which should be validated. The vertical migration has been parameterized as a sub grid scale physical process. The balance of forces acting on an individual brown shrimp within a turbulent environment (gravity, bouyancy, Stoke's friction and dynamical uplift) leads to a net uplift or sinking depending on shrimp size, relative velocity and the angle of inclination. The relative velocity of the shrimp to the surrounding water is related to the tidal current velocity shear on the bottom.

Assignable to horizontal gradients in hydrographic properties, tidal streams are associated with local changes in temperature and salinity within the German Bight. These

changes are assumed to be the crucial factor for an individual shrimp to start vertical migration.

Integrating these assumptions into the model-system should clarify if the parameterization of vertical transport might be realistic and leads to an efficient transport of juvenile *Crangon Crangon* into the tidal flats. The model results show that the parameterized individual behaviour leads to a vertical migration of simulated shrimps. For a temperature as well as for a salinity signal a transport of shrimp onto the coast in about 20 to 40 days takes place. Within that time period juvenile Crangon Crangon reaches lengths of up to 19 mm.

The results leads to the conclusion that the individual behaviour of species at higher stages might be highly influenced by environmental conditions and must not necessarily be dominated by active movements.