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Influence of vertical migration on the shelf retention of larvae

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Three-dimensional numerical model was used to simulate the dispersion and recruitment of larvae in the shelf waters in front of the Ria de Aveiro estuary, North of Portugal. Two simulations were done, one for February and March of 2002 and other for April and May of the same year. The model was forced by bulk fluxes from the NCEP reanalysis database. The larvae were simulated as floats with horizontal passive behaviour but with four vertical schemes of migration. The objective was to reproduce the behaviour of the crab larvae Carcinus maenas and other larvae with same release and migration patterns. The particles were released during the periods of the neap tides and their trajectories was analysed during five weeks, the average time Carcinus maenas spend in the shelf waters where it develops in zoeal stages until become megalopa, before reenter the estuary, a necessary condition for settlement and further development. The four migration schemes included two purely Lagrangean in which particles were released near the surface in one case and with an uniform vertical distribution in the other. In the other two schemes the particles had an imposed diel vertical migration, between the surface and bottom in one case, and between a variable depth upper and lower layer in the last scheme. The particles from the different schemes showed different responses to the wind forcing. While the Lagrangean particles were more sensitive to the wind driven surface currents, the particles with diel vertical migration become more retained in the inner shelf region. This was more evident during the spring simulation (April and May) which was characterised by upwelling favourable winds during almost all the simulation period. The upwelling internal onshore current moves the particles at the lower layers back shoreward retaining them in the inner shelf and near the coast. In these locations it is easier for the particles to reach the estuary region of influence where they will be sucked during the flood tides. Thus, the diel vertical migration featured by some species may be a mechanism to allow them

to remain in inner shelf waters and reenter the estuary.