

## **THE ROLE OF NORTH SEA ESTUARIES FOR YOUNG HERRING: A DYNAMIC MODEL FOR THE LIFE HISTORY OF *CLUPEA HARENGUS***

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Large numbers of young-of-the-year herring typically enter and remain within North Sea estuaries during the winter months. This type of juvenile fish migration is documented very well but the environmental and biotic stimuli initiating the movement to estuaries and the following recruitment by emigration to the sea remain poorly understood. The key factors controlling for the timing of migrations between sea and estuaries were identified using a dynamic fitness model. The abiotic environment was simulated by spatio-temporal gradients in temperature, light intensity and turbidity. Biotic interactions affecting the fitness of herring are predation, food availability and schooling dynamics. Model simulations using real input data for the Scheldt Estuary (The Netherlands) which discharges into the southern North Sea suggest that (1) the time lag in temperature between the estuary and the North Sea may stimulate migration behaviour and that (2) turbidity has an important role as environmental resource since it mediates the feeding and anti-predator behaviours of herring. Turbidity reduces the probability of predator-induced mortality but, of greater importance is the ability of herring to switch from particulate to filter feeding under turbid conditions in estuaries. This behaviour enables herring to profit from increased estuarine copepod production during the winter months.