Can individual-based models provide useful insights into the management of the European seabass (*Dicentrarchus labrax*)?

Kieran Hyder[1], Claire Beraud[1], Johan van der Molen[1], Leila Fonseca[1,2], Ewan Hunter[1], & Mike Armstrong[1]

1. Centre for Environment, Fisheries & Aquaculture Science, Pakefield Road, Lowestoft, Suffolk NR33 0HT, UK
2. Department for Environment, Food & Rural Affairs, Nobel House, 17 Smith Square, London SW1P 3JR, UK

Abstract

The European seabass (*Dicentrarchus labrax*) is a high value fish with significant exploitation by both commercial and recreational fisheries. Scientific assessments of the northern stock have shown a rapid decline in the spawning stock biomass since 2006 attributed to a succession of weak year classes from 2008-2012 and increased fishing mortality. The stock exhibits very large interannual variability in recruitment driven by environmental factors, and significant reductions in the harvest of seabass have been implemented by the European Commission to conserve stocks. Individual-based models (IBMs) are simulations that describe individual 'agents' of organisms that have been shown to be to be effective management tools in many systems, but have yet to be applied to seabass. In this study, the effectiveness of IBM for the management of seabass is assessed. An IBM of the pelagic phase of seabass was developed to assess the impact of environmental conditions on settlement that incorporated a model of the pelagic phase of seabass was developed that included both the physical environment (temperature and currents) and life history characteristics (growth and behaviour). The model was able to predict differences in strength of settlement in poor and good settlement years regardless of larval behaviour, but larval behaviour an important factor in determining arrival at nurseries grounds. Spatial IBMs were also developed for adults that take into account life history and exploitation by both commercial and recreational fishers. The model outputs are discussed in the context of the management and conservation of seabass.