ABM LAB

ABM Lab (among others) allows for:

- discrete representations of unique individuals
- local interactions
- use of adaptive, fitness-seeking behaviour
- explicit representation of how individuals and their environment affect each other
- representation of full life cycles

These can for instance, be used to predict the behaviour of large marine animals or identify hot-spots for connectivity between key habitats by studying the dispersal of larvae or spores. Agent (animals, larvae and so on) movements and states can be described as a response to local conditions or gradients, such as current velocities, water temperature, water quality, food availability and anthropogenic pressures.

ABM Lab may also be used to back-track agents (for example, the origin of fish larvae or eggs found in a particular area).

ABM Lab is fully integrated with ECO Lab and runs in conjunction with our most advanced flexible hydrodynamic modelling software – MIKE 21/3 FM. ABM Lab offers full access to model algorithms through an open equation solver interface – for editing existing ABM model descriptions or building new ABM models from scratch. MIKE 3 FM utilises flexible mesh for defining the computational grid, thereby allowing ABM to be applied to both freshwater and marine ecosystems.

ADVANCED EIAS FOR AQUATIC ORGANISMS

ABM Lab offers advanced solutions to Environmental Impact Assessments (EIAs) for aquatic organisms – whether it involves the behaviour of large animals such as mammals & fish or dispersal units like larvae, seeds and spores of aquatic organisms. For example, the response of large animals to disturbances like underwater noise from drilling or seismic surveys should preferably be based on baseline behaviour modelling. This takes into account seasonal migrations as well as meteorological and hydrodynamic changes.

Linking movement behaviour modelling of Bull sharks (Carcharhinusleucas) with observation data from acoustic tagging of juvenile sharks in a semi-enclosed ecosystem, Australia

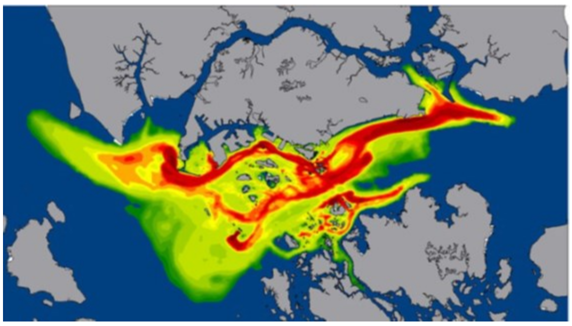
EVALUATING THE IMPORTANCE OF MARINE PROTECTED AREA NETWORKS

Marine protected areas are important for protection of the local environment. However, the importance of the network is related to the role of these protected areas as sources or sink areas for the dispersal of plants and animals. Using ABM Lab, it's possible to determine the connectivity between such areas and define the importance of the protected area networks.

For example, models of coral larvae dispersal can be developed, simulating:

- mortality
- larvae settlement
- individual reaction to environmental and anthropogenic gradients

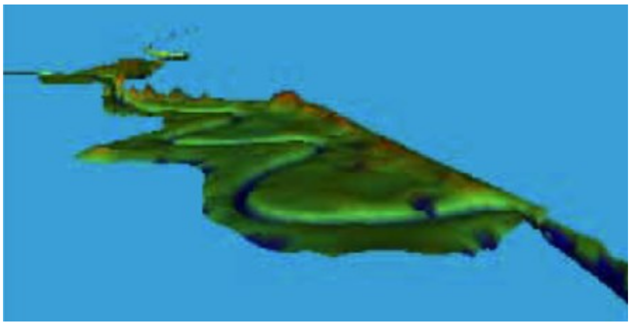
Important connectivity corridors between coral reefs can then be identified based on these models.



Connectivity corridors between five selected reefs shown as cumulative densities of larvae over a five-day period after spawning. Red coloration marks high concentration areas

PLANNING RESTORATION MEASURES

ABM Lab can be used in the planning phase for projects aiming to restore natural habitats and enhance abundance & survival of fish, for instance. An example: ABM modelling of the migration of salmonide fish larvae *(Coregonus oxyrhynchus)* through two different wetland reconstruction designs was used to evaluate which of the two designs had the most positive effects on larvae retention in the wetland. In another example, ABM was used to study the factors determining re-colonisation of eelgrass.



ABM used for testing wetland reconstruction designs

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