

Information transfer, behavior of vessels and fishing efficiency: an individual-based simulation approach



A simulator dedicated to the modeling of individual search behaviors of fishing vessels has been built using multi-agents systems methodology. The harvesting activity of a virtual fleet is simulated and applied to a static virtual fish population, distributed in a bi-dimensional spatially explicit environment. The resource population can differ depending on different degrees of aggregation. Each vessel of the fleet is modeled as a singular and autonomous agent of the fishery system. The model focuses on the representation of information transfer among vessels, which results in an orientation of search effort. The informative search behavior is compared to a stochastic search, in order to estimate efficiency gains allowed by information transfers. Results show a strong dependence of the fleet's efficiency towards the level of aggregation of the resource. For higher levels of aggregation the informative behavior results in important gains in efficiency. Conversely, a misleading effect of information appears in the weakest aggregations. The informative behavior leads to the progressive convergence and the gathering of the agents. When the aggregation is

strong, this "pack effect" is stable in time and enables the vessels to make quick catches. For the weakest aggregation levels, the "pack effect" is unstable and leads the ships to a perpetual pursuit state, without catches. Thus, the size of existing networks appears as a key parameter of vessel behaviors. This approach, using an individual-based simulator, seems quite appropriate to connect individual behaviors to the dynamics of the fishing efficiency, which are generally studied in an aggregated manner. It allows to quantify the effects of the exchange of information among vessels, which is commonly considered as a qualitative phenomenon. Such an approach should be enlarged to a more global modeling of all of the components of the individual search behaviors of vessels.

Auteurs du document : Laurent Millischer, Didier Gascuel

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