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Development and application of a generic method to assess species exploratory potential under climate change: focus on the exploration phase of anadromous fish

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Climate change by altering spatio-temporal distributions of suitable habitats leads to modifications in a multitude of species ranges. In recent years, the ability of species to physically adjust to the changing climatic conditions is of growing concern. We developed a generic trait-based method to assess the ability of species to explore new suitable habitats under climate change. Anadromous fish populations of the northern Atlantic were chosen as a suitable application case due to their high variability in terms of migratory behavior and degree of philopatry. The calculation of an Exploratory Potential Index (EPI) relies on a formal framework and a participatory procedure adapted from the Analytical Hierarchy Process (AHP) theory. It combines independent relevant life-history traits and ecological attributes into a single numeric value and permit to gather expert opinion by decomposing a complex issue into a hierarchy of more easily comprehended sub-problems through pairwise comparison matrices. Straying, earliness of first maturity, body size at first maturity, Distance covered to access feeding grounds and the reproduction strategies were identified by the expert. Results allow to identify different dispersal strategies and support strong differences in the ability to explore potential suitable habitat among anadromous fish. Even though they have contrasted life cycles, Morone saxatalis, Acipenser oxyrinchus and Alosa mediocris outperformed most of the species, while other species as Acipenser brevirostrum demonstrated had the lowest scores. Broader applications of the EPI would help to identify regions acting as potential sources of migrants and thus of priority for conservation biologists and resources managers.

Keywords:

Climate change; range shift; exploration phase; participative method; composite metric; migratory species

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