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Galway-Mayo Institute of Technology
Dublin Road
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October 13, 2019

Prof. Brian D. Fath
Department of Biological Sciences
Towson University
8000 York Road
Towson
Maryland 21252
USA

Dear Professor Fath,

We would like to submit an *Original research* paper titled *'Highly resolved spatiotemporal simulations for exploring mixed fisheries dynamics'* for consideration in *Ecological modelling*. In this paper we develop a simulation model (*MixFishSim*) of a ecological-fishery system where individual fishing vessels exploit multiple heterogeneously distributed fish populations with full spatiotemporal population dynamics. Using*MixFishSim* we address critically important sampling issues which as the importance of spatial and temporal scale when modelling fishery interactions, particularly in relation to modelling observational data from a system with preferential sampling.

Our approach incorporates, in an emergent manner, how fishers exploit a dynamic natural resource with uncertain knowledge of its distribution. We detail how this affects our understanding of the fisheries interactions with multiple fish populations, which cannot be achieved with conventional modelling approaches. By capturing dynamics observed in fisheries data in a novel simulation model where the entire dynamics of the system (including the true spatial distribution of the populations) are known, we expose that degrading the spatial and temporal resolution of data through aggregation reduces our ability to define effective spatial management measures. This would not of been possible without the highly details and resolved simulation approach used here. The framework has many potential additional applications (e.g. monitoring survey design, index standardisation for fisheries assessment, in-year fishery and biological modelling, testing adaptive management approaches, comparison of heuristic and mechanistic fishery effort dynamics models among others). MixFishSim is made available as a documented R software package for users to explore.

Should you consider our work suitable for review, we would like to suggest the following potential reviewers:

- **Dr Tom Carruthers:** Expert in data limited fisheries and spatial fisheries models. Assistant Professor, University of British Columba, Institute for the Ocean and Fisheries, Room 335, 2202 Main Mall, Vancouver, British Columbia, Canada. Email: t.carruthers@oceans.ubc.ca.

- **Dr Coby Needle:** Expert in spatial fisheries modelling. Marine Scotland, Marine Laboratory 375 Victoria Road, Aberdeen, AB11 9DB, Scotland, UK. Email: coby.needle@gov.scot.

- **Prof. Richard Bailey:** Expert in coupled human-environment interactions. St Catherine's College, Oxford University, Manor Road, Oxford, OX1 3UJ. Email: richard.bailey@ouce.ox.ac.uk.
- **Prof. Edward Codling:** Expert in animal movement behaviour and marine fisheries systems. STEM 5.11, University of Essex, Colchester Campus, Wivenhoe Park, Colchester, CO4 3SQ, UK. Email:ecodling@essex.ac.uk.

Thank you for your time and consideration.

Yours Sincerely,

Paul Dolder
Dr Cóilín Minto
Prof Jean-Marc Guarini
Dr Jan Jaap Poos