ICES CM 2016/L:575

Spatio-temporal modelling of fishing effort pattern after displacement due to offshore wind developments using INLA

A. Kafas [a,c] , J. B. Illian [b], I. M. Davies [a], and B. E. Scott [c]

[a] Marine Laboratory
Marine Scotland Science
Aberdeen, Scotland, UK
andronikos.kafas@gov.scot, ian.davies@gov.scot

[b] Centre for Research into Ecological & Environmental Modelling
University of St. Andrews
St. Andrews, Scotland, UK
jbi@st-andrews.sc.uk

[c] Institute of Biological and Environmental Sciences
University of Aberdeen
Aberdeen, Scotland, UK
b.e.scott@abdn.ac.uk

Contact author:
Andronikos Kafas
Marine Laboratory
Marine Scotland Science
Aberdeen, Scotland, UK
andronikos.kafas@gov.scot,

Keywords: Integrated Nested Laplace Approximation, Gaussian Markov Random Fields, fisheries, displacement, offshore wind.

Abstract:
Spatial overlap between emerging offshore wind farms and commercial fishing activity may impede access to traditional fishing grounds. Consequently, fishermen may re-allocate (displace) their fishing effort to alternative sea areas with lower profits and/or less reliability in catches. This study develops a hierarchical spatio-temporal model for fishing effort distribution. The model involves a Gaussian Markov Random Field (GMRF) through the Stochastic Partial Differential Equations (SPDE) approach and adopts the Integrated Nested Laplace Approximation (INLA) algorithm. Multi-year spatio-temporal data for Scottish fishing vessels are sourced through the Vessel Monitoring System (VMS) and used in the model. The effect of relevant covariates as well as time and space dependence is modelled in a Bayesian framework. Validation of the model outputs is undertaken with current fishing patterns. The model evaluates and predicts changes in fishing effort and income patterns in space and time in response to new constraints from offshore wind farms.