Enhance our understanding of small-scale fisheries with the geolocation of fishing vessels: the case of the French kelp fishery off Brittany

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Small-scale fisheries have a large economic and social importance, as they often represent the major part of the fishing activity of a country. Most of the time, they take place in the coastal zone where multiple marine uses compete for space. Thus understanding the spatial dynamics of these fisheries is key for their management. To illustrate that we considered the case of the kelp fishery off Brittany, and demonstrated how the use of geolocation devices are well suited to describe the spatial dynamics of the fishing vessels belonging to the fishery. From high frequency GPS positions recorded along vessels tracks, the sequence of activities (i.e. fishing, travelling, anchored, ...) was estimated using a Hidden Markov model. Because several métiers were practised during the fishing season, the model was designed to detect fishing states associated to each métier. In addition, the model was robust to false fishing states corresponding to entering or exiting fishing harbours. It also accounted for potential fixed positions at sea or in harbour. For a selection of fishing trips, estimated fishing efforts were confronted to observations obtained from volunteer fishermen, thus providing an indicator on the estimation performance. For each fishing trip, the daily captures were attributed to fishing sequences. A comprehensive analysis on all vessels belonging to the kelp fishery was undertaken. Maps of fishing effort and total capture were produced and allowed to quantify how fishermen share space and exploit the resources within the season. Results attested to the spatio-temporal dependence of the fishing activity, which is a key information for the spatial management of the fishery.

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