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Defining small-scale fisheries in the EU on the basis of their operational range of activity The Swedish fleet as a case study

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ABSTRACT

Extending the definition of small scale fisheries is a recurrent issue in policy and research debates. A broader definition of small scale fisheries would need to encompass, in addition to vessel size attributes such as vessel length, variables relating to their local operational range, their social role in coastal communities and the economics of the enterprise. In this study, data mining and geospatial analysis techniques were used to explore the relationship between vessel characteristics and local operational range. The process relies heavily on the availability of detailed logbook data and involves two main steps: (1) clustering vessels on the basis of operational range attributes and (2) finding vessel characteristics that best match the operational range classes through machine learning algorithms. The analysis was carried out using the Swedish fishing fleet as a case study and considers the fishing activity of the entire fleet over the period 2007–2013. Swedish logbook data offers the advantage of providing precise spatial information on the location of the catch. Results clearly identified three operational range clusters: local, medium and long range. When considering engine power and vessel tonnage as explanatory variables, the classification algorithms were able to represent the operational range classes with a success rate of 94%. However, the fact that medium size vessels operate and compete in the same operational range class of small size vessels limits, in practice, the possibility of using vessel characteristics to represent univocally the local operational range characteristics of small scale fisheries, unless very high thresholds for power and tonnage are used.

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1. Introduction

Small scale fisheries (SSF) are of great importance in the European Union (EU) in terms of job opportunities and contribution to the economy of coastal communities. It has been estimated that SSF generate around 53% of the direct employment in the EU catching sector, represent around 83% of the fishing vessels and a quarter of the catch value (Guyader et al., 2013). Despite this importance, the sector is still poorly understood, statistics are limited and there is a lack of a uniform and straightforward definition for SSF. The lack of a common definition for SSF contributes to the difficulty of managing the sector and implementing targeted policies.

The need to define SSF is a recurring issue in policy, management and research debates (e.g. COFI, 2014; Garcia et al., 2008; European Parliament Committee on Fisheries, 2012; Guyader et al., 2013; Symes, 2013). The interchangeability of terms normally associated to SSF – "artisanal", "local", "coastal", "traditional", "small", "subsistence", "non-industrial", "low-tech", "poor" – is indicative of the many values and characteristics underpinning their definition.

In the EU, the reformed common fisheries policy (CFP) includes three main actions in support of SSF: an extension to 2022 of the right for member states (MS) to restrict fishing within 12 nautical miles; the exclusion of SSF from transferable fishing concessions schemes, as well as, a series of targeted financial support measures under the European Maritime and Fisheries Fund (EMFF) (Regulation 508/2014). For the implementation of these measures, the EMFF defines SSF as "fishing carried out by fishing vessels of an overall length of less than 12 m and not using towed fishing gear". This formulation repeats the one used in the previous European Fisheries Fund (Regulation 1198/2006).

Preceding the approval of the reformed CFP, a report by the European Parliament (EP) (European Parliament Committee on Fisheries, 2012) argued in favour of a definition for SSF that considers, in addition to a strict boat-size criterion, the impact on the marine ecosystem, the time spent at sea and the characteristics

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of the economic unit exploiting the resource. In this line, the EP recommended that the "European Commission should, alongside the Member States, set out a more exhaustive and rigorous definition of small-scale fishing. There is a need to know better where, when and how small-scale fishing boats fish". The report also provides a list of the characteristics associated with small-scale fishing: "strong ties to the economy, social structure, culture and traditions of coastal towns and communities; fishing activity undertaken relatively close to the coast and involving shorter periods at sea; greater direct incorporation of human labour, or the employment of more individuals per unit of fish caught; the use of less fuel per unit of fish caught; the use of techniques that are more selective and able to have less impact on living marine resources; closer cooperation between the fisher, the resources and the community of which he/she is part, which could facilitate understanding of the importance of properly conserving resources; involvement in simpler marketing structures and shorter supply chains, with the majority of the fish destined to be consumed fresh; and the prevalence, amongst other operators, of micro-, small and medium sized enterprises, and of family enterprises".

In the scientific realm, several authors have also shown to be in favour of a definition for SSF that is based on other characteristics rather than simply on vessel size, such as modes of enterprise organisation, spatial–temporal dimension of operations, social organisation, economic behaviour and dependence on local ecosystems (Johnson, 2006; Guyader et al., 2013; Symes, 2013; Fréon et al., 2014; García-Flórez et al., 2014). According to Symes (2013), SSF can be seen as a social phenomenon, a choice of life which is accompanied by limitations in fishing activity and operational range. SSF are better integrated in local, social–ecological systems and this makes them more resilient. On the other hand, the inherent individualism of the fishermen makes it more difficult for SSF to unite and represent their corporative interests.

García-Flórez et al. (2014) address the issue of defining SSF through a set of structural (vessel length, gross tonnage, engine power, of gear type) and functional descriptors (duration of fishing trip, number of fishermen per boat, fishing licences). A conclusion from the study relates to the importance of including other important indicators such as operational range of the vessel and fishing effort in the definition of SSF.

Both science and policy are moving towards an extended definition encompassing not only vessel characteristics but additional attributes organised along four main categories: physical attributes of the vessels, patterns of fishing activity, social organisation and economic structure of the enterprise (UNEP, 2004).

The consideration of these dimensions poses two main issues: (1) the dimensions partly overlap and often conflict, for example, a large enterprise fishing locally may share with small family-based or part-time fishing activity a strong linkage to the local fishing port, dependence on local fishing grounds and limitations in operational choices, while diverging substantially in its relation to the market and to fisheries management and (2) to cater for the socio-economic characteristics and the local nature of activity of SSF it is necessary to incorporate attributes which are generally unknown or vary greatly across regions and do not offer the simple and clear "cut" definition that is needed to design and implement policy measures that fulfil the criteria of simplification, legislative clarity and non-discrimination.

In this paper we try to address the issue of defining SSF using geospatial analysis techniques and focusing on the physical attributes of the vessel and patterns of fishing activity while omitting for now the other two dimensions related to the economic characteristics of the enterprise and social attributes.

Our proposed methodology explores physical characteristics of the vessels and local operational range to evaluate the link between "small" vessel size and "local" fishing activity, which is at the core of the definition of SSF adopted in EU policy.

To assess this linkage we begin by spatially analysing logbook data to cluster fishing activity patterns (or operational ranges). In a second step we apply machine learning algorithms to vessel characteristics to identify the best rules representing the identified clusters of operational ranges. We use a data driven approach relying heavily on the availability of detailed logbook data. We consider the Swedish commercial fishing fleet as a case study by examining the fishing activity of the entire fleet over the last seven years reconstructed from the logbook data. The Swedish logbook data has the advantage of providing in addition to the spatial reference to the ICES rectangles, the exact coordinates of the fishing operation. It offers therefore the possibility to evaluate fishing behaviour at a high level of spatial precision.

As characteristics of SSF vary across regions, the results of the analysis cannot be automatically extended to other countries. The aim of this paper is therefore not to provide a universal classification scheme but rather to give proof of concept of a methodology which with the increasing availability of reliable logbook data could be extended to other EU Member States.

2. Data and methods

An extensive analysis on the characteristics of SSF in the EU is given in Macfadyen et al. (2011), which applies the definition of SSF as vessels with length below 12 m. According to this study, the EU SSF is mostly composed by vessels made of wood between 5 and 7 m in length with a gross tonnage of around 3 GT and engines with a power of about 35 kW. More than 90% primarily use passive gears (i.e. gears that are not towed or dragged through the water column or over the seafloor) such as drift and fixed nets, hook and lines, or pots and traps. Vessels using more mobile gears such as dredges and trawls tend to be over 8 m in length.

The data used in the study refers to landings and trip data for the Swedish fleet for the period 2007–2013. These data were obtained in anonymised form from the logbooks and journals compiled according to the fisheries control regulation (Commission Regulation (EU) No 404/2011).

In Sweden, all vessels over 10 m (8 m for the Baltic Sea) are required to register and report their fishing activity in logbooks. Additionally, all vessels over 12 m are equipped with an electronic logbook, so called e-logbook, which has replaced the previously used paper logbook. The e-logbook is used to register and report data electronically. Reporting to the e-logbook should be done after each activity during a fishing trip. If the e-logbook is not working, the vessel is not allowed to leave the harbour. Vessels less than 10 m, or when fishing in Baltic Sea less than 8 m, are instead required to keep coastal journals. The coastal journals are personalised rather than connected to a certain vessel and are sent to the authorities on a monthly basis. There are no exceptions for keeping logbook or journal. There are additional regulations regarding logbooks and journals, for example, vessels using towed gears or landing abroad are required, independent on size to use logbooks, etc.

The variables from the logbooks and journals considered in the study were: date, time and port of departure, arrival at the fishing ground and start of the fishing operation, landing port and date of arrival, fishing ground coordinates and catch volume and value by species and gear.

Swedish logbook data provide in addition to the reference to ICES rectangles and subdivisions the exact coordinates of the fishing position considered as the location where the fishing gear is set. The logbook data are complete and thoroughly checked. When handling the landing information from logbooks the distribution of

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