Are they fishing or not? Effect of time interval and method on estimated fishing effort in a bivalve dredge and octopus traps small scale fisheries in Portugal

Small scale fisheries (SSF, boats < 12 m) represent 90% of worldwide fisheries and 84% of the EU fleet, providing direct employment for ≈100,000 people in the EU. These are a fundamental support for coastal communities, providing nutritional support, jobs and livelihoods, having also an important cultural heritage. The identification of the areas where the fishing operations are occurring and its intensity, is therefore, crucial for marine biodiversity conservation, spatial planning and fisheries management. This information are thus crucial to preserve and defend these important fisheries in the future, which are currently declining.

Recent EU legislation will oblige SSF boats to be tracked, but unlike in most large scale fisheries (LSF) where VMS data has been considered to be sufficient to determine fishing effort, the SSF fisheries require very high spatio-temporal resolution of the location data (i.e. secs-mins). In the current work we use an expert validated data set sampled from four SSF fisheries in Portugal (three areas of a bivalve dredge fleet and one octopus fishery using traps) that were equipped with GPS sensors to record the spatio-temporal position every 30 secs. Using these boat tracks, different statistical approaches can then be applied to discriminate between fishing from traveling periods (or others). Fishing periods are used to produce gridded surfaces of spatio-temporal estimates of fishing effort (fishing intensity) and the respective indicators. In the current work the tracking data was used to test and validate the effect of 1) data pre-processing; 2) statistical methods used to estimate 'fishing events' (i.e. Gaussian Mixture models); 3) temporal resolution (do we require regular 30 secs time intervals, or 5 min would be ok?) on 1) fishing effort indicators and 2) gridded fishing effort maps. Further, a new simple statistical approach was developed specifically for this data set and compared with other methods. The results of this work will be used to implement a system to monitor Portuguese SSF in Portugal, which has the largest marine area in the EU.