

Progress in the use of VMS data for spatial management of fishing activity

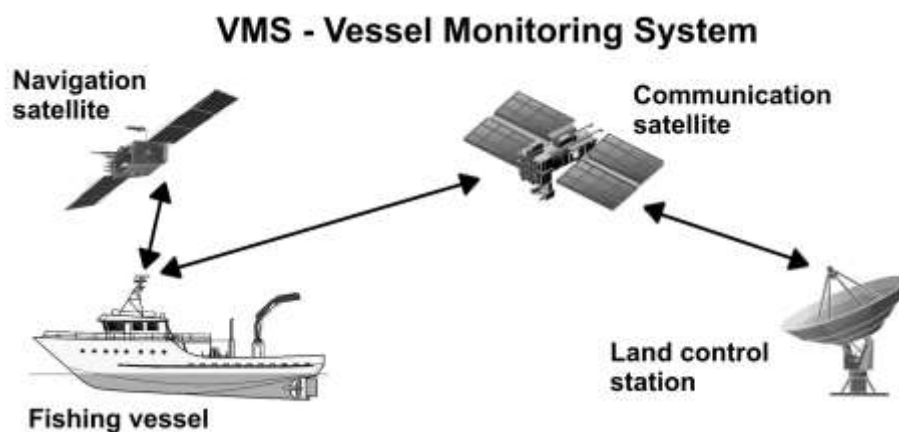
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GENERAL FISHERIES COMMISSION FOR THE MEDITERRANEAN
Trasversal Workshop on Spatial Based Approach to Fishery Management
Rome, Rome, 6-8 February 2012

VMS technology



The context

- VMS data are routinely processed within the **Data Collection Framework** (http://ec.europa.eu/fisheries/cfp/fishing_rules/data_collection/index_en.htm) in order to assess and analyze the spatial extension of fishing effort
- This requires a complex flow since VMS data must be processed and coupled with other data sources (i.e. Logbooks)

The challenge

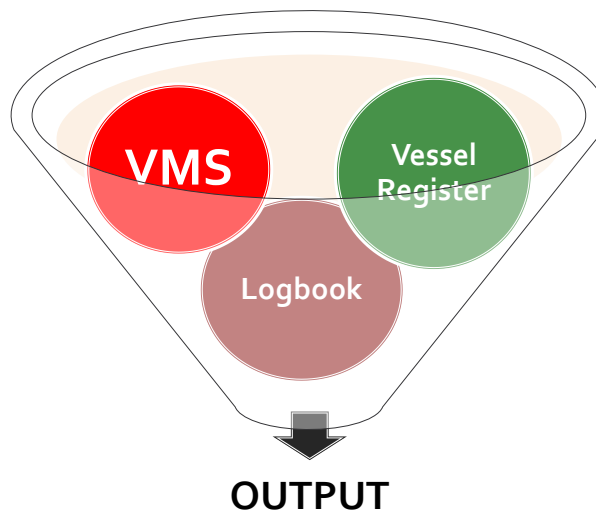
Some key steps are:

- Disaggregation of VMS dataset into single “tracks”, that are fishing trips starting by and ending to a given harbor;
- Interpolation at sound standard frequency (e.g. 10 minutes) in order to realistically represent fishing activity;
- Recognize fishing activity with respect to targeted resources (i.e. Métiers classification)

The challenge

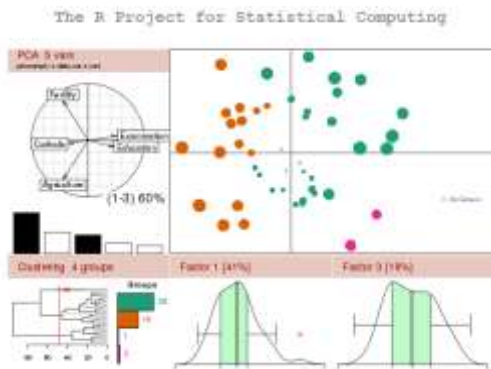
- Distinguish between fishing and steaming points within each classified track;
- Aggregate fishing points per area, per activity and per time, on a spatial grid;
- Analyze the obtained pattern in order to:
 1. Compute pressure indicators (extension of exploited area)
 2. Identify and monitoring fishing grounds through time

The data used

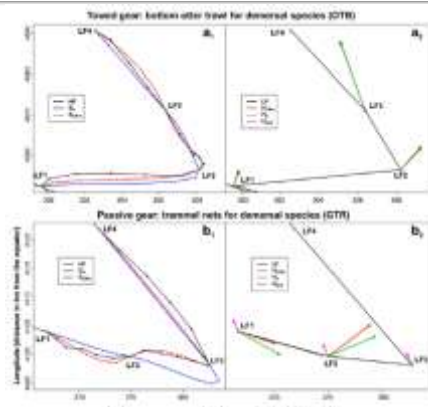


The way

- Development of R code (libraries, routines) in order to facilitate validation, sharing and enhancement of methodological skills

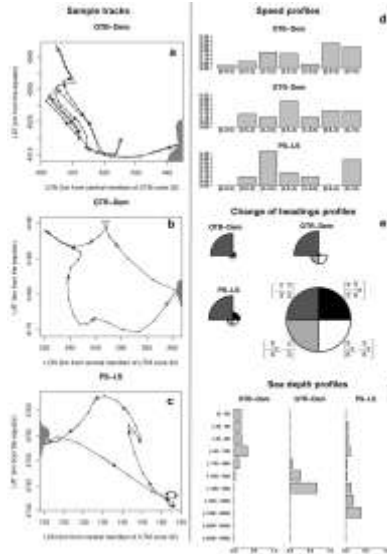


Interpolation



In this way it is possible to obtain high frequency tracks from VMS signals natively characterized by low frequency (e.g. 2 hours, that is the default for Italian fleet)

Recognize fishing activity



When behaviour reveals activity: Assigning fishing effort to métiers based on VMS data using artificial neural networks

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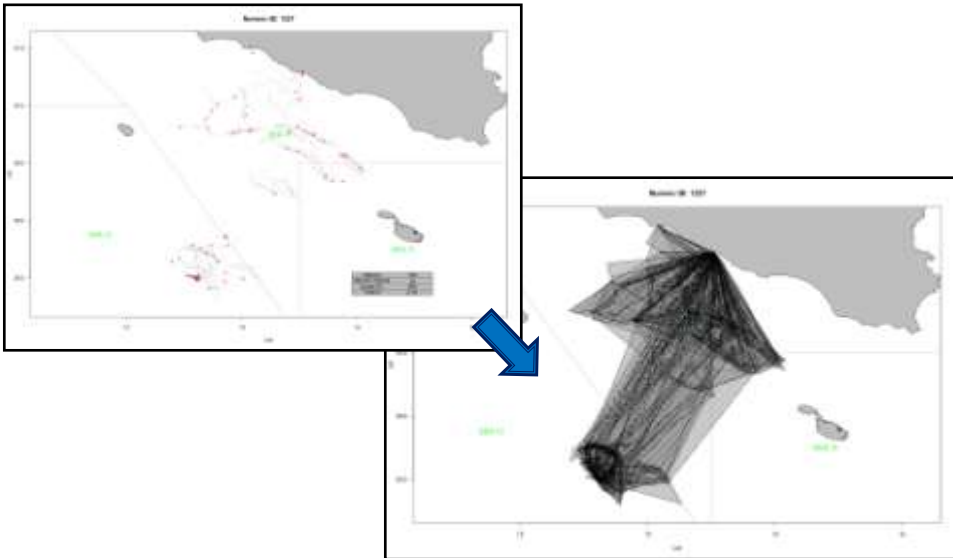
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ABSTRACT

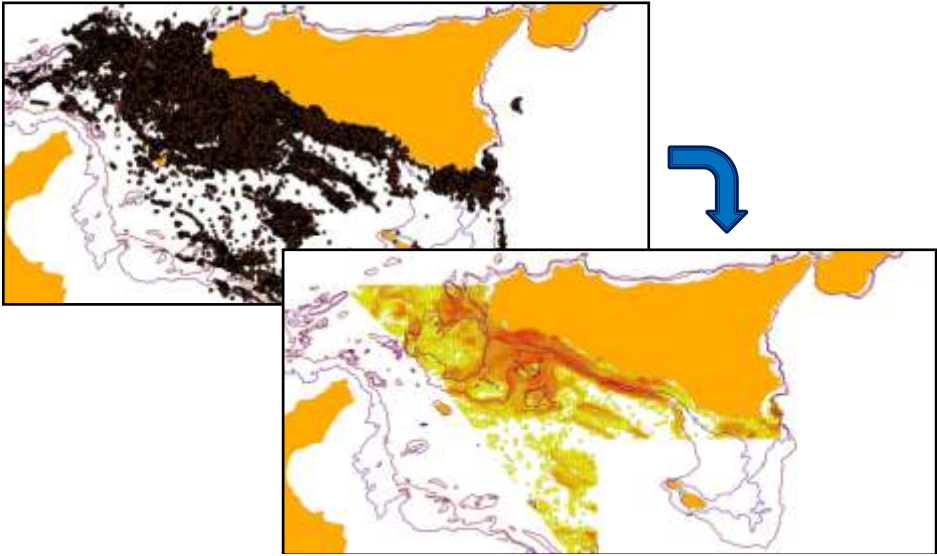
The identification of groups of vessels with the same exploitation pattern (e.g. gear used, fishing period, target species) can be directly related to the concept of "métier", a major topic of fisheries management. However, other aspects on fishing trips (e.g. effort, date, time, frequency or shared information present in abundance of landing catch/hauls), apart from the assumption that the reported landing profiles reflect individual catch, are also relevant to understand the high spatial resolution using vessel monitoring systems (VMS). VMS potentially provide information about vessel fishing activity at the frequency of reports (usually high or approximately instantaneous). An artificial neural network is used to assign interpreted VMS areas and time/depth data as vessels fishing activity. It multi-layer perceptron network (MLP) was trained to recognize and assign 15 métiers (with a set of 12 variables: 11 relating to the vessel type, 2 probability functions: vessel speed, 1 for vessel heading and 1 for size length, respectively). The MLP was successfully trained on subsamples of a large dataset corresponding to the activity of the Italian fishing fleet, for which information about vessel size, effort and catch were available by on-board observations by scientific operators, and then applied on other subsets of the data. The best architecture for MLP was identified and assigned. The mean assignment of vessel predictions (based on the one dataset) was very high (0.92), indicating that VMS data can provide information on vessel activity. Overall, these findings suggest that this is a promising approach to assign fishing effort, assessed as multiple métiers, or specific vessel size, using only vessel position coordinates (latitude and longitude) as those provided by logbook and observer data.

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In summary: from points to tracks

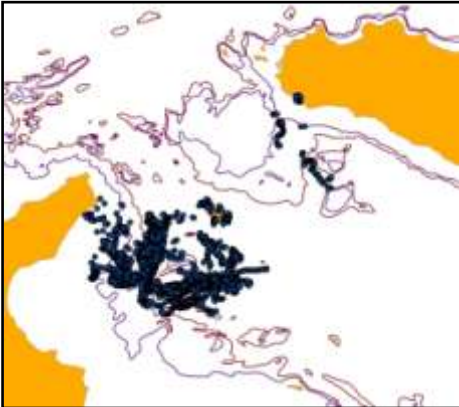


From points to pattern

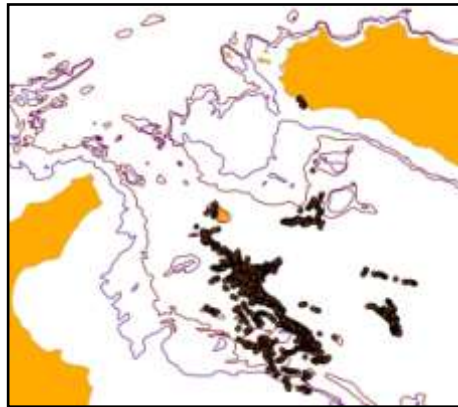


Possible analysis: seasonal patterns

Winter



Spring

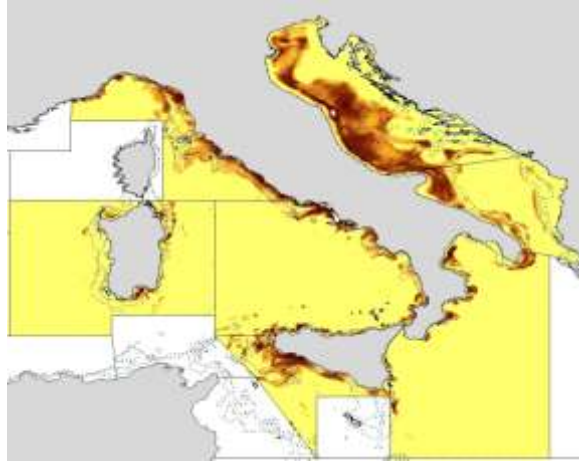


Fishing grounds

Use of VMS data to track spatio-temporal changes of fishing grounds.


We developed a statistical method to identify fishing grounds and to track temporal changes.


"Static" map of the fishing grounds

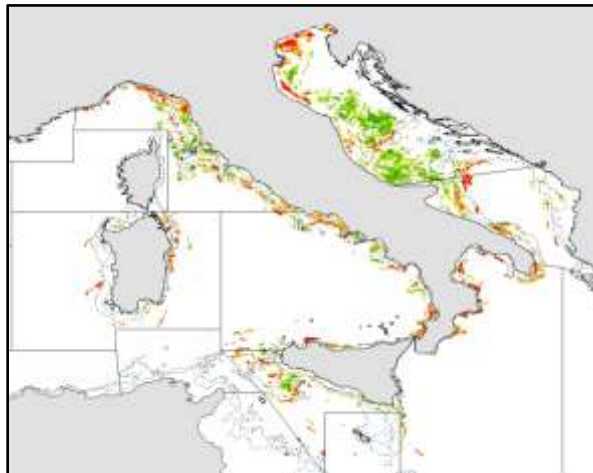


Tracking changes: Temporal trends within fishing grounds

"Dinamic" map of the fishing grounds

 Decreasing effort

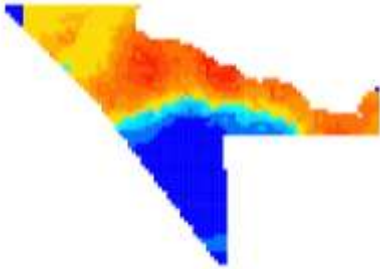
 Increasing effort



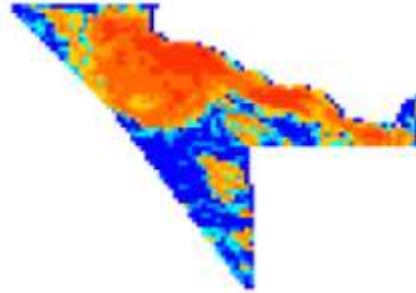
VMS for management of fishing activity

Preliminary analyses suggest an (obvious?) relationship between spatial pattern of fishing effort and resource distribution/status

Distribution of o+ rose shrimp

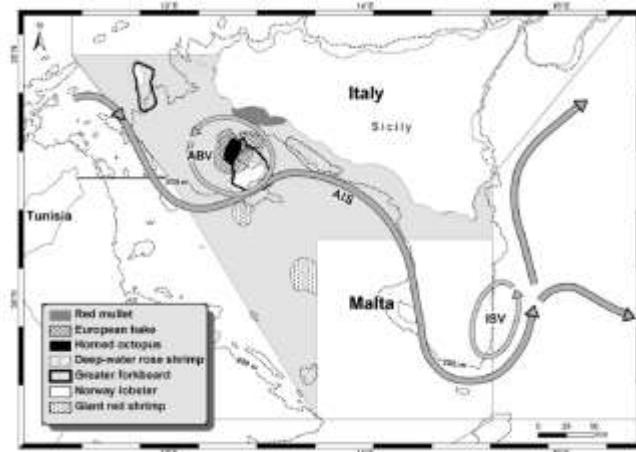


Fishing effort pattern by VMS



VMS for management of fishing activity

VMS could be profitably used to draw new scenarios of fishing effort allocation, also considering information about critical biological areas to be protected



Thank you for the attention

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