Estimating fishing effort from Vessel Monitoring System (VMS) data

Georg Engelhard, March 2010
Developing reliable, repeatable, and accessible methods to provide high-resolution estimates of fishing-effort distributions from vessel monitoring system (VMS) data.

Janette Lee, Andy B. South, and Simon Jennings

Lee, J., South, A. B., and Jennings, S. 2010. Developing reliable, repeatable, and accessible methods to provide high-resolution estimates of fishing-effort distributions from vessel monitoring system (VMS) data. – ICES Journal of Marine Science, 67: 600–600.

Vessel monitoring systems (VMS) are used primarily for fisheries enforcement purposes, but also provide information on the spatial and temporal distribution of fishing activity for use in fisheries and environmental assessment and management. A reliable, repeatable, and accessible method using readily available software for estimating fishing effort from unprocessed VMS data is developed, tested, and applied. Caveats associated with the method are identified, and the biases introduced by our assumptions are quantified. Application of the method provides a high-resolution description of gear-specific fishing activity by UK vessels. An index is developed to describe variation in the spatial pattern of fishing effort generated by different gears. The proposed method for VMS analysis involves removing duplicate VMS records and records close to ports, calculating the time interval between successive records to identify periods of activity, linking each record to a vessel and gear type, differentiating fishing and non-fishing activity, and summing fishing records in time and space to estimate fishing effort. The approach is a step towards the development of standardized methods to facilitate wider exchange and use of European VMS data. A clear audit trail for the methods of VMS analysis already used to inform management needs to be documented.
The need for fishing activity maps

- Vessel Monitoring Systems (VMS) are used primarily for fisheries enforcement purposes.
- Can also provide information on the spatial and temporal distribution of fishing activity.
- This is useful for fisheries and environmental assessment and management.
The need for simple, repeatable methods

- To facilitate data availability
- To ensure consistency
- To provide quality control / audit trail
- To help in sharing data and methods between countries
The process steps

- Raw VMS data are ‘cleaned’ to remove duplicates and records within port locations.
- Data are linked to logbooks to get the fishing gear used.
- Fishing / non-fishing activity are differentiated based on ‘speed rule’.
- Point locations are converted to a spatial estimate of activity using a point summation method.
Establishing a ‘speed rule’

Speed of vessels, verified by UK discard observers onboard as:

• **Fishing**

• **Not fishing**
Estimating fishing, based on speed … VMS data

Transmitted speed of vessels
VMS
2006-2007
Estimating which VMS points are associated with fishing

A simple *speed rule of 1-6 knots across all gears* produces results suitable for planning & consultation at national scale
Traps & Trawls
Some limitations

• **Inshore waters are not covered** as VMS currently only reports vessels with length of 15m +

• For **static fishing gear** (with no detail of the size, type, and soak time of nets or traps) the VMS data can only provide insight into the vessels’ **area of operation** rather than fishing effort

• **Non-UK vessels** are not included as we have **no direct access** to information on the gears used
In CHARM3

The UK provide accurate data for UK vessels fishing within both UK and French waters.

The French provide accurate data for French vessels fishing within both French and UK waters.

We can work together, using a standardised methodology to provide a cohesive set of data for the Channel region.
Thank you for your attention!

Any questions?
Index of similarity

- We developed an index of similarity to compare relative difference in spatial pattern between gears, and between years
- Index of 0 signifies total equality
- Index of 1 signifies maximal difference
# Index of similarity: between gears

<table>
<thead>
<tr>
<th>Gear Class 2007</th>
<th>Dredges</th>
<th>Hooks and lines</th>
<th>Nets</th>
<th>Seines</th>
<th>Traps</th>
<th>Trawls</th>
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Index of similarity: between gears

Seines, 2007

Hooks & Lines, 2007

Index of similarity = 0.999
Fishing in different areas
## Index of similarity: between years

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Index of similarity: between years

Index of similarity = 0.252
Fishing in similar areas
Choosing a spatial resolution (grid cell size)

- We are currently using 0.05 degree (3 minute) cells
- This gives 200 cells per ICES rectangle
- This makes it easier to link to other data sources that are supplied at ICES rectangle scale
- Using a point summation method makes it easy to scale to coarser resolutions