EU fishing coastal communities, fishing grounds and markets
Spatial relations and dependencies emerging from the analysis of high resolution fishing activity data from the AIS system

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In 2012-2013: coastal communities and fishing dependencies on the land-side
Research questions

1. Where to allocate economics (home port)? A better way than relying on fleet register?

2. Port-port relations

3. Define fishing grounds and map fishing effort (part of larger project)

4. Port-fishing grounds relations (dependencies on the sea-side, exploring from a spatial perspective an essential link in fisheries economics)
How?

Logbooks: would be the best (data on catches/species), but:
- Spatially (ICES rectangle) and temporally (24 hours) too coarse for some analyses
- Not available for the entire EU at disaggregated level
- Lacking spatial references in some regions

<table>
<thead>
<tr>
<th>VMS</th>
<th>AIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU for fisheries control</td>
<td>IMO for maritime safety</td>
</tr>
<tr>
<td>point to point transmission</td>
<td>omnidirectional broadcast</td>
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<tr>
<td>refresh rates 2h</td>
<td>refresh rates 2”- 3’</td>
</tr>
<tr>
<td>since 2009 fishing vessels &gt;12 mt</td>
<td>since May 2014 fishing vessels &gt; 15 mt</td>
</tr>
<tr>
<td>EU, systematic coverage</td>
<td>International, no systematic coverage</td>
</tr>
<tr>
<td>Only fisheries control authorities in the EU</td>
<td>Public</td>
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Automatic Identification System (AIS)

In JRC-BlueHub ~200 mio unique AIS messages per month at global scale

<table>
<thead>
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</table>
AIS fisheries data set from BlueHub

80 million pings from 4,353 EU fishing vessels in 586 ports, operating in FAO fishing areas 27, 23 and 37, during 2014

28 April 2015
Coverage - vessels

Overall 51% of EU fleet >15 m
Is the home port in the fleet register the real home?

Declared home = central port of activity for 44% of vessels
Calculation of fishing grounds

1. Fishing vs steaming

2. Kernel density of fishing points

3. From raster to polygons

28 April 2015
From spatial relations to networks

- Edge weight = nr pings in target port/fishing ground from vessels having home at source
- Home= port where vessel has more pings
Network clustering and nodes centrality

Clustering: random walks to maximise modularity (the fraction of the edges that fall within the given groups minus the expected fraction if edges were distributed at random)

*Pascal Pons, Matthieu Latapy: Computing communities in large networks using random walks*

Centrality strength: sum of (in) edges weights

Port-port network clusters and centrality

Centrality representing force of attraction of vessels from other ports (markets, infrastructure, prices...)

28 April 2015
Ports-fishing grounds clusters and centrality

Edges representing dependencies between coastal communities and fishing grounds

Fishing ground centrality representing fishing effort
Ports-fishing grounds clusters
Ports-fishing grounds clusters
Ports-fishing grounds clusters
Conclusions

- AIS offers a valid alternative to VMS to explore spatially socio-economics dependencies of coastal communities on the sea side at EU scale

- Through AIS we could relocate home from fleet register to real center of activity (important to disaggregate spatially economics at coastal communities)

- Interactions ports-ports show several clusters and role of ports as centers of attraction of activity (markets...)

- Interactions ports-fishing grounds give for the first time possibility to assess spatial dependencies between coastal communities and fishing grounds (who fishes where)

- Policy support applications
  
  Maritime Spatial Planning

  spatial clusters as geographical management units (see industrial districts)