From personal networks of fishermen and skippers in Andalusian fishing ports to the co-management of natural resources

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Social Networks and management of natural resources

Motivation

• European fisheries policy entails a gradual **restructuring of the fishing industry**, where trawling is reduced in the benefit of traditional fishing gear.

• In parallel, regional and state government has promoted the modernization of the sector and **new forms of participation and partnership**.

• However, participation in ports remains **essentially local**, **around fishers guilds**. In most ports there is little presence of unions, and some polarization between the guilds and associations of ship-owners.

• In this context, the regional government is exploring ways to foster **touristic, environmental and historic heritage** uses of Andalusian ports.
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Background

- **Co-management**: patterns of communication, knowledge transfer, information exchange, labour relations and collaboration in decision making among different social partners are key in the management of natural resources (Bodin & Crona, 2009).
- Also **power structures and organizational affiliations** impact management in fisheries (Prell, Reed, Racin & Hubacek, 2010; Crona & Bodin, 2010).
- Social **network analysis** has been applied to examining co-management structures, both to understand the engagement of stakeholders, as well as to describe power/resources sharing, and leadership processes (Carlson & Berkes, 2005; Crona & Bodin, 2006).
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Aim

- Previous studies have explored the relationship between diverse structural properties of networks and natural resource management: network ties, network cohesion, bonding and bridging ties, network position and core-periphery configurations (Bodin & Crona, 2009; Crona & Bodin, 2006).
- It seems that heterogeneity (composition) and closure (density and centralization) dimensions serve to describing co-management networks (Carlsson & Sandström, 2008).
- In this paper, we describe the patterns of sociability in fishing enclaves of Andalusia, using meta-representations of collaboration between different professional roles.
Fishing enclaves in Andalusia
Fishing enclaves in Andalusia

Fishing grounds and ports

- **Two distinctive fishing grounds**: Atlantic Ocean vs. Mediterranean Sea.
- **Four types of fishing ports** (Ruiz & Valcuende, 2001):
  1. Ports articulated around a Fishermen’s Guild (Cofradía).
  2. Medium size ports with polarized representativeness.
  3. Large ports with complex associative systems.
  4. Ports around commercial organizations.
- **Local** nature of sociability and participation: relationships are mainly with other members of the local harbour, participation is channelled through specific partnerships in each port, and traditional guilds (“Cofradías”) are central in social and political life of fisheries.
Methods

Participants

• The fieldwork focused in **18 Fishing Ports** (out of 27 fishing enclaves in Andalusia):
  - 9 ports in the Atlantic Ocean and 9 ports in the Mediterranean Sea
  - Criteria to be included: regional ownership and organizational complexity (fishing shelters and small groups of fishermen were excluded, as well as State-owned ports) (Ictioterm, 2013).

• Three members of the port staff were interviewed in each case,
  - obtaining information on their personal networks and their attitudes toward tourism, heritage and environmental uses of ports,
  - Finally **53 personal networks** were obtained: 17 crew members, 18 skippers and/or ship-owners and 18 prominent individuals.
Methods

Name generator

• “Please give me a list of **45 people** to whom you are usually related because of your activity in the harbour. I am interested to mention those with which you have a more frequent and regular contact. They may be co-workers, crew, skippers or ship-owners. They may be part of the auction, the port or outside the port. They can be suppliers, dealer, ice workers, representatives of environmental organizations, management personnel, and so on”.

• Valued relationships:
  • 0. “They do not know each other, they have no relationship or no contact”
  • 1. “They know each other”.
  • 2. “They have some relationship”.
  • 3. “They have a strong relationship or are friends”
Methods

Personal network data

• **Fixed number** of *alteri* (McCarty, 2002), both to capture the diversity of structures of personal networks and to facilitate comparisons and data processing.

• Valued and symmetric matrices (45x45 *alteri*) were processed, analysed and visualised with **Ucinet 6** (Borgatti, Everett & Freeman, 2002) and **Visone** (Brandes y Wagner, 2004).
  - 53 personal networks of 45x45 *alteri* (1.980 edges).
  - 2.385 alteri and 104.940 relationships were analysed in total.
Methods

Two strategies

- **Centrality and cohesion measures** to compare the structure and composition of personal networks (McCarty, 2002):
  - Centrality Measures: Degree, Betweenness, Eigenvector, Closeness, Degree Centralization, Betweenness Centralization.
  - Cohesion Measures: Cliques, Components, Density, E-I Index, IQV Index.

- **Clustered graphs** for summarising and comparing personal networks (either at the individual or aggregate levels) (Brandes, Lerner, Lubbers, McCarty & Molina, 2008, Lerner et al. 2007, 2008, Molina, Lerner & Gómez, 2008; García Macías, 2013).
Methods

Clustered graphs

- Respondents provided information on the professional role, fishing art and organization of each alter:
  - A long list of 24 different professional roles and activities was summarised in **8 main role categories**: crew, skipper, ship-owner, services, market, organization, support and others.

- Three procedures to reduce networks complexity through grouping and clustering nodes in the same category or cluster, **comparing intra-class and interclass ties**:
  - Number of links: $e(A, B)$
  - Density of ties: $e(A, B)/ (A*B)$
  - **Edge Weights**: $e(A, B)/\sqrt{(A*B)}$
From personal network to clustered graph

Prominent individual Personal Network

Prominent individual Clustered Graph
From personal network to clustered graph
Composition of personal networks fishing grounds

ROLE DISTRIBUTION IN ATLANTIC PERSONAL NETWORKS
- Shipowner: 18.55%
- Skipper: 20.68%
- Services: 4.44%
- Market: 12.14%
- Organization: 5.38%
- Support: 8.63%
- Others: 2.56%
- Crew: 27.61%

ROLE DISTRIBUTION IN MEDITERRANEAN PERSONAL NETWORKS
- Shipowner: 31.52%
- Skipper: 8.97%
- Services: 2.88%
- Market: 9.55%
- Organization: 5.19%
- Support: 9.63%
- Others: 3.37%
- Crew: 28.89%
Composition of personal networks

Skippers and ship-owners

• There are three main categories of professional roles in the Andalusian ports that stand above the rest: crew, ship-owners and skippers.

• A different distribution of skippers and ship-owners in the personal networks of the Atlantic and Mediterranean's respondents is observed:
  • There are more skippers in the Atlantic ($Z=-2.971$, $p<.01$),
  • And more ship-owners in the Mediterranean ($t=-2.868$, $p<.01$).
## Centrality measures

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Crew</th>
<th>Shipowner/Skipper</th>
<th>Prominent Individual</th>
<th>Mediterranean Sea</th>
<th>Atlantic Ocean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Degree</td>
<td>43.90</td>
<td>26.20</td>
<td>41.62</td>
<td>33.58</td>
<td>44.07</td>
<td>26.86</td>
</tr>
<tr>
<td>Between</td>
<td>1.36</td>
<td>0.89</td>
<td>1.64</td>
<td>1.11</td>
<td>1.17</td>
<td>0.70</td>
</tr>
<tr>
<td>Closen.</td>
<td>54.13</td>
<td>27.22</td>
<td>54.04</td>
<td>31.66</td>
<td>54.71</td>
<td>28.88</td>
</tr>
<tr>
<td>Eigenv.</td>
<td>18.12</td>
<td>4.30</td>
<td>18.19</td>
<td>2.57</td>
<td>18.50</td>
<td>2.90</td>
</tr>
<tr>
<td>Degre Central.</td>
<td>35.13</td>
<td>16.14</td>
<td>32.80</td>
<td>18.82</td>
<td>34.19</td>
<td>17.41</td>
</tr>
<tr>
<td>Betw. Central.</td>
<td>10.36</td>
<td>10.70</td>
<td>13.80</td>
<td>13.29</td>
<td>9.05</td>
<td>10.10</td>
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</table>
## Cohesion and group measures

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Crew</th>
<th>Shipowner/Skipper</th>
<th>Prominent Individual</th>
<th>Mediterranean Sea</th>
<th>Atlantic Ocean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Density</strong></td>
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<tr>
<td>M</td>
<td>0.44</td>
<td>0.42</td>
<td>0.44</td>
<td>0.46</td>
<td>0.52</td>
<td>0.36</td>
</tr>
<tr>
<td>SD</td>
<td>0.26</td>
<td>0.33</td>
<td>0.27</td>
<td>0.17</td>
<td>0.29</td>
<td>0.19</td>
</tr>
<tr>
<td>N° Cliques</td>
<td>122.17</td>
<td>59.35</td>
<td>124.72</td>
<td>178.94</td>
<td>93.15</td>
<td>152.31</td>
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<tr>
<td></td>
<td>162.25</td>
<td>69.74</td>
<td>136.75</td>
<td>223.35</td>
<td>96.46</td>
<td>207.91</td>
</tr>
<tr>
<td>N° Comp.</td>
<td>2.81</td>
<td>3.41</td>
<td>3.00</td>
<td>2.06</td>
<td>3.04</td>
<td>2.58</td>
</tr>
<tr>
<td></td>
<td>3.96</td>
<td>4.39</td>
<td>4.35</td>
<td>3.13</td>
<td>4.79</td>
<td>2.93</td>
</tr>
<tr>
<td>E-I Index</td>
<td>0.34</td>
<td>0.23</td>
<td>0.31</td>
<td>0.48</td>
<td>0.34</td>
<td>0.34</td>
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<tr>
<td></td>
<td>0.22</td>
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<td>0.22</td>
<td>0.14</td>
<td>0.20</td>
<td>0.25</td>
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<tr>
<td>IQV</td>
<td>0.81</td>
<td>0.74</td>
<td>0.79</td>
<td>0.88</td>
<td>0.79</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>0.10</td>
<td>0.11</td>
<td>0.09</td>
<td>0.07</td>
<td>0.10</td>
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</tr>
</tbody>
</table>
Structural measures

Centrality and cohesion measures

• Personal networks of Mediterranean ports are denser ($t = -2.371, p < .05$), with higher average closeness ($t = -2.083, p < .05$), and a higher average degree ($t = -2.427, p < .05$) of their alteri.

• Personal networks of Atlantic ports are more centralized ($t = 2.037, p < .05$), and with a higher average betweenness ($t = 3.207, p < .01$) of their alteri.

• Personal networks of prominent individuals are more heterophilic (with an E-I Index greater than crew members and skippers/ship-owners), and more heterogeneous in composition (with an IQV greater than crew members and skippers/ship-owners).
Clustered Graphs (Role of Ego)

Prominent Individual

Crew

Skipper/Ship-owner
Clustered graphs (Fishing ground)

Atlantic Ocean

- Shipowner
- Market
- Organization
- Support
- Skipper
- Crew
- Services
- Others

Mediterranean Sea

- Shipowner
- Market
- Organization
- Support
- Skipper
- Crew
- Services
- Others
Clustered graphs

Two patterns of sociability

- In the Atlantic a **clearer differentiation of roles of ship-owner and skipper** is observed.
  - The extractive activity in this fishery is associated with **larger fleets**, where the owner often has a role of manager and distributes his/her relationships between different professional classes in the port.
  - The relationship with higher weight is between the skipper and the crew members.

- In the Mediterranean a **strong link between the ship-owner and the crew**, and also between the ship-owner and commercial roles is observed.
  - In these ports, fishing is artisanal. Ship-owner is usually owner of few boats and very often goes fishing daily.
  - Even with a role of management, for instance with a strong link with commercial roles, it seems to be part of a less industrialised fishing, where informal relationships have prevalence over organizational and labour issues.
Conclusions

Fishing grounds and patterns of sociability

• Meta-representations showed two patterns of professional sociability associated to the complexity of fishing activities in Atlantic and Mediterranean grounds.

• Small Mediterranean ports seem better prepared overall for the conversion of fisheries in coastal artisanal activities. However, the ports of the Atlantic may suffer further the impact of the reduction of trawling and the reorganization of the fishery.

• Despite the efforts of the regional government to develop forms of organization and participation that transcend the local space, traditional guilds seem particularly appropriate and prepared to the new context of fisheries in Spain.
Conclusions

Fishing grounds and patterns of sociability

• Traditional guilds seem to be reacting against new forms of organization designed by the regional government and, at the same time, claim that they provide community and environmental value that are needed in the new situation.

• In any case, there remains a tension between the Common Fisheries Policy (CFP) of the European Union and former impulses of the regional government to reorganise associations in the fisheries sector. How this tension is resolved will depend in part the future of fishermen in Andalusia.

• The regional policies of tourism and fishing heritage are consistent with the European Common Fisheries Policy, as part of a process of deindustrialization and artisanalisation of the sector (Florido, 2008; Suárez, Rodríguez, Florido, 2008).
References

- Ictioterm (2013). Base de datos terminológicos y de identificación de especies pesqueras de las costas de Andalucía: [http://www.ictioterm.es](http://www.ictioterm.es)
Fishing enclaves in Andalusia

Gracias

Laboratorio de Redes Personales y Comunidades
http://personal.us.es/isidromj