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THE KEY ROLE OF THE *BAREFOOT ECOLOGISTS* IN THE CO-MANAGED TURF SYSTEM OF GALICIA (NW SPAIN)

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Introduction

Galicia is an autonomous Spanish region with full authority (fishing powers were transferred in 1981) over the management of the fisheries activities (fishing, shellfishing and aquaculture) in its coastal waters, along its 1,200km of coastline. The relevance of fishing in Galicia, as an economic activity and from a sociological point of view, is more important than in the rest of Spain; 15,000 artisanal fishers extracted 196,000 tonnes, generating a total revenue of EUR 422 million in 2009 (*Consellería do Mar*, 2010). Almost 90% of the landings corresponded to fishes, but shellfish activity is still very relevant; 19,500 tonnes (EUR 116 million), between 70 species (cephalopods, gastropods, bivalves, sea urchin, crustaceans, annelids, sea anemones and algae) (*Consellería do Mar*, 2010).

The fishing activity in Galicia and the organization of fishers in local fisher's guilds, called *confrarías*, has a strong secular tradition since the Middle Ages (Taboada 2007). Nevertheless, in Galicia, historically the shellfishing has been mostly carried out, until the 90s, as a *de facto* open access. During the 60s, 70s and 80s, coinciding with the increasing number of shellfishers, market demand and economic value of the shellfish, the fisheries administration (FA) introduced new regulations step by step to rationalize and manage the activity. But, it was not until 1992 when the regional government introduced a new model for shellfishing, promoting a co-management system between *confrarías* and the FA, based on territorial use rights (TURFs) over a large area and its resources (Molaes and Freire 2003). The new management system, still ongoing, is only applied to the sedentary resources, concerning therefore the so called *S-fisheries* (*sensu* Orensanz et al. 2005; small-scale, spatially structured fisheries targeting sedentary resources with artisanal gears). The main tool of the new system is the Exploitation and Management Plan (E&MP), which defines every year the different components of the management system: authorised fishers, fishing grounds, general objectives, state of the fishery and stock assessment analyses, harvesting and trade plans, actions for stock enhancement and a financial plan.

Despite the strong shellfishing tradition in Galicia and its socioeconomic relevance, the technical advice of the FA, just like the scientific advice from universities and research institutions, was, before the 90s, weak or null. This was the result of an historic non-collaborative environment between Galician fishers, managers and scientists (Freire 2000) and lack of political support.

Technical advice was given by a small group of young Biology graduates and extension workers from the FA, by far, insufficient for the huge amount of shellfisheries and fisher's groups. The CIMA, the FA marine research centre responsible for giving the scientific advice for artisanal fisheries in Galicia, was small and precarious, while the other national research institutions and the universities were almost not implicated in any way.

Fortunately, during the middle 90s the Galician regional government started to change this situation. The FA promoted two main plans (Plan 10 and Plan Galicia) oriented to make a shift in the shellfishing sector, from unorganized shellfishers gathering wild resources unsustainably, to organized shellfisher's groups that do not only gather sustainably, but also increase productivity by seeding and mariculture. The plans had funds for hiring several technical assistants (young graduated in Biology, Marine Science and/or aquaculture technicians), who, coordinated by biologists from the FA, worked daily within the fisher's communities in bivalve enhancing techniques and mariculture. That was the embryo of the actual program of *Asistencias Técnicas* (TAs), in which the TAs, directly hired by the *confrarías* (with government subsidies), have extraordinarily developed their roles and responsibilities in the *S-fisheries* management system of Galicia. They have become what Prince (2003) called *Barefoot Ecologists* (BEs), a key actor, who can work on the interface among science, industry, and management, as Berkes et al. (2001) envisaged, to act as a change agent building human capacity (Berkes et al., 2001) and social capital (Dietz et al., 2003), empowering fishing communities to monitor and manage themselves (Berkes et al., 2001; Prince, 2003), with their ongoing technical-scientific advise and support (Macho et al. 2008).

In this work, an overview of the Galician *Asistencias Técnicas - Barefoot Ecologists* program, its historical development and its role and relevance in the management of the *S-fisheries*, is given, identifying its weak points and pointing out the demands of the BEs' group (*Asociación Galega de Técnicos en Xestión de Recursos Mariños*).

History of the *Asistencias Técnicas*' program (roles and responsibilities)

The TAs in Galicia were not conceived at the beginning for the *confrarías*, resources, and with the roles and duties that have today. From a bivalve seeding and Mariculture pilot project (1993-1995) for two *agrupacións de mariscadoras* (women shellfisher's groups), the program has evolved in a global plan for all *confrarías* and *S-fisheries* management (Table 1, Figure 1). In this pilot project (CIMA), TAs were hired to work close and exclusively with two *agrupacións de mariscadoras*. The experience was very positive so the FA decided to create an extended autonomic plan (Plan 10, 1996) with the same aim but with 11 *confrarías* and 8 TAs. The plan was scaled-up again (Plan Galicia, 1997-1999) to all *confrarías* interested (33), with the novelty that since 1998 a TA, hired by the FA, were physically assigned to each *confraría* (Mahou 2008). That was a key factor to increase the trust and knowledge sharing between *mariscadoras* and TAs. During that period the TAs started to prepare the E&MPs for the *confrarías*, required since 1992, although, they were gradually enforced during the forthcoming years (Molares and Freire 2003, Frangoudes et al. 2008).

Between 2000 and 2006, a total of 50 *confrarías* signed an agreement with the FA (8 agreements were directly signed with shellfisher's groups, shellfisher's associations, cooperatives and producers' organizations - herein included when referring to *confrarías*) to hire 47 TAs. The responsibility for hiring the TAs was transferred (funding as well) to the *confrarías* to increase their involvement in resources' management with the community. During those years a great leap forward took place in the roles and responsibilities of the TAs, mostly because of the direct relationship established with the *confrarías* (several TAs, *pers. com.* 2000s). The TAs continued, in a steady development, to take charge of more responsibilities related to the E&MP, voluntarily or being required by the *confrarías* (see the comprehensive list of Table 2).

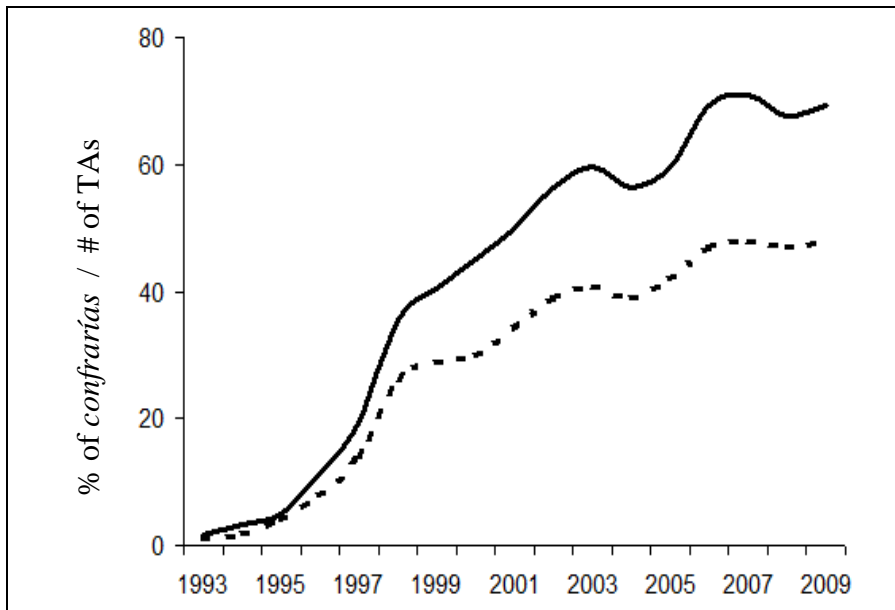


Figure 1. Development from 1993 to present of the TAs–BEs program in Galicia (solid line: percentage of *confrarías* with a BE; dashed line: total number of BEs) (data from several TAs, *pers. com.* 2009).

New projects implemented by the TAs in collaboration with universities, research institutes and consultancies, even though they are not a compulsory task, have become a very powerful tool for developing improvements in the fisheries. The TAs continued the work initiated by a FA's group (ADELGA) who in the 2000s visited all the *confrarías* analysing their necessities and proposing specific projects to solve them. The new impulse of the TAs helped to strengthened the weak relationship between fishers, managers and scientists in Galicia, and to develop new and innovative projects in several fields (Table 2).

From 2007 to the present, the TAs were hired by the *confrarías* through funds obtained from the FA by applying for annual projects. The TAs and *confrarías* have to compulsory undertake several tasks (Table 2) in order to get FA funding, as a way of maintaining control over the responsibilities of the TAs, while continuing to develop the co-governance scheme between the *confrarías* and the FA. The number of *confrarías* and TAs hired from 2007 to the present did not go up, since by 2007 almost all the *confrarías* with *S*-fisheries (E&MP compulsory) were already taking part of the projects and the great majority of the E&MPs were already developed (only annual actualizations had to be done). In 2010, 11 *confrarías* presented E&MPs without the advice and support of a TA, representing only 8.1% of the total number of plans in Galicia. At the moment, 48 TAs work every day in 51 *confrarías* (including 8 TAs placed in shellfisher's groups, shellfisher's associations, cooperatives and a producing organization), covering 73% of the *confrarías* and 92% of the *S*-fisheries E&MPs.

The great incidence of TAs in the *confrarías*, the responsibilities acquired, their effort and the goals achieved in governance, management, human capacity and social capital, in an already long-term plan (some of the TAs are still working in their *confrarías* after 15 years), have become the TAs in a key actor in Galician *S*-fisheries management. Together with the organized fisher communities, the surveillance plans, FA technicians (extension workers and biologists), sanitary and water quality monitoring and higher critical mass and implication of the universities and research institutes, allow to envisage an optimistic scenario for the Galician *S*-fisheries in a near future, although TAs still have a lack of support and advice from the manager-scientist community that should be reinforced.

Table 1. Historical development of the TAs program in Galicia. Column titles mean: years when the plan took place, name of the plan, institution hiring the TAs, where the TA's office is, number and percentage of TAs and *confrarías* participating, resources that are responsibility of the TA, and main roles and duties of the TAs during the plan. (¹ although different institutions hired the TAs at different times, funding always came from the Galician FA; ² by *confrarías* are also included shellfisher's groups, shellfisher's associations, cooperatives and a producing organization, since these other organizations are also granted with FA funding for hiring a TA)

Years	Plan	Institution	Office	TAs	<i>Confrarías</i> ²	Resources	Roles & Duties
1993-1995	CIMA's project	CIMA ¹	CIMA	2	2 (3%)	grooved carpet shell clam and flat oyster	Seeding and intertidal mariculture
1996	Plan 10	Galician FA	Galician FA	8	11 (16%)	clams and oysters	Seeding and intertidal mariculture
1997-1999	Plan Galicia	Galician FA	Beginning: Galician FA End: <i>confrarías</i>	29	33 (47%)	clams and oysters + some <i>S-fisheries</i>	Seeding and intertidal Mariculture + M&EP
2000-2006	Collaborative agreement	<i>confrarías</i>	<i>confrarías</i>	47	50 (71%)	<i>S-fisheries</i> resources	Many (see Table 4)
2007-present	Project	<i>confrarías</i>	<i>confrarías</i>	48	51 (73%)	<i>S-fisheries</i> resources	Many (see Table 4)

Weak points and TAs' demands

Several circumstances should change soon if Galicia is seeking a higher development of *S-fisheries* management and governance, where *Primary Management* (goal is trying to avoid undesirable thresholds) is just a benchmark towards *Tertiary Management* (aims for optimal targets in the long-term) (*sensu* Cochrane et al. 2010).

Training the BEs in basic fisheries assessment and management, and also equipping them with social skills to facilitate interactions, to build social capital within communities, and to deal with conflict resolution (Cochrane 2010) are needed. It would be much easier to achieve this if BEs and fishers' communities were networked with the scientific/management community as a whole and dynamic learning community.

For sure, a place where much effort is needed, are the demands and difficulties pointed out by the Galician BEs in several instances (Macho et al 2008):

- Higher support and advice in fisheries and social science from the FA technicians in charge of the management
- Increasing the BEs level in fisheries and social science by the establishment of an ongoing training program (courses, workshops, seminars, field work...) within the scientific/management community.
- Supply of protocols for sampling design. indirect fishery analysis evaluations (CPUE, sizes, catches,...) and
- Better coordination with the FA and close BEs
- Clarification of the reference point and higher transparency in the decision making process.

Overcoming these tasks is essential to take the train to Tertiary Management shown by Cochrane.

Table 2: Roles and duties of the Galician TAs: voluntary or required by the *confrarías* (although not in all *confrarías* the TA have all these responsibilities), or compulsory duties (*) to be reported to the FA.

ROLES AND DUTIES OF THE GALICIAN “BAREFOOT ECOLOGISTS”

- *State of shellfisheries*
 - *Drawing up, technical management and daily implementation of the E&MP
 - *Monthly reports with the basic parameters of the fisheries (effort, catches, CPUEs, fishing areas, prices,...)
 - *Direct and in situ stock assessment of all shellfishery resources every 6 months, and more frequently in situ size structure samplings
 - Monthly-weekly checking of resources legal sizes at the first-sale market
 - *Drawing up state of the shellfisheries reports
 - Exploratory surveys for new shellfish beds detection
 - Exploratory surveys and evaluation of new shellfish resources that could be exploited
 - Organization of the surveillance checking protocol and fishery data gathering
 - Biology and ecology works: reproduction, growth rates, recruitment, invasive species,...
- *Stock enhancement actions*
 - *Drawing up, technical management and implementation of the bivalve (clams) seeding projects
 - Coordination of fitting works in bivalve beds: predators and algal removal, sandbank conditioning, resource reallocation,...
- *Sanitary monitoring of shellfish beds*
 - *Collecting and sending samples of water and shellfish to the INTECMAR (FA) for microbiology and biotoxin monitoring
 - Report of dumping points close to the shellfish beds
 - Special works: *Prestige* oil spill crisis, cartography and characterization of dumping points along the coastline...
- *Paperwork*
 - Request of official authorizations and changes concerning the daily management of the E&MP
 - Request of official authorizations and changes concerning special works like sampling, seeding...
 - Processing and organization of fisher's training courses (harvesting, diving, safety...)
 - Drawing up and implementation of surveillance plans
- *Advice to the confrarías and shellfisher's groups*
 - *Advice to the *confrarías* for a sustainable management exploitation
 - Advice for organization of groups and association inside the *confrarías*
 - Organization and development of shellfisher's groups meetings (state of the resources and the fishery, E&MP, surveillance, conflicts...)
- *Projects development for fisheries improvements (in collaboration with Universities, Research Institutions and Consultancies). Drawing up, processing, coordination and implementation of projects concerning:*
 - Stock assessment and state of the fishery analysis
 - Mariculture: floating structures (bivalves, algae, octopus...)
 - Inland hatcheries
 - Marketing strategies and shellfish processed products
 - Quality, origin (chain of custody) and sustainable fisheries certifications
 - Sanitary and quality certifications for the first-sale market
 - Environmental issues: residues of the fishery, pollution of fishery areas, energy saving and use of alternative energies (on boats, first-sale market, offices...)
- *Other first-sale market works*
 - Collaboration with the surveillance in the catch and size checkpoint
 - Auction responsibilities, sales tickets, loading...
- **Any other FA requirement and instructions for management implementation*

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