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Editor Antti Roose

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The changing relations among resources, communities and institutions in Sardinian wetlands

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University of Cagliari, Italy*

During the past few decades, coastal wetlands in the Mediterranean region experienced phases of generalized and intense destruction followed by increasingly effective and widespread conservation policies. The case of Sardinia, analyzed through the complex relations among fishing activities and environmental protection within changing institutional frameworks in Tortolì and Cabras, shows interesting examples of growing awareness of the value of ecosystemic services. The overlapping of projects related to recreation and tourism and the revitalization of fishing traditions and productions, along with widespread critical issues still related to the expansion of human activities in fragile coastal environments and to a persistently marginal socio-economic context, creates crucial challenges for local development. The analysis of these systems shows their changing character, through complex forms of relations among wetland environments and human societies, and highlights the potential and risks of locally managed planning.

1. Introduction

Within a relatively short period of time, Mediterranean coastal wetlands experienced phases of generalized and intense destruction (particularly through land reclamation) followed by widespread protection (particularly following the Ramsar Convention), thus paradigmatically showing how processes of "value assignment" can realize a dynamic process of "location production" (Lefeuvre *et al.*, 2002; Scampini and Ciampi, 2010; Turner *et al.*, 2000; UNDP, 2009). This process occurs through different practices and policies according to changing power relations behind the processes of construction of spatial artifacts and the local unique relations among environment, land and social development (Pearce, 1996; Thibodeau and Ostro, 2001). Over the past decades, many institutional initiatives have focused on coastal wetlands, within a framework in which the rhetoric of the action emphasized the opportunities for resource protection, improvement of production, exaltation of local knowledge, take-off of a new entrepreneurial spirit (Scodari, 1994; Schuyt and Brander, 2004). The image that is conveyed by many of these interventions is that of rural areas and subregions which should be able to derive their specificity from landscape, folk traditions, handicrafts and food products. These elements, which are important for tourism and for global economy, take on new symbolic meanings in this context (Lai and Sistu, 2012).

The valuation of ecosystems is therefore associated with specific social and anthropological characters, as well as power relations among specific stakeholders (Bardecki, 1998). In this

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sense, different processes which are redefining power relations in the wetlands of Sardinia will be analyzed, focusing on two cases (Tortolì and Cabras) where the reshaping of interests related to integral protection, fishery and tourism produces a complex mosaic of relationships within a fragile system of power in its formal and informal dimensions.

2. Between land and water

The adopted theoretical framework recalls Foucault (1977), as well as Raffestin (1980). The idea is that any relation between social subjects implies unbalanced relations of power and thus displays political strategies in any territorial framework of human action (Painter and Jeffrey, 2011; Rossi and Vanolo, 2010; Governa and Memoli, 2011).

This is particularly evident in institutional and formal relations but also in those that involve informal groups, able to trigger social changes through less conventional instruments. These actions tend to identify the territorial space as an arena as well as a product of the conflict itself. Wetlands, in particular, tend to suffer from an apparent clash of interests between exploitation and ecosystem protection; but, as Mathevet points out (2004, 17), understanding their values and their functions is of capital importance if a society wants to preserve and manage them in sustainable ways. This would imply taking account of the peculiar challenges and difficulties related to conservation and management, as well as the specific value that wetlands have in biodiversity protection, water resources management and flood prevention.

The claim that they constitute a "space-problem" in territorial planning is also the result of contradictory strategies developed through the centuries around their conservation and/or reduction. These contradictions are reflected in planning practices and in the evolution of legislation and related regulations.

2.1. Management

Wetlands have often been victims of their bad reputation over the last few centuries. In particular, in the Mediterranean region, they used to be generally perceived as unhealthy and dangerous places. In the collective view, the relation between marshes and malaria has played a major role in the formation of the strongly negative repute which characterized these environments until recent times (Tognotti, 2008; Soru, 2000).

As of the end of the 19th Century, technological knowledge was applied to their transformation and to the control of water levels according the local social convenience. At the same time, hygienist theories blamed stagnant waters for air insalubrity and many endemic or epidemic diseases. This approach motivated and encouraged numerous engineering actions of deviation or canalization of rivers and streams to the detriment of coastal wetlands, in order to favour agricultural expansion, urbanization and construction of roads, railways, ports and airports. This process intensified in the second half of the last century due to post-war reconstruction and further expansion of intensive agriculture, before the rapid advent of coastal tourism (Van Vuuren and Roy, 1993). Their protection was long considered of little or no economic value compared to other uses that could have generated more immediate and visible opportunities. Strategic choices underestimated the general and economic value of wetlands, associating them with excessive short-term costs of protection rather than long-term opportunities (Barbier *et al.*, 1997; Beecher, 1994; Earll, 2005; Environment Canada, 2001). Inadequate understanding of temporality and ecosystemic services led to numerous improper choices. Thus, since 1900, more than half of the world's wetlands have disappeared (Barbier, 1993).

Wetlands are an arena where different, often conflicting interests overlap. Moreover, for the most part, these territorial systems are public goods, without clear property rights and with frequent weaknesses in the protection of the collective interests (Ostrom, 1990). In order to orientate planning choices towards a more effective protection, their values and opportunities, including economic ones, should be properly estimated.

Economic literature proposes several methods to estimate the economic value of wetlands, in terms of use values and existence values. Many of the benefits of direct use are linked to tourist activities (Andereck, 1993; Bacon, 1987; Eagles *et al.*, 2002). In this case, the process of territorial construction is influenced by political entities (European Union, national and local governments) and economic actors (companies, professional associations, individual operators), as well as experts from universities and research centers (Papa, 1999; Piermattei, 2007). These mechanisms are able to generate and convey a specific exogenous image of a location (Siniscalchi, 2000). Thus, agricultural and crafts productions can become true "cultural objects", recognized as expressions of territorial systems' abilities (Lai, 2007; Sistu and Lai, 2012).

3. Values

Lagoon areas and other wetlands are in a state of constant change, which is closely linked to the perception that human societies have about them. Most of the change processes are subtle, but they all produce some sort of immunization defense against their own disappearance, even if human intervention often causes accelerated aging and decay of these basins.

The concept of wetland was defined in the Ramsar Conference in 1971, whose final document's definition includes "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres", and also "riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands".

This definition encompasses a complex series of ecosystems, either natural or transformed by human actions, for the most part present in the Mediterranean and its islands. These are areas of great importance from geological, chemical, physical, biological, ecological and economic points of view. The articulation of aquatic vegetation is accompanied by a fauna represented by invertebrates, amphibians, reptiles, mammals and many species of fish (Della Pietà, 1999). However, birds largely represent the iconography of wetlands, in terms of attractiveness (as birdwatching has become a metonym for all activities of production, education, leisure and culture) and conflicts (for example, competition among cormorants and fishermen).

If we limit the analysis to coastal wetlands, Sardinia has an extensive system of ponds and lagoons located along its perimeter like a crown. It is one of the largest wetland systems in the Mediterranean (Cannas *et al.*, 1998; Tiana and Schenk, 1998). The Italian Government ratified the Ramsar Convention in 1976 and included in the list 46 areas, 8 of which are located in Sardinia (with a total surface of 12,570 hectares). All of them are located along the Southern and Western coasts of the island (provinces of Cagliari and Oristano). The protection of wetlands was further strengthened thanks to the opportunities arising from the Directive 79/409/EEC "Birds" (partially implemented by Italy through the Law 157/1992) on the protection of wild birds, especially those in risk of extinction. Accepting this Directive, Member States shall undertake specific protection for territories hosting the species listed in Annex I, classifying them as Special Protection Areas (SPAs). Other wetlands of various types and sizes, scattered along the coasts of Sardinia, fall within several types of protected areas, including National Parks (La Maddalena and Asinara), Protected Marine Areas, Regional Natural Parks

(LR 31/1989), Regional Reserves (Wildlife Protection Oases) and Sites of Community Importance (SCI) under the Directive 92/43 EEC ("Habitat").

From a morphogenetic point of view, the coastal wetlands of Sardinia can be divided into different categories: some of them are true ponds located at the mouths of rivers following their obstruction and extension into retrodunal water bodies and channels. Another type of wetland can be found along the coastal fronts of plains affected by subsidence processes where submersion gulfs (Cagliari, Oristano, Palmas, Asinara) were barred by long regular beaches (such as the Plaia of Cagliari) with the formation of lagoons which progressively turned into the largest ponds of the island, such as those located at the two tips of the Campidano plain. Finally, a third type, largely created by marine action, includes coastal lagoons formed by the obstruction of ancient inlets through the formation of sand spits which leaned on headlands, such as San Teodoro and Calich, or minor islands facing the coast, as in Capo Bellavista and Capo Mannu (Mori, 1975, 95–96).

4. Conflicts

The coastal location of Sardinian wetlands exposes them to major threats, due to littoral urbanization and industrialization, and also assigns them a significant yet uncertain role within the development of seaside tourism. These processes have resulted in a sharp increase in environmental pressures, besides the already widespread negative impacts produced over time by the gradual expansion of agricultural and pastoral activities. This leads to multiple situations of conflict related to the prevalence of the specific interests of different local stakeholders.

Many Sardinian wetlands disappeared for good during the late 19th and the 20th Century, mainly due to land reclamation processes, and many others are currently threatened or already affected and damaged by human activities. The vast land reclamation projects belong to the past and do menace these environments anymore, but many other major interventions are still likely to affect them, either directly or indirectly: overbuilding, channeling of rivers, water consumption for agricultural and domestic use, maritime infrastructures modifying sediment circulation, development of fisheries, creation of storage basins or lagoons for different kinds of discharges, etc. Moreover, other relatively widespread critical issues are related to summer fires, unlawful hunting and fishing, illicit disposal of waste, discharges of domestic, agricultural and industrial pollutants, encroachment of motorized vehicles in delicate areas, eutrophication, etc.

In many cases, these impacts have already severely damaged the ecological quality of these environments (Cannas *et al.*, 1998). The control on continental inflows (water and sediments), the maintenance of mouths and internal circulation, the regulation of the exchanges with the sea are management tasks that are essential not only to ensure the normal dynamics of fish migrations between sea and ponds, which is essential for fishing activities, but also for the very preservation of the environment as a whole (Cavallo, 2007; Lipu, WWF, 2003).

The wetlands of Cabras, Santa Giusta, S'Ena Arrubia, San Teodoro and Molentargius-Terramaini have been repeatedly affected, in recent years, by several episodes of large-scale mortality of the aquatic fauna. In these specific areas, the abnormal increase in fertilizers and nutrients, mainly due to discharges from urban areas and agricultural activities, including sheep and cattle livestock, causes eutrophication phenomena that alter the balance of all wetland ecosystems (Sechi, 1983). The discharge of pollutants in the wetlands has important and persistent environmental consequences, particularly when heavy metals and organochlorides enter the food chain. In addition to these threats resulting from industrial and agricultural activities, major risks are also related to sewage discharges, especially in the periods of peak tourist presence. Mining landfill, and abandoned mining sites in general, are another aspect of

the problem, as in the case of streams which drain the landfills of the former mining district of Montevecchio and carry large amounts of heavy metals into the lagoon of Marceddì. Moreover, other activities, such as oil mills, dairies and intensive fishing, are other sources of pollution and can also inhibit the development of ecotourism.

5. Frailties

This synthetic overview shows the complexity and diversity of Sardinian wetlands. In-depth analysis of significant case studies with paradigmatic value can show the specific meaning of the experience of deconstruction of historical territoriality and the complexity of the process of constructing a new territoriality.

Fieldwork was done by the authors through several encounters with local stakeholders (within Local Agenda 21 processes, projects for tourism development, international co-operation, etc.) in the two areas of Cabras and Tortolì between 2007 and 2013 (Corsale and Sistu, 2009). The time of atavistic repulsion towards the wetlands in Sardinia seems to be gone and partly replaced by a widespread yet generic perception of attractiveness which is still far from producing strong territorial assets. The two case studies can actually be considered as an emblem of different opportunities offered by these particular resources and, at the same time, show the persistence of conflicting interests. Their story highlights the difficulties arising from the overlap of explicit institutional planning of the only partially formalized framework of local stakeholders' actions and interests.

The Regional Administration of Sardinia, thanks to its specific responsibilities regarding state properties, is the subject which determines the "prevailing vocation" of each wetland. In the case of both Cabras and Tortolì, the Regional Government focused on increasing fish production as the main asset, with a more recent inclusion of ecotourism, also linked with local food and wine traditions. These choices were made in contexts of strong contrasts among stakeholders. In fact, the management of fishing domains, which used to be a historical structural element of feudal power along the coasts of the island, is currently experiencing a period of heated territorial confrontation, as the end of the concessions granted by the Regional Government since the early 1960s must be renewed through public bids, according to the Directive 2006/123/EC ("Bolkestein"). This transition period, characterized by the issuance of provisional licenses and renewals, has resulted in an almost anarchical management of conflict situations.

5.1. Tortolì: a success story

The current pond of Tortolì, located along the Eastern coast of Sardinia, within the municipalities of Tortolì-Arbatax and Girasole, province of Ogliastra, occupies an area of 2.3 km^2 (Fig. 1).

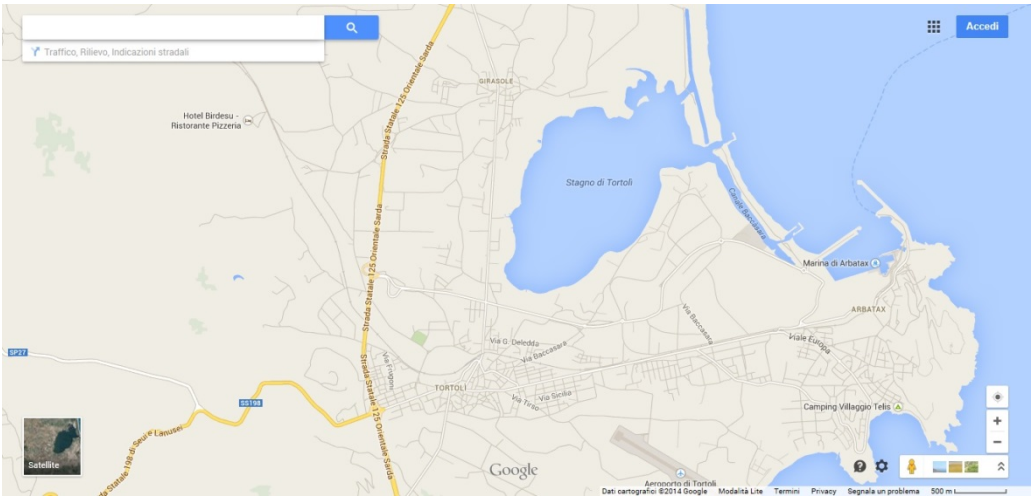

Figure 1. The Tortolì pond. Source: Google Maps.

Historical sources indicate that it used to be an open port in Roman times, while the current pond formed over the centuries through a process of gradual accumulation of continental sediments, favored by many hydrogeological processes. The pond and the connected fish farm were a feudal property until the early 19th Century, when it entered the public domain and was granted in concession to local individuals until the beginning of the 1950s. During this long period, the balance of the wetland was guaranteed by river freshwater inflows. The pond escaped drainage during the phases of malaria eradication which led to the loss of many Sardinian wetlands areas during the 20th Century.

The Fishermen Cooperative of Tortolì was created in 1944 by 13 founding members coming from Campania and Sardinia. By the end of the 1950s the number of fishermen reached 60 and they started a common struggle in order to obtain the removal of the holder of the concession, who anachronistically received 50% of the revenues of fishing. During the next decade the structure of the cooperative strengthened and their production grew, reaching the marketplaces of Cagliari.

From the second half of the 1960s, however, the process of industrialization along the Eastern coast of Sardinia started to impact on the wetlands through the construction of the enormous structures of a paper mill and a plant for the construction of oil rigs. Major changes related to the construction of these facilities led to the opening of new water canals and ultimately connected the pond to the sea turning it into a lagoon. At the same time, agricultural development required the construction of several dams within the river basins of Flumendosa – Mulargia, thus reducing the inflow of freshwater. The interference with industrial and agricultural development caused profound transformations in the characteristics of the ecosystem, including wildlife, with a rapid increase in the presence of marine species.

Facing these changes, the co-operative focused on the production of fish species with higher added value. At the end of the 1990s, the perception of the opportunities associated with the growth of new sensitivities in the regional tourism market led to the opening of a "kilometer zero" restaurant, which is permitted by the new Regional regulations on agrotourism (LR 18/1998). Following these innovations, the revenues for the co-operative currently exceed two million Euros per year. The original members have been joined by several employees, mostly family members of fishermen. Between 2007 and 2013, tourism linked to these new initiatives

has recorded an average of 50 000 customers per year, a very significant value within the province of Ogliastra, where tourist arrivals do not exceed 130 000 and are usually highly concentrated in the summer months (80%) (Crenos, 2012).

Direct management of marketing, trading, catering and tourist fishing proved to be successful and the co-operative started operating in new directions, including environmental education, the creation of a new trademark for its most renowned products (including the typical bottarga, or mullet roe) and international co-operation (supporting development and collaboration projects in Brazil, Senegal and Tunisia). The average age of its members (38 years) has remained the same since 1998, in contrast to the advanced aging of the fishing workforce in many Mediterranean contexts.

However, the expiry of fishing concessions led to a difficult confrontation with the Regional Government. The release of a provisional concession until 2020 finally allowed to curb conflicts and prevented individual actions that may have altered the balance of the ecosystem. The success of the co-operative's strategies has been confirmed by the designation of its President to the presidency of the Group of Coastal Action of Eastern Sardinia, created in order to manage the local development actions of the European Fisheries Fund (EFF).

5.2. Cabras: opportunities and challenges

With its 3.6 km^2 hectares, of which 2.2 are submerged, the Cabras lagoon is the largest in Sardinia. It is located in the Western coast of the island, within the municipalities of Cabras, Riola Sardo, Nurachi and Oristano, in the province of Oristano (Fig. 2).

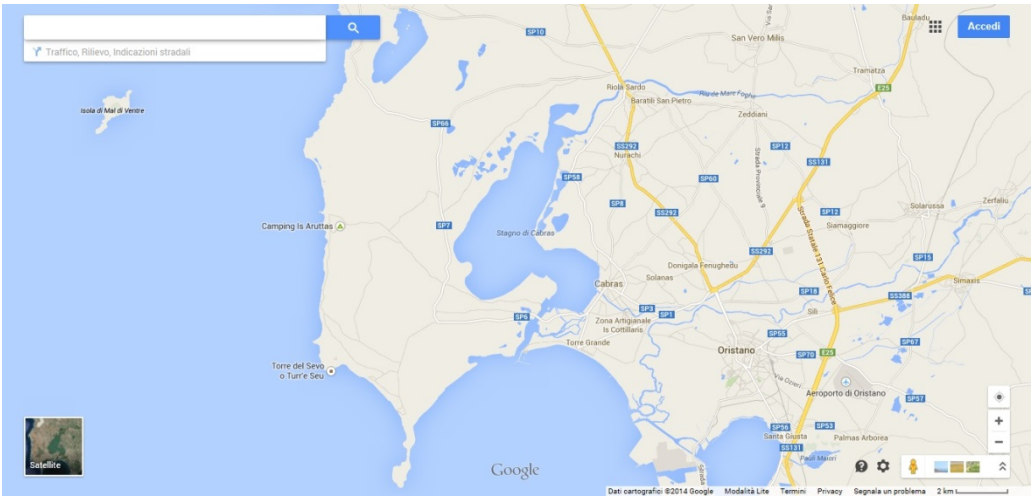

Figure 2. Location of Cabras Lagoon. Source: Google Maps.

Its configuration and the complex dynamics of its water flows make this environment particularly interesting, also considering its hydrobiological features and its flora and fauna. The drainage canals provide an important supply of freshwater. The lagoon opens to the sea through a diversion canal equipped with gates, distributing marine water to a system of channels which make the Southern part of the lagoon essentially brackish (Manca Cossu, 1990).

The pond proper is the hub of a complex system of wetlands located between the coasts of the Gulf of Oristano and the Sinis peninsula, partly protected by the Protected Marine Area of

Sinis - Isola Mal Ventre, a unique ecosystem because of the richness of its plant and animal biodiversity. The entire area is also protected by the Ramsar Convention.

The economic activities of the population of Cabras have historically been based on fishing, agriculture, crafts and livestock. In particular, fishing in the pond of Cabras is an important specific economic resource (85% of the fleet operates in the local pond, while only 15% is used for fishing in the sea) and is managed by 11 fishing co-operatives which consist of approximately 300 fishermen. The co-operatives belong to the *Nuovo Consorzio Cooperative Pontis*. In 1993 the Regional Government entrusted the consortium with the fishing concession for the area. Formerly, fishing used to be managed according to essentially feudal law until 1977, when the last "owner" of the lagoon died. Before 1977, a very rigid internal organization of fishing authorizations and functions created an unchanging social structure within the community. Different categories of fishermen and workers used to be given a complex set of functions: preparation and construction of reed dikes and dams, control of fish migrations, fishing, selling the product, etc.. The richness in fish stocks and the originality of local tools and techniques contrasted with an unfair distribution of the revenues, which caused severe social unrest (Fiori, 1961).

Following the sudden end of the exclusive fishing rights, the new co-operatives inherited a complex management system and faced the difficulty of creating an equitable and unified organization. The devastating large-scale fish deaths that affected the ponds of Santa Giusta (1989, 1994) and Cabras (1999), led many fishermen to apply for sea fishing licenses, in order to create an alternative to fishing in the lagoon alone. The main source of these crises was the alteration of the ecosystem caused by pollution and alteration of the water regime. The fish abundance in the ponds (historically about two quintals per hectare) has been severely affected by the effects of eutrophication produced by the discharge of untreated wastewater from industrial and agricultural activities.

The importance of these threats encouraged closer cooperation between the operators and the municipality of Cabras, which has produced an important process of diversification of activities through direct marketing of fish and processed fish products and the launch of fishing-related tourism activities, including a restaurant. In particular, tourism activities produced revenues for more than one million Euros in 2007, with over 45 000 customers. In the whole province of Oristano, tourist arrivals in classified structures are about 133 000 per year (Crenos, 2012).

However, elements of latent conflicts, recalling historical divisions, are still present. In fact, the expiry of the concession to the Fishing Consortium Pontis unchained the contradictions of this control model. The eleven co-operatives forming the consortium became progressively unable to mediate among the individual interests of the fishermen. As a consequence, about 80% of fishermen quit the co-operatives and started operating individually, without the necessary co-ordination that would ensure the environmental sustainability of their activities. Among the tragically negative consequences of this disbandment, in 2013 an unauthorized fisherman died during a clandestine fishing expedition, and, in the same year, the restaurant was destroyed by arson. Following these events, new mediation attempts by the consortium led many individual fishermen to join the grouping again and the restaurant was recently rebuilt and reopened. The perspectives are thus uncertain, with encouraging co-ordination efforts coexisting with persistently recurrent infightings.

6. New horizons

In conclusion, it is useful to focus on the weight that can be attributed to the political initiative in defining the perspectives for coastal wetlands. The action of a subject such as the European Union, which links protection, co-operation in research and development, the enhancement of non-codified knowledge, the legacy of history and the heritage of tangible and intangible knowledge coming from remote communities, is currently the highest standard reference in our field of interest. The measures implemented within the frameworks of LEADER and LEADER PLUS by Local Action Groups are a good example, as they aim at strengthening the role of wetlands' products as the result of the specific know-how of these territories; a process that, on the political level, appears to be the effect of synergies between institutional policies and actions of fragile wetlands' actors (Abram, Waldren, Macleod, 1997; Hannerz, 2001).

The experiences of Sardinia show that the integrity of a wetland depends on all the activities that are carried out: only integrated action, an "explicit institutional connection between protection and global governance of the territory" (Turco, 1983, 104), can preserve these values and the man-made environments that are related, given the historically symbiotic relationship between man and the lagoon; but it is also essential that all stakeholders have a voice and can help shaping the analysis of problems and aims. The same experiences also highlight the inconsistency in the definition of the value to be attributed to the local dimension of decision-making, within an institutional framework characterized by a highly centralized strategy. Besides the Regional institutional actor, the local political systems are still largely tied to a case-by-case regulation of the affairs of the territory and tend to keep a strong power of interference with respect to the application of general principles. Finally, the local communities, in addition to traditional technical knowledge and openness to innovation, seem to be able to act proactively within project choices, yet they are penalized not only by the contradictions of the intervention models but also by insufficient institutional support and the emergence of individual interests which are not always governed in a framework of appropriate mediation.

The comparison between the experiences of Cabras and Tortolì shows the efforts of the fishermen in capturing the value of the opportunities related to the positive transformation of the image of the coastal wetlands occurred in recent decades, through the strengthening of the ways and techniques of production, without harming the quality of wetland ecosystems. Their actions are important factors of attraction to specific resources in territories which used to be ignored by the regional tourism system. The differences between the two cases derive from different levels of conflict among the stakeholders. In the case of Tortolì, the presence of a single co-operative, and a management team which can negotiate with the individual needs, means that new initiatives were implemented with the consent of most of the fishermen. In the case of Cabras, the situation is more complex; the historic rivalry between the fishermen's co-operatives, a difficult legacy of the "feudal" past, has not been entirely overcome, and it is likely, in the absence of new rules for the use of shared resources, to give rise to new conflicts that could compromise the successes which had been reached in recent years.

The quality of the fishing activities and the connected activities is strategic; fishing and sustainable fish farming are largely compatible with the perspectives of conservation and local development, using tourism as a connective element. The actions of recovery and rediscovery of traditional methods of fish processing may become important factors of attraction in terms of experience for the regional tourism demand, also considering its teaching and educational dimensions. This unique natural heritage is a key element in the strengthening of regional ecological network. The growth of cultural tourism linked to the recovery and promotion of archaeological sites and museums located in the vicinity of some of the most important

wetlands of Sardinia is one of the bases for further integration with the cultural history of these places, through active involvement of visitors in the historical knowledge; but only the integrated management of the ecosystem components of these fragile contexts can truly integrate tourism in the range of activities of local communities, without being overwhelmed by superficial museumfication.

The overlapping of projects related to recreation and tourism and the revitalization of fishing and traditions associated with it, along with widespread critical issues still related to the expansion of human activities in fragile coastal environments and to a persistently marginal socio-economic context, poses additional problems for the future. The analysis of these systems shows their changing character, through complex forms of relations among wetland environments and human societies, and highlights the potential and risks of locally managed planning.

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