May current scientific ecological knowledge be part of the problem?: the role of scientific advice in promoting (or hindering) biodiversity conservation - A case study at El Hondo Nature Park (SE Spain)

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Abstract

The guiding principles of the EU biodiversity conservation policy, as expressed in their main Directives, are strongly based on the contributions made by scientific knowledge, specially from the biological and ecological sciences. However, their translation to regional and local policies (the real arena where the conservation of European biodiversity must be played) have in many cases caused conflicts among stakeholders and have not been as effective in guaranteeing the conservation of biodiversity as desired. We expose some cases studied at El Hondo Nature Park (Valencia Region, Spain) where the measures taken by the the Environmental Administration, according to the result of a specific EU-funded LIFE research project, for the conservation of the important local population of white-headed duck (*Oxyura leucocephala*), a species protected by the EU Birds Directive, and of the halophilous plant formations existing in the Park, considered priority habitats by the European Directive, have generated a very conflictive situation among local stakeholders which puts at risk the sustainability of whole system. We discuss how normal scientific advice, although scientifically sound, frequently neglects the complexity of the real socio-ecological system where it must be applied, and precludes political considerations, so jeopardizing the survival of the biodiversity it tries to protect. On the contrary, we give some examples showing that, when these complexity and social considerations are taken into account through a real collaboration with stakeholders, and taking into account their socio-cultural and economic expectations, the ecological scientific advice on the importance of biodiversity can be assumed and even actively promoted by local stakeholders. However, this requires important changes both in the organization/behaviour of the environmental institutions, at different levels, and in the way that scientific research is conceived and supported by the academic institutions.

Keywords: Environmental scientific advice, biodiversity conservation, wetlands, Protected areas, Environmental Management, *Oxyura leucocephala*, *Limonium* sp., El Hondo Nature Park, Alicante, Elche, Spain

Introduction

Our objective in this paper is to propose a reflection on the real contribution of current scientific environmental research and advice to biodiversity conservation and its socio-economic benefits. To this aim, we present and discuss some results obtained through a case study carried within the WADI project (EC- FP7, INCO Program, CT2005-015226) in the Nature Park of El Hondo, one of most important biodiversity hotspots of the European Union, and at present one of the most socially conflictive and endangered ones.

WADI was designed and proposed with the aim of furnishing some useful information and advice to the European Commission in relation to the challenges posed by the EC biodiversity conservation policy (as expressed, for example, by the Habitats Directive and the Birds Directive,a and also the Water Framework Directive), especially when related to wetlands (Sacpini, 2009). Among them, El Hondo is a specially interesting study site because of their high biodiversity value, its high protection level, also at European levels (it is Special Area for Conservation, SAC, within the European Nature 2000 Network and Special Protection Area, SPA, according to the Birds Directive) and, paradoxically, its progressive, and apparently unsolvable environmental degradation, and its permanent social conflictivity .

European biodiversity policy is based upon considerable and technically sound scientific information, as a mere glance at the text of the Directives will show. What is clear is that, since the approval of the EU Directives, the ecological constraints they impose, when translated to regional and local policies, have caused conflicts among stakeholders and have not been as effective in

guaranteeing the conservation of biodiversity as desired. We think that, in order to be effective, the policy endorsed by the above-mentioned Directives require a deeper understanding of the actual consequences of their implementation at a local or regional level through sound case-study analysis, i.e. taking into account their specific environmental, socio-cultural, and institutional contexts.

More than fifteen years ago, Kristin Shrader-Frechette and Earl D. McCoy, in their seminal critical book on the science of ecology (Shrader-Frechette and McCoy,1993) remarked that, because of the difficulties associated with ecological concepts, theories and value judgements, applied ecology require the use of new scientific methods, and propose specifically a wider use of case studies (see also Shrader-Frechette and McCoy, 1994).

The case-study approach has been defined as 'a method for learning about a complex instance, based on a comprehensive understanding of that instance, obtained by extensive description and analysis of the instance, taken as a whole and in its context' (U.S. General Accounting Office 1990). In using a case-study, one must confront the facts of a particular situation, and then look for a way to make sense of them (Shrader-Frechette and McCoy, 1993). Case-study seems the best adapted methodology for promoting an effective understanding of real, conflictive situations affecting natural resources and biodiversity (Kartez and Bowman 1993; Homer-Dixon, 1994; Kyllönen et al. 2006; Keough and Blahna, 2006).

Moreover, case studies are well suited to provoke discussion, to highlight issues and stimulate public awareness of the problems (Stake, 1978), so informing and educating a larger audience (Branch et al., 2001). For Carson (1986), cases are occasions for teaching. So, the case-study approach seemed to suit perfectly the WADI project main objectives, both the construction of an integrated, meaningful picture of what is happening in the selected wetlands, and the promotion, at the same time, of social learning on environmental and biodiversity issues among local stakeholders.

Study site

El Hondo Natural Park is situated in the middle of the province of Alicante, in the semiarid South-East of Spain, the only large European semiarid area. The Nature Park was created in 1988 in order to protect 2387 Ha a water system sustaining enormous faunistic and botanical values.

The water system is of an enormous complexity, partly as a result of a long history of gradual human control of the water fluxes in an area which was in ancient times a large swampy area fed by two main rivers: the Segura and the Vinalopo. The system has been historically built on the basic rationale that residual irrigation waters (i.e.,waters that have irrigated a given field and have been captured by the drainage systems) could always be re-used for the irrigation of another field placed in a lower position. According to this system, the water til 4 or 5 different fields before being poured into the sea.

During the first decades of the 20th century, the new opportunities offered by the electrical technology for pumping up irrigation water, made possible an additional re-use of used waters. So, those waters which have irrigated until 4 or 5 fields could be diverted from drainage canals shortly before their entry into the sea and pumped up to irrigate once again, in this case the dry lands of the Elche countryside. Several companies were created then with this aim, the most important and ambitious of which was the "Real Compañía de Riegos de Levante", created in 1918, Riegos de Levante, in order to store and regulate the water pumped up, built two large reservoirs during the years 1930s and 1940s in a former, salty lowland area, occasionally inundated, named "El Hondo" or "El Fondo" (the Depression). The spontaneous biological colonization of these two large freshwater ponds (450 and 650 hectares) generated a rich wetland ecosystem with a considerable animal and plant diversity. In fact, hunting and fishing soon became an additional source of income for the water company. Nowadays, disappeared the private company, the possession and management of the ponds and the whole irrigation system corresponds to the General Community of Irrigators of Riegos de Levante, an association of all the farmers using these waters (more than 20.000, covering almost the in the Southern part of the province of Alicante).

The rapid and fruitful colonization of the ponds by interesting game and fishing species had another important consequence from an ecological point of view, but also through the active intervention of local people: the owners of the poor salty fields existing in the surroundings of the ponds became aware that the revenues obtainable from hunting and fishing in inundated lands were higher than those obtainable from cultivated lands, and transformed their former fields into ponds, in this case, using normally brackish water from local springs or from drainage waters with too high salt content for being used in agriculture. All these new, smaller ponds soon presented considerable biodiversity levels, to the point that nowadays they are considered the richest part of the Nature Park from a biological point of view.

It is important to remark that the water system is the result, not only of a human modification of a natural one, but rather, and in some aspect, a human creation. Presently, the El Hondo Nature Park water system is formed by the two large ponds of fresh irrigation water pumped up from the mouth of the Segura river and five drainage canals, about ten smaller private hunting/fishing ponds (with brackish water of different characteristics, since the provenance of these waters is very diverse), four ponds dedicated to ecological conservation (three owned by the environmental administration and the fourth by a conservationist NGO), and thousands of kilometres of drainage and irrigation canals, of very different water quality, connecting all above-mentioned ponds and water reservoirs (Figure 1). This complex system is naturally and inextricably connected to another Nature Park (the Salines of Santa Pola), also with a very complex water system.

In relation to social aspects, the situation is no less complicated. Many different administrations, from the national (i.e. Water Administration) to the regional (i.e. Environmental administration) and local levels (10 town councils directly involved) have some degree of responsibility on the system's management. Every level of management involves multiple actors. For instance, El Hondo falls within two national Water Administrations, that of the Segura river (Confederación Hidrográfica del Segura) and that of the Vinalopó River (corresponding to the Confederación Hidrográfica del

Júcar). The large General Community of Riegos de Levante, supplying water to some 20.000 farmers in the province of Alicante, is the owner of the two largest ponds of El Hondo, the core of the protected area. But the protected area includes also a decene of smaller private ponds (many of them with considerable biodiversity values, traditionally dedicated to fishing and hunting).

At the local level, 20 communities of irrigators have the direct responsibility for the day-to-day operation of the whole water system (of which the Nature Park is only a small portion). For this complex task, they rely mainly on ancient, not-written traditional knowledge and norms. To the south of El Hondo, the irrigator communities most directly related to El Hondo water system are those of Catral, Dolores, San Felipe Neri, San Fulgencio and the Carrizales de Elche, which use also water directly or indirectly derived form the Segura river, and with complex functional connection with El Hondo water system. To the north, other irrigator's communities, also functionally related with El Hondo, took their water traditionally form the river Vinalopo, and presently from various sources (including urban . Each of these irrigator's communities typically are formed by ca. 300-400 farmers.

There are also many agricultural associations, civic platforms and conservationist groups, cultural associations, etc., with relevant influence on the social system and its recent events.

Methods

Case studies typically use multiples sources of information and a variety of methods, both quantitative and qualitative, in order to obtain the data needed and to identify and explain the the particular aspects of the case (Branch et al., 2001). The specific issues exposed in this paper have relied mainly on the results obtained through the following qualitative and quantitative methods (for more details, see Martin-Cantarino et al., 2009)

- Semi-structured interviews with key stakeholders (Huntington, 2000). 45 taped interviews,

plus the written notes of other 50 interviews for which taping was not possible, have been systematized and analysed.

- Focus groups (group discussion). Some working meetings have been hold with specific categories of stakeholders around (i.e.: best technical solutions to El Hondo problems, the past and present importance of hunting and fishing, the impact of environmental management measures on daily life of local stakeholders, etc.).
- Participant observation, based on a collaborative interaction between researchers and informants while jointly developing a given task, for example, the preparation of reports and working meetings, celebrations,etc. It should be noted that this methodology not only provides a kind of information hardly obtainable through other techniques, but it is also an opportunity of influencing in some way the social environment at the same time that it is being studied. If properly conducted, and specially if the research issues have been selected according to the informants needs or interests, participant observation can induce mutual learning between informants and researchers. According to the WADI rationale, we have tried to stimulate social learning during the research tasks, and so in a mutual manner, and not as a ex-post, top-down expert advice.
- Analysis of written or audiovisual documentation (reports, press news and releases, administrative documentation, legal texts, etc.), including formal qualitative and quantitative content analysis (Schilling, 2006; Elo and Kyngäs, 2008). This technique has been also applied to the texts generated by the WADI project through the above-mentioned methods (transcriptions of interviews, collaborative wrting documents, etc.).

Results

We present and analyse three recent cases showing the role played by scientific advice on some important issues at the Nature Park of El Hondo related to biodiversity conservation. But first of

all, it is important to remark at least three general aspects revealed by our analysis in order to understand the framework on which the conflicts should be considered:

a) The role played by the traditional rural sector and its traditional environmental knowledge in the configuration and maintenance of the present ecosystem and its biodiversity levels is, in general, only implicitly recognized in the official, scientific and administrative literature, and always in the form of a "historical" or "folkloric" chapter, from which no clear management conclusion for the present problems of El Hondo is normally drawn (Martin-Cantarino, 2010b)

b) Despite the evident fact that the water system (and thus its biodiversity levels) has been created and maintained by the *savoir-faire* of the local people, no single study on the local traditional ecological knowledge had been carried out by the environmental administration, nor by academic researchers since the creation of the Nature Park. The more-or-less exhaustive and multidisciplinary bibliography on El Hondo system compiled by the WADI project (Martin-Cantarino, 2009) has not been able to register any published reference on this subject- the only ones being those generated by the WADI project itself (for example: Belda et al., 2008).

c) Accordingly, these aspects has had no presence in the environmental interpretation and education programs developed at the Park, an activity in which a substantial part of the budget and human resources of the Park is employed (Candela-Quesada et al., 2007).

a) The *malvasia* case: the risks of objective scientific advice

In May 2005, a legal decree (Decree 93/2005 of the Regional Government of Valencia on the approval of the Recuperation Plan of the White-Headed Duck, *Oxyura leucocephala,* in the Valencian Region) was formally passed on. Soon, it came to be popularly known as the "Malvasia's Decree", because Malvasia is the Spanish name for *Oxyura leucocephala*. The malvasia or White-headed duck is a waterfowl species internationally protected by the Bern Convention, Bonn Convention, Ramsar Convention and European Directive 79/409/ECC ("Birds Directive"). El

Hondo is an essential site for the conservation of the species in the Iberian Peninsula and in the Western Mediterranean area. In 2002, for example, 70% of the Spanish population of White-headed duck inhabited El Hondo. Also it is considered as an endangered and strictly protected species by Spanish national and Valencian regional legislation.

In a certain manner, the "Malvasia's Decree" was the first legal disposition with a real scientifically-based environmental management content affecting El Hondo Nature Park biodiversity. In fact, its dispositions were based on a specific and well-funded LIFE project carried out from 1st January 2001 to 1st January 2005. The content analysis of this text reveals a predominant scientific style, including numerous ecological data and technicisms.

The most transcendent disposition was that no 'sudden' variation in the water level was permitted during the breeding period of the White-headed duck, from 1st February to the end of August (art. 5.2), because, as exposed by the scientific data, a rapid change in water levels can cause the destruction of nests and broods. This implies the prohibition of any important discharge of water from the two larger ponds of El Hondo (the irrigation water reservoirs of Riegos de Levante) or any introduction of water into them during this period.

Additionally, hunting and fishing were prohibited or seriously limited in the wetlands where inhabits the malvasia (art. 5.2), because researchers demonstrated that these activities can cause the death of adult malvasia ducks.

As expected, the Decree was not well received in the Agrarian sector of Elche, specially in Riegos de Levante, as . In june 2005, after several very dry moths, the executive assembly of Riegos de Levante decided to release water from the ponds in order, allegedly, to irrigate fields and save crops, despite the legal prohibition imposed by the malvasia's Decree. Green groups immediately denounced in court this obvious transgression of the malvasia's Decree and the damages caused to protected fauna of the Nature Park. As a consequence, the executive manager of Riegos de Levante was legally charged with environmental crime and a lawsuit was brought against him. An official report by the Environmental Administration, requested by the legal court, which

documented the loss of malvasia's broods, was used as the main incriminating evidence. The tension between Riegos de Levante and the Environmental Administration reached its peak during the formal start of WADI project (1st January 2006). However, the project, whose approach and aims, and especially its participatory character, had been extensively presented to all parties during the previous year, was apparently felt as providing new possibilities for each position. In fact, despite the tension, all contacted parties attended the official presentation meeting of WADI in February 2006, and participated actively, offering their collaboration for the development of the project.

The situation remained stationary during the following months. Evidently, given legal consequences, Riegos de Levante did not release any more water from the ponds during the periods in which such discharges are prohibited by the malvasia's Decree. The feeling of grievance grew among irrigators and generally among rural sectors of the area. Political aspects were also present, creating a quite explosive situation. The presentation by the Environmental Administration during the last months of 2006 of the drafts of new management plans for the Nature Park, which endorse a series of use limitations, and barely contain any proactive or compensatory measure for affected sectors was felt as another cause of resentment, as manifested angrily during the WADI general meeting with stakeholders held in February 2007. During the summer of 2007, and after complaining several times that agricultural fields had not been irrigated due to the malvasia's Decree, Riegos de Levante also denounced that they could not even pump up to the ponds of El Hondo the much-needed and relatively good water that, thanks to some strong rains, was available in the Segura River at the end of summer, and which ended up running into the sea. In the context of the local traditional water culture, this loss of water is radically incomprehensible, and thus a very sensitive popular argument against the Administration’s decisions.

As a result of this conflict, in order to manifest its feeling of grievance, in November 2007 Riegos de Levante contested at the court the malvasia,s Decree, and in January 2008 its Executive Directive took the decision to close the entrance to their property and thus, to impede access of the

general public, environmental managers and of researchers to the most important part of the Nature Park. Despite the importance of the decision, no public declaration was made by the Environmental Administration, and no measure was taken against this situation by any other institution. Moreover, no repercussion was noted in the social environment of the area, even after months had passed and the closing of the ponds was maintained.

In August 2008 Riegos de Levante denounced an outbreak of botulism and a massive mortality of waterfowl due to immobilization of poor quality waters, and publicly demanded from the Environmental Administration the drainage of the two ponds for sanitary and environmental reasons. After some reluctance (extraction of water in spring and summer was precisely the cause of the conflict, due to its interdiction by the malvasia's Decree), the environmental administration, when the epizootic outbreak was confirmed by its technicians, finally authorized the drainage of the ponds. Once dried, Riegos de Levante publicly declared that they would not pump up new water into the ponds until the malvasia's Decree was abrogated or drastically changed according to irrigator's demands.

Despite the fact that the most important part of the Nature Park was not only closed, but had also been dried out, no public declaration was made during these months neither by the Environmental Administration nor by any other stakeholder, except, as usual, by Green groups. After months of inactivity, Riegos de Levante took up the initiative again. On 19th December 2008, a large public demonstration organized by Riegos de Levante, in collaboration with other local agricultural associations, marched through the streets of Elche in order to reclaim irrigation rights in El Hondo and the abrogation of the malvasia's Decree. Riegos de Levante succeeded at mobilising, not only agrarian associations, but also other Elche's civic organizations and even town authorities. Their capacity to mobilise local forces was confirmed by the fact that all political parties represented in the Town Council, including the political party heading the Regional Administration (and thus the Environmental Administration) supported the demonstration more or less enthusiastically.

This demonstration was the final catalyst which obliged the Environmental Administration to call for a dialogue. Apparently the success in mobilising such a range of very disparate local forces (except Green groups), including groups not normally sympathetic to the positions of Riegos de Levante, surprised and preoccupied the political decision makers showing they had lost the control of the situation.

The way in which administration normally ignores how things go at local levels, and specifically in the rural or agricultural world, i.e., the emotional charge in discourses, the importance of informal relations, the more-or-less generalized sense of grievance (which acts always as a common ground against administration), etc. is a typical example of what sociologists have pointed out regarding similar environmental conflicts (Navarro Pedreño and Cid Cid 1998). During January 2009, the environmental regional Minister and the chiefs of Riegos de Levante formally initiated negotiations in order to put an end to the conflict, and the property is re-opened.

After many negotiations, analysis of possible solutions, the situation seems paralyzed. In January 2010 the criminal trial against the executive manager of Riegos de Levante is formally opened. The day before, all the parties represented in the Town Council of Elche (including also that supporting the Regional administration) had publicly declared their support to Riegos de Levante and had required a change in the way El Hondo is being managed by the Regional Environmental Administration – a political declaration which seems to explicitly defy the alleged scientific basis of the malvasia's Decree.

The final verdict was of “not guilty”, mainly on the base of the statements made by the very Environmental Administration, including the Director of the Nature Park, that “no harm to the malvasia was detected after the water release”, thus seemingly contradicting the first report signed by the same administration which resulted in the incrimination of Riegos de Levante. Obviously, the socio-political pressure has produced this odd behaviour change of the environmental administration.

However, and significantly, this 'happy end' for Riegos de Levante did not result in a decline of

the conflictivity, because the malvasia's Decree continued in force at the moment without any modification, despite the numerous negotiations hold between the administration and Riegos de Levante during the year. Moreover, in march 2010, the Environmental Administration passed the Natural Resources Plan of El Hondo and related wetlands ("Plan de Ordenacion de los Recursos Naturales": PORN, one of the planning instruments established by the Spanish and Valencian Conservation Legislation for the protected areas). This Plan provoked an outright rejection from local stakeholders. Apparently, most of the amendments from the previous drafts, previously agreed between local stakeholders and the environmental administration technicians, were not incorporated to the finally passed text. Riegos de Levante, once again, succeeded in capitalizing this discontent, obtaining a practically unanimous support from local rural entities, as testified by a meeting hold in Elche with the assistance of the most representative agrarian and local associations. The expression 'declaration of war' against the Valencian environmental administration was pronounced several times.

When scientific advice can cause conflicts and loss of biodiversity

In our opinion, the main lesson arising from the malvasia story is that even an ideal situation (from a researcher point of view), where scientific findings have successfully influenced management decisions, can generate unexpected, dramatic consequences. Typically, scientists perceive that science is perverted by politics, that frequently scientific facts are perverted or not taken into account due to political interests (Cooperrider, 1996; Cortner, 2001). In our case, however, the scientific counsel, based upon a scientific research of good quality (of course, according to the standards of ecological science), was fully endorsed by decision makers to the extent that a protection law was passed assuming almost literally the scientific recommendations. Additionally, a considerable economic effort was made through campaigns and environmental education activities, as recommended, in order to raise public awareness about the White-headed

duck and the soundness of protection decisions. and gave a clear counsel to decision makers,

What has gone wrong then? One could simplistically think that the failure of the malvasia story cannot be attributed to scientific research, and that the complex mixture of social, political and cultural problems responsible for such a turbulent situation has more strictly to do with managerial (or political) problems than with scientific questions. According to this, scientists have done their job giving decision makers clear recommendations, based on objective and scientifically sound argumentation. The rest, could we think, is a question of the "savoir-faire" of managers.

For us, the question is more complex. In relation to the malvasia's case, it is probably appropriate to recall the affirmation of Boehmer-Christiansen (1994): 'Science is often more comfortable in providing advice on what ought to be done and why, rather than practical advice on how it might be achieved'. It is obvious that in our case, researchers have clearly said what ought to be done in order to conserve malvasia's populations and why. In fact, a considerable part of written reports, published materials and even legal documents was dedicated to explain the importance of the White-headed duck and, thus of maintaining certain water levels and ruling out traditional activities that might endanger malvasia's well-being. But, on the other hand, these reports offered no information on the complexity of the socioeconomic and cultural system on which the malvasia depends and on how these measures could be applied realistically. Significatively, the only reference to stakeholders was the proposal of an environmental education plan aimed at illustrate them about the ecological value of the malvasia – and which was finally materialized in a series of brochures, games and posters directed at school children (following the normal trend of environmental education programs carried out in El Hondo from its declaration).

But given the objectivity of scientific evidence and measures proposed, the Administration simply adopted and legally ratified them integrally. In our opinion, this case perfectly illustrates what Herrick and Jamieson (2001) call the futility of policies trying to ensure above all the 'objectivity' of data and information used for policy decisions, or even the consequences of 'excessive objectivity' denounced by Sarewitz (2000). The quest for objectivity in data usable by

environmental management is not, of course, reprehensible. But the problem arises when the supposed 'objectivity' of facts obscures public and policy debate (Herrick and Jamieson 2001). Has the objectivity and the scientific excellence of research on malvasia's ecology obscured public debate? What is clear is that the malvasia case fits well with what Endter-Wada et al.(1998) consider the 'worst' possible implication of an isolated ecological research: considering that people are political obstacles to implementing what the natural scientists believe is necessary to meet ecological goals, and that the role of social science and managers is to 'educate' people so they become more supportive of those goals. As seen, the malvasia's Decree, obviously prepared with no consideration to the social system in which it should be enforced, included a mandate on the need of establishing environmental education programs in order to "educate" local people on the importance of the white-headed duck – a mandate routinely materialized in activities and materials addressed to school children.

The Environmental Administration not only needs to know how the malvasia can be preserved, but also (or firstly) how the socio-ecosystem should be influenced or handled in order to guarantee the conservation of the malvasia. In other words, it is not so much a matter of managing the malvasia that a matter of working with stakeholders upon whom the survival of malvasia depends. And this kind of information has not been provided (nor could be provided) to managers by current scientific research, because it needs a comprehensive approach encompassing rather than reducing complexity - a kind of research certainly not frequent at this moment. Thus, a specific, somehow revolutionary effort of integration of social and environmental, quantitative and qualitative, formal and informal information is absolutely needed.

For Walker et al. (2001), this activity of integration is distinctly different from those of managers, planners or current researchers, and not one that sits appropriately within the strict boundaries of any of these categories, but one that could evolve from any of these starting points. The usual opinion that scientists should provide data and information, and that managers must find the ways of implementing the recommendations resulting from this information is too simplistic.

What managers need is not pure scientific information, obtained through normal disciplinary constraints, but rather the integration of this information into their real context, i.e. where they find practical sense. Being also a research activity, WADI tried to take research as a starting point for advancing towards the so badly needed integration in the management of our systems, as the case of the malvasia at El Hondo dramatically documents.

b) The 'Lemonium case, or the difference between competitive and cooperative conflicts in environmental management

'Lemonium' or 'Lemonio' is the approximate name that some local farmers of the area of El Hondo (and specifically that of Carrizales of Elche, the area towards the Southeast of El Hondo ponds from which we have obtained the information for the present case) have given in the last years to a plant the Environmental Administration has said to them that is present in their lands. Few of them know exactly which plant it is, but this plant, even unknown, has become very important to them because the environmental authorities have said (or they have interpreted the Administration has said) that the 'Lemonium' is protected and they cannot plough and cultivate their lands if the 'Lemonium' is there.

The 'Lemonium' has become one of the symbols of what 'Medioambiente' (Environment) means to local people: an alien, bureaucratic, ununderstandable and coercive force that tries to change their traditional way of life, on the base of incomprehensible arguments somehow related to what they qualify as an obsession with not harming wild animals and plants. 'Medioambiente', in this special sense, is a very important term for the understanding the local imaginary and the local framing of environmental conflicts – and how the concepts about biodiversity arrive at the local scenes. During the Presentation meeting of El Hondo WADI site in February 2006, which launched the project WADI, some speakers from the agricultural sector pronounced phrases like 'These lands have nothing to do with the 'Environment', these lands are ours!'. In this personified concept of

‘environment’ farmers include not only the Environmental Administration and its managers, but also Green groups and scientists i.e., alien sectors. The WADI team was obliged to explain to some rural sectors that we were not ‘Environment’ (in this particular sense) in order to establish relation of trust with them.

‘Lemonium’ is, of course, the local folk distortion of the name of the *Limonium* genus (Plumbaginaceae), and its local legend at Elche countrysise has much to do with the European Habitats Directive, as implemneted in the area by the regional envirornmental administration. The genus *Limonium* includes a great number of halophilous plants in the province of Alicante, many of them endemics to the area. Their taxonomy is very complex (Crespo and Lledo 1998). Many species and forms, due to their restricted distribution, are included in the White Book of the endangered, endemic and rare species of the Valencian Region (Laguna 1998).

More importantly, *Limonium* species are associated with a Priority Habitat according to the European Council 92/43/EEC Directive on the conservation of natural habitats and of wild fauna an flora (commonly known as the ‘Habitats Directive’), specifically, the nº 1510 ‘Mediterranean salt steppes (*Limonietalia*)’. Due to the high salt content of lands and water, the unploughed fields are soon covered by salty scrub formations rich in *Limonium* species. In fact the Management Plan of the Nature Park or El Hondo, in one of its most controversial dispositions, establishes that no 'saladar' formation can be broken up and put into cultivation. And this means that if a land has been left uncultivated during some years, it could not been cultivated again. For example, some farmers cannot cultivate the lands cultivated by their parents. Obviously, this norm has generated a very explosive situation, and even several farmers have been fined for having ploughed their fields.

Once again, science has been very effective in identifying, and even mapping important biodiversity aspects, but not in providing a comprehensive picture of what the *Limonium* species means within the real socio-ecological system of the zone. And, of course, no attempt was made for establishing collaborative channels with the rural world .

During a field visit in 2006 to the surroundings of El Hondo, the President of a community of irrigators, while walking through a field where the Environmental Administration had prohibited cultivation because it was covered by a saladar formation, asked us: 'But which of all these plants is the famous 'Lemonium'?'. Despite the value given to the plant, and the conflictive norms adopted for the protection of its habitat, despite so numerous research efforts for documenting the distribution, ecological characteristics, no campaign was never made by the Environmental Administration nor by any other official or academic instance, to show local stakeholders which are the plants named *Limonium* nor why they must be considered so important.

The remarkable thing is that this kind of conflictive perceptions have been framed as a case of absolutely incompatible goals. The interests of the 'Environment' and those of the farmers are considered as being absolutely incompatible. And, once again, the scientific advice (*Limonium* exemplars should not be touched!), perfectly understandable from standard scientific criteria, poses a serious management problem to the environmental administration. And, what is worse, set off a suit of undesirable consequences.

Some registered testimonies from the Environmental Administration staff certifies that this perception of incompatibility, shared by many influential managers and decision-makers, has had serious consequences at a planning level, for example in the area delimited for the application of the Natural Resources Plan (Plan de Ordenacion de los Recursos Naturales: PORN). Although the delimitation of the area of application of the PORN should be defined according to scientific criteria in order to guarantee the conservation of the natural resources and ecological processes on which the Nature Park depends, the consciousness of the perceived incompatibility between the environmental protection and the traditional uses, has led the decision makers of the Environmental Administration to reduce at a minimum the protected area in order to avoid conflicts as much as possible. This area has been limited to an arbitrary periphery of 500 meters, around the Nature Park.

This way, the perception of the existence of a conflictive situation, triggered in part by scientific advice, has led to a policy in which there is no guarantee of an adequate, scientific

management of the supposedly protected natural values. As in the malvasia case, no solution was achieved, except the separation (to the maximum possible degree) of the conflictive, supposedly incompatible goals. But it is important to note that this tendency to avoid conflicts goes in the detriment of sustainability and, in a sense, also in the detriment of true stakeholders benefits. And despite all these efforts to avoid conflicts, finally, in march 2010, also the PORN, immediately after its official publication, has been contested on the court by Riegos de Levante, with the support of the main local stakeholders. We may conclude that the common tendency of administration of avoiding conflicts is not only detrimental from the point of view of enciornmental management, but also form mere political considerations.

The malvasia conflictive story has had another detrimental effect in relation to the protection of El Hondo biodiversity. Given the troubles caused by the malvasia's Decree to the Environmental administration, no official management plan has been designed yet for the other endangered waterfowl species, the marbled duck (*Marmaronetta angustirostris*) despite the fact that a specific Life project was funded by the EU in order to design such conservation plan.

c) The role of integrated research in re-framing of conflicts

As said before, the WADI team has carried out an intensive collaborative work in the area, with the aim of obtaining an integrated picture of the socio-ecosystem. This collaborative work has had, among other influences, the positive result of making the local farmers conscious of the value of their activities not only as a cultural heritage, but also as a driver of potential developments. For example, the WADI study on traditional fishing knowledge activities has have been proposed by the Community of Irrigators of Carrizales and the Association of Private Owners of El Hondo to the Environmental Administration, such as traditional fishing exhibitions and in situ tasting of traditional fish cooking, as a part of a formal strategic program of eco-tourism and local development.

Also the WADI collaborative prospective work on ethnobotany and traditional agriculture has had also some local influence. Among others, several agricultural and ethnobotanical products were identified by local stakeholders as capable of promoting social benefits including the local high-quality variety of melon, local traditional pomegranates, some vine varieties for the production of white wine, several textile plants grown in relation to irrigation infrastructures and used for handicrafts (mainly *Imperata cylindrica* and hemp, *Cannabis sativa*) and a series of uncommon vegetables, including spontaneous plants traditionally eaten in the area (*Sonchus tenerrimus*, *Cichoria intybus*, *Beta vulgaris*). A formal request to the University of Alicante was made for the study of the plant biodiversity resources present in the area in order to analyze their potential for prormoting sustainable development.

More importantly, through the organization of a series of meetings, workshops, etc., the WADI project led some farmers, and specially the younger ones, to think that, perhaps, the 'Environment' and the well-being of local farmers and the maintenance of traditional activities of local population were not completely incompatible. Or even more, that the integration of these two aspects could offer them a better future scenario.

As a result of the WADI meeting of November 15th 2008, when experiences from another WADI site (Parco de la Maremma, Italy) and from other Spanish protected areas were very adequately shown to El Hondo stakeholders, and taking advantage of the findings of the collaborative WADI work on local ethnobotanical and agricultural values, the Community of Irrigators of Carrizales has devised a strategic plan for promoting these agro-ecological potential enterprises. Although the initiative is yet embrionary, it has been officially supported by the environmental and agricultural administration. It is important to note that the name selected by the farmers for this initiative: "Agrarian Nature Park of Carrizales" (which has obtained support also from the environmental and land planning administration) aim to integrate both natural and agricultural values. Even some representatives of the Green groups have been incorporated to the managing board of this Agrarian Nature Park with the aim of promoting Green initiatives.

Castillo et al. (2005), in their case-study of rural communities in Mexico, have showed the relevance of rural communities demanding scientific information for ecosystem management and of academic institutions accepting to respond to these demands in order to envisage a more promisory future scenario for biodiversity conservation. However, these authors recognize that both the administration and the academy institutions don't favour these kind of collaborative work. Our case-studies has also shown that the current science, as promoted by the scientific institutions, despite its quality in academic terms, hardly provide the kind of integrative knowledge necessary for promoting a creative, cooperative way of managing the real environmental conflicts and preserving our biodiversity heritage. A collaborative, truly integrative scientific advice, taking into account the complexity of the socio-ecological systems in which the battle of biodiversity conservation is really played, is not only possible, but necessary.

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