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Context in Landscape Planning: Improving Conservation Outcomes by Identifying Social Values for a Flagship Species

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Abstract: Sustainable conservation planning depends on understanding local context including the way social values impact a landscape. Flamingos are used here as a flagship species to focus the social values of a broad range of people living in and working in the Camargue in France. A survey questionnaire ($n = 87$) was used to identify the range of ways in which people value the landscape and their perception of effectiveness of flamingo management strategies. Survey analysis was conducted through a multi-method approach, triangulating standard descriptive statistics, qualitative data analysis, and multivariate analysis applying numerical taxonomy. Applying numerical taxonomy allowed us to identify and define six social assemblages. Each assemblage had geographical characteristics with distinct values and perceptions in relation to management. The primary residence and geographic identity of the participants was defining, showing clear value differences from participants living in different parts of the delta. The participants most frequently agreed that flamingos contributed to the aesthetic, economic, biodiversity, and recreational values of the landscape. We show how identifying points of consensus and points in contest is necessary for navigating differences in values for conservation planning. This research shows the importance of the local social context in sustainably managing landscape change.

Keywords: Camargue; flagship species; global changes; landscape management; socio cultural values

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1. Introduction

Landscape values are a manifestation both of human use and human value which are often linked to ecosystem services [1]. It is people who make decisions about how landscapes are used, justifying the consideration of human agency in conservation planning. Landscapes are valued in a diversity of ways [2]. Recognizing the range of values invested in a landscape provides insights into the socio-landscape connections driving management [3,4]. Sound conservation planning depends on acknowledging the contributions of economic values as well as socio-cultural values. The “non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences” [5] are too often neglected in decision-making. To make these values explicit in conservation planning, this research applied a tested typology of landscape values (socio-cultural, economic and ecological) coupled with perceptions of management objectives across a social catchment of voices. Management of the flagship species, Greater Flamingo (*Phoenicopterus roseus*), in the Camargue (France) served as a case study.

Flagship species have become a symbol and defining element for conservation initiatives. They have been instrumental in conservation policy initiatives [6]. Because flagship species are charismatic, they are often key features of the valuation of natural and managed landscapes [7]. They are also used to arouse public interest and promote broader ecological and economic values of conservation [8]. Locally appropriate flagship species play a key role in encouraging a wider level of support and commitment from local communities for managing their landscapes [9,10]. There is a need to include a range of intellectual perspectives in conservation planning that include the “identification of cultural values and beliefs . . . and the identification of the complicated networks of intra- and intergroup and interspecies relationships” [11]. Assessing the values people attributed to flagship species contributes to the public acceptance of conservation projects and management of the habitat used by these species [12].

Landscapes comprise dynamic and interactive processes across incommensurate socio-cultural, political and ecological scales. This research located a flagship species within the context of a socio-cultural landscape, within a range of knowledge systems (i.e., local, scientific, indigenous). The research provides insight into the social values inherent to the concept of conservation beyond a particular species, to provide a substantiation of explicit value frames and thus socially contextualized direction for conservation planning. Landscapes are undergoing rapid and fundamental transformations across the world resulting in the gradual replacement of traditional landscape practices [13]. These changes cause both social and ecological tensions [14]. As global conditions change, there are modifications in landscape structure impacting the dynamic between flagship species and socio-cultural values [3,15].

In a review of conservation successes, Hoffmann et al. [16] indicate that the overall pattern of decline in biodiversity conceals the impact of conservation successes but that “current conservation efforts remain insufficient to offset the main drivers of biodiversity loss”. In particular, the impact of human behavior and practice was mentioned to be of key importance, including agricultural expansion, logging, overexploitation, and invasive alien species.

Conservation plans are generally implemented with only limited attention to social values of landscapes [17]. A reorientation of focus that considers causes which are inherently about people and the way they act in an environment necessarily accounts for the importance of involvement from each causally related sector [18]. This approach requires the inclusion of social values in addition to the ecological values traditionally defined by conservation science [17]. The limitations of definition and representation, particularly of the social values that underpin much of decision-making in environmental situations requires approaches that integrate the social and ecological elements of landscapes. For instance, a recent analysis showed strong support for the reintroduction of guanacos (*Lama guanicoe*) into the Chilean silvo-pastoral system in terms of aesthetic and intrinsic values but less support for their reintroduction in terms of utilitarian values [10]. Exploring how flagship species are valued by people in the landscape they inhabit may help to anticipate and adapt conservation plans and legitimize actions.

Here we define landscape values as the perceived material and symbolic qualities associated with a place [19]. We examined the landscape values differentiated by socio-cultural, symbolic, and economic values evident in the areas used by flamingos in the Camargue to better understand the relationship between this flagship species and the socio-ecological landscape. The results of our survey serve as a practical guide for conservation managers to better incorporate the values of the local population in landscape management and to legitimize actions within a given socio-cultural context.

2. Materials and Methods

This research provides explicit definition and operationalization of social science concepts that are important in application for conservation planning. Drawing on trans-disciplinary knowledges allows a better integration of the social and ecological domains that is more likely to result in the normalization (mainstreaming) of conservation as a

cultural practice in an eco-cultural landscape [4]. This methodology spans the disciplinary divide between the social and biophysical sciences, as well as integrating interests in practice, context, and governance scale.

2.1. Study Area and Species

The Camargue is one of the largest wetlands in the Mediterranean basin and is internationally recognized as an important area for waterbird staging, wintering and breeding [20,21]. The Camargue has undergone important land-use changes over recent decades, impacting the habitats and species living and frequenting the area [22].

This study focused on the area of the delta that is managed by the Natural Regional Park of the Camargue (PNRC) (100,000 ha), encompassing three communes: Arles, Saintes-Maries-de-la-Mer, and Port-Saint-Louis-du-Rhône. The hamlets within the PNRC include: Salin-de-Giraud, Le Sambuc, Gimeaux, Mas Thibert, Arles, Albaron, and Gageron (Figure 1). Despite differences in environmental and socio-cultural heritage characteristics [23–25], the three communes are integral to a collective expression of the Camargue.

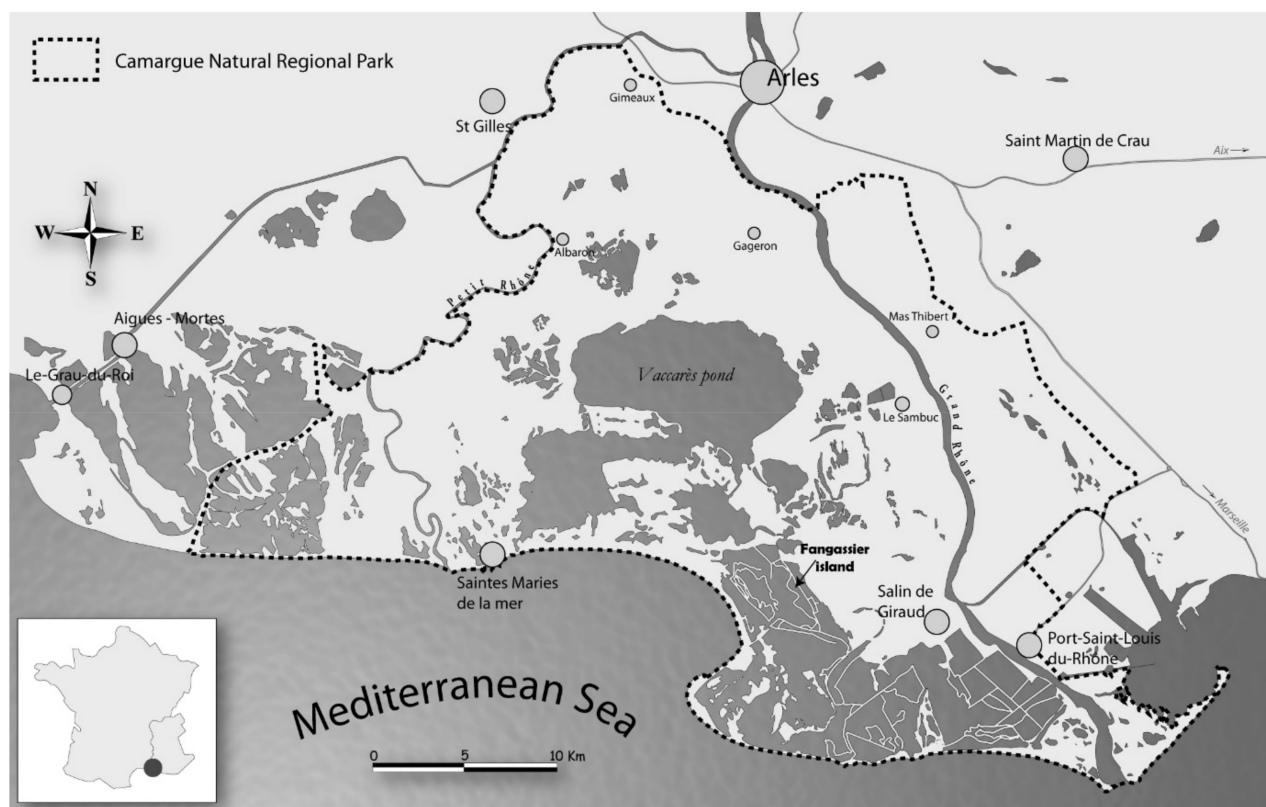


Figure 1. Localisation of the Camargue Natural Regional Park, workshop locations and flamingo breeding sites.

The traditional socio-economic activities include salt production, rice farming, extensive grazing (bovine and equine), hunting and tourism [23]. Research and natural resource management are important economic activities. There is one productive saltpan in the PNRC (Salin-de-Giraud). The saltpans are privately owned and managed by the salt company “SALINS”, which also owns a saltpan in Salin-de Giraud (within the PNRC) and another in Aigues-Mortes (outside of the PNRC, but within the limits of the UNESCO Biosphere Reserve of the Camargue).

The Greater Flamingo (referred to here as “flamingo”) is not a globally threatened species. However, it is considered vulnerable due to its dependence on a limited number of wetlands for reproduction [26]. Hence, the species is internationally protected by Annex 1 of the Wild Birds Directive of the European Union (designating protected areas for threatened and migratory birds) and Appendix II of the Bern Convention (strictly protected

species). In the 1960's, concerns were raised about a decrease in flamingo breeding in the Mediterranean basin with a risk of extinction of the west Mediterranean population. As a result, the Tour du Valat Mediterranean Wetlands Research Institute in partnership with the salt company SALINS built an artificial breeding island in the Fangassier Lagoon, one of the salt pans of Salin-de-Giraud (Figure 1). The operation was a success, establishing and maintaining a productive flamingo population for the following four decades not only for the Camargue, but also across the Mediterranean basin. The population in the Camargue grew and the flamingo is now a common species in residence year round with an average of 13,000 pairs of flamingos breeding annually in Fangassier Lagoon in the Camargue which is one of the most important breeding sites in the west of the Mediterranean [26].

Over the past 20 years, flamingos have begun foraging in rice fields sometimes causing significant damage resulting in economic losses for rice farmers [27–30]. Over the past 8 years a series of changes have impacted the breeding colony in association with the reduction of salt production and the change in ownership of approximately 5400 ha of the salt pans including the Fangassier Lagoon [31–33]. These changes in ownership have given way to the largest ecological coastal restoration project in the Mediterranean Basin and have had direct impacts on the use and visitation to the area (PNRC unpublished data) with associated controversy and protest due to changes made in accessibility and water management. The wetland renaturalization has caused greater fluctuations in annual and seasonal water levels. In addition, changes in agricultural policies have resulted in significant modifications in water management in the Camargue including a reduction of 25% of the rice surface area [34]. The renaturalization of the ex-salt pans around Salin-de-Giraud and the creation of a new artificial breeding island in Aigues-Mortes have resulted in less ideal breeding grounds in Salin-de-Giraud and more attractive breeding grounds in Aigues-Mortes.

2.2. Survey Sample

Research direction in conservation biology is driven both by distinct paradigms in addition to political and event proximity timeframes. The interactive dynamics between knowledge systems, community and social values is important. The diversity of land-uses and decision-making interests in the three communes (Arles, Saintes-Maries-de-la-Mer, and Port-Saint-Louis-du-Rhône) required a comprehensive sampling to capture the breadth of environmental and socio-cultural heritage characteristics [23–25]. The notion of a social catchment provides the framing for sampling [35]. The methodology behind the strategy is not based on a statistical representation of the population, but rather a continuum-community landscape context [36,37]. Thus, the integration of social scales and ecological scales includes a range of communities (i.e., place, identity and interest, and that of politics) and socio-political scales. Including the 'usual suspects' as the captured community, and those less often included in formal decision-making processes, as the critical community, ensured a comprehensive sampling of direct and indirect voices in decision-making as a social catchment.

We ensured an adequate sample population by sampling the three communes of the PNRC. Three survey approaches were combined: (1) participatory workshops opened to the general public (walk in participation) were hosted by the PNRC in two hamlets: Salin-de-Giraud and Mas Thibert ($n = 19$); (2) internet surveys were made available through the Tour du Valat and the PNRC websites. They provided the opportunity for a 'volunteer public' to participate in the study outside the immediate influence of other respondents present in a workshop setting [38] ($n = 42$); and (3) face-to-face survey delivery covered gaps in representation of socio-professional groups (rice farmers, hunters, herders, tourist industry, site managers, scientist and local authorities) or from specific geographic locations to maximize the representation across the interests and region ($n = 26$). Overall, a total of 87 people responded to the questionnaire using one of the three approaches (Table 1).

Table 1. Socio-demographic information from the participants in the study.

Variable	Total N	Total %
Gender		
Male	41	53%
Female	46	47%
Age		
<18	1	1%
18–24	4	5%
25–39	23	26%
40–64	52	60%
65–79	6	7%
≥80	1	1%
Primary residence		
Salin-de-Giraud	11	12%
Le Sambuc	5	6%
Gimeaux	5	6%
Albaron	3	3%
Mas Thibert	3	3%
Arles	25	29%
Towns around Arles	6	7%
Other towns in southern France	19	22%
Other towns in France	8	9%
Other countries	3	3%
Activity in Camargue		
Rice farming	5	6%
Cattle raising	2	2%
Other Agriculture	2	2%
Salt working	3	3%
Hunting	2	2%
Fishing	6	7%
Tourism	16	18%
Environmental management	19	22%
Research	24	28%

Like other valuation approaches, the setting and methodologies can influence outcomes [39]. This study opted to use the different approaches for questionnaire delivery to increase the geographic and socio-professional representation. This combination of survey delivery allowed us to increase our representation and thus identify voices that may not have been represented if only one method had been used. In addition, potential bias in participant selection due to access to internet or processes of information diffusion [40] was avoided.

2.3. Survey Questionnaire Design

A survey questionnaire, which can be found in Supplementary Materials, was developed to capture the landscape values and the level of agreement with management strategies in the Camargue. The survey questionnaire contained 20 questions with 69 different variables (Annex 1). The first section of the questionnaire retrieved socio-demographic information through nine structured questions (gender, age, employment position, professional sector, geographic identity) providing descriptors for the sampled population [41]. The second section (4 structured questions) sought to determine the level of knowledge concerning flamingos and their breeding behavior (“Where do flamingos breed in France?” and “How long can a flamingo live in the wild?”). This section was included to determine correspondence between level of knowledge and values attributed to flamingos. Seven structured and semi-structured questions in the third section established perceptions and the way in which landscapes were valued to establish links between the flamingos in Camargue and the management of the delta.

Landscape values reflect both of human use and human value. The typology of landscape values selected for the survey were developed and tested by Brown and colleagues [42] and form a non-reducible typology. The landscape values framework developed by Brown and Reed [43] was tested in the Camargue [44] and a subset of 5 values was selected for relevance to flamingos in the Camargue. We added two additional values pertinent to flamingo management in the Camargue: wilderness and economic loss. The wilderness value was included to attempt to capture the links between management intensity and the presence of flamingos. The economic loss value allowed for the analysis of the perceived risk due to damage caused by flamingos in rice fields [27]. A 5-point Likert scale (strongly disagree, disagree, don't know, agree and strongly agree) [45] was used to rate the importance of the landscape values (wilderness, recreation, aesthetics, biodiversity, economic gains and economic risks) attributed to the areas frequented by flamingos in Camargue. The same 5 point Likert scale was used to rate the level of agreement of current management strategies related to environmental, economic and social pillars of sustainability [46]. An open-ended question at the end of the questionnaire aimed to identify the perceived threats to flamingos in the Camargue by asking "What are the main threats facing the flamingos in Camargue today?".

2.4. Data Analysis

Survey analysis was conducted through a multi-method approach, triangulating standard descriptive statistics and numerical taxonomy (PATN). Standard descriptive statistics were used to identify the participants' level of agreement with statements on landscape values and management practices in the Camargue.

We applied numerical taxonomy, including multidimensional scaling, to identify the broad framing of relationships between geographic identity, socio-professional groups, landscape values, and management agreement. We used PATN software [47] which provides reliable test of data structure to describe and depict patterns showing clusters, reliability of the clustering information, variables that are important in forming the clusters, and networks of values in the patterns [4]. We used matrix dissimilarities between the responses to the value questionnaire to identify clusters of people with similar values based on the Gower distance. This allows the presence of a mixture of all variable types and tolerates missing values [48,49]. Clustering that had a stress level less than 0.2 were discarded. The socio-demographic variables were used as extrinsic variables to describe the identified value clusters. A total of 46 variables out of 69 questionnaire variables were used in this analysis. Given the important weight of "scientists" and "managers" in the survey responses, we compared the results of each survey question with and without these socio-professional groups.

3. Results

3.1. Flagship Species Values

The participants most frequently agreed (agreed or completely agreed) that flamingos contributed to the aesthetic (96%), economic (85%), biodiversity (77%), and recreational (68%) values of the landscape (Figure 2). Wilderness (21%) and economic loss (39%) were the least cited landscape values. A percentage of the participants did not know ("I don't know") how to interpret economic loss (14%) and biodiversity (13%) values. When assessing the general population (controlling for the knowledge of "scientists" and "managers"), the most important differences from the "scientists" and "managers" were in the lower levels of agreement for aesthetic (63%), economic (78%), and biodiversity (63%) values.

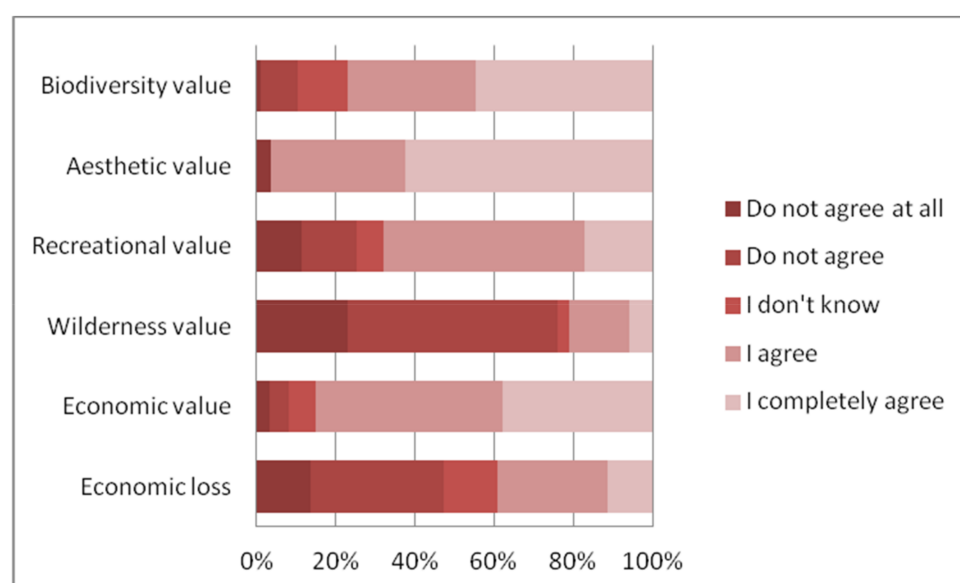


Figure 2. Landscape values attributed to Greater flamingos in the Camargue.

3.2. Social Assemblages Characterizing the Participants

The numerical taxonomy used in this study differentiated six social assemblages that were described through socio-demographic data and management perceptions (stress 0.1884 in 2 dimensions; Annex 2). Each assemblage showed geographical characteristics with distinct values and perceptions for management. The primary residence and geographic identity of the participants was very important, with clear differentiation in values for participants living in the south, north or outside of the delta.

The “outsider’s perspective” (23% of total survey responses) consisted primarily of participants living outside of the Camargue (in villages within 30 km surrounding the Camargue (35%) or in other cities in France (25%). These participants agreed with the current management strategies for biodiversity and with the idea that flamingos provided important economic value to the Camargue.

The participants with a “northern Camargue perspective” (17% of total survey responses) lived primarily in the north of the delta (47%) or in surrounding areas (46%). They saw the Camargue as a place to “escape” and they agreed with the current management strategies for biodiversity and agricultural production. Most of the participants from this social assemblage completed the questionnaire through face-to-face delivery and were involved in tourism, land management and research. This group felt that it was important to have flamingos breeding annually in the Camargue.

The participants with a “perspective from northern Camargue and Arles with business interests in Camargue” (6% of the total survey responses) highlighted the economic risks linked to flamingos and did not value flamingos for their contribution to the wilderness in the landscape. This group did not agree with the current management strategies for biodiversity or birds. They believed that it was important to maintain the flamingo population somewhere in Camargue, but that it was not necessary that they reproduce at Salin-de-Giraud.

The participants with a “perspective from southern Camargue” (20% of the total survey responses) was made up of different socio-professional groups and had high levels of knowledge about flamingos. They did not agree that flamingos cause economic loss. This group did not believe that it was necessary to have flamingos breeding in the Camargue every year.

The “Arlesians interested in landscape management” (22% of the total survey responses) showed high levels of agreement for aesthetic and economic values of the Camargue and less with the recreational value. The group consisted primarily of “managers” but no “scientists”. This value assemblage showed agreement with the current management

strategies for biodiversity and expressed a perception that flamingos should breed in the Camargue every year or two.

The “Arlesians employed in environmental research and management” (13% of the total survey responses) had high levels of knowledge about flamingos. This group felt that it was important to maintain a breeding island in Salin-de-Giraud, but the flamingos did not need to breed there every year. This social assemblage agreed that the current management strategies were favorable for biodiversity and economic activities.

It is important to note that a group of respondents (“A perspective from Arles and surrounding areas working in environmental management and research”) only responded to the questionnaire through the internet and another group (“A perspective from southern Camargue”) did not respond through face-to-face deliveries. Approximately 50% of the surveyed population was involved either in environmental research or management.

4. Discussion

Social values are inherent to decision-making at all socio-geographic scales. Accommodating the social norms of a local context is critical for sustainable biodiversity management. Thus, the integration of social values is essential if we are to build an integrated and participative conservation approach. Despite improved security for flamingos in the Camargue, this research demonstrates the need to account for local social context in a time of accelerating global change.

Using flamingos as a flagship species, we analyzed landscape values and perceptions of the management in the Camargue in a time of global change. The majority of the participants demonstrated a sound knowledge of the ecological needs of flamingos in France and could specify the name of the breeding lagoon (the Fangassier Lagoon in the salt pans of Salin-de-Giraud). This reflects the importance and social valuing of the flamingo in Camargue. Media attention given to flamingo breeding both locally and nationally has made a contribution to this awareness [12]. Evidence of local ecological knowledge could contribute to the high biodiversity value attributed to the areas where flamingos are present [50].

In our research, the participants agreed that flamingos contribute to the aesthetic value of the Camargue. This aesthetic value could be linked to the biodiversity value as shown in previous research by Gobster et al. [51]. The economic value related to flamingos was also highly rated by the participants. Economic value has been studied extensively among other flagship species (examples include the work of Di Minin et al. and Ruiz-Frau et al.) [52,53] and is often used as an argument for conservation advocacy. Although flagship species are valued economically, they may also be associated with economic risks resulting in conflicts in landscape management [54]. The landscape value that was the least recognized in our research was wilderness. This is interesting as much of the eco-tourism (and thus economic landscape value) makes reference to the “Wild Camargue” (www.camarguesauvage.com, www.camargue.fr, accessed on 15 April 2018) despite the human management dominating the Camargue over the past century [23,24,55]. The landscape values (aesthetic, economic, biodiversity and recreational) are positively associated and could contribute to build a consensus regarding the maintenance of the flamingo population in the Camargue and the breeding island in Salin-de-Giraud. Recognizing these values attributed to a flagship species could illicit greater public support for management decisions and increase the likelihood of successful management outcomes [2].

Scientists and conservation land managers contribute to governance and have a strong influence on management decisions. Given the importance of these roles, it is necessary to understand divergences in value judgments and management visions between these actors and the local population. Our results showed both similarities in knowledge about flamingos and landscape value judgments. There were some differences related to landscape values, with “scientists” and “managers” placing higher importance on the aesthetic, economic and biodiversity landscape values. Despite these differences in values, the general public and the “scientists” and “managers” shared similar views on

the management options for flamingo breeding in the Camargue. This general agreement could be used to enforce the legitimacy of conservation land managers to implement conservation actions that will be more likely to be accepted locally [39], preparing the way for more effective implementation of conservation strategies that are couched within a broader socio-cultural framing [55,56].

Public support for management strategies of the Camargue landscape was demonstrated through the overall agreement (>50%) for the current management strategies for biodiversity, flamingo breeding and tourism, yet there were lower levels of agreement (<50%) for the management of the economic activities, especially for the agricultural activities. These differences could indicate contest between how the landscapes are valued for production and economic purposes. It is essential that the management bodies take into account the fact that lower levels of agreement concerning economic activities may impact the local population's acceptance of conservation strategies [57]. Given the principal economic activities in the Camargue (agriculture, hunting, tourism and scientific research), it is important to consider the impact of the various management options on these sectors. Some potential management activities could involve the support and development of eco-tourism activities or the labeling of local products with a "nature friendly" PNRC logo. The added economic value gained from nature conservation could prove complementary to mainstream monetary incentives [58].

The differences between the values of social assemblages identified through the numerical taxonomy correlates with research in the Camargue [59,60] and elsewhere [61], showing the importance of the local context in managing landscape change. The socio-professional descriptors of the participants demonstrated the differences in landscape perspective between social assemblages, distinguishing scientists and conservation land managers from other socio-professional groups [62]. This could indicate that values underpinning the vision show a divergence of economic values, highlighting potential conflicts of interest. Navigating these differences in values plays an important role in averting or solving conflicts and ensuring sustainable management. Different people may hold the same values, yet these values may be translated into different management strategies [2].

The focus on flamingos as a flagship species was a useful tool for generating interest and engagement with the local population. However, Cisneros-Montemayor and Vincent [63] caution that an emphasis on flagship species as drivers for management action can undervalue other pressing issues and may prove problematic for conservation efforts on the whole. The Camargue is a UNESCO biosphere reserve holding unique landscape values not only for the local population, but for humanity. As a next step, it would be useful to expand the geographic scope of this study outside of the perimeter of the PNRC to include the entire UNESCO biosphere reserve and eventually include a larger scale of participants to capture a broader global perspective.

5. Conclusions

Inadequate attention to the social context in conservation planning may result in a low probability of success (as in Hoffmann et al. [16]). Our research demonstrates the interactive dynamics between knowledge, community and social value-systems in conservation. These dynamics are critical social components in conservation planning. There has been a shift in emphasis from the rigid policies and practices of land-management agencies towards public and private inter-agency cooperation. The integration of local, regional, national, and international levels based on cooperation and communication improves cooperation and legitimizes conservation actions. Thus, land management must account for biological and ecological requirements for conservation, as well as integrate a broader framing that draws on socio-cultural variables. The consideration of landscape values linked to a flagship species has a greater potential to result in conservation strategies that are both ecologically and socially acceptable.

The analysis of landscape values shows that there are a range of frames to which people designate landscape values. The diversity of these values includes cultural, economic and

symbolic landscapes in which conservation has an integral future. This research reflects the values of a science-engaged agenda that acknowledges the social and cultural context of flagship species in landscapes. Conservation managers can use this information to more effectively communicate conservation actions to the public within a values framework that is most appropriate for each human and flagship population.

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Data Availability Statement: The data presented in this study are available on request from the corresponding author due to privacy restrictions.

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