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Participatory mapping: Exploring landscape values associated with an iconic species

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ABSTRACT

Participatory mapping provides a way to collate a wide range of landscape values providing a visual representation to inform conservation planning. We tested the use of an iconic species, the Greater Flamingo, as a lens for participatory mapping to render explicit the socio-cultural values attributed in a landscape. Spatial information on six landscape values in a biodiversity hotspot, the Camargue Biosphere Reserve (southern France) was collected from 113 participants through surveys, interviews and workshops. This data was geolocated through a SoftGIS methodology to map and quantify the overlap of bivariate hotspots identifying value concurrence. The most frequent values recorded through total number of polygons and surface areas were wilderness and recreation. The least frequently mapped values were economic loss and biodiversity. There was frequent concurrence between biodiversity and aesthetic values especially in wetlands (lagoons, salt flats and sea). There was also frequent concurrence between biodiversity and recreational values with more overlap in sites with easy access (along roads and public areas). Our results show that using an iconic species is an effective way to render explicit spatial variations in the values attributed to a landscape and to identify concurrence of values, thus enabling integration of multiple landscape values in conservation planning.

1. Introduction

Human wildlife conflicts are increasing and new pathways are needed to mitigate them in order to conciliate biodiversity conservation with human livelihoods and human well-being (Redpath et al., 2013). Increased public participation in planning and management that integrates socio-cultural values could effectively overcome this challenge (Cole, McCool, & others, 1997; Ernoul & Wardell-Johnson, 2013). Engaging civil society through participatory surveys on landscape values (Brown & Weber, 2011a; Wardell-Johnson, 2006) provides a promising avenue to integrate social and ecological values for conflict mitigation.

Visualization techniques such as mapping are useful tools for environmental management. They can be used to prioritize investments and foster strategic planning (Pettit, Raymond, Bryan, & Lewis, 2011). The same landscape can be valued for multiple reasons, creating overlaps or hotspots of values (Stephenson, 2008). Participatory GIS provides a unique approach for engaging civil society in decision-making by integrating local knowledge with complex spatial information (Lasimbang, 2011; Sieber, 2006). SoftGIS approaches gather and analyze local experiential knowledge integrating GIS with quantitative techniques (Rantanen & Kahila, 2009). This process generates information from individuals and populations about the way they value their own living environment, providing local communities (and local knowledge sources) with an active voice in planning and management (Kahila-Tani, Broberg, Kyttä, & Tyger, 2015). This participatory mapping of landscape values has drawn on approaches developed by Brown et al. (Brown & Raymond, 2007; Brown & Weber, 2011b; Brown, 2004) in which 14 landscape values were identified and tested: aesthetic, biodiversity, cultural, learning, therapeutic, spiritual, future, economic, historic, recreation, life sustaining, subsistence, intrinsic and wilderness values. This valuation scheme retrieves positive (i.e. benefits obtained from landscapes) and negative values (i.e. degrading processes or threats) (Raymond et al., 2009).

Species, landscapes, and ecosystems are valued differently by

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individuals and across human populations. Landscapes are important for socio-cultural and ecological values (Martínez Pastur, Peri, Lencinas, García-Llorente, & Martín-López, 2016; Van Riper & Kyle, 2014) and understanding the overlap of these values can help conservation professionals to design strategies to address potential value-conflicts (Bryan, Raymond, Crossman, & King, 2011; Moore, Brown, Kobryn, & Strickland-Munro, 2017). Iconic species are widely used as symbols to stimulate conservation awareness and action (Simberloff, 1997). Marketing and communication experts have used these values to advance conservation objectives (Douglas & Veríssimo, 2013).

Although there has been an increasing amount of work on landscape value analysis (see Moore et al., 2017; Ramirez-Gomez, Brown, Verweij, & Boot, 2016; Zolkafli, Liu, & Brown, 2017), mapping has not previously focused on an iconic species to identify concurrence of social and ecological landscape values in relation to conservation management. Given that conservation planning and management should account for the values expressed by the local human populations (Brown & Weber, 2012) within a landscape context (Ernoul & Wardell-Johnson, 2014), we tested the use of participatory values mapping using flamingos as a proxy to reveal spatial variations in landscape valuation. The Greater Flamingo (*Phoenicopterus roseus,* hereafter flamingo) is an iconic species for the Camargue (Rhône Delta) in southern France (Johnson & Cézilly, 2007). Flamingos have thrived in the Camargue landscapes for over six centuries but concerns raised in the 1960s resulted in a conservation program to support breeding in the Camargue. The program was a success and increased the flamingo population across the Mediterranean basin (Johnson & Cézilly, 2007); however, global changes and conflicts with other land-uses have the potential to compromise this success (Béchet et al., 2012). This research aimed to identify value hotspots linked to flamingos in the Camargue to support effective conservation planning and landscape management. The results demonstrate the value of focusing on an iconic species as a lens for participatory mapping in conservation planning.

2. Methodology

2.1. Study area and species

The Camargue is a Biosphere Reserve (UNESCO) recognized for its human and ecological landscape values. It is also one of the largest wetlands in the Mediterranean basin and recognized as important in the staging, wintering and breeding of water birds (Ramsar, 1986, p. 4). The delta forms a triangle of 150 000 ha encompassing three distinct management zones: Grande Camargue, Petite Camargue and the Plan du Bourg (Fig. 1).

The greater flamingo's range spans Africa, the Middle East and Southern Europe. It is in Annex 1 of the Wild Birds Directive of the European Union (European Union, 2009) and in Appendix II of the Bern Convention (strictly protected speies) (Council of Europe, 1979).

The species is not globally threatened, but it is considered of conservation concern given its dependence on a limited number of wetlands (Johnson & Cézilly, 2007). An artificial breeding island was constructed in the salt pans of Salin-de-Giraud in 1970 in response to concerns about a declining flamingo population in the Mediterranean basin. The island created ideal breeding conditions in the Camargue, increasing the breeding population to an average of 13 000 pairs per year (Béchet & Johnson, 2008; Béchet, Arnaud, Germain, & Johnson, 2009; Bechet et al., 2012). Despite abundant natural habitat, flamingos have evolved their behavior in response to improved foraging conditions in agricultural fields. This has resulted in significant economic loss for rice producers, causing local conflicts between environmental and economic priorities (Ernoul, Mesléard, & Béchet, 2012; Ernoul, Mesléard, Gaubert, & Béchet, 2013; Tourenq et al., 2001).

A series of global changes have impacted the breeding colony over the last decade including the reduction of salt production (Béchet et al., 2012), changes in ownership of parts of the salt pans (Ernoul & Wardell-Johnson, 2016) and agricultural intensification (Pernollet, Cavallo, Simpson, Gauthier-Clerc, & Guillemain, 2017) exacerbating human-flamingo conflicts. These changes have caused greater variation in annual and seasonal water levels, reducing flamingo breeding conditions some years. In 2014, water levels around the flamingo island were so low that terrestrial predators (i.e. fox) were able to reach the colony causing flamingos to abandon their breeding site in Salin-de-Giraud and relocate to Aigues-Mortes (Fig. 1). In 2015, new hydraulic infrastructure and heavy winter rains restored the conditions and the flamingo colony returned to breed successfully in the salt pans of Salin-de-Giraud. The vulnerability of this iconic species to a range of human-induced conditions demonstrates the need to understand the potential conflicts in land-use and landscape value for conservation planning to be effective.

2.2. Sample

Although only 25 participants are necessary for polygon analysis in participatory mapping (Brown & Pullar, 2011), we increased our sample size to include a larger representation of stakeholder groups and geographic zones. An effort was made to ensure participation of land-users and socio-professional groups (rice farmers, hunters, herders, tourism industry, site managers, scientists and local government authorities) with interest in the three zones of the Camargue (Greater Camargue, Lesser Camargue and the Plan du Bourg). We applied three approaches for collecting spatial information: participatory workshops (with open participation and meetings publicized in local newspapers), internet surveys (distributed by the Natural Regional Park of the Camargue (PNRC) and the Tour du Valat Mediterranean Wetlands Research Institute (TdV)) and face-to-face delivery by the researchers. The first two approaches are considered volunteer geographic information (Brown, Weber, & de Bie, 2014a) as compared to the face-to-face delivery which sampled participants strategically to ensure a population cross-section based on interests, socio-professional occupation or geographic location (Wardell-Johnson, 2011, pp. 15–29). The participants in workshops and face-to-face delivery used a facilitated mapping approach while the internet participants used a self-administered approach. Participatory workshops were organized by the PNRC in three villages: Salin-de-Giraud, Mas Thibert and Grau-du-Roi (Fig. 1). There were between 8 and 15 participants in each workshop (total of 28 participants). The workshops began with an introduction to flamingo conservation in the Camargue by a local expert (AB), then each participant completed a facilitated questionnaire and values-mapping.

Internet surveys provided the opportunity for a 'volunteer public' to participate in the study outside the immediate influence of other respondents present in a group work setting (Brown, Kelly, & Whitall, 2014b). Information was made available through the TdV and the PNRC. A total of 52 individuals participated in the internet survey. To ensure the representation of all of the identified interests, socio-professional groups and geographic sectors, we delivered the survey face-to-face for the categories that were under-represented (geographic and socio-professional). The individuals were selected through local social networks. Face-to-face delivery attracted 33 individual responses. In total, 113 individuals participated in the mapping with socio-demographic information collected for each participant.

2.3. Values mapping of the iconic species

We used a values mapping methodology developed by Brown and Reed (2009) and tested by members of the team both in Australia (Wardell-Johnson, 2006) and in the Camargue (Ernoul & Wardell-Johnson, 2014). A subset of the 14 values was selected for its relevance to flamingos and the potential to delineate these values on a map geographically within the landscape. Four values (Recreation, Aesthetic, Biodiversity and Economic) were selected for this study along with two additional values: wilderness, and economic risks which were