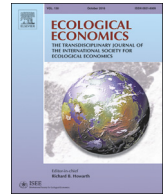




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Analysis

## Identifying Consensus on Coastal Lagoons Ecosystem Services and Conservation Priorities for an Effective Decision Making: A Q Approach

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## ABSTRACT

Coastal lagoons ecosystems, while representing benefits for the local populations, have been subjected to high anthropogenic pressures for decades. Hence, conservation measures of these ecosystems are urgently needed and should be combined with their sustainable uses. To address these issues, new research avenues for decision support systems have emphasized the role of the assessment of ecosystem services for establishing conservation priorities by avoiding monetarization approaches. These approaches, because they flatten the various values of nature by projecting them on the single monetary dimension, are often rejected by the stakeholders. We undertake a Q analysis to identify levels of consensus and divergence among stakeholders on the prioritization of ecosystem services provided by two French Mediterranean coastal lagoons areas. The results highlighted that there is a strong consensus among categories of stakeholders in the study sites about the paramount importance of regulation and maintenance services. Three groups of stakeholders, each sharing the same points of view regarding ecosystem services conservation, were identified for each study site. As a non-monetary valuation, Q methodology is very instrumental for the new pluralistic approach of decision support by capturing the values expressed by the stakeholders, without triggering a rejection reflex due to the monetarization.

### 1. Introduction

Natural areas in densely populated territories create a strong challenge for public policies. On one hand, conservation measures and management are needed to safeguard the ecosystems. On the other hand, it is important to consider the benefits that the local populations obtain from these ecosystems and to know their desires for ecosystem uses in the future in order to reconcile these with the conservation objectives. Therefore, the concept of ecosystem services (ESs) provides an operational analysis framework for thinking and assessing the relationships between human society and ecosystems. It facilitates the assessment of the values an ecosystem represents for humans. Traditionally, the cost-benefit approach has been considered as a central tool for decision-making for public action, involving the mobilization of economic methods to assign monetary values to environmental

impacts. This involves integrating the costs or benefits of conservation measures and ecological restoration (De Groot et al., 2013; De Wit et al., 2017) into the traditional investment decision-making or planning tools. Ecological restoration is an intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity and sustainability (Society for Ecological Restoration International Science and Policy Working Group, 2004), and thus includes actions for improving water quality in aquatic ecosystems. However, whether for good or bad reasons, monetarization is often met with skepticism, when it does not trigger rejection, particularly in the area of ecological economics. Recent work emphasizes the need for other approaches for decision support systems, which focus more strongly on the values that are legitimate for individuals (Jacobs et al., 2018; Keune et al., 2015; O'Neill and Spash, 2000). These new research avenues (Guerry et al., 2015; Madrian, 2014; Rey-Valette et al., 2017)

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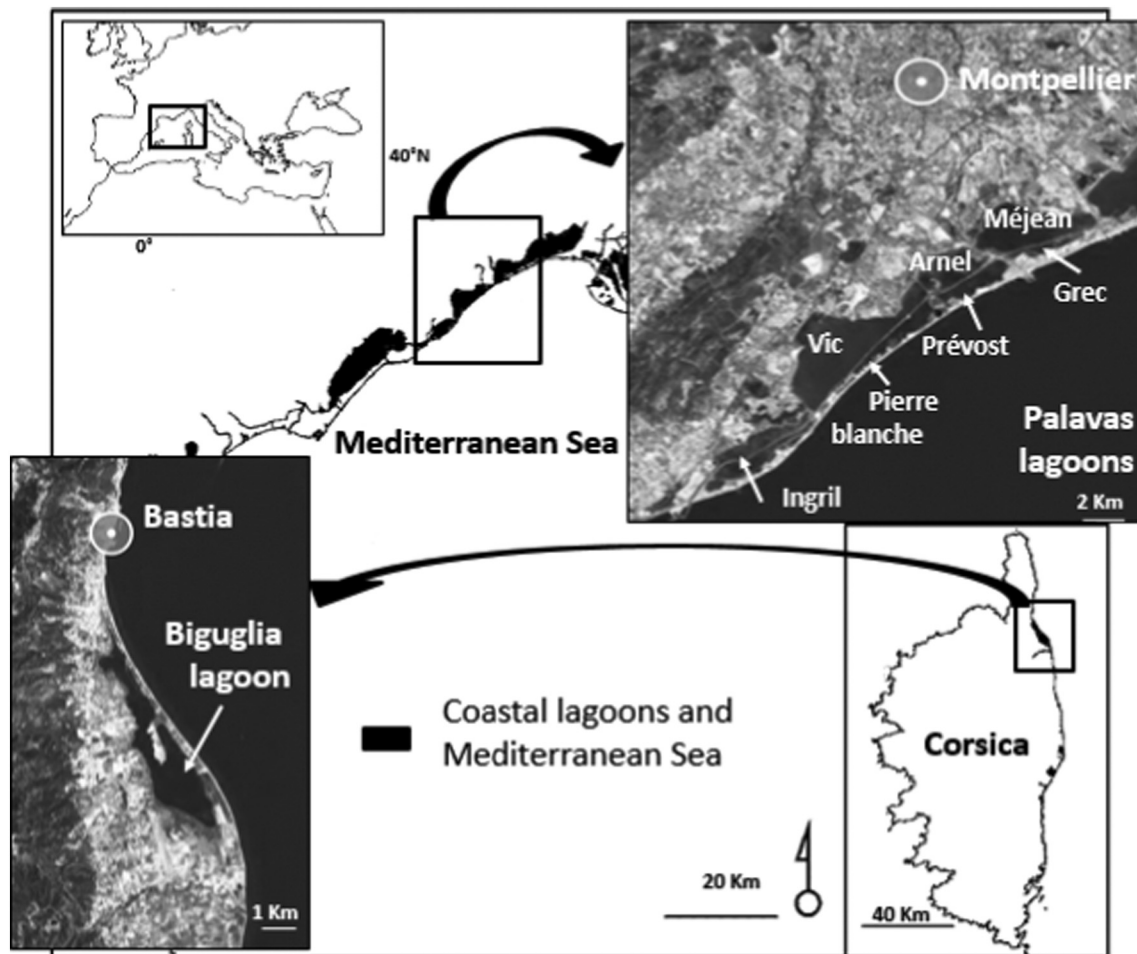


Fig. 1. Location of the Palavas and Biguglia lagoons in the Western Mediterranean Sea (satellite images obtained from IGN-Géoportail).

encourage the need for concerted approaches or the implementation of new types of information and awareness-raising incentives. Behavioral economics and environmental psychology provide concepts and tools that are very promising in this respect. To address these new challenges for the decision support systems of the management of ecosystems, the quality of the procedures implemented within the deliberative forums is very important for the legitimacy of such decisions. The evaluation of the quality of decision support systems depends on the tools used to gather individuals' points of view, expression of arguments, analysis of convergence and divergence, and transparency of the trade-offs criteria. Unfortunately, most publications do not provide sufficient detail about the ESs assessment procedures.

We used Q methodology which, so far, has been little used in the field of ESs assessment (e.g. [Armatas et al., 2017, 2014](#); [Bredin et al., 2015](#); [Buchel and Frantzeskaki, 2015](#); [Pike et al., 2015](#)). The advantage of the Q method is that, unlike approaches where deliberation is based on open discussions, the assessment is done individually. The collected data and the subsequent analysis allow then to identify possible consensus. Moreover, the variety of opinions is explicitly inventoried in the Q-method. Therefore, using Q method in decision making is more transparent than using methods based on open discussions. The Q method creates a kind of virtual forum where the protocol is strictly controlled in order to collect all the points of view. Thus, Q methodology allows investigating the diversity of discourses and facilitates public participation ([Zabala and Pascual, 2016](#)). In other words, it does give insights into the range of opinions that exist about some issues within a sample population, and how those opinions differ and converge ([Bredin et al., 2015](#)).

The Q method is a semi-qualitative approach created by a physicist-psychologist William Stephenson in 1935 ([Brown, 1980](#)). The method was primarily used in the field of psychology and has more recently been applied in many disciplines involving subjective science such as ecological and environmental economics. This method proposes a technique for small samples and thus broadens and statistically strengthens the potentials of the analysis. It is therefore a pertinent method in the study of public opinion and attitudes, groups, roles, decision making, values and other self-involving domains ([Brown, 1980](#)). It is indeed important for the decision-makers not only to be able to prioritize the perceptions and preferences of stakeholders regarding environmental preservation policies but also to be able to assess the degree of consensus and the structure of the agreements around these preferences and shared values. Facing an increasing development of participatory approaches, decision makers seek in fact quality and representativeness of results (consensus) stemming from these methods ([Dryzek and Tucker, 2008](#); [Faehnle and Tyrväinen, 2013](#); [Font et al., 2016](#)).

The aim of this paper is to describe the variety of views among stakeholders on ESs that are considered as important in the future and identify consensus among them on the prioritization of these ecosystem services. The Q methodology was used, because, as mentioned before, this method is particularly promising for this purpose. Our article is not intended as a methodological assessment of Q methodology. However, as it is still very little used in the environmental science community, we will describe its stages and its statistical specificities with some detail. This study focuses on French Mediterranean coastal lagoons areas and their fringing wetlands in two different densely populated areas, which

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