

Project “Assessing the resilience of the ecological functions of Mediterranean Wetlands”

Introduction

One of the key messages of the Millennium Ecosystem Assessment was that wetland ecosystems (lakes, rivers, marshes and coastal regions) are being lost and degraded faster than other ecosystems (Millennium Ecosystem Assessment 2005, Springate-Baginski et al. 2009). Consequently, the status of species associated with both coastal and freshwater areas is rapidly deteriorating (Springate-Baginski et al. 2009). At the European level, wetlands are considered as the most threatened ecosystems by human activities (European Commission 2007, MWO 2012). Several pressures related to land-use change, such as fragmentation, drainage or pollution, are currently menacing Europe’s wetlands (EEA 2008). This has resulted in 51% of wetland-related habitats being in an unfavourable-bad status, according to the conservation status assessments (European Commission 2015).

Although important legal instruments such as the EU Birds and Habitats Directives have contributed to designate wetland areas for protection, in most cases the quality and subsequent management of the designated areas is not known (EEA 2008). There is also a lack of information as for the state of the remaining unprotected valuable wetlands (EEA 2008). In the Mediterranean context, wetlands play an important role in the Mediterranean biodiversity hotspot, but they are being severely affected by anthropogenic pressure through rising human populations, increased irrigation for agriculture and arterialisation of water flows (MWO 2012). This translates to a loss of biodiversity, not only understood as a loss of species, but also as the loss of ecosystem functioning (EEA 2010). If such losses are large enough, they may potentially compromise the provisioning of the ecosystem functions and services (e.g. food and water supply), which are the foundation for human well-being (Bennett et al. 2015, Newbold et al. 2016). From a European perspective, the Mediterranean area is considered to be most vulnerable when it comes to the security of ecosystem services supply towards the future (Schröter et al. 2005). The loss of ecosystem function can be linked to the current loss of species (Hooper et al. 2012) and, where possible and needed, interventions may be required to prevent the collapse of local ecosystem functioning (Mace et al. 2014, Steffen et al. 2015, Newbold et al. 2016).

The Planetary Boundaries framework (Rockström et al. 2009) takes into account the footprints in important fluxes such as freshwater use and climate change. Recently, the imprint of global land-use pressures on biodiversity and ecological function resilience was quantified at the biome or global scale (Newbold et al. 2016). The approach taken in this paper relies on the use of an adapted version of the Biodiversity Intactness Index [BII; the average abundance of originally present species across a broad range of species, relative to abundance in an undisturbed habitat (Scholes and Biggs 2005)] (Mace et al. 2014, Steffen et al. 2015, Newbold et al. 2016).

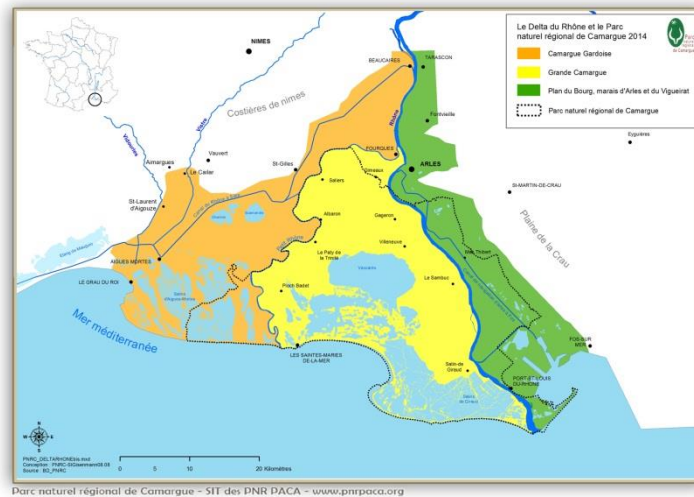
Justification

Data on how wetland habitats have been changing in the Mediterranean area, and the consequences in terms of biodiversity, functions, and ecosystem services, are at best patchy (MWO 2012). So far only limited, pan-Mediterranean wetland assessments, or long-term monitoring of a few items (e.g. waterbird species) have been carried out (MWO 2012).

Even within birds, there are many cases of species for which quantitative data (i.e. abundance data) is of bad quality or missing. For this reason, expert opinion can be a very powerful tool to generate new information that did not exist before (Kuhnert et al. 2010), as well as to inform ecological models (Murray et al. 2009). Therefore, one of the priorities of Tour du Valat (in collaboration with Wetlands International) is to fill this knowledge gap by generating an entirely new dataset based on expert opinion to be able to determine changes in ecological functions in the Camargue area, and possibly linking them to the ecosystem services provided by Mediterranean wetlands.

This study focuses on the Camargue (Fig. 1A), one of the richest wetlands in the Mediterranean basin (Perennou 2009). Using all available literature, the project compiles present (2010s) and historical (1970s) information on species for a total of eight different species groups (Fig. 1B). All this information is then structured in the form of a questionnaire where experts provide their estimates of trends as well as past and present species abundances (Fig. 2).

A



B

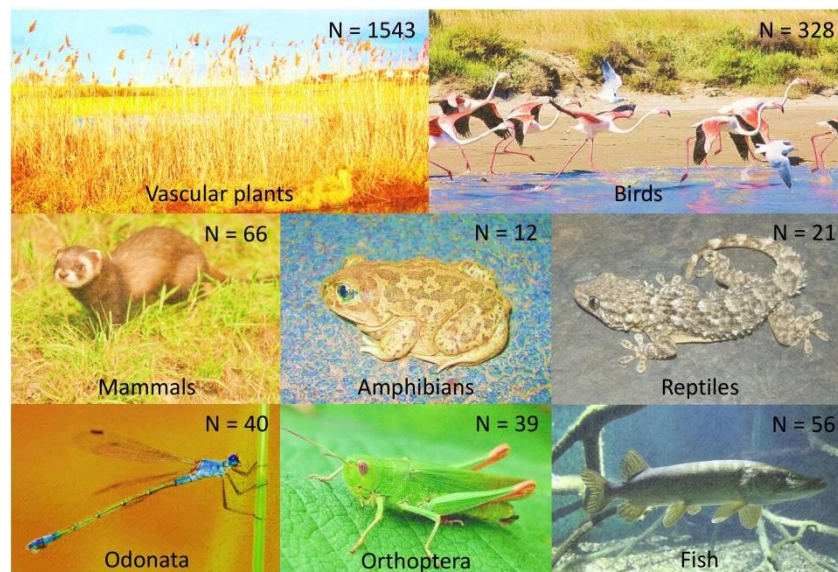


Fig. 1A Study area – Rhône delta (source: *Parc Naturel Régional de Camargue*); Fig. 1B Number of species included in each of the taxonomic groups studied (note that numbers may eventually change).

This information can be extremely useful to capture population changes at the species level, at the species-group level and at the general level (i.e. all species groups included). In a first step of the project, data are being collected for different species groups in the Camargue in a collaborative effort with experts from several fields of study. In a next step, the project aims to determine how the species richness and abundance of Mediterranean wetlands have been changing and to position Mediterranean Wetland ecosystems with respect to the planetary biodiversity safety boundary.



Fig. 2 Meeting with fish experts on the 27th September 2017.

Hypotheses

Given the current pressures facing Mediterranean wetlands, we predict that this ecosystem will have experienced a reduction of function beyond the safe limit suggested by Steffen et al. 2015, which was placed at a precautionary 10% reduction in BII, but it might be as high as a 70% reduction. If indeed Mediterranean ecosystems functions and services are found to be compromised, we risk being far away of meeting the goals adopted within the Strategic Plan for Biodiversity 2011–2020 (CBD 2010, SCBD 2014) and attaining Sustainable Development Goals for important ecosystem services (Geijzendorffer et al. 2017).

Duration of the project and research outcomes

This project, started in June 2017, will finalise in October 2018. At least two research items are expected to be published from this study: 1) a research article in which expert knowledge is used to reconstruct the changes that have taken place in species richness and abundance in the Camargue (1970s-2010s); 2) a research article on how resilient the ecological functions are in the Camargue, using the collected data and the planetary safety boundary approach.

For any questions on this research project, please contact [Sara Fraixedas](#), [Thomas Galewski](#) or [Ilse Geijzendorffer](#).

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