THE SOCIO-ECOLOGICAL VULNERABILITY OF ARTISANAL FISHERIES TO CLIMATE IMPACT

Raquel Ruiz-Díaz, Xiaozi Liu and Elena Ojea. Furure Oceans Lab, Univeristy of Vigo

INTRODUCTION

Fisheries livelihood and coastal inhabitants benefit from marine ecosystems by harvesting food, gaining protection to extreme events, earning income or deriving social and cultural meaning from them, contributing human well-being (MEA 2005). Under the growing threat of climate change, understanding the ecological vulnerability of resources and the interdependency of fishers and industries is important to identify vulnerabilities to target policies (Marshall et al. 2010). A vulnerability assessment is a tool that can help addressing these challenges.

OBJECTIVES

- To assess the socio-ecological vulnerability of artisanal fishers to climate impacts, using the goose barnacle fishery in Galicia as case study.
- To compare the vulnerability of "on foot" and "on boat" fishers.

METHODOLOGY

Study area

Ecological, socioeconomic, and governance data were compiled from 24 guilds in the modality "on boat" and 17 guilds in the modality "on foot" in Galicia (NW Spain). Interviews with 25 barefoot advisors were also performed in the fishing guilds to complement the information needed.

Vulnerability framework

Framework developed by Cinner et al. (2013), (Fig.1) and methodology decribed in Fig.2 were used to assess the vulnerability.

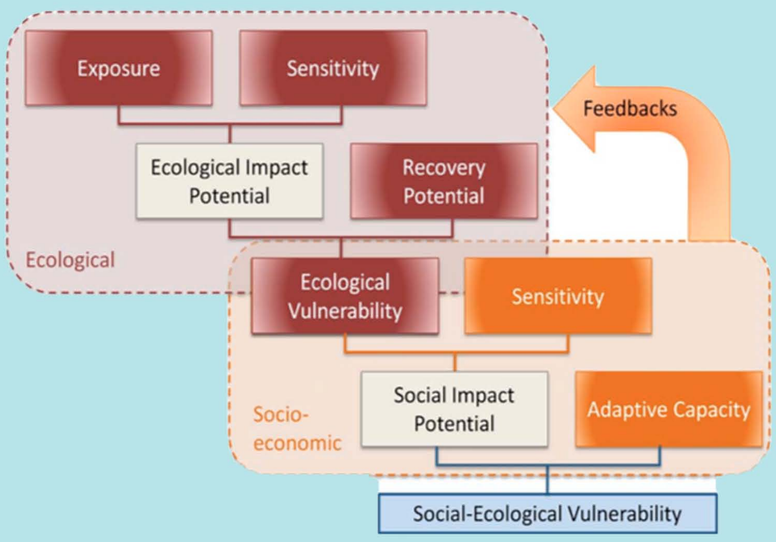


Figure 1. Heuristic framework that links social and ecological vulnerability (Cinner et al. 2013)

REFERENCES

Cinner, J. E., Huchery, C., Darling, E. S., Humphries, A. T., Graham, N. A., Hicks, C. C., ... & McClanahan, T. R. (2013). Evaluating social and ecological vulnerability of coral reef fisheries to climate change. PloS one, 8(9), e74321.

Marshall, N. A., Marshall, N. A., Marshall, P. A., Tamelander, J., Obura, D., Malleret-King, D., & Cinner, J. E. (2010). A framework for social adaptation to climate change: sustaining tropical coastal communitites [sic] and industries. IUCN.

Selection of indicatores: (Based on literature, available databases and surveys)

Studying the correlation: (Pearson's correlation coefficient).

Building the vulnerability index.

1.Normalization of indicators: Using Min-Max method to have an identical range [0, 1].

2.Weighting and aggregation: Indicators have been equally weighted. Factors were calculated as $Factor = \Sigma(indicators)_i / Nindicators_i$

3.Calculation of the dimension: The simplest additive aggregation method was used. "Factors" were summed to form the "Dimensions". Note: Indicators and factor have different sings due to their contribution to increase/decrease vulnerabiliy

4.Index construction: Ecological vulnerability was computed using the formula given by Cinner et al. (2013).

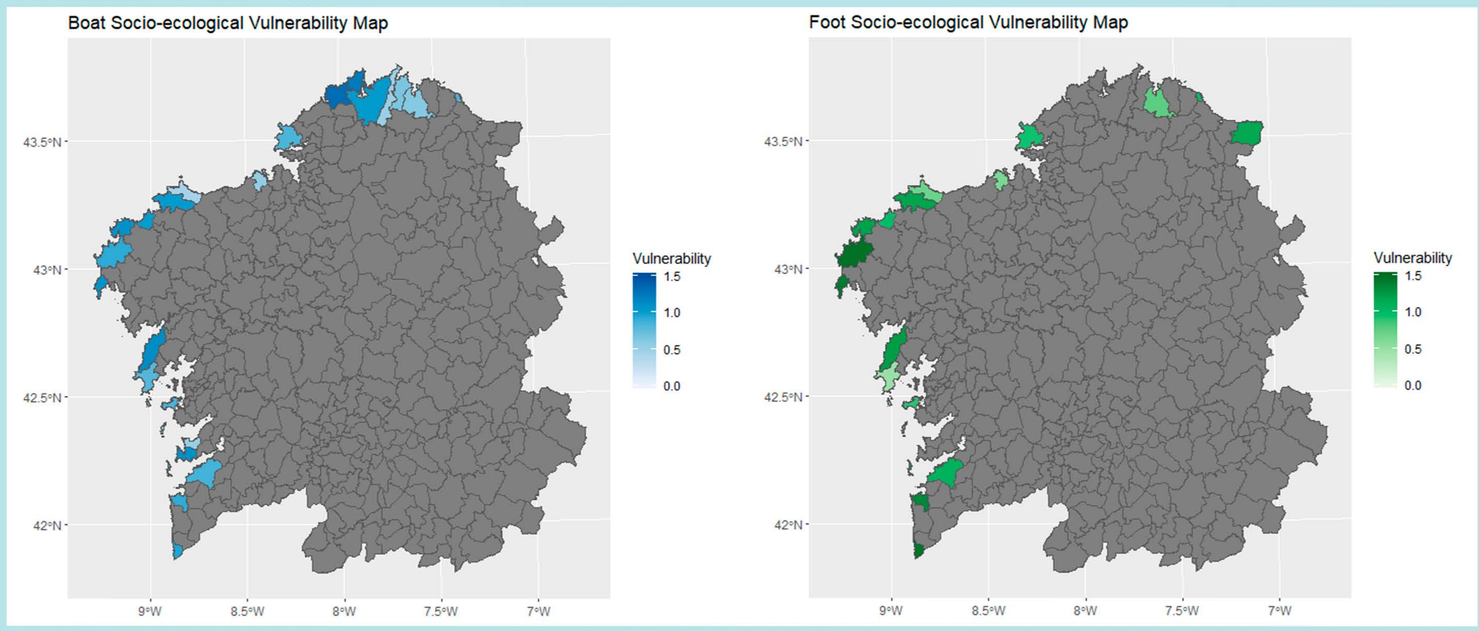
$Ecological_{vul} = (Exposure_{eco} + Sensitivity_{eco}) - Recovery\ potential$

This ecological vulnerability was used as exposure dimension in the Socioecological Vulnerability Index.

$Socio\text{-}Ecological_{vul} = (Ecological_{vul} + Sensitivity_{socio}) - Adaptive\ capacity$

Figure 2. Methodology for construct the vulnerability index

RESULTS



Map 1 & 2. Vulnerability of fishing guilds for the "on boat" and "on foot" harvesting modalities

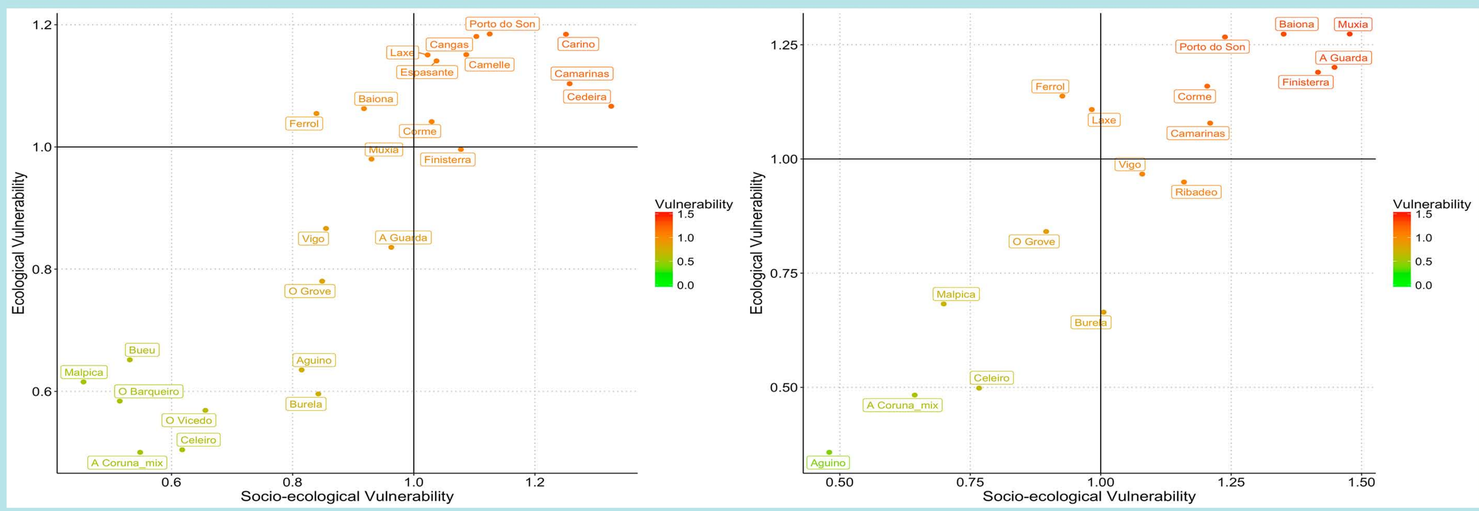


Figure 3 & 4. Ecological and Socioecological vulnerability for both fishing modalities over a treshold in 1.

- For "on boat" harvesters the highest vulnerability occurs in the northern bays (Cedeira and Cariño), while for "on foot" harvesters the higher vulnerability occurs in Costa da Morte (Muxía and Fisterra) and the south (A Guarda).
- In both modalities, the trend in the vulnerability does not shows a pattern, meaning that the vulnerability is more related with the intrinsic characteristics of the guilds such as their working operation rather than their location.
- Guilds holding low socioecological vulnerability are expected to be able to adapt to the impacts of climatic change.

DISCUSSION

- Our results provide valuable insight on socioecological vulnerability of Galician goose barnacle fishery to climate impact at local scale.
- Guilds showing vulnerability in one fishing modality do not necessary show high vulnerability in the other fishing modality. However, some guild are vulnerable in both and these should be given priority in policy interventions.
- By increasing adaptive capacity, vulnerability can be reduced and guilds that now show the highest values in vulnerability could move to a lower vulnerability level.