

The half-empty, half-full glass scenario of ecological resilience in no-take MPAs

Jose A. Sanabria-Fernandez

University of Barcelona, Dept Evolutionary Biol Ecol and Environm Sci, Barcelona, Spain

jsanabriafernandez@gmail.com

Marine Protected Areas (MPAs) are global tools to avoid biodiversity loss. This MPAs can involve different protection levels, which hold dissimilar diversity. For instance, several studies suggest that the areas with the maximum protection (no-take zones, NT) presents the highest biodiversity values. Although biodiversity can increase the resilience (capacity of recovery) of the community, there are a lack of studies that test if the resilience varies with the protection levels.

Our aim?

- To develop a resilience index for temperate rocky reefs.
- To assess the resilience in different protection levels.

Where?

In three MPAs, and their levels of protection (N=69)



How?

We calculated the Resilience index at 2 levels:

- RIGlobal** has been calculated with all the sample stations of the three study islands
- RILocal** has been calculated for each island, using exclusively the sample stations of each island

To calculate the RIs we used the next 17 resilience indicators

Quantifying resilience indicators

Resilience Indices (RIs)
1. RIGlobal
2. RILocal



Data analyses and results

>Model1<-lme(RIGlobal & RILocal ~ island * status * RImethod, random=~ 1|station)

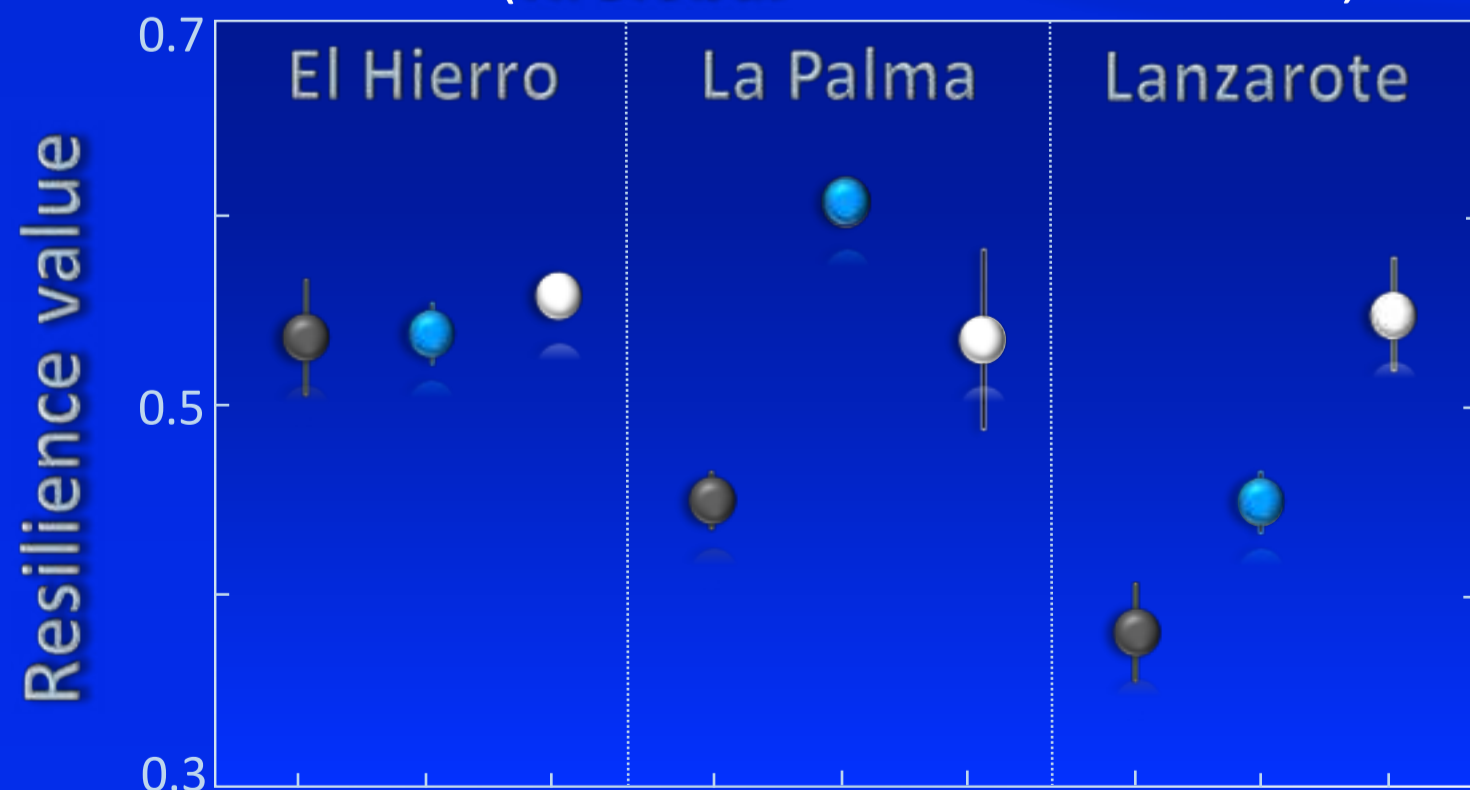
Where:

- Island is a fixed factor with 3 levels (El hierro, La Palma and Lanzarote)
- Status is a fixed factor with 3 levels (UN, BF and NT)
- RImethod is a fixed factor with 2 levels (RIGlobal & RILocal)
- Station is random factor

Results Model 1

Source	P-value
Islands	0.019 ✓
Status	0.001 ✓
RImethod	0.001 ✓
Island*Status	0.16 ✗
Island*RImethod	0.001 ✓
Status*RImethod	0.001 ✓
Status*RImethod*Status	0.001 ✓

>Model2<-lme(RIGlobal ~ island * status, random=~ 1|station)

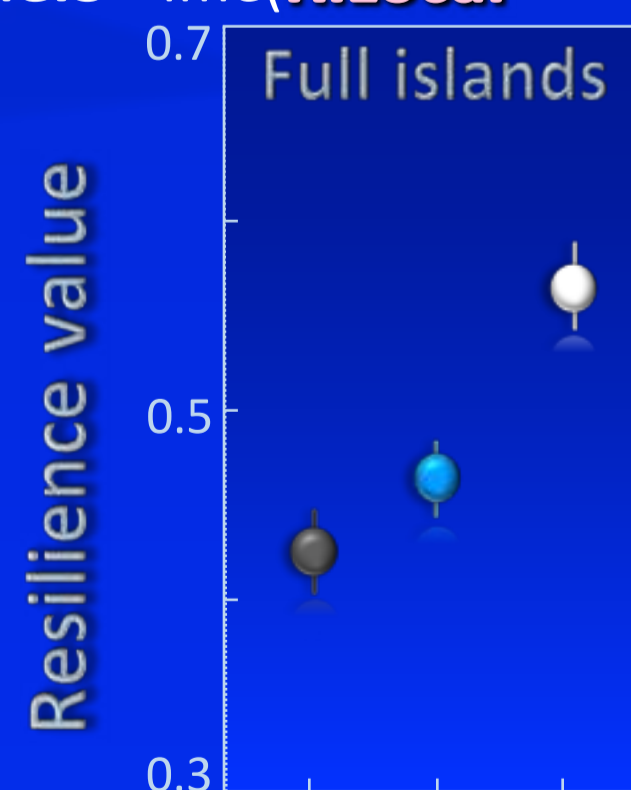


Results Model 2

Source	P-value
Islands	0.001 ✓
Status	0.006 ✓
Island*Status	0.024 ✓

- Unprotected (UN)
- Buffer (BF)
- No-take (NT)

>Model3<-lme(RILocal ~ island * status, random=~ 1|station)



Results Model 3

Source	P-value
Islands	0.606 ✗
Status	0.001 ✓
Island*Status	0.217 ✗
Pairwise Tukey	
UN*BF	0.083 ✗
NT*BF	0.071 ✗
NT*UN	0.001 ✓

Conclusions

- No-take zones hold the maximum values of resilience.
- The protection effect on resilience varied as a function of scale and geography: **RIGlobal** has 20% of resilience in NT more than UN, and **RILocal** has 35% of resilience in NT more than UN.
- Although our results suggest that resilience is higher in NT, we are far from areas with resilience values of 100%, and the maximum resilience of our NT is 56%.
- Our resilience assesment approach integrate biological, environmental, management factors, thus it may be a conservation tool to detect priority conservation areas.

References

- Holling (1973) Resilience and stability of ecological systems. *Ann Rev Ecol Sys.* 4:1-23.
Maynard *et al* (2010) Building resilience into practical conservation: identifying local management responses to global climate change in the southern Great Barrier Reef. *Coral Reefs.* 29:381-391.

Thank you!

We thank to Reef Life Survey volunteer.
MARINERES grant (CGL2013-49122-C3-1-R)