LEH-AO

Laboratoire d'Ecologie Halieutique – Afrique de l'ouest

Changes in the fish assemblage structures of marine protected areas in West Africa: the case of a tropical estuarine MPA (Bamboung) and a coastal and marine MPA (Joal-Fadiouth)

Modou THIAW, Oumar SADIO, Justin KANTOUSSAN, Saliou FAYE, Ismaïla NDOUR; Bamol Ali SOW, Patrice BREHMER

modou.thiaw@isra.sn

IRD Institut de Recherche pour le Développement FRANCE

AWA

C.R.O.D.T.

PLAN OF THE PRESENTATION

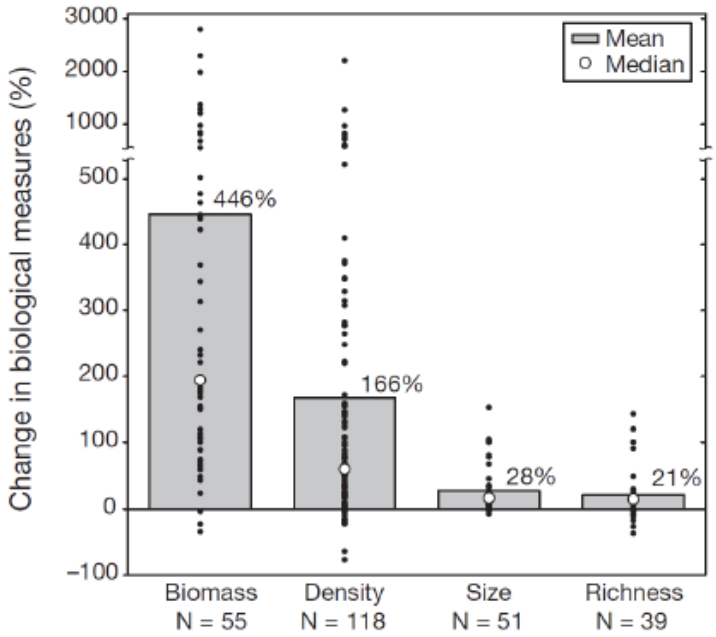
1. Outcomes
2. Objective
3. Materials and methods
4. Comparative aquatic environmental between both AMP
5. Changes in the fish assemblage structures
6. Changes in size of fish communities structures
7. Conclusion

OUTLINE

- Over the last four decades, most coastal fish resources have been overexploited raising doubts about the long-term sustainability of certain fisheries.
- In addition, fish habitat has also been strongly altered by widely used fishing gears such as trawls and dredges, resulting in reduced seabed complexity and removal of macrobenthic organisms that provide shelter for others.
- Marine protected areas (MPAs) are increasingly considered in coastal areas as an instrument to preserve vagile fauna and habitat from detrimental effects of fishing.
- Marine protected areas (MPAs) are increasingly envisaged as a tool to manage coastal ecosystems and fisheries.

ECOLOGICAL OUTCOMES OF MPA

- The potential ecological benefits of MPAs to marine systems include process benefits, ecosystem benefits, population benefits, and species benefits (Angulo-Valdés and Hatcher, 2010).
- No-take reserves, in particular, may result in beneficial environmental outcomes.
- There is a significant difference between no-take areas and partially protected areas in terms of overall benefit and density of organisms.



A global review of no-take reserves affirms that no-take MPAs have resulted in average increases in biomass of 446%, species density of 166%, in species richness of 21%, and in size of organisms of 28%.

OUTLINE

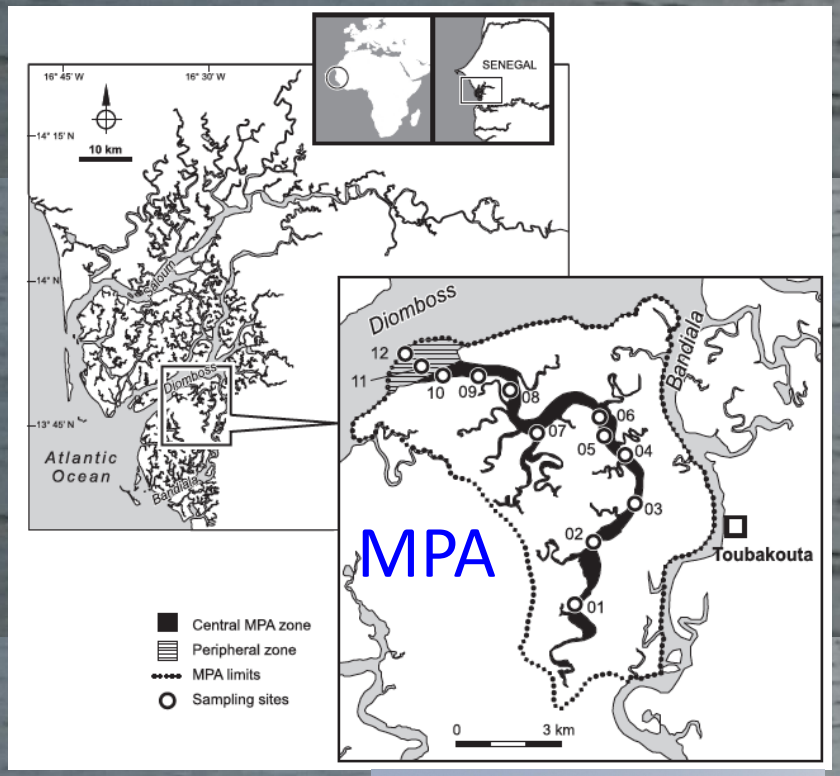
- Marine protected areas (MPAs) are increasingly envisaged as a tool to manage coastal ecosystems and fisheries
- Assessment of their performance with respect to management objectives is therefore important.
- Observed benefits do not apply to all species at all times, and responses to protection are also highly variable among fish taxa.

OBJECTIVE

To assess the effects of MPA on the fish assemblage in the years following fishing bans for Bamboung and Joal-Fadiouth MPA.

STUDY SYSTEMS

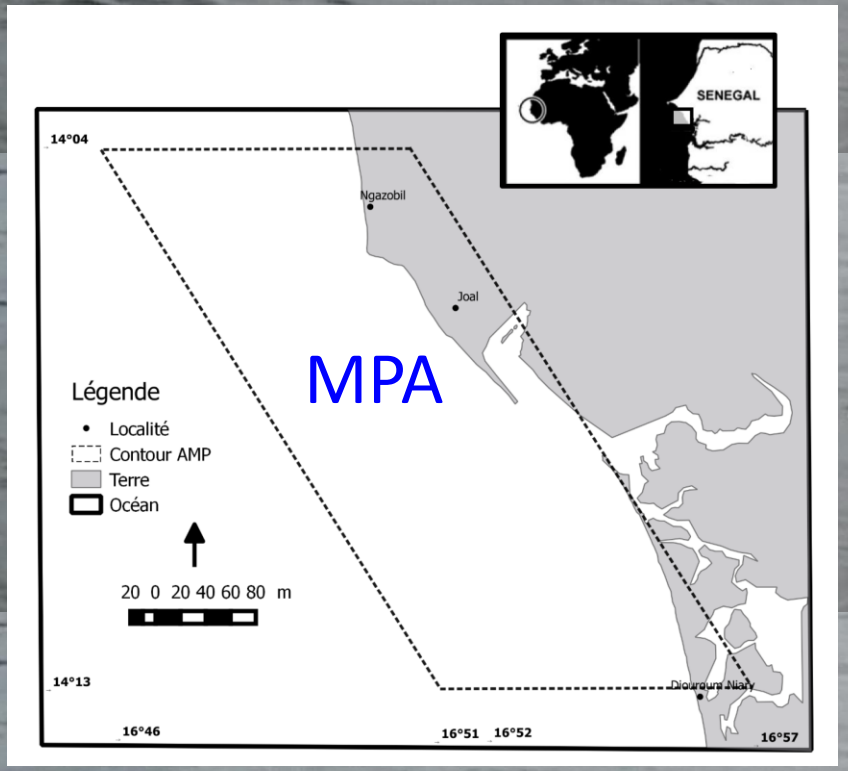
MPA of the Bamboung bolong



Area : 7 km^2

Ban area to fishing in 2004 (and continuous campaign surveys)

Joal-Fadiouth MPA



MPA to multiple used:

- 174 km^2,
- Operational

MATERIALS AND METHODS

- Evaluation at the assemblage level, while accounting for the assemblage structure, we analysed all data together, and applied multivariate approaches to several metrics pertaining to different groups of fish.

- Sampling strategy
- Fish sampling method
- Collected data
- Analysis of data

Sampling design and data collection

Bamboung MPA

Joal-Fadiouth MPA

Environmental parameters collected

Biological parameters collected

Analysis of data

evaluation the change of fish assemblage structure in the MPA.

- Multivariate techniques (PCA and AFC) suited for ecological data.
- Wilcoxon test used

We ensured that the observed spatial variation was due to MPA effects and not due to other factors (like habitat).

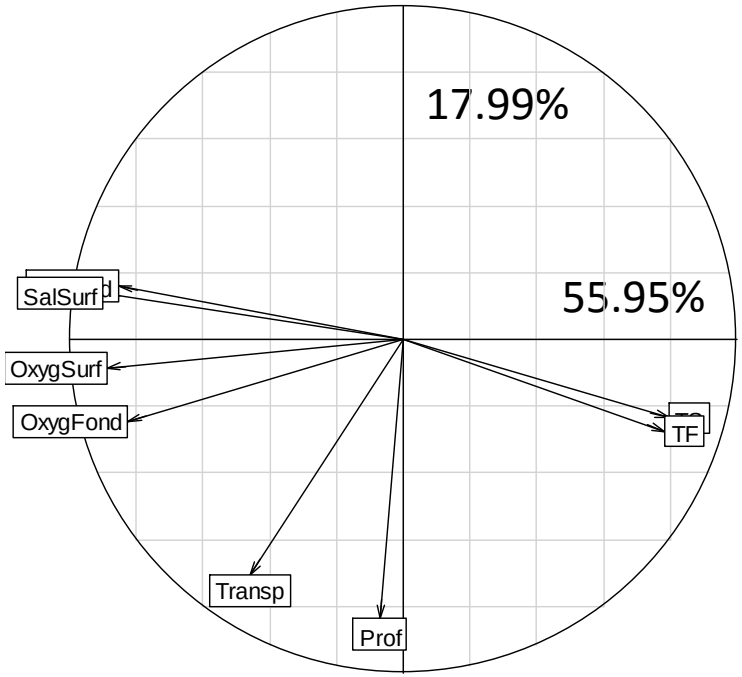
Bio-ecological categories according to Albaret (1999) observed in the Bamboung MPA.

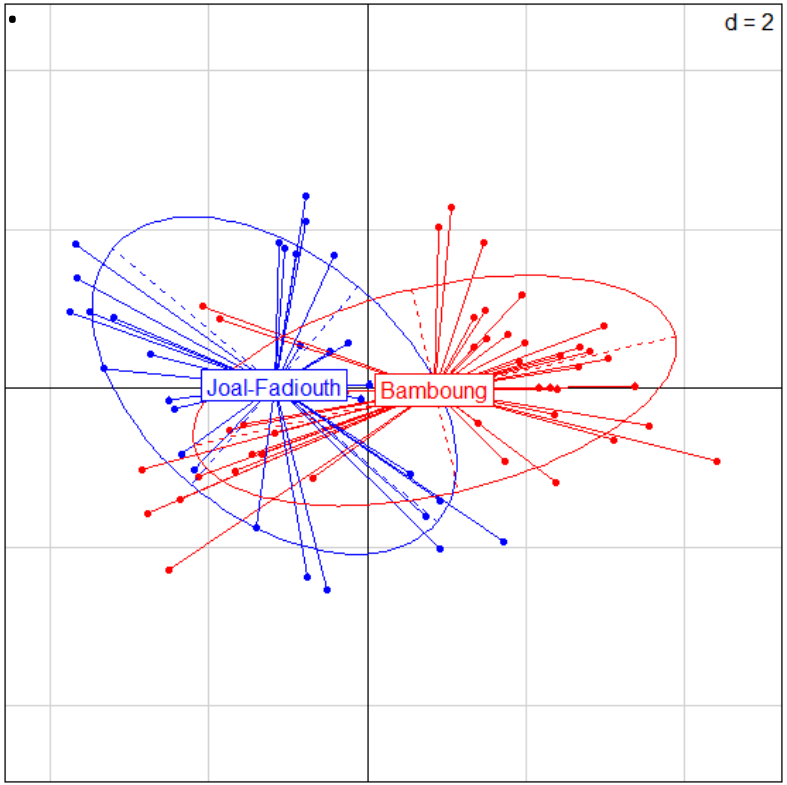
Code	Description
Es	Strictly estuarine species
Em	Estuarine species from marine origin
ME	Marine-estuarine species
Ma	Marine species, accessory in estuaries
Mo	Marine species, occasional in estuaries

RESULTS

1. Comparative aquatic environmental between both AMP

Wilcoxon test shows no significant difference for the main environmental parameters between the Bamboung MPA and Joal-Fadiouth MPA: Deph (p. 0.306); salinity (p. 0.003), SST (p<0.05), transp. (p>0.05) and O2 (p<0.05).





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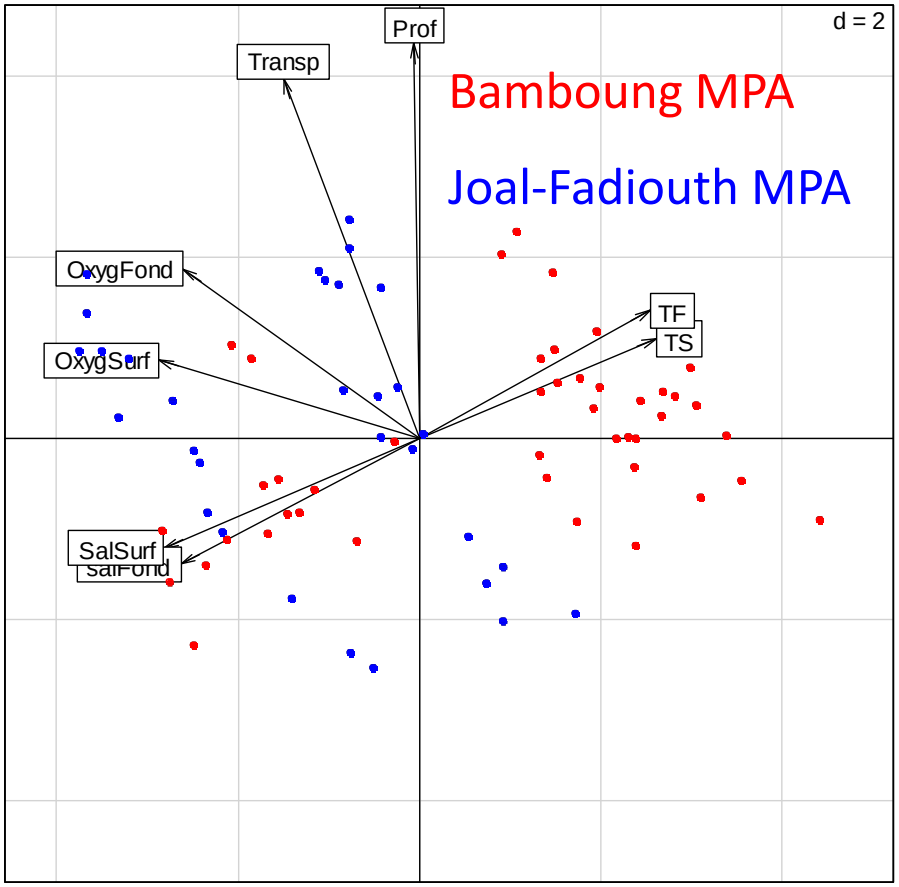
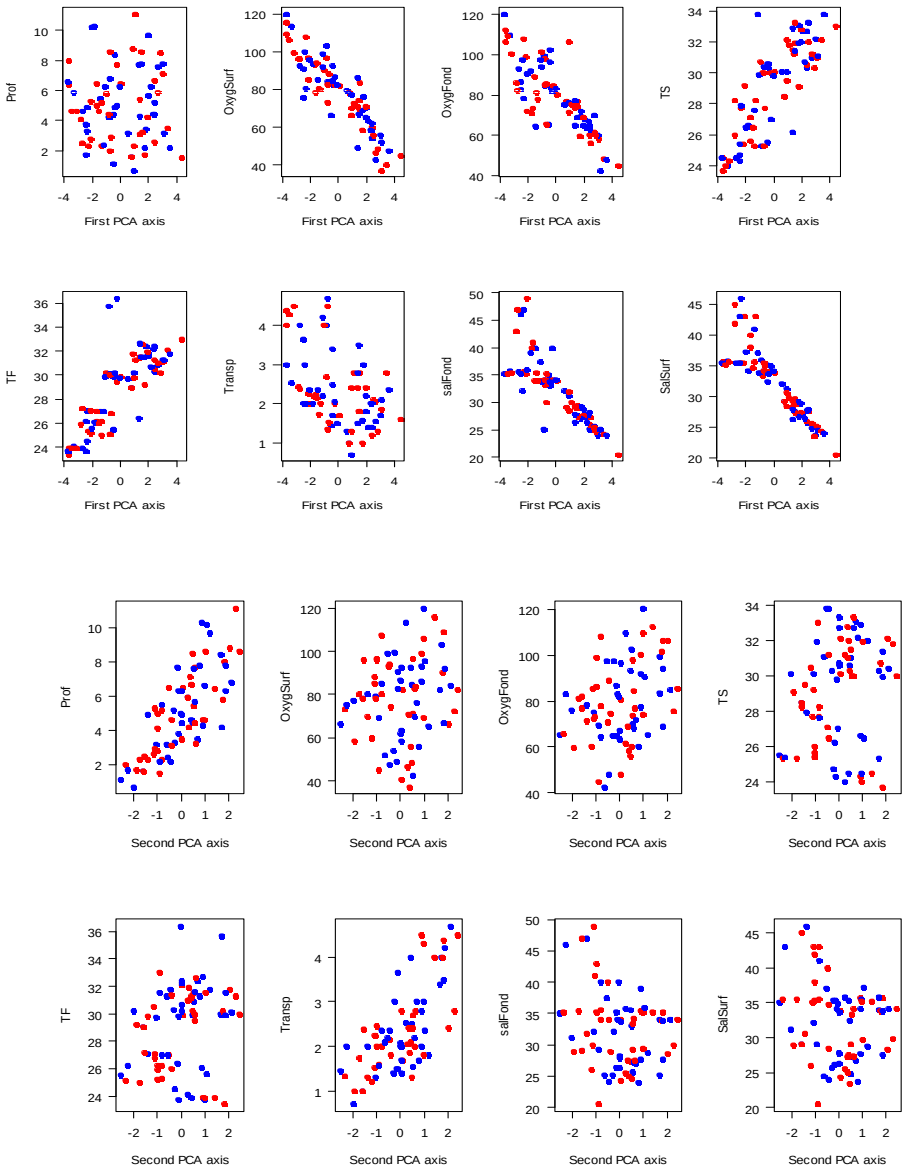
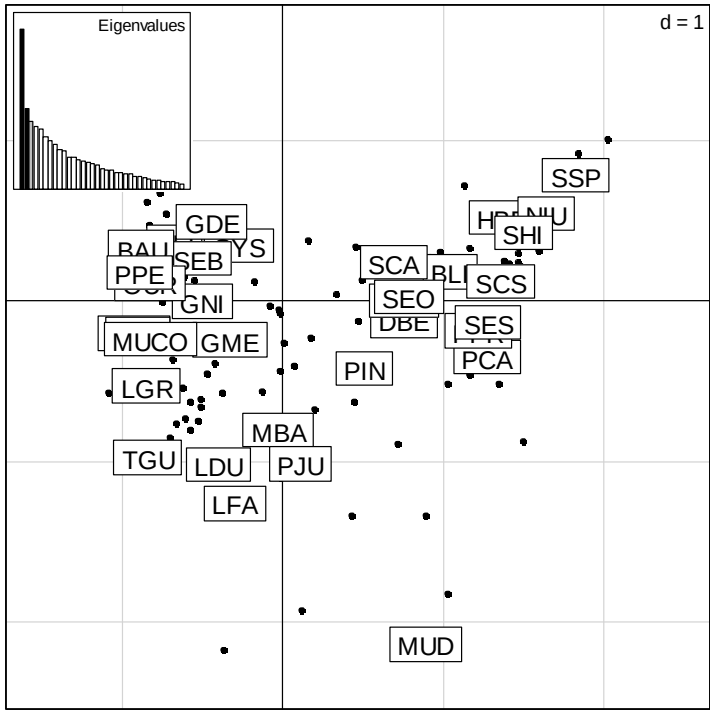


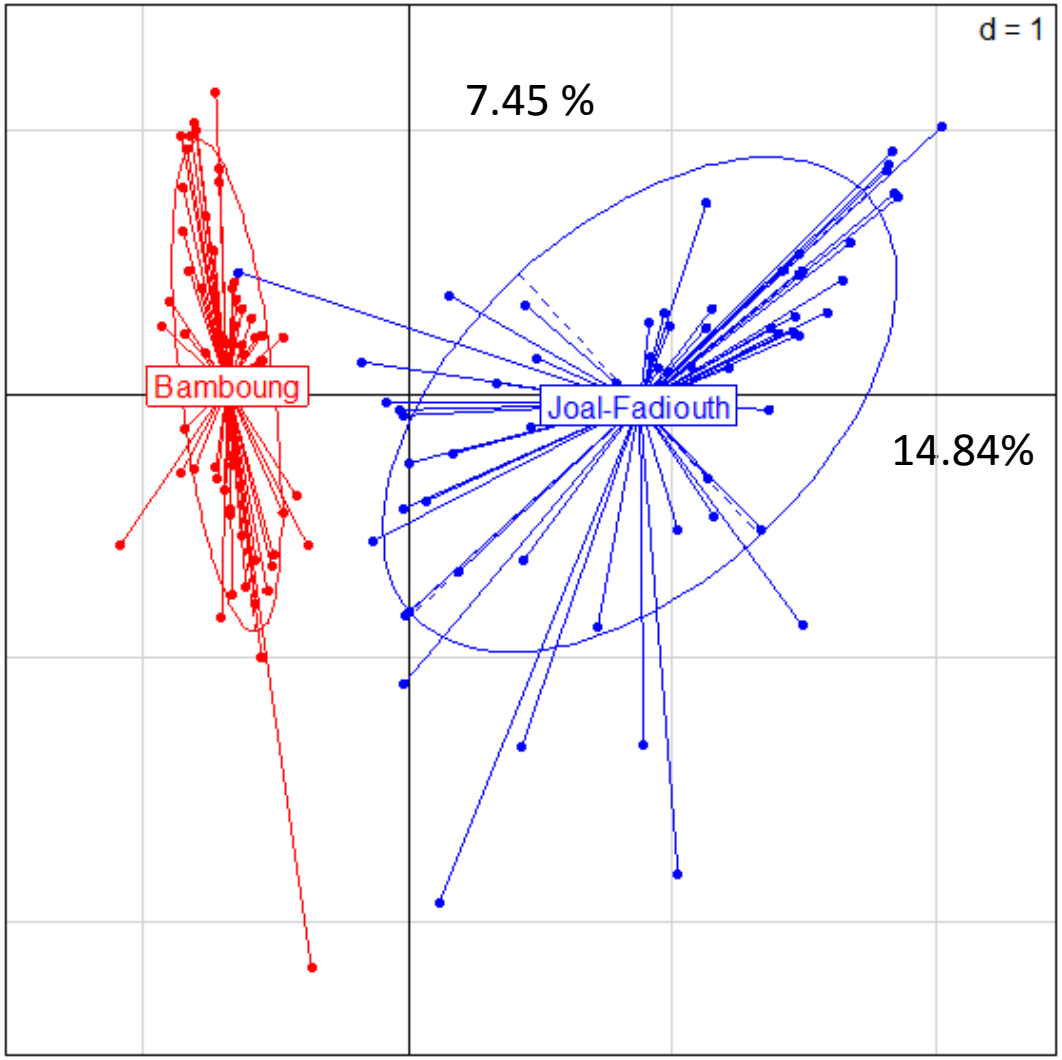


No significant difference for the main environmental parameters

2. Changes in the fish assemblage structures



Fish assemblage structures are different between both MPA



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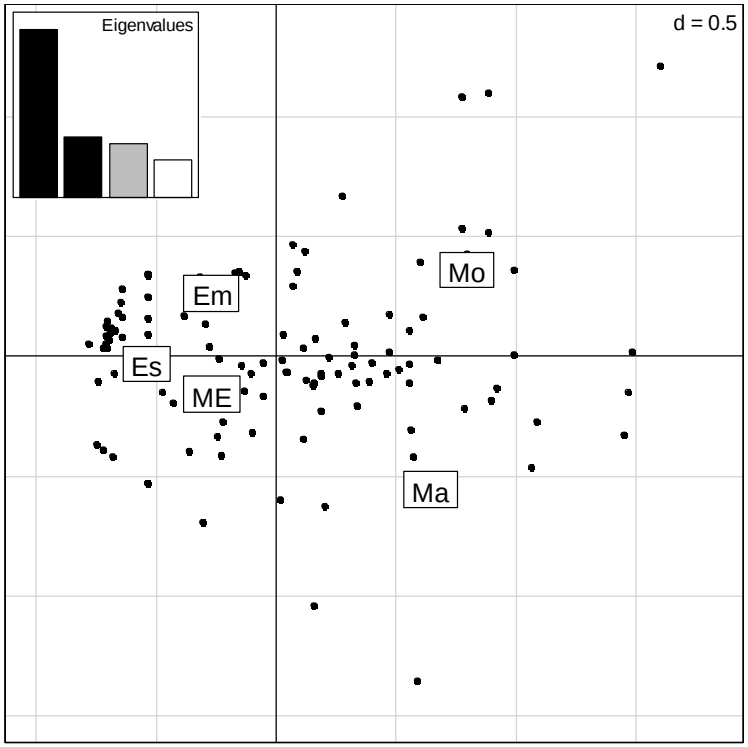
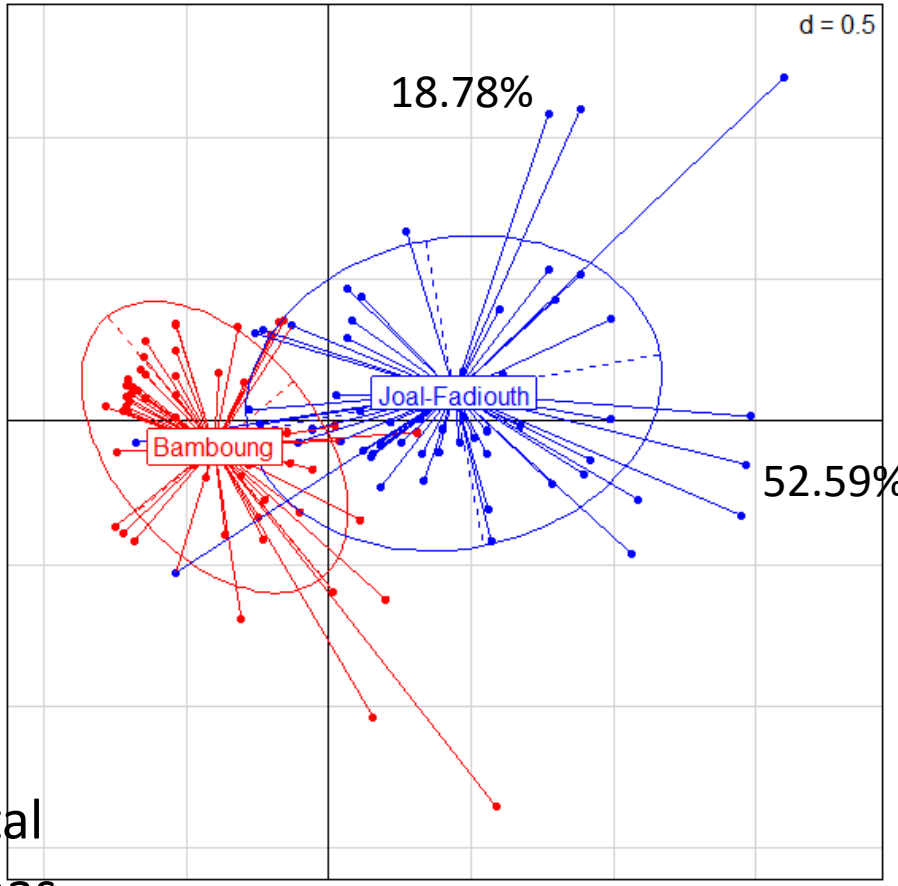
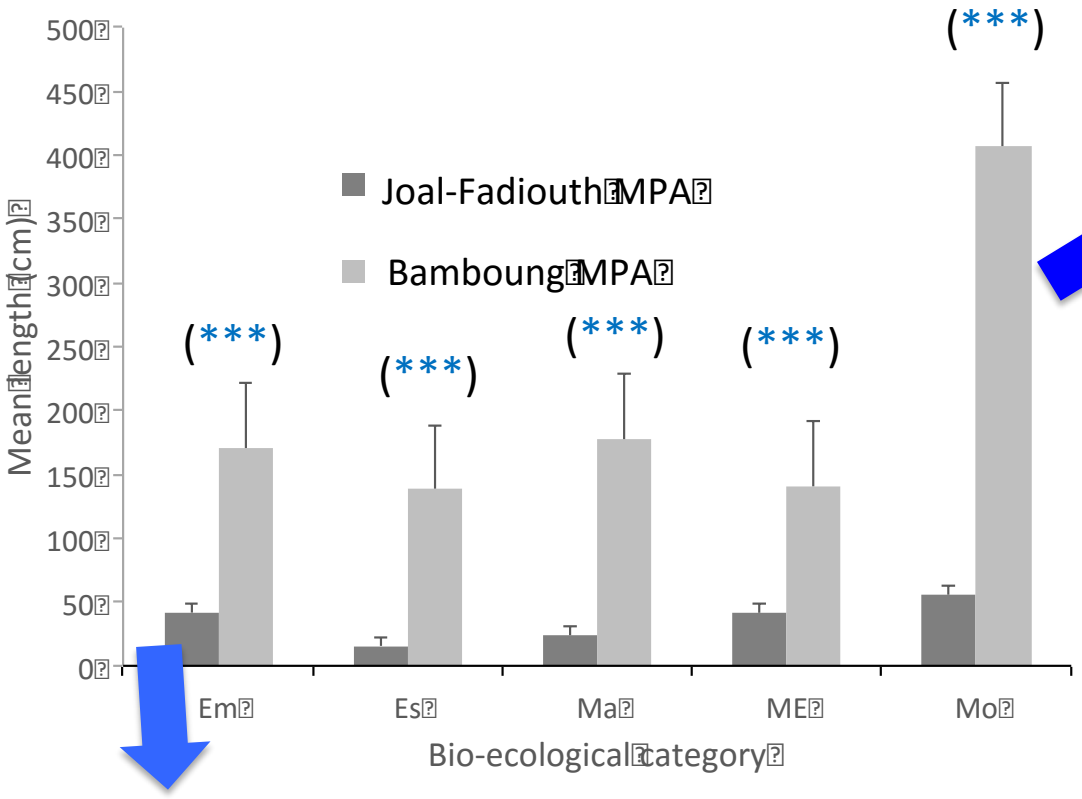




In the Bamboung MPA, an increase of total fish biomass and of maximal fish length has been registered after the fishing ban.

3. Changes in size of fish communities structures



Marine predators which abundance and size were reduced by fisheries were again important components in the Bamboung MPA

In summary

In Bamboung MPA

- An increase of marine affinity species in depends of the estuarine part of the assemblage.
- An increase of the mean trophic level (piscivorous predators) and a sharp decrease of herbivorous and detritivorous species (low trophic levels).

In Joal-Fadiouth MPA

- an increase of abundance of the estuarine affinity species to the detriment of marine species that are exploited.
- low-trophic level species as herbivorous are more important in the reserve due to the high habitats diversity (mangroves, sandy and muddy bottom, algae) and the fishing ban effects.

CONCLUSION

The total ban on fishing in the estuarine area can significantly improve the fish assemblage for the fishing, and this is not evident for a coastal and marine area like Joal-Fadiouth MPA.

PARTNERS

Université Gaston Berger

Université Cheikh Anta Diop

Université Assane Seck