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INTRODUCTION

The main purposes of Marine Protected Areas (MPA) are to ensure the conservation of biodiversity patterns, biological connectivity and mitigate regime shifts due to climate change. Projections of future climate change scenarios point to alterations in ocean circulation and sea surface temperature, affecting the life cycle of marine organisms.

These changes directly affect the reproduction and dispersal capacity of marine organisms, including changes in egg and larvae survival conditions, as well as in the trajectory imposed by the surface circulation.

METHODOLOGY

Future projections from global coupled numerical modeling solutions will be used to model the biological connectivity and acclimation patterns of the reef fishes into Brazilian oceanic islands and the continental shelf. The selected future scenarios are from the HadGEM2-ES, ensemble r2i1p1, RCP8.5, which is based on the premise that no mitigation action is fulfilled.

It will be simulated the dispersion of egg and larvae reef fishes from nine regions, situated in Marine Protected Areas (Figure 1).

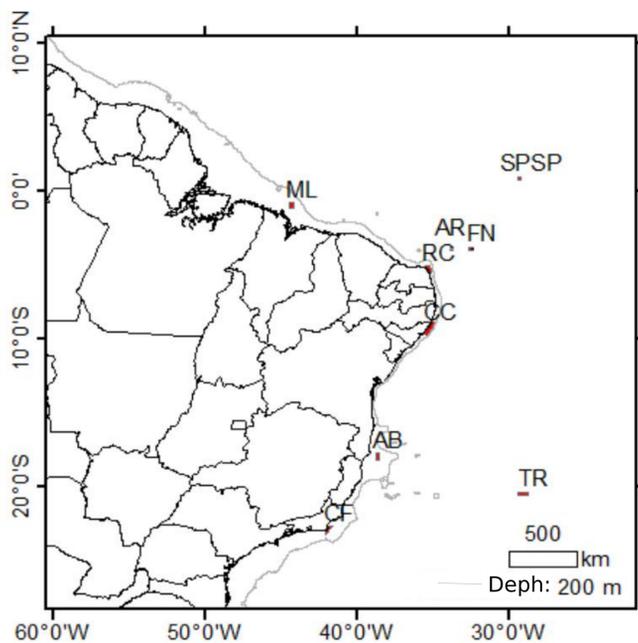


Figure 1: Marine Protected Areas used as egg release and larvae recruitment sites (SPSP - São Pedro and São Paulo Archipelago; ML - Manuel Luis; FN - Fernando de Noronha; AR - Rocas Atol; RC - Recife de Corais; CC - Costa de Corais; AB - Abrolhos; TR - Trindade and Martim Vaz; CF - Cabo Frio).



Figure 2: *Sparisoma* sp. Endemic to Brazil where can be found in all reef environments defined in this study. Photo credits: Graham Edgar, Reef Life Survey.

The oceanic downscaling of these scenarios will be carried out using the Regional Oceanic Model System (ROMS) for the hydrodynamic modeling of the tropical Atlantic Ocean, and the Ichthyop for the individual-based biological modeling.

In ROMS, it will be simulated the historical scenario, and compared with Remote Sensing analysis to verify the representativeness of the model for the studied area. And after it will be simulated the future scenario.

The target reef fish is the genus *Sparisoma* (Scaridae) found in these areas (Figure 2). The role of MPAs in conserving biological connectivity for the RCP 8.5 scenario will be discussed based on recruitment and selfrecruitment rates.

REFERENCES

DONELSON, J.M.; MCCORMICK, M.I.; BOOTH, D.J.; MUNDAY, P.L. (2014) Reproductive Acclimation to Increased Water Temperature in a Tropical Reef Fish. **PLoS ONE**, 9(5): e97223.

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PRELIMINARY ANALYSIS

Temperature influence significantly reef fishes reproduction and survival. Donelson et al. (2014) indicates the ability of tropical fish to adapt to waters with temperatures up to 3°C higher. Therefore, it is intended to carry out the study of the impacts of climate changes on Brazilian reef fish, as well as to simulate situations of acclimatization of fish to temperature.

Before running the ROMS model, the outputs of the HadGEM with observer data are compared in order to observe its behavior. The bias between mensal HadGEM2-ES historical and OSTIA analysis (Figure 3) indicates that the model is colder than analysis unless in the coast. With downscaling this difference can be corrected.

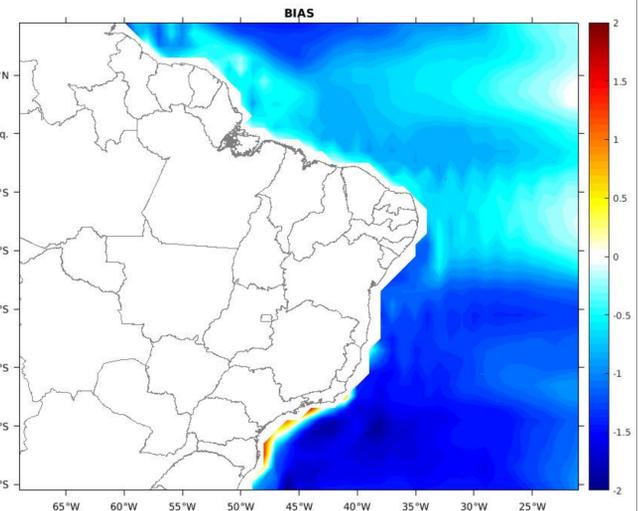


Figure 3: Bias between SST mensal HadGEM2-ES and OSTIA data.

Figure 4 presents the mensal difference between RCP 8.5 series (2080-2100) and actual scenario from OSTIA (1985 - 2005) and Figure 5 present the winter and summer time series for of the nine MPA.

Visually, it is possible observe that: the SST in RCP 8.5 is warmer than OSTIA near Equator, and in subtropical areas are less intense.

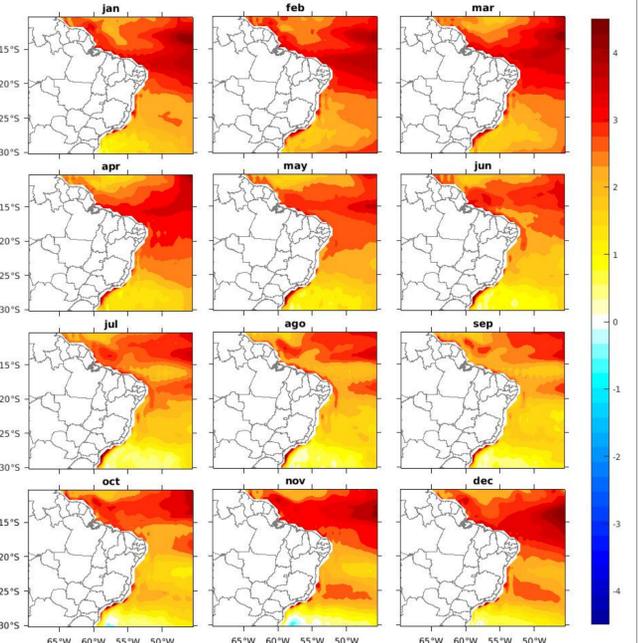


Figure 4 Mensal difference between RCP 8.5 and actual OSTIA series.

In AR, RC, CC, AB, TR and CF, winter series overlap summer series. It is a preliminary study before carrying out the modeling, in spite of guarantee the representativeness of the model. The following is the analysis of the surface currents.

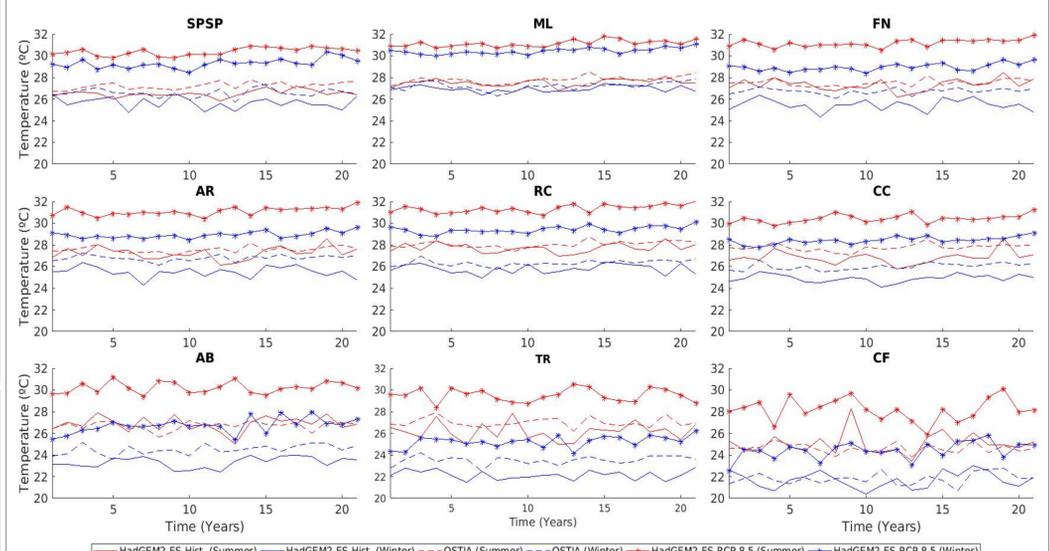


Figure 5: Winter and summer time series.