

ENSURING A SUSTAINABLE FUTURE FOR BRAZILIAN REEFS:

FROM GLOBAL IMPACTS TO REGIONAL ACTIONS

POLICY BRIEF

HIGHLIGHTS

- Brazilian reefs vary in terms of species composition and structure, as well as in degree of fishing intensity and potential responses to climate change;
- Conservation of Brazilian reefs biodiversity and the maintenance of its ecosystem services provision depend on effective management of fisheries, as well as mitigation strategies tailored to address the climate crisis;
- These actions should be developed and applied in a regional context considering the current spatial heterogeneity of Brazilian reef biodiversity as well as projections under multiple CO₂ emission scenarios.
- In addition to regional-specific action planning, reef biodiversity conservation must also account for the high connectivity along the coast and among the oceanic islands.

Reefs: submerged structures of hard, consolidated substrate. They can be formed by rocks or by living organisms such as corals, calcareous algae, and sponges. This policy brief focuses on reefs that occur up to 30m depth, excluding, for example, the Amazon reefs.

Ocean acidification: the decrease in ocean pH, caused primarily by the absorption of carbon dioxide (CO₂) from the atmosphere. Acidification impairs the production of skeletons, shells, and calcium carbonate structures in important organisms such as corals, calcareous algae, mollusk shells, and even fish.

REEFS HARBOR MOST MARINE LIFE

Formed by rocks, algae, corals, and other invertebrates, reefs play an important role in coastal protection, tourism, and fishing. In Brazil, shallow reefs occur from Maranhão to Santa Catarina and harbor over 400 fish species and about 20 coral species, 30% of which are only found in Brazil. Brazilian corals are adapted to live in the turbid, nutrient-rich waters that result from a coastline full of rivers flowing into the sea. Although the dominant organisms covering these reefs are algae, corals are key species for the maintenance of marine biodiversity, favoring greater species richness.

Regional differences are marked among Brazilian reefs. Tropical reefs, which occur north of Espírito Santo, are richer in corals. Southeastern and southern reefs have fewer corals and greater algae diversity and abundance. Fish of various shapes, colors, and feeding habits thrive in Brazilian reefs, playing a crucial role in maintaining ecosystem health.

Current understanding of mesophotic reefs remains limited. This ecosystem grows at depths of 30-220 m and under reduced light intensity. They extend along the Brazilian coast, including the mouth of the Amazon River.



Photo: João Paulo Krajewski

GLOBAL AND LOCAL THREATS TO BRAZILIAN REEFS

The impacts of global climate change influence Brazilian reefs by causing ocean warming and acidification. Forecasts for the next 30 years indicate that tropical regions may no longer harbor certain species because they may become too warm and/or acidic. Currently cooler areas are likely to reach milder temperatures, becoming more similar to what is observed in tropical areas today. Thus, reefs in the south and southeast may provide shelter and refuge for tropical species in the future.



Photo: Vinicius Giglio

Climate change may also compromise ecosystem services provision. For example, the impacts of climate change on tropical reefs in the north and northeast pose a significant threat to both artisanal fisheries and the aesthetic value of these environments, which are vital for national tourism. Thus, the regional context becomes even more relevant for conservation and management of Brazilian marine ecosystems.

On a local scale, worrisome issues are the impacts of pollution, disorderly coastal occupation, and overfishing. The latter, for example, has significantly reduced the abundance of important, eventually keystone species, such as sharks, groupers, snappers and parrotfishes. Furthermore, we still lack comprehensive fisheries' assessments for these species—information regarding the extent of their current fishing pressure and its potential impact on their ability to recover.

CONSERVATION TOOLS

Marine protected areas (MPAs) are a major tool to mitigate human-derived impacts on reefs. In Brazil, current MPAs may be well positioned to accommodate future changes in coral occurrence. However, they face vulnerabilities that could undermine its effectiveness, including lack of law enforcement and absence of complementary conservation measures [BOX 1]. Strengthening the current network of Brazilian MPAs is essential to recover fish stocks and protect biodiversity while accounting for the impacts of climate change.



Photo: Guilherme Ortigara Longo

BRAZILIAN MARINE PROTECTED AREAS

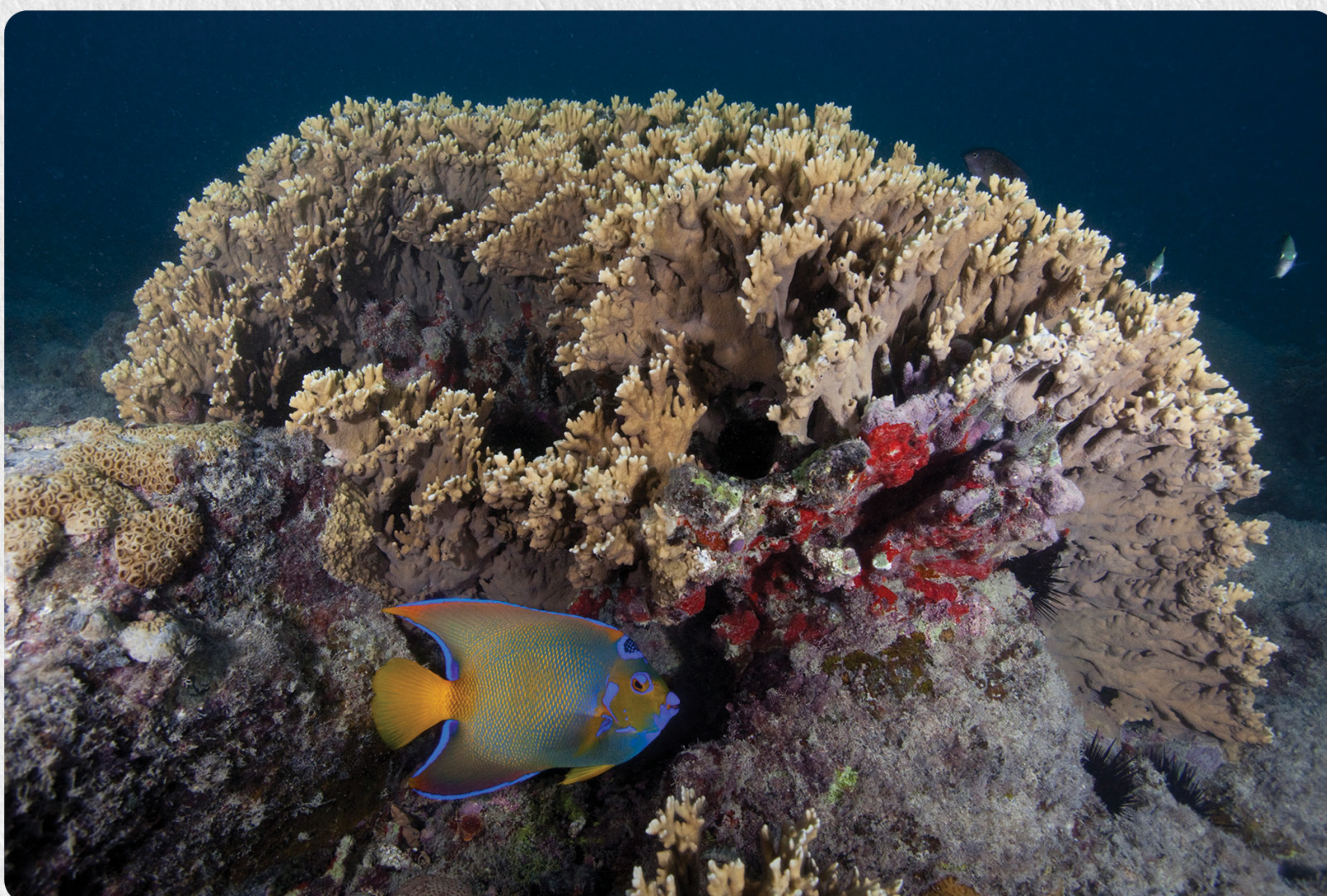
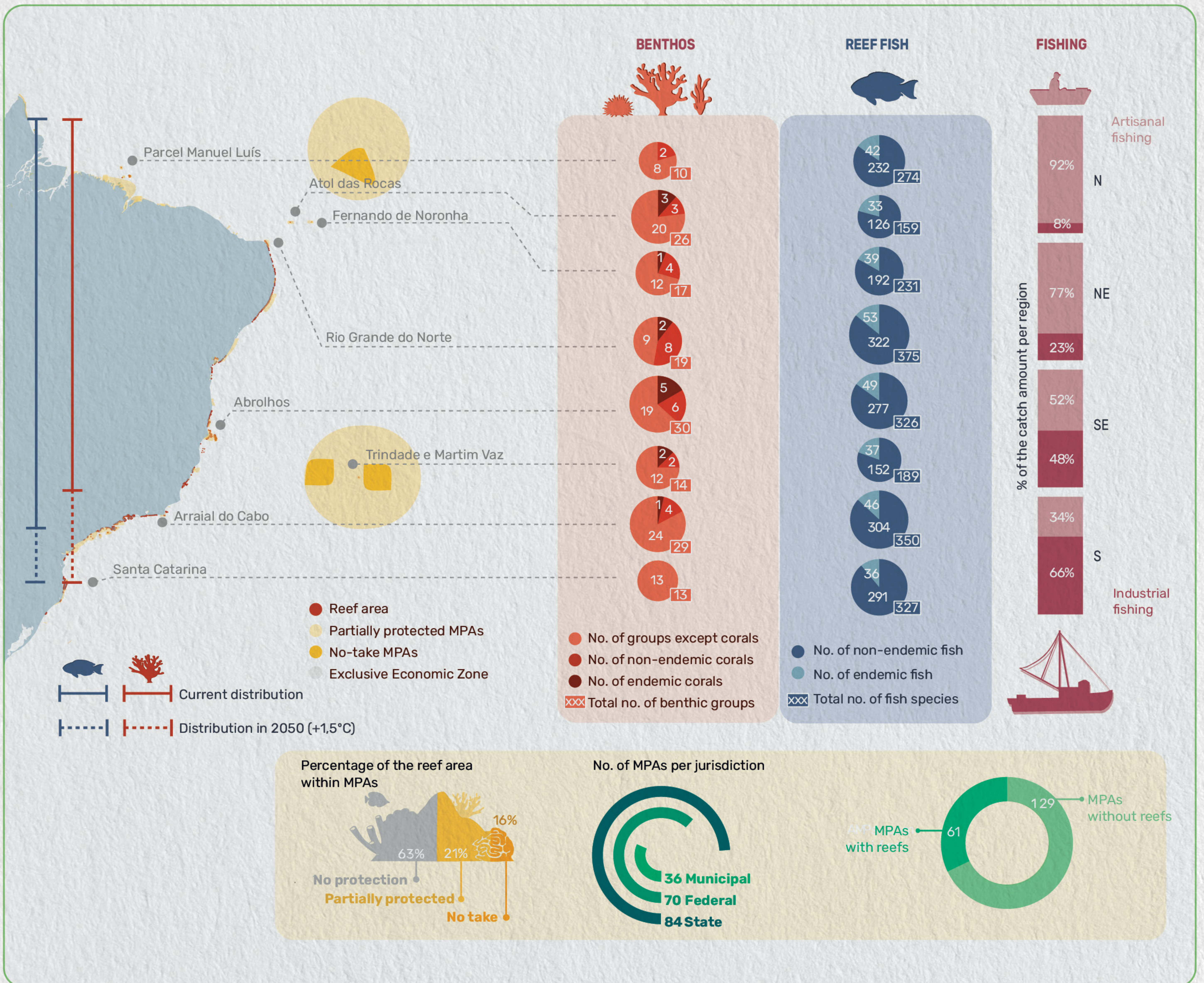
Currently, Brazil manages 190 Marine Protected Areas (MPAs): 84 of these are under federal jurisdiction, 70 are state managed, and 36 are managed at the municipal level. Combined, these areas comprise 27% of the Territorial Sea and the **Exclusive Economic Zone (EEZ)**, 25% of which cover the open ocean and do not offer protection to reef-associated species, and less than 2% are in the continental shelf, where the majority of reefs and multiple local impacts are concentrated. Such uneven distribution of habitat protection reflects the lack of solid scientific basis in the development of public policies.

Lack of surveillance and implementation of management plans undermine the effectiveness of Brazilian MPAs. For example, the Greenbeak parrotfish (*Scarus trispinosus*) is a Brazilian endemic species, with its fishing banned since 2014. Although some of its nursery areas are protected within MPAs, its populations continue to decline due to unregulated fishing inside and around these areas, and low compliance to existing recovery and management plans.

The establishment of MPAs requires municipal, state and national governments to monitor and enforce current legislation and sustainable fishing, and to establish effective and shared management among the multiple users of these areas.

Keystone species: species that play a fundamental role in the structure and functioning of communities or ecosystems, even when they exist in low abundances. The loss of these species significantly impacts and leads to drastic changes in the local environment.

Exclusive Economic Zone (EEZ): extends to a distance of 200 nautical miles (about 370 kilometers) from a country's coast and oceanic islands. In this area, each coastal country has exclusive rights to the use and protection of the oceans' natural resources.



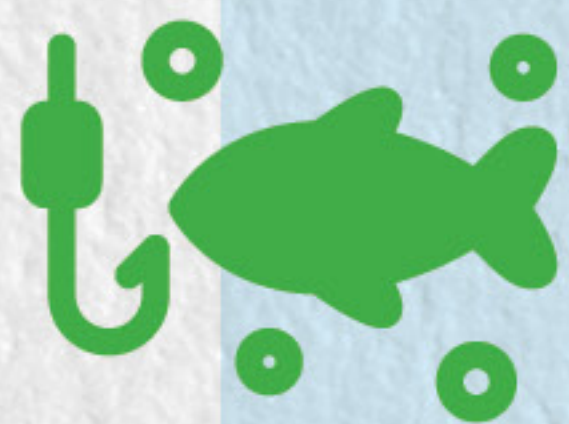
The fire coral *Millepora alcornonis* and the queen angelfish (*Holocanthus ciliaris*) on the reefs of Abrolhos, northeastern Brazil.

Photo: João Paulo Krajewski

RECOMMENDATIONS



- Prioritize reef conservation at regional level, including reef responses to local impacts (such as fishing and pollution) and global impacts (such as climate change). These actions should occur in conjunction with coastal management initiatives;



- Urgently reinstate comprehensive national fishing statistics, with a specific focus on reef areas. This is a crucial step for informing the development of effective management and conservation strategies for fishery resources, ensuring both food security and social welfare of coastal populations;



- Implement effective guidelines for promoting sustainable fisheries and their recovery, as well as law enforcement and management of MPAs and their buffer zones. These guidelines play a critical role in ensuring the success of MPAs, fisheries, and compliance among various interested parties;



- Strengthen the existing network of MPAs to mitigate local impacts and foster connectivity between the tropical (North and Northeast) and subtropical (Southeast and South) regions, considering the potential shifts in distribution and occurrence of coral and fish species due to climate change;



- Prioritize conservation actions in reef areas, contributing to the control of the climate crisis and to the maintenance of the ecosystem services they provide to Brazilian society, including artisanal fishing and tourism;



- Map and conduct a thorough study of Brazilian mesophotic reefs to enhance our understanding of their biodiversity, functioning, and potential anthropogenic impacts.

ABOUT REEFSYN

The “ReefSYN - Brazilian Reefs in the Anthropocene” project integrates biodiversity data from Brazilian reefs to unravel spatial patterns of diversity and its determinants, understand the effects of climate change and local impacts such as fishing on reef biodiversity, and associated ecosystem services.

ABOUT SinBiose

The Brazilian Synthesis Center on Biodiversity and Ecosystem Services (SinBiose) supports the development of knowledge synthesis to tackle current issues in biodiversity and ecosystem services. The initiative is led by CNPq, with the support from the Ministry of Science, Technology and Innovation (MCTI) and state research foundations. Learn more at www.sinbiose.cnpq.br.

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