

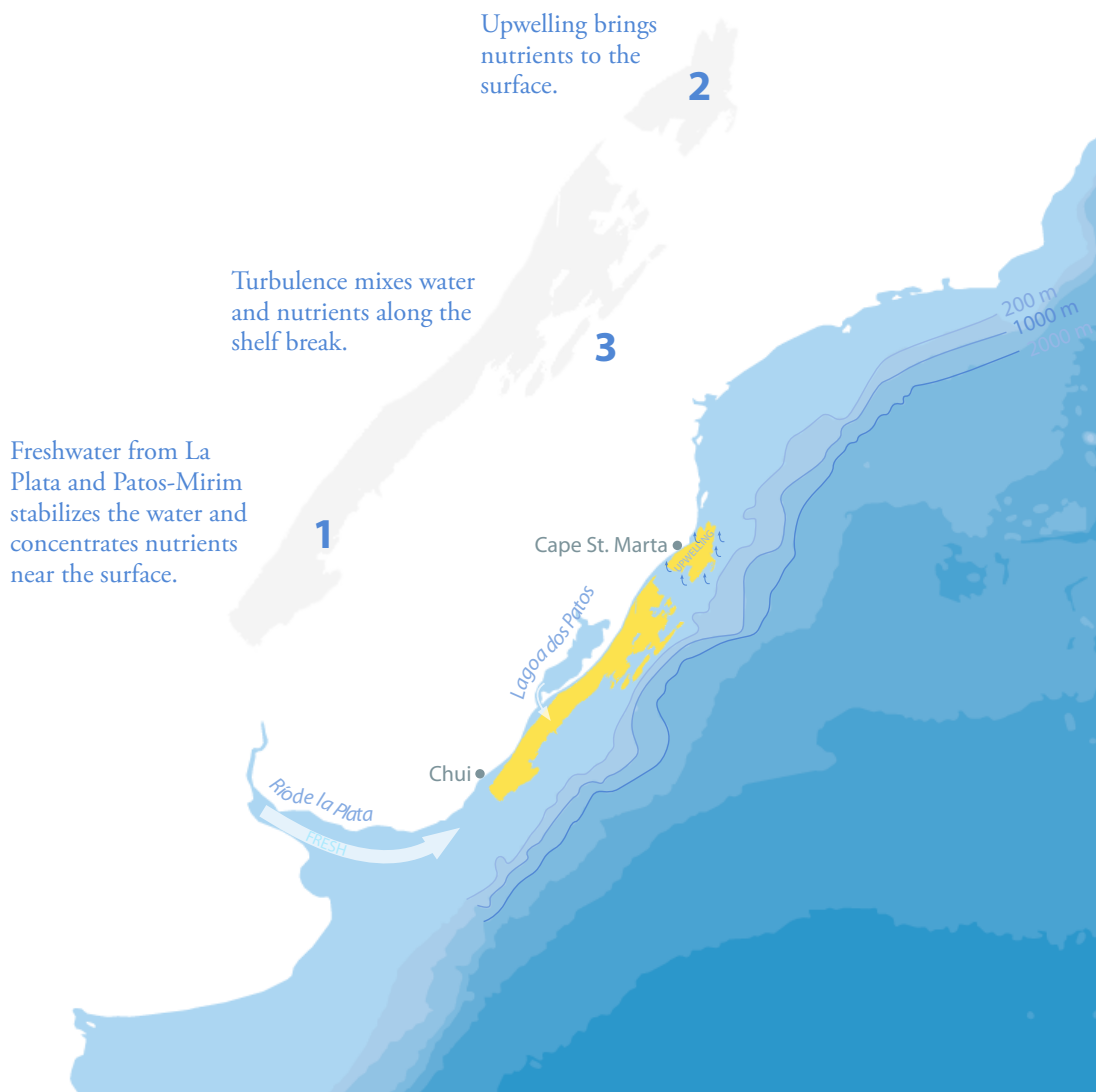
Hotspots in the south-western Atlantic Ocean

Human activities influence marine ecosystems. So does the ocean itself.

The biodiversity of the South Brazil Shelf is closely related to processes in the ocean. Variations in the ocean propagate through the food chain, from nutrients to algae and further on to fish, birds and mammals.

Three main biodiversity hotspots have been identified. These are located in regions where currents and upwelling support high levels of nutrients and biological production.

Global warming is expected to change the circulation off the coast of Brazil. Being aware of changes in currents and upwelling is vital to preserving both the natural environment and fisheries.



Birds, fish and animals thrive in the South Brazil Bight. This richness is closely linked to ocean currents and river run-off. When the physical environment changes, ecosystems and fishing grounds could also change.

The southwestern Atlantic Ocean is among the most important global ocean hotspots. During the Southern Hemisphere spring and summer, northeasterly winds cause upwelling along the coast, also helped by the regional circulation. This brings nutrient-rich water to the surface layer, allowing algae to bloom.

Zooplankton feed on the algae, creating spawning conditions for pelagic fish. Meanders and eddies in the water spread the fish larvae, helped by plumes of freshwater from the Patos-Mirim complex and the La Plata River.

Because these physical features affect the ecosystems, local as well as large-scale changes in the ocean are likely to impact the life-cycle of organisms on the South Brazil shelf.

Hotspots on the shelf

Three overall hotspot areas have been identified, coinciding with areas of specific oceanographic processes.

Southern, coastal hotspot

The southern region is influenced by freshwater from the La Plata River and Patos Lagoon estuary. Freshwater propagates north as a plume, creating fronts and a stable surface layer. This introduces nutrients and increases biological production, providing suitable conditions for several groups of species throughout their life cycles.

Northern, coastal hotspot

What is a hotspot?

Biodiversity hotspots are areas with one or more of the following:

- many different species
- many rare, threatened or endangered species
- high complementarity
- high taxonomic distinctiveness

In an upwelling area around Cape Santa Marta, South Atlantic Central Water intrude at 100–500 meters' depth. Bottom turbulence brings nutrients to the upper layers, causing a zone of high primary production and zooplankton biomass. The intensity of the upwelling modulates the abundance of plankton, fish eggs and larvae.

Shelf break hotspot

The shelf break is characterized by intense meanders of the Brazil current. These meanders and the resulting turbulence generate downwelling and upwelling that increase the phytoplankton and zooplankton biomass, enhancing biological production in the region.

A diversity of fish

The highest diversity is distributed along the shelf break and slope between 200 and 1000 m. Fish eggs and larvae hotspots are concentrated and spread towards the inner continental shelf near Cape Santa Marta, while the hotspot in the north reach a depth of 2000 meters.

Cartilaginous fish have hotspots in the coastal zone and inner continental shelf between Cape Santa Marta and Chui. Teleost fish associated with reef habitats are restricted to the continental shelf. Most of the region is rich in teleost fish not associated with reef habitats.

A maximum of 508 species of seabird are found along the coastline and in local estuaries. The variety of species falls as one approaches the outer shelf, for birds as well as for marine mammals.

Implications for human activities

The distribution of fish eggs and larvae can indicate the location and condition of spawning habitats and provide key information on the fish populations in the region. Such information can also guide the implementation of Marine Protected Areas, expected to act as a source of larvae for local fisheries.

Summary and key points

- **Interconnected ecosystems:** The biodiversity of the South Brazil Shelf is intimately linked to the ocean's physical processes, such as currents and upwelling.
- **Biodiversity hotspots:** Three critical areas of rich marine life correlate with regions of high nutrient levels and biological productivity, influenced by oceanic currents.
- **Climate change impacts:** Anticipated changes in global climate could affect the ocean's circulation patterns, with significant consequences for both natural habitats and fisheries.
- **Ecosystem health:** Changes in the physical ocean environment can lead to shifts in ecosystem dynamics and fish population distributions, which are central to local fishing industries.

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Under a changing climate, it is important to protect spawning habitats and fish stocks as a means to procure food security.

- **Spawning grounds:** The distribution of fish eggs and larvae informs us about the health of spawning habitats, which is vital for maintaining fish populations.

What's at Stake?

- **Marine Protected Areas:** Identifying and protecting biodiversity hotspots is essential for the creation of MPAs, which help sustain local fisheries and ensure a stable source of fish larvae.
- **Adaptation strategies:** Understanding oceanic changes enables the development of proactive strategies to protect marine life and secure food resources in the face of climate change.



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