Title/Name of the area: Amazonian Shelf-edge Reefs, Canyons and Seamounts

Presented by

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Abstract (*in less than 150 words)*

The Amazon River mouth has a complex mosaic of geologic and geomorphological features, comprising shelf-edge reefs, canyons, ravines and seamounts. This area has one of highest values of chlorophyll biomass and primary productivity in the world. The shelf-edge reefs represent one of the few hard substrates in the Amazon continental shelf, being well known that such substratum inside muddy bottoms can increase 50-100 times the number of species. The area harbors the faunal corridor of South America, which extends beyond the Amazon River mouth, includes the hump of Brazil and serves as a connection between south-western Atlantic with the Caribbean zoogeographical provinces. Even virtually unknown, surveys in the area already revealed a diverse fish and octocoral fauna. The distance from the coast and the great depths ensures a high degree of naturalness, whilst it prevents access to the area for small vessels and prevent fishing with trawl.

Introduction

The shelf off the Amazon River has more than 300 km wide and gently inclined, with an overall gradient of 1:2,240 until the shelf break at 100 m deep (Milliman, 1979). The inner shelf initiates approximately at the 20 m isobaths (15 km away from the coast along the northeast of Pará State), where transgressive siliciclastic marine sands start to occur. Most of the sand is composed by well sorted clear quartz (Zembruscki *et al*., 1971). The outer shelf is dominated by carbonate sedimentation, both in the form of sand and reefs that have been dated at 17,000 years BP (Milliman and Barreto, 1975). In the continental slope sediments are mainly composed by mud of continental origin.

Within the aforementioned area, Figueiredo Jr. et al. (2008) and Costa (1997) pointed out the occurrence of shelf-edge reefs in the continental shelf border, whilst expeditions of "PIATAM Oceano" Project collected a high number of live hermatipic and ahermatipic corals. On the continental slope, in depths ranging from 300 to 4000 m, ravines, seamounts and canyons has been reported, being the largest one known as Amazon Canyon.

Location

The proposed area covers the transition region between the shelf and continental slope from the Amapá State to northern State of Maranhão. It is diagonally located across the region following the break-platform slope between coordinates 043º and 051º W and 00 º 10' S and 05º 40' N. It covers the 80 m isobath extending to 4000 m. It includes the Canyon of the Amazon and other

smaller canyons, ravines in the central and south part, and seamounts in the north of Maranhão State.

It is an oceanic transition area within national jurisdiction. This area is not subject to a submission to the Commission on the Limits of the Continental Shelf.

Feature description of the proposed area

The area includes environments such as shelf-edge reefs, muddy bottoms, seamounts and canyons. The reefs occur between the isobaths of 80 and 100m, rising to over 20 m from the bottom adjacent (Figueiredo Jr. *et al*., 2008). Costa (1997) termed the area of these reefs as ecofacies 11, echo character penetrating subsurface reflectors inclined toward the continental slope. Muddy sediments of continental origin dominate the continental slope. Submarine canyons, like the Amazon canyon, are prominent geomorphological features of this area. These canyons represent indentations on the continental shelf with slopes of 2/80 kilometers. Further important features include the seamounts that are also virtually unknown.

The shelf-edge reefs represent one of the few hard substrates in the Amazon continental shelf, being well known that such substratum rounded by muddy bottoms can increase 50 to 100 times the number of species (Little and Kitching, 2001). Feitoza et al. (2005), supported by Gilbert (1972) and Uyeno et al. (1983), presented evidence that the faunal corridor of South America (Collette and Rutzler, 1977), which extends beyond the Amazon mouth area, includes the hump of Brazil and serves as a connection between cold habitats in southern Brazil and the Caribbean. The occurrence of reef fish species such as the snowy grouper, the tiger grouper (*Mycteroperca tigris*), the yellowedge grouper (*Epinephelus flavolimbatus*), the dusky grouper and the sea bass recorded in the northern shelf-edge region or even on the upper slope of the current study area, reinforces the hypothesis of a dispersion corridor for deep reef fishes along the South American continental margin, connecting the south-western Atlantic with the Caribbean zoogeographical provinces (Olavo et al., 2011).

Submarine canyons support high concentrations and a great diversity of marine wildlife. Physically, they are complex, with outcrops, steep slopes, and different classes of substrates. They also provide a high flux of fine-particle nutrients and often encompass areas of upwelling, which are associated with high biological productivity. Submarine canyons are also major hotspots of biological production and fisheries catch (Breaker and Broenkow, 1994; Sobarzo et al., 2001). Smith et al. (2010) point to the importance of submarine canyons as “hotspots” for cetacean diversity and abundance. Evidence from cetacean range shifts during oceanographic perturbations suggests that submarine canyons may serve as ecological refuges from the impact of ocean perturbations (Benson *et al*., 2002).

Feature condition and future outlook of the proposed area

The area was defined as having high priority for conservation of coastal and marine biodiversity in Brazil (MMA, 2007). However, despite their ecological and economic importance, the area is virtually unknown (geomorphology, geology, hydrodynamic and biota). In order to increase the knowledge about the area, the project Tropical Marine Environments, one of the Brazilian National Institutes of Science and Technology (INCT Mar), will carry out studies focusing on the geodiversity and biodiversity on the areas between depths of 50 and 800 m.

Assessment of the area against CBD EBSA Criteria

The proposed area satisfies several criteria of CBD EBSA as (i) it represents a geographical region with unique oceanographic characteristics (area with the largest discharges of sediment

carried to the ocean in the world and greater extent of the Brazilian continental shelf, located at the mouth of the world's largest river in flow and extent), virtual ignorance of its biota (**Uniqueness** or **rarity**), (ii) the great potential for biological diversity (**Biological diversity**) and (iii) its location within the oceanic region, which virtually has guaranteed its preservation from human actions (**Naturalness**).

CBD EBSA Criteria (Annex I to decision IX/20)	**Description** (Annex I to decision IX/20)	**Ranking of criterion relevance** (please mark one column with an X)			
		Don't Know	**Low**	**Some**	**High**
Uniqueness or rarity	Area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features				**X**
Explanation for ranking - The area includes the faunal corridor of South America (Collette and Rutzler, 1977), which extends beyond the Amazon mouth area, includes the hump of Brazil and serves as a connection between cold habitats in southern Brazil and the Caribbean (Gilbert, 1972; Feitoza *et al*., 2005; Olavo *et al*., 2011). - The mosaic formed by different types of bottoms (gravel, mud, sandstone reefs), bathymetries (ranging from 80 to 4000m), reliefs (steep slopes in canyons and flat areas outside canyons) and unique marine environments (like seamounts), covers the area of high biological and ecological importance, despite the virtual lack of knowledge about its biota. -					
Special importance for life-history stages of species	Areas that are required for a population to survive and thrive.	**X**			
Explanation for ranking - The low knowledge about the biota and ecosystems do not permit to rank this criterion.					
Importance for threatened, endangered or declining species and/or habitats	Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.				**X**
Explanation for ranking - Within this area, juveniles of the declining red snapper *Lutjanus purpureus* (Souza, 2002) and more than 35 elasmobranchs species are found (Souza and Fonseca, 2008). Among elasmobranchs, at least 14 species are under some sort of threat (Camhi *et al*., 2007).					
Vulnerability,	Areas that contain a relatively high			**X**	

fragility, sensitivity, or slow recovery	proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.				
Explanation for ranking - The large number of elasmobranchs species, with low fecundity, long life and slow recovery recommend attention to the area, since it can be became an important place for these species future conservation.					
Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity.				**X**
Explanation for ranking - The location in the Amazon river plume characterizes the area as eutrophic, with maximum chlorophyll *a* concentration of 25.5 $mg.l^{-1}$ and primary production of 8 $g.C.m^{-2}.d^{-1}$ (Smith Jr. and DeMaster, 1996; Santos et al., 2008), representing some of the highest values of these parameters recorded in oceanic waters in the world (Figure 2).					
Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.			**X**	
Explanation for ranking - The varied topography (100 to 4000 m with abrupt slope in some areas) and seafloor composition (both hard and soft substrate) is highly likely to support a diverse array of species (based on other studies on shelf-edge reefs and canyons on the Brazilian coast). Studies carried out, even a few studies, on the area have shown high diversity of octocorals (30% of the species recorder for Brazil are present on the area) (Cordeiro, 2012), fishes (more than 200 species) and elasmobranchs (more than 35 species) (Souza and Fonseca, 2008).					
Naturalness	Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation.				**X**
Explanation for ranking - The great distance from the coast ensures a high degree of naturalness, as it prevents access to the area for small vessels. Similarly, the high depths prevent fishing with trawl, even there are some fisheries using longline and traps.					

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