

5c – 10411 Potential for increasing captures and limiting factors in the Brazilian Exclusive Economic Zone

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Introduction

From 1995 to 2005, the Brazilian Ministry of the Environment, in a joint effort with the National Research Council (CNPq), the Brazilian Navy, PETROBRAS and the scientific community specialized in oceanography and fisheries from universities and research institutes developed the REVIZEE program (Assessment of the Sustainable Yield of the Living Resources in the Exclusive Economic Zone). This program resulted from the commitment undertaken by Brazil on ratifying the United Nations Convention on Law of the Sea (UNCLOS). Its main scope was to attain significant advances in the inventory of the living resources and of the environmental characteristics of their occurrence, as well as biomass and sustainable catch estimates of the fishing resources within the 3.5 million km² of the ZEE. The REVIZEE program was developed in two phases, the first one was state-of-the-art reviews on fisheries (Paiva, 1997) and on fishing surveys (Haimovici et al. 2007). In the second phase, the 8,500 km long coastline was divided into four large regions: 1) North, with a wide muddy bottom continental shelf under the influence of the North Brazil warm current and the Amazon River discharge that enhances productivity; 2 and 3) both Northeast and Central, mostly with narrow shelves with hard bottoms under the influence of the warm and poor in nutrients Brazil Current; 4) the South, with a wide sandy and muddy shelf with relatively high productivity due to the seasonal influence of the La Plata River and the cold Malvinas current.

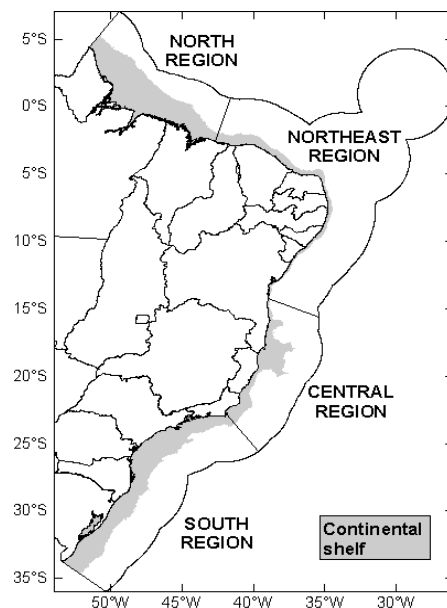
Exploratory fishing and surveys were performed in all four regions, as well as sampling programs on the fishery statistics, fleet dynamics and stocks assessment of species already under exploitation, but not yet sufficiently studied. Reports on these issues can be downloaded from www.mma.gov.br. The REVIZEE program focused mainly on the resources of the outer shelf, slope and oceanic waters of the EEZ and was oriented to the industrial fishing resources.

Main Results

The fisheries: landings from marine and estuarine fishing from 2000 to 2003 were near 500,000 t. The industrial fishing fleet, with 3,000 boats over 20 t TRB, and 30,000 fishers was responsible for 47% of the landings. From the social point of view, small scale or artisanal fisheries were far more important since they involved 270,000 fishers and around 27,000 rowing, sailing and motorboats under 20 t TRB (10-12m) and were responsible for 53% of the total landings. For a review of estuarine and coastal fisheries consult Isaac et al. (2006) (www.mileniodomar.org.br). Industrial fishing amounted for 85% of the landings in the South while in the three other regions, small scale fishing was dominant and ranged from 76% to 95%, involving far more fishers.

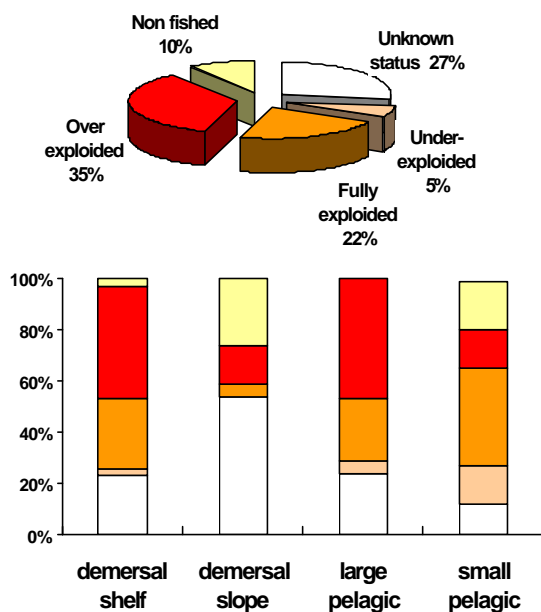
The surveys: they presented regional particularities due to previous research experience, expected target species, type of bottoms and available geared vessels. However, a general picture of the fishing potential was achieved. Trawling surveys totaled 445 hauls. In the South, mean density in the 100-600 m depth range was 1.299 kg/km²; in the Central region (250-2200m), it was 370 kg/km², and in the North (10-639m), 511 kg/km² and 996 kg/km².

Large pelagic fish surveys were performed in all regions totalizing 425 hauls. Most were carried out



with monofilament nylon longlines, light attraction and squid as bait and caught preferentially swordfish *Xiphias gladius*, with higher yields in the Central and North regions. Sharks, mainly *Prionace glauca* had the highest yields in the South, tunas in the South and North and billfishes in the Central region. Pelagic acoustic surveys included 24,672 km of echointegration with 200 sampling hauls with midwater trawls. Between the 100 and 1500 m isobaths in the South, the estimated biomasses ranged from 1.40 to 2.08 million tons, with large densities of anchovies, *Engraulis anchoita*, cuttlasfishes *Trichiurus lepturus*, lanternfishes *Maurollicus stehmanni* and squid *Illex argentinus*. In the Central region, pelagic biomass was small and almost all of longspine porcupine fish *Diodon holocanthus* and in the Northeast was almost null. Demersal longline fishing included 424,395 hooks soaked in 443 hauls. In 3 h hauls, the yields per 1,000 hooks were 169 kg and 72,6 kg respectively, in the South and in the Central regions. In the Northeast, bottom longline fishing yields were about 271 kg but estimated with a small number of long hauls in the very narrow slope. Handline fishing was too heterogeneous for comparisons among regions. Fishing with traps totalized 770 hauls and 3,500 soaked traps. Fish rectangular traps caught gulf-hake *Urophycis mystacea* in the South and Central regions and lutjanids in Northeast and North regions. Crustacean circular traps caught red and golden crabs *Chaceon notialis* and *C. ramosae* (0,699 to 1,52 kg/trap) in the South, *C. ramosae* in the Central region (0,166 kg/trap) and *Chaceon* sp in the Northeast (0,5 to 4 crabs/trap). The giant isopod *Bathinomus spp* occurred in all regions but was dominant in the North.

EXPLORATION STATUS, 152 STOCKS



Stock assessment. overall, 152 stocks of fish and shellfish were assessed based on the best available information, some only through experts' educated guesses: 32,7% were considered to be overexploited or collapsed; 22,9%, fully exploited, 15,7% lightly or not exploited and 28,8% of unknown status. However, all important stocks on the shelf and upper slope in every region as well as the large pelagic fishes of the oceanic adjacent waters have been fully exploited or collapsed.

Conclusions

The perspective of increasing the Brazilian EEZ fishing production is limited to the large pelagic fishes in the North and Central regions and to *Engraulis anchoita* and *Illex argentinus* in the South. However, these two species present sharp seasonality and large year to year variability in their abundance. The REVIZEE Program showed that there are few options to expand marine fishing in Brazilian EEZ. The present state of the fisheries is not just due only to environmental limitations but is also caused by the excessive industrial fishing capacity and unspecific licensing that made sequential overfishing easier. Besides, unsound trawling practices have produced high discard rates, worsening the state of the stocks. So far, Brazil has not been capable of keeping acceptable landing records and controlling the fishing effort effectively. Historically, management has promoted the development of industrial fisheries but this approach is no further possible and management should prioritize sustainability and avoid future collapses.

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