

# Information Sheet on Ramsar Wetlands

Categories approved by Recommendation 4.7 of the Conference of the Contracting Parties.

NOTE: It is important that you read the accompanying *Explanatory Note and Guidelines* document before completing this form.

## 1. Date this sheet was completed/updated:

December 97 / updated December 1999

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Designation date

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Site Reference Number

## 2. Country:

Brazil

**3. Name of wetland:** Parque Estadual Marinho (State Marine Park) do Parcel Manoel Luís including the Baixios do Mestre Álvaro and Tarol

## 4. Geographical coordinates:

Manoel Luís Bank

Lat.00°46'S e Long. 44°15'W

Lat.00°46'S e Long. 44°21'W

Lat.00°58'S e Long. 44°21'W

Lat.00°58'S e Long. 44°09'W

Lat.00°50'S e Long. 44°09'W

Álvaro Bank

Lat.00°16'S e Long. 44°49'W

Lat.00°16'S e Long. 44°50'W

Lat.00°19'S e Long. 44°50'W

Lat.00°19'S e Long. 44°49'W

Tarol Bank

Lat.00°57'S e Long. 44°45'W

Lat.00°57'S e Long. 44°46'W

Lat.00°58'S e Long. 44°45'W

Lat.00°58'S e Long. 44°46'W

## 5. Altitude: (average and/or max. & min.)

Sea Level to an average depth of 30m

**6. Area:** (in hectares) The Decree that creates the area states an area of 45,237 ha. However, recently Nautical Chart No. 400 was digitized and an area of 34,556 ha was obtained, but the areas of the Álvaro and Tarol Banks have not yet been digitized.

## 7. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

Oceanic region where normal faults occurred with rocky flourishings, probably dolerite, which gave rise to an extensive coralline formation. Until further clarification as to the classification of the Manoel Luís coralline formation, it will be called CORAL BANK. In this bank there are several associations among the benthonic life forms, specifically among the algae and other sessile beings such as cnidarian hydrocorals, rocky corals, octocorals and among the porifera and several larval forms and other beings such as polychaetes, ophiuras, in fact a profusion of life forms that live in harmony in the marine environment.

## 8. Wetland Type (please circle the applicable codes for wetland types as listed in Annex I of the *Explanatory Note and Guidelines* document.)

marine-coastal: A · B · C · D · E · F · G · H · I · J · K

inland: L · M · N · O · P · Q · R · Sp · Ss · Tp · Ts  
· U · Va · Vt · W · Xf · Xp · Y · Zg · Zk

man-made: 1 · 2 · 3 · 4 · 5 · 6 · 7 · 8 · 9

Please now rank these wetland types by listing them from the most to the least dominant:

9. Ramsar Criteria: (please circle the applicable criteria; see point 12, next page.)

1a · 1b · 1c · 1d · 2a · 2b · 2c · 2d · 3a · 3b · 3c · 4a · 4b

Please specify the most significant criterion applicable to the site: 4b

10. Map of site included? Please tick *yes*  -or- *no*

(Please refer to the *Explanatory Note and Guidelines* document for information regarding desirable map traits).

11. Name and address of the compiler of this form:

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*Please provide additional information on each of the following categories by attaching extra pages (please limit extra pages to no more than 10):*

12. Justification of the criteria selected under point 9, on previous page. (Please refer to Annex II in the *Explanatory Note and Guidelines* document).

1c

Ogden & Gladfelter (1983) call attention to the need to analyze the interaction among mangrove swamps, marine phanerogam meadows and coralline formations, the three largest tropical coastal ecosystems. Not much study has been done on this, in spite of the fact that issues related to coastal zone development have no borders.

Coral reefs are closed ecosystems only if productivity is considered (in the symbiosis between the zooxanthellae and the corals, gorgonians and other coelenterates that they live in). However, if we view from the perspective of consumers, they are open systems, since there is a large quantity of fish and invertebrate involved in migratory movements between the reefs and other ecosystems (id).

Still according to Ogden & Gladfelter (1983), mangrove swamps and marine phanerogam meadows are open ecosystems, true nutrient exporters, increasing the secondary productivity of coral reefs by providing

alternative feeding sites. But the characteristic of retaining sediments is of special interest to coralline formations, that need clear waters. Their significance becomes clear when those systems undergo alterations. As a rule, the most critical impacts occur from land to sea, the most common being coral reefs receiving impacts from other ecosystems rather than the opposite.

#### 1d

Together with the Parcel de Paredes, these are the only coral reefs distant from the coast in Brazil in which coral pinnacles appear on the surface.

In the biogeographical region of the North Coast of Brazil, wherein lies the Parcel Manoel Luís, in particular the Manoel Luís and Álvaro banks, the only coralline formations with live corals are to be identified in this platform, setting the northern limit of coral distribution in the country. This statement is in agreement with Laborel (1970) and Castro (1999) in their recent report for the Workshop "Assessment and Priority Actions for the Conservation of the Coastal Zone and Marine Biodiversity" held in Porto Seguro, Bahia, on October 25-29, 1999. They indicate an yet unexplored area in the North, corresponding to the Ceará coast, where there is evidence of the existence of other banks between Manoel Luís and Cabo de São Roque (Rio Grande do Norte).

#### 2a

It supports a sizeable amount of rare or endangered species, such as the endangered jewfish (*Epinephelus itajara*), the rare marbled grouper (*Epinephelus inermis*), the rare purple reef fish (*Chromis scotti*) to be found only in the Parcel, and the hawksbill turtle (*Eretmochelys imbricata*) and the green sea turtle (*Chelonia mydas*), besides the endemic species of the area such as the coral *Millepora sp.*

Coura (1994, 1995), Amaral et al.(1998), Hudson et al. (1999), Medeiros & Castro (1999) and Castro (1999) identify that in this region are to be found almost all the coral species that form reefs recorded in the Brazilian Northeast.

#### 2b

Coral reefs are recognizably the largest genetic banks of marine fauna all over the world because of their tropical calcareous structures in shallow waters which provide support to a variety of marine animals and plants. It is a complete ecosystem. Ogden & Gladfelter (1983) even consider them biologically more complex than other systems due to the intimate symbiosis between plants and animals. They are at the same time primary producers, primary and secondary consumers as well as responsible for building the reef structure by their continuous growth (Coura, 1994).

#### 2c

Coral banks operate as nurseries for several marine species and as feeding sites, particularly for ichthyofauna.

#### 2d

A species of *Millepora* and a species of *Scolymia* are being described based on samples collected in the Parcel Manoel Luís by Fernanda Amaral from the University of Pernambuco.

A new species of octocoral *Muriceopsis sp* is being described (sensu Medeiros, 1998) with an occurrence restricted to Brazil. Up to now specimens have been identified from the Parcel Manoel Luís to the Ponta do Lucena in Paraíba (Medeiros & Castro, 1999).

There are also cnidarian species with restricted distribution in Brazil such as: *Millepora braziliensis*, *Mussismilia hispida*, *Phyllogorgia dilatada*, *Favia gravida*, *F. lepdophyla* (the latter is mentioned in Hetzel & Castro 1994 as being endemic to the south of Bahia, but now its distribution is extended to the Parcel Manoel Luís).

The mollusk *Strombus goliath* is also an example of the Brazilian endemic species that occurs in the Parcel Manoel Luís (Silveira & Oliveira, 1999).

Rocha (1999) makes the following observations for the ichthyofauna recorded in the Parcel Manoel Luís:

- *Gramma brasiliensis*, *Starksia brasiliensis* and *Lythrypnus brasiliensis* are endemic species of the Brazilian coast living on the Manoel Luís bank;

- *Thalassoma noronhanum*, previously known in the Atol das Rocas, Fernando de Noronha, Paraíba and Pernambuco, is very common in the Parcel Manoel Luís;

- *Gillellus cf. uranoidea*, known from the south of Florida and the Caribbean Sea;

- *Starksia aff. lepicoelia*, previously known in the Caribbean region is recorded in the Western South Atlantic;

- *Coryphopterus thryx*, previously known in the Caribbean region and recently (1996) mentioned for the first time in the Brazilian Southeast, is recorded for the first time for the Brazilian Northeast;

- *Chromis scotti* known in Bermudas, North Carolina, southern Florida, Bahamas, Jamaica, Belize, Colombia and Curacao, is recorded for the first time in the Western South Atlantic;

- *Opistognathus aff. aurifrons*, known previously in the Florida Keys and the Caribbean Sea, has its distribution expanded to the Brazilian Northeast (Maranhão);

- *Priolepsis dawsoni*, previously known in the Atol das Rocas and the Bahia coast has its geographic and bathymetric distribution expanded; it has been collected in the Parcel Manoel Luís at depths between 12 and 25m, being quite common in small caves (in the Atol das Rocas it was collected at 10m).

Rocha adds that the results on fishes further reflect the lack of knowledge and indicate the need to carry out basal research on the reef fishes of the Brazilian Northeast. Several species have morphological and color differences when compared to the Caribbean populations that bear further analysis.

In spite of the above information, the knowledge of the endemism issue, both for fauna and flora of the region, is still very restricted.

#### 4

The scientific project "Composition and Structure of the Fish Community of the Marine State Park of Parcel Manoel Luís" was developed with the participation of researchers from the Federal University of Paraíba and aimed at increasing knowledge of the fish communities of the region. The support of resources from the Small Grants Fund and the Secretariat for Amazon Affairs of the Ministry of Environment, through the Maranhão Environment and Water Resources Management (GAMA) was extremely important to carry out this work.

#### 4a

Survey of the ichthyofauna existing in the Parcel Manoel Luís carried out by Rocha (1999) recorded the existence of 132 species belonging to 52 families of fish in this Park (Annex II). The same author describes that some species are closely linked to their micro-habitat and can only be found in certain areas of the Parcel Manoel Luís. The structure of the community was determined through randomly chosen

visual stationary surveys. The results obtained indicate that the diversity is high, and no numeric dominance of a specific species over the others was observed. The most frequent and abundant species in the central part of the Parcel Manoel Luís was the *Acanthurus chirigus*. The most abundant families were *Acanthuridae*, *Scaridae*, *Haemulidae*, *Pomacentridae* and *Lutjanidae*.

#### 4b

There are several species of commercial interest such as the dog snapper (*Lutjanus jocu*), the black grouper (*Mycteroperca bonaci*), the Cubera snapper (*Lutjanus cyanopterus*), the horse-eye jack (*Caranx latus*), the yellowtail snapper (*Ocyurus chrysurus*), among others that use the area as a feeding, development and breeding site.

We highlight the following conclusions on the Parcel Manoel Luís ichthyofauna contained in Rocha (1999):

The Parcel Manoel Luís region is the northern limit of distribution of several species endemic to the Brazilian coast. This region is limited to the south by sandy barriers of the eastern coast of Maranhão and the Parnaíba delta and to the north by the mouth of the Amazon.

Observations were carried out on ecological interactions, and one that still had not been recorded involved the shark sucker (*Echeneis naucrates*) and *Scaridae*. The absence of specialized cleaning fishes was noted, where *Anisotremus virginicus* and *Bodianus pulchellus* were the only cleaners present in the area. Feeding interactions were also observed involving follower fish (*Carangoides bartholomaei* and *Dasyatis americana*; *Mycteroperca bonaci* and *Gymnothorax funebris*; *Halichoere spp.* and *Pseudupeneus maculatus*), and agonistic behavior related to territorialism in *Holocentrus ascencionis*, *Stegastes spp.*, *Bodianus rufus* and *Opistognathus aurifrons*.

A strong tendency to zonation was seen related to the depth and complexity of the floor, three areas being distinguishable with characteristic ichthyofauna: the tops of pinnacles, the ground between the pinnacles and their vertical walls, and the sandy bottom.

The surveys carried out in the central region of the pinnacles showed the Parcel Manoel Luís to be a rich, diversified region with a low level of perturbation, strengthening its importance as an area of protection of the reef ichthyofauna of Brazil.

### 13. General location: (include the nearest large town and its administrative region)

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Situated on the northern Brazilian Coast, Maranhão Continental Shelf

Distances: 86.3km from Maiaú Island

179.19km north of the São Luís Island

51.32km from the continental slope

Administrative Region: State of Maranhão, Brazil

### 14. Physical features: (e.g. geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth water permanence; fluctuations in water level; tidal variations; catchment area; downstream area; climate)

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- Floor substrate

There are hard grounds (rocky, granite or dolerite) corresponding to a normal fault of tectonic origin that enable the reef formations and a mobile, biodegradable substrate (calcareous algae, corals, spicules and microorganisms).

Around the main axis of the Coral Bank the bottom varies from 25m to 35m, with white sand of varying granulometry, small pinnacles covered in corals, algae, sponges and other benthic beings.

#### - Characterization of the Regional Climate

The climatology of the Maranhão coastal region is quite complex, reflecting an ample climatic variety from the point of view of rainfall, but not much thermal variation. All months have an average temperature greater than 25°C.

According to Koppen, the regional climate is type Aw' (tropical with one rainy season and average temperature of the coldest month higher than 18°C).

Estimates for the Parcel Manoel Luís: rainfall not greater than 1,400mm/year; evaporation is around 1,000mm/year; annual insolation is approximately 2,300 hours.

#### - Water Temperature

Average temperature 28.0°C, considered normal for the northeastern region; in the Parcel Manoel Luís region, there are isotherms of 27.6°C (SUDENE, 1976).

#### - Winds

Winds can reach 25 knots from August to December. Direction east and northeast. In Barth & Costa (1968), the wind in this region is described as mostly E to ESSE with an average speed of 20 knots, on a trip aboard the N.A. Saldanha.

#### - Salinity

35.5‰ and 35.10‰ (SUDENE, 1976)

#### - Currents and Tides

According to Barth & Haulia (1968) and Barth (1969) who analyzed maritime currents between Recife (Pernambuco) and Cabo Orange (Amapá), the South Equatorial Current has its axis approximately 5° South, crosses the Atlantic continuing the Benguela Current, meeting the South American coast between Recife and Natal, where it branches into two: one branch goes south (Brazil Current) and the other goes NW. The latter moves parallel to the coast, making most of the Amazon River water go NW over the large Amapá shelf. The water of the South Equatorial Current is aged, because throughout its entire trajectory (from the African to the South American Coast) it does not meet any important resurgence areas, so that the number of surface fish species that make up schools is reduced. The amount of nutrient salts increases only where the current meets the shelf and where, through turbulence and occasional and temporary resurgences, the primary production reaches higher figures. These waters, now richer in mineral salts and plankton, flow according to the current direction, also parallel to the coast in a NW direction, always remaining at a greater distance from the continent, specially in areas where the shelf widens as in the coast of Piauí and Maranhão.

Although Barth & Haulia (1968) recorded that the region between Natal and São Luís was under the absolute influence (during their second collection trip aboard the N.A. Saldanha) of the South Equatorial Current, which allowed, in depths of up to 80m, development of more plankton through turbulence and coastal influence; on the first trip the continuity of fertilization was on a greater or lesser scale, interrupted by the invasion of purely oceanic water. The authors further recorded strong 20 knots winds, which due to their direction, strength and duration resulted in the transport of surface water of the high seas to the coast. And, as a consequence of the constant SE winds the resurgence phenomena could not

occur in the region between Natal and São Luís, since the oceanic water with more than 36%0 fills the whole shelf up until the coast. Barth & Costa (1968) explained that the strong winds caused drift currents influencing to a depth of 20/25m, where the speed is reduced by half. In this way there is displacement of tropical oceanic waters in the surface in the direction WSW at a depth of 20/25m to S (which seems to explain the occurrence of green waters in certain periods of the year, observed during field activities of the team associated to GAMA during the Parcel Manoel Luís research activities).

According to Barth & Costa (1968) studies on the biological characterization of the water masses with different geographical origins show that the *Leuciferinae* (planktonic crustaceans) through their presence or absence indicate superimposition of portions of water with different origins. Plankton samples collected by the N. A. Saldanha in 1967/68 recorded the occurrence of *Leucifer typus* and *L. faxoni* on the north coast. Reduced amounts of *L. typus* were collected in areas close to the Parcel Manoel Luís. In the Park region its absence is noted. On the other hand *L. faxoni* had an average richness of 10 individuals/100 m<sup>3</sup> of water in the period October - November 1967. In the areas close to the south and to the west of the Parcel Manoel Luís (Álvaro bank) its occurrence was double - 20 individuals/100 m<sup>3</sup>. But in April/May 1968 its absence was observed in surface water and its occurrence was only 5 individuals/100m<sup>3</sup> in vertical collections.

The distribution maps of this work show that there are gaps in the distribution of *Leucifer* between the 44 and 46°W parallels and below 0°S. This work also found other gaps in the distribution for the region of Recife and Rio Grande do Norte for example, whose cause was determined to be the approximation of the South Equatorial Current to the coast, with the formation of a counter-current moving below the surface current in the opposite direction, to the high seas, that is there are formations of physical oceanographic phenomena which need to be studied in greater depth. But the scarcity or temporary lack of the *Leuciferinae* in restricted regions indicates, perhaps, the vertical invasion of deep waters in which these animals do not live.

In the coast of the Reentrâncias the strong tide currents predominate, but on the southwest the Guyana Current (NW branch of the South Equatorial Current) has greater influence (Stride, 1992).

Variation in the tide of the Parcel Manoel Luís is quite smaller than on the coast, probably not more than 1.5m. There is a 2.5 hr difference in time with respect to São Luís. Its influence is felt twice a day, since the tide is semi-diurnal with diurnal, perfect inequality (2 high tides and 2 low tides a day).

Normally the Parcel Manoel Luís waters are blue, with a visibility of more than 30m depth and more than 50m horizontally at depths of 20m. When the green waters occur, visibility drops to approximately 15m.

#### **15. Hydrological values:** (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc)

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Initially, since the formation of the Parcel Manoel Luís is strictly marine, consisting of coral banks, considering the complex shelf on which it is inserted (between two valleys and in front of vast sand banks) and furthermore the strength of the tide currents, we could infer that the Manoel Luís Bank provides protection that assists in coastal stabilization. However, if we look more closely at the dimension of the formation of the coral banks, the shelf and the sand banks and the distance from the coast, we will see that this function, if it occurs, is reduced and would need to be further examined.

#### **16. Ecological features:** (main habitats and vegetation types)

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Odum (1972) explains that although corals are animals (*Coelenterata* phylum), a coral reef is not a heterotrophic community but rather a complete ecosystem, with a large trophic structure that includes a large biomass of green plants. In fact, some red calcareous algae (*Lithothamnion*, specially the *Porolithon* genus) could be of equal or greater importance in the coralline formation, particularly on the side of the sea, since they resist better to the effect of the waves. These algae contribute not only to the construction of the reef, but also to its primary production. Thus, a coral reef is in reality a reef of coral and algae.

In the Parcel Manoel Luís, up to now, no representatives of *Lithothamnion* were found, but the calcareous algae are well represented by the genus *Halimeda* (Coura, 1994).

**17. Noteworthy flora:** (indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc)

We still do not have analysis of the occurrence of endemism, rarity, endangered species of biogeographical importance of the marine algae found in the Parcel Manoel Luís. But a specialist of the region (Marco Valério Cutrim, professor at the Federal University of Maranhão) is joining the team with a specific project.

Initial survey of the Marine Flora of the Parcel Manoel Luís:

| Kingdom                      | Class              | Species                         |
|------------------------------|--------------------|---------------------------------|
| Plantae                      | Clorophyceae       | <i>Caulerpa mexicana</i>        |
|                              |                    | <i>Codium isthmocladum</i>      |
|                              |                    | <i>Valonia aegrophylla</i>      |
|                              |                    | <i>Halimeda incrassata</i>      |
|                              |                    | <i>Halimeda opuntia</i>         |
|                              |                    | <i>Halimeda sp.</i>             |
|                              |                    | <i>Codium isthmoclaum</i>       |
|                              |                    | <i>Udotea sp.</i>               |
|                              |                    | <i>Ulva Fasciata</i>            |
|                              | Phaeophyceae       | <i>Dictyopteris delicatula</i>  |
|                              |                    | <i>Dictyota sp.</i>             |
|                              |                    | <i>Sargassum sp.</i>            |
|                              |                    | <i>Dictyota dichotoma</i>       |
|                              | Rhodophyceae       | <i>Spatoglossum schroederii</i> |
|                              |                    | <i>Hypnea musciformis</i>       |
|                              |                    | <i>Gracilaria sp.</i>           |
|                              |                    | <i>Gelidium sp.</i>             |
|                              |                    | <i>Amansia multifida</i>        |
|                              |                    | <i>Bryothamnion seoforthu</i>   |
| <i>Cryptonemia crenulata</i> |                    |                                 |
| <i>Corallina sp</i>          |                    |                                 |
| <i>Jania adherens</i>        |                    |                                 |
|                              | <i>Amphiroa sp</i> |                                 |

Source: Coura (1994) revised and expanded by Cutrim (personal communication)

**18. Noteworthy fauna:** (indicating, e.g., which species are unique, rare, endangered, abundant or biogeographically important; include count data, etc )

Ongoing research in the region allowed us to make inferences on the distribution of the species in this region and their relation/similarity to the Brazilian and Caribbean coasts. Some specific cases are being



further studied as is the case of the *Millepora* genus (with a possible occurrence of a new species) and in the case of the genus *Muriceopsis*. Further information on endemism is described in item 12, sub-item 2d of this information sheet. In item 12 there is also a summary of the information on the ichthyofauna of the Parcel Manoel Luís (sub-items 2 and 4).

In the report by Silveira & Oliveira (1999) we have the following information about the material collected in the banks of Parcel Manoel Luís, Álvaro and Tarol: 21,970 organisms were collected in the Parcel Manoel Luís thus distributed: annelids were dominant with 10,361 individuals, followed by protozoa with 3,310, arthropods with 2,964, mollusks with 2,660 specimens, cnidarian with 2,128 specimens, followed by the organisms with smaller richness (see Table I in Annex II).

The material collected in the Álvaro and Tarol banks had a smaller number of organisms than those in the Parcel Manoel Luís with respect to the number of individuals. The Tarol bank showed a greater amount (2,366), when compared to Álvaro bank (649), but with respect to the diversity of species, the Álvaro bank had more. However the Parcel Manoel Luís was well represented in terms of diversity and number of specimens (21,970). It should be highlighted that there were differences in the number of collections carried out in these places.

Out of all the organisms collected (647) in the Álvaro bank, the crustaceans were more numerous with 255 individuals, followed by polychaetes - 105, mollusks - 73 (see Table II in Annex II).

In the Tarol bank the most representative organisms were: foraminifera (1,824), crustaceans (131) and bryozoa (17) (see Table III in Annex II).

Among the most representative or most easily observed creatures in the associations of coralline environments (by collected samples) are the cnidaria, algae, sponges, polychaete annelids, mollusks, crustaceans, equinoderms (besides fish, target of more specific observations).

Some of these organisms such as sponges, mollusks and worms, such as the annelids, contribute greatly to the equilibrium of this ecosystem since they provoke erosion and open spaces for new species, besides contributing to the formation of the sediment that fills the empty spaces of the reefs, Hetzel & Castro (1994).

Among the corals found in the Parcel Manoel Luís are the true corals which are very important to the construction of coral reefs since these animals segregate calcium carbonate by the base of the polyp, forming the external skeleton (id.).

There are corals that develop better in places of greater depth and low lighting, while others such as the *Meandrina sp* prefer clear and calm waters (id.).

Among the organisms that live in the Parcel Manoel Luís present in the samples, the polychaete have the greatest richness, particularly the *Eunicidae* family, followed by the *Syllidae*, which according to Colin (1978) is a sponge parasite. It should be stressed that the polychaete annelid families mentioned in the work carried out by Colin (1978) in the Caribbean reefs were similar to those found in the Parcel Manoel Luís and in the Álvaro bank, while for the Tarol bank up to now polychaete annelids have not been identified.

Out of the organisms found in the researched samples, the crustaceans were well represented in all ecosystems. According to Colin (1978) these organisms live in sponges, corals and algae in search of food

and shelter. In fact when anesthesia was applied and the sponge samples were fixed a considerable amount of young crustaceans left the insides of the sponges (personal communication from Coura).

In the Parcel Manoel Luís *Siderastrea* were found. According to research carried out by Echeverria (1997) in the Atol das Rocas the same genus was found with a high tolerance for the limits of high temperatures, being very common in the Brazilian coralline reefs, showing a high plane of segmentation in turbulent waters.

The cnidaria in the Parcel Manoel Luís are quite similar to that found in the Álvaro bank, while that of the Tarol bank is different, since it is dominated by calcareous algae.

Based on the material sent by the State Environment Agency, the following identifications were made by the professors Clóvis Barreira e Castro, Débora de Oliveira Pires (both from the cnidarian area) and Eduardo Hajdu (porifera area), who collaborated in this project. The identified examples have been deposited in the collections of the National Museum in Rio de Janeiro:

- Álvaro bank: the corals *Montrastea cavernosa* and *Agaricia agaricites* and the sponges *Haplosclerida*, *Niphatidae* family and *Xestospongia sp.*

- Parcel Manoel Luís: cnidarian *Agaricia agaricites*, *A. fragilis*, *Meandrina braziliensis*, *Montrastea cavernosa*, *Porites astreoides*, *Scolymia wellsi*, *Mussismilia hispida*, *Siderastrea stellata*, *Favia gravida*, *Phyllogorgia dilatada*, *Plexaurella dichotoma* and *Muriceopsis sp.*; zoanthid *Palythoa caribaerum*; sponges *Cynachyrella kuekenthali*, *Halichondria sp.* and *Xestospongia sp.*; and *Bryozoa*.

The cnidarian identified by Amaral et al (1998) and Hudson et al (1999) that live in the Parcel Manoel Luís are: 4 hydrocorals – *Millepora alcicornis*, *M. braziliensis*, *Millepora sp.* *Stylaster roseus*; 13 corals – *Agaricia agaricites*, *A. fragilis*, *Favia gravida*, *F. leptophylla*, *Madracis decactis*, *Meandrina braziliensis*, *Montastrea cavernosa*, *Mussismilia hispida*, *Porites astreoides*, *P. branneri*, *Scolymia wellsi*, *Scolymia sp* and *Siderastrea stellata*; and another 3 cnidaria – anemone *Condylactis gigantea*, zoanthid *Palythoa sp.* and gorgonian *Phyllogorgia dilatada* (the examples referring to the material identified above are deposited in the collection of the Reef Environment Laboratory of the Federal University of Pernambuco).

Coura (1994) made the following observations about the fauna in general:

Although it is in the route of continental migratory birds, only isolated seagulls were observed. The presence of marine turtles is frequently, 4 or 5 are seen daily, some gigantic. The fish commonly seen by divers were: barracudas, triggerfish, pompano (+18kg), red snapper, muttonfish, grouper, jewfish, *guaraximbora*, common jack, amber fish and the horse-eye jack. There are also other fish with no economic relevance: red parrotfish, *piramboca*, hogfish and the black angelfish, the latter being very abundant.

Emerenciano (1978) cites the following species that made up the fishing product of dropline fishing close to the Parcel Manoel Luís: snapper (*Lutjanus purpurus*), the groupers (*Mycteroperca pheuax* and *Epinephelus mesrio*), yellowtail snapper (*Ocyurus chrysurus*), dog snapper (*Lutjanus jocu*), Crevalle jack (*Caranx hippos*) and mutton snapper (*Lutjanus analis*). It also reports the occurrence of the spiny lobster (*Panulirus argus*), the locust lobster (*Scyllarides brasilienses*) and the cape verde lobster (*Panulirus laevicauda*) until around 46.3 km to the north of the Manoel Luís reef.

The two species of *Panulirus* mentioned above were also mentioned for Fernando de Noronha (IBAMA/FUANTURA, 1990b).

In the study on the neoplanktons carried out by Barth (1969) for the north coast of Brazil the record may be seen of a region with more than 100 fish larvae/100m<sup>3</sup> of water analyzed from the area of the Parcel Manoel Luís. This is the only region in the coast of Maranhão with this figure. The author explains that the regions with a higher occurrence to the north of São Luís (Maranhão), to the north of Salinópolis (Pará) on the Amazon shelf and to the east of Cabo Orange (Amapá) are influenced by the entrance of river waters, rich in nutrients, in the case of the area close to São Luís, through the various rivers that discharge in the São Marcos Bay; close to Salinópolis by the river Pará; and close to Cabo Orange by the northern branch of the Amazon. Close to this high concentration area two areas with no larvae were recorded, one next to the area of highest concentration just above the São Marcos bay and the other next to the coast from the São José Bay until close to the Piauí coastline, also observed at the height of the Amazon estuary. The author suggests two possible explanations for the need for further study: these are stationary halostatic waters and thus aged, or a superficial shallow layer of oceanic water from the South-Equatorial current which invaded the shelf and slid over the water influenced by the river waters, specifically heavier because of the number of suspended particles, specially at the mouth of the Amazon.

**19. Social and cultural values:** (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

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The area is very important in fishing production because it exports fish to other places and has inestimable scientific value, being an unique ecosystem on the Brazilian coast, bringing together characteristics of the reefs of the Brazilian coast and of the Caribbean seas.

This region, hydrographed for the first time by Baron de Houssin in 1829, has already received the nickname ship cemetery (Guedes 1971), since it is not possible to visually observe the proximity of the banks except when one is too close. It was only in the early seventies that the region received signs from the Barca Farol 1 (Lighthouse Vessel), even then the vessel is displaced fairly frequently due to the dynamics and strengths of the tide currents, so accidents may still occur.

During the research developed between 1993 and 1999 an agreement was signed with the company Acqua Marítima Tecnologia Submarina LTDS and thirteen sunken ships (intact and broken up) were found in the Parcel region. More historical research is needed, but based on the few recovered artifacts and on the routes followed by the ships listed as capsized on the Maranhão coast, we have already positive identification of ships sunk in 1984, 1962 and 1921.

Archeological Sites - various wrecks from 6 ships: in an area of approximately 40,000 m<sup>2</sup> were found several wrecks were found among the pinnacles that make up the east point of the Parcel Manoel Luís. These are parts of ships that were separated from the main hull during the initial impacts against the coral pinnacles. Since the conditions for diving are difficult, little research has been done up to now in the region.

**20. Land tenure/ownership of:**

(a) site

Property of the Federal Government, under administration of the State of Maranhão since the creation of the State Marine Park of Parcel Manoel Luís was authorized by the Ministry of the Navy and the Ministry of Environment.

(b) surrounding area

---

All the area included within 12 nautical miles from the coast until the limit of 200 nautical miles is under the regime of the Exclusive Economic Zone, according to the Law of the Sea in force.

**21. Current land use:**

(a) site

Scientific research and leisure

(b) surroundings/catchment

Navigation, fishing and leisure

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**22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects:**

(a) at the site

As factors that may promote changes in this Park we may cite climatic changes (in the region some coral colonies may already be seen with a bleaching effect, although the cause cannot yet be fully explained).

In the past there have been several verifiable accidents of ships sinking in that region, and it is possible that more accidents may occur since the area is very close to the navigation route of the São Marcos bay. Even with the technological development brought by GPS, navigation is still dangerous. In the cases of accidents with ships, the possibility of oil and/or cargo spills must be considered, as well as the impact between the ship and the coral bank.

If certain precautions are not taken, tourism may generate impacts such as those from fishing (specially underwater fishing that, in principle, is prohibited), collection of fauna samples for purposes other than scientific, anchoring of vessels on coralline formations, lack of care with waste generated on board these vessels (that may even bring problems for tourists since food leftovers thrown into the sea attract carnivorous fish such as sharks).

(b) around the site

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The main risk factors to the environment are fishing (specially trawling and lobster) and possible oil spills (specially from the washing of hulls) - currently none have been recorded.

**23. Conservation measures taken:** (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

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With the support we have obtained specially from the Ministry of Environment and the Ramsar Convention (SGF) besides the participating researchers we now have an area diagnosis which is enabling the development of the Management Plan for the Parcel Manoel Luís, based on guidelines from Ramsar (1997), IBAMA (1996) and IUCN (Kelleher & Kenchington, 1992). It should be concluded in January 2000.

**24. Conservation measures proposed but not yet implemented:** (e.g. management plan in preparation; officially proposed as a protected area etc.)

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Up to now none of the documents mentioned above are available, since this is still a largely unknown

area. But the staff of the State Environment Agency already has a document that establishes norms and procedures for visitors. This was achieved with support from IBAMA, the Federal University of Paraíba, The Federal University of Pernambuco, Revizee (the Program to Assess the Sustainable Potential of the Living Resources of the Exclusive Economic Zone) and Corallus.

**25. Current scientific research and facilities:** (e.g. details of current projects; existence of field station etc.)

---

The Park region has no infrastructure, but a room will be set up in the Maranhão Historical Museum in São Luís with pieces collected from wrecks and with information on the Parcel Manoel Luís for the public.

The partners that we have had up to now for the preliminary surveys have been mostly the Federal Universities of Maranhão, Rio de Janeiro, Pará and Rural de Pernambuco, besides the National Museum of Rio de Janeiro.

**Current Projects:**

BITTENCOURT, J.B. & COURA, M.F. 1994. State Coastal Zone Management Program. Agreement 008/94 MMA/PNMA/PNGC and Sema/Ma.

CASTRO, A C.L. de; et al. 1996-99. Dynamics of populations and assessment of stocks. LABOHIDRO/ UFMA under agreement with MMA/ MCT/ MM.

**Projects not yet begun:**

COURA, M.F. 1998. Development of Management Plan for the State Marine Park of Parcel Manoel Luís, Phase 2. Presented to the MMA through Proecotur.

**26. Current conservation education:** (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

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We have two folders distributed in the newspaper "O Imparcial": VIVA - Especial Series on Ecology, ano I n° 1 e 2. and a leaflet about the Gerco/Ma.

We have two video tapes (VHS), Diving in Brazil and Acqua Marítima.

Another video is being prepared based on the field activities carried out in 1997 through an agreement between MMA/SCA and Sema/Ma.

**27. Current recreation and tourism:** (state if wetland is used for recreation/tourism; indicate type and frequency/intensity)

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Due to the difficulties found in local navigation, tourism is still not very intense, although this area is very attractive to divers, both amateurs and professionals.

However, there are recommendations that only experienced divers (advanced stage) should dive in these waters. This is because of the dynamics of the local currents and other physical characteristics (distance from the coast, difficulties for assistance in case of accidents), with the main objective of ensuring the safety of the visitors. The main attractions are scenic beauty, diversity of marine creatures concentrated on this bank and the wrecks.

**28. Jurisdiction:** (territorial e.g. state/region and functional e.g. Dept of Agriculture/Dept. of Environment etc.)

Property of the Federal Government, under administration of the State of Maranhão since the creation of the State Marine Park of Parcel Manoel Luís was authorized by the Ministry of the Navy and the Ministry of Environment.

All the area included within 12 nautical miles from the coast until the limit of 200 nautical miles is under the regime of the Exclusive Economic Zone, according to the Law of the Sea in force.

**29. Management authority:** (name and address of local body directly responsible for managing the wetland)

Gerência de Qualidade de Vida - GQV  
 Gerência Adjunta do Meio Ambiente e Recursos Hídricos – Gama  
 Supervisão de Estudos e Monitoramento Ambientais – SEMA  
 Serviço de Zoneamento Ecológico e Econômico – SZEE  
 Programa Estadual de Gerenciamento Costeiro – Gerco/Ma

Endereço: Av. Euclides Figueiredo, s/n.º, Calhau, São Luís/Ma, Brasil  
 Postal address: Caixa Postal: 1008, São Luís/Ma, CEP.: 65.001 – 970.  
 Tel.: (98) 246 8429 / Fax: (98) 246 7999 / 248 1101  
 E-mail : lino.a.moreira@brazilmail.com

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**Annex I - Charts that include the State Marine Park of Parcel Manoel Luís**

| Item | Name of Chart/Map   | Scale       | Year | Base                    | Type                | Area of coverage   | Contents  |
|------|---|-------------|------|-------------------------|---------------------|--|---|
| 01   | CARTA NAÚTICA 400   | 1:317.010   | 1970 | DHN                     | PLANIALTIME<br>TRIC | Mouth of the Gurupi River until Santana Island.              | Navigation guides (navigation buoys and beacons) access channels, ports e harbors and details of the coastline and logistic support information |
| 02   | SETORIZAÇÃO DO LITORAL MARANHENSE PARA ESTUDO DO GERCO/MA                             | 1:1.250.000 | 1997 | Mapa Rod. do DER do Ma. | THEMATIC            | Mouth of the Gurupi River to the mouth of the Parnaíba River | Sectorization of the Maranhão coast   |
| 03   | UNIDADES DE CONSERVAÇÃO DA ZONA COSTEIRA DO MARANHÃO                                  | 1:1.250.000 | 1997 | Mapa Rod. do DER do Ma. | THEMATIC            | Mouth of the Gurupi River to the mouth of the Parnaíba River | Protected areas of the Maranhão coast   |
| 04   | CORREÇÃO DA CARTA NAÚTICA 400 QUANTO A POSIÇÃO E FORMA DO BANCO DE CORAIS MANOEL LUÍS | 1:55.000    | 1994 | Carta Náutica 400 – DHN | PLANIALTIME<br>TRIC | State Marine Park of Parcel Manoel Luís                      | Coralline formation and bathymetry  |
| 05   | CARACTERIZAÇÃO CLIMÁTICA -<br>DIFERENCIAÇÃO CLIMÁTICA **                              | 1:2.000.000 | 1995 | Sudene                  | THEMATIC            | Mouth of the Gurupi River to the mouth of the Parnaíba River | Climatic differentiation  |
| 06   | CARACTERIZAÇÃO CLIMÁTICA -<br>NEBULOSIDADE **   | 1:2.000.000 | 1995 | Sudene                  | THEMATIC            | Mouth of the Gurupi River to the mouth of the Parnaíba River | Cloudiness  |
| 07   | CARACTERIZAÇÃO CLIMÁTICA -<br>PRECIPITAÇÃO  | 1:2.000.000 | 1995 | Sudene                  | THEMATIC            | Mouth of the Gurupi River to the mouth of the Parnaíba River | Maximum rainfall  |

|    |  |             |      |        |          |  |                  |
|----|--|-------------|------|--------|----------|--|------------------|
|    | MÁXIMA**   |             |      |        |          |  |                  |
| 08 | CARACTERIZAÇÃO<br>CLIMÁTICA -<br>PRECIPITAÇÃO MINIMA** | 1:2.000.000 | 1995 | Sudene | THEMATIC | Mouth of the Gurupi River to<br>the mouth of the Parnaíba<br>River | Minimum rainfall |
| 09 | CARACTERIZAÇÃO<br>CLIMÁTICA -<br>PRECIPITAÇÃO MÉDIA ** | 1:2.000.000 | 1995 | Sudene | THEMATIC | Mouth of the Gurupi River to<br>the mouth of the Parnaíba<br>River | Average rainfall |

\*\* Charts prepared and digitized by the Gerco/Ma staff, with support from consultants in the interpretation of thematic areas, in the Laboratório de Geoprocessamento do Gerco/Sema/Ma.

## Annex II – Organisms captured in the banks of Parcel de Manoel Luís, Álvaro and Tarol and placed in the benthos collection of the Federal University of Maranhão

Table 1- Organisms captured in the State Marine Park of Parcel de Manoel Luís.

| PHYLLUM  | CLASS                 | FAMILY       | GENUS        | SPECIES                        | Nº OF INDIVIDUALS |
|----------|-----------------------|--------------|--------------|--------------------------------|-------------------|
| Porifera | Sponge                | -            | -            | -                              | 173               |
| Porifera | Demospongiae(Sponge)  | Haliclonidae | Haliclona    | <i>Haliclona sp</i>            | 06                |
| "        | Sponge                |              | Avrainvillea | <i>Avrainvillea asarifolia</i> | 01                |
| "        | Demospongiae(Sponge)  |              | Hemectiyon   | <i>Hemectiyon ferox</i>        | 01                |
| "        | "                     |              | Ágelas       | <i>Ágelas ciathrodes</i>       | 02                |
| "        | "                     |              | Xestospongia | <i>Xestospongia muta</i>       | 01                |
| "        | "                     |              | Ircinia      | <i>Ircinia strobilina</i>      | 01                |
| Cnidaria | Anthozoa (Coral)      | -            | -            | -                              | 181               |
| Cnidaria | Anthozoa (Coral)      | -            | Millepora    | <i>Milepora sp</i>             | 12                |
| Cnidaria | Anthozoa (Coral)      | -            | Meandrina    | <i>Meandrina sp</i>            | 18                |
| Cnidaria | Anthozoa (Coral)      | -            | Favia        | <i>Favia sp</i>                | 07                |
| Cnidaria | Anthozoa              | -            | Agaricia-    | <i>Agaricia-sp</i>             | 13                |
| "        | "                     |              | Astrangia    | <i>Astrangia solitária</i>     | 03                |
| "        | "                     |              | Mussismilia  | <i>Mussismilia sp</i>          | 04                |
| "        | "                     |              | Scolymia     | <i>Scolymia sp</i>             | 02                |
| "        | "                     |              | Porites      | <i>Porites sp</i>              | 01                |
| "        | "                     |              | Siderastrea  | <i>Siderastra radians</i>      | 08                |
| "        | "                     |              | Siderastrea  | <i>Siderastrea sp</i>          | 05                |
| Cnidaria | Anthozoa (Anemone)    | -            | Condylactis  | <i>Condylactis gigantea-</i>   | 02                |
| Cnidaria | Anthozoa (true coral) | -            | -            | -                              | 01                |
| Cnidaria | Anthozoa (octocoral)  | -            | Phylogorgia  | <i>Phylogorgia dilatada</i>    | 27                |
| Cnidara  | Anthozoa (octocoral)  | -            | -            | -                              | 01                |
| "        | "                     |              | Leptogorgia  | <i>Leptogorgia miniata</i>     | 01                |
| "        | "                     |              |              |                                | Colony            |
| "        | "                     |              | Muriceopsis  | <i>Muriceopsis sp</i>          | Colony            |
| "        | Ctenophora            |              |              |                                | 01                |
| Cnidaria | "                     | -            | Physalia     | -                              | 01                |
| Cnidaria | Bryozoa               | -            | -            | -                              | 1822              |

|             |                             |              |             |                               |       |
|-------------|-----------------------------|--------------|-------------|-------------------------------|-------|
| Cnidaria    | Hydrozoa                    | -            | -           | -                             | 18    |
| Mollusca    | "                           |              |             |                               | 01    |
| Mollusca    | Bivalvia                    | -            | -           | -                             | 717   |
| Mollusca    | Bivalvia                    | Muricidae    | Pinna       | <i>Pinna cornea</i>           | 01    |
| Mollusca    | Gastropoda                  | -            | -           | -                             | 1867  |
| "           | "                           | Strombidae   | Stromus     | <i>Strombus sp</i>            | 01    |
| "           | "                           | "            | "           | <i>Olivella watermani</i>     | 01    |
| "           | Gastropoda (Nudibraquia)    | Facelinidae  | -           | -                             | 01    |
| Mollusca    | Polyplocophora              | -            | -           | -                             | 71    |
| Protozoario | Rhizopodea (Foraminifero)   | -            | -           | -                             | 3310  |
| Arthropoda  | Crustacea                   | -            | -           | -                             | 2,805 |
| "           | "                           | -            | Panulirius  | <i>Panulirius laevicauda</i>  | 09    |
| "           | Pycnogonida                 |              |             |                               | 01    |
| Arthropoda  | Arachnida                   | -            | -           | -                             | 148   |
| Arthropoda  | Pycnogonida                 | -            | -           | -                             | 01    |
| cnodermata  | Echinoidea (Ouriço regular) | -            | Diadema     | <i>Diadema antillarum</i>     | 04    |
| cnodermata  | Stelleroidea                | -            | -           | -                             | 29    |
| cnodermata  | Stelleroidea (ophiuroida)   | -            | -           | -                             | 190   |
| "           | "                           | -            | Ophyurderma | <i>Ophyurderma rubicundum</i> | 01    |
| "           | Stelleroidea (asteroidea)   | -            | -           | -                             | 63    |
| "           | "                           |              | Echinaster  | <i>Echinaster spinulosus</i>  | 01    |
| Annelida    | Polychaeta (not identified) | -            | -           | -                             | 7703  |
| "           | Polychaeta                  | Serpullidae  | -           | -                             | 56    |
| "           | "                           | Operculidae  | -           | -                             | 05    |
| "           | "                           | Amphinomidae | -           | -                             | 47    |
| "           | "                           | "            | Amphitrite  | -                             | 01    |
| "           | "                           | Terebellidae | -           | -                             | 01    |
| "           | "                           | Sepunculidae | -           | -                             | 08    |
| "           | "                           | Syllidae     | -           | -                             | 1249  |
| "           | "                           | Cerratulidae | -           | -                             | 02    |
| Annelida    | Polychaeta                  | Syllidae     | Syllis      | <i>Syllis cornuta</i>         | 411   |
| Annelida    | Polychaeta                  | Syllidae     | Syllis      | <i>Syllis ferrugina</i>       | 36    |

|              |            |              |              |                                       |        |
|--------------|------------|--------------|--------------|---------------------------------------|--------|
| Annelida     | Polychaeta | Nereididae   | -            | -                                     | 39     |
| Annelida     | Polychaeta | Nereididae   | Nereis       | <i>Nereis pelagica</i>                | 11     |
| Annelida     | Polychaeta | Nereididae   | Nereis       | <i>Pseudonereis<br/>gallapagensis</i> | 02     |
| Annelida     | Polychaeta | Nereididae   | Nereididae   | <i>Notomastu lobatuss</i>             | 01     |
| Annelida     | Polychaeta | Amfaretidae  | Isolda       | <i>Isolda pulchella</i>               | 01     |
| Annelida     | Polychaeta | Serpulidae   | Vermiliopsis | <i>Vermiliopsis<br/>acanthophora</i>  | 08     |
| Annelida     | Polychaeta | Eunicidae    | -            | -                                     | 645    |
| Annelida     | Polychaeta | Eunicidae    | Eunice       | <i>Eunice cariboea</i>                | 97     |
| Annelida     | Polychaeta | Amphinomidae | Eurythae     | <i>Eurythae complanata</i>            | 04     |
| Annelida     | Polychaeta | Cirratulidae | -            | -                                     | 02     |
| Annelida     | Polychaeta | Arabellidae  | Drilonereis  | <i>Drilonereis cf. filum</i>          | 03     |
| Annelida     | Polychaeta | Arabellidae  | Arabella     | <i>Arabella mutanns</i>               | 01     |
| Annelida     | Polychaeta | Sabellidae   | Chone        | <i>Chone letterstedti</i>             | 07     |
|              | "          | Aphroditidae | "            | "                                     | 02     |
| Annelida     | Hirudinea  | -            | -            | -                                     | 19     |
| certae sedis | -          | -            | -            | -                                     | 69     |
| Nermetinea   | -          | -            | -            | -                                     | 01     |
| Hirudinea    | -          | -            | -            | -                                     | 09     |
| Chordata     | Ascidiacea | -            | -            | -                                     | 08     |
| Total        |            |              |              |                                       | 21,970 |

Source: Silveira & Oliveira (1999)

Table 2 - Organisms collected at the Álvaro Bank-MA.

| PHYLLUM  | CLASS            | FAMILY | GENUS     | SPECIES                     | Nº OF INDIVIDUALS |
|----------|------------------|--------|-----------|-----------------------------|-------------------|
| Porifera | Sponge           | -      | -         | -                           | 19                |
| Cnidaria | Anthozoa (Coral) | -      | -         | -                           | 08                |
| Cnidaria | Anthozoa (Coral) | -      | Meandrina | <i>Meandrina sp</i>         | 13                |
| Cnidaria | Anthozoa (Coral) | -      | Favia     | <i>Favia sp</i>             | 15                |
| Cnidaria | Anthozoa (Coral) | -      | Millepora | <i>Millepora alcicornis</i> | 03                |
|          | "                | -      | Millepora | <i>Millepora sp</i>         | 06                |

|             |                             |           |              |                              |        |
|-------------|-----------------------------|-----------|--------------|------------------------------|--------|
|             | "                           | -         | Agaricia     | <i>Agaricia fragilis</i>     | 01     |
|             | "                           | -         | Scolymia     | <i>Scolymia sp</i>           | 01     |
|             | "                           | -         | Porites      | <i>Porites sp</i>            | 01     |
|             | "                           | -         | Siderastrea  | <i>Siderastrea radians</i>   | 01     |
|             | "                           | -         | Montrastrea  | <i>Montrastrea cavernosa</i> | 02     |
| Cnidaria    | Anthozoa (octocoral)        | -         | -            | -                            | 03     |
| Cnidaria    | Anthozoa (octocoral)        | -         | Phyllogorgia | <i>Phyllogorgia dilatada</i> | 08     |
| Cnidaria    | Anthozoa (octocoral)        | -         | -            | -                            | Colony |
| Cnidaria    | Bryozoa                     | -         | -            | -                            | 07     |
| "           | Hydrozoa                    | -         | -            | -                            | 01     |
| Mollusca    | Bivalvia                    | -         | -            | -                            | 12     |
| Mollusca    | Gastropoda                  | -         | -            | -                            | 57     |
| Mollusca    | Polyplacophora              | -         | -            | -                            | 04     |
| Arthropoda  | Crustacea                   | -         | -            | -                            | 255    |
| Cnidaria    | Stelleroidea (asteroidea)   | -         | -            | -                            | 05     |
| Cnidaria    | Stelleroidea (ophiuroida)   | -         | -            | -                            | 37     |
|             | "                           | -         | Ophiurida    | <i>Ophiurida rubicundum</i>  | 01     |
| Protozoário | Rhizopodea (Foraminifera)   | -         | -            | -                            | 76     |
| Annelida    | Polychaeta (not identified) | -         | -            | -                            | 61     |
| Annelida    | Polychaeta                  | Eunicidae | -            | -                            | 25     |
| Annelida    | Polychaeta                  | Syllidae  | -            | -                            | 19     |
| Cnidaria    | -                           | -         | -            | -                            | 01     |
| Chordata    | Ascidacea                   | -         | -            | -                            | 05     |
| TOTAL       |                             |           |              |                              | 647    |

Source: Silveira & Oliveira (1999)

Table 3 - Organisms collected at Tarol bank - MA.

| PHYLLUM  | CLASS    | FAMILY | GENUS | SPECIES | Nº OF INDIVIDUALS |
|----------|----------|--------|-------|---------|-------------------|
| Cnidaria | Bryozoa  | -      | -     | -       | 17                |
| Mollusca | Bivalvia | -      | -     | -       | 27                |

|             |                           |               |               |                             |       |
|-------------|---------------------------|---------------|---------------|-----------------------------|-------|
| Mollusca    | Bivalvia                  | Myteloidea    | Modiolus      | <i>Modiolus americanus</i>  | 07    |
| Mollusca    | Bivalvia                  | Verenidae     | Ventricolaria | <i>Ventricolaria rigida</i> | 04    |
| Mollusca    | Bivalvia                  | Thachycardium | Thachycardium | <i>Thachycardium magnum</i> | 04    |
| Mollusca    | Bivalvia                  | Ostrea        | Ostrea        | <i>Ostrea cristata</i>      | 01    |
| Mollusca    | Gastropoda                | Cassidae      | Cassis        | <i>Cassis tuberosa</i>      | 04    |
| Mollusca    | Gastropoda                | Strombidae    | Strombus      | <i>Strombus goliath</i>     | 02    |
| Mollusca    | Gastropoda                | -             | -             | -                           | 126   |
| Protozoario | Foraminifero              |               |               |                             | 1824  |
| Arthropoda  | Crustacea                 | -             | -             | -                           | 132   |
| "           | Amphipoda                 |               |               |                             | 07    |
| Cnidaria    | Stelleroidea (asteroidea) | -             | -             | -                           | 05    |
| Cnidaria    | Stelleroidea (ophiuroida) | -             | -             | -                           | 02    |
| "           | Echinoidea                | -             | -             | -                           | 02    |
| Cnidaria    |                           | -             | -             | -                           | 16    |
| Polychaeta  | Amphinomida               |               |               |                             | 31    |
| "           | "                         | Choeia        |               |                             | 01    |
| "           | Nereididae                |               |               |                             | 09    |
| "           | Eunicidae                 |               |               |                             | 72    |
| "           | Syllidae                  |               |               |                             | 70    |
| "           | Terebellidae              |               |               |                             | 01    |
| "           | Cirratulidae              |               |               |                             | 01    |
| "           | Serpulidae                |               |               |                             | 01    |
| TOTAL       |                           |               |               |                             | 2.366 |

### Annex III - List of the Ichthyofauna of the Parcel Manoel Luís, by Luiz Alves Rocha, UFPb, 1999.

132 species were identified, belonging to 52 families, of which 8 are elasmobranchia and 124 bony fishes. Witness specimens (130 examples belonging to 59 species) were deposited at the Ichthyological Collection of the Federal University of Paraíba. The common names listed are those used by the Maranhão fishermen and some were obtained in arvalho Filho (1994). Some species have no common names, usually because they have no commercial interest or are not within the reach of fishermen. The list is in systematic family order, according to Nelson (1994).

#### GINGLYMOSTOMATIDAE

*Ginglymostoma cirratum* (Bonnaterre, 1788) – tubarão lixa

#### CARCHARHINIDAE

*Carcharhinus perezii* (Poey, 1876) – tubarão bico fino

*Rhizoprionodon porosus* (Poey, 1861) – cação-frango

*Sphyrna lewini* (Griffith & Smith, 1834) – tubarão martelo

#### DASYATIDAE

*Dasyatis americana* Hildebrand & Schroder, 1928 – raia manteiga

*Dasyatis guttata* (Bloch & Schneider, 1801) – raia lixa

*Dasyatis sp.*

#### MYLIOBATIDAE

*Aetobatus narinari* (Euphrasen, 1790) – raia chita

#### MEGALOPIDAE

*Megalops atlanticus* Valenciennes, 1846 - camurupim

#### MURAENIDAE

*Gymnothorax funebris* Ranzani, 1840 – moréia verde

*Gymnothorax moringa* (Cuvier, 1829) – moréia pintada

*Gymnothorax vicinus* (Castelnau, 1855)

#### OPHICHTHIDAE

*Ahlia egmontis* (Jordan, 1884)

*Myrichthys ocellatus* (Kaup, 1856) - mututuca

*Ichthyapus ophioneus* (Evermann & Marsh, 1902)

#### SYNODONTIDAE

*Synodus intermedius* (Spix, 1829) - calango

*Trachinocephalus myops* (Forster, 1801) – peixe lagarto

#### BATRACHOIDIDAE

*Amphichthys cryptocentrus* (Valenciennes, 1837) - cuica

*Porichthys kymosemeum* Gilbert, 1968

*Thalassophryne nattereri* Steindachner, 1876

#### EXOCOETIDAE

*Hirundichthys affinis* (Gunther, 1866) – peixe voador

*Parexocoetus brachypterus* (Richardson, 1846)

#### HEMIRAMPHIDAE

*Hemiramphus cf. brasiliensis* (Linnaeus, 1758) - agulha

#### HOLOCENTRIDAE



*Holocentrus ascensionis* (Osbeck, 1765) - mariquita  
*Myripristis jacobus* Cuvier, 1829 - mariquita do olho

#### SCORPAENIDAE

*Scorpaena plumieri* Bloch, 1798 - peixe pedra

#### SERRANIDAE

*Cephalopholis fulva* (Linnaeus, 1758) - Piraúna  
*Dermatolepis inermis* (Valenciennes, 1833) - Garoupa Mármore  
*Diplectrum formosum* (Linnaeus, 1766) - Michole  
*Epinephelus itajara* (Lichtenstein, 1822) - Mero  
*Epinephelus morio* (Valenciennes, 1828) - Garoupa São Tomé  
*Mycteroperca bonaci* (Poey, 1861) - Sirigado  
*Rypticus saponaceus* (Bloch & Schneider, 1801) - Peixe Sabão  
*Serranus baldwini* (Evermann & Marsh, 1900) - Mariquita Pintada  
*Serranus flaviventris* (Cuvier, 1829)

#### GRAMMATIDAE

*Gramma brasiliensis* Sazima, Gasparini & Moura, 1998

#### OPISTOGNATHIDAE

*Opistognathus* aff. *aurifrons* (Jordan & Thompson, 1905)

#### PRIACANTHIDAE

*Priacanthus arenatus* Cuvier, 1829 - Olho de Vidro

#### APOGONIDAE

*Apogon americanus* Castelnau, 1855 - Totó Vermelho  
*Apogon pseudomaculatus* Longley, 1932

#### MALACANTHIDAE

*Malacanthus plumieri* (Bloch, 1786) - Pirá

#### ECHENEIDAE

*Echeneis naucrates* (Linnaeus, 1758) - Rêmora

#### RACHYCENTRIDAE

*Rachycentron canadum* (Linnaeus, 1766) - Beijupirá

#### CORYPHAENIDAE

*Coryphaena hippurus* Linnaeus, 1758 - Dourado

#### CARANGIDAE

*Alectis ciliaris* (Bloch, 1788) - Galo do Alto  
*Carangoides bartholomaei* Cuvier, 1833 - Guarajuba  
*Carangoides crysos* (Mitchill, 1815) - Xixarro  
*Carangoides ruber* (Bloch, 1793)  
*Caranx latus* Agassiz, 1831 - Garacimbora  
*Decapterus* cf. *macarellus* (Cuvier, 1833) - Cavalinha  
*Elagatis bipinnulatus* (Quoy & Gaimard, 1824) - Peixe Rei  
*Trachinotus falcatus* (Linnaeus, 1758) - Pampo Garabebéu  
*Uraspis secunda* (Poey, 1860) - Cara-de-Gato

#### LUTJANIDAE

*Lutjanus analis* (Cuvier & Valenciennes, 1828) - Cioba  
*Lutjanus apodus* (Walbaum, 1792)  
*Lutjanus cyanopterus* (Cuvier, 1828) - Caranha  
*Lutjanus jocu* (Bloch & Schneider, 1801) - Pargo  
*Lutjanus synagris* (Linnaeus, 1758) - Ariacó  
*Ocyurus chrysurus* (Bloch, 1791) - Guaiúba

## HAEMULIDAE

- Anisotremus surinamensis* (Bloch, 1791) - Pirambú  
*Anisotremus virginicus* (Linnaeus, 1758) - Mercador  
*Haemulon aurolineatum* Cuvier, 1829 - Xira  
*Haemulon melanurum* (Linnaeus, 1758) - Sapuruna  
*Haemulon parra* (Desmarest, 1823) - Cambuba  
*Haemulon plumieri* (Lacépède, 1802) - Biquara

## SCIAENIDAE

- Equetus lanceolatus* (Linnaeus, 1758)  
*Pareques acuminatus* (Bloch & Schneider, 1801) - Zumbi

## MULLIDAE

- Mulloidichthys martinicus* (Cuvier, 1829)  
*Pseudupeneus maculatus* (Bloch, 1793) - Saramonete

## PEMPHERIDAE

- Pempheris schomburgki* Müller & Troschel, 1848 – Piaba do Mar

## CHAETODONTIDAE

- Chaetodon ocellatus* Bloch, 1787 – Borboleta jandaia  
*Chaetodon sedentarius* Poey, 1860 – Borboleta Namorada  
*Chaetodon striatus* Linnaeus, 1758 – Peixe Borboleta

## POMACANTHIDAE

- Holacanthus ciliaris* (Linnaeus, 1758) – Paru Verde  
*Pomacanthus arcuatus* (Linnaeus, 1758) – Frade Cinza  
*Pomacanthus paru* (Bloch, 1787) - Frade

## KYPHOSIDAE

- Kyphosus sectatrix* (Linnaeus, 1758) - Piranjica

## CIRRHITIDAE

- Amblycirrhitus pinos* (Mowbray, 1927) - Pinus

## POMACENTRIDAE

- Abudefduf saxatilis* (Linnaeus, 1758) - Saberé  
*Chromis multilineata* (Guichenot, 1855) - Mulata  
*Chromis scotti* Emery, 1968  
*Microspathodon chrysurus* (Cuvier & Valenciennes, 1830) – Donzela Azul  
*Stegastes pictus* (Castelnau, 1855) – Donzela Bicolor  
*Stegastes variabilis* (Castelnau, 1855) – Saberé Amarelo

## LABRIDAE

- Bodianus pulchellus* (Poey, 1860) – Budião Arara  
*Bodianus rufus* (Linnaeus, 1758) – Budião Papagaio  
*Clepticus* sp. – Peixe Alma  
*Halichoeres bivittatus* (Bloch, 1791)  
*Halichoeres cyanocephalus* (Bloch, 1791) – Budião Azul  
*Halichoeres maculipinna* (Müller and Troschel, 1848) – Budião Palhaço  
*Halichoeres poeyi* (Steindachner, 1867) - Budião  
*Halichoeres radiatus* (Linnaeus, 1758) – Budião Verde  
*Xyrichtys* cf. *martinicensis* Valenciennes, 1839  
*Xyrichtys novacula* (Linnaeus, 1758) – Budião de Arcia  
*Thalassoma noronhanum* (Boulenger, 1890)

## SCARIDAE

- Cryptotomus roseus* Cape, 1871

*Nicholsina usta* (Valenciennes, 1839)

*Scarus coelestinus* Cuvier & Valenciennes, 1839 – Bico Verde

*Scarus* sp.

*Sparisoma chrysopterygum* (Bloch and Schneider, 1801) – Papagaio Aquarela

*Sparisoma radians* (Valenciennes, 1839)

*Sparisoma rubripinne* (Valenciennes, 1839) – Papagaio Verde

*Sparisoma aff viride* (Bonaterre, 1788) – Papagaio Espelho

#### DACTYLOSCOPIDAE

*Gillellus cf. uranoidea* Böhlke, 1968

#### LABRISOMIDAE

*Malacoctenus aff. triangulatus* Springer, 1959

*Starksia brasiliensis* (Gilbert, 1900)

*Starksia aff. lepicoelia* Böhlk & Springer, 1961

#### BLENNIIDAE

*Ophioblennius atlanticus* (Valenciennes, 1836)

#### CHAENOPSIDAE

*Emblemariopsis aff. signifera* (Ginsburg, 1942)

#### TRIPTERYGIIDAE

*Enneanectes altivelis* Rosenblatt, 1960

#### CALLIONYMIDAE

*Callionymus bairdi* Jordan, 1887 - Dragãozinho

#### GOBIIDAE

*Coryphopterus dicrus* Böhlke & Robins, 1960

*Coryphopterus thrix* Böhlke & Robins, 1960

*Gobionellus saepepallens* Gilbert & Randall, 1968

*Gnatholepis thompsoni* Jordan, 1902

*Lythrypnus brasiliensis* Greenfield, 1988

*Priolepis dawsoni* Greenfield, 1989

#### MICRODESMIDAE

*Ptereleotris aff. helenae* (Randall, 1968)

#### EPHIPPIDAE

*Chaetodipterus faber* (Broussonet, 1782) – Paru Branco

#### ACANTHURIDAE

*Acanthurus bahianus* Castelnau, 1855 - Barbeiro

*Acanthurus chirurgus* (Bloch, 1787) - Caraúna

*Acanthurus coeruleus* Bloch & Schneider, 1801 – Caraúna Azul

#### SPHYRAENIDAE

*Sphyraena barracuda* (Walbaum, 1792) - Barracuda

#### SCOMBRIDAE

*Scomberomorus cavalla* (Cuvier, 1829) - Cavala

*Scomberomorus brasiliensis* Collette, Russo & Zavala-Camin, 1978 - Serra

#### BITHIDAE

*Bothus sp* – Linguado

#### BALISTIDAE

*Balistes vetula* Linnaeus, 1758 - Cangulo

*Canthidermis sufflamen* (Mitchill, 1815)

#### OSTRACIIDAE

*Acanthostracion polygonius* (Poey, 1876) – Peixe Cofre

#### TETRAODONTIDAE

*Canthigaster aff. rostrata* (Bloch, 1782)

*Sphoeroides spengleri* (Bloch, 1785) - Baiacú

#### DIODONTIDAE

*Diodon hystrix* Linnaeus, 1758 – Baiacú de Espinho