THE DISTRIBUTION AND OCCURRENCE OF THE MARINE MANATEE (*TRICHECHUS MANATUS*) IN THE ESTUARY OF THE MAMANGUAPE RIVER, PARAÍBA, BRAZIL

ABSTRACT

Although the existing historical records of marine manatees in the Brazilian coast since the 17th century, few studies about this species were conducted in Brazil. Among them, the estuary of the Mamanguape River is told to be the main place of this species concentration in the northeastern coast of Brazil, but this one is suffering oppression due to the improvement of human activities which can compromise the ecosystem as a whole. In this way, this work viewed to obtain information about the marine manatee´s ecology and behavior in the estuary of the Mamanguape River, establishing seasonal modifications in its emergence, checking preferable places of occupation and detecting possible human activities which interfere in its biological cycle. With this purpose, it was developed one program for marine manatee groups in the region of Bar of Mamanguape and adjacent, by direct observation and interviews with fishers from 1988 to 1991. During the studies period, 608 monitoring visits were made to Bar of Mamanguape, totalizing 285 watching of isolated or grouped manatees and 2.185 hours of observation in fixed places. The major number of sightings happened from October to May, when the animals were seen more regularly and frequently in groups. From June to September, the animals went to that region sporadically and almost always alone. The biggest group observed was one formed by nine animals and the biggest one of registered animals at the same time was by 11 manatees. It was detected that the human activities which produce many noises in the water interfere with the animals´ behavior, scaring and dispersing the groups. Purse seines, drift and gill nets, used in the region, when closer to the groups, besides scaring away the animals, can be damaged due to the possible collisions with the marine manatees. Already the more resistant gill nets (*caçoás*) imply extreme danger, because can flog the animals and get them to death. It is concluded that the region of the Bar of Mamanguape is of paramount importance for the maintenance of the reproductive cycle of the marine manatee, because it is one of their most concentration in the Northeast of Brazil. Creating restrictive zones within the Area of Environmental Preservation (AEP) of the Bar of Mamanguape and ranking human activities are essential for the preservation of this species.

KEYWORDS: Aquatic Mammals; Occurrence; Conservation Unit; Monitoring; Impact.

DISTRIBUIÇÃO E OCORRÊNCIA DO PEIXE-BOI MARINHO (*Trichechus manatus*) NO ESTUÁRIO DO RIO MAMANGUAPE, PARAÍBA, BRASIL

RESUMO

Apesar da existência de registros históricos de peixe-boi marinho na costa brasileira desde o século XVII, poucos estudos sobre esta espécie foram realizados no Brasil. Entre as informações existentes, o estuário do rio Mamanguape (PB) é relatado como sendo o principal local de concentração da espécie no litoral nordeste do Brasil, entretanto o mesmo vem sofrendo pressões para o incremento das atividades humanas que poderão comprometer o ecossistema como um todo. Desta forma, este trabalho teve como objetivo obter informações sobre o comportamento e a ecologia do peixe-boi marinho no estuário do rio Mamanguape, estabelecendo as modificações sazonais do seu aparecimento, determinando locais preferenciais de ocupação e detectando possíveis atividades humanas que interferem no ciclo biológico do animal. Com esta finalidade entre 1988 a 1991 foi desenvolvido um programa de monitoramento dos grupos de peixes-bois marinhos na região de Barra de Mamanguape e adjacências, através da observação direta e entrevistas com pescadores. Durante o período do estudo foram realizadas 608 saídas de monitoramento na Barra de Mamanguape, totalizando 285 avistagens de peixes-bois marinhos sozinhos ou agrupados e 2.158 horas de observação em locais fixos. Os maiores números de avistagens foram a partir do mês de outubro até o mês de maio, quando os animais foram vistos com maior regularidade e freqüentemente em grupos. Nos meses de junho a setembro, os animais freqüentaram a região esporadicamente e quase sempre solitários. O maior grupo observado foi de nove animais e o maior número de animais registrado ao mesmo tempo foi de 11 peixes-bois marinhos. Constatou-se que as atividades humanas que produzem muitos ruídos na água interferem no comportamento dos animais, assustando e dispersando os grupos. As redes de cerco, de deriva e de espera, utilizadas na região, quando próximas aos grupos, além de espantar os animais, podem ser danificadas devido às eventuais colisões com os peixes-bois marinhos. Já as redes de espera mais resistentes (caçoas), são de extremo perigo, pois podem malhar os animais e levá-los a óbito. Concluiu-se que a região da Barra de Mamanguape é de suma importância para a manutenção do ciclo reprodutivo do peixe-boi marinho, pois é um dos locais de maior concentração no Nordeste do Brasil. A criação de zonas restritivas dentro da APA da Barra de Mamanguape e o ordenamento das atividades humanas são essenciais para a preservação desta espécie.

PALAVRAS-CHAVE: Mamíferos aquáticos; Ocorrência; Unidade de Conservação; Monitoramento; Impacto.

***Natural Resources**, Aquidabã, v.1, n.2, august, 2011.*

*ISSN **2237-9290***

*Section: **Articles***
*Theme: **Aquatic Megafauna***

DOI: 10.6008/ESS2237-9290.2011.002.0007

Kleber Grubel da SILVA
http://lattes.cnpq.br/6508024149816895
nema@nema-rs.org.br

Danielle PALUDO
http://lattes.cnpq.br/7617645119170669
danielle.paludo@icmbio.gov.br

Eunice Maria Almeida de OLIVEIRA
eunice.oliveira@icmbio.gov.br

Régis Pinto de LIMA
http://lattes.cnpq.br/5149180797409019
regis.lima@icmbio.gov.br

Ricardo José SOAVINSKI
ricardo.soavinski@icmbio.gov.br

Published: 1992

Originally published:

SILVA, K. G.; PALUDO, D.; OLIVEIRA, E. M. A.; LIMA, R. P.; SOAVINSKI, R. J.. Distribuição e ocorrência do Peixe-Boi Marinho (Trichechus manatus) no estuário do rio Mamanguape, Paraíba, Brasil. *Peixe-Boi, João Pessoa, v.1, n.1, p.6-18, 1992.*

Referencing well:

SILVA, K. G.; PALUDO, D.; OLIVEIRA, E. M. A.; LIMA, R. P.; SOAVINSKI, R. J.. The distribution and occurrence of the marine manatee (Trichechus manatus) in the estuary of the Mamanguape River, Paraíba, Brazil. *Natural Resources, Aquidabã, v.1, n.2, p.58-67, 2011.*

INTRODUCTION

Although the existing historical records of the marine manatee (*Trichechus manatus*) in the Brazilian coast since the seventeenth century (Whitehead, 1978), few studies about the species were conducted in Brazil. In the 70s, Banks (1971) and Silveira (1975) describe the first scientific information about the species, showing its occurrence in Pernambuco, Paraíba and Rio Grande do Norte states. Albuquerque and Marcovaldi (1982) indicate the estuary of the Mamanguape River, in Paraíba state, as the main place for the species concentration in the northeastern coast in Brazil, where groups of even 15 animals are seen near the mouth of the river and along the coast, advising the region as one place for the creation of one permanent preservation area, for the marine manatee protection and management. Thereafter, Borboria and Lodi (1990) observed isolated or grouped animals of until three individuals, when making boats outings in this region, on January to May, 1986.

Nowadays, the estuary of the Mamanguape River and the adjacent coastal region is in process of transformation into one Area of Environmental Protection for the marine manatee conservation and for the important ecosystems it shelters (mangroves, dunes, rainforest, reefs and cliffs). This area, until then used by small-scale fishermen, has been suffering oppressions due to the improvement of the human activities which can compromise the ecosystem as a whole.

The objective of this work was to obtain information about the behavior and ecology of the marine manatee in the region, establishing the seasonal modifications in its emergence, checking preferable places of occupation and detecting possible human activities which can interfere in its biological cycle. The results of this study can subside the environmental planning in the region, harmonizing the future expansion and development projects with the manatee biological cycle.

METODOLOGY

The estuary of the Mamanguape River, located in the Municipality of Rio Tinto, Paraíba, Brazil (6º45´S; 35º05´W) is approximately 30 km long and it is surrounded by 6.000 hectares of mangroves (Figure 1). Its mouth in the Atlantic Ocean, nominated Bar of Mamanguape, is totally protected by one extensive line of reefs, forming one environment of shallow and calm waters, with depth from 1 to 5 meters in the zones of channels and many banks of sands that are discovered in the low tide. It has a cycle of semi-daytime tide, with the very amplitude of variation of 2,5 meters in the sizigial tides.

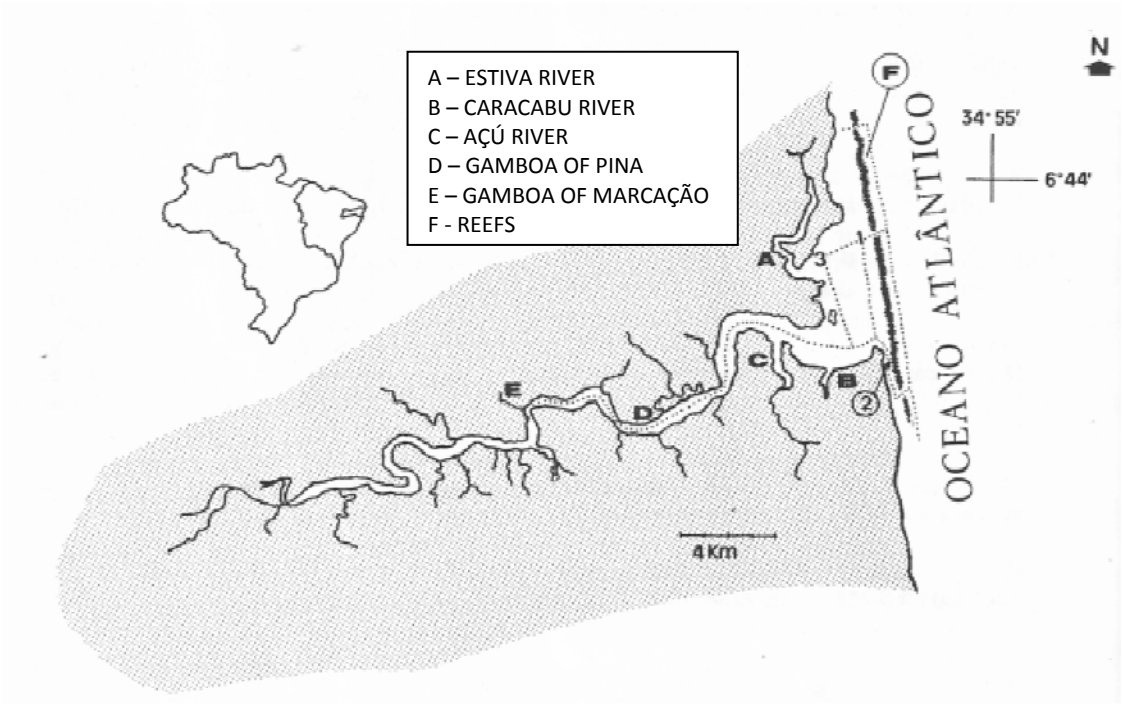


Figure 1: Map of the Mamanguape River region. 1, 2 and 3: Areas where the marine manatee frequently stay in the estuary region.

Awareness activities for coastal communities, by interviews, speeches and direct contact with the regional fishermen, started with the implantation of the Base for the Manatee Research and Protection, in 1987. From November 1988 to September 1991, one program of marine manatee groups monitoring in the region of Bar of Mamanguape and adjacent was developed. It was taken by direct observation and interviews, using one aluminum boat with 45hp outboard motor that went about the studied area systematically. The last portion of the estuary was divided into 15 quarters of 1.000 thousand meters side, for the best control over the region. For each field journey, the boat went through the region delivering observers in pre-established strategic places that covered one or more quarters. The observation was made with the help of Baush Lomb (7x50) binoculars, and, for each monitored place, one field spreadsheet was filled registering the following information: observation place, tide and watching schedule, wind direction, air and water temperature, water clearness, the local human activities, the animals´ number and behavior.

The tidal range variation was recorded by divided scales calibrated periodically by the tidal fluctuations table of Port of Cabedelo (6°58´S; 34°50´W); the water transparency, by one Secchi disk, and the water and air superficial temperature, by one thermometer accurate to 0,5º C.

In this period, frequent field outings were made going about approximately 20 km upstream to the main bed of the Mamanguape River and its small tributaries. The coastal region comprehended between the Bar of Mamanguape and the Miriri River (Figure 2) was monitored by regular journeys, where direct observations, interviews with fishermen and contact with one collaborator who lives in the mouth of the Miriri River were conducted.

RESULTS

During the period of November 1989 to September 1991, 608 field monitoring outings for the Bar of Mamanguape were performed, totalizing 285 sighting procedures of solitaire or grouped marine manatees and 2.185 hours of observation in fixed places. The regions defined as 1, 2 and 3 (Figure 1) were the ones which presented major watching regularity and frequency (90,2% of the total number of observations), being characterized as the preferable places for the animals permanence. The other places where they were seen (9,8% of the observations) were classified as secondary regions of emergence or routes of displacement in the estuary and coastal region (Table 1; Figure 1).

Table 01: Distribution of the number of sightings, reunited in regions and classified by year, of the 608 field monitoring outings made in the region of the Bar of Mamanguape in the period of November 1988 to September 1991.

	1988	**1989**	**1990**	**1991**	**TOTAL**	**%**
Region 1	10	63	46	25	144	50,4
Region 2	-	14	53	18	85	30,0
Region 3	8	8	12	-	28	9,8
others	2	14	6	6	28	9,8
TOTAL	20	99	117	49	285	100,0
***E. O. (h)**	124	738	901	401	2158	

*E.O.: Effort of Observation in Hours

The sporadic emergence of isolated or grouped animals in front of the Açu River and Caracabu River, at 5km upstream of the mouth of the river, is well known by regional fishermen and was supported by the observations. During 35 field journeys through the main bed of the Mamanguape River made in the study period, only once 2 animals were sighted approximately 10 km from the sea (Gamboa of Pina). The rare presence of marine manatees making incursions through the river until the Gamboa of Marcação was diagnosed by the interviews with regional fishermen applied. (Figure 1).

During the 62 monitoring journeys for the coastal region, between the Bar of Mamanguape and the Miriri River, some animals were observed by the reefs and the emerged stones in the Campina and Oiteiro Beaches. The information collected with one collaborator, who lives in the margin of the Miriri River, revealed the frequent presence of animal groups near the mouth of this river. Information about incursion to the upstream of the Miriri River made by manatees (2 animals) was recorded in 1989. According to the regional fishermen, the animals go into the river in flood and go out in low tide, due to its mouth shallow depth.

The record of two marine manatees´ deaths, frequent sightings and the accidental capture of three animals in the Lucena Beach, added to the direct observations and interviews made, prove the constant presence of isolated or grouped marine manatees in the coastal region, between the Municipality of Lucena and Bar of Traição (Figure 2).

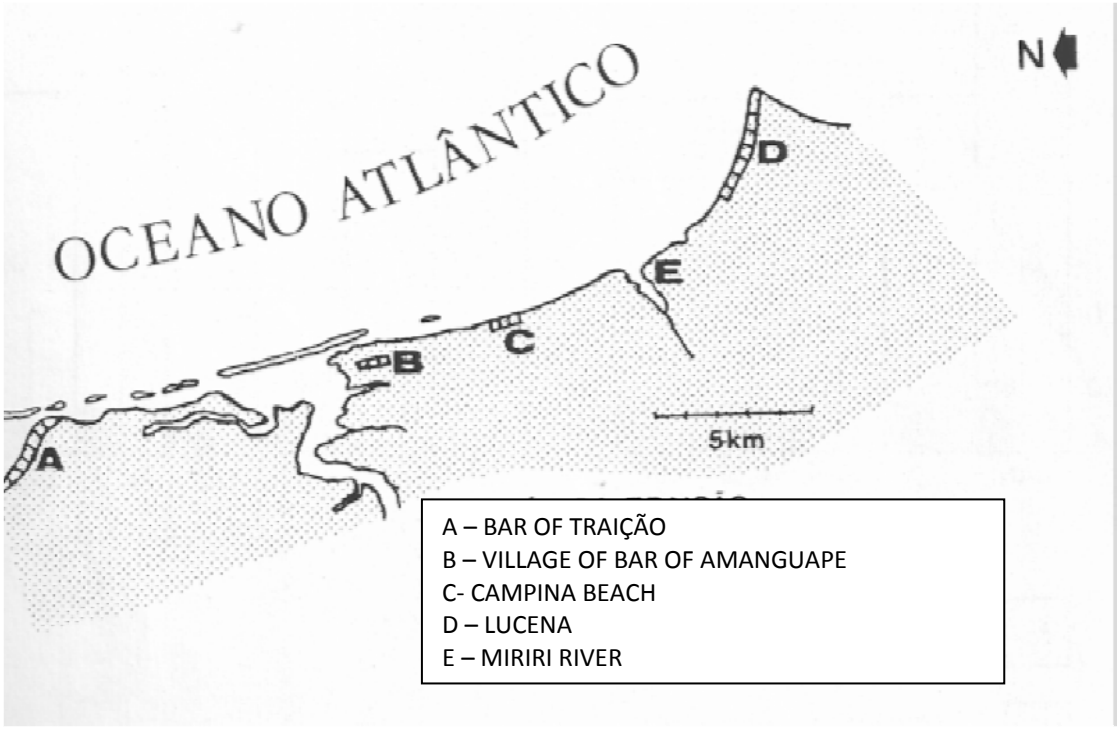


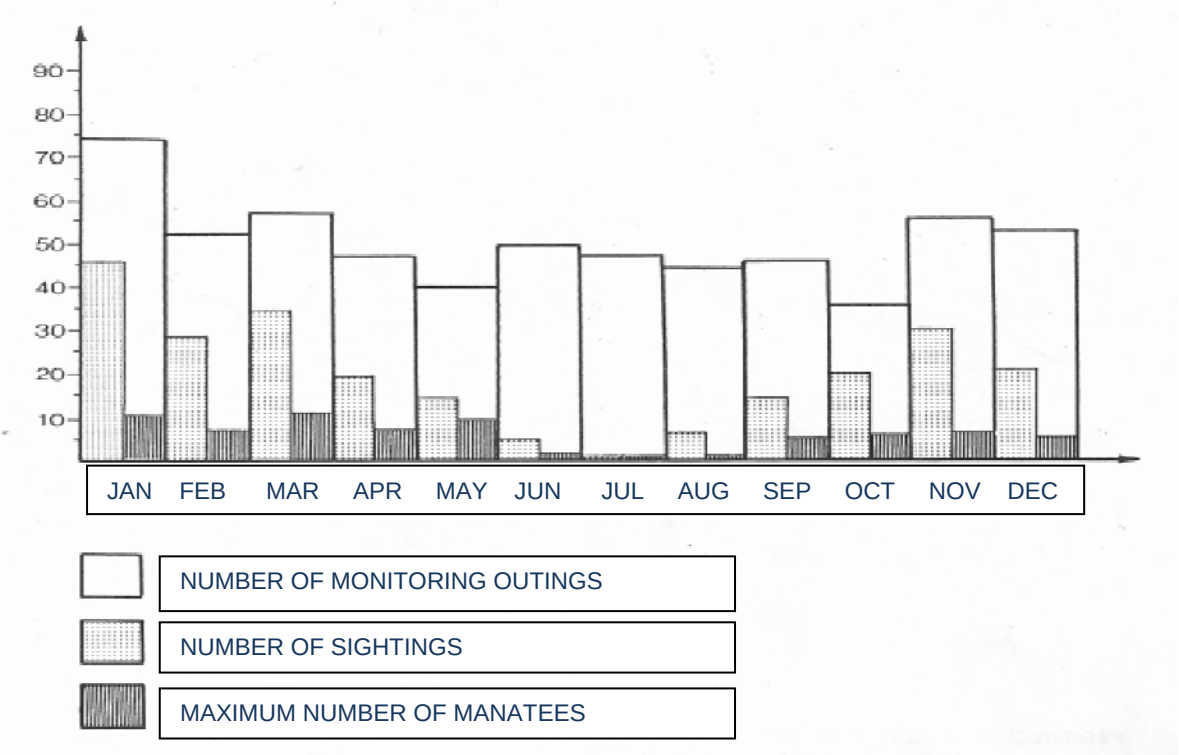
Figure 2: Regional information about frequent occurrences of marine manatees, near the reefs and proximal coastal zone.

Observing the Table 2, that represents the summary of the results of the monitoring made in the region, and the Graphic 1, that presents the month frequency distribution of the number of sightings and the number of monitored animals, it can be concluded that the isolated or grouped marine manatees go to the region of the Bar of Mamanguape during all the year.

Table 2 – Summary of the results of the monitoring made in the estuary of the Mamanguape river/PB, in the period of November 1988 to September 1991. The parameters here presented expose only the data collected during the journeys for marine manatee monitoring.

Months	**OS** (days)	**EF** (days)	**EO** (hs)	**EOA** (n°)	**EWT** (c)	**EAirT** (c)	**EWTr** (m)
JAN	74	46	412	1-10	27-31	26-30	’30-3,5
FEB	52	28	218	1-07	27-31	25-33	’30-3,0
MAR	56	34	201	1-11	27-32	27-31	’20-1,6
APR	47	19	164	1-07	28-31	27-32	’20-3,0
MAY	40	14	167	1-09	26-30	25-31	’20-3,0
JUN	49	04	159	1-02	25-29	25-30	’30-2,8
JUL	47	01	138	1	25-285	25-30	’05-3,6
AUG	44	06	139	1	25-29	22,5-29	’20-1,6
SEP	46	14	121	1-04	24-29	22-31	’20-1,8
OCT	35	20	123	1-05	27-29	26-29	’30-2,2
NOV	55	30	171	1-06	27-30	26-31	’20-1,8
DEC	53	21	165	1-05	27-31	27-34	’40-2,6

OS – Number of Outings; **EF –** Emergence Frequency; **EO** – Effort of Observation; **EOA** – Evaluation of the Number of Observed Animals; **EWT** – Evaluation of Water Temperature; **EAirT** – Evaluation of Air Temperature; **EWTr** – Evaluation of Water Transparency.



Graphic 01: Monthly accumulated frequency in the period of November 1988 to September 1991.

The largest numbers of sightings occur from October to May, when the animals are seen with more regularity and frequently in groups. On June to September, they are present sporadically and almost always solitaires. The biggest group observed was formed by nine animals (May/1990) and the largest number of animals recorded at the same time in the bar of the river was by eleven marine manatees (Mar/1990).

The air and water temperature in the studied area is higher in the period between October to May, where this last one varies between 26º and 31º C and the first one varies between 25º and 33º. From May to June, it was observed that the water temperature can vary from 23º to 29º and the air temperature from 22º to 31º C. It must be highlighted that even in the colder months, it was less observed the water temperature under 24º C.

The water transparency in the Bar of Mamanguape had its visibility varied from 0,05 m to 3,6 m and did not present one direct relation with the animals emergence frequency. The majority of monitoring journeys (85%) detected turbid waters, with visibility under 1,5 m. It was detected that the water turbidity in the studied area is directly related to the winds direction and intensity, the tidal variations amplitude and the rainfall patterns. From November to February, the prevalence of the eastern and northern light winds, associated to the lower rate of rainfall and the quadrature tides which cause less flood in mangroves areas and remobilize less quantity of sediments, permit that the clearer waters entrance into the estuary region with more frequency.

The Figure 3, that matches the number of sightings with the tide amplitude, shows clearly that groups of manatees prefer days with less tide amplitude variation to occupy the Bar of

Mamanguape. It was also detected that 81% of the sightings (n=209), in the regions 1, 2 and 3, occurred in tide levels over 1 meter.

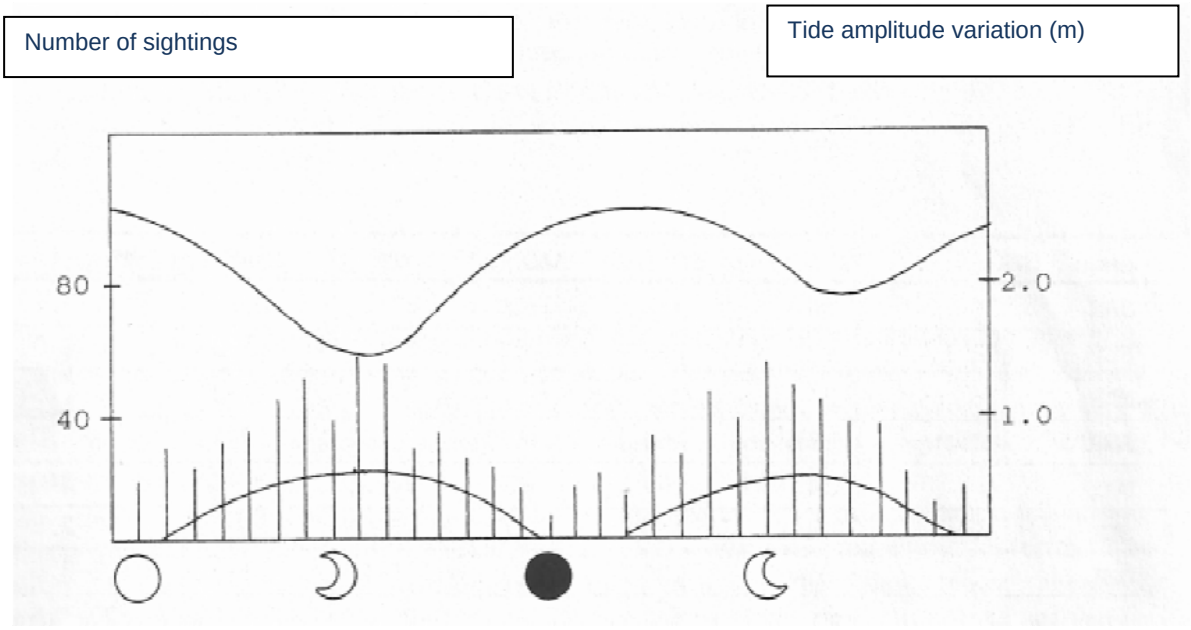


Figure 03: Number of sightings matched with tide amplitude.

BEHAVIOR: The marine manatees move regularly in the estuary, entering and leaving the bar, according to the tides cycles. When the tide amplitude levels reach less than one meter, they tend to abandon the regions of permanence (1, 2 and 3) and get out through the rifts naturally formed in the reefs, dispersing themselves through the coastal region adjacent to the Bar of Mamanguape (Figure 1).

The water turbidity in the region (which characterized estuaries with mangroves) did not permit the animals underwater sightings, hindering thus the gender definition and the identification by the individual tags. The information about behavior was restricted to the displacements of the animals on the surface. In the preferential regions of marine manatees´ permanence, the 5 kinds of behavior were catalogued according to the following descriptions:

Feeding: isolated or grouped animals stopped at one same place, alternating long term dives with short term ones, varying from 30 seconds to 10 minutes, near seaweed beds or marine phanerogams.

Jokes: grouped animals of 3 to 7 individuals, making dives of irregular frequency of 1 to 6 minutes. They show all the body when emerging, able to remain floating on the surface for some seconds, generally in places with over 4 meters deep, with no incidence of vegetation.

Sexual behavior: groups of 5 and 7 individuals, with close proximity, emerging and submerging together, in irregular dives of 1 to 6 minutes of variation. Animals rubbing up, doing laps around the body of other individuals, quite restless, can stay until 30 seconds on the surface.

When there was the presence of juveniles in group, normally, were deprived of sexually active animals.

Displacements: animals moving when in emersion show the muzzle, the back and the tail at the time of breath and thrust. Generally, regular and long dives (2 to 10 minutes), reappearing tens of meters away from the sighting initial point.

Puppy-female interaction: larger animal accompanied by a cub, performing displacements jokes and feeding very close, sometimes leaning over each other, emerging and submerging nearly always together.

HUMAN INTERFERENCE: it was detected that the activities which produce many noises in the water (beats in the water, engine noise) interfere in the animals´ behavior, scaring and dispersing the groups. Purse seines (*tainheiras*), drift (*caceios*) and gill (*caçoeiras*) nets, used in the region, when closer to the groups, besides scaring away the animals, can be damaged due to the possible collisions with the marine manatees.

Already the more resistant gill nets (*caçoás*), placed near the reefs or passages the animals pass through, are of extreme danger for the manatees, because they can flog and get and catch puppies and or/adults, killing them by drowning. About ten years ago, one of these traps caught one adult marine manatee in the region 1. The trawls, which are used inside the estuary, did not offer effective hazard, because act in swallow tides and near sandbanks, and the animals can be free, in case of accidental captures. In the Lucena Beach, this fishing gear, acting in the proximal coastal region, has yet caught three animals, which were free immediately by aware fishermen.

Another danger are the trawls with boards (*camaroneiras*), operated by motor boats in the coastal region comprehended within the Bar of Traição and Lucena, which do not obey the restrictive band of three miles from the coast. Those nets have killed two animals in the last 3 years.

ARGUMENTS AND CONCLUSIONS

The manatee´s (*Trichechus manatus)* distribution and movements are well known in Florida. During spring and summer times, the animals are dispersed along the Gulf and Atlantic coast of Florida. In autumn, they migrate to the South, attracted by the regions which provide warmer waters, over 20º C, remaining in these places during all the winter (Hartman 1974, Rathbun 1984 in Kochaman et al, 1985).

In the region of the Bar of Mamanguape, and in all northeast of Brazil, the seasonal variation of the water temperature can not be considered one determining factor. On colder months, the water surface temperature hardly reaches values below 23º C. Although the water temperature is not a restrictive factor at the marine manatees´ groups presence or absence in the studied region, warmer waters (over 27º C), that occur from October to May in the studied region, can act like a physiological trigger, stimulating the social gathering (puppies, adults and juveniles)

for the reproduction ritual. The groups of marine manatees´ preference to occupy tides with low amplitude variation and at levels higher than 1 meter can be explained by the lowest current speed which allows the animals to make their behavior activities within the flat waters of the Bar of Mamanguape.

These data permit to conclude that the manatees which live in the coastal region adjacent to the Bar of Mamanguape has got a migration pattern similar to a range, that is, the animals wander isolated through the coastal region and reunite themselves in this protected region, on summer months, for social encounters with intercourse aim.

In the estuary region of the Mamanguape River and adjacent, one significant seasonal variation for feeding availability was not observed. The highest rainfall for the region, that occurs from March to June, with rates monthly over 20 mm (Lima & Hechendore, 1985), is not linked to the animals´ migration pattern, neither with the reproduction seasonality, as indicated by Colmenero-Rolon (1985), considering the species from the region of Emiliano Zapata, Mexico.

The emergence of social groups, the incidence of females and their puppies from October and one newborn puppy´s running aground (black color and cord traces) on December 1989, added by the records of four newborn puppies from the northeast coast, all from this period (Manatee Center, non-published data) indicate that the species´ reproduction occurs on summer (October to March.)

Bengston (1981) describes the importance of the marine manatees´ traditional behavior, historically passed on by the groups, mainly due to the long interaction female-puppy. This tradition allows groups to manage the resources usage, to learn the location of warm waters refuges and to increase the chance of intercourses, establishing the named sites of *rendevouz.*

Considering that the feeding availability and the temperature and rainfall variation are not determinant factors in the social groups´ seasonal presence in the Bar of Mamanguape, it is believed that this place is printed in collective memory of the manatees´ populations which live in the region like an important site for the reproduction rituals, puppies´ birth and breeding, in one typical traditional behavior.

Finally, it is concluded that the region of Bar of Mamanguape is of paramount importance for the maintenance of the marine manatee´s reproductive cycle, because it is one of the places where they most concentrate in the Northeast of Brazil. The creation of restrictive zones in the regions 1, 2 and 3 (Figure 1) within the Area for Environmental Protection and the ranking of the human activities with potential interference on the animals behavior (fishing, ships traffic and tourism) are essential for this species´ preservation.

ACKNOWLEDGEMENT

To Mr. Heleno Francisco dos Santos, Antônio Francisco and Geraldo de Brito, for the dedication in the support and data collection work.

To the trainees of the Base for the Manatee Protection and Research, who took part of the data collection in the period of November 1988 to September 1991.

To the fishermen of the communities of Tramataia, Camurupim, Coqueirinho, Lucena Beach and, mainly, Bar of Mamanguape, who provided valued information during the conduction of this study.

REFERENCES

ALBUQUERQUE, C.; MARCOVALDI, G. M.. Ocorrência e Distribuição das Populações do Peixe-Boi Marinho no Litoral Brasileiro (SIRENIA – Trichechidae, *Trichechus manatus,* Linnaeus, 1758). SIMPÓSIO INTERNACIONAL DE ECOSSISTEMAS COSTEIROS: **POLUIÇÃO E PRODUTIVIDADE**. FURG/DUKE University. Rio Grande, 1982.

BANKS DA ROCHA, N.. Memória sobre um exemplar de *Trichechus manatus*, Linnaeus, 1758, capturado em Goiana, Pernambuco. **Arquivos do Museu Nacional**, v.54, n.101-103,1971.

BENGSTON, J. L.. **Ecology PF manatees (*Trichechus manataus*) in the St. Johns River, Florida**. Ph.D. dissertassion. University of Minneapolis, 1981.

BOROBIA, M.; LODI, L.. Peixe-boi marinho (*Trichechus manataus*) no nordeste brasileiro: ocorrência e conservação. REUNIÓN DE TRABAJO DE ESPECIALISTAS EM MAMÍFEROS ACUATICOS DE AMÉRICA DEL SUR, 4. **Anais**. Valdívia, 1990.

COLMENERO-ROLON, L. C.. Aspectos de La ecologia y comportamiento de una colonia de manaties (*Trichechus manataus*) en el municipio de Emiliano Zapata. **Anales**. Instituto de Biologia, Universidad Nacional Autonoma do México. Série Zoologia. v.56, p.589-602, 1986.

KOCHMAN, H. I.; RATHBUN, G. B.; POWELL, J. A.. Temporal and Spatial Distribution of Manatees in Kings Bay, Crystal River, Florida. **J. Wildl. Manage**, v.49, n.4, p.921-924, 1985.

LIMA, P. J.; HECHENDORE, W. D.. **Climatologia**: Atlas Geográfico da Paraíba. Governo do Estado da Paraíba, 1985.

LIMA, R. P.; PALUDO, D.; SILVA, K. G.; SOAVINSKI, R. J.; OLIVEIRA, E. M.. Distribuição, ocorrência e status de conservação do peixe-boi-marinho (*Trichechus manataus*) ao longo do litoral do nordeste do Brasil (no prelo) **Peixe-Boi**: Centro Peixe-Boi.

SILVEIRA, E. K. P.. The management of Caribean and Amazonian manatees (*Trichechus manataus* and *Trichechus inunguis*) in captivity. **International Zoo Yearbook**, v.15, p.223-226, 1975.

WHITEHEAD, P. J. P.. Registros antigos da presence do peixe-boi do Caribe (*Trichechus manatus*) no Brasil. **Acta Amazônica**, v.8, p.497-506, 1978.