

MEAT CONSUMPTION OF *SOTALIA GUIANENSIS* BY FISHING COMMUNITIES AND SOLUTIONS FOR THE SPECIES CONSERVATION IN MARANHÃO STATE, BRAZIL

Rosana G. Garri¹; Fagner A. Magalhães¹ & Carolina H. Tosi¹

1. Projeto Cetáceos do Maranhão – PROCEMA / Ilha do Caju Institute, Av. Presidente Vargas, 235 – Centro 64200-200 – Parnaíba/PI, Brazil (procemaicep@yahoo.com.br).

Introduction

The estuarine dolphin, *Sotalia guianensis* (Van Bénédén, 1864) is a small cetacean with typical coastal habits (Pinedo *et al.*, 1992; Di Benedetto *et al.*, 2001), occurring from Honduras in Central America (15°58'N, 85°42'W) (Borobia *et al.*, 1991; da Silva & Best, 1996) to Santa Catarina, in Southern Brazil (27°35'S, 48°34'W) (Simões-Lopes, 1988).

S. guianensis is vulnerable to the impacts related to human activities in coastal waters including degradation of habitat (Lodi, 2003). This species is listed as “insufficiently known” by the Brazilian Environmental Department (IBAMA, 2001) and qualified as highly vulnerable (IBAMA, 2001), being also included in the Appendix I & II of CITES, and in Appendix II of CMS and IUCN. The incidental capture represents the most serious threat to this species in Brazil, due to their preference for coastal and estuarine brackish waters. According to Siciliano (1994), *S. guianensis* is the most common cetacean being caught in gillnets along the Brazilian coasts. The IWC Scientific Committee recommended in 1994 that steps must be taken urgently in order to reduce the by-catch mortality and simultaneously better systems for recording and monitoring must be applied (IWC, 1995).

Fishermen had reported many problems caused by dolphins, including entanglement in fishing nets that disrupted the fishing activities, and other troubles such as damage of gears and competition. Through the analysis of by-catch literature and the interview data is suggested that entanglement in gillnets is the main cause of cetacean mortality (Lopez *et al.*, 2003).

Several studies on the ecology, conservation and behavior of the coastal estuarine dolphins are being developed in Maranhão State, Northeastern Brazil since January 2005. The main purpose of this study was to obtain information, through interviews about fishing interactions and consumption of *Sotalia guianensis* meat by coastal communities.

Material and Methods

The Maranhão State (01°31'S, 45°07'W) is located in the mid-northern coast of Brazil. It presents a very particular area with 640km of sandy beaches, mangrove and small islands. The west and central coasts, where data were collected, are considered an Environmental Protected Area (EPA) and defined as a world Interest Area by Ramsar Convention.

This coastal ecosystem can be described as a series of bays and estuaries connected through mangrove. Maranhão State is a very important source of fish in the Northeastern region, representing 30% of regional production (Stride, 1992). Excluding São Luís (Capital city) most of the coastal communities inhabit small villages distributed along the coast, and fishing activities represent the main source of sustainability.

Along the 2005 season, eight coastal fishing communities from central to west coast of Maranhão were visited by members of Projeto Cetáceos do Maranhão (PROCEMA). The studied area was divided in six codes: (A1) Ribamar County (localized in central coast of Maranhão, on

São Luís Island); Raposa (Main fishing port of Maranhão according to Centro de Estatística Pesqueira do Nordeste/ CEPENE, 2003) and São Luís County; (A2) Alcântara; (A3) Cedral; (A4) Apicum-açu; (A5) Bacuri and (A6) Turiaçu (Figure 1).

These communities were characterized accordingly to different factors such as antropic influences, coastal morphology and fishing arts being used. Information requested to the fishermen included: (1) State of arts (2) cetacean meat consumption, (3) interactions with fisheries (4) Species were recognized by fishermen through cetacean photograph catalog of the species that occur in the study area.

Differences among meat consumption in visited sites were tested by chi-square test (Siegel, 1975), using Statistica for Windows vs. 5.0 program procedures.

The PROCEMA team performed environmental education activities with the members of the community. The activities were conducted to offer alternatives and no extractive uses of dolphins. Information about what people could do in order to help cetaceans conservation and why it is important, were discussed with the communities during expeditions based on Kendall and Smith (1997).

Results

The fishermen communities of the central and west coasts of Maranhão State were visited from January 2005 to January 2006, totalizing 340 fishermen interviews.

Results indicate that *Sotalia guianensis* meat consumption was higher representing 29.85% in west coast (n=134) when comparing with 5.33% in the central coast (n=206) ($\chi^2= 42.73$; d.f= 1; $p\leq 0.05$). The central coast presented a decreasing percentage, 72% less of meat consumption comparing with few last years. In the other hand, the west coastal communities registered a significant increasing of 38%.

Despite of the significant percentage from the data above, 42.53% (n=57) in west coast and 69.41% (n=143) in central coast never consumed *Sotalia* meat, while 5.97% (n=8) and 6.79% (n=14) did not answered the questions (Figure 2).

The empirical informations brought some curious data about meat cooking and what they think about it, some of their opinions are reproduced as follows:

"The meat is like the cow's meat, we eat it as fried food, roast and boiled" (fishermen from Cedral);

"The meat is not good, it has too much blood and smells like a bat and cockroach" (fishermen from Cedral);

"I use the skin of dolphins to cure rheumatism" (fishermen from Ribamar).

Others aspects were also discussed, including pathogenic agents that may be get from the meat consumption of *S. guianensis*.

During the expeditions, it was also observed that the increasing of nets in some areas, such as Cedral, is influencing the presence of *S. guianensis*. A total of 100 fishermen were interviewed in this location. The results indicated that 55.9% of fishermen observed fewer dolphins than last years; and only 5.08% observe more dolphins nowadays (Figure 3).

Discussion

The by-catch of dolphins from artisanal fishing in Maranhão State causes serious ecological problems. The high proportion of meat consumption in the west coast of Maranhão may be explained by the distance of this area from the capital city (approximately 200km) and the lack of continuous research there. Most of fishermen interviewed knew about the ban of consuming cetaceans. However the precarious conditions of some communities and the starvation

motivate the use of cetaceans, as animal protein source (Figure 4) and the trade of teeth, eyes and genitalia.

In other hand, the central coast presented a low proportion of *S. guianensis* meat consumption, probably influenced by the fact that there are more urbanized areas nearby that helps information about conservation and environment education.

The impact of fishing activities over cetaceans doesn't occur only along the west and central coast but Delta do Rio Parnaíba also presented report of meat consumption, evidencing that the fact is common for the whole Maranhão coast (Magalhães *et al.*, 2005).

The by-catch of marine mammals in fishing gear could be affecting even more sharply the status of the most vulnerable species along the Brazilian coast. This assessment would be necessary in order to identify and measure the impact of human interactions and to apply policies tending to reduce the by-catch (Harwood, 1999). The preliminary data suggests that *Sotalia guianensis* distribution would be seriously affected due to human activities along the Maranhão State coast. CEPENE (2003) reported the increasing of fishing activities in the study sites which may be influencing *S. guianensis* sightings.

Through environmental education, it was clearly observed that the communities cooperated with the researchers, and referred about the problems that are affecting cetaceans. Information about the size of nets was also discussed with fishermen with the purpose to minimize incidental catches as a possible solution for the specie conservation in Maranhão.

Despite of conservation efforts, most research would be performed to preserve this fragile ecosystem and the complex relations between marine mammals and humans.

Acknowledgements

Our gratitude to all who helped in field work, especially, to PROCEMA team: Mariana Soares and Rafaela Diniz (Universidade Federal do Maranhão); Mariana Bueno, Nathali Ristau, Paula Guimarães (Centro Universitário do Maranhão/UNICEUMA); Miguel Nery (Mirante TV, Maranhão State) for logistical support; João Ribeiro de Souza, Apicum-açu community who helped us in west coast visit; Projeto Quelônios Aquáticos do Maranhão/QUEAMAR team, Dra. Larissa Barreto (Universidade Federal do Maranhão) for her hospitality and Dra. Marcela Junin (MACN-CONICET) for the review.

References

- Borobia, M., Siciliano, S., Lodi, L. and Hoek, W. (1991). Distribution of the South American dolphin *Sotalia fluviatilis*. *Canadian Journal Zoology* 69: 1025-1039.
- da Silva, V. M. F. and Best, R.C. (1996). *Sotalia fluviatilis*. Mammalian Species. *American Society of Mammalogist* 527: 1-7.
- Di Benedetto, A. P. M., Ramos, R. M. A. and Lima, N. R. W. (2001). *Os golfinhos: origem, classificação, captura acidental, hábito alimentar*. Editora Cinco Continentes, Porto Alegre, Brasil.
- Harwood, J. (1999). A risk assessment framework for the reduction of cetacean by-catches. *Aquatic Conservation: Marine and Freshwater ecosystems* 9: 593-599.
- IBAMA. (2001). *Mamíferos Aquáticos do Brasil: Plano de Ação, Versão II*. Brasília: Diretoria de Fauna e Recursos Pesqueiros/IBAMA (Ed.).
- IBAMA.(2003). Centro de Pesquisa e Gestão dos Recursos Pesqueiros do Nordeste, CEPENE, Tamandaré, Brasil.
- IWC. (1995). Report of the Scientific Committee. Annex G. Report of the Sub-Committee on Small Cetaceans. *Report of the international Whaling Commission* 45: 165-179.
- Kendall, S. and Smith, A. (1997). *Spreading the world: How to run a successful education programme in your local area*. Whale and Dolphin Conservation Society, United Kingdom.
- Lodi, L. (2003). A conservação do boto-cinza na Baía de Paraty. *Ciência Hoje* 34(199): 67-69.
- Lopez, A., Pierce, G. L., Santos, M. B. and Guerra, A. (2003). Fishery by-catches of marine mammals in Galician waters: results from on-board observations and an interview survey of fishermen. *Biological Conservation* 111: 25-40.
- Magalhães, F. A., Tosi, C. H. and Garri, R. G. (2005). *A recent report on Sotalia fluviatilis Cetacea: Delphinidae) meat consumption in the east coast of Maranhão, Northeastern Brazil* Page 122 in Abstracts, 19th Annual meeting of the Society for Conservation Biology, 15-19 July, Brasília, Brazil.
- Pinedo, M. C., Rosas, F. C. W. and Marmotel, M. (1992). *Cetáceos e pinípedes do Brasil: uma revisão dos registros e guia para identificação das espécies*. Manaus: UNEP/FUA.
- Siciliano, S. (1994). Review of small cetaceans and fishery interactions in coastal waters of Brazil. *Report of the International Whaling Commission* 15: 241-250.
- Siegel, S. (1975). *Estatística não paramétrica*. São Paulo: McGraw-Hill.
- Simões-Lopes, P. C. (1988). Ocorrência de uma população de *Sotalia fluviatilis* Gervais 1853, (Cetacea, Delphinidae) no limite sul de sua distribuição, Santa Catarina, Brasil. *Biotemas* 1: 57-62.
- Stride, R. K. (1992) *Diagnóstico da pesca artesanal marinha do Estado do Maranhão*. CORSUP/EDUFMA, São Luís, Brasil.

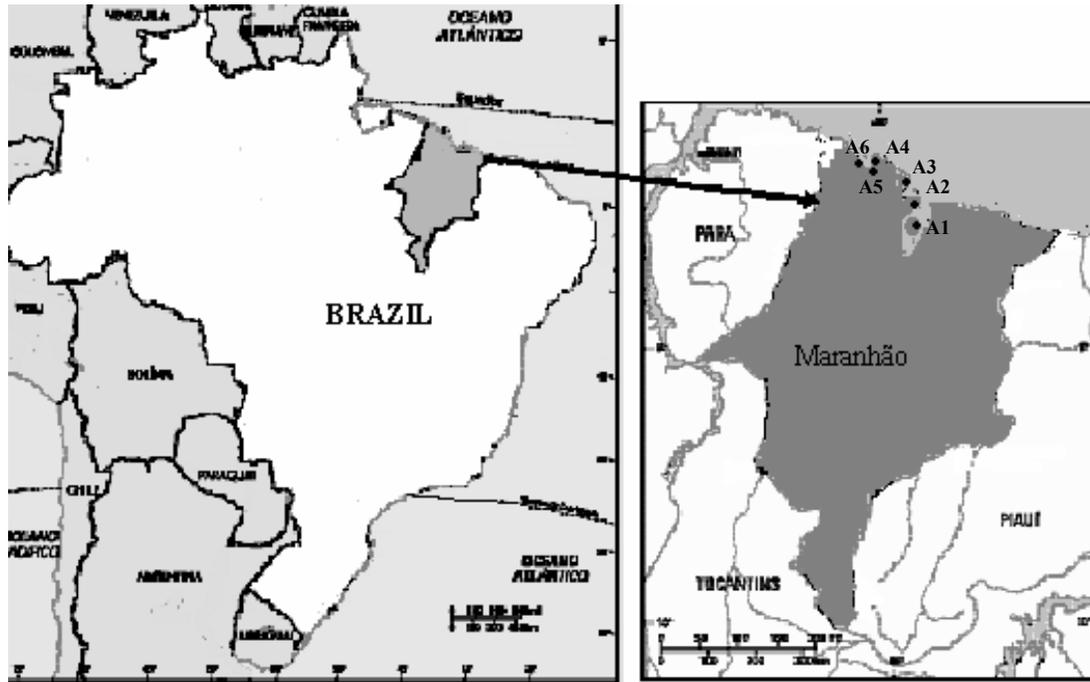


Figure 1. Map of Maranhão State showing the Communities visited (A1) Ribamar; Raposa and São Luís; (A2) Alcântara; (A3) Cedral; (A4) Apicum-açu; (A5) Bacuri and (A6) Turiçu.

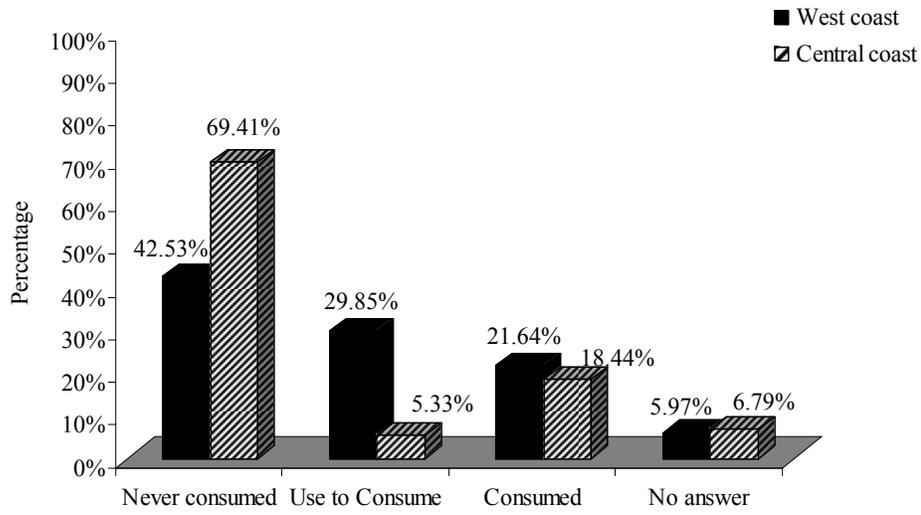


Figure 2. Percentage of cetacean meat consumption in west and central coast of Maranhão.

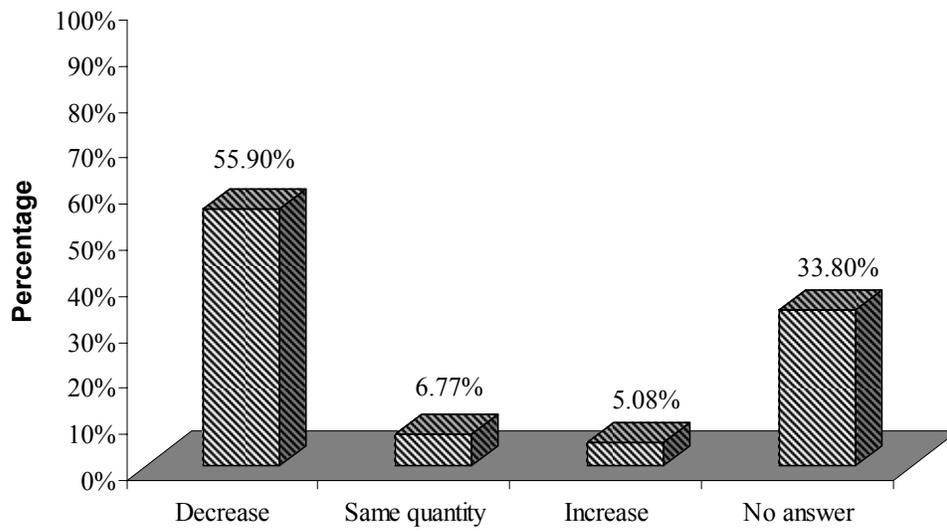


Figure 3. Data comparing historic sightings of *Sotalia guianensis* in Cedral, west coast of Maranhão.

Meat



Figure 4.

consumption of estuarine dolphin, *Sotalia guianensis*, by fishermen in the west coast of Maranhão. (Photo: Carolina Tosi, PROCEMA, 2005)