

Bone lesions in *Sotalia fluviatilis* (Cetacea) as a consequence of entanglement. Case report

Lesões ósseas em *Sotalia fluviatilis* (Cetacea) como consequência de enredamento. Relato de caso

Renata Maria Arruda RAMOS; Ana Paula Madeira DI BENEDITTO¹;
Sheila Mendonça de SOUZA²

CORRESPONDENCE TO:
Renata Maria Arruda Ramos
Universidade do Norte
Fluminense, CBB – LCA
Av. Alberto Lamego, 2.000
Campos dos Goytacazes
28015-620 – Rio de Janeiro – RJ
e-mail: renataramos@uol.com.br

1- Universidade do Norte
Fluminense, CBB – LCA
2- Departamento de Antropologia
do Museu Nacional, Quinta da
Boa Vista, São Cristóvão –RJ e
Departamento de Endemias da
Escola Nacional de Saúde
Pública, FIOCRUZ

SUMMARY

The objective of the present study was to describe a set of lesions caused by entanglement of *Sotalia fluviatilis* accidentally captured by gillnet on July, 23, 1995, in the Northern Rio de Janeiro State (21°37'S-041°01'W), Southeastern of Brazil. The specimen presented lacerated lesions of the skin and subcutaneous tissue around the posterior extremity of the rostrum. Nylon twines were found associated to these lesions. Bone and teeth lesions were also observed in the underlying area and affected the maxillaries, pre-maxillaries and mandibles. The lesions were likely caused by non-lethal entanglement in fishing gears. Abnormalities in the growth layer pattern of the damaged teeth between the third and sixth growth layers suggest that this encounter had taken place when the specimen was around three years old. The data indicate that non-lethal encounters with fishing gears may cause serious health problems to small cetaceans and reduce their lifetime. This is the first description of fisheries-related chronic lesions in *S. fluviatilis*.

UNITERMS: *Sotalia fluviatilis*; Bone and skin lesions; Entanglement; Southeastern Brazil.

The accidental capture represents the most serious threat to cetacean populations⁹. Besides, non-lethal encounters with fishing gears may inflict severe lesions that may reduce the survival time of the individuals, which succeeded in escaping the nets⁶. A large number of small cetaceans are incidentally caught in gillnets every year along the Brazilian coast¹². In the coast of the Rio de Janeiro State, *Sotalia fluviatilis* is the species most commonly taken during coastal fishery operations^{2,12}. The objective of the present study was to describe a set of lesions caused by entanglement of *S. fluviatilis* in gillnet fishery.

On July, 23, 1995, a male *S. fluviatilis* was accidentally captured by gillnets in the Northern Rio de Janeiro State (21°37'S-041°01'W). The 179.0 cm long specimen presented lacerated lesions of the skin and subcutaneous tissue around the posterior extremity of the rostrum.

The diagnosis was conducted after analysis of the photos of the specimen and direct examination of the prepared skull. X-ray pictures of the bones complemented the diagnosis. The description and interpretation of the lesions were based on dry bone pathology patterns, specially following Ortner and Putschard⁷ and Steinbock¹¹.

Age was estimated by counting the number of growth layer group (GLG) in the dentine⁸. Twelve teeth were selected for analysis of the dentinal deposition pattern: a tooth extracted of the injured area, one of a healthy area and 10 from unknown location, recovered after thorough cleaning of the skull. The latest teeth were selected according to the presence of small alterations in their shape or apparent lesions. Two methods were applied to prepare the dental material. The method of decalcified thin and

stained section (40 µm) of the teeth was applied following the recommendations of Hohn et al.³ and Perrin and Myrick Jr.⁸ (Method 1). The method of etched half tooth followed the recommendations of Pierce and Kajimura¹⁰ (Method 2). Only the complete layers were considered in counting for age determination.

Partially healed lacerated lesions surrounded by reactive tissue were observed on both sides on the rostrum, being more severe on the right side. They extended from the superior part of the beak to its inferior part (Fig. 1A). The appearance of the lesion especially at the right side of the snout suggested the presence of a large amount of new tissue, probably granulation tissue, however a histopathology exam could not be made because the tissue sample was not collected. The incomplete healing as well as the extension and aspect of the wounds indicated that the material that had caused the lesion probably persisted into it maintaining and, likely, enlarging it. Indeed, pieces of nylon twine 0.5 mm thick and of blue colour were found inside the lesions. This type of nylon was different from the one used in the net in which the animal died, which was 0.6 mm thick and white. Secondary infection, attested by discrete active periosteal reaction around the lesions, probably not very significant, was present at the moment of the death. Besides, some teeth in that area had been dislocated or lost and an ulcerated lesion was observed in the inferior part of the buccal cavity.

After cleaning the skull, bone lesions were observed around the whole circumference of the beak and included the maxillaries, pre-maxillaries and mandibles at the level of the 25th and neighbours teeth, approximately.

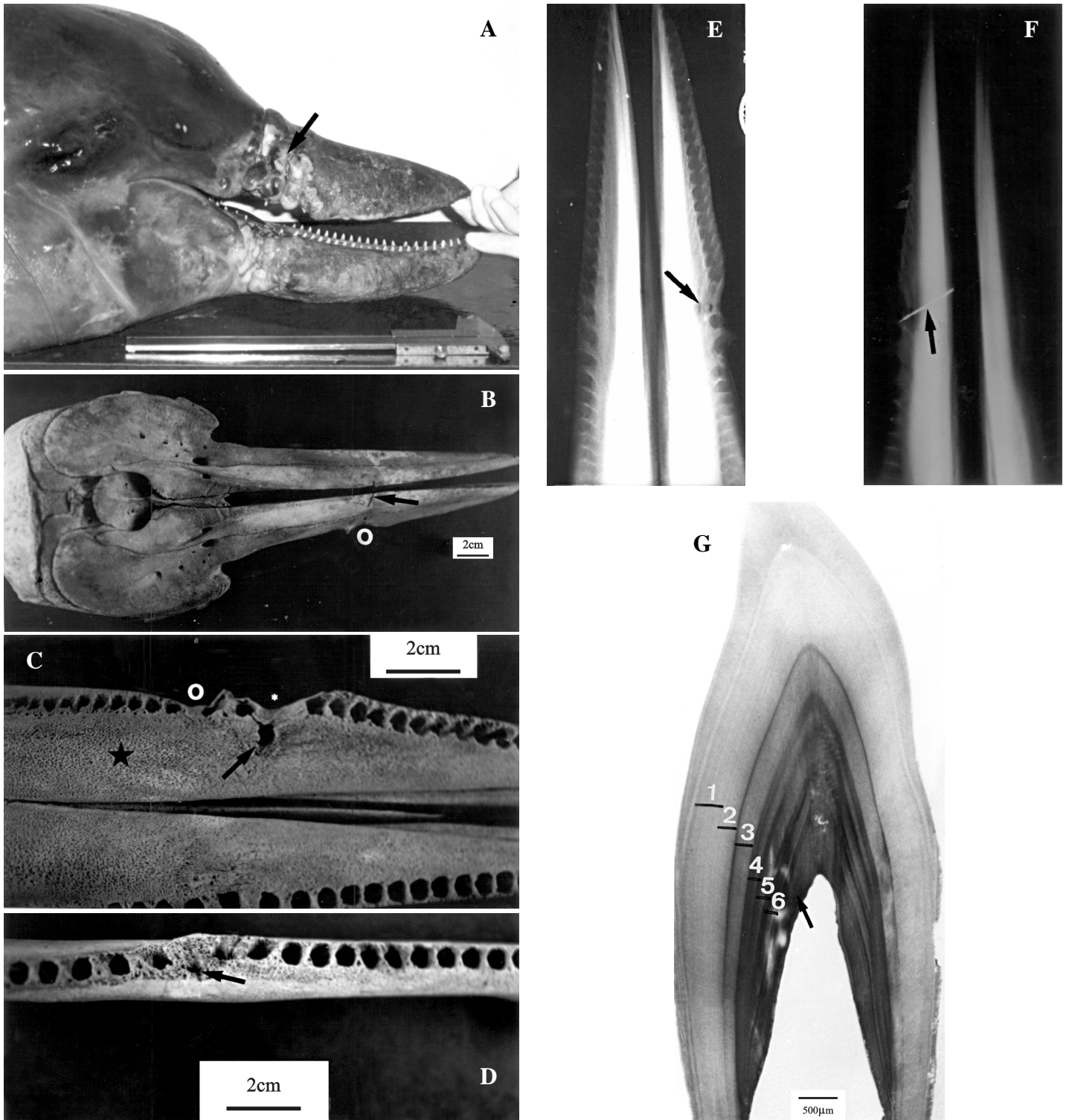


Figure 1

Male *Sotalia fluviatilis* with lacerated lesions in the rostrum and bone and dental lesions. **A:** right side of the rostrum. The arrow indicates the lacerated lesion around the posterior portion of the rostrum. **B:** dorsal view of skull. The white circle indicates the shallow depression bordered by high crest on the lateral face of the right maxilla and the arrow indicates the groove in the right pre-maxillaries caused by piece of the entangling nylon thread. **C:** Detail of alveolar lesions on the right and left maxilla. The arrow indicates the alveoli forced into the ventral side of the maxillary, the white circle indicates the alveoli closed due to avulsion of the tooth, the white asterisk indicates a slight deviation of the alveoli and enlarged intervals between them and star indicates a newborn formation in the palate. **D:** detail of lesions in the left mandible. The arrow indicates the alveolus partially closed due to tooth avulsion. **E** and **F:** X-ray of the maxillae and pre-maxillaries. In **E**, the arrow indicates the teeth versions. In **F**, a metallic pin has been inserted to indicate the channel left by the nylon thread at the right side (indicated by arrow). **G:** Mid-longitudinal stained thin sections in the tooth. The numbers indicate the each Growth Layer Group (GLG) and the arrow indicate the inconspicuous layer after six GLG. (Photos: Márcia Adriana Dutra).

A shallow depression bordered by a sharp, short and high crest could be seen on the lateral face of the right maxilla at the level of alveoli 25/26 (Fig. 1B). Continuous to this depression, the ventral side of the maxillary and the alveoli were deformed at the level of teeth 21-24/25. One of the alveoli, probably number 22, was ill positioned and seemed to be forced into the ventral side of the maxillary (Fig. 1C). Besides, two teeth had suffered avulsion and the alveoli were closed. At the superior part of the depression close to the right premaxillaries there is a small regular furrow measuring 2.0 mm long per 1.0 mm broad that could be the scar of a nylon thread. On the left maxillary, the alveoli 21 to 24 presented slight deviation of their axes and enlarged intervals between them (Fig. 1C). At the level of the affected alveoli rough abnormal new bone formation can be seen at the palate, suggesting healed periostitis (Fig. 1C).

At the right premaxillaries at the level of the same teeth there is a groove measuring 13.0 mm long per 1.0 mm broad. A similar but shorter groove – 3.0 mm long – continues its oblique course through the left premaxillaries, close to the midline suture. Although no foraneous corpses were found in the bones, the grooves have probably been caused by a piece of the entangling nylon thread that made its way through the soft tissue lesions, remaining enclosed by the healing bone (Fig. 1B).

The lesions of the right mandible are mainly concerned to the alveoli 23, 24 and 25 and consisted in discreet periosteal reaction. On the left mandible, the lesions were observed from alveoli 23 till 26. At the left mandible tooth 24 suffered avulsion and the corresponding alveolus was partially closed and surrounded by ill-formed new bone (Fig. 1D). The bony tissue in the centre of the lesions was macroscopically porous disorganised suggesting remodelling activity. A reactive bone growth can be seen at the lateral part of the left mandible close to the alveolus 24. Different colour and texture on both sides of the jaw near the ill bone is suggestive of necrosis, but the conditions of the analysis made it impossible to exclude a taphonomic effect⁷.

In spite of the extent of the bone lesions, there was generally no apparent sign of serious active bacterial infection. However, discrete porosity and newbone apposition suggest discreet inflammation that could be due to bacterial infection in some areas near the alveoli.

X-ray examination confirmed the absence of osteitis or osteomyelitis, the newly formed bone tissue was organised around of the lesions without increase of density or lythic areas. Assymetries of the bones and teeth versions are clearly seen when comparing left to right sides (Fig. 1E). A metal pin placed inside a thin channel-like area indicates one of the nylon thread scars inside the bone (Fig. 1F).

The extension of the lesions was probably due to the number of threads, which were wrapped around the beak, their continuous presence and the time elapsed since the accident. Channels and grooves in the healed bones corresponding to the migration and trapping of nylon threads confirm the time elapsed. Though the animal apparently survived for a long period, these lesions likely caused him serious health problems during its lifetime.

An inconspicuous layer deposition was observed in the tooth extracted from the affected areas (Method 1). Six layer

groups were counted in each tooth originating from a healthy area (Method 1), and also in one of the teeth from unknown location (Method 2). Three of the other teeth from unknown locations (Method 1) showed inconspicuous patterns, making it impossible to distinguish the GLGs. In another teeth, inconspicuous dentine deposition prevents counting more than six GLGs, perhaps two to three surplus layers (Fig. 1G). The inconspicuous layers could not be defined as complete layers representing annual cycles, but probably represented disturbance of the normal teeth development between the third and sixth GLGs. This abnormal growth layers pattern was only observed in the teeth from the injured area. The inconspicuous dentine deposition in these teeth was probably due to disturbances during the growth process. The formation of annual layers has been defined as a record of growth rate for individuals. Annual layers may be affected both by endogenous and exogenous factors⁵. The variation in the dentine patterns between the third and sixth GLGs in this specimen indicates a negative impact on dentogenesis at the age of three years. This may represent the age at which the dolphin was first tangled.

The dolphin may have got entangled in fishing gear in active use or after they were discarded or lost. Accidental entanglement in fishing gear is considered one of the main threats to small cetaceans throughout the world⁹, deriving nets and plastic debris are also causing widespread mortality in marine species⁴. After they become entangled in the loops and openings of these items. Once ensnared, these animals may be unable to swim or feed, or may develop open infected wounds⁶.

In Northern Rio de Janeiro, interactions between dolphins and fisheries have been monitored since 1987² and, until now, about 460 dolphins have been found entangled in fishing gears. Around 4% of them could have been released alive. The frequency of escape, associated to possible damage to the fishing gear, is unknown in that area. Along the Brazilian coast, stranded cetaceans frequently show net marks on the rostrum, flippers, flukes and dorsal fins indicating interactions with fishing nets. Alves-Júnior et al.¹ reported five specimens of *Steno bredanensis* stranded along the coast of Ceará State with (parts of) nets wrapped around their bodies.

It is probable that many dolphins and porpoises may escape from fishing gear with remains of nets attached to their bodies. However, it is unknown how many will survive. These data indicate that non-lethal encounters with fishing gears may cause serious health problems to small cetaceans and reduce their lifetime. This is the first report of fisheries-related chronic lesions in *S. fluviatilis*.

ACKNOWLEDGEMENTS

We would like to thank to Dr. Marie Françoise Van-Bresseem and Salvatore Siciliano for the useful comments and suggestions to improve the manuscript and for the English review; and to Ana Bernadete Fragoso (Universidade do Estado do Rio de Janeiro – UERJ) and Mário Romão (Departamento de Patologia e Clínica Veterinária da Universidade Federal Fluminense - UFF) for providing the X-rays.

RESUMO

O objetivo do presente estudo foi descrever um grupo de lesões causadas por enredamento em *Sotalia fluviatilis* capturado acidentalmente por rede de pesca em 23 de julho de 1995 no Norte do Estado do Rio de Janeiro (21°37'S-041°01'W), Sudeste do Brasil. O espécime apresentou lesões laceradas na pele e no tecido subcutâneo ao redor da extremidade posterior do rostró. Fios de náilon foram encontrados associados às lesões. Lesões ósseas e nos dentes foram também observadas na área subjacente e afetaram as maxilas, pré-maxilas e mandíbulas. As lesões provavelmente foram causadas por enredamento não-letal em aparelho de pesca. Anomalias no padrão de camadas de crescimento dos dentes lesados, entre a terceira e a sexta camada, sugerem que esta lesão ocorreu aos três anos de idade. Os dados indicam que encontros não-letais com redes de pesca podem causar sérios problemas de saúde em pequenos cetáceos. Esta é a primeira descrição de lesão crônica em *S. fluviatilis* relacionada a pescarias.

UNITERMOS: *Sotalia fluviatilis*; Lesões na pele e óssea; Enredamento; Sudeste do Brasil.

REFERENCES

- 1- ALVES-Jr., T. T.; ÁVILA, F. J. C.; OLIVEIRA, J. A.; FURTADO-NETO, M. A. A.; MONTEIRO-NETO, C. Registros de cetáceos para o litoral do Estado do Ceará, Brasil. **Arquivo Ciência do Mar**, v. 30, n. 1-2, p. 79-92, 1996.
- 2- DI BENEDITTO, A. P. M.; RAMOS, R. M. A.; LIMA, N. R. W. Fishing activity in Northern Rio de Janeiro State (Brazil) and its relation with small cetaceans. **Brazilian Archives of Biology and Technology**, v. 41, n. 3, p. 296-302, 1998.
- 3- HOHN, A. A.; SCOTH, M. D.; WELLS, R. S.; SWEENEY, J. C.; IRVINE, A. B. Growth layers in teeth from known age, free-ranging bottlenose dolphins. **Marine Mammal Science**, v. 5, n. 4, p. 315-342, 1989.
- 4- JONES, L. L.; FERRERO, R. C. Observations of net debris and associated entanglements in the North Pacific Ocean and Bering sea, 1978-1984. In: SHOMURA, R. S.; YOSHIDA, H. O. (Ed.). **PROCEEDINGS OF THE WORKSHOP ON THE FATE AND IMPACT OF MARINE DEBRIS**, Honolulu, Hawaii, 1984. **NOAA Technical Mem. NMFS-NOAA-TM-NMFS-SWFC-54**, 1985, p. 183-196.
- 5- KLEVEZAL, G. A. Layers in the hard tissues of mammals as a record of growth rhythms of individuals. In: PERRIN, W. F.; MYRICK Jr., A. C. (Ed.). **Age determination of toothed whales and sirenians**. Report International Whaling Commission, special issue 3, p. 89-94, 1980.
- 6- NORSE, E. A. **Global marine biological diversity: a strategy for building conservation into decision making**. Washington: Island Press, 1993.
- 7- ORTNER, D. J.; PUTSHARD, W. G. J. **Identification of pathologic conditions in human skeletal remains**. Washington: Smithsonian Inst. Press, 1997.
- 8- PERRIN, W. F.; MYRICK Jr., A. C. (Ed.). Report of the workshops on determination age of Odontocete Cetaceans. In: **Age determination of toothed whales and sirenians**. Report International Whaling Commission, special issue 3, p. 1-50, 1980.
- 9- PERRIN, W. F.; DONOVAN, G. P.; BARLOW, J. (Ed.). Report of the workshop on mortality of cetaceans in passive fishing nets and traps. In: **Gillnets and cetaceans**. Report International Whaling Commission, special issue 15, p. 1-26, 1994.
- 10- PIERCE, K. V.; KAJIMURA, H. Acid etching and highlighting for defining growth layers in cetacean teeth. In: PERRIN, W. F.; MYRICK Jr., A. C. (Ed.). **Age determination of toothed whales and sirenians**. Report International Whaling Commission, special issue 3, p. 99-104, 1980.
- 11- STEINBOCK, R. T. **Paleopathological diagnosis and interpretation**. Springfield: C. C. Thomas, 1976.
- 12- SICILIANO, S. Review of small Cetaceans and Fishery Interactions in Coastal Waters of Brazil. In: PERRIN, W. F.; DONOVAN, G. P.; BARLOW, J. (Ed.). **Gillnets and cetaceans**. Report International Whaling Commission, special issue 15, p. 241-250, 1994.

Received: 25/06/2001

Accepted: 31/01/2002