

## Plastic debris ingested by a rough-toothed dolphin, *Steno bredanensis*, stranded alive in northeastern Brazil

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### Resumo

**Ingestão de lixo plástico por um golfinho-de-dentes-rugosos, *Steno bredanensis*, encalhado vivo no Nordeste do Brasil.** Um macho adulto de golfinho de dentes-rugosos, *Steno bredanensis*, encalhou vivo na Praia do Poço da Draga, Fortaleza, Ceará, nordeste do Brasil. O animal não conseguia nadar e estava visivelmente desnutrido, e veio a óbito durante o transporte para as instalações de reabilitação da AQUASIS. Durante a necrópsia, dois sacos plásticos e quatro pedaços de esponja do mar foram encontrados no estômago anterior, onde a mucosa continha várias úlceras. A ingestão de lixo plástico por golfinhos não é bem entendida. Eles podem ingeri-lo por engano, já que se assemelha a alguns de seus itens alimentares, ou ingeri-lo junto com uma presa. No Estado do Ceará, a disposição incorreta de resíduos sólidos é uma das maiores ameaças à zona costeira. Medidas urgentes são necessárias para minimizar esta ameaça a fauna marinha costeira, como instrumentos legais, fiscalização e campanhas educacionais.

**Unitermos:** cetáceos, golfinho de dentes-rugosos, lixo plástico, nordeste do Brasil, *Steno bredanensis*

### Abstract

An adult male rough-toothed dolphin, *Steno bredanensis*, stranded alive on Poço da Draga Beach, Fortaleza, Ceará State, northeastern Brazil. The animal was unable to swim, was visibly emaciated, and died while being transported to the AQUASIS rehabilitation facilities. During the necropsy, two plastic bags and four pieces of sea sponges were found in the fore-stomach chamber, where the mucosa had several ulcers. The ingestion of plastic debris by dolphins is not well understood. They can eat it by mistake, since it resembles some of their prey species, or ingest it along with a prey. In Ceará State, the inappropriate disposal of solid wastes and urban effluents are major sources of pollution in the coastal zone. Urgent measures are required to minimize this threat to coastal marine mammals, such as legal mechanisms, enforcement and awareness campaigns.

**Key words:** cetaceans, rough-toothed dolphin, plastic debris, northeastern Brazil, *Steno bredanensis*

Environmentally persistent debris is widespread in the world's marine ecosystems (Laist, 1987). Considerable quantities of plastic debris can be found in these ecosystems (Dufault and Whitehead, 1994), and millions of tons of these pollutants enter the ocean each year (Ship and Burton, 1991; Derraik, 2002). However, the threat of plastic materials to the marine environment has been ignored for a long time, and its seriousness has only recently been recognized (Stefatos et al., 1999). To marine life, these threats are primarily mechanical due to ingestion of plastic debris and entanglement in packaging bands, synthetic ropes and lines, or drift nets (Laist, 1987 and 1997; Quayle, 1992).

Ingestion of plastic debris is known in relation to fishes, seabirds, turtles and marine mammals (Derraik, 2002). In Brazil, these pollutants have been found in the stomachs of sea turtles *Chelonia mydas*, *Caretta caretta*, *Dermochelys coriacea* and *Lepidochelys olivacea* (Bugoni et al., 2001; Mascarenhas et al., 2004) as well as coastal species of cetaceans, such as *Sotalia*

*fluviatilis* (Geise and Gomes, 1992) and *Pontoporia blainvillei* (Pinedo, 1982), and more pelagic species such as *Globicephala macrorhynchus* (Barros et al., 1997) and *Mesoplodon densirostris* (Secchi and Zarzur, 1999).

Here we document a case of plastic ingestion by a rough-toothed dolphin, *Steno bredanensis*, stranded alive on the northeastern Brazilian coast.

On June 7<sup>th</sup> 2001, a 262-cm-long adult male of the rough-toothed dolphin species was stranded alive at Poço da Draga Beach (3 43'S, 38 31'W), Fortaleza, Ceará State, northeastern Brazil (Figure 1). The animal was unable to swim and had to be supported in the shallow waters of the beach. Upon external examination it was noted that the dolphin was visibly emaciated, with a distinct concavity on the dorsal surface, on both sides of the body, and a pronounced "neck" (Figure 2) indicating atrophy of the epaxial muscles. Several stalked crustaceans of the genus *Lepas* were found attached to the mouth, in the upper teeth.

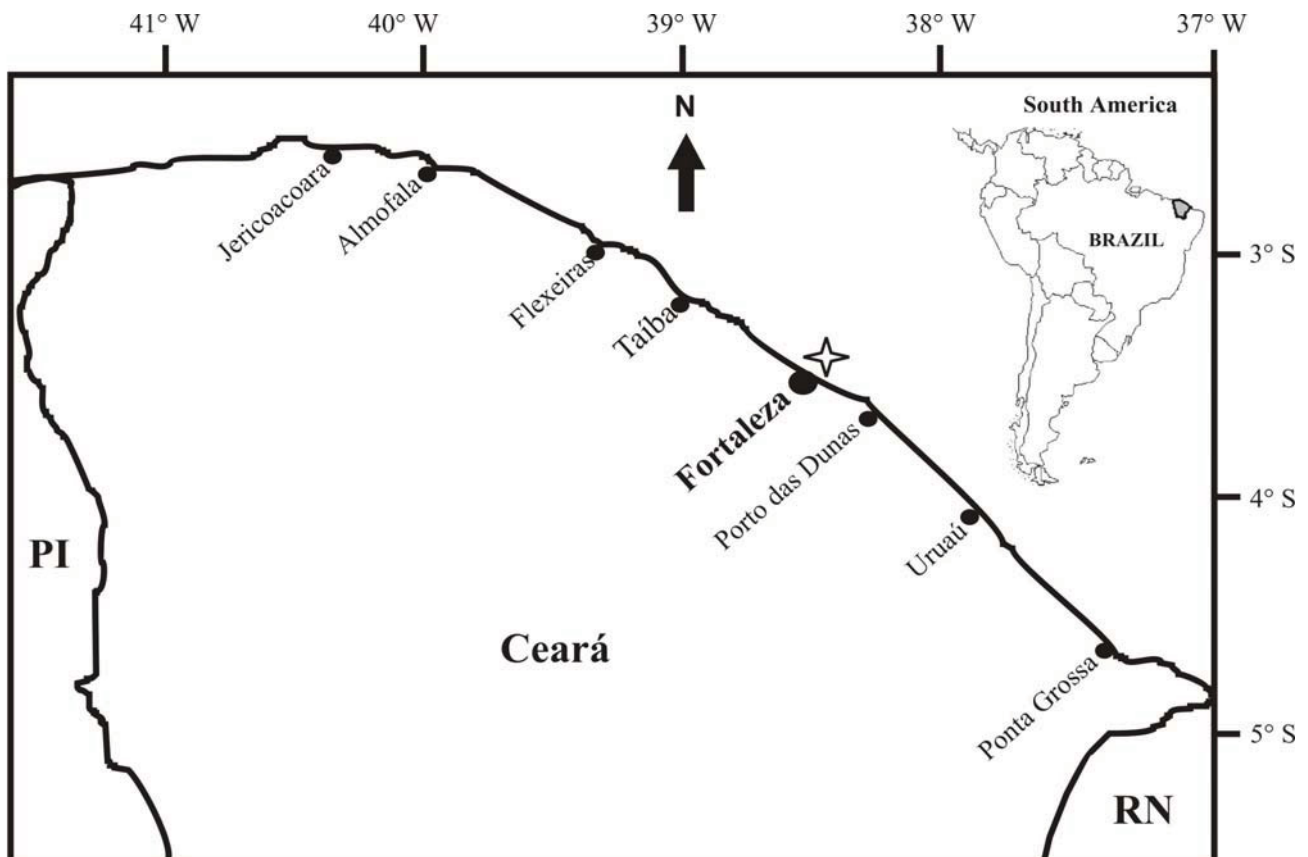


FIGURE 1: Map of South America indicating the location of the State of Ceará (shaded area). The *S. bredanensis* stranding area is marked with a star.

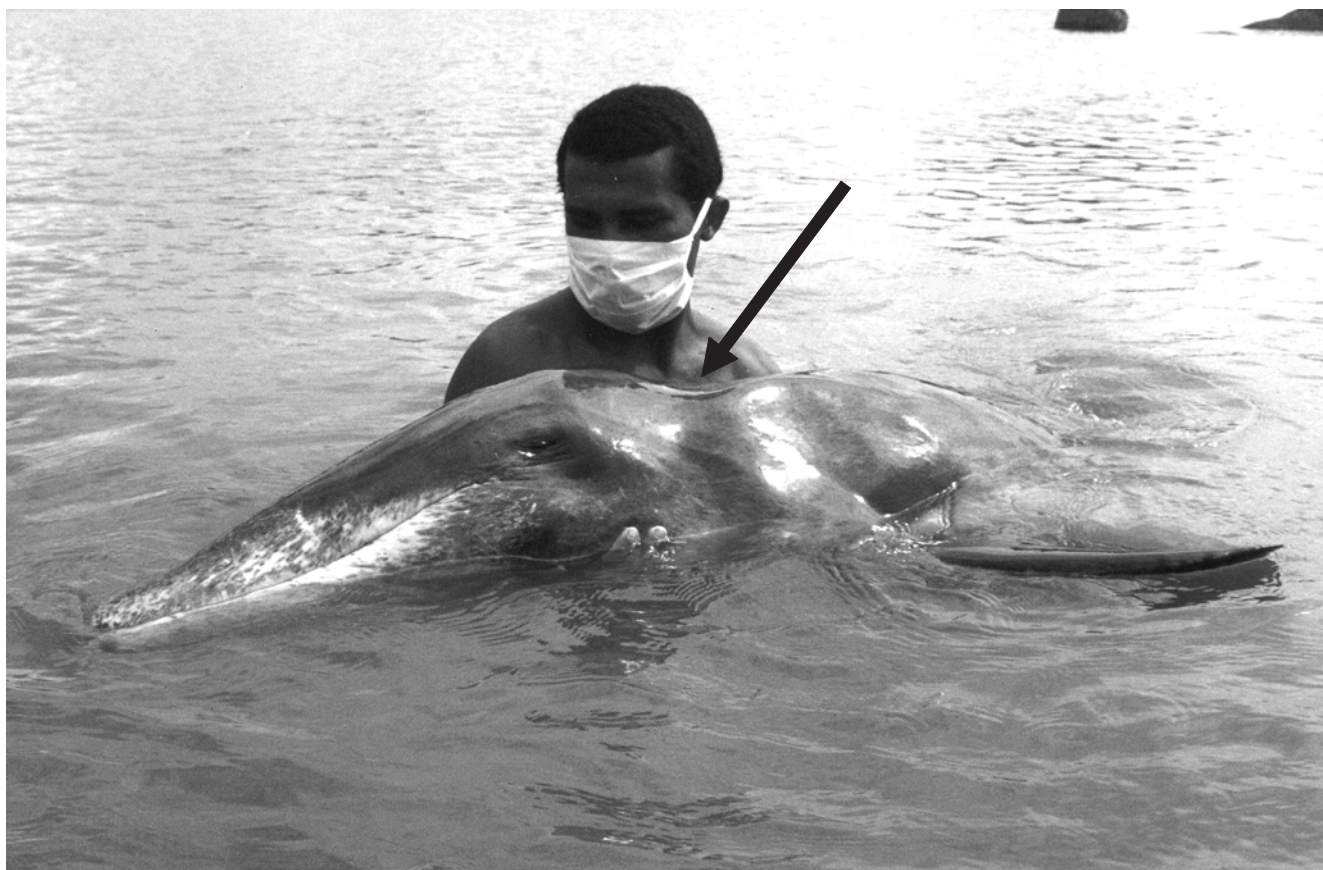


FIGURE 2: Emaciated rough-toothed dolphin supported in shallow waters of Poço da Draga beach. Note the pronounced "neck" (arrow) formed by the atrophy of the epaxial muscles.

Due to the animal's health condition and the impossibility of putting it back into the ocean, the AQUASIS rescue team decided to transfer the dolphin to the *Centro de Reabilitação de Mamíferos Marinhos*, but it died while being transported. During the necropsy, stomach analysis revealed the presence of two plastic bags (a combined weight of 14.12g) and four pieces of sea sponges (16.96g) occupying 2/3 of the fore-stomach chamber, and occluding the passage to the main stomach, where the majority of digestion occurs. The three stomach chambers were completely free of food remains, indicating that the dolphin had not been feeding for some days. The examination of the fore-stomach chamber mucosa showed the presence of several ulcers, probably caused by the presence of the debris and the excessive production of gastric acids.

The presence of plastic bags in the stomach of *S. bredanensis* has already been reported by Walker and Coe (1990). According to Hetzel and Lodi (1993), this

species is very intelligent and curious, and it was observed playing with plastic bags and artificial baits near Ponta da Juatinga, Rio de Janeiro state, southeastern Brazil. Kastelein and Lavaleije (1992) suggested that plastic bags can be accidentally swallowed by dolphins due to their investigative behavior.

The rough-toothed dolphin feeds basically on fish and mollusks (octopuses and squids) (Layne, 1965; Perrin and Walker, 1975; Miyasaki and Perin, 1994). Thus, Kastelein and Lavaleije (1992) and Ryan (1994) believe that the plastic bags can be ingested by mistake, because they resemble some of the prey species of this dolphin. However, according to Walker and Coe (1990), this mistake is unlikely to occur because of odontocete cetacean echolocation capabilities. Some captive experiments have shown that dolphins are capable of making fine discriminations in size, shape, texture and composition of objects (Evans and Powell, 1967; Norris, 1969). But there is also a possibility that plastic bags are

ingested incidentally along with their prey, as discussed by Walker and Coe (1990).

The sea sponges found in the dolphin's stomach could have been incidentally ingested while pursuing common prey or it could be explained by the incapacity of the animal to hunt the usual prey species due to the weakness caused by lack of feeding. Thus, the animal could have been feeding on materials easier to obtain, as suggested by Kastelein and Lavaleije (1992).

Some authors indicate that the presence of certain epizoids in small cetaceans can be related to the slower movement of animal which are sick (e.g. Aznar, 1994; Di Benedito and Ramos, 2000; Marigo, 2002). Thus, the presence of *Lepas* sp. attached to the dolphin studied here reinforces the idea that the animal was debilitated, and was not able to hunt properly.

Based on the dolphin's symptoms and the findings of the necropsy, we believe that the animal's debilitation could have been caused by the ingestion of the plastic bags, leading to stranding and death. The ingestion of this kind of material can cause a false sensation of satiation, which could have reduced the dolphin's appetite, compromising the energy consumption and its health (Kastelein and Lavaleije, 1992).

In Ceará State, the inappropriate disposal of solid wastes and urban effluents are major sources of pollution in the coastal zone (Campos et al., 2003). Population growth and the lack of planning in human settlements, associated with the longevity of debris in the environment, increase the threats to small coastal cetaceans, especially in their shallow feeding grounds.

The need for legislation at the national and local levels, requiring appropriate collection and disposal of solid waste and encouraging recycling, could help reduce this problem if properly enforced. Educational campaigns are also very important to increase the awareness of the general public about the need for environmental conservation.

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## References

- Aznar, F. J.; Balbuena, J. A.; Raga, J. A. 1994. Are epizoids biological indicators of a Western Mediterranean striped dolphin die-off? **Diseases of Aquatic Organisms**, **18**: 159-163.
- Barros, N. B.; Gasparini, J. L.; Barbosa, L. A.; Netto, R. F.; Moraes, C. S. 1997. Ingestão de plástico como provável causa mortis de uma baleia-piloto-de-peitorais-curtas, *Globicephala macrorhynchus* Gray, 1846, no litoral do estado do Espírito Santo. **Anais do 7º Congresso Nordestino de Ecologia**, Ilhéus, Bahia, Brazil, p.336.
- Bugoni, L.; Krause, L.; Petry, M. V. 2001. Marine debris and human impacts on sea turtles in Southern Brazil. **Marine Pollution Bulletin**, **42**: 1330-1334.
- Campos, A. A.; Monteiro, A. Q.; Monteiro-Neto, C.; Polette, M. 2003. **A Zona Costeira do Ceará: diagnóstico para a gestão integrada**. AQUASIS, Fortaleza, Brazil, 248pp.
- Derraik, J. G. B. 2002. The pollution of the marine environment by plastic debris: a review. **Marine Pollution Bulletin**, **44**: 842-852.
- Di Benedito, A. P.; Ramos, R. 2000. Records of the barnacle *Xenobalanus globicipitis* (Steentrup, 1851) on small cetaceans of Brazil. **Biotemas**, **13** (2): 159-165.
- Dufault, S.; Whitehead, H. 1994. Floating marine pollution in "the Gully" on the continental slope, Nova Scotia, Canada. **Marine Pollution Bulletin**, **28**: 489-493.
- Evans, W. E.; Powell, B. A. 1967. Discrimination of metallic plates by an echolocating delphinid. **Proceedings of the Symposium Bionic Models of Animal Sonar System**, Frascati, Italy, p.363-398.
- Geise, L.; Gomes, N. 1992. Ocorrência de plástico no estômago de um golfinho, *Sotalia guianensis* (Cetacea, Delphinidae). **Anais da 3ª Reunião de Trabalho de Especialistas em Mamíferos Aquáticos da América do Sul**, Montevideo, Uruguay, p.26-28.
- Hetzel, B.; Lodi, L. 1993. **Baleias, botos e golfinhos: guia de identificação para o Brasil**. Nova Fronteira, Rio de Janeiro, Brazil, 279pp.
- Kastelein, R. A.; Lavaleije, M. S. S. 1992. Foreign bodies in the stomach of a female harbour porpoise (*Phocoena phocoena*) from the North Sea. **Aquatic Mammals**, **18**: 40-46.
- Laist, D. W. 1987. Overview of the biological effects of lost and discarded plastic debris in the marine environment. **Marine Pollution Bulletin**, **18**: 319-326.
- Laist, D. W. 1997. Impacts of marine debris: entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records. In: Coe, J. M. & Rogers, D. B. (eds.). **Marine debris: Sources, impacts and solutions**. Springer Verlag, New York, USA, p.99-140.
- Layne, J. N. 1965. Observations on marine mammals in Florida Waters. **Bulletin of the Florida State Museum**, **9** (4): 131-181.

- Marigo, J. 2002. Parasites - Report of the Working Group on Biology and Ecology. **Latin American Journal of Aquatic Mammals**, **1** (1): 31-32.
- Mascarenhas, R.; Santos, R.; Zeppelini, D. 2004. Plastic debris ingestion by sea turtle in Paraíba, Brazil. **Marine Pollution Bulletin**, **49**: 354-355.
- Miyasaki, N.; Perrin, W. F. 1994. Rough-toothed dolphin *Steno bredanensis* (Lesson, 1828). In: Ridgway, S. H. & Harrison, R. (eds). **Handbook of Marine Mammals**. Academic Press, London, UK, p.1-21.
- Norris, K. S. 1969. The echolocation of marine mammals. In: Andersen, H. T. (ed). **The biology of marine mammals**, Academic Press, London and New York, p.391-421.
- Perrin, W. F.; Walker, W. A. 1975. The rough-toothed porpoise, *Steno bredanensis*, in the eastern tropical Pacific. **Journal of Mammalogy**, **56** (4): 905-907.
- Pinedo, M. C. 1982. **Análises dos conteúdos estomacais de *Pontoporia blainvillei* (Gervais & D'Orbigny, 1844) e *Tursiops gephyreus* (Lahille, 1908) (Cetacea, Platanistidae e Delphinidae) na zona estuarial e costeira do Rio Grande, RS, Brazil**. Dissertação de Mestrado, Universidade do Rio Grande, Brazil, 95pp.
- Quayle, D. V. 1992. Plastics in the marine environment: problems and solutions. **Chemical Ecology**, **6**: 69-78.
- Ryan, P. G. 1994. The impact of marine debris. **Working group Report of the Third International Conference on Marine Debris**, Miami, USA, 20pp.
- Secchi, E.; Zarzur, S. 1999. Plastic debris ingested by a Blainville's beaked whale, *Mesoplodon densirostris*, washed ashore in Brazil. **Aquatic Mammals**, **25**: 21-24.
- Ship, D. J.; Burton, H. R. 1991. Accumulation of fishing debris, plastic litter, and other artifacts, on Heard and Macquarie Islands in the Southern Ocean. **Environmental Conservation**, **18**: 249-254.
- Stefatos, A.; Charalampakis, M.; Papatheodorou, G.; Ferentinos, G. 1999. Marine debris on the seafloor of the Mediterranean Sea: examples from two enclosed gulfs in Western Greece. **Marine Pollution Bulletin**, **36**: 389-393.
- Walker, W. A.; Coe, J. M. 1990. Survey of marine debris ingestion by odontocete cetaceans. **Proceedings of the Second International Conference on marine Debris**, Honolulu, USA, p.747-774.