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Note

Plastic debris collars on juvenile carcharhinid sharks (*Rhizoprionodon lalandii*) in southwest Atlantic

Ivan Sazima [a,*], Otto B.F. Gadig [b], Rafael C. Namora [c], Fábio S. Motta [c]

[a] *Departamento de Zoologia and Museu de História Natural, Universidade Estadual de Campinas, Caixa Postal 6109, 13083-970 Campinas, São Paulo, Brazil*

[b] *Departamento de Biologia, Universidade Santa Cecília, Av. Washington Luiz, 493, apt. 52, 11055-001 Santos, São Paulo, Brazil*

[c] *Pós-Graduação, Instituto de Biociências, Unesp, Av. 24A, 1515 Bela Vista, 13506-001 Rio Claro, São Paulo, Brazil*

Abstract

Three juvenile Brazilian sharpnose sharks (*Rhizoprionodon lalandii*) caught in gillnets in southeast Brazil, southwest Atlantic, were found with plastic debris rings around their gill or mouth region. The rings caused severe abrasion on the sharks' tissues as the animal grew, the collars probably hampering normal feeding and/or ventilation since two of the collared individuals were emaciated. The rings were identified as detachable lid parts from plastic bottles, likely thrown overboard by fishery and/or recreation boats. As several carcharhinid shark species dwells and reproduce in shallow waters, the impact of discarded plastic debris likely is greater on this shark type.

Keywords: Southwest Atlantic; Brazilian sharpnose shark; Entanglement; Detachable bottle parts; Plastic debris rings

Plastic debris at the sea causes harm and impact on marine vertebrates, from fishes to mammals (Dufault and Whitehead, 1994; Laist, 1997). Many species of marine fishes have been reported entangled/encircled by man-made artifacts, although there are relatively few reports about sharks (e.g., Gudger and Hoffmann, 1931; Bird, 1978; Schwartz, 1984). Entanglement/encircling by plastic debris has been recorded for several shark species over the world (Laist, 1997), the investigative behavior of sharks in relation to inanimate objects in their habitat being regarded as the main cause for these events (Bird, 1978). Although information on the impact of plastic debris in the marine environment has been reported from north Atlantic (Wilber, 1987), few data is available for south Atlantic, especially on the South American coast. We report herein on plastic debris rings attached to three juvenile sharks in southwest Atlantic and comment on its incidence and damage to the fish. The specimens are deposited in the fish collection of the Museu de História Natural, Universidade Estadual de Campinas (ZUEC).

Three juvenile specimens of the Brazilian sharpnose shark (*Rhizoprionodon lalandii*) caught in gillnets on the coast of São Paulo, southeast Brazil, were found with plastic debris rings around their gill or mouth region. The rings, with projections along their internal surface, were identified as detachable parts of bottle lids (internal diameter 36–42 mm). The largest shark specimen (a female 45.5 cm total length (TL)) was caught in Itanhaém, São Paulo (about 24°11′S) on 2 May 1999. The specimen was netted with additional eight sharpnose sharks, all of them juveniles (45.5–54.5 cm TL), plus 32 juveniles of the scalloped hammerhead shark, *Sphyrna lewini* (61–75 cm TL) and one juvenile smalltail shark, *Carcharhinus porosus* (48.5 cm TL). A smaller female (42.5 cm TL) was caught in Ubatuba, São Paulo (about 23°30′S), on 25 August 2001 and came along with 73 juveniles of the same species (36–51 cm TL). The smallest specimen (a male 38 cm TL) was netted in the same area on 28 September 2001 along with 18 juvenile *R. lalandii* about the same size (35–40 cm TL). Size of this shark species at birth is 33–34 cm TL (Ferreira, 1988).

In the largest specimen (ZUEC 5563) the 42 mm diameter ring encircled the otic area of the cranium, covering the mouth corners (Fig. 1). The shark was emaciated and probably was unable to open its mouth wide, which would hamper its normal feeding (and perhaps ventilation as well). The tissue on the top of its

* Corresponding author. Fax: +44-19-3289-3124.
E-mail address: isazima@unicamp.br (I. Sazima).

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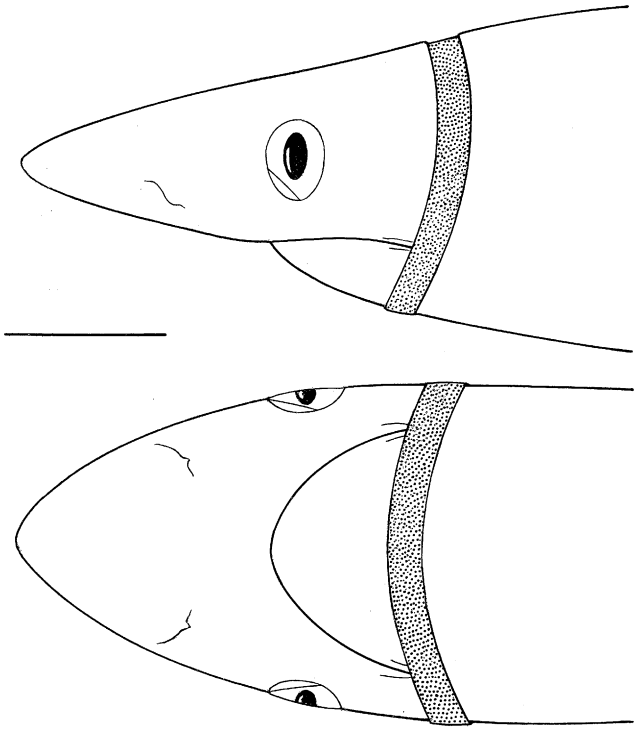

Fig. 1. Schematic lateral and ventral views of the head of a *R. lalandii* female (45.5 cm TL), showing plastic debris collar (dotted) around its mouth region. Itanhaém, São Paulo, southeast Brazil (ZUEC 5563). Scale line = 20 mm.

head was severely eroded, much more than on the ventral side. This may be due to the fact that the dorsal, rounded side of the head conforms well to the ring, whereas the more flattened ventral side does not contact most of the ring internal surface. Laterally, the ring compressed a complex of very important muscles related to feeding mechanisms in carcharhinid sharks, the dorsal portion of the *levator labii superioris* and the ventral portion of the *adductor mandibulae* (see Lima et al., 1997).

The smaller female (ZUEC 5565) was encircled by a collar with a diameter similar to that found in the previous shark. In this female, however, the ring encircled the gill region, causing severe erosion in the head tissue as the shark grew (Fig. 2). The gill region was partly obstructed by the collar and the shark was emaciated like the previously described individual, which also may indicate that the ring was a hindrance both to its normal feeding and perhaps ventilation as well. It was possible to move the collar a little around the shark gill openings, this movement probably increasing the tissue damage.

The smallest specimen (ZUEC 5566) wore a 36 mm diameter ring, whose damage was mostly restricted to the gill region and was less serious than those shown by the two previous specimens, which indicates that the collar was acquired recently. The ring was loosely attached and was easily removed by pulling it head-wards.

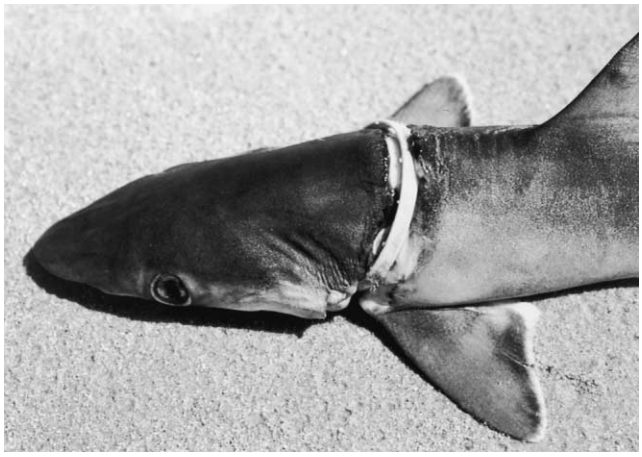

Fig. 2. Dorso-lateral view of the head of a *R. lalandii* female (42.5 cm TL), showing damage to tissue on the gill region surrounded by a plastic debris collar. Ubatuba, São Paulo, southeast Brazil (ZUEC 5565).

This shark seemed still healthy and had fish remains in the gut.

In both latter sharks the ringed region was narrowed and the gill area was the most eroded. The rings' internal projections likely have the potential to severely erode the shark tissue in short time. In the two specimens from Ubatuba the rings were fouled by marine organisms (algae, bryozoans).

The incidence of plastic collars on the Brazilian sharpnose shark is possibly related to debris discarded both by fishery boats (year-round) and recreation boats (summertime). *R. lalandii* is the most abundant coastal shark in southeast Brazil, dwelling in shallow coastal waters on sandy and muddy bottoms (Ferreira, 1988), a kind of habitat heavily plied by shrimp-fishery and recreation boats, both of which indiscriminately discard their plastic waste overboard in southeast Brazil (pers. obs.). Moreover, marine coastal areas concentrate most of the discharged plastic debris from shoreline human occupation, which adds to the already great amount coming from boats.

Carcharhinid sharks likely are the most affected by plastic collars (Laist, 1997) as this group and their close relatives, the hammerhead sharks (Sphyrnidae), are the most abundant and diverse shark groups in coastal areas worldwide and generally reproduce in shallow waters (Compagno, 1984). However, hammerhead sharks are naturally protected from such encircling by their laterally expanded anterior part of the head (the "hammer"). Thus, due to its abundance, coastal habitat and small size, *R. lalandii* may be one shark most affected by small, plastic collar-like debris discarded in the inner continental shelf of the southeast Brazil.

The production increase of plastic bottles worldwide during the last two decades, with the manufacture of about 130 billions per year of lids in the United States alone (Renstrom, 2001), may be regarded as a strong

indication that plastic debris encircling of small predatory coastal sharks most likely will increase too.

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