*Aquatic Mammals* 2014, *40*(3), 297-304, DOI 10.1578/AM.40.3.2014.297

# Short Note

## Depredation of a Sport Fishing Tournament by Rough-Toothed Dolphins (*Steno bredanensis*) off Angola

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The interactions between cetaceans and fisheries have received increasing focus in recent years, both in terms of the unintentional mortality of animals in fishing gear as bycatch (Reeves et al., 2013) and as depredation behaviour (Hamer et al., 2012). In the context of this short note, *depredation* refers to the removal of, or damage to, bait or target fish (commercial or recreational) by odontocete cetaceans (Read, 2008). Studies of cetacean depredation have concentrated on commercial fisheries, especially pelagic and demersal longline fisheries where the passive nature and long soak time are particularly favourable for exploitation by cetaceans. Hamer et al. (2012) carried out an extensive review of cetacean interactions with longline fisheries, identifying 15 odontocete species for which there was evidence of depredation or bycatch. Depredation by larger cetaceans, including killer whales (*Orcinus orca*) and sperm whales (*Physeter macrocephalus*), can have considerable economic impact on some commercial longline fisheries (e.g., Roche et al., 2007). In addition to economic losses for fishermen, depredation can have conservation and welfare implications when it results in injury or mortality of animals via entanglement or gear ingestion. For example, declines in an endangered population of false killer whales (*Pseudorca crassidens*) around Hawaii have been linked with mortality in the longline tuna fishery (Reeves et al., 2009).

In contrast to commercial fisheries, the prevalence of depredation in recreational fisheries has received relatively little attention (Navarro & Bearzi, 2007). However, regular depredation of several recreational hook and line fisheries by bottlenose dolphins (*Tursiops truncatus*) has been documented in Florida (Zollett & Read, 2006; Powell & Wells, 2011; Stolen et al., 2013) and may be increasing due to growing competition for resources between anglers and dolphins (Powell & Wells, 2011).

The rough-toothed dolphin (*Steno bredanensis*) has been implicated in depredation of Hawaiian recreational and commercial hook and line fisheries for billfish and tuna (Nitta & Henderson, 1993), and it is reported that this species can remove 20 to 50% of the bait set in some areas (West et al., 2011). However, reports of depredation by this species have primarily been anecdotal in nature, and no specific accounts could be located by Hamer et al. (2012) in their review. In this short note, we provide details of fishing gear and dolphin behaviour during the depredation of a recreational sport fishing tournament by rough-toothed dolphins in Angola. These events represent the first reported incidences of cetacean depredation in Angolan waters.

The annual Luanda Sailfish Classic was held over 3 d from 9 to 11 November 2012, and it involved 38 sport fishing vessels (overall lengths of 6 to 16 m) that targeted Atlantic sailfish (*Istiophorus albicans*). The boats fished within a 30 nmi (55.6 km) range of Luanda, and as the tournament progressed, most vessels congregated in a relatively small area (frequently within 200 m of one another) northwest of Luanda in approximately 150 to 250 m water depth (Figure 1). The boats travelled back to Luanda each evening of the tournament and then returned to fish again the following morning. Sea state over the period of the tournament was calm (Beaufort ≤ 2), swell height was less than 1 m, and visibility was excellent.

Each vessel towed a trolling spread of fishing gear consisting of (1) various combinations of hookless "teasers," made up of plastic lures deployed in configurations intended to imitate schools of prey to attract game fish; and (2) hooks baited with either plastic lures or fresh bait with the aim of capturing a sailfish. As a typical example, one tournament vessel (*Blue Sniffer*) towed (1) two "daisy chain" teasers, each comprising a

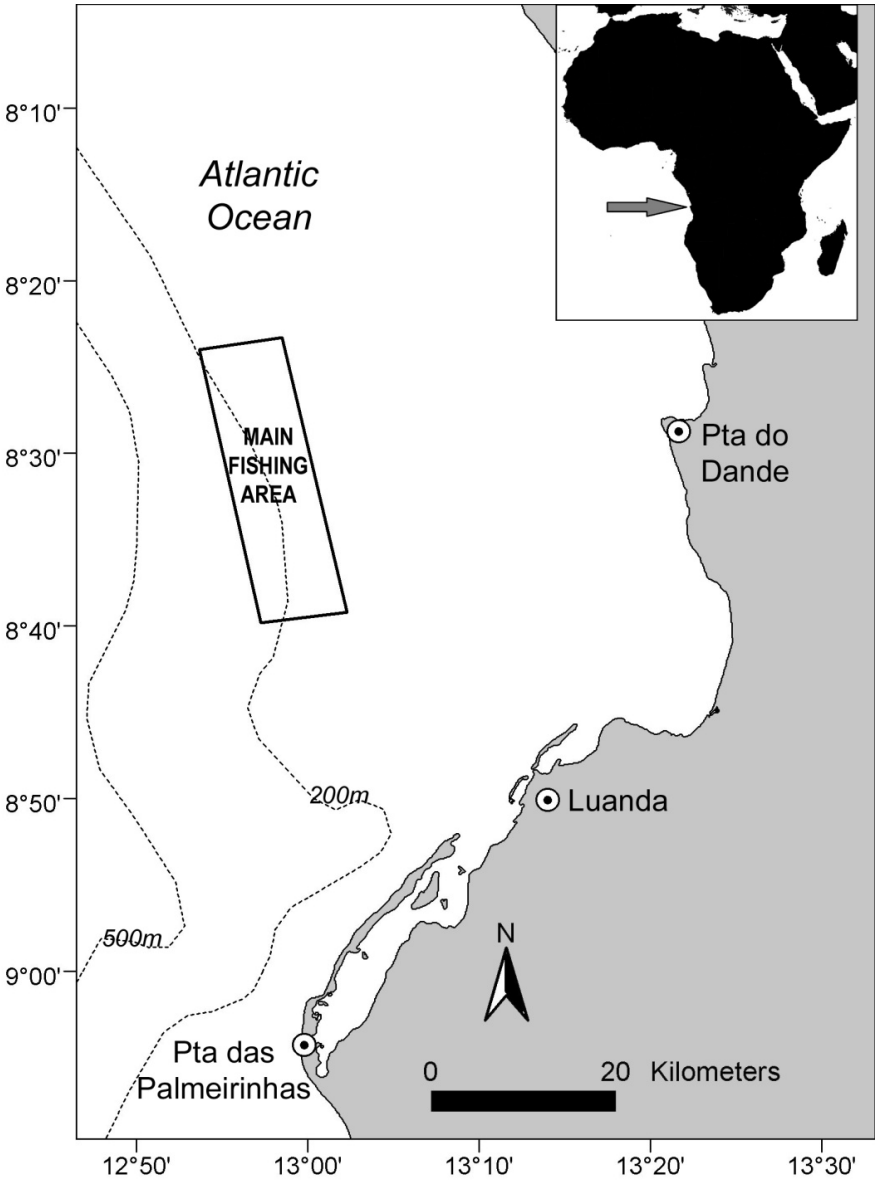


**Figure 1.** Location of the primary fishing area during the Luanda Sailfish Classic fishing tournament, 9 to 11 November 2012

line to which four to eight hookless plastic squid were attached at distances of 10 to 15 m astern and towed along the surface to attract sailfish; (2) a single "dredge" teaser, comprising six arms to which up to 30 hookless plastic lures were attached and towed 1 to 2 m below the surface to create the appearance (and vibrations) of a three-dimensional school of bait fish; and (3) four 20- to 30-cm-long freshly dead bait (ballyhoo [*Hemiramphus brasiliensis*]) hooked on separate lines via circle hooks through the top of the head. The baits and lures were located 10 to 50 m astern of the vessel, either directly behind the boat or out to the side using outriggers (so that they towed in clear water outside of the propeller wash). Trolling speeds were typically 4 to 5 kts for boats using dead bait and 7 to 8 kts for boats using artificial lures.

Following the tournament, one of the participants (IN) contacted CW to report that dolphins had approached many boats and interacted with the fishing gear. Subsequently, a simple questionnaire

aimed at determining the dates and nature of the interactions was sent to the participants, and documentation (video or photographs) was requested. The crews of six vessels that had been approached by dolphins provided responses to the questionnaire (Table 1). The crews of two further vessels, the *Yellowfin* and the *OLOY*, provided video and images, respectively, but no other information. Detailed information was available from two vessels: (1) the *Blue Sniffer* from which an interaction was documented firsthand by IN; and (2) the *Djamila 2* from which a 20.75-min video was available.

The sequence of events commenced on 4 November 2012 when a sport fisherman radioed IN to report that approximately 30 unidentified dolphins had approached his vessel's trolling spread and removed all of the fresh ballyhoo bait, additionally taking the plastic squid daisy chain teasers. The location was west of Luanda, < 20 km south of the subsequent Luanda Sailfish Classic location and in ~200 m water depth. No further information is available on that event.

The following weekend (9 to 11 November 2012), approximately 10 to 15 boats were actively approached by dolphins (some repeatedly) during the Luanda Sailfish Classic tournament. Anecdotal reports and questionnaire data indicate that the dolphins were present and interacted with fishing gear to remove bait on all three tournament dates. Photographs and video were provided by three crews. In all cases, the animals were identified as rough-toothed dolphins based on the lack of crease between the melon and the rostrum, large flippers, tall dorsal fin with broad base, narrow dark grey dorsal cape, white lips, and the presence of white-pink blotches on the lower flank (West et al., 2011) (Figure 2). Only three estimates of group size were provided; two crews reported that around 20 dolphins were present around their boats, while another crew estimated over 100 animals in total but with animals dispersed in smaller groups. Opinions varied regarding whether the encounters related to a single group of animals that travelled from boat to boat or comprised several separate dolphin groups. However, most anglers thought there were several groups dispersed across the tournament area since even when moving considerable distances (~8 km) at speed they quickly re-encountered dolphins.

Five of the crews from which questionnaire data were returned reported that the dolphins had approached the stern of their vessel and entered the trolling spread. Of those, four crews directly observed dolphins approach the towed baits from astern and then remove and consume ballyhoo (Figure 3; Table 1). Some vessels had bait removed by dolphins on both 10 and 11 November. The dolphins were only reported to bite (1) hookless plastic lures (which they subsequently abandoned following removal from the line) and (2) hooked fresh bait which they removed entirely, leaving only the hooks on the lines (both J hooks and circle hooks were used by tournament participants). There was only one report of a single dolphin taking a hook (Table 1, Ref. 3).

The four crews who confirmed depredation during the questionnaires, and the crew of the *Yellowfin* all subsequently attempted to evade the dolphins. This involved removing their gear from the water and/or speeding up (~20 kts) in an attempt to leave the dolphins behind. However, some anglers ceased fishing temporarily and instead interacted with the animals, including feeding them and entering the water to swim with them.

A detailed depredation observation was observed and videoed by IN from the *Blue Sniffer*. At 1200 h on 10 November, approximately 20 rough-toothed dolphins approached from astern of the *Blue Sniffer* and immediately dispersed within the trolling spread so that one or two animals surfaced within centimeters of the separate towed baits. One individual took hold of and swam away with a ballyhoo bait, activating the outrigger line. Within minutes, the dolphins had investigated all

**Table 1.** Summary of the information provided by the crews of six vessels participating in the Luanda Sailfish Classic fishing tournament (9 to 11 November 2012) that were approached by rough-toothed dolphins (*Steno bredanensis*); all crews fished with freshly dead ballyhoo (*Hemiramphus brasiliensis*) bait.

| Ref. | Vessel | Information provided | Tow speed (kts) | Date(s) of dolphin approaches | Depredation? |
|---|---|---|---|---|---|
| 1 | *Blue Sniffer* | Questionnaire, video, photographs | 4-6 | 10 Nov | Yes |
| 2 | *Djamila 2* | Questionnaire, video | 7-8 | 11 Nov | No |
| 3 | *Mbiri Mbiri* | Questionnaire | 7-9 | 10 Nov | Yes |
| 4 | *Deepwater* | Questionnaire | 8 | One day* | Yes |
| 5 | *Fegosa* | Questionnaire | 7 | 9 to 11 Nov | No |
| 6 | *Tudo Fish* | Questionnaire | 7-8 | 10 Nov and 11 Nov | Yes |

*Crew could not recall which specific date.

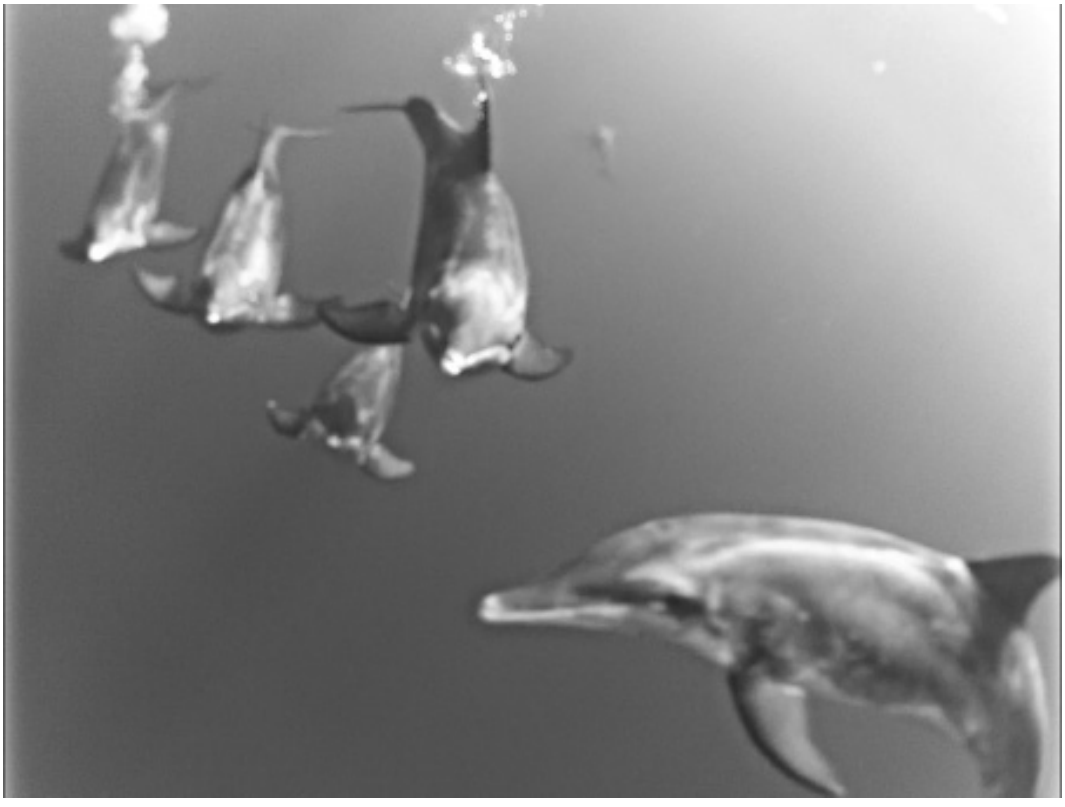

**Figure 2.** Rough-toothed dolphins (*Steno bredanensis*) close to the stern of the *Djamila 2* during the Luanda Sailfish Classic fishing tournament on 11 November, showing the characteristic smoothly sloped forehead, large flippers, narrow dark grey dorsal cape, white lips, and pale blotches on the lower flank (still from video)

of the baits, removing and consuming two of the four fresh ballyhoo baits to leave only the circle hooks remaining on the lines. They also mouthed the plastic squid daisy chain teasers, removing two and leaving others marked with tooth indents. At this point, the anglers began to retrieve their lines, and video footage shows rough-toothed dolphins in pursuit as the baits were reeled in toward the stern of the boat. They also closely followed and mouthed the plastic lure fish at the end of the dredge teaser as it was reeled to the stern.

Subsequently, a fresh (but dead) ballyhoo was thrown off the side of the boat (Figure 4). Video footage shows that the four rough-toothed dolphins following closely behind the dredge teaser immediately turned sharply toward the dead fish. One animal took the fish from the surface without hesitation and carried it briefly before swallowing it. A second fish was then thrown to the same four animals and again all turned immediately toward it. The first rough-toothed dolphin to approach the dead fish reached up underneath it but did not make contact, and the fish was then collected and consumed by a second individual. This fish-throwing process was repeated by the anglers at least 10 times, with the rough-toothed dolphins deviating clearly toward the thrown fish on each occasion with one animal (it was unclear whether it was the same animal or multiple animals) retrieving and swallowing it. Anglers reported that the dolphins were very methodical but tentative in their technique, gently mouthing the dead fishes before swallowing them.

A second detailed observation of rough-toothed dolphin behaviour was provided in video (including underwater) footage provided by the crew of the *Djamila 2*. After the dolphins began bow-riding their vessel on 11 November, the crew retrieved their fishing gear, stopped their boat, and attempted to feed the dolphins. Underwater footage taken from the side of the boat shows 10 to 15 rough-toothed dolphins milling close (< 10 m) to the drifting boat while anglers threw several dead ballyhoo off the stern. Dolphins approached and closely investigated the fish as they sank down through the water column, but only two fish were clearly consumed. After 1.5 min of feeding interaction, four swimmers entered the water, and the

**Figure 3.** Rough-toothed dolphins following immediately behind the bait as a line is retrieved back onboard the *OLOY* during the Luanda Sailfish Classic fishing tournament on 10 November

**Figure 4.** Angler onboard the *Blue Sniffer* throwing a fresh (but dead) ballyhoo (*Hemiramphus brasiliensis*) to rough-toothed dolphins during the Luanda Sailfish Classic fishing tournament; the rough-toothed dolphins subsequently collected and consumed this fish (still from video).

rough-toothed dolphins milled and vocalised in the vicinity of the swimmers for at least 15.4 min (the video footage ends while swimmers were still in the water).

The depredation events described herein are of interest for several reasons. First, interactions between cetaceans and fishing gear are not frequently captured on film, and documented instances usually relate to commercial rather than recreational fisheries. Second, previous mentions of rough-toothed dolphins depredating recreational sport fishing (in Hawaii: Nitta & Henderson, 1993) lacked supporting details. Third, this appears to represent the first reported observation of cetacean depredation behaviour in Angola, and in the wider Gulf of Guinea region. Finally, these events comprised repeated approaches to a number of boats working in a relatively small spatial area over a 3-d period; consequently, they appear to demonstrate targeted depredation behaviour by rough-toothed dolphins.

The rough-toothed dolphin is a regular component of the Angolan cetacean community, usually inhabiting waters along the continental slope (Weir, 2011). However, none of the tournament anglers had previously encountered depredation by rough-toothed dolphins, or other dolphin species, in Angolan waters. For example, sport fishing using lures and fresh-rigged baits (mostly ballyhoo and occasionally mullet [*Mugil* sp.]) has been carried out by IN off Angola at least once per week (on average) between September and May every year since 1986 without dolphin–fishing interactions. Dolphin depredation behaviour therefore seems to be uncommon overall in Angolan waters. However, there have been other observations along the west coast of Africa that implicate the rough-toothed dolphin in commercial fishery interactions in the eastern tropical Atlantic region. Addink & Smeenk (2001) reported rough-toothed dolphins following a trawl operation in close proximity for several hours off Mauritania, feeding on discarded fish. They also noticed individuals with scarring suggestive of other fishing interactions. de Boer (2010) attributed the deep incisions on the dorsal fins of some rough-toothed dolphins photographed off Gabon to interactions with fishing gear. C. W. Oliver (pers. comm.) observed and photographed rough-toothed dolphins close to purse seine operations in the Gulf of Guinea during August 1972.

Several observations during the Luanda Sailfish Classic suggest that depredation behaviour by rough-toothed dolphins during the tournament was non-random. First, the fishing boats departed the tournament area each evening and returned again the next morning. Dolphin depredation occurred on all three tournament dates, however, suggesting that animals purposefully re-located the boats after they returned to the area each day. Second, the rough-toothed dolphins moved from boat to boat and followed close to the stern of boats for prolonged periods. Similar behaviour has been observed in conditioned (in this case, to deliberate feeding by humans) bottlenose dolphins in Australia, which moved methodically from boat to boat in expectation of food (Finn et al., 2008). Additionally, rough-toothed dolphins pursued the lures in toward the vessel sterns as the lines were retrieved. Similar "pursuit" behaviour has been reported for bottlenose dolphins during regular depredation of recreational fisheries in Florida (Zollett & Read, 2008). Finally, the rough-toothed dolphins did not hesitate to enter the trolling spread, to investigate dead fish in the water, or to consume dead fish on the line or thrown to them by anglers. All of these factors are suggestive of familiarity with this fishing method and with the consumption of dead fish, supporting a coordinated, deliberate, and repeated targeting of this fishing tournament.

There are several potential implications of this type of depredation behaviour. Cetaceans depredating commercial fisheries are at risk of being caught in fishing gear as non-target bycatch and injured or killed (Read, 2008; Hamer et al., 2012). Depredation of various recreational fisheries in Florida by bottlenose dolphins has resulted in severe line entanglement (causing emaciation and mortality) and ingestion of gear, including hooks, portions of monofilament line, metal sinkers, swivels, and lures (Zollett & Read, 2006; Stolen et al., 2013). Gear that becomes lodged in the mouth, throat, or stomach can lead to internal injuries, infection, starvation, and potentially death (Gorzelany, 1998; Powell & Wells, 2011; Stolen et al., 2013). Some bottlenose dolphins interacting with (i.e., depredating or being fed by) recreational or commercial fisheries specifically select habitat where there are concentrations of boaters or anglers (Finn et al., 2008; Powell & Wells, 2011), thus, also increasing their exposure to accidental propeller strike. Additionally, in geographic areas where dolphin depredation is frequent, fishermen may take retribution. For example, Zollett & Read (2006) reported one recreational charter boat captain firing his gun into the water to protect his catch and fishing gear from bottlenose dolphins. Commercial fishermen, frustrated by depredating odontocetes, are known to sometimes shoot or poison animals or use explosives to deter them (Read, 2008; West et al., 2011; Hamer et al., 2012). There may be implications even when fishermen respond positively to depredating dolphins. For example, the feeding of wild dolphins in these situations may potentially act as positive

reinforcement and increase the likelihood of future occurrences (Powell & Wells, 2011).

There is evidence in other odontocetes that exploitation of a new food resource can spread quickly through a population and can quickly intensify when animals learn to associate human activities with feeding opportunities. For example, in Western Australia, the number of wild bottlenose dolphins conditioned to illegal feeding by recreational fishing boats increased from one animal in 1993 to at least 14 by 2003 (Finn et al., 2008). The rapid increase in depredation behaviour by several killer and sperm whale populations worldwide is considered to be an example of cultural transmission (Whitehead et al., 2004), and fishermen have observed bottlenose dolphins teaching depredation behaviour to their calves in the Florida king mackerel troll fishery (Zollett & Read, 2006). Cetaceans may also learn to associate particular sounds with the availability of food during fishing operations and, therefore, maximize their depredation efficiency. For example, depredating killer whales (Visser, 2000) and sperm whales (Thode et al., 2007) are thought to respond to acoustic cues such as the hydraulic winches or propeller cavitations of fishing boats.

Read (2008) and Powell & Wells (2011) consider it likely that odontocete depredation behaviour will increase in future years due to factors such as declining prey populations, cultural transmission of depredation behaviour through populations, and the feeding of wild cetaceans by humans. The opportunities for rough-toothed dolphin depredation of recreational fishing are likely to be fewer than those documented for bottlenose dolphins in Florida (Powell & Wells, 2011; Stolen et al., 2013), considering the less predictable nature of their mobile, pelagic distribution (vs the coastal, resident nature of those bottlenose dolphin communities) and game fishing activities (vs coastal angling). Nevertheless, the rough-toothed dolphin is considered to be naturally inquisitive with a complex social system and a high capacity for learning novel behaviours (Kuczaj & Yeater, 2007; West et al., 2011); the scope for cultural transmission of depredation behaviour within this species may be high.

## Acknowledgments

We would like to thank all of the participants of the 2012 Luanda Sailfish Classic who provided feedback on dolphin encounters during the event. Special gratitude to the following people who contributed video footage and questionnaires: Francisco Ilunga de Almeida, Fernando Carreira, Marco Couto, Jan Hendrik Jongschaap, Manuel Morais, Alberto Hamilton Santos, and Fernando Santos. Thank you to Inês Figueiredo for assistance with Portuguese translation related to the questionnaires. We are grateful to the two anonymous reviewers for comments that improved this manuscript.

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