

Opportunistic feeding behaviour of rough-toothed dolphins *Steno bredanensis* off Mauritania

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A small group of rough-toothed dolphins *Steno bredanensis* was observed at the outer edge of the Banc d'Arguin, Mauritania. The animals were feeding opportunistically around a trawling research vessel. Hunting behaviour and mother-calf interactions are described.

Introduction

The rough-toothed dolphin *Steno bredanensis* (G. Cuvier in Lesson, 1828) is found in all tropical and warm-temperate seas. In most areas, however, the species is not often seen and its exact distribution is not very well known. The rough-toothed dolphin is assumed to be largely pelagic and most records are from deep water (Leatherwood & Reeves, 1983; Miyazaki & Perrin, 1994). However, the species is also known from shallow coastal waters as, e.g., off Japan (Miyazaki, 1980) and Brazil (Lodi, 1992; Ott & Danilewicz, 1996; Flores & Ximenez, 1997; Lodi & Hetzel, 1999). In West Africa, Maigret et al. (1976) observed a group of twelve animals in the shallow Baie du Lévrier, Mauritania, while Cadenat (1949) reports on a mass stranding of more than 120 individuals on Cap Vert, Senegal.

During the period 8-22 June 1988 we took part in an expedition by the National Museum of Natural History, Leiden, to the outer edge of the Banc d'Arguin off Mauritania, on board the Dutch research vessel "Tyro". The work was directed by Dr Jacob (Jaap) van der Land. The following notes on a spectacular encounter with rough-toothed dolphins are dedicated to Jaap on the occasion of his retirement from the museum, as a few pearls of remembrance and a small tribute to his able and pleasant leadership.

Observation off Mauritania

On 21 June, when the ship was trawling and slowly moving due west at a speed of 2.5 knots, a group of 10-12 rough-toothed dolphins appeared. They were first seen at 13.00 h local time, at 20°40' N 17°31' W, in water of 70 m deep. They finally disappeared from sight at c. 17.30 h, at 20°40' N 17°39' W, depth 175 m, whereas trawling continued until 18.00 h. Many photographs were taken, as well as about 65 minutes of video (in part concurrent). In this article we describe and interpret some aspects of the dolphins' feeding behaviour, partly based on an analysis of video recordings.

A bottom trawl was operated from the stern most of the time that the dolphins were around. The animals apparently were attracted by the fish disturbed by the trawl. Several species of dolphin have been observed to feed opportunistically

around trawls where fish is easily available (Fertl & Leatherwood, 1997), so the fact that rough-toothed dolphins too, will stay with a trawling vessel is not surprising. In captivity this species appears easy to train and quick to learn new tricks or master a new situation (Norris, 1974; Pryor, 1975). Moreover, there is much fishing activity in Mauritanian waters: Maigret (1994) reports that in 1988 alone, 42 pelagic trawlers were operating off Mauritania, not counting the various artisanal fisheries. The dolphins therefore must have been familiar with trawls.

Group size and social behaviour

We estimated that the group consisted of 10-12 animals. At least two of these were calves or juveniles, of about three-fourths the size of the adults. They were consistently associated with the same adults, assumed to be the mothers. There also appeared to be clear associations between some of the other animals, with several dolphins surfacing in unison much of the time, often breathing synchronously (figs 1, 5, 10, 13). At times the group was widely scattered, but we had the impression that the dolphins were well aware of each other's location. From time to time they all gathered and surfaced simultaneously. A similar association between certain individuals was observed by Lodi & Hetzel (1999).

Social interactions were frequent and consisted of fluke-stroking, chasing and belly-flashing (see Würsig et al., 1990), whereby an animal would turn on its side and briefly expose its white abdomen towards other members of the group. Belly-flashing in cetaceans is also known as a fish-herding technique, but in this case its function seemed largely social. However, as belly-flashing may enhance visual communication during co-operative herding of fish (Würsig et al., 1990), it may have served both functions here. Jumping and head-slapping were also seen.

Feeding behaviour

Feeding was clearly opportunistic. Several feeding bouts took place very close (within 10 m) to the ship, with the dolphins sometimes touching the vessel. The animals often co-operated in what we believe was fish-herding. They split up into groups of two or three, would regroup and then swim fast around a shoal of fish (fig. 14). Finally they dived into the shoal, to re-appear with a fish in their beak. At times this diving was very boisterous, with the animals somersaulting before emerging. This fishing method is similar to what Bel'kovich et al. (1991), in their study of bottlenose dolphins *Tursops truncatus* in the Black Sea, call a "horizontal carousel" followed by a "vertical carousel" or "kettle formation". The dolphins often pursued an individual prey at great speed, possibly fish that had escaped from the trapped shoal. Since those fishes appeared relatively large, this must have been a rewarding additional hunting method. Such individual chasing is also described by Bel'kovich et al. (1991) for bottlenose dolphins. On some occasions dead fish floating at the surface were picked up. We could not see whether these had been killed by the dolphins or by the trawl. Largely similar hunting methods of rough-toothed dolphins are described by Lodi & Hetzel (1999), who suggest that the animals made use of boats by trapping fish against the hull.



Fig. 1. A formation of six rough-toothed dolphins. Note that at least five animals breathe synchronously. Splitting up and regrouping of such formations during fishing was observed frequently. The calf in the centre is paler than the adults and has a relatively shorter beak. Photo: W.W.C. Kolvoort.



Fig. 2. One of the two calves. The calves spent time away from their mothers, engaging in rather boisterous behaviour. Photo: W.W.C. Kolvoort.

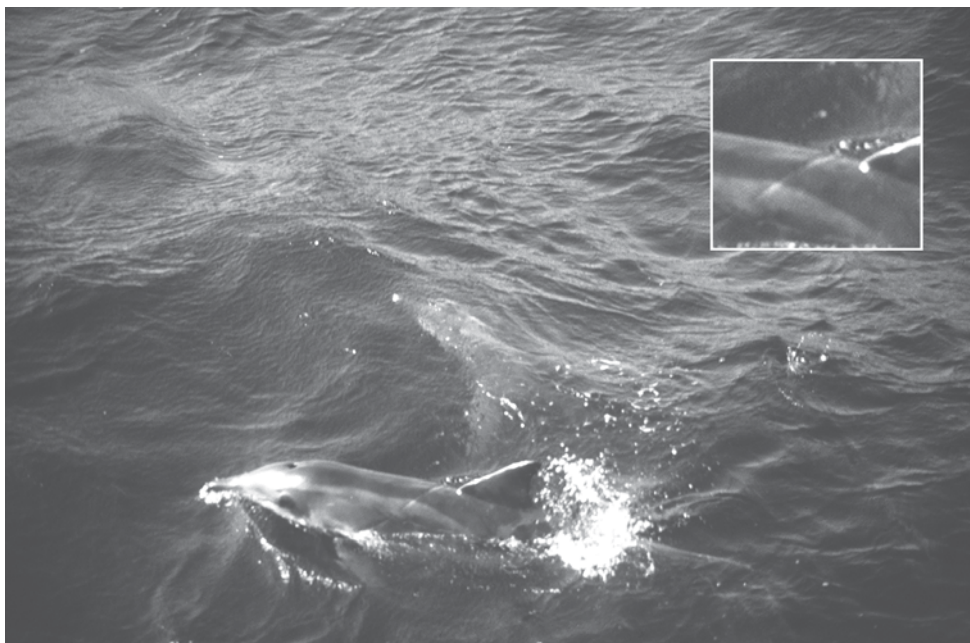


Fig. 3. An adult with a clear netmark in front of the dorsal fin, probably caused by a gillnet. Photo: W.W.C. Kolvoort.



Fig. 4. A mother, with the head of her calf visible beside her. Photo: W.W.C. Kolvoort.



Fig. 5. Three dolphins breaching simultaneously. Photo: W.W.C. Kolvoort.



Fig. 6. Close-up of two dolphins. The upper animal shows skin patches possibly caused by sunburn (see fig. 8). Note *Xenobalanus globicipitis* suspended from the tip of its dorsal fin. Photo: J.C. den Hartog.



Fig. 7. The mother carries a fish in her mouth. Photo: W.W.C. Kolvoort.

Rough-toothed dolphins are most often seen in groups of 10-20 animals (among which smaller associations can be distinguished), sometimes up to about 60, which, however, may form part of larger, more dispersed aggregations numbering a few hundred (Norris, 1976; Watkins et al., 1987; Miyazaki & Perrin, 1994; see also the mass stranding reported by Cadenat, 1949). This suggests that the fish-catching techniques of this species may in some respect resemble those of, e.g., the dusky dolphin *Sagmatias* (= *Lagenorhynchus*) *obscurus*, which also feeds in small groups that may "call in" other groups nearby in order to deal with large fish shoals (Würsig, 1986).

Mother-calf interaction

We witnessed various mother-calf interactions. Several times we saw what looked like suckling behaviour, with a calf touching that part of the adult's abdomen where the milk-glands are located. During this, the mother stayed in an upright position ("vertical presentation"), as seems common in bottlenose dolphins suckling older calves (Cockcroft & Ross, 1990). We also observed "echelon-swimming", with the calf positioned at the mother's side behind her flipper. For the rest, the calves seemed quite independent. They often swam separate from their mothers and behaved boisterously (fig. 2). This behaviour of calves and juveniles jumping or pirouetting close to but separate from feeding adults is also described by Steiner (1995) and Lodi & Hetzel (1999). Lodi (1992) gives an observation that could indicate a prolonged mother-calf relation in this species including lactation, though the evidence is rather vague. Our sightings and analysis of video indicate the same where large calves (or small juveniles) were still clearly associated with an adult.

We saw one remarkable interaction between a calf and its mother. The calf seemed to be "playing" with a c. 50-60 cm long fish (which perhaps it found difficult to swallow) that was already injured or stunned and lying at the surface. Several times it dropped the fish, but each time the mother, by gently pushing, seemed to encourage her calf to pick it up again. A similar observation of a mother assisting or teaching her calf during feeding is reported by Lodi & Hetzel (1999), though in that case the adult caught and held the fish - of a considerable size - each time the calf let it go. The fish observed in our encounter was much smaller and moreover appeared stunned, so did not have to be held by the dolphin to prevent it from escaping.

Colour pattern and body scars (figs 1-14)

Apart from their flat melon, the rough-toothed dolphins were characterized by a tripartite colour pattern. A dark, sharply demarcated greyish-brown "cape" extended from the head to the tail stock, slightly narrowing behind the head and widening again below the dorsal fin. Laterally, from the side of the head to below the dorsal fin, there was a narrow pale zone; the flanks were again dark greyish-brown. A patch around the eye appeared dark. See Balcomb (1999) for other illustrations of this colour pattern. We could not discern any whitish colour on the lips. The calves were much lighter coloured, with less contrast between body parts. Miyazaki (1980) gives photographs of rough-toothed dolphins caught off Japan, showing the head and front



Fig. 8. The same animal as in fig. 3 (in front). The netmark and the probable sunburn patches on the back and dorsal fin testify to an earlier entanglement in a gillnet. Photo: W.W.C. Kolvoort.



Fig. 9. A formation of five dolphins. Photo: W.W.C. Kolvoort.



Fig. 10. Two dolphins surfacing and breathing in unison. Photo: W.W.C. Kolvoort.



Fig. 11. Note the ragged edge of the dorsal fin of the first dolphin. Photo: W.W.C. Kolvoort.



Fig. 12. A mother and her calf. Photo: W.W.C. Kolvoort.



Fig. 13. Three dolphins, two of them surfacing and breathing simultaneously. Photo: W.W.C. Kolvoort.



Fig. 14. Five dolphins encircling a shoal of fish. Photo: W.W.C. Kolvoort.

part of the body, in which the same differences between adults and calves is apparent.

Although the dorsal fins of some animals had scars which allowed individual recognition, none of the dolphins showed the extensive body-scarring or blotching that is often seen in older animals and which is probably caused by bites of cookie-cutter sharks *Isistius brasiliensis* (e.g., Cadenat, 1949; Norris, 1976; Leatherwood & Reeves, 1983; Leatherwood et al., 1988; Miyazaki & Perrin, 1994). One animal had large, mottled skin patches on the back and dorsal fin, which probably were due to sun exposure (fig. 8) and a long scar clearly caused by entanglement in a gillnet (figs 3, 8). These lesions are signs of the animals' often dangerous interaction with fishing operations; cf. Maigret (1994), who estimated that off Mauritania 500-1000 dolphins fall victim to pelagic trawlers each year, though no rough-toothed dolphins appear in his records. Lodi & Hetzel (1999) report this species associating with various types of fishing in coastal waters off Brazil, with some fatal consequences.

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