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Description of selected behaviours of humpback dolphins *Sousa chinensis*

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Introduction

Despite its apparent wide distribution in the Indo-Pacific, the humpback dolphin (*Sousa chinensis*) does not appear to be abundant anywhere and remains little known (Klinowska, 1991; Reeves & Leatherwood, 1994). The natural history of humpback dolphins has recently been studied in detail in the Algoa Bay region on the south Eastern Cape coast of South Africa (Karczmarski, 1996). This long term study included many hours of field observations and provided an ideal opportunity to collect data on dolphin behaviour (Karczmarski & Cockcroft, submitted). This paper describes several behaviours of humpback dolphins observed in the Algoa Bay region throughout the three year period between May 1991 and May 1994 and discusses their probable ecological determinants.

Description of selected behaviours

Feeding

Two foraging/feeding strategies were used by humpback dolphins in Algoa Bay. Generally, feeding groups were widely dispersed, with individuals moving in various directions without an obvious pattern. All large groups of humpback dolphins fed in this manner, though smaller groups (≤ 6 dolphins) remained in fairly close, although varied, proximity to each other (roughly 1–20 m) and kept moving up and down along several hundred meters of coastline approximately 200–300 m offshore. Consequently, with only these two feeding strategies seen, the observed behaviour of humpback dolphins appears to be less diverse than that of some other dolphin species (e.g. Würsig, 1986; Belkovich *et al*., 1991). As seen from above the water, cooperation between individuals, if any, seems to be limited.

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The intentional beaching of humpback dolphins when feeding, which was reported to occur in tidal channels of the Bazaruto Archipelago, Mozambique (Peddemors & Thompson, 1994) was neither seen in Algoa Bay (present study) nor previously recorded in Eastern Cape waters. The topography of the environment could be the reason. The Eastern Cape region lacks extensive, shallow, tidally influenced bays, lagoons or estuaries which seem to facilitate the intentional beaching of both humpback dolphins off the Mozambican coast and bottlenose dolphins (*Tursiops truncatus*) from several sites world-wide (e.g. Hoese, 1971; Silber & Fertl, 1995). The apparent inter-individual co-operation reported by Peddemors & Thompson (1994) seems unusual when compared to the feeding behaviour of humpback dolphins in Algoa Bay in this study or Plettenberg Bay (Saayman & Tayler, 1979) and could be opportunistic and attributed to habitat differences.

Respiratory and aerial behaviour

Humpback dolphins display a fairly stereotyped surfacing–breathing pattern, with the rostrum rising steeply above the water before the forehead breaks the surface. When the blowhole is exposed to air, most of the body remains submerged with only a small part of the upper back and the anterior portion of the dorsal hump above the water. It seems possible that this pattern of surfacing, which is similar to that of baiji (*Lipotes vexillifer*) from China (Renjun *et al*., 1986), results in a relatively long period of blowhole exposure. Hui (1989) suggested that dolphins may control the blowhole-exposure time by controlling the emergence angle of porpoising leaps; increasing emergence angle increases exposure time with little modification of forward speed. Consequently, the surfacing pattern of humpback dolphins may possibly benefit the efficiency of ventilation before the next dive (Dral & Verwey, 1977), which for this species (26.3 ± 12.7 s), seems to be slightly longer than average dive times of some other coastal dolphins (Renjun *et al*., 1986; Shane, 1990; Lockyer & Morris, 1987), but similar to that of baiji (Renjun *et al*., 1986).

Although humpback dolphins in the Algoa Bay region displayed versatile aerial behaviours, including porpoising leaps, vertical leaps, side leaps, somersaults and backward somersaults (see also Saayman & Tayler, 1979), aerial behaviour was generally infrequent. The most common were 'quasi-leaps' (Hui, 1989), with the snout entering the water while the middle of the body was clearly above the water, but the tail not yet emerged. Vertical leaps, side leaps and somersaults were typical of behaviour categorized as 'socializing & playing'. This is similar for humpback dolphins in several other areas along the east African coast (Saayman & Tayler, 1979).

Courtship and mating

The apparent courtship and mating of humpback dolphins was seen several times during prolonged bouts of social behaviour and occurred within groups of various sizes (4–16 animals including all age classes) and under varied water clarity (2.0–7.2 m). The animals involved in courtship and mating-like behaviour were most often temporarily isolated from other members of the group and the number involved varied between two and six dolphins.

Behaviour appearing to be courtship was usually initiated by vigorous movement of two individuals side by side, with consistent, helical interchanging of their relative positions (Fig. 1a). The animals frequently exposed almost half of their body above the water and displayed prolonged body contact. This rapid movement was occasionally interrupted by an aerial display by one of the individuals (quasi-leaps, side leaps or vertical leaps). This spiral-like movement lasted less than a minute (precise timing was not obtained) and was followed by high speed movement to another location, mostly less than 100 m distant, where the behaviour was repeated. The entire sequence was usually repeated several times.

It was subsequent to these energetic behaviours that the dolphins apparently initiated true mating. This is best illustrated in the description of one instance where an individual (identified as female) rolled onto its side and, inverted almost up-side-down, swam slowly beneath the surface. This dolphin was then approached by its partner, both individuals interlocked ventrally (Fig. 1b) and remained together for about 25–30 s, swimming slowly and rolling beneath the surface (Fig. 1c). Although neither erection nor intromission were seen, this particular behaviour appeared to be copulation. After approximately 1–2 min of separation and several respirations, the animals performed another ventral contact of similar length. These apparent copulatory episodes were repeated several times. The pattern varied little between the 11 sightings when the apparent courtship and mating was observed.

On three occasions, several adults (3–6) were involved in courting-like behaviour at the same time and remained together, in one group, for almost 20 min. The animals swam at high speed in a circle of 5–8 m in diameter. At least some of the dolphins displayed the spiral-like movement described earlier and varied aerial behaviour. After this spiral and circular movement the group swam rapidly to another spot where this activity was again initiated. This sequence was repeated several times (Fig. 1d) and was followed by apparent copulation consisting of several 'copulatory episodes'. Despite the number of individuals involved, never more than a single pair was seen 'mating' at one time. However, the remaining part of the 'courting group' always remained in close proximity to the 'mating' pair and it is unknown if the consecutive 'copulatory episodes' involved the same, or different individuals. Similar behaviours occasionally occurred among juveniles, but seldom lasted more than 2–3 min, with brief (2–3 s) 'copulatory episodes'.

This apparent sexual activity of humpback dolphins was sporadically accompanied/interrupted by bouts of unusual behaviour. In one instance, a dolphin lay on its back, motionless at the surface, exposing its ventral surface and pectoral fins above the water and appeared to be resting. To respirate, the animal rolled about its vertical axis, breathing and rolling again to the inverted position. Sometime later (3–5 min) the animal would roll onto its side and join the activity of others. On another occasion a dolphin hung vertically in the water, head downward, the tail and part of the caudal peduncle protruding above the water. The dolphin then slowly sank beneath the surface.

There are several similarities between the courtship and mating behaviour of humpback dolphins reported here and that described previously (particularly Saayman & Tayler, 1979). The courtship observed in Algoa Bay, however, was more complex than that which Saayman & Tayler (1979) termed 'precopulatory activity', or that which Zbinden *et al.* (1977) referred to as 'apparent mating display'. The vigorous, simultaneous courtship of several animals seen in Algoa Bay resembles that observed in the Persian Gulf (Pilleri & Gihr, 1973–74) and in the Indus delta region (Roberts *et al*., 1983). The 'vertical rising' out of the water by two ventrally interlocked animals, however, was not seen in Algoa Bay. Generally, the apparent courtship and mating behaviour of humpback dolphins in Algoa Bay seems very much like that observed

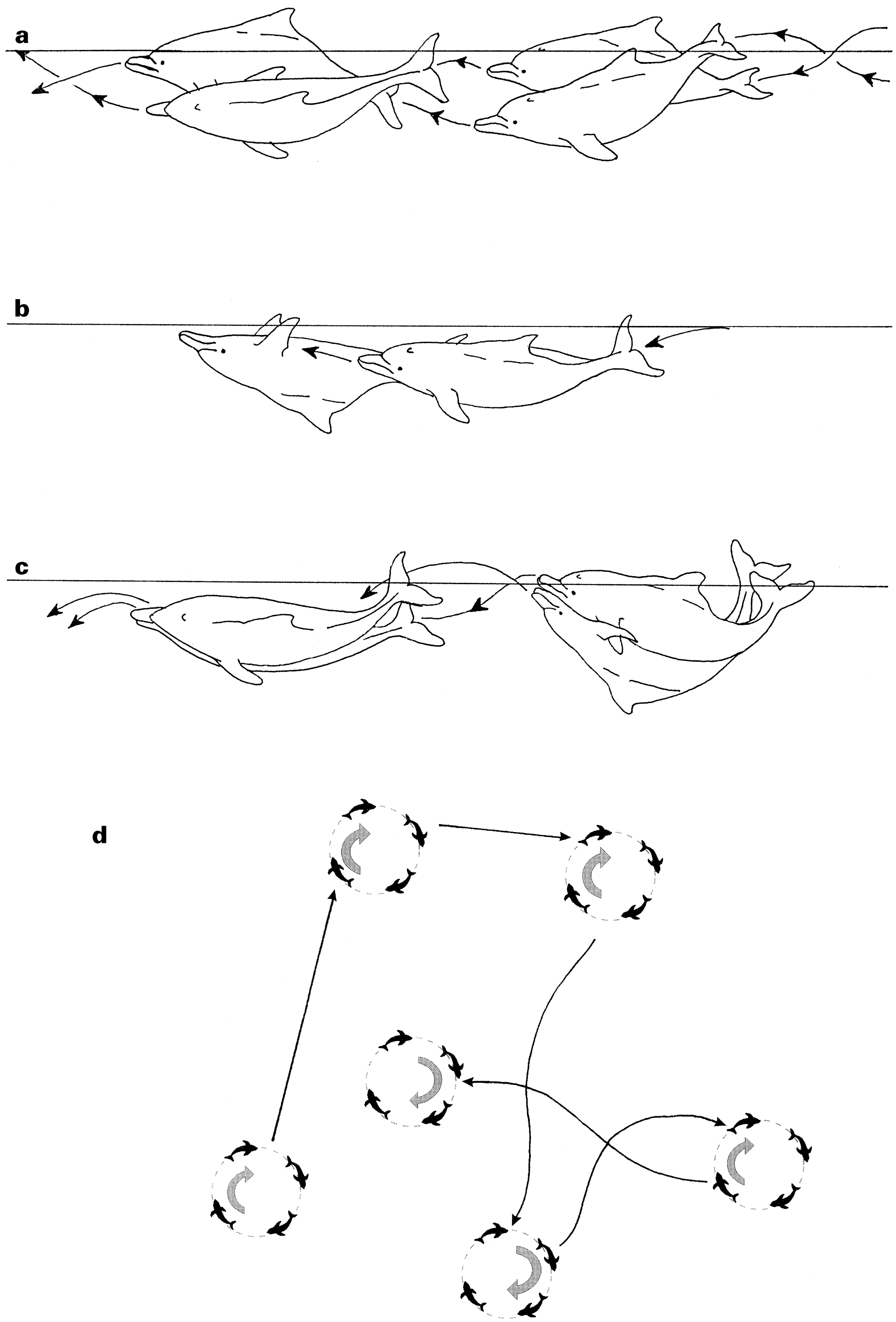

Figure 1. Sequences of an apparent courtship and mating of humpback dolphins observed in Algoa Bay during the period between May 1991 and May 1994.

for bottlenose dolphins (Puente & Dewsbury, 1979; dos Santos & Lacerda, 1987).

Allomaternal alliances
Nursing female humpback dolphins were seen several times forming temporary alliances—a visibly distinct subunit within the humpback group which appeared to have a calf-care function. The alliance formation was particularly evident when the animals were disturbed by inshore boat traffic, with the females positioning themselves between their calves and the approaching boat. Generally the 'allomaternal alliances' appeared to be a short term, defence behaviour and seldom lasted more than three to four hours. The membership of 'allomaternal alliances' in Algoa Bay varied considerably between sightings, but little during a particular survey day, as did the membership of humpback dolphin groups.

Allomaternal care for offspring has been previously suggested for a number of cetaceans, including humpback dolphins (Saayman & Tayler, 1979), bottlenose dolphins (Wells, 1986), killer whales (*Orcinus orca*) and pilot whales (*Globicephala* sp.) (Heimlich-Boran & Heimlich-Boran, 1993) sperm whales (*Physeter macrocephalus*) (Arnbom & Whitehead, 1989). Many other large, long-lived mammals, including primates (e.g. De Vore, 1965) and several species of carnivores (e.g. Malcolm & Marten, 1982; Packer *et al*., 1992), are also known to share the responsibility of nurturing an infant with related associates as well as non-related affiliates.

Interactions with bottlenose dolphins
Although mixed groups containing both humpback and bottlenose dolphins were seen occasionally in Algoa Bay, interactions between the two species were generally limited. In mixed groups, humpback dolphins always formed a visibly distinct subunit on the periphery of the bottlenose dolphin group. Humpback dolphins seemed to follow bottlenose dolphins, apparently feeding on the outskirts of the bottlenose dolphin group and somewhat behind them; which is a similar type of association to that recorded by Saayman & Tayler (1979) and Corkeron (1990). Although the primary feeding grounds of humpback dolphins were often also used by bottlenose dolphins, the two species were seldom seen simultaneously. However, if they were seen on the same feeding ground at the same time, they usually remained on opposite sides of the feeding ground and did not mix. No form of aggression between these two species was seen. However, apparent aggressive interaction between bottlenose and humpback dolphins, although infrequent, was reported by Saayman & Tayler (1979).

Within a group of six humpback dolphins—three adults, one juvenile and two calves—an intriguing association between one of the adults and a bottlenose dolphin calf was observed. The bottlenose dolphin was estimated to be $\leq$3–4 months of age and followed a specific, photographically identified, fully grown adult humpback dolphin of undetermined sex. This incident may represent an interspecific adoption or, possibly, an inter-generic hybridization. In the order Cetacea, several interspecific and inter-generic hybrids (including both captive and wild animals) have been recorded and the genus *Tursiops* was often one of the interspecific parents (Sylvestre & Tasaka, 1985; Reyes, 1996). The hybrids usually displayed several external features which were intermediate between the parental species. The calf accompanying the humpback dolphin in Algoa Bay, however, did not display any external characteristics similar to those of humpback dolphins. Unfortunately, the success of the 'adoption' or the fate of the 'hybrid' was not determined as neither the calf nor the adult humpback dolphin were resighted.

Boat avoidance
Humpback dolphins seemed to be highly susceptible to disturbance caused by inshore boat traffic. The animals were not affected by the presence of bathers and/or surf-boards, but appeared to be particularly disturbed by powerboats. In contrast to bottlenose dolphins, humpback dolphins were never seen riding the bow or stern waves of boats, never approached the research vessel and, on numerous occasions, were seen actively avoiding moving vessels. Those areas most heavily used by the inshore traffic (around the Port Elizabeth harbour and most popular beaches) were seldom visited by humpback dolphins (Karczmarski, 1996).

If harassed by a boat, humpback dolphins in Algoa Bay displayed fairly stereotyped escape behaviour. They usually made a long dive, changed their direction and swam a long distance underwater at almost right angles to the passage of the boat (Fig. 2). Humpback dolphins in the Indus delta region and baiji in Changjiang river escape approaching boats in an apparently similar way (Roberts *et al*., 1983; Renjun *et al*., 1986).

An alteration of dolphin behaviour in response to boat approach has been reported for a number of species (e.g. Würsig & Würsig, 1980; Slooten & Dawson, 1988; Acevedo, 1991). Although some dolphin species seem not to be negatively affected by high levels of boat traffic, become habituated (Acevedo, 1991; Henningsen & Wüsig, 1992), or even attracted to moving vessels (e.g. Slooten & Dawson, 1988; Jefferson, 1991), many others actively avoid contact with powerboats. Even large animals like belugas and killer whales, were seen to

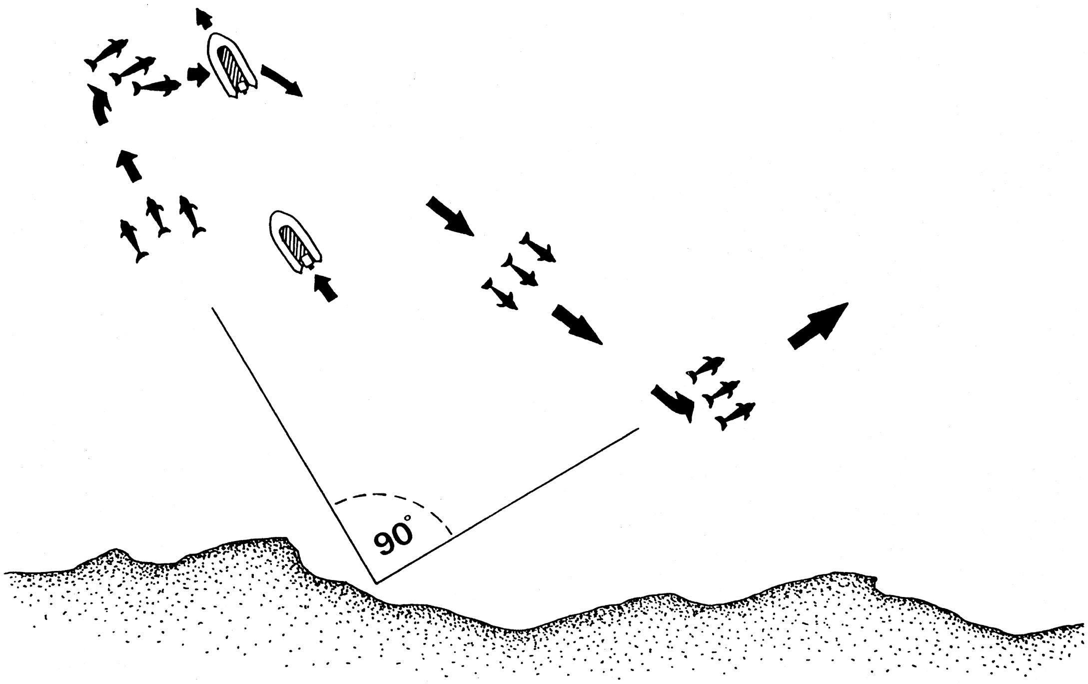

Figure 2. Escape behaviour of humpback dolphins displayed in Algoa Bay.

be negatively affected by increased boat activity (Stewart *et al.*, 1982; 1983; Kruse, 1991). Members of the bottlenose dolphin community in Sarasota Bay, Florida, are known to avoid areas with heavy boat traffic (Wells, 1992). Similar factors apparently contributed to the decrease in abundance of bottlenose dolphins in Biscayne Bay, Florida (Odell, 1976).

The specific aspects/characteristics of inshore boat traffic that cause humpback dolphins to actively avoid boats remain undetermined. They are, however, likely to be similar to those listed by Wells (1992) for coastal bottlenose dolphins resident in Sarasota Bay, western Florida. Discomfort caused by intense sounds of boat engines at close range and masking sounds of prey species, which may be important in foraging, may be particularly significant. It was suggested that humpback dolphins could rely on the sounds made by some of their fish prey for hunting (Zbinden *et al.*, 1977; Pilleri *et al.*, 1982); just as bottlenose dolphins may (Barros, 1993). Sciaenids and sparids, which appear to form a large proportion of humpback dolphin diet (Cockcroft & Ross, 1983; Barros & Cockcroft, 1991) are considered producers of the loudest sounds among fish groups (Barros, 1993).

Overall, humpback dolphin behaviour appears similar to that described for other cetaceans, especially other coastal dolphin species like the bottlenose dolphin. Their restricted inshore occurrence which facilitates year-round sea and land-based observations (Karczmarski, 1996), make humpback dolphins particularly well suited for detailed behaviourial research. It is recommended, following similar recommendations by Wells (1992), that potential disturbance factors which affect humpback dolphins and alter their natural behaviour should be identified and examined in detail. The behaviourial responses of dolphins to powerboat traffic should be quantified relative to the vessel and engine size, underwater noise production and nature of vessel approach. Dolphin sounds, those of their prey and powerboat engine emissions should be compared to assess possible acoustic interference. As nothing is known about the night time activities of humpback dolphins, further research should incorporate a study of their nocturnal behaviour.

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