Cetacean sightings in the Agulhas Retroflection, Agulhas Rings and Subtropical Convergence

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Vyftien Cetacea-waarnemings wat gedurende die 21 dae lange Subtropiese Konvergensie en Agulhasretrofleksievaart in Februarie en Maart 1987 op die SA Agulhas *gedoen is, word bespreek. Slegs sewe hiervan is positief geïdentifiseer, en beskrywings hiervan, tesame met die gepaardgaande omgewings- en biologiese data, word gegee. Die meeste waarnemings het geskied in gebiede van skerp termokliene waar liggame warm Agulhasring- en koue Atlantiese Oseaan-water ontmoet het. Die meeste setaseë wat gesien is, was vergesel van seevoëls. Die verspreiding van Cetacea-waarnemings in die Agulhasretrofleksiegebied van die Suidelike Oseaan word bespreek.*

Fifteen cetacean sightings made during the 21-day Subtropical Convergence and Agulhas Retroflection Cruise (SCARC) in February and March 1987 on the SA Agulhas *are presented. Only seven of these were positively identified and descriptions of these, with associated environmental and biological data, are given. Most sightings were in areas of steep thermoclines, where bodies of warm Agulhas ring and cold Atlantic Ocean water met. Most cetaceans seen were accompanied by seabirds. The distribution of cetacean sightings in the Agulhas Retroflection area of the Southern Ocean is discussed.*

Introduction

The identity, occurrence, distribution and aspects of the natural history of cetaceans inhabiting the coastal zone of the Southern African subcontinent are relatively well known from strandings (Ross, 1984), whaling records (Best, 1974, 1979), incidental captures (Cockcroft, 1990) and multi-disciplinary research cruises. Likewise, the concentration of southern pelagic whaling in the Antarctic and the consequent intensive research into whale stocks in this area have resulted in a substantial literature on the biology, occurrence and distribution of cetaceans in Antarctic seas. However, little is known of the distribution and occurrence of cetaceans in the seas between the Southern African subcontinent and the Antarctic.

This paper describes sightings made during the 21-day Subtropical Convergence and Agulhas Retroflection Cruise (SCARC) of the *SA Agulhas*, which is the most extensive multi-disciplinary cruise yet undertaken from South Africa (Lutjeharms, 1987). The objective of SCARC was to study the physiographic, oceanographic and biological characteristics of the Agulhas retroflection area and its associated rings (Valentine, Duncombe Rae, Van Ballegooyen & Lutjeharms, 1988) and the STC (Fig 1), an area that shows some unusual hydrographic features.

The Agulhas retroflection area has been shown to be one of the most highly variable in the world, with Agulhas rings being spawned at intervals of about two months (Lutjeharms & van Ballegooyen, 1988). These rings are the most intense found anywhere (Olson & Evans, 1986). Furthermore, these warm mesoscale rings of nutrient-poor water rapidly lose their surface heat to the atmosphere (Walker & Mey, 1988), subjecting any organism in the upper few hundred metres to marked and rapid changes.

The Subtropical Convergence (STC), south of this area of retroflection, has some extreme horizontal gradients in nutrients, but particularly in temperature (Lutjeharms & Valentine, 1984) and is generally considered to form the generic boundary of the Southern Ocean and to also be a biogeographical limit. In addition, Allanson, Hart & Lutjeharms (1981) have shown that it has associated with it some very high values of chlorophyll a and primary productivity, thus forming a singular habitat of its own.

In view of the remarkable hydrographic regime in these areas, the distribution of cetaceans in relation to temperature and nutrients can be instructive. A lengthy account of cetacean sightings is also important for the confirmation of existing information and to provide new descriptions of the behaviour, colour pattern and distribution of certain of these species.

Methods

Between 12 February and 3 March 1987 observations were made from the port flying bridge (elevation about 20 m) of the *SA Agulhas*. A look-out was kept from about 07:00 to dusk at approximately 20:00, with short breaks by one, or in bad weather conditions all, of the observers for meals. The search area for two of the observers, VGC and VMP, was limited to an arc of approximately 25° on either side of the forecastle and to a distance of 1 000 m or less from the ship. The third observer, PGR, scanned for birds on a 90° arc between bow and beam, on the side of the ship with the most

favourable light conditions. Although only birds out to a distance of 300 m were counted, the higher plane of observation allowed vision of a wider sea area than that of the other two observers.

Sightings by any observer were immediately communicated to the other observers. The time, position, water temperature, some oceanographic data, the number or estimated number of animals and the presence of associated birds were recorded. Cetaceans were observed through binoculars, identified if possible and notes made on their colour pattern and behaviour, with reference to standard texts (Leatherwood & Reeves, 1983; Hoyt, 1984).

Results

In general, weather conditions during the cruise were poor, and Beaufort condition was greater than 4 for more than half the cruise. Nevertheless, even on some days when Beaufort condition was less than 2 for most of the day, no sightings were made during 12 hours of observation.

Fifteen sightings of whales and dolphins were made (Table 1; Fig 1), of which only seven were positively identified; the remainder were either identified only tentatively or not at all (Table 1). Photographs of most identified sightings are archived at the Port Elizabeth Museum.

Descriptions of identified sightings

Fin whales (*Balaenoptera physalus*) (sightings 3, 8 and 10) were identified by their asymmetric head colouration. In all instances, these whales were attracted to and approached the ship and swam alongside for short periods. Consequently, it was difficult to distinguish between ship and whale associated birds or to assess surface water temperature variations with which the whales were associated.

The confirmed sperm whale (*Physeter macrocephalus*) sighting (sighting 5) was made at Beaufort state 2 and consisted of four adult whales and one smaller whale, probably the calf of one of the adults. This pod was sighted some 800 m to starboard of the ship. When the ship diverted to meet the whales they swam away rapidly. The water temperature minutes prior to the sighting was 16,6 °C, but rose to 17,6 °C as the whales were approached. The deep scattering layer was between 400 and 500 m at this point and a CTD trace showed low salinity (16‰), with warmer water down to about 50 m and then a dramatic drop in temperature. A relatively large flock of prions, *Pachyptila* spp, was feeding in the area. A Bongo net sample showed some euphausiids, although it is not clear from what depth they came.

The sighting of southern bottlenose whales (*Hyperoodon planifrons*) (sighting 11) was made in bad weather conditions, Beaufort state exceeding 5 and wind speed about 28 knots. Five animals were seen surging through the water approximately 1 000 m directly starboard of the ship. The whales were estimated to be between 8 m and 10 m in length, with a big head and blunt melon. Their colour was a dark fawn on the dorsal surface, with a hint of grey, giving a slightly mottled effect. The dorsal fin was large and set well back. Water temperature at the time of sighting was 16,2 °C. No birds were seen in association with these animals.

Southern bottlenose whales have previously been described as cloud grey or bluish-black (*Leatherwood & Reeves, 1983*) or brown or greyish (*Hoyt, 1984*). The description provided here is more like that of the north-

Table 1

A chronological list of cetaceans sighted during SCARC. The locality, identity (uidd = unidentified dolphin, uidw = unidentified whale) and number of animals sighted are given. The occurrence of an abrupt change in water temperature at the sighting is indicated in column A (y = yes, n = no) and the presence of birds in the vicinity of the sightings is indicated in column B (y = yes, n = no)

Sighting	Date	Position (°S)	Position (°E)	Identity	Number	A	B
1	14/02/87	34°47'	15°47'	uidd	50	y	y
2	17/02/87	37°52'	08°31'	uidw	3	y	y
3	17/02/87	37°51'	08°38'	*Balaenoptera physalus*	2	n	n
4	19/02/87	37°38'	11°15'	uidw	2	y	y
5	19/02/87	37°44'	11°28'	*Physeter macrocephalus*	4	y	y
6	20/02/87	37°46'	14°10'	uidd	250	y	y
7	20/02/87	38°11'	14°41'	uidw	2	n	n
8	20/02/87	38°15'	14°44'	*Balaenoptera physalus*	2	n	n
9	21/02/87	38°16'	17°34'	uidw	2		
10	22/02/87	37°59'	15°00'	*Balaenoptera physalus*	1	n	n
11	27/02/87	42°29'	20°36'	*Hyperoodon planifrons*	5	y	n
12	28/02/87	42°42'	22°52'	uidw	1	y	y
13	01/03/87	42°22'	23°10'	*Globicephala macrorhynchus*	100	y	y
14	01/03/87	42°07'	23°36'	*Mesoplodon grayi*	6	y	y
15	03/03/87	37°15'	20°28'	uidw	4	y	n

ern bottlenose whale, although similar to the latter reference.

On 1 March about 100 pilot whales were sighted some 1 000 m off the starboard bow (sighting 13). Notes made at the time of sighting describe these whales as short-finned pilot whales (*globicephala macrorhynchus*) because of their apparently small relative size. However, later examination of photographs by V G Cockcroft and an independent source (Dr PB Best) suggests that these animals were almost certainly long-finned pilot whales (*Globicephala melaena*).

When sighted, the whales were moving rapidly towards the ship and appeared to be feeding. The animals were in three distinct pods, although all were moving in the same direction. The largest animal, which had a distinct white scar on its left lateral surface, just below the dorsal fin, was estimated to be about 4 m in length. At least two small calves were present in one of the pods, with a number of other smaller animals, probably adolescents, within this same pod. Nine species of birds, viz wandering albatross (*Diomedea exulans*) (1), shy albatross (*D. cauta*) (1), yellownosed albatross (*D. chlororhynchos*) (1), greatwinged petrel (*Pterodroma macroptera*) (1), soft-plumaged petrel (*P. mollis*) (1), whitechinned petrel (*Procellaria aequinoctialis*) (12), great shearwater (*Puffinus gravis*) (1), Wilson's storm petrel (*Oceanites oceanicus*) (1) and blackbilled storm petrel (*Fregatta tropica*) (1), were observed in association with the pilot whales. Notes taken at the time indicate that the whitechinned petrels and the great shearwater were diving amongst the whales. The former performed shallow dives, while the latter remained submerged for in excess of five seconds during dives.

As the ship approached the animals the surface water temperature fell from about 20 °C to 17,2 °C and there was an intense deep scattering layer only some 10 to 20 m below the ship.

The final identified sighting was of six Gray's beaked whales (*Mesoplodon grayi*) (sighting 14), which were sighted some two hours after the pilot whales, about 200 m from the bow quarter of the ship. Sighting conditions were ideal and the water surface was glassy smooth. The larger animals were approximately 4 m in length, while the others were only slightly smaller. The dorsal surface was a heavy, slate grey with a hint of lighter, but still dark, brown on the back, posterior to the blowhole, but anterior to the dorsal fin. The larger animals appeared to be a little mottled on the dorsal surface, possibly as a result of the brown colouration or from scarring. The rostrum and lips on the larger animals were very white and the jaw line was not well marked. On the smaller animals, however, the jaw line appeared a little darker, although it was still lighter than the rest of the darker dorsal surface. On the upper surface of both large and smaller animals the white of the jaw line appeared to form a 'V' shape on the top of the rostrum, the inner apex of the 'V' ending at the melon apex, while the arms of the 'V' sloped down to the eyes. When surfacing, these animals raised the beak and head completely from the water, arched the back showing the dorsal fin and then dived. There was no splash and no noticeable blow when doing this. There was no bird-life in the vicinity of these animals. The water temperature had dropped from a high of some 19 °C, 20 minutes earlier, to 14,2 °C and there was no marked deep scattering layer.

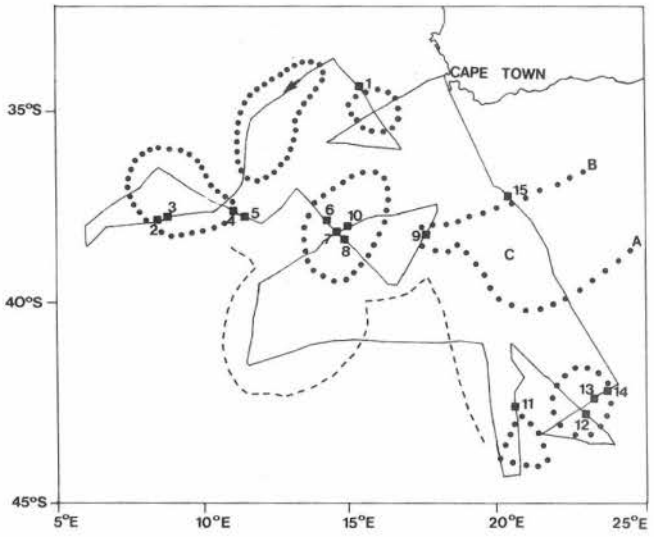

Fig 1: *Localities of cetacean sightings (squares) during the Subtropical Convergence and Agulhas Retroflection cruise (SCARC) (solid line). The Agulhas current (B), the Agulhas return current (A), the Agulhas retroflection (C), Agulhas rings (area within dots) and the Subtropical Convergence (dashed line) are shown. Note that most sightings are at the boundaries of warm features*

This description of the colour pattern of Gray's beaked whale coincides well with previous descriptions (Leatherwood & Reeves, 1983; Hoyt, 1984). However, the slight differences in colouration between the larger and smaller whales had not previously been described and may either be evidence of age-related colour pattern changes or differences between sexes.

Discussion

The paucity of cetacean sightings during SCARC was surprising, particularly at the STC where no sightings were made. We had expected to find cetaceans concentrated in this area because of the very high values of chlorophyll a and primary productivity associated with the STC (Allanson *et al*, 1981). We had also expected a greater number of sightings in Agulhas rings and the retroflection area in view of the demonstrated enhancement of primary productivity at the edge of the Agulhas current and its features (Lutjeharms, Walters & Allanson, 1985). Thus, although most sightings, 13 of the 15, were made either on the edges of or within Agulhas rings (Fig 1), the relative scarcity of birds (Ryan, 1990), the low chlorophyll content of water samples (Helen Barber, pers comm) and the considerable clarity of the water for most of the cruise suggested little primary productivity in this area, which was unexpected.

It is not clear why there was little evidence of primary productivity during SCARC, though abnormal oceanographic and weather conditions may have been a factor. A prolonged study of the general characteristics of this area has indicated that the period of the SCARC was unusual, with a substantial, extensive and persistent flow of cold sub-Antarctic surface water across the STC into

the South Atlantic (Shannon, Lutjeharms & Agenborg, 1989), which perhaps influenced the biological characteristics of the area. Interestingly, an International Whaling Commission (IWC) cruise of three research ships returning from Antarctic Area II to Port Louis, Mauritius, in February 1987 reported a low density of cetacean sightings in the Southern Indian Ocean (Anon, 1987). This was attributed largely to the passage of tropical cyclone Cotilda through the Indian Ocean during February, which resulted in a major reduction in search effort. Although the track of the three IWC ships was much further east than that of the *SA Agulhas*, it is possible that the bad weather conditions and low sighting rate during SCARC may also be ascribed to the effects of Cotilda.

Of the fifteen sightings made during SCARC, only four, the three of fin whales that approached the ship and one unidentified whale sighting, were not associated with areas of steep thermoclines (Fig 1). This suggests a positive relationship between cold and warm water interfaces and cetacean distribution in this area. The concentration of cetaceans at convergence regions is not unusual. Gaskin (1968) has suggested that dolphin distribution off New Zealand is related to current convergence regions, while, in a study of cetaceans off California, Smith, Dunstan, Au, Baker & Dunlap (1986) found that distribution was related to chlorophyll concentration, possibly as a result of the increased productivity at the borders of major water bodies. Despite the generally low signs of primary productivity in Agulhas rings and at the STC during SCARC, Allanson *et al* (1981) and Lutjeharms *et al* (1985) have shown increases in primary productivity at these convergence zones. The deep scattering layer, which in one instance during SCARC appeared to be associated with euphausiid concentrations, may be a reflection of this and represent an area of food resource for cetaceans.

The majority of cetacean sightings in the Southern Atlantic, excluding those of fin whales that approached the ship, were either in association with pelagic birds or when an increased bird abundance had been noted, even though bird-life throughout SCARC was relatively sparse (Ryan, 1990). Bird and cetacean association at sea is relatively common and its occurrence throughout the world has been reviewed by Evans (1982), while Enticott (1986) provides information for bird and cetacean association in the Southern Ocean for the period 1978 to 1985. Evans (1982) and Ridoux (1987) suggest that bird association with cetaceans may directly benefit seabirds, since food resources normally inaccessible to them would be available as offal from feeding cetaceans.

A number of tentative conclusions can be drawn from SCARC, given that the weather and oceanographic conditions were probably abnormal and that the STC was crossed only a few times. Cetaceans appear more abundant in the Southern Ocean where Agulhas rings adjoin surrounding sub-Antarctic water or where filaments of warm or cold water protrude into surrounding water and possibly promote primary production. The STC immediately south of the Agulhas retroflection does not appear as rich in cetacean numbers or diversity as was supposed. Future efforts to monitor cetacean abundance and distribution in relation to the hydrographic features of this area should provide interesting comparative data.

Acknowledgements

We would like to thank the crew and all our fellow researchers aboard the *SA Agulhas* during SCARC.

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