Delphinids of southern Africa: A review of their distribution, status and life history[1]

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ABSTRACT

Eighteen species of delphinids have been recorded from Africa, south of 17°S. This review includes analyses of the distribution and status, life history and feeding habits for each species, primarily using published data from strandings, incidentally caught animals and sightings. Although there is little known for most of the species distributed over the continental shelf, it appears that there is presently little human-induced threat to these. However, more research emphasis should in future be placed on possible detrimental interactions due to overfishing of delphinid prey stocks. Increased commercial fishing pressure will inevitably also increase interactions between the fishery and the affected delphinids. Only three inshore species are presently considered to be vulnerable: Heaviside's dolphins (*Cephalorhynchus heavisidii*), bottlenose dolphins (*Tursiops truncatus*) in KwaZulu-Natal and Namibia, and Indo-Pacific hump-backed dolphins (*Sousa chinensis*) in KwaZulu-Natal. Heaviside's dolphins are endemic and, although presently probably able to sustain mortalities following interactions with commercial fishing gear, may become negatively impacted should fishing activities increase. The bottlenose dolphin population in Namibia appears localised in its distribution and may therefore also be vulnerable to any future coastal development or commercial fishery expansions, while in KwaZulu-Natal they are subjected to ongoing incidental catches in shark nets, heavy pollution levels, habitat destruction and increased competition with fishermen for limited food resources. In KwaZulu-Natal, Indo-Pacific hump-backed dolphins are subjected to the same pressures as experienced by bottlenose dolphins, albeit more severely, while in Mozambique it is occasionally caught incidentally in gillnets or in a targeted fishery. Although generally considered an offshore species, southern right whale dolphins (*Lissodelphis peronii*) also appears to be extremely localised in distribution within southern Africa, and any future planned expansion of commercial driftnet fisheries off Namibia should be carefully monitored for incidental catches which may impact this population.

KEYWORDS: AFRICA; INCIDENTAL CATCHES; FOOD/PREY; POLLUTANTS; CONSERVATION; TAXONOMY; REPRODUCTION; SMALL CETACEANS-GENERAL; REVIEW

INTRODUCTION

Although there has historically been little financial support for cetacean research in southern Africa, there are currently three centres of expertise within the sub-region, all of which are in South Africa: the Mammal Research Institute of the University of Pretoria (housed at the South African Museum) in the Western Cape, the Port Elizabeth Museum in the Eastern Cape and the Sharks Board in KwaZulu-Natal. Interest in cetacean research is increasing in both Namibia and Mozambique, primarily following training of personnel through interaction with colleagues from South Africa and an injection of foreign funding. Initial delphinid research was based on distribution records from strandings and incidentally caught animals (True, 1914; Gill, 1936; Smithers, 1938; Barnard, 1954; Davies, 1963; Tietz, 1963; van Bree, 1966; Best, 1969; van Bree *et al.*, 1978; Ross *et al.*, 1985; Findlay *et al.*, 1992) followed by life history studies obtained from these specimens (Ross, 1977; 1984; Cockcroft and Ross, 1990), and seminal studies on free-ranging dolphins off the Eastern Cape (Saayman *et al.*, 1972; Tayler and Saayman, 1972). These were followed by an upsurge in distribution and abundance studies through aerial surveys and ship-based transects (Ross *et al.*, 1987; Cockcroft *et al.*, 1990b; 1991; 1992; Peddemors, 1993; Peddemors *et al.*, 1997; In press). Subsequently, a series of studies on free-ranging delphinids throughout the region (Guissamulo, 1992; Peddemors, 1995; Karczmarski, 1996; Keith *et al.*, In press) plus renewed investigations into feeding biology (Cockroft and Ross, 1990; Barros and Cockcroft, 1991; Sekiguchi *et al.*, 1992; Cockcroft *et al.*, 1993; Young and Cockcroft, 1994; Peddemors and Cockcroft, 1997), have been instrumental to a better understanding of the ecology of southern African delphinids. This paper reviews the findings of these published studies in an effort to present a synopsis of current knowledge about delphinids of southern Africa. The original version of this paper provided background information for a review of small cetaceans in the coastal waters of Africa by the IWC Scientific Committee (IWC, 1998). A map of the study area is given as Appendix 1 on p. 165.

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Bottlenose dolphins (*Tursiops truncatus*)

Distribution and status

It is now recognised that there are probably three ecotypes of bottlenose dolphins (*Tursiops truncatus*) within the region: two inshore (the larger west coast ecotype and smaller east coast ecotype previously designated as *T. aduncus*) and one offshore (Ross, 1984; Ross and Cockcroft, 1990). The east coast inshore ecotype is found primarily within the 50m isobath (Ross *et al.*, 1987) from Mozambique to False Bay in the southwest (34°06'S, 18°48'E), while the west coast inshore ecotype (Findlay *et al.*, 1992) occurs north of Walvis Bay, Namibia (23°S, 14°58'E). The offshore bottlenose dolphin is similar to the inshore west coast ecotype and Findlay *et al.* (1992) suggest that it may be a contiguous population from east to west coasts.

Research has primarily focussed on bottlenose dolphins off KwaZulu-Natal where the population is subjected to continuing mortalities due to incidental captures in shark nets set to protect bathers in this province (Cockcroft, 1990; Peddemors *et al.*, 1997). Following a series of aerial surveys, it is estimated that there are approximately 900 bottlenose dolphins resident in KwaZulu-Natal (Ross *et al.*, 1987; Cockroft and Ross, 1990; Cockcroft *et al.*, 1991; 1992; Peddemors, 1993; Peddemors *et al.*, In press). Groups averaging 67 dolphins (Peddemors *et al.*, In press) reside in

'preferred areas' or 'home ranges' of approximately 37km longshore (Cockcroft *et al.*, 1990b) with overlap between adjacent areas (Peddemors, 1995). Recent findings indicating that there may be a separate stock of between 1,900 and 3,000 bottlenose dolphins, of the inshore ecotype, moving along the east coast (Peddemors *et al.*, In press) complicate determination of the status of the bottlenose dolphin population in KwaZulu-Natal, as incidental captures peak during the period that these 'migratory' dolphins are present (Peddemors, 1995). Preliminary genetic investigations suggested the existence of discrete groupings representing historically 'resident' bottlenose dolphins, with a possible divergence between the stocks north and south of Durban (Durham, 1991; Goodwin *et al.*, 1996). Additional studies indicate that there is greater heterogeneity south of Durban (where interaction with the 'migratory' stock occurs) than on the coast north of Durban (Goodwin *et al.*, 1996). However, continued incidental captures (mean 1986-96, 42.2 - Peddemors *et al.*, 1997) plus high organochlorine levels (Cockcroft *et al.*, 1989), inshore habitat destruction and overfishing of preferred prey species, raise concerns over its status in KwaZulu-Natal (Peddemors, 1995). To the north (Mozambique) and south (Eastern Cape) of this region, it appears that bottlenose dolphins experience little human-induced impact (Guissamulo, 1992; Karcsmarski, pers. comm.).

Estimates of population size for Namibia suggest that only approximately 100 bottlenose dolphins occur in the approximately 150km of coastline between Sandwich Bay and Hentjiesbaai (Best, pers. comm.). Such a small population would be extremely susceptible to human-induced pressures through pollution, incidental captures in fishing nets or overfishing of prey stocks.

There are few data for the offshore ecotype on either the east or west coast, as particularly on the west coast, it is morphologically difficult to distinguish from the inshore ecotype; however, sightings data indicate that it resides in water depths greater than 200m (Findlay *et al.*, 1992).

Biology

Cockcroft and Ross (1990) provide information on the biology of the east coast inshore ecotype. Size at birth is approximately 1.0m (15kg) with both sexes reaching physical maturity and their asymptotic size - 243cm and 176kg for males, and 238cm and 160kg for females - between 12 and 15 years. Females reach sexual maturity between 9 and 11 years of age, 2 to 3 years earlier than males. Gestation is 12 months and parturition occurs year-round but exhibits a bimodal pattern with peaks in spring and autumn. The calving interval is three years.

The west coast inshore ecotype is born at approximately 1.2m (Peddemors *et al.*, 1992), females reaching sexual maturity at 5.5 years (3.16m and 296kg; Peddemors, 1989). A captive male sired his first calf at 9.5 years (3.5m and 350kg) (Durban Sea World, unpublished data). Maximum length and weight reported thus far are 3.6m and 450kg (Best, pers. comm.).

Ross (1984) examined five specimens of the offshore ecotype. Only one female was examined, but was sexually immature at a length of 2.79m. Sexual maturity in males is apparently reached at greater than 2.72m, the longest recorded southeast coast male being 3.27m. A 2.78m male weighed 234kg at the time of his death in the Durban Sea World, but a stranded offshore ecotype of bottlenose dolphin weighed 335kg at 2.95m (unpublished data).

Diet

The east coast inshore ecotype appears to be an opportunistic feeder with over 72 prey species recorded, six of which accounted for 60% by mass (Cockroft and Ross, 1990). Decapods comprised 36.4% of reconstituted prey mass. Peddemors and Cliff (In press) suggest that food selection is dependant on the seasonal patterns of inshore distribution and abundance of prey.

The west coast inshore ecotype feeds near the coast; 19 prey species have been recorded, four of which are commercially important species (Sekiguchi *et al.*, 1992). Analysis of diet by modified volume indicated that 36.4% of prey constitutes squid (*ibid.*).

The offshore ecotype on the southeast coast feeds on pelagic squid and fish (Ross, 1984).

Indo-Pacific hump-backed dolphins (*Sousa chinensis*)

Distribution and status

On the east coast, Findlay *et al.* (1992) reported that Indo-Pacific hump-backed dolphins are found in shallow waters from Mozambique as far south as False Bay (34°07'S, 18°28'E). This species readily enters large enclosed bays or estuarine systems, including busy harbours such as Richards Bay and Durban. Although few data exist for the population off Mozambique, recent studies in Maputo Bay and Bazaruto Bay indicate that they occur at a density of 0.47 dolphins per km and that they are subjected to both incidental mortalities in gillnet fisheries and directed catches for human consumption (Guissamulo, 1992). Off KwaZulu-Natal, the population is estimated to be 161 dolphins (Durham, 1994) and there is a significant correlation in distribution with river mouths and turbid waters, the highest density occurring on the Tugela Bank (Durham, 1994). Correspondingly, the highest incidental capture of Indo-Pacific hump-backed dolphins in the shark nets (74%) occurs in the four northernmost net installations (Durham, 1994). Between 1984 and 1992, the Natal Sharks Board incidental sightings of this species in KwaZulu-Natal apparently decreased by 50%, possibly indicating a population decrease in this region (Durham, 1994). A recent photo-identification study yielded a population estimate of 213 in the area off Richards Bay (Keith *et al.*, In press), substantially higher than that calculated for the entire coast by Durham (1994). This suggests that variations in sighting effort may have resulted in the lower incidental sightings observed in the latter years of the data used by Durham (1994). However, continued mortalities in shark nets (mean 1986-96, 6.6 - Peddemors *et al.*, 1997), the highest organochlorine levels for any marine mammal in southern Africa (Cockcroft, pers. comm.), plus the destruction of its prime habitat, suggest that the KwaZulu-Natal population may be under severe pressure. Yet, in the Eastern Cape, Indo-Pacific hump-backed dolphins appear to be in a less severe situation, utilising both turbid and clear water (Saayman and Tayler, 1979; Karczmarski, 1996) and occurring at a relative density of 0.42 dolphins per kilometre of coast within Algoa Bay (Karczmarski, 1996). In Algoa Bay, it appears that increased inshore boat traffic is the primary factor which is altering dolphin abundance and distribution (Karczmarski, 1996). The status of this species in the Western Cape is unknown.

Biology

After a gestation period of one year, Indo-Pacific hump-backed dolphins are born at approximately 1.0m length with a weight of 14kg (Cockcroft, 1989). Mother and calf association appears to exceed two growth layer groups

(GLGs – see IWC, 1980) (Barros and Cockcroft, 1991). Females become sexually mature at about 10 GLGs, while males mature 2 or 3 GLGs later (Cockcroft, 1989). Although calves are born throughout the year, there appears to be a peak in summer (Saayman and Tayler, 1979; Ross, 1984; Cockcroft, 1989). Calving interval appears to be three years. Longevity may exceed 40 GLGs and distinct sexual dimorphism is shown: asymptotic length and weight for males and females is about 2.7m and 260kg, and 2.4m and 170kg, respectively (Cockcroft, 1989).

Although group size can vary between one and 30, an average school size of 7 dolphins appears constant throughout the region (Saayman and Tayler, 1973; Ross, 1984; Guissamulo, 1992; Durham, 1994; Karczmarski, 1996).

Diet

Throughout their range, Indo-Pacific hump-backed dolphins appear to favour estuarine associated fish (Ross, 1984; Barros and Cockcroft, 1991; Peddemors and Thompson, 1994) with over 61 species of fish and three squid species recorded from the stomachs of incidentally caught animals in KwaZulu-Natal (Barros, pers. comm.). Only six prey species were identified from stranded dolphin stomach contents for the Eastern Cape; these indicated that the dolphins had fed on inshore demersal species (Barros and Cockcroft, 1991). In the Bazaruto Archipelago off Mozambique, they appeared to feed on the sandbanks during ebb tides (Peddemors and Thompson, 1994), while studies in South Africa have indicated that in some areas feeding increases on the rising tide (Saayman and Tayler, 1979), a strategy that may be linked to prey availability (Peddemors and Cockcroft, 1997). In Algoa Bay, the tide did not appear to have a major affect on feeding; however, feeding was directly correlated with the distribution of shallow rocky reefs (Karczmarski, 1996).

Common dolphins (*Delphinus delphis*)

Distribution and status

Although sightings of common dolphins are distributed from about 31°S on the west coast to north of 28°S on the east coast within the 500m isobath, strandings and an incidental capture as far north as 18°S on the west coast suggest that common dolphins avoid the cooler inshore waters, preferring the warmer offshore waters (Findlay *et al.*, 1992). On both the south and southeastern coasts, common dolphins are found over the continental shelf throughout the year, but in KwaZulu-Natal they only come inshore during the winter months when they appear to follow the movement of sardines (*Sardinops sagax*) up the coast. Specimens have been recorded off the west coast during both summer and winter, but it is not known if these originate from inshore or offshore populations (Findlay *et al.*, 1992) Although two colour morphs corresponding to the long-beaked and short-beaked species of the eastern North Pacific (Heyning and Perrin, 1994) have been identified from strandings (Best, pers. comm.), variations in their distribution patterns are unknown.

Common dolphins do not appear to be under any serious threat in the region, although high organochlorine levels on the southeastern coast may threaten the lives of first-born calves (Cockcroft *et al.*, 1990a). Additionally, this population is seasonally subjected to incidental mortalities in the shark nets off KwaZulu-Natal (Cockcroft, 1990; mean 1986-96, 47.6 - Peddemors *et al.*, 1997); however, as this population is estimated at between 15,000 and 20,000 (Cockcroft and Peddemors, 1990), it is unlikely that this incidental catch constitutes a serious impact. No population estimate exists for the south and west coasts.

Biology

Reproduction in the southeastern coast population appears to be bimodal, with a main breeding season in March-April and a second peak in September-October (Mendolia, 1990). Most calves are born during December-January at approximately 1.0m length, females reaching sexual maturity at 2.13m (85kg) and 9 GLGs and males at 2.2m (120kg) and 10-12 GLGs. Calving interval is 24 months, with some females capable of becoming pregnant while still lactating (Mendolia, 1990). Although maximum age may reach 40 GLGs, there appears to be reproductive senescence in females (Mendolia, 1990). Sexual dimorphism is exhibited, maximum length and mass for females is 240m and 150kg, and for males is 255m and 165kg.

Group size for 52 scientific sightings in the region ranged from 1-1,000 animals, with a mean of 267 (Findlay *et al.*, 1992), but recent aerial surveys off the east coast between Port Elizabeth and Richards Bay suggested larger school sizes ranging between 50 and 10,000 (mean 1,193) in this area (Cockcroft and Peddemors, 1990).

Diet

Off the east coast, common dolphins appear to feed opportunistically, their diet reflecting local prey abundance and availability and exhibiting resource partitioning within different size and sex groups (Young and Cockcroft, 1994). A total of 36 fish and 4 cephalopod prey species were identified, but only 5 species made up 86.9% of the diet by weight (Young and Cockcroft, 1994). Prey are primarily pelagic, as is the case for common dolphins in the Western Cape. In that region, only 21 prey species have been recorded, but again five species comprise 86.5% of the modified volume diet (Sekiguchi *et al.*, 1992). Six commercially important species are fed on by common dolphins in the Western Cape, but only round herring (*Etrumeus whiteheadi*) and sardine (*Sardinops sagax*) were of similar size to those taken in the commercial fisheries (Sekiguchi *et al.*, 1992).

Striped dolphins (*Stenella coeruleoalba*)

Distribution and status

The distribution of striped dolphins appears strongly associated with the Agulhas Current, with all sightings made in summer and all in water deeper than 500m (Findlay *et al.*, 1992). Striped dolphins occur throughout the east coast and, although some strandings have occurred around the Cape Peninsula as far west as Ysterfontein (33°22'S, 18°09'E), the western boundary appears to be determined by the edge of the shelf of the Agulhas Bank (Findlay *et al.*, 1992). There is no population estimate; however, it appears that there are no major threats to this species at present.

Biology

Calves are born at approximately 1.0m length and between 7kg and 11kg weight, with males possibly being slightly larger (Kroese, 1993). This sexual dimorphism is more apparent at asymptotic size, with males reaching 2.46m and 140kg at 25 years (maximum size is 2.65m and 157kg) and females 2.3m and 130kg at 20 years (maximum 2.4m and 130kg) (Kroese, 1993). Deposition of GLGs has been estimated to be annual, resulting in maximum age estimates of 42 years for females and 47 years for males (Kroese, 1993).

Findlay *et al.* (1992) reported the mean group size for 12 dedicated scientific sightings of striped dolphins to be 74.5 (±SD 57.2).

Diet
Off the southeastern coast, the diet consists of squid (20%) and fish (80%), all of the prey being comparatively small and rarely exceeding 250mm in length (Ross, 1984). Myctophids constituted 82.5% of the fish component and at least 80% of all prey items had luminous organs (Ross, 1984). Feeding appears to occur primarily in oceanic waters or over the continental slope throughout the region (Ross, 1984; Sekiguchi *et al.*, 1992). Off the west coast, striped dolphins fed primarily on small chokka squid (*Loligo vulgaris reynaudii* - 74.4%), hake (*Merluccius* spp. - 8.7%) and deep-water squid (*Sthenoteuthis* sp. - 8.1%), but the chokka squid were smaller than those taken by the commercial fishery, implying minimal direct interaction with the fishery.

Pantropical spotted dolphins (*Stenella attenuata*)
Distribution and status
Pantropical spotted dolphins are found on the southern African coast east of 29°00'E usually in waters deeper than 200m (Findlay *et al.*, 1992) and warmer than 22°C (Gambell *et al.*, 1975; Ross, 1984); however, recent sightings with spinner dolphins (*Stenella longirostris*) off Cape Vidal during April were in 30m water depth, as was a winter sighting with common dolphins off the Wild Coast (Peddemors, unpublished data). There are insufficient data to assess the status of this species in the region. The only known impact is very irregular catches (only one between 1986 and 1996) in the shark nets off KwaZulu-Natal (Peddemors *et al.*, 1997)

Biology
Pantropical spotted dolphins in southern Africa are born at approximately 0.85m and reach a length of at least 2.2m (83.9kg) for males and 2.14m (93kg) for females (Ross, 1984). A single neonate stranding during November suggests that calving may occur during the austral summer. No other reproductive data are available. Findlay *et al.* (1992) report that pantropical spotted dolphins occur in fairly large groups of 93.86 (±SD 92.4).

Diet
A total of 16 prey species was identified from three stomachs, but they appear mainly to feed on deep-water ommastrepid squid (54.8%) and *Chiroteuthis* sp. (27.5%) reflecting their association with the continental shelf edge (Sekiguchi *et al.*, 1992).

Spinner dolphins (*Stenella longirostris*)
Distribution and status
Although strandings have occurred at Durban, sightings data suggest that northern KwaZulu-Natal appears to be the southernmost limit of spinner dolphins in the western Indian Ocean. In this area, only incidental sightings have been made, and all have been within the 50m isobath (Ross *et al.*, 1985; unpublished data). Off Mozambique, sightings suggest that spinner dolphins occur throughout the coastal zone (Peddemors *et al.*, 1999) Population size is unknown, but, other than some probable incidental catches in driftnets set in Bazaruto Bay, it appears that there is little threat to spinner dolphins in the region.

Biology
There are few biological data available. A single pregnant stranding indicates that females reach sexual maturity before they attain 1.77m (53kg); the length at birth is probably *ca* 0.82m. No other biological data are presently available.

Diet
No information on food and feeding is available; no stomachs have been examined for the region.

Fraser's dolphins (*Lagenodelphis hosei*)
Distribution and status
At-sea sightings of Fraser's dolphins off the coast of southern Africa were first reported by Perrin *et al.* (1973). The majority of confirmed sightings have been made in summer; however, sightings in August and April indicate that Fraser's dolphins are not solely a summer migrant (Findlay *et al.*, 1992). All sightings have been on the east coast north of 34°30'S, in water more than 1,000m deep, with an apparently localised occurrence strongly associated with the subtropical component of the Agulhas Current (Findlay *et al.*, 1992). There are insufficient data to assess the status of this species in the region.

Biology
There are few data available for this species. Ross (1984) reported that both males and females reach a maximum length of at least 2.64m (208.7kg); length at birth is unknown but is probably less than 1.1m. Females reach sexual maturity between 2.25m (129.3kg) and 2.36m (163.3kg) length (Ross, 1984), but no reproductive data are available for males.

Fraser's dolphins appear to be a gregarious species, Findlay *et al.* (1992) report groups ranging from 7 to 1,000 animals with a mean of 183.1 (±SD 277.1).

Diet
Three cephalopods and six fish species have been identified from the stomachs of two specimens (Sekiguchi *et al.*, 1992). From this limited sample, deep-sea mid-water squid appear to comprise the main diet of Fraser's dolphins (*Chiroteuthis* sp. 53.8%, *Histioteuthis* sp. 31.9% and *Taningia danae* 10.3%), but some mesopelagic deep-water fish, such as members of the Malacosteidae, Melamphaidae and Photichthyidae, were also present (Sekiguchi *et al.*, 1992).

Dusky dolphins (*Lagenorhynchus obscurus*)
Distribution and status
Sighting data were all west of 19°E and suggest that the dusky dolphin is a year round resident of the west coast of southern Africa, being found predominantly over the shelf in shallow waters, but also off the shelf edge (Findlay *et al.*, 1992). No population estimates are available. Some individuals are apparently being caught by the fishing industry (Peddemors *et al.*, 1997).

Biology
No biological data are available.

Findlay *et al.* (1992) reported that there is no seasonal difference in school size, dusky dolphins occurring in groups ranging from 2 to 800 dolphins (mean 35.32 ± SD 104.46).

Diet
Seven cephalopod and 16 fish species have been identified from stomach samples, indicating that dusky dolphins feed primarily on pelagic shoaling prey such as maasbanker

(*Trachurus t. capensis* - 30.2%), but take hake (*Merluccius* sp. - 18.4%) and some deep-water squid (*Todarodes angolensis* – 12.5%), lanternfish (*Lampanyctodes hectoris* - 11.7%) and lightfish (*Maurolicau muelleri* - 3.0%), thereby suggesting possible foraging in the deep scattering layer at night (Sekiguchi *et al.*, 1992). There may be some direct competition with commercial fisheries as both maasbanker and anchovy (*Engraulis capensis*) were a similar size to the mode in the west coast commercial catch. Redeye roundherring (*Etrumeus whiteheadi*) and sardine (*Sardinops sagax*) were smaller than those taken in commercial catch (Sekiguchi *et al.*, 1992).

Risso's dolphins (*Grampus griseus*)

Distribution and status

Sightings of Risso's dolphins have been made between 31°S on the west coast and 29°S on the east coast throughout the year, but stranding records indicate that the range probably extends to at least 21°35'S (Findlay *et al.*, 1992). Although found throughout southern African pelagic waters (Findlay *et al.*, 1992), off the east coast, they are possibly associated with the 1,000m isobath (Ross, 1984). There are insufficient data to assess the status of Risso's dolphins for the region; however, interactions with commercial squid fisheries on the southeastern coast can be expected (see below).

Biology

Length at birth is approximately 1.33m (19kg) and females attain a maximum length of 2.83m at about 260kg (unpublished data); males reach 3.25m (Ross, 1984). Southern African Risso's dolphins are significantly shorter in length than Mediterranean or North Atlantic specimens (Ross, 1984). Females and males reach sexual maturity at approximately 2.7m length (Ross, 1984). Birth probably occurs in the summer months between December and April (Ross, 1984).

Findlay *et al.* (1992) reported group sizes of Risso's dolphins ranging from 1 to 80, with a mean of 11.09 (±SD 13.37).

Diet

On the east coast, Risso's dolphin prey consists exclusively of cephalopods (17 species were identified) (Cockcroft *et al.*, 1993), whereas two fish and 14 cephalopod species were identified from west coast stomachs (Sekiguchi *et al.*, 1992). The east coast sample suggested that Risso's dolphins probably feed both in the Agulhas Current and in coastal waters where the shelf is narrow, and that there may be resource partitioning between subgroups of dolphins according to sex and size class (Cockcroft *et al.*, 1993). Here, chokka squid (*Loligo vulgaris reynaudii*), a shallow water, semi-pelagic subspecies comprised 81% by mass of the total prey and 48.1% and 29.2% by number and frequency of occurrence, respectively (Cockcroft *et al.*, 1993) On the west coast, Risso's dolphins also seem to forage both in coastal and offshore waters. While inshore, feeding occurs on pelagic prey such as anchovy (*Engraulis capensis* - 18.9%) and benthic octopus (*Octopus* sp. - 44.2%), offshore prey include deep-water cephalopods (*Todaropsis eblanae* - 10,4% and *Octopoteuthis* sp. - 10.3%) (Sekiguchi *et al.*, 1992).

The most important commercial fishery on the east coast is that for chokka squid (Augustyn, 1990) and it is expanding rapidly. This may lead to increased interaction between Risso's dolphins and this fishery.

Rough-toothed dolphins (*Steno bredanensis*)

Distribution and status

Only three confirmed rough-toothed dolphin specimen records exist for the region: one from KwaZulu-Natal on the east coast (29°28'S, 31°16'E) and one from Namibia on the west coast (19°20'S, 12°35'E), both reported in Findlay *et al.* (1992), and one from Hermanus (18°30'S, 19°50'E; Best, pers. comm.). There have been no sightings of rough-toothed dolphins in southern African waters. These single records may represent individuals at the extreme southern limits of their ranges. There are insufficient data to assess the status of rough-toothed dolphins in the region.

Biology and diet

The only available information is that the single specimen collected from the east coast was a sexually mature female, 2.44m in length (Ross *et al.*, 1985).

Southern right whale dolphins (*Lissodelphis peronii*)

Distribution and status

Although there are no confirmed sightings from systematic surveys for the region, 18 incidental sightings of southern right whale dolphins have been made on the west coast between 24°S and 30°30'S (Rose and Payne, 1991; Findlay *et al.*, 1992). Sightings have occurred year-round in water depths between the 100-200m and 1,000-2,000m isobaths (Cruikshank and Brown, 1981; Rose and Payne, 1991; Findlay *et al.*, 1992).

From these records, it would appear that southern right whale dolphins occur in a small area off Namibia, perhaps associated with the Lüderitz upwelling cell (Rose and Payne, 1991). The rarity of sightings implies that the population may be resident in Namibian waters and may be vulnerable to overexploitation if commercial gillnet fisheries are allowed to fish the area, as has been the case in other parts of the world (e.g. IWC, 1994).

Biology

There is no biological information for the region, but sightings data (Cruikshank and Brown, 1981; Findlay *et al.*, 1992) indicate that groups range in size between 3 and 250 with a mean of 52.25 (±SD 82.59). Rose and Payne (1991) witnessed two groups joining together to number in excess of 500 dolphins. Half of the sightings recorded to date have been in close association with other small cetacean species, particularly with dusky dolphins, bottlenose dolphins and pilot whales (Cruikshank and Brown, 1981; Rose and Payne, 1991).

Diet

Although no stomachs have been examined, bongo-net samples and continuous acoustic records taken during sightings of southern right whale dolphins off Namibia indicated that the area contained an abundance of myctophid lantern-fish (*Lampanyctodes hectoris*) and that euphausiids (*Nyctiphanes capensis*) and small squid (*Lolinguncula* sp.) were also common (Cruikshank and Brown, 1981). Such a diet would correspond to similar prey items for right whale dolphins found in other parts of the world (e.g. Torres and Aguayo, 1979).

Heaviside dolphins (*Cephalorhynchus heavisidii*)

Distribution and status

A resident of nearshore waters of the west coast of southern Africa, all records of Heaviside's dolphin are from west of Cape Point (Findlay *et al.*, 1992) as far north as northern Namibia (17°23'S, 11°55'E) (Rice and Saayman, 1984),

although one unconfirmed fishing mortality has been reported from 17°09'S (Findlay *et al.*, 1992). All dedicated and incidental sightings have been made in waters shallower than 200m, the highest densities being inshore of the 100m isobath (Findlay *et al.*, 1992). Heaviside's dolphins suffer mortality through incidental entanglement in fishing gear (Best and Abernathy, 1994) and are occasionally deliberately exploited for their meat (Rice and Saayman, 1984); however, the extent of the impact of these mortalities on the population is not known (IWC, 1985).

Biology

The first colour photographs of Heaviside's dolphin were only published in 1987 (Griffin and Loutit, 1987). The first detailed description for the species using fresh specimens was published at approximately the same time (Best, 1988).

Heaviside's dolphins are born in the austral summer months at approximately 0.85m length after an unknown gestation period (Best and Abernathy, 1994). They reach physical maturity at approximately 1.7m length and show no sexual dimorphism in size (Best and Abernathy, 1994). The maximum length and weight measured are 1.74m and 74.4kg, respectively (Best, 1988). Sexual maturity for both sexes is probably reached at approximately 1.56-1.59m (Best and Abernathy, 1994).

Group size ranges between 1 and 30 with a mean of 3.15 (±*SD* 3.07) for scientific sightings (Findlay *et al.*, 1992). Groups of between 2-5 readily enter bays and inlets (Griffin and Loutit, 1987) and may show some residency for particular areas (Rice and Saayman, 1984).

Diet

Sekiguchi *et al.* (1992) reported on the feeding of Heaviside's dolphins. Five cephalopod and 12 fish species have been identified from stomachs, the diet consisting mainly of demersal organisms (48% *Merluccius* sp., 12.3% *Octopus* sp. and 13.6% Ophidiidae). Juvenile goby (*Sufflogobius bibarbatus*) in the diet suggests a pelagic feeding habitat as well as the nearshore demersal feeding habitat indicated by the presence of juvenile hake (*Merluccius* sp.).

Long-finned pilot whales (*Globicephala melas*) and short-finned pilot whales (*G. macrorhynchus*)

Distribution and status

Due to the difficulty of differentiating between the two species of pilot whale at sea, stranding data are probably the most accurate method of determining distribution patterns, despite the limitations of such data. Long-finned pilot whales appear to be a cold-water species found on the south and west coasts, an eastwards movement to approximately 28°E reflecting the distribution of cooler water inshore of the Agulhas Current system (Findlay *et al.*, 1992). Short-finned pilot whales appear to be a warm-water species found on the east coast, with some movement westwards to approximately 25°E with the Agulhas Current (Findlay *et al.*, 1992). All 13 confirmed sightings of pilot whales from dedicated cetacean surveys have been in association with the shelf edge or in water greater than 1,000m deep (Findlay *et al.*, 1992). Limited sighting data of confirmed identification suggest that long-finned pilot whales are resident year-round off the west coast (Ross, 1984). There are too few records to determine whether the short-finned pilot whale migrates seasonally on the southern African east coast, but the known records are all in the cooler months (Ross, 1984).

Biology

Almost no biological data are available for the long-finned pilot whale in this region, apart from the fact that females reach at least 4.5m (Ross, 1984). Group size is probably between 2 and 120, regularly in association with bottlenose dolphins (Findlay *et al.*, 1992).

More data are available for the short-finned pilot whale. Although size at birth is unknown, females reach up to 4.1m and males up to 5.89m (Ross, 1984). Females reach sexual maturity at about 3.8m or 3.9m length, and males possibly at approximately 4.37m (Ross, 1984). School sizes of confirmed sightings on the east coast were between 2-25 animals, which is within the range of school sizes elsewhere in the world (Ross, 1984). Elsewhere, short-finned pilot whales are also regularly seen in close association with bottlenose dolphin schools (Leatherwood and Reeves, 1983).

Diet

Sekiguchi *et al.* (1992) summarised what is known about the feeding of long-finned pilot whales in the region. Twenty-three species of cephalopod and some unidentified otoliths were recovered from five stomachs. They appear to feed mainly on deep-water squid (*Todarodes angolensis*, 80.8% and *Lycoteuthis ?diadema*, 13.0%), suggesting an offshore distribution, with feeding often associated with the edge of the continental shelf.

Ross (1984) reported on the stomach contents of four short-finned pilot whales. These included cephalopod beaks, including chokka squid (*Loligo v. reynaudi*) and deep-water squid (*Oregoniateuthis* sp.).

Melon-headed whales (*Peponocephala electra*)

Distribution and status

Only one record of a specimen exists for the region: a single animal that stranded alive at Hout Bay (34°04'S, 18°21'E) and probably represented the southern limit of its range (Best and Shaughnessy, 1981). Sightings records of melon-headed whales from the east coast of Africa (Peddemors and Ross, 1988) and Mozambique (Peddemors *et al.*, 1999) suggest that this species occurs throughout the east African coast and probably into the southern region along the Mozambique and KwaZulu-Natal coasts. The scarcity of information makes it impossible to determine the status of the species in this region.

Biology

The single specimen examined was a 2.48m long male and weighed 206kg (Best and Shaughnessy, 1981). Comparison of the testis weight with published data for Australian specimens indicated that the South African specimen was probably mature (Best and Shaughnessy, 1981). No other data are available for the region.

Diet

The stomach contents of the South African specimen contained two upper and one lower beak of chokka squid (*L.v. reynaudi*), a lower beak of a juvenile ommastrepid squid, a squid pen and two hake (*Merluccius* sp.) otoliths (Best and Shaughnessy, 1981).

Killer whales (*Orcinus orca*)

Distribution and status

This cosmopolitan species occurs throughout the year in the region and at all water depths (Findlay *et al.*, 1992). It appears possible that both 'resident' and 'transient' groups[2]

[2] For discussion of these types, see, for example Bigg *et al.* (1990).

of killer whales are found in these waters. Stomach content data and seasonal (September to October) increases in sightings off the east coast whaling grounds suggest that some of the animals are highly migratory, while a resident component is inferred through the year-round sightings in shelf waters throughout the region (Findlay, 1989). Insufficient data exist to determine the stock status, but it is unlikely that the 36 animals taken by the whaling industry (Best and Ross, 1977) had any impact on the population.

Biology
Size at birth is unknown, but is probably slightly smaller than the 2.27m male neonate stranding which exhibited a healed umbilicus (Ross, 1984). On the east coast, males may reach 8.8m and females 7.9m (Best and Ross, 1977). No reproductive data are available for females, but males probably reach sexual maturity at around 6.05m (Ross, 1984).

Diet
The remains of at least three elephant seals, *Mirounga leonina*, in a stomach of a harpooned killer whale off Durban suggests that some killer whales in southern African waters feed on marine mammals (Findlay *et al.*, 1992). As the nearest rookery for elephant seals is some 1,000 n.miles from the point of capture, this implies that this Durban specimen may be transient in nature. The prey of the resident component of killer whales in the region is unknown; however, several observations of killer whales have recorded them apparently feeding on marine mammals and seabirds while inshore (unpublished data; Ross, pers. comm).

False killer whales (*Pseudorca crassidens*)
Distribution and status
Confirmed sightings of false killer whales suggest that this species occurs seasonally throughout southern African waters; however, a paucity of sighting data for the winter months may merely reflect reduced search effort on both coasts during this time of year (Findlay *et al.*, 1992). All mass strandings occurred during the summer months between August and December (Findlay *et al.*, 1992). Sightings were all in depths of more than 1,000m (Findlay *et al.*, 1992). The lack of data precludes an assessment of the status of false killer whales off southern Africa.

Biology
Available data suggest a length of about 1.6m at birth (Ross, 1984). Males attain a length of at least 5.8m, females being on average approximately 0.5m to 1.0m shorter (Smithers, 1938). No reproductive data are presently available for the region.

Group size of confirmed sightings ranged from 1-50 with a mean of 16.0 (±SD 22.9), although one incidental sighting reported off the Cape Peninsula (33°53'S, 18°03'E) contained approximately 68 animals (Findlay *et al.*, 1992). Mass strandings have included from 4 to 200 animals and have all occurred within a limited stretch of coastline in the southwestern Cape (Findlay *et al.*, 1992).

Diet
Five species of cephalopod were identified from a stomach examined off the east coast (Ross, 1984), while eight cephalopod species were identified from the west coast (Sekiguchi *et al.*, 1992). These were all cephalopods from the continental shelf region, reflecting the offshore distribution of false killer whales.

Pygmy killer whales (*Feresa attenuata*)
Distribution and status
Only one confirmed sighting of 11 pygmy killer whales has been made off the coast of KwaZulu-Natal (31°S,29°E) in water 1,000-2,000m deep (Best, 1970), but strandings have occurred all along the coastline with the exception of the area between Cape Peninsula and Algoa Bay (Findlay *et al.*, 1992). The stranding records from Namibia as far north as 23°S probably reflect animals that originated from warmer offshore waters (Findlay *et al.*, 1992). Limited data suggest that this species may be found in the region in any month of the year, and may even be resident throughout the year (Ross, 1984). There is clearly insufficient information to assess the status of this species in the region.

Biology
There are few biological data available. Males reach physical maturity by 2.15m and females by 2.21m (Ross, 1984), but Best (1970) found no difference between maximum lengths of females and males. Group size range for the region is unknown, the only dedicated sighting being of 11 animals (Best, 1970).

Diet
Records for a single stomach from the east coast indicated that the specimen had fed on cephalopods (Ross, 1984), while a single stomach from the west coast included nine hake (*Merluccius* sp.) and one goby (Sekiguchi *et al.*, 1992). This small sample does not allow analysis of feeding habits for pygmy killer whales in southern Africa.

CONCLUSIONS

Eighteen species of delphinids have been recorded from Africa, south of 17°S. Although there is little known for most of the species distributed over the continental shelf, it appears that there is presently little human-induced threat to these. However, more research emphasis should in future be placed on possible detrimental interactions due to overfishing of delphinid prey stocks. Increased commercial fishing pressure will inevitably also increase interactions between the fishery and the affected delphinids. Only three inshore species are presently considered to be vulnerable: Heaviside's dolphins, bottlenose dolphins in KwaZulu-Natal and Namibia, and Indo-Pacific hump-backed dolphins in KwaZulu-Natal. Heaviside's dolphins are endemic and, although presently probably able to sustain mortalities following interactions with commercial fishing gear, may become negatively impacted should fishing activities increase. The bottlenose dolphin population in Namibia appears localised in its distribution and may therefore also be vulnerable to any future coastal development or commercial fishery expansions, while in KwaZulu-Natal they are subjected to ongoing incidental catches in shark nets, heavy pollution levels, habitat destruction and increased competition with fishermen for limited food resources. In KwaZulu-Natal, Indo-Pacific hump-backed dolphins are subjected to the same pressures as experienced by bottlenose dolphins, albeit more severely, while in Mozambique they are occasionally caught incidentally in gillnets or in a targeted fishery. Although generally considered an offshore species, southern right whale dolphins also appears to be extremely localised in distribution within southern Africa, and any future planned expansion of commercial driftnet fisheries off Namibia should be carefully monitored for incidental catches which may impact this population.

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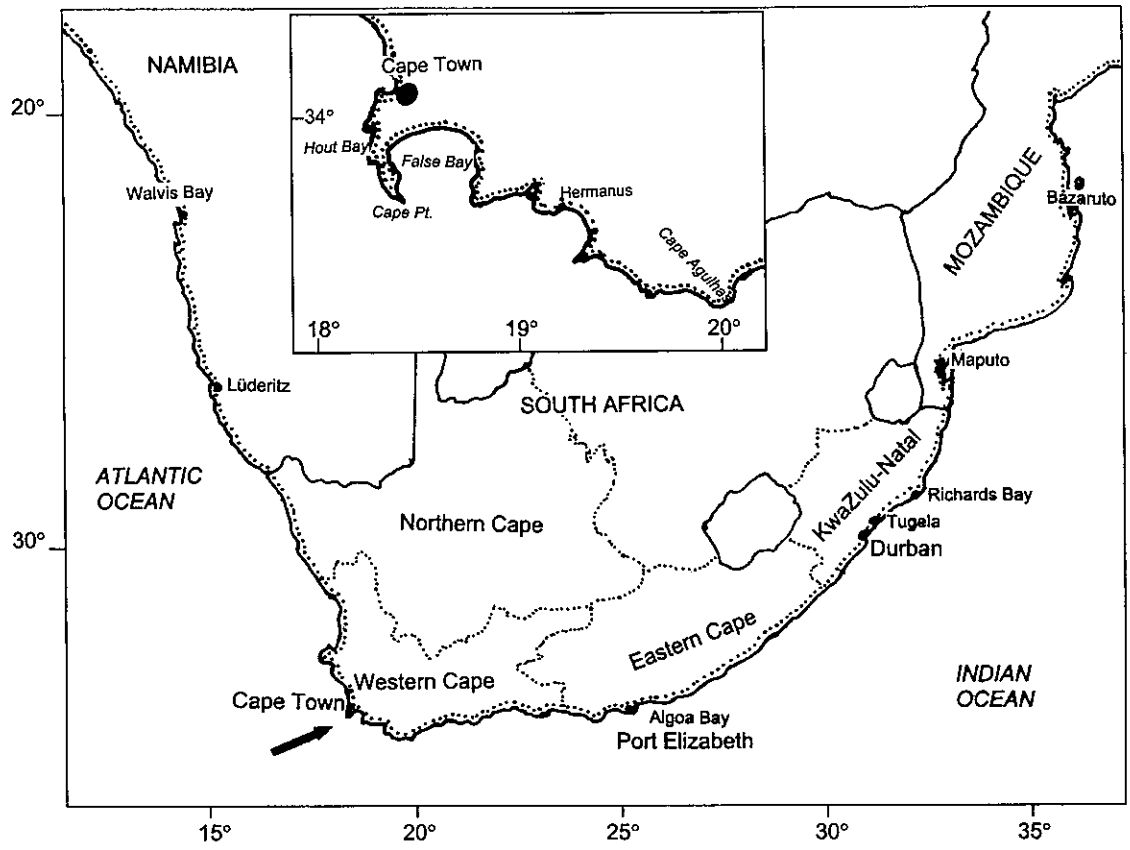

Appendix 1. Map of the study area.