CHAPTER 14(a)

Preliminary investigations of shark predation on Cape fur seals *Arctocephalus pusillus pusillus* from the Eastern Cape coast of South Africa

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ABSTRACT

Shark predation on Cape fur seals, *Arctocephalus pusillus pusillus*, from the Eastern Cape coast of South Africa was investigated. Observations were made on an opportunistic basis over a five year period from 1991 to 1996. Evidence of shark predation was obtained from: (i) incidental observations of shark attacks on live Cape fur seals, and (ii) counts of shark bite wounds on the bodies of live and dead seals. In Eastern Cape waters, potential shark predators include the white, *Carcharodon carcharias*; broadnose sevengill, *Notorynchus cepedianus*; bluntnose sixgill, *Hexanchus griseus*; shortfin mako, *Isurus oxyrinchus*; bull, *Carcharhinus leucas*; tiger, *Galeocerdo cuvier*; and dusky, *Carcharhinus obscurus*. Only the white and broadnose sevengill shark have been observed actively feeding on Cape fur seals. Shark bitten seals (n = 33) were observed throughout the year, with coastal records peaking in the autumn/winter period. Adult animals were observed with shark bite wounds more often than young. Wounds were usually located on the lower body, suggesting that attacks were made from behind. Fresh shark bite wounds were found on a minimum of 3.4% of seals found stranded on local beaches, and 0.3% of seals observed at the Black Rocks colony during the breeding season. Although predatory encounters appear to be common, long term studies are required before we can fully assess the extent of shark predation along the Eastern Cape coast. These records are the only known examples of shark inflicted injuries on southern fur seals *Arctocephalus* spp. south of 10°S.

INTRODUCTION

Shark predation is thought to be a significant cause of natural mortality in some species of seals, including the monk seal, *Monachus schauinslandi* (Wirtz, 1968; Kenyon, 1980, 1981; Alcorn & Kam, 1986), northern elephant seal, *Mirounga angustirostris* (Ainley *et al.,* 1981, 1985; Le Boeuf *et al.,* 1982; Klimley *et al.,* 1992), harbour seal, *Phoca vitulina*, and grey seal, *Halichoerus grypus* (Boulva & McLaren, 1979; Brodie & Beck, 1983). Apart from direct mortality, shark predation may significantly lower the survival rate of individual seals (Wirtz, 1968; Johnson & Johnson, 1981; Gilmartin, 1983; Alcorn, 1984), and reduce reproductive success (Ainley *et al.,* 1981; Le Boeuf *et al.,* 1982). It may also influence the timing of the breeding season (Ainley *et al.,* 1985), and influence the selection of preferred pupping habitats (Westlake & Gilmartin, 1990).

The Cape fur seal, *Arctocephalus pusillus pusillus*, is the only pinniped indigenous to southern Africa. It breeds at 25 colonies from Black Rocks (lat. 33° 50'S, long. 26° 15'E) on the south-east coast of South Africa, to Cape Cross (lat. 21° 46'S, long. 13° 57'E), Namibia. Current population size is estimated to be *c.* 1.5 to 2 million (Butterworth & Wickens, 1990). On the south-east coast, where two breeding colonies occur (Seal Island, Mossel Bay; Black Rocks, Algoa Bay), population levels are declining (SFRI, unpubl. data; Stewardson, unpubl. data), underlying the immediate need to document the biology of these top predators, and evaluate potential threats.

Cape fur seals are often observed with fresh shark bite wounds (pers. obs.), and have been found in the stomachs of white sharks, *Carcharodon carcharias* (Cliff, *et al.,* 1989, 1996), bluntnose sixgill sharks, *Hexanchus griseus*, and broadnose sevengill sharks, *Notorynchus cepedianus* (Ebert, 1991*a*, *b*, 1994; M. Smale, pers. comm.). However, the extent and effect of shark predation on the local seal population is not known.

The present paper examines shark predation on Cape fur seals from the Eastern Cape coast of South Africa. Evidence of shark predation was obtained from: (i) observations of shark attacks on live Cape fur seals, and (ii) counts of shark bite wounds on the bodies of live and dead seals. Attack behaviour was inferred from direct observation (interviews with experienced fishermen) and the position of wounds on prey.

MATERIALS AND METHODS

Study area

Data were collected between Plettenberg Bay (34°03'S, 23°24'E) and East London (32°58'S, 27°58'E), with the addition of a few beached animals collected from KwaZulu-Natal (Fig. 14(a).1). Two seal colonies occur in the study area: Black Rocks (Algoa Bay), a breeding colony with *c.* 700 seals (SFRI unpubl. data), and Rondeklippe (Plettenberg Bay), a small non-breeding colony.

Black Rocks consists of a series of five rocky outcrops surrounded by water *c.* 30 m deep. The largest outcrop, the main breeding rock, is 8 360 m^2 and 6 m above mean sea level.

Rondeklippe consists of a rocky platform, covering *c.* 240 m^2. The highest point is *c.* 2.8 m above mean sea level. Water depth is 3.5 m.

Large predatory sharks found off the Eastern Cape coast

A list of predatory sharks known to inhabit Eastern Cape waters and prey on marine mammals was compiled from the FAO species catalogue, *Sharks of the world* (Compagno, 1984). Seven species of sharks have been implicated as predators of marine mammals: the white (Compagno, 1984; Ross, 1984; Cliff, *et al.,* 1989, 1996); broadnose sevengill (Ebert, 1991*a*, *b*; M. Smale, pers. comm.); bluntnose sixgill (Compagno, 1984; Ebert, 1994; M. Smale. pers. comm.); shortfin mako, *Isurus oxyrinchus* (Compagno, 1984; Long & Jones, 1996); bull, *Carcharhinus leucas* (Compagno, 1984; Cockcroft *et al.,* 1989); tiger, *Galeocerdo cuvier* (Cockcroft *et al.,* 1989; Compagno, 1984); and dusky, *Carcharhinus obscurus* (Cockcroft *et al.,* 1989) sharks.

Shark bitten seals

Between May 1992 and November 1994, six day trips were made to Black Rocks to assess the number of seals with signs of shark inflicted injuries. Counts began at 800 hrs from an inflatable boat, *c.* 10 m from the rocks, and were completed on foot.

Between January 1991 and August 1996, seals beached (dead) or injured along the coast were examined for shark bite wounds. Old Port Elizabeth Oceanarium (PEO) stranding log books (1987–1991) were examined for additional records of shark bitten seals.

Comprehensive information was collected from seals with fresh bite wounds, and old scars that resembled shark bites. Wounded animals were classified as pups, juveniles (7 months to 2 years) and subadult/adults (≥ 3 years of age). Bite position was classified as upper body (head and neck region); mid-body (shoulder, chest, fore-flippers); lower body (from posterior to the fore-flippers); and hind-flippers.

A fresh shark bite wound was defined as pink or bloody in appearance, or showing little evidence of having healed (Ainley *et al.,* 1985). Fresh bites were classified as: (a) shallow/deep punctures; (b) shallow/deep lacerations; (c) open wounds on the body; and (d) dismemberment (amputation of limbs; decapitation; body severed) (Fig. 14(a).2). Punctures, lacerations and open wounds were usually semi-oval or oval in shape (Le Boeuf *et al.,* 1982; Randall *et al.,*

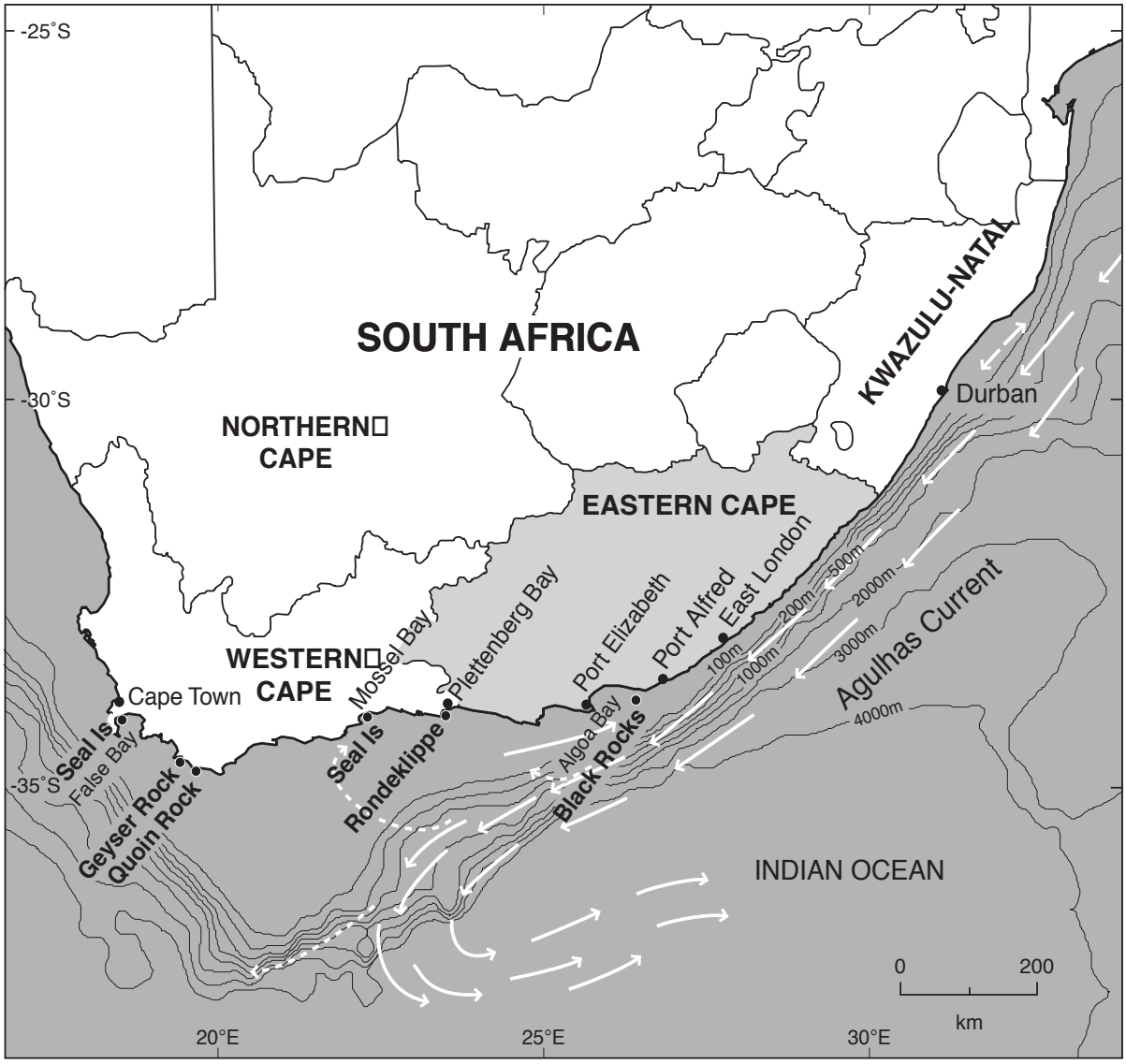

Fig. 14(a).1 Study area showing the locations of Black Rocks (Algoa Bay) and Rondeklippe (Plettenberg Bay) seal colonies off the Eastern Cape coast of South Africa.

1988; Long & Jones, 1996; Long *et al.,* 1996). Shallow wounds penetrated the skin and/or blubber, whereas deep wounds exposed the underlying muscle and/or bone.

To determine the percentage of shark bitten animals at the two seal colonies ground counts of wounded seals were conducted during the breeding season, when the number of animals was maximal. These took place at Black Rocks on 16 November 1993, and at Rondeklippe on 6 December 1994. Only fresh wounds were counted.

The total number of seals at Black Rocks was estimated from near vertical aerial photographs taken 24 December 1993, through the open door of a Cessna 172, flying at a speed of 60 knots and an altitude of 300–350 feet. Black and white photographs were enlarged (25 × 20 cm) and the number of black pups counted by two readers using a magnifying lamp. The estimated minimum number of pups (i.e., the number of individual pups counted by both readers + additional pups counted by reader one and reader two) was then multiplied by five to obtain an estimate of the total population (Anonymous, 1991).

Unpublished records of shark bitten subantarctic fur seals, *Arctocephalus tropicalis*, found beached or injured along the south-east coast were also included in this study. These records were collected over a 15 year period, between July 1979 and August 1994 (Stewardson *et al.,* unpubl. data). Fresh shark bite wounds and old scars that resembled shark bites were noted. These records were used for comparative purposes, to assess attack behaviour inferred from the position of wounds on the seal's body.

RESULTS

Observations of shark attacks on live Cape fur seals indicated that: (i) large white sharks prey on Cape fur seals in Eastern Cape waters; (ii) pups, juveniles and adults are taken; (iii) the seals were attacked from

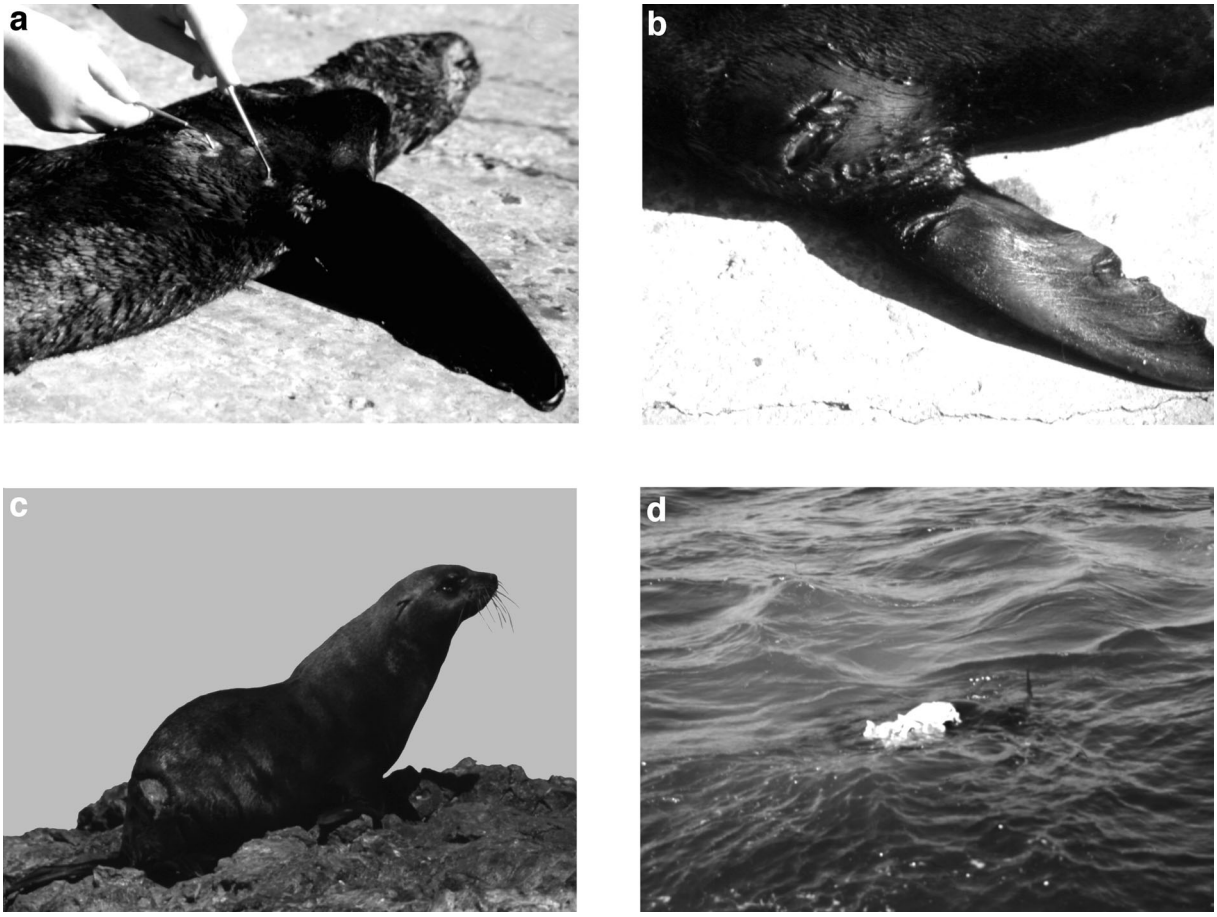

Fig. 14(a).2 Shark bite wounds observed on Cape fur seals from the Eastern Cape coast of South Africa: (a) punctures, (b) lacerations, (c) open wounds on the body and (d) dismemberment.

behind; and (iv) the sharks fed immediately (Table 14(a).1). Shortfin mako sharks (1–4 m in length) and blue sharks, *Prionace glauca*, have been observed pursuing seals (juveniles and large adult males) in this region; however, no kills have been confirmed (Dave Craig, pers. comm.).

During six day trips to Black Rocks colony, a total of 13 seals with fresh shark bite wounds were identified; all were adults (Table 14(a).2). The ratio of injured males to females was 1 : 3. These animals had been bitten only once before escaping. Sixty nine percent of wounds were located on the lower body.

Table 14(a).1 ***Eyewitness accounts of white sharks killing and consuming Cape fur seals on the Eastern Cape coast of South Africa***

No.	Date	Location	Total length of shark (m)	Age class of seal	Description of attack	Witness
1	Jan/Feb 1992	Rock River (Nature's Valley)	*c.* 4	Adult	- seal was attacked from the rear - whole seal consumed - bite sequence NR	B. Joubert
2	Jan 1993	Robberg (Plettenberg Bay)	*c.* 3	Juvenile	- seal was attacked from the rear - whole seal consumed in a single bite	W. Stanley
3	NR	Bird Island (Algoa Bay)	*c.* 4	Black pup	- seal was attacked from the rear - hind-flippers severed first - whole seal was consumed	Anon (Bird Island guano worker)

NR, not recorded.

Table 14(a).2 ***Fresh shark bite wounds and bite scars found on Cape fur seals sighted at Black Rocks seal colony between May 1992 and November 1994***

No.	Date	Locality	Age class	Sex	Bite category[a]	No. of bites	Bite position[b]	Other comments
1	11 May 1992	Black Rocks	Adult	M	fresh open wound	1	lower body (dorsal)	Infected wound & locomotion impaired
2	11 May 1992	Black Rocks	Adult	F	fresh deep laceration	1	mid-body (dorsal)	–
3	11 May 1992	Black Rocks	Adult	F	fresh open wound	1	mid-body (fore-flipper)	–
4	11 May 1992	Black Rocks	Adult	F	fresh deep laceration	1	hind-flipper	–
5	11 May 1992	Black Rocks	Adult	F	fresh superficial laceration	1	lower body (dorsal)	–
6	16 November 1993	Black Rocks	Adult	F	old bite (healed)	1	lower body (dorsal)	–
7	16 November 1993	Black Rocks	Adult	F	fresh open wound	1	hind-flipper	Infected wound
8	16 November 1993	Black Rocks	Adult	F	fresh open wound	1	lower body (dorsal)	Pregnant (full term)
9	16 November 1993	Black Rocks	Adult	M	old bite (healed)	1	lower body (dorsal)	Bull in breeding condition
10	16 November 1993	Black Rocks	Adult	M	fresh superficial laceration	1	lower body (dorsal)	–
11	16 November 1993	Black Rocks	Adult	M	old bites (partially healed)	2	lower body (dorsal) mid-body (ventral)	–
12	20 November 1993	Black Rocks	Adult	M	fresh deep laceration	1	lower body (dorsal)	Bull in breeding condition
13	20 November 1993	Black Rocks	Adult	F	fresh deep laceration	1	lower body (dorsal)	Pregnant (full term)
14	22 February 1994	Black Rocks	Adult	F	fresh open wound	1	lower body (dorsal)	Observed feeding pup
15	22 February 1994	Black Rocks	Adult	F	old bites (healed)	2	lower body (dorsal)	Poor physical condition
16	22 February 1994	Black Rocks	Adult	M	old bites (healed)	2	lower body (dorsal)	Bites slightly overlapping
17	15 September 1994	Black Rocks	Adult	F	fresh open wound	1	lower body (dorsal)	–
18	27 October 1994	Black Rocks	Adult	–	fresh dismem-berment	–	lower body (axillary girth)	Lower body floating at water surface
*19	5 December 1994	Rondeklippe	Adult	M	old bite (healed)	1	mid-body (fore-flippers & chest)	Large bull, (TL *c.* 2.2 m)
*20	5 December 1994	Rondeklippe	Juvenile	–	fresh superficial laceration	1	mid-body (fore-flippers)	Poor physical condition & locomotion impaired

[a] See text, page 296.
[b] See text, page 296.
* Seals 19 and 20 from Rondeklippe; observations made during the breeding season.

Few animals had wounds to the hind-flippers (two seals) or mid-body (two seals). No head or neck wounds were observed. Two animals had infected wounds, one had difficulty in walking, and one dead animal was presumably killed during the attack.

Old scars resembling shark bite wounds were found on five animals; two adult females and three adult males (Table 14(a).2). On most, bite scars were on the lower body. Three animals had more than one bite scar.

From January 1991 to December 1995, a total of 114 Cape fur seals were found beached (dead), or drowned in commercial trawl nets. Four of these seals (3.5%) had fresh shark bite wounds: three juveniles and one adult (Table 14(a).3). Each animal had a single shark bite located on the lower or mid-body. No head or neck wounds were observed. Two animals were in poor body condition, and one live animal had a dislocated shoulder and was in shock. Macroscopic visual observation of gross body organs did not disclose obvious abnormalities.

Table 14(a).3 *Fresh shark bite wounds and bite scars found on Cape fur seals beached (dead), or drowned in commercial trawl nets, between January 1991 and December 1995*

No.	Date ashore	Locality	Dead or Alive	Age class	Sex	SBL[a] (cm)	Weight (kg)	Bite category[b]	No. of bites	Bite position[c]	Bite width (cm)	Other comments	Accession no.[d]
21	11 March 1993	Pollock Beach (Port Elizabeth) 33°59'S, 25°41'E	D	Juvenile	M	118	23	fresh open wound	1	lower body (dorsal)	20	–	PEM2035
22	28 May 1993	Seaview (Port Elizabeth) 34°02'S, 25°31'E	D	Adult	M	206	–	old bite (healed)	1	lower body (dorsal)	–	–	PEM2044
23	28 June 1993	Trawl net 34°43'S, 24°28'E	D	Adult	M	171	–	old bite (healed)	1	hind-flipper	21	–	PEM2052
24	5 July 1994	Schoenmakerskop 34°02'S, 25°33'E	D	Juvenile	M	103	15	fresh deep punctures	1	mid-body & lower body (ventral & dorsal)	19	Poor physical condition	PEM2201
25	23 July 1994	Maitlands 33°59'S, 25°18'E	A[e]	Juvenile	F	86	12	fresh deep punctures	1	mid-body (ventral)	23	Fractured shoulder & shock	PEM2204
26	27 August 1995	Seaview 34°01'S, 25°27'E	D	Adult	M	130	–	fresh deep laceration	1	lower body (dorsal)	12	Poor physical condition	PEM2415

[a] Standard body length (straight line from tip of the snout to tip of the tail, with the animal lying on its back).
[b] See text, page 296.
[c] See text, page 296.
[d] Port Elizabeth Museum accession number.
[e] Alive, but died within hours of collection.

Old scars resembling shark bite wounds were found on two adult males (Table 14(a).3). Each animal had a single bite scar, located on the lower body or hind-flippers.

From January 1987 to September 1991, a minimum of seven Cape fur seals were treated for shark bite wounds at the Port Elizabeth Oceanarium: one pup, three juveniles, and three adults (Table 14(a).4). Four of these animals were males; three were unsexed. Eighty six percent of wounds were located on the lower body or hind-flippers. Only one animal had wounds to the mid-body. No head or neck wounds were observed. It was not possible to calculate a percentage for shark bitten seals because the total number of seals treated at the oceanarium during this period was not recorded.

The total population estimate for the 1993 breeding season at Black Rocks was 915 animals (i.e., 183 pups). On 16 November 1993 a minimum of three animals had fresh shark bite wounds; 0.3% of the animals examined (Table 14(a).2).

The total population estimate for the 1994 breeding season at Rondeklippe was 11 animals. On 5 December 1994, fresh shark bite wounds were observed on one of these animals; (Table 14(a).2).

From July 1979 to August 1994, a total of 158 subantarctic fur seals were recorded in the study area, of which nine (5.7%) had fresh shark bite wounds (Table 14(a).5). Twenty six animals returned to sea soon after their arrival; 17 were beached (dead), and 115 were taken to the local oceanaria for rehabilitation, or were relocated. Many of the emaciated animals died during rehabilitation. The majority of bite wounds were found on the mid-body and lower body. No head or neck wounds were observed. Three animals had infected wounds (seals 5, 8 and 9), two of which died from septicaemia.

Table 14(a).4 *Fresh shark bite wounds and bite scars found on injured Cape fur seals brought into the Port Elizabeth Oceanarium for medical treatment between January 1987 and September 1991*

No.	Date ashore	Locality	Age class	Sex	Bite position[a]
27	2 May 1987	Jeffrey's Bay 27°34'S, 32°41'E	Black pup	–	mid-body (fore-flipper)
28	1 December 1988	Swartkops Beach 33°52'S, 25°38'E	Juvenile	–	hind-flippers
29	8 December 1991	Maitlands 33°58'S, 25°17'E	Juvenile	M	lower body (dorsal)
30	14 May 1994	–	Adult	M	hind-flippers
31	5 July 1994	Schoenmakerskop (Port Elizabeth) 34°02'S, 25°33'E	Adult	M	lower body (dorsal)
32	19 June 1996	Cape Recife 34°01'S, 25°42'E	Juvenile	–	lower body (dorsal)
33[b]	2 August 1996	East coast-offshore (Trawl net)	Adult	M	lower body (dorsal & ventral) & hind-flippers

[a] See text, page 296.
[b] The lower back of animal 33 was partially paralysed from the bite (captured alive in trawl net).

DISCUSSION

Predatory sharks

In Eastern Cape waters only the white shark and broadnose sevengill sharks are known to actively feed on live Cape fur seals (Cliff *et al*., 1989, 1996; Ebert, 1991 *a*, *b*; M. Smale, pers. comm.; present study). Bluntnose sixgill sharks feed on Cape fur seals; however, it has yet to be confirmed if live prey or carrion is taken (Ebert, 1994; M. Smale, pers. comm.).

Several factors suggest that white sharks are responsible for the majority of attacks on Cape fur seals from the Eastern Cape coast: (i) white sharks have been observed attacking and eating Cape fur seals in this area (present study); (ii) seal remains have been found in the stomachs of white sharks captured along the south-east coast (Cliff *et al.,* 1989, 1996; D. Craig, pers. comm.); (iii) there have been numerous reports of large sharks (300–550 cm) near the Eastern Cape seals colonies (Ferreira & Ferreira, 1996); (iv) Black Rocks is thought to be a pupping ground for white sharks, as suggested by the large number of small sharks (*c.* 180 cm) found there (Cliff *et al.,* 1996; Ferreira & Ferreira, 1996); (v) white sharks inflict large bites (10–50 cm) resembling ovate or crescentic arcs with triangular punctures or jagged tears (Long *et. al,* 1996), typical of those found on dead and injured seals (present study).

Shark bites

A total of 33 Cape fur seals was observed with shark bite wounds (25 seals with fresh bites; eight seals with shark bite scars). Injuries included punctures, lacerations, open wounds and dismemberment. Bite width measured on dead animals ranged from 12–23 cm, indicating that these animals were attacked by large sharks (Long & Jones, 1996). Some injured animals showed signs of impaired body movement (four seals), and infection (two seals).

Age of prey

Shark inflicted injuries were observed on one pup, seven juveniles and 25 adults. The large number of adults with shark bite wounds suggests that either: (i) adults are attacked more often than young animals, or (ii) predatory attacks on adult seals are less successful than attacks on younger seals. Young seals may be more vulnerable to shark attack because of their smaller, manageable size, undeveloped swimming/diving abilities, and their inexperience (Le Boeuf *et al.,* 1982; Brodie & Beck, 1983; Ainley *et al.,* 1985; Le Boeuf & Crocker, 1996). Therefore, it is likely that the low incidence of shark bite wounds observed on young Cape fur seals indicates that such attacks are usually fatal (Brodie & Beck, 1983; Hiruki *et al.,* 1993; present study). Large body size of adult seals (males: mean range 200–300 kg; females: mean range 40–80 kg; David, 1987) would increase their chance of surviving an attack, whereas younger animals are more likely to succumb.

Location of bites

Fur seals (Cape and subantarctic) with single shark bite wounds, were usually bitten on the lower body, suggesting that animals were approached from behind. Larger sharks presumably find it difficult to capture fleeing otariids; therefore, they usually attack from behind and/or below unsuspecting animals, at or near the water surface (Tricas & McCosker, 1984; Tricas, 1985; Klimley *et al.,* 1996; Long *et al.,* 1996). Once bitten, white sharks usually release their prey for a short period before feeding (Klimley *et al.,* 1996). By releasing the injured seal immediately after the initial strike, the predatory shark presumably reduces the risk of injury from the seal's highly developed

fore-flippers, sharp teeth and nails (Tricas & McCosker, 1984; McCosker, 1985; Tricas, 1985; Klimley *et al.,* 1996). Because the fore-flippers are not usually disabled during the initial strike, large otariids may escape before the second strike. Unlike phocids, which use hind-flipper locomotion, otariids propel themselves through the water with their fore-flippers. If the hind-flippers of the otariid are damaged during the initial strike, the animal still retains mobility, whereas phocids generally surface immobile (Ainley *et al.,* 1985; Klimley *et al.,* 1996).

Seasonality

In the present study, coastal PEM/PEO records indicate that 77% of shark bitten Cape fur seals were observed in May–August (Austral autumn/winter). This may reflect an increase in shark abundance in the area. At Dyer Island and Struis Bay (Western Cape), white sharks are present throughout the year, with peak sightings in July/August (Ferreira & Ferreira, 1996). In the warmer waters of KwaZulu-Natal, shark numbers appear to peak from August to January (Cliff *et al.,* 1996). If white sharks are more abundant near the Eastern Cape seal colonies in autumn/winter, then younger seals and/or nursing cows would be their main prey because young seals remain close to the colony, but make brief trips to sea to supplement their milk diet with fish and crustacea (Rand, 1956). In contrast, seals > 2 years of age, including non-nursing cows, spend much of their time at sea feeding during this period (Rand, 1956).

Percentage of seals with shark bite wounds

Fresh shark bite wounds were found on a minimum of 3.4% of Cape fur seals found stranded on local beaches, and 0.3% of seals observed at the Black Rocks colony during the breeding season. However, these estimates do not account for the number of fatal attacks, and, therefore, underestimate the extent of shark-seal interactions in this area. Furthermore, when estimating the number of wounded animals from coastal strandings, several factors may bias counts negatively. For example: (i) currents and tides may prevent seals from washing ashore, or carry beached animals out to sea; (ii) some dead seals may sink to the ocean floor, or be scavenged by other animals; (iii) strandings may occur in sparsely populated or in less accessible areas, and are less likely to be reported; and (iv) it is not always possible to differentiate between direct predation and post-mortem scavenging. When counts are conducted at the colonies, estimates may also be negatively biased because: (i) it is not possible to see the ventral surface of all animals; (ii) animals partially submerged at the waters edge, or feeding at sea, are excluded from counts; (iii) superficial wounds are possibly overlooked, hidden beneath the seal's thick pelage.

CONCLUSIONS

The data presented in this study provides the first published records of shark inflicted injuries on southern fur seals *Arctocephalus* spp. south of 10°S. Preliminary findings suggest that white sharks are responsible for the majority of attacks on Cape fur seals from the Eastern Cape coast. Although predatory encounters appear to be common, long term studies are required before we can fully assess the extent of shark predation in this area. Such research should include quantitative data on: shark prevalence, length, diets and feeding behaviour; identification of species of sharks responsible for fresh bite wounds found on the bodies of dead or injured seals; and regular observations at the East Cape colonies to assess the seasonal and inter-annual extent and effects of shark predation.

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Appendix 14(a).5 ***Fresh shark bite wounds found on vagrant subantarctic fur seals collected from the south-east coast of southern Africa between July 1979 and August 1994***

No.	Date ashore	Locality	Age class	Sex	Bite position[a]	Other comments
1	9 October 1984	Port Alfred 33°36'S, 26°55'E	Adult	M	–	poor physical condition; died (13 October 1984); PEM1085
2	19 June 1986	Flat Rocks (Port Elizabeth) 34°00'S, 25°42'E	Adult	M	lower body (dorsal)	poor physical condition; returned to sea (22 June 1986)
3	17 August 1987	Shelly Beach (Durban) 30°48'S, 30°25'E	Adult	M	lower body (dorsal)	released (16 March 1988); *A. tropicalis*/*gazella* hybrid; named Rattigan
4	15 July 1988	Sodwana Bay 27°34'S, 32°41'E	Juvenile	F	mid-body (dorsal) & hind-flippers	mid-body wound required 30 stitches; sold (10 October 1989) to WMSP, England; named Otta
5	26 July 1988	Beach View (Port Elizabeth) 34°00'S, 25°49'E	Juvenile	F	mid-body (fore-flipper) & lower body (dorsal)	wound infected/ maggots; resident of PEO; named Tess
6	26 July 1989	Humewood (Port Elizabeth) 33°58'S, 25°38'E	Adult	M	mid-body (fore-flipper)	poor physical condition; returned to sea (26 July 1989)
7	15 July 1989	Schoenmakerskop (Port Elizabeth) 34°02'S, 25°33'E	Adult	M	–	poor physical condition; released (22 July 1989); found dead at Bird Island (25 July 1989) with fresh shark bite wounds
8	2 September 1990	St Lucia 28°24'S, 32°26'E	Juvenile	_	_	developed septicaemia; died (6 September 1990); named Aero
9	30 August 1991	Virginia Beach (Durban) 29°46'S, 31°04'E	Adult	M	lower body (dorsal)	developed septicaemia; died (31 August 1991); named Tim

[a] See text, page 296.
PEO, Port Elizabeth Oceanarium.
WMSP, West Midlands Safari Park, England.