Appendix 1.2

PENGUIN Conservation Assessment and Management Plan (PENGUIN CAMP)

Report from a Workshop held 8-9 September 1996, Cape Town, South Africa
Edited by Susie Ellis, John P. Croxall and John Cooper
Data sheet for the African Penguin *Spheniscus demersus*

African Penguin *Spheniscus demersus*

STATUS: New UCN Category: Vulnerable
Based on: A1a, A2b, E

CITES: Appendix II

OTHER: In South Africa, endangered in terms of the Nature and Environmental Conservation Ordinance, No. 19 of 1974 of the Province of the Cape of Good Hope. This now applies to the Northern Cape, Western Cape and Eastern Cape Provinces. In Namibia, there is no official legal status. Listed as Near Threatened in *Birds to Watch 2* (Collar *et al.* 1994). Listed as Vulnerable in the *Red Data Book for South Africa, Lesotho and Swaziland* (Crawford 2000). Listed in Appendix II of the Convention for the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Taxonomic status: Species.

Current distribution (breeding and wintering):

Breeding distribution: Between Hollams Bird Island, Namibia and Bird Island, Algoa Bay, South Africa.

Number of locations: 27 extant breeding colonies - eight islands and one mainland site along the coast of southern Namibia; 10 islands and two mainland sites along the coast of Western Cape Province, South Africa; six islands in Algoa Bay, Eastern Cape Province, South Africa (Crawford *et al.* 1995a). There is no breeding along the coast of South Africa's Northern Cape Province, which lies between Namibia and Western Cape Province.

Concentrated Migration Regions: None. Juveniles tend to disperse along the coastline to the west and north (Randall *et al.* 1987).

Historical Distribution: Breeding no longer occurs at nine localities where it formerly occurred or has been suspected to occur (Crawford *et al.* 1995b) - Neglectus, Seal, Penguin, North Long, North Reef and Albatross Islands in Namibia; Jacobs Reef,

Quoin and Seal (Mossel Bay) Islands in South Africa. In the 1980s, breeding started at two mainland sites in South Africa (Boulders, Stony Point) for which no earlier records of breeding exist.

Area occupied: Throughout breeding range and farther to the north and east. Rare off KwaZulu-Natal (Cyrus and Robson 1980; Wilkinson *et al*. 1999). Vagrants have occurred north to Sette Cama (2 32 S), Gabon, on Africa's west coast and to Inhaca Island (26 58 S) and the Limpopo River mouth (24 45 S), Mozambique, on the east coast (Shelton *et al.* 1984; Parker 1999). In coastal waters, usually within 12 km of the shore. Birds feeding chicks forage within 20-46 km of the colony (Wilson 1985; Randall 1989), mostly within 3 km of the coast (Berruti *et al.* 1989). Adults generally remain within 400 km of their breeding locality, but juveniles regularly move in excess of 1000 km from their natal island (Randall 1989).

Extent of occurrence: About 25 000 km^2, category D (> 20000 km^2).

Population Trends: % Change in Years: There were an estimated 222 000 adults (birds in adult plumage) in the late 1970s 194 000 in the late 1980s and 179 000 in the early 1990s (Crawford *et al.* 1995a). This gives a mean annual rate of decrease between the late 1970s and the early 1990s of 1.3 %, and between the late 1980s and the early 1990s of 1.5 %.
% Change in Generations: Adult survival is estimated to be about 0.90 p.a. (Randall 1983, Crawford *et al.* 1999). Therefore, average life expectancy of breeders is 6.6 years. Mean age at breeding is about four years (Randall 1983, Crawford *et al.* 1999). This gives an average age of breeders of 10-11 years. Birds have been known to live to more than 24 years in the wild (Whittington *et al.* 2000). The overall decrease in breeders between the late 1970s and early 1990s, i.e. about 15 years or 1.5 generations, was 19.4% (Crawford *et al.* 1995a). Therefore, the mean recent decrease per generation is 12.9 %

Trend over past 100 years: In 1910, there were probably 1.4 million adult birds at Dassen Island (Shannon and Crawford 1999). In the mid 1950s, the overall African Penguin population was estimated to be about 300 000 adults (Rand 1963a, b). This included 145 000 at Dassen Island, which may have underestimated the population there by as much as 70 000 (Shannon and Crawford 1999). By the early 1990s, the World's wild population had decreased to about 180 000 adults.

World population: In 1991-1994, the World's wild population was estimated to be 56 000 breeding pairs representing 179 000 adults (Crawford *et al.* 1995a). The number of adults was estimated from the ratio between birds in adult plumage and breeding pairs at Robben Island.

Regional populations: There has been regional variation in trends in the abundance of African Penguins (Crawford *et al.* 1990,1995a). In Namibia, there has been a 30% reduction since the late 1970s, the most severe declines being south of Lüderitz, where colonies continue to decrease. Populations at Mercury, Ichaboe and Halifax

Islands now appear to be stable. In South Africa, numbers fell by 17% between the late 1970s and early 1990s, with especially severe decreases near Saldanha Bay and at Dassen and Dyer Islands. These decreases have been arrested, except at Dyer Island. Three new colonies were established in the Western Cape Province in the early 1980s, and now support about 10 000 adult birds. At islands in Algoa Bay, the estimated number of adults increased by nearly 30 000 between the late 1970s and the early 1990s, with large increases at St Croix and Bird Islands.

Data Quality: 1 (Reliable census/population monitoring data) The estimated numbers of breeding pairs and adults at localities in 1991-1994 are listed in the following table (Crawford *et al.* 1995a):

Locality	**Pairs**	**Adults**
Hollams Bird Island	1	3
Sylvia Hill	26	83
Mercury Island	3659	11709
Ichaboe Island	2858	9146
Halifax Island	981	3139
Possession Island	8	26
Plumpudding Island	26	83
Sinclair Island	63	202
Namibia	**8373**	**26794**
Bird Island, Lambert's Bay	25	80
Malgas Island	99	317
Marcus Island	207	662
Jutten Island 1349	4317	
Vondeling Island	229	733
Dassen Island	9389	30045
Robben Island	2799	8957
Boulders	359	1149
Seal Island, False Bay	95	304
Stony Point	77	246
Dyer Island	8349	26717
Geyser Island	328	1050
Western Cape Province, South Africa	**23305**	**74577**
Jahleel Island	549	1757
Brenton Island	31	99
St Croix Island	19478	62330

St Croix Island	19478	62330
Seal Island, Algoa Bay	375	1200
Stag Island	24	77
Bird Island, Algoa Bay	3784	12019
Eastern Cape Province, South Africa	**24241**	**77572**
South Africa	**47546**	**152149**
WORLD	**55919**	**178943**

Recent Field Studies: Breeding cycle: Off southern South Africa the main breeding season is January to September; most birds moult between October and January (Randall 1989; Crawford *et al.* 1995c). The annual cycle farther north lags this by a few months (Crawford *et al.* 1995a).

Population surveys: Namibia's Ministry of Fisheries and Marine Resources (MFMR) counts annually the number of breeding pairs at Mercury, Ichaboe and Possession Islands. In South Africa, Marine and Coastal Management (MCM), Department of Environmental Affairs and Tourism (formerly the Sea Fisheries Research Institute (SFRI)) monitors the number of breeding pairs at 11 localities (all except Stony Point) in South Africa's Western Cape Province. Breeding pairs at Stony Point are counted by a committee of the local municipality. Port Elizabeth Museum (PEM) counts breeding pairs at Bird Island, Algoa Bay. Other breeding localities are surveyed less frequently by MFMR, MCM and PEM.

Counts of moulting birds are undertaken at two-weekly intervals by MFMR at Mercury, Ichaboe, Halifax and Possession Islands, Cape Nature Conservation (CNC) at Dassen Island, MCM at Robben Island, and nature conservation authorities of Eastern Cape Province at Bird Island, Algoa Bay. Counts during the peak moult are also made at Boulders by MCM and at St Croix Island by PEM. The relationship between counts of breeding birds and counts of moulting birds, that will enable the adult population to be estimated from counts of breeding birds, is being investigated for Algoa Bay by PEM.

Population parameters: Demographic parameters of African Penguins have been measured at Robben Island (Crawford *et al.* 1999). Adult survival was between 0.82 and 0.90 in 1993/94, but fell to 0.75 in 1994/95 when many birds at the island were oiled following the sinking of the *Apollo Sea* in June 1994. Some penguins initiated breeding when two years old, and all probably bred at age five. The proportion of mature birds that bred in a year varied between about 0.70 and 1.00. During the breeding season, pairs laid their first clutch between January and August, mostly in February and March. The average clutch was 1.86 eggs. Of lost clutches 32% were replaced, whereas 23% of pairs losing broods relayed and 21% of pairs that successfully fledged chicks relayed. On only one occasion was the laying of a third clutch during a breeding season recorded, and this was unsuccessful. The mean number of chicks fledged per breeding pair varied between 0.32 and 0.59 per annum.

Success of rehabilitation efforts: The return to islands and breeding success of penguins rehabilitated after being oiled following sinking of the Apollo Sea has been monitored by the ADU, MCM and CNC (Underhill *et al.* 1999). Of penguins flipper banded after rehabilitation, 65% had been seen at islands within two years of their release. At Dassen Island, there were some seasonal differences in the breeding success of rehabilitated birds and birds not affected by oil (Nel and Williams submitted). Moulting and breeding cycles were affected.
Diet: The diet of African Penguins is monitored by SFRI at three islands - Dassen, Robben and Dyer (Crawford and Dyer 1995). Anchovy *Engraulis capensis* is the main prey item at Robben Island (Crawford *et al.* 1995c). At Dyer Island there has been a trend to replacement of Anchovy by Sardine, *Sardinops sagax* (Adams *et al.* submitted).

Foraging range: The foraging range of breeding penguins at different localities is being investigated using transmitters to satellites. An adult rearing chicks at Dassen Island moved as far as Boulders and Marcus Island, but normally foraged closer to Dassen Island.

Threats:
CLIMATE:
Heat: African Penguins are subject to heat stress (Randall 1983). In hot, humid, cloudless and windless conditions, parents abandon clutches and broods for the sea to cool and prevent further dehydration. Losses to Kelp Gulls *Larus dominicanus* and other predators of eggs and chicks then frequently occur. African Penguins apparently reduce heat stress by breeding in shade, e.g. under bushes and in burrows. However, as a consequence of removal of accumulated deposits of guano, in which burrows can be excavated, penguins have been forced to nest on the surface at many localities, increasing their susceptibility to heat stress. Rain: Heavy rain may result in flooding of nests, drowning of small chicks and losses of older chicks to hypothermia (Randall *et al.* 1986).

There has been a change in the center of distribution of the breeding population of African Penguins. Much of the breeding population is now in Algoa Bay, where conditions are warmer than elsewhere, both on land and at sea. Should ambient temperatures increase as a result of global warming, increased desertions of nests and decreased reproductive success can be anticipated. Should rainfall increase, greater flooding of nests will occur.

PARASITES AND DISEASE:

This section deals with parasites and disease in the wild and in captivity. Most of the information arises from studies of captive populations and birds in rehabilitation centers. The possibility exists that diseases contracted by rehabilitated birds can be passed to wild populations.

Endoparasites: Various worms occur in the gastro-intestinal (GI) tract, and some in the

kidneys and lungs. Most can be treated with standard anti-worm medication. Cerebral symptoms may be seen with GI worms, whose eggs may be encysted in any part of the body, or endoparasites that lodge in liver, spleen, brain, lungs etc. Strigeid digenian trematodes *Cardiocephaloides physalis* were responsible for large numbers of chick mortalities at St Croix Island in July 1981 (Randall and Bray 1983). Ectoparasites: Lice, ticks and fleas are common, but not usually a problem.

Aspergillosis: A fungus that affects the lungs, particularly if penguins are stressed or overcrowded. Treatment is expensive and labor-intensive, involving nebulization (prophylaxis) and injections of Amphotericin-B. Oral itroconazole is favored by many as an effective and simple treatment (R. Norman pers comm.).

Bumblefoot: May be caused by *Staphylococcus* bacteria, but always associated with damp floors. Treatment difficult, but a dry environment will avoid it. Haematozoa: The most important is avian malaria *Plasmodium relictum*. Mortality is high, but, if diagnosed, birds can be treated with Chloroquin plus Doxycycline or Proguanil. The latter can be suspended in Keltrod, a mix of Hydroxy-benzoates, which makes it easier to administer. All penguins should be given prophylaxis during their stay in rescue stations, especially in summer, but controlled scientific assessment of the best drug and dose has not been done in South Africa. *Leucocytozoon* (commonly present in many flying birds) occasionally affects penguins. Possibly responds to Chloroquine. Babesiosis is endemic in African Penguins and has been reported elsewhere. Probably causes no symptoms, except under stress conditions.

Newcastle Disease: A virus with very high mortality and very contagious. A vaccine can be prepared, but its efficacy is unknown. Avian cholera: Avian cholera *Pasturella multocida* has killed penguins at Dassen Island (Crawford *et al.* 1992a). Infections: Pneumonia (viral or coccal) is common. Usually treated with amoxycillin. Steps need to be implemented to minimize the risk of rehabilitated penguins returning disease to wild colonies.

FISHING: Commercial purse-seine fisheries off South Africa and Namibia catch large quantities of Sardine and Anchovy, which are important prey items for African Penguins (Frost *et al*. 1976). Sardine stocks off South Africa and Namibia collapsed in the 1960s, respectively contracting to the southeast and north as they did so. A consequent reduced availability of prey was probably the main reason for the large decrease in numbers of penguins between Lüderitz and Dassen Island (Crawford *et al.* 1990). The decrease in number of penguins at Possession Island, southern Namibia, from 23 000 pairs in 1956 to fewer than 500 pairs in 1987 was exponential, with decay equivalent to the natural mortality rate of adults. Recruitment to the colony in this period appears to have been minimal (Cordes *et al.* 1999).
At Robben Island between 1989 and 1995, African Penguins fed mainly on Anchovy. The number of chicks fledged per breeding pair was significantly related to estimates of spawner biomass for the South African Anchovy resource (Crawford and Dyer 1995, Crawford *et al.* 1999). Numbers of immature birds immigrating to the colony were also significantly related to Anchovy biomass. The proportion of adults breeding

in any year at Robben Island was related to the biomass of the South African stock of Sardine. Development of a purse-seine fishery in Algoa Bay may decrease availability of prey fish to the large African Penguin population there.
Limited mortality results from entanglement of penguins in fishing nets (Cooper 1974, R.M. Randall, D.C. Nel unpublished). There is potential for this to increase if gill nets are set in proximity to breeding colonies. In South Africa, gill nets are only used in small fisheries for mullets and sharks.

COMPETITION WITH OTHER PREDATORS FOR FOOD: In addition to fishing, greatly expanded herds of Cape Fur Seals *Arctocephalus pusillus* have decreased availability of food to African Penguins (Crawford *et al.* 1992b).

HUNTING FOR FOOD OR OTHER PURPOSES: Collection of penguin eggs was primarily responsible for the very large decrease in numbers of African Penguins at Dassen Island between 1910 and 1956. It is estimated that in the first half of the 20th century 48% of eggs produced at Dassen Island were harvested (Shannon and Crawford 1999). The last sanctioned egg collections were in 1967.

There are unconfirmed reports of penguins being killed as use for bait in rock-lobster traps. Apparently they are attractive as bait because their flesh and skin is relatively tough compared to that of fish and other baits. The extent of this practice is unknown. Most reports emanate from the Namibian islands.

HUMAN INTERFERENCE OR DISTURBANCE: Exploitation and disturbance by humans is the probable reason for penguins stopping breeding at four colonies, one of which has since been recolonized (Crawford *et al.* 1995b). At other localities, egg collecting caused large decreases, especially at Dassen Island and in Algoa Bay. Historically, guano collection has been a major cause of disturbance at many colonies.

Disturbance may also arise from tourism, mining, management and research actions, and other activities at breeding localities, such as maintenance, angling and swimming. Disturbance is most damaging during breeding, at times causing panic and desertions of nest sites with losses of eggs and small chicks to Kelp Gulls. Young birds may also be deterred from breeding (Hockey and Hallinan 1981). Where there are burrows, humans moving about may cause burrows to collapse, thereby destroying breeding habitat and sometimes causing mortality.

Modeling has shown that regular searches for oiled birds have potential to severely depress populations if not properly controlled (Shannon and Crawford 1999). At some localities (e.g. Boulders) African Penguins show remarkable tolerance of humans, whereas at others (e.g. Seal in Algoa Bay) they are readily disturbed. Some of the human residents adjoining the colony at Boulders do not show the same tolerance to penguins. They seek a reduction in the number of penguins at the colony.

LOSS OF HABITAT: Competition for breeding space: Competition with Cape Fur Seals for breeding space is the probable reason for cessation of breeding at five

former breeding colonies (Crawford *et al.* 1995b). Expanding seal herds have displaced large numbers of penguins at other breeding localities, including Hollams Bird, Mercury and Sinclair Islands (Rand 1952, Shaughnessy 1980, Crawford *et al.* 1989). Displacement of penguins by seals has recently been countered to some extent by a policy of seal-scaring and placement of artificial shelters at breeding colonies (Crawford *et al.* 1994). African Penguins compete with other seabirds for breeding space. At Bird Island in Algoa Bay, they were displaced from a portion of prime breeding habitat by Cape Gannets *Morus capensis* (R.M. Randall unpublished). The projected rise in sea level may further reduce breeding habitat of African Penguins.

MARINE PERTURBATIONS, INCLUDING ENSO AND OTHER SHIFTS: In addition to fishing, environmental change is thought to have influenced alternating regimes of high and low abundance of Sardine and Anchovy worldwide, including the Benguela system (Lluch-Belda *et al.* 1989, 1992). Long-term trends of African Penguin populations in the Benguela system may to some extent be linked to regimes of Sardine and Anchovy. For example, the decreasing numbers of penguins at Dyer Island since the mid 1980s have matched a decreasing trend in the biomass of the South African Anchovy stock (Adams *et al.* submitted). In the same period, the stabilization or increase of colonies between Stony Point and Lambert's Bay has corresponded with an increasing trend in the South African Sardine stock.
These trends are the opposite of trends that followed the collapse of Sardine and rise of Anchovy off South Africa in the 1960s (Crawford *et al.* 1990).

PREDATION:
Sharks: Detailed examination of injuries sustained by penguins at St Croix Island indicated they were inflicted by Great White Sharks *Carcharadon carcharias* (Randall *et al.* 1988). At St Croix Island, these injuries were second only to oil pollution as a cause of mortality of penguins (Randall *et al.* 1988, R.M. Randall unpublished). Cooper (1974) attributed injuries observed at Dassen Island to sharks.

Seals: There are many accounts of Cape Fur Seals killing penguins (Cooper 1974, Broni 1984, Rebello 1984). This phenomenon has been recorded at Ichaboe, Halifax, Possession, Malgas, Dassen and Dyer Islands. The phenomenon is thought to be regional and periodic in occurrence. Mortality may be high - at least 25 penguins were killed on one day at Dassen Island (Cooper 1974).

Killer Whales: There are isolated records of Killer Whales *Orcinus orca* preying on African Penguins (Rice and Saayman 1987, Williams *et al.* 1990). Their influence is likely to be minor, because they are uncommon in southern African inshore areas (Ross 1989).

Kelp Gulls and Sacred Ibis: Kelp Gulls prey on eggs and chicks (Cooper 1974). Most of their takings constitute scavenging, such as deserted clutches, infertile eggs and dying chicks. They have learnt to capitalize on disturbance, preying on eggs and chicks that are temporarily exposed when parent birds take fright at human activities.

The desirability of controlling Kelp Gulls at particular localities needs investigation. Sacred Ibis *Threskiornis aethiopicus* also have potential to scavenge eggs and small chicks. Mole Snakes: At Robben Island, Mole Snakes *Pseudapsis cana* eat penguin eggs (Crawford *et al.* 1995c). If this predator attains high levels of abundance, the desirability of control should be researched.

Feral Cats: Feral Cats *Felis catus* prey on eggs or chicks of penguins at Dassen and Robben Islands (Berruti 1986, Crawford *et al.* 1995c) and probably also at Bird Island, Lambert's Bay, Boulders and Stony Point. Control programs are underway at Dassen and Robben Islands and are successful in maintaining cat populations at moderately low levels. Ideally cats should be eliminated at these islands.

Other mainland terrestrial predators: Various small predators prey on young stages of penguins at mainland localities and at the two islands (Bird at Lambert's Bay and Marcus) now joined to the mainland. Leopards *Panthera pardus* have eaten adult penguins at Stony Point (Crawford *et al.* 1995a). At this locality, predation is thought to have caused a decreasing trend. Some small predators have been trapped and released elsewhere. Black rats *Rattus rattus* occur at Marcus Island (R.M. Randall unpublished) and probably other localities linked to the mainland. They are potential predators of eggs.

POLLUTION:
Oil: Oil spills have major impact on African Penguins, especially when the oil washes ashore at breeding localities (Morant *et al.* 1981, Adams 1994, Underhill *et al.* 1999). Oil kills penguins by impairing the insulative capacity of their feathers, so that they die of hypothermia in water (Erasmus *et al.* 1981) or of starvation on land because hypothermia makes it impossible for them to feed at sea. Ingested oil may produce a range of physiological abnormalities and is associated with a greater diversity of potentially pathogenic bacteria (Kerley and Erasmus 1987).

Catastrophic oil spills occur irregularly, but there is persistent chronic oiling. Of 689 dead penguins found at St Croix Island over a 10-year period, oil pollution accounted for more deaths (44%) than any other factor (R.M. Randall unpublished). Cleaning oiled penguins has been undertaken with considerable success, notably by the Southern African National Foundation for the Conservation of Coastal Birds (SANCCOB) - (Underhill *et al.* 1999, Nel and Williams submitted). Development of a proposed harbor near to St Croix Island, will place this large colony at increased risk of pollution.

Chemicals: Residues of polychlorinated biphenyls (PCBs) and the organochlorine pesticides DDE and Dieldrin have been found in penguin eggs (Van Dyk *et al.* 1982, De Kock and Randall 1984). In all cases the residue levels were low and unlikely to cause reproductive impairment.

CATASTROPHIC EVENTS:
Fire: At Robben Island and Boulders, the two new colonies where African Penguins

breed under wooded vegetation, fire could cause extensive loss of breeding habitat and mortality of birds, eggs and chicks. The risk of fire should be minimized by clearing old wood.

Comments: Classification of the African Penguin as "Vulnerable" according to IUCN Red List Categories (A1a, A2b, E) is straightforward. "Endangered" status is approached, based on a probable decrease of 40% in the last three generations, and a possible decrease of 40% in the next three generations, extrapolated from the present rate of decrease.
There is little evidence that the annual loss of birds has slowed as the population has decreased (Crawford *et al.* 1995a). If the present loss (40 000 adults in the last 15 years) continues, extinction in the wild will occur within 70 years.

Future trends in the overall population of African Penguins are difficult to predict. The recent decrease has been driven by large losses at Dyer Island and at colonies in the south of Namibia. It could be argued that as these colonies become smaller, further decreases will have less impact on the world population, and may indeed be offset by increases at expanding colonies. Similar reasoning in the early 1980s would have held that increases at then expanding colonies, including Dyer Island, would sooner or later have offset losses elsewhere.

It can be expected that trends at the two large colonies in Algoa Bay (St Croix and Bird Islands), which between them support 42% of all African Penguins (Crawford *et al.* 1995a), will have a large influence on the future world population. For example, a catastrophic oil spill in Algoa Bay could almost halve the world population. The proposal to create a port and heavy industrial complex near the St Croix group of islands will place the colonies there at high risk.
Trends in Western Cape Province will mainly be influenced by events at Dassen, Dyer and Robben Islands, which support 37% of the World population. The proposal to develop Saldanha as a major port for oil and bulk carriers, with a predicted frequency of major oil spills (equivalent to or larger than the *Apollo Sea* spill) of once in 20 years, threatens the penguin populations within and adjacent to the area.

Mercury and Ichaboe Islands support 78% of the Namibian and 12% of the world populations. Penguins at these localities will be at risk, e.g. from displacement by seals (Crawford *et al.* 1989), if island staff is withdrawn. Additional threats in this region are prospecting for and exploitation of diamonds on or immediately adjacent to breeding localities, oil exploration along the Namib coast, and the present extreme shortage of food for penguins.

The total area available for nesting by African Penguins is less than 1000 ha (about 16 km^2). There are only 14 colonies with more than 1000 adults. The establishment of two new breeding localities in the 1980s, and recolonization of a third, must be offset against the loss of one colony off southern Namibia. Breeding may also soon stop at Pomona and Hollams Bird Islands.

RECOMMENDATIONS:

1. Population monitoring
Trends in populations should continue to be monitored at all extant colonies. At selected localities, demographic parameters should be monitored. Of particular concern is the present paucity of recruitment of young adults to the breeding population at several localities, e.g. Possession Island.

2. Legal protection
All breeding localities of this vulnerable species should be legislated as nature reserves.

3. Security of food base
Food is probably the main limiting factor at most colonies west of Cape Agulhas. Means of improving the forage base should be investigated, e.g., ensuring adequate escapement of prey fish from fisheries.

4. Management of oiling
A reduction in oil contamination should be targeted. Rescue of oiled birds should be supported. A coordinated contingency plan for the rescue of oiled penguins should be devised. A rehabilitation facility in Algoa Bay is necessary given the high proportion of the World population found in that region. The likely impact for the colony at St Croix Island of development of the proposed port nearby needs investigation. The impact on breeding colonies of searches for, and capture of, oiled birds requires research. Procedures to minimize disturbance during rescue operations should be devised. The likelihood of rehabilitated birds returning disease to wild colonies must be minimized. It is necessary to have a data base of hematological values in all captive populations in southern Africa.

5. Management of breeding habitat
Breeding habitat of African Penguins must be secured, e.g., through continued exclusion of seals, and improved, e.g. through shading and drainage. No guano scraping should be allowed in and around colonies of African Penguins. Risks of fire at Robben Island and Boulders should be minimized.

6. Management of predation
The impact of seal predation at selected colonies, e.g. Dyer Island, needs fuller investigation through field observations and modeling. There is potential for remedial action through the culling of "problem" seals. Populations of Feral Cats at Bird Island (Lamberts Bay), Dassen Island and Robben Island should be eliminated. The desirability of controlling Kelp Gulls at particular localities needs investigation. Measures must be implemented to preclude introduction of rats to islands.

7. Management of mortality arising from humans
There should be no exploitation of African Penguins or their eggs. The effect of net fishing in the immediate vicinity of penguin colonies must be investigated, and no

netting that causes mortality of penguins leaving or returning to colonies should be allowed.

8. Management of tourism
Tourism to selected penguin colonies should be carefully implemented, and its effects monitored. Appropriate national tourism strategies need to be developed. Management of the Boulders colony to minimize conflict with man needs attention.

9. Augmentation and establishment of colonies
Means of establishing new colonies, or of manipulating colonies to expand in a certain direction (to minimize conflict with man), should be investigated. There is a likelihood that studies of behavior of captive populations can help in this. The possibility of returning birds bred in captivity to the wild should be investigated. The purpose of this would be to augment populations at colonies that are presently depressed of decreasing, and to establish techniques for reintroductions before the overall population has decreased to a critical level. This is a complex procedure and will require the assistance of specialist groups outside southern Africa. The technique, if established, will have value for other *Spheniscus* penguins.

10. Management of captive populations
African Penguins in captivity (except for rehabilitation) should be kept in such a manner as to be individually recognizable, so that accurate information on ancestry can be maintained in stud books. Export of African Penguins from southern Africa should only be allowed from institutions that keep accurate records of stock, including provenance information, when available, and to institutions that keep similar records.

PHVA: Yes. (Population and Habitat Viability Assessment needed.)

Captive Program Recommendation: Level 3 (A captive breeding programme is not currently recommended as a demographic or genetic contribution to the conservation of the species, but is recommended for education, research or husbandry.)
Level of Difficulty: 1 (Least difficult. Techniques are in place for capture, maintenance and propagation in captivity.)
Existing Captive Population (ISIS): 873 (121 in Japanese collections may be hybridized and their lineages and genetics need to be examined before inclusion in co-operative programs). In recent years South Africa's East London Aquarium (ELA) has sold captive-born juveniles from excess stock to reputable zoos in other countries. The total number of birds traded by ELA is probably less than 30. In each instance, provincial nature conservation authorities issued the appropriate permits. The Port Elizabeth Oceanarium has sold no birds as yet, but is actively seeking buyers for its excess stock. There seems to be no trade of genuinely wild African Penguins, not even rumours of such activity.

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Copies of the full CAMP report, covering 20 penguin species (and subspecies), can be ordered through the Conservation Breeding Specialist Group, IUCN Species Survival Commission, 12101 Johnny Cake Ridge Road, Apple Valley, MN 55124 USA. The price is US$35.

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