THE PENGUIN CONSERVATION ASSESSMENT AND MANAGEMENT PLAN: A DESCRIPTION OF THE PROCESS

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SUMMARY

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In conjunction with the Third International Penguin Conference, a Penguin Conservation Assessment and Management Plan (CAMP) workshop was conducted in September 1996. Facilitated by the Conservation Breeding Specialist Group of the IUCN, this process involved more than 75 experts from 40 institutions working together to review the current information on distribution, threats and status of 20 penguin taxa. Based on the compiled data, IUCN Red List Categories of Threat were assigned; 12 of the 20 taxa were listed as threatened, an increase from the five taxa assessed as threatened in the *1996 IUCN Red Data Book.* This paper outlines the causes for concern for the various penguin taxa and describes the criteria used to make these assessments. It also summarises urgent research and management recommendations made by the workshop participants. It is the responsibility of these participants, as well as all penguin researchers, to call attention to the grave situation facing penguins through the media and public education. By aiding the pooling of expertise and information, and helping to set new directions for future conservation efforts, the CAMP process assists these efforts.

INTRODUCTION

The World Conservation Union (IUCN) is a union of nearly 900 sovereign states, government agencies and non-governmental organisations. As a union, IUCN exists to serve its members, promoting a common approach to the World's environmental problems, based on sound scientific expertise and the best available information. IUCN is one of the very few organisations in which governments and non-governmental organisations work together as partners. The World Conservation Union has six commissions, one of which is the Species Survival Commission (SSC). Each is a voluntary network of technical, scientific and policy experts who develop policies, create action plans and advise IUCN members on conservation projects and programmes. Within the Species Survival Commission there are approximately 100 specialist groups comprised of mainly taxonomically-based groups in addition to five disciplinary specialist groups: including the Conservation Breeding Specialist Group.

The Conservation Breeding Specialist Group (CBSG) is the largest specialist group and is a network of approximately 800 volunteers with expertise in species' recovery planning, small population biology, reproductive and behavioural biology, wild and captive animal management as well as other disciplines. Within the SSC, the CBSG's primary goal is to contribute to the development of holistic and viable conservation strategies. The CBSG has developed a series of innovative tools, models and workshop processes for risk and status assessment and management/co-ordination of threatened species (Seal 1993, Ellis & Seal 1996). These tools have evolved and been used in a series of nearly 160 workshops over the past six years, with nearly 5000 participants.

Each workshop is a consensus-building process in which interested stakeholders focus on preventing the extinction of the species or group of species under review. This process allows for the extraction of knowledge from expert participants, recognising that much of the information about species is unpublished. Workshop processes facilitate the validation of each person's experience and perspective. In many cases, people have been working on the same species for years but may never have met. The CBSG acts as a neutral facilitator. The recommendations are made by and the resultant document is 'owned' entirely by the participants. Rapid turnaround is key – generally, a rough draft document is generated by the end of each workshop and a second is in the hands of the participants within several months for further review.

During these workshops, participants attempt to determine what can be done to aid in the recovery of a threatened species or population. There are a number of management strategies that can be developed in response to factors affecting populations, ranging from emergency planning, habitat management and population monitoring to education programmes. Research activities also recommended, including investigations of limiting factors, taxonomic research and population censuses and surveys.

THE CONSERVATION ASSESSMENT AND MANAGEMENT PLAN (CAMP) PROCESS

The CAMP process is one of prioritisation, assembling 10 to 40 experts (e.g. wildlife managers, SSC Specialist Group members, representatives of the academic community or private sector, researchers and captive managers) to evaluate threat

status of all taxa in a broad taxonomic group, geographical region or country. Conway (1995) stated that 'The CAMP's proven heuristic value and constant refinement and expansion have made it one of the most imaginative and productive organising forces for species conservation today'. Information gathering is focused on the most recent available data, estimates, informed guesses and identification of needed knowledge that allow:

1. assignment to IUCN Category of Threat;
2. broad-based management recommendations; and
3. specific conservation-orientated research recommendations useful to generate the knowledge needed to develop more comprehensive management and recovery programmes *in situ* and/or *ex situ.*

Workshop participants make all decisions and recommendations. The CBSG's role is to facilitate organised discussion and, if necessary, provide access to expert advice. Since the programme's inception in 1991, more than 70 CAMP workshops have been undertaken. The CAMP continues to evolve as a result of dynamic discussions at each workshop and from input received from wildlife experts world-wide. CAMPs have been recommended as the first step in developing Action Plans by specialist groups within the Species Survival Commission and by BirdLife International.

THE PENGUIN CONSERVATION ASSESSMENT AND MANAGEMENT PLAN

A CAMP workshop for penguins was held in August 1992 in Christchurch, New Zealand. This workshop was held early in the evolution of the CAMP process, which has changed significantly since that time. The results of the workshop were taken to the Second International Penguin Conference in the same month for discussion and further review. Those discussions led to John Croxall and Eric Woehler revising the assessments for Antarctic and sub-Antarctic penguins and to the second Penguin CAMP workshop which followed the Third International Penguin Conference, held in Cape Town, South Africa in September 1996 (Ellis *et al*. 1998).

Figure 1 shows the process used to derive data for the second Penguin CAMP. Data from the initial CAMP were distributed to about 75 experts working with the different penguin species world-wide. After these experts reviewed and commented on the data, they then were sent to taxonomic editors who took responsibility for incorporation of these comments, editing and revising the information. Additionally, data for Antarctic and sub-Antarctic species were reviewed by the Bird Biology Subcommittee of the Scientific Committee on Antarctic Research. This compendium of information, representing contributions from more 40 institutions, was then reviewed by the participants in the CAMP workshop.

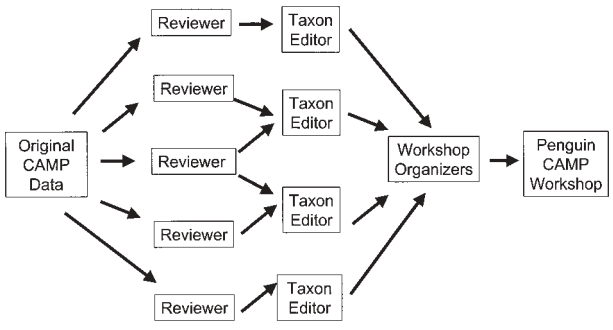

Fig. 1. *Penguin CAMP process – data collection and review.*

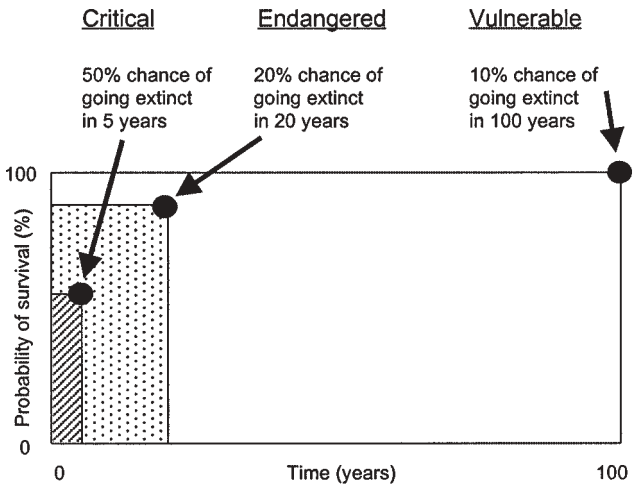

Fig. 2. *Extinction probabilities and the IUCN Red List categories of threat. This figure indicates the relative difficulty (represented by the shaded rectangles enclosed by their threshold lines) of qualifying as Endangered and, especially, Critical, compared with Vulnerable (the large, pale, rectangle) (from Collar* et al. *1994).*

IUCN RED LIST CATEGORIES OF THREAT

The threatened species categories now used in Red Data Books and Red Lists were in place, with some modification, for almost 30 years (Mace & Stuart 1992). The Mace-Lande criteria (Mace & Lande 1991), from which the new criteria evolved, were a step in an attempt to make those categories more explicit, using numerical criteria that reflect stepwise increases in the risk of extinction (Fig. 2) based on measured or estimated rates of decline, population levels and range sizes (Collar *et al*. 1994). These criteria were tested extensively in early CAMP workshops and have been subsequently revised and formulated into the New IUCN Red List Categories, which are now used in the CAMP process. The new IUCN Red List Categories provide a system that facilitates comparisons across widely different taxa and is based both on population and distribution criteria (Fig. 3). These criteria can be applied to any taxonomic unit at or below the species level (Collar *et al.* 1994, IUCN 1994, Mace & Stuart 1994).

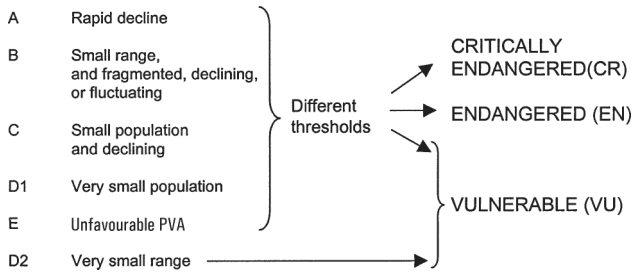

Fig. 3. *Relationship of criteria to threatened categories. The categories are decided by different thresholds in five main criteria, with Vulnerable additionally being decided by a range-size stand-alone (from Collar* et al. *1994).*

TABLE 1

Penguin taxa and their assigned categories of threat, after Ellis *et al.* (1998)

Species	Category of threat	Criteria used to make assessment
Emperor Penguin *Aptenodytes forsteri*	LR	
King Penguin *A. patagonicus*	LR	
Adélie Penguin *Pygoscelis adeliae*	LR	
Chinstrap Penguin *P. antarctica*	LR	
Gentoo Penguin *P. papua*	LR	
Eastern Rockhopper Penguin *Eudyptes chrysocome filholi*	VU	>50% decline in last 20 years or 3 generations based on direct observation and decline in area of occupancy, occurrence and/or habitat quality.
Southern Rockhopper Penguin *E. c. chrysocome*	VU	>50% decline in last 20 years or 3 generations based on direct observation and decline in area of occupancy, occurrence and/or habitat quality.
Northern Rockhopper Penguin *E. c. moseleyi*	VU	>50% decline in last 20 years or 3 generations based on direct observation and decline in area of occupancy, occurrence and/or habitat quality.
Royal Penguin *E. schlegeli*	VU	Area of occupancy <100 km^2 or fewer than 5 locations.
Macaroni Penguin *E. chrysolophus*	NT	
Fiordland Crested Penguin *E. pachyrhynchus*	VU	>50% decline in last 20 years or 3 generations based on direct observation; estimated < 10,000 mature individuals and a decline ≥20% within 10 years or 3 generations; Continuing decline, observed, projected, or inferred in mature individuals and population structure with no population with >1000 mature individuals.
Snares Island Crested Penguin *E. robustus*	VU	Area of occupancy <100 km^2 or fewer than 5 locations.
Erect-crested Penguin *E. sclateri*	EN	Extent of occurrence estimated <5,000 km^2 or area of occupancy estimated <500 km^2 and in < 5 locations; continuing decline observed, inferred, or projected in number of mature individuals.

TABLE 1(continued)

Penguin taxa and their assigned categories of threat, after Ellis *et al*. (1998)

Species	Category of threat	Criteria used to make assessment
Little Penguin *Eudyptula minor*	LR	
White-flippered Penguin *E. m. albosignata*	EN	Extent of occurrence estimated <5,000 km^2 or area of occupancy estimated <500 km^2 and in <5 locations; continuing decline observed, inferred, or projected in extent of occurrence and area of occupancy.
Yellow-eyed Penguin *Megadyptes antipodes*	VU	>50% decline in last 20 years or 3 generations based on direct observation, index of abundance appropriate for the taxon and decline in area of occupancy, occurrence and/or habitat quality; Extent of occurrence estimated <20,000 km^2 or area of occupancy estimated <2,000 km^2 and in <10 locations; Extreme fluctuations extent of occurrence.
Humboldt Penguin *Spheniscus humboldti*	VU	Population estimates <10 000 mature individuals and a decline ≥20% within 10 years or 3 generations; continuing decline, observed, projected or inferred in mature individuals and population structure with o population with >1000 mature individuals.
Galapagos Penguin *S. mendiculus*	EN	>50% decline in last 10 years or 3 generations based on direct observation; Extent of occurrence <500 km^2 or area of occupancy <500 km^2 and in ≤5 locations; Continuing decline observed, inferred, or projected in number of mature individuals; Estimated <2500 mature individuals and continuing decline, observed, projected, or inferred with all individuals in a single population; ≥10% probability of extinction within 100 years.
Magellanic Penguin *S. magellanicus*	LR	
African Penguin *S. demersus*	VU	>50% decline in last 20 years or 3 generations based on direct observation and ≥50% decline predicted in near future based on index of abundance appropriate to the taxon; ≥10% probability of extinction within 100 years.

TABLE 2

Population information for declining penguin taxa, after Ellis *et al*. (1998)

Species	World population size (pairs)	IUCN Red List Category of Threat	Trend	Rate of decline and location	Most likely cause of decline
Eastern Rockhopper Penguin *Eudyptes chrysocome filholi*	137 652	VU	Declining	94% / 50 years Campbell Island, 8% / 17 years Antipodes Island, 45% / 24 years Auckland Island.	Rising sea surface temperature leading to decline in prey availability.
Southern Rockhopper Penguin *E. c. chrysocome*	700 000	VU	Declining (Falkland Islands)	~50% / 10 years overall, 24% / 11 years Beauchene Island, 14% / 6 years New Island.	Fisheries activities, human disturbance, pollution.
Northern Rockhopper Penguin *E. c. moseleyi*	350 000	VU	Declining	unknown.	Fisheries activities changes in the marine environment.
Macaroni Penguin *E. chrysolophus*	9 000 000	NT	Declining	50% / 20 years South Georgia Island.	Fisheries activities, changes in the marine environment.
Fiordland Crested Penguin *E. pachyrhynchus*	2500–3000	VU	Declining	33% / 7 years Open Bay Island.	Predation by Weka *Gallirallus australis*, human disturbance, introduced predators, decline in prey species, fisheries activities.
Erect Crested Penguin *E. sclateri*	170 000	EN	Declining	50% / 20 years Antipodes Island, 100% / 20 years Campbell Island.	Changes in the marine environment, fisheries activities.
White-flippered Penguin *Eudyptula minor albosignata*	2200	EN	Declining	65% / 13 years Banks Peninsula.	Predation by introduced Ferrets *Mustela furo*, fisheries activities.
Yellow-eyed Penguin *Megadyptes antipodes*	1000–2000	VU	Declining	Unknown overall. Decline of 50% in 1986 and again in 1990 at South Island followed by recovery within 4 years of 1990 event. 36% / 4 years Campbell Island.	Chick predation, habitat loss, catastrophic events.
Galapagos Penguin *Spheniscus mendiculus*	1500–4000	EN	Declining	50% / 14 years.	Marine perturbations (El Niño), human disturbance, pollution, fisheries activities.
Humboldt Penguin *S. humboldti*	7500	VU	Declining	61% / 15 years Peru, 68% / 14 years Chile.	Marine perturbations (El Niño), decline in prey species, fisheries activities, human disturbance, habitat loss.
African Penguin *S. demersus*	56 000	VU	Declining	60% / 40 years.	Fisheries activities, pollution, human disturbance, habitat loss, predation.

The new IUCN Red List Categories are: Extinct (EX); Extinct in the Wild (EW); Critically Endangered (CR); Endangered (EN); Vulnerable (VU); Conservation Dependent (CD); Lower Risk (LR), with subcategories of Near-threatened (NT), Of less concern and Abundant; Data Deficient (DD); and Not Evaluated (NE). The inclusion of the category Critically Endangered imparts a strong sense of urgency, with a message that any taxa such assessed is under the immediate threat of extinction.

OUTCOMES FROM THE PENGUIN CAMP

Based on the new IUCN criteria, data compiled at the 1996 Penguin CAMP indicate that 12 of the 20 assessed taxa are threatened (Ellis *et al*. 1998, Table 1), an increase from the five taxa listed as threatened in the 1996 Red Data List (IUCN 1996). Three taxa were assigned to the Endangered category and nine assessed as Vulnerable (Tables 1 & 2).

TABLE 3

High priority research and management recommendations for threatened penguin taxa, after Ellis *et al.* (1998)

Rockhopper Penguin *Eudyptes chrysocome* VU
Eastern *E.c. filholi*
- investigate taxonomic status (New Zealand vs. Indian Ocean)
- determine status and trends at Crozet, Heard, Macquarie and Prince Edward Islands
- carry out demography and foraging ecology studies
- Population and Habitat Viability Assessment (PHVA) recommended

Southern *E.c chrysocome*
- determine status and trends in Argentina, Chile and Falklands/Malvinas
- study demography and foraging ecology
- determine impact of hydrocarbon exploration/exploitation
- determine impact of tourists (especially in Argentina)
- impact of removals for captive collections
- Population and Habitat Viability Assessment (PHVA) recommended

Northern *E.c. moseleyi*
- determine status and trends at Tristan da Cunha and Gough; re-survey Amsterdam and St. Paul Islands
- carry out foraging ecology studies
- determine impact of human-penguin interactions at Tristan da Cunha

Royal Penguin *E. schlegeli* VU
- carry out studies of demography and foraging ecology
- delimit marine element of biosphere reserve
- determine status and trends of population
- remove introduced predators

Macaroni Penguin *E. chrysolophus* NT
- determine population status and trends in Indian Ocean and to assess the cause of decline on South Georgia Island
- carry out studies of demography and foraging ecology

Fiordland Penguin *E. pachyrhynchus* VU
- repeat census to establish population trends over geographic range
- quantify the effect of introduced predators
- determine foraging range and diet composition
- Population and Habitat Viability Assessment (PHVA) recommended

Snares Penguin *E. robustus* VU
- carry out detailed survey for population trends
- study foraging ecology with reference to breeding chronology and success and potential sea temperature changes
- Population and Habitat Viability Assessment (PHVA) recommended

Erect-crested Penguin *E. sclateri* EN
- survey Auckland Island and Bounty Island to determine extent of decline
- study foraging ecology with reference to breeding chronology and success and potential sea temperature changes
- carry out basic life history studies to obtain basic data
- Population and Habitat Viability Assessment (PHVA) recommended

Yellow-eyed Penguin *Megadyptes antipodes* VU
- publication of results of existing studies
- evaluation of implemented management techniques
- conduct a Population and Habitat Viability Assessment (PHVA) with particular focus on assessing the species' tolerance to predation

White-flippered Penguin *Eudyptula minor albosignata* EN
- resolve taxonomic status
- refine population estimates in New Zealand
- identify and obtain resources for habitat management, including predator control
- Population and Habitat Viability Assessment (PHVA) recommended

Humboldt Penguin *Spheniscus humboldti* VU
- very high priority to conduct a PHVA with appropriate agencies from Chile and Peru*

* (held in Olmüe, Chile in September–October, 1998)
- complete population assessment
- protect breeding locations and enforce existing regulations funding and support of wardens
- regulate guano harvest (Peru)
- predator control

Galapagos Penguin *S. mendiculus* EN
- decrease use of fishing nets within foraging range
- decrease effects of human disturbance in breeding areas
- control predators and decrease further predator introductions
- Population and Habitat Viability Assessment (PHVA) recommended

African Penguin *S. demersus* VU
- continue monitoring colonies
- secure food base
- sufficient escapement of prey fish from fishing nets
- management of oiling and rehabilitation procedures
- Population and Habitat Viability Assessment (PHVA) recommended*

* (held in Cape Town, South Africa in February 1999)

The cause for concern for all penguin taxa, especially those outside of the Antarctic Circle, is great. Data compiled on population trends at the CAMP workshop show that many of the taxa or populations appear to be declining (Table 2), with varied causes. For example, all three subspecies of Rockhopper Penguins *E. chrysocome* have decreased in numbers. The Eastern Rockhopper Penguin *E. c. filholi* has decreased by as much as 94% on Campbell Island (Cunningham & Moors 1994), its former stronghold, and possibly also on Antipodes Island (A. Tennyson *in litt*.). Using data from the 1930s, the breeding population of Southern Rockhopper Penguins *E. c. chrysocome* was estimated in 1984 as 2 500 000 pairs (Croxall *et al*. 1988); Woehler (1993) reported that it now numbers approximately 700 000 pairs. The Northern Rockhopper Penguin *E. c. moseleyi* is also reported to have declined substantially (Woehler 1993, P. Jouventin & H. Weimerskirch *in litt.)* As another example, the study population of Fiordland Crested Penguins *E. pachyrhynchus* at Open Bay Island, New Zealand was estimated to have declined by 30% (mean 5% per year) from 1989 to 1995 (Cooper *et al*. 1986); a decline also may have occurred for many years on Solander Island. Moore & Moffatt (1992) and Moore (1992) reported a decline of 36% between 1988 and 1992 for the population of Yellow-eyed Penguins *Megadyptes antipodes* on Campbell Island, followed by what appears to be a slow recovery.

A confounding variable is that, except for Adélie Penguins *Pygoscelis adeliae* (Ainley *et al*. 1984), long-term demographic data are not available for penguin taxa, so it is difficult to ascertain with any certainty the long-term population trends (Woehler 1993). However, it is useful for scientists and managers to try to work and think in the long-term. The human career span is usually 20–40 years; and it often is difficult to envision beyond that time frame. In population and species biology, however, it is essential to be able to project trends for longer periods of time, especially when working with long-lived species. If working with population models, for example, a 100-year time frame is probably the minimum for long-term assessment of population trends, especially since penguins may live for several decades.

The CAMP process is an attempt to define the scope of the problems affecting a taxon and to make broad-based management and research recommendations to begin to ameliorate those problems. Recommendations may include: marking/monitoring; enhanced protection measures; disease prevention; introduced predator control; translocation/reintroduction; creating alternative populations in safer areas; and public education programmes. For penguins, management strategies require taking into consideration a number of factors such as the effects of introduced predators, tourism, disease outbreaks, oil spills, and climatic changes such as El Niño Southern Oscillation events. Research and management recommendations developed at the penguin CAMP are listed in Table 3, after Ellis *et al*. (1998).

Making recommendations is different from implementing them. The task of stakeholders (resource managers, land owners, scientists and others) is to take the available data, synthesise it and put it in a form to communicate to others to effect change. In the case of penguins, it is the responsibility of the scientific community, to use, for example, foraging data to try to effect changes in fisheries and oil transport policy. Other data, such as reactions to human approach might be used to influence practices in eco-tourism.

There is no greater forum of experts on penguins than those assembled at the International Penguin Conferences. There is no group better able to call attention to the plight of these taxa through the media and through public education. By aiding the pooling of expertise and information and facilitating the development of an outline for future conservation action, the CAMP process can assist these efforts.

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