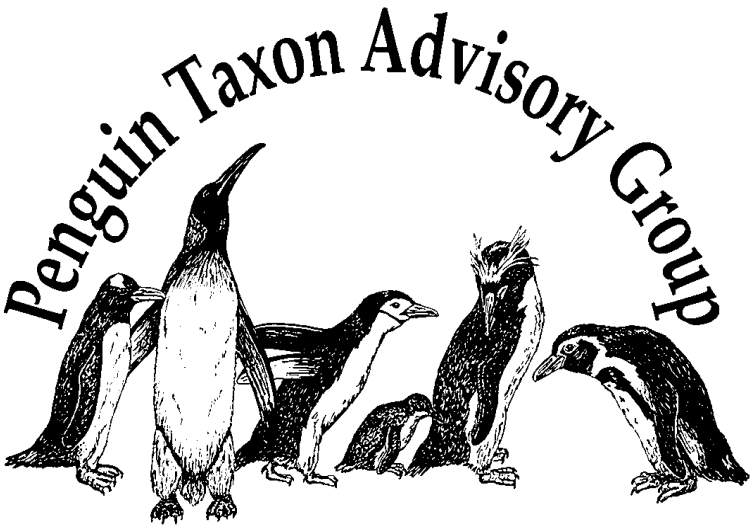

PENGUIN TAXON ADVISORY GROUP

REGIONAL COLLECTION PLAN 2010-2015

Fourth Edition

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REGIONAL COLLECTION PLAN
2010-2015

INTRODUCTION

This is the forth edition of the Penguin Regional Collection Plan. This edition has management recommendations for penguins in North American AZA accredited institutions from 2010 through 2015.

TAG MISSION

The goal of the Penguin TAG is to provide leadership for the management of penguins in captivity in order to maintain healthy, sustainable populations for the purposes of:

- ◊ Engendering appreciation for these charismatic species that are indicators of the health of marine and coastal environments;
- ◊ Promoting conservation concern and conservation action through education programs and internet resources.
- ◊ Furthering *in situ* conservation and research in support of captive management.

The TAG will accomplish this by providing guidance in the selection of species, acquisition of animals, exhibit and facility design, captive management, developing educational programs, and by participating in field conservation projects. The Penguin TAG will implement the collection plan to effectively manage the spaces dedicated to penguin species. The TAG also supports research seeking to improve the health and husbandry of captive collections of penguins.

TAG DEFINITION

The taxa under the management of this TAG are all in the order Sphenisiformes, which contains one family, Spheniscidae. *Handbook of the Birds of the World*, Volume 1, recognizes six genera, seventeen species and twenty-six taxa. While the TAG continues to recognize the Handbooks of the World as our taxonomic source, we acknowledge the recent study by Jouventin *et al*. (2006) which notes the morphological and genetic variations between *E. c. chrysocome* and *E. c. moseleyi.* Since Birdlife International and IUCN now recognize the northern rockhopper penguin as a separate species, this version of the RCP will recommend that the captive northern rockhopper population be managed separately.

All recognized taxa and their distribution are described in Table 1.

CONSERVATION STATUS OF TAXA

The Fifth International Penguin Conference was held in Ushuaia, Argentina on September 6 – 10 September 2004 and was attended by many of the world's top penguin biologists. Because of the threats facing many of the penguin species, a two day Penguin Conservation Workshop was held immediately after this conference and 45 experts from 11 countries participated in the assessment of the world's penguin populations, including several members of the Penguin TAG. The results of this meeting still represent some of the most accurate estimates of the world's penguin populations and the threats they face. A summary of this workshop was compiled by Susie Ellis, Eric J. Woehler, Elizabeth Skewgar and P. Dee Boersma and published as the *Penguin Conservation Assessment.* This document is included as Addendum 8 and the results are summarized in Table 2.

In addition, the International Union for Conservation of Nature's Red List has been monitoring the status of penguin populations since 1988 and assessed all penguin populations in 2008. This assessment determined population trends and noted that many penguin species' populations are decreasing. The results of this most recent assessment can be found at http://www.iucnredlist.org/apps/redlist/search. The Red List data is summarized in Table 3.

Table 1. Penguin Taxa and Geographic Distribution.
From *Handbook of the Birds of the World*, (HBW) Volume 1

Common Name	**Scientific Name/Subspecies**	**In NA**	**Distribution**
Emperor penguin	*Aptenodytes forsteri*	Yes	Circumpolar; restricted to Antarctica
King penguin	*Aptenodytes patagonicus*		
	◊ *A.p.patagonicus*	Yes	Falkland Islands, South Georgia
	◊ *A.p.halli*		Marion Island to Macquarie Islands.
Gentoo penguin	*Pygoscelis papua papua*		
	◊ *P.p. papua*	Yes	Sub Antarctic
	◊ *P. p. ellsworthiii*	Yes	Antarctic Peninsula to South Sandwich Island
Adelie penguin	*Pygoscelis adeliae*	Yes	Circumpolar; restricted to Antarctica
Chinstrap penguin	*Pygoscelis antarctica*	Yes	Circumpolar; most in south Atlantic
Southern Rockhopper penguin	*Eudyptes chrysocome*		
	◊ *E. c. filholi*	No	Southern Ocean
	◊ *E c. chrysocome*	Yes	Cape Horn, Falkland Islands
Northern Rockhopper penguin *	*Eudyptes moseleyi*	Yes	South Atlantic; east of Africa
Macaroni penguin	*Eudyptes chrysolophus*	Yes	S Atlantic and S Indian oceans
Fiorland penguin	*Eudyptes pachyrhynchus*	No	South Island, New Zealand
Snares Island penguin	*Eudyptes robustus*	No	Snares Island
Erect-crested penguin	*Eudyptes sclateri*	No	Islands S and SE of New Zealand
Royal penguin	*Eudyptes schlegeli*	No	Macquarie Islands
Yellow-eyed penguin	*Megadyptes antipodes*	No	Islands off coast of new Zealand
Blue Penguin	*Eudyptula minor*	Yes	All subspecies off of southern Australia
	◊ E.m. novaehollondiae		S. Australia and Tasmania
	◊ E.m. iredalei		N North Island
	◊ E.m. variabilis		S North Island; Cook Strait
	◊ E.m. albosignata		E South Island
	◊ E.m. minor		West and south South Island
	◊ E.m. chatamensis		Chatham Island
Magellanic penguin	*Spheniscus magellanicus*	Yes	Southern coasts of South America
Humboldt penguin	*Spheniscus humboldti*	Yes	Coasts of Chile and Peru
African penguin	*Spheniscus demersus*	Yes	South Africa and Namibia
Galapagos penguin	*Spheniscus mendiculus*	No	Galapagos Islands

* The northern rockhopper is not recognized as a separate species by HBW, however, because of recent studies BirdLife International now recognizes this taxa as a separate species and the TAG acknowledges this recent work.

Table 2. Overall population trends and changes in threat status during 1988 - 2004 for the 18 penguin species. From 2004 Penguin Conservation Assessment meeting held in Ushuaia Argentina in September 2004. (Ellis et al., 2007)

Common and Scientific name	Region	Population and trends	1988 Red List [1]	2004 Red List	Threats		
					Nesting colonies	Foraging at sea	Wintering grounds
Emperor *Aptenodytes forsteri*	Continental Antarctica and Antarctic ice shelves	135-175,000 pairs (1992); populations may be stable	LR/LC	LC	Winter ice reduction from climate change/global warming, Human disturbance		
King *Aptenodytes patagonicus*	Antarctica (Peninsula only?); South America (Argentina and Chile), Australia; Subantarctic islands (Falkland, South Georgia, Heard, MacDonald, South Sandwich Islands, French Southern Territories)	1.6+ million pairs (2001); increasing throughout range	LR/LC	LC	Potential competition for nesting areas from increasing fur seals	Potential competition for food from increasing fur seals	
Adélie *Pygoscelis adeliae*	Antarctic Continent and Peninsula, some subantarctic islands	2.6 million pairs; regional trends apparent (decreasing Peninsula, increasing East Antarctica and Ross Sea)	LR/LC	NT	Breakup of ice shelves and increased icebergs. Local effects of tourist operations in Peninsula	Regional fishing pressure in South Atlantic	Changes in extent and distribution of winter sea ice
Chinstrap *Pygoscelis antarctica*	Antarctic Peninsula and some subantarctic islands.	4 million pairs (2001).	LR/LC	LC	Local effects of tourist operations in Peninsula	Regional/local fishing pressure in South Atlantic. Potential oil spill in Southwest Atlantic.	
Gentoo *Pygoscelis papua*	Antarctic Peninsula and some subantarctic islands.	314,000 pairs. Regional trends apparent: increasing on Antarctic Peninsula & South Sandwich I, decreasing on some islands	LR/LC	LC	Local effects of tourist operations in Peninsula. Increased sensitivity of nesting birds at Indian Ocean colonies	Regional/local fishing pressure in South Atlantic. Potential oil spill in Southwest Atlantic.	

1 Before 1994 the more subjective threatened species categories used in Red Data Books and Red Lists had been in place, with some modification, for almost 30 years (IUCN, 2000). Although the need to revise the categories had long been recognized (Fitter and Fitter 1987), the current phase of development only began in 1989 following a request from the IUCN Species Survival Commission (SSC) Steering Committee to develop a more objective approach. The IUCN Council adopted the new Red List system in 1994.

Common and Scientific name	Region	Population and trends	1988 Red List [1]	2004 Red List	Threats		
					Nesting colonies	Foraging at sea	Wintering grounds
Rockhopper *Eudyptes chrysocome*	Sub Antarctic Islands (Falkland, Far Southern Chile and Argentina, Gough, Tristan da Cunha, French Southern Territories, Prince Edward, Marion, Crozet, Kerguelen, Heard, Macquarie, New Zealand Islands)	3.7 million pairs, 41 sites; overall decline of 30% over 30 years, very large declines at some colonies	LR/LC	VU	Human disturbance (egging on some islands, introduced predators, disease, increasing human population and development)	Pollution (including plastics, diesel fuel, oil), competition with fisheries, prey distribution changes by sea temperature changes; oil exploitation (extraction and transport) on Patagonian shelf; bycatch in driftnets, hunting for bait	Pollution, fisheries competition and bycatch, etc.
Macaroni *Eudyptes chrysolopus*	Sub Antarctic islands	216 colonies, 50 sites; 9 million pairs; in decline; losing 1% per year; more severe decline in some colonies over past 30 years	LR/LC	VU	Introduced predators	Commercial fishing in SW Atlantic. Competition for food from increasing fur seals on South Georgia Island.	
Fiordland *Eudyptes pachryrhynchus*	Southern NZ and offshore islands	2,500-3,000 pairs; declining (33% between 1988-95)	NT	VU	Introduced predators (weka, dogs, cats, stoats). Human disturbance at nesting colonies; car fatalities. Restricted breeding range. Disease. Seal predation.	Prey shortage due to sea temperature change. Fisheries bycatch Fisheries competition Pollution.	Unknown range. Prey shortage due to sea temperature change. Fisheries bycatch. Fisheries competition. Pollution.
Snares *Eudyptes robustus*	Snares Island (NZ) (3 sq km)	Order of 30,000 breeding pairs; probably stable	LR/LC	VU	Restricted nesting range, Vulnerable to introduced predators. Disease.	Prey shortage due to sea temperature change. Fisheries bycatch. Fisheries competition. Pollution.	Unknown range. Prey shortage due to sea temperature change. Fisheries bycatch Fisheries competition. Pollution.
Royal *Eudyptes schlegeli*	Macquarie, Bishop, Clerk Islands	850,000 pairs on Macquarie, 1,000 pairs on Bishop and Clark	LR/LC	VU	Introduced predators		

Common and Scientific name	Region	Population and trends	1988 Red List [1]	2004 Red List	Threats		
					Nesting colonies	Foraging at sea	Wintering grounds
Erect-crested *Eudyptes sclateri*	Bounty and Antipodes Islands (NZ); sub Antarctic	28,000 breeding pairs (1997 Bounty), 52,000 (1995 Antipodes); Declined 50% in past 20 years. No longer present on Auckland Campbell	LC	EN	Restricted nesting range. Vulnerable to introduced predators. Disease.	Prey shortage due to sea temperature change. Fisheries bycatch. Fisheries competition. Pollution	Unknown range. Prey shortage due to sea temperature change. Fisheries bycatch. Fisheries competition Pollution
Little (Blue) *Eudyptula minor*	Australia and New Zealand	350,000 – 600,000 breeding birds. Population stable?	LR/LC	LC	Introduced predators. Habitat loss.	Potential competition with fisheries. Indirect effects of fishing (e.g., pathogens introduced into prey). Global warming.	Foraging (???)
Yellow-eyed *Megadyptes antipodes*	New Zealand (600 sq km)	3,587 pairs; fluctuating	TH	EN	Introduced predators (ferret, stoat, cats). Human disturbance/ impact of tourism. Habitat degradation. Disease.	Prey shortage due to sea temperature change. Fisheries bycatch. Pollution. Predation by sea lions.	Prey shortage due to sea temperature change. Fisheries bycatch. Pollution.
African *Spheniscus demersus*	Southern Africa (coast and islands)	59,000 pairs; decreasing (15% over 13 generations - 33 years)	TH	VU	Habitat degradation due to removal of guano and habitat loss due to inter-specific competition. Predation (including: kelp gulls, feral cats). Diseases (including those caused by algal blooms and those intrinsic to the population). Fire especially at colonies with woody vegetation. Human disturbance (e.g. tourism, researchers, traffic, illegal landings on islands, hunting).	Food availability due to increased competition with commercial fisheries and competing species. Food availability due to long-term climate change and short-term environmental variability. Oil spills both chronic and catastrophic (including fish-oil). Predation (including: fur seals, sharks). Diseases. Marine pollution other than oil (e.g. entanglement – including incidental capture, ingestion of plastics).	

Common and Scientific name	Region	Population and trends	1988 Red List [1]	2004 Red List	Threats		
					Nesting colonies	Foraging at sea	Wintering grounds
Humboldt *Spheniscus humboldti*	Chile and Peru; temperate and tropical	41,000-47,000 (2003 - all birds in adult plumage)); decreasing historically; current trends not quantified; PHVA analysis suggests extinction within 100 years	TH	VU	Illegal capture. Unregulated exploitation of guano. Unregulated human disturbance (recreation, tourism). Predation.	Entanglement. Fishing competition, Pollution (unknown source). El Niño	
Magellanic *Spheniscus magellanicus*	South America, temperate	1.3 million, slow decline; mixed trends across colonies	LR/LC	NT	Marine perturbations and global climate change. Predation by exotics. Hunting/egging. Tourism and recreation. Disease. Gull predation. Habitat loss/ degradation.	Prey reduction by fisheries. Mortality in nets. Pollution (mainly from petroleum). Harmful algal blooms. Marine perturbations and global climate change.	Prey reduction by fisheries/ Mortality in nets. Pollution (mainly from petroleum). Harmful algal blooms. Marine perturbations and global climate change.
Galapagos *Spheniscus mendiculus*	Galapagos Islands (equatorial)	600 pairs; decreasing (65% over 10 years)	NT	EN	Introduced predators. Human disturbance (tourism and recreational). Hunting.	Climate change (increased frequency of El Nino; fewer less intense La Nina). Bycatch. Competition with fisheries. Oil pollution.	Climate change. Fishing. Oil pollution.

Table 3. IUCN Red List Summary and Trends.

Common name	1988 Red List status	1994 Red List Status	2000 Red List Status	2004 Red List Status	2008 Red List Status	2008 Red List Population Trend
King penguin	L Risk/Lt Concern	L Risk/Lt Concern	L Risk/Lt Concern	Least Concern	Least Concern	
Emperor penguin	L Risk/Lt Concern	L Risk/Lt Concern	L Risk/Lt Concern	Least Concern	Least Concern	
Gentoo penguin	L Risk/Lt Concern	L Risk/Lt Concern	L Risk/Lt Concern	Near Threatened	Near Threatened	Decreasing
Adelie penguin	L Risk/Lt Concern	L Risk/Lt Concern	L Risk/Lt Concern	Least Concern	Least Concern	
Chinstrap penguin	L Risk/Lt Concern	L Risk/Lt Concern	L Risk/Lt Concern	Least Concern	Lest Concern	
Macaroni penguin	L Risk/Lt Concern	L Risk/Lt Concern	Vulnerable	Vulnerable	Vulnerable	Decreasing
Royal penguin	L Risk/Lt Concern	L Risk/Lt Concern	Vulnerable	Vulnerable	Vulnerable	Stable
Rockhopper penguin	L Risk/Lt Concern	L Risk/Lt Concern	Vulnerable	Vulnerable	Not recognized	
S. Rockhopper penguin	Not recognized	Not recognized	Not recognized	Not recognized	Vulnerable	Decreasing
N. Rockhopper penguin	Not recognized	Not recognized	Not recognized	Not recognized	Endangered	Decreasing
Fiordland crested penguin	Near Threatened	Vulnerable	Vulnerable	Vulnerable	Vulnerable	Decreasing
Snares crested penguin	Lower Risk/ Least Concern	Vulnerable	Vulnerable	Vulnerable	Vulnerable	Stable
Erect-crested penguin	Lower Risk/ Least Concern	Vulnerable	Endangered	Endangered	Endangered	Decreasing
Yellow-eyed penguin	Threatened	Vulnerable	Endangered	Endangered	Endangered	Decreasing
Little penguin	L Risk/Lt Concern	L Risk/Lt Concern	L Risk/Lt Concern	Least Concern	Least Concern	
African penguin	Threatened	Lower Risk/ Near Threatened	Vulnerable	Vulnerable	Vulnerable	Decreasing
Humboldt penguin	Threatened	Lower Risk/ Near Threatened	Vulnerable	Vulnerable	Vulnerable	Decreasing
Magellanic penguin	L Risk/Lt Concern	L Risk/Lt Concern	Lower Risk/ Near Threatened	Near Threatened	Near threatened	Decreasing
Galápagos penguin	Near Threatened	Vulnerable	Endangered	Endangered	Endangered	Decreasing

SPACE ANALYSIS

In January 2009 a space survey was sent to all institutions with Penguin TAG Institutional Representatives. An e-mail was sent to the Institutional Liaison for all zoos and aquariums without IRs, asking if they were planning on exhibiting penguins by 2013 or if they wanted an IR assigned to their institution. The request to the ILs resulted in several institutions responding to the survey and adding IRs. Based on these new institutions, there currently are 109 zoos and aquariums with IRs. One hundred and seven IRs responded to the survey, representing a 98.2 % return rate. There was an 82% response rate from the zoos without IRs that are not planning on exhibiting penguins prior to 2013.

The survey asked each institution to identify their current holdings, their desired holding, and maximum holding by 2013. The draft RCP was distributed to all IRs in November 2009, with a request to review the space survey results for accuracy. The results of this survey are summarized in Table 4. The complete survey results, by institution are listed in Addendum Five. Several zoos that are planning new temperate exhibits and are willing to work with any *Speniscid* species and this is reflected in the survey results.

Because of the distinct temperature and husbandry requirements, the survey summary is divided into two groups; High-latitude (Antarctic and sub-Antarctic) and temperate species in the genera *Spheniscus* and *Eudyptula*. High-latitude species require cold temperatures and are displayed in indoor, climate-controlled exhibits. The two Antarctic species, emperor and Adelie penguins, require colder temperatures than others in this group and are exhibited at only a few institutions. The temperate species can be exhibited indoors or outdoors.

Table 4. Space Survey Summary.

High Latitude Species Survey Results

Species	**2009 Population**	**Desired Pop. by 2013**	**Maximum Population by 2013**
Adelie	149	168	180
Chinstrap	127	122	124
Emperor	33	48	48
Gentoo	411	389	467
King	241	293	334
Macaroni	150	212	240
Rockhopper	341	394	447

Temperate Species Survey Results

Species	**2009 Population**	**Desired Pop. by 2013**	**Maximum Population by 2013**
African	648	909	1045
Little	56	68	90
Humboldt	300	376	461
Magellanic	192	281	343
Speniscid sp.	0	88	115

There is adequate space for all species currently managed in North America, including the two SSP species, African and Humboldt penguins, so the TAG is not prioritizing species selection. In fact, there is more interest for the Humboldt and African penguins than the two SSPs can accommodate and efforts are underway to expand these two populations to meet institutional needs. Most PMP recommended penguin species' populations can be managed to satisfy desired institutional requests. A summary of the status of each captive penguin species is included in Addendum Six.

Because penguin exhibits have specific requirements, there is little competition from other taxa for those spaces. It is felt that these estimates are realistic for the purposes of the RCP and will allow for the expansion of existing collections while providing birds for future exhibits.

SELECTION CRITERIA

The TAG reviewed the WCMC recommended species selection criteria to recommend taxa for AZA collections. Based on a review of current programs, the TAG believes that all penguin species currently in captivity meet the selection criteria for long term management in North America. There is adequate space for proper management of all these species and these species can meet the needs of new and expanding exhibits. No additional species will be recommended for program management, with the exception of further analysis of the northern rockhopper as described below.

Ten of the twelve penguin species in North America have management plans and all have species managers. Two of the species are SSPs and eight are managed as PMPs. All programs have up-to-date studbooks and management plans or are waiting scheduling from the PMC. The two taxa without recommended management plans are the emperor and the northern rockhopper penguins. The emperor penguin is only maintained at SeaWorld San Diego and this small aging population is being monitored by Linda Henry at that institution.

The northern (long-crested) rockhopper has only recently been recognized as a separate species. In the last RCP, this sub-species was recommended to be phased-out in favor of the southern (short-crested) rockhopper. The TAG will revisit its status during the next PMP analysis to determine the feasibility of developing a long-term management plan with more aggressive management and the potential of acquiring additional specimens from EAZA institutions. In the meantime, the management status of this species has been upgraded to a DERP. A new rockhopper species manager was appointed in September 2009 and this population will be analyzed within the next three years.

Species Selection Criteria Details

a. Conservation status**.** Conservation status is described earlier in this document and is based on information from the Penguin Conservation Assessment workshop (September 2004) and 2008 Red List data. Many of the species recommended for management in North America still occur by the millions in the wild. The best role for all species is to "engender appreciation for these charismatic species that are indicators of the health of marine and coastal environments".
b. Viability of the North American captive population. With the exception of the emperor, little, and the northern rockhopper, all penguin taxa held in North American institutions have viable populations. The long term viability of the little penguin will require importation of captive reared birds from Australia.
c. Availability of potential founders. Because of the large founder base, there are no plans to recommend acquisition of wild caught founders in the form of either egg collection trips or wild-caught individuals during the time period of this RCP. Captive hatched little penguins have been imported into North America from Australia. Non-releasable rehabilitated birds are occasionally available for importation to North America. It may be possible to acquire additional founders from other regions if management plans between regions are better coordinated. One of the goals of the TAG is to integrate management plans for penguins in different regions.
d. Conservation potential. There are no short or long term plans for reintroduction of any penguin species and captive penguins do not serve as a genetic reservoir. There are several *in situ* programs in place and the TAG and individual institutions have supported several field programs. Captive penguins offer considerable fund-raising opportunities to support field programs and efforts will continue to develop and support *in situ* projects. See the Three Year Action Plan (TYAP) in Addendum 4 for additional details on on-going projects.
e. Scientific/research potential. The TAG supports current research projects and has completed several institutional projects in the past decade. See the TYAP in Addendum Four for additional details on on-going projects.
f. Husbandry expertise. The TAG believes that expertise is available for meeting all penguin species' biological needs. The TAG produced the third edition of the Husbandry Manual in 2005. This document has had worldwide distribution. The Penguin Animal Care Manual is nearing completion and will be distributed in 2010.
g. Exhibit value. The TAG believes that all penguin species are highly appealing to zoo visitors and have equal exhibit value. Some species have additional value in zoogeographic exhibits.
h. Education value. All penguin species can be ambassadors for the marine and coastal environments and have the potential to educate zoo visitors on marine environmental issues. The use of penguins in interactive and educational programs is increasing and provides a unique opportunity for the public to interact with these charismatic birds. See Penguin TAG Guidelines in Addendum 2 for the TAG's recommendations for penguins used in educational programs and the TYAP in Addendum 4 for details on on-going projects.
i. Taxonomic uniqueness. All penguins are in the order *Sphenisiformes*, which contains one family, *Spheniscidae.* Taxonomic uniqueness is not considered in species selection.

MANAGEMENT CRITERIA

The WCMC Management Assessment Criteria (Tables 5 and 6) was used to determine what level of population management is appropriate for each species. Most of the species' previous recommended programs are reflected by the Management Selection Criteria (Table 5). Based on these criteria, all existing programs will maintain their current level of management, with the exception of the northern rockhopper penguin. The TAG believes that these species can meet all AZA institutional needs during the time frame of this RCP.

The TAG is not recommending any new species be brought into North American facilities. The species which are currently managed can meet all AZA institutional exhibit and educational needs. Collecting wild penguins, either as adults or eggs is expensive and logistically difficult, so at this time the TAG does not feel it can justify recommending any additional species. It is the long-term goal of the TAG to integrate management of penguin populations with EAZA populations in order to benefit the populations in both regions.

Table 5. WCMC Management Assessment Criteria

CRITERIA	**SSP**	**PMP**	**No Management (DERP/PHASE IN)**
Availability within AZA	LOW	MODERATE	EXTREMES*
Availability outside AZA	LOW	MODERATE	EXTREMES*
Extinction Risk without Management (in Zoos & Aquariums)	ENDANGERED/THREATENED	VULNERABLE	EXTREMES
Extinction Risk with Management (in Zoos & Aquariums)	DECREASES	DECREASES/STABLE	STABLE
Demand within AZA	HIGH	MODERATE	LOW
Institutional Commitment	HIGH	MODERATE	LOW
Ease of Breeding	LOW/MODERATE	HIGH	EXTREMES
Extinction Risk (Wild)	ENDANGERED/THREATENED	VULNERABLE	LEAST CONCERN
Acquisition Cost (Outside AZA)	HIGH	MODERATE	LOW
Program Operating Costs	HIGH	MODERATE	LOW
International Program	YES	NO	NO
Link to Conservation of Wild Population	DIRECT	INDIRECT OR NONE	NONE
North American Governmental Conservation Program	YES	NO	NO
CHARACTERISTICS OF POPULATION MANAGEMENT LEVELS			
	SSP	PMP	No Management
Participation	FULL/MANDATORY	VOLUNTARY	N/A
Memorandum of Participation	NO	NO	N/A
Compliance	MANDATORY	VOLUNTARY	N/A
AZA Conflict Resolution Process	YES	NO	N/A
Non-member Participation	YES	PER PARTICIPANT A/D POLICY	PER PARTICIPANT A/D POLICY
Animal-by-Animal Recommendations	YES	PER PROGRAM DECISION	NO

Steering Committee	OPTIONAL	NO	NA
AZA PMC Assistance	YES	YES	NO
SPMAG Assistance	YES	YES	EVALUATED ON A CASE-BY-CASE BASIS
AZA Regional Studbook	YES	YES	NO

Table 6. Management Assessment for Recommended Species

CRITERIA	Adelie	African	Little (Blue)	Chin strap	Emperor	Gentoo
Availability within AZA	Moderate	Moderate	Low	Moderate	Low	Moderate
Availability outside AZA	Low	Low	Moderate	Low	Low	Low
Extinction Risk without Management (in Zoos & Aquariums)	Vulnerable	Vulnerable	Vulnerable	Vulnerable	Vulnerable	Vulnerable
Extinction Risk with Management (in Zoos & Aquariums)	Decreases	Decreases	Decreases	Decreases	Decreases	Decreases
Demand within AZA	Low	High	Moderate	Low	Low	Moderate
Institutional Commitment	Low	High	Moderate	Moderate	Low	Moderate
Ease of Breeding	Low	Moderate	Moderate	Moderate	Low	Moderate
Extinction Risk (Wild)	Near Threatened	Vulnerable	Least Concern	Least Concern	Least Concern	Least Concern
Acquisition Cost (Outside AZA)	High	High	Moderate	High	High	High
Program Operating Costs	High	High	High	High	High	High
International Program	No	Yes	Yes	No	No	No
Link to Conservation of Wild Population	Indirect	Direct	Indirect	Indirect	Indirect	Indirect
North American Governmental Conservation Program	No	No	No	No	No	No
Total SSP(S) PMP(P) DERP(D)	**S=6 P=6 D= 1**	**S =8 P=5 D= 0**	**S =4 P=8 D=1**	**S =4 P=7 D=2**	**S=6 P=4 D=3**	**S =4 P=8 D=1**
TAG Program Recommendation	**PMP**	**SSP**	**PMP**	**PMP**	**DERP**	**PMP**

CRITERIA	Humboldt	King	Macaroni	Magellanic	S. Rock-hopper	N. Rock-hopper
Availability within AZA	Moderate	Moderate	Moderate	Moderate	Moderate	Low
Availability outside AZA	Low	Low	Low	Low	Moderate	Moderate
Extinction Risk without Management (in Zoos & Aquariums)	Vulnerable	Vulnerable	Vulnerable	Vulnerable	Vulnerable	Vulnerable
Extinction Risk with Management (in Zoos & Aquariums)	Decreases	Decreases	Decreases	Decreases	Decreases	Decreases
Demand within AZA	High	Moderate	Low	Moderate	High	Low
Institutional Commitment	High	High	Low	Moderate	High	Low
Ease of Breeding	Moderate	High	Moderate	Moderate	High	High
Extinction Risk (Wild)	Vulnerable	Least Concern	Vulnerable	Vulnerable	Vulnerable	Vulnerable
Acquisition Cost (Outside AZA)	High	High	High	High	High	High
Program Operating Costs	High	High	High	High	High	High
International Program	Yes	No	No	No	Yes	Yes
Link to Conservation of Wild Population	Direct	Indirect	Indirect	Direct	Indirect	Indirect
North American Governmental Conservation Program	No	No	No	No	No	No
Total SSP(S) PMP(P) DERP(D)	**S =9 P=4 D=0**	**S=5 P=7 D=1**	**S =5 P=6 D=2**	**S =6 P=7 D=0**	**S =5 P=8 D=0**	**S =3 P=8 D=2**
TAG Program Recommendation	**SSP**	**PMP**	**PMP**	**PMP**	**PMP**	**DERP**

TAG PROGRAM RECOMMENDATIONS

The TAG used the space analysis, selection criteria, management criteria, and the status of the captive population to determine taxon management recommendations. Based on these criteria, there has not been any change in status of penguin management programs since the last RCP, with the exception of the northern rockhopper penguin. A summary of each species is listed in Table 7 and a more detailed species report is included in Addendum 6.

The emperor penguin program recommendation does not fit into the management selection criteria. This species requires very specific environmental conditions and is held at only one AZA institution, Sea World San Diego. SWSD is closely managing this species, but it is an aging population with minimal reproduction. Acquiring additional wild caught birds or individuals from other regions is unlikely. Therefore, the TAG is recommending that this species be maintained as a DERP and monitored by SWSD staff.

In the previous RCPs, the northern (long-crested) rockhopper penguins was considered a rockhopper sub-species and was recommended to be phased-out based on its small population size and aging population, recommending that institutions concentrated on southern (short-crested) rockhoppers. As described in the previous section, the TAG has upgraded this taxa to a DERP until a more thorough analysis can be completed by the PMC.

Definition of Program Recommendations

Species Survival Plan (SSP): Studbook required, intense management to maintain x% genetic diversity for y years (as defined by the SSP Coordinator, with input from an SPMAG advisor and/or the AZA Population Management Center), compliance by participating institutions required, breeding and transfer recommendations communicated through a Master Plan, program managed by a Species Coordinator and Management Group (if the TAG and Coordinator deem a Management Group necessary), non-member participants must be approved, conservation of the species a consideration, institutional input through IRs.
Population Management Plan (PMP): Studbook required, moderate management to maintain captive population, institutional compliance encouraged, breeding and transfer recommendations communicated through a Population Management Plan, program managed by a PMP Manager, no Management Group, institutional input through ILs, non-member participation through AZA and institutional A&D policies.
Display/Education/Research Population (DERP): DERPs are not managed under the auspices of AZA or its programs and are not guaranteed population management advice or support from SPMAG/PMC. No studbook or long-term genetic or demographic management is required for these species, but TAGs may choose to identify species champions who may track DERPs through registries.
Phase-Out Population (POP): Not viewed as a managed program. Currently in AZA institutions but should be phased out through a breeding moratorium; phase-out may be

monitored through a registry and a species champion may be assigned to oversee this process; they have no studbooks and are not guaranteed population management advice or support from SPMAG/PMC.
Not Recommended (NR): Taxon that are not currently in AZA institutions and are not recommended to be brought into AZA collections.

Table 7. Penguin TAG Program Recommendation and Status Table 2010-13

Species	Program	Program Leader	Program Initiated	Leadership Assumed	SB Published	PMP / SSP Published
Adelie Penguin *Pygoscelis adeliae*	PMP	Lauren DuBois Sea World San Diego 619-222-6363 Lauren.dubois@SeaWorld.com	Feb 02	Dec 04	March 2010	June 07 Update TBD by PMC
African Penguin *Spheniscus demersus*	Studbook SSP	Seana Jean Davidson Tulsa Zoo 918-669-6638 SDavid0042@aol.com Steve Sarro National Aviary 412-323-7235 Steve.sarro@aviary.org	1988 1995	Feb 07 1996	March 2009	October 2009
Little Penguin *Eudyptula minor*	PMP	Heather Urquhart New England Aquarium 617-973-0263 Hurquhart@neaq.org	March 99	March 99	October 2008	March 06 Update TBD by PMC
Chinstrap Penguin *Pygoscelis antarctica*	PMP	Jennifer Aughinbaugh Sea World San Antonio 210-523-3241 Jennifer.Aughinbaugh@Seaworld.com	March 00	January 09	December 2009	March 07 Update TBD by PMC
Emperor Penguin *Aptenodytes forsteri*	DERP	Linda Henry Sea World San Diego 619-222-6363 Linda.Henry@SeaWorld.com	NA	NA	NA	NA
Gentoo Penguin *Pygoscelis papua papua* *P. p. ellsworthiii*	PMPs	Sharon Jarvis Sea World Orlando 407-351-3600 Fuzzg172@yahoo.com	April 01	Dec 04	March 2009	March 2010
Humboldt Penguin *Spheniscus humboldti*	Studbook	Gail Brandt (SB) Brookfield Zoo 708-485-0263 gabrandt@brookfieldzoo.org	1983	Mar 99	June 2009	NA

Humboldt Penguin *Spheniscus humboldti*	SSP	Alex Waier Milwaukee County Zoo 414-256-5449 Alex.Waier@Milwcnty.com	1987	Sept 09	NA	December 09
King Penguin *Aptenodytes patagonicus*	PMP	Debbie Denton Sea World San Diego 619-222-6363 Debbie.Denton@SeaWorld.com	July 99	July 99	April 2010	July 06 Update TBD by PMC
Macaroni Penguin *Eudyptes chrysolophus*	PMP	Jessica Jozwiak Detroit Zoo 248-398-0903, x 3116 jjozwiak@detroitzoo.org	1992	April 02	December 09	March 07 Update TBD by PMC
Magellanic Penguin *Spheniscus magellanicus*	PMP	Nancy Gonzalez Wildlife Conservation Society 718-220-5100 ngonzalez@wcs.org	April 00	Dec 05	March 09	Feb 08
Southern Rockhopper *Eudyptes. chrysocome*	PMP	Amanda Ista Milwaukee County Zoo 801-641-3900 amanda.ista@milwcnty.com	1992	September 09	December 06	April 07 Update TBD by PMC
Northern Rockhopper *Eudyptes moseleyi*	DERP	Amanda Ista Milwaukee County Zoo 801-641-3900 amanda.ista@milwcnty.com	1992	September 09	December 06	NA
Erect-crested Penguin *Eudyptes sclateri*	NR					
Yellow-eyed Penguin *Megadyptes antipodes*	NR					
Galapagos Penguin *Spheniscus mendiculus*	NR					
Snares Island Penguin *Eudyptes robustus*	NR					
Fiordland Penguin *Eudyptes pachyrhynchus*	NR					
Royal Penguin *Eudyptes schlegeli*	NR					

Conservation, Education, Research Functions

Many species of penguins still occur in the wild by the millions, and with the exception of the Galapagos penguin, all species occur in the thousands. However, based on the 2004 Penguin Conservation Assessment results, many populations of penguins are decreasing and face numerous threats. These are described at length in Addendum 8. There are currently no plans for reintroductions of penguins to the wild or to supplement wild populations with captive birds. The Penguin TAG is committed to maintaining self-sustaining populations of penguins which will ultimately serve to further conservation, research and educational initiatives.

The greatest conservation role that North American captive penguin populations can serve is to engender the public's support for these unique birds. Through informative public programs, institutions displaying penguins can educate the public about the natural and anthropogenic threats facing them and their marine environment. A secondary role is assisting with fundraising efforts that support field conservation, research, and education efforts. Projects planned for the next three years are summarized in Table 8 and described in more detail in the Three Year Action Plan 2010-2013 in Addendum Four.

Table 8. Conservation, Education, and Research Functions

Species	Conservation function	Education function	Research function
Adelie Penguin		Conservation education	
African Penguin	Support of SANCCOB Rehabilitation facility in Cape Town, SA	Conservation education	Health survey of free-living and captive sea birds in South Africa; Chick growth and condition index
Little Penguin		Conservation education	
Chinstrap Penguin		Conservation education	
Emperor Penguin		Conservation education	Reproductive
Gentoo Penguin		Conservation education	
Humboldt Penguin	Assist with field census of population.	Conservation education	Ecological *in situ* studies in Chile
King Penguin		Conservation education	Artificial insemination
Macaroni Penguin		Conservation education	
Magellanic Penguin		Conservation education	
Short-crested Rockhopper		Conservation education	

Excluded taxa

Based on the Penguin Conservation Assessment recommendations, institutional needs, and other discussions, it was determined that species not presently held in captivity should not be added. It is felt that the current species can meet the TAG's exhibit, educational, and conservation needs. All species currently in captivity will be maintained. The northern rockhopper penguin, formerly considered a separate rockhopper sub-species (the long-crested rockhopper penguin) has been upgraded to a DERP and its status will be reviewed during the next PMP analysis.

Target population

The Population Management Center performed the third evaluation of target sizes for the Penguin TAG completing the review in August 2009. New analysis were not performed for the penguin populations that have large population sizes, whose demographic and genetic status has not changed significantly since 2006, and whose 2006 analysis showed the population meeting and/or exceeding genetic goals (>90% GD for 100 years). Populations that were analyzed in 2009 either did not meet goals in 2006, or are populations more at risk of changing demographically or genetically.

The stated program goal for each species was the maintenance of 90% gene diversity for 100 years into the future. Of the ten species with management plans, eight exceed the program's genetic goals. The target populations for these populations will be determined by exhibit needs.

Three of these species are unable to meet program goals because of their populations' declining growth rate. The TAG believes that improved genetic and demographic management will result in the macaroni and Magellanic meeting program goals and chinstraps will maintain GD close to its current level, nearly meeting genetic goals. Blue penguins will not be able to meet program goals without recruitment of additional founders. Captive reared founders are likely to be available from Australian zoos and this strategy will be explored as more space becomes available for blue penguins. These management strategies are summarized in Table 9 and additional details are available in the PMC report, Addendum 7.

It should be noted that the current gentoo penguin population is larger than the target population and the desired institutional holding over the next three years. Sea World parks in particular are holding 40 more birds than their desired number, but they will be sending gentoo penguins to facilities in other regions in 2010. This exportation will allow the TAG to meet the recommended target population sizes while meeting AZA institutional needs.

Table 9. Penguin Target Populations

Penguin Species	2009 Pop.	Desired 2013 Holding	PMC Target Population	TAG Recommend Target Size
Adelie	149	168	98	160
African	648	939	191	900
Little	56	68	Not attainable	90
Chinstrap	127	122	Not attainable	150
Gentoo	411	389	252	390
Humboldt	292	376	245	370
King	241	293	117	290
Macaroni	163	232	96	230
Magellanic	192	256	147	170
Rockhoppers	341	394	226	340

ADDENDUM 1.
TAG OPERATIONAL STRUCTURE

Steering Committee Size and Structure
The Penguin TAG consists of a Chair and fourteen elected Steering Committee members. The Steering Committee members are elected to three-year terms, with staggered terms. Steering Committee members elect the Vice-Chair and Secretary from the Steering Committee membership. These two positions are open to Steering Committee members when the people holding those positions are themselves up for re-election to the Steering Committee. In other words, these positions are voted on every three years.

Voting Procedures
The Secretary is responsible for holding the Steering Committee elections. A notice of an upcoming Steering Committee vote is placed on the IR list serve notifying all Institutional Representatives that there is an election and that all IRs are eligible to be placed on the ballot for a Steering Committee position if they are interested. A vote by all IRs is then completed over the list serve. The Secretary tabulates the results and reports them to the Chair. The Chair then notifies the people on the ballot of the results as well as reporting the results to the AZA office and to all Institutional Representatives through the list serve. On years that the Secretary is up for re-election, the AZA TAG liaison tabulates the results.

Steering Committee Responsibilities
All Steering Committee members are required to actively participate in the TAG. Participation is defined, as recommended by the Avian Scientific Advisory Group, as responding to 75 percent of the communications during a calendar year. Failure to do this can result in that person being asked to resign from the Steering Committee. In addition, all Steering Committee Members are required to have access to e-mail. Steering Committee members are also encouraged to participate in committees and TAG projects and to have their institution actively engaged in penguin issues.

The Chair is responsible for overseeing the publication of the Regional Collection Plan, insuring species management programs are completed on schedule, maintaining the SC listserve, distributing the Animal Care Manual, monitoring the TAG account, and tracking progress of TAG approved programs. The Vice-Chair is responsible for reviewing requests and assisting the Chair with the administration of the TAG. The Secretary maintains the general and IR listserves, takes notes at meetings, is responsible for IR votes on issues, and for running the Steering Committee voting procedures.

Executive Board

Tom Schneider	Chair	Detroit Zoo	tschneider@detroitzoo.org 248-541-5717 ext. 3128	VOC 2001
Heather Urquhart	Vice-Chair	New England Aquarium	hurquhart@neaq.org (617) 226-2229	2012
Gayle Sirpenski	Secretary	Mystic Aquarium	gsirpenski@mysticaquarium.org 860-572-5955 x 108	2010

Steering Committee Members

			Term expires
Alex Waier	Milwaukee Zoo	Alex.Waier@milxcnty.com (414)256-5449	2012
Lauren DuBois	Sea World San Diego	Lauren.DuBois@SwaWorld.com (619)222-6363	2012
Pat Sharkey	Roger Williams Zoo	psharkey@rwpzoo.org (401) 785-3510 x311	2011
Sherry Branch	Sea World Orlando	sherry.branch@seaworld.com (407)363-2361	2011
Ed Diebold	Riverbanks Zoo	ediebold@riverbanks.org (803) 779-8717 x1135	2011
Steve Sarro	National Aviary	Steve.sarro@aviary.org (412) 323-7235 x211	2011
Rick Urban	Newport Aquarium	rurban@newportaquarium.com (859) 815-1465	2011
Diane Olsen	Moody Garden	dolsen@moodygardens.com (409) 683-4102	2010
Cheryl Dykstra	John Ball Zoo	Cheryl.Dykstra@kentcountymi.gov. (616) 336-8473	2010
Karen Waterfall	Indianapolis Zoo	kwaterfall@indyzoo.com (317) 630-2072	2010
Robert Gramzay	Central Park Zoo	rgramzay@wcs.org (212) 439-6556	2010
Mike Macek	St. Louis Zoo	macek@stlzoo.org (314) 646-4825	2010

TAG Advisors

Scientific Advisors	Eric Woehler eric_woe@iprimus.com.au	University of Tasmania
Scientific Advisors	John Croxwall john.croxall@birdlife.org	British Antarctic Survey
Scientific Advisors	Dr. P. Dee Boersma Boersma@U.Washington.edu	University of Washington
Scientific Advisors	Braulio Araya Modinger FAX: 011-56-322-973016	Vina del Mar, Chile
Scientific Advisor	Patty McGill pamcgill_home@yahoo.com	Former Humboldt SSP Coordinator
Education Advisor	Elizabeth Mulkerrin elizabethm@omahazoo.com	Omaha's Henry Doorly Zoo
SPMAG Advisor	Sarah Long slong@lpzoo.org	AZA Population Management Center
Medical Advisors	Roberta Wallace RWallace@milwcnty.com	Milwaukee County Zoo
Medical Advisors	Mike Cranfield, DVM mcranfield@marylandzoo.org	Maryland Zoo

Nutritional Advisor	Kerri A. Slifka kslifka@dallaszoo.com	Dallas Zoo
Marketing Advisor	David DiGregorio darodi@gmail.com	New England Aquarium volunteer
WCMC Advisor	Ann Baker abaker@toledozoo.org	Toledo Zoo
EAZA Advisor	Miguel Bueno MBueno@grpr.com	Madrid Zoo
ARAZPA Advisor	Chris Hibbard CHibbard@zoo.nsw.gov.au	Taronga Zoo
Japanese TAG Advisor	Michio Fukuda mogufuku@beige.ocn.ne.jp	Tokyo Sea Life Park

Education Committee

Elizabeth Mulkerrin, Chair	Elizabethm@omahazoo.com	Omaha's Henry Doorly Zoo
Julie Anderson	outreach@omahazoo.com	Omaha's Henry Doorly Zoo
Emily Brown	educate@omahazoo.com	Omaha's Henry Doorly Zoo
Jim Swarts	Jim.Swarts@kentcountymi.gov	John Ball Zoo
Jennifer Lemmond	jlemmond@denverzoo.org	Denver Zoo

Web Page Manager

Heather Urquhart	hurquhart@neaq.org	New England Aquarium

ADDENDUM 2.

TAG GUIDELINES

Regional Collection Plan 2010-2013

- The TAG strongly encourages that the following recommendations be followed by any institution displaying, or planning on displaying, penguins.
    - The TAG Chair or SSP/PMP Coordinator should be contacted regarding the availability of species for new or expanded facilities.
    - Acquisition of captive-raised birds is strongly preferred and the TAG will assist when possible with recommending species availability.
    - Because of the low reproductive rate of these species, the institution should contact the TAG Chair or species manager at least two, and preferably three, years in advance of a planned exhibit opening.
- The TAG strongly supports the AZA board approved full participation in SSP partnerships and processes. The TAG encourages institutions to abide by PMP recommendations.
- Because of their gregarious and social nature, the TAG recommends that institutions maintain a minimum of ten penguins in an exhibit. For exhibits that display more than one species, the TAG recommends a minimum of six individuals of any one species. The TAG acknowledges that individual birds and situations may limit opportunities to follow these recommendations. However, it is the responsibility of penguin managers to ensure the well-being of the individuals by making certain that the social / health needs of all birds are being met.
- The TAG recognizes that penguins are valuable additions to education, outreach, and visitor experiences. Institutions are encouraged to maintain their “education” penguins in with the colony whenever possible. The TAG understands that this is not always possible, especially if penguins are used in off-site programs. In these situations, it is recommended that a minimum of six birds be maintained in the educational holding area with water and land areas that meet the Penguin Animal Care Manual standards.
- The TAG encourages the use of graphics and spoken presentations to provide the public with information on such topics as natural history, threats to the wild populations, the AZA cooperative breeding programs (SSP and PMP), and why penguins do not make good pets.
- TAG coordinated and managed penguin populations should not be bred with the intent to transfer an animal to a dealer or to any institution or facility that does not maintain standards comparable to those in AZA institutions.
- The TAG supports the inclusion of non-releasable rehabilitated birds in North American collections even if they are not recommended as a managed species in the North American Regional Collection Plan.

ADDENDUM 3. Program Recommendations Update

Species	Program Leader	Previous Program Status	Current Recom-mendation	Program Leader Change
Adelie Penguin *Pygoscelis adeliae*	Lauren DuBois Sea World San Diego 619-222-6363 Lauren.dubois@SeaWorld.com	PMP	PMP	No
African Penguin *Spheniscus demersus*	Seana Jean Davidson (SB) Tulsa Zoo 918-669-6638 SDavid0042@aol.com Steve Sarro (SSP) National Aviary 412-323-7235 Steve.sarro@aviary.org	SSP	SSP	Yes No
Little Penguin *Eudyptula minor*	Heather Urquhart New England Aquarium 617-973-0263 Hurquhart@neaq.org	PMP	PMP	No
Chinstrap Penguin *Pygoscelis antarctica*	Jennifer Aughinbaugh Sea World San Antonio 210-523-3241 Jennifer.Aughinbaugh@Seaworld.com	PMP	PMP	Yes
Emperor Penguin *Aptenodytes forsteri*	Linda Henry Sea World San Diego 619-222-6363 Linda.Henry@SeaWorld.com	DERP	DERP	No
Gentoo Penguin *Pygoscelis papua papua* *P. p. ellsworthiii*	Sharon Jarvis Sea World Orlando 407-351-3600 sharon.jarvis@seaworld.com	PMPs	PMPs	No
Humboldt Penguin *Spheniscus humboldti*	Gail Brandt (SB) Brookfield Zoo 708-485-0263 gabrandt@brookfieldzoo.org Alex Waier Milwaukee County Zoo 414-256-5449 Alex.Waier@Milwcnty.com	SSP	SSP	No Yes
King Penguin *Aptenodytes patagonicus*	Debbie Denton Sea World San Diego 619-222-6363 Debbie.Denton@SeaWorld.com	PMP	PMP	No
Macaroni Penguin *Eudyptes chrysolophus*	Jessica Jozwiak Detroit Zoo 248-398-0903, x 3116 jjozwiak@detroitzoo.org	PMP	PMP	No
Magellanic Penguin *Spheniscus magellanicus*	Nancy Gonzalez Wildlife Conservation Society 718-220-5100 ngonzalez@wcs.org	PMP	PMP	No

Southern Rockhopper *Eudyptes chrysocome*	Amanda Ista Milwaukee County Zoo 801-641-3900 amanda.ista@milwcnty.com	PMP	PMP	Yes
Northern Rockhopper *Eudyptes moseleyi*	Amanda Ista Milwaukee County Zoo 801-641-3900 amanda.ista@milwcnty.com	Phase Out as separate sub-species	DERP	Yes
Erect-crested Penguin *Eudyptes sclateri*		NR	NR	
Yellow-eyed Penguin *Megadyptes antipodes*		NR	NR	
Galapagos Penguin *Spheniscus mendiculus*		NR	NR	
Snares Island Penguin *Eudyptes robustus*		NR	NR	
Fiordland Penguin *Eudyptes pachyrhynchus*		NR	NR	
Royal Penguin *Eudyptes schlegeli*		NR	NR	

ADDENDUM 4. Three Year Action Plan

Captive Population Management

- Update all studbooks and management plans every three years for all penguin species with PMP or SSP recommended programs. *Penguin Program Managers*
- All SSPs, PMPs, and studbooks will be posted on the AZA website. *Penguin Program Managers*
- Manage captive penguin populations so that institutions developing new penguin exhibits will be able to acquire penguins for exhibit. *Penguin Program Managers and Steering Committee Members*
- Review species distribution to determine if space can be reallocated to help target species meet genetic and demographic goals. Advise new or expanding facilities to consider working with under-represented species. *Steering Committee Members*
- Continue to develop cooperative programs with penguin managers in Europe and Australia. Schedule a "captive session" at the International Penguin Conference in Boston in August 2010. *Tom Schneider, Heather Urquhart, Sherry Branch*

Penguin Husbandry

- Complete and distribute the Penguin Animal Care Manual. *Tom Schneider*

Education Projects

- Create, develop, and distribute Penguin Tool Kit to AZA organizations managing penguins. *Elizabeth Mulkerrin and Education Committee.*
- Maintain educational content of website. *Elizabeth Mulkerrin and Education Committee.*
- Maintain the Penguin TAG web page, www.zoopenguins.org. *Heather Urquhart*
- Create educational DVD "African Penguin: A Species in Trouble" *Gayle Sirpenski*

Veterinary research

- Artificial insemination research on king and emperor penguins. *Lauren DuBois and Dr. Judy St. Leger*
- Continue molt research study. *Debbie Denton*
- Health survey of free-living and captive seabirds in South Africa with a special emphasis on African penguins. *Gayle Sirpenski and Steve Sarro*

Marketing, Fundraising, and Grants

- Pursue grants for Penguin TAG programs. *Steering Committee Members*

In Situ Conservation

- Continue to support *in situ* Humboldt penguin research projects and census work in Chile and Peru. *Kim Smith, and Roberta Wallace*
- Study juvenile dispersal and the level of philopatry (tendency of an individual to return to, or stay in its home area) in the Humboldt penguin (*Speniscus humboldti*) in Chile. *Dr. Roberta Wallace and Dr.Alejandro Simone*
- Continue with ongoing comprehensive range-wide health survey of Galapagos penguins. *Mike Macek, Patty Parker*

- Initiate a comprehensive health assessment of the Humboldt penguin population in Punta San Juan, Peru. *Mike Macek*
- Continue development of oiled bird training course, either with regional workshops or as an on-line training program. The first course was held at Moody Gardens in 2007. *Diane Olson*
- Assist field researchers with the development of chick condition index for African Penguins *Steve Sarro*

Professional Support

- Host the Seventh International Penguin Conference at the New England Aquarium in August 2010. *Heather Urquhart*
- Develop and publish an online version of Penguin Conservation bi-annually. *Jessica Jozwiak and Linda Henry*

ADDENDUM 5 Space Survey Results By Species

ADELIE PENGUINS

Institution	2001 Holding	2006 Holding	2009 Holding	2013 Desired Holding	2013 Max. Holding
Milwaukee	5	0	0	0	0
Newport Aquarium	0	0	0	8	10
Six Flags Ohio	61	0	0	0	0
SW San Diego	121	110	121	130	130
SW Florida	0	16	28	30	40
Total	**187**	**126**	**149**	**168**	**180**

LITTLE PENGUINS

Institution	2001 Holding	2006 Holding	2009 Holding	2013 Desired Holding	2013 Max. Holding
Cincinnati Zoo	13	24	25	30	40
Detroit Zoo	1	1	0	0	0
Louisville Zoo	0	0	0	8	20
New England Aquarium	11	13	18	20	20
Newport Aquarium	0	0	0	12	12
Omaha Henry Doorly	26	30	13	20	30
Roosevelt Park Zoo	0	0	0	8	8
Total	**51**	**68**	**56**	**68**	**90**

CHINSTRAP PENGUINS

Institution	2001 Holding	2006 Holding	2009 Holding	2013 Desired Holding	2013 Max. Holding
Biodome			0	6	8
Central Park Zoo	31	42	45	30	30
Lincoln Park Zoo	5	5	3	6	6
Moody Gardens	0	40	20	20	20
Newport Aquarium	0	0	6	0	0
SW Orlando	49	0	0	0	0
SW San Antonio	44	55	53	60	60
SW San Diego	72	0	0	0	0
Total	**201**	**142**	**127**	**122**	**124**

EMPEROR PENGUINS

Institution	2001 Holding	2006 Holding	2009 Holding	2013 Desired Holding	2013 Max. Holding
SW San Diego	46	36	33	48	48
Total	**46**	**36**	**33**	**48**	**48**

GENTOO PENGUINS

Institution	2001 Holding	2006 Holding	2009 Holding	2013 Desired Holding	2013 Max. Holding
Albuquerque			0	10	15
Biodome	11		29	20	22
Calgary Zoo			0	20	20
Central Park Zoo	28	16	19	16	16
Detroit Zoo			0	20	30
Indianapolis Zoo	2	11	21	21	25
Milwaukee Zoo	0	0	6	6	6
Moody Gardens	0	12	29	16	30
Newport Aquarium	4	14	11	10	14
Omaha Henry Doorly	19	24	26	30	30
Pittsburgh Zoo	0	13	20	10	14
Riverbanks	0	10	9	10	10
Shedd Aquarium	18	16			
Six Flags Ohio	21	0	0	0	0
St. Louis Zoo	0	19	20	20	20
SW Orlando	57	54	105	70	90
SW San Antonio	42	50	42	50	50
SW San Diego	65	53	64	50	65
Tennessee Aquarium	0	0	10	10	10
Total	**267**	**292**	**411**	**389**	**467**

MACARONI PENGUINS

Institution	2001 Holding	2006 Holding	2009 Holding	2013 Desired Holding	2013 Max. Holding
Biodome	13		10	12	14
Calgary Zoo			0	20	20
Central Park Zoo			0	10	10
Cincinnati Zoo			0	6	6
Cleveland Zoo	7	0	0	0	0
Detroit Zoo	12	24	29	40	50
Moody Garden	0	0	6	12	12
Newport Aquarium	0	0	0	8	10
Omaha's Henry Doorly Zoo	0	0	1	2	2
Pittsburgh Zoo	0	14	9	12	16
Six Flags Ohio	40	0	0	0	0
SW Orlando	0	9	0	0	0
SW San Diego	73	89	85	80	90
SW San Antonio	0	6	0		
Tennessee Aquarium	0	0	10	10	10
Total	**145**	**142**	**150**	**212**	**240**

ROCKHOPPER PENGUINS

Institution	2001 Holding	2006 Holding	2009 Holding	2013 Desired Holding	2013 Max. Holding
Audubon Aquarium		3	3	6	10
Biodome	15		17	16	18
Cincinnati Zoo	5	7	9	10	14
Colorado Springs	19	0	0	0	0
Detroit Zoo	17	18	23	18	23
Fort Worth			0	8	12
Indianapolis Zoo	28	30	24	25	25
Lincoln Park Zoo	13	13	12	14	14
Louisville Zoo	6	20	23	26	30
Milwaukee Zoo	10	10	8	10	10
Monterey Bay Aquarium	0	3	0	6	6
Moody Gardens	0	6	16	26	26
New England Aquarium	15	19	15	20	20
Omaha Henry Doorly	25	23	30	40	40
Pittsburgh Zoo	3	0	0	0	0
Riverbanks Zoo	14	14	13	14	14
Shedd Aquarium	17	19	8	8	20
St. Louis Zoo	0	19	19	20	20
SW Orlando	53	57	80	72	90
SW San Antonio	54	41	44	55	55
Total	**294**	**299**	**341**	**394**	**447**

KING PENGUINS

Institution	2001 Holding	2006 Holding	2009 Holding	2013 Desired Holding	2013 Max. Holding
Albuquerque			0	5	10
Biodome	5	6	6	6	8
Calgary Zoo			0	20	20
Central Park Zoo			0	8	8
Cincinnati	7	6	7	10	10
Detroit Zoo	22	19	18	20	24
Indianapolis Zoo	5	5	5	7	7
Lincoln Park Zoo	6	4	2	6	6
Milwaukee Zoo	8	3	2	0	0
Moody Gardens	36	30	31	25	35
Newport Aquairum	11	9	10	10	12
Omaha Henry Doorly	28	25	23	30	30
Pittsburgh Zoo	2	2	4	8	10
Riverbanks Zoo	0	3	2	6	6
St. Louis Zoo	0	18	19	20	20
SW Orlando	43	35	49	40	56
SW San Diego	6	3	3	2	2
SW San Antonio	51	47	60	70	70
Total	**230**	**215**	**241**	**293**	**334**

HUMBOLDT PENGUINS

Institution	2001 Holding	2006 Holding	2009 Holding	2013 Desired Holding	2013 Max. Holding
Akron Zoo	6	17	19	24	24
Brookfield Zoo	31	33	30	30	36
Columbus Zoo	11	14	10	10	14
Great Plains Zoo	0	0	0	24	30
Louisville Zoo	0	0	0	2	2
Denver Zoo	12	14	9	16	16
Elmwood Zoo			0	10	20
Milwaukee Zoo	22	11	11	16	20
Oregon Zoo	29	29	28	24	30
Philadelphia Zoo	22	24	25	20	30
Roger Williams Zoo	8	11	7	20	24
Rosamond Gifford Zoo	0	20	30	30	30
Santa Barbara Zoo	0		15	15	15
Sedgwick County Zoo	0	0	15	25	40
St. Louis Zoo	0	21	27	30	30
SW San Diego	78	52	46	40	40
Woodland Park Zoo	15	11	20	40	60
Totals	**234**	**257**	**300**	**376**	**461**

MAGELLANIC PENGUINS

Institution	2001 Holding	2006 Holding	2009 Holding	2013 Desired Holding	2013 Max. Holding
Blank Park Zoo	9	8	7	10	12
Bronx Zoo	8	7	7	16	20
Cincinnati Zoo	2	2	2	2	4
John Ball Zoo	20	23	27	30	40
Jacksonville			0	25	30
Monterey Aquarium			0	20	30
Pointe Defiance	7	10	5	12	12
Potter Park Zoo	10	8	11	13	14
San Francisco	45	61	51	55	60
St. Louis Zoo	0	0	6	6	6
Shedd Aquarium	4	0	13	20	28
SW Orlando	12	11	18	20	30
SW San Antonio	6	6	6	6	6
SW San Diego	41	31	35	35	35
Zoo Boise	0	0	11	11	16
Total	**155**	**159**	**192**	**281**	**343**

AFRICAN PENGUINS

Institution	2001 Holding	2006 Holding	2009 Holding	2013 Desired Holding	2013 Max. Holding
Adventure Aquarium	17	20	18	24	24
Audubon Aquarium		0	17	20	22
Maryland (Baltimore) Zoo	69	54	46	53	63
Bramble Park Zoo	0	4	10	12	12
Caldwell Zoo			9	12	12
Capron Park Zoo			0	8	10
Cincinnati Zoo	12	1	2	6	10
Cheyenne Mountain Zoo	0	19	17	20	20
Columbus Zoo	0	2	0	0	0
Dallas World Aquarium	12	18			
Dallas Zoo and Aq.	8	0	11	11	11
Denver Zoo	12	10	19	20	20
Erie Zoo	0	11	12	14	14
Florida Aquarium	0	0	8	8	11
Fort Wayne Zoo	20	19	23	26	26
Fort Worth Zoo	26	3	22	24	24
Georgia Aquarium			11	35	45
Great Plains Zoo	27	12	0	0	0
Henry Villas Zoo	12	11	11	12	12
Henson Robinson Zoo	7	5	4	10	15
Kansas City Zoo			0	15	15
Jacksonville Zoo			0	20	20
Jenkinson's Aquarium			14	20	22
Little Rock Zoo			0	16	16
Knoxville Zoo	9	14	13	14	16
Landry's' Downtown Aq.			0	25	25
Lehigh Valley			8	12	12
Louisville Zoo	2	2	2	2	2
Lowry Park Zoo			15	20	25
Minnesota Zoo	0	0	0	20	20
Memphis Zoo	8	24	26	25	30
Monterey Bay Aquarium	15	37	17	23	30
Montomery Zoo			7	12	18
Mystic Aquarium	21	21	26	30	30
National Aviary	1	4	5	15	17
NE Wisconsin Zoo	8	8	9	10	14
New England Aquarium	37	38	50	50	50
Newport Aquarium		0	8	10	14
NY Aquarium	42	22	14	26	40
Omaha Henry Doorly	41	30	30	30	30
Potawatomi Zoo	9	0	0	0	0
Pueblo Zoo	19	18	19	20	24
Racine Zoo	9	6	6	6	6
Ripley's Aquarium	0	0	0	30	35
Riverbanks Zoo	11	11	0	0	0
Roosevelt Park Zoo	4	13	14	18	18

AFRICAN PENGUINS (continued)

Institution	2001 Holding	2006 Holding	2009 Holding	2013 Desired Holding	2013 Max. Holding
Seneca Park Zoo	20	38	28	25	35
Six Flags Marine Wd	3	8			
St. Paul Como Zoo	10	7	6	10	10
Tautphaus Zoo	16	16	23	24	28
Toledo Zoo	8	20	12	22	22
Toronto Zoo			0	12	24
Tulsa	0	16	27	20	30
Turtle Back Zoo			5	12	12
Utah's Hogle Zoo	14	16	12	0	0
Total	**512**	**538**	**648**	**909**	**1045**

SPENISCID SPECIES

Institution	2009 Holding	2013 Desired Holding	2013 Maximum Holding
Calgary Zoo		30	35
Detroit Zoo		20	30
Mill Mountain		14	14
Ripley's Aquarium		12	24
Shedd Aquarium		12	12
Total	**0**	**88**	**115**

ADDENDUM 6. Individual Species Summaries

ADELIE PENGUINS
Pygoscelis adeliae

AZA Population
2007 Studbook Data - 60.56.3 (119) at two institutions
2006 Space Survey – 126 individuals at two institutions
2009 Space Survey – 149 individuals at two institutions
2013 Projected Space – 168

Captive Population Status Summary
This population could meet standard genetic goals with a target size as low as 98; with a population size approximately equal to the current size, 90% gene diversity could be maintained for 135 years. Target size in this population is driven by exhibit need and not genetic goals. The current population size is 121 individuals in two institutions.

Wild Conservation Status
Range: Antarctic Continent and Peninsula, some sub-Antarctic islands

2004 Penguin Conservation Assessment workshop - 2.6 million pairs
2008 IUCN Red List - Least Concern

Current AZA Program
PMP
Program Manager – Lauren DuBois, Sea World San Diego
Studbook Last Published – 18 February 2007
PMP Last Published – 17 July 2007

Current TAG Endorsed Field Conservation Programs
None

AFRICAN PENGUINS

Spheniscus demersus

AZA Population

2009 Studbook Data – 413.357.40 at 45 AZA and 9 non-AZA institutions
2006 Space Survey – 542 individuals at 36 institutions
2009 Space Survey – 648 individuals at 42 institutions
2013 Projected Space - 909

Captive Population Status Summary

This SSP has been in existence since 1995. The management group has done a commendable job of managing the demographics and genetics of this large population over the years. The population is able to maintain 95% gene diversity for 100 years and remain above 90% for 200 years. There are 91 founder animals and a current mean kinship of 98.58 with a potential of 99.21MK. The husbandry of the species is well known. Their life span can often extend into their twenties and occasionally into the thirties. African penguins are able to breed at two years of age, Egg production and chick rearing has been observed in all months although there are generally two spikes of reproductive activity during the year; December and April.

A number of facilities maintain larger colonies such as the Mystic Aquarium, New England Aquarium, Maryland Zoo in Baltimore, Seneca Park Zoo, Memphis Zoo, and Omaha's Henry Doorly's Zoo. African penguins have been imported from Europe and South Africa in recent years; however, SSP approval is required for all AZA institutions.

African penguins are comfortable in a wide range of temperatures and exhibit configurations. The demand for African penguins has grown in recent years. With new exhibits planned to open in the next few years, it will be somewhat of a challenge to keep up with the demand for penguins. The 2009 – 2011 SSP master plan depicts breeding recommendations that are both aggressive to meet the future demands and balanced to preserve genetic diversity

Wild Conservation Status

Range: Southern Africa (coast and islands)

2004 Penguin Conservation Assessment workshop - 59,000 pairs; decreasing
2008 IUCN Red List - Vulnerable

Current AZA Program

SSP
Studbook Keeper - Seana Jean Davidson, Tulsa Zoo
Species Coordinator – Steve Sarro, National Aviary
Studbook Last Published – March 2009
SSP Last Published – October 2009

Current TAG Endorsed Field Conservation Programs

The African Penguin SSP supports in-situ facilities and programs including SANCCOB, SAMREC, the Dyer Island Conservation Trust's efforts to install fiberglass nest burrows, health survey of seabirds especially African penguins, avian malaria research, on-going census work, and spot pattern recognition assessment.

CHINSTRAP PENGUINS

Pygoscelis antarctica

AZA Population

2009 Studbook Data - 61.62.0 (123) at four institutions
2006 Space Survey – 142 at four institutions
2009 Space Survey – 127 at five institutions
2013 Projected Space - 122

Captive Population Status Summary

This population cannot meet 90% genetic diversity for 100 years with the current population. There are currently 61.62.0 individuals held at 4 different facilities. According to the last space survey results, no zoos are interested in adding chinstrap penguins to their collections. Chinstrap penguins have not regularly bred well in North American institutions for the last four years with totals being 1 chick in 2008, 3 chicks in 2007, 1 chick in 2006, and 2 chicks in 2005. The 2007 PMP suggested 15 chicks be hatched and raised in 2008.

This species has a new program manger, Jennifer Auginbaugh, assigned in January 2009. The Studbook was updated in December 2009. The PMP will be updated when scheduling is possible with the PMC.

Wild Conservation Status

Range: Antarctic Peninsula and some sub-Antarctic islands.

2004 Penguin Conservation Assessment workshop – four million pairs
2008 IUCN Red List – Least Concern

Current AZA Program

PMP
Program Manager – Jennifer Aughinbaugh, Sea World San Antonio
Studbook Last Published – November 2006
PMP Last Published – 6 March 2007

Current TAG Endorsed Field Conservation Programs

None

EMPEROR PENGUINS

Aptenodytes forsteri

AZA Population

2006 Space Survey – 36 at one institution
2009 Space Survey – 33 at one institution
2013 Projected Space - 48

Captive Population Status Summary

This population cannot meet 90% genetic diversity for 100 years with the current population. There are 19.13.0 individuals at a single institution including 25 founders. Seventy-two percent of the population is over the age of 27 years and there has been no reproduction beyond F1. The sex ratio is skewed towards older, founder males; several older females continue to produce eggs but in recent years no eggs have been fertile. The last emperor penguin chick hatched in 2002. Due to their specific housing requirements there are only about three to four zoos exhibiting emperor penguins worldwide.

Wild Conservation Status

Range: Continental Antarctica and Antarctic ice shelves

2004 Penguin Conservation Assessment workshop – 135,000 to 175,000 pairs
2008 IUCN Red List – Least Concern

Current AZA Program

DERP
Program Manager – Linda Henry, Sea World San Diego

Current TAG Endorsed Field Conservation Programs

None

GENTOO PENGUINS
Pygoscelis papua

AZA Population
2009 Studbook Data - 169.215.27 (411) at fourteen institutions
2006 Space Survey – 298 at twelve institutions
2009 Space Survey – 411 at fourteen institutions
2013 Projected Space - 390

Captive Population Status Summary
Once held as two separate sub species; *Pygoscelis papua papua* and *Pygoscelis papua ellsworthi*, the Gentoo Penguin population has been combined into a single population by the decision of the Penguin TAG. The current population stands at 411 individuals 169.215.27 (current to April 2009) at 14 institutions. Gentoo penguins breed regularly at most of these institutions and easily meet the demand in North America.

The first PMP meeting for the Gentoos was conducted in October of 2009 and will be completed in early 2010. Preliminary responses from holding institutions suggest that most are content with their current populations and would like to continue small scale breeding yearly. Sea World is planning on exporting some gentoos to other regions which will allow the TAG to meet their recommended target population.

Wild Conservation Status
Range: Antarctic Peninsula and some sub-Antarctic islands.

2004 Penguin Conservation Assessment workshop – 314,000 pairs
2008 IUCN Red List – Near Threatened

Current AZA Program
PMP
Program Manager – Sharon Jarvis, Sea World Orlando
Studbook Last Published – September 2006
PMP Last Published –

Current TAG Endorsed Field Conservation Programs
None

HUMBOLDT PENGUINS

Spheniscus humboldti

AZA Population

2009 Studbook Data – 152.129.9 (290) at fifteen institutions
2006 Space Survey – 298 at twelve institutions
2009 Space Survey – 257 at fifteen institutions
2013 Projected Space - 376

Captive Population Status Summary

This population can maintain 98% genetic diversity with its current population of 290 for 100 years, assuming that 25 -27 viable hatches occur per year and the overall population mortality rate stays at 33%. According to space survey results and additional institutional requests, many institutions are interested in modifying existing exhibit spaces or building new exhibits to house large colonies of Humboldt penguins. Humboldt penguins readily breed in North American institutions, and with proper management it is likely that the demands can be met within a certain extended timetable. At the most recent master plan session held in September 2009, discussions included a 3 year minimum advanced notice to request Humboldt penguins for new exhibits and potentially recommending double clutching priority pairs and breeding some of the pairs that are slightly below the population mean kinship in order to fulfill the demand.

Wild Conservation Status

Range: Peru and Chile

2004 Penguin Conservation Assessment workshop – 41,000 – 47,000 pairs
2008 IUCN Red List – Vulnerable

Current AZA Program

SSP
Studbook Keeper – Gayle Brandt, Brookfield Zoo
Species Coordinator – Alex Waier
Studbook Last Published –
PMP Last Published –

Current TAG Endorsed Field Conservation Programs

The TAG and Humboldt SSP supports with funding and personnel contributions ongoing census work in both Chili and Peru, a hybridization ecology study in Southern Chile involving Magellanic and Humboldt populations, juvenile dispersal and the level of philopatry, and the creation of artificial burrows to enhance nesting success. St. Louis Zoo has initiated a comprehensive health assessment of the Humboldt penguin population in Punta San Juan, Peru.

KING PENGUINS
Aptenodytes patagonicus

AZA Population
2009 Studbook Data - 127.109.16 (252) at fourteen institutions
2006 Space Survey – 215 at fifteen institutions
2009 Space Survey – 241 at fifteen institutions
2013 Projected Space - 293

Captive Population Status Summary
The population can meet 90% genetic diversity for 100 years with a population as small as 92 animals. There are currently 259 individuals in 14 institutions with 103 founders and 40 potential founders. Sixty-nine of these 259 individuals (27%) are aged 20 or above. Although both sexes have shown reproductive success up to the age of 25, these instances are rare. Balancing breeding with deaths and exportation, the population has remained consistent, averaging 232 individual since 2000. Numerous requests for exportation has affected the captive population in North America by slowing the normal growth curve, but it has also allowed for the removal of unknown pedigreed birds and the opening of holding spaces for breeding. SeaWorld manages the largest and in turn, most prolific breeding colony, producing 9-12 chicks a year divided unevenly between two breeding seasons. Other breeding colonies are located in Omaha, Moody Gardens, Detroit, and recently St Louis; Detroit has managed their breeding due to space constrictions, but has supplied eggs to other institutions. The remaining institutions have not shown significant reproduction to impact the North American numbers.

SeaWorld has received requests to export over 30 individuals over the next five years as new exhibits are created internationally. Regionally, one institution is considering adding kings, and one more is interested increasing the size of its smaller collection. With continued breeding and careful management regional requests and some exports can be provided.

Two sub-species have been identified in North America, *Aptenodytes patagonicus patagonicus* and *Aptenodytes patagonicus halli*. Differing only in morphometrics and point of origin, the sub-species are managed at the species level.

Wild Conservation Status
Range: Antarctica; South America (Argentina and Chile), Australia; Sub-Antarctic islands.

2004 Penguin Conservation Assessment workshop – 1,600,000 pairs
2008 IUCN Red List – Least Concern

Current AZA Program
PMP
Program Manager – Debbie Denton, Sea World San Diego
Studbook Last Published – May 2009
PMP Last Published – July 2006

Current TAG Endorsed Field Conservation Programs
None

PENGUIN CONSERVATION ASSESSMENT

SUMMARY REPORT

Ushuaia, Tierra del Fuego, Argentina
11-12 September 2004

Compiled by Susie Ellis, Eric J. Woehler, Elizabeth Skewgar and P. Dee Boersma

A Collaborative Workshop
British Antarctic Survey
University of Washington
BirdLife International
CONICET - CADIC
Conservation International
Conservation Breeding Specialist Group, IUCN/SSC

Generously Sponsored by
Sea World
New England Aquarium

A CONTRIBUTION OF THE IUCN/SSC CONSERVATION BREEDING SPECIALIST GROUP.

COVER PHOTO BY ERIC J. WOEHLER

Ellis, S., Woehler, E.J., Skewgar, E., and Boersma, P.D. 2007. *Penguin Conservation Assessment: summary document*. IUCN/SSC Conservation Breeding Specialist Group: Apple Valley, MN.

Additional copies of this publication can be ordered through the IUCN/SSC Conservation Breeding Specialist Group, 12101 Johnny Cake Ridge Road, Apple Valley, MN 55124 USA. Send checks for US$35 (for printing and shipping costs) payable to CBSG; checks must be drawn on a US bank. Funds may be wired to First Bank NA ABA 091000022, for credit to CBSG Account No. 1100 1210 1736. VISA or Mastercard also are accepted.

PENGUIN CONSERVATION ASSESSMENT
USHUAIA, TIERRA DEL FUEGO, ARGENTINA
11-12 September 2004

Summary Report

Background
Penguins are among the most popular and well-studied avian groups, yet they face serious population declines throughout their range. Penguins are relatively large birds with high body masses, and are dependent on locally highly-productive marine waters where they prey upon fish, crustaceans and squid. Life history strategies include delayed reproductive maturity, long life expectancies and low annual breeding success. All penguin species nest close to the sea, and depend on marine ecosystems to survive. This makes them vulnerable to a wide range of threats including fisheries pressure, climate change, introduced predators, human disturbance, marine pollution, disease, oil spills, hunting, and degradation of nesting habitat. Burgeoning human populations and concomitant resource use have led to an escalation in the intensity and frequency of these threats.

It is difficult to readily assess penguin population trends. Penguins are buffered against population decreases by high survival rates of breeding adults and unknown participation in annual breeding populations. Counts of breeding adults do not necessarily indicate changes in survival or recruitment of younger age classes into the breeding cohort, but may instead reflect unusually good or poor breeding conditions in a given year. If survival of breeding adults remains high, a population decrease may be undetectable for more than 10 years. Demographic data on the proportion of breeding age birds that do not breed in a particular season further hinder our efforts. Penguins also generally live and breed in remote places. Because it is expensive to visit and count many species' breeding colonies, many colonies have yet to be accurately censused. Finally, some individuals may 'skip' a breeding season due to poor body condition (or other reasons), and so annual counts of breeding individuals are only a minimum estimate of the breeding population for that year, and do not reflect the total breeding population for the species. To fully understand whether a count represents a poor year or reflects a true decrease in breeding individuals, a series of counts in consecutive years at the appropriate times is needed. These factors all combine in a variety of ways to make it difficult to obtain accurate penguin population numbers and trends.

Despite these difficulties, the conservation status of the majority of penguin species is clearly and unambiguously deteriorating. Since 1990, the number of penguin species considered threatened has more than doubled – in 1998, five species were included on the IUCN Red List; by 2004, a total of 12 species was listed (Table 1).

In order to provide a substantive review and update of the draft Penguin Conservation Assessment and Management Plan (CAMP) generated at a workshop in New Zealand in 1992 (Boersma et al. 1992), the IUCN/SSC Conservation Breeding Specialist Group (CBSG) facilitated a collaborative Penguin CAMP workshop in September 1996 (Ellis et al. 1998), following the Third International Penguin Conference in Cape Town, South Africa. This workshop was held in collaboration with the British Antarctic Survey and the Avian Demography Unit at the Percy Fitzpatrick Institute at the University of Cape Town. Thirty-seven people from ten countries participated in the two-day event, which was generously sponsored by Sea World, Inc. and the New England Aquarium. The workshop focused on updating and compiling all available information concerning the status of the 20 penguin taxa (including some subspecies) being reviewed.

The alarming data presented at the 1996 workshop indicated that of all of the penguin species, only those in the Antarctic do not seem to be facing grave, documented declines or other problems that put them at serious risk. Even Antarctic species are not secure in perpetuity – threats that have put the other penguin species at risk appear to have spread to the boundaries of the Antarctic. Table 1 shows the steady increase in threat status for penguins from 1988 to the present.

This Workshop

The Fifth International Penguin Conference was convened in Ushuaia, Tierra del Fuego, Argentina from 6-10 September 2004, with participation by penguin experts from around the world. The urgency of the situation for penguin species, and the need to take advantage of the presence of so many penguin biologists, led to the convening of a two-day Penguin Conservation Workshop. This exercise was hosted by the Centro Austral de Investigaciones Cientificas (CADIC)/Consejo Nacional de Investigaciones Cientificas y Técnicas (CONICET). Forty-five experts from 11 countries participated in the workshop (Appendix I), which was facilitated by the IUCN/SSC Conservation Breeding Specialist Group[1]. The workshop was a collaborative effort among the British Antarctic Survey, the University of Washington, Conservation International (US), the SCAR Scientific Experts on Birds, BirdLife International (United Kingdom), CADIC/CONICET (Argentina), Universidad Católico del Norte (Chile), Percy Fitzpatrick Institute of Ornithology (South Africa), African Penguin Conservation Project (Namibia), Phillip Island Penguin Reserve (Australia), and the Department of Conservation (New Zealand) to:

(a) review the 2004 Red List fact sheets for penguins, as established by BirdLife International, with updated information to be submitted to BirdLife for its and for the 2005 Red List assessments;
(b) review and update the taxon data sheets from the 1996 CAMP workshop; and
(c) identify and prioritize key threats in each region and/or for each species, necessary actions to deal with specific threats and to identify how the penguin biology community can move ahead to address these priority issues/threats.

1 The Conservation Breeding Specialist Group (CBSG) is a specialist group of the Species Survival Commission of the IUCN-The World Conservation Union. CBSG is a global network of more than 800 volunteers from 70 countries with expertise in disciplines such as species recovery planning, small population, reproductive and behavioral biology, and captive animal management. CBSG works closely with zoos, aquariums, and other agencies committed to species conservation via captive breeding and habitat preservation in the wild. Because it does not represent any particular political constituency, CBSG is able to serve as a neutral catalyst and mediator for intensive species conservation efforts worldwide. CBSG has pioneered the use of scientifically-based management tools that allow informed and efficient decision-making regarding resource allocation and strategies for species management and survival. . (www.cbsg.org)

Table 1. Penguin species and changes in IUCN Red List status from 1998 to 2004.

Genus/species	English name	1988 Red List status[2]	1994 Red List Status	2000 Red List Status	2004 Red List Status
Aptenodytes patagonicus	King penguin	Lower Risk/ Least Concern	Lower Risk/ Least Concern	Lower Risk/ Least Concern	Least Concern
Aptenodytes forsteri	Emperor penguin	Lower Risk/ Least Concern	Lower Risk/ Least Concern	Lower Risk/ Least Concern	Least Concern
Pygoscelis papua	Gentoo penguin	Lower Risk/ Least Concern	Lower Risk/ Least Concern	Lower Risk/ Least Concern	Near Threatened
Pygoscelis adeliae	Adelie penguin	Lower Risk/ Least Concern	Lower Risk/ Least Concern	Lower Risk/ Least Concern	Least Concern
Pygoscelis Antarctica	Chinstrap penguin	Lower Risk/ Least Concern	Lower Risk/ Least Concern	Lower Risk/ Least Concern	Least Concern
Eudyptes chrysolophus	Macaroni penguin	Lower Risk/ Least Concern	Lower Risk/ Least Concern	Vulnerable	Vulnerable
Eudyptes schlegeli	Royal penguin	Lower Risk/ Least Concern	Lower Risk/ Least Concern	Vulnerable	Vulnerable
Eudyptes chrysocome	Rockhopper penguin	Lower Risk/ Least Concern	Lower Risk/ Least Concern	Vulnerable	Vulnerable
Eudyptes pachyrhynchus	Fiordland crested penguin	Near Threatened	Vulnerable	Vulnerable	Vulnerable
Eudyptes robustus	Snares crested penguin	Lower Risk/ Least Concern	Vulnerable	Vulnerable	Vulnerable
Eudyptes sclateri	Erect-crested penguin	Lower Risk/ Least Concern	Vulnerable	Endangered	Endangered
Megadypes antipodes	Yellow-eyed penguin	Threatened	Vulnerable	Endangered	Endangered
Eudyptula minor	Little penguin	Lower Risk/ Least Concern	Lower Risk/ Least Concern	Lower Risk/ Least Concern	Least Concern
Spheniscus demersus	African penguin	Threatened	Lower Risk/ Near Threatened	Vulnerable	Vulnerable
Spheniscus humboldti	Humboldt penguin	Threatened	Lower Risk/ Near Threatened	Vulnerable	Vulnerable
Spheniscus magellanicus	Magellanic penguin	Lower Risk/ Least Concern	Lower Risk/ Least Concern	Lower Risk/ Near Threatened	Near Threatened
Spheniscus mendiculus	Galápagos penguin	Near Threatened	Vulnerable	Endangered	Endangered
Number Near Threatened		**2**	**2**	**1**	**2**
Number Threatened		**2**	**5**	**10**	**10**
TOTAL		**4**	**7**	**11**	**12**

2 Before 1994 the more subjective threatened species categories used in Red Data Books and Red Lists had been in place, with some modification, for almost 30 years (IUCN, 2000). Although the need to revise the categories had long been recognized (Fitter and Fitter 1987), the current phase of development only began in 1989 following a request from the IUCN Species Survival Commission (SSC) Steering Committee to develop a more objective approach. The IUCN Council adopted the new Red List system in 1994.

SUMMARY OF THREATS TO PENGUINS

Dependent on both the land and sea, penguins face a wide spectrum of threats at all stages of their annual cycles - while foraging at sea, at their breeding colonies, and during their non-breeding seasons away from colonies. Anthropogenic factors comprise the main threat to penguins, in particular, oiling and fisheries interaction.

Fisheries Competition and Bycatch
As the majority of fisheries worldwide become fully- or over-exploited, the world's fishing fleets are progressively changing their target species, sometimes down the food chain (Pauly et al., 1998). New fisheries also are developing. This combines to increase competition with natural predators, including penguins. Twelve of the 17 penguin species face substantial threats from competition with commercial fisheries (Table 2). Although not yet well-quantified for penguins, many researchers fear that fisheries bycatch poses a significant threat for a number of temperate penguin species, including rockhopper, fiordland, Snares, erect-crested, yellow-eyed, little, African, Humboldt, Magellanic and Galapagos penguins.

Global Climate Change
Penguins are sentinel species for not only the current health of the world's oceans but also for future climate scenarios (Ainley, 2002). Global climate change, and, in particular, regional warming negatively affect penguins in many ways. Increased frequencies and escalating intensities of El Niño Southern Oscillation (ENSO) events and associated decreases in cold-water periods results in decreases and/or redistributions of penguin's prey species. This, in turn, reduces foraging success which in turn decreases breeding success. As the global climate becomes more variable, the reproductive success and survival of penguins is expected to decrease. Associated increases in sea surface temperatures also may lower ocean productivity, making it more difficult for penguins to find food. Climate variability also affects foraging ranges during the breeding and non-breeding seasons, rates of egg and chick mortality, and nest site quality.

Introduced Predators
Penguins breed primarily on oceanic islands and along expanses of continental and Antarctic coastlines, where there are relatively few, if any, natural predators. On land, where they are especially vulnerable. penguins are easy prey. Predation by introduced mammalian species has played a role in the population decreases of mainland and island populations of many species (Boersma, 1986; Croxall, 1987; Stahel and Gales, 1987; Dann, 1992). In New Zealand, predation by stoats *(Mustela erminea),* ferrets *(M. putorius),* dogs *(Canis familiaris),* and cats *(Felis catus)* has dramatically contributed to the decrease yellow-eyed penguins (Darby and Seddon, 1990).

Human Disturbance at Nesting Colonies
For many penguin species, particularly those living in areas which are attractive for recreation and tourism, human disturbance at nesting colonies is a major threat. Disturbances may include habitat loss from development, hunting, egg collection, guano collection, and intrusions from recreational and tourist activities. African and Humboldt penguins are still hunted for food, and eggs from several species still are collected, which reduces reproductive success. In Peru and southern Africa, over-harvesting of guano from nesting colonies degrades the substrate and reduces the quality of available nest sites. Galapagos penguins are threatened by hunting, fishing and recreation and tourism. Nine of the 17 penguin species are presently threatened by human disturbance of one or more forms (Table 2); greater protection is needed to reduce adverse effects.

Pollution
Whether originating from extractive activities, transport, ballast water or accidental spills, petroleum

Table 2. Population trends and primary threats to penguin species at nesting colonies, at sea and at their non-breeding areas.

Common and Scientific names	Breeding localities	Estimated breeding population size (pairs) and trends where known	Threats to species:		
			Nesting colonies	Foraging at sea	Non-breeding areas
Emperor *Aptenodytes forsteri*	Continental Antarctica and Antarctic Peninsula	195,000 pairs (1999); global population believed to be stable	Winter ice reduction from climate change/global warming, Human disturbance.	Unknown.	Unknown.
King *Aptenodytes patagonicus*	Subantarctic islands: Falklands, South Georgia, Heard, MacDonald, Macquarie, Prince Edward Is, South Sandwich Is	1.6+ million pairs (2001); increasing at many breeding sites	Potential competition for nesting habitat from increasing populations of fur seals *Arctocephalus* spp.	Potential competition for food from increasing populations of fur seals and commercial fisheries.	Unknown.
Adélie *Pygoscelis adeliae*	Antarctic Continent and Antarctic Peninsula, South Sandwich, South Orkney, South Shetland Is, high-latitude peri-Antarctic islands	2.6 million pairs; some regional trends evident (eg decreasing in Antarctic Peninsula, increasing East Antarctica)	Local effects of tourist operations at colonies on Antarctic Peninsula. Break-up of ice shelves and increased icebergs.	Regional fishing pressure in South Atlantic sector of Southern Ocean.	Changes in extent and distribution of winter sea ice.
Chinstrap *Pygoscelis antarctica*	Antarctic Peninsula and high-latitude peri-antarctic islands, primarily in the South Atlantic sector of the Southern Ocean.	4 million pairs (2001).	Local effects of tourist operations at colonies on Antarctic Peninsula?	Regional/local fishing pressure in South Atlantic sector of the Southern Ocean.	Unknown.
Gentoo *Pygoscelis papua*	Prince Edward Is, Crozet, Kerguelen, Heard, Macquarie, Falkland Is, South Georgia, South Sandwich, South Orkney, South Shetland Is, Antarctic Peninsula	314,000 pairs. Some regional trends evident: increasing on South Sandwich Is, decreasing on some islands	High sensitivity to human disturbance, particularly at Indian Ocean colonies	Regional/local fishing pressure in South Atlantic.	Some birds present at colonies year-round, potential for disturbance at colonies in winter.
Rockhopper *Eudyptes chrysocome*	Prince Edward Is, Crozet, Amsterdam & St Paul, Kerguelen, Heard, Macquarie, Auckland, Campbell, Antipodes, Bounty, Falkland Is, Tristan da Cunha, Gough, South America.	3.7 million pairs, 41 sites; overall decrease of 30% over 30 years, very large decreases at some colonies	Human disturbance (egging on some islands, introduced predators, disease, increasing human population and development).	Pollution (including plastics, diesel, oil), competition with fisheries, prey distribution changes resulting from sea temperature changes; oil exploitation (extraction and transport) on Patagonian shelf; by-catch in driftnets, hunting for bait.	Pollution, fisheries competition and by-catch, etc.
Macaroni *Eudyptes chrysolopus*	Prince Edward Is, Crozet, Kerguelen, Heard, Falkland Is, South America, South Georgia, South Sandwich, South Orkney, South Shetland, Antarctic Peninsula	216 colonies, 50 sites; 9 million pairs; population decreasing at 1% per year; more rapid decreases in some colonies over last 30 years	Introduced predators	Commercial fishing in SW Atlantic. Competition for food from increasing populations of fur seals *Arctocephalus* spp. on South Georgia.	Unknown.

Common and Scientific names	Breeding localities	Estimated breeding population size (pairs) and trends where known	Threats to species:		
			Nesting colonies	Foraging at sea	Non-breeding areas
Fiordland *Eudyptes pachyrhynchus*	Southern New Zealand and offshore islands	2,500-3,000 pairs; decreasing (33% decrease 1988-95)	Introduced predators (weka, dogs, cats, stoats). Human disturbance at nesting colonies; car fatalities. Restricted breeding range. Disease. Seal predation.	Prey shortage due to sea temperature change. Fisheries by-catch Fisheries competition Pollution.	Unknown range. Prey shortage due to sea temperature change. Fisheries by-catch. Fisheries competition. Pollution.
Snares *Eudyptes robustus*	Snares I (New Zealand) (total area 3 km^2)	30,000 pairs; probably stable	Highly restricted nesting range. Vulnerable to introduced predators. Disease.	Prey shortage due to sea temperature change. Fisheries by catch. Fisheries competition. Pollution.	Unknown range. Prey shortage due to sea temperature change. Fisheries by catch Fisheries competition. Pollution.
Royal *Eudyptes schlegeli*	Macquarie I and offshore islets	850,000 pairs on Macquarie I, 1,000 pairs estimated on islets	Introduced predators, landslips from erosion.	Unknown.	Unknown.
Erect-crested *Eudyptes sclateri*	Bounty and Antipodes Is (New Zealand).	28,000 pairs (1997 Bounty), 52,000 (1995 Antipodes); Decreased 50% in last 20 years. No longer present on Auckland and Campbell	Restricted nesting range. Vulnerable to introduced predators. Disease.	Prey shortage due to sea temperature change. Fisheries bycatch. Fisheries competition. Pollution	Unknown range. Prey shortage due to sea temperature change. Fisheries bycatch. Fisheries competition Pollution
Little *Eudyptula minor*	Australia and New Zealand	350,000 – 600,000 birds. Populations on SE Australian mainland decreasing, island populations may be stable	Introduced predators (dogs, cats, mustelids). Habitat loss from coastal developments. Disturbance from human activities.	Potential competition with fisheries. Indirect effects of fishing (e.g. pathogens introduced into prey). Global warming.	Unknown.
Yellow-eyed *Megadyptes antipodes*	New Zealand (600 km^2)	3,587 pairs; fluctuating	Introduced predators (ferret, stoat, cats). Human disturbance/ impact of tourism. Habitat degradation. Disease.	Prey shortage due to sea temperature change. Fisheries bycatch. Pollution. Predation by sea lions.	Prey shortage due to sea temperature change. Fisheries bycatch. Pollution.
African *Spheniscus demersus*	Southern Africa (coast and islands)	59,000 pairs; decreasing (15% over 3 generations -33 years)	Habitat degradation due to removal of guano and habitat loss due to inter-specific competition.	Food availability due to increased competition with commercial fisheries and competing species. Food availability due to long-term climate change and short-term	Unknown.

Common and Scientific names	Breeding localities	Estimated breeding population size (pairs) and trends where known	Threats to species:		
			Nesting colonies	Foraging at sea	Non-breeding areas
African, cont.			Predation (including: kelp gulls, feral cats). Diseases (including those caused by algal blooms and those intrinsic to the population). Fire especially at colonies with woody vegetation. Human disturbance (e.g. tourism, researchers, traffic, illegal landings on islands, hunting).	environmental variability. Oil spills both chronic and catastrophic (including fish-oil). Predation (including: fur seals, sharks). Diseases (including those caused by algal blooms and those intrinsic to the population). Marine pollution other than oil (e.g. entanglement – including incidental capture, ingestion of plastics).	
Humboldt *Spheniscus humboldti*	Chile and Peru; temperate and tropical	41,000-47,000 (2003 - all birds in adult plumage)); decreasing historically; current trends not quantified; PHVA analysis suggests high probability of extinction within 100 years	Illegal capture. Unregulated exploitation of guano. Unregulated human disturbance (recreation, tourism). Predation.	Entanglement. Fishing competition, Pollution (unknown source). El Niño	Unknown.
Magellanic *Spheniscus magellanicus*	South America, temperate	1.3 million birds/pairs, slow decrease; mixed trends across colonies	Marine perturbations and global climate change. Predation by exotics. Hunting/egging. Tourism and recreation. Disease. Gull predation. Habitat loss/ degradation.	Prey reduction by fisheries. Mortality in nets. Pollution (mainly from petroleum). Harmful algal blooms. Marine perturbations and global climate change.	Prey reduction by fisheries/ Mortality in nets. Pollution (mainly from petroleum). Harmful algal blooms. Marine perturbations and global climate change.
Galapagos *Spheniscus mendiculus*	Galapagos Is (equatorial)	600 pairs; decreasing (65% over 10 years)	Introduced predators. Human disturbance (tourism and recreational). Hunting.	Climate change (increased frequency of El Nino; fewer less intense La Nina). Bycatch. Competition with fisheries. Oil pollution.	Climate change. Fishing. Oil pollution.

products typically have a highly detrimental impact on marine life. Penguins are especially vulnerable to oil spills (e.g., Erasmus et al., 1981; Stephenson, 1997; Crawford et al., 2000). Large oil spills may have a devastating impact on individual penguins while at sea and on birds at breeding colonies. The extent and duration of oil spill effects are affected by the spill timing, its proximity to colonies, and the oil type. After many major oil spills in the past, environmental, governmental and community-based efforts undertook massive efforts to rehabilitate oiled birds. The value of these efforts as a conservation tool has been the topic of ongoing debate (e.g., Fowler et al., 1995; Underhill et al., 1999). However, a 10.5-year study of African penguins (Wolfaardt, 2007) through the Apollo Sea and Treasure oil spills off South Africa showed that 74 percent of de-oiled, rehabilitated birds were restored to the breeding population – substantially greater rates of restoration than were reported in earlier studies (Randall et al., 1980; Morant et al., 1981).

PRIORITY NEEDS - RESEARCH

Population census and trends
Long-term, accurate census data are fundamental to all penguin conservation efforts, providing information on population trends and effectiveness of management. It is critical that surveys adopt consistent and species-appropriate methodologies. Most penguin populations have not been censused appropriately during the last 10 years, and some extant population data are considered to be of relatively low quality. To determine global population trends, accurate long-term studies are essential, with global penguin population censuses conducted at least every five years to determine these trends. More frequent and extensive monitoring for all penguin species would help to determine population trends at finer scales and provide critical data (currently missing) for priority conservation efforts.

Wintering Areas and Foraging Ecology
Information on the location(s) of non-breeding areas and of penguin foraging areas is scarce for most species. Many penguins leave their breeding grounds after breeding and moulting and head to sea to spend one to six months away from their colonies. Highly oceanic species such as penguins are very difficult to study away from their breeding colonies. Consequently, we lack basic knowledge on the non-breeding distribution(s) of about half the penguin species for approximately half of each year.

Similarly, data gaps on the foraging areas of most species make it impossible to accurately evaluate threats from commercial fisheries activities and marine pollution events. Most dietary studies are conducted during the breeding season; however, penguins may switch to different prey species during the winter, either because different prey is available, they are foraging in different oceanic bodies or because their nutritional needs differ between breeding and non-breeding seasons. Knowledge of winter diet is needed to determine potential degree of threats from prey reduction by commercial fisheries. Most importantly, more information on winter foraging areas is needed to determine accurately the rate of penguin by-catch, which may play a substantial role in some population decreases.

Quantifying Interactions with Fisheries
Sufficient data has led to consensus among penguin researchers that interactions between human fisheries and penguins at sea are a significant threat to the conservation of temperate penguin species. However, further data are needed for the other species. Where national and international fisheries policies are discussed and decided, *prima facie* evidence of harm is often required before a policy action is taken that is detrimental to vested economic interests. Fisheries managers often are charged with protection of penguin populations and at the same time are required to address the needs of fisheries (Araya et al. 2000). It is therefore in the interest of conservation for penguin researchers to strengthen the collection and dissemination of quantitative data on the effects of human fisheries on penguins - including correlations

between specific fisheries and penguin mortality, changes in foraging ecology due to fisheries, and numbers of penguins caught as by-catch - so that fisheries decision-makers can convince their constituencies of needed changes.

PRIORITY NEEDS – CONSERVATION

Fisheries Management and Marine Habitat Protection
It is clear that more marine areas need protection from commercial fisheries activities. High-seas areas that are used by dispersive species such as penguins, require novel mechanisms to identify and protect these marine habitats (e.g., Boersma and Parrish, 1989; Harris et al. 2007). For example, large marine reserves (up to 200 nm offshore that included 'no-take' areas) were declared around Macquarie Island and Heard Island in the Indian Ocean (http://www.heardisland.aq/protection/management_plan/download_plan.html); these reserves include foraging areas for resident penguins. Governments and conservation groups alike are struggling with the mechanisms to identify, develop and manage large-scale marine protected areas. If successfully developed and managed, and coupled with responsible fisheries management, such flexible approaches could benefit the conservation of most species of penguins throughout the world.

Eradicating and/or Preventing Introduction of Mammalian Predators
Eradicating existing populations, and preventing the further introductions of mammalian predators is critical for the conservation of penguins, particularly for species such as rockhopper, macaroni, fiordland, snares, royal, little and yellow-eyed penguins whose breeding populations provide easy predator targets. On islands, introduced mammalian predators typically remove all age classes, from breeding adults to chicks, and substantially lower adult and juvenile survival rates. There also may be problems with disease transmission from introduced species. Islands that currently do not have introduced predators need strong prophylactic measures to prevent the accidental or deliberate introductions of these predators, and all islands that support nesting colonies could benefit from predator eradication programs.

Nesting Habitat Protection
Protection efforts also must be directed towards penguin nesting habitats. In addition to control of introduced predators, removal or commercial extraction of nesting material, pollution and responsible management of ecotourism are all critical issues that need to be addressed. Some species, such as Humboldt penguins, use their guano as nesting material and local people also use it as fertilizer/energy sources. Overzealous guano extraction has destroyed nesting habitat for Humboldt penguins and clearly signals a need for the enforcement of conservation plans to control guano extraction. Due to penguins' charismatic nature, a penguin colony can attract many tourists, which can provide financial support and engenders appreciation for the birds but also may have detrimental effects. Tourist colonies need to be established that focus primarily on the protection of penguins, balanced with providing a satisfactory 'penguin experience' for visitors to the colony that strictly limits number of visitors and regulates disturbance.

Addressing Global Climate Change
Climate change is easily the single biggest problems affecting all global conservation efforts today. It is also the most difficult to address. While the extent and rate of warming are still indeterminate, and vary from region to region, the predictions of regional and global warming will herald further pressures on all species of penguins, from the Equator to the Antarctic. In Antarctica, environmental changes which may be attributable to global warming are most apparent in the Antarctic Peninsula (e.g., Fowbert and Smith, 1994; Frazier et al. 1992).

Hand-in-hand with global warming is the predicted rise is sea level and a greater intensity and frequency of extreme weather events. Given the coastal nesting habits of many penguin species, higher sea levels and more intense storms more frequently will also contribute

additional pressure on penguins at their nesting sites. In some cases, suitable habitat is available that would allow penguins to relocate nesting colonies as required in response to changes in weather, but in many cases, the adjacent habitat has been modified (e.g., for residential development or agriculture), which will prevent penguins from relocating.

Although many solutions have been proposed or already exist, virtually all attempts to implement measures for dealing with global climate change has been met with energetic resistance from industry and government alike. Even if all greenhouse gas emissions were stopped immediately, it would take decades before there was a noticeable reversal of their effects. One of our best strategies to conserve penguins (and indeed many other species) may be to use scenario planning for global climate change, and to protect habitat that the penguins will be likely to use in the future. Additionally, it will be critical to continue to lobby governmental groups to address this issue and to implement measures to stop global climate change before it is too late.

CONCLUSION

Most of the world's penguin species are facing critical, rapid population decreases which will be reversed only through immediate and affirmative action on the part of the global community of researchers, governmental entities, conservation organizations, fisheries' managers and the general public. No single action will slow or reverse this trend – we must address the identified threats and undertake priority actions using an innovative, integrated, and interdisciplinary approach. The participants of this workshop urge that penguins not be viewed in isolation from their environment, but rather as indicators for the escalating crisis affecting all marine life and ecosystems.

REFERENCES

Ainley, D.G. (2002) *The Adelie Penguin: bellweather of climate change*. New York: Columbia University Press. 310 pgs.

Araya, B. *et al.* (2000) *Population and Habitat Viability Assessment for the Humboldt Penguin (Spheniscus humboldti).* IUCN/SSC Conservation Breeding Specialist Group.

Boersma, P.D. (1976) An Ecological and Behavioral Study of the Galapagos Penguin. *Living Bird* 15, 43-93.

Boersma, P.D. *et al*. (1992) *Penguin Conservation Assessment and Management Plan – Discussion Draft.* IUCN/SSC Conservation Breeding Specialist Group, Apple Valley, MN.

Boersma, PD and Parrish, JK. (1999) Limiting abuse: marine protected areas, a limited solution. Ecological Economics 31(2):287-304.

Crawford, R.J.M. *et al*. (2000) Initial impact of the Treasure oil spill on seabirds off western South Africa. *South African Journal of Marine Science-Suid-Afrikaanse Tydskrif vir Seewetenskap* 22, 157-176.

Croxall, J.P. (1987) The status and conservation of Antarctic seals and seabirds: a review. *Environment International* 13, 55-70

Dann, P. (1992) Distribution, population trends and factors influencing the population size of Little Penguins *Eudyptula minor* on Phillip Island, Victoria. *Emu* 91, 263-272.

Darby J.T. and Seddon, P.J. (1990) Breeding biology of Yellow-Eyed Penguins *(Megadyptes antipodes*). Davis, L.S. and Darby, J.T., eds.). *Penguin Biology.* San Diego: Academic Press

Ellis, S. *et al.* (1998) *Penguin Conservation and Management Plan.* IUCN/SSC Conservation Breeding Specialist Group, Apple Valley, MN.

Fitter, R., and Fitter, M. (eds). (1987) *The Road to Extinction*. IUCN, Gland, Switzerland.

Fowbert, J. A. and Lewis Smith, R.I. (1994) Rapid population increases in native vascular plants in the Argentine Islands, Antarctic Peninsula. *Arctic and Alpine Research*, 26: 290-296.

Fraser, W. R., *et al.* (1992) Increases in Antarctic penguin populations: reduced competition with whales or a loss of sea ice due to environmental warming? *Polar Biology* 11: 525-531.

Harris, J., *et al*. (2007) A new approach to selecting Marine Protected Areas (MPAs) in the Southern Ocean. *Antarctic Science* 19, 189-194.

IUCN. 2000. *IUCN Red List Categories*. IUCN, Gland, Switzerland.

Pauly, D. *et al.* (1998) Fishing down marine food webs. *Science* 279, 860-863.

Stahel, C., and Gales, R. 1987. *Little Penguin: Fairy Penguins in Australia,* New South Wales University Press

Stephenson, R. 1997. Effects of oil and other surface-active organic pollutants on aquatic birds. *Environmental Conservation* 24, 121-129.

Appendix I.
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