DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[FWS–R9–IA–2008–0069; 96000–1671–0000–B6]

RIN 1018–AV73

Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List Four Penguin Species as Threatened or Endangered Under the Endangered Species Act and Proposed Rule To List the Southern Rockhopper Penguin in the Campbell Plateau Portion of Its Range

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule and notice of 12-month petition finding.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 12-month finding on a petition to list four species of penguins as threatened or endangered under the Endangered Species Act of 1973, as amended (Act). After a thorough review of all available scientific and commercial information, we find that the petitioned action for the Campbell Plateau portion of the range of the New Zealand/Australia Distinct Population Segment (DPS) of the southern rockhopper penguin (*Eudyptes chrysocome*) is warranted, and we propose to list this species as threatened under the Act in the Campbell Plateau portion of its range. This proposal, if made final, would extend the Act's protection to this species in that portion of its range. In addition, we find that listing under the Act is not warranted for the remainder of the range of the southern rockhopper penguin and throughout all or any portion of the range for the northern rockhopper penguin (*Eudyptes moseleyi*), macaroni penguin (*Eudyptes chrysolophus*), and emperor penguin (*Aptenodytes forsteri*).

DATES: We made the finding announced in this document on December 18, 2008. We will accept comments and information on the proposed rule received or postmarked on or before February 17, 2009. We must receive requests for public hearings on the proposed rule, in writing, at the address shown in the **FOR FURTHER INFORMATION CONTACT** section by February 2, 2009.

ADDRESSES: *Comments on Proposed Rule*: If you wish to comment on the proposed rule to list the southern rockhopper penguin in the Campbell Plateau portion of its range, you may submit comments by one of the following methods:

- Federal eRulemaking Portal: *http://www.regulations.gov*. Follow the instructions for submitting comments.
- U.S. mail or hand-delivery: Public Comments Processing, Attn: [FWS–R9–IA–2008–0069]; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, Suite 222; Arlington, VA 22203.

We will not accept comments by e-mail or fax. We will post all comments on *http://www.regulations.gov*. This generally means that we will post any personal information you provide us (see the Public Comments Solicited section below for more information).

Supporting Documents for 12-Month Finding: Supporting documentation we used in preparing this finding is available for public inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Division of Scientific Authority, 4401 N. Fairfax Drive, Room 110, Arlington, VA 22203; telephone 703–358–1708; facsimile 703–358–2276. Please submit any new information, materials, comments, or questions concerning this finding to the above address.

FOR FURTHER INFORMATION CONTACT: Pamela Hall, Branch Chief, Division of Scientific Authority, U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, Room 110, Arlington, VA 22203; telephone 703–358–1708; facsimile 703–358–2276. If you use a telecommunications device for the deaf (TDD), call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(A) of the Act (16 U.S.C. 1533(b)(3)(A)) requires the Service to make a finding known as a ''90-day finding,'' on whether a petition to add, remove, or reclassify a species from the list of endangered or threatened species has presented substantial information indicating that the requested action may be warranted. To the maximum extent practicable, the finding shall be made within 90 days following receipt of the petition and published promptly in the **Federal Register**. If the Service finds that the petition has presented substantial information indicating that the requested action may be warranted (referred to as a positive finding), section 4(b)(3)(A) of the Act requires the Service to commence a status review of the species if one has not already been initiated under the Service's internal candidate assessment process. In addition, section 4(b)(3)(B) of the Act requires the Service to make a finding within 12 months following receipt of the petition on whether the requested action is warranted, not warranted, or warranted but precluded by higher-priority listing actions (this finding is referred to as the ''12-month finding''). Section 4(b)(3)(C) of the Act requires that a finding of warranted but precluded for petitioned species should be treated as having been resubmitted on the date of the warranted but precluded finding, and is, therefore, subject to a new finding within 1 year and subsequently thereafter until we take action on a proposal to list or withdraw our original finding. The Service publishes an annual notice of resubmitted petition findings (annual notice) for all foreign species for which listings were previously found to be warranted but precluded.

In this notice, we announce a 12-month finding on the petition to list four penguins: southern rockhopper penguin, northern rockhopper penguin, macaroni penguin, and emperor penguin. We will announce the 12-month findings for the African penguin (*Spheniscus demersus*), yellow-eyed penguin (*Megadyptes antipodes*), white-flippered penguin (*Eudyptula minor albosignata*), Fiordland crested penguin (Eudyptes pachyrhynchus), Humboldt penguin (*Spheniscus humboldti*), and erect-crested penguin (*Eudyptes sclateri*) in one or more separate **Federal Register** notice(s).

Previous Federal Actions

On November 29, 2006, the Service received a petition from the Center for Biological Diversity to list 12 penguin species under the Act: Emperor penguin, southern rockhopper penguin, northern rockhopper penguin, Fiordland crested penguin, snares crested penguin (*Eudyptes robustus*), erect-crested penguin, macaroni penguin, royal penguin (*Eudyptes schlegeli*), white-flippered penguin, yellow-eyed penguin, African penguin, and Humboldt penguin. Among them, the ranges of the 12 penguin species include Antarctica, Argentina, Australian Territory Islands, Chile, French Territory Islands, Namibia, New Zealand, Peru, South Africa, and United Kingdom Territory Islands. The petition is clearly identified as such, and contains detailed information on the natural history, biology, status, and distribution of each of the 12 species. It also contains information on what the petitioner reported as potential threats to the species from climate change and changes to the marine environment, commercial fishing activities, contaminants and pollution, guano extraction, habitat loss, hunting, nonnative predator species, and other factors. The petition also discusses existing regulatory mechanisms and the perceived inadequacies to protect these species.

In the **Federal Register** of July 11, 2007 (72 FR 37695), we published a 90-day finding in which we determined that the petition presented substantial scientific or commercial information to indicate that listing 10 species of penguins as endangered or threatened may be warranted: Emperor penguin, southern rockhopper penguin, northern rockhopper penguin, Fiordland crested penguin, erect-crested penguin, macaroni penguin, white-flippered penguin, yellow-eyed penguin, African penguin, and Humboldt penguin. Furthermore, we determined that the petition did not provide substantial scientific or commercial information indicating that listing the snares crested penguin and the royal penguin as threatened or endangered species may be warranted.

Following the publication of our 90-day finding on this petition, we initiated a status review to determine if listing each of the 10 species is warranted, and opened a 60-day public comment period to allow all interested parties an opportunity to provide information on the status of the 10 species of penguins. The public comment period closed on September 10, 2007. In addition, we attended the International Penguin Conference in Hobart, Tasmania, Australia, a quadrennial meeting of penguin scientists from September 3–7, 2007 (during the open public comment period), to gather information and to ensure that experts were aware of the status review and the open comment period. We also consulted with other agencies and range countries in an effort to gather the best available scientific and commercial information on these species.

During the public comment period, we received over 4,450 submissions from the public, concerned governmental agencies, the scientific community, industry, and other interested parties. Approximately 4,324 e-mails and 31 letters received by U.S. mail or facsimile were part of one letter-writing campaign and were substantively identical. Each letter supported listing under the Act, included a statement identifying ‘‘the threat to penguins from global warming, industrial fishing, oil spills and other factors,’’ and listed the 10 species included in the Service’s 90-day finding. A further group of 73 letters included the same information plus information concerning the impact of ‘‘abnormally warm ocean temperatures and diminished sea ice’’ on penguin food availability and stated that this has led to population declines in southern rockhopper, Humboldt, African, and emperor penguins. These letters stated that the emperor penguin colony at Point Geologie has declined more than 50 percent due to global warming and provided information on krill declines in large areas of the Southern Ocean. They stated that continued warming over the coming decades will dramatically affect Antarctica, the sub-Antarctic islands, the Southern Ocean and the penguins dependent on these ecosystems for survival. A small number of general letters and e-mails drew particular attention to the conservation status of the southern rockhopper penguin in the Falkland Islands.

Twenty submissions provided detailed, substantive information on one or more of the 10 species. These included information from the governments, or government-affiliated scientists, of Argentina, Australia, Namibia, New Zealand, Peru, South Africa, and the United Kingdom, from scientists, from 18 members of the U.S. Congress, and from one non-governmental organization (the original petitioner).

On December 3, 2007, the Service received a 60-day Notice of Intent To Sue from the Center for Biological Diversity (CBD). CBD filed a complaint against the Department of the Interior on February 27, 2008, for failure to make a 12-month finding on the petition. On September 8, 2008, the Service entered into a Settlement Agreement with CBD, in which we agreed to submit to the **Federal Register** 12-month findings for the 10 species of penguins, including the five penguin taxa that are the subject of this proposed rule, on or before December 19, 2008.

We base our findings on a review of the best scientific and commercial information available, including all information received during the public comment period. Under section 4(b)(3)(B) of the Act, we are required to make a finding as to whether listing each of the 10 species of penguins is warranted, not warranted, or warranted but precluded by higher priority listing actions.

Introduction

In this notice, for each of the four species addressed, we first provide background information on the biology of the species. Next, we address each of the categories of factors listed in section 4(a)(1) of the Act. For each factor, we first determine whether any stressors appear to be causing declines in numbers of the species at issue anywhere within the species’ range. If we determine they are, then we evaluate whether these stressors are causing population-level declines that are significant to the determination of the conservation status of the species. If so, we describe it as a ‘‘threat.’’ In the subsequent finding section, we then consider each of the stressors and threats, individually and cumulatively, and make a determination with respect to whether the species is endangered or threatened according to the statutory standard.

The term ‘‘threatened species’’ means any species (or subspecies or, for vertebrates, distinct population segments) that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The Act does not define the term ‘‘foreseeable future.’’ For the purpose of this notice, we define the ‘‘foreseeable future’’ to be the extent to which, given the amount and substance of available data, we can anticipate events or effects, or reliably extrapolate threat trends, such that we reasonably believe that reliable predictions can be made concerning the future as it relates to the status of the species at issue.

Species Information and Factors Affecting the Species

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1) of the Act. The five factors are: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence.

Southern Rockhopper Penguin and Northern Rockhopper Penguins

Taxonomy

Rockhopper penguins are among the smallest of the world’s penguins, averaging 20 inches (in) (52 centimeters (cm)) in length and 6.6 pounds (lbs) (3 kilograms (kg)) in weight. They are the most widespread of the crested penguins (genus *Eudyptes*), and are so named because of the way they hop from boulder to boulder when moving around their rocky colonies. Rockhopper penguins are found on islands from near the Antarctic Polar Front to near the Subtropical Convergence in the South Atlantic and Indian Oceans (Marchant and Higgins 1990, p. 183).

The taxonomy of the rockhopper complex is contentious. Formerly treated as three subspecies (Marchant and Higgins 1990, p. 182), recent papers suggested that these should be treated as two species (Jouventin *et al.* 2006, pp. 3,413–3,423) or three species (Banks *et al.* 2006, pp. 61–67).

Jouventin *et al.* (2006, pp. 3,413–3,423), following up on recorded differences in breeding phenology, song characteristics, and head ornaments used as mating signals, conducted genetic analysis between northern subtropical rockhopper penguins and southern sub-Antarctic penguins using the Subtropical Convergence, a major ecological boundary for marine organisms, as the dividing line between them. Their results supported the separation of *E. chrysocome* into two species, the southern rockhopper (*E. chrysocome*) and the northern rockhopper (*E. moseleyi*).

Another recently published paper in the journal *Polar Biology* confirmed that there is more than one species of rockhopper penguins. Banks *et al.* (2006, pp. 61–67) compared the genetic distances between the three rockhopper subspecies and compared them with such sister species as macaroni penguins. Banks *et al.* (2006, pp. 61–67) suggested that three rockhopper subspecies—southern rockhopper (currently *E. chrysocome chrysocome*), eastern rockhopper (currently *E. chrysocome filholi*), and northern rockhopper (currently *E. chrysocome moseleyi*)—should be split into three species.

BirdLife International (2007, p. 1) has reviewed these two papers and made the decision to adopt, for the purposes of their continued compilation of information on the status of birds, the conclusion of Jouventin *et al.* (2006, p. 3,419) that there are two species of rockhopper penguin. In doing so, they noted that the proposed splitting of an eastern rockhopper species from *E. chrysocome* has been rejected on account of weak morphological differentiations between the circumpolar populations south of the Subtropical Convergence (Banks *et al.* 2006, p. 67). Furthermore those two groups are more closely related to each other in terms of genetic distance than either is to the northern rockhopper penguin (Banks *et al.* 2006, p. 65).

We conclude that, while both analyses have merit, the split into a northern and southern species on the basis of both genetic and morphological differences represents the best available science. On the basis of our review, we accept the BirdLife International treatment of the rockhopper penguins as two species: The northern rockhopper penguin (*E. moseleyi*) and the southern rockhopper penguin (*E. chrysocome*).

Life History

The life histories of northern and southern rockhopper penguins are similar. Breeding begins in early October (the austral spring) when males arrive at the breeding site a few days before females. Breeding takes place as soon as the females arrive, and two eggs are laid 4–5 days apart in early November. The first egg laid is typically smaller than the second, 2.8 versus 3.9 ounces (oz) (80 versus 110 grams (g)), and is the first to hatch. Incubation lasts about 33 days and is divided into three roughly equal shifts. During the first 10-day shift, both parents are in attendance. Then, the male leaves to feed while the female incubates during the second shift. The male returns to take on the third shift. He generally remains for the duration of incubation and afterward to brood the chicks while the female leaves to forage and returns to feed the chicks. Such a system of extended shift duration requires lengthy fasts for both parents, but allows them to forage farther afield than would be the case if they had a daily change-over. The newly hatched chicks may have to wait up to a week before the female returns with their first feed. During this period, chicks are able to survive on existing yolk reserves, after which they begin receiving regular feedings of around 5 oz (150 g) in weight. By the end of the 25 days of brooding, chicks are receiving regular feedings averaging around 1 lb 5 oz (600 g). By this stage they are able to leave the nest and crèche with other chicks, allowing both adults to forage to meet the chicks' increasing demands for food (Marchant and Higgins 1990, p. 190).

Northern rockhopper penguins and birds in the eastern colonies of southern rockhopper penguins typically rear only one of the two chicks. However, southern rockhopper penguins near the Falkland Islands are capable of rearing both chicks to fledging when conditions are favorable (Guinard *et al.* 1998, p. 226). In spite of this difference, southern rockhopper penguins average successful breeding of one chick per pair annually for the colony as a whole. Chicks fledge at around 10 weeks of age, and adults then spend 20–25 days at sea building up body fat reserves in preparation for their annual molt. The molt lasts for around 25 days, and the birds then abandon the breeding site. They spend the winter feeding at sea, prior to returning the following spring (Marchant and Higgins 1990, p. 185).

The range of southern and northern rockhopper penguins includes breeding habitat on temperate and sub-Antarctic islands around the Southern Hemisphere and marine foraging areas. In the breeding season, these marine foraging areas may lie within as little as 6 miles (mi) (10 kilometers (km)) of the colony (as at the Crozet Archipelago in the Indian Ocean), as distant as 97 mi (157 km) (as at the Prince Edward Islands in the Indian Ocean), or for male rockhoppers foraging during the incubation stage at the Falkland Islands in the Southwest Atlantic, as much as 289 mi (466 km) away (Sagar *et al.* 2005, p. 79; Putz *et al.* 2003b, p. 141). Foraging ranges vary according to the geographic, geologic, and oceanographic location of the breeding sites and their proximity to sea floor features (such as the continental slope and its margins or the sub-Antarctic slope) and oceanographic features (such as the polar frontal zone or the Falkland current) (Sagar *et al.* 2005, pp. 79–80). Winter at-sea foraging areas are less well-documented, but penguins from the Staten Island breeding colony at the tip of South America dispersed over a range of 501,800 square miles (mi^2) (1.3 million square kilometers (km^2)) covering polar, sub-polar, and temperate waters in oceanic regions of the Atlantic and Pacific as well as shelf waters (Putz *et al.* 2006, p. 735) and traveled up to 1,242 mi (2,000 km) from the colony.

Southern Rockhopper Penguin

Distribution

The southern rockhopper penguin (*Eudyptes chrysocome*) is widely distributed around the Southern Ocean, breeding on many sub-Antarctic islands in the Indian and Atlantic Oceans (Shirihai 2002, p. 71). The species breeds on the Falkland Islands (United Kingdom, Argentina), Penguin and Staten Islands (Argentina) at the southern tip of South America, and islands of southern Chile. Farther to the east, the southern rockhopper penguin breeds on Prince Edward Islands (South Africa); Crozet and Kerguelen Islands (French Southern Territories); Heard, McDonald, and Macquarie Islands (Australia); and Campbell, Auckland, and Antipodes Islands (New Zealand) (BirdLife International 2007, pp. 2–3; Woehler 1993, pp. 58–61).

Population

Falkland Islands

At the Falkland Islands, between the census in 1932–33 and the census in 1995–96, there was a decline of more than 80 percent, with an overall rate of decline of 2.75 percent per year (Putz *et al.* 2003a, p. 174). Reports of even greater declines (Bingham 1998, p. 223) have been revised after re-analysis of the original 1930's census data, which recorded an estimated 1.5 million southern rockhopper breeding pairs (Putz *et al.* 2003a, p. 174). The census in 2000–01 of 272,000 breeding pairs indicated stable numbers since the mid-1990s (297,000 breeding pairs) in the Falkland Islands (Clausen and Huin 2003, p. 389), although further declines since then (Putz *et al.* 2006, p. 742), and a lower figure of 210,000 breeding pairs in 2005–06, have been cited (Kirkwood *et al.* 2007, p. 266).

The declines of southern rockhoppers in the Falkland Islands appear not to have been gradual. Clausen and Huin (2003, p. 394) state that ''circumstantial evidence'' suggests that in the early 1980s, there were no more than 500,000 pairs, a decline of 66 percent since the 1930s. By the mid-1990s, the total decline had reached 80 percent. A mass mortality event in the 1985–86 breeding season killed thousands of penguins and was linked to starvation before molt (Putz *et al.* 2003a, p. 174; Keyme *et al.* 2001, p. 168). In summary, although there has been a long-term decline in numbers at the Falkland Islands, numbers have not declined at a consistent rate, but rather, there have been periodic declines over a long period of time. As mentioned below, Schiavini (2000, p. 290) suggested that Falkland Island birds may be dispersing to Staten Island, potentially contributing to the stable or increasing numbers there.

Southern Tip of South America

In the region of the southern tip of South America, large numbers of southern rockhopper penguins are reported with approximately 180,000 breeding pairs in southern Argentina at Staten Island (Schiavini 2000, p. 286; Kirkwood *et al.* 2007, p. 266), 134,000 breeding pairs at Isla Noir (Oehler 2005, p. 7), 86,400 breeding pairs at Ildefonso Archipelago, and 132,721 breeding pairs at Diego Ramirez Archipelago (Kirkwood *et al.* 2007, p. 265). Kirkwood *et al.* (2007, p. 266) concluded that numbers for the southern tip of South America are approximately 555,000 breeding pairs. These relatively recent estimates are substantially larger than previous estimates of 175,000 breeding pairs reported in Woehler (1993, p. 61), but it is unclear whether this reflects population increases or more comprehensive surveys. In the Chilean archipelago, Kirkwood *et al.* (2007, p. 266) found no substantive evidence for overall changes in the number of penguins between the early 1980s and 2002, although one colony in the region (the Isla Recalada colony, a historical breeding site) declined from 10,000 pairs in 1989 to none in 2005 (Oehler *et al.* 2007, p. 505). On the Argentine side, Schiavini (2000, p. 290) stated that the numbers at Staten Island are stable or increasing, perhaps as a result of a flux of birds from the Falkland Islands. In summary, the overall number of southern rockhopper penguins at the Falklands and the southern tip of South America is estimated at 765,000 breeding pairs distributed as follows: Falkland Islands, 27 percent; Argentina, 24 percent; and Chile, 48 percent. Based on the available information, there does not appear to be a declining trend in southern rockhopper penguin numbers on the southern tip of South America. Although there may have been population increases in the region based on the reported population numbers, it is unclear if these higher numbers reflect true increases in numbers, more comprehensive surveys, or movement of other penguins from the Falkland Islands.

Prince Edward Islands

Two species of *Eudyptes* penguins breed at Marion Island (46.9 degrees (°) South (S) latitude, 37.9° East (E) longitude), one of two islands in the sub-Antarctic Prince Edward Islands group in the southwest Indian Ocean. They are the southern rockhopper penguin (*E. chrysocome*) and the macaroni penguin (*E. chrysolophus*). For southern rockhopper penguins, the numbers of birds estimated to breed at Marion Island decreased by 61 percent from 173,000 pairs in 1994–95 to 67,000 pairs in 2001–02 (Crawford *et al.* 2003, p. 490). The number of southern rockhopper penguins at nearby Prince Edward Island appears to have been stable since the 1980s with 35,000–45,000 pairs present (Crawford *et al.* 2003, p. 496). The decreases at Marion Island are thought to result from poor breeding success, with fledging rates lower than required for the colonies to remain in equilibrium; a decrease in the mass of males and females on arrival at the colony for breeding; and low mass of chicks at fledging (Crawford *et al.* 2003, p. 496). These changes are attributed to an inadequate supply of food for southern rockhopper penguins at Marion Island (Crawford *et al.* 2003, p. 487), presumably from a decrease in the availability of crustaceans or competition with other predators for food (Crawford *et al.* 2003, p. 496). Winter grounds of southern rockhopper penguins are not known. However, over-wintering conditions, which are reflected in the condition of birds arriving to breed, influence the proportion of adults that breed in the following summer and the outcome of breeding (Crawford *et al.* 2006, p. 185).

Crozet and Kerguelen Islands

Jouventin *et al.* (2006, p. 3,417) referenced 1984 data from French Indian Ocean territories that showed 264,000 breeding pairs at Crozet Islands and 200,000 breeding pairs at Kerguelen Island. These figures did not agree with those presented by Woehler (1993, pp. 59–60) and, if accurate, represent an increase of about 25 percent for the Crozet Islands and over 100 percent for Kerguelen. We are not aware of reported declines at the Crozet and Kerguelen Islands.

Heard, McDonald, and Macquarie Islands

Numbers at Heard and McDonald Islands (Australia) are reported as small, with an ''order of magnitude estimate'' of greater than 10,000 pairs for Heard Island and greater than 10 pairs for McDonald (Woehler 1993, p. 60). No information has been reported on trends in numbers in these areas. Order of magnitude estimates at Macquarie Island (Australia) reported 100,000–300,000 pairs in the early 1980s (Woehler 1993, p. 60; Taylor 2000, p. 54). The 2006 Management Plan for the Macquarie Island Nature Reserve and World Heritage Area reported that the total number of southern rockhopper penguins in this area may be as high as 100,000 breeding pairs, but estimates from 2006–07 indicate 32,000–43,000 breeding pairs at Macquarie Island (BirdLife International 2008b, p. 2). Given the large range in the earlier categorical estimate, we cannot evaluate whether the more recent estimate represents a decline in numbers or a more precise estimate.

Campbell, Auckland, and Antipodes Islands

In New Zealand territory, southern rockhopper numbers at Campbell Island declined by 94 percent between the early 1940s and 1985 from approximately 800,000 breeding pairs to 51,500 (Cunningham and Moors 1994, p. 34). The majority of the decline appears to have coincided with a period of warmed sea surface temperatures between 1946 and 1956. It is widely inferred that warmer waters most likely affected southern rockhopper penguins through changes in the abundance, availability, and distribution of their food supply (Cunningham and Moors 1994, p. 34); recent research suggests they may have had to work harder to find the same food (Thompson and Sagar 2002, p. 11). According to standard photographic monitoring, numbers in most colonies at Campbell Island continued to decline from 1985 to the mid-1990s (Taylor 2000, p. 54), although the extent of such declines has not been quantified in the literature. The New Zealand Department of Conservation (DOC) provided preliminary information from a 2007 Campbell Island survey team that ''the population is still in decline'' (D. Houston 2008, p. 1), but quantitative analysis of these data have not yet been completed. At the Auckland Islands, a survey in 1990 found 10 colonies produced an estimate of 2,700–3,600 breeding pairs of southern rockhopper penguins (Cooper 1992, p. 66). This was a decrease from 1983, when 5,000–10,000 pairs were counted (Taylor 2000, p. 54). There has been a large decline at Antipodes Islands from 50,000 breeding pairs in 1978 to 3,400 pairs in 1995 (Taylor 2000, p. 54). There is no more recent data for Auckland or Antipodes Islands (D. Houston 2008, p. 1).

Other Status Classifications

The IUCN (International Union for Conservation of Nature) Red List classifies the southern rockhopper penguin as 'Vulnerable' due to rapid population declines, which ''appear to have worsened in recent years.''

Summary of Factors Affecting the Species

Factor A: The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Terrestrial Habitat

There are few reports of destruction, modification, or curtailment of the terrestrial habitat of the southern rockhopper penguin. Analyses of large-scale declines of southern rockhopper penguins have uniformly ruled out that impacts to the terrestrial habitat have been a limiting factor to the species (Cunningham and Moors 1994, p. 34; Keyme *et al.* 2001, pp. 159–169; Clausen and Huin 2003, p. 394), and we have no reason to believe threats to the terrestrial habitat will emerge in the foreseeable future.

Climate-Related Changes in the Marine Environment

Reports of major decreases in southern rockhopper penguin numbers have been linked to sea surface temperature changes and other apparent or assumed oceanographic or prey shifts in the vicinity of southern rockhopper penguin breeding colonies or their wintering grounds. Actual empirical evidence of changes has been difficult to compile, and conclusions of causality for observations at one site are often inferred from data from other studies at other sites, which may or may not be pertinent. In the most cited study, Cunningham and Moors (1994, pp. 27–36) concluded that drastic southern rockhopper penguin declines were related to increased sea surface temperature changes at Campbell Island in New Zealand. In another study, Crawford *et al.* (2003, p. 496) hypothesized altered distribution or decreased abundance of marine prey at Marion Island, where mean sea surface temperature increased by 2.5 degrees Fahrenheit (°F) (1.4 degrees Celsius (°C)) between 1949 and 2002, as a factor in a decline of southern rockhopper penguin numbers by 61 percent during that period (Crawford and Cooper 2003, p. 415). Clausen and Huin (2003, p. 394), in discussing the factors that may be responsible for large-scale declines in this species at the Falkland Islands since the 1930s (and especially in the mid-1980s), found the most plausible explanation to be changes in sea surface temperatures, which could in turn affect the available food supply (Clausen and Huin 2003, p. 394). Extreme El Niño-like warming of surface waters occurred during the 1985–86 period when the most severe decline occurred at the Falkland Islands (Boersma 1987, p. 96; Keyme *et al.* 2001, p. 168). None of these authors cites historical fisheries data to corroborate the hypothesis that prey abundance has been affected by changes in sea surface temperatures.

As noted above, changes in oceanographic conditions and their possible impact on prey have been cited in reports of southern rockhopper penguin declines around the world (Cunningham and Moors 1994, pp. 27–36; Crawford *et al.* 2003, p. 496; Crawford and Cooper 2003, p. 415; Clausen and Huin 2003, p. 394). We examine the case of Campbell Island in depth in the following paragraphs, since this provides the most studied example.

At Campbell Island, a 94-percent decrease in southern rockhopper penguin numbers occurred between the early 1940s and 1985. Cunningham and Moors (1994, pp. 27–36) compared the pattern of the penguin decline (from 800,000 breeding pairs in the early 1940s to 51,500 pairs in 1985) to patterns of sea surface temperature change. The authors concluded that drastic southern rockhopper penguin declines were related to increased sea surface temperature changes at Campbell Island. They found that peaks in temperature were related to the periods of largest decline in numbers within colonies, in particular in 1948–49 and 1953–54. One study colony rebounded in cooler temperatures in the 1960s; however, with temperature stabilization at higher levels (mean 49.5 °F (9.7 °C)) in the 1970s, declines continued. Colony sizes have continued to decline into the 1990s (Taylor 2000, p. 54), and preliminary survey data indicate that numbers at Campbell Island continue to decline (Houston 2008, p. 1).

Cunningham and Moors (1994, p. 34) concluded that warmer waters most likely affected the diet of the Campbell Island southern rockhopper penguins. In the absence of data on the 1940's diet of Campbell Island southern rockhopper penguins, the authors compared the 1980's diet of the species at Campbell Island to southern rockhopper penguins elsewhere. They found the Campbell Island penguins eating primarily fish—southern blue whiting (*Micromesisteus australis*), dwarf codling (*Austrophycis marginata*), and southern hake (*Merluccius australis*)—while elsewhere southern rockhopper penguins were reported to eat mainly euphausiid crustaceans (krill) and smaller amounts of fish and squid. Based on this comparison of different areas, the authors concluded that euphausiids left the Campbell Island area when temperatures changed, forcing the southern rockhopper penguins to adopt an apparently atypical, and presumably less nutritious, fish diet. The authors concluded that this led to lower departure weights of chicks and contributed to adult declines (Cunningham and Moors 1994, p. 34).

Subsequent research, however, has not supported the theory that southern rockhopper penguins at Campbell Island switched prey as their ''normal'' euphausiid prey moved to cooler waters (Cunningham and Moors 1994, pp. 34–35). This hypothesis has been tested through stable isotope studies, which can be used to extract historical dietary information from bird tissues (*e.g.*, feathers). In analyses of samples from the late 1800s to the present at Campbell Island and Antipodes Islands, Thompson and Sagar (2002, p. 11) found no evidence of a shift in southern rockhopper penguin diet during the period of decline. They concluded that southern rockhopper penguins did not switch to a less suitable prey, but that overall marine productivity and the carrying capacity of the marine ecosystem declined beginning in the 1940s. With food abundance declining or food moving farther offshore or into deeper water, according to these authors, the southern rockhopper penguins maintained their diet over the long timescale, but were unable to find enough food in the less productive marine ecosystem (Thompson and Sagar 2002, p. 12).

Hilton *et al.* (2006, pp. 611–625) expanded the study of carbon isotope ratios in southern and northern rockhopper penguin feathers to most breeding areas, except those at the Falkland Islands and the tip of South America, to look for global trends that might help explain the declines observed at Campbell Island. They found no clear global-scale explanation for large spatial and temporal-scale rockhopper penguin declines. While they found general support for lower primary productivity in the ecosystems in which rockhopper penguins feed, there were significant differences between sites. There was evidence of a shift in diet to lower trophic levels over time and in warm years, but the data did not support the idea that the shift toward lower primary productivity reflected in the diet resulted from an overall trend of rising sea temperatures (Hilton *et al.* 2006, p. 620). No detectable relationship between carbon isotope ratios and annual mean sea surface temperatures was found (Hilton *et al.* 2006, p. 620).

In the absence of conclusive evidence for sea surface temperature changes as an explanation for reduced primary productivity, Hilton *et al.* (2006, p. 621) suggested that historical top-down effects in the food chain might have caused a reduction in phytoplankton growth rates. Reduced grazing pressure resulting from the large-scale removal of predators from the sub-Antarctic could have resulted in larger standing stocks of phytoplankton, which in turn could have led to lowered cell growth rates (which would be reflected in isotope ratios), with no effect on overall productivity of the system. Postulated top-down effects on the ecosystem of southern rockhopper penguins, which occurred in the time period before the warming first noted in the original Cunningham and Moors (1994, p. 34) study, are the hunting of pinniped populations to near extinction in the 18th and 19th centuries and the subsequent severe exploitation of baleen whale (Balaenopteridae) populations in the 19th and 20th centuries (Hilton *et al.* 2006, p. 621). While this top-down theory may explain the regional shift toward reduced primary productivity, it does not explain the decrease in abundance of food at specific penguin breeding and foraging areas.

Hilton *et al.* (2006, p. 621) concluded that considerably more development of the links between isotopic monitoring of rockhopper penguins and the analysis of larger-scale oceanographic data is needed to understand effects of human activities on the sub-Antarctic marine ecosystem and the links between rockhopper penguin demography, ecology, and environment.

Meteorologically, the events described for Campbell Island from the 1940s until 1985, including the period of oceanic warming, occurred after a record cool period in the New Zealand region between 1900 and 1935, the coldest period since record-keeping began (Cunningham and Moors 1994, p. 35). These historical temperature changes have been attributed to fluctuations in the position of the Antarctic Polar Front caused by changes in the westerly-wind belt (Cunningham and Moors 1994, p. 35). Photographic evidence suggests that southern rockhopper penguin numbers may have been significantly expanding as the early 1900s cool period came to an end (Cunningham and Moors 1994, p. 33) and just before the rapid decrease in numbers.

Without longer-term data sets on southern rockhopper fluctuations in numbers of penguins at Campbell Island and longer temperature data records at a scale appropriate to evaluating impacts on this particular breeding colony, it is difficult to draw conclusions on the situation described there. There are even fewer data for Auckland and Antipodes Islands.

For now, local-scale observations may be of more utility in explaining mass declines of southern rockhopper penguins. At the Falkland Islands, the mass starvation event of 1985–86 coincided with a Pacific El Niño event, and the unusually long and hot southern summer in the southwest Atlantic was analogous to the Pacific El Niño (Boersma 1987, p. 96; Keyme *et al.* 2001, p. 160). There was an influx of warm water seabirds from the north, indicating movement of warm water into the area, and it was hypothesized that warm weather negatively affected the growth and presence of food in a manner similar to what occurs when the warm El Niño current extends southwards off the Pacific coast of Peru. Perturbations of upwellings essential to sustaining the normal food chain appear to have been caused by unusually strong westerly winds in the Atlantic, with prey failure leading to a starvation event (Boersma 1987, p. 96; Keyme *et al.* 2001, p. 168). The severe El Niño event of 1996–97 has also been cited as a possible factor in the decline and disappearance of the small Isla Recalada colony in Chile, with the suggestion that response to this climatic event may have been one factor leading birds at this colony to disperse to other areas such as the large Isla Noir colony 75 mi (125 km) away (Oehler *et al.* 2007, pp. 502, 505).

In other local-scale observations, studies of winter behavior of southern rockhopper penguins foraging from colonies at Staten Island, Argentina, indicated that penguins respond behaviorally to different oceanographic conditions such as seasonal differences in sea surface temperatures by changing foraging strategies. Even with such behavioral plasticity, differences in winter foraging conditions (for example, between an average and a cold year) led to differences in adult survival, return rates to breeding colonies, and breeding success between years (Rey *et al.* 2007, p. 285).

Changes in the marine environment and possible shifts in food abundance or distribution in the marine environment have been cited as leading to historical and present-day declines in three areas within the distribution of southern rockhopper penguins around the world—the Falkland Islands in the South Atlantic (80-percent decline), Marion Island in the Indian Ocean (61-percent), and the New Zealand sub-Antarctic islands (Campbell Island (94-percent), Auckland Island (50-percent), and the Antipodes Islands (93-percent)).

While southern rockhopper penguin numbers have declined in some areas, there are significant areas of the southern rockhopper range (representing about one million pairs) where numbers have remained stable or increased. This indicates that the severity and pervasiveness of these factors in the marine environment are not uniform throughout the species' range. For example, declines have been reported at the Falkland Islands; however, nearby colonies at the southern tip of South America appear to have increased and now represent 72 percent of southern rockhopper abundance in the larger south Atlantic and southeast Pacific region. Similarly, at the Prince Edward Islands, declines have been documented at Marion Island; however, colonies at nearby Prince Edward Island have remained stable. As noted above, in large areas of the Indian Ocean, including the French Indian Ocean territories at Kerguelen and Crozet Islands, large numbers are stable or increasing.

This difference in trends in locations within the species' range, and the limitation of declines to regional areas, illustrates that while temperature changes in the marine environment have been widely cited as an indicator of changing oceanographic conditions for southern rockhopper penguins, there is not a unitary explanation for phenomena observed in the widely scattered breeding locations across the Southern Hemisphere. In fact, as illustrated for the most studied example at Campbell Island, a detailed analysis of causality has so far led to further questions, rather than a narrowing down of answers. Nevertheless, in the absence of any major factors on land, the best available information indicates that some change in the oceanographic ecosystem has led to past declines in southern rockhopper penguins in some regions and has the potential to lead to future declines in southern rockhopper penguin colonies in those regions of New Zealand.

Large-scale measurements show that temperature changes have been occurring in the Southern Ocean since the 1960s. Overall, the upper ocean has warmed since the 1960s with dominant changes in the thick near-surface layers called ''sub-Antarctic Mode waters,'' located just north of the Antarctic Circumpolar Current (ACC) (Bindoff *et al.* 2007, p. 401). In mid-depth waters—2,952 feet (ft) (900 meters (m))—temperatures have increased throughout most of the Southern Ocean, having risen 0.31 °F (0.17 °C) between the 1950s and 1980s (Gille 2002, p. 1,275). However, the ocean temperature trends described are at too large a scale to relate meaningfully to the demographics of the southern rockhopper penguins, whether at any single penguin colony or breeding or foraging area, or to the variation in trends in colonies around the world at larger scales. We have noted above that attempts to ascribe trends in rockhopper penguin numbers to large-scale sea-temperature changes using biological measurements of southern rockhopper population and foraging parameters have been unsuccessful in revealing any causal links.

Despite larger-scale conclusions that Southern Ocean warming is occurring, we have not identified sea temperature data on an appropriate oceanographic scale to evaluate either historical trends or to make predictions on future trends and whether they will affect southern rockhoppers across the New Zealand/Australia region. For example, Gille (2002, p. 1,276) presented a figure of historical Southern Ocean deep-water temperatures to illustrate an overall warming trend. However, while the scale of measurement is too large to draw any conclusions at a local-scale, in the region of the New Zealand/Australia portion of the species' range, the figure provided appears to show that ocean temperatures have decreased on average from the 1950s to the 1990s.

Looking at the situation from the perspective of physical oceanography, attempts to describe the relationship between southern rockhopper penguin population trends and trends in ocean temperatures, based on large-scale oceanographic observations of temperature trends in the Southern Ocean, and to arrive at historical or predictive models of the impact of temperature trends on penguins are equally difficult. Such analyses are hampered by: (1) The fact that measurements of temperature and temperature trends are provided at an ocean-wide scale; (2) the measurement and averaging of temperatures over large water bodies or depths, which do not allow analysis of impacts at any one site or region or allow explanation of divergent trends between colonies in the same region; (3) lack of real-time data on temperature and trends at biologically meaningful geographical scales in the vicinity of breeding or foraging habitat for penguins; and (4) absence of consistent monitoring of southern rockhopper penguin abundance and demographic and biological parameters to relate to such oceanographic measurements. We have insufficient information to draw conclusions on whether directional changes in ocean temperatures are affecting southern rockhopper penguins throughout all of their range.

We have examined areas of the range of the southern rockhopper penguin where numbers have declined, such as at Campbell Island and the Falkland Islands. At the same time, numbers in the majority of the range of the southern rockhopper penguin have remained stable or increased. For example, in the region of the southern tip of South America, numbers have increased and now represent 72 percent of southern rockhopper abundance in the larger south Atlantic and southeast Pacific regions. At the Prince Edward Islands, declines at Marion Island have been accompanied by stability at nearby Prince Edward Island. At Kerguelen and Crozet Islands, numbers are increasing or stable.

Within the New Zealand/Australia portion of the species' range, the New Zealand islands have experienced severe declines; however, trend information for the Australian Macquarie Island colonies is much less certain, given the poor quality of the baseline estimate at Macquarie. Based on our review of the best available information (see above), we conclude that changes to the marine environment, which influence the southern rockhopper penguin, have affected the Campbell Plateau, but their effects on the Macquarie Ridge region are unknown. In the absence of identification of other significant threat factors and in light of the best available scientific information indicating that prey availability, productivity, or sea temperatures are affecting southern rockhopper penguins within the Campbell Plateau, we find that changes to the marine environment is a threat to the Campbell Plateau colonies of southern rockhopper penguins at Campbell, Auckland, and Antipodes Islands.

While rockhopper penguin numbers in certain areas of the species' range have been affected by changes to the marine environment, numbers in the majority of the range are stable or increasing. This indicates that the severity and pervasiveness of stressors in the marine environment are not uniform throughout the species' range, and we have not identified sea-temperature data on an appropriate oceanographic scale to be able to identify broad-scale trends or to make predictions on future trends about whether changes to the marine environment will affect southern rockhoppers penguins either across its range or within the New Zealand/Australia region.

On this basis, we find that the present or threatened destruction, modification, or curtailment of both its terrestrial and marine habitats is not a threat to the southern rockhopper penguin throughout all of its range now or in the future.

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Despite the overall increase in southern rockhopper penguin numbers in southern Chile, the Isla Recalada colony—a historical breeding site—declined from 10,000 pairs in 1989 to none in 2005 (Oehler *et al.* 2007, p. 505). In attempting to explain this local decline, Oehler *et al.* (2007, p. 505) cited the collection of adult penguins for export to zoological parks from 1984–1992 as a disturbance that may have caused adult penguins to move to other areas, but this has not been verified. The authors also reported that between 1992 and 1997, in times of shortage of fish bait, local fishermen harvested adult southern rockhopper penguins at the Isla Recalada colony for bait for crab pots (Oehler *et al.* 2007, p. 505), but we have no information on the effect of this stressor in terms of numbers of individuals lost from the colony.

Collection for zoological parks is now prohibited, and the species is not found in trade (Ellis *et al.* 1998, p. 54). There is no information that suggests this ban will be lifted in the future.

Tourism and other human disturbance impacts are reported to have little effect on southern rockhopper penguins (BirdLife International 2007, p. 3).

In summary, although there is some evidence of historical and even relatively recent take of southern rockhopper penguins from the wild for human use, collection for zoological parks is no longer occurring, and other harvest that may be occurring for fish bait is not on a large enough scale to be a threat to this species. We have no reason to believe the levels of utilization will increase in the future. Therefore, we find that overutilization for commercial, recreational, scientific, or educational purposes is not a threat to the species in any portion of its range now or in the future.

Factor C: Disease or Predation

Investigations have ruled out disease as a significant factor in major population declines at Campbell Island in the 1940s and 1950s or in the sharp declines in the mid-1980s at the Falkland Islands. At Campbell Island, de Lisle *et al.* (1990, pp. 283–285) isolated avian cholera (*Pasteurella multocida*) from the lungs of dead chicks and adults sampled during the year of decline 1985–86 and the subsequent year 1986–87. They were unable to determine whether this was a natural infection in southern rockhopper penguins or one that had been introduced through the vectors of rats, domestic poultry, cats (*Felis catus*), dogs (*Canis familiaris*), or livestock that have been prevalent on the island in the past. While the disease was isolated in four separate colonies along the coast of Campbell Island, and there was evidence of very limited mortality from the disease, the authors concluded there was no evidence that mortality from this pathogen on its own may have caused the decline in numbers at Campbell Island (Cunningham and Moors 1994, p. 34). Assays for a variety of other infectious avian diseases found no antibody responses in southern rockhopper penguins at Campbell Island (de Lisle *et al.* 1990, pp. 284–285).

Following the precipitous decline of southern rockhopper penguins at the Falkland Islands in the 1985–86 breeding season, examinations and full necropsies were carried out for a large number of individuals. Mortality was primarily attributed to starvation. A large number of predisposing factors were ruled out, such as anthropogenic factors (oiling, fish net mortality, ingestion of plastic, trauma, or trapping at sea or on breeding grounds) or natural causes (heavy predation on or near breeding grounds, botulism at the breeding grounds, or dinoflagellate poisoning caused by red tides). Infectious diseases were considered in depth, but no specific disease was identified (Keyme *et al.* 2001, p. 166). A secondary factor, ''puffinosis,'' caused ulcers on the feet of some young penguins, but no mortality was associated with these lesions (Keyme *et al.* 2001, p. 167). Examination for potential toxic agents found high tissue concentrations for only cadmium; however, cadmium levels did not differ between the year of high mortality and the subsequent year when no unusual mortality occurred (Keyme *et al.* 2001, pp. 163–165).

Bester *et al.* (2003, pp. 549–554) reported on the recolonization of sub-Antarctic fur seals (*Arctocephalus tropicalis*) and Antarctic fur seals (*Arctocephalus gazelle*) at Prince Edward Island. Rapid fur seal recolonization is taking place at this island. There are now an estimated minimum 72,000 sub-Antarctic fur seals (Bester *et al.* 2003, p. 553); the population has grown 9.5 percent annually since 1997–98. Similarly, at Marion Island, sub-Antarctic fur seal populations increased exponentially between 1975 and 1995. Adult populations were 49,253 animals in 1994–95. Crawford and Cooper (2003, p. 418) expressed concern that the burgeoning presence of seals at Prince Edward and Marion Islands may be increasingly affecting southern rockhopper penguins through physical displacement from nesting sites, prevention of access to breeding sites, direct predation, and increasing competition between southern rockhopper penguins and seals for prey; however, these potential effects of fur seals on southern rockhopper penguins have not been investigated.

At Campbell Island in New Zealand, de Lisle *et al.* (1990, p. 283) ruled out Norway rats (*Rattus norvegicus*), which were present on the island at the time of precipitous declines, as a factor in those declines. Feral cats are present on Auckland Island, but have not been observed preying on chicks there (Taylor 2000, p. 55). Although it was suggested that introduced predators may affect breeding on Macquarie and Kerguelen Islands (Ellis *et al.* 1998, p. 49), no information was provided to support this idea.

In summary, based on our review of the best available information we find that neither disease nor predation is a threat to the southern rockhopper penguin in any portion of its range, and no information is available that suggests this will change in the future.

Factor D: The Inadequacy of Existing Regulatory Mechanisms

The majority of sub-Antarctic islands are under protected status. For example, all New Zealand sub-Antarctic islands are nationally protected and inscribed as the New Zealand Subantarctic Islands World Heritage sites; human visitation of the islands is tightly restricted at all sites where penguins occur (Taylor 2000, p. 54; BirdLife International 2007, p. 4; UNEP WCMC (United Nations Environmental Program, World Conservation Monitoring Center) 2008a, p. 5). The Australian islands of Macquarie, Heard, and McDonald are also World Heritage sites with limited or no visitation and with management plans in place (UNEP WCMC 2008b, p. 6; UNEP WCMC 2008c, p. 6). In 1995, the Prince Edward Islands Special Nature Preserve was declared and accompanied by the adoption of a formal management plan (Crawford and Cooper 2003, p. 420). Based on our review of the existing regulatory mechanisms in place for each of these areas and our analysis of other threat factors, we find that the only inadequacy in existing regulatory mechanisms regarding the conservation of the southern rockhopper penguin (BirdLife International 2007, p. 4; Ellis *et al.* 1998, pp. 49, 53) to be the inability to ameliorate the effects of changes to the marine environment on the species in the Campbell Plateau portion of its range.

In Chile, collection for zoological display, which used to be permitted, is now prohibited, and the species is not found in trade (Ellis *et al.* 1998, p. 54). Fisheries activities in the Falkland Islands, which have increased dramatically since the 1970s, are now closely regulated. A series of conservation zones has been established, and the number of vessels fishing within these zones is regulated to prevent fish and squid stocks from becoming depleted. The Falkland Island Seabird Monitoring Program has been established to collect baseline data essential to identifying and detecting potential threats to seabirds (Putz *et al.*

2001, p. 794). As discussed under Factor E, current licensing arrangements limit squid harvest to between the beginning of February and the end of May and the beginning of August and the end of October, which minimizes overlap with the southern rockhopper penguin breeding season, when feeding demands are high (October to February) (Putz *et al.* 2001, p. 803).

In summary, aside from the inadequacy of regulatory mechanisms to ameliorate the threat of changes in the marine environment in the Campbell Plateau portion of the species' range, we find that the existing national regulatory mechanisms are adequate regarding the conservation of southern rockhopper penguins in all other parts of the species' range. There is no information available to suggest these regulatory mechanisms will change in the future.

Factor E: Other Natural or Manmade Factors Affecting the Continued Existence of the Species

Fisheries

While competition for prey with commercial fisheries has been listed as a potential factor affecting southern rockhopper penguins in various portions of their range (Ellis *et al.* 1998, pp. 49, 53), we have found that it is only in the Falkland Islands where this potential competition between commercial fisheries and southern rockhopper penguins has emerged and been addressed. Bingham suggests that rapid southern rockhopper penguin declines at the Falkland Islands in the 1980's were a result of uncontrolled commercial fishing (but see analysis of El Niño under Factor A), but reports that following the establishment of a regulatory body in 1988, the effects of over-fishing at the Falkland Islands have been greatly mitigated (Bingham 2002, p. 815), and southern rockhopper penguin populations have stopped declining. At the Falkland Islands, the inshore area adjacent to colonies is not subject to fishing activities (Putz *et al.* 2002, p. 282). The diet of southern rockhopper penguins, in general, is dominated by crustaceans, with fish and squid varying in importance. At the Falkland Islands, squid, in particular Patagonian squid (*Loligo gahi*), is of greater importance in the diet than in other rockhopper penguins (Putz *et al.* 2001, p. 802). The Patagonian squid is also an important commercial species fished around the Falkland Islands. Current licensing arrangements limit squid harvest to between the beginning of February and the end of May and the beginning of August and the end of October, which minimizes overlap with the southern rockhopper penguin breeding season, when feeding demands are high (October to February). Nevertheless, reports of decreasing catch per unit of effort for squid indicate a declining squid stock over the 1990s (Putz *et al.* 2001, p. 803). Coincidentally, Patagonian squid has declined in southern rockhopper penguin diets. However, southern rockhopper penguin diets have shifted to notothenid fish, a prey that has higher nutritional value than squid and that has become more common. It is not certain whether squid abundance or fish abundance is driving the switch. Bingham (1998, p. 6) reported that there is no direct evidence that food availability has been affected by commercial fishing, but both he and Putz *et al.* (2003b, p. 143) drew attention to the need for careful monitoring of southern rockhopper penguin prey availability in the face of commercial fisheries development.

The winter foraging range of southern rockhopper penguins breeding at the Falkland Islands takes them into the area of longline fishing at Burdwood Bank and onto the northern Patagonian shelf. Birds are not in direct competition for fish prey species there. The risk of bycatch from longline fishing is not a threat to penguins, as it is to other seabird species, and on the northern Patagonian shelf where jigging is the primary fishing method, bycatch is not a significant threat (Putz *et al.* 2002, p. 282).

In our review of fisheries activities, we found no other reports of documented fisheries interaction or possible competition for prey between southern rockhopper penguins and commercial fisheries or of documented fisheries bycatch in any other areas of the range of the southern rockhopper penguin.

In summary, while fisheries activities have the potential to compete for the prey of southern rockhopper penguins, we find that there are adequate monitoring regimes and fisheries controls in place to manage fisheries interactions with southern rockhopper penguins throughout all of its range, and we have not reason to believe this will change in the future.

Oil Spills

Oil development is a present and future activity in the range of southern rockhopper penguins breeding at the Falkland Islands. A favorite winter foraging area of southern rockhopper penguins is the Puerto Deseado area along the coast of Argentina, which lies just to the south of Commodoro Rivadavia, a major refinery and oil shipment port. Oil pollution and ballast tank cleaning have been a significant threat to Magellanic penguins (*Spheniscus magellanicus*) north of this zone (Ellis *et al.* 1998, pp. 111–112). In 1986, 800 southern rockhopper penguins were found dead near Puerto Deseado, to the south of Commodoro Rivadavia, but consistent with trends for that year elsewhere in the range, the birds appeared to have starved and there were no signs of oiling (Ellis *et al.* 1998, p. 54). At the Falkland Islands, hydrocarbon development is planned for areas north and southwest of the Falkland Islands. As of 2002, oil-related activities in the Falkland Islands were suspended, but exploration and production may start again in the near future (Putz *et al.* 2002, p. 281). We have no information on petroleum development in other areas of the southern rockhopper penguin's range.

We recognize that an oil spill near a breeding colony could have local effects on southern rockhopper penguin colonies now and in the future. However, on the basis of the species' widespread distribution and its robust population numbers, we believe the species can withstand the potential impacts from oil spills. Therefore, we do not believe that oiling or impacts from oil-related activities are factors affecting the southern rockhopper penguin throughout all of its range now or in the future.

On the basis of analysis of potential fisheries impacts and possible impacts of petroleum development, we find that other natural or manmade factors are not threats to the southern rockhopper penguin in any portion of its range now or in the future.

Foreseeable Future

In considering the foreseeable future as it relates to the status of the southern rockhopper penguin, we considered the stressors and threats acting on the species. We considered the historical data to identify any relevant existing trends that might allow for reliable prediction of the future (in the form of extrapolating the trends). We also considered whether we could reliably predict any future events (not yet acting on the species and therefore not yet manifested in a trend) that might affect the status of the species.

With respect to the southern rockhopper penguin, the available data do not support a conclusion that there is a current overall trend in population numbers, and the overall population numbers are high. As discussed above in the five-factor analysis, we were also unable to identify any significant trends affecting the species as a whole, with respect to the stressors and threats we identified. There is no evidence that any of the stressors or threats are growing in magnitude. Thus, the foreseeable future includes consideration of the ongoing effects of current stressors and threats at comparable levels.

There remains the question of whether we can reliably predict future events (as opposed to ongoing trends) that will likely cause the species to become endangered. As we discuss in the finding below, we can reliably predict that changes to the marine environment will continue to affect some southern rockhopper penguins in some areas, but we have no reason to believe they will have overall population-level impacts. Thus, the foreseeable future includes consideration of the effects of such factors on the viability of the species.

Southern Rockhopper Penguin Finding Throughout Its Range

We identified a number of likely stressors to this species, including: (1) Changes in the marine environment, (2) human use and disturbance, (3) disease, (4) competition with fisheries, and (5) oil spills. To determine whether these stressors individually or collectively rise to a ''threat'' level such that the southern rockhopper penguin is in danger of extinction throughout its range, or likely to become so within the foreseeable future, we first considered whether the stressors to the species were causing a long-term, population-scale declines in penguin numbers, or were likely to do so in the future.

Based on a tally of estimated numbers of southern rockhopper penguins in each region of the species' range, there are approximately 1.4 million breeding pairs in the overall species' population. While there have been major declines in penguin numbers in some areas, particularly at the Falkland Islands and at Campbell Island and other New Zealand islands, colonies in the major portion of the species' range have experienced lesser declines, remained stable, or appear to have increased. Therefore, based on the best available data, we do not find an overall declining trend in the species' population. In other words, the combined effects of the likely stressors are not causing an overall long-term decline in the southern rockhopper penguin numbers. Because there appears to be no ongoing long-term decline, the species is neither endangered nor threatened due to factors causing ongoing population declines, and the overall population of about 1.4 million pairs or more appears robust.

We also considered whether any of the stressors began recently enough that their effects are not yet manifested in a long-term decline in species' population numbers, but are likely to have that effect in the future. Given that the effects of stressors have either been ameliorated (*e.g.*, human use, competition with fisheries), or because their effects appear to be restricted to a small portion of the species' range, we do not believe their effects would be manifested in overall population declines in the future. Therefore, the southern rockhopper penguin is not threatened or endangered due to threats that began recently enough that their effects are not yet manifested in a long-term decline.

Next, we considered whether any of the stressors were likely to increase within the foreseeable future, such that the species is likely to become an endangered species in the foreseeable future. As discussed above, we concluded that none of the stressors was likely to increase significantly.

Having determined that a current or future declining trend does not justify listing the southern rockhopper penguin, we next considered whether the species met the definition of an endangered species or threatened species on account of its present or likely future absolute numbers. The total population of about 1.4 million pairs appears robust. It is not so low that, despite our conclusion that there is no ongoing decline, the species is at such risk from stochastic events that it is currently in danger of extinction.

Finally, we considered whether, even if the size of the current population makes the species viable, it is likely to become endangered in the foreseeable future because stochastic events might reduce its current numbers to the point where its viability would be in question. Because of the wide distribution of this species, combined with its high population numbers, even if a stochastic event were to occur within the foreseeable future, negatively affecting this species, the population would still be unlikely to be reduced to such a low level that it would then be in danger of extinction.

Despite regional declines in numbers of southern rockhopper penguins, the species has thus far maintained what appears to be high population levels, while being subject to most if not all of the current stressors. The best available information suggests that the overall southern rockhopper penguin population is not declining, despite regional changes in population numbers. Therefore, we conclude that the southern rockhopper penguin is neither an endangered species nor likely to become an endangered species in the foreseeable future throughout all of its range.

Distinct Population Segment

Section 2(16) of the Act defines ''species'' to include ''any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.'' To interpret and implement the DPS provisions of the Act and Congressional guidance, the Service and National Marine Fisheries Service published a Policy regarding the recognition of Distinct Vertebrate Population Segments in the **Federal Register** (DPS Policy) on February 7, 1996 (61 FR 4722). Under the DPS policy, three factors are considered in a decision concerning the establishment and classification of a possible DPS. These are applied similarly to endangered and threatened species. The first two factors—discreteness of the population segment in relation to the remainder of the taxon and the significance of the population segment to the taxon to which it belongs—bear on whether the population segment is a valid DPS. If a population meets both tests, it is a DPS, and then the third factor is applied—the population segment's conservation status in relation to the Act's standards for listing, delisting, or reclassification (*i.e.*, is the population segment endangered or threatened).

Discreteness Analysis

Under the DPS policy, a population segment of a vertebrate taxon may be considered discrete if it satisfies either of the following conditions: (1) It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors (quantitative measures of genetic or morphological discontinuity may provide evidence of this separation) or (2) it is delimited by international boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act.

Southern Rockhopper penguins are widely dispersed throughout the sub-Antarctic in colonies located on isolated island groups. With respect to discreteness criterion 1, many of these areas are clearly separated from others. Differences in physical appearance or plumage patterns have been described between the nominate *chrysocome* type, which breeds in the Falkland Islands and off the southern tip of South

America, and the eastern *filholi* type, which breeds in the Indian Ocean and southwest Pacific south of Australia and New Zealand, but we are unaware of further differences in physiological, ecological, or behavioral factors among any groups within the overall range (Marchant and Higgins 1990, p. 191). Among the prominent breeding areas of the southern rockhopper penguin, we have identified two areas that may be markedly separated from other populations of the same taxon or face significant differences in conservation status from other southern rockhopper populations: (1) The Falkland Islands, and (2) the islands to the south of Australia and New Zealand, including Macquarie, Campbell, Auckland, and Antipodes Islands, where southern rockhopper penguins breed.

Falkland Islands: The southern rockhopper penguin breeds at about 52 locations around the Falkland Islands in aggregations numbering from a few hundred to more than 95,000 nests or breeding pairs. The most recent population estimates are of approximately 210,000 breeding pairs (Kirkwood *et al.* 2007, p. 266). The Falkland Islands breeding sites are separated from the nearest major southern rockhopper penguin breeding concentrations at Staten Island, Argentina, by about 264 mi (425 km). At Staten Island, there are reported to be 180,000 breeding pairs (Schiavini 2000, p. 288). It is not known to what extent interbreeding or movement of breeding pairs occurs between the Falkland Islands and the extensive breeding colonies in southern Argentina and Chile, although the possibility of movement of breeding birds from the Falkland Islands to Staten Island has been suggested (Schiavini 2000, p. 290).

Winter foraging studies show that the relatively short distance between these colonies allows for interchange between the southern rockhopper penguins at the Falkland Islands and those at the southern tip of South America (Putz *et al.* 2006, p. 741). This overlap is by no means complete; at least half of the breeding rockhopper penguins from both the Falkland Islands and Staten Island forage in distinct winter foraging areas that are not used by birds from the other region (Putz *et al.* 2006, p. 741). However, in other areas there is extensive mixing on the winter foraging grounds. For example, about 17 percent of the birds from Staten Island foraged in the region of Burdwood Bank, an isolated extension of the Patagonian continental shelf, due east of Staten Island and due south of the Falkland Islands. About 25 percent of the birds from the southern colonies on the Falkland Islands also foraged in the Burdwood Bank region. Thus, Burdwood Bank is a foraging area for some 90,000 breeding southern rockhopper penguins over the winter period; about 31,000 originating from the Falklands and 60,000 from Staten Island. There is also mixing, although made up of a smaller percentage of Falkland Islands birds (6 percent), in the winter foraging areas along the northeastern coast of Tierra del Fuego.

While Falkland Islands colonies have historically been considered a significant stronghold of the southern rockhopper penguin in the southwestern Atlantic Ocean and declines there have been of significant concern, recent research has identified major previously undocumented colonies in the same region that are as significant, or more significant, in abundance, and occupy portions of the same ecological region. These include colonies at nearby Staten Island in Argentina and at Ildefonso and Diego Ramirez Archipelagos in Chile, which are about 149 miles (240 km) further west. The overall southern rockhopper penguin numbers in this region, including the Falkland Islands, total about 765,000 breeding pairs (Kirkwood *et al.* 2007, p. 266), with Falkland Islands colonies constituting 27 percent of this total. As discussed above, extensive ecological overlap in foraging range between Falkland Islands birds and the Staten Island colonies has been documented, with overlap in use of the Burdwood Bank and some shared foraging range on the Patagonian shelf. In turn, the foraging ranges of Staten Island birds are likely to overlap with those of the Chilean colonies to the west (Putz *et al.* 2006, p. 740). We find that the literature increasingly refers to the biology and conservation of the suite of colonies around the southern tip of South America and the Falkland Islands as a significant larger regional concentration, downplaying emphasis on the discreteness of the Falkland Islands colonies (Kirkwood *et al.* 2007, p. 266; Putz *et al.* 2006, pp. 743–744; Schiavini *et al.* 2000, p. 289). We concur with this conclusion; therefore, we find that the Falkland Islands colonies of the southern rockhopper penguin do not meet the criterion of discreteness for determination of a DPS. On this basis, we do not consider the Falkland Islands colonies of the southern rockhopper penguin to be a DPS.

New Zealand/Australia: With respect to the discreteness criterion 1, the southern rockhopper breeding islands south of New Zealand and Australia are geographically isolated from southern rockhopper breeding areas in the Indian Ocean and near the southern tip of South America, with the closest colonies being roughly 7,300 km (4536 miles) at the Heard and McDonald Islands.

Based on the large geographic distance between the populations south of New Zealand and Australia from other populations, we conclude that this segment of the population of the southern rockhopper penguin passes the discreteness conditions for determination of a DPS.

Significance Analysis

If a population segment is considered discrete under one or more of the conditions described in our DPS policy, its biological and ecological significance is to be considered in light of Congressional guidance that the authority to list DPSs be used ‘‘sparingly’’ while encouraging the conservation of genetic diversity. In carrying out this examination, we consider available scientific evidence of the population segment's importance to the taxon to which it belongs. This consideration may include, but is not limited to: (1) Its persistence in an ecological setting unusual or unique for the taxon; (2) evidence that its loss would result in a significant gap in the range of the taxon; (3) evidence that it is the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; or (4) evidence that the DPS differs markedly from other populations of the species in its genetic characteristics. A population segment needs to satisfy only one of these criteria to be considered significant. Furthermore, the list of criteria is not exhaustive; other criteria may be used, as appropriate. Below, we consider the biological and ecological significance to the New Zealand/ Australia DPS.

Historical numbers of southern rockhopper penguins in this region may have been as high as 960,000 breeding pairs, with declines recorded from the New Zealand islands. Currently there are approximately 89,600–101,500 breeding pairs in the region, which represents 6 to 7 percent of the current estimated population of 1.4 million southern rockhopper breeding pairs rangewide.

This group of breeding colonies inhabits a unique ecological and geographical position in the range of the southern rockhopper penguin. The underwater topography and oceanography of this area is unique and has been described in detail in the Macquarie Island Management Plan (Parks and Wildlife Service (Australia)

2006a, pp. 20–22). The islands sit in areas of relatively shallow water, generally less than 3,280 ft (1,000 m) deep. Macquarie Island is on the shallow Macquarie Ridge, which is associated with a deep trench to the east, and connects to the north with the broader Campbell Plateau, an extensive area of shallow water that is part of the continental shelf extending southeast from New Zealand. The New Zealand islands (Campbell, Auckland, and Antipodes), with breeding colonies of southern rockhopper penguins, sit on the Campbell Plateau. This region and all these islands sit just north of the Antarctic Polar Front Zone (APFZ), a distinct hydrographic boundary with cold nutrient-rich surface waters to the south and warmer, less rich, water to the north. In addition, the Macquarie Ridge and Campbell Plateau form a major obstruction to the ACC, which runs easterly at about 50° S latitude. This further increases the high degree of turbulence and current variability in the area and is likely to directly or indirectly encourage biological productivity (Parks and Wildlife Service (Australia) 2006a, pp. 20–22).

We conclude that loss of the colonies in the region would create a significant gap in the range of the taxon and remove southern rockhopper penguins from the unique ecological setting of the Macquarie Ridge and Campbell Plateau that lies in a unique position relative to the APFZ and the ACC. Therefore, because we find the New Zealand/Australia population segment to be discrete and because it meets the significance criterion, with respect to (1) Its persistence in an ecological setting unusual or unique for the taxon; and (2) evidence that its loss would result in a significant gap in the range of the taxon, it qualifies as a DPS under the Act.

New Zealand/Australia DPS Finding

Historical numbers of southern rockhopper penguins for this New Zealand/Australia DPS may have been as high as 960,000 breeding pairs; they are currently estimated at 89,600–101,500 breeding pairs. Significant historical declines have been reported, in particular, at Campbell Island, where a decline of 94 percent was recorded between the early 1940s and 1985; at Antipodes Islands, where a decline of 94 percent was recorded; and at Auckland Islands, where the numbers halved between 1983 and 1990. Current quantitative data is not available to indicate whether, and to what extent, numbers throughout all of this DPS continue to decline, but qualitative evidence indicates that numbers at Campbell Island continue to decline. At Macquarie Island, which represents 32 to 48 percent of this DPS, southern rockhopper penguin numbers were recently estimated to be lower than previous categorical estimates, but it is not clear whether this reflects a decline versus more precise surveys.

As described in our five-factor analysis, changes to the marine environment are cited as factors that have led to historic or recent large declines at some, but not all, of the breeding locations within the New Zealand/Australia DPS. While the oceanographic factors contributing to such declines have not been clearly explained, they appear to relate to changes in sea surface temperatures or to changes in marine productivity at scales affecting individual colonies or regions, leading to periodic or long-term reductions in food availability. There is little or no current information, however, on the effects of these changes on the breeding and foraging success of southern rockhopper penguins in areas of previous decline. Although changes in the marine environment appear to be affecting some southern rockhopper breeding areas within this DPS, information is not at a meaningful scale to evaluate current changes to the marine habitat in the overall New Zealand/Australia DPS or to make predictions on future trends about whether changes to the marine environment will affect southern rockhoppers penguins across the New Zealand/Australia DPS.

Although the data indicate that changes to the marine habitat may be a threat to New Zealand colonies on the Campbell Plateau, we do not find that historical declines there are currently rising to the level of having a significant effect on the entire DPS. Therefore, on the basis of the best available scientific and commercial information, we find that the present or threatened destruction, modification, or curtailment of this species' marine habitat or range is not a threat to the southern rockhopper penguin throughout the range of New Zealand/Australia DPS, now or in the future. Below, we will further consider whether the New Zealand colonies are a significant portion of the range (SPR) of the DPS.

We have not documented any significant changes to the terrestrial habitat of the southern rockhopper penguin. Also, on the basis of our five-factor analysis, we did not find any of the other factors to be threats to the southern rockhopper penguin's continued existence in any portion of the species' range in the New Zealand/Australia DPS now or in the future.

On the basis of our analysis of the best available scientific and commercial information, we find that the southern rockhopper penguin is not in danger of extinction throughout all of its range in the New Zealand/Australia DPS or likely to become so in the foreseeable future as a consequence of the threats evaluated under the five factors in the Act.

Significant Portion of the Range Analysis

Having determined that the southern rockhopper penguin is not now in danger of extinction throughout all of its range or in the New Zealand/Australia DPS or likely to become so in the foreseeable future as a consequence of the stressors evaluated under the five threat factors in the Act, we also considered whether there were any significant portions of its range where the species is in danger of extinction or likely to become so in the foreseeable future.

The Act defines an endangered species as one ''in danger of extinction throughout all or a significant portion of its range,'' and a threatened species as one ''likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' The term ''significant portion of its range'' is not defined by statute. For purposes of this finding, a significant portion of a species' range is an area that is important to the conservation of the species because it contributes meaningfully to the representation, resiliency, or redundancy of the species.

The first step in determining whether a species is endangered in a SPR is to identify any portions of the range of the species that warrant further consideration. The range of a species can theoretically be divided into portions in an infinite number of ways. However, there is no purpose to analyzing portions of the range that are not reasonably likely to be significant and endangered. To identify those portions that warrant further consideration, we determine whether there is substantial information indicating that (i) the portions may be significant and (ii) the species may be in danger of extinction there. In practice, a key part of this analysis is whether the threats are geographically concentrated in some way. If the threats to the species are essentially uniform throughout its range, no portion is likely to warrant further consideration. Moreover, if any concentration of threats applies only to portions of the range that are unimportant to the conservation of the species, such portions will not warrant further consideration.

If we identify any portions that warrant further consideration, we then determine whether, in fact, the species is threatened or endangered in any significant portion of its range. Depending on the biology of the species, its range, and the threats it faces, it may be more efficient for the Service to address the significance question first, or the status question first. Thus, if the Service determines that a portion of the range is not significant, the Service need not determine whether the species is threatened or endangered there. If the Service determines that the species is not threatened or endangered in a portion of its range, the Service need not determine if that portion is significant. If the Service determines that both a portion of the range of a species is significant and the species is threatened or endangered there, the Service will specify that portion of the range as threatened or endangered pursuant to section 4(c)(1) of the Act.

The terms ''resiliency,'' ''redundancy,'' and ''representation'' are intended to be indicators of the conservation value of portions of the range. Resiliency of a species allows the species to recover from periodic disturbance. A species will likely be more resilient if large populations exist in high-quality habitat that is distributed throughout the range of the species in such a way as to capture the environmental variability found within the range of the species. In addition, the portion may contribute to resiliency for other reasons—for instance, it may contain an important concentration of certain types of habitat that are necessary for the species to carry out its life-history functions, such as breeding, feeding, migration, dispersal, or wintering. Redundancy of populations may be needed to provide a margin of safety for the species to withstand catastrophic events. This does not mean that any portion that provides redundancy is a significant portion of the range of a species. The idea is to conserve enough areas of the range such that random perturbations in the system act on only a few populations. Therefore, each area must be examined based on whether that area provides an increment of redundancy important to the conservation of the species. Adequate representation ensures that the species' adaptive capabilities are conserved. Specifically, the portion should be evaluated to see how it contributes to the genetic diversity of the species. The loss of genetically based diversity may substantially reduce the ability of the species to respond and adapt to future environmental changes. A peripheral population may contribute meaningfully to representation if there is evidence that it provides genetic diversity due to its location on the margin of the species' habitat requirements.

To determine whether any portions of the range of the southern rockhopper penguin warrant further consideration as possible threatened or endangered significant portions of the range, we reviewed the entire supporting record for the status review of this species with respect to the geographic concentration of threats and the significance of portions of the range to the conservation of the species. As previously mentioned, we evaluated whether substantial information indicated that (i) the portions may be significant and (ii) the species in that portion may be currently in danger of extinction or likely to become so within the foreseeable future. We have found that population declines are uneven across the range, indicating the possible occurrence of differential stressors or threats across the range of the southern rockhopper penguin. On this basis we determined that some portions of the southern rockhopper's range might warrant further consideration as possible threatened or endangered significant portions of the range.

The southern rockhopper penguin is widely distributed throughout the Southern Ocean. In our five-factor analysis we did not identify any factor that was found to be a threat to the species throughout all of its range or throughout all of the New Zealand/Australia DPS. In our status review, we identified the Falkland Islands, Marion Island, and finally, the Campbell Island Plateau region within the New Zealand/Australia DPS as areas where declines have occurred, indicating the possibility that the species may be threatened or endangered there.

Falkland Islands SPR Analysis

For the Falkland Islands, we first considered whether there is substantial information to indicate that this portion of the range may be in danger of extinction. The southern rockhopper penguin breeds at about 52 locations around the Falkland Islands in aggregations numbering from a few hundred to more than 95,000 nests or breeding pairs. In the period from 1932–33 to 1995–96, the Falkland Islands numbers declined from an estimated 1.5 million breeding pairs to 263,000 breeding pairs, or about 2.75 percent per year. However, since that time numbers have been largely stable, fluctuating from 263,000 pairs in 1995–96 to a high of 272,000 breeding pairs in 2000–01 to approximately 210,000 breeding pairs in 2005–06 (Kirkwood *et al.* 2007, p. 266). It is unclear from available information whether numbers are fluctuating or moving into another period of decline.

In summary, even though numbers of southern rockhopper penguins at the Falkland Islands have shown an overall decline over time, numbers have not declined at a consistent rate, but rather, there have been periodic decreases in numbers, as well as at least one period of increase. Therefore, we cannot assume a consistent rate of decline into the future. Furthermore, it is unclear to what extent the fluctuations in numbers are attributed to potential relocations to nearby Staten Island, where numbers are stable to increasing. Numbers at the Falkland Islands appear to be relatively high, at approximately 210,000 breeding pairs, and in our five-factor analysis, we were unable to identify ongoing threats to southern rockhopper penguin colonies at the Falkland Islands.

Therefore, we have determined that the Falkland Islands portion of the range does not satisfy one of the two initial tests, because there is not substantial information to suggest that southern rockhopper penguins in the Falkland Islands portion of the range may be currently in danger of extinction, and since we cannot establish a continuing declining trend in numbers or a continuing trend in threat factors, we have no reason to believe that the species is likely to become endangered there within the foreseeable future. Because we find that the southern rockhopper penguin is not threatened or endangered in this portion of the range, we need not address whether this portion of its range is significant.

Marion Island SPR Analysis

For the Marion Island portion of the southern rockhopper penguin's range, we first considered whether there is substantial information to indicate that this portion of the range is significant. In terms of abundance, Marion Island represents less than 5 percent of the overall southern rockhopper penguin population, which is estimated at more that 1.4 million breeding pairs, with colonies widely distributed around the Southern Ocean. Even not considering the breeding pairs at Marion Island, the distribution of the species includes other large, stable or increasing populations in high-quality habitat representing the environmental variability found within the range of the species. Therefore, even without the colonies at Marion Island, the species would have sufficient resiliency to recover from periodic disturbances.

Furthermore, given the wide distribution of the species, even without the colonies at Marion Island, the species would have sufficient redundancy of other populations, such that random perturbations in the system would only affect a few of the remaining populations. Finally, not considering colonies at Marion Island, we find that the species has adequate representation of its adaptive capabilities to enable the species to adapt to future environmental changes. For example, the number of southern rockhopper penguins at nearby Prince Edward Island appears to have been stable since the 1980s with 35,000–45,000 pairs present. Given Marion Island's position within the species' range (*i.e.*, far from the periphery of its range), and its proximity to other southern rockhopper breeding areas, we do not believe the penguins at Marion Island represent unique adaptive capabilities that would be lost if their breeding colonies were lost from the population. Therefore, we have determined that the Marion Island portion of the species' range does not satisfy the significance test of being a significant portion of the species' range, and we need not address whether this portion of its range is threatened or endangered.

Campbell Plateau SPR Analysis

In our analysis of the New Zealand/Australia DPS of southern rockhopper penguins, we identified major declines in numbers of southern rockhopper penguins at the New Zealand breeding locations at Campbell, Auckland, and Antipodes Islands, while numbers at Macquarie Island are reported to be stable. As reflected in our five-factor analysis, declines in penguin numbers at the locations identified above are attributed to changes in the marine environment, which may have affected overall marine productivity or the distribution and abundance of southern rockhopper prey species at these sites. We view the New Zealand Campbell Plateau colonies as an integral part of the geographic area encompassed by the New Zealand/Australia DPS, and not as discrete in and of itself. On this basis and on the basis of the severe declines in this area, we will analyze the Campbell Plateau portion of the range as a possible SPR.

With approximately 60,000 breeding pairs in the New Zealand range of the southern rockhopper penguin, the three Campbell Plateau breeding areas (Campbell, Auckland, and Antipodes Islands) make up over 60 percent of the New Zealand/Australia DPS and represent three out of its four breeding concentrations. The presence of four breeding areas in this DPS provides a measure of resiliency against periodic disturbance. The loss of the Campbell Plateau breeding colonies would greatly reduce the overall geographic range of this DPS to one location. The species would no longer inhabit the ecologically distinct Campbell Plateau, an area of historically high-quality habitat (as evidenced by previous high numbers at Campbell Island). Loss of some or all of these three breeding concentrations, two of which number less than 3,600 breeding pairs, would significantly reduce the redundancy of populations in this DPS and increase the impact of random or catastrophic perturbations on remaining population numbers in the New Zealand/Australia DPS. Therefore, we conclude that this Campbell Plateau portion of the range passes the significance criterion for evaluating a SPR.

We next evaluate the Campbell Plateau portion of the range relative to the geographical concentration of threats in this region. Among colonies of southern rockhopper penguins throughout the species' range, the three island groups within the Campbell Plateau portion of the range have experienced the most severe declines. While trends are unclear at Macquarie Island, overall numbers at Campbell Island are recorded to have been as high as 800,000 breeding pairs in the early 1940s, and the last 1985 census numbers indicated a 94-percent reduction to 51,500 pairs. Current qualitative information indicates that colonies are still in decline, although the rate of that decline is undocumented. In our analysis of the New Zealand/Australia DPS, we concluded that changes to the marine environment that influence the southern rockhopper penguin have affected the Campbell Plateau more than the Macquarie Ridge region; therefore, the present or threatened destruction, modification, or curtailment of its habitat or range is a risk factor that threatens the southern rockhopper penguin in the Campbell Plateau of the New Zealand/Australia DPS. On this basis, we conclude that there is substantial information indicating that listing of the Campbell Plateau portion of the range of the southern rockhopper penguin as threatened or endangered may be warranted.

Having determined that the Campbell Plateau populations of the New Zealand/Australia DPS of the southern rockhopper penguin are significant and that there is substantial information indicating that listing of this portion of the range as threatened or endangered may be warranted, we will now summarize our analysis on whether listing of the Campbell Plateau SPR is warranted.

Finding of Campbell Plateau SPR

Within the Campbell Plateau portion of the range of the southern rockhopper penguin, significant historical declines have been reported, in particular for Campbell Island where a decline of 94 percent was recorded between the early 1940s and 1985. Continued unquantified declines were reported to the present day. The most recent survey data available from Campbell Island is from 1985, when there were 51,500 breeding pairs (Cunningham and Moors 1994, p. 34). At Antipodes Islands, a decline of 94 percent was recorded between 1978 and 1995, and current estimates are of 3,400 breeding pairs. At the Auckland Islands, the number of penguins halved between 1983 and 1990 to 3,600 breeding pairs. There are no current quantitative data to indicate whether, and to what extent, declines have continued at any of these three island groups. Historical numbers of southern rockhopper penguins in the Campbell Plateau portion of the species' range may have been as high as 860,000 breeding pairs in the early 1940s; an overall decline of 94 percent or more has brought this number down to less than 60,000 breeding pairs today. Given the low numbers at Antipodes and Auckland Islands, Campbell Island is the primary stronghold for the Campbell Plateau portion of the species' range.

In our five-factor analysis (see above), we did not find documentation of any significant changes to the terrestrial habitat of the southern rockhopper penguin. Changes to the marine environment, however, are cited as factors that have led to historical or recent large declines within the Campbell Plateau portion of the range. While the oceanographic factors contributing to such declines have not been clearly explained, they appear to relate to periodic or long-term changes in sea surface temperatures within the summer or winter foraging ranges of southern rockhopper penguins, or to changes in marine productivity at scales affecting individual colonies or regions. These oceanographic changes have apparently led to reductions in food availability that may have occurred in short periods or extended over periods of years. The available regulatory mechanisms have not ameliorated the effects of these changes in the marine environment, and we have no reason to believe these changes in the marine environment will be ameliorated in the future; therefore, we find it reasonably likely that the effects on the species in this portion of its range will continue at current levels or potentially increase. On the basis of the best available scientific and commercial information and evidence of precipitous decreases of penguin numbers in this area, we find that the present or threatened destruction, modification, or curtailment of its marine habitat or range is a threat to the southern rockhopper penguin in the Campbell Plateau portion of its range now and in the future.

On the basis of our five-factor analysis of the best available scientific and commercial information (see above), we find that overutilization for commercial, recreational, scientific, or educational purposes; disease; and predation are not threats to the southern rockhopper penguin in the Campbell Plateau portion of its range. On the basis of information on fisheries and oil development, we find that other natural or manmade factors are not a threat to the southern rockhopper penguin in the Campbell Plateau portion of its range.

We find that precipitous population declines have depleted the Campbell Plateau SPR to 6 percent of its prior abundance, and based on our review of the best available information, we find it is reasonably likely that these severe declines resulted from effects of changes in the marine environment. We have no reason to believe that these changes in the marine environment will not continue to affect southern rockhopper penguins in the Campbell Plateau SPR at current (and potentially greater) levels, further reducing population numbers.

Lower population numbers, a reasonably likely result in the foreseeable future, would make this species even more vulnerable to the threats from changes in the marine habitat, and would make the species vulnerable to potential impacts from oil spills and other random catastrophic events. Therefore, on the basis of our analysis of the best available scientific and commercial information, we find that the southern rockhopper penguin in the Campbell Plateau SPR of the New Zealand/Australia DPS is likely to become endangered with extinction in the foreseeable future.

Proposed Determination for the Southern Rockhopper Penguin in the Campbell Plateau Portion of its Range

On the basis of analysis of the five factors and the best available scientific and commercial information, find that listing the southern rockhopper penguin as a threatened species in the Campbell Plateau portion of its range under the Act is warranted. We, therefore, propose to list the southern rockhopper penguin as a threatened species in the Campbell Plateau portion of its range under the Act.

Final Determination for the Southern Rockhopper Penguin in All Other Portions of its Range (*i.e.*, not including the Campbell Plateau)

On the basis of analysis of the five factors and the best available scientific and commercial information, we find that listing the southern rockhopper penguin as threatened or endangered under the Act throughout all or in any other portion of its range is not warranted.

Northern Rockhopper Penguin

Distribution

The northern rockhopper penguin (*Eudyptes moseleyi*) is restricted to islands of the Tristan da Cunha region and Gough Island (St. Helena, United Kingdom) in the South Atlantic and St. Paul and Amsterdam Islands (French Southern Territories) in the Indian Ocean.

Two chicks banded at Amsterdam Island in 1992 were recovered off the coast of eastern and southern Australia 7 and 9 months later, indicating that immature Indian Ocean birds may winter off southern Australia (Guinard *et al.* 1998, p. 224).

Population

The overall breeding population of northern rockhopper penguins is estimated to be approximately 315,000–334,000 pairs on these island groups in the South Atlantic and Indian Oceans and is thought to be declining (Jouventin *et al.* 2006, p. 3,417; Guinard *et al.* 1998, p. 224; Woehler 1993, p. 58); however, based on the current information available on population trends throughout the species' range, as discussed below, the overall population trend of the northern rockhopper penguin appears uncertain. Documentation of current trend information is at this time only available for areas of Gough Island, as discussed below, which is only part of the species' overall range.

South Atlantic Ocean

Gough Island

Early records indicate that numbers were historically in the millions on both Gough Island and Tristan da Cunha. The most recent population estimates indicate that over the past 45 years, numbers have declined by about 96 percent on Gough Island, where there are currently estimated to be 32,000–65,000 breeding pairs (Cuthbert in litt., as cited in BirdLife International 2008a, pp. 2–3). Numbers on this island are reported to have experienced large declines prior to the 1980s (BirdLife International 2008a, p. 2), but were stable between 1982 and 2000 (Cuthbert and Sommer 2004, p. 101). Recent unpublished reports are said to indicate recent substantial declines (Jouventin *et al.* 2006, p. 3,422); however, we have no further information on the regional extent of decline, and so we cannot evaluate the effect of these declines on the overall population status of the northern rockhopper penguin.

Tristan da Cunha

Tristan da Cunha consists of a main island and several smaller islands. It is reported that the main island experienced a decline of about 98 percent 130 years ago until about 30 years ago, but over the past few decades numbers have been stable, with numbers currently estimated at 3,200–4,500 breeding pairs (Cuthbert in litt., as cited in BirdLife International 2008a, pp. 2–3.)

At Inaccessible Island, numbers may have declined ''modestly'' and are currently estimated at 18,000–27,000 breeding pairs. Trends at Nightingale and Middle Islands are poorly known, but recent observations suggest local declines in the main colony on Nightingale Island. The latest estimate of numbers of northern rockhopper penguins on these two islands was in the 1970's and was reported to be 125,000 pairs (Cuthbert in litt., as cited in BirdLife International 2008a, p. 3). No information is available on numbers or trends at Stoltenhof Island. In summary, given the numbers reported above, there appear to be from 146,200–156,500 breeding pairs of northern rockhopper penguins in the Tristan da Cunha Island group, not including those on Stoltenhoff Island. Although numbers appear stable at Tristan, the main island, trends are unknown throughout the remainder of this region.

Indian Ocean

Amsterdam Island

Northern rockhopper penguins at Amsterdam Island decreased in numbers from 58,000 breeding pairs in 1971 to 24,890 in 1993, for an overall decrease of 57 percent. The declines were most rapid, at 5.3 percent per year, between 1988 and 1993, but this was also a period when there was the widest fluctuation in numbers, from a low of 17,400 to a high of 39,871 breeding pairs (Guinard *et al.* 1998, pp. 226–227). After a lengthy period of gradual decline, the most recent available data indicate a period of population fluctuation with both increases (up to 39,871 breeding pairs from 17,400 pairs) and decreases in numbers. With the final reported figure of 24,890, which is above previous lows, best available data do not allow us to evaluate if the colonies at Amsterdam Island continue to fluctuate, or are stable, increasing, or declining.

St. Paul Island

At St. Paul Island, 50 mi (80 km) south of Amsterdam Island, the numbers of northern rockhopper penguins increased by 56 percent over the period of 1971–1993, with a current estimate of 9,000 breeding pairs (Guinard *et al.* 1998, p. 227). This increase is considered to have begun after the cessation of the use of rockhopper penguins as bait in a crayfish industry, which operated in the 1930s, although all the interrelationships acting on this gradual, upward trend are not understood (Guinard *et al.* 1998, p. 227).

Other Status Classifications

The IUCN Red List classifies the northern rockhopper penguin as 'Endangered,' due to ''very rapid population decreases over the last three generations (30 years) throughout its range.''

Summary of Factors Affecting the Species

Factor A: The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Terrestrial Habitat

We have found no current reports of threats to the terrestrial breeding habitat of northern rockhopper penguins, and we have no reason to believe threats to the terrestrial habitat will emerge in the future.

Climate-Related Changes in the Marine Environment

With respect to the marine environment, Guinard *et al.* (1998, p. 224) reported that sea surface temperatures declined significantly, approximately 1.4 °F (0.8 °C), around Amsterdam and St. Paul Islands between 1982 and 1993. The annual mean decrease correlated with declines in numbers of northern rockhopper penguins at Amsterdam Island in the same period. Summer (February) sea surface temperatures were also correlated with the numbers of northern rockhopper penguins at Amsterdam Island the following spring. However, there was no relationship between spring temperatures and the numbers of penguins at Amsterdam Island, and there were no significant correlations between sea surface temperatures and numbers at adjacent St. Paul Island, where penguin numbers increased 56 percent during this same period. The authors hypothesized that with cooling water temperatures, prey may have shifted towards more northern waters, which are less accessible for breeding penguins (Guinard *et al.* 1998, p. 227). Guinard *et al.* (1998, p. 226) did not find major differences in breeding success between the Amsterdam Island colony and study colonies in other areas. The absence of conclusive correlations and the opposing trends occurring at the two adjacent islands make it difficult to draw conclusions relative to the impact of sea surface temperature changes on northern rockhopper penguin marine habitat in these areas.

We have identified no reports of apparent marine habitat changes for northern rockhopper penguins at Gough Island and Tristan da Cunha, or reports of declines in the prey base in these areas.

Conclusion

Although it is possible that climate change will result in changes to the marine habitat of the northern rockhopper penguin, data on the relationship between sea surface temperature and other oceanic conditions are ambiguous and not sufficient to draw conclusions as to the contribution of changes in these conditions to the local declines at Amsterdam Island. This precludes us from being able to identify current relationships or to predict possible future trends.

Therefore, on the basis of the best available scientific and commercial information, we find that the present or threatened destruction, modification, or curtailment of this species' terrestrial and marine habitats or range is not a threat to the northern rockhopper penguin in any portion of its range now and we do not foresee that it will become so in the future.

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Use as Bait

Northern rockhopper penguins at the small colonies at St. Paul Island in the Indian Ocean were exploited heavily for bait to support a crayfish fishery in the 1930s, but this practice has been discontinued since the 1940s (Guinard 1998, p. 227), and we have no reason to believe it will recommence in the future.

In the Tristan da Cunha region, driftnet fishing and penguin use for bait is reported to have caused significant mortality in the past. Such activities are now prohibited and regarded as unlikely to return (BirdLife International 2007, p. 3).

Harvest of Eggs

In the South Atlantic, the United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) reported that harvesting of many seabirds, including northern rockhopper penguins, was intensive in the past, but is now greatly reduced, and restricted to egg collection for traditional domestic use of the 269 residents of Tristan da Cunha. Under the 2006 Conservation Ordinance, egg collection is restricted to Nightingale (25,000 breeding pairs), Stoltenhof and Middle Islands (100,000 breeding pairs) in the Tristan da Cunha group (DEFRA 2007, p. 2; Tristan da Cunha Website 2008, p. 1). Rockhopper penguins lay two eggs, the first of which often fails during incubation. If the chick from the first egg hatches, this chick usually dies or is discarded as the parents raise the larger chick from the second egg. If the second egg fails to hatch or is lost, the chick from the first egg may survive (Marchant and Higgins 1990, p. 190); therefore, this information suggests that limited harvest of eggs for traditional domestic use can be conducted without influencing breeding success of the large colonies where collection occurs. However, we cannot evaluate whether this is true because: (1) Empirical data are not available to verify whether breeding success is affected by this practice; (2) population trends, which would be a partial indicator of population status, on these islands are unknown; and (3) since the restrictions on egg harvest were only recently adopted in 2006, there may not have been sufficient time to for the adopted restrictions on egg collection to have exhibited their affects on population growth. Nevertheless, given that northern rockhopper penguin numbers in the Tristan da Cunha region are estimated at 146,200–156,500 breeding pairs, we do not find over-harvest of eggs to be a threat to the species. Furthermore, we have no reason to believe that the level of egg harvest will increase in the future.

Collection of Penguins From the Wild

The United Kingdom permitted a one-time harvest of 146 live northern rockhopper penguins from Tristan da Cunha for exports to zoos in the autumn of 2003 (DEFRA 2007, p. 2). Under the 2006 Conservation Ordinance, no take, capture, removal, or collection of any native organism is allowed without a permit (Tristan da Cunha Website 2008,

p. 1). Any take of live penguins from the wild would reduce numbers, potentially acting as stressor to local colonies. However, given the large numbers of breeding pairs (146,200–156,500) in this region and the new (2006) regulations restricting take from the wild, we do not consider the current level of limited take of individuals from the wild to be a threat to this species. We have no reason to believe that the level of collection of individuals from the wild will increase in the future.

Scientific Research

Scientists studying northern rockhopper penguins at Amsterdam Islands applied flipper bands to all incubating birds in a study colony of from 100–300 breeding pairs. They reported that the mean adult survival rate of 72 percent was significantly lower in the first year after banding than in subsequent years (mean adult survival of 84 percent) suggesting that there was an effect of banding on the birds. There was a similar effect for banded chicks (Guinard *et al.* 1998, p. 223–224). Based on this information, we believe that bird banding acts as a stressor on northern rockhopper penguins in this region; however, given the small size of the study colony and the relatively small decrease in survival of a small number of birds, we conclude that the bird banding practice as described in the literature is not a threat to the northern rockhopper penguins at the Amsterdam Islands or elsewhere in the species' range. There is no information that suggests banding activities will increase in magnitude in any portion of the species' range in the future.

Conclusion

We conclude that the primary utilization of northern rockhopper penguins at this time in the Tristan da Cunha region is the regulated collection of eggs for traditional domestic consumption by the small number of residents, as well as regulated collection of individuals from the wild. Although there may have been insufficient time since regulations were put in place, to determine whether the current levels of egg and animal collection are acting as stressors on the species in this area, we believe that with the recent regulations in place, the effects of these activities on the species in this area have likely been reduced since 2006, and we expect that any as of yet unobserved effects of the regulations would result in positive effects on the conservation of the species. We have no reason to believe these collection and harvest activities will increase over the current levels. We do not have documentation of current population trends on the islands where egg collection is occurring, but given that the numbers in the Tristan da Cunha region are estimated at 146,200–156,500 breeding pairs, we do not find over-harvest of eggs, nor over-collection of individuals to be a threat to the species.

Based on the available information, the only other utilization of the species within its range that we were able identify is banding of individuals for scientific research at Amsterdam Island. As discussed above, we do not consider this activity a threat to the species now or in the future.

On the basis of this information, we find that overutilization for commercial, recreational, scientific, or educational purposes is not a threat to the northern rockhopper penguin in any portion of its range now or in the future.

Factor C: Disease or Predation

Disease

We are aware of no reports in the literature on the effect of disease on northern rockhopper penguins anywhere within the species' range, and we have no information to suggest that disease incidence or transmission to the northern rockhopper penguin will increase in the future. Therefore, we find that disease is not a threat to the northern rockhopper penguin in any portion of the species' range now or in the future.

Predation by Sub-Antarctic Fur Seals

Predation by sub-Antarctic fur seals has been identified as a possible stressor on northern rockhopper penguins at Amsterdam Island, where numbers of fur seals increased from 4,868–35,028 between the 1970s and 1982 (Guinard *et al.* 1998, p. 227). This increase in fur seal numbers occurred within the time period (1971–1993) that northern rockhopper penguin numbers at Amsterdam Island reportedly declined by 57 percent. Fur seal numbers subsequently leveled off through the mid-1990s. It is reported that fur seals occasionally hunt and prey upon rockhopper penguins, and Guinard *et al.* (1998, p. 227) concluded that, even if penguins represent a minor part of the fur seal diet, the increase in predation could be contributing to the declines of northern rockhopper penguins observed at Amsterdam Island. The researchers indicated that further study is needed to evaluate the effect of fur seals on rockhopper penguins.

We acknowledge that fur seal predation has the potential to reduce numbers of northern rockhopper penguins; however, as of yet the extent of predation and its effect on the northern rockhopper penguin population has not been determined. Furthermore, because fur seal numbers have leveled off, we do not believe the possibility of predation on northern rockhopper penguins will increase in the future. Although the population trend at Amsterdam Island is unknown, according to the best available information, there are an estimated 24,890 breeding pairs there, which is above previously low numbers.

There is no information to suggest that predation from fur seals is or will become a threat to the northern rockhopper penguin in any other portion of its range in the future.

Therefore we find that predation by fur seals is not a threat to the northern rockhopper penguin in any portion of its range now or in the future.

Introduced Predators

Rats were eradicated from St. Paul Island in 1999 (Terres Australes and Antarctiques Francaises (TAAF) 2008, p. 3). At Gough Island, Jones *et al.* (2003, p. 81) reported on the presence of mice (*Mus musculus*), but did not indicate any effect on northern rockhopper penguin colonies. There is no information available that suggests predation is a threat to northern rockhopper penguins in any other portion of its range and no reason to believe predation will become a threat to this species in any portion of its range in the future.

Factor D: The Inadequacy of Existing Regulatory Mechanisms

Northern rockhopper penguins are protected from human over-exploitation at the Tristan da Cunha area. Activities involving take of the species, specifically harvest of eggs for domestic use by the small community at Tristan da Cunha Island has been greatly reduced and restricted (BirdLife International 2007, p. 4; DEFRA 2007, p. 2; Tristan da Cunha Web site 2008, p. 1). Gough Island Wildlife Reserve is a Natural World Heritage site and was first protected under the Tristan da Cunha Wildlife Protection Ordinance in 1950. Inaccessible Island, also in the Tristan da Cunha group, was given protection under the Wildlife Protection Ordinance in 1997 and added to the Gough Island Wildlife Reserve World Heritage site in 2004 (UNEP WCMC 2008d, pp. 1–2; Ellis *et al.* 1998, p. 57).

Amsterdam Island was included in the French Antarctic National Park (Parc National Antarctique Francais) in 1938 (World Wildlife Fund and M. McGinley 2007, p. 4). Extensive restoration efforts are underway at both Amsterdam and St. Paul Islands to restore native flora, control introduced predators and, in particular, to protect and restore the habitat of the endemic Amsterdam albatross (*Diomedea amsterdamensis*) (World Wildlife Fund and M. McGinley 2007, p. 4).

Regular monitoring of northern rockhopper penguins is reported to be taking place at Tristan da Cunha, and Gough, Amsterdam, and St. Paul Islands (Birdlife International 2007, p. 4).

The literature reviewed has not highlighted any current deficiencies in regulatory protection (Ellis *et al.* 1998, p. 57; BirdLife International 2007, p. 4), and we have no reason to believe the existing regulatory mechanisms will be reduced or will be less effective in the future. Therefore, on the basis of the information before us, we find that the existing regulatory mechanisms regarding the conservation of northern rockhopper penguins are adequate now and in the future throughout all or any portion of the species' range.

Factor E: Other Natural or Manmade Factors Affecting the Continued Existence of the Species

Competition With Fisheries

We have found no information documenting competition for prey with fisheries. Reports of possible bycatch from driftnet fishing are identified as having occurred in the past and not likely to recur (BirdLife International 2007, p. 3). BirdLife International (2008a, p. 4) suggests that northern rockhopper penguin food supplies may be affected by squid fisheries, but we have no supporting information to evaluate this factor as potential threat now or in the future.

Oil pollution is a possible concern for northern rockhopper penguins, but we have no information to conclude that this rises to the level of a threat for this species (Ellis *et al.* 2007, p. 5) now or in the future.

Therefore, we find that other natural or manmade factors are not a threat to the northern rockhopper penguin throughout all or any portion of its range now or in the future.

Foreseeable Future

In considering the foreseeable future as it relates to the status of the northern rockhopper penguin, we considered the stressors acting on the species. We considered the historical data to identify any relevant existing trends that might allow for reliable prediction of the future (in the form of extrapolating the trends). We also considered whether we could reliably predict any future events (not yet acting on the species and therefore not yet manifested in a trend) that might affect the status of the species.

With respect to the northern rockhopper penguin, the available data do not support a conclusion that there is a current overall trend in population numbers although the evidence suggests that there may have been significant declines in the past, and the overall population numbers are high. As discussed above in the five-factor analysis, we were also unable to identify any significant trends with respect to the stressors we identified. There is no evidence that any of the stressors are growing in magnitude. Although we believe that recent restrictions on egg collection and take from the wild may manifest itself in the future in a positive manner with respect to trends, with respect to the foreseeable future, we have considered the ongoing effects of current stressors at comparable levels.

There remains the question of whether we can reliably predict future events (as opposed to ongoing trends) that will likely cause the species to become endangered. As we discuss in the finding below, we acknowledge that periodic take from the wild and predation by fur seals may continue to reduce local numbers in some northern rockhopper penguin colonies, but we have no reason to believe they will have population-level impacts. We also acknowledge that restricted egg collection for traditional use and penguin banding activities may affect reproductive success in some colonies; however, we have no reason to believe these activities will have population-level impacts. Thus, the foreseeable future includes consideration of the effects of these factors on the viability of the northern rockhopper penguin.

Northern Rockhopper Penguin Finding Throughout Its Range

We identified a number of likely stressors to this species, including traditional egg harvest, take of individuals from the wild, bird banding associated with research activities, and predation by fur seals. To determine whether stressors individually or collectively rise to a ''threat'' level such that the northern rockhopper penguin is in danger of extinction throughout its range, or likely to become so within the foreseeable future, we first considered whether the stressors to the species were causing a long-term, population-scale decline in penguin numbers, or were likely to do so in the future.

As discussed above, the overall northern rockhopper population is estimated at 315,000–334,000 breeding pairs. Although this species declined severely in numbers over a large portion of its range, these long-term, large-scale declines appear to have ended due to the amelioration of historical threats: (1) Northern rockhopper penguin exploitation for use as bait at St. Paul Island ended in the 1940s, and the species' numbers there subsequently increased by 56 percent; (2) driftnet fishing and penguin use for bait in the Tristan da Cunha region is now prohibited; (3) fisheries bycatch has been reduced or eliminated; (4) egg collection at Tristan da Cunha has been restricted to traditional use for the small local population and has been restricted to certain areas since 2006; and (5) take of individuals from the wild at Tristan da Cunha has also been limited by regulation since 2006. Currently, the only recent documented declines are on Gough Island, which only represents 10 to 20 percent of the overall northern rockhopper population, but information is not available on the scope of the declines on Gough Island. We also do not know if local declines on Gough Island are being offset by increases in other areas. Because there appears to be no ongoing long-term decline, the species is neither endangered nor threatened due to factors causing ongoing population declines, and the overall population of 315,000–334,000 breeding pairs appears robust.

We also considered whether any of the stressors began recently enough that their effects are not yet manifested in a long-term decline, but are likely to have that effect in the future. The small, periodic decrease in numbers due to take from the wild is immediately reflected in population trends. Declines associated with fur seal predation began in the early 1970s, and since fur seal numbers leveled off through the 1990s, there has been sufficient time for the effect on population numbers to be reflected in population trends. The limited number of bird-banding activities has been demonstrated to manifest their effects on reproductive success the year subsequent to the banding activities. Any lag times associated with egg collection are unknown, but since this activity has been severely restricted, we expect any as of yet unobserved effects to be in the positive direction. Therefore, the northern rockhopper penguin is not threatened or endangered due to threats that began recently enough that their effects are not yet manifested in a long-term decline.

Next, we considered whether any of the stressors were likely to increase within the foreseeable future, such that the species is likely to become an endangered species in the foreseeable future. As discussed above, we concluded that none of the stressors were likely to increase significantly.

Having determined that a current or future declining trend does not justify listing the northern rockhopper penguin, we next considered whether the species met the definition of an endangered species or threatened species on account of its present or likely future absolute numbers. The total population of approximately 315,000–334,000 breeding pairs appears robust. It is not so low that, despite our conclusion that there is no ongoing decline, the species is at such risk from stochastic events that it is currently in danger of extinction.

Finally, we considered whether, even if the size of the current population makes the species viable, it is likely to become endangered in the foreseeable future because stochastic events might reduce its current numbers to the point where its viability would be in question. Because of the wide distribution of this species, combined with its high population numbers, even if a stochastic event were to occur within the foreseeable future, negatively affecting this species, the population would still be unlikely to be reduced to such a low level that it would then be in danger of extinction.

The best available information suggests that the historical long-term, large-scale population declines have ended, largely due to an amelioration of historical threats to the species. Therefore, we conclude that the northern rockhopper penguin is neither an endangered species nor likely to become an endangered species in the foreseeable future throughout all of its range.

Distinct Population Segment

A discussion of distinct population segments and the Service policy can be found above in the southern rockhopper penguin Distinct Population Segment section.

We are not aware of any information that would lead us to conclude that the northern rockhopper penguin is comprised of population segments that are either discrete or significant. Therefore, we have not analyzed the northern rockhopper penguin under the Service's DPS policy.

Significant Portion of the Range Analysis

Having determined that the northern rockhopper penguin is not now in danger of extinction throughout all of its range or likely to become so in the foreseeable future as a consequence of the stressors evaluated under the five factors in the Act, we also considered whether there were any significant portions of its range where the species is in danger of extinction or likely to become so in the foreseeable future. See our analysis for southern rockhopper penguin for how we make this determination.

The northern rockhopper penguin is found in two primary areas of the South Atlantic and Indian Oceans. In our five-factor analysis, we did not identify any factor that was found to be a threat to the species throughout its range. In our status review, we identified Gough Island, Tristan da Cunha, and Amsterdam Island as areas where declines have occurred, indicating the possibility that the species may be threatened or endangered there.

Gough Island

The most recent population estimates indicate that over the past 45 years, numbers have declined by about 96 percent on Gough Island, where there are currently estimated to be 32,000–65,000 breeding pairs (Cuthbert in litt., as cited in BirdLife International 2008a, p. 2–3). Numbers on this island are reported to have experienced large declines prior to the 1980s (BirdLife International 2008a, p. 2), but were stable between 1982 and 2000 (Cuthbert and Sommer 2004, p. 101). Although recent unpublished reports are said to indicate recent substantial declines on Gough Island (Jouventin *et al.* 2006, p. 3,422), more detailed information on these declines is not currently available. Therefore, we cannot assess the regional extent in the declines or the magnitude of the decline. This precludes us from being able to evaluate the overall trend in numbers at Gough Island, and given the recent emergence of the reported decline, we are not able to predict if the decrease in numbers will continue into the future. We have not identified any threat to the species in this area, nor do we have reason to believe this will change within the foreseeable future. Therefore, we find that the northern rockhopper penguin is not threatened or endangered in this portion of its range, and we consequently need not address the question of significance.

Tristan da Cunha

It is reported that from 130 years ago until about 30 years ago the main island of Tristan experienced a decline of about 98 percent. However, since numbers have been stable for the past few decades, there is currently no ongoing long-term decline there. At Inaccessible Island, numbers are reported to have possibly declined ''modestly,'' but the limited information on the basis of this suggestion does not allow a sufficient analysis of trends in this area. Trends at Nightingale and Middle Islands are, likewise, poorly known, and no information is available for trends at Stoltenhof Island. In summary, given the numbers reported above, there appear to be from 146,200–156,500 breeding pairs of northern rockhopper penguins in the Tristan da Cunha Island group, not including those on Stoltenhof Island. Numbers appear stable at Tristan, the main island, but since trends are unknown throughout the remainder of this region, we are unable to establish an overall trend for the region.

Based on our five-factor analysis, we found that the known historical threats to this species in this region have been ameliorated: (1) Driftnet fishing and penguin use for bait is now prohibited; (2) fisheries bycatch has been reduced or eliminated; (3) egg collection has been restricted to traditional use for the small local population and has been restricted to certain areas since 2006; and (4) take of individuals from the wild has also been limited by regulation since 2006. In our five-factor analysis, we were unable to identify any current threats to the species in this area, and we have no reason to believe this will change in the future. Therefore, we find that the northern rockhopper penguin is not threatened or endangered in this portion of its range, and we consequently need not address the question of significance.

Amsterdam Island

The overall numbers at Amsterdam Island declined 57 percent between 1971, when there were 58,000 pairs, and 1993, when there were 24,890 pairs. During the last period from 1988–1993, the numbers fluctuated widely. For the years that survey data are available—in 1988, there were 39,871 pairs (69 percent of the 1971 estimate); in 1990, there were 30,000 pairs (51 percent); in 1991, there were 17,400 pairs (30 percent); in 1992, there were 35,000 pairs (60 percent); and in 1993, there were 24,890 pairs (43 percent). Given the wide fluctuations in this period, with both increases and decreases in numbers, with the last year of data above the lowest figure recorded, it is not possible to conclude that an overall declining trend has continued after this period. The wide fluctuations in this period and the ability of numbers of breeding pairs to rebound by 100 percent between two breeding seasons suggest that observed numbers at breeding colonies during years of low numbers in 1991 and perhaps in 1993 are not representative of the actual abundance in these years. There have been no survey data at Amsterdam Island for the past 15 years, and given the wide fluctuations during the last period of surveys, we cannot reliably predict a future population trend. The most recent population estimate of 24,890 breeding pairs is above previously low numbers, and based on our five-factor analysis, we have not identified any threat to the species in this area, nor do we have reason to believe this will change in the future. Therefore, we find that the northern rockhopper penguin is not threatened or endangered in this portion of its range, and we consequently need not address the question of significance.

Final Determination for the Northern Rockhopper Penguin

On the basis of analysis of the five factors and the best available scientific and commercial information, we find that listing the northern rockhopper penguin as threatened or endangered under the Act in all or any significant portion of its range is not warranted.

Macaroni Penguin

Background

Biology

The macaroni penguin (*Eudyptes chrysolophus*) is a large, yellow-crested, black-and-white penguin that inhabits sub-Antarctic islands from the tip of South America eastwards to the Indian Ocean (BirdLife International 2007, p. 1). It breeds in 16 colonies at 50 sites in: Southern Chile, Falkland Islands, South Georgia and the South Sandwich Islands, South Orkney and South Shetland Islands, Bouvet Island, Prince Edward and Marion Islands, Crozet Islands, Kerguelen Islands, Heard and MacDonald Islands, and locally on the Antarctic Peninsula (Woehler 1993, pp. 52–56; BirdLife International 2007, pp. 2–3).

Breeding colonies range in size from a few breeding pairs to large colonies of up to 180,000 breeding pairs or more (Crawford *et al.* 2003, p. 478; Trathan *et al.* 2006, p. 242). For example, at South Georgia Island in the South Atlantic, there are approximately 17 main breeding aggregations, ranging in size from 1,000 breeding pairs at Sheathbill Bay to 2,560,000 breeding pairs at the Willis Islands (Trathan *et al.* 2006, p. 241; Trathan *et al.* 1998, p. 266). Within these larger locations are individual colonies. For example, at Bird Island, the Fairy Point colony has about 500–600 pairs, Goldcrest Point colony has 43,811 pairs, and Macaroni Cwm colony has about 10,000 breeding pairs (Trathan *et al.* 2006, p. 242). In 2000–01 at Marion Island in the southwestern Indian Ocean, about 53 colonies were distributed around the entire perimeter of the 12 × 7 mi (19 × 12 km) island. Colonies at Marion Island range in size from a few breeding pairs to two large colonies of 143,000 and 186,812 breeding pairs, respectively (Crawford *et al.* 2003, p. 478).

The basic life history of macaroni penguins at breeding sites has been well-described, and there is reported to be little variation in the breeding biology of the members of the genus Eudyptes as a whole (Crawford *et al.* 2003, pp. 477–482). At both South Georgia and Marion Islands, after spending the winter at sea from May to September, breeding birds arrive at the colony synchronously in mid-October. During pre-breeding, incubation, and chick-brooding, the adults fast for long periods ashore, alternating with long periods at sea. At Marion Island, incubation was 35 days; chicks gathered into crèches at 23–25 days and fledged at 60 days around the third week of February (Crawford *et al.* 2003, p. 482). After abandoning the chicks, the adults leave the colony to feed and then return to molt before leaving the colonies for the winter. Age at first breeding at Marion Island is 2–3 years (Crawford *et al.* 2003, p. 482).

Given its large numbers and its widespread distribution, the macaroni penguin is considered to be one of the most abundant bird consumers of Antarctic krill (*Euphausia superba*). In global terms, the species is considered to be one of the most important avian predators, possibly consuming more food than any other seabird species (Trathan *et al.* 2006, pp. 239–240 ; Brooke 2004, p. 248).

Feeding habits studies have identified a variety of prey species consumed by macaroni penguins. At Marion Island, they were found to feed on crustaceans, mainly a decapod shrimp (*Nauticaris marionis*), euphausids (krill) (*Euphaudia vallenti* and *Thyssanoessa vicina*), and amphipods (*Themisto gaudichaudii*) (Crawford *et al.* 2003, p. 484). At South Georgia Island, the primary mass of the diet of macaroni penguins was found to contain krill (*Euphausia superba* (Antarctic krill) and *Thysanoessa* sp.), decapod shrimp (*Chorismus antarcticus*), and amphipods (*Themisto gaudichaudii*), as well as a number of cephalopod and fish species (Croxall *et al.* 1999, p. 128).

Macaroni penguins leave their colonies to forage at sea during the breeding season. At South Georgia Island, they forage in waters bathed by the ACC, which transports krill to the region from the waters around the western Antarctic Peninsula and the Scotia Sea (Trathan *et al.* 2003, p. 569; Trathan *et al.* 2006, p. 240; Reid and Croxall 2001, p. 382; Fraser and Hoffman 2003, p. 13). During the winter the birds leave the colonies, reportedly foraging widely north of the Antarctic Convergence and have been reported from the waters of Australia, New Zealand, southern Brazil, Tristan da Cunha, and South Africa (Shirihai 2002, p. 77).

The range of adults foraging at sea during ''brood guard'' (a portion of the chick provisioning stage—the period when males stay ashore to guard the chicks) is very tightly constrained, with females making limited duration foraging trips lasting about 12 hours (Trathan *et al.* 2006, p. 240). At South Georgia Island, females, when leaving the individual colonies, swim in straight lines along colony-specific trajectories toward predictable prey aggregations at the edge of the continental shelf. If prey is encountered before they reach the shelf edge, they stop and feed until they either return to the colony or move farther offshore to find more prey (Trathan *et al.* 2006, p. 248). In moving in predictable directions offshore during all parts of the chick provisioning stage, penguins move towards waters influenced by the southern ACC front, an area where krill abundance has been shown to be generally higher (Trathan *et al.* 2006, p. 249; Trathan *et al.* 2003, pp. 577, 579). These studies illustrate the importance of the southern ACC front in transporting krill from the region of the Antarctic Peninsula to the waters of South Georgia Island (Trathan *et al.* 2006, p. 240; Reid and Croxall 2001, p. 380).

Population

In 1993, the worldwide population of macaroni penguins was estimated at 11.8 million pairs (Woehler 1993, p. 52). Current estimates place the total population at 9 million pairs (BirdLife International 2007, p. 2; Ellis *et al.* 2007, p. 5; Ellis *et al.* 1998, p. 60), although due to potential underestimates in the South Georgia Island region (see South Atlantic Ocean discussion below), this estimate is, therefore, also likely to be an underestimate of the overall population size.

South Atlantic Ocean

In 1980, there were approximately 5.4 million pairs ± 25 to 50 percent, (Woehler 1993, pp. 3, 55) of macaroni penguins at South Georgia Island, yielding a range of 2.7–8.1 million pairs. At that same location, the current estimates are 2.5–2.7 million pairs (BirdLife International 2007, p. 3; DEFRA 2007, p. 2). The current estimate, however, is likely to be an underestimate as it is based on extrapolations of counts in smaller areas to predict numbers in larger areas—an estimation technique of questionable use in this species (for example, at the Prince Edward Islands in the Indian Ocean, extrapolations of declining trends at small study colonies to estimates of overall trends for the overall island were not supported by empirical data; declines at larger colonies were much less significant than those at small colonies (Crawford *et al.* 2003, p. 485)).

At South Georgia Island, the current overall number was extrapolated from bird counts at a selected number of colonies that had declined by 50 percent over the last 2 decades of the 20th century (BirdLife International 2007, p. 3; Trathan *et al.* 2006, pp. 249–250). The conclusion that the overall South Georgia numbers had halved during that same time period has not been empirically verified in the literature (Trathan *et al.* 1998, p. 265; Trathan and Croxall 2004, p. 125; Trathan *et al.* 2006, pp. 249–250; Trathan 2004, p. 342). Furthermore, given the large variability in the 1980s estimate (2.7–8.1 million pairs) combined with the likely underestimate of current numbers at South Georgia Island (2.5–2.7 million pairs), we cannot reliably determine that there has been any decline in overall population numbers at South Georgia Island, nor can we reliably predict a declining population trend in the future.

South of the large concentrations of macaroni penguins at South Georgia Island, there are small colonies scattered locally around South Shetland Islands (about 7,080 total pairs), South Orkney Islands (about 50 pairs), and South Sandwich Islands (about 3,000 pairs), and a pair reported on the Antarctic Peninsula (Woehler 1993, p. 54–55; BirdLife International 2007, p. 3).

In the southeast Atlantic Ocean at Bouvet Island (Norwegian Territory), there were some 100,000 breeding pairs in the 1960s and early 1970s, but these are reported to have ‘‘subsequently decreased’’ but there is no current estimate (BirdLife International 2007, p. 3; Woehler 1993, p. 52).

Macaroni penguins also breed in small colonies in approximately 8 island sites around the southern tip of South America in southern Chile with abundance totaling up to 75,000 pairs and are reported to be stable (Woehler 1993, p. 56; BirdLife International 2007, p. 4).

Indian Ocean

In the Prince Edward Islands (South African Territory), there are about 300,000 pairs reported at Marion Island and 9,000 pairs at Prince Edward Island (Crawford and Cooper 2003, p. 417; Crawford 2007, p. 9). At Marion Island, there was a decline from 434,000 pairs in 1994–95 to 356,000 pairs in 2002–03, but given the magnitude of the population numbers, this 18-percent decline over the 8-year time period is not considered to be a significant change in the population (Crawford *et al.* 2003, p. 485). In the three subsequent breeding years (2003–06) small fluctuations between 350,000 and 300,000 pairs were observed (Crawford 2007, p. 9).

On a local scale at Marion Island, significant declines in three small study colonies (each under 1,000 pairs) have been reported, although the extent of the declines is questionable. Monitoring of these colonies between 1979–80 and 2002–03 indicated a cumulative decrease in numbers by 88 percent (Crawford *et al.* 2003, p. 485); however, changes in survey methodology, as explained below, limit the comparability of the survey data, calling into question actual changes in population numbers. While Crawford *et al.* (2003, p. 485) and Crawford (2007, p. 9) reported that the total number of breeding pairs in these colonies (comprising 9 to 20 percent of the total breeding numbers at Marion Island) decreased by 60 percent from 1994–95 to 2002–03, after a long period of relative stability, a sudden drop in numbers appeared at the same time as an apparent shift in the investigators’ survey or tallying methodology (Crawford *et al.* 2003, p. 478). Despite the declines reported, breeding success increased from 1995–96 to 2004–05 in study colonies (Crawford *et al.* 2003, p. 484).

At Prince Edward Island, which has a fraction of the macaroni penguins of its neighboring Marion Island, numbers declined from approximately 17,000 pairs in 1976–77 to an estimated 9,000 pairs in 2001–02 (Crawford *et al.* 2003, p. 483). According to the more current information provided here, the current IUCN figures overestimate the percentage decline of the macaroni penguin at the Prince Edward Islands (BirdLife International 2007, p. 3). Summing the figures provided above on overall population declines at Marion and Prince Edward Islands, we calculate the total decline for the two islands to be approximately 32 percent since 1979, instead of the 50 percent reported.

Moving eastward in the southern Indian Ocean, Woehler (1993, p. 52; BirdLife International 2007, p. 4) reported up to 2 million breeding pairs at the Crozet Island. Farther east at the Kerguelen Islands, there are reported to be about 1.8 million pairs of macaroni penguin, with a reported increase of 1 percent per year between 1962 and 1985, and 1998 data indicate colonies are stable or increasing (BirdLife International 2007, p. 4).

The Heard and McDonald Islands south of the Kerguelen Islands are reported to have about 1 million breeding pairs each (Birdlife International 2007, p. 3; Woehler 1993, p. 53). There are no reports of trends.

Other Status Classifications

The macaroni penguin is categorized as ‘Vulnerable’ by IUCN Criteria because ‘‘overall a majority of the world population appears to have decreased by at least 30 percent over 36 years (three generations).’’ However, it is noted that this ‘‘classification relies heavily on extrapolation from small-scale data, and large-scale surveys are needed to confirm the categorization’’ (BirdLife International 2007, p. 1).

Population Summary

Current estimates place the total population of macaroni penguins at 9 million pairs (BirdLife International 2007, p. 2; Ellis *et al.* 2007, p. 5; Ellis *et al.* 1998, p. 60). Although penguin numbers appear to have declined by about 32 percent in the Prince Edward Islands since the late 1970s, this area represents only 3.4 percent of the overall current macaroni penguin population. As described above, in other parts of the species’ range, trends are increasing, stable, or unknown due to poor or scant data. Given the different population dynamics observed throughout the range of the macaroni penguin, as described above, we cannot reliably predict nor do we have reason to believe that the overall population numbers will decline in the future.

Summary of Factors Affecting the Species

Factor A: The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Terrestrial Habitat

We have found no current reports of threats to the terrestrial breeding habitat of the macaroni penguin, and we have no reason to believe threats to the terrestrial habitat will emerge in the future.

Reduced Prey Availability

Changes in the availability of prey to the macaroni penguin have been hypothesized for declines observed in study colonies at Marion and South Georgia Islands. Below, we discuss both the potential impacts of low prey availability, as well as potential causes of reduced prey availability, including interspecific competition and climate-related changes in the marine environment. In Factor E, we discuss the potential impacts of fisheries on prey availability.

At Marion Island, moderate decreases in macaroni penguin numbers have been attributed to an altered availability of food (Crawford and Cooper 2003, p. 417) based on changes in weight of returning birds after a winter at sea and variations in mass of chicks at fledging (Crawford *et al.* 2006, pp. 185–186), but there is currently insufficient research evaluating the causes of declines at Marion Island to draw science-based conclusions.

At South Georgia Island, researchers have looked in depth at the foraging behavior and diet of macaroni penguins and other marine predators and related them to interspecific competition, prey switching, and changes in the overall food base. While krill is known as the primary prey of the macaroni penguins, at South Georgia Island study colonies, the percentage of krill in the diet at Bird Island declined significantly from 1980–2000, particularly after 1995 (Reid and Croxall 2001, p. 379). During this period, there was also a decline in the small Bird Island study colony (Reid and Croxall 2001, p. 379). The percentage of krill in the macaroni penguin diet was significantly correlated to the density of krill in the region and was also directly related to prey-switching by the penguins (Barlow *et al.* 2002, p. 211). In 1984, for example, krill was abundant and comprised 95 percent of the mass of prey in the diet of macaroni penguins studied at South Georgia Island (Croxall *et al.* 1999, p. 115). However, in years when krill abundance was reduced, as in 1994 when there was a four-fold decrease in krill biomass from 1984, the penguins studied shifted their diet to other prey species, including amphipods (63.2 percent of the mass in the diet) and fish species (15 percent, in particular, myctophids (*Krefftichthys anderssonii*) and channichthids (*Pseudochaenichthys georgianus*)), while krill comprised only 13.1 percent of the diet (Croxall *et al.* 1999, p. 117). This prey-switching behavior suggests that the macaroni penguin has some adaptability in adjusting to temporary fluctuations in their preferred prey (krill).

Reduction of Prey Due to Competition

Barlow *et al.* (2002, pp. 205–213) examined whether the decreased availability of krill for macaroni penguins at South Georgia Island is a result of competition with the other major krill predator in the region, the Antarctic fur seal. Study colonies of macaroni penguins have declined at South Georgia Island over the past 2 decades (see Population discussion above), while fur seal numbers have increased at a very rapid rate since the 1950s. The fur seal has recovered from near extinction in the first half of the 20th century (to 400,000 in 1972 and to more than 3 million individuals breeding at South Georgia Island at the present day), and they have expanded their breeding range across the northwest end of South Georgia Island (Barlow *et al.* 2002, p. 206). These researchers found at the Bird Island study site that there was substantial overlap in the foraging range of macaroni penguins and Antarctic fur seals during the breeding season, and that the size and nature of krill prey consumed were very similar. They were unable to determine if the different population trajectories of the two species during the same period reflected ‘‘different and independent species-specific responses to variation in krill availability, or whether (or to what extent) they have been substantially influenced by direct interspecific competition’’ (Barlow *et al.* 2002, p. 211). Therefore, although the researchers suggest there is a dynamic interaction that currently favors Antarctic fur seals over macaroni penguins in the study area, this suggestion is speculation because the empirical data have not distinguished whether the penguins and fur seals each have different and independent responses to the variation in krill availability or, alternatively, whether the two species have been influenced by being in direct competition with each other (*i.e.*, the research has not confirmed that competition is occurring). Furthermore, given that the level of interspecific competition is uncertain, the authors' prediction that competition will likely increase as fur seals continue to increase (Barlow *et al.* 2002, p. 212) is also speculation.

With respect to changes in the krill abundance at South Georgia Island, Reid and Croxall (2001, pp. 377–384) examined population demographics of the krill prey in the diets of four marine predators breeding at Bird Island—Antarctic fur seals, macaroni penguins, gentoo penguins (*Pygoscelis papua*), and black-browed albatrosses (*Thalassarche melanphrys*). For data averaged over the decade of the 1980s, the two penguin species and the Antarctic fur seals were consistently consuming the majority of their krill diet from the largest of three size classes identified. For the decade of the 1990s, there was a change in all three species toward consuming krill in the middle size class (Reid and Croxall 2001, p. 380). At the same time, negative changes in the reproductive performance of all four species were recorded. For macaroni penguins in the colonies studied, arrival condition and reproductive output declined significantly in the second decade after stability in penguin numbers in those colonies in the 1980s. These results suggest that in the 1980s the biomass of krill in the largest size class was sufficient to support predator demand, but it was not in the 1990s (Reid and Croxall 2001, p. 378).

Indices of reproductive output for macaroni penguins in study colonies declined over the period from 1980–2000 (Reid and Croxall 2001, pp. 379–380). While it is difficult to separate the relative contribution to this decline from interspecific competition versus reduction of krill due to other reasons, macaroni penguins were found to be unique among the four predator species studied because they were able to compensate for low availability of krill by switching to other prey (Reid and Croxall 2001, pp. 379, 381; Croxall *et al.* 1999, p. 117).

Reid and Croxall (2001, p. 383) concluded that the balance between krill supply and predator demand altered substantially from 1980–2000. They suggested that a combination of two factors: (1) Changes in the krill population structure arriving from the Antarctic Peninsula source region, and (2) increased predator-induced mortality on the larger size classes of krill arriving in the region effectively removed the buffer of krill abundance and increased ‘‘the frequency of years where the amount of krill is insufficient to support predator demand’’ (Reid and Croxall 2001, p. 383). They suggested that this buffer or ‘‘krill surplus’’ noted in the 1980s may have dated from the time when whaling severely reduced the numbers of great whales in the Southern Ocean. This unusually high temporary biomass of krill might have supported a higher biomass of predators, potentially resulting in artificially high population numbers of certain predator species, such as macaroni penguins. We acknowledge that the change in ecosystem dynamics could lead to a new predator-prey equilibrium, whereby, some species temporarily decline in numbers. This possibility precludes our ability to reliable extrapolate population trends into the future, as long as population numbers are relatively high, as they are in the macaroni penguin.

Reduction of Prey Due to Climate-Related Changes in the Marine Environment

Changes in climate could potentially impact aspects of the marine environment such as sea surface temperatures or shifts in currents, ultimately leading to changes in prey availability. Reid and Croxall (2001, p. 377) hypothesized that changes in the Antarctic Peninsula region could affect the recruitment of the Antarctic krill populations that supply the South Georgia Island marine ecosystem. Reid *et al.* (2002, p. 1) showed that the size structure of the local South Georgia Island krill population tracked closely with krill-recruitment events in the Elephant Island region at the northeastern tip of the Western Antarctic Peninsula (WAP). Events at Elephant Island, in turn, have been found to be coherent with events at the Peninsula itself (Fraser and Hoffman 2003, p. 9).

Trathan *et al.* (2003, p. 581) concluded that physical data at the spatial and temporal resolution necessary to identify possible relationships between large-scale variability within the ACC and the krill biomass at South Georgia Island are not available. They did note, on a preliminary basis, that periods of high krill abundance (*i.e.*, January 1992 and January 1998) were linked to unusually low sea surface temperatures in the southern ACC front near South Georgia Island and that periods of krill scarcity were linked to sea surface temperatures in the upper 20 percent of recorded values (*i.e.*, January 1991 and January 1994) (Trathan *et al.* 2003, p. 581). In describing warm and cold anomalies in the temperature of the southern ACC front, these authors did not address the question of whether there are consistent directional changes occurring in the temperature of this current (Trathan *et al.* 2003, pp. 569–582).

Fraser and Hoffman (2003, pp. 1–15) reviewed the krill cycle and the recruitment of krill and related them to cyclical patterns of sea-ice extent at the WAP. In studies similar to those at South Georgia Island, the authors examined data on krill size classes in the diet of a different species, the Adelie penguin (*Pygoscelis adeliae*) near Palmer Station on the WAP, and compared these data against cyclical variability in sea-ice extent between 1973 and 1996. Analyses have shown that WAP sea-ice extent exhibits 4- to 5-year cycles of high ice years followed by several low-ice years. The cycles follow the periodicity of the Antarctic Circumpolar Wave (a phenomenon of interannual anomalies in the atmospheric pressure, wind stress, sea surface temperature, and sea-ice extent over the Southern Ocean that propagates eastward with a period of over 4–5 years and takes 8–10 years to circle the globe) (White and Peterson 1996, p. 699; Fraser and Hoffman 2003, p. 8). At the WAP, Fraser and Hoffman (2003, p. 6) identified the beginning of five cycles between the 1973–74 and 1996–97 field seasons, and tracked four complete cycles (two 4-year, one 5-year, and one 6-year). They looked at trends in krill size classes within the diet of Adelie penguins and found that years of high krill recruitment followed years of maximum September (winter) sea-ice extent (Fraser and Hoffman 2003, p. 6). In the years following high krill-recruitment years, the Adelie penguin diet reflected the consumption of larger and larger krill each year as the dominant large cohort grew, through a 4-to 5-year period, until the next large krill-recruitment year occurred.

The strong age classes produced in a good ice year become the core spawning stock for the next cyclical sea-ice maximum, generally 4 or 5 years away, with smaller cohorts in the intervening years. Krill reach the limit of their life span after 5 years, and this age class is reduced from several years of predation and mortality. We have discussed above the work of Fraser and Hoffman (2003, pp. 1–15), who reviewed the krill cycle and the recruitment of krill and related them to cyclical patterns of sea-ice extent at the WAP. Of significance to the observed trends at South Georgia Island, a 6-year ice cycle occurred between 1980 and 1986 (a gap unique in the contemporary WAP sea-ice record), which had significant consequences for krill recruitment (Fraser and Hoffman 2003, p. 12). This ‘‘senescence event’’ in which the large krill cohort originating from the 1980 sea-ice maxima may have died before they could reproduce and contribute to the next generation of recruits may have led to a loss of most of the strong 1980–81 cohort and its reproductive potential (Fraser and Hoffman 2003, p. 12). The authors suggested this may have had major ecological consequences. Correspondingly, krill abundance was at its lowest recorded levels at Elephant Island in 1990, at the time the lost cohort would have been expected to spawn again and, at South Georgia Island, krill predators, including macaroni penguins at study colonies, began to decline significantly after being stable throughout the 1980s (Fraser and Hoffman 2003, p. 13). The authors noted that two or more closely spaced senescence events of this sort would have devastating consequences on the structure and function of krill populations and the ecosystems they support (Fraser and Hoffman 2003, p. 13).

The study of Trathan *et al.* (2003, p. 581) described 2 years of ‘‘particularly high’’ krill abundance and 2 years of ‘‘particularly low’’ krill abundance during the 1990s. The study raises questions as to the ability to generalize comparisons between the 1980s and 1990s to the current period (2001 to the present), for which we currently have little or no empirical data either for krill or macaroni penguin abundance or reproductive output. The decadal analyses of krill abundance and macaroni penguin reproductive output at study colonies at South Georgia Island through the year 2000 (Reid and Croxall 2001, p. 377), and of krill response off the WAP to climate change, physical forcing (*e.g.*, shifts in current or temperature patterns), and ecosystem response, suggest that the krill populations and the ecosystems they inhabit have become more vulnerable to climate-induced perturbations (Fraser and Hoffman 2003, p. 13) and that overall krill abundance has declined significantly in the last few decades (Atkinson *et al.* 2004, p. 101; Loeb *et al.* 1997, p. 897).

Conclusion for South Georgia Island

Significant changes in krill abundance and composition have been documented in study colonies of macaroni penguins on South Georgia Island during a period of decline (up to 50 percent) of macaroni penguins in those colonies over the last 2 decades of the 20th century. Although these declines have been associated with a variety of factors, including: (1) Variations in the temperature of the ACC at South Georgia Island (Trathan *et al.* 2003, p. 581) and cycles of sea-ice extent at the WAP, which have affected krill recruitment (Fraser and Hoffman 2003, p. 13), and (2) increases in numbers of Antarctic fur seals, which share the same food, suggesting competition, not enough information is known about these relationships to predict the availability of krill to macaroni penguins in the future.

Despite concurrent declines in macaroni penguin numbers and increases in fur seal numbers in certain areas of the South Georgia region, studies have not confirmed that competition between the two species is occurring. Therefore, we cannot make reliable predictions about whether competition will occur in the foreseeable future, much less to what extent it would affect the availability of krill to the macaroni penguin.

Although it is possible that climate change will result in changes within the ACC and krill biomass and/or the frequency or severity of krill ''senescence events,'' potentially affecting the macaroni penguin population in the South Georgia Island region, we do not have sufficient physical data at the spatial and temporal resolution necessary to identify or predict possible trends or relationships between large-scale variability within the ACC, sea ice changes, and potential changes in the krill biomass.

Aside from our inability to identify future trends related to krill availability to the macaroni penguin at South Georgia Island, neither do we have enough information on the adaptability of the macaroni penguin to changing krill availability. For example we do not know the extent of flexibility it has in: (1) Relying on a greater diversity of prey species to satisfy its long-term biological needs; (2) altering its foraging routes; or (3) moving its breeding locations closer to more dependable food supplies.

Despite our inability to predict future trends with regard to changes in prey availability to the macaroni penguin or its ability to adapt to those potential changes, we do not believe that the changes in food availability currently acting on the macaroni penguin population at South Georgia Island are causing a long-term decline in this population. Although numbers may have declined locally, these declines could have been offset, at least to some extent, by increases elsewhere within the South Georgia Island region, and the population continues to survive there in large numbers.

Macaroni penguins at South Georgia Island appear to have some ability to switch to different prey at times of low krill abundance. Given its flexibility in switching to alternative prey species and the estimated abundance of the macaroni penguin population at South Georgia Island (2.5–2.7 million pairs, and likely greater due to potential underestimates), we believe that this population can withstand disturbances linked to the marine changes identified. Given the lack of comprehensive survey data throughout the South Georgia Islands, we cannot reliably predict, nor do we have reason to believe, that the overall population numbers will decline in the future as a result of the marine changes identified. Therefore, we find that the present or threatened destruction, modification, or curtailment of the species' marine habitat or range is not a threat to the macaroni penguin in the South Georgia Island portion of its range now or in the foreseeable future.

Conclusion for the Remainder of the Macaroni Penguin's Range

At Marion Island, moderate decreases in macaroni penguin numbers have been attributed to an altered availability of food (Crawford and Cooper 2003, p. 417), but there is currently insufficient research evaluating the causes of declines at Marion Island to draw any conclusions about the causes, much less make predictions about future trends of prey availability in that area. There is no information available suggesting that a reduction in prey availability is a threat to the macaroni penguin in any other portion of the species' range.

Although penguin numbers appear to have declined by about 32 percent in the Prince Edward Islands since the late 1970s, this area represents only 3.4 percent of the overall current macaroni penguin population. As described above (see Population discussion), in other parts of the species' range, trends are increasing, stable, or unknown due to poor or scant data. Given the different population dynamics observed throughout the remainder of the range of the macaroni penguin, we cannot reliably predict nor do we have reason to believe that the overall population numbers will decline in the future as a result of marine changes. Therefore, we find that the present or threatened destruction, modification, or curtailment of the species' marine habitat or range is not a threat to the macaroni penguin in any other portion of its range now or in the foreseeable future.

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

We are not aware of any overutilization for commercial, recreational, scientific, or educational purposes that is a threat to the macaroni penguin in any portion of its range (BirdLife International 2007, pp. 1–3; Ellis *et al.* 1998, p. 61) now or in the foreseeable future.

Factor C: Disease or Predation

No blood-borne parasites (*haematozoa*) were found in any of 89 blood smears from macaroni penguins collected at Marion Island in 2001 (Crawford and Cooper 2003, p. 418). Although parasites and disease have not been identified as stressors at this island or other areas of the Prince Edward Islands, the potential susceptibility of sub-Antarctic penguins to haematozoan vectors has been recognized, and so strict measures have been put in place at the Prince Edward Islands to minimize the possibility of introducing avian diseases. Therefore, we do not have reason to believe that disease will become a threat at the Prince Edward Islands in the foreseeable future. Disease has not been identified as a threat to macaroni penguins in any other areas of the species' range, nor do we have reason to believe disease will become a threat in any portion of the species' range within the foreseeable future. Therefore, we find that disease is not a threat to the macaroni penguin in any portion of its range now or in the foreseeable future.

Predation has not been cited as a threat in macaroni penguins. Although predation by feral cats has been reported on Kerguelen Archipelago, remains of macaroni penguins were rarely found in scat analyses from feral cats there (Pontier *et al.* 2002, p. 835), and the rare exceptions could have been a result of scavenging on carcasses as opposed to predation. There have been no reported local or large-scale declines in macaroni penguin numbers at the Kerguelen Islands, and in fact, there were reported increases in numbers there at a rate of 1 percent per year between 1962 and 1985. The 1998 data indicate colonies are stable or increasing (BirdLife International 2007, p. 4). This suggests that predation is not affecting the macaroni penguin numbers there. There is no information available that suggests the number of predators at the Kerguelen Islands will increase in the foreseeable future or that the current potential predators will begin to affect penguins in the foreseeable future. Therefore, we do not consider predation to be a stressor, much less a threat to macaroni penguins on the Kerguelen Archipelago. There is no information available that suggests predation is a threat to macaroni penguins in any other portion of its range, now, nor do we expect it to become a threat in the foreseeable future.

Based on review of the best available scientific and commercial information, we find that predation is not a threat to the macaroni penguin in any portion of its range now or in the foreseeable future.

Factor D: The Inadequacy of Existing Regulatory Mechanisms

The macaroni penguin is widely distributed on largely uninhabited islands in the territories of seven countries and the region under the jurisdiction of the Antarctic Treaty and the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR). Breeding islands are largely inaccessible, access is tightly controlled, and most of them are under protected status (BirdLife International 2007, p. 4; Ellis *et al.* 1998, p. 61). South Georgia Island is administered by the Government of South Georgia and South Sandwich Islands (GSGSSI). Research on macaroni penguins in South Georgia, for example at Bird Island, which is a Specially Protected Area under the South Georgia Environmental Management Plan, is conducted by the British Antarctic Survey under annual permits from the GSGSSI. Visitation to South Georgia is tightly controlled with visitors' permits required prior to visiting research sites (British Antarctic Survey 2008, p. 2). The Australian islands of Heard and McDonald are also World Heritage sites with limited or no visitation and with management plans in place (UNEP WCMC 2008, p. 6). In 1995, the Prince Edward Islands Special Nature Preserve was declared and accompanied by the adoption of a formal management plan (Crawford and Cooper 2003, p. 420). In our analysis of other factors, we determined that existing national regulatory mechanisms are adequate regarding the conservation of macaroni penguins throughout all or any portion of the species' range. (For example in our discussion of Factor E, we consider the adequacy of CCAMLR in the conservation and management of krill fisheries.) Furthermore, there is no information available to suggest this will change within the foreseeable future.

Factor E: Other Natural or Manmade Factors Affecting the Continued Existence of the Species

Competition With Commercial Krill Fisheries

Another possible factor affecting krill abundance is commercial krill fisheries. Krill fisheries have operated in the region of South Georgia Island since the early 1980s and are managed by CCAMLR (Reid and Croxall 2001, p. 383). Harvesting occurs in the winter around South Georgia Island and moves south as the ice retreats in spring and summer. Krill fisheries have harvested only a fraction of the approved CCAMLR catch limits since 1993 (Croxall and Nichol 2004, p. 574). In their analysis of predator response to changes in krill abundance, Reid and Croxall (2001, p. 383) note that the fishery near South Georgia Island is small and that total catches actually declined by almost 50 percent since 1980 for commercial reasons, rather than due to lack of krill abundance. They do not cite competition with krill fisheries as a contributor to macaroni penguin declines (Reid and Croxall 2001, p. 383); however, given that we have already identified the reduced availability of krill as a stressor to the macaroni penguin (see Factor A), we recognize that commercial krill fisheries have the potential to contribute as one of several sources of this stressor. With respect to the local macaroni penguin declines observed, Reid and Croxall (2001, p. 383) note that the potential for competition with krill fisheries should be taken into account in future CCAMLR krill management strategies.

Croxall and Nicol (2004, pp. 570–574) reported on the ongoing efforts within CCAMLR to improve management procedures for the krill fishery in long-established fisheries areas and sub-areas in the Southern Ocean. These included improving the overall estimation of krill to redefine catch limits over large sectors of the Southern Ocean (Croxall and Nicol 2004, p. 573). Also, out of concern that krill management was being undertaken at a scale too large to prevent localized depletion of the krill resource if the fishery was concentrated in small proportions of a particular established area or sub-area, CCAMLR adopted approaches to better manage the area encompassing the Antarctic Peninsula, Scotia Sea, and South Georgia.

First, on the basis of the work of their scientific committee, the CCAMLR Commission in 2002 formally adopted smaller and more ecologically realistic management areas, referred to as Small-Scale Management Units (SSMUs) to manage krill fishing at scales most relevant to the natural environment—prey-predator interactions (Hewitt *et al.* 2004, p. 84). This includes three SSMUs established in the South Georgia region. At the same time, CCAMLR adopted precautionary catch limits, well below the catch limits identified in global scale analyses, to limit harvest in the fisheries areas while specific protocols for dividing harvest among the SSMUs are being developed (Hewitt *et al.* 2004, p. 84).

The process of establishing science-based approaches by which to allocate harvest to the SSMUs was agreed by the CCAMLR commission and is well underway. Allocation options have been developed (Hewitt *et al.* 2004, pp. 81–97); these are being evaluated in a series of meetings that have taken place over the last 3 years; and by spring 2008, a model will be developed to allocate catch limits (Trivelpiece 2008, pers. comm.). This model will allow testing of different approaches to allocating catch and lead to recommendations to the Scientific Committee and the CCAMLR Commission (Hewitt *et al.* 2004, p. 84). This work to establish decision rules includes assessing: (1) Spatial and temporal use of the area by krill predators and fisheries; (2) fluxes of krill into and out of the area; (3) competition between species; and (4) how to manage these areas to respond to ecosystem change (Croxall and Nicol 2004, p. 573). In support of development of allocation approaches at the level of SSMUs, CCAMLR has already adopted a requirement that krill catches be reported to very small geographical detail (10 x 10 nm) and over small 10-day time scales (Hewitt *et al.* 2004, p. 84). Parallel efforts by the CCAMLR Ecosystem Monitoring Program involve monitoring selected predator, prey, and environmental indicators of ecosystem status to detect and record changes in critical components of the ecosystem and distinguish the impacts of harvesting from other environmental variability (Croxall and Nichol 2004, pp. 573–574).

Conclusion for South Georgia Island

Based on: (1) The small size of krill fisheries in the region of South Georgia Island, and (2) the ongoing efforts under CCAMLR to sustainably manage krill species, efforts specifically designed to investigate and respond to the phenomena described for the South Georgia Island region (*e.g.*, the setting of precautionary catch limits designed to limit local impacts and the development and implementation of SSMUs), we find that competition with krill fisheries is not a threat to the macaroni penguin at South Georgia Island. Furthermore, we have no reason to believe that the krill fisheries will expand in this region in the foreseeable future or that the current management and regulatory mechanisms will be weakened or become less effective in the foreseeable future.

Conclusion for the Remainder of the Macaroni Penguin's Range

Given the ongoing efforts within CCAMLR to improve management procedures for the krill fishery in long-established fisheries areas and sub-areas in the Southern Ocean (Croxall and Nicol 2004, pp. 570–574), including: (1) Efforts already completed to provide better management of overall harvest limits and the adoption of precautionary catch limits for smaller management areas, and (2) the substantial progress being made in bringing krill harvest management down to the scale of SSMUs, we find that regulatory mechanisms for the management of krill fisheries are adequate. We have no reason to believe that the current regulatory mechanisms will be weakened or become less effective in the future. As discussed above, management efforts even improved over the last several years. Therefore, we find that competition with krill fisheries is not a threat to the macaroni penguin in any other portion of its range now or in the foreseeable future.

Oil Spills

The possibility of oil pollution is cited in reviews of the conservation status of macaroni penguins (BirdLife International 2007, p. 3; Ellis *et al.* 1998, p. 61). At Marion Island, oil spills have had severe effects on penguins at landing beaches, but a new Prince Edward Islands Management Plan, prepared by the Republic of South Africa, now requires that utmost care be taken to avoid fuel spills during transfers at the islands (Crawford and Cooper 2003, p. 418).

Oil and chemical spills can have direct effects on the macaroni penguin in New Zealand waters, and based on previous incidents around New Zealand, we consider this a stressor to this species. For example, in March 2000, the fishing Vessel *Seafresh 1* sank in Hanson Bay on the east coast of Chatham Island and released 66 tons (60 tonnes (t)) of diesel fuel. Rapid containment of the oil at this very remote location prevented any wildlife casualties (New Zealand Wildlife Health Center 2007, p. 2). The same source reports that in 1998 the fishing vessel D*on Wong 529* ran aground at Breaksea Islets, off Stewart Island, outside the range of the erect-crested penguin. Approximately 331 tons (300 t) of marine diesel was spilled along with smaller amounts of lubricating and waste oils. With favorable weather conditions and establishment of triage response, no wildlife casualties of the pollution event were discovered (Taylor 2000, p. 94). We are not aware of reports of other oil spill incidents within the range of the macaroni penguin.

We recognize that an oil spill near a breeding colony could have local effects on macaroni penguin colonies. However, on the basis of the species' widespread distribution around the remote islands of the South Atlantic and southern Indian Oceans and its robust population numbers, we believe the species can withstand the potential impacts from oil spills. Also, given the remoteness of South Georgia Island, its relatively high population numbers, and the measures in place to control cruise vessel activities in the region, we believe the population on South Georgia Island can withstand the potential impacts from oil spills. Furthermore, we have no reason to believe that the frequency or severity of oil spills in any portion of the species' range will increase in the future or that containment capabilities will be weakened. Therefore, we conclude that oil pollution from oil spills is not a threat to the species in any portion of its range now or in the foreseeable future.

Foreseeable Future

In considering the foreseeable future as it relates to the status of the macaroni penguin, we considered the stressors acting on the macaroni penguin. We considered the historical data to identify any relevant existing trends that might allow for reliable prediction of the future (in the form of extrapolating the trends). We also considered whether we could reliably predict any future events (not yet acting on the species and therefore not yet manifested in a trend) that might affect the status of the species.

With respect to the macaroni penguin, the available data do not support a conclusion that there is a current overall trend in population numbers, and the overall population numbers are high. As discussed above in the five-factor analysis, we were also unable to identify any significant trends with respect to the stressors we identified. There is no evidence that any of the stressors are growing in magnitude. Thus, the foreseeable future includes consideration of the ongoing effects of current stressors at comparable levels.

There remains the question of whether we can reliably predict future events (as opposed to ongoing trends) that will likely cause the species to become endangered. As we discuss in the finding below, we can reliably predict that periodic declines in prey availability and oil spills will continue to cause local declines in macaroni penguin colonies, but we have no reason to believe they will have population-level impacts. Thus, the foreseeable future includes consideration of the effects of such crashes on the viability of the macaroni penguin.

Macaroni Penguin Finding Throughout Its Range

We identified a number of stressors to this species: (1) Reduced prey (krill) availability due to (a) competition with Antarctic fur seals, (b) changes in the marine environment, or (c) competition with commercial krill fisheries; and (2) oil spills. To determine whether these stressors individually or collectively rise to a ''threat'' level such that the macaroni penguin is in danger of extinction throughout its range, or likely to become so within the foreseeable future, we first considered whether the stressors to the species were causing a long-term, population-scale decline in penguin numbers, or were likely to do so in the future.

As discussed above, the overall macaroni penguin population is estimated at 9 million pairs (BirdLife International 2007, p. 2; Ellis *et al.* 2007, p. 5; Ellis *et al.* 1998, p. 60) and is likely to be greater due to likely underestimates at South Georgia Island. Although penguin numbers appear to have declined by about 32 percent in the Prince Edward Islands since the late 1970s, this area represents only 3.4 percent of the overall current macaroni penguin population. In other parts of the species' range, trends are increasing, stable, or unknown due to poor or scant data. Based on the best available data, we conclude that the population is stable overall. In other words, the combined effects of reduced prey availability, competition with Antarctic fur seals, changes in the marine environment, competition with commercial krill fisheries, and the impacts from oil spills at the current levels are not causing a long-term decline in the macaroni penguin population. Because there appears to be no ongoing long-term decline, the species is neither endangered nor threatened due to factors causing ongoing population declines, and the overall population of 9 million pairs or more appears robust.

We also considered whether any of the stressors began recently enough that their effects are not yet manifested in a long-term decline, but are likely to have that effect in the future. There is little data on macaroni penguin prey availability prior to the last 3 decades, and even less information on causes of prey decline. In any case, the periodic declines in prey availability over the last 30 years have had sufficient time to be reflected in population trends, and there appears to be no overall trend, regardless of localized changes in abundance. In addition, no oil spill events have occurred recently enough that the population effects would not yet be observed. Therefore, the macaroni penguin is not threatened or endangered due to threats that began recently enough that their effects are not yet manifested in a long-term decline.

Next, we considered whether any of the stressors were likely to increase within the foreseeable future, such that the species is likely to become an endangered species in the foreseeable future. As discussed above, we concluded that none of the stressors were likely to increase significantly.

Having determined that a current or future declining trend does not justify listing the macaroni penguin, we next considered whether the species met the definition of an endangered species or threatened species on account of its present or likely future absolute numbers. The total population of approximately 9 million pairs or more appears robust. It is not so low that, despite our conclusion that there is no ongoing decline, the species is at such risk from stochastic events that it is currently in danger of extinction.

Finally, we considered whether, even if the size of the current population makes the species viable, it is likely to become endangered in the foreseeable future because stochastic events might reduce its current numbers to the point where its viability would be in question. Because of the wide distribution of this species, combined with its high population numbers (approximately 9 million pairs), even if a stochastic event were to occur within the foreseeable future, negatively affecting this species, the population would still be unlikely to be reduced to such a low level that it would then be in danger of extinction.

Despite local declines in numbers of macaroni penguins in some colonies, the species has thus far maintained what appears to be high population levels, while being subject to most if not all of the current stressors. The best available information suggests that the overall macaroni penguin population is stable, despite localized changes in population numbers. Therefore, we conclude that the macaroni penguin is neither an endangered species nor likely to become an endangered species in the foreseeable future throughout all of its range.

Distinct Population Segment

A discussion of distinct population segments and the Service policy can be found above in the Distinct Population Segment section of the southern rockhopper penguin finding.

Macaroni penguins are widely dispersed throughout the sub-Antarctic in colonies located on isolated island groups. Among these groups, we have identified two possible segments to evaluate for DPS status: (1) The Prince Edward Islands, administered by South Africa, and (2) South Georgia Island, administered by the United Kingdom. For both of these areas, there may be differences in conservation status from other areas of the range of the macaroni penguin. Based on the data available, these are the only two areas where decreases in penguin numbers within colonies have been documented. Throughout the remainder of the macaroni penguin's range, population trends are for the most part unknown but in limited cases reported as stable or increasing (see Population discussion).

Discreteness Analysis

A discussion of discreteness can be found above in the southern rockhopper penguin Discreteness Analysis section.

Prince Edward Islands: Considering the question of discreteness, this island group is unique in the range of the macaroni penguin in being administered by the Republic of South Africa. Numbers are reported to have declined by approximately 18 percent at Marion Island between 1983–84 and 2002–03 and 47 percent at nearby Prince Edward Island in the same period for an overall 32-percent decline from about 451,000 to about 309,000 breeding pairs at the Prince Edward Islands. Based on its delimitation by international boundaries and its potentially different conservation status from other areas of abundance of the macaroni penguin, we conclude that this segment of the population of the macaroni penguin passes the discreteness conditions for determination of a DPS.

South Georgia Island: At this island, which is administered by the United Kingdom, macaroni penguin numbers at study colonies are reported to have declined by 50 percent in the last two decades of the 20th century. Based on its delimitation by international boundaries and its potentially different conservation status from other areas of abundance of the macaroni penguin, we conclude that this segment of the population of the macaroni penguin passes the discreteness conditions for determination of a DPS.

Significance Analysis

A discussion of significance can be found above in the southern rockhopper penguin Significance Analysis section.

Prince Edward Islands: The current abundance of about 309,000 breeding pairs of macaroni penguins at the Prince Edwards Islands represents 3 percent of the overall estimated population of macaroni penguins worldwide and 6 percent of the estimated numbers in the Indian Ocean. This does not provide a significant contribution globally to the abundance of the taxon. The Prince Edward Islands are the westernmost of one of four island groups that lie just north of the Antarctic Convergence Zone and comprise the Indian Ocean breeding habitat of the macaroni penguin. The Prince Edward Islands and the Crozet Islands sit 641 mi (1,066 km) apart in similar ecological settings, rising at about 46° S at the western and eastern ends, respectively, of the shallow Crozet Plateau. Both islands are adjacent to both the shallow waters of the plateau and the deeper water areas to the south of this region. Even though it is the westernmost breeding location in the Indian Ocean, loss of the Prince Edward Islands colonies would not create a significant gap in the range of the taxon. The Indian Ocean colonies are already very isolated (1,581 mi (2,545 km)) from the closest colonies to the west in the South Atlantic Ocean at Bouvet Island. The distance between Bouvet Island and the Prince Edward Islands is 1,581 mi (2,545 km) and the distance between Bouvet Island and Crozet Island is 2,135 mi (3,426 km). Loss of the Prince Edward Island population would increase the distance between Indian Ocean breeding areas and Bouvet Island by only 25 percent, or 554 mi (886 km). We do not have data to evaluate whether interchange occurs between these South Atlantic Ocean and Indian Ocean breeding colonies, so we do not know if the 25-percent increase in the distance between these breeding areas is significant. We also have no evidence that the Prince Edward Island populations differ markedly from others in genetic characteristics. On the basis of this information, we conclude that the Prince Edward Island birds do not comprise a significant numerical contribution to the overall population of macaroni penguins, they do not occupy an unusual or unique ecological setting for the taxon, and their loss would not result in a significant gap in the range of the taxon. This population is not the only surviving natural occurrence of this species, and it is not known to differ genetically from other populations of the species. On this basis, the Prince Edward Islands populations of the macaroni penguin are not significant to the taxon as a whole and therefore do not constitute a DPS.

South Georgia Island: The current abundance of macaroni penguins at South Georgia Island represents 28 percent of the global estimated population and is the largest known concentration of breeding colonies of this species. For the South Atlantic region, the South Georgia Island population segment represents the core of a range that includes areas of abundance at the tip of South America and scattered small colonies in the islands at the tip of the Antarctic Peninsula. We conclude that loss of the colonies at South Georgia Island would create a significant gap in the range of the taxon and remove macaroni penguins from the unique ecological setting of South Georgia Island, which lies at the downstream end of the flow of nutrients and krill carried by the ACC from the vicinity of the Western Antarctic Peninsula. Therefore, we conclude that the South Georgia Island population of the macaroni penguin is significant to the taxon as a whole and qualifies as a distinct population segment.

South Georgia Island DPS Finding

We identified a number of stressors to the South Georgia Island DPS of the macaroni penguin: (1) Reduced prey (krill) availability due to (a) competition with Antarctic fur seals, (b) changes in the marine environment, or (c) competition with commercial krill fisheries; and (2) oil spills. To determine whether these stressors individually or collectively rise to a ''threat'' level such that the macaroni penguin is in danger of extinction in the South Georgia Island DPS, or likely to become so within the foreseeable future, we first considered whether the stressors were causing a long-term, population-scale decline in the DPS, or were likely to do so within the foreseeable future.

The macaroni penguin DPS at South Georgia Island is estimated to include 2.5–2.7 million breeding pairs; however, as previously discussed (see Population discussion) the current estimate is likely to be an underestimate as it is based on extrapolations of counts in smaller areas to predict numbers in larger areas—an estimation technique of questionable use in this species. Although study colonies within the South Georgia Island DPS have decreased steeply in numbers (by 50 percent) over the period from 1980–2000, we do not know the status of the remainder of the colonies throughout the DPS, and therefore, do not know the overall population trend for the South Georgia Island DPS. In a similar situation at the Prince Edward Islands, the use of figures from censuses of small study colonies would have led to a 100-percent overestimate of declines (*i.e.*, an inferred 50-percent decline, would actually be a 25-percent decline) (Crawford *et al.* 2003, p. 485). We also do not have information on whether the reported declines have continued over the last decade.

In our five-factor analysis for the macaroni penguin, we found that at South Georgia Island, reduced krill availability has been identified as a stressor associated with local declines of up to 50 percent at small study colonies over the last 2 decades of the 20th century. In our assessment of this stressor, we were unable to reliably identify the source of reduced krill availability to macaroni penguins in the South Georgia Island DPS. We do not have sufficient information as to the continued abundance of krill populations reaching the waters of South Georgia Island, nor predictive capability related to the future abundance of krill and other prey of the South Georgia DPS, to conclude that prey shortages will lead to future declines. Under CCAMLR, measures are being taken to monitor krill abundance and manage krill fisheries, which are small in scale, at ecosystem scales relevant to safeguarding prey for predator species at South Georgia, including the macaroni penguin. At the same time, studies have shown that macaroni penguins at South Georgia Island have some ability to compensate for declines in krill by switching to alternative prey. This may provide a means to mitigate, at least to some degree, against reproductive failure in times of reduced krill abundance.

With respect to other factors, we are not aware of any overutilization for commercial, recreational, scientific, or educational purposes that is a threat to the South Georgia DPS, and, based on review of the best available scientific and commercial information, we find that neither disease nor predation is a threat to the DPS. We find that regulatory mechanisms are adequate at South Georgia Island now or in the foreseeable future. With respect to other natural or manmade factors, we find that oil spills are not a threat to the DPS now or in the foreseeable future.

In evaluating the impact of these factors, we have also considered the size and trends of the South Georgia DPS of macaroni penguin. Recognizing the highlighted uncertainties about the overall population estimates for the South Georgia and the likelihood that these figures are likely to be underestimates, the best available information provided by the United Kingdom government indicates that there are estimated to be 2.7 million pairs (DEFRA 2007, p. 2). The previous estimate from 1980 has a large margin of error, which limits its use in establishing trends—5.4 million pairs ± 25 to 50 percent, (Woehler 1993, pp. 3, 55), yielding a range of 2.7–8.1 million pairs. Based on the poor quality of this population information, we cannot reliably establish an overall trend in the South Georgia Island DPS of the macaroni penguin. Therefore, there is no reliable data that lead us to believe that the combined effects of reduced prey availability, competition with Antarctic fur seals, changes in the marine environment, competition with commercial krill fisheries, and the impacts from oil spills at the current levels are causing a long-term decline in the South Georgia Island DPS of the macaroni penguin population. Because we cannot establish an ongoing long-term decline, this DPS is neither endangered nor threatened due to factors causing ongoing population declines, and the overall population estimate of 2.7 million pairs appears robust.

We also considered whether any of the stressors acting on colonies within the South Georgia DPS of the macaroni penguin began recently enough that their effects are not yet manifested in a long-term decline, but are likely to have that effect in the future. There is little data on macaroni penguin prey availability in the South Georgia region prior to the last 3 decades, and even less information on causes of prey decline. In any case, the periodic declines in prey availability over the last 30 years have had sufficient time to be reflected in population trends, and there is no reliable evidence of an overall population trend for the DPS, regardless of localized changes in abundance. In addition, no oil spill events have occurred recently enough that the population effects would not yet be observed. Therefore, the macaroni penguin is not threatened or endangered in the South Georgia Island DPS due to threats that began recently enough that their effects are not yet manifested in a long-term decline.

Next, we considered whether any of the stressors were likely to increase within the foreseeable future, such that the species is likely to become an endangered species in the foreseeable future. As discussed above, we concluded that within the South Georgia Island DPS, none of the stressors were likely to increase significantly.

Having determined that a current or future declining trend does not justify listing the South Georgia Island DPS of the macaroni penguin, we next considered whether the species met the definition of an endangered species or threatened species on account of its present or likely future absolute numbers. The total macaroni penguin population in the South Georgia Island DPS is estimated at 2.7 million pairs, and appears robust. It is not so low that, despite our conclusion that there is no ongoing decline, the population is at such risk from stochastic events that it is currently in danger of extinction.

Finally, we considered whether, even if the size of the current population makes the species viable, it is likely to become endangered in the foreseeable future because stochastic events might reduce its current numbers to the point where its viability would be in question. Because of the large number of dispersed breeding areas (17 main breeding aggregations) throughout the South Georgia DPS, the large number of individual colonies within these larger areas, and finally, because of the large overall population size within the South Georgia DPS, we believe that even if a stochastic event were to occur within the foreseeable future, the population would still be unlikely to be reduced to such a low level that it would then be in danger of extinction.

Despite local declines in numbers of macaroni penguins in some colonies within the South Georgia DPS, the population has thus far maintained what appears to be high population levels, while being subject to most if not all of the current stressors, and there is no reliable information that shows an overall declining population trend of the South Georgia DPS. Therefore, we conclude that the South Georgia DPS of the macaroni penguin is neither an endangered species nor likely to become an endangered species in the foreseeable future.

Significant Portion of the Range Analysis

Having determined that the macaroni penguin is not now in danger of extinction or likely to become so in the foreseeable future throughout all of its range or in the South Georgia DPS as a consequence of the stressors evaluated under the five factors in the Act, we also considered whether there were any significant portions of its range, both within the South Georgia DPS, and within the remainder of the species' range where the species is in danger of extinction or likely to become so in the foreseeable future. See our analysis for southern rockhopper penguin for how we make this determination.

The macaroni penguin is widely distributed throughout the Southern Ocean. In our five-factor analysis, we did not identify any factor that was found to be a threat to the species throughout its range or throughout the South Georgia DPS.

SPR Analysis Within the South Georgia Island DPS

In an effort to determine whether this species is endangered or threatened in a significant portion of the range of the South Georgia Island DPS of the macaroni penguin, we first considered whether there was any portion of this range where stressors were geographically concentrated in some way. However, since we only have trend information on a limited number of colonies with respect to both stressors and population trends, we could not determine whether stressors were acting differently in one portion of the range versus another. Therefore, we were not able to identify any portions of the range within the South Georgia Island DPS that warrant further consideration.

SPR Analysis Within the Remainder of the Macaroni Penguin's Range

In an effort to determine whether this species is endangered or threatened in a significant portion of the remainder of the species' range (*i.e.*, anywhere within the species' range except the South Georgia DPS), we first considered whether there was any portion of this range where the species may be either endangered or threatened with extinction. Declines have been reported in the Prince Edward Islands. There was a decline from 451,000 pairs in 1983–84 to 356,000 pairs in 2002–03, but given the magnitude of the population numbers, this 18 percent decline over the 8-year time period is not considered to be a significant change in the population (Crawford *et al.* 2003, p. 485). In the three subsequent breeding years (2003–06) small fluctuations between 350,000 and 300,000 pairs were observed (Crawford 2007, p. 9). In our analysis, we found that the total decline has been approximately 32 percent since 1979. In our analysis of the five factors for the macaroni penguin we identified no unique stressor affecting the Prince Edward Islands populations. On the basis of its large population size and limited declines (relative to overall population numbers) observed over a period of 30 years, we conclude that there is not substantial information that the Prince Edward Islands portion of the range may currently be in danger of extinction or likely to become in danger of extinction in the foreseeable future. Therefore this portion of the range does not pass the test of endangerment for consideration as an SPR.

Final Determination for the Macaroni Penguin

On the basis of analysis of the five factors and the best available scientific and commercial information, we find that listing the macaroni penguin as threatened or endangered under the Act in all or any significant portion of its range or in the South Georgia DPS is not warranted.

Emperor Penguin

Background

Biology

The emperor penguin (*Aptenodytes forsteri*) is the largest living species of penguin. It is congeneric with the king penguin (*Aptenodytes patagonicus*), but is double the size of this next largest penguin species at 3–4 ft (1–1.3 m) in height and 44–90 lb (20–41 kg) in weight (Shirihai 2002, pp. 57, 59). Emperor penguins generally feed over continental shelf and continental margins of Antarctica, except for a wide-ranging and relatively undocumented juvenile life stage. In winter, they breed in colonies distributed widely along the sea ice fringing the coast of Antarctica. In summer, during the molting period when they must stay ashore, they depend on areas of stable pack ice or nearshore, land-fast ice (Kooyman 2002, pp. 485–495; Kooyman *et al.* 2000, p. 269).

Life History

The life history of emperor penguins is unique among birds, with breeding and incubation taking place in the Antarctic winter. Kooyman (2002, pp. 485–495) summarizes this life history. Breeding birds arrive in the colonies in April. After a period of courtship, egg-laying takes place in mid-May. Male emperor penguins incubate the eggs through the Antarctic winter until mid-July to early August. The females depart the colony soon after egg-laying and forage at sea for 2 months. When the females return, the males break their extensive winter fast. This fast of 110–115 days has been documented to last from before courtship, through incubation, and past the hatching of the chick (Kirkwood and Robertson 1997, p. 156). However, unlike previous natural history descriptions of emperor penguins, late fall transects have suggested that at some of the largest colonies in the northern Ross Sea, where open water is closely accessible in late fall, males and females may feed after courtship and immediately before egg-laying, thus shortening the fast and the energetic stress of incubation for males (Van Dan and Kooyman 2004, p. 317). After the single egg hatches, the female emperor penguin returns. At that point, the males and females begin to share the feeding of the chick, coming and going on foraging trips away from the colony throughout the late winter and spring. These foraging trips last from 3 weeks to as little as 3 days, getting progressively shorter as the spring advances (Kooyman 2002, pp. 485–495; Kooyman *et al.* 1996, p. 397). The adults leave the colonies from mid-December to mid-January on pre-molt foraging trips, which may take them up to 186 mi (300 km) north of the continent and up to 745 mi (1,200 km) from the colony. By late January to early February they arrive in areas where they can find stable land-fast ice or pack ice to allow them to stay ashore for the 1-month molt (Kooyman *et al.* 2004, pp. 281–290; Wienecke *et al.* 2004, pp. 83–91). Following the molt, they embark on post-molt foraging trips, which bring breeding birds back to the colony in April.

The dispersal patterns of emperor penguin chicks after fledging are poorly known. Once they leave the colonies they are seldom seen and do not return again for several years. They return to the colony when 4 years old and breed the following year (Shirihai 2002, p. 61). Kooyman *et al.* (1996, p. 397) followed the movements of five radio-tagged juveniles at their departure from their colony at Cape Washington in the Ross Sea. All traveled north beyond the Ross Sea to the Antarctic Convergence, the boundary of the Southern Ocean, reaching 56.9° S latitude. While radio-signals were lost before the onset of winter, Kooyman *et al.* (1996, p. 397) suggested that the birds may have remained in the water north of the pack ice until at least June. He noted that at this crucial period of their lives, juvenile emperor penguins may be exposed to conditions similar to more northern penguin species, for example, commercial fishing in the Southern Ocean. It is hypothesized that juveniles ranging north from the Mawson Coast may feed and compete with king penguins that are foraging south in the fall and winter from their Indian Ocean breeding colonies.

Distribution

Emperor penguins breed on land-fast ice in colonies distributed around the perimeter of the Antarctic continent from the western Weddell Sea to the southwestern base of the Antarctic Peninsula (Kooyman 2002, p. 490; Lea and Soper 2005, p. 60; Woehler 1993, pp. 5–10;). For example, in the Ross Sea, six colonies are spaced 31–62 mi (50–100 km) apart along the Victoria Land coast (Kooyman 1993, p. 143).

Looking at the reported data, we conclude that the total number of historically or presently recorded colonies is approximately 45. Woehler (1993, pp. 5–10) documented 42 reported colonies around the continent, which included seven colonies discovered between 1979 and 1990 (Woehler 1993, p. 5). Colonies along Marie Byrd Land east of the Ross Sea are few or undocumented, with only one confirmed, recently discovered breeding colony at Siple Island (Lea and Soper 2005, pp. 59–60) and one outlying small colony at the Dion Islands at the western base of the Antarctic Peninsula (Woehler 1993, p. 9; Ainley *et al.* 2005, p. 177). At least three new locations have been discovered since 1990 (each with over 2,000 breeding pairs) and one other colony was confirmed (Woehler and Croxall 1997, p. 44; Coria and Montalti 2000, pp. 119–120; Lea and Soper 2005, pp. 59–60; Melick and Bremmers 1995, p. 426; Todd *et al.* 2004, pp. 193–194).

However, given the remote locations of emperor penguin colonies and the difficulties of accessing them, the number of colonies may vary from the 45 reported. At the time of the 1990's compilation of emperor penguin numbers and colony locations cited above, Woehler (1993, p. 5) stated that many colonies had not been observed or counted for many years, with in some cases, the most recent data dating to the 1950s and 1960s. On the other hand, in describing a new colony along the coast of Wilkes Land near a research base that had already been utilized for 35 years, Melick and Bremmers (1995, p. 427) cited a very strong likelihood that more emperor penguin colonies were waiting to be discovered in this area and that such discoveries could significantly raise the present estimates of emperor penguin numbers.

Breeding Areas

Emperor penguin breeding colonies are variable in size. In 1993, Woehler (1993, pp. 2–9) provided size estimates for 36 of the 42 colonies. Adding the 3 newly discovered colonies cited above, colony size for 39 colonies ranged from under 100 breeding pairs to 22,354 breeding pairs (with 2 colonies above 20,000 breeding pairs, 6 colonies between 10,000 and 20,000 pairs, 21 colonies between 1,000 and 10,000 pairs, and 10 colonies below 1,000 pairs). The largest colonies at Cape Washington and Coulman Island had 19,364 and 22,137 downy chicks (and accordingly the same number of breeding pairs), respectively, in 1990 (Kooyman 1993, p. 145), and 23,021 and 24,207 chicks, respectively, in 2005 (Barber-Meyer *et al.* 2007b, p. 7).

Emperor penguin breeding colonies are also variable in physical location. Scientists have attempted to describe the most important physical characteristics of colony locations and how they influence colony size. For six western Ross Sea colonies, Kooyman (1993, pp. 143–148) identified stable land-fast ice, nearby open water, access to fresh snow (for drinking water and thermal protection), and shelter from the wind as physical characteristics. At Beaufort Island, Cape Crozier, and Franklin Island, limited land-fast ice areas seem to dictate colony size (179, 477, and 4,989 fledgling chicks, respectively) because the birds were unable to move away from snow and ice that had been contaminated by guano over the course of the breeding season, and they had limited options to shelter from winds. At Coulman Island and Cape Washington, the largest known emperor penguin colonies (22,137 and 19,364 fledgling chicks, respectively), suitable land-fast ice areas were unlimited with a good base of snow. Access to open water in the winter is another major characteristic. Known locations of emperor penguin colonies have been found to be associated with known coastal polynyas-areas of winter open water in East Antarctica (Massom *et al.* 1998, p. 420).

Localized changes in colony size and breeding success have been recorded at specific colonies and attributed to local- or regional-scale factors. Changes in the physical environment can have an impact on individual colonies, especially smaller ones, which show higher year-to-year variation in live chick counts than larger colonies (Barber-Meyer *et al.* 2007b, p. 4).

Feeding Areas

The primary foods of emperor penguins are krill (*Euphausia superba*), Antarctic silverfish (*Pleurogramma antarcticum*), and some types of lanternfish and squid (Kirkwood and Robertson 1997, p. 165; Kooyman 2002, p. 491). The proportion of each of these in the diet is variable according to colony location and season, with fish comprising 20 to 90 percent, krill 0.5 to 68 percent, and squid 3 to 65 percent by weight in the diet (Kooyman 2002, pp. 488, 491).

During their winter feeding trips, female emperor penguins travel over ice to reach areas of open water or polynyas, which are generally accessible from emperor penguin colonies (Massom *et al.* 1998, p. 420). Penguins from the Auster and Taylor colonies on the Mawson coast of Antarctica, carrying time-depth recorders, took about 8 days to reach the ice edge and spent 50–60 days at sea foraging. They foraged about 62 mi (100 km) northeast of the colony in water over the outer continental shelf and shelf slope. As penguins are visual foragers, foraging was limited to daylight, with penguins entering the water just after dawn and emerging at dusk after spending on average 4.71 hours in the water (Kirkwood and Robertson 1997, pp. 155, 168). Both on the journey north and between foraging days at sea, females occasionally huddled together in groups on the ice to minimize heat loss (Kirkwood and Robertson 1997, p. 161).

As mentioned above, juvenile penguins leaving their natal colonies upon fledging have been radio-tracked to 56.9° S latitude, the area of the Antarctic Convergence where they presumably feed (Kooyman *et al.* 1996, p. 397).

Molting Areas

The summer molt is a critical stage in the life history of the emperor penguin. The birds must find stable land-fast ice or pack ice to allow them to stay ashore for the 1-month molt (Kooyman *et al.* 2004, pp. 281–290; Wienecke *et al.* 2004, pp. 83–91). In the western Ross Sea, penguins departing their breeding grounds in December generally traveled an average straight-line distance of 745 mi (1,200 km) from their colonies to molt in the large consolidated pack-ice area in the eastern Ross Sea (Kooyman *et al.* 2000, p. 272). In 1998, molting birds were sighted on the southern edge of the summer pack ice in the western Weddell Sea (Kooyman *et al.* 2000, p. 275), and birds sighted were assumed to be from colonies in the eastern Weddell Sea up to 869 mi (1,400 km) to the east, although some may have come from the Snow Hill Colony recently discovered to the north of this area (Kooyman *et al.* 2000, pp. 275–276). Along the Mawson Coast, penguins departing colonies prior to molt traveled for 22–38 days and reached molting locations up to 384 mi (618 km) from the colony. Unlike Ross Sea penguins, they did not travel directly to consolidated pack-ice locations, but first moved north, apparently to feed, and then returned to molt in nearshore areas where land-fast ice persisted throughout the summer (Wienecke *et al.* 2004, p. 90).

Abundance and Trends

There are estimated to be 195,000 emperor penguin pairs breeding in approximately 45 colonies around the perimeter of the Antarctic continent. The population is believed to be stable rangewide (Woehler 1993, pp. 2–7; Ellis *et al.* 2007, p. 5) and in the Ross Sea (Barber-Meyer *et al.* 2007b, p. 3). As cited above, even as overall numbers remain stable, fluctuations in individual colony size have been reported for a number of colonies (Kato *et al.* 2004, p. 120; Kooyman *et al.* 2007, p. 37; Barber-Meyer *et al.* 2007b, p. 7; Barbraud and Weimerskirch 2001, pp. 183–186) and seem to reflect the impacts of local and regional physical and climatic variation in the harsh Antarctic environment, as well as the resilience of this species in responding to this variation.

Other Status Classifications

The emperor penguin is listed in the category of 'Least Concern' on the 2007 IUCN Red List on the basis of its large range and stable global population (BirdLife International 2007, p. 1). A species is considered of least concern when it has been evaluated against the IUCN criteria and does not qualify for 'Critically Endangered,' 'Endangered,' 'Vulnerable,' or 'Near Threatened.' Widespread and abundant species are included in this category (BirdLife International 2007, p. 1).

Summary of Factors Affecting the Species

Factor A: The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

The breeding range of the emperor penguin consists of land-fast ice along the continental margins of Antarctica. The emperor penguin is an ice-dependent species. Therefore, emperor penguins are vulnerable to changes in the winter land-fast ice and polynya system (Ainley 2005, p. 178; Croxall 2004, p. 90), which comprises their breeding habitat, and to changes in the pack ice or residual land-fast ice, which they use for summer molt haul-out areas (Barber-Meyer *et al.* 2007b, p. 11; Kooyman *et al.* 2004, p. 289).

Studies reviewed below indicate that the emperor penguin lives in a harsh and highly changeable environment. Changes and perturbations that affect emperor penguins occur on daily, seasonal, annual, decadal, and historical timeframes. Localized changes in colony size and breeding success have been recorded at specific colonies and attributed to local- or regional-scale factors.

Changes in the physical environment can have an impact on individual colonies, especially smaller marginal ones that show higher year-to-year variation in live chick counts than larger colonies (Barber-Meyer *et al.* 2007b, pp. 7, 10). A dramatic example of physical changes to the breeding and foraging environment comes from the periodic calving of giant icebergs from the Ross Ice Shelf, expected every 3–4 decades on average (Arrigo *et al.* 2002, p. 4).

For example, the calving in 2000 and subsequent grounding of two giant icebergs in the Ross Sea severely affected the Cape Crozier and Beaufort Island emperor penguin colonies. In 2001, nesting habitat was destroyed at Cape Crozier by the collision of iceberg B15A with the northwest tongue of the Ross Ice Shelf, dislodging the ice shelf and creating a huge collection of iceberg rubble. Adult mortality was high, either due to trauma from shifting and heaving sea ice or subsequent starvation of penguins trapped in ravines. The colony produced no chicks in 2001. The high mortality of adults (Kooyman *et al.* 2007, p. 37) and continued instability and unsuitability of the area of this traditional colony contributed to a reduction in chick production that ranged from 0 to 40 percent of the high count of 1,201 chicks produced in 2000 (Kooyman *et al.* 2007, pp. 31, 34–35). Chick counts fluctuated from 0 in the iceberg year of 2001, to 247 in 2002, to 333 in 2003, to 475 in 2004, to 0 in 2005, to 340 chicks in 2006. The situation in 2005 was highly unusual because the 437 adults in the colony in mid-October showed no signs of breeding (*i.e.*, no eggs and no chicks). The reason for breeding failure was not apparent (Barber-Meyer *et al.* 2007b, pp. 7, 9). However, preliminary reports from 2006 indicated that breeding success at Cape Crozier was again improved with about 340 live chicks (Barber-Meyer *et al.* 2007b, p. 9). Recovery may have been slowed as a consequence of the high adult mortality in 2001. While breeding birds have persistently returned to the colony after the iceberg departed in 2003, they may be waiting for conditions at the colony to improve before breeding there again (Kooyman *et al.* 2007, p. 37).

At the Beaufort Island colony, the arrival of iceberg B15A, along with iceberg C16 in 2001, did not physically affect the colony substrate itself, but separated the breeding birds in the colony from their feeding area in the Ross Sea polynya with a 93-mi (150-km) long barrier. In the 2001–2004 breeding seasons, adult birds were forced to walk up to 56 mi (90 km) before being able to enter the water. Chick counts in 2004, the worst year of this period, dropped to 131 (6 percent of the high count of 2,038 in 2000). Unlike at Cape Crozier, once the icebergs finally left the area by 2005, the surface conditions of the colony were restored to pre-iceberg condition and, with accessibility to the Ross Sea polynya restored, the first post-iceberg breeding season saw recovery in chick production to 446 chicks (Kooyman *et al.* 2007, p. 36) to 628 chicks (Barber-Meyer *et al.* 2007b, p. 7), a little under one-third of 2000 levels.

Changes in the physical environment have also been shown to affect the food sources of emperor penguins in the Ross Sea (Arrigo *et al.* 2002, pp. 1–4). The presence of the B15A iceberg in the Ross Sea blocked the normal drift of pack ice and resulted in heavier spring and summer pack ice in the region in 2000–01. This resulted in a delay in the initiation of the annual phytoplankton bloom in some areas and failure to bloom in others, with a reduction in primary productivity in the Ross Sea region by 40 percent. While emperor penguin diets were not reported, Adelie penguin diets shifted to a krill species normally associated with extensive sea-ice cover during the first year of this grounding event (Arrigo *et al.* 2002, p. 3). The very large emperor penguin colony at Cape Washington, about 124 mi (200 km) away, experienced reduced chick abundance in the period when B15A was in the area; the iceberg's presence may have modified breeding behavior and chick nurturing in some way. Chick numbers rebounded in 2004 and 2005 (Barber-Meyer *et al.* 2007b, p. 10).

Future iceberg calving events are likely to affect emperor penguin colonies in the Ross Sea. Calving of the Ross Ice Shelf, which led to the formation of icebergs B15A and C16, is described as a cyclical phenomenon expected every 3–4 decades on average from the northeast corner of the ice shelf. While the Ross Ice Shelf front has been relatively stable over the last century, such events are a consequence of the longer-term behavior of the West Antarctic Ice Sheet in the Ross sector. Current retreat of the Western Antarctic Ice Shelf has been underway for the past 20,000 years since the last glacial maximum, and retreat is expected to continue, with or without global climate warming or sea-level rise (Conway *et al.* 1999, pp. 280–283). Efforts are underway to understand and predict the overall behavior of the West Antarctic Ice Sheet (Bentley 1997, pp. 1,077–1,078; Bindschalder 1998, pp. 428–429; Bindschalder *et al.* 2003, pp. 1,087–1,989), but we are not aware of any current predictions of local-scale changes in calving rates in the Ross Sea in the near future.

A number of studies have attempted to relate population changes at individual emperor penguin colonies to the effects of regional and global oceanographic and climatic processes affecting sea surface temperatures and sea-ice extent. In the Ross Sea, which contains the highest densities of emperor penguins in Antarctica and the largest and smallest and most southerly of all penguin colonies, Barber-Meyer *et al.* (2007b, pp. 3–11) examined large-scale and local-scale climatic factors against trends in chick abundance in six colonies in the western Ross Sea from 1979–2005. They found that overall emperor penguin numbers in the Ross Sea were stable during this period. They were unable to find any consistent correlation between trends in chick abundance and any of the climate variables of sea-ice extent—sea surface temperature, annual Southern Oscillation Index, and Southern Hemisphere Annular Mode. They determined that chick abundance in smaller colonies was more highly variable than in large colonies, suggesting that small colonies occupy marginal habitat and are more susceptible to environmental change. While they concede that significant local events such as the grounding of iceberg B15A may have masked subtle relationships with local sea-ice extent and large-scale climate variable, their analysis indicated that the environmental change most affecting chick abundance is fine-scale sea-ice extent and local weather events (Barber-Meyer *et al.* 2007b, pp. 3–11).

Similar analyses have been conducted for a single, small emperor penguin colony located near the D'Urmont D'Urville Station in the Point Geologie archipelago in Adelie Land in a study that has been widely cited as demonstrating the impacts of climate change on this species (Barbraud and Weimerskirch 2001, pp. 183–186). In the late 1970s, a 50-percent decline in the number of breeding pairs at this small colony (from 5,000–6,000 pairs to 2,500–3,000 pairs) occurred at the time of an extended period of warmed winter temperatures at the colony and reduced sea-ice extent in the vicinity. After the period of decline, numbers stabilized at half the pre-1970 levels for the next 17 years. Meteorological data collected at the station were used as a proxy for sea surface temperatures. The authors found that overall breeding success was not related to sea surface temperatures or sea-ice extent. Instead, the decrease was attributed to increased adult mortality. Emperor penguin survival apparently was reduced when temperatures were higher and penguins survived better when sea-ice extent was greater. The authors hypothesized that with decreased sea-ice extent during the warmer period in the late 1970s, krill recruitment may have been reduced, making it more difficult for adults to find food. The authors attributed an increased variability in breeding success during the 17 years of population stability after this period to a combination of local- and annual-scale physical factors, such as blizzards and early break out of the ice supporting the colony (Barbraud and Weimerskirch 2001, pp. 183–186). This increased variability over the last 17 years is consistent with the observations for the Ross Sea (Barber-Meyer *et al.* 2007b, p. 7), where annual variability in breeding success is larger for smaller colonies.

The conclusions of the Barbraud and Weimerskirch study and the ability to generalize based on its results have been questioned by several authors. As noted above, the results and conclusions are not supported by a larger-scale study of six large and small penguin colonies in the Ross Sea, which represent 25 percent of the world's population (Barber-Meyer *et al.* 2007b, pp. 10–11). In discussing this study, Ainley *et al.* (2005, pp. 177–180) concluded that the confounding factors of severe blizzards and increases in early departure of the land-fast ice nesting substrate suggest that the continued low population numbers at Point Geologie have not been fully explained, and they questioned the conclusion that higher mortality of adult emperor penguins during 1976–1980 was caused by increased sea surface temperatures. Croxall *et al.* (2002, p. 1,513) stated ''that current data on environment-prey-population interactions are insufficient for deriving a single coherent model that explains these observations.''

Further work at this same Antarctic location, building from local observations of seabird dynamics and measurements of regional sea-ice extent and the Southern Oscillation Index, led Jenouvrier *et al.* (2005, p. 894) to suggest that in the late 1970s there may have been a regime shift in cyclical Antarctic environmental factors such as sea-ice extent and the Southern Oscillation Index, which may have affected the dynamics of the Southern Ocean. In another paper, Weimerskirch *et al.* (2003, p. 254) suggested that the decrease in sea-ice extent in the late 1970s in the Adelie Land area could be related to a regional increase in temperatures in the Indian Ocean during that period.

In related work, Ainley *et al.* (2005, pp. 171–182) further described decadal-scale changes in the western Pacific and Ross Sea sectors of the Southern Ocean during the early to mid-1970s and again during 1988–1989. These large-scale periods of warming and cooling and corresponding changes in weather and sea-ice patterns were linked to decadal shifts in two atmospheric pressure-related systems in the region. The first is the semi-annual oscillation (the strengthening and weakening of the circumpolar trough of low pressure that encircles Antarctica), and the second is the Antarctic oscillation (now referred to as the Southern Annual Mode), the pressure gradient between mid latitudes and high latitudes (Ainley *et al.* 2005, p. 172). The study showed that environmental changes in a number of sea-ice variables during these cyclical periods, including polynya size, led to corresponding reductions and increases in a number of Adelie penguin colonies in the Ross Sea and changes in the number of adults breeding and the reproductive output at a number of individual Adelie penguin colonies in the Ross Sea. The authors attempted to compare Ross Sea data for Adelie penguins with the observations at Pointe Geologie for emperor penguins, but data from the much more detailed subsequent studies of Barber-Meyer *et al.* (2007b, pp. 3–11) leave the reader with only the general conclusion that the two species respond differently to these cyclical environmental changes (Ainley *et al.* 2005, p. 171).

The primary breeding and winter foraging habitat of the emperor penguin is land-fast ice along the margins of the Antarctic continent. While overall populations are stable, local- or regional-scale variations in physical, oceanographic, and climatological processes, as described above, lead to year-to-year variations in chick production or colony breeding success in colonies scattered widely along the coast of Antarctica. Field observations show that emperor penguins respond to such factors, when they occur, but given the stability of penguin numbers around Antarctica, we have found no consistent trends with respect to the destruction, modification, or curtailment of their habitat or range.

With respect to larger-scale observations of the climate of Antarctica and the extent of the sea ice that makes up the primary habitat of the emperor penguin, the Working Group I report to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), which reviewed the observations on the physical science basis for climate change, found that ‘‘Antarctica sea ice extent continues to show interannual variability and localized changes, but no statistically significant overall trends, consistent with lack of warming reflected in atmospheric temperatures averaged across the region’’ (IPCC 2007, p. 9).

Observations of climate and ice conditions are not uniform throughout Antarctica in any particular season or year. Attempts to describe and understand long-term observed conditions and to predict future conditions either on the basis of the demographic behavior of individual penguin colonies or on the basis of global-scale climate observations are difficult and incomplete. At a continent-wide scale, observational studies show sea-ice cover decreased significantly in the 1970s, but has increased overall since the late 1970s (Parkinson 2002, p. 439; Parkinson 2004, p. 387; Yuan and Martinson 2000, p. 1,712). More recently, the IPCC reported that Antarctic results show a small, positive trend in sea-ice extent that is not statistically significant (Lemke 2007, p. 351).

With respect to regional trends along the continent, satellite observational studies have shown, for Southern Ocean regions adjoining the South Atlantic, South Indian, and southwest Pacific Oceans, increasing trends in sea-ice cover, particularly during non-winter months. Regions adjoining the southeast Pacific Ocean, however, have shown decreasing trends in sea-ice coverage, particularly during the summer months (Stammerjohn and Smith 1997, p. 617; Kwok and Comiso 2002, p. 501; Yuan and Martinson 2000, p. 1,712). The distribution of sea-ice-extent anomalies (areas of more- or less-than-average sea ice) observed around the continent is bimodal with increased ice cover in the Indian Ocean sector, a slight decrease between the eastern Indian Ocean and Western Pacific, large increases in the western Pacific Ocean and Ross Sea sector, a large decrease in the Bellinghausen and Amundsen Seas of the eastern Pacific sector, and a large increase in the Weddell Sea (Curran *et al.* 2003, p. 1,205; Yuan and Martinson 2000, p. 1,712). Attempts to link south polar sea-ice trends to climate outside this polar region are extremely complex. In statistical and observational studies of Antarctic sea-ice extent and its global variability, sea-ice anomalies in the Amundsen Sea, Bellinghausen Sea, and Weddell Gyre, corresponding to the Western Antarctic Peninsula region, showed the strongest links to extrapolar climate (Yuan and Martinson 2000, p. 1,697) and to variations in the Southern Oscillation Index (Kwok and Comiso 2000, p. 500); however, these factors did not explain the trends of stable or increasing sea-ice extent for the majority of the continental coast of Antarctica, which encompasses the range of the emperor penguin.

Future Projections

With respect to the future of Antarctica, the IPCC reported, ‘‘in 20th and 21st century simulations, Antarctic sea ice cover is projected to decrease more slowly than in the Arctic, particularly in the vicinity of the Ross Sea where most models predict a minimum in surface warming. This is commensurate with the region with the greatest reduction in ocean heat loss, which results from reduced mixing of the ocean’’ (Meehl *et al.* 2007, p. 770).

Simulation models, comparing 1980–2000 observed winter and summer mean sea-ice concentrations around Antarctica with modeled 2080–2100 sea-ice concentrations, predicted declines in sea-ice concentrations in this timeframe (Bracegirdle *et al.* 2008, p. 8; Meehl *et al.* 2007, p. 771). While these models showed extensive deviation around mean predictions, they provided a general predictive picture of future Antarctic sea-ice conditions in the range of the emperor penguin. They showed winter sea-ice reductions by 2080–2100, with ice concentrations remaining high around the bulk of the continent and highest in the Ross, Amundsen, and Weddell Seas, and around the Mawson Coast in the Indian Ocean sector. Summer sea-ice concentrations also retreat, with sea ice persisting in the Ross and Weddell Seas and apparently greatly reduced or not persisting in the Indian Ocean sector. These large-scale model predictions seem to indicate that emperor penguins, especially in the Ross and Weddell Seas, are likely to continue to encounter suitable sea-ice habitat for breeding in the winter and molting in the summer in the 100-year timeframe. The IPCC is very clear on the limitations of these models—the report contains a section discussing the limitations and biases of sea-ice models and finding that even in the best cases, which involve Northern Hemisphere winter sea-ice extent, ‘‘the range of simulated sea ice extent exceeds 50% of the mean and ice thickness also varies considerably, suggesting that projected decreases in sea ice remain rather uncertain’’ (Randall *et al.* 2007, p. 616). It is difficult and premature, given the large geographic scale of these models, their extensive deviations around mean predictions, and their 100-year timeframe, to make specific predictions about the sea-ice conditions in any particular region of emperor penguin habitat around Antarctica. This is particularly difficult when empirical evidence to date suggests that such continent-wide sea-ice declines have not yet begun.

With respect to atmospheric temperatures, increases in the Southern Annular Mode (SAM) index (a monthly measure of differences in sea-level atmospheric pressure between the mid latitudes and high latitudes of the Southern Hemisphere) (Trenberth *et al.* 2007, p. 287) from the 1960s to the present are associated with a strong warming over the Antarctic Peninsula and, to a lesser extent, with cooling over parts of continental Antarctica, the area of the range of the emperor penguin (Trenberth *et al.* 2007, p. 339). There is continued debate as to whether these trends in the SAM are related to stratospheric ozone depletion and to greenhouse gas increases (Trenberth *et al.* 2007, p. 292) or to decadal variation in teleconnections or large-scale patterns of pressure and circulation anomalies that span vast geographical areas and ''modulate the location and strength of storm tracks and poleward fluxes of heat, moisture and momentum'' (Trenberth *et al.* 2007, pp. 286–287). Reconstructions of century-scale records based on proxies of the SAM found that the magnitude of the current trend may not be unprecedented even in the 20th century (Trenberth *et al.* 2007, pp. 292–293). The response of the SAM to the ozone hole in the late 20th century, which has also had a warming affect on temperature, confounds simple extrapolation into the future (Christensen *et al.* 2007, p. 907).

At the regional scale, the IPCC reported that very little effort has been spent to model the future climate of Antarctica (Christenson 2007, p. 908). Annual warming over the Antarctic continent is predicted to be ''moderate but significant'' (2.5–9 °F (1.4–5 °C), with a median of 4.7 °F (2.6 °C)) at the end of the 21st century (Christenson 2007, p. 908). Models tend to show that the current pattern, which involves warming over the western Antarctic Peninsula and little change over the rest of the continent, is not projected to continue through the 21st century (Christenson 2007, p. 908). Ainley *et al.* (unpublished ms, n.d., pp. 1, 26–29), using a composite of selected climate models for 2025–2070, projected that an increase in earth's tropospheric temperature by 3.6 °F (2 °C) would result in a marked decline or disappearance of 50 percent of emperor colonies (40 percent of the population) at latitudes north of 70° S latitude because of severe decreases in pack-ice coverage and ice thickness, especially in the eastern Ross and Weddell Seas. Without further review and testing of this model, it would be premature to use this model's results to make specific predictions about the sea-ice conditions in the emperor penguin habitat around Antarctica.

We have examined current conditions and predictions for changes in sea ice and temperatures around Antarctica for the coming 100 years, which remain very general. We have paid particular attention to sea ice because it is the dominant habitat feature of the emperor penguin's life cycle. To date, evidence does not support the conclusion that directional changes in temperature or sea-ice extent are already occurring in the habitat of the emperor penguin. We do not discount the strong likelihood that predicted sea-ice changes will eventually reduce the habitat of emperor penguins. However, on the basis of: (1) Current observed conditions; (2) the stability of emperor penguin colonies throughout their range; (3) the likelihood in the 100-year timeframe that emperor penguin habitat requirements will continue to be met in current core areas of their range; and (4) the uncertainty of current large-scale predictive models and the absence of fine-scale climate models predicting conditions for the range of the emperor penguin, we conclude that there is not sufficient evidence to find that climate-change effects to the habitat of the emperor penguin will threaten the emperor penguin within the foreseeable future.

On the basis of this information, we conclude that the present or threatened destruction, modification, or curtailment of the emperor penguin's habitat or range is not a threat to the species in any portion of its range now or in the foreseeable future.

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The ecotourism industry in Antarctica has been growing, with an increase from 6,750 tourists during the 1992–93 summer season to a projected 35,000 tourists in 2007–08 (Austen 2007, p. 1). A few emperor penguin colonies have become the focus of increased, but limited, tourism activities in Antarctica. In particular, the newly discovered Snow Hill colony near the Antarctic Peninsula, which numbers about 4,000 pairs (Todd *et al.* 2004, pp. 193–194), is accessible to ice-breaking vessels coming to the Antarctic Peninsula from the southern ports of South America. The International Association of Antarctica Tourism Operators (IAATO 2007b, p. 1) reported that 909 visitors landed to visit the Snow Hill Colony in the 2006–07 summer season. These visitors all came off one vessel, the icebreaker *Kapitan Khlebnikov.* In November 2006, Burger and Gochfeld (2007, pp. 1,303–1,313) reported that there was one visit in 2004, no tour visits in 2005, and at least three visits in 2006. These authors concluded it was unlikely tourists would visit early in the season when chicks are most vulnerable.

Burger and Gochfeld (2007, pp. 1,303–1,313) examined whether the presence of tourists had an impact on the movement of emperor penguins between the colony and the sea. They found that penguins noticing the presence of people paused more often and for longer in their movements than those passing at a greater distance. The authors provided recommendations for tourist behavior to mitigate the effects of tourist presence on traveling penguins.

For the remainder of continental Antarctica tourists, visits and landings are extremely limited. For example, in 2006–07, 263 people are recorded as landing from one ship, again the icebreaker *Kapitan Khlebnikov,* at Cape Washington in the Ross Sea, the site of one of the largest emperor penguin colonies. Only 13 sites off the Antarctic Peninsula are recorded as receiving tourists (IAATO 2007c, p. 1).

The Antarctic Treaty sets out requirements for tourism operators and tourists entering the Antarctic Treaty region. Tourism operators are required to operate under the Antarctic Treaty's Guidance for those Organising and Conducting Tourism and Non-governmental Activities in the Antarctic: *Recommendation XVIII–1, adopted at the Antarctic Treaty Meeting, Kyoto, 1994.* This detailed guidance sets out requirements for: (1) Advance planning and advanced notification, as well as post-visit reporting of any proposed activities in the region, (2) preparation and compliance with contingency-response plans, including for waste management and marine pollution, and (3) awareness of and proper permitting related to Specially Protected Areas, Sites of Special Scientific Interest, and Historic Sites and Monuments (International Association of Antarctica Tour Operators (IAATO 2007a, p. 1). The Antarctic Treaty Guidance for Visitors to the Antarctic: *Recommendation XVIII–1, adopted at the Antarctic Treaty Meeting, Kyoto, 1994* is intended to ensure that all visitors to the Antarctic are aware of and comply with the treaty and its Protocol for Environmental Protection. This focuses in particular on the prohibition on taking or harmful interference with Antarctic wildlife, including care not to affect them in ways that cause them to alter their behavior, and on preventing the introduction of nonnative plants or animals into the Antarctic (Antarctic Treaty Secretariat 2007, pp. 1–5). Scientific research is also strictly regulated under the Antarctic Treaty.

On the basis that tourist activities reach very few penguin colonies, the number of tourists are limited, and their behavior is well regulated by the Antarctic Treaty, we find that tourism is not a threat to the emperor penguin in any portion of its range now or in the foreseeable future.

In addition, we are unaware of any overutilization for other commercial, recreational, scientific, or educational purposes that is a threat to the emperor penguin in any portion of its range now or in the foreseeable future.

Factor C: Disease or Predation

Antarctic species, such as the emperor penguin, are potentially susceptible to the introduction of avian diseases from outside the region (Jones and Shellam 1999, p. 182). Gardner *et al.* (1997, p. 245) found antibodies of an avian pathogen, Infectious Bursal Disease Virus (IBDV), in 65.4 percent of 52 emperor penguin chicks sampled at the Auster colony on the Mawson Coast in 1995, although no evidence of clinical disease was present. This pathogen of domestic chickens may have been introduced by humans into this area. The authors suggested that careless or inappropriate disposal of poultry products, allowing access by scavenging birds or inadvertent tracking by humans, was a potent source for spread of this environmental contaminant. The authors concluded that the potential for tourists or expeditions to be vectors of disease may pose a significant threat to Antarctic avifauna. Although disease may be a stressor to penguins, the Antarctic Treaty Parties have subsequently addressed concerns over the introduction of disease and invasive species in protocols to the treaty and guidelines arising out of them. These are discussed below under Factor D.

We are unaware of any information relative to detrimental predation impacts on the emperor penguin, either from native or nonnative species.

In conclusion, we find that neither disease nor predation is a threat to the species in any portion of its range now or in the foreseeable future.

Factor D: The Inadequacy of Existing Regulatory Mechanisms

The Antarctic Treaty, which entered into force in 1961, applies to the area south of 60 °S latitude including all ice shelves (Antarctic Treaty area). The primary purpose of the treaty, which has 28 full members or Parties, is to ensure ''in the interests of all mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene of international discord'' (Jatko and Penhale 1999, p. 8). Measures for the Conservation of Antarctic Fauna and Flora arising out of language in Article IX of the treaty concerning ''preservation and conservation of living resources in Antarctica'' were adopted in 1964. They were incorporated into the Protocol on Environmental Protection to the Antarctic Treaty, which was ratified in 1991 and entered into force in January 1998. In the protocol, the Parties to the Antarctic Treaty committed themselves to the comprehensive protection of Antarctica's environment and dependent and associated ecosystems, and they designated Antarctic as a reserve devoted to peace and science (Jatko and Penhale 1999, p. 9). Five annexes to the protocol address specific areas of environmental protection, including environmental impact assessment, conservation of Antarctic fauna and flora, waste disposal and waste management, prevention of marine pollution, and the designation and management of protected areas. Annex II of the Protocol includes prohibitions on killing, capturing, handling, or disturbing animals or harmfully interfering with their habitat, as well as tight restrictions on the introduction of nonnative species; Annex III provides a comprehensive system of requirements for management of wastes generated in Antarctica, including elimination of landfills; and Annex IV addresses requirements to prevent marine pollution from ships operating in the Antarctic Treaty area (Jatko and Penhale 1999, pp. 9–10). As noted above, guidelines for activities in Antarctica directly address these prohibitions on the introduction of nonnative species as well as disposal of garbage (IAATO 2007a, pp.1–4). The Scientific Committee on Antarctic Research, originally established by the International Council of Scientific Unions, provides scientific advice to the Treaty Parties (Jatko and Penhale 1999, p. 8).

Because the Antarctic Treaty does not affect the rights of any State under international law with respect to the high seas, a series of separate conventions have been negotiated and ratified with respect to the exercise of rights in the seas around Antarctica. In particular, CCAMLR addresses the conservation of marine resources. Article II ''defines the objective of this Convention as the conservation of Antarctic marine living resources and states that conservation includes rational use of harvesting'' (Jatko and Penhale 1999, p. 11). CCAMLR operates on three principles: (1) Prevention of population decrease below that which ensures stable recruitment of harvested species; (2) maintenance of the ecological relationships among harvested, dependent, and related species; and (3) prevention of changes or minimization of risks of ecosystem changes. CCAMLR has been active in assessing the status of krill and species dependent upon krill, such as birds and mammals; regulating the harvest of Patagonian tooth fish (*Dissostichus* spp.); and ecosystem monitoring with the goal of detecting changes in critical components of ecosystems.

We find, on the basis of the protection and management of Antarctic ecosystems under the Antarctic Treaty and CCAMLR, that the inadequacy of regulatory mechanisms is not a threat to the emperor penguin in any portion of its range now or in the foreseeable future.

Factor E: Other Natural or Manmade Factors Affecting the Continued Existence of the Species

Fishery Interactions

We have found no evidence of fishing impacts on emperor penguins in the foraging range of adults along the continental margins. Kooyman *et al.* (1996, p. 397) found that juveniles range north into waters where commercial fishing may occur and noted the importance of determining the dispersal patterns of the young to ensure adequate protection. Kooyman (2002, p. 492) also noted that the Antarctic Treaty and CCAMLR extend only to the 60th parallel in this region of Antarctica. However, we are unaware of any reports of fisheries interactions with emperor penguin juveniles and have no reason to believe that this potential stressor will occur at a level to impact this species in the future.

Oil Pollution

Annex IV of the Protocol on Environmental Protection to the Antarctic Treaty sets out requirements to prevent pollution from ships operating in the Antarctic Treaty area (Jatko and Penhale 1999, p. 10). The November 2007 sinking of the cruise ship *MV Explorer* near the Antarctic Peninsula illustrates the possibility of oil spills and other ship-based pollution from increased vessel traffic in Antarctic waters. The *MV Explorer,* which held about 48,000 gallons (181,680 liters) of marine diesel fuel when it sank (Austen 2007, p. 1), did not sink near emperor penguin colonies, but it did sink in the vicinity of colonies of other penguin species. As noted in the discussion of Factor B above, emperor penguin colonies are not a significant destination of the increasing tourist activity in Antarctica. The wide dispersal of emperor penguin colonies around Antarctica mitigates the concern that a single vessel accident could affect the population of emperor penguins, as does the fact that emperor penguin activity at rookeries may be reduced at the time of year when vessel traffic becomes significant. Vessel operations in the vicinity of emperor penguin colonies, near summer molting areas or elsewhere in their foraging range, remain a source of concern. Although we consider this a potential stressor to the emperor penguin, we have no reason to believe oil pollution will occur at a level to impact this species in the future.

Therefore, we find that fishery interactions and oil pollution are not threats to the emperor penguin in any portion of its range now or in the foreseeable future.

Foreseeable Future

A general discussion of threatened species and foreseeable future can be found above in the southern rockhopper penguin Foreseeable Future section.

In considering the foreseeable future as it relates to the status of the emperor penguin, we analyzed the stressors acting on this species. We reviewed the historical data to identify any relevant existing trends that might allow for reliable prediction of the future (in the form of extrapolating the trends). We also considered whether we could reliably predict any future events (not yet acting on the species and, therefore, not yet manifested in a trend) that might affect the status of the species.

As discussed above in the five-factor analysis, we were unable to identify any significant trends with respect to the stressors we identified for this species: (1) Physical changes in the sea-ice and marine habitat; (2) potential introduction of avian diseases from outside the region; (3) potential fishery interactions with juveniles that range north into waters where commercial fishing may occur; and (4) possible oil pollution in the vicinity of summer molting areas or in the penguin's foraging range. There is no evidence that any of the stressors are growing in magnitude. Thus, the foreseeable future includes consideration of the ongoing effect of current stressors at comparable levels.

There remains the question of whether we can reliably predict future events (as opposed to ongoing trends) that will likely cause the species to become endangered. As we discuss in the finding below, we can reliably predict that physical changes in the sea-ice and marine habitats will continue to have an impact on individual colonies, especially smaller marginal colonies, but we have no reason to believe the physical changes will have population level impacts. Thus, the foreseeable future includes the consideration of the effects of such changes on the viability of the emperor penguin.

Emperor Penguin Finding

We have carefully assessed the best available scientific and commercial information regarding the past, present, and potential future threats faced by the emperor penguin above. To determine whether the stressors identified above individually or collectively rise to the level of a threat such that the emperor penguin is in danger of extinction throughout its range or likely to become so within the foreseeable future, we considered whether the stressors were causing a long-term, population decline or were likely to do so in the future.

As discussed above, the overall emperor penguin population is estimated at 195,000 breeding pairs in approximately 45 colonies distributed around the perimeter of the Antarctic continent. We consider the population to be currently stable, and we are not aware of significant historical or current declines. Observed fluctuations in numbers at specific colonies, particularly smaller ones, are ongoing and have been attributed to physical events in the harsh Antarctic environment and seasonal, annual, and longer cyclical climatic or meteorological events. While observations of emperor penguin colonies are by nature constrained by the logistics of reaching remote sites, and many colonies are rarely visited or poorly described (Barber-Meyer *et al.* 2007a, p. 1,565), we are unaware of colony changes of significance to the overall population or of significant impacts to the emperor penguin's sea-ice or marine habitat. We also found no evidence that disease, fishery interaction, or oil pollution was affecting a decline in the emperor penguin population. Based on the best available data, we find that the identified stressors are not causing a long-term decline in the emperor penguin's population. Thus, we conclude that the species is neither threatened nor endangered due to factors causing ongoing population declines.

We also considered whether any of the stressors began recently enough that their effects are not yet manifested in a long-term decline, but are likely to have that effect in the future. As discussed above, the emperor penguin is an ice-dependent species, and changes in the physical environment can affect individual colonies. At the current time, based on the best available scientific evidence, we conclude that no current directional climatic changes are affecting the habitat of the emperor penguin, and we do not have sufficient scientific information to make reliable predictions as to declines of the species in the foreseeable future. Also, we are unaware of any reports of diseases in emperor penguins, fishery interactions with juvenile penguins, or oil spills that have affected emperor penguins. Therefore, the emperor penguin is neither threatened nor endangered due to threats that began recently enough that their effects are not yet manifested in a long-term decline.

Then, we considered whether any of the stressors were likely to increase within the foreseeable future, such that the species is likely to become endangered. As explained in greater detail in Factor A, climate model simulations of winter and summer mean sea-ice concentrations around Antarctica for the period 2080–2100 project declines in sea-ice concentrations from those observed in the 1980–2000 timeframe (Bracegirdle *et al.* 2008, p. 8; Meehl *et al.* 2007, p. 771). While these model simulations exhibit extensive deviation around mean predictions, they provide a general picture of future Antarctic sea-ice conditions in the range of the emperor penguin. They show winter sea-ice reductions by 2080–2100, with sea-ice concentrations remaining high around the bulk of the continent and highest in the Ross, Amundsen, and Weddell Seas, and around the Mawson Coast in the Indian Ocean sector. In the 2080–2100 timeframe, summer sea-ice concentrations also retreat, with sea ice persisting in the Ross and Weddell Seas and apparently greatly reduced or not persisting in the Indian Ocean sector.

The IPCC, Fourth Assessment Report (IPCC AR4), is very clear on the limitations of the climate models and their projections (Christenson 2007, p. 908; Randall *et al.* 2007, p. 616). It is difficult and premature to use these model results to make specific predictions about the sea-ice conditions in any particular region of emperor penguin habitat around Antarctica. This is particularly difficult when empirical evidence to date suggests that such continent-wide sea-ice declines have not yet begun. However, considering the species as a whole, these large-scale model predictions seem to indicate that emperor penguins, especially in the Ross and Weddell Seas, are likely to continue to encounter suitable sea-ice habitat for breeding in the winter and molting in the summer in the 100-year timeframe (*i.e.*, 2080–2100). Therefore, we conclude that there is not sufficient evidence to find that climate change effects to the habitat of the emperor penguin are likely to be a threat to the emperor penguin in the foreseeable future. In addition, as discussed above, disease, fishery interaction with juveniles, and oil pollution are not likely to increase significantly in the future.

Next, we considered whether the species met the definition of an 'endangered' or 'threatened' species on the basis of its present or likely future numbers. The total population of 195,000 breeding pairs appears to be stable, and we are unaware of significant current declines. The population is widely distributed on the Antarctic Peninsula and the total number of penguins is not so low that the species is currently in danger of extinction.

Finally, we considered whether the species is likely to become endangered in the foreseeable future because stochastic events might reduce its current numbers to the point where its viability would be in question. Because this species is distributed in approximately 45 colonies on the Antarctic Peninsula, a future stochastic event that negatively affected the species would be unlikely to reduce the population to such a low level that the species would be in danger of extinction.

On the basis of analysis of the five factors and the best available scientific and commercial information, we find that the emperor penguin is not currently threatened or endangered in any portion of its range or likely to become so in the foreseeable future.

Distinct Population Segment

A discussion of distinct population segments and the Service policy can be found above in the southern rockhopper penguin Distinct Population Segment section.

Discreteness Analysis

A discussion of discreteness can be found above in the southern rockhopper penguin Discreteness Analysis section.

Emperor penguins have a continuous range from Marie Byrd Land east of the Ross Sea to the Weddell Sea. With respect to discreteness, while the emperor penguin can be found in three broadly defined areas of distribution, we are unaware of any marked separation between areas of abundance of the emperor penguin or of differences in physical, physiological, ecological, or behavioral factors among any groups within that range. We are unaware of any research on genetic or morphological discontinuity between any elements of the population. The range of the emperor penguin is entirely within the jurisdiction of the Antarctic Treaty and CCAMLR, except for one area of the Pacific Ocean where dispersing juveniles may spend some time outside of the CCAMLR zones. We find no significant differences in conservation status, habitat management, or regulatory mechanisms between any possible segment of the emperor penguin population. As a result of this analysis, we do not find any segments of the population of the emperor penguin that meet the criterion of discreteness for determination of a DPS. Therefore, we do not find a DPS for the emperor penguin.

Significant Portion of the Range Analysis

Having determined that the emperor penguin is not now in danger of extinction or likely to become so in the foreseeable future, we also considered whether there were any significant portions of its range where the species is in danger of extinction or likely to become so in the foreseeable future. See our analysis for the southern rockhopper penguin for how we make this determination.

First, we examined possible portions of the range that might be considered significant, and then we considered whether there were any portions of the range where the threats were different or concentrated in particular areas. Woehler (1993, p. 5) described three main areas, each of which encompasses a large area of the Antarctic coast: (1) The Weddell Sea and Dronning Maud Land; (2) Enderby and Princess Elizabeth lands; and (3) the Ross Sea. Within these areas, colonies are widely distributed along the coastline, and each is very isolated from its nearest neighbors. The area ''between'' these general regions is not a distinct geographical barrier, but an area where colonies are spread even more sparsely along the coast. In these areas, there is a longer distance between the individual colonies or ''links'' in the chain of colonies encircling most of the continent. During the period of molting, adult penguins range widely and often into the vicinity of other colonies. For example, Wienecke *et al.* (2004, p. 90) inferred potential mixing at sea between birds from four colonies along the Mawson Coast and suggested this was a potential vehicle for interbreeding of birds from different colonies.

In fact, the wider distribution of colonies between ''regions'' may actually be an artifact of the difficulty of visiting remote areas of the coast away from the few research stations that exist on the coast or difficulties of reaching these areas at a time when breeding can be detected (Kooyman 2002, p. 492). A recent discovery of a new colony along one of the longest stretches of Wilkes Land led researchers to predict that more colonies will be found in one of the longest gaps of recorded colonies. With each confirmed new discovery has come evidence indicating more colonies may exist. This would provide evidence of stronger connections between areas (Lea and Soper 2005, pp. 59–60; Melick and Bremmers 1995, p. 427) and greater potential for mixing or interbreeding between regions.

In the course of our review, we have discussed the declines that occurred at the small Cape Crozier and Beaufort Island colonies in the Western Ross Sea over the period of 2001–2005 as the result of the impact of iceberg B15A. The most recent data from 2005 indicated that the Beaufort Island colony had seen significant post-iceberg recovery in chick counts. After an initial breeding failure in 2001 at Cape Crozier, the year of iceberg impact, chick counts fluctuated from 247 in 2002, to 333 in 2003, to 475 in 2004, to 0 in 2005, and 340 chicks in 2006 (Barber-Meyer *et al.* 2007b, pp. 7, 9). Given the small current and historic size of these colonies (averaging 526 (Cape Crozier) and 896 (Beaufort Island) chicks over 22 years) and their location in the vicinity of four other larger emperor penguin colonies in the western Ross Sea with chick counts averaging from 2,843 (Franklin Island), to 19,776 (Cape Washington), to 23,859 (Coulman Island) and to 6,215 (Cape Roget) chicks) over the same period, we do not consider these colonies to represent a significant portion of the range of the emperor penguin.

Finding of Emperor Penguin SPR Analysis

Given the current stability of conditions for the emperor penguin throughout its range and the paucity of current stressors identified, we do not find through our five-factor analysis any stressor that has the potential to affect any one portion of the range of the emperor penguin differently than any other. With respect to the longer-term issue of changes in sea-ice cover, we do not find that current models provide sufficient predictive power to evaluate regional scenarios with confidence or to make distinctions as to the potential risks to any particular portion of the range. For these reasons, we conclude that there are no portions of the emperor penguin's range that warrant further consideration as significant portions of the range.

Final Determination for the Emperor Penguin

On the basis of analysis of the five factors and the best available scientific and commercial information, we find that listing the emperor penguin as threatened or endangered under the Act in all or any significant portion of its range is not warranted.

Public Comments Solicited on the Proposed Rule To List the Southern Rockhopper Penguin in the Campbell Plateau Portion of Its Range

We intend that any final action resulting from this proposal will be as accurate and as effective as possible. Therefore, we request comments or suggestions on this proposed rule. We particularly seek comments concerning:

(1) Biological, commercial, trade, or other relevant data concerning any threats (or lack thereof) to this species and regulations that may be addressing those threats.

(2) Additional information concerning the range, distribution, and population size of this species, including the locations of any additional populations of this species.

(3) Any information on the biological or ecological requirements of the species.

(4) Current or planned activities in the areas occupied by the species and possible impacts of these activities on this species.

You may submit your comments and materials concerning this proposed rule by one of the methods listed in the **ADDRESSES** section. We will not consider comments sent by e-mail or fax or to an address not listed in the **ADDRESSES** section.

If you submit a comment via *http://www.regulations.gov,* your entire comment—including any personal identifying information—will be posted on the website. If you submit a hardcopy comment that includes personal identifying information, you may request at the top of your document that we withhold this information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy comments on *http://www.regulations.gov.*

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on *http://www.regulations.gov,* or by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Division of Scientific Authority, 4401 N. Fairfax Drive, Room 110, Arlington, VA 22203; telephone 703–358–1708.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Act include recognition, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness, and encourages and results in conservation actions by Federal governments, private agencies and groups, and individuals.

Section 7(a) of the Act, as amended, and as implemented by regulations at 50 CFR part 402, requires Federal agencies to evaluate their actions within the United States or on the high seas with respect to any species that is proposed or listed as endangered or threatened, and with respect to its critical habitat, if any is being designated. However, given that the Campbell Plateau portion of the range of the New Zealand/Australia Distinct Population Segment (DPS) of the southern rockhopper penguin is not native to the United States, critical habitat is not being designated for these species under section 4 of the Act.

Section 8(a) of the Act authorizes limited financial assistance for the development and management of programs that the Secretary of the Interior determines to be necessary or useful for the conservation of endangered and threatened species in foreign countries. Sections 8(b) and 8(c) of the Act authorize the Secretary to encourage conservation programs for foreign endangered species and to provide assistance for such programs in the form of personnel and the training of personnel.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered and threatened wildlife. As such, these prohibitions would be applicable to the Campbell Plateau portion of the range of the New Zealand/Australia Distinct Population Segment (DPS) of the southern rockhopper penguin. These prohibitions, under 50 CFR 17.21, make it illegal for any person subject to the jurisdiction of the United States to "take" (take includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt any of these) within the United States or upon the high seas, import or export, deliver, receive, carry, transport, or ship in interstate or foreign commerce in the course of a commercial activity, or to sell or offer for sale in interstate or foreign commerce, any endangered wildlife species. It also is illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken in violation of the Act. Certain exceptions apply to agents of the Service and State conservation agencies.

We may issue permits to carry out otherwise prohibited activities involving endangered and threatened wildlife species under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22 for endangered species, and at 17.32 for threatened species. With regard to endangered wildlife, a permit must be issued for the following purposes: for scientific purposes, to enhance the propagation or survival of the species, and for incidental take in connection with otherwise lawful activities.

Peer Review

In accordance with our joint policy with National Marine Fisheries Service, "Notice of Interagency Cooperative Policy for Peer Review in Endangered Species Act Activities," published in the **Federal Register** on July 1, 1994 (59 FR 34270), we will seek the expert opinions of at least three appropriate independent specialists regarding this proposed rule. The purpose of peer review is to ensure that our proposed rule is based on scientifically sound data, assumptions, and analyses. We will send copies of this proposed rule to the peer reviewers immediately following publication in the **Federal Register**. We will invite these peer reviewers to comment during the public comment period, on our specific assumptions and conclusions regarding this proposed rule.

We will consider all comments and information we receive during the comment period on this proposed rule during our preparation of a final determination. Accordingly, our final decision may differ from this proposal.

Public Hearings

The Act provides for one or more public hearings on this proposal, if we receive any requests for hearings. We must receive your request for a public hearing within 45 days after the date of this **Federal Register** publication (see **DATES**). Such requests must be made in writing and be addressed to the Chief of the Division of Scientific Authority at the address shown in the **FOR FURTHER INFORMATION CONTACT** section. We will schedule public hearings on this proposal, if any are requested, and announce the dates, times, and places of those hearings, as well as how to obtain reasonable accommodations, in the

Federal Register at least 15 days before the first hearing.

Required Determinations

Regulatory Planning and Review (Executive Order 12866)

The Office of Management and Budget has determined that this rule is not significant under Executive Order 12866.

National Environmental Policy Act (NEPA)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*), need not be prepared in connection with regulations adopted under section 4(a) of the Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

Clarity of the Rule

We are required by Executive Orders 12866 and 12988, and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

(a) Be logically organized;

(b) Use the active voice to address readers directly;

(c) Use clear language rather than jargon;

(d) Be divided into short sections and sentences; and

(e) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in the **ADDRESSES** section. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the numbers of the sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

References Cited

A complete list of the references cited in this notice is available on the Internet at *http://www.regulations.gov* or upon request from the Division of Scientific Authority, U.S. Fish and Wildlife Service (see **FOR FURTHER INFORMATION CONTACT**).

Author

The authors of this proposed rule are staff of the Division of Scientific Authority, U.S. Fish and Wildlife Service (see **FOR FURTHER INFORMATION CONTACT**).

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Proposed Regulation Promulgation

Accordingly, we propose to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—[AMENDED]

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 16 U.S.C. 1531–1544; 16 U.S.C. 4201–4245; Public Law 99–625, 100 Stat. 3500; unless otherwise noted.

2. Amend § 17.11(h) by adding a new entry for "Penguin, southern rockhopper" in alphabetical order under BIRDS to the List of Endangered and Threatened Wildlife as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	*	*	*		*
BIRDS							
*	*	*	*	*	*		*
Penguin, southern rockhopper.	*Eudyptes chrysocome.*	Southern Ocean, South Atlantic Ocean, South Pacific Ocean, Southern Indian Ocean.	New Zealand—Campbell Plateau.	T		NA	NA
*	*	*	*	*	*		*

* * * * *

Dated: December 2, 2008 .

H. Dale Hall,

Director, U.S. Fish and Wildlife Service.

[FR Doc. E8–29673 Filed 12–17–08; 8:45 am]

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