

PENGUINS

A SEAWORLD EDUCATION DEPARTMENT PUBLICATION

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PENGUINS

SCIENTIFIC CLASSIFICATION

A. Class – Aves.

This class includes all birds. Birds have an outer covering of feathers, are endothermic (warm-blooded), have front limbs modified into wings, and lay eggs.

B. Order – Sphenisciformes.

This order includes all living and extinct penguins.

C. Family – Spheniscidae.

Spheniscidae includes all penguins, living and extinct, and is the only Family in the Order Sphenisciformes.

D. Genus, species.

1. Most scientists recognize 17 species of penguins:

- emperor, *Aptenodytes forsteri*
- king, *Aptenodytes patagonicus*
- Adélie, *Pygoscelis adeliae*
- gentoo, *Pygoscelis papua*
- chinstrap, *Pygoscelis antarctica*
- rockhopper, *Eudyptes chrysocome*
- macaroni, *Eudyptes chrysolophus*
- royal, *Eudyptes schlegeli*
- Fiordland crested, *Eudyptes pachyrhynchus*
- erect-crested, *Eudyptes sclateri*
- Snares Island, *Eudyptes robustus*
- yellow-eyed, *Megadyptes antipodes*
- fairy (also known as little blue), *Eudyptula minor*
- Magellanic, *Spheniscus magellanicus*
- Humboldt, *Spheniscus humboldti*
- African (formerly known as black-footed), *Spheniscus demersus*
- Galápagos, *Spheniscus mendiculus*

2. Some scientists recognize an 18th species: the white-flipped form of fairy penguin, *Eudyptula albosignata*.
- E. Fossil record.
1. Scientists recognize 40 or more species of extinct penguins. (Williams, 1995)
 2. Scientists believe that penguins evolved from flying birds at least 65 million years ago during the Cretaceous Period. (Williams, 1995; Harrison et al 2004) As the ancestors of penguins became adapted to an oceanic environment, structural changes for diving and swimming led to the loss of flying adaptations.
 3. To date, the discovery of all penguin fossil fragments has been limited to the Southern Hemisphere. Records show that prehistoric penguins were found within the range of present-day penguins.
 - a. The earliest penguin fossil fragments were found in New Zealand in the mid-1800's. The oldest penguin fossils date from 58 to more than 60 million years ago. (Williams, 1995)
 - b. Fossil records show that the largest extinct species lived in the Miocene Period (11 to 25 million years ago). *Pachydyptes ponderosus* probably stood 1.4 to 1.5 m (4.5 -5 ft.) and may have weighed 90 to 135 kg (198-298 lb.). *Anthropornis nordenskjoldi* probably stood 1.5 to 1.8 m (5-5.9 ft.) and weighed 90 to 135 kg (198-298 lb.). Measurements are estimates, since only a few bone fragments have been found.
 4. The extinct species of penguins began disappearing during the Miocene, about the same time that the number of prehistoric seals and small whales started increasing in the oceans. One hypothesis is that seals, whales, and penguins may have competed for the same food source. Another hypothesis is that penguins could have become prey for some of these other predators. Both factors may have contributed to their extinction.
 5. Penguins share molecular and morphological characteristics with birds in the Order Procellariiformes (the albatrosses, shearwaters, and petrels), the Order Gaviiformes (loons and grebes), and frigatebirds (Order Pelecaniformes).
- F. Discovery of modern penguins.
1. The first European explorers to see penguins probably were part of the Portuguese expedition of Bartholomeu Dias de Novaes in 1487-1488. They were the first to travel around what is now known as the Cape of Good Hope in southern Africa.

2. The first documentation of penguin sightings is credited to members of the Portuguese voyage of Vasco de Gama to India in 1497. They described penguins (African) they saw along the southern coasts of Africa.
3. The discovery of South America's Magellanic penguin was chronicled during the journey of Spanish explorer Ferdinand Magellan in 1520.
4. The origin of the word "penguin" has been a subject of debate. The theories of researchers and historians range from references to the amount of fat (*penguigo* in Spanish and *pinguis* in Latin) penguins possess to the claim that the word was derived from two Welsh words meaning "white head." The most agreed-upon explanation is that "penguin" was used as a name for the now-extinct great auk, which the modern-day penguin resembles and for which it was mistaken.

DISTRIBUTION AND HABITAT

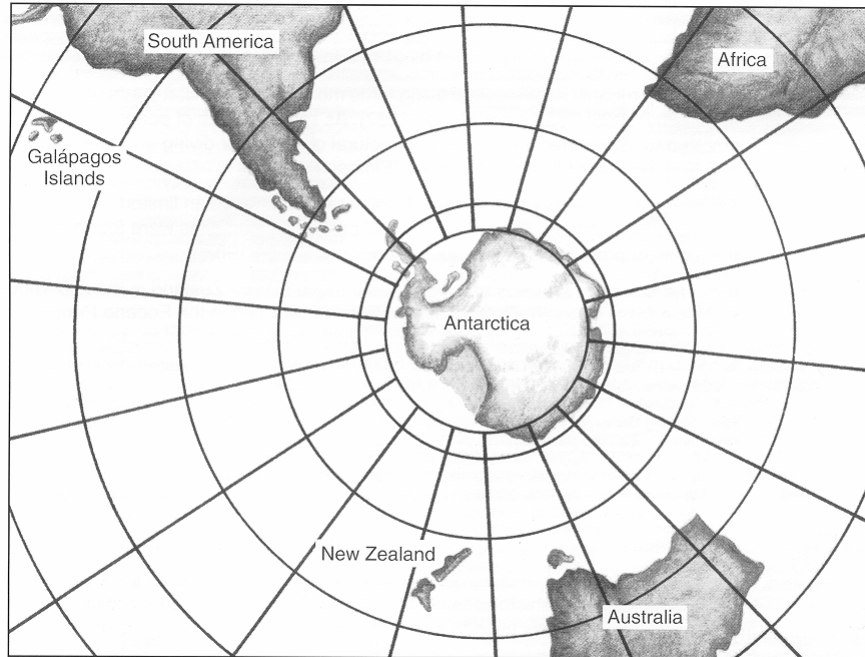
A. Distribution.

All 17 species of penguins live in the Southern Hemisphere. See Appendix on page 30 for information on distribution for each species. Penguins are found on every continent in the Southern Hemisphere. They are abundant on many temperate and subantarctic islands.

B. Habitat.

1. Penguins generally live on islands and remote continental regions free from land predators, where their inability to fly is not detrimental to their survival.
2. These highly specialized marine birds are adapted to living at sea—some species spend as much as 75% of their lives at sea. Penguins are usually found near nutrient-rich, cold-water currents that provide an abundant supply of food.
3. Different species thrive in varying climates, ranging from Galápagos penguins on tropical islands at the equator to emperor penguins restricted to the pack ice of Antarctica.

4. The seasons of the Southern Hemisphere are opposite those of the Northern Hemisphere. When continents above the equator experience spring and summer, the areas below the equator experience fall and winter.



All 17 penguin species live in the Southern Hemisphere.

C. Migration.

1. Adult penguins usually disperse from breeding rookeries to feed in coastal waters. Studies have found that adult emperor, Magellanic, and Humboldt penguins travel long distances between feeding and breeding grounds.
2. Young birds usually disperse when they leave their colonies and may wander thousands of kilometers. They generally return to the colonies where they were hatched to molt and breed.

D. Population.

1. Population data usually are gathered during the breeding season. Some researchers count chicks to estimate the total population, others count breeding pairs. The Appendix on page 30 lists population estimates by species.
2. Chinstrap penguins may be the most numerous, with a population estimated at 4 million breeding pairs. (Bird Life International, 2005)

PHYSICAL CHARACTERISTICS

A. Size.

1. The emperor penguin is the largest of all living penguins, standing 1.1 m (3.7 ft.) and weighing 27 to 41 kg (60–90 lb.).
2. The smallest of the penguins is the fairy penguin, standing just 41 cm (16 in.) and weighing about 1 kg (2.2 lb.).

B. Body shape.

1. The penguin's body is adapted for swimming. Its body is fusiform (tapered at both ends) and streamlined. A penguin has a large head, short neck, and elongated body.
2. The tail is short and wedge-shaped.
3. The legs and webbed feet are set far back on the body, which gives penguins their upright posture on land.

C. Coloration.

1. All adult penguins are countershaded: dark on the dorsal (back) surface and white on the ventral (underside) surface. The dark dorsal side blends in with the dark ocean depths when viewed from above. The light ventral side blends in with the lighter surface of the sea when viewed from below. The result is that predators or prey do not see a contrast between the countershaded penguin and the environment.
2. Many species have distinct markings and coloration.
 - a. The emperor penguin has a black head, chin, and throat, with broad yellow patches on each side of the head.
 - b. The king penguin has a black head, chin, and throat, with vivid orange, tear-shaped patches on each side of the head. The orange coloration extends to the upper chest.
 - c. The Adélie has a black head. Distinctive white eye rings appear during the breeding season.
 - d. The gentoo has a black head with white eyelids, and a distinct triangular white patch above each eye, usually extending over the head.
 - e. The top of a chinstrap's head is black and the face is white, with a stripe of black extending under the chin.
 - f. The crested penguins (genus *Eudyptes*), such as the rockhopper and macaroni, are distinguished by orange or yellow feather crests on the sides of the head, above the eyes.

- g. The yellow-eyed penguin, as its name suggests, has yellow eyes and a stripe of pale yellow feathers extending over its dark head.
 - h. The fairy penguin, also known as the little blue, has slate-blue to black feathers and a white chin and chest.
 - i. Temperate penguins (genus *Spheniscus*), such as the Humboldt and Magellanic, have unfeathered fleshy areas on the face and one or two distinct black stripes across the chest.
- 3. Chicks, juveniles, and immature penguins may have slightly different markings than adults. Generally, they appear duller in color than adults. Adult markings take a year or longer to develop.
 - 4. Sexual dimorphism
 - a. Generally, penguins are not sexually dimorphic: males and females look alike. Crested penguins are exceptions: the males are more robust and have larger bills than females.

D. Flippers.

- 1. Wings are modified into paddlelike flippers. The bones are flattened and broadened, with the joint of the elbow and wrist almost fused. This forms a tapered, flat flipper for swimming.
- 2. Each flipper is covered with short, scale-like feathers. The long wing feathers typical of most birds would be too flexible for swimming through water.
- 3. Penguins propel themselves through the water by flapping their flippers.

E. Head.

- 1. Different species of penguins can be identified by their head and facial markings.
- 2. Penguins have a variety of bill shapes. A penguin captures fish, squid, and crustaceans with its bill.
 - a. Generally, the bill tends to be long and thin in species that are primarily fish eaters, and shorter and stouter in those that mainly eat krill.
 - b. The mouth is lined with horny, rear-directed spines to aid in swallowing live prey.
- 3. Eyes.
 - a. The color of irises varies among the species.
 - (1) Many species have brown, reddish-brown, or golden-brown eyes.

- (2) Rockhopper and macaroni penguins have red eyes.
 - (3) Fairy (little blue) penguins have bluish-gray eyes.
 - (4) As their name implies, yellow-eyed penguins have yellow eyes.
- b. The pupil of a penguin's eye is circular. When constricted, however, the pupils of the king penguin are square.
 - c. Like many animals, penguins have a *nictitating membrane*, sometimes called a third eyelid. This is a clear covering that protects the eye from injury.

F. Legs and feet.

1. Penguin legs are short and strong. Feet are webbed, with visible claws. The legs are set far back on the body to aid in streamlining and steering while swimming. This placement also causes penguins to stand vertically and walk upright.
2. Penguins walk with short steps or hops, sometimes using their bills or tails to assist themselves on steep climbs.
 - a. The maximum walking speed for Adélie penguins is 3.9 kph (2.4 mph).
 - b. Emperor and king penguins walk slowly and do not hop. The maximum walking speed for emperors is 2.8 kph (1.7 mph).
 - c. Some species, like the rockhopper penguin, jump from rock to rock.
3. When traveling on ice, Antarctic penguins often "toboggan" on their bellies. They use their flippers and feet to slide their bodies forward along the ice.

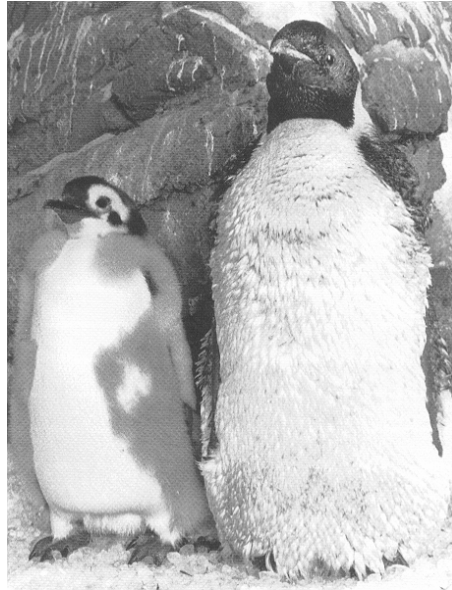
G. Tail.

A penguin's tail is short and wedge-shaped, with 14 to 18 stiff tail feathers. Adélie, gentoo, and chinstrap penguins (collectively known as brush-tailed penguins) have longer tail feathers, which they often use as a prop when on land.

H. Feathers.

1. Shiny feathers uniformly overlap to cover a penguin's skin. Penguin feathers are highly specialized – short, broad, and closely spaced. This helps keep water away from the skin. Tufts of down on the feather shafts increase the insulative properties of the feathers.

2. Penguins have more feathers than most other birds, with about 100 feathers per square inch.
3. Most penguin species go through one complete *molt* (shed their feathers) each year, usually after the breeding season. The exception is the Galápagos penguin, which usually goes through two moults per year.

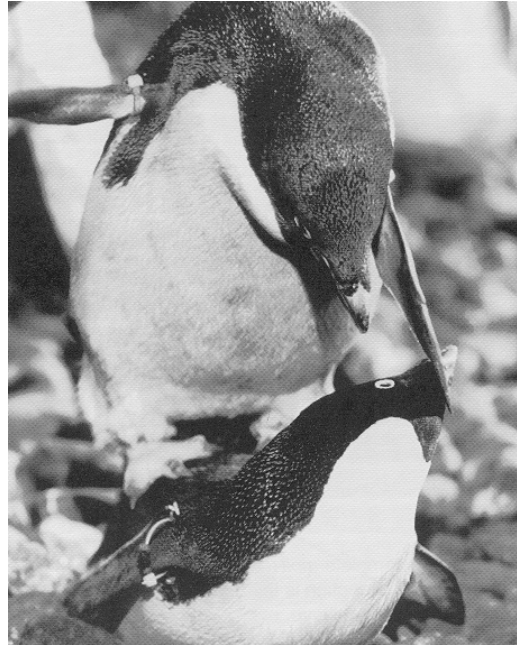


- a. Moulting is essential because feathers wear out during the year. Feathers become worn when penguins rub against each other, come in contact with the ground and water, and regularly *preen* (clean, rearrange, and oil) their feathers.
- b. The new feather grows under the old one, pushing it out. The old feather does not fall out until the new one is completely in place. The molt is patchy and can give individual penguins a scruffy look.
- c. During the moult, feathers lose some of their insulating and waterproofing capabilities, and penguins stay out of the water until their plumage is restored to optimal condition.
- d. Depending on the species, the average length of the moult varies from 13 days for the Galápagos penguin to 34 days for the emperor penguin.
- e. Penguins fast when moulting. Prior to this, they each build up a thick layer of fat to provide energy until the molt is complete.

SENSES

A. Hearing.

As in most birds, penguin hearing is probably good, but not as acute as that of marine mammals. The hearing range for most birds is 0.1–8 kHz. Hearing for penguins has not been well researched, but vocalization has. *Vocalizations* (calls) are important in communication and mate recognition.



B. Eyesight.

1. A penguin's eyes are adapted to see clearly both in air and under water. (Howland and Sivak, 1984)
2. Penguins have color vision and are sensitive to violet, blue, and green wavelengths of light.

C. Taste.

The sense of taste in penguins has not been extensively studied. In general, the sense of taste is poorly developed in birds.

D. Smell.

A penguin's sense of smell may be more developed than early studies indicated. The olfactory lobe of a penguin's brain is large. Studies on captive Humboldt penguins indicate that this species may have some sense of smell.

ADAPTATIONS FOR AN AQUATIC ENVIRONMENT

A. Swimming.

1. Some penguin species spend as much as 75% of their lives in the sea. They may spend several months at a time at sea, only coming ashore for breeding and molting. The Fiordland crested penguins occasionally grow barnacles on their tails – an indication that they are at sea for long periods.
2. Swimming speeds generally are not well known. Earlier estimates of swimming speeds were taken from observations of penguins swimming alongside moving ships, a method that proved to be unreliable. The fastest swimmers belong to the genus *Aptenodytes*.

Emperors have been observed swimming 14.4 kph (8.9 mph), though they normally do not exceed 10.8 kph (6.7 mph). Both kings and chinstraps have been recorded at 8.6 kph (5.3 mph), Adélie penguins reach speeds of 7.9 kph (4.9 mph). Fairy penguins swim slower at about 2.5 kph (1.6 mph).

3. A penguin hunches its head into its shoulders to maintain its streamlined shape and reduce drag while swimming. It keeps its feet pressed close to the body against the tail to aid in steering.
4. Penguin wings are paddlelike flippers used for swimming. The motion of the flippers resembles the wing movements of flying birds, giving penguins the appearance of flying through water. The wing and breast muscles are well developed, to propel penguins through water – a medium much denser than air.
5. Having solid, dense bones helps penguins overcome buoyancy.
6. Although it is more energy efficient for penguins to swim under water than at the water's surface, they must come to the surface to breathe. Many species of penguin *porpoise* – leap in and out of the water, like dolphins or porpoises.
 - a. When porpoising, penguins can continue breathing without interrupting forward momentum. They maintain a steady speed of 7 to 10 kph (4.3–6.2 mph). Porpoising also may confuse underwater predators.
 - b. Not all species exhibit this behavior. Emperor penguins are not known to porpoise and this behavior is infrequently seen in king penguins.

B. Diving.

1. Most prey of penguins inhabit the upper water layers, so penguins generally do not dive to great depths or for long periods.
 - a. Most species stay submerged less than a minute.
 - b. Gentoo and Adélie penguins have been recorded staying under water for seven minutes.
 - b. Chinstraps can reach depths of 100 m (328 ft.), but most dives are less than 30 m (98 ft.). (Wilson and Peters 1999) Nearly half are less than 10 m (33 ft.), and last between 20 and 30 seconds.
 - c. Most dives of king penguins last less than four to six minutes, although dives of nearly eight minutes have been documented. (Culik *et al*, 1996; Kooyman *et al*, 1992a, Kooyman *et al*, 1997) The maximum recorded depth for a king penguin dive was 304 m (997 ft.). (Kooyman *et al* 1992a)

2. Studies using radio tracking and automatic depth recorders reveal that emperor penguins sometimes hunt at great depths.
 - a. Emperors hunt fast midwater squids and fishes and therefore tend to dive more deeply and remain submerged longer than other penguins.
 - b. The deepest dive recorded for an emperor penguin was 535 m (1,755 ft.). (Kooyman and Kooyman, 1995) The longest recorded dive for an emperor penguin was 22 minutes. (G. Robertson In Ponganis *et al* 1997) Both of these measurements are considered extremes; most dives are within 21 m (70 ft.) of the surface and last two to eight minutes.
3. During deep dives, the penguin heart rate slows.
 - a. Adélie and gentoo penguins reduce their heart rate from 80 to 100 beats per minute (bpm) to about 20 bpm.
 - b. The heart rate of a diving emperor penguin is about 15% lower than its resting heart rate, which averages about 72 bpm. (Kooyman *et al*, 1992b)
4. Under experimental diving conditions, penguins exhibit reduced peripheral blood flow.
5. The temperatures of a penguin's peripheral areas (limbs and skin) drop during a dive while those of the core regions (heart, deep veins, and pectoral muscle) are maintained at the normal temperature. (Ponganis *et al*, 2001, 2003, 2004)

C. Respiration.

When swimming, penguins inhale and exhale rapidly at the surface. Just before a dive, penguins inhale and then dive on a breath of air. (Kooyman *et al*, 1971)

D. Salt secretion.

Penguins have glands under the eyes that help rid the body of excess salt. The secretion of salt and fluid often collect as droplets on the bill and are shaken off. These glands are so effective that penguins can drink sea water without ill effects.

E. Sleep.

1. A penguin typically sleeps with its bill tucked behind a flipper, which some scientists believe serves no known purpose in penguins, but is a remnant of ancestral relations to flighted birds. Other researchers believe the behavior may reduce the amount of heat lost through the face, particularly the nostrils.

2. To conserve energy while fasting, penguins may increase the time they spend sleeping.
3. During the Antarctic winter, when the period of darkness may last more than 20 hours, huddling emperor penguins that are incubating eggs may sleep for most of a 24-hour period.

F. Thermoregulation.

1. The internal temperature range of penguins is 37.8°C to 38.9°C (100°F-102°F).
2. Overlapping feathers create a surface nearly impenetrable to wind or water. Feathers provide waterproofing critical to penguins' survival in water that may be as cold as -2.2°C (28°F) in the Antarctic. Tufts of down on feather shafts trap air. This layer of air provides 80% to 84% of the thermal insulation for penguins. The layer of trapped air is compressed during dives and can dissipate after prolonged diving. Penguins rearrange their feathers by preening.
3. To conserve heat, penguins may tuck in their flippers close to their bodies. They also may shiver to generate additional heat.
4. A well defined fat layer improves insulation in cold water, but probably is not enough to keep body temperature stable at sea for long. Penguins must remain active while in water to generate body heat.
5. Species in colder climates tend to have longer feathers and a thicker fat layer than those in warmer climates.
6. The dark plumage of a penguin's dorsal surface absorbs heat from the sun, which increases body temperature.
7. On land, king and emperor penguins tip up their feet, and rest their entire weight on their heels and tail, reducing contact with the icy surface.
8. Emperor penguins huddle together to conserve heat. As many as 6,000 males will cluster while incubating eggs during the middle of the Antarctic winter.
9. Emperor penguins are able to recapture 80% of heat escaping in their breath through a complex heat exchange system in their nasal passages.
10. On land, overheating may sometimes be a problem.
 - a. Penguins may prevent overheating by moving into shaded areas and by panting.

- b. Penguins can ruffle their feathers to break up the insulating layer of air next to the skin and release heat.
 - c. If a penguin is too warm, it holds its flippers away from its body, so both surfaces of the flippers are exposed to air, releasing heat.
 - d. Temperate species, like Humboldt and African penguins, lack feathers on their legs and have bare patches on their faces. Excess heat can dissipate through these unfeathered areas.
11. A penguin's circulatory system adjusts to conserve or release body heat to maintain body temperature.
- a. To conserve heat, blood flowing to the flippers and legs transfers its heat to blood returning to the heart. This *countercurrent heat exchange* helps ensure that heat remains in the body.
 - b. If the body becomes too warm, blood vessels in the skin dilate, bringing heat from within the body to the surface, where it is dissipated.

BEHAVIOR

A. Social behavior.

- 1. Penguins are among the most social of all birds. All species are colonial.
- 2. Penguins may swim and feed in groups, but some may be solitary when diving for food. Emperor penguins have been observed feeding in groups with coordinated diving.
- 3. During the breeding season penguins come ashore and nest in huge colonies called rookeries. Some rookeries include hundreds of thousands of penguins and cover hundreds of square kilometers.
- 4. Penguins exhibit intricate courting and mate-recognition behavior. Elaborate visual and vocal displays help establish and maintain nesting territories.
- 5. Although king penguins are highly gregarious at rookery sites, they usually travel in small groups of 5 to 20 individuals.
- 6. Penguins communicate by vocalizing and performing physical behaviors called "displays." They use many vocal and visual displays to communicate nesting territories and mating information. They also use displays in partner and chick recognition, and in defense against intruders.

B. Individual behavior.

1. Navigation.
Studies of Adélie penguins indicate that they use the sun to navigate from land to sea. They adjust for the sun's changing position in the sky throughout the day.
2. Preening.
 - a. Penguins preen their feathers frequently. Feathers must be maintained in prime condition to ensure waterproofing and insulation.
 - b. Penguins preen with their bills. A gland near the base of the tail secretes oil that the penguin distributes throughout its feathers.
 - c. Penguins preen for several minutes in the water by rubbing their bodies with their flippers while twisting and turning.

COMMUNICATION

A. Vocalization.

1. Penguin calls (vocalizations) are individually identifiable, allowing mates to recognize each other and also their chick. This is important because members of a large colony of penguins are nearly indistinguishable by sight.
2. Research has identified differences in the calls of male and female emperor penguins. These differences probably function in courtship and mate selection.
3. There are three main kinds of penguin calls.
 - a. The *contact call* assists in recognition of colony members. The contact call of emperor and king penguins can be heard one kilometer (0.6 mi.) away.
 - b. The *display call* is the most complex of all the calls and is used between partners in a colony. The call must convey information on territorial, sexual, and individual recognition.
 - c. The *threat call* is the simplest and is used to defend a territory and warn other colony members of predators.

B. Displays.

Penguins communicate by vocalizing and performing physical behaviors called displays. They use many vocal and visual displays to communicate nesting territories, mating information, nest relief rituals, partner and chick recognition, and defense against intruders.

FOOD AND FORAGING

A. Food preferences and resources.

1. Penguins eat krill (a shrimp-like crustacean in the Family Euphausiidae), squids, and fishes. Various species of penguins have slightly different food preferences, which reduce competition among species. See Appendix on page 30 for the diet of each species.
2. The smaller penguin species of the Antarctic and the subantarctic primarily feed on krill and squids. Species found farther north tend to eat fishes.
3. Adélie penguins feed primarily on small krill, while chinstraps forage for large krill.
4. Emperor and king penguins mainly eat fishes and squids.

B. Food intake.

1. Intake varies with the quantity and variety of food available from different areas at different times of the year.
2. A colony of 5 million Adélie penguins may eat nearly 8 million kg (17.6 million lb.) of krill and small fishes daily.

C. Method of collecting and eating food.

1. Penguins feed at sea. Most feeding occurs within 15.3 to 18.3 m (50–60 ft.) of the surface. The location of prey can vary seasonally and even daily.
2. Penguins primarily rely on their vision while hunting. It is not known how penguins locate prey in the darkness, at night, or at great depths. Some scientists hypothesize that penguins are helped by the *bioluminescence* (light producing) capabilities of many oceanic squids, crustaceans, and fishes.
3. Penguins catch prey with their bills and swallow it whole while swimming. A penguin has a spiny tongue and powerful jaws to grip slippery prey.
4. Different species travel various distances from the colony in search of food.
 - a. Hunting areas may range from 15 km (9 mi.) from the colony for Adélies to nearly 900 km (559 mi.) from the colony for king penguins. Emperor penguins may cover 164 to 1,454 km (102– 903 mi.) in a single foraging trip.

- b. Penguins walk and toboggan from feeding grounds to rookeries. When fishing grounds are far away, penguins will feed in seal holes and other openings in the ice.

D. Fasting.

1. Penguins go through annual fasting periods. Prior to fasting, penguins build up a fat layer, which provides energy.
 - a. Penguins fast for prolonged periods during breeding seasons; they do not leave nesting areas to feed. Some penguins fast throughout the entire courtship, nesting, and incubation periods.
 - b. Penguins also fast during annual molting periods. The temporary reduction in insulation and waterproofing caused by the loss of feathers during a molt prohibits penguins from entering the water to feed. Their fat layer provides energy until the molt is over.
 - c. Chicks fast near the time they are ready to shed juvenile feathers for adult plumage. Usually by this time, the parents no longer are feeding the chick. Growth stops during this fasting period, but resumes once the molt is complete.
2. The length of fasting depends on penguin species, sex, and type of fasting. The king and emperor penguins have the longest fasting periods.
 - a. Breeding male king penguins may fast for up to 54 days during courtship and the first incubation shift.
 - b. Breeding male emperor penguins may fast 90 to 120 days during courtship, breeding, and the entire incubation period.

REPRODUCTION

A. Sexual maturity.

1. Like most seabirds, penguins tend to be long-lived. They may take three to eight years to reach sexual maturity.
2. With some of the smaller species, breeding may begin at three to four years, but most larger species are not accomplished breeders until much later. On average, breeding does not begin until the fifth year, and a few males do not breed until the eighth year.

B. Mating activity.

1. Breeding seasons differ from species to species.
 - a. Most species have an annual breeding season – spring through summer.

- b. The king penguin has the longest breeding cycle of all the penguin species, lasting 14 to 16 months. A female king penguin may produce a chick during alternate breeding seasons.
 - c. Emperor penguins breed annually during the antarctic winter, June through August.
 - (1) During the emperor breeding season, air temperature may drop to -60°C (-76°F) and winds may reach speeds up to 200 kph (124 mph).
 - (2) For most of the winter, antarctic penguins live in an environment of darkness or half-light. Why emperors breed during the harshest season of the year is unknown, but some scientists speculate that when the chicks become independent five months later (in January and February, the antarctic summer), environmental conditions are more favorable for the young birds.
 - d. The fairy penguin breeds throughout the year and has the shortest breeding cycle, which lasts about 50 days.
 - e. Some of the temperate penguins, like the Humboldt and the African, tend to nest throughout the year.
2. Courtship.
- a. Courtship varies among species. It generally begins with both visual and auditory displays. In many species, males display first to establish a nest site and then to attract a mate. Not all species exhibit all displays, but in general there are three distinct types of displays.
 - (1) *Ecstatic*. Also called trumpeting, head swinging or advertisement, this display establishes possession of a nest site, attracts females, and warns other males to stay away. Males at the nest site commonly exhibit the ecstatic display before females arrive. The male may dip its head low and then stretch its head and neck upward with flippers held outstretched and squawk or “bray”. Some species, like the Adélie, chinstrap, and crested penguins, may swing their head or flap their flippers while calling.
 - (2) *Mutual*. Once paired, male and female penguins perform the mutual display together. This display seems to strengthen the pair bond. The mutual display is similar to the ecstatic display – head and neck stretched upward with a braying vocal. Crested, brush-tailed, and temperate penguins, stand

facing each other, performing the action in unison. Within these species there are some behavior differences. For example, gentoos generally hold their outstretched head and flippers still, while macaronis flap flippers and roll their heads from side to side. Emperor penguins have a unique mutual display position: Standing face to face, individuals hold their heads down with bills pointed to the ground while braying. Mutual displays continue throughout the breeding season, often taking place at the nest when parents switch places for egg incubation and chick feeding.

(3) *Bowing*. Bowing displays may lessen the likelihood of aggression and strengthen recognition between partners. One or both of the penguins dips its head and points its bill at the nest or at the other bird's feet. Crested penguins may vibrate their bills while pointing in a type of display called "quivering". The call is a low hiss or growl.

- b. Most penguin species are *monogamous* (one male breeds with one female during a mating season); however, research has shown that some females may have one to three partners in one season and some males may have one or two partners.
- c. Mate selection is up to the female, and it is the females that compete for the males.
- d. In some penguin species, a female selects the same male from the preceding season to mate with. Adélie penguins have been documented re-pairing with the previous year's mate 62% of the time. Chinstraps re-paired in 82% of possible cases, and gentoos re-paired 90% of the time. In one study of Adélies, females paired with males within minutes of arriving at the colony.
- e. When a female selects a different mate it is usually because her mate from the previous season fails to return to the nesting area. Another reason may be mistiming in returning to the nesting area. If they arrive at different times and miss each other, one or both penguins may obtain new mates.

C. Nesting.

1. Nest site fidelity.

- a. Studies have shown that individuals of most penguin species return each year to the same rookeries. In addition, most penguins return to the same nesting site within the rookery. Studies have indicated that fidelity to the previous year's nest site

was 99% for male Adélie penguins, 94% for chinstraps, and 63% for gentoos.

- b. Males arrive first to the rookeries to establish and defend their nesting sites. In a study on Adélie and chinstrap penguins, females arrived one day and five days after the males, respectively.
 - c. When it is time to breed, mature birds return to the rookery where they hatched. This results in large numbers of penguins at a single rookery rather than penguins colonizing new areas. Some penguin rookeries number millions of birds.
2. Nesting habitats vary among species.
- a. Emperor penguins form colonies on the Antarctic continent. They prefer sites on a fairly level surface of ice in areas sheltered from wind, with easy access to feeding areas. Rookeries must be far enough inland that the ice does not melt under them prior to the chicks being ready to go to sea.
 - b. King penguins nest and breed on subantarctic and antarctic islands. They prefer beaches and valleys of level ground or gentle slopes, free of snow and ice, and accessible to the sea.
 - c. Adélies often nest 50 to 60 km (31.1–37.3 mi.) from the edge of the sea ice on the antarctic continent and nearby on rocky islands, peninsulas, beaches, hillsides, valleys, and other areas free of ice.
 - d. Gentoo penguin colonies can be inland or coastal on antarctic and subantarctic islands and peninsulas. They tend to breed on ice-free ground on beaches, in valleys, on inland hills, and on cliff tops.
 - e. Chinstrap penguins nest on fairly steep slopes.
 - f. Fiordland crested penguins nest in a wet, coastal rain forest habitat, under bushes, between tree roots, in holes, or on rocky coasts among rocks or in caves.
 - g. Galápagos penguins nest in volcanic caves or cracks in rock.
 - h. The temperate penguins and the fairy penguin nest underground in burrows. These species breed in areas where the climate can range from tropical to subantarctic. Underground burrows provide an environment with a relatively constant temperature (about 25° to 29° C, or 77° to 84° F) for the eggs and chicks.
 - i. Humboldt penguins burrow and create nesting sites in *guano* (fecal) deposits.

3. Nesting materials vary from species to species and from location to location.
 - a. Adélie build nests of small stones. They are known to take stones from other Adélie nests. A penguin returning to the nest sometimes brings its mate a stone as a courtship gesture.
 - b. Chinstrap penguins usually construct nests with perimeters of eight to ten stones, just enough to prevent eggs from rolling away.
 - c. Gentoo penguins use nesting materials ranging from pebbles and molted feathers in Antarctica to vegetation on subantarctic islands. One medium-sized gentoo nest was composed of 1,700 pebbles and 70 molted tail feathers.
 - d. Emperor and king penguins build no nests. They stand upright while incubating a single egg on the tops of their feet under a loose fold of abdominal skin. Under this loose fold is a featherless patch of skin called a *brood patch*, which occurs in all incubating birds. The brood patch contains numerous blood vessels that, when engorged with blood, transfer body heat to the eggs.

D. Eggs.

1. Eggs may be white to bluish or greenish. The shape varies among species. In Humboldt and Adélie penguins the egg is more or less round. In emperor and king penguins the egg is rather pear-shaped, with one end tapering almost to a point. With this elliptical shape, if an egg falls off of the feet of a parent bird, the egg will roll in a circle instead of away from the parent.
2. Egg size and weight varies with species. From the records of SeaWorld's successful penguin breeding programs, emperor penguin eggs measure 11.1 to 12.7 cm (4.4-5 in.) long and weigh 345 to 515 g (12.1-18 oz.), and Adélie penguin eggs measure 5.5 to 8.6 cm (2.2-3.4 in.) long and weigh 61 to 153.5 g (2.1-5.4 oz.).
3. A nest of eggs is called a *clutch*, and with the exception of emperor and king penguins, clutches usually contain two eggs. (Emperor and king penguins lay a single egg.) A clutch with more than one egg presents a better chance of at least one chick surviving.
 - a. In the *Eudyptula*, *Spheniscus*, and *Pygoscelis* genera, the first-laid egg is generally larger than the second, and usually hatches first (except in the chinstrap species). Usually the first chick to hatch has the survival advantage since it will already have fed and will be larger by the time the second egg hatches. The second, usually

smaller, chick cannot compete with the larger chick for food and may perish in times of scarce food resources.

- b. In the *Eudyptes* genus, the second-laid egg and the subsequent chick is usually the larger of the two and usually the survivor. It typically hatches first or at the same time as the chick from the first-laid egg. The first-laid egg is often kicked out of the nest by the adults prior to hatching time.
- c. The chinstrap and yellow-eyed species usually lay two eggs. Parents typically raise both chicks, which are nearly equal in size.

E. Incubation.

1. Incubation is the time spent warming the egg before it hatches. With the exception of emperor penguins, partners take turns incubating eggs, allowing each mate to leave to feed for several days at a time.
2. A female emperor penguin transfers a single egg to the top of her mate's feet. The female goes to sea to feed while the male incubates the egg. She returns several weeks later, usually just before the egg is ready to hatch, to relieve her mate so that he may feed. The male fasts throughout the courtship, nesting, and incubation periods. He lives off reserves of body fat which may be 3 to 4 cm (1.2-1.6 in.) thick, and loses up to 45% of his body weight.
3. The incubation period varies with species. It may be as short as one month, as in the erect-crested penguins, or as long as 62 to 66 days for emperor penguins.
4. The incubation temperature for penguins is approximately 36°C (96.5°F); it is a bit lower for the larger species. Emperor penguins can maintain an incubation temperature of 31°C (87.8°F) in an environment that is -60°C (-76°F).
5. The greatest single cause for reproductive failure in some species is the mistiming between parents for nest relief during incubation. This usually occurs when the female fails to return from a foraging trip before the male deserts the nest. A male will spontaneously leave the nest and eggs when the motivation to feed overcomes that for incubating eggs.



F. Hatching.

1. Chicks first “pip” by poking a small hole in the egg. They then chip at the shell until they can push off the top. Chicks take up to three days to chip their way out.
2. Fine down feathers cover most newly hatched chicks. (King penguin chicks hatch naked and grow down feathers within a few weeks.)
 - a. Down feathers of different species may be white, gray, black, or brown.
 - b. Down feathers are not waterproof, and chicks must remain out of the water until they acquire their juvenile plumage.
 - c. Adult plumage is acquired at about one year.
3. In all species, the coloration and markings of chicks separate them from adults. Scientists believe that the chicks’ coloration elicits parental behavior from the adults, and that adult penguins do not perceive the young birds as competitors for mates or nesting sites.
4. The striking markings of emperor chicks may help to make the chicks more visible against the ice and snow, significant because emperors don’t have individual nest sites where the young can be found.

G. Care of the chicks.

1. Chicks require attentive parents for survival. Both parents feed the chick regurgitated food. Adults recognize and feed only their own chick. Parents are able to identify their chick by its distinctive call.
2. Male emperor penguins exhibit a feature unique among penguins. If the chick hatches before the female returns, the male, despite his fasting, is able to produce and secrete a curdlike substance from his esophagus to feed the chick, allowing for survival and growth for up to two weeks.
3. Parents brood chicks (keep them warm) by covering them with their brood patch.



4. In some species, partially grown chicks gather in groups called *crèches*. (Crèche is a French word for crib.)
 - a. Crèches provide some protection from predators and the elements.
 - b. Crèches were once thought to be functional nurseries with adults providing protection and communal care. This has proven not to be the case. Parents feed only their own chick.
 - c. Temperate or subtropical crested penguins, like the macaroni or erect-crested, and penguins that nest in burrows, like the fairy or Humboldt, do not form crèches.

H. Chick development.

A chick depends on its parents for survival between hatching and the growth of its waterproof feathers. This period may range from seven weeks for Adélie chicks to 13 months for king chicks. For most penguin species, once a chick has replaced its juvenile down with waterproof feathers it is able to enter the water and becomes independent of its parents. Juvenile Gentoo penguins that have undergone a complete moult, leave the colony to forage at sea during the day but return to the colony with some still receiving food from their parents for 25 to 35 days following the moult.

LONGEVITY AND MORTALITY

A. Longevity.

1. The average life expectancy of penguins is probably 15 to 20 years. Some individuals live considerably longer.

2. High mortality occurs among the young.
 - a. Winter starvation may claim the lives of 50% of king penguin chicks.
 - b. Emperor chicks may experience a 90% mortality within the first year of life.
 - c. When mortality affects one chick in species producing two offspring of moderate size differences, it is usually the smaller chick that does not survive.
- B. Predators.
1. When in the water, penguins may be eaten by leopard seals, fur seals, sea lions, sharks, or killer whales.
 2. On land, foxes, snakes, and introduced predators such as feral dogs, cats, and stoats (members of the weasel family) prey on eggs and chicks of some penguin species, including the yellow-eyed and Galápagos penguins.
 3. Antarctic and subantarctic eggs and chicks are susceptible to predatory birds such as antarctic skuas, sheathbills, and giant petrels. These predators may prey on chicks that have strayed from the protection of the crèche or are sickly and too weak to defend themselves.
 - a. Skuas may work in pairs to obtain their prey. One bird distracts the penguin on the nest, and the other swoops in to steal the egg or chick.
 - b. Sheathbills intercept chinstrap regurgitation as penguin parents feed their offspring.
 4. Gulls and ibises eat 40% of African penguin eggs.
 5. Fairy penguins rely on burrows and a nocturnal lifestyle to avoid predators such as swamp harriers, peregrines, gulls, snakes, rats, and lizards.
- C. Human impact.
1. Historians believe that, for centuries, indigenous peoples have hunted some species of penguins and taken eggs.
 2. Mass exploitation occurred when early explorers, sealers, whalers, and fishermen turned to penguin colonies as sources of fresh meat and eggs. Sometimes more than 300,000 eggs were taken in annual harvests from one African island. Explorers were known to kill and salt 3,000 penguins in a day for voyage provisions. Penguins were easy prey because of their inability to fly and their seeming lack of fear of

humans. Although egg-collecting was banned in 1969, illegal harvesting continues today.

3. During much of the 19th century, and into the 20th, penguin skins were used to make caps, slippers, and purses. Feathers were used for clothing decorations and as mattress stuffing.
4. The extraction of oil from penguins' fat layers became economically important in the 1800s and early 1900s. Oil was used for lighting, tanning leather, and fuel. In the Falkland Islands alone, an estimated 2.5 million penguins were killed within a 16-year time span. The oil industry came to a halt in 1918 due to protests by the general public and because of cheaper and better quality chemical products.
5. Seabird guano has great commercial value as a nitrogen-rich fertilizer. Although the Incas used seabird guano to improve their crops as far back as 500 BC, they carefully managed the resource by extracting it at a slower rate than it was being produced. Guano became a major product of international trade in the 1800s, and in the early 1900s, Guano deposits were in danger of being depleted. Guano harvesting is better managed today, but overexploitation of this commodity is a serious threat to the Humboldt penguin population, which relies on accumulated seabird guano to dig burrows into rocky and soil-poor nesting areas.
6. In some places, such as islands in the southern Indian Ocean, fishermen still use penguin meat for bait.
7. Human competition for food sources can affect penguin populations. Overfishing of anchovetta (a small fish), the primary food source of the Humboldt penguin, has contributed to penguin population declines.
8. The introduction of predators has had devastating effects in some areas. Rats, dogs, pigs, and ferrets have been known to prey on chicks, eggs, and even adult penguins. Introduced herbivores, such as sheep and rabbits, cause serious deterioration of habitat.
9. Colonies of penguins have been affected by building activities and road construction. One colony of king penguins at Iles Crozet (a small group of islands in the Indian Ocean) was completely destroyed. A nearby area was cleared, and fortunately, the penguins recolonized.
10. Trash in the ocean can affect seabirds. Penguins have been known to ingest plastic or become tangled in debris, causing injury and death.
11. Oil spills affect penguins.

- a. Oil fouls penguin feathers, reducing the waterproofing and insulating properties of their plumage. The birds become susceptible to *hypothermia* (chilling).
 - b. Penguins also ingest the oil while trying to preen, which poisons them and causes internal organ damage.
 - c. On June 23, 2000 the ore carrier *Treasurer* caused an oil spill near Robben and Dassen islands off South Africa. The International Fund for Animal Welfare's (IFAW) International Oiled Wildlife Response Team, directed by the International Bird Rescue Research Center (IBRRC), was immediately mobilized to South Africa to help care for more than 20,000 oiled penguins. Due to this rapid response, within a year, the African penguin population on Robbin Island recovered to prespill numbers. (University of Cape Town Web site)
12. Traces of dichlorodiphenyltrichloroethane (DDT) and other pesticides (chlorinated hydrocarbons) have been found in the tissues of Adélie and chinstrap penguins. Scientists speculate that these pollutants were transported by ocean currents or other animals. Their appearance in antarctic penguins is significant in that these toxic substances have now reached the pristine Antarctic.
 13. Activity that may seem harmless, such as aircraft flying over penguin colonies, may cause panic and stampedes, resulting in injuries and easy predation.
 14. The popularity of "ecotourism" is increasing with cruise ships frequenting antarctic waters. Enthusiastic sightseers must be careful not to interfere with normal penguin activity by staying back and keeping noise levels down.
 15. Penguins may be indirectly affected by past hunting of whales. The increase of some penguin species over the last 30 years may be attributed to the greater availability of krill following the reduction of some antarctic whale populations. However, the commercial value of krill may encourage large-scale harvesting of this resource in south polar waters, which would impact penguins and other marine animals that rely upon krill as a food source.

D. El Niño.

The El Niño Southern Oscillation (ENSO) is a natural phenomenon that involves a change in wind and ocean current patterns, which warms surface temperatures and reduces the upwelling of nutrient-rich water. A decrease in nutrients affects plankton, krill, and small fishes, which comprise the

food supply for marine animals. The penguin species most affected are the Humboldt and Galápagos penguins.

1. The 1982-1983 ENSO caused a 65% depletion of the Humboldt population off the coast of Peru. The population partially recovered, but once again plummeted during the 1997-1998 El Niño event. (BirdLife International, 2005)
2. Up to 77% of the Galápagos penguin population was wiped out by the 1982-1983 ENSO, leaving only 463 total birds. A slow recovery began in 1985. However, a further decline of 66% of the population occurred during the 1997-1998 ENSO. The population appears to be once again in a recovery phase. (BirdLife International, 2005)

CONSERVATION

- A. Legal protection for penguins.
 1. Currently all 17 species of penguins are legally protected from hunting and egg collecting. At least three species are considered at risk.
 2. The Antarctic Treaty was signed by 12 nations in 1959 and reauthorized in 1991 to protect Antarctica and preserve its living resources. The Treaty makes it illegal to harm, or in any way interfere with, a penguin or its eggs. Every penguin specimen collected with a permit must be approved by and reported to the Scientific Committee for Antarctic Research (SCAR).
 3. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international treaty developed in 1973 to regulate trade in certain wildlife species, including penguins. CITES categorizes various animals according to their current status.
 - a. Appendix I lists species that are endangered, or in danger of extinction. The Humboldt penguin is listed on CITES Appendix I.
 - b. Appendix II lists species that are threatened, or likely to become endangered. The African penguin is listed on CITES Appendix II.
 4. IUCN/The World Conservation Union.
 - a. IUCN/The World Conservation Union is a worldwide conservation organization. This organization links together government agencies, non-government agencies, and independent states to encourage a worldwide approach to conservation. See Appendix on page 31 for listings for each species.
 5. The Endangered Species Act, 1973 (ESA).

- a. The Endangered Species Act of 1973 (ESA) is administered by the U.S. Departments of Interior and Commerce. It seeks to stop the extinction of wild animals and plants in the United States, other nations, and at sea.
 - b. Under the ESA, the Galàpagos penguin is listed as “endangered” (species faces a very high risk of extinction).
- B. Wildlife refuges.
 - 1. Protection of habitat began in the early 1900s. In 1919 the Tasmanian government stopped all exploitation of penguins on Macquarie Island and proclaimed the island a sanctuary. In 1997, Macquerie island was designated as a World Heritage site by the United Nations Educational, Scientific and Cultural Organization (UNESCO).
 - 2. In 1924 the French declared the Kerguelen Islands off Antarctica a National Park.
- C. Conservation management plan.

The Conservation Assessment and Management Plan (CAMP) is an assessment tool to evaluate the status of various animals and to determine conservation priorities. CAMP was developed by the Conservation Breeding Specialist Group (CBSG) of the Species Survival Commission of the International Union for the Conservation of Nature and Natural Resources (IUCN)/The World Conservation Union.

In September of 2004, the Fifth International Penguin Conference was held in Ushuaia, Argentina. Following the conference, a two-day collaborative workshop sponsored by SeaWorld and the New England Aquarium reviewed the 2004 IUCN penguin Red List fact sheets, updated the 1998 CAMP for all species of penguins, and looked at penguin conservation priorities and future initiatives.
- D. Zoological parks.
 - 1. Most people do not have the opportunity to observe penguins in the wild. The unique ability to observe and learn directly from live animals increases public awareness and appreciation of wildlife.
 - 2. The Species Survival Plan (SSP) is a captive propagation and management program to preserve, in zoos and aquariums, selected species – most of which are threatened or endangered in the wild. The American Zoo and Aquarium Association (AZA) Wildlife Conservation Management Committee (WCMC) has designated an SSP for Humboldt penguins. SeaWorld San Diego is a “Participating Institution.”
 - 3. Currently the four SeaWorld parks maintain emperor, king, Adélie,

gentoo, chinstrap, rockhopper, macaroni, Magellanic, and Humboldt penguin species. Each of these species has successfully reproduced within the parks' comprehensive breeding program.

E. [SeaWorld & Busch Gardens Conservation Fund](#)

1. The non-profit [SeaWorld & Busch Gardens Conservation Fund](#) (SWBGCF) works on behalf of wildlife and habitats worldwide. The goal of the SWBGCF is to encourage sustainable solutions by supporting critical conservation initiatives worldwide.
 - a. The SWBGCF conducts grant awards twice each year and anticipates funding for 2005 to approach \$700,000. Selected projects must be science-based, solution-driven, and community-oriented – attributes needed to achieve effective and long-term conservation success. Groups working on penguin conservation projects are invited to [apply for a SWBGCF grant](#). Projects are carefully selected by a diverse mix of wildlife experts, scientists, business leaders and educators.
 - b. The SWBGCF accepts [donations](#) to support conservation projects in the U.S. and around the world. 100% of donations go directly to selected projects.
 - c. The SWBGCF has sponsored a number of projects on marine and terrestrial animals including penguins.

Project: "Falkland Islands Penguin Census 2005-2006"

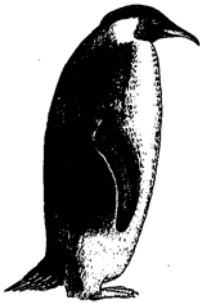
Partner: Falklands Conservation

Location: Falkland Islands

The *SWBGCF* grant funded the Falkland Islands Penguin Census for the 2005-2006 season. The project conducts a full census of all king, gentoo, macaroni, and rockhopper penguins. This will involve counting every colony where these species breed, soon after egg-laying has finished. Three teams of field workers will be involved: one for the main island of East Falkland, one for the island of West Falkland, and one for the offshore islands. The census is part of an on-going long-term monitoring program and is associated with an annual seabirds monitoring program. Results will be compared to previous censuses of 2000 and 1995 to establish the trends and fluctuations in population size of the four species of penguins. On this basis, a review of current penguin management and prioritization of conservation work will be undertaken.

APPENDIX – PENGUIN SPECIES INFORMATION

emperor penguin



Aptenodytes forsteri

size: 112 cm (44 in.), 27–41 kg (60–90 lb.)
distribution: circumpolar on Antarctic continent within limits of pack ice
prey: fishes, squids
predators: leopard seals, killer whales, skuas
population: about 270,000–350,000 individuals
current status: IUCN classifies this species as “least concern”; population stable

king penguin



Aptenodytes patagonicus

size: 94 cm (37 in.), 13.5–16 kg (30–35 lb.)
distribution: subantarctic islands and peninsulas, usually forage in ice-free waters
prey: squids, fishes
predators: leopard seals, skuas, giant petrels, gulls, sheathbills
population: about 2,000,000 adults
current status: IUCN classifies this species as “least concern”; population stable or increasing

Adélie penguin



Pygoscelis adeliae

size: 46–61 cm (18–24 in.), 3.5–4.5 kg (8–10 lb.)
distribution: circumpolar on Antarctic continent within limits of pack ice
prey: primarily krill, also squids and fishes
predators: leopard seals, skuas, sheathbills
population: about 4,000,000 to 5,200,000 individuals
current status: IUCN classifies this species as “least concern”; population increasing in East Antarctica and Ross Sea, decreasing on the Antarctic Peninsula



gentoo penguin

Pygoscelis papua

- size: 61–76 cm (24–30 in.), 5.5–6.5 kg (12–14 lb.)
distribution: circumpolar in subantarctic and antarctic waters; avoids pack ice and continental coasts (except near the Antarctic Peninsula).
prey: krill, squid
predators: skuas, leopard seals, antarctic fur seals, New Zealand sea lions, Southern sea lions
population: estimated 314,000 breeding pairs
current status: IUCN classifies this species as “near threatened”; increasing on Antarctic Peninsula and South Sandwich Island, decreasing on some islands



chinstrap penguin

Pygoscelis antarctica

- size: 46–61 cm (18–24 in.), 4 kg (9 lb.)
distribution: antarctic and South American islands
prey: krill, small fishes
predators: leopard seals, skuas, sheathbills
population: about 8,000,000 individuals
current status: IUCN classifies this species as “least concern”



rockhopper penguin

Eudyptes chrysochome

- size: 41–46 cm (16–18 in.), 2.5 kg (5–6 lb.)
distribution: subantarctic islands
prey: fishes, squids, krill
predators: New Zealand fur seals, New Zealand sea lions, Southern sea lions, skuas, gulls
population: about 7,340,000 mature individuals
current status: IUCN classifies this species as “vulnerable”; populations are declining.



royal penguin

Eudyptes schlegeli

size: 66–76 cm (26–30 in.), 5.5 kg (12 lb.)

distribution: Macquarie, Bishop, and Clerk Islands in the Southern Ocean

prey: krill, squids

predators: New Zealand fur seals, skuas, giant petrels

population: about 1,702,000 adults; most of population on Macquarie Island

current status: IUCN classifies this species as “vulnerable”.
populations recovering from earlier exploitation.



erect-crested penguin

Eudyptes sclateri

size: 64 cm (25 in.), 2.5–3.5 kg (6–8 lb.)

distribution: breed only on the Antipodes and Bounty Islands of New Zealand

prey: probably squids, fishes

predators: possibly New Zealand sea lions, New Zealand fur seals, Australian sea lions

population: estimated 154,000 to 170,000 mature individuals

current status: IUCN classifies this species as “endangered”;
populations in decline



macaroni penguin

Eudyptes chrysolophus

size: 51–61 cm (20–24 in.), 4.5 kg (10 lb.)

distribution: subantarctic islands in the Atlantic and Indian oceans

ID: A crest of orange plumes extends backwards.

prey: squids and krill

predators: leopard seals, antarctic fur seals, skuas, sheathbills

population: about 18,000,000 mature individuals

current status: IUCN classifies this species as “vulnerable”;
populations in decline



Fiordland crested penguin

Eudyptes pachyrhynchus

- size: 61 cm (24 in.), 2.5–3 kg (6–7 lb.)
- distribution: subantarctic islands and New Zealand
- prey: small fishes, crustaceans, cuttlefish
- predators: New Zealand fur seals, stoats (weasel relatives), weka (rail bird)
- population: estimated 5,000 to 6,000 adults
- current status: IUCN classifies this species as “vulnerable”; declining; nesting sites small, widespread and vulnerable to predation and human interference.



Snares Island penguin

Eudyptes robustus

- size: 64 cm (25 in.), 2.5–3 kg (6–7 lb.)
- distribution: south of New Zealand in the Snares Islands (all within 3 sq. km).
- prey: euphausiid “shrimp”, squids, fishes
- predators: New Zealand sea lions
- population: about 46,500 mature penguins
- current status: IUCN classifies this species as “vulnerable”; all individuals are in less than five locations, but current population numbers are probably stable.



yellow-eyed penguin

Megadyptes antipodes

- size: 76 cm (30 in.), 6 kg (3 lb.)
- distribution: southeast New Zealand
- prey: fishes and squids
- predators: New Zealand sea lions, domestic predators (prey on chicks)
- population: estimated 4,840 mature individuals
- current status: IUCN classifies this species as “endangered”; population numbers fluctuating



Magellanic penguin

Spheniscus magellanicus

size: 61–71 cm (24–28 in.), 5 kg (11 lb.)
distribution: Falkland Islands and along the coasts of Chile and Argentina
prey: small fishes, cuttlefish
predators: Southern sea lions, leopard seals, Patagonian foxes
population: about 1,300,000 breeding pairs
current status: IUCN classifies this species as “near threatened”; population has declined at Punta Tombo and in the Falklands.



African penguin (formerly black-footed)

Spheniscus demersus

size: 61–71 cm (24–28 in.), 3 kg (7 lb.)
distribution: South African waters
prey: mostly anchovies, sardines but also squids, crustaceans, and other fishes
predators: South African fur seals, Southern sea lions, octopus, sharks, sacred ibis, gulls
population: about 180,000 adults
current status: IUCN classifies this species as “vulnerable”; CITES lists in Appendix II (threatened); population decreasing; threatened by egg and guano collecting, predation on land, oil pollution, and overfishing of anchovies and sardines.



fairy penguin

Eudyptula minor

size: 41 cm (16 in.), about 1 kg (2 lb.)
distribution: southern Australia and New Zealand
prey: small fishes
predators: Australian sea lions, fur seals, dogs, cats, stoats, ferrets
population: about 350,000 to 600,000 adult penguins
current status: IUCN classifies this species as “least concern”.



Humboldt penguin

Spheniscus humboldti

- size: 56–66 cm (22–26 in.), 4 kg (9 lb.)
distribution: islands off western South America, and along the coasts of Peru and Chile
prey: anchovetta (small fish)
predators: possibly sharks and Southern sea lions
population: approximately 3,300 to 12,000 mature individuals
current status: IUCN classifies this species as “vulnerable”; CITES lists in Appendix I (endangered); significant threats include overfishing of prey species, drowning in gill nets, guano harvesting, human interference, and El Niño Southern Oscillation (ENSO) events.



Galápagos penguin

Spheniscus mendiculus

- size: 53 cm (21 in.), about 2.5 kg (5–6 lb.)
distribution: Galápagos Islands
prey: small fishes
predators: sharks, eared barn owls, Galápagos hawk, feral cats, dogs
population: about 1,200 mature individuals
current status: IUCN classifies this species as “endangered”; listed as endangered on the US Endangered Species List; increased human exploitation of the island contributes to habitat degradation and disturbances. This species has also suffered population declines as a result of ENSO events.