**Information for BZL Teacher-Led Lessons about Magellanic Penguins**

Content

Summary of Content

The information below is provided as background, much of it specific to Potter Park Zoo’s exhibit and penguins. Use the information as it suits the objectives of your program.

* Why zookeepers hand feed the penguins and what a “pill fish” is
* The role penguins play in the food chain
* How penguin camouflage works
* Adaptations that help penguins survive in the water
* Adaptations that help penguins keep warm in the cold
* Exhibit design features that help keep penguins warm in cold weather or cool in hot weather
* The roles of the male and female in rearing young
* Why coins in the pool are dangerous to penguins

Keywords: Adaptations, predator, prey, food chain, camouflage, countershading, insulate, molt, monogamous, incubate

Introduction

* There are about 18 species of penguins (depending on which expert you consult), all found in the southern hemisphere. They are not confined to Antarctica. Several species extend to the tropics, and one species is found on the Equator.
* These Magellanic penguins are named for the explorer Magellan. He and his crew discovered these penguins on the southern coast of South America in the early 1500s while sailing around the world.
* These penguins can live into their early 30s in zoos.

Feeding

* The keeper usually begins by showing the kids the fish and identifying what kind they are: **capelin and herring** (freshly thawed). Different penguins have different preferences and sometimes, different preferences at different times of the year.
* **Pill fish** – The keeper puts the following under the flap covering the gills in the first fish fed to each penguin each day. After that first fish, they can eat as many fish as they want.
* Vitamins because frozen foods lose some of their nutritional value from the freezing. Anti-avian malaria pill, given more frequently during mosquito season.
* **Salt – Note: Change in protocol.** There is a gland just below their eyes to remove salt from water in the ocean. Salt and fluid from this process often collect on the bill and are shaken off. This exhibit has freshwater. (Salt water would make the exhibit harder to maintain.) The old protocol called for salt tabs on the pill fish to keep the gland working and prevent its infection. **New protocol:** **The salt tab is no longer given.** Multiple studies have determined that salt tabs are unnecessary. The penguins get enough salt from the fish they eat.
* The keeper documents how many fish – and what kind – each penguin eats. Individuals are identified by colored plastic zip ties on their flippers: females on left and males on right. (By the way, even the veterinarian cannot tell males from females without the tags. Tests on blood or material from a hatched egg can be used to determine sex.) Different colors are used. Each individual is listed on a laminated chart. White left is WL. Green right is GR. Etc. Column C for capelin and H for herring. A wax crayon is used to tally. After each feeding, the information is transferred to a paper sheet and wiped off the laminated chart, ready for the next feeding.
* A keeper once witnessed a penguin that kept eating until the fish tails were sticking out of its mouth.
* Note that they do not have teeth. They do not chew. They swallow the fish whole, headfirst. Their digestive juices do the work.
* They are hand fed to ensure that each penguin gets its pill fish. Also, keepers can see if individuals are not eating, which may indicate illness. Wild animals try to hide being ill, because predators will pick out the weak. Social status may also be at stake - and access to the best nesting site.
* They are fed twice a day: about 9:45 in the morning and 3:45 in the afternoon. Feedings increased to 3 feedings per day when parents are feeding chicks.
* They may be seen shaking, even in summer. Mainly they “shiver” to help digest fish. Also, they may be shaking off excess water or shaking off salt and fluids from their “salt gland.”

**Predator/Prey & Food Chain**

* Penguins are carnivores and predators, eating fish, squid, and krill. They have fishing beaks and keen eyesight for locating prey in the water.
* Magellanic penguins may travel at speeds up to 15 mph when pursuing prey. They can stay underwater for an average of 3-4 minutes. Gentoo penguins are the fastest penguin, traveling at 22 mph. Emperors are the deepest and longest divers. Most dives last 3-6 minutes with record dives of 22 minutes!
* Penguins are prey for sharks, leopard seals, orcas, Dominican gulls, and giant petrels.
* **Countershading camouflage**. Dark back blends in when viewed from above, white front blends in when viewed from below. What is another animal in the zoo that spends a lot of time in the water and has countershading camouflage? River otter.

**Adaptations** for the Water

* Penguins have unique wing/flipper bones. They have solid bones, no "elbow joint," and their wing bones are not round, but flat, like popsicle sticks. (NOTE: Flighted birds have hollow bones. Why? Do you expect penguins to have hollow bones? Penguins do not need to be light to fly, and solid bones help make them stronger and less buoyant in the water. What is another bird that has solid bones? Ostrich. Emus here at the zoo.)
* Webbed feet
* “Torpedo-shaped” body giving less resistance/drag
* Countershading camouflage, as described above
* Oil for waterproofing feathers, as described below

Adaptations for Keeping Warm

* Blubber to **insulate**
* Down feathers to insulate
* Down feathers are the small fluffy feathers that lie close to the body for warmth, think of down coats.
* Penguins have feathers that overlap one another on the body, trapping air to conserve body heat and protecting it from the cold waters.
* Oil to waterproof outer feathers
* Penguins spend a lot of time and effort preening, that is, keeping their outer feathers oiled and in good shape – waterproofed and trapping a layer of warm air close to the body.
* There is an oil gland near the base of their tail feathers.
* They spread a thin layer of oil on all feathers, like a duck would.
* They reach around with their beak to get some oil from the gland and then they either use the beak to spread the oil onto the feathers or they touch the front edge of their flippers with their beak and then rub their flipper back and forth on the side of their body to spread the oil.
* Petting them would damage the layer of oil on their feathers and undo their work.
* Migrating north to warmer waters
* What is another animal in the zoo that has similar adaptations to keep warm in the water? River otter. (Undercoat of insulating fur and oil to spread on outer coat to waterproof)

The Exhibit

* With six nest boxes, this exhibit has an optimal capacity to hold 12 penguins.
* Pool is six feet deep.
* Most of the time, Michigan weather is fine for these penguins, but sometimes it is too hot in summer or too cold in winter. So -
* The nest boxes extend into a room behind the exhibit where there is air conditioning or heat (depending on the season).
* They have access to that back room all winter and most of the summer.
* The bubbler keeps the water moving to prevent algae build up on the surface, mosquitoes from laying eggs, and ice from forming (which can make the winter water temperature more comfortable than the air temperature). (NOTE: The water is NOT heated in winter.)
* Additional measures are taken in the summer to keep them cool -
* Water is chilled to 55 degrees.
* Fan in the rock is used to simulate ocean breezes.
* Misters overhead in the rocks
* Shade cloth over exhibit (which also helps slow down algae growth)
* A mistake was made by architects at the time of construction: They did not listen to the keepers when they were told that these penguins jump about one foot out of the water. That was enough for the penguins to get onto the rocks, escape, and waddle down the sidewalk. Rocks close to the edge of the pool had to be extended farther out over the water. That took care of the problem.
* Problems
* Water exhibits are high maintenance areas.
* Pool has to be stripped of algae every two weeks in the summer and every three-to-four weeks in the winter.
* Pool must be resealed every few years to combat leakage.
* Chiller and filtering system need constant care.
* Door leading into the exhibit was built for a penguin not a person, so keepers must crouch and crawl through a three-foot door to access the exhibit.

Reproduction

* Male and female look alike. In the bird world, this usually means they are **monogamous** and that both male and female incubate and care for young, as is the case with these penguins.
* In the wild adults return from six months at sea to the rookery where they were born for breeding season. They nest in burrows.
* Here at the zoo –
* Animals pair up, if not already in a pair.
* A pair selects a nest box, usually the same as the previous year.
* Female usually lays one or two eggs in late March. Eggs are a bit larger than chicken eggs.
* Both parents take turnsincubating for about 40 days. **Incubation** is the time spent warming the egg before it hatches.
* Eggs usually hatch in early to mid-May.
* Both parents take turns feeding. They swallow fish, digest it, and regurgitate the small pieces when the chick pecks at the adult’s beak.
* They grow quickly and are a good size by one month of age, when young start moving away from the nest and are removed to the back room.
  + - * To prevent drowning as young are not yet waterproof (In the wild the nests are much farther away from the water. The parents do not take them near the water until it is safe.)
      * To break parental bond so that keeper can train young for hand feeding
      * In late July-early August, young are returned to the pool, where they know what to do.
      * By now, they are almost as big as the adults, but their coloring is different, duller gray without the sharp black-white contrast. Each time they molt and get new feathers, they will look more and more like the adults**. At about 2 years of age they will molt to look like the adults.**

Behind the Scenes

* The holding area – This is where the penguins are when they are not out front or in their nest boxes.
* Door to the exhibit – The door leading into the exhibit was built for a penguin not a person, so keepers must crouch and crawl through a three-foot door to access the exhibit.
* Physical exam - The penguins each get a check-up about once a year. Our zoo veterinarian weighs them, draws blood, gives a West Nile vaccination, and listens to their lungs. The vet even waves a metal detector over them to see if there is any metal in them.
* Keepers can be in exhibit – The penguins have been trained to take food from keepers. A keeper only catches them or picks them up when necessary, such as for a medical exam or to put a new band on a flipper if it has fallen off. In that case, the keeper wears gloves, because penguins have strong beaks and bite.

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