

Did You Know ?

1. Adelie Penguins eat the most readily available, high-energy food they can find and easily swallow.
2. The diet of Adelie Penguins changes when whales are present because the whales eat the same thing but eat much more than do the penguins.
3. Adelie Penguin diet differs depending on the habitat where they are foraging. For example they eat different fish in shallow water compared to deep water.

Diet

Knowing what a bird eats helps us to understand how they live and where they have to go to find food. This is important because to protect a species' population we need to conserve and protect its food source.



This is not the usual way that Adelie Penguins eat fish, but this fish was too large to be easily swallowed while the penguin was swimming. In fact, this penguin had to drag the fish onto the ice flow, but it could not eat it before a skua swooped down and swiped it away.

We know what a penguin eats, at least during the summer, from watching what passes from a parent to its chick, or what the parent regurgitates onto the ground. At other times of the year, we have to capture penguins and cause them to regurgitate into a bucket. During most of the year the Adélie Penguin's diet is composed mainly of small fish. When fish are not easily available or require extra effort to find, they eat krill and squid.



On the left is an Antarctic silverfish. Adélie Penguins eat these during the summer. It is the most abundant small fish in shallow coastal waters around Antarctica, and also its shape makes it easy for Adelies to swallow, head first. On the right are lantern fish, which live in deep water. Adélie Penguins eat a lot of these during the winter. Photo courtesy Jose Torres.



Here a penguin is regurgitating into a bucket. Water was pumped down its throat until the penguin began to feel so full that it was becoming sick to its stomach. The penguin was turned over, pointed into the bucket, and out came its food. The penguin then felt much better. It was released and walked away back to its nest although, rightly so, it was growling at us as it went.



This is what came out of a penguin, which had just had its stomach pumped. The pink shrimp are called krill; the gray stuff is partly digested fish. Fish gets digested much, much faster than krill, because the krill has a protective shell but the fish does not. The fish digest right away. We freeze this sample for later analysis. Back in the laboratory, once this sample is thawed, we have to pick through the goop to find fish otoliths (ear bones) to identify the fish. We measure the otoliths and also the krill.



Here are some fish otoliths, or ear bones, from the two main fish prey of Adélie Penguins. The small, rounded ones are from silverfish and the larger, flat ones are from lantern fish. Every fish species has a distinctively-shaped otolith. Otoliths also grow as the fish grows. Therefore we can tell the species and the length of the fish that the penguin has eaten. These ear bones are very small. These have been magnified. Photo courtesy Nina Karnovsky.



One way to determine what kind of fish penguins eat is to put a tray where they will build their nests. Over the season, they will poop into the tray. At the end, we wash what is in the tray to find the otoliths. Kind of like panning for gold. Otoliths are a part of fish that take the longest to digest.



This parent had caught so much food that it spilled some on the ground while feeding it's very small chick (the chick's mouth was too small!!!). It's pink, so it's krill. Sometimes the parents regurgitate partly digested fish onto the ground.

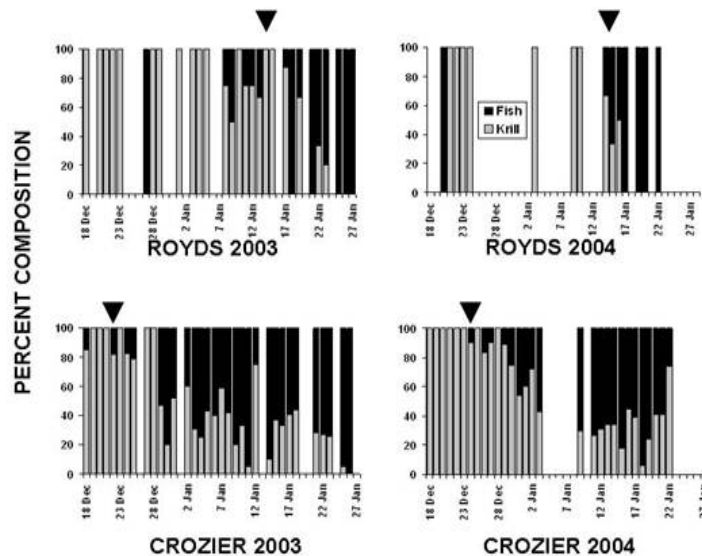


This parent is feeding its chick some pink stuff, which we know, by its color, is krill. The dark spots in this pink mass passing from the parent into the chick's mouth are the krill's eyes (which are black).

To understand where the penguins' prey is located requires a very expensive but exciting study. We need a ship that can move in the pack ice, and one that can pull nets through the water or sense the occurrence of fish or crustaceans by sound waves. The trawling (catching fish with a net) needs to occur where we know that the penguins are feeding (see Satellite tag section). The large white structure at the back end of this vessel is a frame for pulling a large net through the water.

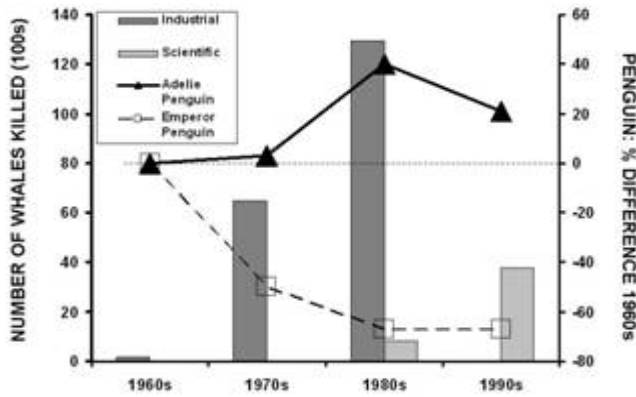


The large white structure at the back end of the vessel on the left is a frame for pulling a large net through the water. On the right a scientific net is being pulled from an ice-covered sea, using the frame at the stern of the ship. This net is put into the ocean and then, using an electronic signal, is opened only when it reaches the depth at which the scientists want to catch fish. Photo courtesy Jose Torres.



These are minke whales, the smallest baleen whale (only about 25 feet long!). Like the Adélie Penguin they occur in pack-ice covered waters, and they eat the same food as do Adélies, both fish and krill. However, one whale in a day eats about 2000 times more food than one penguin.

Here's an example of how whales can change what the penguins are eating. In both years at the Royds and Crozier penguin colonies, the penguins' diet switched from mostly krill to mostly fish when lots of minke whales appeared in the penguins' foraging area. The arrows show when the whales appeared. Such a diet switch is ok, as the penguins and whales have been living together for 3 million years.



Here is what happened in the Ross Sea sector when people from Japan killed many thousands of minke whales during the 1970s and 1980s (see bars, and labeling on the left). The whales compete with Adélie Penguins for food. As the whale population decreased the Adélie Penguin population increased (lines, and labeling on the right) because there was more food. When the whaling stopped, the number of Adélie Penguins declined as the whales began to recover and once again were competing for

the food. In the case of Emperor Penguins, whose numbers quickly declined, we're not so sure, but maybe the removal of lots of minke whales led to killer whales eating Emperor Penguins, because no longer were there enough minke whales to eat. It's all very complex, but knowing what penguins eat helps us to understand such things.

As a population, Adélie Penguins depend on the ocean to provide large amounts of food. So far in the history of Adélie Penguins the ocean has been able to provide enough food to feed the penguins, the whales and the rest of the ocean-going creatures. Now that man has entered the system, this balance has been interrupted and Adélie penguins in some areas may have trouble finding enough food to raise their chicks. In other areas, if whales are killed, they will have an easier task.