

Tracking Penguins



Did You Know?

1. Adélie Penguins can dive 150 m deep.
2. Adélie Penguins can hold their breath 6 min.
3. Adélie Penguins can swim at 8km/hr, for many hours without stopping.
4. On a foraging trip, Adélie Penguins can travel up to 250 km from the colony and be gone for 6 days.
5. The usual foraging trip of an Adélie Penguin is less than 2 days, or just a few hours, long.
6. During winter, Adélie Penguins remain in the pack ice, but in areas where there is still daylight; they do not stay with their mates.
7. Adélie Penguins are changing their migration as a result of climate change.

Electronic tags are commonly used to track animals as they migrate, or simply move around looking for food. From elephants to fish, in the last 15 years or so, these handy instruments have helped us understand the range of an animal's habitat. Large animals, like bears, can carry a tag that is similar to the computers in newer cars (airplanes or cruise missiles) that can tell your exact location. These tags use information from Global Positioning Satellites (GPS) to record where you are at any given moment.

Instruments, which continually 'talk' back and forth with a satellite, require a very large battery and are way too large for Adélie Penguins to carry. However, a much smaller one can simply store data to be retrieved later. The battery needed is much, much smaller and, therefore, the instrument can be worn safely by a penguin. The memory chip in the instrument also records the time and date. When this information is downloaded into our computer, a map can be drawn to show where the penguin has been or a chart can be created showing how deep it has been diving. Two different kinds of tracking tags are used on Adélie Penguins. We track them both horizontally, over the surface of Earth to see where they go, and vertically, to see how deep they dive in the ocean.

1. **Splash Tags.** These are medium-sized tags (Fig 1) that we attach to the back of Adélie Penguins. The tag is attached with tape to the bird's feathers so it neither hurts nor interferes with the bird's movements. We select birds from nests with young chicks to feed, because we know that bird is committed to return to the same place and we can retrieve the tag. These tags are on the bird only a few days.



Figure 1. An Adélie Penguin with a splash tag



Figure 2. An Adélie Penguin outfitted with a splash tag and its chick

Here is a satellite tag, taped to the back of a penguin (Fig 1 and 2). The wire is an antenna which sends information to a satellite, which determines the penguins' location every time it passes over the Ross Sea, which is several times each day. The satellite then stores the information and later sends it to us as an email message. This system is called ARGOS and is operated by French and US company.

Once attached, the tag starts to send messages to the satellite recording its positions, which determines the movement of the bird. It only sends a signal when the penguin, and the tag, is at the surface of the ocean. The satellite tag that we use, manufactured by Wildlife Computers, also records the diving behavior of the penguins. Every second, the tag records its depth, using a pressure sensor (water pressure increases with depth). This is called a time-depth-recorder. It does not record depth information when the tag is dry. Two minutes after the penguin jumps from the sea onto an ice floe, the tag dries, and no longer records any information. This saves the battery, which are only good for about a month of continual operation. Using these tags we know where, and at what depth the penguin is finding its prey.

Below is a map (Fig 3) we created using the data from these tags showing where penguins from two different breeding colonies were for 6 different days. It shows where the birds went looking for food. Each color is for a different day and for a different bird. Three penguins from Cape Crozier went about 150 km away in order to find food.

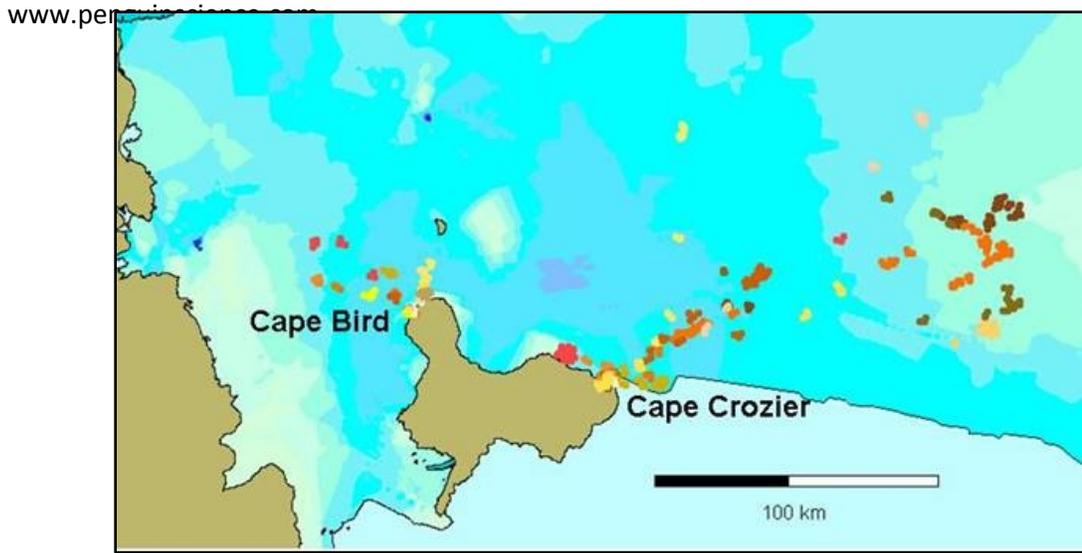


Figure 4. Data from time-depth-recorder

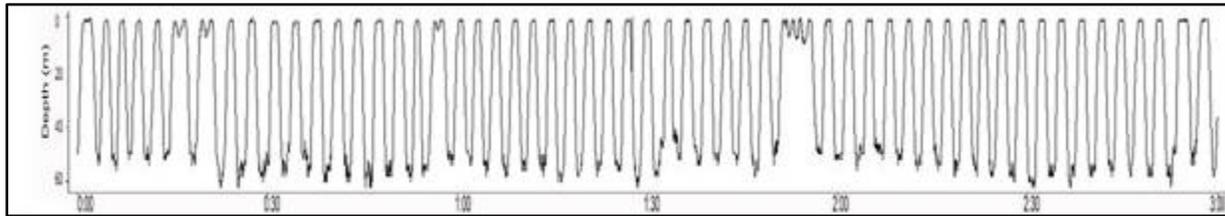


Figure 3. Map of penguin movements

This is a trace (Fig 4) from a time-depth-recorder showing the dives, maximum to 60 m, that a penguin made over a period of three hours. Pretty amazing creatures, aren't they?

2. GLS tags. These tags are very small, with only a very tiny battery and do not send a signal to a satellite. They are so small that they do not interfere at all with the penguin. They can comfortably wear this tag, attached to a plastic leg band, for many months. We put them on the penguins at the end of the season to find out where they go during the winter.



Figure 5. Adélie Penguin with a GLS tag.

Here, (Fig. 5) on the left leg of this penguin, is the tag it will wear for the entire winter. It will tell us where the penguin was every day once we retrieve the tag a year later.

These tags store information about where it is located twice a day for the entire time that the penguin is away from the colony, for 9 months!! Every few minutes it senses the amount of light where the penguin is. We have to find and then capture the penguin the next year, remove the tag, and download the information into a computer. From light level data, position can be determined in the same way used by sailing ships for centuries before the age of computers and satellites. If one knows the date and the length of the day, then one can know the latitude. Day length changes with season at a known rate for each latitude. Knowing the clock time for the midpoint of daylight we can determine longitude.

This information is important in understanding the extent and range of Adélie Penguins habitat or how much space they need to live and where they go to find food. As global warming changes the amount of sea ice in Antarctica, the migration patterns of Adélie Penguins are changing. To learn more about this go to our "Climate & Penguins" page.

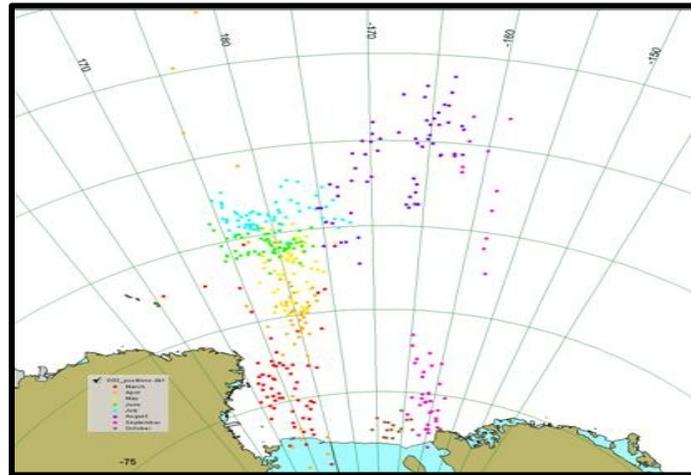


Figure 6. Map of one Adélie Penguin's winter journey

The positions determined from the light data recorded by a GLS tag, after an entire winter's journey, look like this. This penguin traveled in a circular route, reaching 2500 km away from Cape Crozier during its winter. Its journey spanned 15 degrees of latitude and 15 degrees of longitude. Each color of dot represents a different month, red being March and brown being October.