

READING PASSAGE 1

The changing fortunes of Antarctic penguins

Robert Gates explains how climate change has started to affect the natural habitat of the Adélie penguin

The effects of climate change are complex, with scientists constantly trying to understand how ecosystems are affected. Nowhere is this more so than in the Antarctic – a place where no humans live permanently, but which nevertheless is undergoing change due to human interference.

Over the last five years, scientists have been examining the populations of different types of penguin that inhabit the Antarctic continent. In particular, they have been looking at penguins living on Ross Island – a huge island connected to the Antarctic mainland by a permanent sheet of ice, and formed from four large volcanoes, one of which is still active. On the western side of Ross Island is Cape Royds, home to a colony of Adélie penguins. In 2000, there were estimated to be about 4,000 Adélie nests, but a survey carried out in the last few months found that the number had fallen to 2,100.

Scientists say there are two main reasons for the population decline in this part of Ross Island. Firstly, Adélies cannot lay their eggs directly onto ice or snow. However, the average winter air temperature of the area has risen in the past half century. This causes more snow to fall, which buries the rocks on which Adélie penguins would typically construct their nests. Secondly, after a female Adélie lays her egg, she walks to the sea in search of food, while the male remains behind to hatch the egg. As soon as the female reaches an area of open sea, she will dive into the water and start feeding. When the female returns with fish for the penguin chick to eat, the hungry male also hurries off to reach the sea. In previous centuries, the walk would have been relatively short, between 15 and 20 kilometres. But in 2000, a large iceberg blocked the mouth of McMurdo Sound, where many Adélie penguins went to find food. At the same time, the ice in the bay at Cape Royds failed to break up as it had done in the past. This meant the Adélies then had to walk much further over the ice – often up to 75 kilometres – before they could reach the ocean. The result was often that the parent waiting on the nest became too hungry to wait any longer, and the eggs were abandoned.

Elsewhere on Ross Island, in contrast to McMurdo Sound, the situation is more encouraging. At Cape Crozier, Adélie penguins are thriving. The colony is now thought to have an estimated 230,000 breeding pairs, an upturn of 20% over the last three decades. Penguins nesting on this part of Ross Island may actually be benefitting from human activity, scientists suspect. In 1996, a fishing company opened near the area, and started fishing for vast quantities of Chilean sea bass – otherwise known as the Patagonian toothfish. As both the Adélies and the sea bass eat

silverfish, competition for this food source has now been dramatically reduced, and this may partly explain why penguin numbers have risen at Cape Crozier.

However, it isn't fish, but krill – tiny, shrimp-like creatures that live just below the pieces of ice that float on the sea – that form the largest part of an Adélie's diet. Unfortunately, krill numbers are also declining rapidly. Dr So Kawaguchi, a biologist working for the Australian government's Antarctic Division, suspects he knows the main reason behind this. He accepts that commercial fishing is partly responsible for huge amounts of krill being removed from the sea, but he points to rising levels of carbon dioxide as the chief cause. It is this which is making the waters of the Antarctic more acidic, in turn preventing the krill eggs from hatching. Diminishing levels of krill not only means less food for penguins. Digesting up to 40 million of these tiny animals per day, most whales depend on them for survival, too. Also, thanks to their more diverse diet, Gentoo penguins, a species which eats squid and small crab-like creatures as well as krill, have hardly been affected by this situation. In fact, their numbers appear to be on the rise. Other species, such as the Chinstrap and Emperor penguins, however, have the same narrow diet as Adélies.

Scientists are now concerned that Adélie penguins will be forced to move further south in search of more suitable breeding and feeding locations. A team made up of researchers from Stanford University, USA, and the British Antarctic Survey have recently used geolocation sensors attached to a number of penguins to track them in order to better understand their patterns of migration. They know that Adélie penguins leave their nesting areas in February to begin the slow march north to avoid the darkest time of the year. Around 480 kilometres from completely open water, they stop on the floating sea ice to spend time feeding and increase their body weight. They then turn around, and march back to the nesting areas – a journey of about 13,000 kilometres in total. Scientists also know that Adélies have never lived further south of Cape Royd, and suspect that this is because they need light in order to navigate and search for food. It also allows them to spot such predators as the skua – a large bird that can easily kill young penguins. So, will the Adélies be able to adapt, move further south, and live in a darker environment? Scientists doubt that this kind of evolutionary change can happen in a short time.

Questions 1–5: Choose NO MORE THAN TWO WORDS AND/OR A NUMBER from the passage for each answer.

1. What geographical features have created the land of Ross Island?

_____.

2. How many Adélie penguin nests were counted at Cape Royds?

_____.

3. On what type of surface do Adélie penguins usually choose to build their nests?
_____.
4. What has, in the past, prevented penguins from reaching the open sea in the McMurdo Sound?
_____.
5. Approximately, what distance did Adélie penguins then have to travel to get to the sea?
_____.

Questions 6–13: Choose NO MORE THAN TWO WORDS from the passage for each answer.

6. The Adélie penguin population has increased in the part of Ross Island known as _____.
7. Both Adélie penguins and the Chilean sea bass feed on _____.
8. Dr Kawaguchi believes that an increase in _____ is the main reason for declining numbers of krill.
9. Not only penguins, but also _____ will be affected by smaller krill populations.
10. The _____ species of penguins have more variety in their diet than other penguins.
11. British and American scientists have used special equipment to find out more about penguin _____.
12. The British-American team know that it is in _____ that the penguins begin to walk in a northerly direction.
13. It is now thought by the British-American team that penguins require _____ to help them avoid threats and to find food.

READING PASSAGE 2

The history of chocolate

Why people first started eating chocolate and how it spread across the world

No one is certain which **Mesoamerican*** culture first farmed cacao trees. However, archaeologists think the Olmec people of southern Mexico were one of the earliest to create a drink using cacao beans. While the Olmecs left behind no written records, researchers have dug up pots from this ancient civilisation that date back to 1500 BC. After the pots were taken to a laboratory and analysed, it was discovered that they contained theobromine, a chemical found in cacao beans. A small team of archaeologists has also been looking at a site in the Mexican state of Chiapas. Here, they claim, is proof of another society making cacao drinks even earlier. Not everyone accepts their evidence, so it seems further investigation is necessary.

Each fruit of the cacao tree is full of white flesh, and inside this are about 60 brown seeds, or *beans*. Some researchers theorise that early Mesoamerican cultures boiled the flesh for stews, before discovering that the seeds could also be used. This seems highly likely, as the flesh is sweet, but the seeds are incredibly bitter. It's remarkable, in fact, that anyone would have thought to dry out the seeds and then roast them in the first place. Perhaps what happened is that someone was eating the fruit and spitting seeds into a fire. They might have then noticed that the burnt seeds were producing a rich smell, and decided to experiment, but we can never know for sure. More certain is the fact that the Olmecs turned the roasted beans into a thick paste to make their drink, and into this was added chilli and vanilla.

Unlike the Olmecs, the Mayan people left behind paintings showing their use of cacao beans. From these pictures, we know that cacao beans and chocolate drinks had a special status in Mayan society, and were often used in marriage ceremonies and other rituals. Later, when the Aztecs ruled much of Mesoamerica, they wanted cacao beans for themselves, and would trade with the Mayans to get them. Although other crops were important at the time, they were nowhere near as valuable as cacao beans. This was partly because cacao trees could not survive in the dry highlands of central Mexico, the centre of Aztec civilisation. Unusually for plants, cacao trees depended on tiny swarms of flies for pollination, and these insects lived only in a humid climate.

In Mayan society, we know that cacao beans were very valuable, perhaps so valuable that it may have been worth creating 'fake beans'. Archaeologists have discovered beans made of clay in many Mesoamerican sites, and suspect that they were used by Mayans when they had to pay a form of tax to the Aztecs. But it wasn't just their economic value that made them important in society. Like today, the Mayan people liked to prepare traditional dishes to share with friends and family. Extended families would have come together to collect cacao beans and slowly turn them into a rich drink, using the occasion to strengthen their social ties.

In the 16th century, the Spanish arrived in Mexico and noticed the way in which cacao was central to the local diet. We still have records of the letters they sent home to Spain. Expedition leader Hernán Cortés wrote to King Carlos I of Spain about a strange drink called *xocoatl*, which he mistakenly believed the Aztecs, including their ruler, Montezuma, used for medicinal purposes. One of Cortés's officers even claimed to have seen Montezuma drinking more than 50 cups of a chocolate drink per day, and thought he was doing this to improve his health. That number is no doubt inaccurate, but even if it were true, the officer missed the point. The Aztecs simply saw cacao as part of their diet and did not attribute any special qualities to it. Nevertheless, the Spanish were soon exporting cacao beans back to Spain and creating chocolate drinks for themselves, adding sugar and honey to sweeten them. The demand for cacao soon spread across the rest of Europe.

Until 1828, it was only the wealthy that could afford these new chocolate drinks. It was in this year that Dutch chemist Coenraad Johannes van Houten invented the cocoa press, a machine that could squeeze the natural oils from roasted cacao beans. The beans were then crushed into powder, combined with alkaline salts, and sold as cheap blocks of cooking chocolate. Later, in 1847 the first edible chocolate was created by Fry and Sons in England. Unfortunately, its bitter taste was unpopular with consumers. In 1874, Swiss chocolate maker Daniel Peter finally realised that milk was perfect for improving the taste and texture of chocolate, and it has been a key ingredient ever since.

* **Mesoamerica:** A region stretching from Mexico to Costa Rica in which several advanced civilisations existed before the 1600s.

1. What are we told about research into the origins of cacao-based drinks?

- a. Researchers have used written documents as evidence.
- b. Researchers have failed to agree about the findings.
- c. It was carried out in laboratories outside Mexico.
- d. No more research is needed.

2. When the writer discusses the early use of cacao beans, he is surprised that

- a. they were first eaten raw.
- b. people preferred the flesh to the seeds.
- c. people regarded them as something to throw away.
- d. anyone had the idea that they could be eaten.

3. What problem did the Aztecs face in getting cacao beans?

- a. The beans were destroyed by insect pests.

- b. The Mayans asked increasingly high prices for the beans.
- c. The local conditions were unsuitable for growing the cacao tree.
- d. The Mayans were unwilling to trade with them for religious reasons.

4. Which of the following best summarises the writer's argument in the fourth paragraph?

- a. The Aztecs mainly appreciated cacao beans for their economic benefit.
- b. The sharing of food is not as important now as it used to be in earlier societies.
- c. Cacao beans had a value which went beyond how much they were worth.
- d. The use of artificial cacao beans meant that real ones lost their value.

5. The writer refers to the drinking of chocolate by the Aztec ruler Montezuma to show how

- a. the Spanish misunderstood why Aztecs drank chocolate.
- b. the history of chocolate has not always been a peaceful one.
- c. the Aztecs pretended their chocolate drink had powerful qualities.
- d. people tend to make untrue claims about food and drink.

6. What is the writer doing in the final paragraph?

- a. Highlighting why modern chocolate is less healthy than its original form.
- b. Questioning whether modern chocolate is superior to older types.
- c. Outlining the steps that led to the kind of chocolate we have today.
- d. Explaining why rich people were prepared to pay more for chocolate.

7. According to the writer, what led to chocolate becoming a successful mass product?

- a. The price of manufacturing chocolate became cheaper.
- b. New machines were invented which made it easier to create chocolate.
- c. A lot of the fatty oils were taken out of cacao beans.
- d. The recipe was altered to reflect what consumers wanted.

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