

# OCEAN HUNTERS

Unique adaptations make penguins skilful underwater predators. They fly through the ocean depths hunting fish, krill and squid

**W**atching their comical waddle on land, you might not think penguins would be agile hunters.

But under water, fish beware! These birds are transformed into fast and formidable predators, perfectly adapted for catching their marine prey.

From the freezing seas of Antarctica to the equatorial heat of the Galapagos, penguins feed mainly on fish, krill and squid, though their exact menu varies with their location and the time of year. Many species are opportunistic feeders, adapting their diet to whatever is seasonally abundant, while others are more specialist.

## Crazy about krill

In parts of the Southern Ocean around Antarctica, the penguins' diet is dominated by Antarctic krill. The sea ice provides a nursery for these shrimp-like crustaceans, which graze on microscopic green algae growing on the underside of the ice. Krill underpin the entire marine food web, feeding the vast majority of Antarctic animals either directly or indirectly – from whales to seals and penguins.

Chinstraps – one of three brush-tailed penguins with Adélies and gentoos – are

huge consumers of krill near their breeding grounds. Gentoos are more opportunistic, their diet varying with season and location, while Adélies eat both krill and small fish.

All three species hunt in the same fast, efficient way. Antarctic krill are usually an easy meal – a penguin can simply swim through the water and swallow them whole, or scrape them off the ice with its sharp, pointed bill. But when hunting schools of fleet fish, or dense swarms of krill, penguins adopt a different, more dramatic strategy. They circle closely, forcing their prey into a ball – sometimes pushing them to the surface – then swoop in from below, snapping their powerful beaks.

Using their strong wings as propellers gives them great manoeuvrability, enabling them to twist and turn in pursuit of prey. Footage of hunting Adélies has revealed ▶

**A penguin's tongue lacks taste buds, but it does have large, keratinised bristles that help grip slippery krill or fish**

**Penguins tend to form colonies near the most productive waters. Upwelling brings cold, nutrient-rich waters to the surface where plankton bloom, supporting the fish, krill and squid that penguins eat**

# CRUCIAL KRILL

Almost all life in the Southern Ocean depends on krill. A big drop in numbers would be catastrophic for birds, fish, whales, seals and invertebrates.

■ Krill need sea ice to breed and feed under, but warming oceans mean the ice that protects their nurseries is melting. This affects krill numbers and distribution – populations have declined by about 80% since the 1970s.

■ Krill is caught on an industrial scale to meet our demand for omega-3 oil (and feed for captive fish), placing further pressure on populations.

■ By eating carbon dioxide-absorbing phytoplankton and excreting carbon-rich pellets that sink to the sea floor, krill remove millions of tonnes of carbon from the Earth's atmosphere.

■ We're working with our partners to better understand the role of krill in the carbon cycle, how they're being affected by climate change – and how we can protect them.



their remarkable speed, catching individual krill at a rate of up to two per second in swarms, and their astonishing accuracy. Not once did a penguin miss its target!

## Twist and turn

While smaller penguins such as Adélies and gentoos tend to frequent shallower waters where krill swarm below the surface, the larger king and emperor penguins have to dive deep. Their preferred prey – small bioluminescent lanternfish and Antarctic silverfish respectively – spend most of the day hundreds of metres down, and so the penguins have evolved to follow.

They regularly dive to 100m, but are capable of reaching even greater depths

beyond the reach of sunlight. An emperor once plunged to a remarkable 565m. On average, dives last three to six minutes but the longest on record was 22 minutes.

Both species also eat small squid when they're readily available and have an ingenious adaptation to help them hold on to their slippery meal. Like all birds, penguins don't have teeth and must swallow their prey whole, but their tongues and mouths are lined with large, spiky bristles (papillae) that curve backwards, so their prey can only move in one direction: down the penguin's throat.

Emperors – the largest of the penguins – typically eat about 2-3kg of seafood a day during the summer, but on good hunting days they can eat twice as much. It's vital

## DID YOU KNOW?

Gulping down seafood means penguins ingest lots of salty seawater and need to flush it out. Special glands above their eyes filter salt out of the bloodstream. This drips from the nostrils and is 'sneezed' off.

they build up fat reserves ahead of the breeding season, particularly if they're male.

Male emperors famously fast for up to four months, from when they arrive at the colony to when their egg hatches and the female returns from feeding at sea. During this time, they lose almost half their body weight as they rely solely on the fat reserves built up over the summer. Or so it was thought.

In 2018, scientists discovered that males at Cape Washington, Antarctica – the second-largest emperor colony in the world – were visiting a pool of open water

surrounded by sea ice to feed. By breaking their fast in the dead of winter, when days are short, the penguins have a better chance of successfully fledging a chick. The drawback: they have to dive for fish in the dark. Prey becomes harder to see at night, as do predators such as orcas and leopard seals, but overcoming their natural aversion to night diving might be vital for the colony's success.

Like all animals, penguins are constantly adapting to natural challenges, but it may be impossible for them to evolve quickly enough to overcome the changes caused by humans. ■



Adélies are remarkable divers, capable of descending to 180m