

EDUCATION

Ri Aus

WHO'S EATING WHO



An Antarctica Murder Mystery



Australian Government

Department of Agriculture, Water and the Environment

Australian Antarctic Division



AUSTRALIAN
ANTARCTIC
PROGRAM

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Some of our krill are missing!

In the icy waters of the Southern Ocean, there lurks a dangerous new threat. After living together and eating happily for eons there is now rising panic amongst residents.

The number of krill populations has dropped drastically and we need your help to find out who is responsible.

Read the information about the local inhabitants of the Antarctic to see if you can solve the case.

Antarctic Krill are disappearing. We need to find out why to protect the entire ecosystem



*All of the Antarctic animals
depend on krill for their
survival.*



Who is eating more than their fair share?

Huge numbers of the tiny krill, better known as low life, are missing, feared dead. Is someone eating more than their fair share of the tiny krill or is there something more sinister at work?

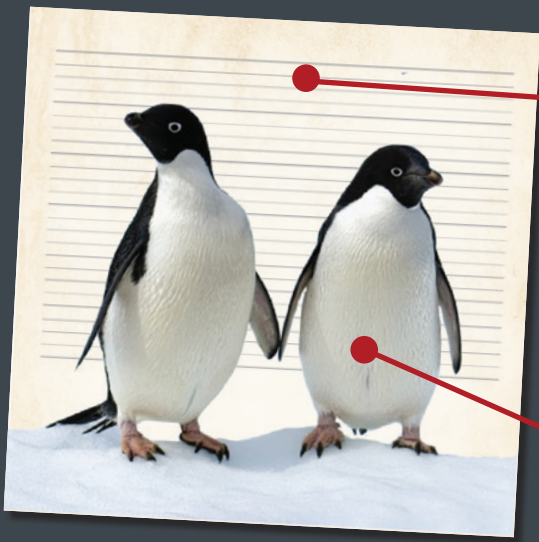
Krill are a snack enjoyed by just about everyone. All of the Antarctic animals depend on this low life for their survival. But recently, something has upset the balance. The atmosphere is tense. Starvation is now a very real threat. The six rival Southern Ocean gangs are watching each other closely.

The feathered fiends are blaming the slippery characters. The slippery characters in turn are pointing their flippers at the mister bigs. The only ones with an alibi are the phytoplankton: these low life are vegetarians! But no one is above suspicion! Even the fish and squid are

inclined to think that something fishy is going on!

It seems everyone has a motive. The black-browed albatross, a member of the notorious flying squad, is known to swoop down on the krill, gorging on hundreds of the tiny fishy 'snacks'. And then there's the blue, humpback and the southern right whales, the Mister Bigs of the sea world, who cruise through the schools of krill, mouths agape, swallowing hundreds of thousands of them in a single gulp. Even the krill themselves, during moments of desperation, have been known to eat their own kind.

You are the special agent called in to investigate this dastardly crime, and it's a tough assignment. Your mission, should you choose to accept it, will take you to the end of the Earth.



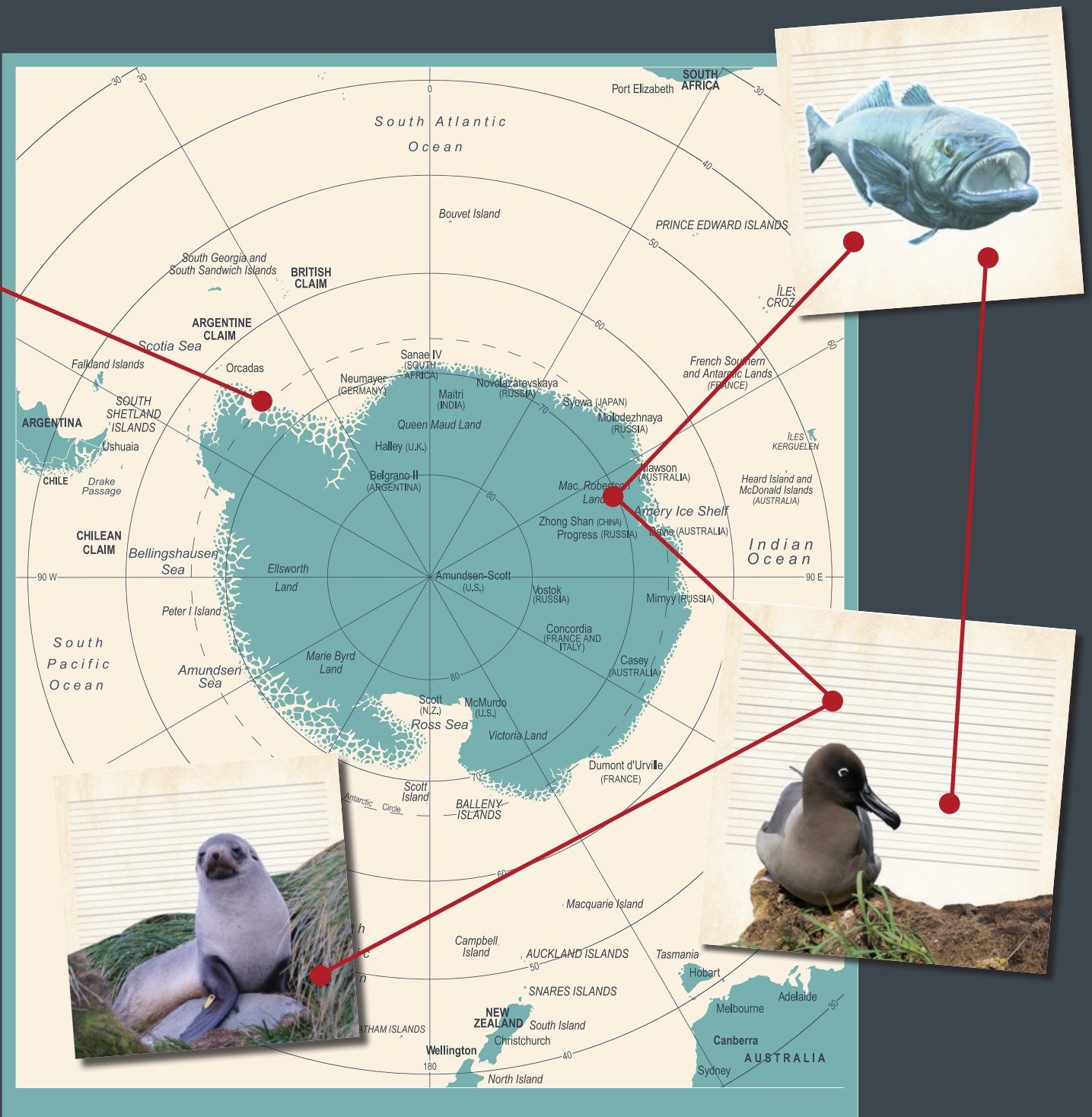
This is not a simple case!



The crime scene stretches across the vast Southern Ocean with its frozen expanses of pack ice, screaming winds and towering waves. Clues are there but you have to search carefully, rejecting false leads and closing in on the culprit or culprits! This is not a simple case. There are many possibilities.



But the krill killers are clever and have covered their tracks well. They can strike at any time. One important clue is that several witnesses have reported unusual noises before each heist. The squid and jellyfish, not known for their investigative powers, dismissed the noise as a badly out-of-tune whale song. However, some Patagonian toothfish experienced the noise at close quarters and were lucky to live to tell the tale! These survivors have important information about the source of this sinister sound!



Carefully review all the information in this dossier, taking care to trawl for clues. Every page has an important lead. But remember, this is a complex issue. There are many factors (not to mention suspects!) at work. Your conclusions may vary from your classmates so make sure you have the evidence to support your claims.

Hint: As a starting point for your investigation, you might like to map out exactly 'who's eating who'. Use the information about food webs on pages 8 – 9 as a guide.

Good luck solving one of the greatest mysteries of our time!

Weaving a Southern Ocean Food Web

In the natural world the smallest animals are usually eaten by larger animals, which in turn are eaten by even larger animals. You can map 'who's eating who' in a diagram called a food web. Food webs begin with plants (primary producers). Plants get their energy from The Sun and provide the food for the first animals in the web.

Some animals only eat plants. These animals are called herbivores. Others eat plants and animals and are called omnivores. Animals that eat just other animals are called carnivores.

Food webs are finely balanced ecosystems. The loss of even one species can break the delicate chains of the web and have a serious impact on the environment.



Food Web



Low Life

In the icy waters around Antarctica, phytoplankton are the first vital link in the food chain. Many other Antarctic animals depend on this rich food source to survive. Krill, which may be the most important of the Antarctic low life, feed on the tiny phytoplankton.

Phytoplankton are tiny plants that live in all the world's oceans and lakes. They are so small they can only be seen with a microscope. Scientists have counted as many as a million tiny phytoplankton in just one litre of seawater. During spring and summer, they multiply rapidly, turning parts of the ocean into a thick-looking pea soup! They make their own food by using sunlight to convert water and carbon dioxide into sugar in a process called photosynthesis. They may be low life but all other life in the ocean depends on them.

Diatoms are the most common phytoplankton in the Southern Ocean. They have hard shells and are very beautiful when seen at high magnification under a special microscope.

Krill (*Euphausia superba*): The most

important of the Antarctic low life are the small shrimp-like creatures called krill. They grow up to 6 centimetres long and swim together in huge swarms, hundreds of metres across and 15 to 20 metres deep.

The total number of krill in the Southern Ocean is estimated to be 150 million million! Krill feed mainly on the tiny phytoplankton that they trap using fine hairs on their front legs. But they also occasionally eat other krill. In turn, the krill are eaten by just about every other animal in the Antarctic food chain including the giant baleen whales, seals, fish, penguins and many other seabirds. Although they are low down in the 'snacking-order' they are the centrepiece of the entire Antarctic food chain.

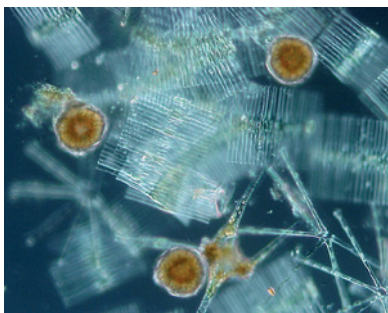
Infact, if you could see inside an Adélie penguin's stomach after a feeding trip at sea, you would see hundreds of mushy krill.

Netting krill

Fishing for krill is now a major industry and trawlers can net between 8 and 12 tonnes in an hour - that's up to 12 million of the tiny creatures. Overfishing of krill →

*Euphausia
superba*

KRILL



Krill feed on tiny phytoplankton



*Krill trawler off Elephant Island,
Antarctica.*

would be a real threat to the balance of life in Antarctica. Australian scientists use echo sounders to calculate the distribution and abundance of krill in the Southern Ocean. This information is used to manage the krill fishery in a way that allows for the needs of all the animals, big and small.

Silent killer?

The ozone layer is a very important part of the Earth's atmosphere. It is found about 15 – 30 kilometres above the surface of the Earth and acts as a powerful shield against the Sun's harmful UV radiation. In 1985, scientists discovered a hole in the ozone layer above Antarctica. Since then it has grown at an alarming rate and is now four times the size of Australia and still growing. Certain chemicals called CFCs that were used in spray cans were found to be causing most of the damage. All living things are easily injured by UV radiation. It can cause sunburn, skin cancers and other health problems in humans. Scientists working in Antarctica have shown that increased UV radiation kills phytoplankton and reduces the life expectancy of krill. Any further increase in UV in the Antarctic will have unknown effects.

Something's Fishy

There are about 120 fish species known to live in Antarctic waters. They show some remarkable adaptations to their environment, including proteins in their blood that act as antifreeze to help them survive in the icy waters. The 'antifreeze' lowers the freezing point of their body fluids to about minus 2°C and stops them from freezing, even when water temperatures are below zero.

Antarctic ice fish have colourless blood and have a ghostly white appearance.

Starfish are some of the most colourful low life in Antarctic waters.

Jellyfish can vary in size from 0.5 to 50 centimetres and are very common in Antarctic waters.

Squid are fast, cunning, have a very healthy appetite and excellent eyesight. They swim using a form of jet propulsion. There are thought to be about 20 different types of squid in the Southern Ocean. They feed on small fish and small crustaceans,

especially krill. And some species are cannibals! Wandering albatrosses, emperor penguins, some seals and most whales love to snack on squid. They generally have 10 tentacles, each lined with strong suckers. At the centre of the tentacles are very powerful jaws called a beak. Squid are plentiful throughout the Southern Ocean and occupy an important position in the food web. Giant squid live several hundred metres deep and are reported to be up to 18 metres long. They are a favourite meal of sperm whales.

The Patagonian toothfish (*Dissostichus eleginoides*) is one of the most remarkable fish species in the world. It lives anywhere between 300 to 2500 metres below the surface, under incredible pressure and in almost total darkness. Patagonian toothfish grow slowly and reach spawning age after 10 to 12 years, at which stage they are about 70 centimetres long. They can live for 50 years, grow to over 2 metres and weigh more than 120 kilograms. →



*Dissostichus
eleginoides*

PATAGONIAN
TOOTHFISH

Scientists can calculate the age of a toothfish by counting the growth rings on the fish's ear bones. They mostly eat smaller fish, squid, krill and plankton.

Patagonian toothfish heist!

In April 2001, the South Tomi, a fishing vessel suspected of illegal fishing in Australian Antarctic waters, was apprehended after a 14-day hot pursuit across the Southern Ocean. The vessel, which was brought back to Australia under the control of the Australian Fisheries Management Authority, was carrying a haul of Patagonian toothfish worth about \$1.5 million. The Patagonian toothfish story is one of looming environmental tragedy. Scientists believe that if illegal fishing continues at the current rate, the whole fishery may collapse within five years.

Low Life Menu

Phytoplankton focaccia

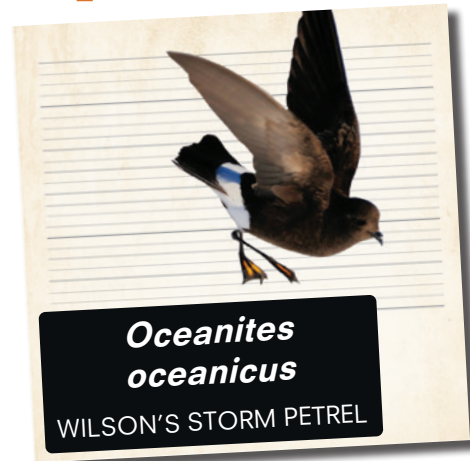


Krill crackers



Squid soup

Flying Squad



Members of the flying squad vary in size from the tiny storm petrels with a wingspan of about 40 centimetres, to the giant wandering albatross with a wingspan of over 3 metres.

Seabirds have their own special tactics when it comes to catching a meal. Cormorants can dive below the surface and use their strong webbed feet to paddle after their prey. Storm petrels skip, walk and patter over the surface in search of krill. Albatross simply float on the surface and seize unsuspecting squid and fish in their hooked bills.

Wilson's storm petrel (*Oceanites oceanicus*) are tiny birds who skip over the surface of the ocean fishing for krill and other crustaceans, their main source of food.

The black-browed albatross (*Diomedea melanophris*) is

recognised by a dark eyebrow smudge and is the most abundant of all albatrosses. It mostly feeds on fish and krill from the surface but can also catch its prey by diving into the water from the air.

Cape petrels (*Daption capense*) have beautiful black and white bodies with a striking checked pattern on their wings. They fly with a mixture of rapid wing beats and long glides and dive into the water when fishing for squid, plankton, krill and fish. They nest on the Antarctic continent and subantarctic islands. In the winter they migrate as far north as the Equator.

Except for cool-black eyes and a short black bill, Snow petrels (*Pagodroma nivea*) look whiter than white. They are seldom found far from floating ice. Their main food is krill and small fish. →

Phalacrocorax atriceps

BLUE-EYED CORMORANT



The blue-eyed cormorant (*Phalacrocorax atriceps*) is the only member of the cormorant family to breed in Antarctica. It has a striking blue ring around its eyes. The orange flashes of colour on the upper beak are very bright during the breeding season.

Phoebetria palpebrata

LIGHT-MANTLED SOOTY ALBATROSS



Light-mantled sooty albatross (*Phoebetria palpebrata*) have a prominent semi-circle of white feathers behind their eyes.

The grey-headed albatross (*Diomedea chrysostoma*) has a distinctive black bill with bright yellow top and bottom ridges. It builds a large nest out of mud and grass and lays a single egg.

Male wandering albatross often exhibit elaborate courtship displays to attract the female.



Wandering Albatross



Albatross in love.

The wandering albatross (*Diomedea exulans*) easily earns the title of leader of the flying squad. It is one of the world's largest birds with a wingspan of over three metres, it is beautifully adapted to life at sea. It lives for between 60 – 80 years and spends almost all of its time at sea, only coming ashore to lay eggs and raise young. Wanderers usually feed on large prey such as squid, but also eat small fish. They sit on the surface to feed, usually only dipping their head and bill beneath the water.

Plumage: Adults are almost pure white. Younger birds are dark brown but as they age their plumage becomes whiter and whiter.

Salt Glands: Special salt glands are located in the skull above the eyes to remove excess salt that all seabirds ingest when they feed.

Bill: The hooked bill is used to firmly grip struggling prey and for tearing pieces of prey that are too big to swallow whole.

Feet: Large webbed feet are used as brakes during flight.

Waterproofing: Body feathers have a thick under-layer that traps a pocket of air to help insulate against the cold. Feathers are kept water-resistant by using oil that is spread from the preen gland located at the base of the tail.

Wings: The albatross is a perfect glider. It rarely needs to flap its long wings, travelling distances of thousands of kilometres is no obstacle. The wind does most of the work for the albatross. Rough air deflected from the surface of the waves provides the wind power for flying.

Flying Squad Menu

Krill crackers

⋮

Fish stew

⋮

Squid schnitzel



Albatross feeding chick.

The end of the line

Albatross get hooked and drown when they take the bait on longlines meant to catch tuna, swordfish and toothfish. It is thought that tens of thousands of albatross die this way every year, endangering the very survival of some species.

Feathered Fiends



Thin black marking under the chin gives the Chinstrap penguin its' name.

Early explorers thought penguins were fish, but we now know they are birds. Unlike members of the notorious flying squad, feathered fiends 'fly' through the water rather than through the air.

Penguin wings are flattened into strong flippers that are ideal for swimming. Penguins are very social birds and gather in large numbers each year to lay eggs and raise their chicks. Although there are seventeen different species of penguin in the world, only seven different species are adapted to living in Antarctica or the subantarctic.

King penguins (*Aptenodytes patagonicus*) have very striking orange and yellow markings. They are deep divers and feed mainly on fish and squid.

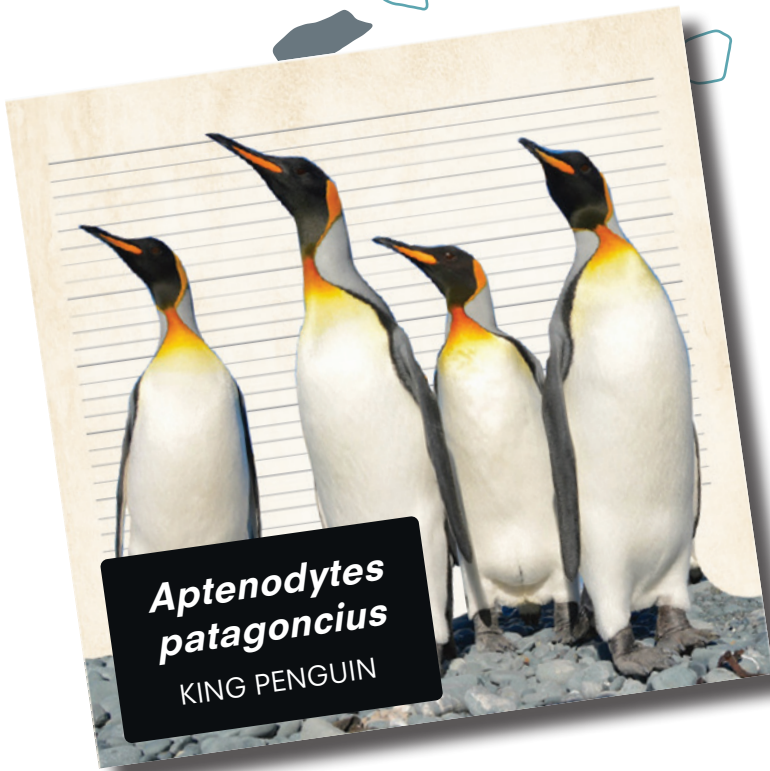
The royal penguin (*Eudyptes schlegeli*) is a member of the

crested penguin group named for the yellow crest on their heads. The only place in the world that royal penguins breed is Macquarie Island. Krill, fish and squid are their favourite foods.

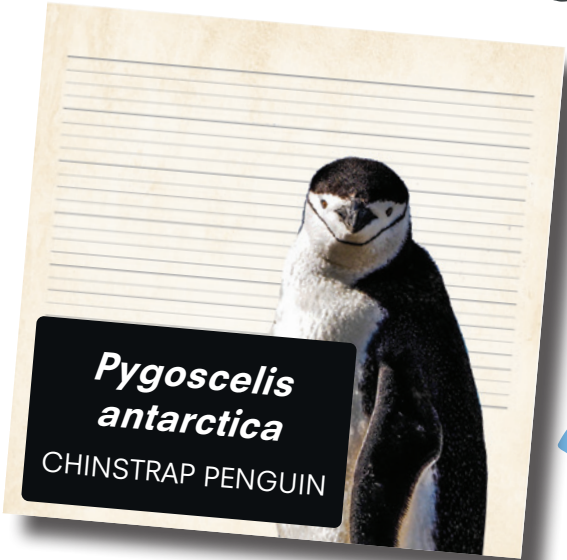
Chinstrap penguin (*Pygoscelis antarctica*) have a thin black marking under the chin gives this penguin its name.

Things are hotting up

Evidence has proven that the Earth's climate is changing, and scientists are predicting an increase in temperatures around the world. Even very small increases of a few degrees in temperature would spell disaster for plants and animals everywhere. Most forms of life, particularly those in Antarctica, could not adapt quickly enough to survive significant temperature changes. Phytoplankton and krill are especially at risk.



Aptenodytes patagonicus
KING PENGUIN



Pygoscelis antarctica
CHINSTRAP PENGUIN



Eudyptes schlegeli
ROYAL PENGUIN

Fair contest?

Scientists use a computerised weigh bridge to weigh Adélie penguins as they go in and out of the colony. In the early summer, an Adélie penguin regularly makes a 200 kilometres round trip to get food for its chicks. It returns with 0.5 kilograms of krill. By comparison, a krill trawler takes over 10 tonnes in one haul.

Measuring climate

The great ice sheet that covers Antarctica is hundreds of thousands of years old. Using a special drill, scientists have extracted long, cylinder-shaped samples of ice called cores. Tiny bubbles of gas from inside the layers of ice provide information about the Earth's past climate.

Adélie Penguins



Once a year, penguins moult, losing their old, frayed feathers.



Adélie penguins (*Pygoscelis adeliae*) spend winters in the Antarctic pack ice and in spring travel great distances over sea ice to reach land, where they build their nests out of a scattered pile of pebbles.

They are superb swimmers and can use their speed to leap up to two metres vertically from the water onto ice floes to avoid their main predator, the leopard seal. Adélie penguins feed on small fish and krill.

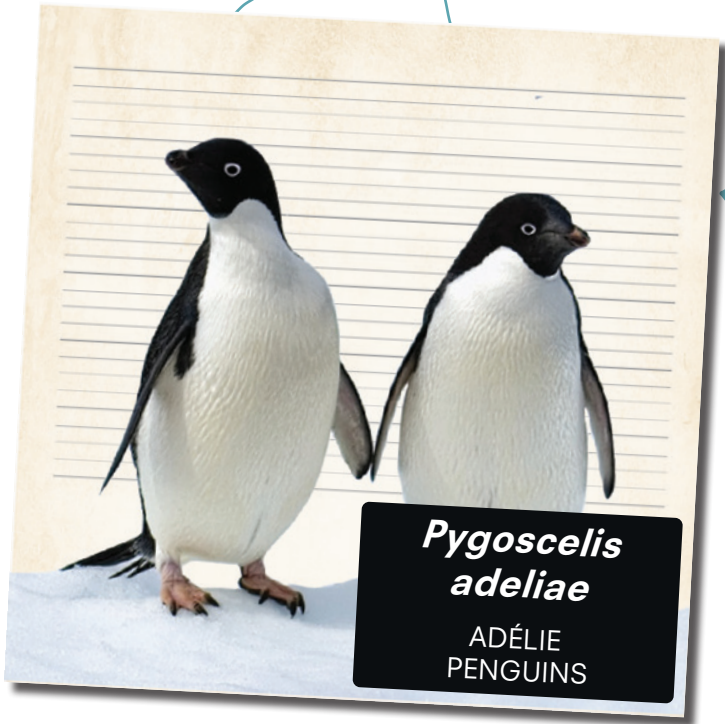
Body shape: Their streamlined body shape resembles a torpedo and is very important for fast, effortless swimming. Adélie penguins can swim continuously at speeds of 4 – 7 km/h and swim in short bursts of up to 15 km/h.

Feathers: They have almost a complete covering of feathers. Even the base of their beak is feathered!

The feathers in the tough outer layer overlap each other to form a barrier against water, snow and wind that helps keep them warm. This layer is so effective that on sunny days penguins actually have a problem keeping cool.

Flippers: The swimming action of a penguin is similar to the flying action of a bird but penguins 'fly' through water instead of air!

Feet: These feet are made for walking. At the end of the long, dark winter Adélie penguins walk up to 300 kilometres across the sea ice to their colonies to lay eggs and rear their chicks. They also use their feet for steering while they are swimming. The three front toes of their feet are webbed and this helps them to change direction quickly while chasing fish and krill or when trying to outrun killer whales and leopard seals.



Feathered Fiends Menu

Krill kebabs



Fish pie



Squid beaks



A parent Adélie penguin will keep its chick safe and warm by holding it close between its feet.



Beaks: A penguins tough beak is used for many important tasks. They build their nests out of small pebbles and rocks they collect and carry in their beaks. They won't hesitate to give another penguin a sharp peck if they catch them stealing any of their rocks! They also catch and hold their food in their beaks. They have spikes on their tongues to make sure their wriggling, slippery prey of fish and krill don't get away. Once they have caught their tasty meal the spikes stop the prey from escaping.

Emperor Penguins



Emperor penguins on sea ice in front of the Aurora Australis in the East Antarctic sea zone.

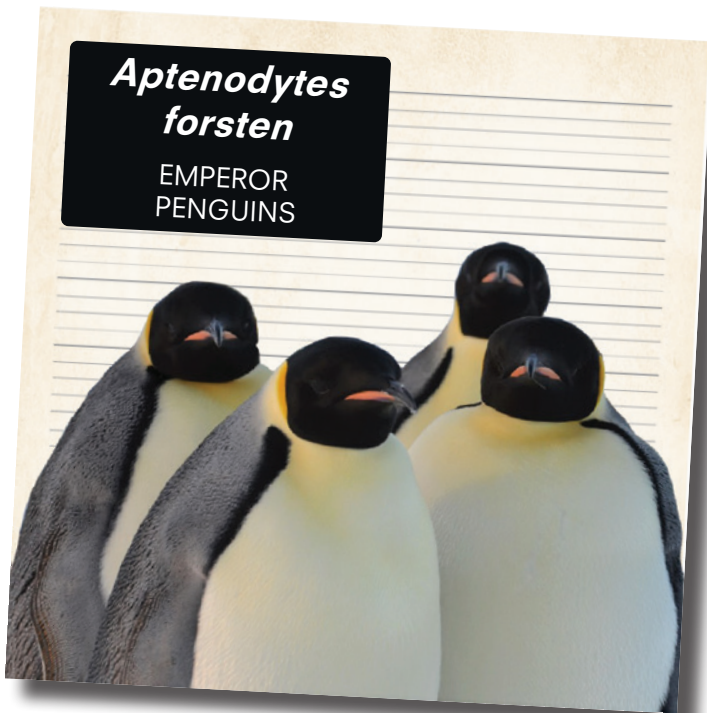
Around 195,000 pairs of emperor penguins live in 40 or more colonies on the Antarctic coast. The males remain on the Antarctic continent during the freezing winter, holding their eggs on their feet for 65 days before they hatch.

Emperor penguins (*Aptenodytes forsten*) are the largest and heaviest of all the penguins, weighing about 30 kilograms and standing about a metre tall. Most penguin species feed close to the surface, but emperors can dive to incredible depths hunting for their food, which includes a mixture of squid, fish, and krill.

Huddling: To cope with the freezing conditions of an Antarctic winter, male emperors huddle together in a tight pack. As many as 10 birds pack into every square metre of huddle.

Outside a huddle it can be minus 35°C but in the centre of a huddle the temperature is a cosy +38°C. As the penguins on the outside of the huddle get cold they slowly move from the outside to the inside of the huddle. Keeping the huddle together means life or death for the penguins and their eggs.

Fat layer: A thick layer of fat under the skin provides a source of energy when food is scarce. Each year after the female has laid her egg she goes to sea to feed and the male stays on to incubate the egg. From their arrival at the colony to the end of their incubation shift, the males must go without food for up to 150 days and have to depend upon their fat reserves for survival.



Males hold the eggs on their feet for 65 days before they hatch!

Dive, Dive, Dive! Emperors can hold their breath underwater for over 20 minutes, which enables them to dive to astonishing depths in their hunt for food. By attaching miniature computers or 'data-loggers' to the feathers on the backs of penguins, scientists have recorded regular dives to depths of more than 300 metres. The deepest dive known for any penguin is 458 metres.

Flippers: The emperor penguins' flippers are highly modified 'wings' that function like powerful propellers. They can easily swim at speeds of 24 km/h, reaching 50 km/h for short bursts.

Warm and cosy: The feathers overlap like tiles on a roof, creating and trapping a layer of warm air. Preening transfers oil from a gland near the tail to the feathers and assists with waterproofing.

More Feathered Fiends Menu

Mixed krill

⋮

Fish soup

⋮

Sizzlin squid

Slippery Characters



*Weddell seal pup
and parent*

All Antarctic and subantarctic seals are sleek and supple and live up to their nickname of slippery characters. Their torpedo-like bodies are designed for efficient underwater travel.

Seals are mammals, which means they give birth to live pups and suckle their young. Milk is an important part of a young seal's diet although they very quickly learn to hunt krill, squid, fish and other seals for themselves.

Crabeater seals (*Lobodon carcinophagus*) are filter feeders and have a diet consisting almost exclusively of krill, which they strain through their special-shaped teeth. Killer whales and leopard seals are their main predators and a high proportion of young crabeater seals carry open wounds or fresh scars in their skin and blubber from

close encounters with these killers. Scientists count the number of crabeater seals in the pack ice from helicopters and from the Australian Antarctic research vessel.

Weddell seals (*Leptonychotes weddellii*) live in the pack ice and are often seen in tide cracks or sleeping on the ice.

Antarctic fur seals (*Arctocephalus gazella*) have thick, soft coats. Each square centimetre of their skin has about 40,000 hairs. This dense cover keeps them well insulated against the icy cold waters of the Southern Ocean.

The southern elephant seal (*Mirounga leonina*) is the largest of the seals, with males weighing over 4 tonnes. It can produce a deafening roar from its trunk-like nose to scare off rivals.

***Lobodon
carcinophagus***
CRABEATER SEAL



***Leptonychotes
weddillii***
WEDDELL SEAL



***Mirounga
leonina***
SOUTHERN ELEPHANT
SEAL



***Archocephalus
gazella***
ANTARCTIC FUR
SEAL



Lucky to be alive!

During the 1800s Antarctic fur seals were hunted to near extinction by sealers wanting their fur for ladies' coats. Records show that British and American sealing ships took as many as 112,000 fur sealskins just one twelve-month period (between 1800 and 1801). Fortunately, fur seal populations have slowly recovered since the demise of the sealing industry.

Leopard Seal



Leopard seal pup and Adélie penguin

The Leopard seal (*Hydrurga leptonyx*) is a ferocious and skilful hunter. Although clumsy and ungraceful on land, in the water it is an excellent swimmer and can dive to great depths hunting for fish, squid and even other seals.

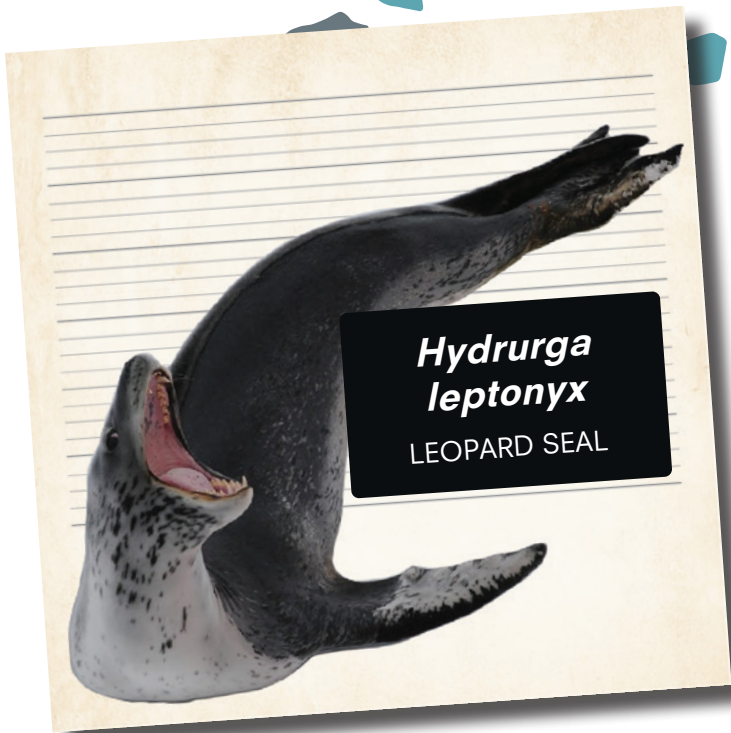
Krill are an important part of their diet although Adélie penguins are one of their favourite foods! Leopard seals often hide near penguin colonies to catch unsuspecting birds. They grow to about 3 metres long and their soft grey fur has dark spots.

Fat layer: Leopard seals have a thick layer of fat or blubber up to 10 centimetres thick under their skin

that gives the seals their smooth, sleek appearance and is also excellent insulation against the cold.

Lung capacity: Like all mammals, seals breathe air but they can stay underwater for up to an hour and dive to depths of 600 metres or more in search of food. To avoid getting the 'bends', a seal breathes out before it dives and reduces the amount of air in its lungs to a minimum.

Hind-flippers: The strong muscular hind-flippers are very efficient paddles in the water, making the seals excellent swimmers and divers.



Slippery Characters Menu

Crumbed krill

⋮

Fish basket

⋮

Calamari

⋮

Penguin puffs

⋮

Seal steaks

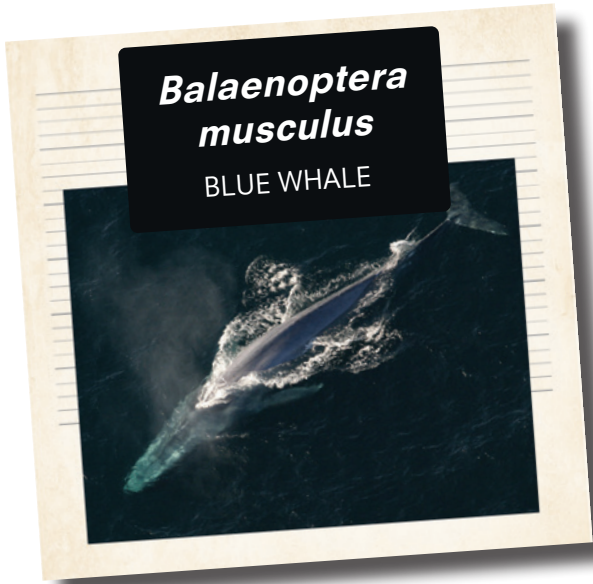


Eyes: The large eyes of the leopard seal have an almost spherical lens, which helps them see underwater.

Teeth: Some of their teeth have prominent cusps that are used for filtering krill, but generally they are sharp and well suited for cutting and tearing flesh.



Mister Bigs



Whales really are the Mister Bigs of the animal kingdom. One species, the blue whale, is the largest animal ever to live on Earth.

Baleen whales have huge plates inside their mouths which they use to filter plankton, krill and small fish from vast quantities of seawater. They feed near the surface of the ocean. The humpback, southern right and the blue are baleen whales.

Toothed whales are hunters! They snack on penguins, squid, fish, seals and other whales. They often dive a kilometre deep in search of their food. The sperm whale is a toothed whale.

Blue whales (*Balaenoptera musculus*) are the largest of all the

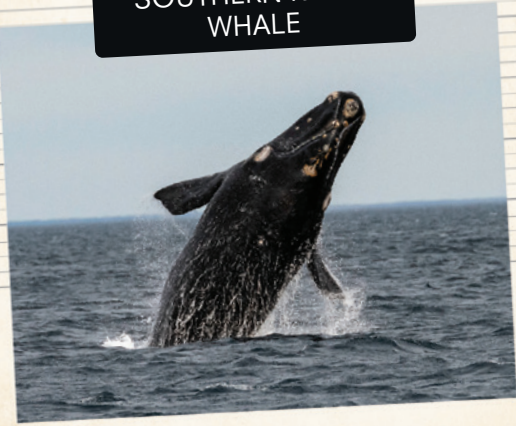
whales, and fully grown are up to 30 metres long and weigh 150 tonnes. They were the number one target for whalers and were hunted to the edge of extinction. These gentle giants live almost entirely on krill.

Sperm whales (*Physeter macrophalus*) are the largest of the toothed whales weighing about 40 tonnes and growing up to 19 metres long. They are champion divers. The longest recorded dive is 90 minutes and dives may reach depths of 3 kilometres or more. One particularly hungry sperm whale was found with over 18,000 squid beaks in its stomach!

Southern right whales (*Eubalaena australis*) have massive heads covered with distinctive, crusty, →

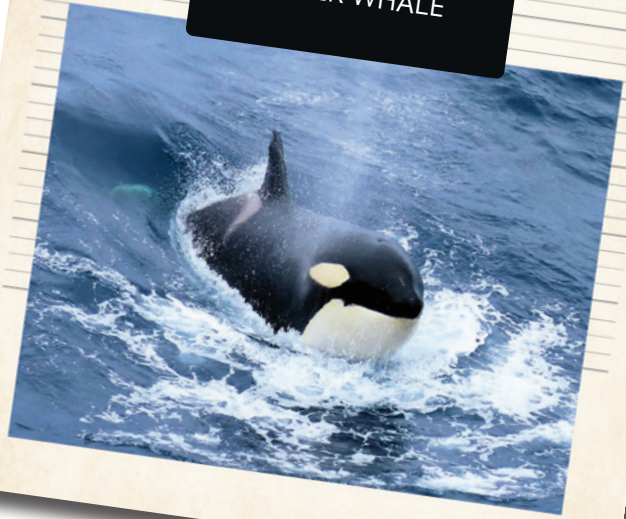
Eubalaena australis

SOUTHERN RIGHT WHALE



Orcinus orca

KILLER WHALE



white growths called callosities, which are home to barnacles, worms and lice. Whalers named the southern right whale after their belief that it was the 'right' whale to catch because it floated when harpooned and was easy to approach.

Killer whales (*Orcinus orca*) (which are actually large dolphins) have distinctive, shiny, black and white heads and are one of about 6 species of toothed whales. The toothed whales mostly have quite long jaws, armed with a row of very sharp cutting teeth that are well adapted for seizing or cutting up large and active prey. Although the killer whale will sometimes eat squid or fish, they really prefer warm-blooded prey. This includes penguins, seals and even other whales.

Whaling

Whaling has been carried out in the Southern Ocean since the late 1800s. In the early days, the whales were hunted from small boats using hand-held harpoons. With the introduction of cannon-fired harpoons and ships fitted with on-board processing plants in the 1920s huge numbers of whales were killed for their oil and meat. In just one year 46,000 whales were killed. When whalers hunted one species to near extinction, they simply moved on to the next. Only small numbers of blue, humpback, right, sei and fin whales remain in the Southern Ocean today. It is estimated that no more than about 5% of the original number of blue whales exist today.

Humpback whales



Humpback Whale with her calf

Humpback whales (*Megaptera novaeangliae*) are huge! Fully grown they weigh up to 40 tonnes and can be 16 metres long. The humpback whale is a member of the family of baleen whales, named after the sieve-like plates inside their mouths they use for trapping huge numbers of krill. Other baleen whales include the blue, fin, minke, right and sei whales.

Song: The humpback whale can 'sing', producing a sequence of moans and whistles lasting as long as 10 minutes. Scientists believe singing may be an adaptation that enables the whales to identify each other over long distances.

Tail: They have a flat tail called a 'fluke'. A massive muscle moves the fluke up and down as a powerful propeller.

Breathing: Whales breathe through a blowhole on top of the head. This allows a whale to breathe while swimming at the surface of the water. The blowhole closes when the whale dives.

Food: Humpback whales swim through schools of krill and small fish with their mouths open, catching and filtering krill and small fish up to about 20 centimetres long.

Fat layer: Under the skin there is a layer of blubber up to 15 centimetres thick. This doubles as both a food store and an insulating layer from the cold. Whalers once hunted humpbacks as a rich source of fatty oil.

Slippery Characters Menu

Krill casserole

⋮

Fish fingers

⋮

Squid rings

⋮

Penguin pie

⋮

Seal sausages

⋮

Whale fluke soup



WHAT'S YOUR THEORY?



The early stage of most investigations always seems to raise more questions than it answers! The mystery of the disappearing krill could take years to solve. When searching for answers, Antarctic scientists, like the best detectives, ask lots of questions.

So who *IS* eating who?

Does anyone really have an alibi? Do Feathered Fiends and Some Things Fishy enjoy the same snacks? Is anyone getting too fat? Does anyone NOT have krill on the menu? Are all the slippery characters carnivores? Is there a link between the Low Life and the Flying Squad? What if whalers had



killed the last of the Mister Bigs? How big would the hole in the food web be? Who would care?

Could it be that humans are members of a new rival gang? And anyway, what was that noise the Patagonian toothfish heard?

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