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The background of the entire page is a photograph of an Antarctic landscape. In the foreground, a large colony of penguins, likely King penguins, stands on a snowy beach. The middle ground shows a body of blue water with numerous icebergs of various sizes and shapes. Two kayakers in red kayaks are visible in the water. In the background, a large, snow-covered mountain rises under a cloudy sky.

# ANTARCTIC

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# ANTARCTIC PENINSULA



The Antarctic Peninsula lies just 1,000 kilometers (621 miles) from the southernmost tip of South America and has the mildest climate in Antarctica. Like a beckoning finger the peninsula extends towards South America, inviting travelers to discover the unearthly beauty of the sixth continent. Across the unpredictable Drake Passage, Antarctica's most accessible mainland area contains everything one might expect to experience in Antarctica:

“Like a beckoning finger the peninsula extends towards South America, inviting travelers to discover the unearthly beauty of the sixth continent.”

- Huge icebergs.
- Five penguin species. Native penguins (those that breed here), include Adélie, chinstrap, and gentoo, with the occasional macaroni penguin at a few sites. Here we also find the northernmost breeding population of emperor penguins on Snow Hill Island, on the eastern side of the peninsula.
- Abundant seals. Species of seal commonly seen include Weddell, crabeater, leopard, southern elephant, Antarctic fur, and (very rarely) Ross.
- Several whale species. Common whale species include humpback, minke, and killer (orca). Sightings of blue, fin, sei, southern right, and sperm whales are not as common. Whale watching is a popular activity on every cruise but sightings can never be guaranteed. Sightings are usually more common later in the season than at the start.

◀ Page 2. Brown Station at the Paradise Harbour



▲ Port Lockroy

➤ The full-length portrait of Marilyn Monroe painted on the back of the generator-shed (gift shop) door brings to mind lonely winters during Antarctica's all-male era

- Polar research stations. Scientific research stations representing several different countries exist in the peninsula region. These include Academician Vernadskiy (Ukraine), General Bernardo O'Higgins (Chile), Esperanza (Argentina), Ruperto Elichiribehety (Uruguay), Palmer (USA), Almirante Brown (Argentina), Presidente Gabriel Gonzalez Videla (Chile), and Port Lockroy (United Kingdom). A visit to a station often includes an opportunity to see and learn about the research being undertaken as well as life on an Antarctic base.

The peninsula is highly mountainous; its highest peaks rises to approximately 2,800 meters (9,186 feet). There are about 90 possible visiting-sites in the region of the peninsula, 30 of which receive 80% of all visits. The top 10 sites account for half of all landings, and the 5 most-visited sites together receive 30% of all visits.

### PORT LOCKROY

Nestled under the dramatic mountains of Wiencke Island, the 800-meter (2,625-foot) long harbor of Port Lockroy is the most popular tourist site in Antarctica. Aside from the inspiring vistas, there is a gentoo penguin rookery, blue-eyed shags, and a reconstructed whale skeleton on nearby Jougla Point.

▲ Painting at Port Lockroy

But the main attraction is Bransfield House or "Base A", as it was known. Built in 1944 as part of the secret British Operation "Tabarin", this base was strategically placed on the Antarctic Peninsula to detect German naval activity. In 1948 scientific staff took over the base and operated it continuously until 1962. After years of dormancy, the grounds were restored in 1996 by the Antarctic Heritage Trust and, since then, Bransfield House has been open to the public during the short Antarctic summer. Guests may visit a small museum that retraces the life of the base in the 1950's. They also find a well-stocked souvenir shop and an opportunity to send a postcard from Antarctica.

### NEKO HARBOR

Deep in Andvord Bay we find Neko Harbor, where most visitors set foot on the actual Antarctic continent for the first time. The site is home to a massive glacier that regularly calves into the icy waters. There is also a colony of gentoo penguins and a small emergency hut with supplies maintained by the Argentine government.

### CUVERVILLE ISLAND

Cuverville Island has been identified as an Important Bird Area (IBA) by BirdLife International because it supports a breeding colony of approximately 6,500 pairs of gentoo penguins, the largest colony for this species on the Antarctic Peninsula. Other birds nesting at the site include southern giant petrels and imperial shags.

In the mid-1990's a team of scientists from the University of Cambridge studied the impact of human presence on the penguins and concluded that well-conducted groups, with tourists observing guidelines, have no detectable effect on the penguins' breeding behavior.

➤ It was in Neko's freezing 0.5°C (33°F) waters that legendary American cold-water swimmer Lynne Cox swam nearly 2 kilometers (1.2 miles) in 25 minutes.

➤ Taste a throat-burning gorilka (Ukrainian pepper vodka) made from the clearest Antarctic ice water at the famous bar inside Academician Vernadskiy base.



▲ Achieving the seventh continent



▲ Antarctic icebergs

“The Weddell Sea is often called an “iceberg factory” — myriad huge icebergs with colors of blue, green, violet, and white, make their way through ice-choked straits.”

### WEDDELL SEA

The Weddell Sea area, located on the eastern coast of the Antarctic Peninsula, is surprisingly different from the western side.

Whereas the western side’s snow-covered mountains drop straight into the sea, the eastern coast of the peninsula features large areas of snow-free gravel. The mountains on the eastern side are farther from the sea, thus creating weather conditions more conducive to human exploration. The Weddell Sea area is also much drier, as moisture-rich westerly winds empty themselves of snow and rain over the mountains.

The Weddell Sea is often called an “iceberg factory”—myriad huge icebergs with colors of blue, green, violet, and white, generated by the Larsen, Ronne, and Filchner ice shelves, make their way through ice-choked straits. This steady stream of ice makes navigation in these waters quite difficult—Shackleton’s *Endurance* is the most famous example of at least a half-dozen ships that were crushed and sunk in these waters.

Another noteworthy reason to visit the Weddell Sea is the chance to see the most famous of all Antarctic birds: the emperor penguin. The emperor, found mostly in the area around the Ross Sea, is rare on the peninsula. However, in the Weddell Sea, a breeding population of approximately 4,000 pairs of emperor penguins can be found on Snow Hill Island. The entire island has been identified as an Important Bird Area (IBA) by BirdLife International.



### NOTES

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◀ Page 6. Emperor penguins on Snow Hill Island

# FALKLAND ISLANDS



The Falklands are a compact group of more than 740 islands, situated in the South Atlantic, some 645 kilometers (400 miles) from the South American mainland and 1,370 kilometers (850 miles) north of the Antarctic Circle. Treeless but scattered with tufts of grass, the islands are a small country of moors and rugged coastlines carved by a gray and often wild sea, where birds and plant life form a link between Patagonia and Antarctica.

The islands are located between Longitude 57° and 62° West and Latitude 51° and 53° South; approximately the same latitude south as London is north. The distance from Stanley, on the extreme east, to New Island, on the extreme west, is some 240 kilometers (150 miles). The total land area is approximately 12,175 square kilometers (4,700 square miles). The two main islands are East Falkland and West Falkland. Topographically the islands are generally hilly, with the highest points at Mount Usborne, 705 meters (2,312 feet) on East Falkland, and at Mount Adam, 700 meters (2,297 feet) on West Falkland.

The main soil type is peat and the natural vegetation is grassland, with some species of heath and dwarf shrubs. There are no indigenous trees, although cultivated trees do grow.

> There is an interesting and unusual landscape form on the islands called "stone runs": ribbons of angular quartzite boulders that seem to flow from the hilltops.

◀ Page 8. Black-browed albatross encounters, Falkland Island



▲ HMS Beagle in the Straits of Magellan

➤ During the early 1830's, HMS Beagle visited the islands with the naturalist Charles Darwin on board. Darwin not only collected flora, fauna, and fossils important to the conception of "On the Origin of Species" but also commented on the geological features now known as "stone runs" and on the number of shipwrecks around the islands. The latter are due to the proximity of Cape Horn and a combination of cruel winds and concealed rocks. As trade in the islands increased, so did the number of visiting ships and further wrecks resulted. Many can still be seen around the islands' coasts.

Stanley, located on East Falkland around picturesque Stanley Harbour, is the capital city of the Falklands. Anywhere outside of Stanley is referred to as "the Camp" (from the Spanish word "campo", meaning countryside). The Falkland Islands are an Overseas Territory of the United Kingdom and English is the official language.

## HISTORY

The English navigator John Davis, aboard *Desire*, made the first confirmed sighting of the islands in 1592. The first landing is attributed to the British captain, John Strong, in 1690 at Bold Cove, Port Howard on West Falkland.

The Falkland Islands had no indigenous population and were entirely unoccupied until 1764, when Louis Antoine de Bougainville, French diplomat and explorer, established a settlement at Port Louis on East Falkland.

In 1765 Commodore John Byron, unaware of the French settlement, landed at Port Egmont on West Falkland and took possession of the islands for the British Crown.

Small settlements were established at different locations around the islands during the 18th and 19th centuries by Britain, France, Spain, as well as by Spanish settlers from South America, but none of these lasted for more than a few years.

1833 saw the re-assertion by Britain of its sovereignty, which dated from Britain's claim in 1765. The British flag was entrusted to a British subject at Port Louis, which had suffered from various hostilities, mainly concerning sealing operations. A military administrator was put in charge there a year later. A governor was appointed in 1841. By 1845 the capital had been moved to its present site and named Stanley, after the colonial secretary, Geoffrey Smith Stanley, 14th Earl of Derby.

Stanley became an important port for vessels involved in whaling and rounding Cape Horn. Settlements and farms were built around the islands as sheep farming took over from cattle ranching as the mainstay of the economy.

From April 2 until June 14, 1982, Argentine troops occupied the Falkland Islands. A British Task Force was sent to recover the islands. Their landing at Blue Beach, San Carlos on May 21 is now commemorated each year as "Landing Day". Fierce fighting took place on land, at sea, and in the air with a number of islanders aiding the British military wherever and whenever possible. Following the final battles on the hills around Stanley, Argentine Forces surrendered to Major General Jeremy Moore of the British Forces. A surrender document was signed at the Secretariat Building, in the room now named the "Liberation Room". Liberation Day is commemorated by a public holiday on June 14 with services in Christ Church Cathedral and at the Liberation Monument. Other, smaller memorials relevant to specific battles are situated at locations around the islands.

Today the islands enjoy a healthy economy based on the sale of fishing licenses, tourism, and agricultural production including fine wool, mutton, and beef. Off-shore oil exploration is underway with drilling licenses granted to a number of international companies.

## NATURAL ENVIRONMENT

Fascinating and abundant wildlife and plant life can be found in the Falkland Islands, in many areas of the unspoiled, natural landscape.

The Falkland Islands are home to the world's largest pinniped mammal, the southern elephant seal. Sea lions and fur seals are easily seen around the islands; leopard seals are occasional visitors. Male elephant seals return early in the summer and are a spectacular sight when battling to establish territories at the start of the breeding season or even simply relaxing on the beach. Females arrive soon after with hairy, black pups born mainly during October. Fur seal pups are born in December and sea lions give birth in December and January.

Fourteen species of cetaceans have been recorded in waters around the Falklands. Two species of dolphin (Peale's and Commerson's) are frequently seen along the coast and in the wakes of boats. Killer whales are also regularly observed, particularly near large colonies of seabirds and

➤ The first settlement on the Falkland Islands was established by the French diplomat and explorer Louis Antoine de Bougainville. The French called the islands Les Iles Malouines after the French port of St. Malo, wherefrom most of French sailors came. The Spanish name of the archipelago, las Islas Malvinas, is derived from that French name.



▲ Southern elephant seal

“Most of us imagine penguins to be polar creatures, much more at home in a world of ice and snow than on the sandy beaches and sheep farms of the Falklands. Yet as many as a million penguins nest in the Falklands every summer.”



▲ Macaroni penguins

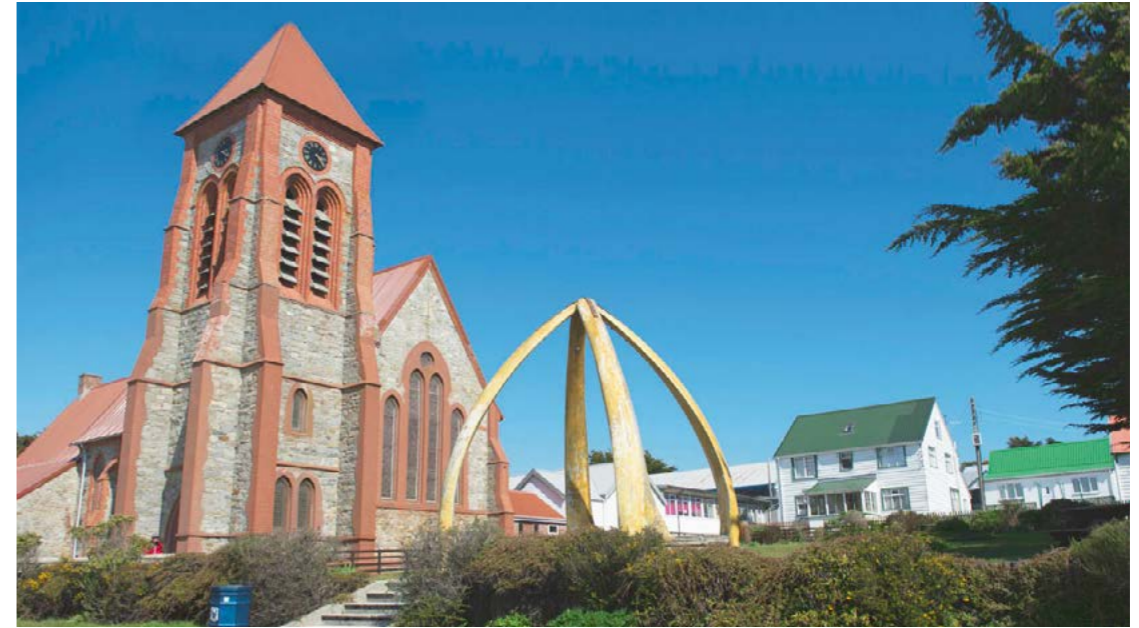
seals, their main prey. Other, less common cetaceans include fin, sei, minke, sperm, southern bottlenose, southern right, and humpback whales. Sightings of whales usually occur in the summer months. While dolphins can be seen year-round, summer tends to be the peak time.

The Falkland Islands offer a very special birding experience. Over 200 species have been recorded in the islands including two endemics (the Cobb's wren and the Falklands flightless steamer duck). Five species of penguin and over 70% of the world's black-browed albatross population breed on the islands. The islands are also home to many rare species, some of which are classified globally as "threatened" or "endangered".

The most obvious avian attractions in the Falklands are the penguins. Most of us imagine penguins to be polar creatures, much more at home in a world of ice and snow than on the sandy beaches and sheep farms of the Falklands. Yet as many as a million penguins nest in the Falklands every summer, representing five of the world's seventeen species: king, gentoo, rockhopper, magellanic, and macaroni. The Falklands' gentoo population is the largest on Earth.

A short walk in the Falklands will reveal an amazing variety of plants for those who know how to look. 175 species and one hybrid are native; 14 of these are endemic to the Falkland Islands and six are globally threatened. 241 introduced species have been counted, of which 139 are considered naturalized, making a grand total of 417 plant species.

Real plant enthusiasts will enjoy seeking out some of the endemics, e.g. vanilla daisy, snake plant, and lady's slipper. Some visitors may simply appreciate the beauty of delicate flowering plants such as pale maiden and dog orchid, while others prefer to taste some berried plants such as diddle-dee and teaberry. Some plants, like balsam-bog and scurvy grass, are the subject of local lore. Lichens are also found in abundance in the islands due to the unpolluted atmosphere.



▲ Whalebone Arch & St. Mary's Church in Stanley

## STANLEY

Stanley, the capital of the Falklands, is a colorful seaside town nestled around the waters of Stanley Harbour. The town boasts many reminders of its British heritage, such as red phone boxes and distinctly English pubs. Visitors can enjoy military monuments, a museum, and the Philatelic Bureau. Christ Church Cathedral and the adjacent Whalebone Arch are two of Stanley's most iconic attractions, situated in the center of Stanley on Ross Road. Step inside to learn more about the history of the building and Christianity in the Falklands.

A visit to the Falkland Islands Museum is a great way to discover the heritage and development of the Falkland Islands community. The museum occupies two buildings, Britannia House on Holdfast Road and Cartmell Cottage on Pioneer Row. Britannia House contains the majority of exhibits with displays covering the social and natural history of the Falklands. Outside is the Reclus Hut, moved from the Antarctic Peninsula and reconstructed on the museum grounds. Cartmell Cottage is one of the original colonists' cottages from 1849, brought in as a kit from Britain for the military pensioners who came to settle here. It is now a recreated period-house showing life as it was in the 1850's, 1940's, and 1970's.

> The Whalebone Arch was constructed from the jawbones of two blue whales in 1933 to commemorate a century of continuous British administration in the islands. St. Mary's Church is an attractive example of a Victorian kit building, located on Ross Road opposite the Standard Chartered Bank. The colored glass windows create a peaceful atmosphere inside.



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# SOUTH GEORGIA



South Georgia is an unmissable Antarctic destination. This subantarctic island is an exposed part of the Scotia Arc, an underwater mountain chain that extends from the Andes to the Antarctic Peninsula.

It is long and narrow, shaped like a huge, curved, fractured and savaged whale bone, some 170 kilometers (106 miles) long and varying from 2 to 40 kilometers (from 1.2 to 25 miles) wide. Two mountain ranges (Allardyce and Salvesen) provide its spine, rising to 2,934 meters (9,626 feet) at Mount Paget. Huge glaciers, ice caps, and snowfields cover about 75% of the island in the austral summer (November to January), whereas in winter (July to September) a blanket of snow reaches down to the sea. The mountain slopes dive some 4,000 meters (3,281 feet) down to the sea floor.

South Georgia lies between Longitude 35.47° and 38.01° West and between Latitude 53.58° and 54.53° South. It is surrounded by the ice-cold waters that flow up from Antarctica (South Georgia is at about the same latitude relative to the South Pole as the north of England is to the North Pole). The tip of South America, Tierra del Fuego, is 2,150 kilometers (1,336 miles) to the west. The Falkland Islands are closer at 1,390 kilometers (864 miles) away. The mountain ranges and the precipitous southern coast shield the north-facing bays from the fierce prevailing westerly winds and low pressure systems that roar across the Southern Ocean.



▲ Southern elephant seals

◀ Page 16. King penguin colony in Gold Harbour



▲ Ernest Shackleton's grave

South Georgia includes many offshore rocks and small islands that provide rodent-free nesting sites for breeding birds.

South Georgia is a United Kingdom Overseas Territory. Continuous UK administration has been in place since 1908. At the height of the whaling period some 2,000 people lived on the island. Now there are no permanent residents, but there are two active British Antarctic research stations as well as government officers and museum curators during the summer months. The stewardship of this wild and beautiful island is entrusted to the South Georgia Government. They in turn work with British Antarctic Survey, IAATO, and many others to ensure proper decisions are made to preserve this isolated, fragile place.

## HISTORY

The island of South Georgia is a unique place; it is one of Nature's paradises yet it is also rich with historical heritage.

South Georgia is positioned in the Southern Ocean between cold Antarctic waters and warmer seas to the north. These contrasting influences contribute to the island's exceptional natural history, creating a unique environment that supports an abundance of marine and avian wildlife.

This same abundance is what attracted humans, who made South Georgia a center for unsustainable sealing and whaling industries. The island was also a gateway to the Antarctic for heroes of polar exploration such as Sir Ernest Shackleton. South Georgia has a diverse, conflicting, yet fascinating human heritage thanks to the scientific research undertaken during the Discovery Investigations, its deserted whaling stations once home to communities of British and Norwegian whalers, and its pivotal role in the history of the Falklands war.

The tumultuous human history of South Georgia began with Captain Cook's visit in 1775, when his reports of numerous seals and whales on and around the island

attracted the attention of British and American industrialists eager to profit from what seemed to be an endless harvest of marine mammals.

Scientists first based themselves on the island in 1882. Today there are two permanent research stations manned by British Antarctic Survey staff.

In 1916 Sir Ernest Shackleton famously crossed the island to alert the world of the plight of his ill-fated *Endurance* Expedition. He subsequently died there in 1922 and is buried on the island at the cemetery near Grytviken.

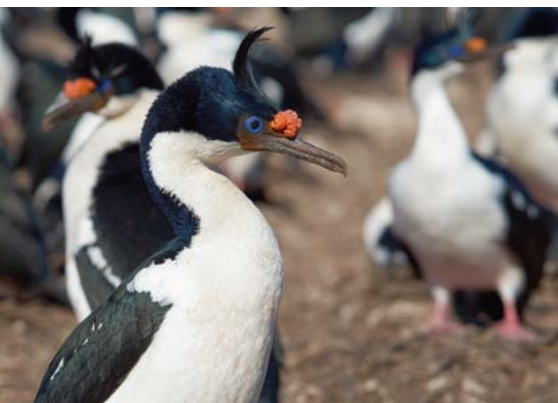
In 1982 the Argentine invasion brought war to the island. After the war ended, a military garrison remained until 2001.

For some 200 years the island of South Georgia hosted first a sealing and then a whaling industry that ended in the mid-1960's. But even after sealing and whaling had ceased, South Georgia continued to suffer from the long-term impact of human encroachment. Today the South Georgia Heritage Trust (SGHT) organization works to reverse the devastation brought to South Georgia's bird population by the introduced Norway brown rat.

SGHT works with all who wish to preserve the island's natural and historical heritage for future generations by redressing the damage done to its environment and by cleaning up and preserving historical sites. Most significantly, the groundbreaking SGHT Habitat Restoration Project was implemented to save native birds from extinction and to increase the numbers of seabirds nesting on South Georgia. The project aims to make the island completely rat-free, firstly by using helicopters to drop approximately 300 tons of toxic rodent bait that kills rats but does not harm native wildlife. The baiting was completed in 2015. Monitoring is ongoing and hopefully the island will be declared rat-free in the next few years. This will be an enormous benefit to seabirds; scientists predict a population increase of up to 100 million seabirds in the next decades and centuries.

➤ **Sealing.** When Captain Cook visited South Georgia in 1775, he noted the island's abundant population of seals. British sealers arrived from South America in 1788, followed by others from the United States in 1791. This began a brutal period in South Georgia's history—the human exploitation of two of its marine mammal species, the Antarctic fur seal and the southern elephant seal. Competition between sealers was intense and there was much secrecy around early sealing activities. As a result, the full extent of sealing that took place during the early years is unlikely ever to be known.

➤ **Whaling.** On November 16, 1904 a Norwegian, Carl Anton Larsen, with whaling experience in Arctic waters, established the first whaling enterprise on South Georgia at Grytviken. Larsen's operation was commercially very successful. Oil and by-products from one whale could fetch £2,500 in those years. His company returned relatively high dividends in its early years of operation. Huge interest in obtaining whaling licenses followed. Initially only blubber was taken and the carcasses discarded, resulting in beaches strewn with bones and a stench of rotting flesh in the air. The government later imposed restrictions on licenses and conditions to ensure that the complete whale was processed, rather than just the blubber, in an attempt to sustain the industry. By 1912, seven whaling stations had been established and South Georgia became known as the southern capital of whaling.



▲ Blue-eyed shags

## NATURAL ENVIRONMENT

Today, some 30 million birds nest and raise their chicks on South Georgia; it is truly Nature's haven in the often wild and ferocious Southern Ocean. Some 81 bird species have been recorded, of which 31 species (including 27 seabirds) are breeders. South Georgia has a similar list of bird species as other subantarctic islands, but the sizes of populations set it apart. Breeding here are around half the world's population of macaroni penguins (about 2 million pairs), grey-headed albatrosses (80,000 pairs, 46% of the world's breeding population), northern giant petrels (around 3,000 breeding pairs), white chinned petrels (about 2 million pairs) and Antarctic prions (around 22 million pairs), the most numerous seabird species at South Georgia. Most of the world's population of South Georgia blue-eyed shags live here as well (some 7,500 pairs). The island's one endemic species, the South Georgia pipit, can only be found in rat-free areas. The South Georgia pintail is considered a subspecies of the yellow-billed pintail duck.

But the main highlights of South Georgia birdlife are the stately king penguins with their orange-yellow crowns. The total number of king penguins is around 400,000 breeding pairs. They have increased by some 5% on average each year for the past 80 years. Other penguin species found here include gentoo penguins (about 100,000 pairs) and chinstrap penguins (about 6,000 breeding pairs).

The legislation of the South Georgia government protects marine mammals within South Georgia's waters and thus it can be viewed as a whale sanctuary. Some whales can now be found close inshore as they make a slow recovery. Southern right whales and humpbacks have been seen in Cumberland Bay and large groups of fin whales have been spotted feeding off Shag Rocks. Sightings of large blue whales remain infrequent. Pods of sperm and killer whales are sometimes seen interacting with longline fishing boats. The southern bottlenose whale, long-finned pilot whale, and hourglass dolphin also inhabit South Georgia's waters.

Four species of seal are seen regularly at South Georgia. Both the southern elephant seal and Antarctic fur seal breed in significant numbers on the island's beaches. A small colony of Weddell seals breed in Larsen Harbour, Drygalski fjord. Leopard seals can be seen all year round, particularly in winter.

Plant life is constrained by the island's isolation and cool summers. Native flora is closely related to that of the Falkland Islands, Tierra del Fuego, and southern Patagonia.

As Captain Cook reported, there are no trees or shrubs on "Isle Georgia". The dwarf-shrub-dominated maritime heath that is abundant in the Falkland Islands and elsewhere in the southern cold temperate zone is not found on South Georgia. The only shrub-like plant is a woody-stemmed herb, commonly called burnet.

Only 25 indigenous higher plants have been recorded on the island. These include one lycopod (clubmoss), six ferns, five grasses, three (or perhaps 4) rushes, one sedge, and nine forbs (non-grass-like herbs). Only six species dominate in distinct communities: greater burnet, Antarctic hairgrass, tufted fescue grass, greater rush, tussac grass, and brown rush.

A large number of lower plant species flourish on the island. There are around 125 species of mosses, some 80 species of liverworts, and about 150 species of lichens. At least 50 species of macro-fungi (toadstools) and about ten macro-algae have been found. Little is known about the microflora (soil fungi, algae, cyanobacteria or bacteria).

Some plant species on South Georgia are found only in the Southern Hemisphere. While others, such as alpine cat's tail, are found at both poles. Still others, such as water blinks and brittle-bladder fern, are found worldwide. With the exception of one hybrid, no endemic higher plants are known to exist. However, a few endemic lichens and bryophytes (mosses and liverworts) have been found.



▲ Wandering albatrosses

“Today, some 30 million birds nest and raise their chicks on South Georgia; it is truly Nature's haven in the often wild and ferocious Southern Ocean.”



▲ King penguins

“Salisbury Plain is the setting for one of Nature’s most memorable and most authentic displays. At the heart of this haven of peace, on the beaches of the bay, a colony of 250,000 king penguins has taken residence.”

### GOLD HARBOUR

Gold Harbour, backed by an amphitheater of hanging glaciers and cliffs, is near the southernmost point of South Georgia. The place is so-called because the sun’s rays make the cliffs yellow with their light in the morning and evening. Here, between high cliffs and deep fjords, is the realm of the king penguin. Adélie, gentoo, chinstrap, magellanic, macaroni, and rockhopper penguins can also be seen along with giant petrels, snow petrels, and an abundance of South Georgia pipits.

### SALISBURY PLAIN

Salisbury Plain is the setting for one of Nature’s most memorable and most authentic displays. Formed by the withdrawal of the Grace Glacier, the basin is surrounded by high mountains which dominate the landscape and demonstrate all the strength and beauty of unspoiled nature. At the heart of this haven of peace, on the beaches of the bay, a colony of 250,000 king penguins has taken residence. In the midst of all these orange-headed couples, fur seals try to beat a path to feed their young. Under the pale southern sun that lights this glacial plain, clouds of birds fly on the wind, enchanting a traveler.

### GRYTVIKEN

The settlement at Grytviken was established on November 16, 1904 by the Norwegian sea captain Carl Anton Larsen as a whaling station for his Compañía Argentina de Pesca (Argentine Fishing Company). It was phenomenally successful, with 195 whales taken in the first season alone.

Today much evidence of the whaling industry remains in Grytviken, including the cemetery where many whalers are buried. The Grytviken whaling station has been extensively cleaned to remove hazardous materials, such as asbestos, heavy oils, and rotten building fabric. Visitors can now walk through the site and view the exposed machinery.

Grytviken is also closely associated with the Anglo-Irish explorer Ernest Shackleton, who died on South Georgia during one of his Antarctic expeditions. His widow chose the island as his final resting place. His grave is located just south of Grytviken, alongside those of whalers who died on the island.

The South Georgia Museum is located in the villa at Grytviken that formerly served as the whaling station manager’s house. The museum was established in 1991 and showcases the discovery, exploration, and natural history of the island with excellent exhibits on Shackleton, surveying and mountaineering expeditions, sealing in the late 18th and early 19th centuries, the early days of whaling, techniques of modern whaling in the middle part of the 20th century, whalers’ social life, and maritime history. Displays also cover the 1982 conflict and the subsequent British military presence lasting until 2001.

### ST. ANDREWS BAY

St. Andrews Bay is a huge outwash plain fed by the Heany, Buxton, and Cook Glaciers. It is home to one of the world’s largest colonies of king penguins with around 200,000 breeding pairs plus almost as many molting and resting birds.

### STROMNESS BAY

Stromness Bay, on the north coast of South Georgia, is 4.8 kilometers (3 miles) wide. It was the destination of Ernest Shackleton’s epic return journey in 1916 after his ship *Endurance* sank in the Weddell Sea. Help was given by the Norwegian whaling station manager.

Whaling activities at Stromness began in 1907 when the bay was first used as an anchorage for a floating factory ship. A shore station was built in 1912 and was run as a whaling station until 1931. It was then used as a ship repair yard until 1961, when it was abandoned. Today the buildings, machinery, and other paraphernalia of whaling and the ship yard exist in various states of decay.

➤ It was the invention of the explosive harpoon that made whaling possible in Antarctic waters.



▲ The Grytviken church

 **NOTES**

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# SOUTH SHETLAND ISLANDS



Stretching across more than 530 kilometers (330 miles), the large chain of South Shetland Islands is the first land most travelers see when visiting Antarctica.

One or more sites in the South Shetlands will almost certainly be on the itinerary of every Antarctic Peninsula cruise due to the ease of access and variety of rewarding places to visit. That aside, they are a fascinating place offering another interesting dimension to the Antarctic experience.

The proximity of the islands to South America and their relatively mild climate made the South Shetlands a popular place to build Antarctic research stations. Most of the stations are placed on King George Island, the largest island of the group.

## HISTORY

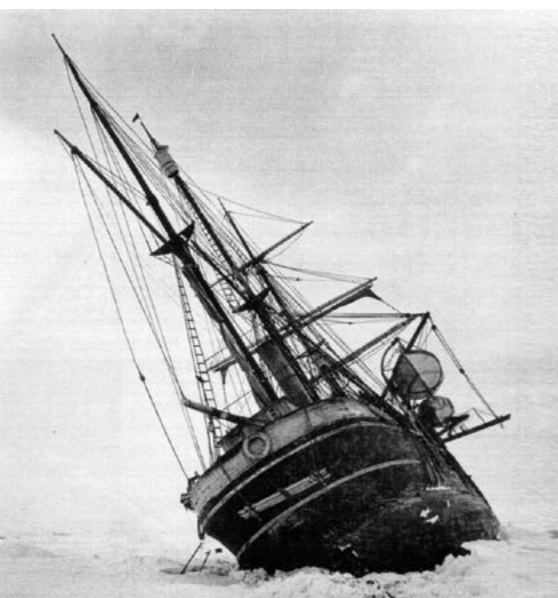
The South Shetland Islands were first sighted by William Smith. While sailing to Valparaiso, Chile in 1819, Smith deviated from his route south of Cape Horn and on February 19 sighted Williams Point, the northeast extremity of Livingston Island. Smith returned in October



▲ Southern elephant seals, Livingston Island

◀ Volcanic landscape of Telefon Bay, Deception Island

- > Eight national winter stations on King George Island make it the unofficial capital of Antarctica.
- > Among the station amenities, unusual for Antarctica, is 24-hour satellite coverage at Frei base. The local personnel enjoy four commercial TV stations.



▲ *Endurance crushed by pack ice in the Weddell Sea*

“Elephant Island is most famously known as the desolate refuge of Ernest Shackleton and his crew in the *Endurance* expedition of 1916.”

of the same year to claim the islands for Great Britain as New South Britain. The name was soon changed to South Shetland Islands (in reference to the Shetland Islands off the northern coast of Scotland). Both sets of islands lie at a similar distance from the South Pole and North Pole respectively.

## ENVIRONMENT

Some of the South Shetland Islands, such as Penguin Island, have active or recently active volcanoes. As its name suggests, visitors to Penguin Island can see Adélie and chinstrap rookeries and abundant petrels. The island offers a hike up the volcanic cone to observe a spectacular view.

The chinstrap penguin colony at crescent-shaped Half Moon Island is also very popular. This small piece of land, about 2 kilometers (1.2 miles) long has a small Argentinean naval base occupied in the summer months only. Whales may be seen around Half Moon Island against a stunning backdrop of mountains.

Hanna Point on Livingston Island boasts a wealth of wildlife. Here chinstrap and gentoo penguins, as well as the occasional macaroni penguin, can be seen nesting on the rocky shoreline. Elephant and fur seals can also be found basking on the beaches near the point.

## ELEPHANT ISLAND

Named after the abundant elephant seals in the area, Elephant Island is most famously known as the desolate refuge of Ernest Shackleton and his crew in 1916. Following the loss of their ship *Endurance* to ice in the Weddell Sea, the 28 exhausted men reached Elephant Island and established a camp at a place they called Point Wild. Realizing there was no chance of rescue, Shackleton decided to sail to South Georgia where he knew there was a whaling station.

In one of the most incredible feats in the history of sailing and navigation, Shackleton sailed with five other men

on a 1300-kilometer (800-mile) voyage in an open lifeboat, arriving at South Georgia after two weeks. His second-in-command, Frank Wild, was left in charge of 21 men on Elephant Island, waiting for Shackleton's return with a rescue ship. The men were confronted with hunger, thirst, bone-jarring cold, and an uncertain fate. Because the island had no natural source of shelter, they constructed a shack from their remaining two lifeboats and pieces of tent canvas. No sign of the camp remains, but the site is marked by a statue of Captain Luis Pardo, skipper of the Chilean ship *Yelcho*, which eventually came to rescue the men after 105 days of survival.

## KING GEORGE ISLAND

Year-round stations maintained by Argentina, Chile, Russia, Brazil, China, South Korea, Poland, Uruguay—as well as summer bases of Ecuador, Germany, Peru, USA, and the Netherlands—are connected by more than 20 kilometers (12 miles) of roads and tracks.

Chilean Presidente Eduardo Frei Montalva station (known as Frei base) was constructed in 1969. Ten years later another Chilean station was built, Teniente Rodolfo Marsh Martin. With less than 1 kilometer (0.6 mile) distance between them, the two stations were incorporated. Frei/Marsh is one of the peninsula region's largest and most complex stations, featuring a hospital, school, post-office, bank, supermarket and tourist shop, chapel, and a large gymnasium.

As part of Chile's policy of territorial claims on some regions of Antarctica, the government has encouraged families to live at Frei base. The first of several children was born here in 1984. Today Frei base accommodates 110 people. Among the few civilians are air-traffic controllers and teachers for the children who make up nearly 25% of the population. Parties of station kids occasionally greet travelers upon arrival.

Close to Frei base and separated from “Chilean Antarctica” by a small stream, there is the Russian Bellingshausen station. The substantial Bellingshausen station, built in 1968, boasts a hospital, school, post-office,

- > On January 29, 2007, the priest of the Holy Trinity church officiated what was probably the first ever church wedding in Antarctica. The husband, Eduardo Aliaga Ilabaca, was a staff member of a Chilean Antarctic base; his wife, Angelina Zhuldybina, was the daughter of a Russian mechanic at Bellingshausen.



▲ *The first wedding in Antarctica*



“The Whalers Bay on Deception Island offers a rare opportunity for a relatively warm Antarctic bath as seawater is slightly heated by geothermal activity.”

bank, souvenir shop, and the first Orthodox church in Antarctica. The Holy Trinity church is a 15-meter (49-foot) tall wooden structure built in the traditional Russian style. It can accommodate up to 30 worshippers.

Poland’s Henryk Arctowski station, set up in 1977, accommodates as many as 50 people. Women visitors were once presented with small bouquets of flowers that had been grown in the local greenhouse. The handsome tradition has been given up because growing of non-food plants now requires special permission under the Antarctic Treaty.

### WHALERS BAY

Whalers Bay, on volcanic Deception Island, is one of the safest harbors in Antarctica. Since the early 19th century, the island was a favored haven from storms and icebergs. It was first used by sealers and whalers, and remains a hub of activity today.

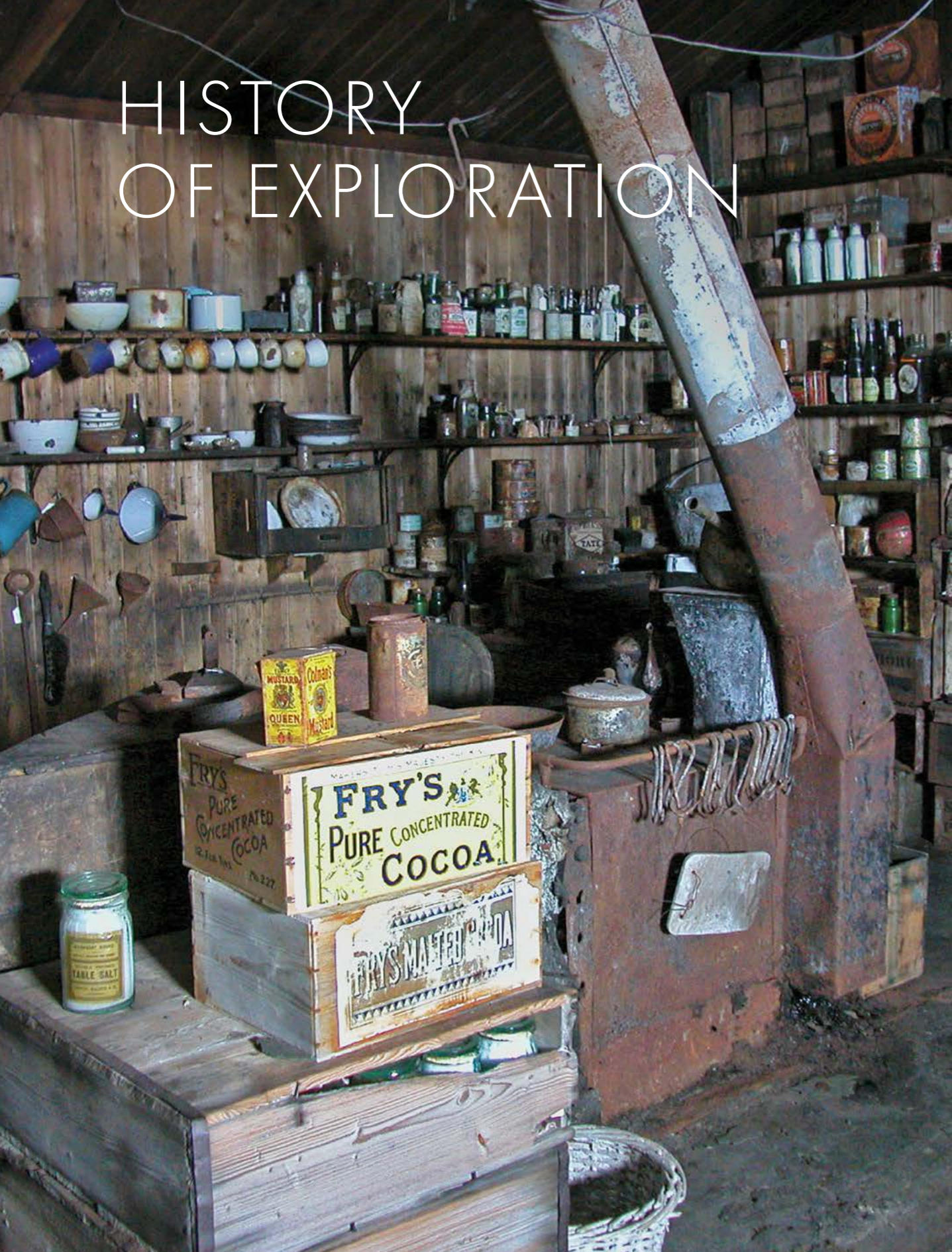
The area is home to historical sites such as the remains of a Norwegian whaling station and British “Base B”, which was built in 1944 as part of the secret wartime operation known as “Tabarin”. Wildlife including Antarctic fur seals, Weddell seals, and chinstrap penguins are commonly seen on the beaches. The bay offers a rare opportunity for a relatively warm Antarctic bath as seawater is slightly heated by geothermal activity.



### NOTES

Lined area for taking notes, consisting of multiple horizontal lines with dashed midlines.

# HISTORY OF EXPLORATION



The idea of the existence of Terra Australis Incognita—the Unknown Southern Land—goes back to the ancient Greeks, who had a fondness for symmetry and balance. There must be a great continent to the south, they postulated, to balance the great land masses in the northern hemisphere. Two thousand years later, the great age of exploration brought Europeans far enough south to test the hypothesis.

In 1520, after he had sailed through the strait that now bears his name, Ferdinand Magellan speculated that the land to his south, Tierra del Fuego, might mark the northern edge of a great continent. Fifty-eight years later, in 1578, Sir Francis Drake sailed his *Golden Hind* through Magellan's Strait. He encountered severe weather on the Pacific side and was blown to the south of Tierra del Fuego, then east around Cape Horn. It became obvious that Magellan's "continent" was merely a series of islands at the tip of South America. If there was indeed a southern continent, it had to be farther south.

For the first 200 years or so of European exploration, most voyages were concerned either with commerce or with the investigation of the newly discovered American continents. Thus the first subantarctic islands (South Shetlands and South Georgia) were discovered by the play of chance. The first systematic search for a southern continent didn't come until nearly the middle of the 18th century.

## EARLY EXPEDITIONS

In 1768 Captain James Cook was sent to the South Pacific, firstly to observe a transit of Venus, and secondly to proceed south in search of the fabled southern continent. He returned to England three years later with a wealth of new geographical, biological, and anthropological information, but no sign of a southern continent. Again, the shores had been pushed south from their presumed position.

In July of 1772, Cook sailed from England again, and this time, following both the British Admiralty's instructions and his own inclination, the search for the southern continent was his primary mission. In early December of that

> It seems ironic that the severe weather that makes the Southern Ocean so dangerous, particularly in the south Atlantic, was a key factor in the discovery of Antarctica. Time and time again, sailors blown off course by a storm discovered new land. Often, this new land was farther south than any previously known.

> Scott's Hut was the base of operations for Captain Robert Scott and his team who ultimately reached the pole but failed in their attempt to return to camp and perished en route. It was last used by Ernest Shackleton's team on their expedition in 1917 and has been abandoned since but preserved in a remarkable state due to the cold temperatures.

➤ Ironically, it was Cook's own penchant for thoroughness that fueled the burst of activity that followed his voyage; he had noted in his log the large numbers of seals and whales he observed in the high latitudes. Before long, hunters were headed south.

“James Cook's Antarctic circumnavigation stands as one of the greatest of all human voyages of exploration.”



▲ Captain James Cook, British explorer, the first to cross the Antarctic Circle

year Cook crossed the convergence and came upon his first iceberg. On January 17, 1773, at about Longitude 40° East, he made the first crossing of the Antarctic Circle in history. At 67° 15'S, the ice pack forced them north again, a mere 80 miles from the Antarctic coastline.

Cook headed south again in late November, 1773. He crossed the Antarctic Circle for the second time in December, reaching 67° 31'S. Once again, however, the pack ice forced him north. On January 26, 1774, his ship *Resolution* crossed the Antarctic Circle for a third time, reaching 71° 10'S at 106° 54'W in the Amundsen Sea. This was farther south than anyone had ever gone before.

On January 14, 1775, after passing through the Straits of Magellan, he sighted new land. By January 16, he had named Willis' and Bird Islands and had re-discovered and named South Georgia Island. Finally, on January 26, the *Resolution* came upon the southern end of what are now known as the South Sandwich Islands. At close to Latitude 60° South, they were at that time the southernmost land ever sighted.

Near the end of February, 1775, Cook crossed his track of 1772, completing the first circumnavigation of Antarctica and proving once and for all that the southern continent, if one existed, was neither as large nor as habitable as once thought. He did believe there was a southern land mass, but that it was of little use to anyone.

James Cook's Antarctic circumnavigation stands as one of the greatest of all human voyages of exploration. His thorough investigation and reasoned dismissal of Antarctica's value was enough to dissuade governments from further expenditures. In fact, except for one British and one Russian expedition, government-funded exploration in the Southern Ocean entered a sixty-year hiatus. But Cook had not taken human greed into consideration.

## THE AGE OF SEALERS AND WHALERS

Between 1784 and 1822, millions of seal skins were taken from South Georgia, the Falkland Islands, the Cape Horn region, the South Sandwich Islands, and the coast of Chile. As many as three million skins were taken from the Juan Fernandez Islands alone, driving the seal population there nearly to extinction. Subantarctic islands, such as Kerguelen, Crozet, Marion, Prince Edward, and Macquarie, were fully exploited as well, leaving sealers eager to find new hunting grounds.

Whalers came south, too, to hunt the southern right whale and to take advantage of the abundance of seals and the high profits of sealing. While many whalers joined the slaughter of fur seals, others hunted the southern elephant seal. Millions of elephant seals were butchered and rendered into oil as a substitute for whale oil.

A new phase in Antarctic exploration, and exploitation, began in 1819. A merchant captain named William Smith was sailing around Cape Horn on his way to Valparaiso, Chile when he detoured to the south to avoid unfavorable winds. On February 19, he sighted previously unknown land and the next day, after the weather had cleared a little, he fixed its position at 62° 17'S and 60° 12'W, further south even than Cook's South Sandwich Islands. Smith had discovered Livingston Island in the South Shetlands. More importantly, he had discovered more seals.

Smith returned in October of the same year to take soundings and to explore his find. On October 16, he made a landing on Desolation Island, planted the flag, and claimed the new land for Britain.

The seal hunters didn't waste any time. As soon as word of Smith's discovery got around the ports of Argentina and Chile, merchantmen were scrambling to take advantage of the new hunting grounds. The first ship to arrive in the South Shetlands was a chartered Argentine vessel. The crew took 14,000 skins in five weeks. On December 25, 1819, British sealers landed on Rugged Island, claimed it for Britain, and set about their business. The American sealer *Hersilia* (with Nathaniel Palmer as second mate) sighted Smith Island on Jan-

uary 18, 1820, and arrived at Rugged Island to join the British a few days later. The extermination of South Shetland seals had begun.

### THE DISCOVERY OF THE SIXTH CONTINENT

The Antarctic continent was first sighted on January 16, 1820 (January 27 by New Style) by the Russian Antarctic Expedition under the command of Fabian Gottlieb Thaddeus von Bellingshausen (Russian: Faddey Faddeyevich Bellinsgauzen).

On January 15, 1820, Bellingshausen crossed the Antarctic Circle (just west of the Greenwich Meridian). His crew was only the second group of men in history to do this. The next day, Bellingshausen was prevented from going further south by a massive, continental ice shelf. This was the Finibul Ice Shelf, and the occasion marked the first sighting of the continent of Antarctica by human eyes.

During the course of the next three weeks, Bellingshausen crossed the Antarctic Circle twice more, each time sighting a barrier of continental ice. On January 27, he recorded his position as 69°21'S, 2°14'W and on February 5 as 69°07'S, 15°00'W. Both times he noted the existence of an enormous ice shelf to the south, stretching far away to the east and west. Since he was only a few miles from the coast of Antarctica each time, the ice shelf was undoubtedly the one that rims the Princess Astrid Coast.

Bellingshausen continued his explorations for the next year, becoming the first explorer to circumnavigate Antarctica since James Cook. On January 21, 1821, Bellingshausen reached 69°53'S and discovered the most southerly known island (Peter I Island). He saw the continent again on January 28 at 69°43'S and named it the Alexander Coast (now called Alexander Island).

Meanwhile, after William Smith's discovery of South Shetland Islands, the British Royal Navy had sent Edward Bransfield to determine if the new land was part of a continent or a string of islands. Bransfield was also ordered to chart harbors, to collect natural science specimens,

and to take weather and magnetic readings. On January 16, 1820, he sighted Livingston Island, and on January 22 made a landing on King George Island, claiming the land (yet again) for Britain. Sailing southwest, Bransfield discovered Deception Island, Tower Island, and the Bransfield Strait. On January 30, Bransfield (or a member of his crew) was the first to lay eyes on the mountains of the Antarctic Peninsula, a place he called "Trinity Land".

Bransfield continued his explorations until the middle of March, 1820, discovering Gibbs, O'Brien, Elephant, Seal, and Clarence Islands, and sailing into the Weddell Sea—the first person in history to do so.

### SEALER-SCIENTISTS

The next sixteen years saw several attempts by sealers to locate new sealing grounds. Many of these voyages were underwritten by the British whaling firm Enderby Brothers (formerly Enderby & Sons), whose owners were as eager to have their captains make new geographical discoveries as they were to have them turn a profit. As a result, new islands were discovered and thousands of miles of new coastline were charted. The outlines of the new continent began to take shape.

One of the first of these "sealer-scientists", however, was not an Enderby man. He was James Weddell, captain of the brig *Jane*. Weddell had taken part in the 1820-21 and 1821-22 sealing seasons in the South Shetlands and had made enough money to finance a third expedition. Like the Enderbys, Weddell was as interested in new discoveries as he was in filling his hold with fur seal skins. He was an avid explorer, naturalist, and geographer. He was also the first Antarctic conservationist, noting that with a little sensible management the South Shetland fur seal population could have provided a sustainable annual harvest of about 100,000 skins. Instead, greed had destroyed the breeding population.

Weddell's first destination was the little-explored South Orkney Islands. On January 15, 1823, he collected six skins of a new species of seal, the one that would later bear his name (*Leptonychotes weddelli*). Finding few fur seals, Weddell carefully charted the islands, then be-

“James Weddell was an avid explorer, naturalist, and geographer. He was also the first Antarctic conservationist.”



▲ Fabian Von Bellingshausen, Russian explorer, the discoverer of the Antarctic mainland



▲ Vostok and Mirny – Russian Antarctic Expedition's ships



▲ James Weddell, British sailor, navigator and seal hunter



▲ The discovery of the Adélie Land

gan to search in uncharted waters. He headed south for a while, then scoured the sea between the South Orkneys and the South Sandwich Islands. Finally deciding that if there were any new lands they must be to the south, he once again set course that way. By February 17, 1823, Weddell was deep into the Weddell Sea. On February 20, at longitude  $34^{\circ} 16' W$ , James Weddell fixed his position at  $74^{\circ} 15' S$ , farther south than anyone had ever gone before. It would be over 80 years before anyone would get that far south again in the Weddell Sea.

At least five landings on the Antarctic continent were made by sealers during this period but, as none of them resulted in finding seals, the records of these significant historical events are fragmentary. In contrast with James Weddell, very few sealers wrote of their experiences as secrecy about the location of good sealing beaches formed a major part of their success.

### THE SEARCH FOR THE SOUTH MAGNETIC POLE

Inspired by Weddell's deep foray into the Weddell Sea, the French, British, and United States governments launched exploratory missions. All of them had two goals: discover new lands and locate the South Magnetic Pole.



▲ Dumont d'Urville, French explorer and naval officer

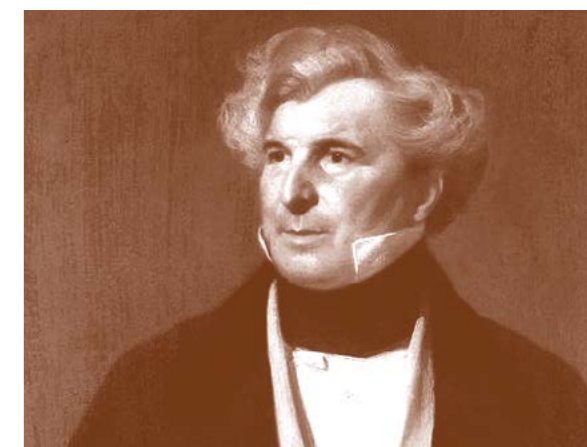
The first to sail was Jules Sébastien César Dumont d'Urville. During late February to early March 1838, d'Urville charted parts of the Antarctic Peninsula and then headed south to search for the Magnetic Pole. During this second southern excursion his ships got to within four miles of the continent. On January 21, 1839, several of his men landed on a small islet a few hundred meters offshore and claimed all the land they had seen for France. Dumont d'Urville named it Terre Adélie (Adélie Land).

The American expedition was commanded by Lt. Charles Wilkes. His United States Exploring Expedition was comprised of six ships and 433 men, making it the largest expedition ever dispatched to explore the Southern Ocean. The fleet sailed in August 1838 with several naturalists and scientists. Wilkes' first foray to the south, in the peninsula region, brought no new discoveries. On his second excursion, however, he charted several hundred miles of new coastline, starting with Cape Hudson in Terre Adélie on January 16, 1840, and ending with what is now called the Shackleton Ice Shelf on February 21. As with d'Urville, ice prevented Wilkes from reaching the Magnetic Pole, but much of the area he charted is now known as Wilkes Land.

Dumont d'Urville had been sent south largely to extend French influence in the Southern Ocean, and Wilkes had been instructed to chart the dangerous southern seas. Their searches for the Magnetic Pole had been secondary. James Clark Ross, on the other hand, was specifically tasked with finding the elusive pole. He had already found the North Magnetic Pole (in 1831), so it seemed fitting that he should search for the southern one.

Ross left England in early October 1839, in command of two ships. Ross' flagship was the *Erebus*, and Francis Crozier was in command of the *Terror*. The men spent the austral winter of 1840 in Australia, where Ross read of d'Urville's and Wilkes' discoveries. Their accounts convinced him to sail farther east before turning south. It was a key decision. On January 9, 1841, Ross pushed through the pack ice and into the Ross Sea. Two days later he sighted the most southerly land yet, a range of mountains he named the Admiralty Range. On January 12, he landed on Possession Island and claimed the land, which he called Victoria Land, for England.

> The new land and the Adélie penguin were named after Dumont d'Urville's wife.



▲ James Clark Ross, British naval officer and explorer

“On January 24, 1895, members of the 1893-94 whaling expedition headed by Captain L. Kristensen and Norwegian explorer Carsten Borchgrevink landed at Cape Adare. It was the first-ever landing on the Antarctic continental mainland.”



▲ Carsten Borchgrevink, Anglo-Norwegian polar explorer

By January 22, Ross had beat Weddell's farthest south. Discoveries followed one after the other. On January 27, he landed on and claimed Franklin Island. The next day, he discovered and named Mounts Erebus and Terror on Ross Island. His ships' southerly advance was stopped finally by the Ross Ice Shelf (which Ross called the Victoria Barrier). James Ross had sailed as far south as it is possible to do. He had also discovered that the South Magnetic Pole lay inland, inaccessible by sea.

### THE WHALERS' DISCOVERIES

During the early part of the 19th century, whalers had ventured farther south to look for additional stocks of the rapidly disappearing southern right whales. Their search for prey brought new geographical discoveries: Bismarck Strait and the Neumayer Channel were discovered by a German captain, Eduard Dallmann; Dundee Island was discovered by whalers of Dundee Expedition; Foyen Land and King Oscar II Land were discovered by the Norwegian whaling expedition under Captain Carl Anton Larsen.

Deciding to seek right whales in the Ross Sea, Norwegian businessman Henryk Bull and whaler Svend Foyn financed the 1893-94 whaling expedition of the ship *Antarctic*, commanded by Captain L. Kristensen. Carsten Borchgrevink, a Norwegian immigrant, joined the ship in Australia. After taking seals in the subantarctic islands, the crew of the *Antarctic* made for the Ross Sea. On January 16, 1895, they sighted Cape Adare but the ice kept them offshore. They landed on Possession Island and Borchgrevink discovered lichen on the rocks, the first time vegetation had been recorded in the deep Antarctic. On January 24, they were able to land at Cape Adare, the first-ever landing on the continental mainland. Several biological and geological specimens were collected before the crew headed back to Australia.

This landing, and the specimens collected, were to provide the fuel for the greatest upsurge in Antarctic exploration yet seen.



▲ A killed whale on the Grytviken flensing plan

### THE HEROIC AGE OF EXPLORATION AND CONTINENTAL PENETRATION

In July of 1895, participants of the Sixth International Geographical Congress called for further exploration of the Antarctic regions. Scientists and explorers from Belgium, Britain, France, Germany, Sweden, Scotland, Norway, Australia, and Japan soon heeded the call. Nearly all of the resulting expeditions were designed from the outset to conduct scientific investigations. The reasons for activity in the Antarctic had begun to shift away from profit and toward science (with a fair measure of national pride thrown in).

On August 16, 1897, Belgian naval officer Adrien de Gerlache set sail from Antwerp in the refitted whaler *Belgica*. With a multinational crew including Roald Amundsen, Frederick Cook, and Henryk Arctowski, the Belgian Antarctic Expedition reached the Antarctic Peninsula in January 1898. The ice-strewn waterway through which he sailed, between the rugged coast of Graham Land and a long string of islands to the west, was named Gerlache Strait in his honor. After naming and charting several islands during some 20 separate landings, the expedition crossed the Antarctic Circle on February 15, 1898. Later that month, they became trapped in the ice of the Bellinghousen Sea. They were forced to spend a



▲ Adrien de Gerlache, Belgian Naval officer and explorer



▲ The *Discovery* frozen into offshore ice during the winter, Antarctica

long, grueling winter struggling to free their ship from the clutches of the ice. In March 1899, after over a year in the ice, they freed their ship and sailed back to Belgium with news of their discoveries.

Meanwhile, success of the British Antarctic Expedition of 1898-1900 under command of Carsten Borchgrevink (it was so-named because the wealthy British publisher Sir George Newnes had sponsored it; only three of its members were actually British) marked the beginning of humankind's penetration into the vast Antarctic interior. Borchgrevink, along with nine other men and 75 dogs, spent the winter in the camp they established at Cape Adare. Borchgrevink and two others climbed the Ross Ice Shelf and sledged south to 78°50'S. This was farther south than anyone had ever gone. The expedition zoologist, Hanson, died and was the first person to be buried on the Antarctic mainland.

In 1901 Robert Falcon Scott, an officer in the Royal Navy, led the *Discovery* expedition to Victoria Land. The ship *Discovery* was the first British vessel built specifically for scientific explorations in high latitudes.

The expedition built a hut at the southern tip of Ross Island in McMurdo Sound where *Discovery* wintered. Scott and two his companions, Edward Wilson and Ernest



▲ Robert Falcon Scott, British Royal Navy officer and explorer

Shackleton, trekked south using dogs to pull their sledges. They reached 82°S before being forced to turn back.

In the same year Otto Nordenskjöld led a Swedish expedition to the Weddell Sea but his vessel *Antarctic* was destroyed by pack ice and sank. After a series of adventures and extraordinary hardship, involving small groups of men stranded at three different places, the whole party was rescued more than two years later in November 1903.

In 1903, a French expedition followed under Jean-Baptiste Charcot. He settled in for the austral winter of 1904 in a bay on the coast of Booth Island, near 65°S on the western side of Graham Land but the expedition was cut short when the ship struck a submerged rock. Charcot returned in 1908 aboard the *Pourquoi-pas?* to continue his work of charting the coast of Graham Land and all offshore islands. In all, he surveyed more than 2,010 kilometers (1,250 miles) of coastline and new territory. Charcot was a very humane man, known as "the polar gentleman", and was one of the first to point out the dangers of over-exploiting the whales.

Ernest Shackleton's *Nimrod* Expedition left New Zealand on New Year's Day, 1908 with the primary goal of reaching the Geographic South Pole. Shackleton and five other men made the first ascent of Mount Erebus, the second highest volcano in Antarctica. On January 9, 1909, Shackleton and his pole party made it to a farthest south of 88°23'S on the polar plateau, a mere 156 kilometers (97 miles) from the pole, before being forced to turn around.

The final assault on the South Pole began in January 1911 with the arrival of Roald Amundsen and his ship, the *Fram*, at the Bay of Whales and the arrival of Robert Scott in the *Terra Nova* at Cape Evans, Ross Island. Both built substantial camps and settled in for the winter. On October 20, Amundsen and four others set out with sledges and dog teams to make the pole. On November 11, he spotted and named the Queen Maud Range. He passed Shackleton's furthest south on December 8, and on December 14, 1911 Amundsen and his team reached the Geographic South Pole.



▲ Roald Amundsen, Norwegian polar explorer, the first to reach the South Pole



▲ Amundsen and his team at the South Pole



▲ Robert Scott and his crew celebrate Scott's birthday in Terra Nova Hut

Where Amundsen's overriding goal was to make the pole, Scott had planned substantial scientific studies as well. He sent a western party out to explore the Dry Valleys and the Koettlitz Glacier. A northern party was deposited at Cape Adare in February 1911, where they repaired Borchgrevink's two huts and built a third winter hut of their own. They spent the winter making exploratory surveys of the Victoria Land coast.

Edward Wilson, Birdy Bowers, and Apsley Cherry-Garrard embarked on a winter overland trip from Cape Evans to Cape Crozier to collect emperor penguin eggs. It was to be a journey forever labeled as "The Worst Journey in the World". The men endured temperatures below  $-50^{\circ}\text{C}$  ( $-58^{\circ}\text{F}$ ), one time as low as  $-61^{\circ}\text{C}$  ( $-78^{\circ}\text{F}$ ) and were battered relentlessly by vicious storms. But they survived to bring eggs back to Cape Evans.

On November 1, 1911, Robert Scott and his party left for the South Pole. The going was slow and difficult. On January 9, 1912, they reached Shackleton's furthest south. Finally, on January 17, they reached the pole, only to find Amundsen's tent and a Norwegian flag waiting for them. The sight destroyed their morale. Short of food and pinned in their tent several times by storms, all five of the



▲ Sir Douglas Mawson, Australian geologist and Antarctic explorer

pole party members died on the return trip. Douglas Mawson landed his own party at Cape Denison in Commonwealth Bay at about the same time when that Scott reached the South Pole in January 1912. He established a camp on a rocky promontory of Cape Denison. By the time he realized he had selected one of the windiest places on Earth, it was too late. Once the Cape Denison camp was under construction, the ship left to deposit the eight-man "western party" at the Shackleton Ice Shelf, where another camp was established. During the course of the next year, the western party mapped large areas of Queen Mary Land and discovered new penguin rookeries.

Mawson's group at Commonwealth Bay surveyed and mapped sections of George V Land and attempted to reach the South Magnetic Pole. On one sledging trip, Mawson lost both of his partners (one in a crevasse and the other to vitamin A poisoning) and very nearly perished himself. On one occasion he fell into a crevasse and had to extricate himself. Because he didn't return to Cape Denison in time to be picked up by his ship, he and several others were forced to spend a second winter. They were finally rescued on December 24, 1913. Mawson's expedition is notable for several firsts. He established the first flagged road over the otherwise trackless snow. He discovered the first meteorite in Antarctica. Most notably, as a harbinger of what was to come, Mawson brought the first airplane to Antarctica (even though it never flew) and was the first to use a radio. In February 1913, two-way radio communication was established between Cape Denison and Macquarie Island. The airplane and radio would soon transform Antarctic exploration.

The final major quest of the heroic era was Ernest Shackleton's Endurance Expedition in 1914. Shackleton had failed in his own attempt to be the first man to reach the South Pole, but he conceived another goal in trying to be the first man to lead an expedition across Antarctica. His plan was to traverse the continent from the Weddell Sea to the Ross Sea. But his ship, *Endurance*, became trapped in the Weddell Sea pack ice and drifted through the winter. Ultimately, the *Endurance* was crushed by the ice and sank on November 21, 1915. There followed the most incredible survival story in Antarctic history.



▲ A member of Mawson's expedition surveys pancake ice in Commonwealth Bay

➤ "For scientific discovery give me Scott; for speed and efficiency of travel give me Amundsen; but when disaster strikes and all hope is gone, get down on your knees and pray for Shackleton."  
Sir Raymond Priestly,  
Antarctic Explorer and  
Geologist.





▲ Sir Ernest Henry Shackleton, British polar explorer

Shackleton and his men dragged and rowed their lifeboats over the ice and through transitory leads until they made it to Elephant Island. From there, Shackleton and five others set out in the largest of the boats, the 6-meter (20-foot) *James Caird*, to cross about 1300 kilometers (800 miles) of the stormiest seas in the world. After fifteen grueling days, they arrived at the southern shore of South Georgia Island. Rough seas delayed their landing for two days. Shackleton and two others then climbed across the island (with no food, water, or shelter) to reach the whaling station at Stromness Bay.

Meanwhile, the twenty-two men stranded on Elephant Island survived by using upturned boats as shelters. Food was meager; at times they were reduced to eating stewed seal bones and seaweed. Finally, after several unsuccessful attempts, Shackleton returned to rescue them in the Chilean trawler *Yelcho*, 105 days after they had arrived.

Shackleton also had a party in the Ross Sea whose job it was to lay depots for the traverse team. These men became stranded when their ship blew away in a blizzard and were forced to winter at Cape Evans and Hut Point on supplies left over by Robert Scott. The men trapped at Hut Point (after laying depots for the now-nonexistent traverse) had it particularly bad. One died of scurvy and two others were lost in a blizzard. The remaining men were finally rescued in January of 1917.

In the 27 years since Carsten Borchgrevink first set foot on Cape Adare, Antarctica had seen seventeen expeditions from eight countries.

### THE MECHANIZED AGE OF EXPLORATION

The advent of more powerful engines, steel-hulled ships, airplanes, and radios greatly advanced the cause and execution of Antarctic exploration. The radio was particularly important; for the first time, Antarctic explorers were not completely isolated from the rest of the world.

One of the first to use the new aeronautical technology was Sir Hubert Wilkins. From a base at Deception Island, Wilkins flew over Graham Land and became the



▲ Shackleton and his companion camping on the pack ice after the *Endurance* had sunk

first Antarctic explorer to discover new land by air. He was also the first to use aerial photography for mapping.

Richard Byrd's first Antarctic expedition reached the Ross Ice Shelf on December 25, 1928. He had with him three airplanes, 95 dogs, and over 50 men. His goal was to fly over the South Pole. After establishing his Little America camp at the Bay of Whales, Byrd made his first flight on January 15, 1929. On a flight two weeks later, he discovered the Rockefeller Mountains. Several other reconnaissance flights were made, then the planes were stored and the men settled in for the winter.

The next austral summer, on November 28, 1929, Byrd and three others took off in their Ford Tri-motor and headed south. After a harrowing climb over the Transantarctic Mountains, Byrd and his crew became the first to fly over the South Pole, on November 29, 1929.

Richard Byrd returned to Antarctica with another expedition on January 17, 1934, this time with scientific research as his primary goal. After re-occupying Little America for the winter, he and his team set about their work, which included more survey and mapping flights, ground-based geology, meteorology, biology, and atmospheric studies. Richard Byrd spent most of the winter alone at an inland camp, the Bolling Advance Weather Station, where he nearly perished from carbon monoxide poisoning.

This expedition could boast two notable accomplishments. Byrd proved once and for all that Antarctica was a single continent and that there was no channel between the Weddell and Ross Seas. This was also the first expedition successfully to use motorized transport on the ice (three Citroen tractors).

In 1935 Lincoln Ellsworth, a polar explorer from the United States, arrived at Dundee Island at the tip of the peninsula, preparing to fly across Antarctica to the Ross Sea. Though Ellsworth was forced down by weather several times, he nonetheless succeeded in being the first to fly across the continent. Ellsworth and his companions were also the first to land and to take off again in unknown territory. During the journey, they discovered the Ellsworth Mountains.



▲ Sir George Hubert Wilkins, Australian polar explorer and pilot

“Sir Hubert Wilkins was the first to use the aeronautical technology in Antarctica. He became the first Antarctic explorer to discover new land by air.”



▲ Richard Evelyn Byrd, American naval officer and navigator



## Penguins

If you ask somebody to name five things about Antarctica, one of them will surely be “penguins”. Only two species (emperor and Adélie) of this iconic Antarctic bird live in the heart of the sixth continent, although others (chinstrap, gentoo and macaroni) breed on the northern tip of the Antarctic Peninsula, where conditions are less harsh. King penguins only breed on the warmer, more northerly subantarctic islands.

Antarctic penguins all have striking black and white plumages. The distinguishing features of each penguin species are on their heads and necks—some are black and white, some have yellow patches, and others have colored eyebrows.

All penguins have similar body form and structure but they vary greatly in size, from the little penguin, weighing only 1.1 kg (2.4 lb) and reaching about 40 cm (1.3 ft) tall, to the emperor penguin, which weighs up to 40 kg (88.2 lb) and stands about 115 cm (3.8 ft) tall.

Penguin Species	Approximate weight	Approximate height
Adelie	5.3 kg (11.7 lbs)	71 cm (2.3 ft)
Chinstrap	5.0 kg (11 lbs)	71 cm (2.3 ft)
Emperor	38 kg (83.8 lbs)	115 cm (3.8 ft)
Gentoo	5.6 kg (12.3 lbs)	75 cm (2.5 ft)
King	16 kg (35.3 lbs)	94 cm (3.1 ft)
Macaroni	5.0 kg (11 lbs)	71 cm (2.3 ft)

Although they have wings and feathers, penguins cannot fly. Instead, they have evolved into the most efficient swimmers and divers of all birds. Some species spend 75% of their time at sea—the most of any bird.

“If you ask somebody to name 5 things about Antarctica, one of them will surely be “penguins”.”



▲ *Gentoo penguins, Cuverville Island*

◀ *Page 48. Gentoo penguins*

> Do penguins have knees? Yes they do, but hidden under their feathers. Penguins appear to have very short legs, but this is because the upper parts can't be seen underneath their baggy coat.

Penguin wings are stiff, short flippers that propel them underwater—they literally fly through the sea. Their legs are set far back on the body and, together with the tail, form an underwater rudder to steer their perfectly streamlined bodies. Their “cruising” speed in water is about 10 kilometers per hour (6.2 mph). To take breaths and to save energy while swimming, they leap clear of the water every few meters.

They are excellent divers, descending to depths of over 250 meters (820 feet), though most dives are not deeper than 10 meters (33 feet). Unlike flying birds, penguin bones are dense to facilitate diving. Underwater they are every bit as fearsome to their prey as lions are to theirs!

However, penguins are rarely seen underwater, so our main impressions of them are confined to how they appear on land. With their legs set far back for efficient movement underwater, penguins walk awkwardly in a very upright position. This is possibly the reason for their extraordinary appeal: they look like funny little people.

Even on land, penguins are surprisingly agile. They can travel vast distances on foot or by “tobogganing”—sliding on their bellies over the ice, propelled by their wings and feet. Some penguins are also able to hop up great heights compared to their size.

### PENGUINS OF OLD

Fossil records show that penguins evolved from flying birds (petrels) about 50 million years ago. There were at least 25 species, many of which have become extinct. Some prehistoric penguins were larger than the ones that exist today, with one species almost as tall as a man—1.7 meters (5.6 feet).

### KEEPING WARM

Penguins cope well in the cold—some breed in the coldest conditions in the world. Their short outer feathers overlap, like tiles on a roof, to form a thick waterproof

layer. Underneath they have fluffier feathers for warmth. Like seals and whales, a layer of fat under the skin provides insulation (and extra energy reserves for when food is scarce). As a rule, the larger the body, the easier it is to conserve heat. In fact, many penguins are so good at keeping warm that they have a problem with overheating during the summer months.

### COLONIES

Penguins are sociable creatures both on land and at sea. Their colonies—known as “rookeries”—are often huge, some with up to a million nesting pairs. In the pure Antarctic air, you can smell a penguin rookery from a long way away! Penguins generally breed on exposed rock, beaches, or tussock grass, with the exception of the emperor, which breeds on sea-ice.

### ENEMIES

A healthy adult penguin on land has no natural predators, though eggs and chicks are taken by other birds such as skuas and giant petrels. Penguins usually live in places free of land predators, against which they would be mostly defenseless. However, in water, penguins are hunted by leopard seals and killer whales. Leopard seals cruise the ice edge next to penguin colonies, waiting for the birds to plunge into the water.

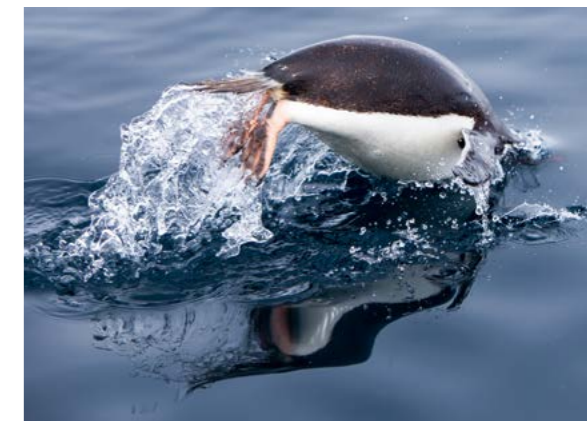
### FOOD

The penguin diet consists mainly of fish, squid, and crustaceans. In the Antarctic, smaller penguins feed mostly on shrimp-like krill. Although krill are small, up to 5 cm (2 inches) in length, they form dense swarms which are a rich food source. Penguins can adapt their diet to what is available, and their diets vary considerably with the seasons.

Electronic dive recorders fitted to the backs of penguins give a picture of their feeding habits, recording the times and depths of their dives. The deepest diving



▲ Meeting a gentoo penguin



▲ Diving gentoo penguin

“Penguins are excellent divers, descending to depths of over 250 meters (820 feet). Underwater they are every bit as fearsome to their prey as lions are to theirs!”

### > Why don't penguins' feet freeze?

Penguins stand for hours on ice, but they have two clever ways of keeping their feet the right temperature—a few degrees above freezing. Blood flow to their feet is tightly controlled, with reduced flow in cold conditions. Heat exchangers at the top of their legs take heat from the blood flowing to the feet, and use it to heat up the blood flowing back into the body.



▲ King penguins, Gold Harbour

penguins are the kings and emperors as they search for squid and fish. The record holder is a female emperor penguin who reached an astonishing depth of 535 meters (1,755 feet).

### NUMBERS AND BREEDING

The total number of breeding pairs of penguins in the Antarctic region is estimated to be about 20 million. Although this covers a huge geographical area, the penguins are concentrated in coastal regions. Huddled up in the cold of winter, emperor penguins can reach a density of 19 birds per square meter.

The timing of breeding is crucial for penguins. Unlike humans, who can have babies at any time of year, the penguin breeding cycle is finely tuned so that chicks hatch and are ready to fend for themselves when food is most plentiful.

Penguins are very sensitive to environmental conditions. Breeding success is usually controlled by the abundance and availability of prey. If sea-ice does not break up, or if krill numbers are low, then significant breeding failures can occur, with few chicks surviving. Older birds are the most successful breeders.

Most penguins (except the emperor and king) lay more than one egg, usually two. Incubation duties are shared by both parents working in shifts until the chick hatches, with varying shift lengths from daily changeovers (gentoo) to over a month (emperor). When they are old enough, chicks gather together in a crèche, watched over by a few adults. This allows both parents to feed at sea, and provides the chicks some protection from the elements and predators.

### FEATHERS AND MOLTING

A penguin's feathers keep it waterproof and warm, and must be well oiled (using oil from a special gland at the base of the tail). But feathers become worn out and must be replaced every year. During the molting period of 3-4 weeks, penguins come ashore. Because

they are not waterproof when they are changing their feathers, they cannot go to sea to feed. Therefore, penguins fatten up before molting, gaining an additional 50-70% in weight.

### ADÉLIE PENGUIN (*PYGOSCELIS ADELIAE*)

With their black back and head and white front, Adélie penguins are like miniature men in evening attire. They are named after the wife of Dumont d'Urville, the French Antarctic explorer.

Adélie penguins are true Antarctic penguins, restricted to Antarctic coastal waters. During winter they spend their time in the pack ice. In the summer they move south, back to the Antarctic coast.

Tightly packed Adélie rookeries of many thousands of pairs are found all around the Antarctic continent, on ice-free slopes and islands, often far from open water. Fishing mainly for krill, they can dive up to 175 meters (574 feet), but mainly catch their food at the surface.

Adélie penguins experience the briefest of breeding seasons in the harshest conditions. The males arrive at the breeding ground first, sometimes walking many miles over sea-ice. When the females arrive a few days later, a brief courtship of flipper-waving and calling follows. But they must hurry—with such a short summer, they don't have much time. Two eggs, tended by both parents, are laid in mid-November and hatch in late December. The chicks join a crèche at three weeks old, and by mid-February they are at sea.

Adélie chicks are very vulnerable until they reach the crèche stage; less than two-thirds of them make it this far. Once at sea they are relatively safe and can live more than 16 years. Though they have the highest mortality rate for juveniles and adults of any penguin species, they are a successful species, with an estimated total population of two and a half million pairs.

“With their black back and head and white front, Adélie penguins are like miniature men in evening attire. They are named after the wife of Dumont d'Urville, the French Antarctic explorer.”



▲ Adélie penguin

> Chinstrap penguins take their name from the obvious line of black feathers that runs, like the strap of a hat, under their white chins.

> In the world of penguins, chinstraps live in some of the largest cities, with colonies of over 100,000 pairs on some islands.



▲ Chinstrap penguin

### CHINSTRAP PENGUIN (*PYGOSCELIS ANTARCTICA*)

Named after the band of black feathers under their chin, chinstrap penguins are probably the most abundant penguin in the Antarctic regions with an estimated population of nearly eight million pairs, concentrated mostly on the Antarctic Peninsula.

Living mainly on a diet of crustaceans (they can dive up to 70 meters, 230 feet, but catch most of their food in half-minute dives in the top 10 meters, 33 feet, of the sea), chinstraps stay close to their breeding grounds in summer. They often feed at night.

They nest on ice-free slopes with thousands of other breeding pairs, sometimes alongside Adélie and gentoo penguins, their closest relatives. The highest slopes are the most popular (they become ice-free earliest in spring). Beak and claws are used to reach seemingly inaccessible nesting sites.

Chinstrap penguins form a strong pair bond, returning each year to the same nest site with the same partner. Because of their warmer breeding location, chinstraps enjoy a longer breeding season than Adélies.

A clutch of two eggs is laid in late November and hatch in early January. Chicks are usually fledged two months later. The two chicks are treated equally by the parents, but breeding success is severely reduced if the sea-ice blocks access to feeding areas near their colonies.

### EMPEROR PENGUIN (*APTENODYTES FORSTERI*)

The emperor is the giant of the penguin world and one of the largest of all birds. Gold patches on their ears and on the top of their chest brighten up their black and white bodies. If the Adélies are the jesters of the penguin world, then the slow, dignified emperors are the elder statesmen. Emperors and their closest relative, the king penguin, have unique breeding cycles, with very long chick-rearing periods. Emperor penguins breed the farthest south of any penguin species, forming large colonies on the

sea-ice surrounding the Antarctic continent. They are true Antarctic birds, rarely seen in subantarctic waters.

To give chicks a chance to fledge in the late summer season, emperors breed during the cold, dark winter, enduring temperatures as low as  $-50^{\circ}\text{C}$  ( $-58^{\circ}\text{F}$ ) and winds up to 200 kilometers per hour (124 mph). The female lays a single egg in May then passes it over to her mate to incubate while she goes to sea to feed. For nine weeks the male fasts, losing 45% of his body weight.

The egg is balanced on the male's feet and enveloped in a thick roll of belly skin and feathers. The egg can be kept  $70^{\circ}\text{C}$  ( $126^{\circ}\text{F}$ ) warmer than the outside temperature. To achieve this amazing preservation of heat, emperors have a special combination of adaptations, including a dense double layer of feathers and a large fat reserve. They also eschew the aggression found in other species, with up to 5,000 adults and chicks huddling together for warmth, constantly shuffling around so each gets a turn on the inside of the group. Also, to further prevent heat loss, emperor penguins have proportionally smaller beaks and flippers compared to other penguins.

When the female arrives back in August, just around the time when the chicks are due to hatch, she takes over feeding the chick. Then the male treks up to 100 kilometers (62 miles) over the ice to find food. Afterwards, both adults rear the chick.

When the sea-ice begins to break up in December/January, the chicks shed their soft down but still go to sea, weighing only 60% of adult weight, the lowest value for any penguin. It is thought that emperors evolved this unusual winter breeding strategy to allow the chick to be independent at a time when food is most plentiful. They can breed when they are three years old, but many will not start until they are six. They can live for up to 20 years.

They have a high survival rate compared to other penguins, with an average of 95% surviving the first year. However, if it is a harsh sea-ice year, many chicks will die of starvation. Emperors are the least common Antarctic penguin, with only about 200,000 breeding pairs.

> Emperor penguins may be the only bird never to set foot on land. They even breed on frozen sea.

“The emperor is the giant of the penguin world and one of the largest of all birds. Gold patches on their ears and on the top of their chest brighten up their black and white bodies. If the Adélies are the jesters of the penguin world, then the slow, dignified emperors are the elder statesmen.”



▲ Emperor penguins



▲ A gentoo penguin with its chicks

### GENTOO PENGUIN (*PYGOSCELIS PAPUA*)

No one knows where the name “gentoo” came from, but these penguins live up to their Latin name *Pygoscelis*, which means “brush-tailed”. Of all the penguins they have the most prominent tail, which sticks out behind and sweeps from side to side as they walk.

They have white patches extending from their eyes and bright red-orange beaks. They are one of the least numerous Antarctic penguins, with about 300,000 breeding pairs.

Gentoo penguins are less gregarious than other penguins and are usually found in small groups, sometimes with other species. Although they are not strongly attached to the same nest site (they have plenty of choice of sites) their pair-bonding is strong; they usually mate with the same partner as the previous year.

They nest on low hilltops or open beaches. When available, they make a nest with pebbles and other objects, or they may use a scrape in the ground. In any case, nests are fiercely defended. Two eggs are laid. In southern locations the first- and second-born chicks are equally likely to survive, but on more northerly islands the second gentoo chick to hatch usually dies. If both chicks die, breeding may take place again. Once hatched, the chicks join a crèche about a month later.

There are large differences in gentoo penguins from different locations. Fledging is much quicker in the south (62-82 days) than in the north (85-117 days) and gentoos from the south are smaller than their northerly relatives. Unusually for penguins, their breeding success fluctuates greatly from year to year.

### KING PENGUIN (*APTENODYTES PATAGONICUS*)

The king penguin is the second-largest penguin, with a striking patch of orange-gold feathers on their neck. They are expert divers, reaching depths in excess of 240 meters (787 feet), but walk slowly and deliberately on land.



▲ A king penguin with its downy chick

Unlike their closest relative, the emperor penguin, kings prefer warmer temperatures and live in subantarctic regions. Although they look similar, king and emperor penguins rarely meet. King penguins live on the vegetated margins of subantarctic islands, meaning that they do not have to endure the temperature extremes of the Antarctic continent. However, they too have highly unusual breeding cycles. A single egg is laid any time from November to April and incubated on the feet. Both parents share the parenting as open water is always close by. It can take 10 to 13 months to fledge a chick. Because of this long chick-rearing period, king penguins only produce two chicks every three years. When six weeks old, the chick joins a crèche while its parents go fishing. In a king penguin colony there may be 12-month-old chicks around while other birds are incubating eggs.

### MACARONI PENGUIN (*EUDYPTES CHRYSOLOPHUS*)

Named after the bizarre “Macaroni coiffure” hairstyles of 18th century dandies, macaroni penguins have orange tufted plumes for eyebrows.

With an estimated population of 12 million breeding pairs, macaroni penguins are the most numerous penguins, but only some of them live in the Antarctic region where they inhabit subantarctic islands (although there is one macaroni rookery on the Antarctic Peninsula).

Like other crested penguins, macaroni penguins have a curious egg-laying habit. Two eggs are laid, the first being much smaller than the second. The small egg rarely hatches, and only one chick is ever raised. Why? No one knows.

Scientists are still puzzling as to why the smaller of the two eggs laid by crested penguins will produce a chick only if the larger egg is lost.

> The woolly-coated king penguin chicks were listed as an entirely different species from their parents, “the woolly penguin”, in scientific books of the 19<sup>th</sup> century.

> Scientists are still puzzling as to why the smaller of the two eggs laid by crested penguins will produce a chick only if the larger egg is lost.



▲ Macaroni penguins

> Young gentoo penguins are very adventurous and have been spotted on the shores of New Zealand and Africa.

> While at sea, albatrosses can travel 1,000 kilometers (621 miles) in a single day, with one grey-headed albatross recorded as circumnavigating Antarctica in just 46 days.

## Other birds of Antarctica

Albatrosses—legendary protectors of seafarers—cover huge distances when foraging for food, even during the breeding season, with the foraging ranges of most species covering thousands of square kilometers of ocean. Wandering albatrosses range from subtropical to Antarctic waters on trips covering up to 10,000 kilometers (6,214 miles) in 10-20 days. Outside the breeding season, most species migrate very long distances, some (like the wandering and grey-headed albatross) traveling all the way around the Southern Ocean.

All species of albatross lay a single egg; several species breed only every second year and most take ten years to reach sexual maturity. They have very long life spans, with some individuals living over 60 years. Only one, the black-browed albatross (*Thalassarche melanophris*), breeds annually, occurring in large colonies on hillsides, taking 5.5 months from egg-laying to chick-fledging, feeding its chick on a diet mainly of krill, and to a lesser extent fish and squid.

Its close relative, the grey-headed albatross (*Thalassarche chrysostoma*), breeds only every two years on steep coastal slopes. The light-mantled sooty albatross (*Phoebastria palpebrata*) is also biennial and

breeds solitarily or in very small groups on cliffs. Both these species feed mainly on squid and krill.

The wandering albatross (*Diomedea exulans*) is the largest of seabirds, with a wing span reaching 3 meters (10 feet) and a body mass of 8-12 kg (17.6-26.5 lbs). They arrive in November to breed in loose colonies on flat grasslands with plenty of room for their spectacular courtship displays. They lay eggs in December, chicks hatch in April and are reared throughout the winter (on a diet of fish, squid and carrion), and are fledged in November and December. Successful parents then take a year off, migrating to feeding areas all around the Southern Ocean.

Only a few species of Antarctic seabird are adapted to breed regularly on the Antarctic continent, with emperor (*Aptenodytes forsteri*) and Adélie penguins (*Pygoscelis adeliae*), and Antarctic snow petrels (*Pagodroma nivea*), being the most abundant species. The ability to survive in such climatic extremes is aided by behavioral adaptations and physiological characteristics such as subdermal fat and layers of down and feathers. Though the avifauna of the subantarctic islands is about triple that of the Antarctic, it is considerably poorer than adjacent temperate regions.

Penguins and albatrosses are perhaps the best known of Antarctic marine birds, but it is the family *Procellariidae* (petrels, prions, fulmars, and shearwaters) which contain the majority of species that inhabit the region.

Skuas (*Catharacta maccormicki*) are widespread and prominent in the Antarctic. These birds are notorious for their scavenging behavior, particularly their acts of piracy when pursuing other seabirds and forcing them to drop their catch. They also prey heavily on the eggs and chicks of penguins and small petrels.

Marine birds of the Southern Ocean also include gulls, terns, and two species of cormorant. Endemic terrestrial birds of this region are few and include the South Georgia pipit (*Anthus antarcticus*) and species of freshwater duck on South Georgia and Kerguelen. Two species of sheathbill (pigeon-like shorebirds of scavenging habit) are also restricted to the region. Many other land birds have been recorded as vagrants, but these invariably succumb to the extreme conditions or predators.

“Wandering albatross (*Diomedea exulans*) is the largest of seabirds, with a wing span reaching 3 meters (10 feet)”



▲ Skuas

“Skuas are notorious for their scavenging behavior, particularly their acts of piracy when pursuing other seabirds and forcing them to drop their catch. They also prey heavily on the eggs and chicks of penguins and small petrels.”

◀ Page 58. Wandering albatross colony, Falkland Islands

> The famous killer whale, or orca, is not actually a whale. It is the largest of the dolphins and one of the world's most powerful predators. Orcas feast on marine mammals such as seals, sea lions, and even whales, employing teeth that can be ten centimeters (four inches) long. They are known to grab seals right off the ice.

## Whales and seals

Whales and seals are the two groups of marine mammals found in the Southern Ocean, where they are an important part of the marine ecosystem.

### WHALES

There are two natural groups of whales: toothed and baleen. As the name implies, toothed whales have teeth; they mostly eat squid and fish, and take their prey one at a time. The largest toothed whale is the sperm whale (*Physeter macrocephalus*) of Moby Dick fame. The group includes more than 60 other species, varying in size down to porpoises, one thousand of which would equal the body weight of a single sperm whale. Between these two extremes are more than 20 species of beaked whale, and many dolphins, of which the largest is ironically known as the killer whale (*Orcinus orca*) and preys on fish, penguins, seals, and whales.

Baleen whales, such as the blue whale (*Balaenoptera musculus*) and humpback (*Megaptera novaeangliae*), have fibrous plates of baleen instead of teeth, which they use to strain plankton and small fish from seawater. The most numerous ba-



leen whale is the minke whale (*Balaenoptera acutorostrata*), a species that spends much of its time in the Antarctic near the ice-edge.

Most, if not all, Southern Ocean whales are migratory, heading to warmer waters during the Antarctic winter. Calves are born in these more hospitable seas, as they would struggle to survive in polar waters during their first few months. The whales return south in the austral spring.

### SEALS

There are also two natural groups of seals—true seals and eared seals, the latter group containing fur seals and sea-lions. In fact, all seals have ears, but “eared” seals differ in having a small external ear rather than just a small aperture on the side of the head. Depending on the species, seals feed on fish and squid and/or krill. The leopard seal (*Hydrurga leptonyx*) is also a predator of penguins and other seals. As with whales, thick layers of blubber beneath the skin act as a food reserve and insulation. All Antarctic seals also have a layer of fur providing additional insulation when they are hauled out on land or ice.

Seals only leave the water to breed, rest, and molt. Of the six Antarctic species, four are ice habitat specialists, breeding on the sea ice in spring. Leopard and Ross seals (*Ommatophoca rossii*) tend to be solitary, whereas Weddell (*Leptonychotes weddellii*) and crabeater seals (*Lobodon carcinophagus*) form loose breeding aggregations.

Antarctic fur seals (*Arctocephalus gazella*) and southern elephant seals (*Mirounga leonina*) are both found north of the pack-ice zone and breed in dense colonies on beaches. Here, dominant males (bulls) maintain harems of females (cows) in territories. In constantly defending these, bulls will not forage at sea, relying instead on blubber reserves laid down in the previous winter. All seals breed annually and the timing of pup production and associated behavior is linked to habitat and ecology. Mating occurs after pupping, though a fertilized egg will not implant in the uterus until later in the year.



▲ Antarctic fur seal



▲ Leopard seal

◀ Page 60. Humpback whale, Antarctic Peninsula



# PHYSICAL ENVIRONMENT



## ICE FORMATIONS

The Antarctic ice sheet is the largest single mass of ice on Earth. It covers an area of almost 14 million square kilometers (about 5.4 million square miles) and contains 30 million cubic kilometers of ice. Around 90% of the fresh water on the world's surface is held in the ice sheet, an amount equivalent to 70 meters (230 feet) of ocean depth. In East Antarctica the ice sheet rests on a major land mass, but in West Antarctica some of the ice sheet rests on a bed more than 2,500 meters (8,200 feet) below the current sea level.

As air temperatures do not normally rise above 0°C (32°F) even in summer, frost and snow crystals that gather on the surface of the ice sheet do not melt but accumulate year after year. As these crystals are buried, the weight of the crystals above presses them together. Eventually, they are transformed into dense and impermeable glacial ice.

Glacial ice seems rigid but, under tremendous pressures inside the ice sheet, it will flow like a viscous liquid. This means that the ice sheet does not continue to get thicker indefinitely as new snow falls but rather, due to the force of gravity, it flows over and around obstacles toward the sea. In this way, the ice sheet acts like a conveyor belt, taking moisture from the atmosphere and delivering it back to the sea. Whether the amount of ice entering the system balances the amount leaving is the subject of much research.

Although the surface is often very cold, the base of the ice sheet is generally warmer, even melting in places and lubricating the ice sheet so that it flows more rapidly. This process produces fast-flowing channels in the ice sheet known as ice streams.

### Ice Shelves in Antarctica

Ice is less dense than water and, because ice sheets near the coast generally rest on a bed below sea level, there is a point where ice sheets begin to float. The floating section of an ice sheet either stays attached to

“The Antarctic ice sheet is the largest single mass of ice on Earth. It covers an area of almost 14 million square kilometers (about 5.4 million square miles) and contains 30 million cubic kilometers of ice.”



▲ Iceberg, Pleneau Bay

◀ Page 62. Glacier, Antarctic Peninsula

“British scientists began their measurements of Antarctic ozone in 1956. The aim was to understand the important role that ozone plays through absorbing solar energy and in determining the temperature profile of the stratosphere and its wind circulation. These measurements led to the discovery of the ozone hole.”



▲ Ozone measurement in Antarctica

the ice sheet (in which case it is known as an ice shelf), or it breaks away to form a tabular iceberg. Being afloat, ice shelves experience little friction under them, so they tend to move even more rapidly than ice streams, up to three kilometers (1.9 miles) per year. Much of Antarctica is fringed by ice shelves. The Ross and Ronne-Filchner ice shelves each have areas greater than the British Isles.

Ice comes into contact with seawater at the base of ice shelves. Where this seawater is warm enough, the ice shelf melts, adding cold freshwater to the sea. This diluted seawater eventually helps to form a water mass called Antarctic Bottom Water which is present in many of the deepest parts of the ocean.

Ice also breaks off the ice shelves to form icebergs. Visitors can observe that ice shelves may be sensitive indicators of climate change.

### OZONE HOLE

Ozone is composed of three oxygen atoms, whereas the oxygen molecules we breathe have only two oxygen atoms. It is a minor gas in our atmosphere and mostly occurs in the “ozone layer” at altitudes between 10 and 35 kilometers (6.2 and 21.7 miles). At sea level, the thickness of all the ozone in this “layer” would be around three mm (0.1 inch). Ozone is poisonous in large quantities, but in the stratosphere it prevents harmful ultra-violet radiation from reaching us.

British scientists began their measurements of Antarctic ozone at Halley research station located on the Weddell Sea in 1956. The aim was to understand the important role that ozone plays through absorbing solar energy and in determining the temperature profile of the stratosphere and its wind circulation. These measurements led to the discovery of the ozone hole.

The amount of ozone overhead Halley station follows a regular seasonal pattern. In the spring, ozone amounts begin to fall and reach a minimum in early October—this is the peak of the Antarctic ozone hole. In late spring ozone amounts rise to a maximum and then slowly decline.



▲ Calving glacier in Antarctica

The spring-time ozone hole is the result of emissions, mainly in the Northern Hemisphere, of chlorofluorocarbons (CFCs) and halons, now restricted by the Montreal Protocol. These gases were in widespread use in refrigeration, industrial solvents, and fire control. The gases are broken down into their constituents over the tropics and circulate towards both poles. Only over the Antarctic during winter is it cold enough for clouds to form in the ozone layer, and here chemical reactions on the cloud surfaces convert chlorine into an active form. When the sunlight comes back in the spring, this activated chlorine was found to destroy ozone at a rate of about 1% per day, leading to the ozone hole. As the atmosphere warms, the clouds disappear and the ozone hole fills in.

The discovery of the Antarctic ozone hole provided an early warning of the dangerous thinning of the ozone layer worldwide, and spurred international efforts to curb the production of CFCs. The provisions of the Montreal Protocol of 1987 on Substances that Deplete the Ozone Layer have since been revised and strengthened. There is a reasonable prospect that the Antarctic ozone hole will permanently repair itself, but not until around 2070.

“Much of Antarctica is fringed by ice shelves. The Ross and Ronne-Filchner ice shelves each have areas greater than the British Isles.”

# Conserving Antarctica

*Do Your Part for Antarctica Wilderness Protection.*

Antarctica is like no other place on the planet and visitors must understand that travel through its wilderness is a privilege. Inherent to this privilege is a responsibility to protect and preserve its spectacular scenery, unique wildlife, and wilderness values for future generations. Many scientific, governmental, and non-governmental organizations work together to keep Antarctica pristine, and your own contribution to this work cannot be overestimated. By following the IAATO Visitor Guidelines below and by encouraging your fellow visitors to behave properly as well, you are doing your part for the protection of the Antarctic environment.

*It's not possible to be an invisible traveler. But we do appreciate your efforts to keep your footprint as invisible as possible.*

## GUIDELINES FOR VISITORS TO THE ANTARCTICA

Activities in the Antarctic are governed by the Antarctic Treaty of 1959 and associated agreements, referred to collectively as the Antarctic Treaty System. The Treaty established Antarctica as a zone of peace and science.

In 1991 the Antarctic Treaty Consultative Parties adopted the Protocol on Environmental Protection to the Antarctic Treaty, which designates the Antarctic as a natural reserve. The Protocol sets out environmental principles, procedures and obligations for the comprehensive protection of the Antarctic environment, and its dependent and associated ecosystems.

### Protect Antarctic Wildlife

Taking or harmful interference with Antarctic wildlife is prohibited except in accordance with a permit issued by a national authority.

- Do not feed, touch, or handle birds or seals, or approach or photograph them in ways that cause them to alter their behavior. Special care is needed when animals are breeding or molting.
- Do not damage plants, for example by walking, driving, or landing on extensive moss beds or lichen-covered scree slopes.

- Do not use guns or explosives. Keep noise to the minimum to avoid frightening wildlife.
- Do not bring non-native plants or animals into the Antarctic – live poultry, pet dogs and cats or house plants.

### Respect Protected Areas

A variety of areas in the Antarctic have been afforded special protection because of their particular ecological, scientific, historic or other values. Entry into certain areas may be prohibited except in accordance with a permit issued by an appropriate national authority. Activities in and near designated Historic Sites and Monuments and certain other areas may be subject to special restrictions.

- Know the locations of areas that have been afforded special protection and any restrictions regarding entry and activities that can be carried out in and near them.
- Observe applicable restrictions.
- Do not damage, remove, or destroy Historic Sites or Monuments or any artifacts associated with them.

### Respect Scientific Research

- Do not interfere with scientific research, facilities or equipment.
- Obtain permission before visiting Antarctic science and support facilities; reconfirm arrangements 24-72 hours before arrival; and comply with the rules regarding such visits.
- Do not interfere with, or remove, scientific equipment or marker posts, and do not disturb experimental study sites, field camps or supplies.

### Be Safe

Be prepared for severe and changeable weather and ensure that your equipment and clothing meet Antarctic standards. Remember that the Antarctic environment is inhospitable, unpredictable, and potentially dangerous.

- Know your capabilities, the dangers posed by the Antarctic environment, and act accordingly. Plan activities with safety in mind at all times.
- Keep a safe distance from all wildlife, both on land and at sea.
- Take note of, and act on, the advice and instructions from your leaders; do not stray from your group.
- Do not walk onto glaciers or large snow fields without the

# Antarctic wildlife check list

proper equipment and experience; there is a real danger of falling into hidden crevasses.

- Do not expect a rescue service. Self-sufficiency is increased and risks reduced by sound planning, quality equipment, and trained personnel.
- Do not enter emergency refuges (except in emergencies). If you use equipment or food from a refuge, inform the nearest re-search station or national authority once the emergency is over.
- Respect any smoking restrictions, particularly around buildings, and take great care to safeguard against the danger of fire. This is a real hazard in the dry environment of Antarctica.

## Keep Antarctica Pristine

Antarctica remains relatively pristine, the largest wilderness area on Earth. It has not yet been subjected to large scale human perturbations. Please keep it that way.

- Do not dispose of litter or garbage on land. Open burning is prohibited.
- Do not disturb or pollute lakes or streams. Any materials discarded at sea must be disposed of properly.
- Do not paint or engrave names or graffiti on rocks or buildings.
- Do not collect or take away biological or geological specimens or man-made artifacts as a souvenir, including rocks, bones, eggs, fossils, and parts or contents of buildings.
- Do not deface or vandalize buildings, whether occupied, abandoned, or unoccupied, or emergency refuges.

## Penguins



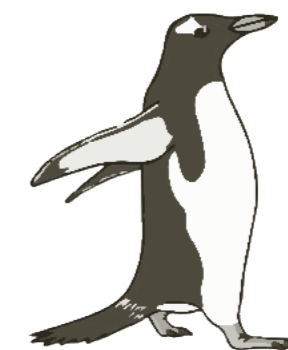
ADELIE PENGUIN  
(PYGOSCELIS ADELIAE)



CHINSTRAP PENGUIN  
(PYGOSCELIS ANTARCTICA)



EMPEROR PENGUIN  
(APTENODYTES FORSTERI)



GENTOO PENGUIN  
(PYGOSCELIS PAPUA)



KING PENGUIN  
(APTENODYTES PATAGONICUS)



MACARONI PENGUIN  
(EUDYPTES CHRYSOLOPHUS)



MAGELLANIC PENGUIN  
(SPHENISCUS MAGELLANICUS)



ROCKHOPPER PENGUIN  
(EUDYPTES CHRYSOCOME)



SOUTH POLAR SKUA  
(STERCORARIUS MACCORMICKI)



SOUTH GEORGIA PIPIT  
(ANTHUS ANTARCTICUS)



ANTARCTIC FULMAR  
(FULMARIUS GLACIALOIDES)

## Birds



ANTARCTIC TERN  
(STERNA VITTATA)



BLACK-BROWED ALBATROSS  
(THALASSARCHE MELANOPHRIS)

## ALBATROSS



GREY-HEADED ALBATROSS  
(THALASSARCHE CHRYSOSTOMA)



BLUE-EYED CORMORANT  
(PHALACROCORAX ATRICEPS)



SNOWY SHEATHBILL  
(CHIONIS ALBUS)



SOOTY ALBATROSS  
(PHOEBETRIA FUSCA)



WANDERING ALBATROSS  
(DIOMEDEA EXULANS)

PETREL



ANTARCTIC PETREL  
(*THALASSOICA ANTARCTICA*)



CAPE PETREL  
(*DAPTION CAPENSE*)



ELEPHANT SEAL  
(*MIROUNGA LEONINA*)



LEOPARD SEAL  
(*HYDRURGA LEPTONYX*)



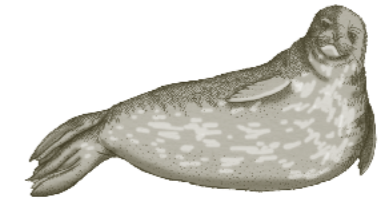
SNOW PETREL  
(*PAGODROMA NIVEA*)



SOUTHERN GIANT PETREL  
(*MACRONECTES GIGANTEUS*)



ROSS SEAL  
(*OMMATOPHOCA ROSSII*)

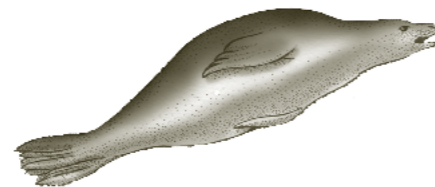


WEDDELL SEAL  
(*LEPTONYCHOTES WEDDELLII*)

Seals



ANTARCTIC FUR SEAL  
(*ARCTOCEPHALUS GAZELLA*)



CRABEATER SEAL  
(*LOBODON CARCINOPHAGUS*)

Whales



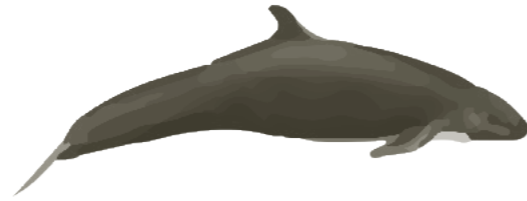
BLUE WHALE  
(*BALAENOPTERA MUSCULUS*)



FIN WHALE  
(*BALAENOPTERA PHYSALUS*)



HUMPBACK WHALE  
(MEGAPTERA NOVAEANGLIAE)



KILLER WHALE  
(ORCINUS ORCA)



MINKE WHALE  
(BALAENOPTERA BONAERENSIS)



SEI WHALE  
(BALAENOPTERA BOREALIS)



SOUTHERN RIGHT WHALE  
(EUBALAENA AUSTRALIS)



SPERM WHALE  
(PHYSETER MACROCEPHALUS)

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THANKS TO:

British Antarctic Survey [www.antarctica.ac.uk](http://www.antarctica.ac.uk)  
Falkland Islands Government [www.falklands.gov.fk](http://www.falklands.gov.fk)  
South Georgia Heritage Trust Organization  
[www.sght.org](http://www.sght.org) for sharing this information.

PHOTO CREDIT:

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Holger Leue, Tavish Campbell, Nikolay Savelyev.

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[www.poseidonexpeditions.com](http://www.poseidonexpeditions.com)