

SOUTH GEORGIA:

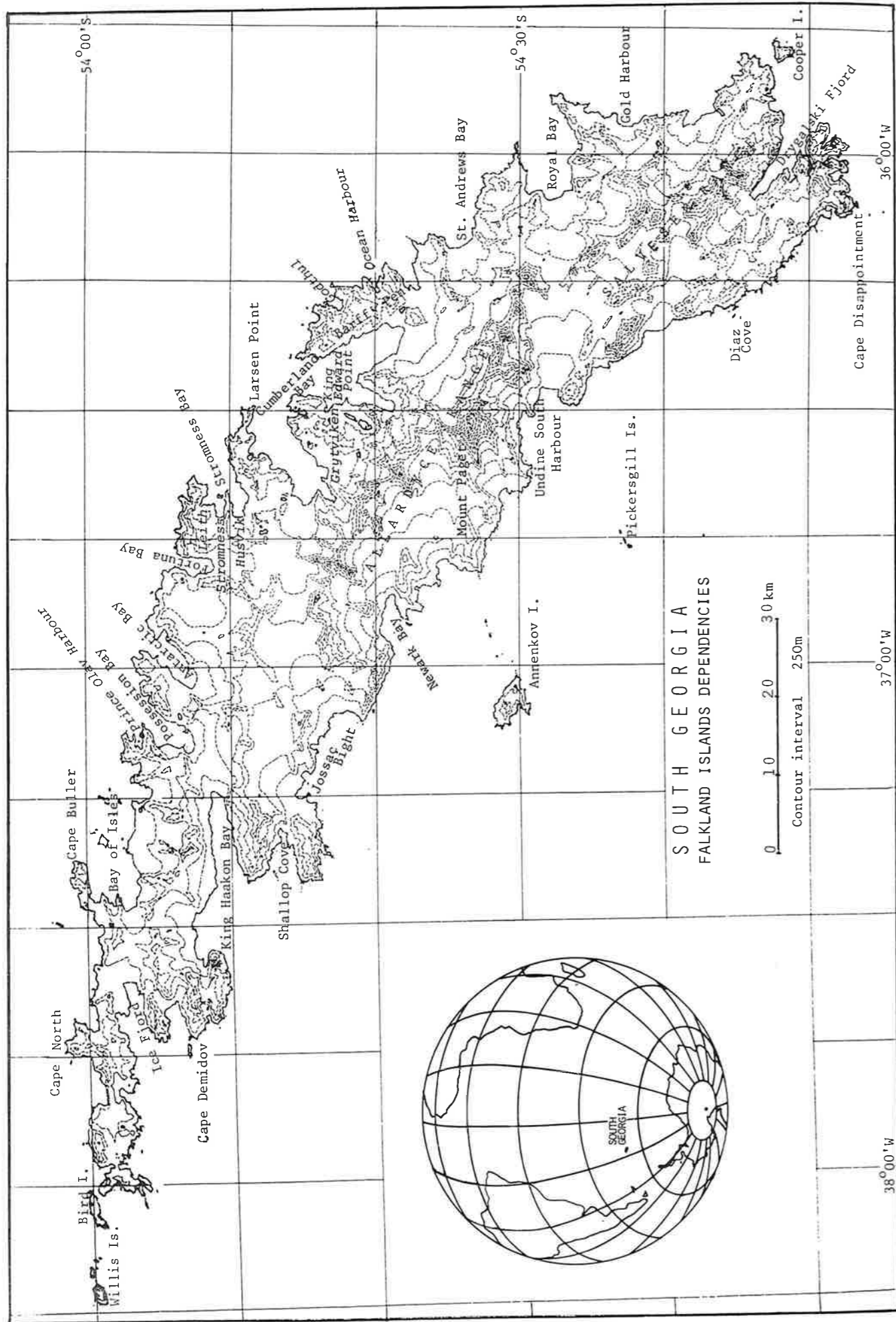
A CONCISE ACCOUNT

*By*

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Natural Environment Research Council



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## Contents

Geography	1	Birds	17
Government	1	Fish	19
History	2	Invertebrates	20
Sealing	7	Conservation	22
Whaling	7	Present circumstances	22
Cartography	8	Research and recording	23
Meteorology	9	Communications	24
Geology	10	Commerce	25
Glaciology	11	Population and settlement	25
Oceanography	12	Future	26
Botany	13	Bibliography	27
Mammals	15	Acknowledgements	28

## GEOGRAPHY

South Georgia is an isolated sub-Antarctic island lying in the Southern or Antarctic Ocean to the south of the Atlantic Ocean. It is the largest and highest of the sub-Antarctic islands with the longest period of continuous habitation and economic history.

South Georgia lies between lat. 53°56' and 54°55' S, and long. 34°45' and 38°15' W. It is roughly crescent-shaped, about 170 km long and 30 km wide near the centre. The surface area is approximately 3 500 km<sup>2</sup>. Around the main island are several off-lying islands together with many islets and rocks. Much of the coast consists of high sea cliffs. These are indented with numerous glacial valleys which provide many harbours and anchorages, especially on the northern side. The island is very mountainous and few unglaciated flat areas occur; most of these are at the western end, and around Stromness, Cumberland and Royal Bays. Glaciers, ice caps, and snow-fields cover about two-thirds of the surface during summer and almost all of the surface during winter.

The Allardyce and Salvesen Ranges, effectively the island's spine, rise to 2 934 m at Mount Paget, the highest peak. Eleven peaks exceed 2 000 m including Nordenskjöld Peak (2 355 m), Mount Carse (2 331 m) and Mount Sugartop (2 323 m). These ranges provide a barrier against the extremes of Antarctic weather, thus the climate is less severe on the north-eastern side. South Georgia forms the summit of a mountain chain rising 6 000 m from the ocean floor.

There are a few small rivers but streams are common and enter almost every bay, at least during summer when there is abundant melt water and high rainfall. Much precipitation is also carried away by glaciers. There are several lakes, mainly in the vicinity of Cumberland Bay, while ponds and tarns are found throughout the island. Bogs and mires, too, are widespread. Elephant seal wallows are a distinct ground feature near many beaches: boggy foetid pools amongst tussock grass, full of malodorous seals at certain seasons.

The administrative centre, and the only place now having a permanent population, King Edward Point, lies at lat. 54°16'38.85" S, long. 36°29'16.74" W. It is about 1 400 km from Port Stanley, Falkland Islands; 1 550 km from Cape Dubouzet, the nearest point on the Antarctic continent; 2 150 km from Dungeness, South America's nearest mainland point; and 4 800 km from Cape Town, South Africa.

## GOVERNMENT

Politically, South Georgia with Shag and Clerke Rocks and the South Sandwich Islands, is a Dependency of the Falkland Islands, which collectively is a British Colony. The administration is conducted by a Magistrate at King Edward Point appointed by the Governor of the Falkland Islands and Dependencies who resides in Stanley. The Magistrate is also the commander of the British Antarctic Survey station "Grytviken" and functions as Postmaster, Collector of Customs, Harbour Master, Receiver of Wrecks, Registrar and in a number of other capacities. However, during the winter season, the island does not need a great deal of administration. A Customs House and Post Office was established at Leith Harbour during the latter days of the whaling era.

The judicial system has the Magistrate holding the court of first instance and appeals lie with the Supreme Court of the Falkland Islands. This, and the Falkland Islands Magistrates Court, are common to the Dependencies. The last sitting on a criminal case in South Georgia took place over 25 years ago.

A *Government Gazette* is published in Stanley for the Falkland Islands and Dependencies. Laws passed for the Falkland Islands only apply to the Dependencies when specially extended to them, and appropriate notifications appear in the *Gazette*.

### HISTORY

South Georgia was probably first sighted in April 1675 by Antonio de la Roché, an English merchant. This was the first recorded sighting of any of the sub-Antarctic islands (and thus of the Antarctic generally). A Spanish trading voyage carrying bullion from Lima to Cadiz in *Leon* in 1756 was blown off course and made the second sighting. A Frenchman on board, Ducloz Guyot, wrote an account and referred to it as Île de San Pierre after the Saint's day (1 July) when the ship passed to the south.

No landing or exploration was made until Captain James Cook in *Resolution* surveyed the northern coast between 14 and 23 January 1775. He took formal possession of the island for King George III on 17 January in Possession Bay and bestowed the King's name upon it. This was the first British claim to Antarctic territory. *Resolution* carried two naturalists and a geographer who made collections and wrote the first scientific descriptions of the island. Cook published a chart and an illustrated account. He was unimpressed by the discoveries and described them as "Lands doomed by Nature to perpetual frigidness, never to feel the warmth of the Sun's rays, whose horrible and savage aspect I have not words to describe". Cook's visit was during a period of history when world-wide temperatures were particularly low and glaciers everywhere were advanced. The last promontory seen, he named Cape Disappointment on discovering that South Georgia was an island and not part of the Antarctic continent.

The accounts of the island resulting from Cook's expedition referred to the presence of seals and, shortly afterwards, sealers, previously working in areas closer to South America, extended their range to South Georgia. British sealers first arrived in 1788 and others from the United States of America arrived in 1791. Sealing developed very rapidly in the latter part of the eighteenth and early nineteenth centuries.

Due to strong competition, there was much secrecy concerning early sealing activities and discoveries of new sealing areas were rarely disclosed. Thus, there is little information available about the early days. In 1800, Captain Fanning in *Aspasia* from New York recorded taking 57 000 fur seal skins; this was probably the most remunerative sealing voyage to South Georgia. Another sealer, Captain Pendleton in *Union* compiled a map in 1802 which was published over a century later.

Vessels from both Great Britain and the United States of America participated in sealing during this period and the men frequently lived on shore for several months at a time. Their activities reached a climax around 1800 and were on such a scale that fur seal stocks were devastated. The sealers subsequently turned to newly discovered breeding grounds in the South Shetland Islands and elsewhere. As late as 1812 there were still about 3 000 men employed taking fur seal skins at South Georgia.

During this time another exploration voyage visited the island. Captain Thaddeus von Bellingshausen, in command of a Russian expedition in *Vostok* accompanied by *Mirny* made a partial survey, mainly of the south-west coast in 1819, whilst circumnavigating the Antarctic during a voyage commissioned by Czar Alexander I. An account was published with a chart and more place-names were bestowed.

Meanwhile, Antarctic sealing continued and South Georgia was visited regularly. In 1825, James Weddell, a British sealer, estimated the number of fur seal skins taken as not less than 1 200 000 and the quantity of elephant

seal oil extracted as 20 000 tons. Initially, only fur seal skins were taken; later, as these became rarer, elephant seal oil was obtained. The value of the fur seal skin was sufficiently high to result in the destruction of the industry, as catching continued to the virtual extermination of the animal. The skins were dried and salted for conveyance to Britain, Europe or North America, as well as to China where the fur was removed for felt making.

Elephant seal oil, however, could only be profitably extracted where the seals were abundant. Thus, though greatly depleted, the elephant seal was never in such a precarious state of survival as the fur seal. Elephant seal oil operations involved landing a party on a suitable beach sometimes with cast iron try pots. These had a capacity of about 400 litres and some of them still remain on South Georgia's beaches. "Shallops", boats up to 30 tonnes, were used for getting to seal beaches and for conveying blubber to the "try works" either on the ship or ashore. Elephant seal blubber was boiled down and the resulting oil stored in casks. Fuel was mainly provided by the remains of the blubber. Whenever possible, fur seal skins were taken and salted. Occasionally, parties would over-winter in accommodation provided by caves and huts, and many remains from this period are still to be found.

Sealing activities declined as the seal populations decreased and few visits were made during the mid-nineteenth century. Some of these are recorded by inscriptions on the seamen's graves on the island.

In 1877, H.W. Klutschak, a German, on board the sealer *Flying Fish* visited the island. He published an account of his journey and of the island which included a chart. From August 1882 to September 1883, the German contingent of the International Polar Year Expedition was on South Georgia. They arrived in *Moltke* and established a station at Royal Bay where eleven men over-wintered under the command of Dr K. Schrader. Biological, geological, astronomical, meteorological and magnetic work was conducted and maps prepared. The remains of the buildings and instrument mountings are still visible. Sealers made some more visits around this time, commenting mainly on the rarity of seals.

A Norwegian whaling expedition arrived in April 1894 and remained briefly at South Georgia. C.A. Larsen, leader and Captain of *Jason*, was accompanied by *Hertha* and *Castor*. Cumberland Bay (Jason Harbour) and Royal Bay were visited. Captain Larsen later became prominent in the island's history.

In 1900, the *Falkland Islands Gazette* carried an advertisement for a mining and general lease of South Georgia. The conditions were generous and resulted in an expedition setting out from Punta Arenas, Chile: the South Georgia Exploration Company, lead by Mr E. Swinhoe in *Consort* which arrived in 1905. Prior to this, however, other events had occurred.

The ship *Antaretic*, under the command of C.A. Larsen, which carried the Swedish Antarctic Expedition, 1902-03, led by O. Nordenskjöld to the Antarctic Peninsula, arrived in Cumberland Bay in April 1902 to over-winter. This expedition explored parts of the island, prepared charts, and made biological and geological collections. Grytviken was visited and named from sealers' try pots found there. The ship later returned to the Antarctic Peninsula to re-embark those of the expedition who had overwintered at Snow Hill Island. She was unable to reach them and was subsequently surrounded by pack ice and crushed. The expedition was eventually rescued after surviving most difficult circumstances.

C.A. Larsen believed South Georgia would be a most suitable base for Antarctic whaling but he was unable to obtain sufficient finance in Norway for such a venture. In Buenos Aires, however, he formed the *Compañía Argentina de Pesca* and, whilst obtaining a permit through the British Minister in Buenos Aires, sailed to South Georgia with *Louise*, *Rolfe* and *Fortuna*. They arrived on 16 November 1904 at Grytviken. A whaling station



was established and the first oil produced on 24 December. The venture proved very remunerative, paying a 70% dividend after the first year of operations. A biologist, E. Sörling, accompanied the expedition, making collections and subsequently a report was published.

In 1905, the South Georgia Exploration Company expedition arrived and some dispute resulted between it and the whaling company. This was resolved in February 1906 by Captain Hodges in HMS *Sappho*. Further scientific collections and charting were also carried out during her visit.

In the years that followed an enormous amount of interest was shown in South Georgian whaling leases. Restrictions on their issue and various conditions were imposed by the Falkland Islands government in order to try to protect the industry from over-exploitation. One of these was a requirement that the whole carcass of the whales was to be used, rather than the blubber only. The great numbers of whale bones scattered along some of the beaches date from prior to this requirement when the flensed bodies, skrots, of whales were cast adrift.

Eventually, seven whaling stations were established. Their locations, dates of operation, and companies were:

1904-65. Grytviken was the first station, operated by Compañía Argentina de Pesca to 1959 thence Albion Star till its closure. It was sub-leased to Gyogyo Kabushiki Ltd of Japan for the last two seasons. Later, it became the property of the Falkland Islands government and in 1979 its lease was purchased by Christian Salvesen and Co.

1907-61. Stromness was at first only a harbour for a floating factory. A shore station was built in 1912. Sandefjord Whaling Co., the Southern Whaling and Sealing Co. and Vestfold Whaling Co. operated it to 1931 when South Georgia Company of Leith Harbour purchased it for use as a ship repair yard; the company still holds the lease.

1907-61. Husvik also started as a floating factory site, a shore station being built in 1910. It was operated by Tønsberg Hvalfangeri until purchased by Albion Star in 1960 when it was closed and some equipment moved to Grytviken. Subsequently, its lease passed to the Falkland Islands government and was later acquired by Christian Salvesen and Co.

1908-29. Godthul was a shore base for a floating factory operated by Messrs Bryde and Dahl. Only one building was constructed there and some storage tanks positioned.

1909-66. Leith Harbour was a shore station operated and still leased by the South Georgia Company, one of the Christian Salvesen group. It was sub-leased to Nippon Suisan Ltd of Japan for the last three seasons.

1909-20. Ocean Harbour, formerly New Fortuna Bay, was operated by the Ocean Whaling Company as a shore station. Following the company's amalgamation with the Sandefjord Whaling Co., it was almost entirely removed to Stromness Station.

1912-32. Prince Olav Harbour also started as a floating factory site until 1916 when a shore station was built. It was operated by the Southern Whaling and Sealing Company until purchased by the South Georgia Company, closed and partly removed to Leith Harbour.

Two other whaling leases were granted, to Rosita Harbour and Jason

Harbour but these were not used for whaling at the sites. Nothing was constructed at the former site, and, at the latter, only a refuge.

The establishment of the whaling stations with their populations, revenue, etc., resulted in the Falkland Islands government appointing a Stipendiary Magistrate, Mr J.I. Wilson, who assumed duties in 1909. The Civil Station was established on King Edward Point where it still functions. Among other duties he established the first Post Office and the first despatch of mail took place on 20 December 1909.

Lieutenant W. Filchner, leader of the German expedition to the Weddell Sea, visited South Georgia in the summer of 1911-12 on board *Deutschland*. The expedition remained for 2 months and then, leaving some horses behind, continued to the continent of Antarctica. A memorial cross was erected on a hill above the Grytviken cemetery to their third officer who disappeared whilst attempting to climb the main range. A second visit was made on their return. The South Georgia Company commissioned a geological and mineralogical investigation of the island in 1911-12. Several reports and a revised map resulted, but no minerals in economic quantities were found. In the 1912-13 summer, R.C. Murphy, a United States ornithologist, arrived on board the sailing brig *Daisy* which was the last of the old-time sealers. He explored several areas of the island, collected natural history specimens and wrote many papers concerning the expedition.

In 1914, Sir Ernest Shackleton's expedition in *Endurance* arrived and remained for a month while preparing for a major continental expedition. The shore party was not able to land on arrival in the Weddell Sea, however, and the ship was beset by ice and drifted towards the Antarctic Peninsula where she was crushed and sank. All hands eventually reached Elephant Island in the South Shetland Islands whence Shackleton and five companions set out in a modified whale boat, *James Caird*. They arrived in King Haakon Bay, South Georgia, on 9 May 1916 after a most difficult journey. Shackleton, Crean and Worsley, with minimal supplies and equipment, then made the first major trek across the island. They continued to Stromness Bay, arriving on 20 May. Subsequently, after several attempts, the rest of the expedition was rescued. Shackleton referred to South Georgia as "The gateway to Antarctica".

HMS *Dartmouth* arrived in 1920 to continue charting and made further collections and observations. Subsequently, ships of the Royal Navy have made many visits for hydrographic and other purposes.

Sir Ernest Shackleton arrived again in 1921 on board *Quest* to begin another continental exploration. He died on 5 January 1922 of a heart attack on board the ship while she was anchored in King Edward Cove. His grave is in the Grytviken cemetery and his comrades erected a memorial cross on Hope Point.

An Interdepartmental Committee was convened by the Colonial Office which, in 1920, published a Command Paper. This was concerned with obtaining information for the scientific control of the whaling industry and, as far as resources permitted, all economic questions in the Falkland Islands Dependencies. The recommendations were put into effect in 1925 by the Discovery Committee named after Captain R.F. Scott's ship which was re-commissioned for the work. A laboratory and accommodation building named "Discovery House" was established at King Edward Point. This still stands. Whaling, sealing and fisheries were studied and a hydrographic survey commenced. Funding of the investigations was effected by a tax on whale oil. The Committee established a programme of whale marking which still continues. Its results were published in a series of *Discovery Reports*, presently 38 volumes, with much scientific material relevant to South Georgia.

From this time onwards a number of scientific and other expeditions arrived at South Georgia, among them the following: the German Atlantic

Expedition on *Meteor* made several visits whilst engaged in an oceanographic survey between 1925 and 1927. A Norwegian expedition, funded by Lars Christensen, in 1927-28 investigated the biology and geology of the island. A. Carcelles made ornithological collections and observations between 1923 and 1930. The Governor, Sir Arnold Hodson, arrived in 1928 on board *Fleurus* — the first vice-regal visit. An expedition in 1928-29 led by L. Kohl-Larsen surveyed some inland glaciated areas, made biological collections, reported on the whaling industry, and made probably the first commercial film of the island. J.M. Chaplin in the launch *Alert* surveyed many harbours and anchorages for the Discovery Committee during 1928-30. Dr B.B. Roberts of the British Graham Land Expedition spent some time on the island in 1936-37 undertaking censuses of several species of South Georgia's penguins and mapping their distributions.

The Second World War interrupted civil expeditionary progress and caused great disruption to the whaling industry. The shore stations of South Georgia were defended by 4-inch guns in Cumberland and Stromness Bays. These, and ancillary buildings, are still in place though in a ruinous state. The guns have never fired in anger. Much of the whaling fleet was destroyed by enemy action and only one station functioned throughout the war.

For the Antarctic, one of the consequences of the War was the establishment of a British naval expedition, "Operation Tabarin". When peace resumed, the control of this passed from the Admiralty to the Colonial Office and it was re-named the "Falkland Islands Dependencies Survey", becoming the British Antarctic Survey in 1962. FIDS and BAS have been involved in scientific research on South Georgia at first from 1951 when Dr R.M. Laws, now the Director, became the first base leader.

Niall Rankin visited the island from 1946 to 1947 with the launch *Albatross*. He was able to survey bird populations in the remoter areas and wrote a general account of this. From 1951 to 1957 during four summer seasons the "South Georgia Survey" led by Duncan Carse was active. It concentrated on mapping the land features but also did much biological, geological and glaciological work, travelling over virtually all the island in the process. At Ample Bay, in the Bay of Isles, Bernard Stonehouse and Nigel Bonner established a biological station and were investigating, in particular, birds and seals during 1953-55. From this time there has been a substantially continuous series of biological observations on the island. Nigel Bonner was appointed the first Government Naturalist in 1956. Another expedition "The British South Georgia Expedition" led by George Sutton was in the field for the 1954-55 season. It was principally involved in mountaineering.

Dr (later Sir) Vivian Fuchs briefly visited the island in 1956 in connexion with the transport of the Trans-Antarctic Expedition. This was involved with the work of the International Geophysical Year, a world-wide scientific operation which took place in 1957 and 1958 and incidentally led to the foundation of the Antarctic Treaty. A laboratory was established on South Georgia where experiments and observations included studies on geomagnetism, ionospherics, seismology, gravitation, glaciology and some other subjects. The laboratory remained until early 1978 when it was demolished.

HRH The Duke of Edinburgh arrived at the island during his world tour in 1957 aboard the Royal Yacht *Britannia*. He visited Leith, Grytviken and King Edward Point, and made part of the journey in a whale catcher.

More hydrographic survey was conducted in 1960 by HMS *Owen* with the use of helicopters to take aerial photographs. Several United States Antarctic Research Programs visits were made to Bird Island around 1960. These were led by Lance Tickell and used a station established by Nigel Bonner for the Falkland Islands Government there in 1957. A Combined Services Expedition in 1964-65 spent some months on the island. They produced a map of the

Royal Bay area, retraced Shackleton's route across the island, and on 30 December 1964 at 05:22 conquered Mount Paget.

The last of the whaling stations ceased operations very early in 1966 after a brief unsuccessful lease to a Japanese Company. As a result, the civil administration was withdrawn and its responsibilities transferred to the British Antarctic Survey in November 1969. During subsequent years, much scientific work has been conducted by the Survey, notably extensive botanical and geological investigations together with further mapping. Several fisheries expeditions have also worked around the island recently. Some of this work is described later. Television and cinema films have been prepared about the island during the last few summer seasons. Mount Paget was climbed for the second time on 1 February 1980 by a private French expedition operating from the yacht *Basile*.

Most recent developments concern the acquisition of all the whaling stations' leases by Christian Salvesen and Co. and the sale of an option to purchase equipment and fixtures to an Argentine salvage company. The leases are still held against the eventuality of Salvesen's restarting their whaling or starting other commercial operations on South Georgia.

#### SEALING

The nineteenth century sealing operations were described in the historical section. Modern sealing, from 1910 to 1964, was for elephant seal oil. Operations consisted of driving selected seals to a beach, killing and flensing them there, and then towing the resulting blubber to the sealing vessel whence it was taken to Grytviken for extraction of the oil. Four sealing divisions and some reserves were established around the island. Licences were granted for particular divisions (rotated annually) allowing hunting between specified dates for bull seals only with a requirement that at least 10% must be left on any beach. The number that might be taken in any year was restricted to 6 000. Furthermore, teeth, for age determination, and catch statistics were required by a Sealing Inspector appointed by the Government. This allowed effective scientific management and the industry to remain stable. Sealing ceased with the closure of the whaling stations and consequent loss of processing capabilities.

*Petrel*, *Dias* and *Albatros*, moored at Grytviken since its closure were once whale catchers. They were subsequently converted to sealers and had a reputation, with their very experienced masters, of being able to navigate almost any bay on the island. As an example of production, 2 011 tonnes of seal oil were produced in the 1955-56 season from 6 000 seals (the licensed limit). Seal oil has properties similar to whale oil and, as the animal was flensed within 2 or 3 minutes of death and only the blubber used, was of a high quality.

#### WHALING

South Georgia was the principal centre for whaling from land stations in the Southern Hemisphere from 1904 to 1966. Seven whaling stations were once operating at the same time. Economic circumstances in 1932-33 resulted in a closure of all but one of them for that season. Grytviken alone operated throughout the Second World War, after which three stations continued from 1945-46. By 1962-63 all stations had ceased whaling but Leith and Grytviken were re-opened briefly when sub-leased to some Japanese companies. The venture was unsuccessful and the stations closed again.

The later whaling operations involved catchers, ships up to 500 tonnes, steaming from the stations to whaling areas, up to 300 km away. Whales were harpooned, inflated with air, and marked with flags, lights, radar reflectors and, later, radios. After a catcher secured a number of whales they were collected and towed to the land stations. There they were hauled on to the flensing plan. The blubber was dissected off and boiled under pressure to extract the oil. Meat and bone were separated and similarly processed. The residues, together with liquids from oil separation, etc., were dried and ground to form meat and bone meals. These substances were used for stock food and as fertilizer. Occasionally, other products, e.g. baleen, endocrine glands, skin, teeth, ambergris, spermaceti, etc., were taken and the marketing of frozen whale meat tried.

Baleen whale oil had a large number of uses. It formed the basis of many edible, pharmaceutical, cosmetic and chemical substances. During both world wars it was an important source of glycerol for the manufacture of explosives. For specialized purposes sperm whale oil is a superior lubricant to mineral oils. In 1955-56, there were 21 whale catchers operating from South Georgia's land stations. These caught 3 049 whales which yielded 29 300 tonnes of oil and 17 413 tonnes of meat and bone meal as well as other products. Probably the largest whale ever recorded was a blue whale taken at Grytviken about 1912, the length of which was 33.58 m. Another taken in 1931 at Prince Olav Harbour was 29.48 m long and estimated to weigh 177 tonnes.

The decline of South Georgia's whaling industry came about as a result of the large reduction of stocks of whales around the island and the Antarctic generally. Complete control by international agreements has proved unsuccessful. Scientific evidence available since the 1920's has indicated that the industry was unstable and that the whale population could not support such a harvest. Later developments involved pelagic factory ships which were far more mobile than shore stations and avoided the taxation and controls imposed on shore. The first factory ship able to take the whale carcass on board was *Lancing* which started Antarctic operations in 1925. Some floating factories still operate but all the Antarctic shore stations are now closed. It has been estimated that stocks of the greater whales are now about 10% of those in 1900. It is now a rare event to see whales around South Georgia.

The abandoned whaling stations are succumbing to the depredations of age, climate and, especially at Grytviken, an enormous amount of vandalism from crews of some of the visiting ships, together with a serious fire. A large amount of archival material, including historical, cartographical, production data and much other information, has recently been removed from the stations and is deposited in the Scott Polar Research Institute, Cambridge, England.

At Grytviken whaling station, the British Antarctic Survey maintains watering facilities and one of the piers for visiting ships, certain recreational facilities and the church. The latter was erected in 1913; it previously stood in Norway. It has two bells cast in Tønsberg in that year which were first rung on Christmas Eve.

#### CARTOGRAPHY

Charting, principally of the north-east coast of South Georgia was first carried out by Captain Cook, and many of the names he applied still stand. Other charts were drawn by Pendleton, Bellingshausen, Klutschak, the German expedition at Royal Bay and the Swedish 1902 expedition. These were greatly improved after the commencement of the whaling industry. Major advances were made in the course of the Discovery Investigations. These charts were

mainly hydrographic and published by the Admiralty. The first land map of the island was published in 1950 by the Directorate of Colonial Surveys for the Falkland Islands Dependencies Survey.

The four South Georgia Surveys led by Duncan Carse from 1951 to 1957 concentrated on mapping land features and their work resulted in the vast improvement of maps. These surveys are the basis of the latest British Antarctic Survey/Directorate of Overseas Surveys maps. Several particular areas have more recent ones available.

Hydrographic survey advanced greatly in 1960-61 with the work of HMS *Owen* using helicopters. HMS *Protector* and HMS *Endurance* have subsequently continued this. Five Admiralty charts are available for the island.

Place-names on South Georgia have had a very varied history and, apart from English names, Norwegian, Russian, Spanish, Polish, German and others have also been applied, sometimes more than once, to the same feature. The Antarctic Place-Names Committee of the Colonial Office published its first gazetteer in 1953 and efforts to secure its uniform adoption were made. The latest edition *Gazetteer for the Falkland Islands Dependencies* of 1977 (amended 1979) lists about 700 names for South Georgia, and a history of the place-names has been published.

#### METEOROLOGY

The climate is cold, wet and cloudy with strong winds and no great seasonal variation. Meteorological conditions are greatly affected by local topography and altitude. The high hills and mountains near Cumberland Bay, where observations are made, cause the area to be warmer in summer and generally much less windy than more exposed locations. Brief and discontinuous observations from several other stations demonstrate a more rigorous climate. Owing to its position 350 km south of the Antarctic Convergence, and its proximity to the Antarctic continent, the island has much colder weather than its latitude indicates. Sub-zero temperatures are recorded every month of the year. The absolute maximum recorded, 22°C, has been during föhn winds; plus 15°C is occasionally reached on a warm windless summer day. At the other extreme, it is uncommon to record temperatures below -15°C at King Edward Point at sea-level.

South Georgia is a very windy place. Gusts approaching 50 m s<sup>-1</sup> have been recorded at King Edward Point - a relatively sheltered area. The yearly average speed has recently been 5 m s<sup>-1</sup>. Gales have recently occurred on about 30 days a year. Equinoctial gales are usually the most severe. Violent whirlwinds ("williwaws"), generated in the mountains then sweeping down valleys and out to sea, are common during periods of strong wind. Another interesting feature is the föhn wind, such as those experienced in the Alps and the Chinook wind of the Canadian Rockies. These result from rapid changes in pressure, humidity and temperature of winds blowing across the mountain ranges from the south-west. When one begins, temperatures may rise 10 degrees in as many minutes and snow and ice may melt rapidly. The wind gathers speed as it descends from the mountains and glaciers, often becoming gale force. The humidity may drop to 10-20%.

Precipitation occurs uniformly throughout the year; dry periods are rare and do not persist. Rain at times may be torrential. Snow depths of at least one metre are usual near King Edward Point in winter. In the steeper valleys, snow tends to avalanche frequently, slab and powder avalanches being the main forms. Much cloud occurs and the station at King Edward Point receives only 35% of its theoretical maximum sunlight. Cloud forms are very varied; stacks of lenticular clouds and other unusual types are not uncommon. Electrical



storms are very rare owing to the frigid climate; however, the occasional spectacular one is encountered.

Much of South Georgia's weather is generated around the Antarctic Peninsula, especially by systems bringing winds and rain. Frontal systems and depressions sweep across the island with monotonous regularity. Following climatic trends in the Peninsula region over the past 30 years, South Georgia's climate is tending to become slightly warmer, windier and wetter. This is being reflected in the behaviour of the glaciers and in the distributions of plants and animals.

Meteorological records have been kept continuously at King Edward Point since 1905 and variously elsewhere. Summarized monthly meteorological statistics from a period of observations of 30 years (1951-1980) are shown in Table I.

Regular daily broadcasts of meteorological data assembled from South Georgia, from all other British Antarctic stations, and from ships and other stations, are made. These are transmitted to the World Meteorological Organization and thence distributed on its Global Telecommunications System. Because of the isolated positions of the observatories, these data are of great value in world forecasting.

TABLE I.  
KING EDWARD POINT; METEOROLOGICAL STATISTICS 1951-80. HEIGHT OF STATION 2.5 m

Month	Air temperatures (°C)			Mean wind speed (m s <sup>-1</sup> )	Days of gale	Precipitation Rain or water equivalent mean (mm)	Mean days of		
	Mean	Max	Min				snow/ sleet	rain/ drizzle	fog
Jan	+4.9	+22.3	-4.8	4.2	1	112.5	10	22	1
Feb	+5.6	+22.8	-2.2	4.5	1	142.7	9	21	2
March	+4.8	+22.2	-4.3	4.8	2	158.6	11	23	2
April	+2.7	+21.8	-9.4	4.2	2	154.1	15	17	2
May	+0.3	+16.1	-9.4	3.9	1	176.2	19	13	3
June	-0.8	+15.6	-12.1	4.1	1	148.8	21	10	2
July	-1.5	+14.4	-14.2	4.4	1	130.1	22	8	2
Aug	-1.2	+14.4	-15.1	4.4	1	144.2	22	9	2
Sept	+0.3	+14.6	-11.7	4.5	1	133.3	18	11	2
Oct	+2.1	+21.1	-8.3	4.9	1	114.2	17	15	1
Nov	+3.2	+19.7	-6.3	4.7	1	96.3	16	16	1
Dec	+3.9	+20.3	-5.0	4.4	1	90.7	17	18	1
Year	+2.0	+22.8	-15.1	4.4	13	1601.6	198	183	20

(Annual means are not necessarily averaged monthly means)

#### GEOLOGY

South Georgia is a detached block of continental crust separated from the southern Andes during the Cretaceous and early Tertiary periods. It

forms part of the Scotia Ridge which extends from the Andes through Tierra del Fuego, Shag Rocks, South Sandwich Islands, South Orkney Islands to the Antarctic Peninsula. Several distinguishable geological formations have been identified in the rather complex structure of the island. Most of it consists of a volcanoclastic flysch sequence (Cumberland Bay Formation) of an Upper Jurassic to early Cretaceous age. This is thrust over more quartzose sediments (Sandebugten Formation) also Mesozoic in age but of a different provenance. The Annenkov Island Formation, to the west of the mainland, has a thick undeformed sequence of andesitic tuffaceous mudstones and structureless volcanic breccias. In the south-west, the Larsen Harbour Formation is an ophiolite sequence of submarine lavas and sheeted dykes emplaced into metasedimentary rocks in a marginal basin. It adjoins the Drygalski Fjord Complex comprising quartzose gneisses, schists and granulites. South Georgia's rocks exhibit intense folding and have few fossils: Lower Cretaceous ammonites, lamellibranchs and fish scales together with various micro-fossils and fossil wood have been found.

The physiography of South Georgia is related to its complex structure and the effects of glaciation. Several early erosion surfaces have been recognized and it is considered that the concordant summit levels of the mountain ranges are remnants of a high-level peneplain. In contrast to the severe topography of the interior are the coastal features - raised forelands and strand flats near sea-level. Raised beaches at about 7 metres above sea-level are a conspicuous feature of the coasts and may be seen in many parts of the island. There are also higher beach levels, but glacial and fluvial erosion has almost completely destroyed these.

Unlike several other islands on the Scotia Ridge, there are no traces of recent volcanism on South Georgia. Large-scale seismic activity is rare, though two perceptible earth tremors have been reported. Seismometers have been maintained since 1971 and are presently recording microseismic events daily.

No minerals of economic interest are known to occur other than quarrying materials for local use. Perhaps one of the most noticeable phenomena is the enormous amount of moraine material and scree. Scree is found almost everywhere, often as steep unstable slopes; a great nuisance when trekking. Other effects of the climate on the rocks include a recent enormous rock-fall and general instability in steep rock faces.

The soils are largely leached forms and podzols resulting from the effects of high precipitation and low temperatures. They range from grey-brown sandy loams, usual in the grassland areas, to sandy and gravelly lithosols from degraded scree and newly exposed areas of moraine. There is extensive humus accumulation in some areas and deep peat deposits are found; these may be virtually constantly saturated with water. Near elephant seal wallows and various rookeries the soils are highly enriched with nitrogen, phosphorus, etc. Various periglacial phenomena, patterned ground, stone stripes and the like, are common and reflect the frequent freeze-thaw cycles the ground experiences. These greatly affect colonization of new areas by vegetation.

#### GLACIOLOGY

Glaciers are an outstanding feature of South Georgia. About 58% of the island is permanently covered by ice, the western windward coast being more glaciated than the eastern coast. One hundred and sixty-one glaciers are recorded and 55 have been officially named. The earliest glacial sediments were laid down during the retreat of an ice cap which extended 12 km beyond the present coastline, about 17 000 years ago. Glacial erosion is evident to



a depth of 270 m below sea-level and is responsible for shaping the landform with its many deep valleys. Since these times, there have been several periods of glacial expansion: two have occurred within the last 150 years. Extensive glacial deposits formed during a period of advance in the latter part of the nineteenth century, and smaller features formed during a similar trend after the 1920s. Since the 1940s, climatic amelioration has produced rapid glacial recession.

Glacial action is extremely powerful, and millions of tonnes of rock are transported as a result. This is responsible for the very irregular floors of the bays and surrounding ocean.

By studying the hydrology (mass balance) of key glaciers, and ice stratigraphy as indicated by oxygen-isotope variations, a relationship may be derived between the behaviour of ice and the climate. During the International Hydrological Decade a research project was initiated to try to define this relationship, initially on Hodges Glacier but presently on "Glacier Col". The data from this work go towards a world-wide glacio-climatic research programme. The glaciers are sensitive to small changes in climate so their study may be used to monitor global climatic changes. The present biological circumstances of South Georgia are comparable to some extent with those prevailing in many other parts of the world during the great ice ages.

Many of the South Georgian glaciers terminate at sea-level. Because of the constant down-hill movement, these eventually calve and massive blocks of ice separate and drift away as icebergs or, if fairly small, "growlers". These are sometimes invisible from a ship in a heavy swell and may cause considerable navigation problems, especially in spring and early summer when the advances made during winter break off.

Icebergs drifting north from the Antarctic continent are common around South Georgia. Some may be almost as large as the island. In 1978, one 38 by 65 kilometres, which had previously been tracked by satellite for 15 years in the Weddell Sea, drifted from the South Shetland Islands. It passed between Shag Rocks and the Willis Islands. The annual variation in the winter maximum position of the edge of the Antarctic pack ice is great. Normally, it is south of South Georgia but in 1980 it was over 200 km north of the island, rendering it ice-bound and unapproachable. Some bays may become frozen over and covered with drifting ice during winters; however, unbroken ice cover usually does not last long owing to the powerful ocean swells resulting from storms, frequently from Drake Passage.

#### OCEANOGRAPHY

The Southern or Antarctic Ocean which surrounds South Georgia is separated from the comparatively warmer waters of the South Atlantic by the Antarctic Convergence. This phenomenon encircles the Antarctic, passing about 350 km to the north of the island. At the Convergence, cold Antarctic water descends and is replaced by South Atlantic water on the surface. A surface temperature difference of several degrees occurs over a short distance. The position of the Convergence remains relatively constant and it is indicated on hydrographic charts. It has a substantial climatic effect, and forms a biological barrier separating many groups of marine organisms. Bird life, too, is greatly different on each side of it.

Tides in enclosed bays are irregular, the usual range being about 1 m. They are greatly affected by meteorological conditions and are difficult to predict on a theoretical basis. Tidal surges are occasionally experienced; some of these have gone up to 100 m inland and buildings have been damaged.

The currents around South Georgia originate from the Southern Ocean

Current passing the west side of the Antarctic Peninsula and from the Antarctic Coastal Current circulating clockwise in the Weddell Sea. The latter is responsible for the marked northward extension of both the pack-ice front and the Antarctic Convergence in the vicinity of South Georgia. These two currents merge and become part of the easterly circulating peri-Antarctic currents. At South Georgia, their set is to the north of east where they are undeviated by local geography, and their rate is roughly half a knot.

#### BOTANY

The vascular flora of the island comprises 26 indigenous species (10 grasses, rushes and sedges, 3 herbaceous dwarf shrubs, 6 other herbs, 6 ferns and a club moss). In addition, there are at least 15 well-established alien flowering plants with another 15 surviving rather precariously, most being in the vicinity of the whaling stations. Cryptogams are much better represented with approximately 125 species of moss and 85 liverworts. There are about 150 lichen species, many occurring at high altitudes on rock and scree. Terrestrial and fresh-water algae are locally abundant. Many fungi occur, some producing prominent fruiting bodies (toadstools, etc.) and others causing rust-like infections in higher plants.

The paucity of the flora is due more to isolation rather than climatic factors alone, although the cold summers are a critical factor. Many other species could be expected to survive if introduced. Only tussock grass (*Poa flabellata*) and two other grasses grow more than 25 cm high. Trees, shrubs and bushes are totally absent; early attempts to establish these have failed. A few native species, such as the grass *Phleum alpinum*, are bi-polar in distribution, while some occur throughout the world such as the fern *Cystopteris fragilis*.

Extensive areas of vegetation occur only at low altitudes in coastal areas, especially on the more sheltered northern coast. There are several distinct plant communities, the best defined of these being tussock grassland, *Festuca* grassland, moss banks, *Acaena* areas, bogs and fellfields. Much recent biological research has been carried out at designated study sites representative of the more important of these.

The most prominent of the plant communities is tussock grassland, dominated by *Poa flabellata*, the largest of the island's plants. This occurs particularly on raised beaches and other low land but it may also grow on very steep slopes rising from the shores. The rate of decomposition of its dead leaves is slow. This, combined with erosion of the peaty soil between individual plants on raised beach areas by the effects of weather, seals, penguins, etc. may result in the formation of pedestals which may raise the uppermost crown of leaves higher than 2 m. Tussock grass does not extend far from the sea and is often inhabited by seals and sea birds. Where this occurs, it benefits greatly from the nitrogen of their excreta and becomes more green and luxuriant. Tussock provides food and shelter for many birds, and the introduced rat, and is the staple diet of the reindeer. The flowers begin developing during summer but remain dormant throughout winter. They emerge very early in spring, often before the plants are completely free from snow, and develop rapidly to set seed before mid-summer, much earlier than most of the other plants. Tussock leaf bases are rich in carbohydrates and have supported shipwrecked mariners in the Falkland Islands.

A dry grassland, light brown in colour due to the high proportion of standing dead foliage, is common in areas from Fortuna Bay to Royal Bay but occurs less extensively elsewhere on the island. It occurs on a loamy soil

and is dominated by *Festuca contracta* but contains some other grasses, *Acaena* species, several mosses and lichens. Moss banks are composed mainly of *Polytrichum* and *Chorisodontium* species with other mosses, *Juncus inconspicuus* and a few species of liverworts and lichens. These banks may be up to 2.5 m deep.

The rosaceous woody-stemmed genus *Acaena* (burnets), with two species and their hybrid, is very common. Its seed heads have small barbed appendages which are sometimes seen attached to birds (as well as to clothing). One species (*A. magellanica*) forms a dense matted community on stable slopes and level areas. It and the smaller *A. tenera* often occur close together with the hybrid commonly growing between them. Either may also exist as a pioneer plant in exposed areas.

Bogs, mires and flushes are dominated by rushes (*Rostkovia magellanica* and *Juncus scheuchzerioides*), together with the reddish brown moss *Tortula robusta*, many other mosses and liverworts. The typical bog moss, *Sphagnum* (*S. fimbriatum*), occurs in only a few sites. Some of the island's more prominent petaloid flowers occur in mossy flushes, e.g. *Galium antarcticum* with small white perfumed flowers, and *Ranunculus bitermatus*, the Antarctic buttercup. *Montia fontana* and *Callitriche antarctica* are also found in these areas. Peat up to 3 m deep forms beneath bogs and mires. Samples taken from the base of several bogs have a maximum age of approximately 9 500 years, as determined by radiocarbon techniques.

Fellfield communities occur on dry exposed areas of glacial debris, rocks and scree; the vegetation comprises mainly scattered lichens and some mosses. Some fellfield areas with less extreme conditions have small pioneer plants of some grasses, especially *Phleum alpinum* and *Deschampsia antarctica* together with the cushion-forming *Colobanthus quitensis*. Even on some of the highest and most windswept rock faces, crustose lichens exist. *Deschampsia* and *Colobanthus* are the only vascular plants which extend their range farther south to the Antarctic continent.

Brilliant orange and yellow lichens of the genera *Caloplaca* and *Xanthoria* are prominent on many rocks exposed to sea spray or used as bird perches. Another noticeable plant is the red snow algae, aggregations of single cells which grow in melting snow banks and ice fields imparting a curious red tinge to them.

There are six species of fern, including *Ophioglossum crotalophoroides* (adder's tongue) and *Hymenophyllum falklandicum* (a filmy fern) as well as *Lycopodium magellanicum* (a club moss). Most of the ferns are found in rock crevices, amongst boulders in scree. The *Lycopodium* may occur in patches amongst *Festuca* grassland.

During its comparatively long period of habitation, many plants have been introduced to the island. Most have been unable to endure its conditions for very long but several have become established. Of these only two have become widespread. The most abundant is the weedy grass *Poa annua*, a hardy and adaptable species which even occurs as a pioneer plant on newly exposed glacial moraine. The other, *Cerastrium fontanum*, a chickweed, is widespread but sparsely established over a few areas. Several alien grasses and some common weeds such as dandelion, buttercup, clover, sorrel and others survive but are more or less restricted to the former whaling stations and King Edward Point. Many adventive species are represented only by one or two isolated persistent plants. Some cultivated ornamental and salad species are maintained at the research station.

In many places, plants are slowly colonizing new areas created by the receding glaciers; pioneer species are becoming established on recent scree, moraines, glacial outwash debris and similar areas. As these grow they accumulate organic and mineral matter occupying crevices or forming "islands"

which provide foci for more rapid development and colonization. The present general amelioration of the climate is being reflected in an increase in the amount of vegetation cover of the island. However, an analysis of pollen and spores in deep deposits of peat has indicated little change in the composition of the flora since the end of the last major glaciation, about 10 000 years ago.

The vegetation of lakes, ponds and some streams often includes a floating fringe of mosses, especially *Drepanocladus uncinatus* and *Pohlia wahlenbergii*, with *Juncus*, *Callitriche*, *Acaena*, *Ranunculus bitermatus* and other plants growing through it. There is no emergent vegetation growing from the beds of these bodies of water. Some aquatic mosses may grow down to about 30 m and mats of algae form to deeper levels. These may occasionally become detached and float to the surface.

There are many species of marine algae of which *Macrocystis pyrifera*, *Lessonia antarctica* and *Durvillea antarctica* are the most spectacular. These giant kelps grow around the rocky shores where they often reach 40 m in length. They provide a favourable habitat for many species of young fish and invertebrates which yield food for several bird species, especially during winter. Since these seaweeds grow in quite shallow water and rarely in depths greater than 20 m, they provide warnings of hazards to navigation by indicating rocks and shallows. The establishment of an industry to extract agar and other alginate products from kelp has been considered.

#### MAMMALS

The only native mammals found at South Georgia are marine: whales and seals. Several alien species of terrestrial mammals have been introduced over the last two centuries.

Six species of seal have been recorded at South Georgia. Two of these, the crabeater seal (*Lobodon carcinophagus*) and the Kerguelen fur seal (*Arctocephalus tropicalis*) are rare visitors, the former from the pack ice much farther south and the latter from the north, possibly from its nearest breeding site at Gough Island.

The Antarctic fur seal (*Arctocephalus gazella*) once bred in great numbers all around the island. Now, after many years of protection, it is making a remarkable recovery from virtual extermination by nineteenth century sealers. The main colonies are at the north-west of the island and are increasing rapidly (about 15% a year). Each year more animals are appearing on many beaches around the island. This fast rate of increase has probably been assisted by the relative abundance of krill (their main diet) following the reduction of whale populations.

Recent estimates suggest 100 000 cows are breeding annually on South Georgia and at least this number of immature animals is present. Fur seals are active, agile creatures with sharp teeth and a tendency to become territorial and pugnacious during the breeding season. From early November, adult bulls compete to hold territories on breeding beaches. The successful ones (usually from 8 to 10 years old) defend a small harem of up to ten cows. Pups, conceived the previous season, are born in early December and are weaned about 4 months later. The whole population is pelagic from May to October.

The elephant seal (*Mirounga leonina*) is so called because of the adult male's erectable proboscis and enormous size. It is the largest of the world's seal species: large bulls can reach a length of 6 metres and weigh four and a half tonnes, of which 40% is skin and blubber. Cows are about one-fourth to one-fifth this size. Following considerable over-exploitation in the previous century, a scientific management plan was successfully followed

from 1910 to 1964 - the period of modern sealing described earlier.

The first breeding bulls haul out of the sea in August followed in September and October by the pregnant cows. Harems are formed which are much larger than those of fur seals, perhaps one hundred cows may be controlled by a "beach-master". Many bachelor bulls lurk in the surrounding areas. Challenges and fights are frequent and spectacular; these take place on the beaches throughout the breeding season and cause much pup mortality. Pups are born soon after the mother hauls out. Their milk diet is exceedingly rich in fat and their weight increases from about 44 kg at birth to 10-180 kg at the conclusion of lactation about 23 days later. They then moult and enter the sea by the end of the year. Prior to this, the adults return to the sea, hauling out in late summer and early autumn to moult and spend much time in foetid wallows.

The diet of the elephant seal is principally squid with some fish. They are capable of remaining continuously on land without feeding throughout the breeding season and moulting by living off their fat reserves.

The leopard seal (*Hydrurga leptonyx*) is essentially a solitary species and individuals are often seen around the beaches of South Georgia. The female reaches a length of up to 4 m - considerably larger than the male. Normally, it breeds on the edge of the pack ice well south of South Georgia but there are several records of breeding on the island. It has impressive recurved tricuspid molars and its diet includes fish, krill, birds (especially penguins), fur seal pups and, farther south, crabeater seal pups. Divers consider it potentially dangerous.

The Weddell seal (*Leptonychotes weddellii*) is at the northern limit of its range on South Georgia and is not often seen. There is one long established breeding colony at Larsen Harbour at the southern end of the island. Its food is principally fish together with squid and other invertebrates.

South Georgia was once the world's greatest whaling centre, but excessive exploitation with inadequate controls has drastically reduced the number of whales, a history not unlike that of the seals in the previous century. Up to the early part of this century, whales abounded in the fjords of South Georgia and in the surrounding oceans. Species which are recorded in the vicinity include *Balaenoptera musculus* (blue), *B. borealis* (sei), *B. physalus* (fin), *B. acutorostrata* (minke), *Megaptera novaeangliae* (humpback), *Eubalaena australis* (southern right) and *Physeter catodon* (sperm). Fin and sei were the whales most commonly encountered towards the end of the whaling era.

All except *Physeter* are krill feeders. They swim with their mouths open through swarms of krill, filtering these through baleen plates, dermal processes of the upper jaw: the "whale bone" of commerce. They have well-defined migratory cycles corresponding with seasonal fluctuations in krill abundance. *Physeter* feeds mainly on squid which it may take from great depths. Its bulbous head has a large reservoir of oil-like spermaceti possibly used in controlling its buoyancy.

The killer whale (*Orcinus orca*) is sometimes seen around the island. Though not hunted, it was often encountered during whaling operations feeding on harpooned whales. It is a predatory carnivore which sometimes hunts in packs.

Other lesser cetaceans recorded at South Georgia are pilot whales (*Globicephala melaena*), Commerson's dolphin (*Cephalorhynchus commersonii*), Peale's dolphin (*Laegorhynchus australis*), and the cruciger dolphin (*L. cruciger*).

Terrestrial mammals are all recent introductions. Norwegian rats (*Rattus norvegicus*) and the small isolated population of house mice (*Mus musculus*) probably arrived with the sealers early in the nineteenth century. Most of the mainland, especially the north-east, now has a substantial rat population though many of the offshore islands are free from them. They are omnivorous, feeding on tussock grass and other vegetation (including kelp in

winter), invertebrates and fish when accessible, and they are serious predators of many bird species, especially of eggs and young. There is a contrast between the avifauna of rat-infested and rat-free areas. Populations of rats still inhabit the abandoned whaling stations. These are still feeding on meat-meal, abandoned supplies and the like, and may be distinguished from the feral "tussock" rat living elsewhere on the island. It is likely that the population of the "tussock" rat is now in a substantially stable state as it is quite well adapted to local conditions. They usually nest in hollowed-out bases of tussock grass thus obtaining both food and shelter.

Mice were discovered at Shallop Cove, in the north-west, by a geological party in 1976. They show some adaptations to the rigorous environment, being larger, and having greater deposits of brown fat, than is usual for the species.

Reindeer (*Rangifer tarandus*) were first introduced from Norway in 1911 by whalers. About 2 000 now occur in three herds. These have resulted from two separate introductions. The animals from another introduction were all killed in an avalanche. The first herd was introduced at Ocean Harbour and colonized the area from St. Andrews Bay to the Barff Peninsula. Around 1963, some of these crossed Cook Glacier to form the Royal Bay herd. A third herd is confined to the peninsula terminating at Larsen Point and around Stromness Bay. Although some herbaceous plants, especially *Acaena magellanica*, are eaten preferentially, their staple diet is tussock grass, particularly in winter. During difficult times they also eat lichens and kelp.

A survey of the effects of reindeer on the vegetation commenced in 1973 when exclosures were established in various plant communities throughout their range. These have then been examined annually; increases in some herbaceous species and a decrease in an alien species are already apparent. In much of their range the reindeer have very greatly depleted many lichen species. The population of reindeer is difficult to determine. It appears to have reached a peak in 1958 and then fallen due to a shortage of food. At the end of winter, a number of animals appear quite thin; starvation and misadventure kill many during this period. Venison, obtained through controlled shooting, is a welcome addition to the diet at King Edward Point.

Breeding populations of cats have died out - probably only two animals now remain. Previously, horses, cattle, sheep, pigs, rabbits, goats, and dogs were kept, some as a source of fresh meat at the whaling stations. Silver foxes, fed on whale products, were introduced experimentally for fur production, but this was unsuccessful and they were removed.

## BIRDS

There are 29 breeding species of birds and 26 other species recorded from South Georgia. As is to be expected from an oceanic island, the avifauna is dominated by sea-birds, but five terrestrial species are resident.

The smallest terrestrial bird, the endemic *Anthus antarcticus* (South Georgia pipit), is only the size of a sparrow. It breeds mainly on Bird Island, some other offshore islands and other relatively rat-free areas. Much of its diet is invertebrates, mainly insects and spiders in summer and invertebrates associated with tide-line debris in winter. Two duck species occur, both with South American affinities. The endemic *Anas georgica* (South Georgia pintail) feeds predominantly on algae and it frequents ponds in summer and sheltered bays in winter. *Anas flavirostris* (speckled teal) was first found breeding in 1967 and occurs only in the Cumberland Bay area. This may reflect its feeding preference for aquatic invertebrates from glacial ponds and lakes.



*Chionis alba* (greater sheathbill) is dependent on sea-birds and seals for its food, being an enthusiastic scavenger around rookeries and seal beaches. In winter, most migrate to the Falkland Islands and South America, although many may remain near king penguin rookeries where food is available throughout the year. *Catharacta lonnbergii* (brown skua) is also principally a scavenger at seal, penguin and albatross colonies feeding on afterbirths, eggs and corpses. In some areas, it takes small petrels at night and is a predator of the rat. Though breeding throughout the island, it is usually found where the petrels are numerous. It, too, migrates for the winter, mainly to the Northern Hemisphere.

The remaining 24 bird species known to breed on South Georgia are dependent directly on the sea for food and most have a distinct feeding niche different from other species. The inshore feeders, *Larus dominicanus* (southern black-backed gull), *Phalacrocorax atriceps* (blue-eyed shag) and *Sterna vittata* (Antarctic tern) feed on shore-line and in-shore invertebrates (mainly limpets), large fish at depths to 30 m and small fish near the surface, respectively. Thus, they avoid direct competition. Similarly, the 21 pelagic feeders each have a distinct feeding habit.

A highly specialized group of birds are the penguins which are adapted for exploiting food resources well below the sea surface, in contrast to the remaining groups which are virtually restricted to taking food at the surface. Eight species of penguin are recorded on the island: four main breeding species, one which breeds only occasionally, and three others.

*Aptenodytes patagonicus* (king penguin) stands about one metre high and has distinctive golden-yellow plumage on its head and breast. The breeding cycle is unique in that it occurs over a 3-year period during which a pair can raise two chicks. There are large colonies at the Bay of Isles, St. Andrews Bay and Royal Bay together with many smaller ones elsewhere. The main colonies are continuously occupied by adults and chicks, each with over ten thousand breeding pairs. Their diet is principally squid and fish.

The smaller *Eudyptes chrysolophus* (macaroni) is far more numerous, occurring in immense numbers on the Willis Islands. The breeding population on South Georgia may exceed five million pairs. They feed almost exclusively on krill, both adult and larval stages being taken, and probably forage well out to sea. *Pygoscelis papua* (gentoo) nest in small colonies throughout the island. They take adult krill and fish during the November to March breeding season. *Pygoscelis antarctica* (chinstrap) is less common, being at the northern extent of its range on South Georgia. There are several breeding colonies and it is thought to be increasing. *Eudyptes crestatus* (rockhopper) is at its southern limit but has been recorded with eggs on a few occasions. It is very common on the Falkland Islands. *Aptenodytes forsteri* (emperor), *Pygoscelis adeliae* (Adélie) and *Spheniscus magellanicus* (magellanic penguin) are the other species recorded as visitors to South Georgia.

There are about 4 300 breeding pairs of *Diomedea exulans* (wandering albatross) on South Georgia, mainly confined to Bird Island and a few other off-shore islands. This species is the largest of the albatrosses and may have a wingspan of 3.5 m. Eggs, laid in late December, hatch in late March and the chicks are reared (principally on squid with some fish) during the winter, finally fledging in November or December. Successful birds cannot then breed again during that season and so most of the population breeds every second year. *Phoebastria palpebrata* (light-mantled sooty albatross) nests solitarily or in small colonies on rocky bluffs around the island. Its food is mainly squid together with krill, other Crustacea, fish and carrion.

The other two nesting albatrosses, *Diomedea melanophris* (black-browed)

and *D. chrysostoma* (grey-headed) are closely related. They breed in colonies, often mixed, of 50 000 and 40 000 pairs, respectively, mainly in the north-west of the island. During January to May, when the chicks are on the nests, *D. melanophris* is mainly a krill feeder while *D. chrysostoma* chiefly takes squid with lamprey and other fish. The former is an annual breeder whilst the latter is biennial.

*Halobaena caerulea* (blue petrel) and *Pachyptila desolata* (dove prion) have different breeding times, otherwise they nest in similar situations - burrows in tussock grass. The two *Pelecanoides* species, *P. georgicus* (South Georgia diving petrel) and *P. urinatrix* (common diving petrel), have separate feeding sites, one being inshore and the other out to sea. *P. georgicus* nests in burrows on high scree slopes throughout the island, thus to some extent escaping rat depredation. *P. urinatrix* is common on Bird Island and nests in tussock grass on cliffs.

The two *Macronectes* species, *M. giganteus* and *M. halli* (giant petrels), have only recently been taxonomically separated. The latter breeds about 6 weeks earlier than the former whose chicks may be present on the nest till early May. Most of the *M. halli* population is on the north-west of the island whilst *M. giganteus* occurs throughout it. They are large powerful birds, mainly carrion eaters and scavengers but both take live prey at times.

Of the remaining breeding species, only *Procellaria aequinoctialis* (shoemaker) and *Oceanites oceanicus* (Wilson's storm petrel) are common. The former is large enough to resist rat depredation; it forages over large distances catching squid and some krill, and is the petrel most frequently seen on land during daylight hours. *Oceanites* is a common breeder in coarse scree and rock crevices. It is a very small bird which may often be seen feeding among kelp beds and in many bays. The other two storm petrels, *Fregatta tropica* (black-bellied storm petrel) and *Garrodia nereis* (grey-backed storm petrel), which are also small birds, are rare and local. *Daption capense* (cape pigeon) and *Pagodroma nivea* (snow petrel) are most frequently seen at sea, and both breed only in small numbers. The former occurred in vast flocks during the whaling era, feeding on floating refuse from the stations.

The remaining species recorded are all non-breeding; many are sea-birds with ranges to the north or south of South Georgia or birds from South America blown over by storms and the prevailing winds. Sightings of herons, egrets, ducks, sandpipers and others are most commonly reported after periods of several stormy days. These birds do not usually survive for very long. An interesting new arrival is *Bubulcus ibis* (cattle egret) only recently established in South America from Africa. *Gallus gallus* (domestic fowl) has a successful breeding colony in a small shed on King Edward Point and previously were kept at whaling stations. *Chloephaga picta* (upland goose) have twice been introduced unsuccessfully from the Falkland Islands though they have bred on South Georgia. Pigeons have been kept, and were once used as message carriers from whale catchers to a shore station before the advent of radio, and sparrows also appeared but failed to survive.

#### FISH

In the waters south of the Antarctic Convergence almost all the fish encountered elsewhere are absent. A single group, the Nototheniiformes, predominates. This is subdivided into four major families: Nototheniidae (Antarctic cod), Channichthyidae (ice fish), Harpagiferidae (plunder fish) and Bathydraconidae (dragon fish). Around South Georgia, 33 species of

bottom-living fish have been recorded, ten of them endemic. As throughout the Antarctic waters, Nototheniidae are the most widely represented with 18 species in coastal waters. The largest fish is *Raja georgianus*, an endemic ray which may weigh 14 kg. Even a flat fish, *Mancopsetta maculata*, is found in deep coastal waters.

Most Antarctic fish have reduced haemoglobin in their blood. This is thought to be an evolutionary response to the high oxygen-carrying capacities of very cold water and of the haemoglobin giving their blood an increased viscosity at low temperatures. The most extreme case is found in the ice fish, such as *Chaenocephalus aceratus*, a large pike-like fish common at South Georgia. These have completely colourless blood and no functional haemoglobin.

Large concentrations of bottom-living fish are found over the continental shelf adjacent to South Georgia. These have attracted several East European fishing fleets during the past 12 years. The principal fish caught are three species of ice fish (*Chaenocephalus aceratus*, *Parachaenichthys georgianus* and *Champscephalus gunnari*) and the Antarctic cod (*Notothenia rossii*). During the 1970-71 season, nearly half a million tonnes of fish were caught around the island but in recent years this has fallen to 10 000-50 000 tonnes. At times, foreign fishing vessels are commonly seen near the coasts and they occasionally visit Grytviken to take on water and tranship cargo. The writer can testify to the excellent taste of many of the local fish.

Lampreys and their relatives, primitive parasitic fish of several species, also occur in the waters around the island. They form an important constituent of the diet of several albatrosses.

#### INVERTEBRATES

Terrestrial invertebrates, other than those parasitic on birds, include 40 species of insects, 4 of spiders, 51 mites, an earthworm, enchytraeids, a land snail, tardigrades, nematodes and some minor groups. Approximately one-third of the species are endemic. The insects are represented by 7 beetle species (one inhabits fresh water), 13 flies, two Hemiptera (bugs), a thysanopteran (thrip), a hymenopteran and 16 species of Collembola (springtails). The comparatively abundant mite fauna contains members of five orders and exploits a very large range of land habitats. Occasionally, alien species have been introduced; for example, the ubiquitous *Blatta germanica* (cockroach) once existed at a whaling station. None of these species has become established because they are unable to endure the winters.

The native arthropod species have several strategies for over-wintering; many do so in inactive stages — eggs or pupae — others remain as larvae or adults. The former may, in the case of some flies, emerge in the adult form in immense numbers from tussock pedestals near elephant seal wallows at the onset of warm, sunny weather after the snow cover has melted. They congregate in small clouds over particular tussock plants. Two species of beetle may be seen crawling on the surface of deep snow in winter during periods of sunshine. It is probable that their dark colour enables them to obtain warmth from the sun's rays, their contact with the frozen substrate being minimal. Other interesting adaptations involve extensive supercooling and the presence of polyhydric alcohols and sugars in arthropod body fluids. These increase the capacity for cold survival by maintaining the body fluid in the liquid phase at temperatures well below its freezing point. Some other species, usually in their larval stages, are capable of survival even after being frozen. The abundant soil-dwelling mite fauna shows large seasonal fluctuations in species and stages of development at different

depths, which may reflect differing life cycles and activities.

The food of terrestrial invertebrates is very varied. Fungi, lichens, algae and possibly mosses support many of them. Some of the beetles are herbivores, grazing *Acaena*, *Poa* and occasional other species. *Lancetes* (the water beetle), the spiders and some of the mites are carnivorous. Some fly larvae feed in elephant seal wallows, their adults being abundant in these areas.

Another, somewhat distinct, group of terrestrial invertebrates is the parasitic fauna, associated mainly with birds. This includes mites, ticks, biting and sucking lice and a flea species. Their relationships and ecology follow closely those in similar situations elsewhere owing to the specialized nature of the parasitic environment.

Invertebrates inhabiting fresh water include 10 species of Crustacea, 16 of rotifers, and at least one each of Annelida, Tardigrada, Nematoda, Platyhelminthes, Gastrotricha, Coelenterata and Protozoa, as well as the water beetle referred to previously. The larger lakes and pools do not freeze to their entire depth during winters, although thick ice may cover them for almost half the year. Shallow ponds and tarns are usually frozen solid; however, many of their inhabitants can survive this — often as eggs — and populations re-establish during the summer.

The marine planktonic invertebrate community is characterized by large numbers of a few species — a classic response to an extreme environment. Perhaps 50% of the zooplankton biomass is of one species, *Euphausia superba* (krill), although numerically Copepoda are the most abundant. Most other marine organisms — squid, fish, seals, whales, and many sea-birds are directly dependent on krill for their food. Hence, its importance in the Antarctic marine ecosystem. Krill swarms regularly form around the island; these may cover several square kilometres and comprise enormous numbers of animals. Of the remaining planktonic groups present ctenophores are among the most common and several other phyla are represented.

In direct contrast, the bottom-dwelling invertebrates have a high species diversity. A single trawl haul may be teeming with various species. This is probably due to the wide range of habitats available to them in kelp beds, in areas of glacial deposition where there is a very wide range of substrates from fine material to rough hard rock, stones and boulders (similar to conditions on coral reefs) and to the isolation of the Antarctic region. This has led to many diverse adaptations and the evolution of many endemic species. Interestingly, such isolation and extreme conditions are reflected in the absence of some groups which are very common elsewhere. For example, the larger Decapoda (crabs, lobsters, etc.) are virtually absent and Cirripedia (barnacles), so common throughout the rest of the world, are restricted to unusual habitats such as areas subjected to strong currents at depths of 500 to 1 000 m and on the skin of whales and seals.

The seas around South Georgia (and the Antarctic generally) are characterized by great clarity in the surface water. This has led to the development of bottom-living communities which are composed of attached filter feeders, such as Tunicata, Porifera (sponges), hydroids, tube-worms, and Mollusca with associated mobile predatory groups such as Echinodermata and Crustacea which browse over the organic "carpet". The biomass of this "carpet" may be as high as 5-10 kg m<sup>2</sup>.

South Georgia's foreshores are poorly colonized owing to exposure to sub-zero temperatures, ice abrasion in winter and lack of strong regular tidal changes. However, a zonal succession of communities of seaweeds and invertebrates develops in some areas and includes small mussel-like bivalves (e.g. *Kidderia*).



## CONSERVATION

The biological environment of South Georgia is, in many cases, extremely delicate. Owing to very slow growth rates, vegetation and its associated fauna may take many years to recover from even quite minor damage such as trampling, and because of this, access to many research sites is restricted. For similar reasons, studies on birds, seals and other fauna are carefully arranged to cause the minimal disturbance compatible with the investigation.

The conservation and protection of the flora and fauna is subject to an ordinance and regulation by the Governor of the Falkland Islands. These provide for the control of import and export of all species for specified scientific purposes only in order to protect the natural ecological system of the region from interference. Similarly, permits are required in all cases where animals are to be killed for any reason. There are three forms of designated area for conservation established by proclamation under a law passed in 1975. "Specially Protected Areas" are designated to preserve their ecological systems. It is the aim of the administration to keep everyone out of these areas to preserve them totally undisturbed for comparisons in the future. "Sites of Special Scientific Interest" are designated to prevent scientific investigations being jeopardized by disturbance. Permits to enter these areas are only issued for compelling scientific reasons which cannot be served elsewhere. "Areas of Special Tourist Interest" are selected areas which are representative of wildlife and scenic beauty where the effects of tourist activity may be systematically assessed. It is now prohibited to land on South Georgia for mountaineering or other "recreational" purposes except in the latter areas, unless granted a special permit to visit other places, in addition to the normal entry formalities.

## PRESENT CIRCUMSTANCES

The British Antarctic Survey presently maintains two stations on South Georgia, "Grytviken" at King Edward Point and "Bird Island" off the north-west extremity. "Grytviken" is manned continually and has a summer population of about 25 men and about 17 in winter. Population is dependent on research activity which will be reduced from 1982. Visitors from the Survey's ships and other vessels rarely stay for more than a few days but will have a small wintering party from 1982-83. "Bird Island" is presently occupied only during summer by about four men. The stations are supplied by the Survey's vessels RRS *John Biscoe* and RRS *Bransfield* (named after two early Antarctic explorers). Assistance is often rendered by HMS *Endurance*, an ice patrol ship of the Royal Navy. The helicopters she carries have been of great value for aerial photography, landing field parties and some difficult cargo transportation. She is to retire from service in 1982.

King Edward Point has well-equipped carpentry, engineering, electrical and building workshops; diving facilities including a recompression chamber; a helicopter landing area; radio and teleprinter communications, etc. Electric power is provided by diesel-driven dynamos which produce about 2 000 kWh/day. Running water, usually available throughout the year, is obtained from a dam in an adjacent valley (a new pipe was laid in 1980). A twenty-five line automatic telephone exchange operates internally. Heating of the major buildings is by gravity-fed oil-fired boilers connected to a main pipe-line. Sea transport consists of the launch *Albatros*, a powered dinghy and inflatable rubber craft powered by outboard engines. Land

transport for use around King Edward Point and Grytviken includes tractors, snow-mobiles and various sledges. A greenhouse is maintained and chickens kept. Medical facilities are available but rarely used as the state of health is very good. A medical officer is present during much of the summer and a dentist visits the station from one of the Survey's ships.

Sports facilities include football, darts, billiards, table-tennis and badminton, sometimes played in the converted "Kino" at the whaling station. It is usual for King Edward Point to defeat ships' companies on the football pitch where up to a dozen international matches are played annually. There are many card and board games. Excellent opportunities exist for photography, modelling, painting and construction. Out-door pursuits, e.g. trekking, diving, skiing, skating and sledging, are one of the island's greatest attractions — but are rather dependent on the weather. There is a well-stocked bar with the most liberal licensing hours. Libraries include general, scientific, polar, magazine, magnetic tape and gramophone record sections. There is a cinematograph projector; films are exchanged annually and swapped with those from ships when the opportunity arises.

The scientific station on Bird Island was established in 1957. It now consists of a main building (Lönnberg House), a dynamo shed, two stores and a jetty. With the exception of one year, the station has been occupied during summers only, commencing with the arrival of the first ship of the season and closed with the departure of the last. Bird Island's radio communications are relayed through King Edward Point. Future plans include substantial rebuilding and subsequent occupation throughout the year.

Fourteen field huts established by the Survey, eight other forms of accommodation and six refuges are available around the island. The former two groups are used for field work, mainly with birds, seals and reindeer, and also for botanical studies. Elsewhere, accommodation is provided by pyramid and other tents as required.

## RESEARCH AND RECORDING

All scientific divisions of the British Antarctic Survey are involved in various programmes on South Georgia. Research and recording presently and recently undertaken is described divisionally below.

The Atmospheric Sciences Division maintains the meteorological observatory, the records of which constitute the second longest continuous set from Antarctica. Highly sensitive rubidium-vapour magnetometers are operated to measure the north-east, north-west and vertical components of the Earth's magnetic field. Measurements of atmospheric ozone and turbidity are regularly made, the former being compared with those from satellite observations. An automatic weather station was deployed in 1980 to produce, as far as possible, synoptic messages suitable for direct transmission. Between 1970 and 1978, quarter-hourly soundings of the ionosphere were recorded.

Terrestrial research of the Life Sciences Division is largely concerned with designated study sites representative of distinct ecosystems. Here, micro-meteorological and climatological observations are being made and correlated with intensive studies of arthropods, other fauna, primary production and decomposition rates and processes, soil microbiology and protozoology. Studies of plant ecology, alien species, colonization, periglacial phenomena, floral phenology and basic collections (new species are not uncommon) continue. A microsporomorph trapping experiment has been established in conjunction with seven other circum-Antarctic stations. A programme to determine the effect of the reindeer on vegetation also proceeds.

Bird and mammal research is principally based on Bird Island and some



of the field sites. Population dynamics and the ecology of albatross species is being investigated and a tagging programme begun in the 1950s continues. Aerial photography and miniature radio transmitters are techniques which have recently been used. Monitoring of populations of penguins and fur seals is also undertaken. A 2-year intensive study of elephant seals has recently been undertaken and comparisons made with the situation around 1950 and with Macquarie Island.

Marine biology maintains studies on sea-water and, recently, an ichthyological investigation was completed. At present, the main marine activity involves an Offshore Biological Programme which is primarily investigating krill and fish ecology and life cycles together with the physical and chemical nature of the Southern Ocean. This is mainly conducted from RRS *John Biscoe* which has recently been equipped with stern trawling apparatus, enlarged laboratories and several other new facilities.

The Earth Sciences Division has recently completed a series of intensive geological investigations throughout the island and many of the results are in the course of publication. Glaciological measurements and analysis of data from sites near King Edward Point together with investigations of glacial retreat also proceed.

#### COMMUNICATIONS

Since November 1909 a Post Office has operated at King Edward Point. Ordinary Falkland Islands stamps were in use until 1944 when they were overprinted for South Georgia. These were replaced in 1946 by an issue for the Falkland Islands Dependencies. A series for South Georgia replaced these in 1963 and was overprinted in 1970 when decimal currency was introduced. The current series was issued on 5 May 1980 once again for the Falkland Islands Dependencies. This set of definitives has fifteen values from £(F.I.) 3.00 to 1 penny (F.I.). The designs are pictorial and include many aspects of the island. Since 1972 special issues have been produced annually commemorating specific events or features. These have recently included Shackleton's death, Captain Cook's visit and voyages, *Discovery* Expedition's 50th anniversary, and the Accession and Coronation Jubilee of Her Majesty Queen Elizabeth II.

South Georgia's stamps are of considerable philatelic interest and revenue is derived from their sale for this purpose. There is a Philatelic Bureau in Port Stanley which provides information and sells stamps of the Dependencies. Only ordinary postal facilities are available on South Georgia. The Post Master is the Base Commander. In summer he is assisted by an officer of the Falkland Islands Post Office who visits the island on one of the Survey's ships to handle the rather large volume of mail at that time.

There is no air strip on the island, which, in any case, is too isolated for ordinary flights to reach it. Thus postal communications are restricted to surface mail which comes from Port Stanley. About four inward and outward services operate between November and April and there is no service during the rest of the year. Inward mail (surface and air) is conveyed to Port Stanley where it is held awaiting the next ship. Outward air-mail is accepted for conveyance to Port Stanley or another place of transshipment.

The only "motorable" road is from King Edward Point to the Grytviken whaling station - about 1 kilometre. A rough pedestrian track connects Husvik, Stromness and Leith; some other paths are established. Otherwise all land journeys are across country, on foot in summer and with snowshoes or skis in winter. Snow-mobiles are occasionally used around King Edward Cove. Land travel in summer is interrupted by many highly crevassed glaciers - a launch is required to cross to the east or west shores of Cumberland Bay from King

Edward Point, for instance, and most other places may only be reached from the sea. In winter, a properly equipped party can travel on land more extensively.

External radio communications were established in 1925. The island's call sign is "ZBH". Telegraphic communications are open throughout the year but there are no external telephone links. Several officers have, at various times, operated amateur radio transmissions and exchanged "QSL" cards with most of the world.

The port of Grytviken is the only port of entry on the island. Apart from the Survey's vessels and HMS *Endurance*, ships from South Africa, the United States of America, the USSR, East and West Germany, Poland, Argentina and Norway, as well as the occasional private yacht, and others, have recently visited the island. Shipping movements may involve over a dozen vessels during the summer. Seventy-one East European trawlers were reported working in the vicinity during one season. Water is available for ships from the former whaling station's facilities, now maintained by the Survey. Occasionally, tourist ships call; *World Discoverer* and *Lindblad Explorer* have made several visits. There are about twenty known shipwrecks around the island and nine hulks or otherwise abandoned vessels in the harbours.

#### COMMERCE

The currency of South Georgia is the Falkland Islands Pound. This is on a par with the Pound sterling which may be used interchangeably. No banking, money-changing facilities, or commerce are formally established. Arrangements for purchasing items not supplied by the British Antarctic Survey are made with the stewards of the Survey's ships, merchants in Port Stanley and elsewhere. The only actual use of money on the island is for postal matters, a limited number of publications sold by the Survey and some charts. Government finances are handled by the Colonial Treasury, Port Stanley. The only imports are food, fuel, scientific and personal equipment. Revenue is derived from posts and telegraphs, income tax, port fees and sale of water to visiting ships.

#### POPULATION AND SETTLEMENT

During the whaling era the summer population was perhaps 2 000 men decreasing to about 200 or fewer after the close of the whaling season. At King Edward Point, the Administrator, who held several other offices, was supported by a staff including customs officers, a policeman, wireless operators, meteorological forecasters and observers, a mechanic and a steward. Many of these officers were recruited in the Falkland Islands. Some were accompanied by their wives and families as occasionally were managers and other officials of the whaling stations. A government biologist and sealing inspector was also present.

The majority of the employees of the whaling stations were Norwegian, mainly from Vestfold county. The United Kingdom and South America provided most of the balance but, especially after the Second World War, a variety of other nationalities was recruited. During the last three seasons Japanese workers became prominent. Cinema clubs, welfare associations, libraries, sports clubs (shooting, football, skiing, etc.) and the like were established. The overwintering personnel held mid-winter "olympics" between the different whaling stations. Four pastors served for short periods at the Grytviken church. Many items of equipment, food and accommodation were provided, and

a "Slop Chest" sold almost everything else required.

A great range of employment was covered at the whaling stations. As well as operations directly connected with whaling, ship repairers, caterers, administrators and other personnel were present. Tradesmen and others included animal attendants, bakers, blacksmiths, boiler men, butchers, carpenters, chemists, clerks, electricians, engineers, foundry men, laundrymen, medical officers, stewards, wireless operators, and many more. Each station had a hospital, equipped mainly to treat injuries. The whaling stations also each have a cemetery, the records of which show many industrial accidents, drownings, etc.

At present, all the residents of the island are officers of the British Antarctic Survey with the exception of some summer visitors undertaking specialized tasks. Most serve for a continuous 2-year period (three summers and two winters). Selection and recruitment are carried out at the Survey's headquarters in Cambridge, United Kingdom. Accommodation, food, clothing, equipment and other such requirements are provided. Salaries are paid in the United Kingdom; taxation, however, is paid to the Falkland Islands Government.

The settlement at King Edward Point consists of ten major buildings and various stores, sheds, etc. The Base Office near the jetty (reconstructed in 1981) houses the Post Office and administrative centre. Other buildings in the vicinity include the power house, with engineering and electrical workshops; the radio and meteorological building with associated external equipment; boat sheds, stores, workshop, etc.; and a food store with cold storage facilities. Discovery House, mentioned above, houses the carpentry and builders' workshops together with the diving facilities and store. The former Administrator's bungalow now provides accommodation, dining, recreational and some other facilities. A gaol (authorized in the *Government Gazette* of 1915), customs house and one remaining civil residence are now stores. The former has provided more accommodation for expeditions than for prisoners. Shackleton House, near Hope Point, a three-storey building constructed in 1963-64, provides accommodation, dining, laboratory, recreational and medical quarters as well as further storage space. It is to be closed, however, from the winter of 1982. All the buildings and the majority of the facilities date from the days of civil administration when the whaling stations operated.

In 1977-78 a programme of demolition commenced and some half dozen buildings were lost from the Point. A reduction in personnel from the conclusion of the 1981-82 summer will render more buildings surplus to requirements. For the next 10 years a plan has been proposed to build a new station near the jetty at King Edward Point.

#### FUTURE

The future is highly conjectural. A socio-economic survey, chaired by Lord Shackleton, investigated the Falkland Islands and Dependencies in 1976. The report described the circumstances, made recommendations and predicted some courses of future development. This mainly concerned the Falkland Islands but attention was given to South Georgia. Tourism, sealing, fishing, krill and kelp harvesting were discussed. The present scientific investigations will most likely continue as much more is to be discovered owing to the exceptional situation of South Georgia. Similarly, use of the island as a base for oceanographic work is expected to continue for many years. One problem especially affecting the Falkland Islands is the persistent Argentine claim to them and their Dependencies (which include South Georgia). An attempt to bring this before the International Court of Justice in 1955 was unsuccessful as Argentina refused to acknowledge the Court's authority.

There is also the possibility that perhaps South Georgia may remain as it is indefinitely: one of the few, almost undisturbed, parts of the Earth of great beauty and scientific interest.

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