

greater potential for advance in branches of the science. Until strongly on the biological side, the economic pressure of fishery is mentioned in the opening and remarkable expansion in due to the growing appreciation due in the study of marine life. Biological oceanography is now being taught by the Universities and in a number of other publicly endowed institutions whose primary business is the study of the sea itself, knowledge of which is material to human welfare. It is included in support of the work of those at Plymouth, Aberdeen, and elsewhere, already been noticed is evident in his somewhat forcefully advocated oceanography in which, without doubt, oceanography will have many activities."

For instance, with a smaller department of the Geophysical Institute devoted to marine physical research. It still exists, is, or was, wholly in England, and in America, the Scripps Institution of Oceanography includes a biological department of oceanography. A department of oceanography was established at the Prince of Monaco in 1911, which Britain was for a time the only one of its kind. Others whom we have already mentioned.

As well as to the goodly number of workers in this field so pre-eminently maintained, but to enhance the interest, it is suggested, of a Scottish Society of Marine Geographers, to be the most appropriate and to atone for its indebtedness to the past, but to be a department of a science obviously of practical value.

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*and Mysteries*. Chapel Hill: University

*Oceanographical Research*." S.G.M.,

## REMOTE ISLANDS OF THE SOUTHERN INDIAN OCEAN

By C. R. V. GIBBS

THE Southern Indian Ocean possesses a generous share of islands, although with the exception of Mauritius and Réunion (and, of course, the large mass of Madagascar) none are of any consequence, and, if Cocos and Christmas be ignored, they are restricted to the western half. All but Mauritius and Réunion lie well away from the shipping lanes. Those between the Equator and 15° S. (Seychelles, Chagos, etc.) are coralline formations, many of them inhabited and producing small quantities of copra for shipment to mainland Africa in small craft, generally sail. South of these, Mauritius and the adjacent Réunion are of considerable size and mountainous, organised colonies of Britain and France respectively, and served by mail steamers. The remote islands of the Indian Ocean lie south of these again—Amsterdam and St. Paul in 38° S. and the remainder from eight to seventeen degrees still further from the Equator. The most remote are over 2000 miles from inhabited land and the nearest something like half that distance. All are uninhabited and, excepting Kerguelen, small, but most rise to at least 1000 feet above the sea. They are claimed by France, which regards them as dependencies of Madagascar. (Incidentally this is the only portion of the Great Southern Ocean where Great Britain does not claim all the outlying islands.) The islands south of 45° S. fall into three groups—the Prince Edwards, the Crozets, and Kerguelen with Heard Island. For the first years of this century a vessel visited Kerguelen annually, otherwise visits to any of these outposts beyond Mauritius have over the last seven decades been few and far between, but the *Sule Skaer* went round them all a few years ago.

Most of these islands belong to the Sub-Antarctic and lie in the path of the permanent westerly winds. Amsterdam and St. Paul, on the other hand, are situated in the temperate zone and a region of constant high atmospheric pressure. It is therefore advisable from the outset to differentiate sharply between the islands south and north of 45° S.

### PRINCE EDWARD GROUP, THE CROZETS, AND KERGUELEN

These islands of the Sub-Antarctic fringe lie 500 miles south of the nearest steamship route, and that the relatively unimportant eastbound-only track between South Africa and Australia. Only on the rarest of occasions does any ship to-day approach closer than this, but it was not always so. These islands have actually receded from our ken. The west wind of the "Roaring Forties" is the most regular on earth and accompanied by a strong current welling up from the Antarctic beyond Cape Horn. Consequently the outward sailing ship route of last century was carried further south than the present steamship lane, and then, of course, it was the only route to Australia. Steam and the Suez Canal have between them emptied these latitudes of shipping. This forms, however, only part of the story, as for several decades about 1855 the islands themselves were constantly visited. They were then centres of the Antarctic sealing industry, and in 1843 no less than 500 sealers were based on Kerguelen. The industry, however, proved short-lived, and since then the islands have reverted into oblivion.

The three groups owe their discovery to one of two simultaneous attempts to locate the Great Southern Continent which in the eighteenth century was believed to lie beyond the most southerly known land. The French searched the Indian Ocean and so discovered these lonely islands in 1772. The British under Captain Cook first examined the Pacific, but Cook proceeded to the Indian Ocean four years later and rediscovered them without knowing the French had already been there. It was he, however, who made the first landings,

for the non-British navigators of this period all seem to have been rather averse to stepping ashore in the lands they discovered.

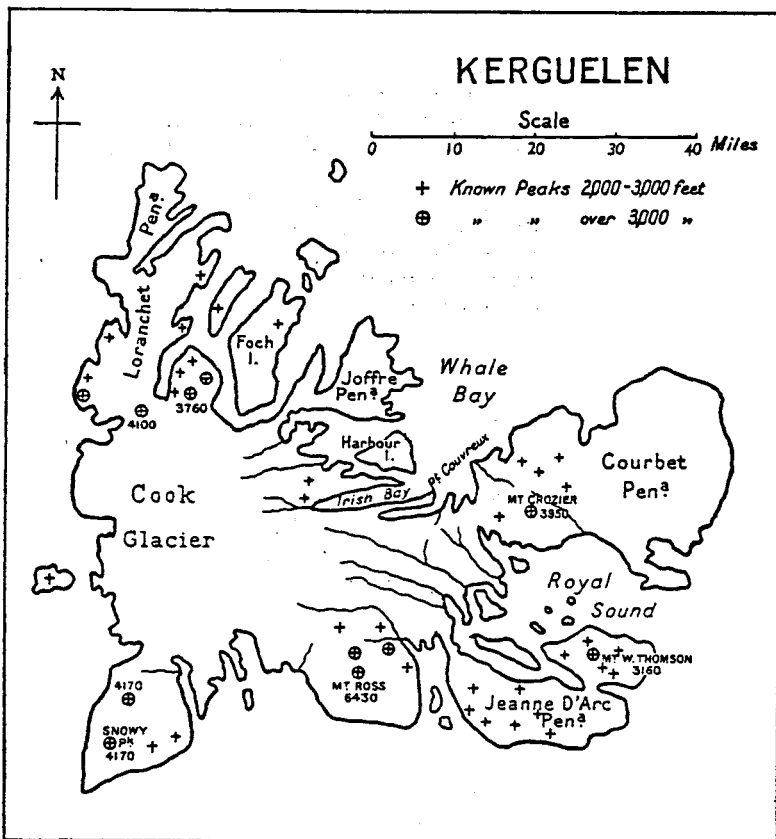
Before passing on to describe my visit in the *Sule Skaer*, something must be said about the climate of these Sub-Antarctic islands. The controlling factor is always that saturated westerly wind which here whistles round the world regardless of season and is so strong that even the westbound Australia-Cape steamships keep well north of the eastbound track in order to escape its influence. Occasional calms do occur, but most days of the year, summer and winter, the wind blows with gale force. Constant wind from the westward and constant damp mark these regions of the "Roaring Forties." The mean annual cloudiness is 65-70 per cent., much the same as north-west Scotland, but near land the percentage is even higher. Cloud is more evenly distributed throughout the year than over the least favoured parts of Britain, and so sunny days are even rarer. The tops of the islands are hardly ever free from mist. Hardly a day passes without rain, whilst heavy snow may fall at any season. The mean temperature is much lower than in equivalent northern latitudes. Kerguelen is slightly nearer the Equator than Cornwall, but belongs to quite a different world. In the Southern Hemisphere the distribution of land and sea has almost eliminated the cool temperate zone, and these islands have an average temperature during the warmest month of only about 45° F. with some ten degrees less in winter. They are spared the severe winters of Newfoundland or Iceland, but also lack their warm summers. And the raw westerly gale, usually with some north in it, blows day-in and day-out! Summer is perhaps best likened to early autumn in Southern Iceland and winter to late autumn. In terms of human habitability the advantage lies with Iceland, where not only do the calm, warm, summer days give a respite, but extensive plains near sea-level provide a living space which possesses no equivalent in these Sub-Antarctic islands. All lie well within the northern limit of drift ice, and short of Antarctica itself there are no less attractive lands.

The *Sule Skaer* left the Cape in September, the equivalent of the northern April, and first called at Marion Island, the larger of the Prince Edward Group and 12 miles long by 7. Its peak is over 4000 feet high, but snow came down to under 1000 feet and shrouded in cloud practically everything above the snow-line. We steamed around Marion and then proceeded 12 miles north-east to its smaller neighbour, Prince Edward, of less than half the height. There are few practicable landing places on either, and the summit of Marion at least is under permanent snow. Both islands are treeless and lack even a bush. Their surface is bare rock strewn with boulders, alternating with expanses of bog and rank moss. The rock is basalt everywhere. This group seems to have no history beyond its discovery and has been less popular with the sealers than the islands further east.

Continuing Australia-wards the *Sule Skaer* made for the Crozets, a series of half a dozen islands scattered over several degrees of longitude. Sailing astern and constantly dipping into the ship's wake was the prolific bird life of the Great Southern Ocean—hundreds of albatrosses, Cape petrels, Mother Carey's chickens, etc. The weather turned bitterly cold. First came rain, then snow, and finally fog descended. To have closed the Crozets under such conditions would have been sheer madness and so we sheered off to the north, waiting for the fog to lift. After two days the visibility showed no signs of improvement and there remained no alternative to missing the Crozets and proceeding to Kerguelen.

The Crozets resemble the Prince Edward Group in every respect. The two largest, Possession and Hog, are about the size of Marion and Prince Edward respectively. Sea-elephants and sea birds frequent them during the breeding season, but pigs let loose on Hog Island have disappeared. The group was much used by the old sealers, and one of their men lived on Hog for several years in the 1870's. About that time, too, small provision depots were established by Great Britain for the benefit of shipwrecked seamen. Shortly afterwards a French sealing vessel, the *Tamaris*, was lost on Hog, and after her crew had eaten

out the local provision depot they set sail in their surviving boat for Possession, but were never heard of again. The story of the wreck was learned a few weeks later from a message tied round the neck of an albatross which was picked up dead on the beach at Fremantle, Western Australia. (It looks as though even the albatrosses of these latitudes observe the "eastbound traffic only" rule!) As a sequel the French Government, which always claimed jurisdiction over the islands in this sector, in 1887 set up larger provision and clothing depots all along the *Sule Skaer's* route (including St. Paul), but their purpose had already almost passed. Sealing had ceased, and the sailing ships which might have been blown so far off their course were approaching the end of their era. The stocks have not been inspected since they were put ashore and all must have completely rotted away by now. Rabbits, however, were introduced into all the islands



long ago and have multiplied to such an extent that no castaway need fear starvation.

The fog lifted as we left the Crozets behind and we arrived off the north-west corner of Kerguelen to find its snow-covered peaks glistening in sunshine. We had been lucky enough to strike one of the few fine calm days of the year.

Kerguelen is extensive, measuring 80 miles by 70, but land and sea are so intermingled that it has an area of only 1400 square miles, equivalent to the six Scottish south-eastern counties less Berwickshire. The scenery is magnificent. Few coasts are more indented and no part of the island situated more than 12 miles from salt water. Many of the isthmuses are so narrow as to have gained the name of "overhauls" from the old sealers who preferred dragging their small boats across rather than sailing round. Plains at or near sea level occupy less than five per cent. of the total area. The western half of Kerguelen is the highest and the least known, much of it is covered by the Cook Glacier. They

are mainly in the "waist" of the island and the eastern part of the Courbet Peninsula. Most of Kerguelen is mountain, ridge, deep valley or plateau. The highest peak, Mt. Ross, reaches nearly 6500 feet and many are known to range over 2000 feet. Kerguelen's size and general appearance are such that, when discovered by the Breton seaman whose name it bears, he believed he at last found the missing Southern Continent. He at once returned to France with the news and came back the following year with two ships, but very quickly learned his mistake. In disgust he named the island "Terre Désolation," most appropriate in any case. Captain Cook arrived three or four years later, landed and gave it more attention than his predecessor. He named the leading features and, in particular, Royal Sound, a magnificent sheet of water in the south-east corner. Kerguelen was visited by several scientific expeditions last century, notably that of the *Challenger*. These and the sealers have spread over the chart a mixture of English and French place-names.

Ninety years back Kerguelen was the main centre of the southern sealing and shore-based whaling industry, but when this collapsed was deserted again. France formally annexed it in 1893, and the idea was entertained of making the island a penal settlement. The argument was that the climate would make the convicts work! Eventually a Havre company was granted a 50-year lease for the exploitation of Kerguelen. The company did some sealing and built a small oil refinery for treating the blubber. Most of the staff was Norwegian. Then in 1908 twenty sheep were imported from Iceland and efforts made to make Kerguelen a French Falklands. Although suitable fodder was found, the attempt failed. Points overlooked were the lower temperature, the fact that the island is even wetter than the Falklands, and the much more limited area at low levels. Finally, Kerguelen's isolation rendered the cost of transport prohibitive, for the island is 2000 miles from the nearest port (East London) and lies on the route to nowhere. While the experiment lasted a few people lived on Kerguelen throughout the year, and as late as 1929 these numbered three men and one woman. The company also did some sealing and built a small oil refinery for treating the blubber.

The island is of essentially volcanic origin with basaltic lavas dominating. Hot springs occur in a few places. Some poor but easily worked coal seams occur between basalt and provided inferior fuel for the tiny steamship which the French company maintained, but no other sedimentary deposits have been found. The presence of coal proves the island to have once been forested and the climate to have deteriorated during geological time.

Half the interior lies under permanent snow and ice and a few of the glaciers reach down to the sea, although most appear to be receding. There are numerous waterfalls of great height and also lakes devoid of life of any kind. None of the peaks has been climbed. Next to nothing is really known about the interior for it has been little visited. Venturing inland is purposeless and the going extremely hard. Where free of snow and ice the surface is either bog or bare rock and great boulders have been carried down from higher levels. The rabbits have played havoc with the limited vegetation.

Kerguelen lacks indigenous land mammals and land birds, but seals and birds of the Antarctic Ocean flock to its shores to breed. It does, however, share with the Prince Edward and Crozet Groups a unique insect life and a peculiar flora. The insects are few in number, and almost all are incapable of flight. As for flora Kerguelen has nothing so big as a bush. Its outstanding species is the Kerguelen Cabbage (*Pringlea anti-scorbutica*), a member of the Cruciferae which in the absence of winged insects has adapted itself to wind pollinisation. This unique plant grows in clumps and reaches a height of about a foot. It ranges from the sea-shore to over 1000 feet up. The distinctive vegetation and insect life are of great antiquity and quite unlike anything in Africa or Australia.

The island is large and high enough to show climatic differences, and the lee side is less raw than the west coast, where the permanent snow-line is