
Introduction

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Introduction

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Mr President, ladies and gentlemen: it is my pleasure, in opening this two-day conference on the terrestrial Antarctic ecosystem, to welcome you as contributors of papers and, as I shall hope, participants in the discussions with which we will conclude each of the four sessions of our meeting.

This symposium was first suggested and has, in very large measure, been organized by Dr Martin Holdgate whom we regretfully, but nevertheless most warmly congratulate on his recent translation from the post of Senior Biologist of the British Antarctic Survey to that of Deputy Director of the Nature Conservancy. The furtherance of Antarctic biology in recent years owes much to Dr Holdgate's energetic and imaginative direction, and I am glad to have this opportunity of acknowledging our indebtedness to him for arranging this discussion.

The Antarctic continent, half as large again as Australia, and the surrounding Southern Ocean, in area about one-fifth of the world's sea surface were, by their very remoteness from the maritime nations of the northern hemisphere, late of exploration. But, while it is little more than 75 years since man first set foot on the Antarctic continent, the more accessible waters of the Southern Ocean have an appreciably longer history of exploration, dating from the pioneering voyages of Captain Cook some 200 years ago. Biological investigations in Antarctica were, therefore, for long concerned almost entirely with observations and studies of animals living in the open ocean or on the sea floor rather than with the terrestrial and freshwater floras and faunas of the continental margin and oceanic islands which, either because of difficulties of access or limitations of time imposed by ships' programmes, were rarely surveyed in detail.

The waters surrounding Antarctica were, moreover, of so great an interest in their content of marine life as to discourage landward diversions. The rich fertility of the Southern Ocean with its immense stocks of whales, seals and other commercially valuable animals, early made known through the voyages of Sir James Clark Ross, the great variety and zoological interest of the benthic animals taken in the dredges of the *Challenger*, and the abundance of the planktonic organisms collected by the tow nets of the *Valdivia* were each in their turn contributory, among the many voyaging expeditions of the nineteenth century, to the continuing emphasis on marine studies to which, in the present century, the work of the Discovery Committee has made such notable contributions.

The past twenty years, however, have witnessed a dramatic change in the character and scale of Antarctic exploration and scientific investigation. Eleven nations now occupy more than forty permanently manned stations in various parts of the Antarctic continent and the outlying islands of the Southern Ocean; and under the terms of a treaty signed in 1959 national claims to territory have been suspended in the interest of mutual scientific endeavour.

The benefits of international cooperation had indeed been manifested prior to the signing of the treaty in the highly successful programmes of the International Geophysical Year of 1957–58 and with the establishment in 1957 of the Scientific Committee for Antarctic Research. A permanent working committee for the formulation and coordination of programmes of biological research was set up in 1960, and in September 1962 the first international conference on Antarctic biology organized by the committee was held in Paris. In the course of five days of discussion embracing a wide variety of aspects of the taxonomy, ecology, physiology and behaviour of Antarctic organisms the ecological dependencies of plants and animals in marine, terrestrial and freshwater environments, the distributions, past history and origins of the Antarctic floras and faunas, problems of conservation and the consequences of man's invasion of the continent, the need for further and more intensive investigation within all these fields of inquiry was at once apparent. The especial interest to biologists of the rather simple but little understood ecosystems of terrestrial and freshwater habitats was, in particular, referred to by many speakers.

It was pointed out, for example, that while the terrestrial flora of Antarctica has been shown to consist mainly of lichens and mosses together with a substantially smaller number of liverworts and a very few basidiomycete fungi and flowering plants, many of the species described are of doubtful taxonomic status and have been but partially surveyed. Above all, perhaps, there is an urgent need in the understanding of the composition and affinities of Antarctic floras for cytological studies of the chromosome complements of species groupings, for experiments on hybridization and for analysis of breeding systems. The importance of accurate and detailed surveys of environments especially favourable for plant growth such as are found on sun-warmed and damp rocks surfaces was noted, while the occurrence of soils of simple composition but of differing texture, and containing in varying measure bacteria capable of decomposing organic matter was seen to give a unique opportunity for the analysis of plant requirements under the conditions peculiar to these simply organized substrates.

Again, although there have been many admirable and detailed surveys of the distribution, variations in numbers and social behaviour of the numerous vertebrates such as seals, penguins and other sea birds which establish their breeding colonies in Antarctica, the invertebrate faunas of the Antarctic province have been but little studied. Among the terrestrial invertebrates of macroscopic size some, such as the numerous species of ticks, mites, biting and sucking lice are parasitic upon the seasonally visiting vertebrates. Free-living forms are restricted, in the main, to mites, rotifers, tardigrades, springtails and diptera, most of which are associated with mosses and lichens. Very little is known of the biology of any of these animals and, though their food dependencies may be supposed to be relatively uncomplicated, their food requirements and the role of microscopic organisms such as fungal hyphae, protozoa and nematodes in the energy cycles have not been studied.

The freshwater lakes of Antarctica are neither numerous nor large. All are ice covered for the greater part of the year although, in the lakes of oceanic islands, the period of summer melt allows of the development of phytoplankton blooms which serve as the primary food supply for a limited number of planktonic and benthic arthropods, most of them crustaceans. The conditions of photosynthesis under low levels of illumination and

long day length, the regimen of nutrient salt availability and the effects of persistent low temperatures are among the many problems awaiting further elucidation.

These and many other aspects of terrestrial and freshwater ecology briefly reviewed at the Paris conference emphasized the urgent need for the establishment of land stations with well-equipped laboratories for the furtherance of long-term investigations by resident and visiting scientists.

In 1957, Professor J. B. Cragg had visited Signy Island in the South Orkneys to examine, on behalf of the Falkland Islands Dependencies Survey, the suitability of the island for biological studies and for the establishment of a biological laboratory. Following his favourable report and with the encouragement of the British National Committee for Antarctic Research, Sir Vivian Fuchs, the Director of the Survey (now more appropriately named the British Antarctic Survey), and Dr Holdgate, as Senior Biologist, prepared detailed plans for the laboratory which was constructed on the island in the 1963–64 season.

The papers which are to be read at this meeting and upon which our discussions are to be based are the first fruits of the work that has since been done at Signy by resident biologists of the British Antarctic Survey, and by the increasing number of visitors who have profited by the opportunities afforded for research in this outlying island of the oceanic province of Antarctica. Our discussions during the next two days will, I am sure, show how well the Signy laboratory and the biologists who have made use of it have served the advancement of our knowledge of Antarctic terrestrial and freshwater studies.