

The Wolves of Isle Royale, by L. David Mech. U.S. Government Printing Office, Washington, D.C. 20402, \$1.

By a series of fortunate circumstances David Mech has been able to present us with an absorbing study of the interactions of a pack of wolves and a herd of moose in the United States national park property of Isle Royale in Lake Superior. The island covers 210 square miles and grows coniferous trees, maples, birches, oaks, aspens and willows as well as other shrubs. The moose herd is around 600 animals and there are 20 wolves. These figures represent a dynamic equilibrium: about 83 adult moose are killed annually and are replaced by about the same number of yearlings. The calf kill is about 142 annually. It is estimated that 5,823,300 pounds of browse are needed to support the moose herd which produces 89,425 pounds of moose consumed by about 1512 pounds of wolves. We do not often have such a well-documented ecological pyramid.

The island has a mixed history of use and misuse and is now enjoying respite as a national park. Quondam residents such as caribou, lynx, and marten have gone. The moose probably swam over from Canada about 1905 and established themselves on the secondary growth which followed logging and burning. Then followed the usual rapid increase and crash with deaths from starvation.

The wolves arrived in the late 1940's, coming over the ice from Canada. They have stayed, a steady population, preying on the moose and keeping that population steady at 600. There are now no moose deaths from starvation. One might think this halcyon period could go on for ever, but that is unlikely unless the National Park Service is prepared to have an intentional forest fire now and again to start a new phase of vegetational succession. The moose is a creature of secondary vegetational succession of aspen, willow and birch; the climax of conifers is not for him.

David Mech has done a fine job of observation and deduction during these years and we are told by Durward Allen, who supervised the project, that this beautiful natural experiment will continue to be watched. The National Park Service has co-operated throughout.

F. FRASER DARLING

Signals in the Animal World, by D. Burkhardt, W. Schleidt and H. Altner. Allen and Unwin, 63s.

This sumptuous volume is a translation by Kenneth Morgan of *Signale in der Tierwelt*, published in Germany in 1966. Its distinguished authors and their team of specialist collaborators review recent research into animal behaviour and bring together in an interesting and clear way a great deal of information that has not previously been available except in specialist publications.

The first part goes into considerable detail of the functioning of sense organs, nerves and hormones of a wide range of animals, both invertebrate and vertebrate. This is followed by a section on the ways in which animals orientate themselves in their environment, with interesting accounts of the migration of salmon and birds, electric location by fishes and echo location at night. Finally, the methods by which animals communicate and understand one another are considered with examples chosen from bees, grasshoppers, fishes, luminous animals and turkeys.

The study of animal behaviour has made rapid progress in recent years but accounts available to the general reader have, perhaps naturally, tended to concentrate on gross observations of larger and better-known species. This book makes clear the contribution that the vast amount of research in laboratories all over the world into the more fundamental physical, chemical and physiological factors is having on our understanding of what determines behaviour.