

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.

This combination of laboratory investigation with field observation is natural history at its best.

The book is well illustrated with splendid photographs in both colour and black and white as well as by many clear, helpful diagrams.

JOHN CLEGG

Man and Environment, by Robert Arvill. Penguin Books, 8s. 6d.

This book sets out to survey and evaluate the impact of man and modern technology on the varied components of our physical and biological environment, of which wildlife is treated as an integral component. Although primarily concerned with Britain, extensive use is made of experience from other parts of the world. The first part is concerned with a survey of the country's environmental resources and an appraisal of the impact of current and future expanding and competing demands. By bringing together an impressive amount of scattered and often inaccessible information, the author has achieved a remarkably comprehensive survey that will be indispensable to all concerned with any aspect of land use and conservation in Britain. In the latter half of the book, he sets out his views on the steps necessary to achieve continuous improvement in the quality of the environment. In many ways, this is the most interesting part. In his view, the key lies in the realistic long-term strategic planning of resources backed by a comprehensive educative programme designed to produce a climate of opinion prepared to accept the implications inherent in this kind of policy. The inadequacies of the present planning system are analysed and proposals to reform the appropriate aspects of central and local government are put forward.

Throughout, the author displays an encyclopaedic knowledge in the spheres of planning, administration and legislation, but one suspects that he is less at home when dealing with the ecological aspects of land use planning and wildlife conservation. This book is essential reading for conservationists, planners, educationalists and all concerned in any way with influencing or fashioning the environment of tomorrow.

D. T. STREETER

Tropical Pastures, edited by W. Davies and C. L. Skidmore. Faber, 50s.

The editors of this book, one a former director of the Grassland Research Institute, Hurley, the other the Director of the Commonwealth Bureau of Pastures and Field Crops, also of Hurley, have written the first and last of its thirteen chapters – 'Problems of Pasture Improvements' and 'Reflections and the Future' respectively. Each of the remaining eleven is also by a specialist, experienced in some aspect of tropical grassland management or research; two are by veterinarians. With such a sweeping title it is understandable that there should be some gaps, the most notable of these being the lack of emphasis on arid and semi-arid tropics; over half of the authors had most of their experience in the humid tropics.

In a brief mention of the tsetse fly good hope is held out for chemo-therapy as a way of allowing cattle to colonise fly-infested land, but the issues of deciding whether or not to clear land of tsetse, the failures of past schemes and the relation of overgrazing to the spread of tsetse in certain semi-arid areas are not discussed.

Looking to the future, the authors have not, surprisingly, predicted more intensive methodology for pasture production with improved use of legumes and fertilisers. There is a plea for biologists and economists to work as a team, but no mention of sociologists although in many regions social factors are easily as