

Finally, *Life with Dakтари* (doctor) describes the diverse activities in East Africa of a veterinary partnership, Sue Harthoorn and her husband Toni, which include such amazing operations as the removal of a semi-feral lion's eye and screwing back a cheetah's displaced heel bones, as well as the fantasy of 'The Rhino with a Rubber Horn'. Exciting adventures, narrow escapes and near disaster are vividly recounted. Toni is responsible for having pioneered and developed the now indispensable technique of immobilising wild animals, and some of his extraordinary experiences and triumphs are graphically recorded. Well illustrated in black-and-white and colour, together with amusing sketches in outline, there is also a useful map.

C. R. S. PITMAN

Comparative Nutrition of Wild Animals edited by **M. A. Crawford**. Academic Press, 130s

A Practical Guide to the Study of the Productivity of Large Herbivores edited by **F. B. Golley** and **H. K. Buechner**. IBP Handbook No 7 Blackwell, Oxford, 40s.

A deeper purpose than simply presenting scientific information on nutrition evidently motivated the organisers of this London Zoological Society symposium and promoted them to include papers on elephant populations, the biology of Sirenia and the domestication of eland. The unifying theme is the need to re-examine feeding systems and to consider how effectively wild species use their food supplies. By inference, great benefits might accrue to man from a more judicious management of a great variety of animals.

Deer exhibit seasonal fluctuations of food intake and growth, and are physiologically adapted to a self-induced starvation during the rut; in the laboratory their resting metabolism is higher than that of sheep. In some ways, therefore, deer appear to be poorer food-converters for meat production than domestic stock. But a direct comparison is artificial, and the effective efficiency of deer has somehow to be measured in habitats supplying range and browse that are otherwise difficult to exploit.

Among African herbivores the eland has water requirements that are higher than many other species including zebu cattle, yet it can live in dry scrub without drinking by an elegant combination of physiological and behavioural devices: it selects succulent food, forms exceptionally dry faeces, and in the cool of the night it increases its metabolic rate to produce metabolic water. Unlike mad dogs and Englishmen it avoids the midday sun.

Cape buffalo, cattle, warthog, hartebeest, topi, pig, kob and elephant exhibit almost identical patterns in the amino-acid composition of their muscle, and at the molecular level, therefore, all these mammals need to achieve the same end result, yet their separate evolutionary developments have provided them with astonishingly diverse means of deriving their requirements from vegetable food. A new significance is given to examining the way in which species are ecologically separated and to the meaning of their efficiency as secondary producers.

The elephant studies show this beast to be an agent that must rank in importance with fire and man in shaping African ecology. Populations appear to go through long cycles of changing abundance, accompanying environmental changes partly induced by the elephants themselves. For the first time data is given on the age structure of different populations and their organisation into family groups. This is the most important paper yet published on the management of elephant populations.

The IBP Handbook is a technical publication that outlines the methods to be used in the kinds of studies presented in the symposium. Its many sections are inevitably uneven in presentation and some give little detailed guidance to the worker in the field. In general, however, it provides the best starting point for anyone wanting to examine secondary productivity in large herbivores, and its sections range over such topics as energy flow, growth, age determination, metabolism and habitat manipulation.

P. A. JEWELL

Animals in the Night by J. H. Prince. Angus and Robertson, 40s.

One of the many interesting points made by Professor Prince in this book is that the majority of wild animals are either nocturnal or arrhythmic, which means that they can be as active at night as during the day. The reasons, which are complex, are discussed in the introduction, but the main theme of the book concerns the senses which have evolved to function equally well under the widely differing conditions of day and night. The echolocation of bats comes obviously to mind but it is, perhaps, not so well known that some birds, including those which provide the Chinese delicacy bird's-nest soup, also use this system of finding their way in the dark and locating their food. Even more usual senses such as sight and hearing have many refinements in nocturnal animals: higher sensitivity, methods of amplifying dim light by a mirror-like membrane behind the retina, and 'super ears', as the author calls them, which respond to a wider range of sounds than we can recognise.

Echolocation under water, the acute sense of smell possessed by sharks, the use of barbels and other taste organs by fish and the highly sensitive taste cavities in snakes, which give them a tracking power far superior probably to that of any other animals, are some of the fascinating subjects discussed. Particularly valuable is the very clear and detailed account of the functioning of the lateral line system of fish, which among other things enables them to swim in compact shoals with rapid changes of direction without colliding.

The text is illustrated by many photographs and bold if somewhat crude, diagrams.

JOHN CLEGG

Waterfowl: Their Biology and Natural History by Paul A. Johnsgard. University of Nebraska Press, \$8.95.

Paul Johnsgard is able to present to a non-specialist public the basic biological knowledge of waterfowl in a way that is eminently clear and understandable, arranged by subject rather than by species, and stressing biology and behaviour, the whole being freely illustrated by photographs both in black-and-white and colour. Of 142 living species, he has observed no fewer than 136 in life, and photographs of essentially all these species are included in what must be about the most comprehensive collection ever assembled for one book. It must be a great disappointment to him that the reproduction of those in black-and-white leaves much to be desired; many are far too dark, so that plumage details and contrast are lost. On the other hand the colour reproductions are excellent.

Without doubt Paul Johnsgard has succeeded in his most ambitious task. Among the subjects dealt with are distribution and migration; ecology and general behaviour; sound production; social behaviour, breeding biology; moults and plumages; evolution and hybridisation; waterfowl, man and the future. He pays a special tribute to the Wildfowl Trust, where he studied from 1959-61