

hensiveness of outlook it would not have been difficult to improve the chapter on the "Faunal Position" of the area in question; and even in regard to the particular factors which Mr. Harvie-Brown emphasises in his interpretation of the faunistic peculiarities of the areas, his "argument," as he calls it, appears to us too jerky and elliptical to win conviction. But he gives some references to papers dealing with the physiological conditions in some detail.

Turning to the list of mammals—which is somewhat mournful—we find that there is only one bat, the pipistrelle; the hedgehog, the lesser shrew, and the water-shrew are rare; the true wild cat still lingers; foxes, once *very* numerous, are now scarce; the marten, once abundant, is trembling in the balance between rarity and extinction; the polecat has become decidedly rare; a colony of badgers still persists; the rabbit, introduced about 1850, is in many places taking a rapid—lamentably rapid—hold of newly afforested grounds; and so on. The chief value of such information lies in the precision with which it records increase or decrease, *e.g.* of squirrel and polecat, within a term of years, and thus illustrates evolutionary processes going on around us.

We need hardly refer to the records of adder, lizard, and slow worm, of frog and toad, and two newts; but we may be allowed to note, without being captious, that the title on the back of the book and on the beautiful frontispiece, "A Fauna of the North-West Highlands and Skye," is somewhat too big for the volume, which deals with mammals, birds, reptiles, and amphibians, and no more.

The most entertaining part of the book is that which deals with the birds, in regard to which the authors speak from rich experience and with infectious enthusiasm. There is naturally enough a dominant *note personnel*, but it is always pleasant, even when the information given does not seem very important. Among the rare visitors we may mention the lesser whitethroat, the barred warbler, the nuthatch, the golden oriole, the great grey shrike, the waxwing, the rose-coloured pastor, the roller, the hoopoe, the osprey, the bittern, Pallas's sand-grouse, the red-necked phalarope, the great crested grebe, and the fulmar. Among the most interesting residents are the chough, the raven, the hen-harrier, the sea-eagle, the rock dove, and the ptarmigan. This section is rich in historical material, *e.g.* in regard to the starling, the golden eagle, the sea-eagle, the osprey, the grey lag goose, and the fulmar. Apart from their historical interest, the notes on the birds are full of interesting observations, and some of the descriptions by the late Mr. MacPherson are fine pieces of picturesque writing. Mr. Harvie-Brown gives here and there an inkling of his strong views on bird protection; thus, "the Bird Acts require steady and relentless revision and change. The idea of saving trouble at Westminster and County Council and Sheriff Courts, by dividing Great Scotland into two divisions—north and south—for all species mentioned in these Acts, is absurd, and appears to me to be eminently calculated to defeat all useful purposes of the Acts."

The book is beautifully got up and illustrated, and though, unfortunately, somewhat of a luxury, is sure to be welcomed by those who are interested in the wild life of Scotland. Its mood is one that will foster interest in open-air natural history, and the thoroughness of its lists should help to lessen the ruthless killing of supposed rarities.

J. A. T.

A NATURALIST IN SARAWAK.¹

NEARLY forty years ago Dr. Beccari, the well known traveller-naturalist, made extensive journeys in Sarawak, but not until now has he published an account of his experiences; indeed, for this volume we have to thank the Raneé, H.H. Lady Brooke, who wisely urged Dr. Beccari to give the public the benefit of his knowledge, for, as she justly stated, the conditions have practically remained unchanged from times unknown.

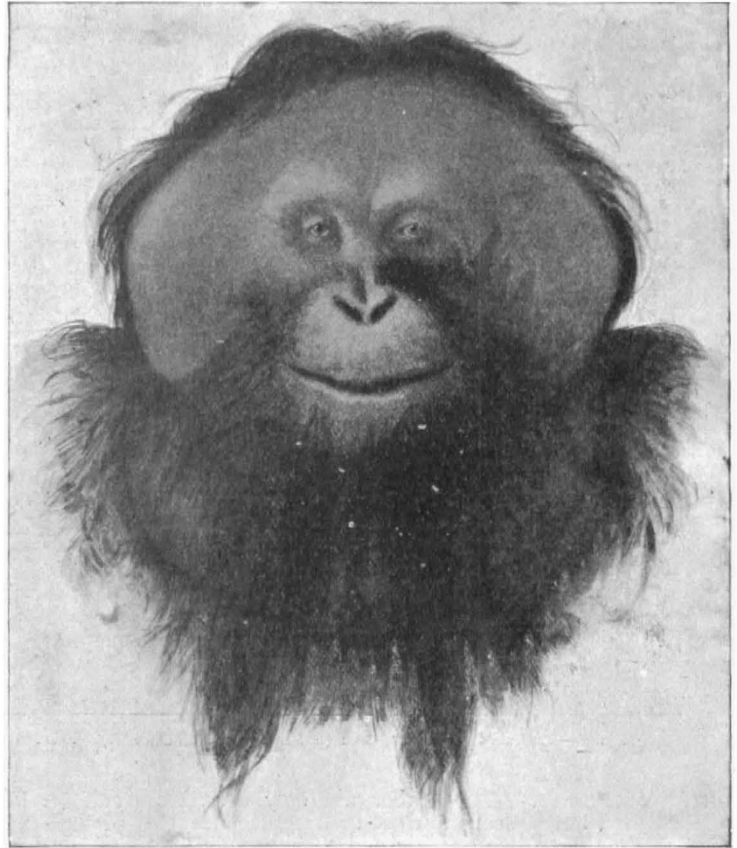


FIG. 1.—Adult Male Mayas Tjaping. From "Wanderings in the Great Forests of Borneo"

Dr. Beccari collected in the land of the Land Dyaks, of the Sea Dyaks, and of the Kayans, not to mention less numerous peoples, and he gives a first-hand account of the people, their houses, dress, weapons, and ways. All this is very interesting reading, but there is little, if anything, that has not been recorded in Ling Roth's great compilation "The Natives of Sarawak and British North Borneo," or in the writings of more recent travellers. Indeed, it is the great fault of this book that the numerous contributions that have of late years been made to the natural history and

¹ "Wanderings in the Great Forests of Borneo: Travels and Researches of a Naturalist in Sarawak." By O. Beccari. Translated by Dr. E. H. Giglioli, and revised and edited by F. H. H. Guillemard. Pp. xxiv + 424 illustrated. (London: A. Constable and Co., 1904.) Price 16s. net

ethnology of Sarawak are one and all ignored. A few references are given to older publications or the *Sarawak Gazette*, and to some of the papers based on the collections sent home by Dr. Beccari. The reader must consequently bear in mind that there is a considerable amount of information about the animals and people of Sarawak which, to say the least of it, supplements Dr. Beccari's book. To the ethnologist the chief value of the book lies in the identification of animals, and especially of plants, employed by the natives, as the author not only gives their uses, but their native and scientific names.

The general naturalist will find the book packed with interesting information. Dr. Beccari is an enthusiastic and keen witted field naturalist. The intending traveller will pick up many valuable suggestions, and the stay-at-home naturalist will gain an extremely good idea of the conditions of life in the

opinion that at least two species of orang-utan exist in Borneo. Dr. Beccari has come to the following conclusions:—There is no well authenticated case of a female with lateral face-expansions, though there is some evidence that such do occur; but there are young orangs with milk dentition which have them well developed, and adult male individuals are found with the expansions rudimentary. Not associated with the above character is the frequent absence of the terminal phalange of the hallux with the total or partial suppression of the nail. Evidently there is great variability in the orang, but Dr. Beccari holds that there is only one species of *Simia satyrus* with two main varieties, "tjaping" with lateral adipose cheek-expansions and highly developed cranial crests, and "kassa" with no lateral cheek-expansions and its skull devoid of strongly pronounced crests. Nevertheless, he suggests "that in a remote past the Mayas tjaping



FIG. 2.—*Rafflesia tuan-mudæ*, Becc. (flower 22 inches in diameter). From "Wanderings in the Great Forests of Borneo."

jungles of Borneo. The author not only describes what he saw, but he seeks to trace the interdependence of organisms upon one another and their relations to the environment. As Dr. Beccari is a professional botanist, the botany of a tropical forest is dealt with more fully and with greater knowledge than is usual in similar books, and those botanists who are interested in ecology will find much that will be of service to them.

The most important zoological observations are those on the orang-utan. The Dyaks recognise several varieties of orang, the two more important being the "Mayas kassa" and the "Mayas tjaping," with a laminar lateral expansion of naked skin in front of each ear. (In a foot-note we read that *tjaping*, in Malay, is the term applied to a small, nearly triangular piece of silver which is hung in front of baby girls as a fig-leaf.) Wallace and others have expressed the

and the Mayas kassa were two quite distinct species, perhaps having their origin in separate regions, and only later coming into contact on the same area . . . at present it seems hardly likely that the two races should remain distinct." Dr. Beccari brought home a large number of skins, skeletons, and heads of these animals, and he confesses to have killed and wounded others which he could not take away. He adds practically nothing to our knowledge of their habits.

Dr. Beccari does not hesitate to throw out a number of hypotheses, many of which will by no means be implicitly accepted by biologists; for example, he suggests (p. 32) that the prominent nose with narrow nostrils directed downwards of the Semitic people is associated with living in an open country, "whilst Negroes and Malays, for the most part dwellers in the forest, have snub noses with wide nostrils turned upwards, such as characterise most monkeys." Again,

he says, "I have always thought that there must have been a formative epoch, in which every creature had the power of special adaptation to its own needs—nay even to its own wishes or caprice. In this epoch of 'plasmation' when the so-called force of heredity—which tends to reproduction according to the type of the progenitor—had but little power, the world being still young, the organism must have been far more susceptible of modification by external forces (p. 36). . . . The actual power of adaptation in organisms is at the present day well nigh non-existent as compared with what they must have possessed in the past (p. 211). . . . The varied forms assumed by those groups of individuals called by naturalists species, would be merely the result of a plasmative force exerted by surrounding conditions on primitive beings (p. 208). . . . May it not be that the *Rafflesia*, and a host of other aberrant species, both animals and plants, are examples of the autcreation of organisms (derived from exceptional circumstances of the environment) and suddenly appeared *à l'improviste*, as it were, in that primitive epoch during which organic matter was easily plasmated, so as to adapt itself with facility even to extraordinary conditions of existence? (p. 389). . . . Therefore, contrary to the present prevailing tendency to attribute a powerful action to variability during the existing period, and to consider every species as inconstant, I hold the opposite opinion, namely, that at the present time species do not vary in Nature, returning thus to the old idea of the nearly absolute fixity of existing species (p. 210)." It is interesting to compare these views with those arrived at by Alfred Wallace, who wandered in the same jungles; and, as Dr. Guillemard, the English editor, rightly observes, "Whether the scientific reader does or does not admit the validity of all Dr. Beccari's theories concerning species-formation, he cannot call in question his abundant experience of the country, or his knowledge of the subjects of which he treats." A. C. H.

OILS FOR MOTOR-CARS.

POSSIBLY this article may be of interest to readers of NATURE who are not chemists, and therefore no apology need be made for treating certain parts of the subject in an elementary manner. The commercial names for motor-oils are numerous and confusing, and the automobilist may well be puzzled to discriminate between them, even if his chemistry has by no means become a mere schoolboy reminiscence.

The various liquids in use at the present time as fuels for motors are derived from three sources, namely, crude petroleum, coal tar, and alcohols. By far the largest quantity is furnished by the petroleum. Coal-tar "spirit" is scarcely beyond the experimental stage. Alcohol is somewhat largely used abroad, but at present is almost out of the question in this country.

Products from Crude Petroleum.—These, so far as motor fuel is concerned, are two: a *light oil* and a heavier or "*burning*" oil. The light oil, in one grade or another, is variously known as gasoline, petroleum spirit, petrol, petrol spirit, motor spirit, mineral spirit, motol, moto-essence, naphtha, petroleum-benzine, and benzoline. Of these, gasoline has the lowest density, benzoline the highest. The oil is obtained in the distillation of American crude petroleum, and may be said generally to be the portion of the distillate passing through the still between the temperature-limits of 60° C. and 150° C., and having a specific gravity ranging from 0.68 to 0.74. The limits, however, vary somewhat with the different refineries. To obtain a good motor "spirit" this fraction of the distillate is purified with sulphuric acid and with soda, and rectified

by re-distillation. Such a spirit is clear, has no strong odour, and leaves no residue when evaporated from the hand. Two or three years ago the best English petrol had a specific gravity of 0.680; but, for reasons to be mentioned later, the density has been gradually raised, and is now generally about 0.720 or more.

Chemically, light oil or petrol is a mixture of several members of the homologous series of paraffin hydrocarbons, C_nH_{2n+2} . It is generally assumed to be mainly heptane, C_7H_{16} , and octane, C_8H_{18} , but both lower and higher members are usually present, and some analyses indicate that the range may commonly be from hexane, C_6H_{14} , to undecane, $C_{11}H_{24}$. A point to notice is that whilst petrol as a whole is a light, volatile oil, it is by no means a homogeneous liquid. The different hydrocarbons composing it have not the same volatility as one another, and they require different quantities of air for their complete combustion.

The heavier oil obtained from crude petroleum corresponds to what is ordinarily known as kerosene, petroleum oil, or paraffin. It is obtained by refining the fraction which distils between 150° and 200°, and has a density of about 0.78 to 0.81. This product contains higher members of the paraffin series than those of petrol. It is consequently less volatile, and has a higher flash-point.

Kerosene is not only cheaper than petrol, but safer in the handling. Why, then, is petrol used so largely as a motor fuel instead of kerosene? And why are some kinds of petrol better than others? To answer these questions we have to remember that, to form the proper explosive mixture for the engine, it is necessary to have the vapour of the liquid mixed with a particular proportion of air. With too little air the mixture burns too gently; with too much there is a diluent effect, and liability to failure of ignition. The ready volatility of petrol allows of the requisite mixture being made more easily, more certainly, and with a simpler form of carburetter than when kerosene is used. Failure to ignite is less frequent, and the combustion is cleaner.

Nevertheless, since the supply of petrol is not limitless, attempts are being made, with some success, to utilise kerosene as a source of motor energy. The principle employed is that of heating up the vapour of the kerosene, or the liquid itself, in order to allow of a readier admixture with the air in the carburetter. This is effected either by the heat of the exhaust or by some other special contrivance. A "smokeless petroleum engine" has recently been described which is said to run without smoke or smell, and without "sooting" the cylinder. It will not, however, start with the cold kerosene. Petrol is used for the first revolutions in order to heat the vaporiser and raise the kerosene to the necessary temperature.

As regards differences of quality met with in motor spirits (petrol), the first thing to notice is that the higher the density of the liquid the nearer does it approach to the character of kerosene and to the possession of the disadvantages peculiar to the latter. To meet the growing demand, makers have been more and more inclined to eke out their supply of petrol by including a portion of the heavier fractions that were formerly rejected. Hence many of the present oils are to that extent of inferior quality. Next, the density alone is not an infallible criterion, because a spirit having a density of, let us say, 0.700, may be made up in different ways. Ideally, it might consist of a single hydrocarbon having the density in question. On the other hand, it might be compounded of two hydrocarbons having widely different densities, such as 0.660 and 0.740 respectively. In the first case it would distil completely at one uniform temperature, in the second there would be a difference of perhaps a hundred