

several narrow bands which appear conspicuous in the cabinet, but which harmonise so beautifully in nature that it is almost impossible to detect a specimen at rest among dead leaves. Neither of these species has yet been bred through, and it would be of the highest interest to do so. *J. archesia* is common in some parts of Kikuyu and *J. limnoria* in Taita, &c. Other species of the genus exist in other parts of the country, but I have confined my observations to those with which I am familiar, and they will perhaps be sufficient to indicate the interest of the subject.

THE DISTRIBUTION OF GAME IN UGANDA

By F. A. KNOWLES

The Game animals of the Uganda Protectorate are practically all common to East Africa, with the exception of the *Cobus thomasi*, or Uganda kob, which do not live east of Lake Victoria, and a small variety of the tragelaphus known as the harnessed antelope. On the other hand, many of those of East Africa are not found in Uganda, such as the Grant's and Thomson's gazelles, the oryx, Coke's hartebeest and wildebeest.

The distribution varies according to the altitude and natural features of the country and the various kinds of grass, scrub, &c. best suited to the different species. In some places the animals of certain species are curiously detached in small herds, which occupy an area of a few square miles, divided from their fellows by huge tracts of country—noticeably the impala—having, it would appear, been killed off either by the natives or by disease in the intermediate spaces, and so become isolated.

Practically half of the province of Buganda and of the districts of Toro and Unyoro is covered with what is known as elephant grass, where no animals but the elephant and buffalo (excepting lion, leopard, and pig) can live. This confines the habitat for the antelope and gazelle to considerably less than

half the area of the Protectorate, including the forests and thickly populated localities with the country where they do not live.

The Uganda Protectorate may be roughly divided into the following zones, each having broadly marked characteristic features which have a general bearing on the game distribution:—

(a) Undulating country with rich soil, bearing 'elephant grass,' intersected throughout by valleys of papyrus swamps and forest scrub.

(b) Heavy timbered forest.

(c) Open plains and rolling downs of poor or shallow soil, with grass of the short growth variety, and stretches of forest scrub and acacia bush.

The Game may be classified roughly under each as follows:—

(a) Elephant, distributed practically throughout, except in thickly populated or badly watered regions, the large herds generally being found in the neighbourhood of the principal rivers.

Buffalo, ditto.

Leopard, occasionally.

Bush pig, numerous everywhere.

Sitatunga (Speke's tragelaphus), fairly plentiful in the large papyrus swamps.

Bush buck } numerous in the forest scrub.
Waterbuck }

(b) Elephant.

Buffalo.

Giant pig (scarce).

Ntalagania,¹ numerous at low altitudes.

(c) Elephant, in the rainy season.

Buffalo, ditto.

Lion.

Leopard.

Waterbuck (*Cobus defassa*).

Bushbuck.

Harnessed antelope.

¹ *Ntalagania* is the Luganda name for a small forest duiker.

Reed buck.

Oribi.

Duiker.

Cobus kob (*Thomasii*), by the lake shores and larger rivers.

Eland, in isolated herds, scarce.

Impala " "

Jackson's hartebeest.

Topi (*Damaliscus senegalensis*).

Wart hog.

Zebra.

Rhinoceros, by the Nile and in certain parts of the Eastern Province, scarce. Giraffe, Ostrich, the greater and lesser Kudu and the Roan antelope, in the Gondokoro Districts, Nile Province, and part of the Eastern Province, but very scarce.

It is curious that the last named animals, though common to British East Africa and the Sudan, do not exist in any other part of the intervening country in the Uganda Protectorate.

Elephant.—Elephants are most plentiful in Unyoro, which is a well-watered country with large forests, interspersed with large open tracts of 'elephant grass,' affording good cover and an inexhaustible food and water supply.

The largest tuskers are to be found in Unyoro also, which country they seem by instinct to have chosen as the safest retreat in which they can find secure hiding places where their enemy, man, would find it both difficult and dangerous to hunt them. In these fastnesses the females rear their young until large enough to travel with the herd.

During the dry season the herds do not wander much, as they never like to move far from water, but, when the rains commence, they roam from one district to another where the conditions of the country suit them. The oldest beasts do not appear to migrate often, though occasionally some of the old bulls, known to have come from Unyoro, are found in the neighbouring provinces.

The elephants of the Buganda Kingdom Province are notably smaller than those from Unyoro.

There is another variety also, which is known as the forest elephant, which sometimes visits Uganda from the Semliki plains and the country to the west of Lake Albert, whose tusks are remarkably long and slender and quite distinct from the Uganda or Unyoro kind.

Buffalo.—The buffalo vary from the massive and short spreading horned variety, known as the Central African, to the wide spreading, classified as the 'Cape.' The former are the most common, the latter practically being found only in one district.

It is curious to note, in this connexion, that the horns of the buffalo grow to an abnormal size together with those of the waterbuck, in this one district, that of Ankoli, while the cattle there are also remarkable for their wide spreading horns. It would seem that the nature of the grazing was possibly the cause of this abnormal development of horn, but this theory is upset by the fact that the horns of the antelope and gazelle in the same region are no larger than elsewhere.

Hartebeest.—The distribution of the Jackson's and Topi hartebeest is curious as, in Uganda, they are never seen together, and, for no apparent reason, they appear to keep carefully to their own particular districts and never invade those of each other, the dividing line being roughly the river Katonga, the Jackson's to the north and the Topi to the south, though Topi are to be found again, some hundreds of miles north, in the Gondokoro district by the Nile.

Rhinoceros.—Rhinoceros are not plentiful. They are only to be found to the east of the Nile, the river, apparently, being an impassable barrier between them and Uganda proper.

Hippopotami and Crocodiles.—Hippopotamuses and crocodiles are plentiful in all the large rivers and lakes, excepting Lake Edward, which it appears they avoid on account of the brackish nature of the water.

In conclusion it is noteworthy to add, concerning Game preservation, that the 'elephant grass' which covers so large a portion of Uganda is a natural protection for the animals which take to it, as it is so tall and dense that it is most difficult to see for more than a few yards ahead. The herds are

completely hidden by it and hunting is thereby rendered practically impossible.

While these huge tracts of waste land, where this grass grows, remain untenanted, the elephant and buffalo will therefore still have haunts to which they can retire unmolested by the advance of civilisation.

NOTES ON THE COMMON PATHOGENIC PROTOZOA IN BRITISH EAST AFRICA

By R. EUSTACE MONTGOMERY, Veterinary Bacteriologist, B.E.A.

In compiling these elementary notes on some of the more common pathogenic Protozoa, I have endeavoured to epitomise the modern literature, and so offer shortly a crude but, I trust, accurate synopsis of the species from a zoological and pathological point of view.

Knowledge of the Protozoa is so imperfect and is proceeding with such rapid strides that systematic treatment of the subject is well-nigh impossible. In view, however, of the many deadly diseases of animals, and of man too, which are due to this Phylum, much attention has been devoted to its study within recent years. Mention of East Coast Fever, Malaria, and Sleeping Sickness at once indicates the progress that has been effected since the time when Laveran (1880) described the parasite of Malaria and Ross (1893) the life cycle in the mosquito, lays bare our ignorance, and exposes the enormous field of research which must be covered before results, which will materially benefit the position from the zoological or from the practical and commercial point of view, can be achieved.

All the parasites discussed in the following pages are to be encountered in the blood of the affected animal and can be studied in the ordinary film of blood or of organs, stained by one or other of the modifications of Romanowsky's method (Methylene blue—Eosin). No mention is made here of the

flagellated and ciliated organisms parasitic in the intestinal tract of apparently healthy animals, nor of the important genus of the Sporozoa—*Coccidia*—one member of which has been found in association with a serious disease of cattle.

The preliminary classification of the Phylum Protozoa is made on the character of the means of locomotion, four sub-phyla being recognised.

1. *Sarcodina*, a group possessing pseudopodia; includes the *Amoebae*, some of which are pathogenic.

2. *Mastigophora*, in which mobility is due to one or two flagella. The trypanosomes are included in this group, as also are the *Spirochaeta*, though the morphology of the latter affords much scope for debate as to the propriety of their inclusion here.

3. *Infusoria*. Ciliated forms, none of which are credited with serious pathogenic powers.

4. *Sporozoa*, a group devoid of motile organs. To this sub-phylum belong the greatest number of pathogenic genera. It is a particularly interesting group on account of the complicated life cycle undergone by all described species, and owing to the necessity, in many cases, for a second host in which to complete development, and which acts as a reservoir or a transmitter for the maintenance of the race.

Mastigophora and *Sporozoa* alone call for attention here: the more important species which are parasitic upon and pathogenic to domestic animals, or which have come prominently under the notice of this Laboratory, are the only ones which will be discussed.

SUB-PHYLUM, *Mastigophora*. Diesing.

CLASS, *Lissoflagellata*.

ORDER, *Spirochaetida*.

GENUS, *Spirochaeta*. Ehrenberg, 1833.

The question as to whether the *Spirochaeta* should be placed among the Bacteria in the vegetable kingdom, or in the Protozoa, is still discussed. At the present moment the consensus of opinion lies with the view that they should be grouped as Protozoa.