

water which has remained dirty and unchanged for months ; but, under these conditions, they do not grow so rapidly, and if the dirty water be too prolonged, they are liable to the attacks of a disease called *peste rouge* in France.

The cultivated carp of Germany is, of course, an excellent eating fish. Attached to all the old monasteries were the carp ponds, or stews, for Friday's dinner, and for the banquets of the more luxurious nobles who, at that time, were unable to get supplies of fish from the sea. A German carp that has been properly fattened and well cooked has an entirely different flavour from the little, muddy-tasting, degenerate carp of British waters. Carp thrive best in a somewhat warmer summer climate than England ; and before being eaten should be put in a small fattening pond and fattened, like a pig, on meal. In the old days, very great care was taken in the breeding and fattening of fish, castration even being practised to hasten the fattening process. Those who care to cultivate the fish on a large scale should read the particularly interesting French work which has lately appeared on this subject—' *Pisciiculture*,' by G. GuenauX (Baillière : Paris).

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NOTES ON SOME OF THE PRINCIPAL BITING FLIES IN BRITISH EAST AFRICA

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Before discussing the methods of collecting biting flies it will be as well to give a short synopsis of the genera most likely to be met with by the ordinary resident or traveller in this Protectorate.

The great majority of bloodsucking flies in Tropical Africa belong to the family *Tabanidae*, of which the principal genera are *Tabanus*, *Haematopota*, *Pangonia*, and *Chrysops*.

Most of the species belong to these four genera, and to simplify matters I do not propose to go into details concerning

several other genera with comparatively few and mostly uncommon species.

The genus *Tabanus* consists of a large number of species of, for the most part, stoutly built flies, many of them being of large size. Usually known in England as 'Gadflies' or 'Horseflies,' they are often called in Africa 'Hippo flies,' 'Mangrove flies,' or on the Nile 'Serut.' The following local native names appear to be correct so far as I have been able to ascertain. The Wakamba call the larger species 'Njoo,' the smaller 'Madzunzuma,' the Wakikuyu 'Igi, Ngikuvwa or Zigayi' (the latter name being sometimes also applied to *Haematopota*, the next genus), the Nandi 'Kiptololet,' the Jalu Kavirondo 'Maugo,' the Jamwa Kavirondo 'Ruuko,' but these two last names are probably applied to all biting flies. The flies of the genus *Tabanus* are characterised by the possession of rather stout antennae, the second joint being very short and the third or tip being from a lateral view somewhat scimitar-shaped. The proboscis is short, stout, and directed vertically downwards so that it cannot be seen from above. Except in a few species such as the red and green *T. africanus* and its allies, the spotted-winged *T. maculatissimus*, and the big black *T. biguttatus*, these flies seldom have defined dark markings in their wings though the whole wing is sometimes infuscated. The wings are carried when the insect is at rest much as in the house-fly.

The genus *Haematopota* is represented in Africa by a very large number of species. The flies of this genus are comparatively fragile insects, with a more slender body and longer and thinner antennae than in *Tabanus*, the proboscis, however, being directed downwards as in that genus. The wings are mottled and spotted and have dark margins. When the fly is at rest the wings are said to be tectiform because the angle they make with each other resembles that of the ridge of a roof. The Wakikuyu call them 'Mbogo or Zigayi,' and the Nandi 'Sogoriet.' The majority of native tribes do not seem to have a distinct name for them but class them with *Tabanus* or other biting flies.

The next two genera, *Pangonia* and *Chrysops*, are placed in a separate sub-family of the *Tabanidae* called *Pangoninae*. They

are characterised by the possession of a spur at the tip of the tibia of the hind leg.

Pangonia has now been subdivided into several genera, but for our purpose it will be sufficient to treat it as one. The flies of this genus are usually rather large insects, some of them, especially some of the smaller species, being rather like a bee in general appearance. They are easily distinguished by their long (sometimes very long) proboscis sticking out horizontally in front of the head. The wings are dark or clear but not mottled or spotted and are carried somewhat extended even when the fly is at rest. The abdomen is not spotted, as in a few species of *Tabanus* and many of *Haematopota*, but frequently bears a number of transverse bands of different colours.

The genus *Chrysops* comprises rather small, often brightly coloured flies. Their proboscis is directed downwards as in *Haematopota*, and their wings, though not spotted, generally have one or more broad dark bands on them, the tip being usually also dark. Their wings are carried as in *Tabanus* not as in *Haematopota*, i.e. not tectiform. Their eyes are very beautiful, being in most species purple with zigzags of golden green. Indeed the eyes of most *Tabanidae* are well worth examination, and as they lose their colour after death careful note of the colour and markings should be made as soon as possible after capture. Two other very important genera of biting flies, *Glossina* and *Stomoxys*, belong to an entirely different family of *Diptera*, the *Muscidae*, to which the house-flies and bluebottles also belong. They differ completely from the above described genera in the form of their antennae. These are much less conspicuous than in any of the above, and the most prominent part of the antennae is somewhat featherlike instead of being single and rather stiff as in *Tabanus*, &c.

The genus *Glossina* comprises the well-known *Tsetse* flies. These are small or medium-sized flies, varying from a trifle larger than a house-fly to about twice that size. They are of various shades of brown or black without very distinct markings. They are characterised by the fact that when at rest their wings overlap like the blades of a pair of scissors *as well as* by the possession of a biting proboscis, the protecting sheath at

least of which projects horizontally from the head. It is important to remember the *combination* of these two characters as there are harmless non-biting flies which carry their wings in the same way as the *Tsetse*.

Being very local in their distribution in British East Africa these flies are unknown to many tribes of natives, but at Kibwezi, where there are three species, the Wakamba call them 'Chitungua.'

There are at least four species of *Tsetse* in the Protectorate. Two large species *G. brevipalpis*, Newstead (formerly known in East Africa as *G. fusca*), and *G. longipennis*. *G. brevipalpis* is one of the largest species and of a dark brown colour; it is only on the wing in the morning and late evening and is seldom seen during the heat of the day except in dull weather. It frequents the banks of rivers, especially where there is a certain amount of cover.

G. longipennis is another large insect, only a little smaller than *brevipalpis*, but is much paler. It bites freely during the heat of the day and seems to be entirely independent of water, chiefly frequenting barren desert localities. Neither of the above species is definitely known to carry disease to man or animals in nature.

G. pallidipes is a markedly smaller, brownish fly, also frequenting river valleys, though it is probably less dependent on water than *brevipalpis*. It bites at all hours of the day and is believed to carry disease to domestic animals.

G. palpalis is the smallest of all the above described species and is very much blacker. It only occurs in British East Africa, so far as is known, in the Nyanza Province, and is confined to the belts of timber on lake shores and river banks. As is well known to all, it carries sleeping sickness to man.

The flies of the genus *Stomoxys* are small, blackish flies, very much like house-flies in appearance, indeed are frequently mistaken for them. A close examination will, however, reveal a rather long, stiff, somewhat curved biting proboscis quite different from the short soft mouth parts of the common house-fly and its allies.

With regard to collecting the above described flies it is difficult to lay down any definite rules. It must be remembered

that the females of all the species bite, and in the case of *Glossina* and *Stomoxys* the males also. The result of this is that they are frequently seeking the collector quite as much as he is seeking them!

The following hints may, however, prove useful. All flies of the family *Tabanidae*, so far as is known, spend their larval state in water or at least damp mud or sand, so that there is always a greater probability of finding them near rivers, swamps, or such damp localities. The male *Tabanidae* are distinguished at a glance from the females by their huge eyes which occupy the entire head, there being no distinct division between the two eyes as there is in the female. Since they do not bite, special methods must be adopted for collecting the males, which are much less well known than the females and are comparatively rare in collections.

The genus *Tabanus*, in British East Africa at least, seems to be much better represented on the low ground than on the higher plateaux.

The females travel comparatively long distances from water, following cattle, &c., in search of food. Canvas, especially if damp, is curiously attractive to them, so that if at all numerous some are nearly certain to find their way into the traveller's tent. Herds of cattle or other domestic animals in the neighbourhood are also well worth examining. These flies are usually to be obtained only during the heat of the day and seem to prefer bright sunshine. The beginning and again towards the end of the rains are usually the best times for this genus. The males should be sought for chiefly at the end of the dry season or during an early break in the rains. They will then be found drinking at damp sand or mud in stream beds. Much depends on locality, as a running stream affords a less chance of locating them than when there are only a few pools in the river bed. The males can also be sometimes obtained by careful search on the reeds at the water's edge or occasionally sunning themselves on the boughs of trees overhanging the stream. I have never myself found the males any great distance from water.

The genus *Haematopota* somewhat resembles *Tabanus* in its habits, but during the rains at least is almost universally

distributed. In the forest areas of cool high districts these flies are probably to be found throughout the year. The males may be obtained in the same way as those of *Tabanus* but are also occasionally to be found in large numbers in swamps or grass land near rivers. They are very sluggish insects compared with the males of *Tabanus*, the same applying to the females though to a less extent. The flies of this genus are generally most noticeable in the mornings and evenings, and are not much in evidence at midday except in dull, damp weather.

The flies of the genus *Pangonia* frequent forest or at least well-wooded areas. They are not, so far as my experience goes, very common in British East Africa. They fly with a deep humming note, the females usually biting natives on the shins or ankles. The males are also sometimes to be seen at flowers.

The genus *Chrysops* also seems to be confined to wooded localities and the rainy season. They are usually only found at comparatively low elevations, and seldom in large numbers.

The *Tsetse* flies are usually, when present at all, very much in evidence, but as explained above they differ a good deal in their habits as regards the time of day when they are mainly on the wing.

The flies of the genus *Stomoxys* occur more or less everywhere, but are much commoner in the neighbourhood of human habitations and domestic animals than in the bush. So far as my experience goes they are more abundant at the higher elevations than in the low country. They seem to prefer domestic animals to man, and are often a serious pest to dogs, the ears of which they attack, causing sores which are difficult to heal.

The above does not pretend to be more than a very sketchy survey of some of the principal flies likely to be met with. To anyone who wishes seriously to take up the important subject of biting flies I would recommend Mr. E. E. Austen's recent book 'African Blood-sucking Flies,' which contains some fine illustrations of many of the more important of them.

In conclusion I would ask the indulgence of my readers in respect of this rather scanty paper, but it has been written out in the bush under considerable stress of other work and with very little literature at my command.