

ZOOGEOGRAPHICAL PATTERNS IN THE DISTRIBUTION OF EAST AFRICAN TREEFROGS (ANURA: RANIDAE)

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ABSTRACT

The savanna fauna of treefrogs in East Africa includes five distributional patterns: a widely distributed element, an element in the savanna north of the central forest from Cameroun to northern East Africa, an element south of the central forest, an East African lowland fauna, and an element in the dry savanna of Kenya and northern Tanzania.

The forest fauna includes two elements: a western element connected with the Congo Forest block and an eastern element with a distribution similar to the East African lowland savanna fauna.

INTRODUCTION

A full systematic treatment of the treefrogs of eastern Africa, i.e. Uganda, Kenya, Tanzania, Zambia and Malawi, was given in a recent paper (Schiøtz 1975). In the present paper a brief summary of some of the zoogeographical patterns is presented. The faunas associated with different vegetational types (Schiøtz 1967) are treated separately.

THE SAVANNA FAUNA

The savanna fauna inhabits the greater part of eastern Africa under varying conditions of altitude and rainfall. Some of the distributional patterns described below seem to be referable to such climatic differences and it may well be argued that they are ecological rather than zoogeographical separations.

Five distributional patterns are evident in the savanna living treefrogs (Figure 1):

1. Two species, *Hyperolius nasutus* and *Kassina senegalensis*, and one superspecies, *Hyperolius viridiflavus*, are distributed throughout the area. The same three forms are distributed throughout or – in the case of *H. nasutus* – almost throughout, the whole tropical savanna of Africa. Considering the lack of barriers in the East African savanna it is surprising that this element is so small. The superspecies *H. viridiflavus* shows considerable splitting into different forms.
2. A second element is distributed through the north-western part of the savanna and continues further west, north of the great forest. In East Africa this element is very meagre, consisting of *Hyperolius balfouri* and *Leptopelis oryi*, both represented by closely related forms as far west as Cameroun. In Park de la Garamba, which is not far from Uganda, two more western species, *Afrivalus weidholzi* and *Leptopelis viridis*, are found. Further exploration in this little known area may show that a greater part of the rich West African-Camerounese savanna fauna may extend as far as north-western Uganda.

3. A similar savanna element is distributed south of the great forest in Angola and southern Zaire and often extending into Zambia and Tanzania. *Kassina kuvangensis*, *Leptopelis cinnamomeus*, *Afrixalus wittei*, *Hyperolius quinquevittatus* and *H. parallelus* are the East African representatives of this fauna.

The division between the two faunas mentioned under 2 and 3 could probably be explained by the so-called Sclater line (Moreau 1966), a belt of forest which, during a considerable part of the Pleistocene, occupied Rwanda-Uganda and extended into Kenya along the Tana River region. Even today much of the savanna in this region has been created by recent human deforestation and farming.

These two fauna elements (2 and 3) do not meet at this line in a very orderly fashion. Uganda, which is well explored, shows signs of being zoogeographically immature with characteristic elements lacking from the fauna and others present in a state indicating recent but

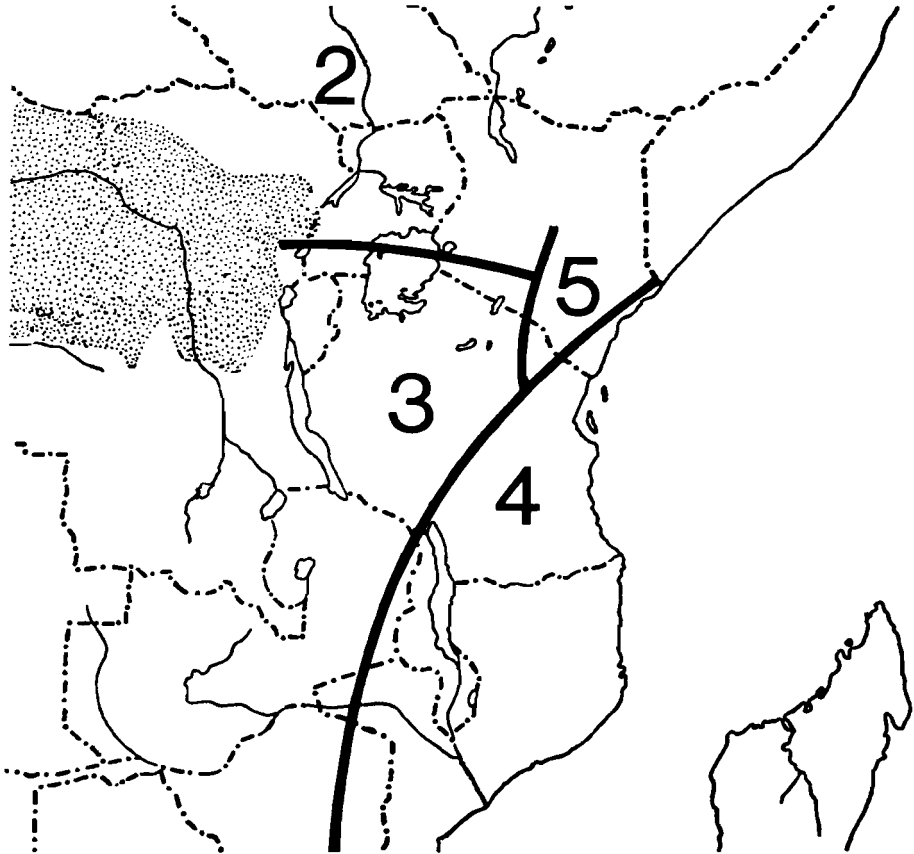


FIGURE 1

The distribution of the faunal elements in the African savanna. The boundaries between the areas are only approximate and are drawn for the sake of clarity. The numbers on the map refer to the groups described in the text.

unstabilized intrusions. There seems to be no savanna *Leptopelis* in the greater part of Uganda, excluding the north-western region, although such an element is normally present in African savanna at low and medium altitudes. On the other hand there seems to be a comparative overabundance of members of the *Hyperolius viridiflavus* superspecies in this area. Figure 43 in Schiøtz (1971) shows the distribution of this superspecies in Rwanda, Burundi and Uganda. According to this map there are four elements of the superspecies interwoven into this restricted area:

- (a) An old element of isolated montane forms regarded as belonging to the species *H. viridiflavus* (PIT, KAR, INT, FRA).
- (b) and (c) Many subspecies of *H. viridiflavus* from medium altitudes which show two sets of characters, one coming from the north in Uganda, another from the south (Schiøtz 1971: 66).
- (d) Finally the well-defined species *H. parallelus* distributed south of the great forest and extending northwards as far as southern Uganda.

4. An East African lowland fauna occupies the low-lying, rather humid savannas from coastal Kenya down through the tropical part of coastal South Africa. In general this fauna is uniformly distributed from Kenya southwards, the different species tapering out gradually in Moçambique and South Africa. In some cases in the latter area they are replaced by the very few non-tropical treefrogs. This fauna is taxonomically distinct from the above-mentioned faunas as only the generally distributed forms, *Kassina senegalensis*, *Hyperolius nasutus* and *H. viridiflavus* (group 1, above) are found both in the East African coastal areas and further west. There is, however, an intrusion by *Leptopelis cinnamomeus*, distributed south of the forest and thus belonging to group 3, but reaching as far east as Moçambique. The factors governing the distribution of this fauna may be high temperature and relatively high rainfall compared with areas further inland. This fauna consists of *Kassina maculata*, *Leptopelis argenteus*, *Africalus fornasini*, *A. bracycnemis*, *A. pygmaeus*, *Hyperolius pusillus*, and *H. parkeri*.

5. There is a further element in the dry part of Kenya and northern Tanzania which is systematically separated from the other savanna faunas. This element consists of *Hyperolius sheldricki*, *H. pusillus* form 2 (Schiøtz 1975), *Africalus pygmaeus septentrionalis* and *Kassina senegalensis somalica*. This is probably a true dry savanna element and its distribution to the north is unknown. The southern border of this fauna is not well defined, thus *K. s. somalica* is found in northern Tanzania while *H. pusillus* form 2 is taken sympatric with *H. v. ferniquet* at Kenani Rock, Kenya. The latter is not regarded as belonging to this fauna.

THE FOREST FAUNAS

The East African forest fauna is divided into two completely separate entities having no species in common.

1. One forest faunal element may be regarded as an eastern extension of the fauna of the Congo

Forest block in Cameroun–Zaire stretching into Uganda. The eastern limit of this fauna is Kakamega Forest in Kenya. In East Africa it is composed of *Phlyctimantis verrucosus*, *Leptopelis christyi*, *L. 'modestus'*, *L. fiziensis*, *Africalus congenericus*, *A. quadrivittatus* (also in savanna), *Hyperolius frontalis*, *H. alticola*, *H. platyceps langi*, *H. lateralis*, *H. kivuensis* and *H. cinnamoventris* (also in savanna). Some of these species are found as far west as Cameroun, but others seem to be distributed to the Ubangi River region. Our knowledge of the distributional pattern in this part of Zaire is incomplete and a further analysis of a possible split in this area cannot be made at present.

The known forest fauna of Uganda, northwestern Tanzania and western Kenya is to be regarded as an impoverished outlyer of the rich fauna of Kivu.

Hyperolius kivuensis has the widest range throughout our area, having been collected as far south-east as Mulanje in southern Malawi where it overlaps the eastern forest fauna. Apart from this no overlapping between these two faunas has been demonstrated.

2. The other forest fauna is found in the East African coastal area. This eastern forest fauna is conspicuously divisible into a farmbush element and a highforest element. For explanation of the terms farmbush and highforest, see Schiøtz (1967). The farmbush element consists of *Leptopelis flavomaculatus*, *Hyperolius puncticulatus*, *H. mitchelli*, *H. argus* and *H. tuberilinguis*. This element is distributed through practically the same area as that mentioned under the savanna fauna as the East African lowland fauna. As is the case of the savanna fauna, the full fauna of the Kenyan coast tapers out southwards in the Moçambique-South Africa area. The only exception is *Hyperolius mitchelli*, which on the Kenyan coast is replaced by the closely related *H. rubrovermicularis*.

The highforest fauna is only found on the small isolated basement hills harbouring high forest. This rich and completely endemic fauna consists of the following species: *Leptopelis uluguruensis*, *L. parkeri*, *L. barbouri*, *L. vermicularis*, *Africalus uluguruensis*, *A. sylvaticus*, *Hyperolius spinigularis* and *Phlyctimantis keithae*. As a rule the fauna is distributed on the Usambara, Ulunguru, Uzungwe, Rungwe to Mulanje mountains. None of the species has been found in all areas, perhaps due to lack of sufficient collecting. The impression is that Usambara is the richest area and there is an impoverishment when moving south to the other forested hills.

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