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A taxonomical report on a collection of *Megachiroptera (Mammalia)* from the Ivory Coast

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RESUME

Ce travail concerne l'étude de 209 spécimens de Megachiroptères de la République de Côte-d'Ivoire. Ils appartiennent à 11 espèces différentes (les chiffres entre parenthèses indiquent le nombre d'individus de chaque espèce): *Eidolon helvum* (8), *Rousettus aegyptiacus* (2), *Hypsignathus monstrosus* (12), *Epomops franqueti* (27), *Epomops buettikoferi* (66), *Micropteropus pusillus* (30), *Nanonycteris veldkampi* (20), *Scotonycteris zenkeri* (1), *Lissonycteris angolensis* (5), *Myonycteris torquata* (35) et *Megaloglossus woermanni* (3).

Les positions taxonomiques de certaines espèces et sous-espèces ont été discutées, en se fondant sur les mensurations et la coloration des spécimens.

INTRODUCTION

The present study deals with a collection of 209 specimens of Megachiroptera from the Ivory Coast, mainly collected by the third author. Eleven species are represented of which *Hypsignathus monstrosus* and *Epomops franqueti* are first records for the Ivory Coast. A twelfth species, *Epomophorus gambianus* (Ogilby, 1835), occuring also in this country (De Vree, 1971a), is not represented in the collection studied here. According to Rosevaer's account on the bats inhabiting West Africa (1965) only one other of the known fruit bat species, *Scotonycteris ophiodon* Pohle, 1943, can be expected in the Ivory Coast.

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The taxonomy and distribution of the West African Megachiroptera are still poorly known. Since Eisentraut's report on the vertebrates of Mount Cameroon (1963) and Rosevaer's extensive compilation on the bats of West Africa (1965), taxonomical and distributional notes were published by Van Orshoven & Van Bree for Guinea (1968), by Kuhn for Liberia (1965) and by De Vree for Togo (1969, 1970, 1971b) and for the Ivory Coast (1971a). Additional data on some species are given by Hayman (1967), and a study on the bats of Togo is about to be published (De Vree, *in lit.*). More extended reports on the fruitbats in other West African countries are not available.

MATERIAL AND METHODS

The bigger part of the collection consists of dried skins and skulls. A small number of specimens are preserved in alcohol. The specimens collected from 1963 to 1967 were taken by the second author and, occasionally, by others (exact data are not available). The specimens collected from 1968 to 1972 were captured by the third author, unless stated otherwise.

Various methods have been used to determine sex and possible age of the specimens. Subadult and adult males in many species are easily recognized by external features, like epaulets, and lactating females distinguish themselves by distinctly developed nipples. It is emphasized that the sexual maturity of a specimen does not necessarily imply that it is full-grown (Eisentraut, 1963). Adultness in the latter sense can usually be concluded from the condition of the teeth. In older specimens the teeth show a certain degree of wear. Another useful character seems to be the relative distance between the cheek teeth. In skulls that have not yet reached their maximum size, the cheek teeth are comparatively more closely set than in fully grown mature skulls.

All measurements were taken from the preserved specimens and given in millimeters. When possible, measurements were taken from the right side of the specimens. From the skins only the forearm lengths were taken, since the state of most skins did not allow other measurements to be taken with the required accuracy.

The rostrum was measured from the most anterior tip of the premaxillae to the most anterior point of the orbital margin. The palatal length has usually not been measured where the palatal skin was still present. The mandible length was measured from the most ante-

rior point of the processus articularis. In *Rousettus aegyptiacus* the angle between mandible and processus coronoideus was measured as the angle between the upper margin of the mandible and the anterior margin of the processus coronoideus. The teeth, numbered according to Eisentraut (1959a), were measured over the cingulae.

Describing the colour patterns in some cases use was made of the colour plates of Ostwald (1939). The so found colour names have been translated into Ridgway colour names with the tables of Zimmerman (1952), and are printed with capital first letters.

In the enumerations of the specimens the given registration numbers are O.R.S.T.O.M. numbers. In a few cases reference is made to specimens from other collections. In those cases the registration numbers, if present, are accompanied by an abbreviation indicating the proper collection.

BMNH - British Museum (Natural History), London;
MNHN - Muséum national d'Histoire naturelle, Paris;
MRAC - Musée Royal de l'Afrique Centrale, Tervuren;
RMNH - Rijksmuseum van Natuurlijke Historie, Leiden;
UBRA - Université de Brazzaville, Brazzaville;
ZMA - Zoölogisch Museum, Amsterdam.

TAXONOMICAL PART

Subfamily **PTEROPINAE**

1. **Eidolon helvum** (Kerr, 1792)

Specimens: 4 adult ♂♂, 1 adult ♀ and 1 adult and 2 subadults of unknown sex.

Localities: Adiopodoumé, VIII.1969, 1 subadult (A6973) and 14.XI. 1970, 1 ♀ (A8746). Gopoupleu, 16.III.1970, 2 ♂♂ (A2946, A2947). Bouaké, 11.VIII.1970, 1 subadult (13.747). Locality and date unknown: 2 ♂♂ (AX0106, A2074) and 1 adult of unknown sex (AX0179).

A2074 and A8746 are preserved in alcohol, the others are skins and skulls, the skull of A2946 and the skin of AX0179 are lacking.

Measurements: Table 3.

Remarks: Schouteden (1947), Eisentraut (1964), Kuhn (1965), Hayman (1967) and, apparently, De Vree (1971) consider *Eidolon* as a monotypical genus with *E. helvum* as the only species and with *dupreanum, helvum* and *sabaeum* as subspecies. With the small col-

lection studied at present we do not feel entitled to follow these authors, and prefer to use the original nomenclature, according to Rosevear (1965). From the available information, however, it is very likely that a detailed study of the genus will reveal the suitability of the new concept mentioned above.

The total skull lengths in AX0106 and A2947, respectively 55.0 and 52.4 mm, and the forearm lengths of the adult specimens, varying from 109.7 to 123.6 mm, fall within the variation limits mentioned by Rosevaer (*loc. cit.*). From the general condition of the teeth in AX0106 can be concluded that the animal was quite old when captured.

The colours in the Ivory Coast specimens more or less match Rosevaer's description (1965), though in the younger specimens the back and belly are rather yellowish brown than yellow-grey. Along the sharp border between the wing membranes and the back fur a narrow zone of the latter consists of contrasting light yellowish brown hairs. Ventrally the median portion of the fur is much darker than the flanks and this seems to become even more conspicuous with age. In the older animals it is even darker than the back fur. The fur on the head, from the eyes on backwards, is dark greyish brown in the adult and lighter brown — in one specimen reddish brown — in the subadult specimens. Shades of reddish brown, orange and yellow are to be found on the back and flanks of the adult specimens and possibly appear first during the development of the orange-brown collar that extends on throat and neck sides. The hairs of this ruff have a very thin basal part, are thicker in the middle part and taper gradually towards the tips. Examination under high magnification shows that the ruff hairs are really thicker than the normal fur hairs, and not only longer, as Rosevaer (1965) stated.

In one specimen (A6973) the wing membranes are inserted between the first and the second toe on the right side and on the second toe on the left side.

The adult female (A8746), collected 14.XI.1970, has well developed nipples and the animal might well have been lactating when caught.

2. **Rousettus aegyptiacus unicolor** Gray, 1870

Specimens : 1 ♀ and 1 ♂, both adult.

Locality : Duékoué, 3.III.1969, 1 ♀ (A9239, collector J.W. LeDuc) and 1 ♂ (A9238, collector L.W. Robbins), in a cave. Both specimens consist of skins and skulls.

Measurements : Table 3.

Remarks: Koopman (1966) suggested that the name *occidentalis* as proposed by Eisentraut (1959a) for the West-African race of *Rousettus aegyptiacus* should be replaced by *unicolor* Gray. The type of *Eleutherura unicolor* Gray (BMNH 62.8.26.1) from Gabon proved to be consistent with specimens from Sierra Leone, Ghana and Angola in the same collection (Koopman, 1972, *in lit.*). The main skull characters distinguishing *unicolor* from the other races *aegyptiacus, arabicus* and *leachi* are the comparatively small teeth measurements and the angle at which the processus coronoideus departs from the mandible. The average of this angle in *occidentalis* is bigger than in *aegyptiacus* and *arabicus,* and smaller than in *leachi* (Eisentraut, *loc. cit.*). In both characters the two Ivory Coast specimens are in conformity with the original description of *occidentalis.*

The teeth measurements are:

Specimen			A9239	A9238
P^3	length :	breadth	2.3 : 1.4	2.7 : 1.5
P^4	»	»	2.7 : 1.7	2.9 : 2.0
M^1	»	»	2.7 : 1.8	3.0 : 1.8
M^2	»	»	1.8 : 1.3	2.0 : 1.6
P_4	»	»	2.4 : 1.6	2.6 : 1.8
M_1	»	»	2.6 : 1.5	2.9 : 1.8
M_2	»	»	2.2 : 1.4	2.5 : 1.8
M_3	»	»	1.7 : 1.2	1.8 : 1.2

The angle between mandible and processus coronoideus is 134.5° in A9239 and 135.0° in A9238.

Moreover, in contrast with the nominate race, the postorbital breadth is surpassing the interorbital breadth (Eisentraut, 1963). The palatum skin was not preserved, so the palatal ridges could not be studied.

The thin, sparsely fur has the same colour pattern as that of the specimens from Guinea described by Van Orshoven & Van Bree (1968). The male is somewhat darker in colour than the female. The same authors describe the almost naked neck region, found in the Ivory Coast specimens as well, V-shaped and pointing backwards along the vertebral line. In this region the lighter skin colour predominates.

3. **Hypsignathus monstrosus** H. Allen, 1861

Specimens : 6 ♂♂ and 6 ♀♀.

Localities : Adiopodoumé, 18.IV.1972, 1 ♀ (A8905), 19.IV.1972, 4 ♂♂ (A8907, A8908, A8911 and A8913) and 3 ♀♀ (A8909, A8910 and A8912). Lamto, near l'Orumbo Boka, 20.II.1972, 1 ♂ (21773) and 1 ♀ (21774). Sassandra River, 17.II.1969, 1 ♀ (A9243), 18.II.1969, 1 ♂ (A9242). The specimens A8905, 21773 and 21774 are preserved in alcohol, the others are skulls and skins. The skulls of A9242 and A9243 are lacking. A9242 and A9243 were collected by L.W. Robbins.

Measurements : Table 3.

Remarks : Although *Hypsignathus monstrosus* is not very rare in collections, not much has yet been published on the taxonomy of the species, and it seems to be quite uniform throughout its distribution area. When compared to our measurements, male specimens from populations in Zaïre seem to attain slightly larger dimensions (Allen, Lang & Chapin, 1917) but data on larger series are necessary to confirm this suggestion.

The colours in the Ivory Coast series show only little variation. In some specimens the main fur colour on back and belly is predominantly dark greyish, in others it is more brownish. In the two specimens from Sassandra River the whole fur is distinctly lighter, rather mixed with yellowish brown.

A collar of very dense, woolly, long hairs exists in both sexes. It is broad and somewhat lighter than the back fur on nape and neck sides, and narrow and more contrastingly lightly coloured in the throat region. The collar hairs do not grow in clusters.

The two specimens from Sassandra River were collected in degraded high forest.

Two females from Belinga, Gabon (ZMA 7798 and 7799), captured on the 1st and on the 11th of February, 1964, and studied together with the Ivory Coast material, have well developed nipples and it is probable that the animals were lactating at the time of their capture. This would be in accordance with Eisentraut's observations (1963) that birth in *Hypsignathus* takes place by the end of January or the beginning of February.

4. **Epomops franqueti strepitans** K. Andersen, 1910

Specimens: 11 ♂♂, 9 ♀♀ and 7 immature specimens.

Localities: Adiopodoumé, 22.XII.1966, 1 ♀ (B0012), 2.X.1969, 1 immature specimen (A8072, ? ♂), 2.XI.1969, 1 ♀ (A8071), 3.XI.1969, 1 ♂ (A8073) and 1 ♀ (A8075), 5.XI.1969, 1 ♀ (A8076), 15.V.1970, 2 ♂♂ (A8301, A8304) and 4 ♀♀ (A8297, A8299, A8300 and A8302), 28.X.1970, 2 ♂♂ (A8728, A8729), 30.X.1970, 1 ♀ (A8740), 14.XI.1970, 4 ♂♂ (A8747 immature, A8749, A8750 and A8753). Lamto, 30.V.1964, 1 immature specimen (21.796). Locality and date unknown: 2 ♂♂ (4269 and 4271) and 5 juvenile or subadult specimens of unknown sex (4268, 4270, 4272 - 4274). The specimens A8728, A8729, A8747, A8750, A8753, B0012, 4268 - 4274 and 21796 are preserved in alcohol, with extracted skulls in nine specimens, the others being skins and skulls. No. A8072 has a deformed skull, the rostrum being very short and turned upwards in front, and the mandible equally shortened and turned downwards in front. The specimen is with some reservation assigned to this species.

Measurements: Tables 1 and 4.

Remarks: The measurements in this *Epomops franqueti* series, for the present assigned to the western race *strepitans*, prove that even locally the variation ranges are bigger than those given by Rosevaer (1965) for the subspecies as a whole. In general they extend the lower limits and, since Rosevaer mentions Kumasi in Ghana as the ultimate western locality of his material, this suggests that within the race *strepitans* specimens of the western populations do not attain the dimensions met with in specimens from the eastern populations.

Furthermore this extension of the measurement variation ranges in *strepitans* also means that, especially in the females, a bigger overlap exists in dimensions between *strepitans* and the bigger, eastern race *franqueti* than is suggested by Rosevaer's measurements (*loc. cit.*).

In fact it is very probable that a size cline exists, not only in *strepitans*, but in the whole species, in the sense that bigger dimensions are found in specimens of more eastern populations. This assumption gives rise to the question whether the two races *franqueti* and *strepitans* are so sharply defined from one another that they deserve subspecific ranks. Rosevaer (1965) and Hayman (1967) mentioned the lower Niger River as the frontier between two races, but Eisentraut (1963) described a series of 36 specimens from Mount Cameroon which he could not assign to either of the two races due to their intermediate dimensions.

Another question that needs further study is that of the relationship between the species *Epomops franqueti* and *Epomops buettikoferi* (Matschie, 1899). Rosevaer mentions Kumasi in Ghana as a locality where both species occur and Hayman (1967) stresses that where the two overlap the possibility of intergradation should be regarded. De Vree (1971) reported already on the occurrence of *Epomops buettikoferi* in Adiopodoumé, and in the present collection there are also three specimens from Adiopodoumé that apparently belong to this bigger species. In Lamto the two species are also sympatric and thus, Adiopodoumé and Lamto are two other localities where the two species meet and where, theoretically, intergradation is possible.

From the other localities in Ivory Coast where *buettikoferi* was collected no *franqueti* is known yet. One of the three *buettikoferi* from Adiopodoumé (A8298) was collected on the same date as four *franqueti*. Unfortunately no data are available on the exact places in Adiopodoumé where the animals were captured, but the possibility still exists that the two species have different roosting places in the same locality, so that intergrading would not be very likely.

Table 1. — Measurements of Ivory Coast specimens of *Epomops franqueti* and *Epomops buettikoferi* *)

	Epomops franqueti			*Epomops buettikoferi*		
	n	♂ ♂	♀ ♀	n	♂ ♂	♀ ♀
total skull lengths	5	40.9 - 48.7		24	55.0 - 60.2	
	9		37.8 - 45.3	25		45.8 - 56.6
forearm lengths	10	84.1 - 88.9		26	92.9 - 102.2	
	10		76.5 - 81.2	28		84.3 - 96.2

The picture is according to what could be expected. The males of both species, and to a lesser extend the females, are clearly different in average dimensions. With the probable clinal size variations in *franqueti* observed before, it seems correct only to compare dimensions of the two species when all specimens are from the same region.

* The measurements of a number of damaged skulls, that could not be included in the frequency distribution diagrams, certainly fell within the here mentioned variation limits and therefore could be included in Table 1.

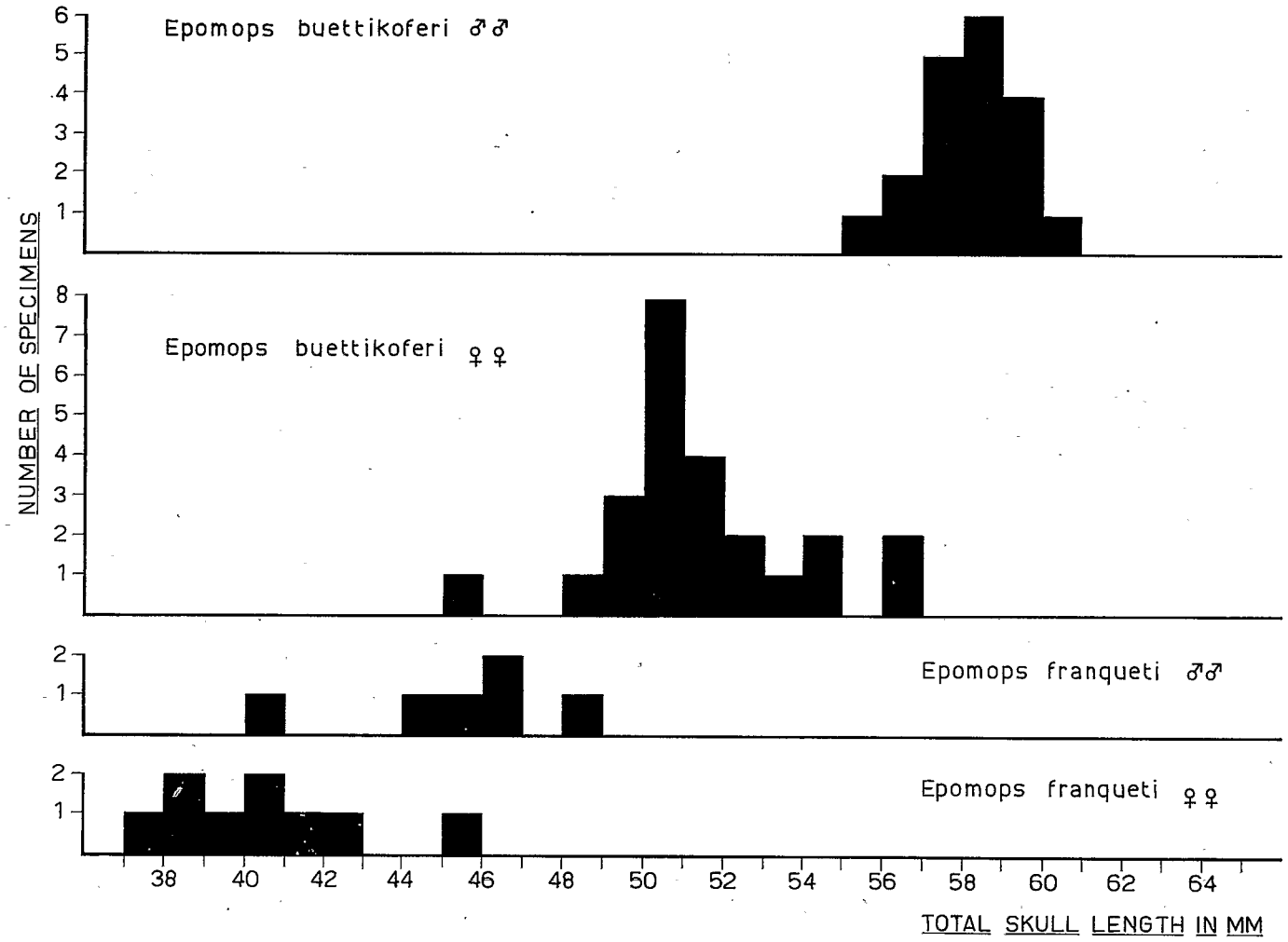

Fig. 1. — Frequency distribution of the total skull length in *Epomops buettikoferi* and *Epomops franqueti* from Ivory Coast

Other differences are to be found in the palatal ridge pattern. Of the 21 *franqueti* specimens in which the third palatal ridge could be studied it was undivided in the middle in 15 specimens (be it slightly notched in three of them), narrowly divided in four specimens and clearly divided in two others. The third ridge was found to be clearly divided in 55 Ivory Coast *buettikoferi* and narrowly divided in one specimen. As De Vree (1971a) points out *franqueti* and *buettikoferi* differ completely in the general aspect of the palatal ridge pattern, especially of the fourth interdental and all the postdental ridges. The median gap dividing these ridges is relatively broader in *buettikoferi* and the denticulated ridge halves in this species are usually characterized by the possession of one « tooth » that is much bigger than the other triangular projections, while in *franqueti* all these forward projecting « teeth » are about equally sized. The 17 *franqueti* and the 56 *buettikoferi* (mostly dry) specimens in which this could be studied seem to agree with De Vree's excellent illustrations of the palatal ridge patterns in these species.

Hayman (1967) gives for the relation zygomatic width/total skull length in *franqueti* about 0.6, against 0.5 in *buettikoferi*. In 12 *franqueti* this relation runs from 0.52 to 0.58, and in 40 *buettikoferi* from 0.46 to 0.54. There seems to be a tendency towards a relatively smaller zygomatic breadth in bigger skulls in both *franqueti* and *buettikoferi*, even so that the biggest *franqueti* skulls have the same relation between zygomatic breadth and total skull length as the smallest *buettikoferi* skulls.

The colour pattern in the Ivory Coast *franqueti* specimens does not differ essentially from that in the Cameroon specimens described by Eisentraut (1963). No particular colour character was found to distinguish them from the darker variety of the Ivory Coast *buettikoferi* described below. The juvenile specimen (A8072), reservedly identified as *franqueti*, has all colours a fair shade darker.

Where the males have their typical whitish epaulets, the females have equally large areas of hairs that also grow in clusters and that are much lighter in colour than the surrounding fur.

The females A8071, A8075 and A8740, respectively taken on the 2nd and 3rd of November, 1969, and on the 30th of October, 1970, have well developed nipples and may have been lactating when caught. Specimen A8300, taken on the 15th of May, 1970, has rather big nipples, and females number A8076, A8299 and A8302, the first taken on the 5th of November, 1969 and the other two on the 15th of May, 1970, have small nipples.

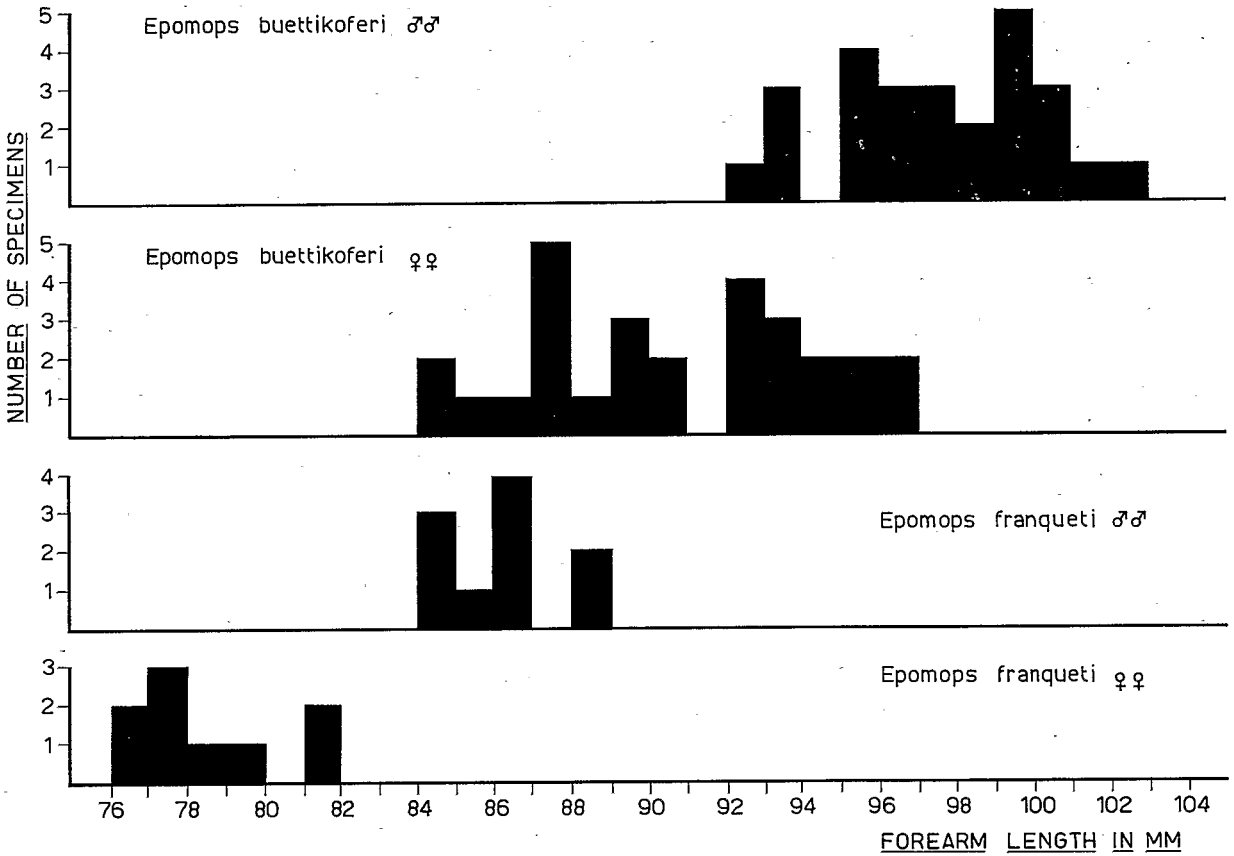

Fig. 2. — Frequency distribution of the forearm length in *Epomops buettikoferi* and *Epomops franqueti* from Ivory Coast.

5. **Epomops buettikoferi** (Matschie, 1899)

Specimens: 27 ♂♂, 29 ♀♀, 4 specimens of unknown sex and 6 immature specimens.

Localities: Adiopodoumé, 15.V.1970, 1 ♀ (A8298), 11.VIII.1970, 1 ♀ (A8362) and 1 ♂ (A8756). Adzopé, 8.III.1971, 2 ♂♂ (A9181, A9182), 5 ♀♀ (A9174, A9175, A9176, A9179, A9180) and 3 subadults (A9173, A9177, A9178). Gueboua, 25.XI.1970, 1 ♂ (A9129). Konankoffikro, IX. 1970, 15 ♀♀ (21.706 - 21.713, 21.716 - 21.718, 21.720, 21.721, 21.723, 21.724) and 4 ♂♂ (21.714, 21.715, 21.719, 21.725) and 1 immature specimen (21.722). Lamto, 26.VI.1964, 2 ♂♂ (21.777, 21.778) and 1 ♀ (21.792) and 2 specimens of unknown sex (21.776, 21.779), 26.III.1970, 1 ♀ (21.532), 23.IV.1970, 4 ♂♂ (21.539, 21.540, 21.541, 21.542), 24.IV.1970, 3 adult ♂♂ and 1 immature ♂ (21.543, 21.544, 21.546, 21.545), 25.IV. 1970, 4 ♂♂ (21.548, 21.549, 21.552, 21.553) and 3 ♀♀ (21.550, 21.551, 21.554), 27.IV.1970, 4 ♂♂ (21.555, 21.556, 21.557, 21.558), 1.VII.1970, 1 ♂ (21.584) and 1 ♀ (21.586), 5.XI.1970, 1 ♀ (21.573). Niebe, 27.II. 1969, 1 ♂ (A9240). Localities unknown: 1 skin, probably female, and 1 skull, probably male, without registration numbers; 1 immature specimen, from Lamto (3.VI.1964, 21.781) or from Adiopodoumé (then: 23.XII.1966, B 0011). Seven specimens (A8756, 21.776 - 21.779, 21.781, 21.792) are preserved in alcohol, all but A8756 with extracted skulls, the others are skulls and skins, except A9240 (skull lacking) and the two specimens from unknown localities.

Measurements: Tables 1 and 4.

Remarks: Comparing our measurements to those mentioned by Rosevaer (1965) and Hayman (1967) the variation ranges, especially in the females, are considerably extended. In 24 Ivory Coast males the total skull length runs from 55.0 to 60.2 mm (Rosevaer: 55.0 - 59.3) and in 25 females it runs from 45.8 to 56.6 mm (Rosevaer: 48.4 - 51 mm). The forearm length in 26 males varies from 92.9 to 102.2 mm (Hayman: 92 - 100 mm) and in 28 females from 84.3 to 96.2 mm (Hayman: 88 - 92 mm).

The colour pattern is quite variable. In juvenile specimens the back fur is from Natal Brown to dark Brüssels Brown, while in the back fur of the adults two main colour patterns can be observed, which are obviously not related to certain seasons.

In one pattern (Plate I, fig. A) the Natal Brown stays present as the main colour. Sometimes a reddish brown hue mixes with it, especially on arms and legs. The fur on the nape and sides of the neck, and on top of the head as well, is of a more woolly consistence and

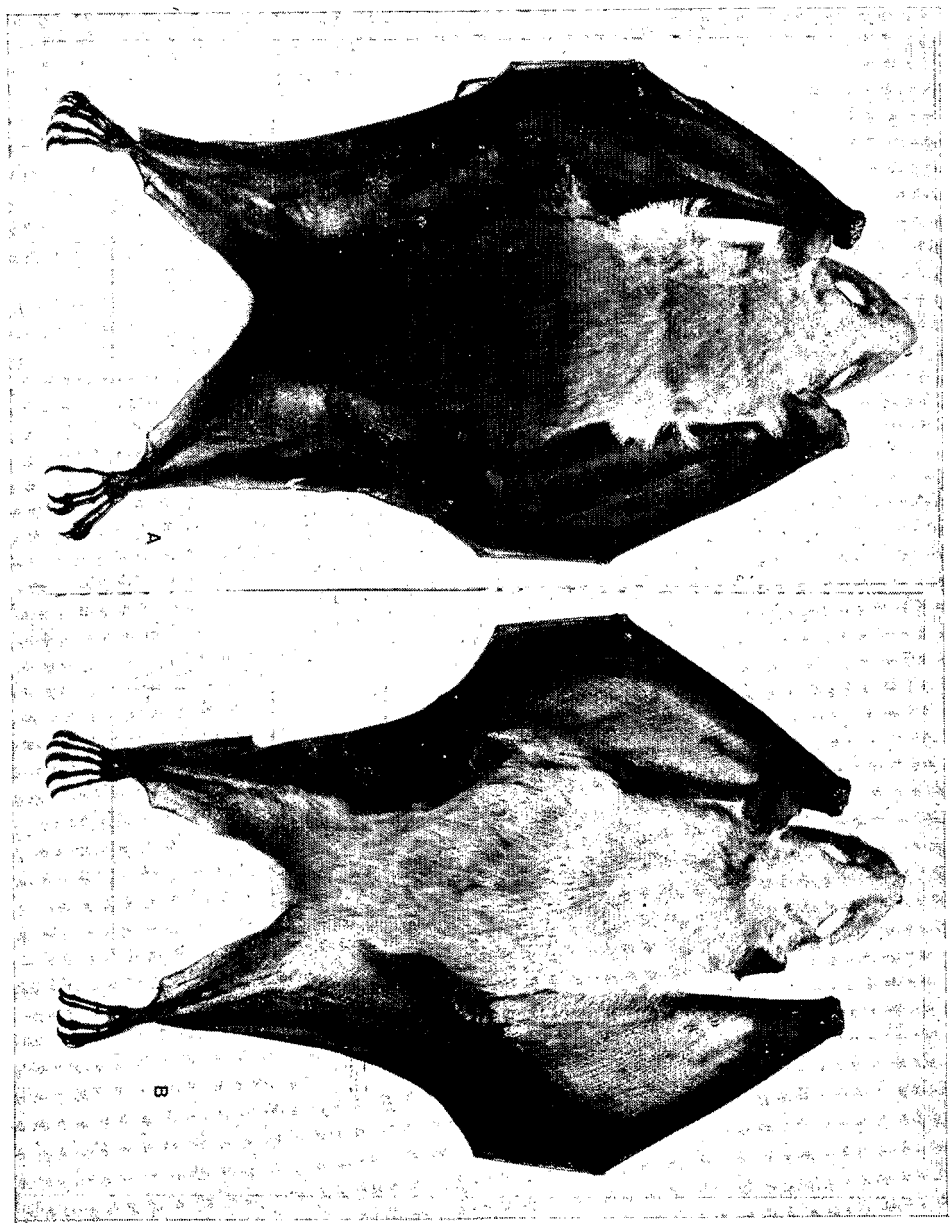

PLATE I.

Two fur colour patterns in *Epomops buettikoferi*.
A: the dark pattern (specimen 21.540) and
B: the light pattern (specimen 21.550).
Both specimens are from Lamto. Photographs L.A. van der Laan.

has a lighter colour, tending to Fawny. The whitish patch on the belly is surrounded by Natal Brown but there is no sharp frontier (in *franqueti* this patch seems to be more distinctly set off). On the throat between the epaulets males have a narrow zone of very dark brown hairs, sometimes only conspicuous right next to the epaulets.

The other pattern (Plate I, fig. B) differs by having a much lighter, and in some cases less uniform, main colour. The back fur shows shades of Light Ochracheous Buff and Cinnamon. The woolly ruff is only a little lighter than the back and in some specimens the frontier between the two is clearly accentuated by a narrow, yellowish white band, usually divided in the middle. Orangey and reddish brown shades are to be found on top of the head and on the arms and insides of the legs. Yellowish white hairs cover the outsides of the legs. The belly patch in these light coloured specimens is sometimes rather yellowish.

The two described patterns from the extremes of a series of patterns in which intermediates occur.

As in *franqueti*, the females feature light coloured shoulder areas of clustering hairs. In the throat region these areas may be connected by a zone of light hairs, that tends to be V-shaped, pointing backwards and almost reaching the belly patch.

Fairly big to big nipples were found in females captured on the 8th of March (A9179, A9180), on the 15th of May (A8298), and in September (21.709, 21.724). The state of preservation of many other female skins however prevented an analysis of this feature in the whole series. One female (21.792), captured on the 7th of July, contained an embryo, about 40 mm in length, with a forearm length of 29 mm and with very short dark brown hairs on back and head.

Discussion : The frequency distribution of the total skull lengths and of the forearm lengths of *Epomops franqueti* and *Epomops buettikoferi* from the collection studied here (figs. 1 and 2), illustrate the particular difficulties in separating the two forms. Although not many forearms could be measured, and still fewer skulls, different average measurements for the two species are strongly suggested. More material of both species from the same regions is necessary to enable us to get a better idea of the total variation range of the forearm lengths, which possibly will show small overlap zones between the males as well as between the females of both species. At first sight the total skull lengths are not so problematical, yet it was here that difficulties arose concerning the identification of two adult female specimens

from Adiopodoumé. No. 8300 has a total skull length of 45.3 mm, which is about equally far from the average values found for *franqueti* (m = 40.4 mm) and *buettikoferi* (m = 51.4). The specimen has a forearm length of 76.8 mm and an undivided third palatal ridge, both *franqueti* characters, and is therefore assigned to this species. No. 8298 has a total skull length of 45.8 mm, but a forearm length of 84.3 mm and a divided third palatal ridge and is provisionally assigned to *buettikoferi* *). Both specimens are from Adiopodoumé, but any conclusions on their possible hybrid status would be far too premature. Anyway, they indicate that Hayman's suggestion (1967) about the possible interbreeding of the two species certainly deserves attention.

6. **Micropteropus pusillus** (Peters, 1867)

Specimens: 10 ♂♂, 5 ♀♀ and 15 immature specimens.

Localities: Konankoffikro, IX.1970, 1 immature (21.705). Lamto, I.1963, 1 ♀ (1013, identification preliminary), 28.V.1964, 2 ♂♂ (21.793, 21.794), 30.V.1964, 1 ♂ (21.795) and 3 immatures (21.789, 21.797, 21.798), 3.VI.1964, 1 ♂ (21.785), 26.VI.1964, 1 ♂ (21.755), 25.V.1970, 1 ♀ (21.562) and 1 immature (21.563), 28.V.1970, 1 ♂ (21.570), 1.VII.1970, 2 ♂♂ (21.583, 21.591) and 3 immatures (21.585, 21.587, 21.588), 2.VII.1970, 1 immature (21.604), 5.VII.1970, 1 immature (21.614), 30.VII.1970, 2 immatures (21.618, 21.619), 31.VII.1970, 3 ♀♀ (21.624, 21.625, 21.627), 1.VIII.1970, 1 immature (21.629), 2.X.1970, 1 immature (21.654), 6.XII. 1970, 1 immature (21.759) and 10.XII.1970, 1 ♂ (21.764). Unknown locality: 1 ♂ (C 784). Specimen 1013 is only a dried skin, the numbers C 784, 21.789, 21.797 and 21.798 are preserved in alcohol, the numbers 21.775, 21.785, 21.793, 21.794 and 21.795 are preserved in alcohol with extracted skulls, and the others are skin and skulls.

Measurements: Table 5.

Remarks: The adult males are easily recognized by their whitish epaulets. From the remaining specimens those with developed nipples are undoubtedly adult females. The sex of the other 12 specimens could not be checked with certainty. Most of them could be identified as not fully mature by the relatively close setting of their cheek teeth.

The forearm length in the adult females (n = 4, m = 54.1) is longer than that in the males (n = 10, m = 51.7), while their skull measu-

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* In this specimen the form of the palatal ridges failed in providing a decisive answer to the identification problem.

rements are slightly less than in the males. The same was shown for a bigger series from Guinea by Van Orshoven & Van Bree (1968). The measurements of the Ivory Coast specimens fall within the variation given for these Guinea specimens, be it that the females are to be found among the higher values.

In colour pattern too, our specimens match the description of that in the Guinea animals. The individual variability in colour and the small number of adults prevent conclusions on sexual dimorphism in the back fur colour as observed by Van Orshoven & Van Bree (*loc. cit.*). On the other hand, the ventral side seems to be somewhat darker in the males than in the females. The greater number of individuals show a more or less distinct light rustbrown hue on top of the head, mostly restricted to the area between the ears, but occasionally extending forwards or backwards.

Again, in this species females develop structures very similar to the epaulets in the males. In females the clustering hairs form two crowns as well, and they are slightly lighter than the surrounding fur. Ventrally, however, they may be bordered by a narrow zone of darker hairs, thus representing a weak reflection of the situation in the males where, ventrally, the epaulets are bordered by zones of very dark brown hairs. This zone is not present in *Nanonycteris veldkampi* from Ivory Coast. Another difference between *Micropteropus* and *Nanonycteris* was found in the structure of the epaulets. In *Micropteropus* these consist of much finer and much more numerous hairs than in *Nanonycteris*. Consequently the tufts in *Micropteropus* give a much softer impression.

7. **Nanonycteris veldkampi** (Jentink, 1888)

Specimens: 10 ♂♂, 8 ♀♀ and 2 immature specimens.

Localities: Adiopodoumé, 22.XII.1966, 1 immature specimen (B 0013), 15.V.1970, 1 ♀ (A8303), 28.X.1970, 2 ♂♂ (A8726, A8727), 27.X.1970, 1 ♂ (A8730), 3.XI.1970, 1 ♂ (A8074), 14.XI.1970, 3 ♀♀ (A8748, A8751, A8752), 16.XI.1970, 4 ♂♂ (A8757 - A8760), 2 ♀♀ (A8761, A8762) and 1 immature specimen (A8763). Adzopé, 8.III.1971, 2 ♀♀ (A9186, A9187). Lamto, 3.X. 1970, 2 ♂♂ (21.655, 21.656). The numbers A8748 and A8757 are preserved in alcohol, the others are skulls and skins.

Measurements: Table 5.

Remarks: The adult males have yellowish white to orange-yellowish white epaulets. The other specimens, but one, are considered as mature females because of the condition of their dentition.

The skull measurements fall practically within the ranges given by Rosevaer (1965). One male has a total skull length of 23.6 mm, therewith extending the lower limit (24.5 mm) of the range. As in *Micropteropus* the females of *Nanonycteris* have longer forearm lengths (n = 8, m = 48.0 mm) than the males (n = 10, m = 46.4 mm). Moreover the variation range of 45 - 50 mm (Rosevaer, 1965) is extended by these females with forearm lengths of 43.3 to 53.2 mm, which means a small overlap with the Ivory Coast *Micropteropus pusillus* females with a forearm length range of 53.0 to 55.2 mm.

In colour there is no marked difference with the animals from Guinea (Van Orshoven & Van Bree, 1968). Over the front of their heads some specimens have a reddish brown hue, due to the colour of the hair tips in that area. As in the other Epomophorine bats with epaulets in the males treated here, the females have shouldertuft-like crowns of clustering hairs, lighter coloured than the surrounding fur. In one female (A8761) these tufts are even almost white.

We measured the cheek teeth in four specimens and found that they were in general longer and narrower than those in the Guinea animals reported on by Van Orshoven & Van Bree (1968).

Table 2. — Cheek teeth measurements of four specimens of *Nanonycteris veldkampi* from Ivory Coast.

Specimen		A8074	A8303	21.656	21.655
P^3	length	1.1	1.4	1.3	1.2
	breadth	0.9	1.0	0.8	0.8
P^4	length	1.5	1.5	1.5	1.5
	breadth	0.9	0.9	0.8	0.9
M^1	length	1.4	1.5	1.4	1.3
	breadth	0.9	0.9	0.9	0.8
P_3	length	1.0	1.2	1.2	1.1
	breadth	0.8	0.8	0.7	0.7
P_4	length	1.2	1.3	1.3	1.4
	breadth	0.7	0.8	0.7	0.8
M_1	length	1.7	1.7	1.8	1.8
	breadth	0.8	0.8	0.7	0.8
M_2	length	1.1	1.1	0.9	1.0
	breadth	0.7	0.8	0.6	0.6

8. **Scotonycteris zenkeri** Matschie, 1894

Specimen : 1 ♂ (21.521).

Locality: Lamto, 27.II.1970. The specimen consists of a dried skin and skull.

Measurements : Table 6.

Remarks : The measurements of this specimen do not extend the known variation in the species. The palatal ridge pattern (fig. 3A) differs more or less from all existing descriptions and illustrations, which emphasizes once more (Kuhn, 1961) the individual variability of this feature.

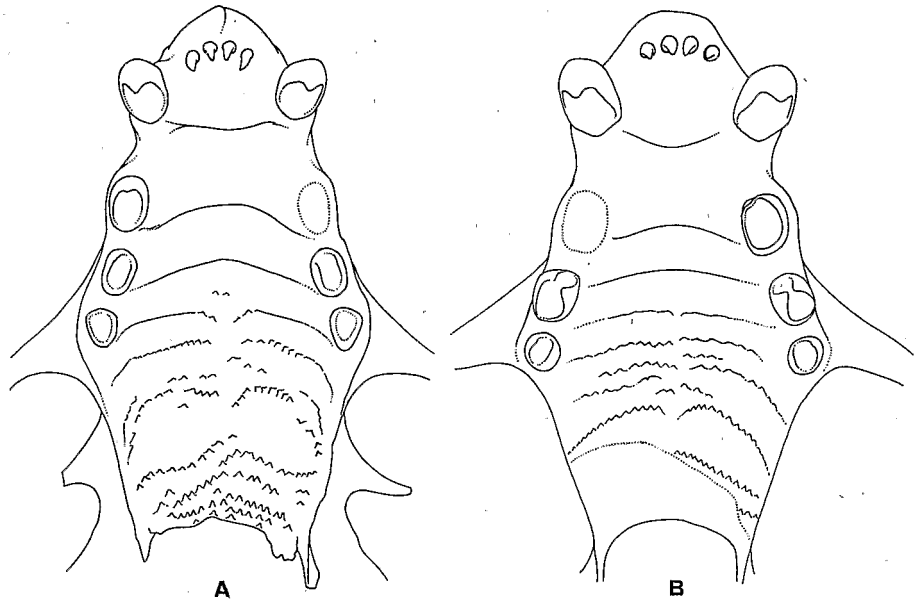

Fig. 3. — *Scotonycteris zenkeri* — A. Palatal ridge pattern and position of M^1 in a specimen from Lamto, Ivory Coast (21.521); - B. Position of M^1 in a specimen from Irangi, Congo (RMNH 16326A).

In relation to the discussions on subspecific divisions within the species it seems useful to describe the colour pattern in detail. The typical oblong white patch on the front of the head, from above the nostrils to the area between the anterior borders of the eyes, is very conspicuous, as are the white patches immediately behind — and about as big as — the eyes. The hairs on the cheeks are very short and thin, brown in front of, and mingled with whitish ones under the

eyes, the general colour impression on the cheeks being Verona Brown. The upper lips have a narrow zone of white hairs, extending from behind the nostrils backwards to the corners of the mouth. The white hairs on front of the head are placed in a more or less right angle to the skin, forming a crestlike formation that passes into the woolly brownish fur covering the top of the head and the nape and sides of the neck. Of course the possibility of an artefact must be taken into account. According to Kuhn (1961) all the back fur hairs make right angles with the skin in live specimens.

As in the longer hairs of the back fur these hairs have three colour zones : about Mummy Brown at their base, whitish in the middle and Russet to Hazel at the tips. The whitish part is relatively long in the hears on head, neck and front of the back and strongly influences the general colour impression there. The relative length of the whitish part decreases towards the lower part of the back, and finally this colour disappears. Mummy Brown with a rustbrown hue dominates the median part of the back, while on the flanks, the haired parts of forearms and legs, the adjoining haired parts of the wings and the tail membrane the rustbrown colour prevails.

Ventrally there is a light greyish brown median zone of whitish tipped, Verona Brown hairs, starting from chin and mouth corners — with narrow zones bordering the lips as offshoots — widening in the throat region and running to the genital area, leaving the haired parts of the forearms, the flanks and the area to the rear of the genitals Verona Brown. There is no sharp border between the greyish and Verona Brown zones. The hairs in the throat region are rather sparse but much longer than the other ventral fur hairs.

Discussion : Though we have not been able to study the taxonomy of *Scotonycteris zenkeri* in detail, we thought it useful to add the following notes. The colour as described above does not provide reasons to place this specimen in the subspecies *occidentalis* based on one female specimen from Ghana (Hayman, 1947), but agrees fairly well with the colour in the nominate form from the Cameroons and Fernando Poo (Eisentraut, 1959b) and with that in an adult female from Liberia as described by Kuhn (1961). As these authors already expressed, the colour pattern is subject to individual variation, while there seems to be a colour change with age as well. In the course of this study we could examine various specimens from Zaïre and Gabon. Two Zaïre specimens, an adult female from Irangi (RMNH 16326A) and a female from Beni (MRAC 3244) had reddish

brown back furs and, ventrally, indistinct lighter coloured median areas rather than more or less well defined longitudinal whitish zones. A male specimen from Kiloboze, Zaïre (MRAC 31345 — and not 3145 as cited in Hayman, Misonne & Verheyen, 1966) had a predominantly sepia coloured back fur and a quite distinctly bordered whitish zone on the ventral side. A fourth, female specimen from Kiliza (MRAC 32584) had an intermediate back fur colour, best described as reddish brown to sepia, and ventrally a less sharply bordered, narrow whitish band. The female from Belinga in Gabon (ZMA 7808) had also an intermediating back fur colour and a distinct, quite sharply defined, yellowish ventral patch. The Irangi, Beni and Belinga specimens prove that the reddish brown colour or a well bordered whitish ventral patch are by no means restricted to individuals of the western populations, and the Kiliza and Belinga specimens cannot be considered to belong to any of the two proposed subspecies because of their intermediating characters.

Rosevaer (1965) and De Vree (1971) indicate that the race *occidentalis* can be identified on the form of the postdental palatum. The lateral margins would be convex and not straight and converging backwards as in *zenkeri*. Moreover the whole palate would be strongly arched in *occidentalis* in stead of weakly so in *zenkeri*. The palate margins in the Ivory Coast specimen seem to be straight and converging, but as they are damaged their original form cannot be determined. However, we found palate margins very much like those described for *occidentalis* in the Kiloboze specimen (MRAC 31345). Indeed the palate is more strongly arched than in the examined Zaïre specimens, but to us this does not seem a very useful character.

The most distinct difference between western and eastern specimens was found by De Vree (1971) in the position of the upper molar, that in *zenkeri* is situated more backwards than in *occidentalis*, at the level of the posterior margin of the anterior zygomatic arch insertion (fig. 3B). Yet, instead of maintaining subspecific divisions, we prefer to await further taxonomical studies on more extensive material of the species, covering more of the probably large distribution area. Besides the Ivory Coast specimen dealt with here, nine more unknown specimens of *Scotonycteris zenkeri* have been encountered in collections :

1 immature specimen from Balileo, Fernando Poo (MRAC 28428);
1 adult female from Belinga, Gabon (ZMA 7808)
1 adult female from Irangi, Zaïre (RMNH 16326A);

1 adult male from Dimonika, People's Republic of Congo (UBRA 1 - ♂ -70 - 03 - 10), and 1 juvenile specimen, probably from the same locality (UBRA 7 - ♂ -70 - 03 - 09);
1 female from Kiliza, Zaïre (MRAC 32584);
3 specimens from Le Makobé, Central African Republic (MNHN, field numbers 54, 56 (1) and 56 (2)).

The specimens from Le Makobé are preserved in alcohol. We did not have an opportunity to study them in detail. The female from Irangi, collected on the 14th of November, and the female from Belinga, captured on the 2nd of February, have big nipples and were probably lactating at the time of their capture. Kuhn (1961) reports on a lactating female with a subadult young, taken on the 14th of December, in Liberia.

9. **Lissonycteris angolensis smithi** (Thomas, 1908)

Specimens : 3 ♂ ♂ and 2 ♀ ♀, all five adult specimens.

Localities : Lamto, 26.VI.1964, 1 ♂ (21.780), 1.VII.1970, 1 ♀ (21.582), 2.VII.1970, 1 ♂ (21.603) and 27.VIII.1970, 1 ♂ (21.644). Yama, 20.III. 1969, 1 ♀ (A9241). Specimen 21.780 is an alcohol specimen, with the skull extracted. The other specimens are skulls and skins. A9241 was collected by J.W. LeDuc.

Measurements : Table 6.

Remarks : The males are easily recognized as mature specimens by their well developed collar. The females have two distinct axillar nipples, and are of the same size as the males. The total skull lengths are from 38.2 to 38.3 mm and the forearm lengths vary from 70.1 to 73.4 mm, from which it follows that these specimens represent the subspecies *smithi.*

The fur on the head is greyish brown to reddish brown, darker or more intense than the light reddish brown back fur, into which it gradually passes. The colour of the back fur lies somewhere in between Cinnamon Brown and Sudan Brown. The ventral side, including the collar region in both sexes, is predominantly Verona Brown, tinged with reddish brown in one specimen (21.582). The wings are of a dark Fuscous. The soft density and the reddish brown colour of the back fur and the abundantly furred neck region leave no problem in identifying these *Lissonycteris* at once from the Ivory Coast *Rousettus* discussed earlier in this paper.

The ruff in the males consists of thick hairs with a thin basal part, that grow in clusters. From the direction of the hairs it seems that they are centered around two hair crowns that are situated behind

the lower jaw on the sides of the neck. The females have the throat region and the neck sides covered, be it sparsely, with long, wavy, thin hairs, that also whorl into crowns on the neck sides but that do not grow in clusters, as far as we have seen.

The palatal ridge pattern, preserved in four specimens, is fairly regular. In one specimen (21.603) the fourth ridge is undivided in the middle, where it is divided in the three other specimens (21.582, 21.644 and 21.780).

According to the label specimen A9241 was captured in a guinea savanna.

10. **Myonycteris torquata** Dobson, 1878

Specimens: 18 ♂♂, 13 ♀♀ and 4 probably female specimens.

Locality: Lamto, 14.V.1964, 2 ♂♂ (1323, 1324), 30.V.1964, 1 ♂ (21.790) and 1 ?♀ (21.791), 3.VI.1964, 2 ?♀♀ (21.782, 21.783) and 1 ♀ (21.784), 5.VI.1964, 2 ♂♂ (21.788, 21.789) and 1 ♀ (21.786) and 1 ?♀ (21.787), 27.V.1970, 1 ♂ (21.568), 1.VII.1970, 1 ♂ (21.590) and 1 ♀ (21.589), 2.VII. 1970, 1 ♀ (21.605), 4.VII.1970, 2 ♀♀ (21.612, 21.613), 5.VII.1970, 1 ♂ (21.615), 30.VII.1970, 3 ♂♂ (21.616, 21.621, 21.622) and 2 ♀♀ (21.617, 21.620), 31.VII.1970, 1 ♂ (21.623) and 1 ♀ (21.626), 1.VIII.1970, 1 subadult ♂ (21.628) and 2 ♀♀ (21.631, 21.632), 2.VIII.1970, 1 ♀ (21.633), 27.VIII.1970, 1 ♀ (21.654), 6.X.1970, 1 ♂ (21.660), 7.XI.1970, 1 ♂ (21.754), 9.XI.1970, 2 ♂♂ (21.756, 21.757), 6.XII.1970, 1 ♂ (21.760). The specimens collected 30.V.1964, 3.VI.1964 and 5.VI.1964 are preserved in alcohol. (The skulls of 21.784, 21.786, 21.788 and 21.790 have been extracted). All other specimens are skulls and skins.

Measurements: Table 6.

Remarks: The males in this series are slightly bigger than the females. The total skull length in the whole series runs from 30.1 to 35.1 mm, the forearm lengths from 57.3 to 65.4 mm. De Vree (1971) argues that, to distinguish the western race *leptodon* from the typical *torquata,* only the difference in overall size remains as a useful character, while the differences in teeth measurements do not seem reliable because of a considerable variation in these measurements in some known series and because of the unknown variation in other populations, that presumably is rather big as well. One could add that the overall size is not very well known either, and though certain differences may be suggested by the specimens collected so far, we prefer to leave the question of the subspecific nomination for the present.

One specimen (21.623) had two fairly large M_4 (1.3 : 0.9 and 1.2 : 0.9 mm). Another specimen (1324) had only a right M_3 and a third specimen (21.617) missed both M_3.

Three specimens (21.612, 21.660 and 21.760) had an aberrant palatal ridge pattern, with the fourth ridge undivided. Some other specimens had reduced ridge patterns. Specimen 21.632 had 3 instead of 4 divided ridges in the middle series, and 1 instead of 2 in the posterior series, which altered the normal formula (3 + 4 + 2) into 3 + 3 + 1.

Rosevaer described the variable fur colour in eight specimens from the Cameroons, Congo and Angola. The Ivory Coast specimens do not differ much from these. The back, caudal of the lighter coloured neck and shoulder region, is almost entirely Clove Brown in some specimens. In others this colour is mixed with or even dominated by Sudan Brown, a colour mostly restricted to the tips of the hairs. In some specimens bright Sudan Brown hairs are to be found on the furred dorsal parts of arms and legs, mostly mixed with the greyish brown basis colour, on top of the head.

The belly colour is much lighter than the back colour, but always more or less corresponding to the predominating back colour. The long ruff hairs in the males have a short, thin, darkly coloured basal part and the thick remaining part can be Light Orange-Yellow, (Light) Ochraceous Buff to pinkish cinnamon, or Tawny Olive to Dark Olive-Buff.

Females as well as juvenile and subadult males have the throat covered with long, rather thin, woolly hairs, occasionally scarce in the centre of the area. In subadult males the first thick ruff hairs appear amidst these thin hairs, which disappear during the further development of the ruff. In fully adult males two distinct hair crowns can be observed, behind the lower jaws at either side of the head. The ruff hairs grow in small clusters, as do the above-mentioned long throat hairs in females and young males. From the females the numbers 21.784 and 21.786 (captured on 3-VI and 5-VI) have big nipples and may have been lactating when captured. All the others, taken in July and August, have rather small nipples and, as far as can be concluded from the dry skins, were not nursing young when caught.

Two males were sexually subadult, one (21.628), caught on the 1st of August, with only the first few ruff hairs and another (21.622), captured on the 30th of July, with a small field of ruff hairs in the centre of the throat region.

Subfamily **MACROGLOSSINAE**

11. **Megaloglossus woermanni** Pagenstecher, 1885

Specimens : 2 ♀ ♀ and 1 specimen of unknown sex.

Localities: Adzopé, 8.III.1971, 1 ♀ (A9184) and 1 specimen of unknown sex (A9183). Lamto, 2.VII.1970, 1 ♀ (21.602).

Measurements : Table 6.

Remarks : In a study on the taxonomy of the species (Bergmans & Van Bree, 1973) the synonymy of the subspecies *Megaloglossus woermanni woermanni* and *M. w. prigoginei* Hayman, 1966, was concluded. Fernando Poo, mentioned by Eisentraut (1964), and Le Makobé, from where three female specimens are present in Paris (MNHN, field numbers 2, 55 and none) can be added to the list of known localities.

Specimen A9183 had two small M_4, while specimen A9184 had two small M^3.

In colour the Ivory Coast specimens answer the description given by Eisentraut (1963). The ruff hairs in the males of this species, as could be observed during the study referred to above, are very thin at their base and thick throughout their further length, and grow in small clusters. In the female from Adzopé and in the other specimen from this locality, clustering of the long, thin hairs, more or less parallelling the male ruff, is very obvious. In the specimen from Lamto this is much less distinct.

The Lamto female, captured on the 2nd of July, and the Adzopé female, captured on the 8th of May, have rather big nipples, and possibly lactated at the time of their capture.

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GAZETTEER

Ivory Coast	Adiopodoumé	5° 19' N 4° 08' W
	Adzopé	6° 06' N 3° 52' W
	Bouaké	7° 41' N 5° 02' W
	Duékoué	6° 44' N 7° 21' W
	Gopoupleu	6° 37' N 8° 23' W
	Guéboua	5° 59' N 5° 41' W
	Konankoffikro	6° 57' N 5° 12' W
	Lamto	6° 12' N 4° 58' W
	Niebe	5° 21' N 7° 22' W
	Sassandra River	7° 00' N 7° 03' W
	Yama	9° 36' N 6° 18' W
Central African Republic	Le Maboké (M'Baïki)	3° 53' N 18° 01' E
People's Republic of Congo	Dimonika	4° 14' S 12° 26' E
Republic of Gabon	Belinga	1° 13' N 13° 10' E
Zaïre	Beni	0° 29' N 29° 27' E
	Irangi	1° 54' S 28° 27' E
	Kiliza	3° 44' S 28° 10' E
	Kiloboze	3° 03' S 28° 09' E

Table 3. — Measurements in mm.

Species	*Eidolon helvum*					*Rousettus aegyptiacus unicolor*		*Hypsignathus monstrosus*					
								♂♂			♀♀		
Specimens	♂ A2074	♂ AX0106	♂ A2947	♂ A2946	♀ A8746	♂ A9238	♀ A9239	n	m	min - max	n	m	min - max
Forearm length	123.6	121.8	112.0	109.7	112.8	91.3	100.8	5	129.6	125.5 - 134.3	5	123.8	118.6 - 127.4
Total skull length		55.0	52.4			42.6	43.6	4	69.3	69.0 - 70.1	2		61.9 - 62.7
Condylobasal length		52.9	50.6			41.0	42.0	4	68.8	68.4 - 69.9	2		61.0 - 62.2
Rostrum length		20.9	17.7			14.4	14.9	4	35.1	34.5 - 35.7	2		29.8 - 34.0
Palatal length		31.3	27.9			23.5	23.8	4	41.2	40.8 - 41.5	2		34.9 - 41.5
Mandible length		42.3	42.0			32.3	34.6	4	56.5	56.0 - 57.0	3	50.0	49.0 - 51.4
Cranium breadth		20.6	20.3			16.5	17.6	4	20.9	20.5 - 21.3	2		20.7 - 21.3
Interorbital breadth		8.7	9.0			8.3	8.1	4	12.9	12.2 - 13.3	3	11.0	10.4 - 11.3
Postorbital breadth		10.0	10.8			8.8	9.2	4	12.1	11.8 - 12.9	3	11.3	10.9 - 11.9
Zygomatic breadth		31.4	30.8			24.7	25.5	4	35.2	32.9 - 36.1	2		32.1 - 32.8
C^1 - M^1								4	22.8	22.2 - 23.5	3	20.9	20.5 - 21.2
C^1 - M^2		20.8	20.7			16.5	16.6						
C^1 - C^1						7.8	8.2	4	14.8	14.3 - 15.5	3	12.8	12.3 - 13.3
M^1 - M^1								3	21.3	20.9 - 21.7	2		18.9 - 19.8
M^2 - M^2		16.6	—			13.2	14.2						
C_1 - M_2								4	29.1	28.8 - 29.5	3	26.2	26.0 - 26.4
C_1 - M_3		23.1	23.4			18.4	18.4						

Table 4. — Measurements in mm.

Species	*Epomops franqueti strepitans*						*Epomops buettikoferi*					
Specimens	♂ ♂			♀ ♀			♂ ♂			♀ ♀		
	n	m	min - max	n	m	min - max	n	m	min - max	n	m	min - max
Forearm length	10	86.1	84.1 - 88.9	9	78.5	76.5 - 81.2	26	97.5	92.9 - 102.2	28	90.6	84.3 - 96.2
Total skull length	5	45.4	40.9 - 48.7	9	40.6	37.8 - 45.3	19	58.2	55.0 - 60.2	25	51.4	45.8 - 56.6
Condylobasal length	4	44.3	39.5 - 48.0	8	39.2	36.3 - 44.1	15	57.8	54.1 - 59.4	17	49.9	44.9 - 53.4
Rostrum length	4	18.2	15.2 - 20.8	8	15.3	14.0 - 18.1	21	26.9	24.9 - 28.5	22	21.8	18.6 - 23.6
Palatal length	3	24.9	23.2 - 26.4	5	21.5	19.6 - 23.0	18	35.1	32.2 - 36.7	14	29.3	28.0 - 31.3
Mandible length	4	36.6	32.0 - 40.0	8	31.9	29.8 - 36.3	23	48.3	45.8 - 50.1	24	41.1	36.8 - 44.6
Cranium breadth	4	16.3	15.6 - 17.0	8	15.9	14.8 - 16.7	22	18.6	17.6 - 19.0	24	17.3	16.4 - 18.5
Interorbital breadth	4	6.9	6.4 - 7.0	8	6.6	6.0 - 7.0	23	8.6	8.0 - 9.2	24	7.8	7.2 - 8.4
Postorbital breadth	4	9.2	8.8 - 9.4	8	9.2	8.9 - 9.7	23	10.1	8.8 - 11.2	24	10.1	8.9 - 10.7
Zygomatic breadth	4	24.9	23.5 - 25.6	8	22.9	21.2 - 25.6	22	28.6	27.0 - 29.8	21	26.1	25.0 - 27.0
C^1 - M^1	4	14.4	12.0 - 15.7	8	13.2	12.2 - 14.3	23	18.9	17.2 - 20.3	23	16.5	14.9 - 17.2
C^1 - C^1	3	8.3	8.2 - 8.5	8	7.2	6.7 - 7.6	22	10.0	9.4 - 10.5	24	9.0	8.2 - 9.8
M^1 - M^1	2		13.3 - 13.4	8	12.2	11.7 - 12.8	22	17.1	15.6 - 18.5	21	14.7	13.0 - 16.1
C_1 - M_2	3	16.4	14.4 - 18.1	8	14.8	13.7 - 15.9	23	20.8	18.8 - 21.8	23	18.3	15.2 - 19.6

Table 5. — Measurements in mm.

Species	*Micropteropus pusillus*							*Nanonycteris veldkampi*					
Specimens	♂♂			♀♀				♂♂			♀♀		
	n	m	min - max	21.562	21.627	21.624	21.625	n	m	min - max	n	m	min - max
Forearm length	10	51.7	49.7 - 54.1	53.0	55.2	54.8	53.3	10	46.4	45.3 - 49.4	8	48.0	43.3 - 53.2
Total skull length	9	29.6	28.3 - 30.5	29.5	29.0	28.6	27.7	9	25.4	23.6 - 26.8	7	25.0	23.9 - 26.3
Condylobasal length	9	28.6	27.5 - 29.4	28.2	28.1	27.7	26.8	8	23.3	21.9 - 24.0	5	23.0	21.6 - 24.4
Rostrum length	9	10.0	9.3 - 10.7	9.6	10.0	9.5	9.3	9	8.7	8.0 - 9.1	7	8.7	8.4 - 9.3
Palatal length	8	16.0	15.5 - 16.5	16.3	15.7	15.6	14.9	1	11.3		1	13.2	
Mandible length	9	22.0	20.5 - 23.2	20.5	20.4	20.6	19.7	9	18.9	18.1 - 19.9	7	18.7	17.2 - 19.9
Cranium breadth	9	12.7	12.0 - 13.4	13.1	12.9	12.5	12.6	8	12.1	11.9 - 12.4	7	11.8	11.6 - 12.0
Interorbital breadth	9	5.4	4.8 - 5.7	5.3	5.3	5.3	5.0	9	4.3	4.0 - 4.5	7	4.4	4.1 - 4.6
Postorbital breadth	9	8.5	8.0 - 9.2	8.8	8.4	8.3	8.5	9	8.0	7.7 - 8.5	7	8.0	7.3 - 8.6
Zygomatic breadth	8	18.4	17.9 - 18.9	18.0	18.3	18.0	17.7	7	14.9	14.7 - 15.3	6	14.7	14.5 - 15.3
C^1 - M^1	9	8.8	8.5 - 9.0	8.7	8.8	8.6	8.4	9	7.0	6.8 - 7.3	7	7.0	6.8 - 7.4
C^1 - C^1	9	6.1	5.9 - 6.6	6.1	5.9	6.0	5.8	9	4.9	4.4 - 5.2	7	4.7	4.5 - 5.0
M^1 - M^1	9	9.9	9.5 - 10.4	9.8	9.7	9.7	9.4	9	6.8	6.3 - 7.0	7	6.8	6.6 - 7.0
C_1 - M_2	9	10.0	9.6 - 10.2	10.1	10.1	9.6	9.7	9	8.0	7.6 - 8.3	7	8.2	7.6 - 8.9

Table 6. — Measurements in mm.

Species	*Scotonycteris zenkeri*	*Lissonycteris angolensis smithi*					*Myonycteris torquata*						*Megaloglossus woermanni*		
Specimens	♂ 21.521	♂ 21.780	♂ 21.603	♂ 21.644	♀ 21.582	♀ A9241	♂♂ n	♂♂ m	♂♂ min - max	♀♀ n	♀♀ m	♀♀ min - max	?♀ 9183	♀ 9184	♀ 21.602
Forearm length	51.1	73.4	71.0	70.1	72.3	71.1	18	61.3	57.3 - 65.4	13	60.7	57.5 - 64.7	40.0	41.7	43.4
Total skull length	—	38.2	38.3	38.2	38.3	38.2	17	33.2	31.9 - 35.1	11	32.5	30.1 - 34.9	25.7	26.6	26.6
Condylobasal length	—	36.9	37.3	37.2	37.8	37.4	14	32.0	30.5 - 34.3	9	30.8	28.7 - 32.0	24.3	25.6	25.8
Rostrum length	9.7	14.2	13.0	13.0	13.5	12.9	12	11.8	11.4 - 12.7	9	11.3	10.8 - 12.0	9.8	10.8	10.7
Palatal length	14.5	21.5	21.6	20.8	20.7	—	15	18.0	17.3 - 18.9	9	17.5	16.2 - 17.9	13.4	14.6	14.6
Mandible length	20.0	29.7	30.0	29.6	29.5	30.0	15	25.6	24.4 - 27.4	11	24.5	23.0 - 25.6	19.0	19.7	20.5
Cranium breadth	—	14.9	14.3	14.6	14.9	14.8	15	13.6	13.1 - 14.4	11	13.4	12.9 - 14.3	10.4	11.1	10.9
Interorbital breadth	5.1	6.3	6.5	6.3	6.8	5.9	15	6.0	5.6 - 6.7	11	5.5	5.0 - 6.2	3.8	4.0	4.0
Postorbital breadth	6.3	8.0	8.4	8.3	8.3	8.3	15	8.2	6.8 - 9.0	11	8.1	7.1 - 8.8	6.7	7.0	7.3
Zygomatic breadth	—	22.2	20.8	20.1	22.3	22.6	12	19.6	18.3 - 20.4	11	18.0	16.4 - 19.3	12.4	13.6	13.1
C^1 - M^1	8.3														
C^1 - M^2		14.6	14.6	14.5	14.0	14.2	15	12.2	11.4 - 12.8	11	11.8	11.4 - 12.5	8.1	8.4	9.3
C^1 - C^1	5.5	7.6	6.8	7.2	7.4	7.4	15	6.3	5.9 - 6.8	11	6.1	5.5 - 6.4	4.2	4.5	4.4
M^1 - M^1	7.8														
M^2 - M^2		11.7	10.7	11.7	11.4	12.2	15	9.3	8.9 - 9.8	11	8.9	8.1 - 9.5	5.9	6.0	6.1
C_1 - M_2	9.4														
C_1 - M_3		15.9	15.9	16.4	15.8	15.9	14	13.5	12.6 - 14.6	10	13.2	12.4 - 13.9	9.0	9.4	9.8

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