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On the differences between sympatric *Epomops franqueti*  
(Tomes, 1860) and *Epomops buettikoferi* (Matschie, 1899),  
with additional notes on the latter species  
(Mammalia, Megachiroptera)

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## ABSTRACT

The approximate limits of the region of sympatric occurrence of the West African fruit bats *Epomops franqueti* (Tomes, 1860) and *Epomops buettikoferi* (Matschie, 1899) are discussed. Series of the two species from that region are compared and a key is given to identify adult specimens. Notes are added on the distribution, ecology and biology of *E. buettikoferi*.

## INTRODUCTION

In 1965 Kuhn proposed, merely by the nomenclature he used, that *Epomops buettikoferi* (Matschie, 1899) should be considered a subspecies of *Epomops franqueti* (Tomes, 1860). As far as I know he was followed in this only by Püscher (1972), whose first concern, however, was not taxonomy. Rosevear (1965) wrote on the sympatric occurrence of *buettikoferi* and *franqueti* at Kumasi in Ghana. Two other localities where both forms were collected, Adiopodoumé and Lamto in Ivory Coast, were mentioned by De Vree (1971) and Bergmans, Bellier & Vissault (1974), respectively. Thus a considerable overlap seems to exist in the distribution areas of the two taxa, which renders a subspecific interrelation as suggested by Kuhn (*loc. cit.*) highly improbable. In fact De Vree (1971), dealing with *buettikoferi* from the Ivory Coast and *franqueti* from Togo, and Bergmans *et al.* (1974), comparing Ivory Coast specimens of both *buettikoferi* and *franqueti*, left no doubt that in their opinion two full species are involved. The latter authors found distinctly different average measurements in the two species, and only two out of 93 specimens were rather difficult to identify. In this context Hayman (1967)

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was cited, who mentioned intergradation as a possibility in the overlap area, especially because he had found that the palatal ridge pattern — one of the important discriminating characters in *Epomops* — is not always so fixed as it was thought to be.

The receipt lately of new Ivory Coast material of both *franqueti* and *buettikoferi* enabled me to amend what little has been published on the identification problem.

The scarce data on distribution, ecology and biology of *buettikoferi* that could be collected are also included in the present paper.

#### METHODS AND MATERIAL

As Bergmans *et al.* (1974) pointed out, comparison of the species *Epomops buettikoferi* and *E. franqueti* should be carried out with material originating from approximately the same region. Where the species occur together, *buettikoferi* attains larger dimensions than *franqueti*, but specimens of *franqueti* from more eastern localities tend to be larger than those from the overlap area. Central African *franqueti* even show considerable overlap in measurements with *buettikoferi*, and using such specimens for comparison would unnecessarily obscure the matter.

For this study 40 specimens of *buettikoferi* and 36 of *franqueti* from the overlap area were available (*E. buettikoferi*: 18 ♂♂ and 7 ♀♀ from Lamto, 1 ♂ and 1 ♀ from Adiopodoumé, 2 ♂♂ and 4 ♀♀ from Adzopé, 2 ♂♂ and 4 ♀♀ from Kumasi and 1 ♀ from Takoradi; *E. franqueti*: 11 ♂♂ and 24 ♀♀ from Adiopodoumé and 1 ♀ from St. George d'Elmina). A number of measurements have been compared to find an adaptable method to distinguish between the two species in this area. The *greatest skull length* (= *total skull length* in Bergmans *et al.*, 1974) is the distance between prosthion and ophistocranium. The maxillary teeth row (C<sup>1</sup>-M<sup>1</sup>) has been measured over the cingulae. The length of the first upper molar (M<sup>1</sup>) has been measured over the cingulum, with a micrometer inserted in a stereoscopic microscope.

All localities mentioned in this paper can be found on the map (fig. 1). Measurements are given in mm, and weights in g. From literature and museum specimens data have been collected on the geographical and ecological distribution and on the biology of *buettikoferi*. In relation to this the vegetation map by Keay (1959) proved to be very useful. Likewise collecting localities of *franqueti* within or near the distribution area of *buettikoferi* have been brought together.

Collections have been abbreviated as follows:

British Museum (Natural History), London	— BMNH
Laboratoire d'Ecologie des Mammifères et des Oiseaux, Centre O.R.S.T.O.M., Adiopodoumé	— ORSTOM
Rijksmuseum van Natuurlijke Historie, Leiden	— RMNH
Senckenberg Museum, Frankfurt/Main	— SMF
Zoölogisch Museum, Amsterdam	— ZMA

I. THE DIFFERENCES BETWEEN SYMPATRIC *Epomops buettikoferi* AND *E. franqueti*.

*Epomops buettikoferi* has been found as far eastward as Kumasi and Takoradi in Ghana (BMNH specimens). De Vree and others collected bats at many localities in Togo (De Vree *et al.*, 1969; 1970; 1971) and never caught a single specimen of *buettikoferi*. Some representative Togo collecting sites of *Epomops franqueti* are introduced on the map (fig. 1). It is likely, therefore, that *buettikoferi* reaches its eastern limit somewhere between the line Kumasi-Takoradi and the western border of Togo. Hayman & Edwards Hill (1971) cite Nigeria as possible part of the *buettikoferi* distribution area, but do not mention any reference material. The few *franqueti* specimens from Nigeria

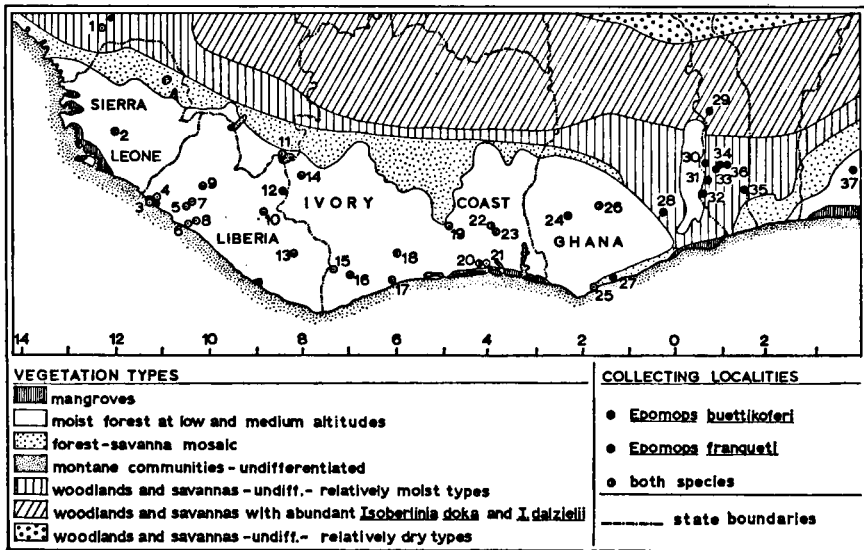


FIG. 1. Distribution of *Epomops buettikoferi* and *Epomops franqueti* in West Africa in relation to the vegetation types. Limits of vegetation types after Keay (1959).

Localities:

- |  |                   |               |
|--|-------------------|---------------|
| 1. Kakansili                           | 13. Pelokehn      | 26. Kumasi    |
| 2. Njala                               | 14. Matonguiné    | 27. Elmina    |
| 3. Robertsport                         | 15. Niebe         | 28. Tafo      |
| 4. Bendu                               | 16. Konankoffikro | 29. Fazao     |
| 5. Mount Coffee & Mühlenberg's Mission | 17. Bolo          | 30. Ahouéhoué |
| 6. Schieffelinsville                   | 18. Guéboua       | 31. Dzjobégan |
| 7. Bavia                               | 19. Ahierémou     | 32. Klouto    |
| 8. Harbel                              | 20. Adiopodoumé   | 33. Agadji    |
| 9. Soforé-Place                        | 21. Abidjan       | 34. Dedomé    |
| 10. Tappita                            | 22. Lamto         | 35. Tététou   |
| 11. Mount Nimba                        | 23. Adzopé        | 36. Adjido    |
| 12. Deaple                             | 24. Bibiani       | 37. Ibadan    |
|  | 25. Takoradi      |               |

that I have seen were — averaging or absolutely — larger than the Ivory Coast specimens, and misidentification of Nigerian *Epomops* is not unlikely to occur. *Epomops franqueti* has been found as far west as Lamto and Adiopodoumé in Ivory Coast (De Vree, 1971: 44; Bergmans *et al.*, 1974) and possibly does not occur much more westward, as it was never met with in other Ivory Coast collecting sites, though fair in number, nor in Liberia (Kuhn, 1965). Overlap in distribution between *buettikoferi* and *franqueti* may thus be located roughly between 05°30' and 01° W, and between the Atlantic Ocean in the south and an unknown limit, probably established by vegetational changes, in the north (fig. 1).

Measurements and some weights of adult specimens of both species from the sympatric area are given in table 1. The third palatal ridge, from the front, was found to be divided in all 37 *buettikoferi* specimens in which this could be checked (including those mentioned by De Vree, 1971), be it only narrowly in three specimens (8%). In the 45 specimens of *buettikoferi* from outside the overlap area in which the palatum had been preserved the third palatal ridge was also always found to be divided, although narrowly so in three specimens (7%). Of 32 *franqueti* specimens from the overlap area the third palatal ridge was typically undivided in 19, notched in the middle in two, narrowly divided in four and more broadly divided in seven specimens.

The following key is based on the measurements in table 1 and on the observations on the third palatal ridge.

Key to adult specimens of *Epomops buettikoferi* and *Epomops franqueti* from the area where the species are sympatric.

Forearm length, males > 91 mm, females usually > 86 mm;  
greatest skull length, males > 51 mm, females usually > 45.8 mm;  
C<sup>1</sup> - M<sup>1</sup>, males > 16.5 mm, females usually > 15.0 mm;  
length M<sup>1</sup> ≥ 3.2 mm;  
third palatal ridge, from the front, divided in the middle . . . *buettikoferi*

Forearm length, males < 91 mm, females < 86 mm;  
greatest skull length, males < 51 mm, females usually < 45.8 mm;  
C<sup>1</sup> - M<sup>1</sup>, males < 16.5 mm, females usually < 15.0 mm;  
length M<sup>1</sup> ≤ 3.2 mm;  
third palatal ridge, from the front, undivided in the middle  
in most specimens . . . . . *franqueti*

Correlating greatest skull length and forearm length in individual specimens serves to divide *Epomops* from the overlap area into four more or less separated divisions (fig. 2). The two species occupy different ranges in the diagram, and within the species the sexes do the same. Overlap between the two male ranges or between the two female ranges has as yet not been found to exist. Unfortunately not many data on the weight of the discussed specimens were available (table 1). Outside the overlap area two *buettikoferi* males weighed 164 and 198 g and ten *buettikoferi* females weighed from 85 to 132 g (m = 108.5 g). From these data and from those in table I it seems that

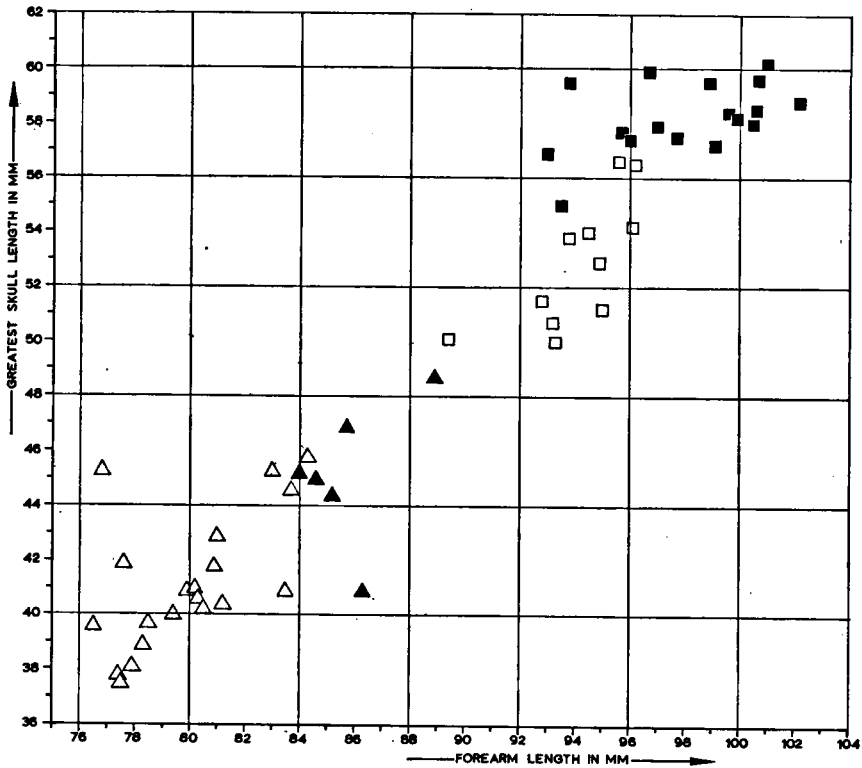


FIG. 2. The relation between greatest skull length and forearm length in sympatric *Epomops buettikoferi* (black squares: males; open squares: females) and *Epomops franqueti* (black triangles: males; open triangles: females).

in many cases the combination of the characters weight and sex will be sufficient to identify adult male specimens, whereas in females some overlap in weight between the two species exists.

## II. NOTES ON *Epomops buettikoferi*.

From the map (fig. 1) Kakansili appears to be the westernmost and northernmost locality where *buettikoferi* has been caught (van Orshoven & van Bree, 1968). Kumasi in Ghana is the ultimate eastern collecting site (Rosevear, 1965) and Takoradi, also in Ghana, the southernmost (BMNH specimen 66.6217). The vegetation types mentioned below are those distinguished by Key (1959), unless stated otherwise. Most of the collecting sites lie within the type "moist forest at low and medium altitudes", classified as "high forest" by Rosevear (1965). The Kakansili specimens were collected in a "guinea savanna . . . near a river bordered by a gallery forest", as stated by van Orshoven & van Bree (1968). Key includes the Kakansili area in the type "woodlands and savannas — undifferentiated — relatively moist types".

TABLE I. Measurements of *Epomops buettikoferi* and *Epomops franqueti* from the overlap area.

	<i>Epomops buettikoferi</i>						<i>Epomops franqueti</i>						
	♂♂			♀♀			♂♂			♀♀			
	n	m	min-max	n	m	min-max	n	m	min-max	n	m	min-max	
Locality													
Greatest skull length	Lamto Adzopé Adiopodoumé Kumasi Takoradi Elmina	16 1 2 4 1	58.3 55.0—60.2 57.4 53.8—54.3	7 4 4 1	53.6 51.6 48.8 47.6	50.0—56.6 50.1—54.2 45.8—50.9	Lamto Adzopé Adiopodoumé Elmina	6 7	45.2 14.5	40.9—48.7 12.0—15.7	19 1	40.9 13.4 14.8	37.5—45.8 12.2—15.0
C1—M <sup>1</sup>	Lamto Adzopé Adiopodoumé Elmina	18 2 4	18.8 17.2—19.6 18.4—20.3	7 4	17.3 16.8	16.3—18.0 16.0—17.3	Lamto Adzopé Adiopodoumé Elmina	7 5 1	3.6 3.4 3.5	3.4—3.8 3.2—3.7	1 22 1	2.7 2.8 3.2	2.7 2.6—3.1 3.2
Length M <sup>1</sup>	Lamto Adzopé Adiopodoumé Elmina	19 2	3.7 3.2—4.0 3.8—3.8	7 5 1	3.6 3.4 3.5	3.4—3.8 3.2—3.7	Lamto Adzopé Adiopodoumé Elmina	11 4	86.2 93.0—102.2 96.0—97.3 96.7	84.0—88.9	22 1	79.7 83.0	76.5—84.3 83.0
Forearm length	Lamto Adzopé Adiopodoumé Elmina	18 2 1	98.0 93.0—102.2 96.0—97.3 96.7	7 4	94.8 92.9	93.3—96.2 89.4—96.1	Lamto Adzopé Adiopodoumé Elmina	4 2 1	100.5 160—180 170	96—110	13 1	72 56—87	56—87
Weight	Lamto Adiopodoumé	2 1	160—180 170				Lamto Adiopodoumé	4 1	100.5 160—180 170	96—110	13 1	72 56—87	56—87

The vegetation of Mount Nimba in southeast Guinea has been classified as a "montane community", which category comprises a variety of types that have not been further distinguished by Keay. At Bendu and Robertsport in Liberia and at Adiopodoumé in Ivory Coast the "moist forest" meets the coastal "mangroves" type. Harbel in Liberia and Elmina in Ghana are said to be surrounded by "coastal scrub" (Rosevear, 1965), a type not indicated by Keay, but the "moist forest" is quite near at both localities.

Summarizing, *Epomops buettikoferi* seems to be restricted to the West African "moist forest" block that stretches from Guinea to Ghana, though it may be encountered in the adjoining types "forest-savanna mosaic" and "woodlands and savannas, relatively moist types", and then probably in or near forested areas.

Keay (*loc. cit.*) claims that the "forest-savanna mosaic" type was derived by degradation of the "moist forest (.....)". Rosevear (1965) calls this type "invasive guinea woodland". In Keay's opinion the northern border of the "moist forest" block is withdrawing southward. If this is true, *buettikoferi* populations outside the "moist forest" block are more likely to be rest populations in remnant forests than immigrants from the "moist forest" block. Limited in its distribution by the dryer savanna zones in the north and by the Atlantic Ocean in the west and south, *buettikoferi* seems to meet a natural eastern barrier in the savanna belt known as the Dahomey gap (Rosevear, 1953), which separates the forest section extending from Guinea to Ghana from the section extending from Nigeria into Central Africa. This would lend some support to the idea that *buettikoferi* does not invade savanna areas as an immigrant from the forest. It also indicates a possible ecological difference between *buettikoferi* and *franqueti*. Apparently the Dahomey gap does not hinder *franqueti*, since this species has frequently been found there (De Vree *et al.*, 1969, 1970, 1971) and on both sides of the gap.

Collecting localities of *buettikoferi* that to my knowledge have not been published before are Njala (00°08' N, 12°05' W) in Sierra Leone, Mount Nimba (07°39' N, 08°30' W) in Guinea, Tappita (06°29' N, 08°51' W) in Liberia, Ahierémou (06°12' N, 04°54' W), Bolo (05°06' N, 06°06' W) and Matonguiné (07°17' N, 08°03' W) in Ivory Coast, and Takoradi (04°55' N, 01°45' W) in Ghana. Localities that could not be traced exactly are Grand Bassa (Kuhn, 1965) and Gwene-Town (De Vree, 1971) in Liberia, and Toyebli in Ivory Coast (De Vree, 1971).

Data on the habits of *buettikoferi* are scarce. Rosevear (1965) quotes T. S. Jones, who collected the species in Sierra Leone, where "it is common in the forest area of the South-western Province and can be easily recognized by its very distinctive honking 'kong' (...). It is present the whole year round and feeds on guavas and bananas and appears particularly fond of the Iroko tree (*Chlorophora excelsior*), presumably because of the stout catkins of the female tree rather than the slender male inflorescences". The specimens from Bolo, Ivory Coast, were collected at a plantation, the precise nature of which is not known to me.

All collected information on the breeding biology of *Epomops buettikoferi* has been brought together in table II. One female from Schieffelinville (RMNH 19639), collected on 11 January, 1887, bore an embryo with a length (*in situ*) of 35 mm and a forearm length of 20.5 mm. Another female from Lamto (ORSTOM 21.792), collected on 7 July, 1964, bore an embryo with a length of about 41 mm and a forearm length of 29 mm (the date of capture of this specimen was erroneously recorded as 26 June 1964 by Bergmans *et al.*, 1974: 29). Subadult specimens have been caught on 8 March at Adzopé (ORSTOM A9176), on 11 August at Adiopodoumé (ORSTOM A8362) and on 19 October at Mühlenberg's Mission (RMNH 19638). The possibility of two propagation periods per year is suggested by the two pregnancies in January and July, but of course much more information is needed to confirm this idea. Okia (1974) describes the breeding biology of *Epomops franqueti* in Uganda, with two fixed breeding cycles per year, a pregnancy period of five to six months and birth occurring at or shortly after the beginning of the rainy seasons.

TABLE II. Data on the breeding biology of *Epomops buettikoferi* as observed in adult female specimens.

Months	J	F	M	A	M	J	J	A	S	O	N	D
Numbers of specimens with: undeveloped nipples			1	2					11		1	2
not fully developed nipples	4	3	2			1		1			3	1
fully developed nipples	2								1			
embryos	1						1					

The variation ranges in measurements of the species as a whole agree in many respects with those from the known specimens from the area where *buettikoferi* and *franqueti* are sympatric. Only the forearm length range in females is extended considerably, mainly due to some specimens from Konan-koffikro (table III).

TABLE III. Measurements of *Epomops buettikoferi*: comparison of the specimens, sympatric with *Epomops franqueti*, with the species as a whole.

		♂♂		♀♀	
		n	min — max	n	min — max
Greatest skull length	overlap area only	19	53.8 — 60.2	16	45.8 — 56.6
	whole distribution area	31	53.8 — 61.0	46	44.5 — 56.6
Forearm length	overlap area only	21	93.0 — 102.2	11	89.4 — 96.2
	whole distribution area	30	92.9 — 102.2	38	84.4 — 96.2

### DISCUSSION

The measurement averages of sympatric *Epomops buettikoferi* and *E. franqueti* in table I emphasize once more that the two taxa differ on species



level. When using the combination of characters mentioned in the key on page 144, specific identification of adult *Epomops* specimens from the sympatric area will not present too many difficulties in the majority of cases.

Bergmans *et al.* (1974) discussed two female specimens from Adiopodoumé that at the time were rather difficult to identify. The first specimen (ORSTOM A8300), with a greatest skull length of 45.3 mm equally far from the known averages in both species from Ivory Coast, was assigned to *franqueti* because of its forearm length of 76.8 mm and its undivided third palatal ridge. The two other key measurements in this specimen confirm this identification:  $C^1 - M^1 = 14.3$  mm and  $M^1$  length = 2.8 mm. The second specimen (ORSTOM A8298), with a greatest skull length of 45.8 mm, was provisionally identified as *buettikoferi* because of its forearm length of 84.3 mm and its divided third palatal ridge. The two other measurements are here:  $C^1 - M^1 = 14.9$  mm and  $M^1$  length = 2.8 mm. According to the key this specimen belongs to the species *franqueti*.

Yet the figures in table III show that the key constructed here may not be definite. More and probably other data on the differences between *franqueti* and *buettikoferi* females are needed to exclude the possibility of doubt.

Two *buettikoferi* females from Konankoffikro have forearm lengths of 84.4 and 85.1 mm (ORSTOM 21.718 and 21.723), and one from Takoradi of which I only saw the skull has, according to its label, a forearm length of 83 mm (BMNH 66.6216). The greatest skull length in these three specimens respectively is 49 mm (reconstructed), 48.6 mm and 47.6 mm. One *buettikoferi* female from Bolo (ORSTOM A9542) has a greatest skull length of 44.5 mm, the minimum measurement found in the species. The other key measurements in this specimen are: forearm length 88.2,  $C^1 - M^1$  14.7 and  $M^1$  length 3.2 mm, while the third palatal ridge is divided and the weight was 116 g. Some of these data indicate that *buettikoferi* series from different populations may show differences in their size ranges, which induces the idea that *buettikoferi* populations are rather restricted in their movements. More information on populations inhabiting the overlap area will probably enlarge the size ranges in table III. In the case of certain individual female specimens this will not simplify identification, but on the other hand an extended knowledge of the populations of *buettikoferi* and *franqueti* from the sympatric area would almost certainly facilitate identification on distributional, ecological and biological grounds. It is of great importance therefore, that future collectors in the area label their specimens with full data on measurements, weight, date, and precise geographical and ecological site.

*Epomops franqueti* specimens from the area of sympatric occurrence were never really difficult to identify. The idea of intergradation between *buettikoferi* and *franqueti* was suggested by Hayman (1967) as a possible explanation of the occurrence of irregularities in the palatal ridge configuration. In this concept it is assumed that neither the typical ridge pattern in *buettikoferi* nor that in *franqueti* is a dominant character, and that cross-breeds would have an intermediate palatal ridge pattern. The majority of specimens with

an atypical third palatal ridge, however, have perfectly typical palatal ridge patterns but for this one feature, and I do not think that we should take these partly aberrant ridge patterns for intermediate patterns.

Seven *franqueti* females from the region of sympatric occurrence (ORSTOM B34, B36, B37, B39, B41, B43 and B61, all from Adiopodoumé) have notched or divided palatal ridges. In none of these specimens any other key character seems to justify doubt as to their correct identification. If intergradation should stand as a possible explanation for these partly atypical palatal ridge patterns we must, judging from these specimens, at the same time accept that all the other key characters in *franqueti* dominate the equivalent characters in *buettikoferi*. This is immediately contradicted by the fact that atypical, narrowly divided third palatal ridges were found in two of the largest known *buettikoferi* males, both from Lamto (ORSTOM 21.541 and 21.546), with forearm lengths of 102.2 and 98.9 mm, greatest skull lengths of 58.8 and 59.5 mm, C<sup>1</sup> - M<sup>1</sup> lengths of 18.8 and 19.2 mm and M<sup>1</sup> lengths of 4.0 and 3.8 mm, respectively.

For these reasons I do not think that aberrant third palatal ridges in either of the two species should be appreciated as indications of possible interbreeding. Adult specimens with one or more intermediate measurements may still have some distinct key characters enabling us to name them. It is, however, not unthinkable that specimens will be met with that cannot be identified on their morphology. Immature specimens for instance may offer great problems. Unless geographical or other evidence on their identity exists, these specimens are for the present best named as *Epomops* species.

#### SPECIMENS EXAMINED

Together with the material mentioned by van Orshoven & van Bree (1968) and Bergmans *et al.* (1974) the following specimens have been studied. Of the BMNH specimens only the skulls have been examined. Unless stated otherwise, the specimens form part of the ORSTOM collection.

#### *Epomops buettikoferi*:

Ahierémou: 22-XI-1972, 1 ♂ (21.809); 23-XI-1972, 4 ♀ ♀ (21.810-21.812, 21.820); 25-XI-1972, 3 subadults (21.813, 21.816, 21.818). Bolo: 31-I-1973, 2 adult ♀ ♀ and 1 subadult ♀ (A9523, A9524, A9527); 1-II-1973, 1 ♀ (A9535); 2-II-1973, 1 ♂ (A9544). Matonguiné: 20-I-1973, 1 ♀ (A9465); 21-I-1973, 1 ♀ (A9501) and 1 ♂ (A9496). Ivory Coast, without further data: 2 ? ♂ ♂ (AX0751, AX0761) and 2 ? ♀ ♀ (AX0748, AX0778). The Matonguiné specimens and one from Bolo (A9544) consist of skins only, the specimens from "Ivory Coast" of skulls. It is possible that these skulls and skins belonged to the same four animals, but unfortunately this is not certain.

Furthermore were studied: Njala: 3 ♂ ♂ and 1 ♀ (BMNH 59.201-59.204). Sierra Leone: 1 ♂ and 1 ♀ (BMNH 9.1.4.4 and 66.22.1). Mühlenberg's Mission: 19-X-1880, 1 imm. ♂ (RMNH 19638). Schieffelinsville: 11-I-1887,

1 ♀ (RMNH 19639). Grand Bassa: 1 ♂ (BMNH 8.7.27.1). Mount Nimba: 2-V-1966, 1 ? subadult ♀ (BMNH 67.1433); 15-VII-1966, 1 ♂ (BMNH 67.1434); 19-VII-1966, 1 imm. ♂ (BMNH 67.1435). Tappita: autumn 1960, 1 ♀ (SMF 20 063). Kumasi: 1 specimen (BMNH 65.685); 15-V-1961, 1 ♀ (BMNH 65.739); 3-XI-1964, 1 ♀ (BMNH 65.684); 29-III-1965, 1 ♂ and 1 ♀ (BMNH 66.6209, 66.6211); 2-IV-1965, 1 ♀ (BMNH 66.6216); 10-IV-1965, 1 ♀ (BMNH 66.6212); 2-VII-1965, 1 ♂ (BMNH 66.6210). Takoradi: 30-V-1965, 1 ♂ (BMNH 66.6217). Ghana: 1 ♀ (BMNH 8.8.6.11).

*Epomops franqueti*:

Adiopodoumé: 26-IX-1972, 2 ♂ ♂ and 3 ♀ ♀ (B26-B28, B30, B31); 28-IX-1972, 5 ♀ ♀ (B32-B34, B36, B37); 5-X-1972, 1 ♀ en 1 ♂ (B39, B40); 6-X-1972, 3 ♀ ♀ (B41-B43); 3-XI-1972, 1 ♀ and 1 imm. (B61, B60). Bibiani, 1 ♀ (BMNH 12.8.2.7.1). St. George d'Elmina: 1 ♀ (ZMA 1626). Kumasi: 15-V-1961, 1 imm. ♂ (BMNH 65.740).

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