

Bonn. zool. Beitr.	Bd. 43	H. 3	S. 433—476	Bonn, Oktober 1992
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# **The species of the *Chamaeleo cristatus* group from Cameroon and adjacent countries, West Africa**

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**Abstract.** A review of the *Chamaeleo cristatus* species group within the *Trioceros* section of *Chamaeleo* (sensu Klaver & Böhme 1986) is presented. It summarizes all available information (types, morphology, iconography, anatomy, taxonomy, distribution, ecology including parasitology) on the species *camerunensis*, *cristatus*, *eisentrauti*, *feae*, *montium*, *pfefferi*, *quadricornis*, and *wiedersheimi*. From the latter species, a new subspecies is described.

**Key words.** Reptilia, Sauria, Chamaeleonidae, *Chamaeleo cristatus* group, distribution, taxonomy, bibliography.

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## **Introduction**

The aim of this study is to present a taxonomic revision of a group of related species of chameleons, viz. the *C. cristatus* group that is distributed over Cameroon and adjacent countries. All relevant literature has been searched and the available information on systematics, morphology, distribution and biology compiled. In addition as much material as possible, present in zoological collections, has been studied. The species of the *C. cristatus* group recognised in this paper are: *C. camerunensis* Müller, 1909, *C. cristatus* Stutchbury, 1837, *C. eisentrauti* Mertens, 1968, *C. feae* Boulenger, 1906, *C. montium* Buchholz, 1874, *C. pfefferi* Tornier, 1900, *C. quadricornis* Tornier, 1899, and *C. wiedersheimi* Nieden, 1910.

The species of the *C. cristatus* group received relatively little attention in the past when compared to species of other species-groups. This appears partly to be due for want of material, partly, apparently, because the delimitation of the species concerned posed few problems. An explanation as to the scarcity of collection material of species such as *C. eisentrauti*, *C. pfefferi* and *C. quadricornis* and to a lesser extent *C. feae* and *C. wiedersheimi* lies in their limited distribution to relatively inaccessible locations. *C. eisentrauti*, *C. pfefferi* and *C. quadricornis* are only found in relict patches of montane rainforest confined to mountains or mountain ranges in the Cameroon-Nigerian hinterland. *C. feae* occurs in a similar habitat on the peaks of Fernando Poo (Bioko), whereas *C. wiedersheimi* has a somewhat wider distribution in either montane rainforest or montane grassland areas of most of the highlands of Cameroon and Nigeria. Ample material is available of *C. montium* that has a (sub-)montane distribution on mountains nearest to the coast, and of *C. cristatus*, a lowland species that has been recorded from the lowland rainforest of Ghana, Togo, Nigeria, Cameroon, Equatorial Guinea (Mbini and Bioko), Gabon, Central African Republic and Congo. Surprisingly, *C. camerunensis*, another lowland species with a distribution limited to the coastal plains south of Mt Cameroon, is one of the rarest species of the group although it was already described in 1909. Rarest of all is *C. pfefferi* that is known from only one male specimen originating from Mt Kupe, Cameroon.

Due to the disjunct (sub-)montane distribution of the majority of the species much of the material present in museum collections happens to be collected quite recently, during expeditions to these limited regions by, for instance, Eisentraut, Amiet, Perret and Böhme. *C. eisentrauti* was described only in 1968. Although *C. quadricornis* was described as early as 1899, female specimens were not discovered until 1968. Many new locations of *C. quadricornis* were recorded by Böhme (1975a & b) and the subspecies *C. q. gracilior* was described in 1981. The study of this recently acquired material combined with the study of largely unexamined material present in zoological collections allows us to define more clearly the taxa concerned and their geographical distribution. As a result the specific status of *C. camerunensis* and *C. feae* is endorsed, the subspecies *C. montium grafi* is shown to be invalid and a new subspecies of *C. wiedersheimi* is described.

From the accumulated information new questions arise inevitably. For instance, the geographical distribution of various species, notably *C. wiedersheimi* and possibly also *C. quadricornis*, is likely to be enlarged by future collection trips to less studied larger and lesser mountainous regions, e. g. Tchabal Mbabo, Tchabal Nganha, Tchabal Gangdaba, Mbang Mts, Gotel Mts, Mambila Mts, Mt Bana, Mt Mbapit, Mt Mbam and perhaps even Shebshi Mts, Hossere Mts and Alantika Mts. Moreover, new (sub-)species may be discovered as well. By bringing together the scattered references and newly acquired information we are able to formulate concisely the present state of our knowledge on the *C. cristatus* group that, we hope, will stimulate the future studies of these mountaineous regions in general and of this fascinating group of chameleons in particular and provide a proper framework to start from. Because the species of the group have also East African affinities (e.g. *C. deremensis*) we shall deal with the phylogeny and zoogeography in a forthcoming paper.



Plate 1: *Chamaeleo wiedersheimi perreti* ssp. n., — from Nsoung/Manengouba Mts (phot. J.-L. Perret).

### Material

The material of this study originates from the following institutions (followed by the institutional acronyms in parentheses): Academy of Natural Sciences, Philadelphia (ANSP), American Museum of Natural History, New York (AMNH), British Museum (Natural History), London (BM), California Academy of Sciences, San Francisco (CAS), Carnegie Museum of Natural History, Pittsburgh (CM), Field Museum of Natural History, Chicago (FMNH), Museo Civico di Storia naturale "Giacomo Doria", Genova (MCSN), Museum of comparative Zoology, Cambridge (MCZ), Muséum d'Histoire naturelle, Genève (MHNG), Muséum nationale d'Histoire naturelle, Paris (MHNP), Museum of Zoology, Michigan (MZM), Rijksmuseum voor Natuurlijke Historie, Leiden (RMNH), Senckenberg Museum, Frankfurt a. M. (SMF), United States National Museum, Washington D.C. (USNM), Universitets Zoologiske Museum, Copenhagen (UZM), Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn (ZFMK), Zoologisch Museum, Amsterdam (ZMA), Zoologisches Museum der Universität, Berlin (ZMB), Zoologisches Museum der Universität, Hamburg (ZMH), Zoologische Staatssammlung, München (ZSM).

The material examined is listed with each species separately under the appropriate subheading. Altogether 831 specimens were examined comprising 11 specimens of *C. camerunensis*, 303 specimens of *C. cristatus*, 11 specimens of *C. eisentrauti*, 54 specimens of *C. feae*, 338 specimens of *C. montium*, 1 specimen of *C. pfefferi*, 27 specimens of *C. q. quadricornis*, 14 specimens of *C. q. gracilior*, 53 specimens of *C. w. wiedersheimi* and 20 specimens of *C. w. perreti* n. ssp.

### Methods

After a short introduction into the systematics of the *C. cristatus* group, accompanied by a key to distinguish the species, a historical review of the literature on the *C. cristatus* group is given. Subsequently each species is discussed with the help of the following scheme:

1. Original description
2. Key to the subspecies
3. Type specimen, viz. precise reference to the types, discussion of number and kind of types and, if applicable, designation of types
4. Terra typica
5. Derivatio nominis
6. Synonymy
7. Subsequent studies
8. Specimens examined, i.e. reference to collection number, sex, locality of origin and dimensions (HBL = head-body length, TL = tail length)
9. Description, comprising information on external morphology, maximal dimensions, coloration, illustrations, karyology, hemipenis morphology, lung morphology, parasitology and biology
10. Status
11. Variation
12. Subspecies
13. Distribution, i.e. only new locality records and/or references to new material from known localities are given. Secondary literature references are omitted.
14. Biotope.

### Systematics of the *C. cristatus* group

With only one exception the species of the *C. cristatus* group have always been classified in the genus *Chamaeleo*. Only the splitter Gray (1865) classified *C. cristatus* in a genus of its own, viz. *Pterosaurius*, before any other species of the group was known. Buchholz (1874a & b) did not follow Gray and considered the multitude of genera recognised by Gray synonymous to the genus *Chamaeleo*. Ever since subse-

quent authors were of the same opinion, cf. Werner (1911) and Mertens (1966). In 1986 Klaver & Böhme put forward a revised phylogeny of chameleons and changed the classification accordingly. The species of the *C. cristatus* group were classified in the subgenus *Trioceros* Swainson, 1839 together with a number of chameleon species of West, Central and East Africa, viz. *C. oweni*, *C. chapini*, *C. johnstoni*, *C. bitaeniatus* c. s., comprising *C. bitaeniatus*, *C. ellioti*, *C. hoehnelii*, *C. jacksonii*, *C. kinetensis*, *C. rudis*, *C. schoutedeni* and *C. schubotzi*; *C. affinis*, *C. deremensis*, *C. melleri* and *C. goetzei* c. s., comprising *C. goetzei*, *C. fuelleborni*, *C. incornutus*, *C. laterispinis*, *C. tempeli* and *C. werneri*.

### Subgenus *Trioceros* Swainson

*Trioceros* Swainson, 1839, Nat. Hist. Fishes, Amph. Rept. 2: 347, 369. — Species typica (by monotypy): *Trioceros grayii* Swainson, 1839 (= *Chamaeleo oweni* Gray, 1831).

*Tricerias* Fitzinger, 1843 (non *Tricerias* Lobarzewski 1840 = Spongia), Syst. Rept.: 15, 42. — Species typica (by original designation): *Chamaeleo owenii* Gray, 1831.

*Pterosaur* Gray, 1865 (non *Pterosaur* Fitzinger 1843 = Reptilia, Agamidae), Proc. zool. Soc. London 1864: 467, 473. — Species typica (by monotypy): *Chamaeleo cristatus* Gray (= Stutchbury 1837).

*Pterosaur* Gray, 1865 (ex errore), Proc. zool. Soc. London 1864: 467.

*Ensirostris* Gray, 1865, Proc. zool. Soc. London 1864: 467, 468, 478; plate 32, fig. 1. — Species typica (by monotypy): *Ensirostris melleri* Gray, 1865.

*Erizia* partim Gray, 1865, Proc. zool. Soc. London 1864: 471. — Species typica (by subsequent designation, cf. Loveridge 1957: 197): *Chamaeleo senegalensis* Daudin, 1802. (Next to the type species Gray included six other species in *Erizia*, including *Chamaeleo affinis*).

Diagnosis: Annulated horns (unique for the subgenus, but not shared by all member species), heterogenous scalation (not unique, but also found in, for instance, the genus *Furcifer*), hemipenis apex ornamentation with four rotulae, (mostly) accompanied by papillae, the latter either single, scattered or concentrated in rows or papillary fields (not unique, similar ornamentation is found in the genus *Calumma*), the only autapomorph character shared by all member species of this subgenus is (unfortunately) an anatomical character: large septa (1, 2 or 3) connected with the medial, lateral and ventral wall of the lung (Klaver & Böhme 1986).

Distribution: Tropical Africa; Ghana, Togo, Nigeria, Cameroon, Equatorial Guinea (incl. Fernando Poo), Gabon, Central African Republic, Congo, Zaire, Angola (i. e. Cabinda), Uganda, Rwanda, Burundi, Sudan, Ethiopia, Somalia, Kenya, Tanzania and Malawi.

### Key to the species

The species of the *C. cristatus* group recognised in this paper can be identified with the help of the following key:

1. a. Gular crest consisting of scaly flattened lobes ..... ♂ & ♀ *C. eisentrauti*  
    b. No gular lobes ..... 2
2. a. Canthi rostrales meet above the tip of the snout to form a prominent ridge and a groove above the upper lip, gular crest present ..... ♂ & ♀ *C. wiedersheimi*  
    b. No such ridge and groove, gular crest absent or present ..... 3
3. a. Dorsal and caudal keel present ..... 4  
    b. Dorsal and caudal keel absent or indistinct ..... 8
4. a. Dorsal and caudal keel not separated ..... ♂ & ♀ *C. cristatus*  
    b. Dorsal and caudal keel separated ..... 5

- 5. a. Horns on the snout ..... 6
  - b. No horns on the snout..... ♂ *C. feae*
  - 6. a. Four, sometimes two or six horns, on the snout, gular and ventral crest present ♂ *C. quadricornis*
  - b. Two horns on the snout, ventral crest absent..... 7
  - 7. a. Two horns on saddle-shaped snout protuberance, gular crest present ♂ *C. pfefferi*
  - b. Two horns on snout, gular crest merely indicated ..... ♂ *C. montium*
  - 8. a. Ventral crest present ..... ♀ *C. quadricornis*
  - b. No ventral crest ..... 9
  - 9. a. Gular crest present ..... ♀ *C. feae*
  - b. Gular crest absent or merely indicated ..... 10
  - 10. a. Gular crest indicated, prominent conical tubercles on the snout, pointed scale behind nostrils ..... ♀ *C. montium*
  - b. Gular crest absent, no prominent conical tubercles on the snout, nor pointed scales behind the nostrils ..... ♂ & ♀ *C. camerunensis*
- When female specimens of *C. pfefferi* will be discovered this key may be changed as follows:
- 9. a. Gular crest present ..... 10
  - b. Gular crest absent or merely indicated ..... 11
  - 10. a. On both sides of the throat just in front of the forelegs on elongate conical tubercle present ..... ♀ *C. pfefferi*
  - b. No such tubercles ..... ♀ *C. feae*
  - 11. a. Gular crest indicated, prominent conical tubercles on the snout, pointed scale behind nostrils ..... ♀ *C. montium*
  - b. Gular crest absent, no prominent conical tubercles on the snout, nor pointed scale behind nostrils ..... ♂ & ♀ *C. camerunensis*

### Historical review

The first record of a species of the *C. cristatus* group was by Stutchbury in 1837 when he described *C. cristatus* from Gaboon. He especially noted the “caudae anterior parte dorsique apophysibus elongatis cristam dorsalem constituentibus”, a most striking character unknown in chameleons until then.

Martin (1838) reported on a second specimen of *C. cristatus* originating from Fernando Poo and discussed the morphological differences between this specimen and the type. He suggested the possibility these differences to be due to “permanent varieties”, but thought the explanation due to age or sex, or both combined more likely. Gray (1845) referred in his Catalogue to the same specimen then present in the collection of the British Museum. Likewise, Duméril (1851) mentioned *C. cristatus* as described by Stutchbury, but mistakenly assigned Fernando Poo as type locality. This error was probably caused by Duméril's reliance on Gray, who mentioned the original author, but gave only the locality of the BM specimen.

In what must be the first major systematic paper devoted exclusively to chameleons Gray (1865) rigorously did away with the one-genus concept by creating next to the genus *Chamaeleo* 12 new genera (11 of them monotypic) and 6 new subgenera (Gray's axiom “species throw themselves into groups agreeing in natural characters” indeed reminds us of the systematic, i. e. numerical wonderland of much later date, but how that could result in so many monotypic genera defies our imagination). Although this proceeding did not particularly contribute to our knowledge of the systematics of chameleons, it contributed vastly to a nomenclatural

confusion that prevailed for more than a century. Especially the frequent use of the generic names *Lophosaura* and *Microsaura* (both junior synonyms of *Bradypodion* Fitzinger, 1843) was hard to come by. In any case Gray assigned *C. cristatus* to a genus of its own, viz. *Pterosaurus*.

Smith (1865) and Bocage (1872) reported briefly on specimens of *C. cristatus* from Old Calabar and Fernando Poo respectively.

Buchholz (1874a, b) reported *C. cristatus* from Cameroon and gave a comprehensive description of the various colourphases of life specimens. He also criticized Gray's splitting that he thought was due to an over-valuation of species-distinguishing characters. He emphasized his point of view by describing the second species of the *C. cristatus* group, viz. *C. montium* from Mt Cameroon, that possesses characters of Gray's genera *Pterosaurus* (dorsal and caudal keels) and *Triceras* (♂ with annulated horns). Günther (1874) also reported on *C. cristatus* and *C. montium* from Cameroon and supplied an excellent illustration of the three BM specimens of *C. montium*.

Reichenow (1874) recorded *C. cristatus* from Gaboon and Cameroon, whereas Peters (1876) recorded *C. cristatus* and *C. montium* from Cameroon (that forms part of what he indicated as 'Oberguinea!'). In his catalogue of the Basel museum Müller (1883) indicated *C. cristatus* to be present in that collection as well.

Boulenger (1887) in his famous catalogue referred to *C. cristatus* and *C. montium*. In this most influential work he did not adopt the elaborate classification of his predecessor Gray, but classified all ordinary chameleons in the genus *Chamaeleo* and the pigmy chameleons in the genera *Brookesia* and *Rhampholeon*.

Matschie (1892) described in one paper five new chameleon species from the Usambara Mts, Tanzania. He observed on the species *C. deremensis*, *C. fischeri* and *C. (Brookesia) temporalis* the presence of a dorsal and caudal keel and compared these with the keels in the West African *C. cristatus* and *C. montium*.

Boettger (1889, 1893) briefly mentioned *C. cristatus* from Cameroon collected by Taschenberg of Halle/Saale. We mention this collector explicitly as it took us some time to realise that Taschenberg is not a name of a mountain in a former German colony in Africa comparable to, for instance, the Johann-Albrechtshöhe.

Mocquard (1896) summarized the available information on the general distribution of *C. cristatus*. This species does not seem to occur south of the river Congo.

Sjöstedt (1897) and Werner (1897, 1898, 1899) reported *C. cristatus* and *C. montium* from Cameroon, the first author mentioned also furnished information about the colours of live specimens and the biotope of *C. cristatus*.

In 1899 Tornier described the third species of the *C. cristatus* group, viz. *C. quadricornis* from Cameroon and noted its similarities in external morphology with the related *C. montium*, e. g. dorsal and caudal keels and annulated horns in ♂ specimens.

Boulenger (1900) indicated the distribution of *C. cristatus* as "Calabar to Gaboon" and in the same year Tornier described another new species, viz. *C. pfefferi* from the Nkosso-Gebirge (Mt Kupe), Cameroon. This species, too, is characterized by dorsal and caudal keels and annulated horns in the ♂ specimen.

Tornier (1901, 1902) mentioned the four species of the *C. cristatus* group and gave information on their distribution. In his study on the skeleton of *Rhampholeon spec-*

trum Werner (1902a) included *C. cristatus* a. o. for comparison. Unfortunately the osteological observations on *Chamaeleo* species are presented in general terms, so it can only be inferred what applies to *C. cristatus*.

Werner (1902b) also published his "Prodromus", a foremost and still very valuable comprehensive study of chameleons. Important is that he did not restrict himself to give excellent descriptions of all chameleons known at the time, but tried to analyse characters, species and distributional data and to arrange chameleon species into natural groups on account of the amount of natural relationship as inferred from their similarities in external characteristics. *C. cristatus*, *C. montium*, *C. pfefferi*, *C. quadricornis* and *C. temporalis* were grouped together and were via *C. deremensis* related to a group consisting of *C. owenii*, *C. johnstoni*, *C. werneri* and *C. melleri*.

Bocage (1903) referred to *C. cristatus* occurring on Fernando Poo and Monk (1903) erroneously attributed an East African distribution to *C. pfefferi* and *C. quadricornis*.

Boulenger (1905) recorded *C. cristatus* from Spanish Guinea and in 1906 from Fernando Poo. In 1906 he also recorded *C. montium* from Cameroon and, more importantly, described a new species from the higher altitudes of Fernando Poo, viz. *C. feae*. Male specimens have dorsal and caudal keels, but do not possess annulated horns as are found in the supposedly related *C. montium* from the mainland.

Case (1909) studied the vertebral column of *C. cristatus* in detail and noted the similarity of the elongated neural spines of this species with those of the Permian Pelycosaurus. The only explanation for the elongated spines he could think of was high specialisation and decadence.

Müller (1909) described *C. camerunensis* from Cameroon, a species that appears to be related to *C. owenii*, but that lacks both dorsal and caudal keels and horns in ♂ specimens. In 1910 he repeated his description, but changed the obvious misnomer *C. owenii* for *C. montium*. He added that the closest relative is probably *C. feae* from which it differs even less than from *C. montium*. He also gave some new locality records for *C. cristatus*.

Nieden (1910a) described another new species from Cameroon, viz. *C. wiedersheimi*, but did not discuss its possible affinities. Nieden (1910b) listed six of the seven species of the *C. cristatus* group to occur in Cameroon (*C. feae* was excluded as it occurs only on Fernando Poo).

Lampe (1911) published new information on locality records of *C. camerunensis*, *C. cristatus* and *C. montium* present in the collection of the museum in Wiesbaden. In the same year Werner (1911a) published a study on the peculiar lungs of chameleons, including those of *C. cristatus* and *C. montium*. Generally, he restricted himself to the external form of the lungs, in particular the presence or absence of diverticula, but in the case of *C. montium* he erroneously denied the existence of septa that divide the lumen of the lungs. He, thus, narrowly missed to hit on a character set that proved much later to be a valuable tool in chameleon systematics.

Werner (1911b) published his second major study on chameleons, the first of the famous "Tierreich Liste" of this group. In it all known species of the *C. cristatus* group were described and their general distribution indicated.

In 1913 Germerhausen published a comprehensive paper on another peculiar anatomical feature of chameleons, viz. the inflatable gular pouch that is connected



with the trachea. *C. cristatus*, *C. montium*, *C. quadricornis* and *C. wiedersheimi* do not possess this structure.

In 1917 Sternfeld published on new specimens and new locations of *C. cristatus* and described the coloration of live specimens. He also stated that to him *C. camerunensis* and *C. feae* seem more closely related to *C. cristatus* than to *C. montium* and are perhaps to be regarded subspecies of *C. cristatus*.

Schmidt (1919) discussed the similarities between *C. camerunensis* and *C. ituriensis* from the Congo, but did not draw any conclusions as to their relationship for want of material for comparison.

Another new species from Cameroon was described by Mertens (1922), viz. *C. serratus*, a species related to *C. wiedersheimi*. Barbour & Loveridge (1929) referred to a cotype of *C. wiedersheimi* present in the Museum of comparative Zoology, whereas Loveridge (1936, 1937) referred to specimens of *C. cristatus* present in the collections of the Field Museum of Natural History and the Academy of Natural Sciences in Philadelphia, respectively.

In his short article on the chameleons of Nigeria Pasqual (1937) referred to *C. camerunensis*, *C. cristatus*, *C. montium*, *C. quadricornis*, *C. pfefferi* and *C. wiedersheimi*. *C. cristatus* does indeed occur in Nigeria, but the other species are either confined to the present Cameroon (*camerunensis*, *montium* and *pfefferi*) or were only much later discovered to occur in Nigeria (*quadricornis* and *wiedersheimi*). However, Pasqual's records are correct if one realizes that after the First World War the German colonies were assigned to either England or France. Eastern Cameroon was assigned to the French and western Cameroon, including all localities of the species mentioned, became British mandate territory that was administered from Lagos, Nigeria.

In 1938 Mertens published a study on the fauna of Mt Cameroon in which he included much new information on variation, colour change, distribution and biotope of *C. cristatus* and *C. montium*. He also described a new subspecies, viz. *C. montium grafi* from the north-west slope of Mt Cameroon, that is distinguished from the nominal form by an aberrant horn configuration.

In 1940 Angel referred to new material of *C. montium* and *C. wiedersheimi* from Cameroon present in the collection of the museum in Paris.

Mertens (1940) demonstrated that *C. serratus* is to be considered synonymous to *C. wiedersheimi* and in 1941 he recorded new material of *C. cristatus* from Fernando Poo.

In 1951 Monard published about new material and localities of *C. cristatus* and *C. montium* from Cameroon. Remarkable is the first record of *C. montium*, until then only known from Mt Cameroon and surroundings, from the Manengouba Mts. In 1952 Aellen made a brief observation on the coloration of *C. cristatus*.

Romer (1953a, b) discussed briefly *C. cristatus* from Nigeria and Mertens (1955) compared the "horn" variation of *C. tavetensis* with that of *C. montium*.

Perret (1957) devoted a paper to what he thought to be the first description of female specimens of *C. quadricornis*, originating from the Manengouba Mts. However, it is clear from the illustrations that the two putative *C. quadricornis* females are in fact a male and a female of *C. wiedersheimi*, an observation that was acknowledged by Perret (1959). He completed his 1957 paper with a key to the

chameleons of Cameroon. Perret & Mertens (1957) furnished new locality records for *C. cristatus* and *C. montium*.

Matthey (1957) and Matthey & Brink (1960) described the karyotypes of *C. cristatus*, *C. quadricornis* and *C. wiedersheimi*. Their karyotype is the same ( $2n = 36$ ) and consists of 12 meta- or submetacentric macrochromosomes and 24 microchromosomes.

In his well-known "Terrarienkunde" Klingelhöffer (1957) gave some general information on colours and behaviour of *C. cristatus* and *C. montium*. In 1958 Discher published the results of his experiments to measure the pulling power of the tongue of *C. montium*.

In 1959 Hillenius published his study on the differentiation within the genus *Chamaeleo*. Unfortunately, the species of the *C. cristatus* group and also several East-African species, e.g. *C. fischeri* c. s., were given far less attention than the remaining Malagasy and African chameleons. He only gave a brief description of *C. cristatus*, *C. montium* and *C. wiedersheimi*, but no description of *C. camerunensis*, *C. feae*, *C. pfefferi* and *C. quadricornis*, although he mentioned them. Also in 1959 Mertens reported about a live specimen of *C. quadricornis* and discussed its colour phases, its behaviour and the use of its horns.

In 1961 Capocaccia referred in the type list of the museum in Genova to the four syntypes of *C. feae* and in the same year Oeser reported on the life-span of *C. montium*.

In 1963 Eisentraut published his first major study on the vertebrate fauna of Mt Cameroon in which he discussed the distributional history of this fauna in view of climatological and ecological changes caused by the pluvial periods during the Pleistocene. He included in his discussion the disjunct distribution of related montane forms from East and West Africa, that are supposed to have been in contact with one another during the pluvial climatic conditions. *C. cristatus* and *C. montium* were mentioned from lowland and submontane regions respectively.

Hillenius (1963) discussed the results of the karyological studies of Matthey & Brink in view of his taxonomic studies. The karyological data of the *C. cristatus* group are in accordance with his findings.

In his study of the reptiles of Fernando Poo Mertens (1964) discussed *C. cristatus* and *C. feae*. The latter species as well as *C. camerunensis* were considered subspecific forms of *C. montium* on account of morphological and zoogeographical considerations.

Oates (1965) referred to the beautiful green *C. feae* from Fernando Poo and in the same year Rasheed discovered *C. cristatus* to be host to various species of parasitic nematodes.

Dunger (1966, 1967) reported on the chameleons of Nigeria, descriptions, new locality records of *C. cristatus* and *C. wiedersheimi* (first record from Nigeria) and a key were given.

Mertens (1966) published the second Tierreich list of the Chamaeleonidae in which, as compared with Werner (1911 b), 32 new taxa were included. The main difference with Werner's list, as far as species of the *C. cristatus* group are concerned, is the subspecific status of *C. camerunensis* and *C. feae*.

De Witte (1967) recorded *C. cristatus* for the first time from the Republic of Congo and Knoepffler (1967) in his key to the chameleons of Gaboon referred to *C. cristatus* as well.

In his type list of the Senckenberg Museum Mertens (1967) mentioned the types of *C. montium grafi*. In 1968 Mertens described a new species of the *C. cristatus* group, viz. *C. eisentrauti* from the Rumpi Mts, Cameroon. This species is clearly related to *C. quadricornis*, but is characterized by a gular crest, consisting of scaly compressed lobes, in both sexes. This remarkable character was until then only known from the unrelated *Bradypodion pumilum* c. s. of South Africa. New locality records of *C. montium* and *C. wiedersheimi* were given as well and female specimens of *C. quadricornis* were described for the first time.

Mertens (1970) in his paper on the life span of amphibians and reptiles referred to Oeser's record on the life span of *C. montium*. Klee (1971) supplied a photo of *C. cristatus* in threat posture and described the accompanying colour phases.

Eisentraut (1973) published his second major study on the vertebrate fauna of Fernando Poo and West Cameroon. In it he expanded on his study of 1963 both in geographical scope and number of species. His hypotheses formulated on the basis of the fauna of Mt Cameroon were shown to be valid under these circumstances as well. *C. cristatus*, *C. eisentrauti* and especially the related *C. feae* and *C. montium* were discussed.

In 1973 Klaver re-investigated the lung morphology of chameleons and discovered far more variation in diverticula and especially septation, than was known from previous studies. More importantly, the septation in particular proved to be a useful taxonomic character set in establishing species relationships. Therefore, this study was continued until the lung morphology of almost the entire group was known (Klaver, 1977, 1979, 1981). In 1973 the lungs of *C. cristatus* were described, in 1977 those of *C. montium* and *C. wiedersheimi* and in 1981 those of *C. camerunensis*, *C. eisentrauti*, *C. feae*, *C. pfefferi* and *C. quadricornis*. With the help of lung morphology the general type locality of this last species could be restricted to the Manengouba Mts. On the basis of the lung morphological data of the majority of chameleon species Klaver (1981) was able to devise the first phylogeny of the Chamaeleonidae.

Böhme (1974) referred in his type list of the Bonn Museum to the type specimens of *C. eisentrauti* and in the same year Knoepffler published several new localities of *C. cristatus* from Gabon.

Böhme (1975a) published his faunistic study on the herpetology of Cameroon, that was based on material he collected during his expedition of 1973–74. Material of *C. cristatus*, *C. montium*, *C. quadricornis* and *C. wiedersheimi* was collected, partly from new localities, e. g. *C. quadricornis* from Mt Lefo and Mt Oku. Böhme (1975b) gave the first record of *C. quadricornis* from Nigeria (Obudu plateau) and the first record of *C. wiedersheimi* from the Obudu plateau, both records based on material from the museum in Copenhagen. He further recorded for a *C. quadricornis* specimen, from the museum in Genova, the new locality Bamboutos Mts, Cameroon. Fischthal (1976) reported *C. cristatus* from Cameroon as host for two species of digenetic trematodes and noted that a related species of trematode was originally described from the intestines of four chameleons from Madagascar.

Hillenius (1978) described the first fossil chameleon, viz. *C. intermedius* and noted the similarity in dorsal squamation between this species and *C. wiedersheimi*.

Durette-Desset & Vaucher (1979) described a new species of nematode originating from the intestines of *C. wiedersheimi* from Cameroon.

Meier (1979) published four photos of fighting males of *C. montium*, clearly showing how they use their horns in a push-contest. The colour-photos also give a good impression of the coloration in this species as does another photo for *C. cristatus*.

Böhme & Klaver (1981) published a preliminary article on one species of the *C. cristatus* group, viz. *C. quadricornis*. They studied all material of this species present in museum collections and were able to confirm their assumptions that two different forms exist. They described a new subspecies as *C. quadricornis gracilior*. In the same paper they attempted to give a historical interpretation of the disjunct distribution of this species and of the (sub-)specific developments that took place in *C. eisentrauti*, *C. quadricornis* and *C. montium*.

Böhme (1982) mentioned the paper of Böhme & Klaver (1981) in the discussion of his new subspecies *C. laterispinis brookesiaeformis* (for subsequent synonymy, see Böhme 1987).

Eisentraut (1982) gave a historical review of his seven expeditions in West Africa and mentioned *C. cristatus*, *C. eisentrauti*, *C. montium*, *C. quadricornis* and *C. wiedersheimi*.

In his faunistic study of Cameroon Joger (1982) referred to specimens of *C. cristatus*, *C. montium* and *C. wiedersheimi* he collected during his travels in Africa.

In the new type list of the herpetological collection Böhme & Bischoff (1984) referred to the types of *C. camerunensis*, *C. eisentrauti* and *C. q. gracilior* present in the museum in Bonn.

Gartshore (1986) reported on the herpetofauna of the Cameroon highlands and supplied distributional and ecological data of *C. eisentrauti*, *C. montium*, *C. q. quadricornis*, *C. q. gracilior* and *C. wiedersheimi*. *C. pfefferi* was not included although it has a submontane distribution and is sympatric with both *C. montium* and *C. quadricornis* on Mt Kupe.

Klaver & Böhme (1986) published a comprehensive study of chameleon hemipenes in which they analyzed the data of this character set together with external morphological, osteological, karyological and lung morphological data. They were able to reconcile these various data and to formulate a new phylogeny and classification of chameleons. The species of the *C. cristatus* group were assigned to the subgenus *Trioceros* within the genus *Chamaeleo* together with distantly related (and partly montane) species of Central and East Africa.

Rieppel (1987) included *C. monticum* (ex errore for *C. montium*) in his study of the phylogenetic relationships within the Chamaeleonidae and listed a number of characteristics of its cranial osteology.

In their faunistical survey of Cameroon Böhme & Schneider (1987) reported *C. montium* from the Buea falls, Mt Cameroon and *C. wiedersheimi* from Akum near Bamenda.

In a study of saurian hemipenis morphology Böhme (1988) described the seasonal variation of the differentiation of the hemipenis ornaments in *C. montium*. He also referred to *C. eisentrauti* in relation to the flattened gular lobe of *Calumma tigris*.

In 1989 Böhme & Nikolaus reported *C. wiedersheimi* to occur in the Gotel Mts, Nigeria.

### The species of the *Chamaeleo cristatus* group

#### *Chamaeleo (Trioceros) camerunensis* Müller

Original description: Müller, 1909. Jb. nassau. Ver. Naturk. Wiesbaden 62: 111.

Type specimens: Müller (1909) based his description of *C. camerunensis* on eight specimens, viz. two of the ZSM-collection and six of the collection of the "Naturhistorisches Museum zu Wiesbaden". However, he expressly excluded the Wiesbaden specimens from the type series ("beide Typen des Münchener Museum (Koll. R. Rohdd (sic))", so the syntype series consists of the two specimens of the Munich museum (cf. art. 72 (b) VI of the ICZN). In 1910 Müller referred to "4 Exemplare (♂, ♀) von Dibongo bei Edea (Typen). Koll. Rohde, 1908". This number of type specimens is, of course, incorrect, the more so as only two specimens could be traced with the type locality and collector mentioned. Moreover, the indication of the sexes, viz. "4 Exemplare (♂, ♀)" as compared with the material of the Wiesbaden museum, viz. "5 Exemplare (♂♂, ♀♀ und juv.)" strongly suggest that the number 4 is a misprint for the number 2, the actual number of syntypes. One specimen of the syntype series is still present in the Munich collection (ZSM 425/1909), the other one is in the Bonn collection (ZFMK 19448) that acquired it by exchange. Böhme & Bischoff (1984) referred to the ZFMK syntype and indicated the existence of three other syntypes in the ZSM collection. This faulty record was caused by the erroneous number of syntypes referred to by Müller (1910). As to the remaining specimens from the Wiesbaden museum, their precise number is hard to establish as the records of Müller (1910) and Lampe (1911) seem contradictory. So much is certain that two specimens were transferred to the museum in Munich. One is still present there (ZSM 389/1920), the other was, in turn, exchanged with the museum in Bonn (ZFMK 19449). Two other specimens were transferred to Hamburg (ZMH-RO1236) and Berlin (ZMB 29483), respectively. The remaining specimens in Wiesbaden were destroyed during the Second World War (Dr. R. Mentzell, in litt. 18-IX-1975). We designate here the ZSM specimen as lectotype, because L. Müller worked at the Munich museum and deposited his material there. Consequently the Bonn specimen becomes a paralectotype.

Lectotype (by present designation): ZSM 425/1909, ♀, HBL: 65 mm, TL: 72 mm. Paralectotype: ZFMK 19448, ♂, HBL: 67 mm, TL: 65 mm.

Terra typica: Dibongo bei Edea, Cameroon; leg. Rohde, 1908. Paralectotype from the same locality, collector and date.

Derivatio nominis: Named after the geographical area where the type specimens were captured, Cameroon.

Subsequent studies: Müller (1910: 592, fig. 5); Nieden (1910b: 29); Lampe (1911: 182); Werner (1911b: 7, 36); Sternfeld (1917: 456); Schmidt (1919: 570, 591, 600); Pasqual (1937: 34); Monard (1951: 126); Perret (1957: 87); Hillenius (1959: 74, 76; 1963: 207); Mertens (1964: 219; 1966: 20); Eisentraut (1973: 377, fig. 18); Klaver (1977: 193; 1981: 38; figs. 5, 6); Böhme & Klaver (1981: 326); Böhme & Bischoff (1984: 186); Klaver & Böhme (1986: 23).

Specimens examined: Cameroon: ZSM 425/1909, Dibongo near Edea, ♀, 65/72, lectotype. ZSM 484/1909, Bibundi, ♂, 85/102. ZSM 488/1916, Cameroon, ♂, 90/102. ZSM 389/1920, Bibundi, ♀, 75/77. ZFMK 19448, Dibongo near Edea, juv. ♂, 67/65, paralectotype, ZFMK 19449, Bibundi, ♂, 88/100. MCZ 15001, Sakbayeme, juv. ♂, 61/72. MCZ 46745, Metet, juv., 31/45. ZMB 29483, Bibundi, ♂, 75/86. SMF 16459, Bibundi, ♀, 85/79. ZMH-RO1236, Cameroon, ♂, 85/91.

Description: Head: Casque flat and only slightly raised posteriorly, pointed at the end; lateral crest weakly developed anteriorly of the point where the temporal crest meets, from this point to the extremity of the casque it is well developed and consists of triangular tubercles; triangle between anterior part of the lateral crest and the temporal crest covered with somewhat larger

rotund convex scales; scales on top of the head and in the temporal region slightly enlarged and polygonal; gular scales somewhat larger than the scales on the body; no parietal crest, horns and gular crest.

Body: Body covered with small flat scales intermixed with numerous somewhat enlarged rotund flat scales, that sometimes form longitudinal rows on the upper part of the flanks; no dorsal and caudal keel, but dorsum and anterior part of the tail slightly crenulate in ♂, at the higher points of the dorsum (neural spines) a somewhat enlarged flat scale; the outer margin of the dorsum with a double row of scales; no ventral crest.

Dimensions: TL generally larger than HBL in both sexes; maximal dimensions: ♂, HBL/TL 90/106 (ZSM 488/1916); ♀, HBL/TL 85/96 (SMF 16459).

Coloration: No descriptive data as to coloration is known from literature or from unpublished field notes.

Illustrations: No illustrations are known from literature and no colour-photo of live specimens is available.

Hemipenis: Truncus with small shallow calyces; four denticulated rotulae on the apex; near the base of each sulcal rotula a papillary field with up to 10 fleshy papillae (Klaver & Böhme 1986).

Lung morphology: Klaver (1981) described the lung morphology of *C. camerunensis*. A smooth muscle network covers the entire luminal surface of the lung. Four or five diverticula may be present. Two large septa of unequal size are connected with the lateral, medial and ventral wall of the lung. They subdivide the lumen in three successive chambers. The two posterior chambers terminate in a diverticulum, the remaining 2–3 diverticula are always attached to the most posterior chamber. A diaphragm and three small dorsal septa are present. A gular pouch is absent.

Status: Mertens (1964, 1966) considered *C. camerunensis* a subspecies of *C. montium*. We think his argumentation to that end is not valid and treat *C. camerunensis* as a valid species. For a detailed discussion see *C. montium* under subspecies.

Distribution: Apart from the type locality (Dibongo near Edea) *C. camerunensis* has been recorded from the following localities in Cameroon (Fig. 1): Isongo, Dehane (Lampe 1911), Metet (MCZ 15001), Sakbayeme (MCZ 46745), Bibundi (ZFMK 19449 a. o.). General records: "plains south of Mt. Cameroon" (Mertens 1966), "Kameruner Niederungsgebiet" (Eisentraut 1973).

Biotope: *C. camerunensis* is distributed in the dense lowland forest areas near sea-level in the coastal plains of Cameroon.

### *Chamaeleo (Trioceros) cristatus* Stutchbury

Original description: Stutchbury, 1837. Trans. Linn. Soc. London, 17: 361, fig. 10.

Type specimens: Stutchbury based his description of *C. cristatus* on a single male specimen that was deposited in the museum of the Bristol Institution, Bristol, Great Britain. The Bristol Institution was the forerunner of the present City of Bristol Museum and Art Gallery. The curator of natural history there, Mrs. A. Hollowell, informed us that the specimen was registered under number "A 715 *Chamaeleo cristatus*, River Gaboon, OC 162" (Hollowell, in litt. 10-X-1979). OC 162 refers to an old catalogue (undated), that contains no additional information. The specimen itself could not be found, it was probably destroyed together with other material when the museum was hit by bombs during the Second World War. As *C. cristatus* is easy to identify and not to be confused with other species, the designation of a neotype is not warranted (cf. art. 75 ICZN).

Terra typica: Gaboon, collector unknown; the type specimen of *C. cristatus* was donated to the Bristol Institution by Messrs. King and Sons, a shipping firm in Bristol.

Derivatio nominis: The name derives from the prominent keel on the back and the anterior part of tail that is supported by elongated neural spines of the vertebrae.

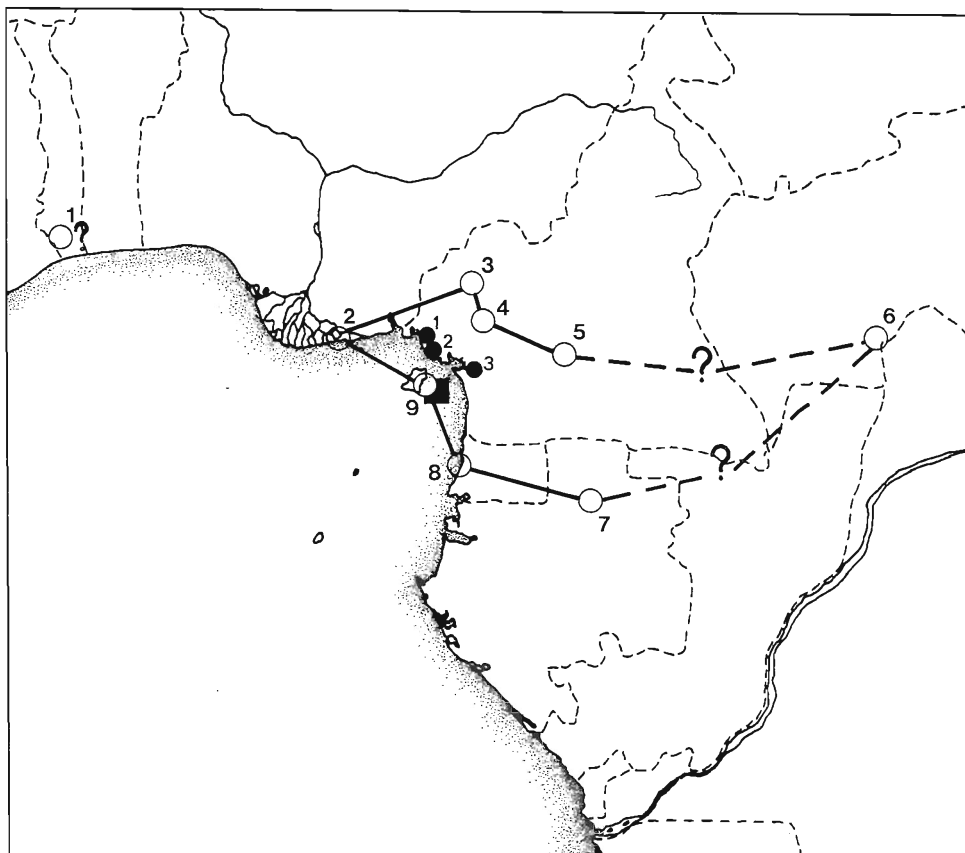


Fig. 1: Distribution of *C. camerunensis* (●) and *C. cristatus* (○) in West/Central Africa, plus distribution area of *C. feae* (■). *C. camerunensis*: 1 — Bibundi, 2 — Isongo, 3 — Dibongo and Sakbayeme (Metet and Dehane could not be traced). *C. cristatus* (only marginal points delimiting the approximate distribution area): 1 — "Togo", 2 — Port Harcourt, 3 — Atolo, 4 — Nyasoso, 5 — Obala, 6 — near Bangui, 7 — Makokou, 8 — Rio Benito, 9 — Fernando Po (= Bioko) (the latter island being the home of *C. feae*). See text for locality references. A record of *C. cristatus* from Quittah, Ghana has not been plotted in the figure. This and locality 1 (Togo) are the only ones west of the Dahomey gap, and therefore questionable.

Synonymy: *Pterosaurus cristata* Gray, 1864 (non *Pterosaurus* Fitzinger 1843 = Reptilia, Agamidae), Proc. zool. Soc. London, 1864: 473.

Subsequent studies: Martin (1838: 63); Gray (1845: 264); Duméril (1852: 262); Gray (1864: 473); Smith (1865: 228); Bocage (1872: 73); Buchholz (1874a: 83, 1874b: 298); Günther (1874: 442); Reichenow (1874: 297); Peters (1876: 196, 211); Müller (1885: 173); Boulenger (1887: 471); Boettger (1889: 277); Matschie (1892: 102, 103, 104, 108); Boettger (1893: 122); Mocquard (1896: 5); Sjöstedt (1897: 21); Werner (1898: 205, 1899: 132); Boulenger (1900: 451); Werner (1902a: 243, 1902b: 394); Tornier (1902: 677); Bocage (1903: 42); Boulenger (1905: 185, 1906: 207); Case (1909: 979, fig.); Müller (1910: 594); Nieden (1910b: 28); Lampe (1911: 181); Werner (1911a: 395, 1911b: 7, 33, fig. 10); Germerhausen (1913: 520, figs 66, 66a); Sternfeld (1917:

455); Schmidt (1919: 600); Loveridge (1936: 78); Loveridge (1937: 268, 289); Pasqual (1937: 34); Mertens (1938: 38, 1941: 278); Monard (1951: 143); Aellen (1952: 57); Romer (1953a: 74, 1953b: 122); Perret (1957: 88); Matthey (1957: 715); Perret & Mertens (1957: 581); Klingelhöffer (1957: 230); Hillenius (1959: 70, fig. 16); Matthey & Brink (1960: 340); Eisentraut (1963: 265); Hillenius (1963: 207); Mertens (1964: 218); Rasheed (1965: 72, 78); Mertens (1966: 11); Dunger (1967: 64, fig.); De Witte (1967: 378); Knoepffler (1967: 247); Mertens (1968: 72); Klee (1971: 493, fig.); Klaver (1973: 160, figs 16, 17); Eisentraut (1973: 299); Knoepffler (1974: 120, fig. 8); Böhme (1975a: 32, 1975b: 127); Fischtahl (1976: 640); Klaver (1977: 186, 1979: 165); Meier (1979: 32–48; figs); Klaver (1981: 43, 52); Eisentraut (1982: 68, plate); Joger (1982: 327); Klaver & Böhme (1986: 22).

Specimens examined: Cameroon: AMNH 15294, Metet, ♀, 144/113. AMNH 28673, Efulen, ♀, 150/104. AMNH 45950–61, Dja-Posten: ♀, 142/106; ♀, 145/107; ♀, 114/87; ♀, 128/91; ♂, 131/91; ♀, 131/97; ♀, 120/92; ♀, 115/90; ♂, 106/81; ♂, 105/85; ♂, 113/87; ♂, 100/81. AMNH 47454–59, Metet: ♀, 160/125; ♂, 133/108; ♂, 118/93; ♀, 120/97; ♀, 121/98; ♀, 77/59. AMNH 50691–719, Efulen: ♀, 138/104; ♀, 140/102; ♀, damaged; ♂, 122/91; ♀, 129/102; ♀, 126/93; ♂, 127/103; ♂, 132/108; ♀, 135/113; ♂, 110/92; ♀, 137/93; ♂, 111/87; ♂, 118/96; ♂, 111/85; ♂, 124/97; ♀, 134/102; ♀, 129/95; ♂, 121/94; ♀, 114/91; ♂, 121/99; ♂, 109/83; ♂, 111/86; ♀, 107/88; ♂, 101/87; ♂, 101/89; ♂, 84/62; ♂, 89/71; ♀, 94/71; ♀, 75/64. ANSP 20655, 30 km E. of Kribi, ♂, 110/90. BM 74.6.8.10-11, Cameroon: ♂, 120/90, ♀, 115/82. BM 76.3.8.4-5, Cameroon: ♂, 134/105, juv., 84/47. BM 94.8.4.2-3, mouth of Loango: ♂, 134/95; ♀, damaged. BM 1933.3.8.4, Beri, Batouri dist., ♂, 96/78. BM 1906.5.28.5, Efulen, ♂, 118/101. BM 1938.6.10.23, Yabassi, ♀, 104/87. BM 1949.1.3.54, Mamfe, ♀, 116/92. BM 1948.1.8.35, Mamfe, ♀, 119/95. BM 1968.444, Isongo, ♂, 120/87. BM 1937.12.1.64-65, Lomie distr.: ♂, 106/85; ♀, 148/112. BM 1968.69, Idenau, ♀, 94/72. BM 1973.3352, Mamfe div., juv., 63/52. BM 1973.3353, Atolo, ♂, 107/92. BM 1973.3370, Bakebe, Mamfe div., ♀, 112/95. BM 1965.1657, Idenau, ♀, 105/89. BM 1969.1658-59, Bisoro, Ndian div.: ♂, 116/79; ♀, damaged. BM 1973.3362-69, Mamfe: ♂, 87/69; ♀, 112/80; juv., 84/66; ♀, 102/72; ♂, 106/78; ♀, 129/97; ♀, 108/81; juv., 89/72; ♀, 125/88. BM 1973.3354-60, Bashor, Mamfe div.: ♂, 116/86; ♂, 123/93; ♀, 111/83; ♂, 115/98; ♀, 110/95; ♂, 112/96; ♂, 108/89. CAS 38856-57, Kribi: ♂, 130/109; ♀, 140/105. CAS 103169-70, Lolodorf: ♂, 126/93; ♂, 82/71. CAS 104579-80, E. of Tekmo: ♀, 123/93; ♀, 112/87. CM 5310, Nko'olong, ♀, 118/90. CM 7010, 7013, 7017-19, 7022-24, 7029-31, 7037-38, 7041-42, 7045-46, 7048, 7050-52, 7059-61, 7063-64, 7068, 8030, 8035, 8040-42, 8049-50, 8056, 8064, 8067, 8077-78, 8082, Sangmelima: ♀, 117/85; ♀, 121/84; ♀, 140/112; ♀, 132/99; ♀, 111/82; ♀, 130/104; ♀, 129/97; ♀, 140/116; ♀, 135/100; ♂, 114/84; ♀, 122/89; ♂, 128/96; ♀, 123/97; ♀, 124/100; ♂, 108/77; ♀, 124/92; ♀, 130/104; ♂, 118/96; ♂, 113/88; ♀, 114/97; ♀, 118/85; ♀, 127/95; ♂, 127/95; ♂, 126/89; ♀, 146/102; ♀, 141/94; ♀, 142/102; ♂, 122/95; ♀, 130/97; ♂, 124/93; ♀, 145/101; ♀, 114/88; ♀, 144/111; ♂, 112/86; ♂, 95/74; ♀, 127/89; ♀, 141/115; ♀, 104/74; ♂, 131/101; ♀, 140/118. CM 9377, 15151, 15156, 15160, Lolodorf: ♀, 138/97; ♀, 146/110; ♀, 132/102; ♂, 132/96. CM 60722, Eseka, ♂, 110/87. FMNH 17040, Batange, ♀, 129/100. FMNH 19886 (19 specimens), Sangmelima: ♀, 134/95; ♂, 112/81; ♀, 122/87; ♀, 146/113; ♂, 117/100; ♀, 104/84; ♂, 110/79; ♀, 97/84; ♂, 113/82; ♂, 111/91; ♀, 101/73; ♀, 141/101; ♀, 112/94; ♂, 104/77; ♂, 112/83; ♀, 140/109; ♂, 117/94; ♀, 143/101; ♀, 114/92. FMNH 59043, Nyabessan, ♀, 127/97. FMNH 59044, Etulan, ♂, 151/94. FMNH 59045, Ekowon, 70 mi S.E. of Ebolowa, ♂, 112/85. FMNH 59046-49, Ebolowa: ♂, 133/97; ♀, 145/107; ♂, 100/77; ♂, 100/76. MCZ 17557, Sakbayeme, ♂, 102/77. MCZ 46746, Metet, ♀, 149/115. MCZ 14246, Metet, ♀, 141/113. MCZ 14949-53, Sakbayeme, near Edea: ♀, 131/96; ♀, 150/115; ♀, 141/105; ♂, 91/67; ♀, 78/59. MHNG 1011.51, Foullassi, ♂, 98/94. MZM 35618, Efulen, ♂, 126/98. MZM 35620, Efulen, ♂, 105/80. RMNH 19130-31, N'kolbisson, 8 km W. of Yaounde: ♂, 132/93; ♂, 114/90. SMF 16456, Ekuk, ♂, 95/71. SMF 24731, Likomba, ♀, 138/104. SMF 24732, Mossaka, ♀, 130/103. SMF 24733-34, Mubenge: ♀, 130/85; juv., 80/66. SMF 54416, Sangmelima, ♀, 150/115. SMF 52516-18, Ngam, Sangmelima: ♂, 114/90; ♀, 127/104; ♂, 91/73. SMF 52519-20, Foullassi: ♀, 118/89; ♀, 140/112. SMF 52521, Nkumajap, Sangmelima, ♀, 116/100. SMF 52522, Kombé, Sangmelima, ♀, 126/96. SMF 52523-25, Njom, Sangmelima: ♂, 121/102; ♀, 128/103; ♀, 120/94. SMF 52526-27, Mfulaja, Sangmelima: ♂, 90/77; ♀, 102/83. USNM 58886, Cameroon, ♂, 88/68.



USNM 61173-74, Metet Mts: ♀, 146/108; ♀, 89/65. ZFMK 18683-84, Kumba: ♀, 114/88; ♂, 96/75. ZFMK 15300, Obala, 30 km N. of Yaounde, ♀, 150/110. ZFMK 1910, Mt Cameroon, ♀, 82/65. ZFMK 5780, Nyasoso, Mt Kupe, ♀, 105/81. ZFMK 15479, Malende, Mt Cameroon, ♂, 82/67. ZMA 14597, 30 km N. of Benglois, ♀, 93/72. ZMA 14598, Ototomo, ♂, 90/78. ZMA 14600 (2 specimens), Assok: ♀, 117/92; ♂, 95/77. ZMA 10157 (5 specimens), near Foulassi: ♂, 118/88; ♂, 123/84; ♀, 133/94; ♀, 135/101; ♀, 131/92. ZMH-R 01242, Mbio, ♂, 138/100. ZMH-R 01243, Ekuk, ♂, 112/73. ZMH-R 01244, Ekób, ♀, 126/103. ZMH-R 01229, Mt Cameroon, ♂, 125/111. ZMH-R 01230-33, 01238, 01245, Bibundi: juv. 85/67; juv. 74/57; ♂, 97/80; ♀, 106/78; ♀, 113/87; ♂, 119/102. ZMH-R 01246-47, Buea: ♂, 125/103; ♂, 131/97. ZMH-R 01234, Isongo, near Bibundi, ♂, 115/92. ZMH-R 01237, Bipindihof, near Kribi, ♂, 132/109. ZMH-R 01239-41, S. of Kribi: ♂, 121/91; ♀, 120/91; ♀, 133/102. ZSM 87/1972 (3 specimens), Kribi, Palm Beach: ♀, 125/100; ♂, 100/85; ♂, 103/70. ZSM 908/20, Kribi, ♂, 97/80. ZSM 62/1926 (2 specimens), Yaounde: ♂, 128/98; ♀, 121/97. ZSM 64/1926, Yaounde, ♀, 145/117. ZSM 21/1915, near Longji, ♂, 101/83. ZSM 473/1911 (2 specimens), Dibongofarm near Edea: juv., 41/36; juv., 41/35. ZSM 290/1907, Mukonjefarm near Mundame, ♀, 117/80. ZSM 373/1920 (2 specimens), Isongo: ♂, 125/99; ♀, 117/81. ZSM 271/1920 (2 specimens), Isongo: ♂, 114/95; ♀, 129/93.

Nigeria: BM 95.7.18.21, Old Calabar, ♂, 112/82. BM 1908.5.12.2, Oban Hills, ♂, 103/80. BM 63.4.5.1, Old Calabar, ♂, 144/69. BM 1910.1.11.1-2, Oban: ♂, 115/92; ♀, 118/82. BM 1912.1.11.2, Oban, ♂, 124/85. BM 1967.187, Port Harcourt, ♂, 106/63. BM 1973.3351, Balegete, ♂, 102/70. BM 63.12.17.2. & 7, Old Calabar: ♀, 135/98; juv., 95/76. BM 1974.739, Opobo river, ♂, 131/93. BM 1973.3349-50, Nko: ♂, 122/99; ♀, 141/106. MCZ 51690, near Port Harcourt, ♂, 124/96. UZM-R 51.189-196, Osombe, Calabar prov.: ♂, 103/81; ♂, 94/67; ♂, 84/65; ♂, 118/110; ♂, 97/80; juv., 79/66; juv., 55/45; juv., 43/40.

Togo: ZSM 23/1915, Togo, ♀, 133/97.

Ghana: ZMH-R 01227-28, Quittah: ♀, 132/106; ♂, 95/74.

Equatorial Guinea: BM 1965.1430, Erinoyong, ♂, 123/110. BM 43.12.12.11, Fernando Poo, ♂, 105/73. BM 1901.8.1.18-19, Benito river: ♂, 143/118; ♀, 144/122. BM 1904.7.23.22, Fernando Poo, ♀, 125/98. MCSN 28156, Musola, ♀, 118/88. MCZ 4107, Fernando Poo, ♂, 126/102. MHNP 85-574, 85-761, 86-3, San Benito: ♀, 147/118; ♀, 138/118; ♂, 142/107. RMNH 4528, Benito, ♂, 134/115. SMF 16454-55, Musola: ♂, 137/111; juv., 52/42. SMF 60705, Fernando Poo, ♂, 110/95. SMF 60707, Musola, ♀, 102/77. ZMFK 9383, Fernando Poo, ♂, 90/77.

Gaboon: MHNP 73-1531/33, Makokua: juv., 55/50; ♀, 137/114; ♀, 133/108. ZMA 10263, Gabon, ♀, 150/130; juv., 70/61. ZMA 11137 (3 specimens), Makokou: ♂, 142/120; ♂, 114/90; ♂, 126/104. ZMA 1138, Makokou, ♂, 145/115.

Congo (Brazzaville): MCZ 6721, French Congo, ♀, 148/108.

Central African Republic: MHNP 68-226, La Maboke, ♂, 145/116. MHNP 64-42, 64-48, Bonkoko: ♂, 110/86; ♀, 155/110. MHNP 65.444-45, La Maboke: ♂, 104/87; ♂, 130/11. ZFMK 33637-38, near Bangui: ♂, 98/94; ♂, 92/72.

Description: Head: Casque flat and strongly elevated posteriorly in ♂, less elevated in ♀; tip of the casque pointed, sometimes rounded; no parietal crest but a groove instead; anterior upper part of the casque concave; lateral crest well developed with enlarged triangular tubercles; a straight moderately developed temporal crest joins the lateral crest at a sharp angle thus enclosing a small triangular area behind the eye; two of three rows of bluntly conical tubercles on the lower lip; scales on the head small and of almost equal size; no gular crest and horns.

Body: Body scales small and granular, intermixed with some scattered slightly enlarged round flat tubercles; in both sexes a high membranous fin-shaped dorsal keel that gradually decreases in height towards posterior, where it continues into a caudal keel on the anterior part of the tail; dorsal and caudal keels are most pronounced in ♂, in which the keel sometimes shows a slight dip in height at the level of the sacrum; the outline of the keels can be slightly crenulate; the keels are supported by extremely elongated neural spines of the vertebrae; outer margin of the dorsal keel consists of a double row of scales; a white mid-ventral line is mostly present, sometimes continuing at the anterior part of the tail; no ventral crest, though sometimes indicated.

Dimensions: TL always much smaller than HBL in both sexes; maximal dimensions: ♂, HBL 145 mm, TL 116 mm (MHNP 68-226); ♀, HBL 160 mm, TL 125 mm (AMNH 47454).

Coloration: Body olive green to rusty brown with a reticular pattern on the flanks with whitish spots surrounded by a darker network; midventral line white to yellowish; orbital crests, lateral crests and temporal crests vivid turquoise blue; the dermis of the throatgrooves between the gular scales bright red; the blue and red coloration is constant in both sexes, i. e. it does not change when the coloration of the body changes (Buchholz 1874a; Sternfeld 1917; Eisentraut 1982, a. o.).

Illustrations: Several excellent illustrations of live specimens are known from literature, e. g. ♂ in Dunger (1964); Knoepffler (1974) and Eisentraut (1982). An informative colour photo (Eisentraut 1982) shows a *C. cristatus* ♂ from Fernando Poo exhibiting a vivid coloration during a threat-display. For threat-display of females see Klee (1971), where they show the red colour of the dermis of the throatgrooves. Striking is the sexual dimorphism in coloration, development of dorsal-caudal keels and the casque elevation.

Karyotype:  $2n = 36$ , the genome consists of 12 meta- or submetacentric macrochromosomes and 24 microchromosomes (Matthey 1957).

Hemipenis: Truncus calyculate; apex with four sickle-shaped rotula with minutely serrated margins; the ridges of the calyces extend over the apex and dissolve gradually into fringes and finally in papillae; two papillary fields located next to the sulcal rotula, each field consists of 8–9 papillae, several scattered papillae between the papillary fields present (Klaver & Böhme 1986).

Lung morphology: Three large diverticula present, the most anterior one has a small appendage and the middle one is bifid; a large and a small septum divide the lumen of the lung into three chambers, of which the middle one continues in the anterior diverticulum; the posterior chamber terminates also in a diverticulum and also bears the third diverticulum; a diaphragm and six small dorsal septa are present; a smooth muscle network covers the entire luminal surface of the lung, except for the most posterior part (Klaver, 1973 & 1981), Werner (1911) records four diverticula per lung; a gular pouch is absent (Germerhausen 1913; Klaver 1973).

Parasitology: Rasheed (1965) reported a crested chameleon (?*C. cristatus*) as a new host of two species of parasitic nematodes, viz. *Africana africana* (Gendre, 1909) Travassos, 1920 and *Amplificum involutum* (Gedoelst, 1916) York and Maplestone, 1926. Fischthl (1976) described a new species of trematode from the intestines of *C. cristatus*, viz. *Malagashitrema cameroonense*. The type species of this genus, viz. *M. aphallosom* Capron, Deblock & Brygoo, 1961 was described from Malagasy chameleon hosts, viz. *Calumma brevicornis*, *Furcifer lateralis*, *F. oustaleti* and *F. verrucosus*. *Mesocoelium pesteri* Saoud, 1964 was also recorded from the intestines of *C. cristatus*.

Biology: Monard (1951) found the stomach of *C. cristatus* to contain remains of acridids and sphingids. Böhme (1975 a) studied the stomach-content of a specimen and found it to consist of remains of carabids and brachypterid grasshoppers. This indication of a diet of mainly terrestrial insects is congruent with the habitat of this species, i. e. living closely to the ground (Sjöstedt 1897). The extremely short tail, as compared with the head-body length, may also be connected with this almost terrestrial life-style.

Knoepffler (1974) recorded ♀ specimens to deposit 16–37 eggs.

Distribution: Apart from the type locality (Gaboon) *C. cristatus* has been recorded from the following localities (Fig. 1): Cameroon: Cameroon Mts (Günther 1874), Yaoundé (Tornier 1902; Nieden 1910; Böhme 1975 a), N'kolbisson, 8 km W. of Yaounde (RMNH 19130-31), Obale, 30 km N. of Yaounde (ZMFK 15300), Victoria (Buchholz 1874a; Werner 1899), Bojongo (Buchholz 1874 a), Efulen Kribi (Case 1909), Mt Cameroon, 600 m (ZMFK 1910), near Malende, near Mueli, Tombel, Mt Kupe (Eisentraut, 1963), Olounou (Fischthl 1976), Kumbe (Rasheed 1965; Joger 1982), Nkumajap, Foulassi, Ngam (Perret & Mertens, 1957), Nyasoso, Mt Kupe, 900 m (Klaver 1981), Bibundi, Isongo (Lampe 1911), Campo (Lampe 1911; Monard

1951), Mowange (Lampe 1911), Kribi (Werner 1902b; Tornier 1902), 30 km E. of Kribi (Loveridge 1937), Batanga (Loveridge 1936), Likomba, Mt Cameroon (Mertens 1938), Mosake, Ekona, Mt Cameroon (Mertens 1938), Mubenge, Mt Cameroon (Mertens 1938), Akak (Monard 1951), near Mundame, Dibongo near Edea (Müller 1910), Bonge, Itoki, N'dian, Edundu (Sjöstedt 1837), Johann-Albrechtshöhe (Tornier 1902), Banjo-Bamenda (Nieden 1910), Bipindi, Ebalowa (Tornier 1902), Longji (Nieden 1910), Kombé, Njom, Mfulaja (Perret & Mertens 1957), Mbio (Besom), Bascho, Ekuk, Ekob (Sternfeld 1917), Limbe (Werner 1899), Loango-Mündung, Barombi, Ssibange (Werner, 1902b), Beri, Batouri distr. (BM 1933.3.8.4), Yabassi distr. (BM 1938.6.10.23), Mamfe, 160–170 m alt. (BM 1949.1.3.54), Lomie distr. (BM 1937.12.1.64–65), Idenau (BM 1968.69), Bakebe (BM 1973.3370), Bisoro (BM 1969.1658–59), Atolo (BM 1973.3353), Bashor, Mamfe (BM 1973.3354–60), Metet Mts (USNM 61173–74), Lolodorf (CAS 103169), E. of Tekmo, 650 m (CAS 104579–80), Buea (ZMH-R 01246–47), Bipindihof near Kribi (ZMH-R 01237), Sangmelima (CM 7013–8082), Nko'olong (CM 5310), Eseka (CM 60722), Sakbayeme, near Edea (MCZ 17557), Dja Posten (AMNH 4950–61), Nyabesson (FMNH 59043), Etulan (FMNH 59044), Ekowong, 70 mi S. of Ebolowa (FMNH 59045), 33 km N. of Benglois (ZMA 14597), Ototomo (ZMA 14598), Assok (ZMA 14600).

Nigeria: Old Calabar (Gray 1864; Smith 1865; Dunger 1967), Port Harcourt (Romer 1953b; Dunger 1967), Umukoroshie, Oban Hills (Dunger 1967), Balegete, Ikom (BM 1973.3351), Nko (BM 1973.3349–50), Osombe (UZM 51.186–196), Opobo River (BM 1974.7.39).

Togo: Togo (ZSM 23/1913).

Ghana: Quittah (Werner 1902b).

Central African Republic: La Maboke (MHNP 68–226), Bonkoko (MHNP 62–41/48), near Bangui (ZFMK 33637–38).

Equatorial Guinea: Gabo San Juan (Cap Saint Jean) (Boulenger 1905), Erinayong, 900 m (BM 1965.1430), Fernando Poo (Martin 1838), Musola (Boulenger 1906; Mertens 1941), San Carlos (Mertens 1964).

Gaboon: Makokou, Belinga, Oyem/Woleu N'ten (Knoepffler 1974), Lambaréné (Mocquard 1896; Werner 1902b), Rama (Werner 1902b).

Congo: Sibiti (De Witte 1967), Beniti River (BM 1901.8.118–19), Benito (RMNH 4528), San Benito (MHNP 85–574), Congo français (Mocquard 1896).

General records: Calabar to Gaboon (Boulenger 1887, 1900); Rep. Congo, Gabon, Cameroon, F. Poo, Nigeria (De Witte 1967); Nigeria, Cameroon, F. Poo, Spanish Guinea, Gabon (Mertens 1966); region littorale du Congo français, du Gabon et Cameroun et dans l'île de F. Poo (Mocquard 1896).

Biotope: *C. cristatus* occurs in forested areas, i. e. lowland rainforest (Hylea) that reaches up to border the cloud- or montane forest areas at an altitude of approximately 900 m in mountainous regions near the coast. The border between these two types of forests is found at more elevated altitudes in mountainous regions away from the coast (Eisentraut 1973). The highest altitude at which *C. cristatus* has been recorded is 600 m in Fernando Poo (Mertens 1964) and 900 m on Mt Kupe (ZMFK 3780).

### *Chamaeleo (Trioceros) eisentrauti* Mertens

Original description: Mertens, 1968. Bonn. zool. Beitr. 19: 70, figs 1, 2, plate.

Type specimens: Holotype (by original designation): ZFMK 5781, ♂, HBL 132 mm, TL 163 mm. Paratypes: ZFMK 5782–85: ♂, HBL 142 mm, TL 169 mm; ♀, HBL 123 mm, TL 135 mm; ♀, HBL 110 mm, TL 116 mm; ♂, HBL 125 mm, TL 144 mm; SMF 64320–22: ♂, HBL 123 mm, TL 152 mm; ♂, HBL 118 mm, TL 153 mm; ♀, HBL 102 mm, TL 119 mm; MHNG 1229.99, ♀, HBL 103 mm, TL 110 mm.

Terra typica: Dikume, Rumpi Mountains, West Cameroon, 1150 m, leg. M. Eisentraut, 17. II.—5. III. 1967; paratypes from the same locality, collector and date.

Derivatio nominis: Named after Prof. Dr. Martin Eisentraut, who collected this material during one of his journeys in Africa. For biographic notes see Böhme (1977, 1982).

Subsequent studies: Eisentraut (1973: 299, 343); Böhme (1974: 167, 1975b: 127); Klaver (1977:

193, 1981: 40, figs 11, 12); Böhme & Klaver (1981: 321, fig. 8c); Eisentraut (1982: 219, plate); Böhme & Bischoff (1984: 186); Gartshore (1986: 236); Klaver & Böhme (1986: 24); Böhme (1988: 148).

Specimens examined: Apart from the holotype and paratypes only two additional specimens were examined. These specimens (ZFMK 48562, ♂, HBL 99 mm, TL 115 mm, coll. J. Steinfurth and ZFMK 51168, ♀, HBL 118 mm, TL 130 mm, coll. J. Steinfurth & E. Wallikewitz) are the only specimens besides the type series known to be present in a museum collection.

Description: Head: Casque strongly elevated, in ♂ more than in ♀, the posterior part curving backwards again; no parietal crest, but a groove instead; lateral crests, orbital crests and rostral crests with large tubercles; temporal crest indistinct; ♂ with two short enlarged tubercles on the tip of the snout; well developed gular crest consisting of a pointed tubercle that is followed by numerous (up to 11) scaly, flattened gular lobes; in both sexes behind the nostrils a single pointed conical tubercle.

Body: Body scalation heterogeneous, i. e. small scales intermixed with numerous large rounded tubercles; membranous dorsal and caudal keel well developed and somewhat crenulate in ♂, less pronounced and less crenulate in ♀, dorsal and caudal keel separated at the level of the sacrum; in ♂ the caudal keel is higher than the dorsal keel; outer margin of the dorsal keel with a double row of scales; ventral crest of conical tubercles present; no white midventral line.

Dimensions: TL larger than HBL in both sexes. Maximal dimensions: ♂, HBL 142 mm, TL 169 mm (ZFMK 5782); ♀, HBL 133 mm, TL 135 mm (ZFMK 5783).

Coloration: The general colour of the ♂ of *C. eisentrauti* is blue-greenish with two large brownish spots on the back reaching onto the dorsal keel; the caudal keel appears to be somewhat brownish as well (Mertens 1968). Unpublished colour photo material of a ♀ specimen shows it to have a similar coloration with the large rounded tubercles on the body more lightly coloured.

Illustrations: Colour photos of this rare and relatively unknown species were published by Mertens (1968) and Eisentraut (1982).

Hemipenis: Truncus calyculate, apex with four rotula; two papillary fields at the base of the sulcal rotulae, each with up to 8 papillae (Klaver & Böhme 1986).

Lung morphology: A smooth muscle network covers the entire luminal surface of the lung; two large septa are present, the larger one extending far backwards; only two diverticula are present terminally at the middle and the posterior chamber; a diaphragm and two small dorsal septa are present as well; a gular pouch is absent (Klaver 1981).

Distribution: This species is only known from the type locality (Fig. 2).

Biotope: *C. eisentrauti* is distributed in montane forest areas of the Rumpi Mts at an altitude of 1100 m.

### *Chamaeleo (Trioceros) feae* Boulenger

Original description: Boulenger, 1906. Ann. Mus. civ. Stor. nat. Giacomo Doria, Genova 2: 207, fig. 4.

Type specimens: Boulenger (1906) based his description of *C. feae* on a series of four specimens, viz. one ♂ and three ♀, that were deposited in the collections of the Museo Civico di Storia Naturale Giacomo Doria in Genova and the British Museum. We found two of the putative ♀ of the syntype series present in the MCSN collection to be ♂, so the syntype series consists of three ♂ and one ♀. The largest specimen is selected here as lectotype, the remaining three specimens thus becoming paralectotypes.

Lectotype (by present designation): MCSN-EE 28165, ♂, HBL: 100 mm, TL: 108 mm. Paralectotypes: MCSN-EE 28165, ♂, HBL: 78 mm, TL: 72 mm; MCSN-EE 28165, ♂, HBL: 95 mm, TL: 36 mm; BM 1906.3.30.65, ♀, HBL: 78 mm, TL: 66 mm.

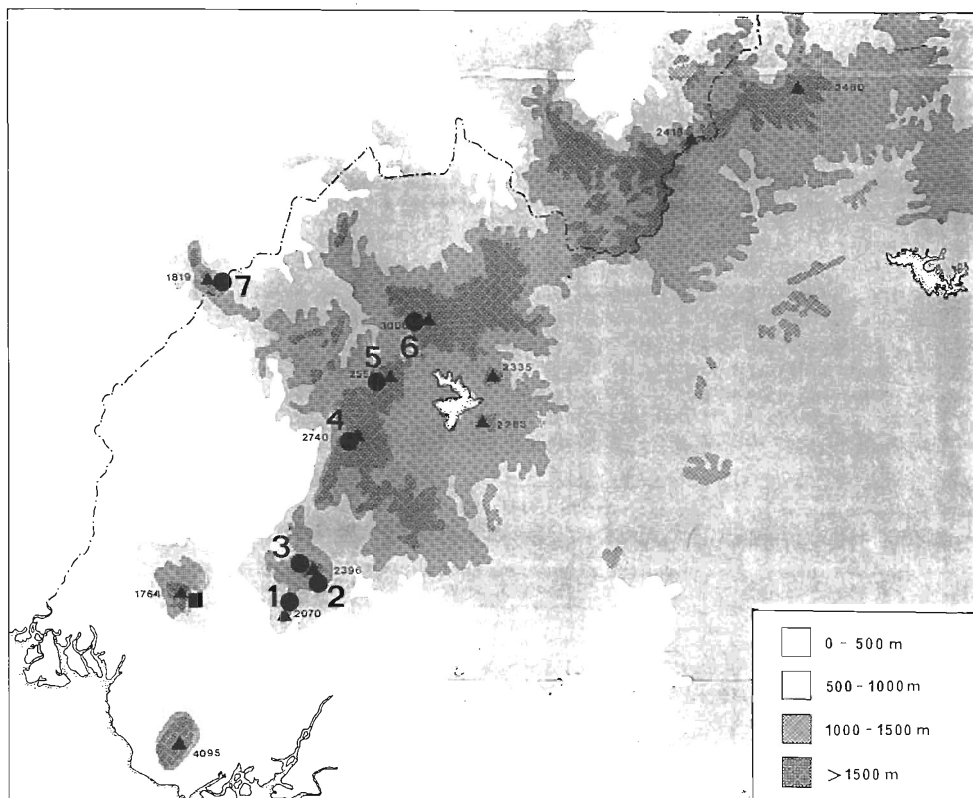


Fig. 2: Distribution of *C. eisentrauti* (■) and *C. quadricornis* (●) in Cameroon and Nigeria. 1 — Esosung/Mt. Kupe, 2 — Nsoug/Manengouba Mts., 3 — Lake Manengouba, 4 — Foto, Dschang/Bambouto Mts., 5 — Mt. Lefo, 6 — Mt. Oku, 7 — Obudu Plateau. See text for locality references.

Terra typica: Moka, Fernando Poo, 1350–1500 m alt., leg. L. Fea, 1897–1903. Paralectotypes from the same locality, collector and date.

Derivatio nominis: Named after Leonardo Fea, who collected the type series during his travels in Western Africa from 1897 to 1903. For an itinerary see Fea (1898/99, 1900, 1902), for biographical notes see Gestro (1904).

Subsequent studies: Müller (1910: 593); Werner (1911 b: 5, 37); Sternfeld (1917: 456); Hillenius (1959: 74, 76); Capocaccia (1961: 101); Hillenius (1963: 207); Mertens (1964: 218); Oates (1965: 87, fig.); Mertens (1966: 20); Eisentraut (1973: 299, 377, fig. 18); Klaver (1977: 193, 1981: 40); Böhme & Klaver (1981: 326); Klaver & Böhme (1986: 24).

Specimens examined: Fernando Po (Bioko): MCSN 28165, Moka, ♂, 100/108, lectotype. MCSN 28165, Moka, ♂, 78/72, paralectotype. MCSN 28165, Moka, juv. ♂, 95/36, paralectotype, tail damaged. BM 1906.3.30.65, Moka, ♀, 78/66, paralectotype. BM 1960.1.3.34, Moka, juv. 55/58. BM 1969.2519, 2521–22, 2527, 2530, 2536–37, 2540, 2543, 2546, Moka valley, ♀, 85/80; ♀, 79/66; ♂, 97/95; ♂, 87/80; ♂, 81/80; ♂, 78/72; ♂, 78/71; ♀, 84/76; ♂,

81/78; ♀, 84/74. BM 1969.2520, 2525-26, 2528-29, 2532-35, 2541, 2544, 2548, Moka valley: Geasa Mioka, ♀, 78/66; ♂, 70/70; ♀, 75/67; ♀, 81/81; ♀, 56/55; ♀, 82/62; ♀, 83/74; ♀, 80/61; ♀, 88/76; ♀, 83/73; ♂, 78/79; ♂, 67/61. BM 1969.2523-24, 2538-39, 2542, 2547, Moka valley: Bioko, ♀, 88/78; ♂, 89/93; ♀, 72/63; ♀, 84/71; ♂, 86/79; ♀, 74/67. BM 1969.2531, Moka region, ♀, 73/63. BM 1969.2545, Moka valley, near Malaco, ♂, 104/107. BM 1969.2549, Moka valley: Mioko, ♀, 81/66. FMNH 195967, Moca, ♂, damaged. FMNH 195968, Moca, ♀, 77/67. SMF 60364-367, Moca: ♂, 83/87; ♂, 94/95; ♀, 98/89; ♀, 84/73. ZFMK 9371-9382, Moca: ♀, 87/65; ♂, 97/95; ♀, 85/75; ♂, 79/79; ♀, 86/74; ♀, 84/63; ♀, 88/79; ♀, 82/71; ♂, 77/71; ♂, 71/73; ♂, 84/81; juv., 58/53.

Description: Head: Dorsal surface of the casque flat, casque raised and pointed posteriorly; lateral crest well developed with pointed triangular tubercles; short poorly developed temporal crest; scales on top of the head large, unequal in size; gular crest, consisting of 3–12, but mostly 5–7 conical tubercles; no parietal crest and horns.

Body: Body covered with granular scales intermixed with large, circular, flat tubercles of irregular size; male with strongly crenulate dorsal keel and a small less crenulate caudal keel; both keels are supported by elongated neural spines of the vertebrae, outer margin of the dorsal keel with double row of scales; female without dorsal and caudal keels; no ventral crest.

Dimensions: TL generally larger than HBL in both sexes; maximal dimensions: ♂, HBL/TL 104/107 (BM 2545); ♀, HBL/TL 98/89 (SMF 60366).

Coloration: Oates (1965) mentioned *C. feae* to be a beautiful green chameleon. Unpublished colour photos show ♂ specimens with the larger tubercles on head and body more lightly coloured.

Illustration: Only one black and white photo of *C. feae* is known from literature (Oates 1965).

Hemipenis: Truncus calyculate; apex with four denticulated rotulae; at the base of each sulcal rotula a large papillary field with up to 16 elongate papillae (Klaver & Böhme 1986).

Lung morphology: A smooth muscle network covers the entire luminal surface of the lung. Four or five diverticula may be present. Two large septa of unequal size are connected with the lateral, medial and ventral wall of the lung. They subdivide the lumen in three successive chambers. The middle and the posterior chamber terminate in a diverticulum. The remaining 2–3 diverticula are always attached to the posterior chamber. A diaphragm and three small dorsal septa are present as well. A gular pouch is absent (Klaver 1981).

Status: Mertens (1964, 1966) considered *C. feae* a subspecies of *C. montium*. We think his argumentation is not valid and treat *C. feae* as a valid species. For a detailed discussion see *C. montium* under the subheading Subspecies.

Distribution: Apart from the type locality (Moka, Fernando Poo) *C. feae* has been recorded from the following localities (Fig. 1): Geasa Mioka, Moka valley, 1600 m (BM 1959.2520 a.o.), Mioko, Moka valley, (BM 1959.2549), near Malaco, Moka valley, 1550 m alt. (BM 1959.2545).

Biotope: *C. feae* is a typical montane species that occurs in the higher altitudes (1300–1600 m) of Fernando Poo, in cool and wet montane forest areas.

### *Chamaeleo (Trioceros) montium* Buchholz

Original description: Buchholz, 1874a. Mber. K. preuss. Akad. Wiss. Berlin 1875: 88.

Type specimens: The original description of *Chamaeleo montium* has been credited to Buchholz and dated in the year 1874. His description was presented at the “Gesamtsitzung vom 22 Januar 1874” of the “Königliche Preussische Akademie der Wissenschaften zu Berlin”. The actual publication of the description, however, took place in 1875 as can be inferred from the title page of the relevant issue of the Monatsberichte, viz.: “1875 (Aus dem Jahre 1874)”. This would only change the year of Buchholz’s description had not Albert Günther of the British Museum published an article on *C. montium* in 1874 (received June 9, 1874; read June 16, 1874; published October 1874; cf. Duncan 1937). Günther gave a detailed description of an adult male, an adult female and a juvenile male accompanied by an illustration of these

three specimens. He referred to what he obviously considered the original description: "*Chamaeleo montium*, Buchholz, Berlin, MB. 1874, p. 88, figs 1–4." This reference to page number and figures is correct, although the figures were not included in the article containing the description. They appeared in a second article of Buchholz published in the same volume, viz. Mber. K. preuss. Akad. Wiss. 1875 (Aus dem Jahre 1874): 298–301. The year of publication in Günther's reference is according to the foregoing incorrect. If Günther's description was published before the one of Buchholz, then his description has precedence. His description fulfils all the requirements of a valid original description, even if unintentional and his reference to Buchholz notwithstanding. Günther's reference to the name *C. montium* is not so puzzling as he and Buchholz by way of Peters corresponded, but the exact reference to page number and figures is if the relevant articles were not to be published until 1875! In his article Günther mentioned in a footnote attached to the discussion of *Rhampholeon spectrum*: "Three weeks after the present communication had been sent to the Society, I received through the kindness of Prof. Peters an early separate copy of Dr. Buchholz's second paper on these Chameleons, . . .". From the text of Günther's paper it can be ascertained that this second paper was the one containing the illustrations of *C. montium*. Considering the exact reference to page number and figures of Buchholz's papers by Günther and the fact that an early separate copy of the second paper was exchanged during the summer of 1874, we infer that Günther must also have received an early separate copy of the first paper of Buchholz in advance of the proper publication. In that case Buchholz's description has precedence over the one by Günther as the date of publication was advanced (art. 21h, ICZN). Consequently Buchholz's description is valid and the date of publication is indeed 1874, but for a different reason than subsequent authors realised. Buchholz (1874a) based his description on two specimens, one male and one female, without designating a type. Consequently both specimens are to be considered syntypes. The specimens are present in the collection of the Berlin museum, we designate the male as lectotype, thus the female becomes paralectotype.

Lectotype (by present designation): ZMB 8025.1, ♂, HBL: 120 mm, TL: 120 mm. Paralectotype: ZMB 8025.2, ♀, HBL: 100 mm, TL: 93 mm.

Terra typica: Bojongo, Mt Cameroon, Cameroon, coll. & leg. R. Buchholz 1874. Paralectotype of same locality, collector and date.

Derivatio nominis: Named after the restricted geographical distribution in mountainous regions, i.e. Mt Cameroon.

Synonymy: *Chamaeleo montium grafi* Mertens, 1938, Abh. senckenb. naturf. Ges. 442: 40 (see under subheading Variation). *Chamaeleo monticum* (ex errore) Rieppel, 1987, Zool. J. Linn. Soc. 89: 54.

Subsequent studies: Buchholz (1874b: 301; figs 1–4); Günther (1874: 442, pl. 56); Peters (1876: 196); Boulenger (1887: 470); Matschie (1892: 108); Sjöstedt (1897: 20); Werner (1897: 402); Werner (1898: 205, 1899: 133); Tornier (1899: 259, 1901: 63, 1902: 677); Werner (1902b: 398); Boulenger (1906: 207); Müller (1909: 111, 1910: 592); Nieden (1910b: 28); Lampe (1911: 182); Werner (1911a: 394, 1911b: 35); Germerhausen (1913: 527); Sternfeld (1917: 456); Schmidt (1919: 600); Pasqual (1937: 34); Mertens (1938: 39, 41, pl. 8, 9, figs 36–41); Angel (1940: 394); Monard (1951: 126, 143); Klingelhöffer (1957: 220, fig. 181); Perret (1957: 87); Perret & Mertens (1957: 582, fig. 8); Dischner (1958: 320, figs); Hillenius (1959: 69); Mertens (1959: 117); Oeser (1961: 53); Eisentraut (1963: 265); Hillenius (1963: 207); Mertens (1964: 219, 1966: 20, 21, 1967: 65, 1968: 72, 1970: 203); Eisentraut (1973: 377, fig. 18); Böhme (1975a: 31); Klaver (1977: 173, figs 21, 22, 1979: 165); Meier (1979: 32, figs); Klaver (1981: 43, 44); Böhme & Klaver (1981: 321, 324, fig. 8d); Joger (1982: 327); Eisentraut (1982: 43, 44, 66, figs); Gartshore (1986: 237); Klaver & Böhme (1986: 22, fig. 8); Rieppel (1987: 54); Böhme & Schneider (1987: 254); Böhme (1988: 11).

Specimens examined: Cameroon: ZMB 8025-1, Bojongo, Mt Cameroon, ♂, 120/120, lectotype. ZMB 8025-2, Bojongo, Mt Cameroon, ♀, 100/93, paralectotype. ZMB 8916 (3 specimens), Victoria, ♂, 100/103; juv. ♂, 65/55; ♀, 66/64. BM 74.6.8.4-9, Cameroon, ♂, 119/110; ♂, 113/118; ♂, 110/107; juv., 91/85; ♀, damaged; ♀, damaged. BM 76.3.8.1-2,

Cameroon, ♂, 80/84; ♂, 124/118. BM 1929.2.27.1, British Cameroon, ♂, 112/118. BM 1906.3.30.63-64, Buea, ♂, 88/92; ♀, 96/80. BM 1971.314-15, Atolo, Mamfe div., ♂, 98/109; ♂, 92/97. BM 1968.445-48, Buea, all damaged. BM 1968.70-75, Buea, ♂, 114/116, ♂, 113/118; ♂, 113/124; ♂, 90/102, ♂, 104/100; ♀, 71/66. BM 1969.1661-64, Buea, ♂, 104/109; ♂, 98/103; ♂ & ♀, damaged. CAS 104566, Nyasoso, Mt Kupe, ♂, 94/103. CAS 125567-80, Buea, Mt Cameroon, ♂, 101/101; ♂, 118/121; ♂, 110/98; ♂, 107/106; ♂, 84/85; ♂, 98/107; ♂, 103/118; ♂, 111/105; juv., 57/57; ♀, 68/68; ♀, 81/81; ♀, 74/72; ♀, 72/66; ♀, 76/73. CAS 136178-79, Bakossi, Nasuki, N. of Tombel, ♂, 80/87; ♂, 70/75. FMNH 19800, 19802-810, 19812-13, Buea, ♂, 118/121; ♂, 108/107; ♂, 90/96; ♂, 82/79; ♂, 90/92; ♂, 87/82; ♂, 102/106; ♂, 90/89; ♀, 95/90; ♂, 69/60; ♂, 103/109; ♀, 103/92. FMNH 195965-66, Buea, ♂, 86/85; ♂, 105/105. FMNH 196242-44, Nasuki, ♀, damaged; ♂, 56/61; ♂, 85/89. MCSN 28153, Buea, ♂, 115/120. MCZ 4108, Mt Cameroon, ♂, 100/103. MCZ 27118, between Buea and Moyuco, ♀, 89/83. MCZ 54127, near Buea, ♂, 98/108. RMNH 4665 (2 specimens), Mt Kupe, ♂, 116/122; ♀, 82/72. SMF 48071, Mt Cameroon, ♂, 95/97. SMF 51556, Mt Cameroon, ♂, 80/78. SMF 26363, Buea, ♂, 115/124. SMF 52529-32, Nkongsamba (this locality record (cf. Perret & Mertens 1957) is erroneous and should read Nsoug, 1500 m; Perret, pers. comm.), ♀, 90/79; ♀, 89/79; juv. ♂, 66/63; ♂, 108/116. SMF 22460, Mongonge, Mt Cameroon, ♂, 109/108, holotype *C. m. grafi*. SMF 22461-62, Mongonge, Mt Cameroon, ♂, 112/120; ♂, 113/116, paratypes of *C. m. grafi*. SMF 53198, Buea, ♂, 121/124. SMF 64999, Nyasoso, Mt Kupe, ♂, 104/110. SMF 64998, Dikume, Rumpi Mts, ♂, 106/120. SMF 29998, Buea, ♂, 100/105. SMF 24769, Moliko, ♀, 82/74. SMF 24767, Klein Soppo, juv. ♂, 58/55. SMF 26364-65, Buea, ♂, 104/102; juv. ♀, 60/53. SMF 16460, Buea, juv. ♂, 66/66. SMF 16297-98, Buea, ♂, 101/105; ♀, 72/63. SMF 24768, Mossaka, ♂, 92/100. SMF 45102, near Nyasoso, Mt Kupe, ♂, 112/113. SMF 24751-52 & 57, Buea, ♀, 85/73; ♀, 79/75; ♀, 85/77. SMF 24749, Buea, ♂, 112/110. SMF 51647-49, Buea, ♂, 103/113; ♂, 116/123; ♂, 121/130. ZFMK 5789-91, Dikume, Rumpi Mts, ♂, 102/110; ♀, 88/77; ♂, 84/83. ZFMK 5787-88, Nyasoso, Mt Kupe, ♂, 88/98; ♂, 81/77. ZFMK 15498, Nyasoso, Mt Kupe, ♀, 77/70. ZFMK 20039, Mt Kupe, ♀, 72/66. ZFMK 15501-04, 15513-36, Nyasoso, Mt Kupe, ♂, 85/85; ♀, 71/66; juv., 45/45; juv., 30/34; ♂, 94/100; ♂, 97/101; ♂, 108/113; ♂, 120/123; ♂, 93/96; ♂, 103/110; ♂, 86/91; ♂, 87/97; ♀, 84/85; ♂, 74/79; ♀, 80/88; ♂, 65/62; ♂, 60/61; ♂, 71/75; juv., 45/42; ♀, 88/83; ♂, 100/104; ♂, 64/74; ♀, 76/74; ♀, 89/78; ♀, 82/77; ♀, 89/87; ♀, 85/77; ♀, 82/76. ZFMK 15505-11, Soppo, Mt Cameroon, ♂, 92/100; ♂, 100/103; ♂, 76/75; ♂, 75/78; ♂, 48/48; juv., 38/41; ♂, 34/36. ZFMK 20757-58, Mt Kupe, ♂, 96/94; ♀, 83/damaged. ZFMK 15512, Buea, ♂, 105/96. ZFMK 8844, Buea, ♂, 115/113. ZFMK 15480-85, 15490-97, Buea, ♂, 113/127; ♂, 110/112; ♂, 111/116; ♂, 92/96; ♀, 75/72; juv. ♂, 45/45; ♂, 94/102; ♀, 91/72; ♀, 72/73; ♀, 63/63; ♀, 57/54; ♀, 57/57; juv. ♀, 34/36; juv. ♀, 34/37. ZFMK 15486-89, near Buea, ♀, 95/damaged; ♀, 95/83; ♀, 83/77; ♂, 62/62. ZFMK 15287-90, 15537-40, 1900-09, 15587-602, 9066-84, 20040-41, Buea, ♂, 85/74; ♂, 88/89; ♀, 90/81; ♀, 96/86; ♂, 98/105; ♂, 104/109; ♂, 117/122; ♂, 110/110; ♂, 77/85; ♂, 100/107; ♂, 103/104; ♂, 110/112; ♂, 104/108; ♂, 52/56; ♀, 85/85; ♀, 65/65; ♀, 81/76; ♀, 83/75; ♂, 112/120; ♂, 114/118; ♂, 85/91; ♂, 68/77; ♂, damaged; ♀, 80/71; ♀, 88/88; ♀, 85/77; ♀, 85/80; ♀, 77/68; ♀, 77/72; ♀, 79/77; ♀, 69/66; ♀, 92/91; ♀, 78/73; ♀, 64/60; ♀, 94/96; ♂, 121/126; ♂, 117/111; ♂, 111/106; ♂, 112/112; ♂, 104/110; ♂, 95/113; ♂, 77/66; ♀, 84/71; ♀, 94/87; ♀, 82/94; ♀, 80/75; ♀, 80/75; ♀, 77/68; ♀, 86/87; ♀, 90/81; ♀, 71/60; ♀, 82/72; ♀, 68/65; ♂, 104/116; ♀, 87/78. ZFMK 41515-16, near Buea-falls, 1250 m alt., ♂, 99/105; ♀, 93/78. ZFMK 48561, Buea, ♀, 71/71. ZFMK 49015-20, Buea, ♂, 119/126; ♂, 100/92; ♂, 83/89; juv. ♂, 60/59; ♀, 81/81; ♀, 80/75. ZFMK 49837, Buea, ♂, 131/damaged. ZMA 10246 (2 specimens), Buea, ♂, 107/104; ♀, 89/75. ZMA-GS, Mt Kupe, ♂, 104/103. ZMH 2694.96-97, Buea, ♂, 92/95; ♂, 109/122. ZMH 3615.98-105, Buea, ♀, 78/67; ♂, 95/106; juv., 53/53; ♀, 94/86; juv. damaged; ♂, 113/115; ♂, 104/103; ♂, 105/108. ZMH 3617.4-21, 3617.72-95, 3616.22-72 & 74, Esosung, Mt Kupe, ♀, 65/63; ♀, 94/92; ♀, 65/60; ♀, 94/82; juv., 44/46; ♀, 101/98; ♀, 72/68; ♀, 80/80; ♀, 93/75; ♀, 87/84; ♀, 79/77; ♀, 91/80; ♀, 65/58; ♀, 59/59; ♀, 95/84; ♀, 81/80; ♀, 77/67; ♀, 49/49; ♀, damaged; ♀, 86/71; ♀, damaged; ♀, 88/81; ♀, 74/73; ♀, 81/71; ♀, 99/87; ♀, 95/84; ♀, 90/77; ♀, 77/66; ♀, 61/57; ♀, 86/81; ♀, 92/90; ♀, 88/77; ♀, 84/87; ♀, 86/78; ♀, 95/90; ♀, 90/84; ♀, 89/85; ♀, 84/78; ♀, 72/68; ♀, 87/83; ♀, 64/61; ♀, 89/79;



♂, 110/118; ♂, 113/119; ♂, 118/124; ♂, 113/116; ♂, 107/99; ♂, 103/101; ♂, 105/116; ♂, 117/120; ♂, 116/128; ♀, 49/48; ♂, 115/141; ♂, 106/94; ♂, 108/104; ♂, 97/103; ♂, 110/116; ♂, 72/72; ♂, 108/113; ♂, 110/113; ♂, 115/120; ♂, 122/123; ♂, 72/80; ♂, 92/94; ♂, 99/103; ♂, 120/124; ♂, 75/77; ♂, 87/92; ♂, 120/133; ♂, 102/110; ♂, 110/117; ♂, 118/128; ♂, 113/118; ♂, 112/117; ♂, 107/123; ♂, 105/105; ♂, 109/119; ♂, 114/118; ♂, 100/112; ♂, 117/126; ♂, 104/105; ♂, 106/109; ♂, 113/120; ♂, 114/121; ♂, 117/115; ♂, 100/97; ♂, 98/98; ♂, 116/107; ♂, 110/110; ♂, 99/104; ♂, 113/121; ♂, 60/60; ♂, 105/100; ♂, 61/64; ♂, 95/103.

**Description:** Head: Casque flat and moderately elevated posteriorly, more or less rounded at the end; lateral crest well developed and tubercular; temporal crest meets the lateral crest where the latter turns upwards towards the elevated posterior part of the casque, triangular area between lateral and temporal crests strongly tubercular; upper part of the skull with polygonal scales of unequal size, no parietal crest but a groove instead; poorly developed gular crest of 2-5 somewhat larger conical scales (contrary to most previous references); lower lip with enlarged scales; behind nostril often a single enlarged conical scale; ♂ with two large annulated horns on the snout, in ♀ these are indicated by enlarged conical tubercles.

**Body:** Body scalation heterogenous, i. e. small flat scales irregularly intermixed with large oval flat tubercles on the flanks; ♂ with a (sometimes strongly) crenulate dorsal keel and a higher caudal keel supported by elongated neural spines, dorsal and caudal keel clearly separated at the level of the sacrum; tail keel ends abruptly; ♀ without keels and only a slight crenulation at the anterior part of the dorsum; dorsal margin of the keel with double row of scales, no ventral crest and midventral line.

**Dimensions:** TL smaller, equal or larger than HBL in both sexes. Maximal dimensions: ♂, HBL/TL 121/130 (SMF 51649), ♀, HBL/TL 101/98 (ZMH 3617.9).

**Coloration:** In ♂ body bright green to brown-green with a broad diagonal yellowish-green band on the flanks, large oval scales in this band also yellowish-green, those outside the band white and bright blue, larger scales on the top of the head, on the lips and in the temporal area white, dermis in the throatgrooves between gular scalation white, eyelids with dark radial bands and a broad dark line from behind the eye up to the tip of the casque, ♀ more uniformly green coloured, often with a brownish reticulation, dermis of the throat white, that of the belly red (Buchholz 1874a, Mertens 1938).

**Illustrations:** Of the various excellent illustrations known from literature the four colour-photos of fighting males by Meier (1979) are to be pointed out.

**Hemipenis:** Truncus with large calyces, apex with four small denticulated rotulae, next to the sulcal rotulae are two papillary fields, each consisting of 16 papillae (Klaver & Böhme 1986).

**Lung morphology:** A smooth muscle network covers almost the entire surface of the lung, three to five diverticula may be present, two large septa are connected with the lateral, medial and ventral wall of the lung, a diaphragm and three small dorsal septa are present, a gular pouch is absent (Germerhausen 1913, Klaver 1977, 1981).

**Biology:** Mertens (1938) reported on the threat display and the reproductive behaviour (January–February). The deposition of eggs was recorded in November. Oeser (1961) recorded a life span of *C. montium* of at least 9 years. Males of *C. montium* are known to fight each-other using their horns in pushing contests. Meier (1979) published four colour photographs of such a contest.

**Variation:** Mainly on account of a somewhat aberrant horn configuration Mertens (1938) established the subspecies *C. montium grafi* for three ♂ specimens from Mongonge at the north-west face of Mt Cameroon (holotype: SMF 22460 and paratypes: SMF 22461 & 62, coll. Oeser 1937). We do not consider this subspecies valid as the observed horn configuration falls well within the morphological variation of *C. montium* s. str. We found *grafi*-like horns in specimens from Buea, e. g. SMF 26363 and 24749 (the latter mentioned by Mertens in his 1938 paper), from Soppo, e. g. ZFMK 15508 and from Esosung, Mt Kupe, e. g. ZMH 3616.52. Moreover, many more different types of horns were observed, viz. straight diverging horns, diverging horns that are curved inwards and diverging horns that are curved outwards. Apart

from these observations the horns may also be more or less elevated, i. e. instead of lying in a horizontal plane parallel to the upper lip as they normally do, they may be pointed more upwards or downwards. In one case horns that are strongly curved ventrad were observed, but this is most probably an anomaly. Consequently, the specimens from Mongonge do not constitute a subspecies, nor can they be considered as members of "eine nur sehr lokal verbreitete etwas abweichende Population" (Eisentraut 1963) as the *grafi*-like horns occur throughout the entire range of the species. Perret & Mertens (1957) mention the possibility of a separate subspecies for a ♂ specimen from Nkongsamba because of its strongly crenulate dorsal keel. However, the same reasoning applies here as in the case of the *grafi*-like horns, as such crenulate keels occasionally occur in specimens from other localities as well, e. g. Buea (ZMH 2694-97, SMF 24749, 26363). In a few specimens originating from the Rumpi Mts and Mt Kupe two large conical tubercles were observed at the dorsal base of the horns. In a few other specimens the casque was not only elevated posteriorly, but curved down and backwards again at the extremity. Both observations strongly remind us of the natural situation as found in *C. quadricornis*, of which *C. montium* is a close relative (Böhme & Klaver 1981).

Subspecies: Four subspecies are recognized in literature, viz. *C. m. montium*, *C. m. camerunensis*, *C. m. feae* and *C. m. grafi* (Mertens, 1938, 1964, 1966). In the previous section we already discussed the status of *C. m. grafi* and it was shown not to be a valid subspecies. The subspecific status of the three other taxa will be dealt with subsequently and jointly as Mertens (1964) assigned them their subspecific rank simultaneously in his paper on the reptiles of Fernando Poo. In this paper Mertens (1964) discussed the unique position of *C. feae* within the herpetofauna of the island. This herpetofauna can be characterized as an impoverished African fauna, i. e. all species occurring on Fernando Poo are conspecific with species on the African continent and only in a few cases are Fernando Poo representatives endowed with a distinct subspecific status. *C. feae* appeared to be the only endemic species of reptile present on Fernando Poo. Mertens tried to remedy this incongruity by postulating a close relationship between *C. feae* and the continental *C. camerunensis* and *C. montium*. This enabled him to treat *C. feae* as a subspecies of yet another continental species and to fit it agreeably into the faunistic scheme. He complemented his argument with a historical zoogeographic explanation of how the distribution and ensuing formation of subspecies came to be to support his phylogenetic assumptions. To our opinion Mertens put despite his elaborations to the contrary the zoogeographical cart before the phylogenetic horse. As to his discussion of the phylogenetic relationships Mertens referred to Müller (1910), who thought *C. camerunensis* and *C. feae* were related, and to Boulenger (1906), who stressed the relationship of *C. feae* and *C. montium*. Not mentioned, although available in prominent papers at the time, were Sternfeld (1917), who discussed at length the relationship of *C. feae* and *C. camerunensis*, species that to his opinion "... *cristatus* erheblich näher [stehen], wenn sie nicht überhaupt als Unterarten dieser Form betrachtet werden müssen", and Schmidt (1919), who considered a possible relationship between *C. camerunensis* and *C. ituriensis*. The point we wish to make is not so much that we think the opinions of the last two authors are to be favoured to those of Müller and Boulenger. We only like to register that different opinions as to the relationship were available but ignored by Mertens in his argument.

Mertens (1964) repeatedly stressed the morphological differences between *C. camerunensis*, *C. feae* and *C. montium* and concluded, surprisingly, that their similarity is so great, that one can consider the three forms without more ado as subspecies. Admittedly the three forms have, despite their differences, characters in common (as is to be expected in species of the same species-group), but inferences concerning their phylogenetic relationship (among themselves and with other species) are best to be arrived at by studying these characters closely instead of postulating relationship out of zoogeographical convenience. In a forthcoming paper we shall elucidate the phylogenetic relationship of the species of the *C. cristatus* group. *C. feae* and *C. montium* will be shown to be closely related species; *C. camerunensis* is more distantly related to either of them and appears to be more closely related to *C. cristatus*.

To explain the present geographical distribution of the putative subspecies Mertens (1964) relied on Eisentraut (1963), who argued that relationship between montane taxa presently occurring on isolated and often distant mountain ranges in West and East Africa can be explained with the hypothesis concerning the expansion of the montane forest habitat towards lower

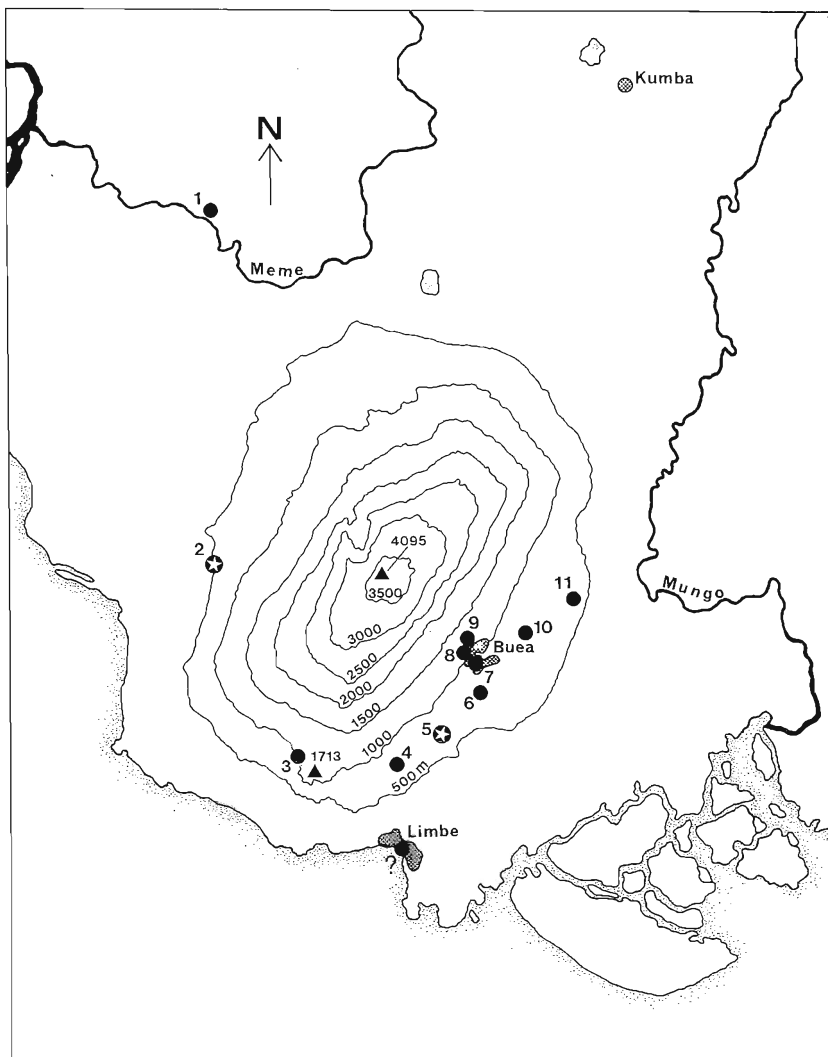


Fig. 3: Distribution of *C. montium* in the Mt Cameroon area. Dots with stars indicate type localities (see text). 1 — Mbongo, 2 — Mongonge, 3 — Bonenza, 4 — Mapanja, 5 — Bonjongo, 6 — Soppo (= Klein Soppo), 7 — Buea, 8 — near Buea, 9 — Buea falls, 10 — Moliko, 11 — Ekona and Musake. Locality references in the text.

altitudes during cool, pluvial periods in the Pleistocene. The presently isolated montane forest patches and the species inhabiting them were once part of one continuous montane forest belt that stretched from West Africa along the northern margin of the Congo lowland forest area towards East Africa. Mertens (1964) argued that during the period of montane forest expansion the sea level was lowered so much that Fernando Poo ceased to be an island and became connected with continental Africa. This land-connection would then have enabled the "... altertümlichste Rasse...", *C. camerunensis*, presently distributed in the lowlands south of Mt

Cameroon, to reach Fernando Poo, where it subsequently evolved into a montane form, viz. *C. feae*. Similarly, but supposedly much earlier because of more profound morphological differences, a (sub-)montane form evolved from *C. camerunensis* on the continent, viz. *C. montium*. Although we consent to a land-connection between Fernando Poo and the African continent that made it possible for the ancestor of *C. feae* to reach the present island, we think it takes neither a lowland species to make this crossing, nor its subsequent evolution into a montane form to explain the present *C. feae*. Eisentraut's (1963) reasoning (which he expanded in 1973 to include Fernando Poo) as to the expansion of the montane forest habitat towards lower altitudes makes the dispersal of an already (sub-)montane chameleon species across the land-connection possible and more likely. Subsequent contraction of the montane forest and ensuing advancing of lowland habitat isolated the (sub-)montane chameleons of Fernando Poo from their mainland conspecifics even before the land-connection between Fernando Poo and Africa was severed. The isolation of the incipient *C. feae* from its closest relative (incipient *C. montium*) is, therefore, likely to have occurred much earlier than the isolation of the various populations of *C. montium* on Mt Cameroon, Mt Kupe, Rumpi Mts and the Manenguba Mts. This explains why *C. feae* is morphologically distinct from *C. montium*, whereas the populations of this latter species show no profound morphological differences and are considered conspecific.

Apart from the absence of direct phylogenetic affinity between the two species concerned and *C. camerunensis*, it can be argued that a lowland species like *C. camerunensis* was probably forced into a lowland habitat refugium far away from the then existing land connection, which Mertens (1964) supposed it to have crossed (Eisentraut, 1963, 1973). The explanation as to why *C. camerunensis* does not occur on Fernando Poo is not to be found in its subsequent evolution into the montane *C. feae*, but in its late arrival on the scene, i. e. after Fernando Poo had become an island again. This explanation is congruent with the relative scarcity of lowland species in relation to the number of montane species on Fernando Poo and the observation that lowland species that did manage to reach Fernando Poo, e. g. *C. cristatus* and *C. owenii*, do not differ significantly from their African relatives with which they are indeed considered to be conspecific. The fact that *C. cristatus* and *C. owenii* did manage to reach Fernando Poo may well be the result of their faster mode of dispersal made possible by their wider ecological range as compared to that of *C. camerunensis*. For instance, *C. cristatus* ranges from sea level up to 900 m on Mt Kupe and 600 m on Fernando Poo, whereas *C. camerunensis* is essentially a lowland form. That the lowland forest habitat was once very much restricted by the expansion of the montane forest habitat into a montane forest belt that reached from West Africa north of the Congo basin towards East Africa (Eisentraut 1963, 1973) can also be inferred from the distribution of other chameleon species. For instance, *C. deremensis*, occurring in the Usambara and the Uluguru Mts, Tanzania, is clearly related to the species of the *C. cristatus* group as can be inferred from its gross morphology (e. g. dorsal and caudal keels, casque shape, scalation, dorsum with a double row of scales and lung septation).

Thus in view of the phylogenetic relationship (or lack thereof) of the species concerned, as well as the relationship and distribution of other chameleon species on Fernando Poo and Africa, and with a more proper consideration of Eisentraut's views, a better and more parsimonious explanation than that of Mertens (1964) can be given.

A (sub-)montane ancestral species spread over Fernando Poo and continental Africa and with the receding of the montane forest habitat the Fernando Poo population became isolated long before Fernando Poo lost its connection with Africa, eventually resulting in the morphologically distinct *C. feae*. The African population of the ancestral (sub-)montane species evolved into *C. montium*. Subsequent climatic and ensuing habitat changes made it possible for a limited number of lowland forest species to reach Fernando Poo just prior to island formation and led to isolation of populations of the ancestral (sub-)montane species on Mt Cameroon, Mt Kupe, Rumpi Mts and the Manengouba Mts. Whether or not these developments took place in one continuous process or not is hard to establish. Once isolated populations of *C. montium* on the continent might have been in contact again during eventual later pluvial periods. This may even have been the case with *C. cristatus* and *C. owenii* populations of Fernando Poo and the African continent. If these secondary contacts between

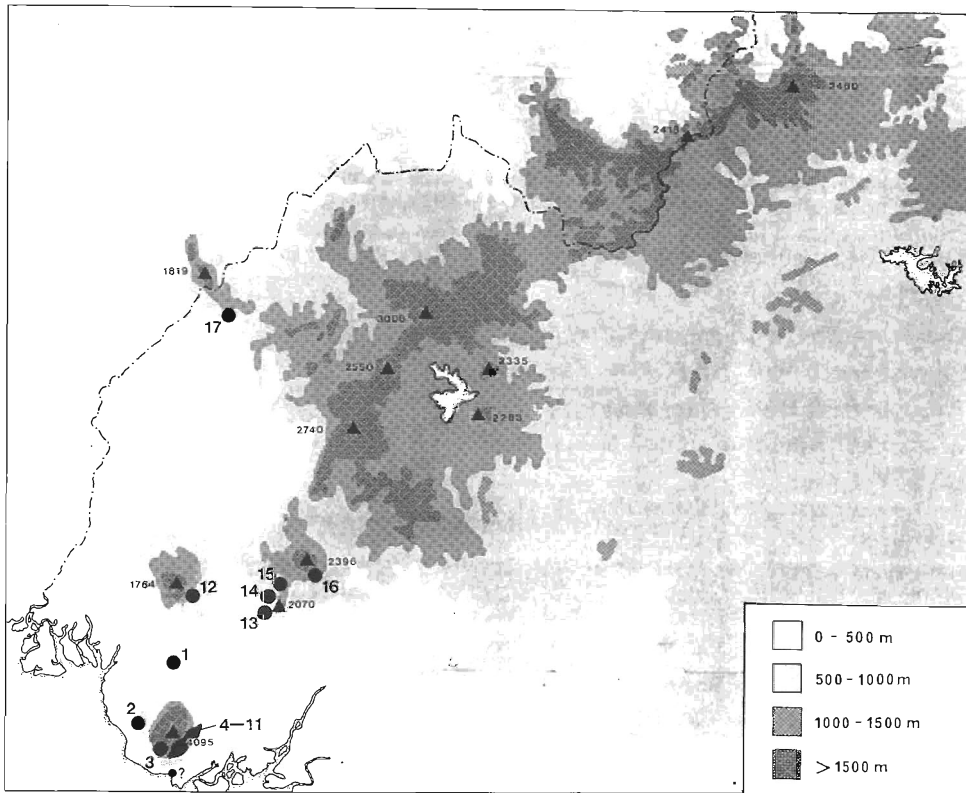


Fig. 4: Distribution of *C. montium* in Cameroon. Nos. 1–11 same as in Fig. 3. 12 — Dikume/Rumpi Hills, 13 — Bakossi, Nasuki/N of Tombel, 14 — Mt Kupe, 15 — Nyasoso/Mt Kupe, 16 — Nsoug/Manengouba Mts, 17 — Atolo/Mamfe District. For locality references see text.

populations occurred then any divergence due to isolation might have been reduced again by genetic interchange. The singularity of the montane *C. feae* of Fernando Poo, however, appears to indicate a more permanent isolation that was not influenced by eventual subsequent pluvial periods. In view of this and the morphological disparity between *C. feae* and *C. montium* we consider *C. feae* and *C. camerunensis* valid species.

Distribution: Apart from the type locality (Bojongo, Mt Cameroon) *C. montium* has been recorded from the following localities (Figs 3, 4): Cameroon: Bonge (Sjöstedt 1897) (= Mbonge at the Meme river, cf. Mertens 1938), Mapanja, Mt Cameroon (Sjöstedt 1897), north of Bonenza, 1100 m (Gartshore 1986), Barombi station (Werner, 1897), Victoria (= Limbe) (Tornier 1901), Moliko, Mt Cameroon (Mertens 1938), Buea, Mt Cameroon (Mertens 1938, Angel 1940), Klein Soppo, Mt Cameroon (Mertens 1938), Upper farm Buea, Mt Cameroon (Mertens 1938), Mosake, Ekona, Mt Cameroon (Mertens 1938), Mongonge, Mt Cameroon (Mertens 1938), Ndoungué, near Nkongsamba, Manengouba Mts (Monard, 1951), Nkongsamba (Perret & Mertens 1957, but see correction under 'specimens examined'), near Buea, 1100–1200 m (Eisentraut 1963, Joger 1982), Soppo, Mt Cameroon (Eisentraut 1963),

Nyasoso, Mt Kupe, 900 m (Eisentraut 1963), Dikume, Rumpi Mts (Mertens 1968), Mt Kupe (Joger 1982), between Buea and Moyneo (MCZ 27118), Nasuki (= Nsouké, Mt Kupe) (FMNH 196242-44), Esosung, Mt Kupe, 1060 m (ZMH 3617.4/21), Atolo, Mamfe distr. (BM 1971-314-15).

Biotope: *C. montium* has a sub-montane distribution from approximately 500 to 1300 m altitude on various mountains in Cameroon, viz. Mt Cameroon, Mt Kupe, Rumpi Mts, Manengouba Mts, and Mamfe. The locality Victoria (= Limbe) (sea level) is probably false, although the species may occur in Victoria where it might have been introduced by man. *C. montium* occurs on forest edges, the shrubbery of an open landscape, in plantations and on hedges along roads and gardens close to and within human settlements, e. g. *Hibiscus* hedges in Buea.

### *Chamaeleo (Trioceros) pfefferi* Tornier

Original description: Tornier, 1900. Zool. Anz. 23: 21, figs 1, 2.

Type specimen: Holotype (by monotype): ZMB 15050, ♂, HBL: 90 mm, TI: 93 mm.

Terra typica: Nyassosso auf dem Nkossogebirge (= Nyasoso, Mt Kupe), Cameroon; leg. M. Conradt.

Derivatio nominis: Named after Prof. Dr. G. Pfeffer, curator at the Hamburg Natural History Museum.

Subsequent studies: Werner (1902b: 401); Tornier (1902: 677); Monk (1903: 327); Nieden (1910b: 26, 28); Werner (1911b: 5, 36); Schmidt (1919: 570, 600); Pasqual (1937: 34); Monard (1951: 126); Perret (1957: 79, 88); Hillenius (1959: 77); Hillenius (1963: 207); Mertens (1966: 23, 1968: 72); Klaver (1977: 193, 1981: 40, figs 15, 16); Klaver & Böhme (1986: 59).

Specimens examined: The type specimen is the only specimen known.

Description: Head: Casque upper surface concave; parietal crest indicated; casque moderately elevated posteriorly and pointed; lateral crest with pointed tubercles; temporal crest absent, but behind the eye and adjacent to the lateral crest a triangular area with bony tubercles; a short gular crest of conical scales at the chin, the second, third and fourth cone elongate; the cathi rostrales meet above the snout and constitute a large saddle-shaped bony basis for two somewhat sideways extending protuberances, at the extremity of each a short annulated horn; the dorsal surface of the protuberances and the head covered with large flat tubercles intermixed with smaller somewhat conical scales; temporal area covered with large flat scales; on both sides of the throat just in front of the foreleg an elongate conical tubercle; behind the nostril a single pointed conical tubercle.

Body: Body scalation heterogenous, small granular scales intermixed with large flat round tubercles that are surrounded by smaller tubercles of similar shape; a number of these large tubercles form a row that begins behind the temporal region and continues over the upper flank; on the lateral surface of the legs a similar scalation as on the body; a crenulate dorsal and caudal keel present; on top of the neural spine projections three enlarged scales, the middle one the largest; the edge of the dorsal keel consists of a double row of scales; no ventral crest and midventral line.

Dimensions: TL larger than HBL, ZMB 15050, ♂, HBL/TL: 90/93. Tornier (1900) gave the dimensions 80/115.

Coloration: The general colour is green with brown-reddish dermal folds (Tornier 1900), probably taken from the preserved specimen.

Illustrations: The only illustration of *C. pfefferi* was published by Tornier (1900).

Lung morphology: The septation of the lungs consists of a diaphragm, two small dorsal septa and two large ventral septa; three diverticula are present, two of them terminally at the middle and posterior chamber respectively, the third diverticulum is attached to the middle chamber; a smooth muscle network covers the entire luminal surface of the lungs; a gular pouch is absent (Klaver 1981).

Status: As has been referred to in the section Historical review *C. pfefferi* is sympatric with *C. montium*, *C. q. quadricornis* and *C. cristatus* on Mt Kupe. *C. pfefferi* is only known from Nyasoso (900 m). *C. montium* has a submontane distribution and has been recorded from Nyasoso (Eisentraut 1963) and Esosung (1060 m, ZMH 3617-4/21). *C. q. quadricornis* has a montane distribution and has been recorded from Esosung as well. As far as the external morphology is concerned *C. pfefferi* has characters in common with *C. montium* and *C. quadricornis*. Casque form and the paired horns (but not the saddle-shaped base of the horns) remind us of *C. montium*, the gular crest and the body scalation remind us of *C. quadricornis*. *C. pfefferi* also possesses a conical tubercle behind the nostrils, just as do *C. montium*, *C. quadricornis*, *C. eisentrauti* and *C. wiedersheimi*. Since the description of *C. pfefferi* the type locality has been visited by collectors several times and chameleons were collected there repeatedly. However, no more specimens of *C. pfefferi* were found. In view of all this we like to put forward the hypothesis that *C. pfefferi* might be a hybrid between the two species that were repeatedly collected on Mt Kupe, viz. *C. montium* and *C. quadricornis*. This view more or less concords with the historical reconstruction of the developments in chameleon distribution (Böhme & Klaver 1981) as it is indeed hard to see how a third related (sub-)montane species could have been evolved on Mt Kupe. Incompatible with this hypothesis are the well developed testes that do not indicate interspecific sterility. Another possible explanation could be that the locality where *C. pfefferi* was said to have been captured is incorrect and that it originates from elsewhere, perhaps from the little visited Tchabal Mbabo, where a related chameleon may exist (Böhme & Klaver 1981, Böhme & Schneider 1987). However, as Conradt was a reliable collector this possibility seems unlikely. As neither of the proposed explanations as to the scarcity of *C. pfefferi* can be ascertained we treat *C. pfefferi* still as a valid species.

Distribution: Only known from the type locality (Fig. 5). In an article on East African chameleons Monk (1903) erroneously lists *C. pfefferi* as a species with an East African distribution.

### *Chamaeleo (Trioceros) quadricornis* Tornier

Original description: Tornier, 1899. Zool. Anz. 22: 259, fig. 2.

Key to the subspecies:

1. a. Dorsal surface of the casque with two large flat scales between irregular shaped scales, anterior lungchamber without a diverticulum ..... *C. q. quadricornis*
- b. Dorsal surface of the casque with irregularly shaped scales of almost equal size, anterior lungchamber with a diverticulum ..... *C. q. gracilior*

### *Chamaeleo (Trioceros) quadricornis quadricornis* Tornier

Original description: See above.

Type specimens: Tornier (1899) based his description of *C. quadricornis* on two ♂ specimens without designating a holotype, consequently the two specimens are to be considered syntypes. One of the syntypes is in the Berlin museum (ZMB 14957), the other one, originally deposited in the Berlin museum as well, was transferred to the Senckenberg Museum in Frankfurt (SMF 43860). Mertens (1959) indicated the ZMB specimen as "der Typus" and the SMF specimen as "der Paratypus". Böhme & Klaver (1981) considered Mertens' indication incorrect and subsequently designated the ZMB specimen as lectotype. According to art. 74(a) of the ICZN, however, Mertens' (unintentional?) indication fulfils the requirements of a valid subsequent designation and consequently the designation of Böhme & Klaver (1981) has no standing. Lectotype (by subsequent designation, cf. Mertens, 1959): ZMB 14957, ♂, HBL: 148 mm, TL: 180 mm. Paralectotype: SMF 43860, ♂, HBL: 156 mm, TL: 210 mm.

Terra typica: Cameroon, subsequent restriction by Klaver (1981): Manengouba Mts, Cameroon; leg. Conrau, no date. Paratype of same locality and collector.

Derivatio nominis: The name derives from the four horns ♂ have on the tip of the snout.

Subsequent studies: Werner (1902b: 399, fig. C); Tornier (1902: 677); Monk (1903: 327); Nieden (1910b: 27); Werner (1911b: 36); Germerhausen (1913: 506, fig. 49); Schmidt (1919: 570, 600); Pasqual (1937: 34); Monard (1951: 126); Perret (1957: 79, 88, fig. 1 a, 1959: 253); Hillenius (1959: 74, 77); Mertens (1959: 114, figs 1–3); Matthey & Brink (1960: 335); Hillenius (1963: 207, 208); Mertens (1966: 25, 1968: 69, 72, 73); Böhme (1975b: 125, figs 1, 2); Klaver (1977: 193, 1981: 40, 44, figs 17, 18); Böhme & Klaver (1981: 313, figs 2, 3, 8 b); Böhme (1982: 354); Eisentraut (1982: 195, plate); Gartshore (1986: 237).

Specimens examined: Cameroon: ZMB 14957, Manengouba Mts, ♂, 148/180, lectotype, SMF 43860, Manengouba Mts, ♂, 156/210, paralectotype, SMF 58224, Nsoug, Manengouba Mts, ♂, 165/215, SMF 65000, near Lake Manengouba, ♂, 127/148, SMF 65001, near Lake Manengouba, ♂, 138/167, BM 1959.1.2.22, Nsoug, Manengouba Mts, ♂, 137/178, FMNH 195964, near Lake Manengouba, ♂, 140/177 MHNG 920.70, Nsoug, Manengouba Mts, ♀, 74/78, MHNG 965.53, Nsoug, Manengouba Mts, ♂, 137/165, MHNG 1011.20–25, Nsoug, Manengouba Mts: ♂, 143/187; ♂, 120/146; ♂, 122/156; ♂, 97/damaged; ♀, 108/130; ♀, 46/50. MHNG 1365.01–05, Nsoug, Manengouba Mts: ♂, 129/154; ♂, 103/120; ♀, 103/126; ♀, 108/110; ♀, 67/73; ♂, 118/160. ZFMK 5793–97, near Lake Manengouba: ♂, 145/196; ♂, 142/208; ♂, 155/186; ♀, 126/136; ♀, 133/158. ZMH-R 01235, Esosung, Mt Kupe, ♂, 168/206 (subspecific status of specimen uncertain, see Böhme & Klaver 1981; we include it here because Mt Kupe is adjacent to the Manengouba Mts).

Description: Head: Casque strongly elevated and pointed posteriorly, curving towards posterior at the extremity, casque elevation in ♀ less than in ♂; dorsal surface of the casque with two very large flat scales between regularly shaped scales in both sexes; no parietal crest but a groove instead; gular crest present, consisting of large, flat and pointed scales; canthi rostrales and orbital crests strongly tubercular; lateral crests less tubercular but distinct; temporal crest runs from behind the orbit almost parallel with the lateral crest which it joins with a sharp angle at approximately  $\frac{3}{4}$  of the casque height; behind the eye a row of bony tubercles running from the corner of the mouth to the temporal crest; ♂ with four annulated horns on the snout, first two larger ones and above the base of these two smaller ones, in ♀ no horns but at the corresponding site enlarged tubercles; behind the nostril is a pointed conical tubercle.

Body: Body scalation heterogenous, i. e. small scales of irregular size intermixed with numerous larger and large flat round scales; dorsal and caudal keels present, caudal keel is high in comparison to the dorsal keel and has a crenulate margin in ♂, both keels in ♀ less pronounced, outer margin of dorsal keel with a double row of scales; ventral crest forming the continuation of the gular crest consists of pointed conical scales that decrease in size towards posterior; no white midventral line.

Dimensions: TL much larger than HBL in both sexes, maximal dimensions, ♂, HBL/TL: 165/215 (SMF 58224); ♀, HBL/TL: 133/158 (ZFMK 5797).

Coloration: Green to yellow-green with a long red-brown zone on the flanks from the shoulder to the hindleg, above this zone two white bands (Mertens 1959) or a large whitish area that covers most of the back and the dorsal keel (Eisentraut 1982) may be present. Mertens (1959) mentions a light blue and a yellowish colour from the dorsal and caudal keel respectively.

Illustrations: Colour photos of live ♂ specimens of *C. q. quadricornis* are only found in Mertens (1959) and Eisentraut (1982), whereas photos of ♀ specimens (alive or preserved) have never been published. A colour photo of a ♀ specimen in our possession shows it to be olive-green with lighter coloured larger tubercles on the head and body.

Karyology:  $2n = 36$ , the genome consists of 12 meta- or submetacentric macrochromosomes and 24 microchromosomes (Matthey & Brink 1960).

Lung morphology: A smooth muscle network covers the entire luminal surface of the lungs; two large ventral septa differing considerably in size subdivide the lumen into three successive chambers, the connection of the large posterior septum with the ventral wall of the lung lies very caudad, approximately at two- third of the length of the lung itself; two diverticula are present, one at the end of the middle chamber and one at the end of the posterior chamber;



a diaphragm and four small dorsal septa are present; a gular pouch is absent (Germerhausen 1913, Klaver 1981).

Variation: Böhme & Klaver (1981) summarized the information on *C. quadricornis* and found, like Mertens (1968) before them, that in several ♂ specimens the second pair of annulated horns were not well developed and replaced by enlarged tubercles, e. g. ZFMK 5795. On the other hand a single specimen from Mt Kupe (ZMH-R 01235) was not assigned to a particular subspecies because of the presence of a third pair of horns above the second pair. After closer examination we found in several specimens from the Manengouba Mts, e. g. SMF 58224 and 65001, a large scale above each second horn possessing an annulated structure (see also Mertens 1959, photo). Although these annulated scales are not as large as the horns of the third pair of the Mt Kupe specimen they suggest that the six-horned condition can be considered a further development of the annulated scales. This view is supported by the observation that the Mt Kupe specimen is one of the largest specimen known, which indicates that only in fullgrown or very large specimens the six-horned condition develops fully. In specimens of the subspecies *gracilior* a similar development of large tubercles next to the second pair of horns was observed (Böhme & Klaver 1981). So there appears to be ample variation in horn development within *C. quadricornis* from two to four to six horns. This led us to consider the third pair of horns in the Mt Kupe specimen an extreme example of this development. It remains to be seen, however, whether *C. quadricornis* from Mt Kupe belongs to the nominal subspecies or not, as its geographical isolation from the nominal population on the Manengouba Mts might have been at least as long as the isolation of the subspecies *gracilior* from the Bamenda plateau (Böhme & Klaver, 1981). Until more material from Mt Kupe has been studied, we provisionally consider the Mt Kupe specimen to belong to the nominal form.

Distribution: Apart from the type locality (Cameroon, restricted to Manengouba Mts, Klaver 1981) *C. q. quadricornis* has been recorded from the following localities (Fig. 2): “East Africa” (Monk 1903, ex errore), 30 km W. of Nkongsamba, Manengouba Mts (Perret 1957, 1959), Nsoug, Manengouba Mts, 1800 m (Mertens 1959), near Lake Manengouba, Manengouba Mts (Mertens 1968), Baffoussam (Klaver 1981; locality probably incorrect, Mahnert in litt. 25. V. 1979), Esosung, Mt Kupe, 1060 m (Böhme & Klaver 1981).

Biotope: *C. q. quadricornis* has a montane distribution in montane or cloud-forest areas at 1060 to 1800 m altitude on the Manengouba Mts and Mt Kupe.

#### *Chamaeleo (Trioceros) quadricornis gracilior* Böhme & Klaver

Original description: Böhme & Klaver, 1981. Amphibia-Reptilia 1: 317, figs 4, 5, 8a.

Type specimens: Holotype (by original designation): ZFMK 15291, ♂, HBL: 128 mm, TL: 159 mm. Paratypes: ZFMK 15292, ♂, HBL: 128 mm, TL: 150 mm; ZFMK 15293, ♂, HBL: 130 mm, TL: 158 mm; ZFMK 15294, ♂, HBKL: 110 mm, TL: 131 mm; ZFMK 15295 (later transferred to the Natural History Museum in Bulawayo, Zimbabwe), ♂, HBL: 97 mm, TL: 112 mm; ZFMK 15296, ♀, HBL: 115 mm, TL: 119 mm; ZFMK 15297, ♀, HBL: 110 mm, TL: 133 mm; ZFMK 15298, ♀, HBL: 93 mm, TL: 108 mm; ZFMK 15299, ♀, HBL: 68 mm, TL: 77 mm; ZFMK 5833, ♂, HBL: 148 mm, TL: 197 mm; MHNG 1365.09, ♂, HBL: 134 mm, TL: 182 mm; MHNG 1365.08, juv., HBL: 66 mm, TL: 79 mm; MHNG 1365.07, juv., HBL: 42 mm, TL: 55 mm.

Terra typica: Mount Lefo, Cameroon, 1800 m, leg. W. Böhme & W. Hartwig, 5–11. III. 1974; paratypes ZFMK 15292–99 and ZMB from the same locality, collectors and date as the holotype, ZFMK 5833 from Mt Oku (Oku See), leg. M. Eisentraut, 20–30. I. 1967 and MHNG 1365.07–09 from Bamboutos Mts, leg. J. L. Amiet, 29. I. 1971.

Derivatio nominis: The name *gracilior* is the comparative form of lat. *gracilis* = slender, it indicates that the subspecies is more slenderly built than the nominal form.

Subsequent studies: Included are also references to specimens of this taxon published prior to the description of the subspecies. Böhme (1975a: 32, 1975b: 125, figs 1, 2); Klaver (1981:

41, figs 19, 20); Böhme & Klaver (1981: 317, figs 4, 5, 8a); Böhme & Bischoff (1984: 186); Gartshore (1986: 238); Klaver & Böhme (1986: 23).

Specimens examined: Cameroon: For a complete list of all known specimens from Cameroon see under Type specimens. Nigeria: UZM-R 51163, Obudu plateau, juv., 86/98 (Böhme & Klaver 1981 could not assign a particular subspecific status to this specimen; we provisionally include it here because its lung morphology is the same as in *gracilior*).

Description: Head: Casque strongly elevated and pointed posteriorly, curving towards posterior at the extremity, casque elevation in ♀ less than in ♂; dorsal surface of the casque with irregularly shaped scales of equal size; no parietal crest but a groove instead; gular crest consisting of elongate, laterally flattened pointed scales; canthi rostrales and orbital crests strongly tubercular; lateral crests less tubercular but distinct; temporal crests run almost parallel with the lateral crests, which they meet in a sharp angle at approximately 3/4 of the casque height; behind the eye a row of bony tubercles from the corner of the mouth to the temporal crest; ♂ with 4, sometimes 6, well developed annulated horns on the snout; ♀ without horns, but at the corresponding site enlarged bony tubercles; behind each nostril a pointed conical tubercle.

Body: Body scalation heterogenous, i. e. small scales of irregular size intermixed with numerous larger and large flat round scales; moderately developed and crenulate dorsal and caudal keels present in ♂; caudal keel, high in comparison to the dorsal keel, diminishes gradually in height; both keels less pronounced in ♀; outer margin of dorsal keel with a double row of scales; ventral crest consists of pointed conical scales that decrease in size towards posterior; no white midventral line.

Dimensions: TL larger than HBL in both sexes. Maximal dimensions: ♂, HBL/TL: 148/197 (ZFMK 5833); ♀, HBL/TL: 130/158 (ZFMK 15293).

Coloration: Green to yellow-green with bluish tones on the back of the head and on the larger scales on the body and legs; in ♂ a slightly darkened zone from shoulders to the hindlegs and above this large white spots (not so pronounced as in *C. q. quadricornis*); in ♀ clear white spots on the back and also a large white band on the belly and lower flank; claws bright red.

Illustrations: Böhme & Klaver (1981) figured the preserved holotype of *C. q. gracilior*.

Hemipenis: Truncus with small shallow calyces, four denticulated rotula on the apex, two papillary fields next to the sulcal rotula, each field with up to 9 papillae (Klaver & Böhme 1986).

Lung morphology: A smooth muscle network covers the entire luminal surface of the lung, two large septa of almost the same size subdivide the lumen, the larger one connects the ventral wall of the lung at approximately halfway the length of the lung itself, four to five diverticula may be present, three of them are invariably at the end of the three chambers, most remarkable is the constant occurrence of a diverticulum at the end of the anterior chamber, the remaining diverticula are connected with either the middle and posterior chamber or only to the posterior chamber, a diaphragm and three to four small dorsal septa are present, a gular pouch is absent (Klaver 1981).

Distribution: Apart from the type locality (Mt Lefo, Cameroon) *C. q. gracilior* has been recorded from the following localities (Fig. 2): Cameroon: Bamboutos Mts, 2200 m (Böhme 1975b), Foto, Dschang, Bamboutos Mts (Klaver 1981), Mt Oku, Mt Lefo (Böhme 1975a). Nigeria: Obudu plateau (Böhme 1975b).

Biotope: *C. quadricornis gracilior* is found in montane rainforest habitats from 1600 to 2200 m altitude in the Bamboutos Mts, Mt Lefo and Mt Oku in Cameroon and on the Obudu plateau, Nigeria.

### *Chamaeleo (Trioceros) wiedersheimi* Nieden

Original description: Nieden, 1910a. Archiv Naturgesch. 76: 239.

Key to the subspecies:

1. a. Dorsal surface of the casque flat; parietal crest consisting of keeled scales on posterior part of casque; gular crest prominent, consisting of large conical scales; tops of the dorsal crenulation with 2—4 enlarged scales . . . *C. w. wiedersheimi*
- b. Dorsal surface of the casque convex; parietal crest indicated on anterior part of the casque; gular crest consisting of blunt conical scales; tops of the dorsal crenulation with 7—11 enlarged scales . . . . . *C. w. perreti* ssp. n.

*Chamaeleo (Trioceros) wiedersheimi wiedersheimi* Nieden

Original description: See above.

Type specimens: Nieden (1910a) based his description of *C. wiedersheimi* on two specimens, viz. one male from Tsch'a (Bekom), Bamenda district, collected by Glauming and one female from the "Genderogebirge" (= Tchabal Mbabo), 1500 m alt., collected by Riggenbach. He neither designated a type nor mentioned any other specimens. The male specimen was deposited in the museum in Munich (ZSM 23/1925), the female specimen in the museum in Berlin (ZMB 21873). Barbour & Loveridge (1929) referred in their typelist of the MCZ to a specimen of *C. wiedersheimi* (coll. Riggenbach, Banjo Mts) that was obtained by exchange from the Berlin museum as "cotype". Likewise, Mertens (1940) referred to a specimen of *C. wiedersheimi* the Frankfurt museum obtained by exchange from the Berlin museum as "cotype". In his typelist of 1967, however, Mertens did not refer to this specimen. The specimens concerned may be part of a series of specimens that were collected by Riggenbach (the MCZ specimen) and originate from the Berlin museum, it cannot, however, be ascertained that they were part of the series of specimens on which Nieden (1910a) based his description, the more so as Nieden did not mention these specimens in his description. The same applies to five other specimens of *C. wiedersheimi* (coll. Riggenbach, Banjo Mts) that are present in the collection of the Berlin museum. Therefore, we consider the two specimens mentioned at the beginning of this section to constitute the type-series. We select the ZMB specimen as lectotype as Riggenbach deposited his material at the Berlin museum where Nieden studied it. Consequently the ZSM specimen becomes paralectotype.

Lectotype (by present designation): ZMB 21873, ♀, HBL 75 mm, TL 70 mm. Paralectotype: ZSM 23/1925, ♂, HBL 53 mm, TL 48 mm.

Terra typica: Genderogebirge (= Tchabal Mbabo), 1500 m, Cameroon, coll. Riggenbach. Paralectotype from Tsch'a (Bekom), Bamenda district, coll. Glauming. Gartshore (1986) mentioned Bekom in the Bamenda Highlands as type locality. At the time being the type locality included all the places of origin of the syntypes. With the present designation the type locality is restricted to that of the lectotype.

Derivatio nominis: Named after Robert Wiedersheim, professor of comparative anatomy at the University of Freiburg. For biographic notes see Gillispie (1970—80).

Synonymy: *Chamaeleon serratus* Mertens, 1922, Zool. Anz. 54: 191, fig. Terra typica: Südkamerun (Syn. fide Mertens 1940: 240). Mertens (1922) based his description of *C. serratus* on two male specimens, one of which he designated as "Typus", viz. "Mus. Stuttgart, nr. 4640 (♂)". According to Wermuth (in litt., 16. IV. 1979) both specimens are not present in the collection of the Staatliches Museum für Naturkunde, Stuttgart. They were probably lost when the museum was destroyed during Second World War. Although the locality of origin is South Cameroon *C. serratus* is considered synonymous to *C. w. wiedersheimi* because of the characteristics given in the original description. These characteristics conform those of the nominal form, in particular the small number of enlarged scales on top of the scolloped dorsal ridge.

Subsequent studies: Nieden (1910b: 28); Werner (1911b: 16); Germerhausen (1913: 520, fig. 67); Schmidt (1919: 600); Mertens (1922: 191, fig.); Barbour & Loveridge (1929: 240); Pasqual (1937: 34); Angel (1940: 393); Mertens (1940: 239); Monard (1951: 126); Hillenius (1959: 68); Matthey & Brink (1960: 335, figs 2, 3); Hillenius (1963: 207); Mertens (1966: 29); Dunger (1966: 45, fig., 1967: 65, fig.); Mertens (1968: 73, figs 3, 4, partim); Böhme (1975a: 31, 1975b: 125); Klaver (1977: 173, figs 19, 20); Hillenius (1978: 12); Durette-Desset & Vaucher (1979: 511, 513);

Klaver (1981: 43, partim); Böhme & Klaver (1981: 325); Joger (1982: 327); Gartshore (1986: 238, partim); Klaver & Böhme (1986: 24); Böhme & Schneider (1987: 254); Böhme & Nikolaus (1989: 28).

Specimens examined: Cameroon: BM 1967.109-110, Ndu estate, N. of Bansa, Bamenda highlands,  $\sigma$ , 79/76; juv.  $\sigma$ , 58/46. BM 1968.80-81, Ndu estate,  $\sigma$ , 71/71;  $\varphi$ , 74/52. BM 1968.451-52, Ndu estate,  $\sigma$ , damaged;  $\varphi$ , 74/60. BM 1969.1670, Ndu estate,  $\varphi$ , 90/69. MHNG 964-37, Kishong, Bamenda,  $\sigma$ , 70/62. MHNG 1010-49-51, Bangwa, East Bamiléké,  $\sigma$ , 84/65;  $\sigma$ , 80/67; juv.  $\sigma$ , 51/39. MHNG 1365-10, Foumbam, Mt Nkogam,  $\sigma$ , 70/66. MHNG 1365.19-31, Foto, Dschang,  $\sigma$ , 75/64; juv.  $\sigma$ , 52/48; juv.  $\sigma$ , 38/29; juv.  $\sigma$ , 44/35; juv.  $\varphi$ , 57/43;  $\varphi$ , damaged; juv.  $\varphi$  49/41; juv.  $\varphi$ , 48/39; juv.  $\varphi$ , 51/36; juv., 38/31; juv., 33/24; juv., 32/26; juv., 30/24. SMF 29256, between Kishong, Dschigaderi and Ngulu, Bamenda distr.,  $\varphi$ , 60/51. SMF 29251-53, Kishong,  $\varphi$ , 81/65;  $\sigma$ , 74/72;  $\sigma$ , damaged. ZFMK 5798-5801, Oku See, Mt Oku,  $\sigma$ , 83/72;  $\sigma$ , 73/68;  $\varphi$ , 80/59;  $\varphi$ , 67/58. ZMFK 15283, Bambuki See, Mt Lefo,  $\sigma$ , 73/71. ZMFK 41517-18, Akum, near Bamenda,  $\varphi$ , 60/51; 38/31. ZMFK 46200, Bali, near Bamenda,  $\varphi$ , 68/53. AFMK 15284, Dschang,  $\varphi$ , 64/56. SFMK 18105-110, Bafout, Mezam,  $\varphi$ , 88/78;  $\varphi$ , 97/71;  $\sigma$ , 83/75;  $\sigma$ , 77/62;  $\sigma$ , 80/73;  $\varphi$ , 75/58. ZMB 21873, Genderogebirge,  $\varphi$ , 75/70, lectotype. ZMB 21860, Bamenda,  $\varphi$ , 68/61. ZMB 21857 (2 specimens), Banjogebirge,  $\sigma$ , 78/69;  $\varphi$ , 83/70 (Klaver 1981 erroneously coined the Tchabal Mbabo as locality of origin to these specimens). ZMB 21861 (2 specimens), Banjogebirge,  $\sigma$ , 77/76;  $\varphi$ , 78/73. ZMB 24909, Bamendo,  $\sigma$ , 62/53. ZSM 23/1925, Tsch'a (Bekorn), Bamenda,  $\sigma$ , 53/48, paralectotype. ZSM 871/1920, S. Cameroon,  $\sigma$ , 84/77.

Nigeria: AMNH 1010.37-39, N'guroje, Mambila plateau,  $\sigma$ , 87/82;  $\sigma$ , 83/75;  $\varphi$ , 78/59. BM 1967.194, Nigeria,  $\varphi$ , 77/62. BM 1966.262, N'guroje, Mambila plateau,  $\sigma$ , 88/77. BM 1965.865, Maisamari village, Mambila plateau,  $\sigma$ , 82/72. BM 1965.864, N'guroje village,  $\varphi$ , 73/63. UZM-R 51.144-149 and 51.161-170, Obudu plateau,  $\varphi$ , 85/70;  $\sigma$ , 87/74;  $\varphi$ , 75/82;  $\varphi$ , 78/63;  $\varphi$ , 73/60; juv.  $\sigma$ , 60/56;  $\varphi$ , 78/62;  $\varphi$ , 79/65;  $\varphi$ , 78/61;  $\sigma$ , 71/70;  $\sigma$ , 75/69;  $\sigma$ , 72/63;  $\varphi$ , 77/65;  $\sigma$ , 86/81;  $\sigma$ , 65/63. ZFMK 47941, Gangirwal, Gotel Mts,  $\sigma$ , 90/96.

Description: Head: Dorsal surface of the casque flat and covered with relatively large scales, casque slightly elevated posteriorly, in  $\sigma$ , somewhat more than in  $\varphi$ , parietal crest indicated by a row of keeled scales at the posterior part of the casque, temporal and lateral crest present, temporal crest joins the lateral crest at a relatively posterior position where the casque curves gradually upwards, canthi rostrales descend steeply from the orbital crest towards the tip of the snout and meet giving rise to a prominent ridge and a groove above the upper lip, gular crest prominent and consisting of large conical tubercles, behind the nostrils one or several conical scales may be present.

Body: Body scalation heterogeneous with one to three longitudinal rows of enlarged flat tubercles on the flanks in  $\sigma$ , in  $\varphi$  these tubercles are mostly smaller but more numerous,  $\sigma$  without membranous dorsal and caudal keel but anterior part of the dorsum with a crenulate outline, the tops of the crenulation supported by elongated neural spines, the dorsal anterior part of the tail is sometimes slightly crenulate, in  $\varphi$  crenulation much less prominent and mostly absent, the edge of the dorsal ridge consists of a double row of scales, the tops of the crenulation with groups of 2-4 enlarged scales, white midventral line present from throat to anus, sometimes continuing on the ventral side of the tail, the white midventral line extends over 2-3 parallel rows of scales.

Dimensions: TL generally smaller than HBL in both sexes. Maximal dimensions:  $\sigma$ , HBL/TL: 87/82 (AMNH 1010.37);  $\varphi$ , HBL/TL: 95/82 (UZM-R 51-146).

Coloration: Males bright yellowish-green with a yellow band from the underside of the head over the flanks to the groins, on the lower flanks an elongate whitish spot; body, tail and legs covered with numerous small brown-orange specks; enlarged flat tubercles on the flanks brown; midventral line white or yellow; patches of lightblue on the lower lip, gular crest and shoulder; vivid orange patches between the temporal and lateral crests and behind the eyes; eyelids with radial orange striation. Females green with white-green pattern; red-brown coloration on the skull, eyes, dorsum and enlarged flat tubercles on the flanks; midventral line white or yellow; gular crest blue (cf. Angel 1940, Dunger 1966, 1967).

Illustrations: Only three black and white photos of preserved specimens of *C. w. wiedersheimi* are known from literature (Dunger 1967, Mertens 1968).

Hemipenis: Truncus covered with large calyces that extend over the apex to end abruptly between the asulcal sickle-shaped rotulae, margins of the four rotulae finely serrated, medially between the sulcal rotulae is one central papillary field with nine papillae (Klaver & Böhme 1986).

Lung morphology: Except for the most posterior part of the lungs a smooth muscle network covers the luminal surface, two large ventral septa of almost equal size divide the lumen into three successive chambers, a third small ventral septum is present as well, four large diverticula are present, one at the end of each chamber, the fourth one is attached to the posterior chamber just in front of the small ventral septum, a diaphragm and three small dorsal septa are present as well, a gular pouch is absent (Germerhausen 1913, Klaver 197, 1981).

Biology: Females of *C. w. wiedersheimi* have been recorded to deposit 11 eggs in June (Dunger 1967).

Variation: Angel (1940) reported the occasional occurrence of one or two slightly enlarged conical scales on the rostral ridge in males from the Bamboutos Mts. Similar conical scales were observed in five specimens of *C. w. perreti* from the Manengouba Mts (MHNG 1365-12, 14-16, 19).

Distribution: Apart from the type locality (Genderogebirde = Tchabal Mbabo, 1500 m) *C. w. wiedersheimi* has been recorded from the following localities (Fig. 5): Cameroon: Tsch'a (Bekom), Bamenda distr., (Nieden 1910a), Banjo Mts (Barbour & Loveridge 1929), Djuttitsa, Bamboutos Mts, 2000 m (Angel 1940), Bamenda, Kishong, Bamenda distr., between Kishong, Dschigaderi and Ngulu (Mertens 1940), near Lake Oku, Mt Oku (Mertens 1968), Mt Lefo, Dschang, Bamboutos Mts (Böhme 1975a), Bafout, Bamboutos Mts (Böhme 1975a, Joger 1982), Foto, Dschang (Klaver 1981), Ndu estate, N. of Banzo, Bamenda highlands, 7500 ft. (BM 1967.109- 110 a. o.), Foubam, Mt Nkogam (MHNG 1365-10), Akum, near Bamenda (Böhme & Schneider 1987), Bali, near Bamenda (ZFMK 46200).

Nigeria: Nguroji, Mambila plateau, 5000–6000 ft., Maisamari, Mambila plateau, 5000–6000 ft. alt. (Dunger 1966), ? Nsukka (Dunger 1967), Obudu plateau, ca. 1670 m (Böhme 1975b), Gangirwal, 2300 m, Gotel Mts (Böhme & Nikolaus 1989).

Biotope: *C. w. wiedersheimi* has a montane distribution and occurs on trees and bushes in montane grassland from 1500–2200 m alt. in the Tchabal Mbabo, Mt Oku, Mt Lefo, Bamboutos Mts, Mt Nkogam, the Bamenda plateau, the Mambila plateau and the Obudu plateau.

### *Chamaeleo (Trioceros) wiedersheimi perreti* ssp. n.

Diagnosis: This subspecies can be distinguished from the nominal form by the convex dorsal surface of the casque, a parietal crest indicated on the anterior part of the casque, a gular crest consisting of blunt conical scales and 7–11 enlarged scales on the top of the dorsal crenulation.

Type specimens: Holotype: MHNG 1010-52, ♂, HBL 80 mm, TL 68 mm, coll. J. L. Perret. Paratypes: MHNG 920-68 & 69, 964-38 & 39, 965-54, 1010-53, 1365-11, 1365-12-18, SMF 64995-97 and ZFMK 5802-3.

Terra typica: Nsoug, Manengouba Mts, Cameroon.

Derivatio nominis: Named after Dr. J. L. Perret, curator of the Muséum d'Histoire naturelle in Genève, who collected much of the material of this new subspecies. He also pointed out the distinct characters of this form, but kindly left the description to us.

Previous studies: Perret (1957: 82, 86, figs 1, 2, 1959: 253); Mertens (1968: 73, partim); Klaver (1981: 43, partim); Eisentraut (1982: 195); Gartshore (1986: 238, partim).

Specimens examined: Cameroon: MHNG 920-68 & 69, Nsoug, Manengouba Mts, coll. J. L. Perret, 1956, ♂, 78/70; ♀, 72/51 (mistaken as females of *quadricornis* by Perret 1957).

MHNG 964-38 & 39, 965-54 and 1010-52 & 53, Nsoung, Manengouba Mts, coll. J. L. Perret, 1957, ♂, 74/62; juv., 46/42; ♂, 80/71; ♂, 80/63; ♂, 71/73. MHNG 1365-12-16, Nsoung, Manengouba Mts, coll. J. L. Perret, 1973, ♂, 74/66; ♂, 79/65; ♂, 72/62; ♂, 72/58; ♂, 65/57. MHNG 1365-17 & 18, Nsoung, Manengouba Mts, coll. J. L. Amiet, 1971, ♀, damaged; ♀, 84/63. MHNG 1365-11, Mwandong, Manengouba Mts, coll. J. L. Amiet, 1971, ♂, 71/71. SMF 64995-97, Manengouba Mts, coll. M. Eisentraut, 1966/67, ♂, 84/73; ♂, 82/70; ♂, 86/88. ZFMK 5802-3, Manengouba Mts, 1800 m alt., coll. M. Eisentraut, 1966/67, ♂, 73/66; ♂, 63/61.

**Description:** Head: Dorsal surface of the casque not flat but convex, casque moderately elevated posteriorly slightly more so in ♂ than in ♀, parietal crest little developed and only present on the anterior upper surface of the casque, lateral and temporal crest present, they meet relatively posteriorly, posterior part of the casque curves upwards, canthi rostralis descendent steeply from the orbital crests towards the snout and meet above the tip of the snout, forming a prominent ridge and a groove above the upper lip, scales of the gular crest short and blunt, behind the nostrils one or several conical scales.

**Body:** Body scalation heterogeneous with one and sometimes two little developed longitudinal rows of enlarged flat scales on the flanks, ♂ with a moderately developed dorsal crenulation at the anterior part of the back, caudal crenulation indicated, in ♀ this crenulation is less prominent or absent, the edge of the dorsum consists of a double row of scales, the tops of the crenulation (above the elongated neural spines) with groups of 7 to 11 slightly enlarged scales, white midventral line very conspicuous from throat to anus and extending on 3 to 5 parallel rows of scales.

**Dimensions:** TL generally shorter than HBL in both sexes. Maximal dimensions: ♂, HBL/TL: 86/88 (SMF 64997); ♀, HBL/TL: 84/62 (MHNG 1365-18).

**Coloration:** Male green with dark green longitudinal band on the flanks from the shoulder to the groin; a whitish streak above the shoulder; midventral line white; a dark yellow band bordered by dark brown stripes runs from behind the eye to the shoulder; eyes with a radial striation of brown, white and blue; temporal crest vivid blue. Coloration of the female unknown.

**Illustrations:** Perret (1957) gave illustrations of preserved specimens of *C. w. perreti*. The only colour photo available is reproduced on plate 1.

**Lung morphology:** The lungs of *C. w. perreti* are similar to those of *C. w. wiedersheimi* (Klaver 1981).

**Parasitology:** Durette-Desset & Vaucher (1979) described a new species of parasitic nematode from the intestines of *C. w. perreti* (from Nsoung), viz. *Oswaldocruzia gassmannae*.

**Variation:** See *C. w. wiedersheimi* under the same subheading.

**Distribution:** Apart from the type locality (Nsoung, Manengouba Mts) *C. w. perreti* has been recorded from the following localities (Fig. 5): 30 km W. of Nkongsamba, Manengouba Mts (Perret 1957, 1959) near Lake Manengouba (Mertens 1968), Mwandong, Manengouba Mts (MHNG 1365-11). Klaver (1981) erroneously recorded *C. wiedersheimi* from the neighbouring Mt Kupe. However, the specimen involved (MHNG 1365-10) originates from Foubam, Mt Nkogam and belongs to subspecies *wiedersheimi*.

**Biotope:** *C. wiedersheimi perreti* has a montane distribution occurring from 1300 to 1800 m in humid cloud or montane rainforest areas in the Manengouba Mts.

### Acknowledgements

We like to thank the following colleagues who made this study possible by the generous loan of material from the collections under their custody: E. R. Brygoo (MHNP), L. Capocaccia (MCSN), R. C. Drewes (CAS), U. F. Gruber (ZSM), W. R. Heyer (USNM), D. Hillenius† (ZMA), M. Hoogmoed (RMNH), K. Klemmer (SMF), A. G. Kluge (MZM), H. W. Koepcke (ZMH), H. Marx (FMNH), C. J. McCoy (CM), J. L. Perret (MHNG), G. Peters (ZMB), J.

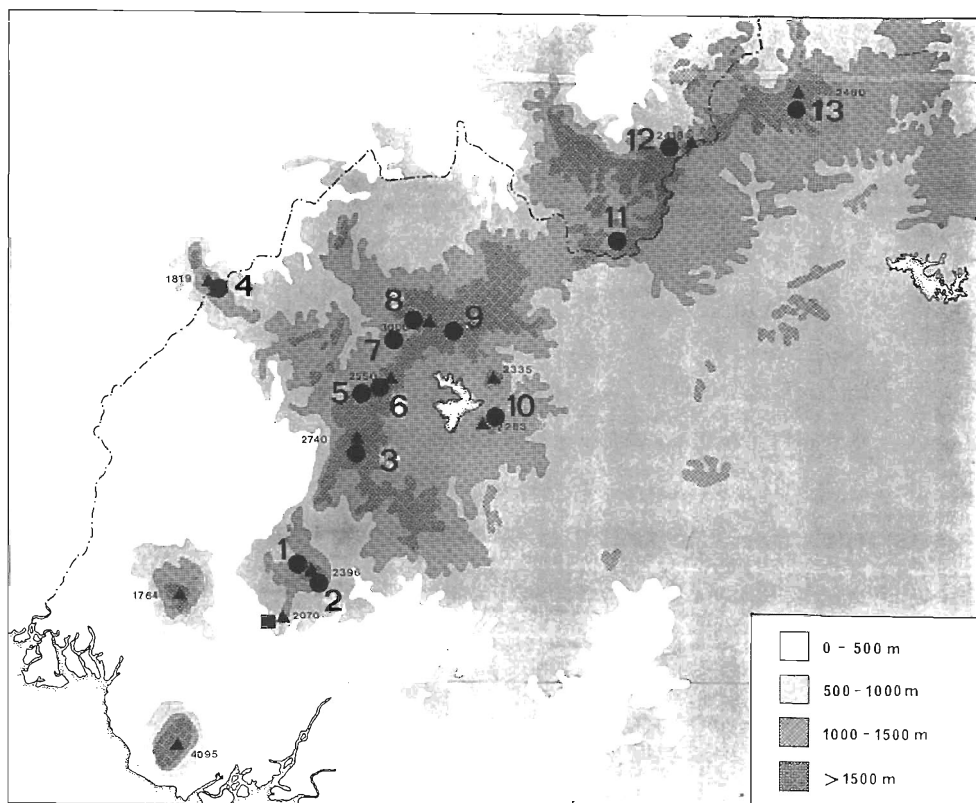


Fig. 5: Distribution of *C. pfefferi* (square, only specimen known from Mt Kupe) and of *C. wiedersheimi* (●) in Cameroon and Nigeria. 1 — Mwandong and Lake Manengouba, 2 — Nsoug = 30 km W of Nkongsamba/Manengouba Mts, 3 — Djuttitsa and Foto, Dschang/Bambouto Mts, 4 — Obudu Plateau, 5 — Tscha Bekom, Kishong etc. near Bamenda, 6 — Lake Bambului/Mt Lefo, 7 — Bafout, 8 — Lake Oku, 9 — Ndu Estate N of Banzo = Kumbo, 10 — Foumban/Mt Nkogam, 11 — Nguroji and Maisamari/Mambila Mts, 12 — Gangirwal/Gotel Mts, 13 — Gendero or Banyo Mts = Tchabal Mbabo. For locality references see text.

B. Rasmussen (UZM), A. F. Stimson (BM), T. M. Uzzell (ANSP), E. E. Williams (MCZ) and R. G. Zweifel (AMNH). We also gratefully acknowledge M. Eisentraut (ZFMK), H. Dischner† (ZFMK), J. L. Perret (MHNG), E. Schmitz (ZFMK), J. Steinfurth (Köln) and E. Wallikewitz (Brühl) for supplying us with photo material; Ms. U. Bott (ZMFK) for preparing the maps and Mrs. M. C. A. Oostinga-de Haan, Ms. A. M. Gerretsen and Mrs. W. van der Berg for typing the text.

#### Zusammenfassung

Eine Revision der *Chamaeleo cristatus*-Gruppe innerhalb der Untergattung *Trioceros* von *Chamaeleo* (sensu Klaver & Böhme 1986). Sie umfaßt alle verfügbaren Informationen (Typen, Morphologie, Ikonographie, Anatomie, Taxonomie, Verbreitung, Ökologie einschl. Parasiten) über die Arten *camerunensis*, *cristatus*, *eisentrauti*, *feae*, *montium*, *pfefferi*, *quadricornis* und *wiedersheimi*. Von letzterer wird eine neue Unterart, *C. w. perreti*, beschrieben. Eine möglichst vollständige Bibliographie wird gegeben.

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