

Chamaeleo (Trioceros) ntunte sp. n., a new chameleon species from Mt. Nyiru, northern Kenya (Squamata: Sauria: Chamaeleonidae)

Chamaeleo (Trioceros) ntunte sp.n.,
eine neue Chamäleonart von Mt. Nyiru, Nord-Kenia
(Squamata: Sauria: Chamaeleonidae)

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KURZFASSUNG

Eine neue Chamäleonart – *Chamaeleo (Trioceros) ntunte* – wird aus Kenia beschrieben. Sie bewohnt Biotope im feuchten Montanwald von Mt. Nyiru, im nördlichen Grenzgebiet von Kenia, woher bisher kein Chamäleon bekannt war. Die neue Art ist ein weiteres Mitglied aus dem "*Ch. bitaeniatus* - Komplex", unterscheidet sich von allen anderen bisher bekannten Formen dieser Gruppe jedoch klar in Merkmalen der externen und Hemipenis-Morphologie, Färbung, Biologie und durch ihre geographische Isolation.

ABSTRACT

A new species of chameleon – *Chamaeleo (Trioceros) ntunte* – is described from Kenya. It inhabits humid montane habitats on Mt. Nyiru in the Northern Frontier Division of Kenya, where no chameleon has been previously recorded. The new species is a further member of the "*Ch. bitaeniatus* complex", but clearly distinct from other members of the complex by a specific combination of features of external morphology, coloration, biology and its geographical isolation.

KEY WORDS

Reptilia: Squamata: Sauria: Chamaeleonidae: *Chamaeleo (Trioceros) ntunte*, new species, taxonomy, Kenya

INTRODUCTION

There are about 20 chameleon species known to occur in Kenya (KLAVER & BÖHME 1997; NECAS 1999; SPAWLS et al. 2002), representing both widespread pan-African species, inhabiting mainly savannah habitats at lower elevations [e.g. *Chamaeleo (Ch.) gracilis* HALLOWELL, 1842; *Ch. (Ch.) dilepis* LEACH, 1819] as well as several forms, limited mainly to montane habitats at higher altitudes [e.g. *Chamaeleo (Trioceros) jacksonii* BOULENGER, 1896; *Ch. (T.) hoehnelii* STEINDACHNER, 1891; *Ch. (T.) narraioca* NECAS et al. 2003; *Ch. (T.) schubotzi* STERNFELD, 1912; *Bradypodion tavetanum* (STEINDACHNER, 1891), *B. excubitor* (BARBOUR, 1911)]. In the last decade, the following taxonomic contributions have been published on Kenyan chameleons: EASON et al. (1988) reanalyzed subspecies of *Ch. jacksonii*, and various chameleon forms were described: *Ch. (T.) marsabiten-*

sis TILBURY, 1991 (from Mt. Marsabit), *Ch. (T.) tremperi* NECAS, 1994 (from western Kenyan highlands), *B. tavetanum boehmei* LUTZMANN & NECAS, 2002 (from the Taita Hills) and *Ch. (T.) narraioca* NECAS, MODRÝ & ŠLAPETA, 2003 (from Mt. Kulal).

Molecular phylogenetic analyses of a large dataset of the family Chamaeleonidae, indicates that the majority of species are older than three million years (TOWNSEND & LARSON 2002). Importantly, this study identified within the subgenus *Trioceros* 4% pairwise mtDNA sequence divergence between *Ch. rudis* BOULENGER, 1906 and *Ch. sternfeldi* RAND, 1963, justifying the species status of the later. The current knowledge of the distribution and species diversity of chameleons therefore should take into account the association of individual taxa with montane forest complexes and, consequently, vicariant mode of their distribution.

The mountains of East Africa have been considered as refugia that provide relatively stable montane forest environments during the Quaternary and as sites of recent speciation. Such relict mountain localities were examined for the presence of chamele-

ons during the past six years (NECAS et al. 2003). A field trip to the forest zone of Mt. Nyiru in the Northern Frontier Division of Kenya confirmed the occurrence of a chameleon species, previously not known to science, which we describe below.

TAXONOMY

Chamaeleo (Trioceros) ntunte sp. n.

Material examined

Holotype: ZFMK (Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany) 73963, subadult male collected 11. II. 2001 at Kosi Kosi (02° 07'25"N, 036°51'01"E) on top of Mount Nyiru (alt. 2650 m a.s.l.), Northern Frontier Division of Kenya, by David MODRÝ, Jan R. ŠLAPETA and Jiří VOLF.

Paratypes: ZFMK 74221, 82146, two females, same collection and locality data as holotype, and ZFMK 82147-148, two juveniles born by the female ZFMK 74221.

Diagnosis

A small, stout-bodied and short-headed chameleon, a member of the genus *Chamaeleo* subgenus *Trioceros* (sensu KLAVER & BÖHME 1986), member of the "*Ch. bitaeniatus* complex", member of the "subgroup of *Ch. rudis*" (sensu RAND 1963), reaching a maximum total length of around 15 cm, with tail length approximately equal to snout-vent length. The body scalation is heterogeneous in males, with only few significantly enlarged lenticular scales on the flank; almost homogeneous in females. The gular crest is weak, the ventral crest indistinct. The head wears a low casque, having a sharp parietal crest, slightly exceeding the dorsal crest on neck. Canthi rostrales become indistinct above the mouth tip.

Chamaeleo ntunte sp. n. differs from other members of the "*Ch. bitaeniatus* complex" in external and hemipenial morphology, coloration, and geographical isolation (see table 1).

Description of the holotype

The type specimen of *Chamaeleo ntunte* sp. n. is a small, stout-bodied chameleon, with a total length of 74 mm and 43 mm snout-vent length (the tip of the tail is amputated). The scalation is heterogeneous, consisting of small standard scales and slightly enlarged tubercular and lenticular scales (not even twice the diameter of the standard scales), disseminated on the body sides. The exceptions are the almost homogeneously scaled belly, legs and underside of the tail. The enlarged scales are organized on a longitudinal line on each flank, extending from behind the eye to the pelvic region. The enlarged scales tend to be in pairs: two scales are either touching each other or separated by one small scale only, while the pairs are separated from each other by a number of small scales. A second, less expressed, interrupted row of enlarged scales extends from the armpit to the groin emarginating the almost uniformly scaled belly. The fingers terminate in fine, single, white claws. There are no tarsal spurs on the hind-feet; the soles of the extremities are smooth.

The dorsal crest is composed of series of mostly 4 (rarely 3) conical scales increasing successively in size caudally, giving the back a slightly serrate appearance, extending to the tail, where it becomes almost indistinct in its proximal third. The gular crest is very weak, being composed of conical scales only slightly larger than the surrounding scales. The throat has narrow longitudinal grooves between the rows of standard scales of almost equal size. The ventral crest is indistinct; it is only indicated by a white midventral line.

Table 1: Basic morphological features distinguishing *Chamaeleo ntunte* sp. n. from other members of the "*Ch. bitaeniatus* complex".

Tab. 1: Grundlegende morphologische Merkmalsausprägungen, durch die sich *Chamaeleo ntunte* sp. n. von anderen Mitgliedern aus dem "*Ch. bitaeniatus* - Komplex" unterscheidet.

Species / Group Art / Gruppe	Range area Verbreitungsgebiet	Distinguishing features of / Unterschiede von <i>Chamaeleo ntunte</i> sp. n.
<i>Ch. bitaeniatus</i>	Disjunctly widespread in East Africa (Tanzania, Kenya, Uganda, Sudan, Ethiopia)	Short head (less than twice as long as wide)
<i>Ch. ellioti</i>	Western Kenya, Uganda, Southern Sudan, Kongo, Rwanda, Burundi	Short head (less than twice as long as wide)
<i>Ch. kinetensis</i>	Southern Sudan (Imatong Mts.)	Short head (less than twice as long as wide)
<i>Ch. balebicornutus</i>	Southeastern Ethiopia (Bale Mts.)	No rostral appendix
<i>Ch. conirostratus</i>	Southern Sudan (Imatong Mts.)	No rostral appendix
<i>Ch. marsabitensis</i>	Northern Kenya (Mt. Marsabit)	No rostral appendix
<i>Ch. harennae</i>	Southeastern Ethiopia (Bale Mts.)	Convex casque, weak gular crest
<i>Ch. hoehnelii</i>	Kenya, Eastern Uganda	Weak gular crest, low casque, no rostral appendix
<i>Ch. narraiooca</i>	Northern Kenya (Mt. Kulal)	Low casque, no rostral appendix
<i>Ch. rudis</i>	Western Uganda, Eastern D. R. Congo (Ruwenzori Mts.)	Weak gular and dorsal crests, unique arrangement of interorbital tubercular scales
<i>Ch. schoutedeni</i>	Eastern D. R. Congo (Mt. Kabobo)	Low casque, weak gular and dorsal crests, no rostral ridge, unique arrangement of interorbital tubercular scales
<i>Ch. schubotzi</i>	Central Kenya (Mt. Kenya, Aberdares)	Weak gular and dorsal crests, nearly homogeneous body scalation, unique arrangement of interorbital tubercular scales
<i>Ch. sternfeldi</i>	N Tanzania (Mt. Meru, Mt. Kilimanjaro)	Weak gular and dorsal crests, nearly homogeneous body scalation, unique arrangement of interorbital tubercular scales

The head is very short, being significantly less than twice as long as wide (RHW = 1.875). For explanation of abbreviations and definition of distances measured see caption of table 2. It wears a very low casque, covered by slightly enlarged flat scales. The level of the casque exceeds the level of the dorsal crest on neck just by 1.5 mm. The head length (tip of mouth to posterior margin of casque) is 15 mm; the casque height (angle of mouth to the top of the casque) is 10 mm, slightly less than the length of the mandible (12 mm). There are no occipital flaps.

The distinct sharp parietal crest starts posteriorly with one significantly enlarged scale, extending rostrally as a double series of six scales in each series terminating in one single scale just between the posterior margins of the orbitae. There is a disrupted prolongation of the parietal crest rostrally between the eyes, consisting of two praeparietal fields of enlarged and prominent tubercular scales, four in the posterior field, two in the rostral field. The fields are separated from each other by a fissure (diasthema) as is the posterior field from

the parietal crest proper. The praeparietal fields are laterally joined with analogous paramesial fields of enlarged tubercles, consisting of five (right) resp. seven (left) scales posteriorly and one scale on each side rostrally, all well separated from the praeparietal fields by a fissure. The supra-orbital and lateral crests proper are composed of slightly enlarged scales, the latter becoming indistinct posteriorly, not reaching the top of the casque. The canthi rostrales become indistinct rostrally. The nares are situated relatively close to the eye, at about 2/3 of the distance between the mouth tip and the rostral rim of the orbit (fig. 1).

Hemipenial morphology. The entire truncus of the hemipenis is covered by relatively shallow hexagonal calyces with smooth margin, reaching at the sulcal side to the sulcal lips. The surface of the apex wears two well developed pairs of rotulae, scattered papillae are found on the field between them. Sulcally, between the lower pair of rotulae, two papillary fields composed of six to seven thick, low, rounded papillae are situated (fig. 2).

Table 2: Morphometry of the type series of *Ch. ntunte* sp. n. CH - Casque height (angle of mouth to top of casque), CN - "Casque exceeding neck" (distance between top of casque and level of the dorsal crest on neck), HBL - Snout-vent-length (tip of mouth to cloacal fissure), HBTL - Total length (tip of mouth to tail tip), HL - Head length (tip of mouth to posterior margin of casque), HW - Head width (at the widest place behind the orbit), ML - Mandible length (tip of mouth to angle of mandible), RCH - Relative casque height (CH/ML), RCN - Relative length of "Casque exceeding neck" (CN/ML), RHW - Relative head width (HL/HW), RTL - Relative tail length (TL/HBTL), TL - Tail length (cloacal fissure to tail tip), * - tail tip amputated, ** - body cavity contains nine well developed embryos.

Tab. 2: Morphometrie der Typuserie von *Ch. ntunte* sp. n. CH - Helmhöhe (Mundwinkel bis Helmspitze), CN - "Helm überragt Hals" (Entfernung von Helmspitze zu Rückenfirst im Halsbereich), HBL - Kopf-Rumpf-Länge (Schnauzenspitze bis Kloakenspalt), HBTL - Gesamtlänge (Schnauzenspitze bis Schwanzspitze), HL - Kopflänge (Schnauzenspitze bis Helm-Hinterrand), HW - Kopfbreite (an der breitesten Stelle hinter der Orbita), ML - Unterkieferlänge (Schnauzenspitze bis Kieferwinkel), RCH - Relative Helmhöhe (CH/ML), RCN - Relative Länge von "Helm überragt Hals" (CN/ML), RHW - Relative Kopfbreite (HL/HW), RTL - Relative Schwanzlänge (TL/HBTL), TL - Schwanzlänge (Kloakenspalt bis Schwanzspitze), * - Schwanzspitze unvollständig, ** - Körperhöhle enthält neun wohl entwickelte Embryonen.

Type series		Holotype	Paratype 1	Paratype 2**	Paratype 3	Paratype 4
Collection Nr.		ZFMK 73963	ZFMK 74221	ZFMK 82146	ZFMK 82147	ZFMK 82148
Sex		male	female	female	juvenile	juvenile
HBTL	Total length (mm)	74	149	141	75	63
HBL	Snout-vent length (mm)	43	79	72	37	32
TL	Tail length (mm)	31*	70	69	38	31
RTL	Relative tail length	0.419*	0.470	0.489	0.506	0.492
HL	Head length (mm)	15	22	21	11,5	11,5
HW	Head width (mm)	8	13	11	6,5	6,5
RHW	Relative head width	1.875	1.692	1.909	1,769	1.769
ML	Mandible length (mm)	12	17	16	9	8
CH	Casque height (mm)	10	15	13	8	7
RCH	Relative casque height	0.833	0.882	0.812	0.889	0.875
CN	Casque exceeding neck (mm)	1.5	2.5	2	1.5	1
RCN	Relative casque exceeding neck	0.125	0.147	0.125	0.167	0.125

Coloration and pattern. When alive, the typical coloration of the type was as follows. The basic color of the body is yellowish with irregular brown markings. There is a longitudinal brown stripe on each flank corresponding with the upper row of enlarged scales. Another disrupted brown stripe emarginates the belly. There are three light brown crossbars on the flanks. The dorsal crest is yellow. The belly is uniformly greyish brown, lighter than the flanks. The gular crest is white, as is the midventral line. The tail is more or less distinctly ringed with regular paler and darker rings. The extremities are the same color like the body outside, yellowish inside. The throat is pale turquoise. The coloration of the mouth mucosa is yellow, the tongue is somewhat darker. The lumen of the temporal gland situated in and above the angle of the mouth is black. Due to the ability to change colors, the coloration is, however, rather variable (fig. 3).

Color in alcohol. Uniform pale gray, the insides and soles of the legs are creme, the eyelids and cranial crests are black. The enlarged body scales as well as the gular and ventral crests are whitish, forming weak longitudinal lines.

Etymology

The species name of the Mount-Nyiru-Chameleon is a Latin phonetic transcription of the Samburu local term "n'tunte" (meaning "having a large belly") that is commonly used for chameleons in the vicinity of South Horr village.

Variation of the paratypes

The variation of the type-series is summarised in the table 2 and commented further.

Coloration and pattern. The basic pattern of females corresponds with

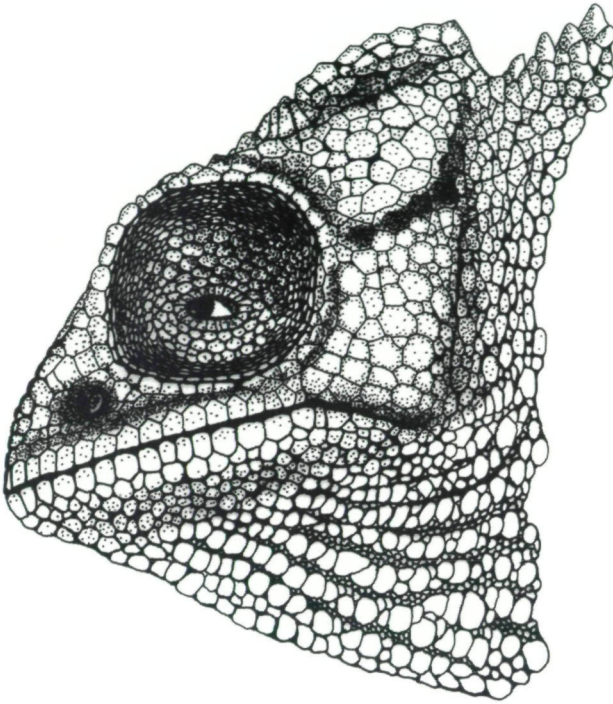


Fig. 1: Head of the male type specimen of *Chamaeleo ntunte* sp. n. (ZFMK 73963).
Drawing: Jan R. ŠLAPETA.

Abb. 1: Kopf des männlichen Typusexemplars von *Chamaeleo ntunte* sp. n. (ZFMK 73963).

the description given for the type. There are two typical color phases in females. The first is a uniform bright green, with only few brown dots on the flanks, corresponding with the enlarged scales. The second is composed of shades of light and dark brown, while there is a disrupted longitudinal white stripe on each flank; the throat and belly are whitish (fig. 4).

The females have an almost homogeneous scalation, the enlarged scales are found only on the sides of the proximal part of the tail and few (approximately six) are situated on one line, analogous to the upper one of the male.

The juveniles have all features less developed than the adults.

Sexual dimorphism is expressed by the above mentioned dichromatism, the presence of an almost homogeneous scalation in females and mainly by the thickened tail-base in males.



Fig. 2: Schematic drawing of the hemipenis of *Chamaeleo ntunte* sp. n. (ZFMK 73963).
Drawing: Jan R. ŠLAPETA.

Abb. 2: Schematische Zeichnung des Hemipenis von *Chamaeleo ntunte* sp. n. (ZFMK 73963).



Fig. 3: Male of *Chamaeleo ntunte* sp. n. (holotype, ZFMK 73963). Photo: D. MODRÝ.
Abb. 3: Männchen von *Chamaeleo ntunte* sp. n. (Holotypus, ZFMK 73963).



Fig. 4: Female of *Chamaeleo ntunte* sp. n. (paratype, ZFMK 74221) in its natural habitat. Photo: D. MODRÝ.
Abb. 4: Weibchen von *Chamaeleo ntunte* sp. n. (Paratypus, ZFMK 74221) im natürlichen Lebensraum.

BIOLOGY

Habitat

Chamaeleo ntunte is endemic to Mt. Nyiru, where it inhabits moorlands at the upper margin of the relict montane forest, above the bamboo zone, at an altitude of 2500-2700 m a.s.l. Local Samburu people inhabiting Mt. Nyiru reported the association of *Ch. ntunte* with shrub vegetation and solitary trees close to their settlements.

Notes on Life History

Chamaeleo ntunte is a rather slow and quiet species, if compared to other chameleons. In the beginning of February 2001 (when the type series has been collected), both collected females were gravid. It is ovoviviparous, as one female (ZFMK 82146) contains nine embryos in its oviducts (five in the right one, four in the left one),

and the second female (ZFMK 74221) gave birth to 11 young in March 2001.

Conservation Status

Chamaeleo ntunte is endemic to the higher altitudes at Mt. Nyiru. Despite the fact, that Mt. Nyiru area is designated as forest reserve, it is under continuous anthropogenous pressure. Even moorlands and montane meadows on the very top of the mountain range are used for extensive grazing by Samburu shepherds, montane forest is furthermore degraded by collection of timber wood and charcoal (authors' observation). It has to be pointed out, that the occurrence of *Ch. ntunte* is probably limited to only a very small area of several square kilometres. Thus, its is one of the smallest distributional ranges of African continental chameleon forms.

DISCUSSION

The described hemipenial structures with calyculated truncus and four apical rotulae justify the including of *Ch. ntunte* to the subgenus *Trioceros* SWAINSON, 1839 (sensu KLAVER & BÖHME 1986). The relatively short head together with its inconspicuous external morphology and small size puts it to the "subgroup of *Ch. rudis*". It is clearly distinct from all other members of *Ch. bitaeniatus* complex, as it is shown in the table 1.

Species of *Ch. bitaeniatus* complex generally show three types of altitudinal distributional patterns: (i) widely distributed species inhabiting low to medium altitudes [*Ch. bitaeniatus* FISCHER, 1884, *Ch. ellioti* GÜNTHER, 1895], (ii) montane species distributed in several mountain ranges [*Ch. hoehnelii* STEINDACHNER, 1891] and (iii) montane species with a range strictly limited to a single mountain or two neighbouring mountains [all other species – see tab. 1]. The montane environment pressure together with the absence of syntopic chameleon species results in similar body form of the taxa of the "subgroup of *Ch. rudis*", regardless the distance of mountains they inhabit.

Thus, the locality should always be considered in species determination.

Chamaeleo ntunte is a further example of the uniqueness of afromontane fauna. The understanding of the evolutionary processes within the *Ch. bitaeniatus* complex, as it seems to be a rather good example of widely distributed and simultaneously finely diversified animal group, might contribute to the overall biogeographical knowledge on East-Africa.

Chamaeleo ntunte represents the only species known to inhabit higher elevations of Mt. Nyiru. According to our field records, *Ch. gracilis* is quite abundant in the *Acacia* scrubland on the foot of the Nyiru massive, up to 1000 m a.s.l. Furthermore, we recorded *Ch. bitaeniatus* on the immediately neighboring Mt. Supuko at 1800 m a.s.l. The local people reported also on the occurrence of another species of chameleon, inhabiting the trees in the montane forest on Mt. Nyiru, said to wear a serrated back and horns above the mouth-tip and a "beard" in the gular region. The existence of a further, most likely also undescribed species there is, therefore, not improbable.

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