

Description of a new species of African skink of the genus *Trachylepis* (Reptilia: Squamata: Scincidae)

Beschreibung einer neuen afrikanischen Skinkart der Gattung *Trachylepis*
(Reptilia: Squamata: Scincidae)

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KURZFASSUNG

Auf der Grundlage aus Tansania/Ostafrika importierter und in Deutschland nachgezüchteter Tiere sowie eines Exemplares mit definierter Herkunft (Zentraltansania) wird eine neue Art der Gattung *Trachylepis* (Scincidae) beschrieben. Die neue Art ist offenbar ein Schwestertaxon der in Ostafrika und auf der Arabischen Halbinsel weit verbreiteten *Trachylepis brevicollis* (WIEGMANN, 1837), unterscheidet sich davon jedoch durch geringere Größe, höhere Schuppenzahlen um die Körpermitte, eine größere Anzahl an Paravertebralia, zwei anstatt von drei Kielen auf den Dorsalia, unterschiedliche Färbung der Jungtiere und ausgeprägten Sexualdichromatismus. Anhand einer Kombination der genannten Merkmale läßt sich die neue Art auch von allen anderen Skinken der Gattung *Trachylepis* abgrenzen. Molekulare Befunde, basierend auf der Untersuchung von drei mitochondrialen Genen, unterstützen die auf morphologischer Basis getroffene Entscheidung.

ABSTRACT

A new species of the lygosomine scincid lizard genus *Trachylepis* is described from captive animals of Tanzanian origin and a wild-caught specimen from central Tanzania. The species is most similar to the widespread East African-Arabian *T. brevicollis* (WIEGMANN, 1837), but differs in its smaller size, increased midbody and vertebral scale row count, two (versus three) keels on dorsal scales, coloration of newborns and its pronounced sexual dichromatism. These features also serve to distinguish the new species from all other congeners. Molecular data also support the distinctiveness of the taxon, which exhibits relatively high genetic divergence from its apparent sister species, *T. brevicollis*, for three mitochondrial genes investigated.

KEY WORDS

Reptilia: Sauria: Squamata: Scincidae, *Trachylepis* sp. n., *Trachylepis brevicollis*, Tanzania, sexual dichromatism, morphology, taxonomy, systematics

INTRODUCTION

The speciose and widespread lygosomine scincid genus *Mabuya* was recently dismantled by MAUSFELD et al. (2002, 2004), who identified monophyletic units on the basis of molecular phylogenetic evidence. Afro-Malagasy *Mabuya* were assigned by these authors to the genus *Euprepis* WAGLER, 1830 and Middle Eastern *Mabuya* have also been shown to be members of this same clade (MAUSFELD & SCHMITZ 2003). BAUER (2003) demonstrated that *Trachylepis* FITZINGER, 1843, rather than *Euprepis*, was the first available generic name applicable to the species in this clade.

Trachylepis brevicollis (WIEGMANN, 1837) is one of several African members of the genus that has a wide distribution, extending from Tanzania in the south to

Sudan in the north and east into the Arabian Peninsula. Although geographic variation in this species has not been formally assessed, the large number of synonyms currently attributed to it (LOVERIDGE 1957) is reflective of the high degree of variation it expresses across its range. The species was first described as *Euprepes brevicollis* by WIEGMANN (1837), who gave the type locality simply as "Abyssinien" [= Eritrea]. SCHÄTTI & GASPERETTI (1994) argued that the precise locality is likely to have been Massawa [= Mitsiwa], Eritrea and, more recently, SCHÄTTI & GÜNTHER (2001) suggested that Hauakil [= Howakil Island (15° 10'N, 40°16'E), Eritrea] might be the true type locality. WIEGMANN (1837) also described *Euprepes pyrrhocephalus*, long con-

sidered a synonym of *T. brevicollis* (BOULENGER 1887), with its type locality at Aschik [=Zahrat Ashiq (16°26'N, 42°38' E), Saudi Arabia]. The nomenclatural history of this taxon was reviewed by SCHÄTTI & GÜNTHER (2001).

Although the status as synonyms of several names associated with type specimens from the Red Sea region appears to be stable (LOVERIDGE 1957; ARNOLD 1980), that of East African forms remains unresolved pending a thorough revision (LANZA 1972). Interestingly, no names have previ-

ously been proposed for the Tanzanian populations of *T. brevicollis* which, in addition to being the southernmost populations, are disjunct from the contiguous portion of the species' distribution, which terminates in Kenya (SPAWLS et al. 2002). In this paper we describe a new species of *Trachylepis* from Tanzania which appears to be most closely allied to *T. brevicollis* and which is conspecific with an undescribed species (reported as *Euprepis* sp. nov.) by MAUSFELD & SCHMITZ (2003).

MATERIALS AND METHODS

Specimens — All specimens in the type series which have been deposited in the collection of the Institut für Systematische Zoologie (the former Zoologisches Museum Berlin), Museum für Naturkunde der Humboldt-Universität, Berlin, ZMB, are derived from animals from the pet trade and/or from animals kept by private terrarium keepers. The first animals were imported from Tanzania at the beginning of the 1990s. There is often doubt associated with the real origin of material derived from the pet trade, and in the present case such doubt cannot be eliminated completely. We see, however, no reason to accept any other locality than Tanzania as the area of origin for the ZMB animals treated herein. This view is supported by one subadult female from the type series (deposited in the Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, ZFMK) which clearly belongs to the new species and which was collected near Dodoma in central Tanzania and by the reliable reporting of skinks similar to our captive specimens by researchers collecting in Tanzania (William Roy BRANCH, X. 2004, pers. comm.).

The animals were initially offered in the animal trade under several different names, but were eventually sold as "*Mabuya brevicollis*", a species to which the new form is closely related. Altogether we acquired two males, seven females and three newborn animals. Most animals were obtained after their deaths and were received by us as frozen specimens, however, the holotype (ZMB 67016) and one adult female paratype

(ZMB 67017) were obtained alive. The latter specimens were photographed alive and fixed in denatured 80% ethanol, in order to facilitate tissue sampling for DNA sequencing. The frozen material was also ultimately transferred into 80% ethanol. Wolfgang BÖHME (in lit.) reported on the origin of the ZFMK specimen which he received "although this specimen derives also from a commercial import from Tanzania, my own inquiries at the importers led to the result that it derives from the area of Dodoma in central Tanzania".

In addition to data from the relevant literature, the most important comparative material, we examined, were the two syntypes of *Euprepes brevicollis* (ZMB 1221 and ZMB 1222) as well as three syntypes of *Euprepes pyrrocephalus* (ZMB 1299, ZMB 62766 [ex ZMB 1299] and ZMB 1220; see BAUER et al. 2003 for a discussion of these specimens).

For both the type series and the comparative material measurements were taken and scale counts recorded. Dimensions greater than 10 mm were measured to the nearest 0.1 mm with a sliding calliper, whereas measurements less than 10 mm were made with an ocular micrometer in a dissecting microscope. Hemipenes were everted by an injection of ethanol into the hemipeneal cavities of the freshly dead holotype, so that these structures could be examined and measured.

Molecular data — DNA sequence variation between *Trachylepis* sp. nov. and *Trachylepis brevicollis* (its presumed sister

Table 1: Primers used for amplification of DNA sequence data.
Tab. 1: Zur Amplifizierung der DNS-Sequenzen verwendete Primer.

Primer name	Sequence 5'-3'	Reference
Cytb WWF	AAAYCAYCGTTGTWATTCAACTAC	This study
Cytb WWR	TGGCCRATGATRATAAATGGG	This study
Cytb F.1	TGAGGACARATATCHTTTGRGG	WHITING et al. 2003
Cytb 2	CCCTCAGAATGATATTTGTCCTCA	PALUMBI et al. 1991
16S F.1	TGTTTACCAAAAACATAGCCTTTAGC	WHITING et al. 2003
16S R.0	TAGATAGAAACCGACCTGGATT	WHITING et al. 2003
12S tPHE	AAAGCACRGCACCTGAAGATGC	WIENS & REEDER 1997
12S K-H	TCCRGTA YRCTTACCDTGTTACGA	GOEBEL et al. 1999
12S A-L	AAACTGGGATTAGATACCCCACTAT	PALUMBI et al. 1991
12S R.4	GACGGCGGTATATAGGCTG	WHITING et al. 2003

species) was examined using portions of three mitochondrial genes; 12S rDNA (934 bp), 16S rDNA (549 bp), and cytochrome b (cyt b, 543 bp). DNA was extracted from liver or muscle tissue preserved in 95-100% ethanol using the Qiagen DNeasy kit (Valencia, CA). DNA templates and controls were amplified using standard PCR techniques in 25 µl reactions, and products were visualized via 2% agarose gel electrophoresis. Portions of the 12S rDNA, 16S rDNA, and cytochrome b (cyt b) genes were amplified using the primers listed in table 1 and the following cycling profile: 95° (3:00); 94° (0:30), 50° (0:30), 72° (1:00) x 40 cycles; 72° (5:00). Target products were purified using the Montage™ PCR₉₆ Filter Plate and Kit (Millipore Co.) and sequenced using the Perkin Elmer Big Dye® version 3 cycle sequencing kit. Sequencing reactions were purified using Sephadex® in Multi Screen™ Durapore PVDF plates (Millipore Co.). Purified sequencing reactions were analyzed on an ABI 3730 automated se-

quencer. To insure the accuracy of sequences, negative controls were included, complementary strands were sequenced, and sequences were manually checked using the original chromatograph data in the program Sequencher® 4.2 (GeneCodes Co.). Sequences were deposited in GenBank under accession numbers AY907711-AY907716. PAUP*4.0 (SWOFFORD 2002) was used to compute uncorrected pairwise distances for all sequences. Only one specimen of both *Trachylepis brevicollis* (California Academy of Sciences, CAS 198871, Kajado District, Rift Valley Province, Kenya) and *T. sp. nov.* (ZMB 67016) were available for analysis, therefore sequences from three specimens of *T. affinis* (GRAY, 1838) (unpublished data) were used as a comparison of intraspecific levels of variation within the genus. According to a very recent publication (MAUSFELD et al. 2004), which was not known to us during our investigations, *T. affinis* is not monophyletic. But this fact does not affect the principal results of our study.

RESULTS AND DISCUSSION

Trachylepis dichroma sp. nov.

Holotype — ZMB 67016, adult male, purchased from the Berlin animal shop „Matamata“ on 30 September 2004. The animal was born at the end of 1993 or at the beginning of 1994 as the offspring of an imported pair in Germany and lived up to the year 2003 with the Berlin herpetoculturist Peter HARBIG. The presumed origin of its parents was Tanzania, East Africa.

Paratypes — ZMB 57533, adult male; ZMB 57096, ZMB 57534, semiadult females; ZMB 61835, ZMB 61836, ZMB 67017 and ZMB 67018, all adult females; ZMB 57097, subadult female and ZMB 57531, ZMB 57532 and ZMB 67019, all young animals only a few days old. All these paratypes lived for varying periods of time in the care of Peter HARBIG, who, after

their respective deaths (with the exception of ZMB 67017, see above) in the second half of the 1990s and at the beginning of the 2000s, donated them to the Herpetological Department of the Institut für Systematische Zoologie (formerly Zoologisches Museum) of the Museum für Naturkunde Berlin. ZFMK 71721, a subadult female, was collected in July 1999 by a local collector near Dodoma in central Tanzania.

Diagnosis — The combination of the following characteristics serves to diagnose the new species with respect to all other *Trachylepis*: SVL of adults (90)100–120 mm, midbody scale rows 36–38, number of paravertebral scales 52–57 and two keels on dorsal and lateral scales.

Description of the holotype (fig. 1) — Measurements and scale counts are presented in table 2. Arrangement and relative size of the head-, body- and tail scales are typical for *Trachylepis*. Robust body with powerful legs, which clearly overlap when adpressed against the body; each extremity with five fingers and/or toes, relative length of fingers $3 > 4 > 2 > 5 > 1$, relative length of toes $4 > 3 > 2 > 5 > 1$. Tail with an 11 mm long regenerated tip and with total length approximately as long as SVL, its basal part trapezoidal and the distal half vertically oval in cross section. Head somewhat longer than broad, relatively pointed and at the level of the ear openings just as broad as in the neck region, snout convex in profile, ear opening vertically oval, 1.5 x 3.0 mm, and with one or three small anterior lobules. Relatively large nostril sunk into the rear edge of the small nasal, a small postnasal, which borders the nostril directly.

Supranasals with an elongate median contact suture, frontonasal with a longitudinal suture on the right side (an abnormality) and distinctly pointed anteriorly, prefrontals hexagonal and likewise with a distinct median contact suture, two undivided loreals, of which the larger, posterior one borders a remarkably large preocular. Frontal nearly as long as the distance between its anterior tip and tip of snout, laterally in contact with three supraoculars, frontoparietals plus interparietal same length as frontal. Interparietal without visible parietal eye, parietals about twice as large as frontoparietals and not in contact with each other, a pair of nuchals

collectively bordered by a total of nine dorsals. A small occipital scale contacts three dorsals posteriorly. Eight supralabials on each side, with the sixth distinctly broader than the others and in subocular position. Eight infralabials on the right and seven on the left, the first on the left side horizontally divided. The postmental borders eight scales. All subdigital lamellae, with exception of some distalmost, keeled. Some of the palmar and tarsal scales bearing spurs or tubercles. Headshields and scales, all scales of the undersurfaces of head, extremities and tail, as well as those of the lower flanks and the distal dorsal half of the tail unkeeled, the majority of back and upper flank scales each bearing two distinct keels. Only a few scales with a weak third central keel. The scales of the dorsum of the upper and lower leg are hardly noticeably bicarinate and the keels of the dorsum of the upper and lower arm are even more weakly developed (if present at all). Dorsal scales are clearly imbricating, whereas ventrals are only weakly so.

The hemipenes are relatively small and slender. The left hemipenis is almost completely everted and served for the measurements and as the basis for illustration (fig. 2). Its length is 8 mm, the maximum diameter of the apex is 4 mm and the trunk has a diameter of 2 mm at its narrowest point (approximately at the center of the organ). Except for a narrow edge of skin on both sides, the asulcal region is without conspicuous structures. The apex is divided into two weakly developed lobes. The darkly pigmented sulcus spermaticus is completely covered by two lips, of which the posterior lip is substantially more strongly pronounced and overlapping the anterior lip. Both lips diverge distally but are recognizable up to the apex. There is a small recess in front of the terminal end of the ductus spermaticus which obviously marks the insertion of the musculus retractor penis.

In the living animal the scales of the entire dorsum were of uniform bright grey-brown with dark brown edges. Entire head (except for the undersurface) with irregular dark-brown markings. Throat grey-blue and lower flanks, tail sides, posterior sides of the neck, as well as entire lower surface of trunk, tail and extremities intensively orange colored (fig. 3). Seven very weakly

Table 2: Measurements and scale counts of the type specimens of *Trachylepis dichroma*, spec. nov. (all measurements in mm). Abbreviations: ZMB Nr - inventory number of the Institut für Systematische Zoologie, formerly Zoologisches Museum der Humboldt-Universität zu Berlin; f - female; m - male; sa - subadult; sa? - possibly mature; SVL - snout-vent length; TL - tail-length; HL - head length from tip of snout to posterior border of ear opening; HW - head width at level of ears; AGD - distance between axilla and groin; EST - distance between anterior margin of eye to tip of snout; EED - distance between posterior margin of eye to anterior margin of ear; END - distance anterior margin of eye to nostril (all measurements including nostrils concern centres of nostrils); IND - internarial distance; FST - distance between anterior tip of frontal scale to tip of snout; FIP - distance between posterior tip of frontal scale to posterior tip of interparietal scale; MSR - number of midbody scale rows; PSR - number of paravertebral scales within one longitudinal row; SC - number of subcaudals; SL - number of supralabials; LF4 - number of subdigital lamella under fourth finger; LT4 - number of subdigital lamellae under fourth toe. ZMB 67016 is the holotype.

Tab. 2: Maße und Schuppenzahlen der Typusexemplare von *Trachylepis dichroma*, spec. nov. (alle Maße in mm). Abkürzungen: ZMB Nr - Inventarnummer des Institutes für Systematische Zoologie, vormalig Zoologisches Museum der Humboldt-Universität zu Berlin; f - Weibchen; m - Männchen; sa - subadult; sa? - möglicherweise geschlechtsreif; SVL - Kopf-Rumpf-Länge; TL - Schwanzlänge; HL - Kopflänge von der Schnauzenspitze bis zum Hinterrand der Ohröffnung; HW - Kopfbreite auf Höhe der Ohröffnungen; AGD - Abstand zwischen Achsel und Leiste; EST - Abstand zwischen Augenvorderrand und Schnauzenspitze; EED - Abstand zwischen Augenhinterrand und Vorderrand der Ohröffnung; END - Abstand zwischen Augenvorderrand und Nasenöffnung (Meßpunkt ist immer der Mittelpunkt der Nasenöffnung); IND - Abstand zwischen den Nasenöffnungen; FST - Abstand zwischen dem Vorderrand des Frontale und der Schnauzenspitze; FIP - Abstand zwischen dem Hinterrand des Frontale und dem Hinterrand des Interparietale; MSR - Anzahl der Schuppenlängsreihen in Rumpfmittle; PSR - Anzahl der Schuppen in einer paravertebralen Längsreihe; SC - Anzahl subcaudaler Schuppenquerreihen; SL - Anzahl der Supralabialia; LF4 - Anzahl der Subdigitalallamellen unter dem vierten Finger; LT4 - Anzahl der Subdigitalallamellen unter der vierten Zehe. ZMB 67016 ist der Holotypus.

ZMB Nr	57096	57097	57533	57534	61835	61836	67016	67017	67018
Sex	f, sa?	f, sa	m	f, sa?	f	f	m	f	f
SVL	94	82	111	90	111	100	111	116	114
TL	105	91	101	60 r	118	103	89 r	97	84
HL	21.8	19.8	23.0	22.2	24.5	22.6	25.7	23.8	24.3
HW	17.2	13.7	17.2	15.1	18.9	15.9	20.6	18.4	17.7
AGD	45.3	37.7	50.7	43.5	58.3	45.6	53.5	56.5	56.0
EST	8.6	7.5	8.4	8.5	9.8	9.0	9.7	10.1	10.0
EED	7.4	6.0	8.0	7.5	8.6	8.2	8.8	8.5	8.4
END	4.9	4.6	5.2	5.3	6.0	5.7	6.0	6.3	5.9
IND	4.0	3.8	4.3	4.6	4.5	4.5	5.4	5.0	5.2
FST	6.5	5.8	6.7	5.8	7.5	5.5	7.1	7.0	7.5
FIP	6.1	5.8	5.6	6.2	6.8	5.5	6.8	7.1	6.8
MSR	38	38	38	36	38	36	36	36	36
PSR	55	55	52	55	55	53	55	57	56
SC	73	76	58	42	72	65	43	50	46
SL	7	7	8	7	7	8	7	7	7
LF4	12	11	12	13	12	11	13	12	11
LT4	17	16	18	16	15	16	17	18	?

developed vertical bars along each flank. Both the coloring and the pattern are still visible today, after five months in preservative, however fading has occurred, particularly on the ventral surfaces where the orange coloration has all but disappeared.

Variation among paratypes — Variation in scalation and body measurements of the ZMB specimens are reported in table 2. The subadult female paratype ZFMK 71721 exhibits the following characteristics (measurements in mm): SVL 86.5, TL 70.3, HL 19.7, HW 14.9, AGD 37.6, EST 8.0, EED 7.6, END 5.7, IND 3.9, FST 5.5, FIP 5.0, MSR 36, PSR 55, SC 51, SL 8, LF4 11, LT4 18. In the majority of the paratypes

the keeled scales are distributed on the body and extremities just as in the holotype and the strength of the keeling is likewise pronounced. On the other hand, in ZMB 67017 and ZMB 67018 the keels are hardly recognizable. While subadult and adult specimens have keeled subdigital lamellae, many of these are spinose in the juveniles. About half of the animals do not have an occipital scale. Several specimens (ZMB 57533, ZMB 57534, ZMB 61836 and ZMB 67018) exhibit abnormal fusions and/or divisions of the headshields, probably due to inbreeding or husbandry errors. In the other animals the arrangement and size of the headshields largely resemble those of the holotype. The

number of the small, triangular or rounded ear lobules at the anterior edge of the ear openings varies between 1 and 4. In unregenerated tails the basal part is trapezoidal in cross section. A round or slightly vertically oval center section follows and the distal portion of the tail end is clearly vertically oval. A parietal eye is only visible in some the adults, but is evident in all young animals.

The male paratype is very similar in color to the female ZMB 67017 (fig. 4) however, it possesses a broad, clearly demarcated, irregular dark longitudinal stripe from the posterior border of the eye to above the insertion of the forelimb. Only two additional animals possess a similar longitudinal stripe. The dorsal headshields are brown in all animals and exhibit a variable pattern of dark brown markings. Like the holotype and paratypes ZMB 57033 and ZMB 67017, ZMB 67018 also exhibits only hints of bars on the flanks and dorsum. The other five female paratypes have distinct dark brown transverse bands, which extend from the sides of the head to the sides of the tail (fig. 5). This banding or barring is particularly noticeable on the flanks. In some animals these bands extend to the vertebral region, for example in ZMB 61638 (fig. 6) and in ZFMK 71721. They vary in number between 8 and 11 on the flanks between the fore- and hind legs. In nearly all animals some whitish small spots (each limited to a single scale) are located chiefly at the posterior borders of the dorsolateral bars. The side of the upper jaw is also conspicuously colored. Here, on a bright background, there are two to four dark markings, whose size and intensity vary and which often continue onto the lower jaw. The lower surface of trunk and tail is unmarked and appears as a bright beige in all fixed animals. The throats are from yellowish-grey to greyish-blue and can exhibit some darker splashes of pigment. The males have a distinctive blue colored throat during the reproductive season, while this remains more grey in females at this time (pers. comm. P. HARBIG). During reproductive season females also have orange coloration on the posterior sides of the neck and the flank region, but this does not extend on to the ventral surface. In life some animals also exhibited a reddish colored rostral and mental, with this

coloring extending to the neighboring supralabials in some cases. It is noteworthy that the banding or barring is particularly prominent in smaller females, whereas in the males and larger females, with one exception (ZMB 61835), the dark transverse bands are hardly visible. Based on this, it appears that the banding is a juvenile character that is lost with age in most(?) specimens.

The scales of the three newborn animals (SVL 43-46, tail length 41-44, midbody scale rows 36-38, paravertebral scales 57-58, subcaudals 61-69, supralabials 8, sublabials 7-9, lamellae under fourth finger 14, under fourth toe 18-19) do not differ in number, arrangement and keeling from those in older animals with the exception of the subdigital scales which are spinose in the juveniles in contrast to the "simply" keeled ones of the adults. All three possess a visible parietal eye in the center of the interparietal. Living young had a brown dorsum, which, up to head and neck, was marked with whitish spots, each localized on a single scale. The markings and bars on the sides of the body were blackish in color in these animals (fig. 7). In fixed specimens the base color of the dorsum is brown-grey and the crossbands and individual dorsal markings are dark brown whereas the light dorsal spots are grey and barely visible. The relative width of the transverse bands is greater than in the adult animals, thus the young animals appear altogether darker. The dark banding stands out from the bright sides of the snout, the lower sides of the neck, the lower flanks and the sides of the tail in particular, resulting in a very highly contrasting pattern in these regions.

Etymology — The specific epithet is derived from the Greek prefix "di-", denoting two, and the Greek root word "chróma", meaning color. The name *dichroma* refers to the fact that adult males and females of the new species exhibit two different color patterns, at least during the mating season. During this period (and sometimes over many months) the males exhibit an intensive orange colored venter and a blue throat, while the females exhibit a beige venter and a grey throat.

Distribution — As stated in the "Materials and Methods" section, the new species originates from Tanzania in East Africa, although details of its particular



Fig. 1: Holotype of *Trachylepis dichroma* sp. nov. in life (Photo: R. GÜNTHER).

Abb. 1: Holotypus von *Trachylepis dichroma* sp. nov. im lebenden Zustand.

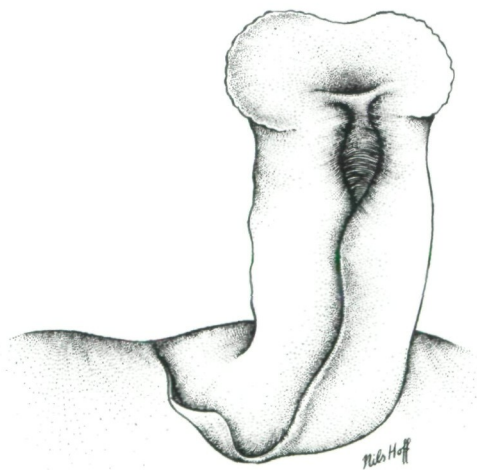


Fig. 2: Left hemipenis of the holotype of *Trachylepis dichroma* sp. nov. in sulcal view. The recess approximately in the center of the apex obviously marks the insertion of the musculus retractor penis (Drawing: Nils HOFF).

Abb. 2: Linker Hemipenis des Holotypus von *Trachylepis dichroma* sp. nov. in Sulcalansicht. Die Vertiefung etwa im Zentrum des Apex markiert wahrscheinlich die Ansatzstelle des Musculus retractor penis.

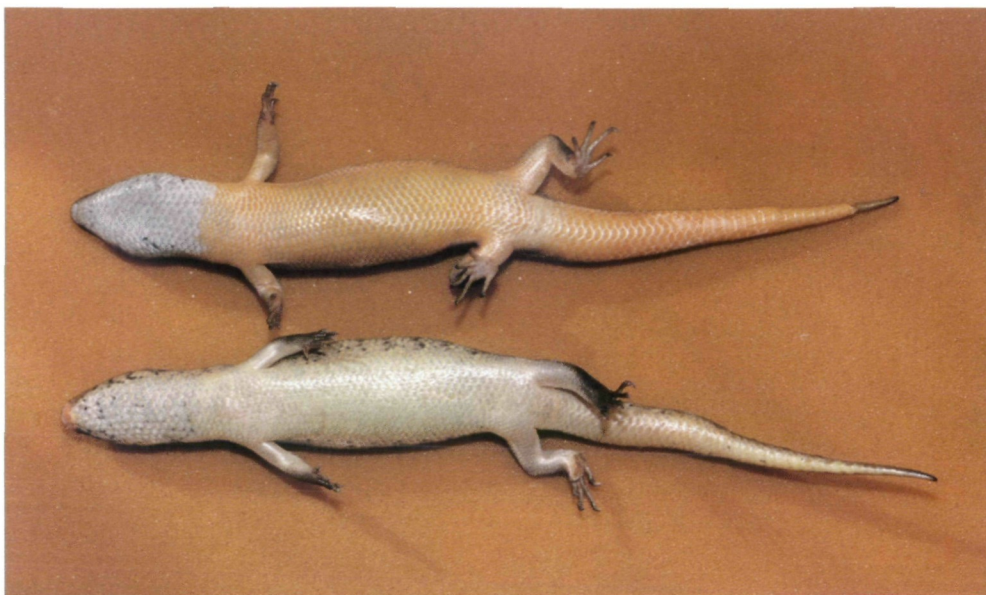


Fig. 3: Ventral aspect of a male of *Trachylepis dichroma* sp. nov. (holotype, above) in comparison to that of a female (paratype ZMB 67017, below) showing the difference in life coloration (Photo: R. GÜNTHER).

Abb. 3: Lebendfärbung der Unterseite eines Männchens von *Trachylepis dichroma* sp. nov. (Holotypus, oben) im Vergleich zur Lebendfärbung der Unterseite eines Weibchens (Paratypus ZMB 67017, unten).



Fig. 4: Lateral view of the female paratype (ZMB 67017) of *Trachylepis dichroma* sp. nov. in life (Photo: R. GÜNTHER).

Abb. 4: Lateralansicht des weiblichen Paratypus (ZMB 67017) im lebenden Zustand.

Table 3. The most important distinguishing characteristics between *Trachylepis dichroma* sp. nov. and *T. brevicollis* (WIEGMANN, 1837). Measurements and scale counts are based on the type series of both species. See table 2 for abbreviations.

Tab. 3: Die wichtigsten Unterscheidungsmerkmale zwischen *Trachylepis dichroma* sp. nov. und *T. brevicollis* (WIEGMANN, 1837). Maße und Zählwerte beruhen auf den Daten der jeweiligen Typenserien. Abkürzungen siehe Tabelle 2.

<i>Trachylepis dichroma</i> spec. nov.	<i>Trachylepis brevicollis</i>
Midbody scale rows 36-38	Midbody scale rows 30-32
Paravertebral scales 52-57	Paravertebral scales 47-49
SVL of adults as a rule less than 115 mm	SVL of adults as a rule more than 115 mm
Upper side of head in profile curved	Head in profile flattened
Ratio FST/FIP as a rule > 1.0	Ratio FST/FIP as a rule < 1.0
Pronounced dichromatism between adults of different sexes	Faint sexual dichromatism reported in Yemeni populations (SCHÄTTI & DESVOIGNES 1999)
Color of newborns brownish with blackish crossbars and few small whitish spots on the back	Color of newborns black with conspicuous rows of whitish spots covering entire dorsal surface (two specimens in the ZMB-collection, see Fig. 8, one photograph in SPAWLS et al. 2002, p. 132 and one photograph, specimen 27592 and 43352, in FRITZ & SCHÜTTE 1988, p. 47.

areas of occurrence remain unknown. SPAWLS et al. (2002) noted that *Trachylepis brevicollis* was known from scattered localities in Tanzania, including Bulyanhulu, Serengeti and Tarangire and it is possible that some or all of these populations may be referable to the new species.

Habitat and habits in captivity — The habitus of the new species and its lifestyle in the terrarium speak for the fact that this is a terrestrial species which is also able to climb on branches or in rocky terrain. The animals basked actively and extensively under metal halide-lamps, took food from forceps and showed increased activity after spraying and watering of plants in their terrarium. The skinks accepted both animal and plant matter as food (pers. comm. P. HARBIG and B. TREU). Animal matter eaten included larvae and imagoes of different kinds of insects (*Tenebrio molitor*, *Locusta migratoria*, *Acheta domestica*, *Galleria melonella*) and spiders, nestling mice, and canned moist cat food. Plant food included lettuce, cucumbers, endives, bananas, grapes, peaches, figs, pears, and apples. Peter HARBIG assumes that the animals eat their own young, as after initial breeding successes and the obvious pregnancy of the females no more young animals were found in the terrarium. Based on the same authority the number of liveborn young is two to four and sexual maturity is attained at an age of about three years.

Comparison with other species — Descriptions and keys of sub-Saharan

African *Trachylepis* (SCHMIDT 1919; HOOGLMOED 1974; BROADLEY & HOWELL 1991; BRANCH 1998; BROADLEY 2000; SPAWLS et al. 2002) reveal that most species are clearly smaller than *Trachylepis dichroma* sp. nov. and only a few species have bicarinate scales and 36-38 midbody scale rows. Further, strong sexual dichromatism appears rare in *Trachylepis* spp. of approximately the same size as *T. dichroma*, although it is known in certain smaller species, such as the southern African *T. sulcata* (PETERS, 1867) (BRANCH 1998), and has been reported in larger-bodied Yemeni populations of *T. brevicollis*, in which the males have "an orange hue" on the flanks (and the underside?) from the throat to the tail base (SCHÄTTI & DESVOIGNES 1999). Two young *T. brevicollis*, obviously just few days or weeks old, from Kilimandjaro (Kenya) and of Keren (Eritrea) showed clear differences in coloration from three newborn specimens of *T. dichroma* (table 3 and fig. 8). It is supposed that the juvenile *T. brevicollis* from Yemen which were figured by FRITZ & SCHÜTTE (1988) belong to two different species. Two of the three specimens shown resemble *T. brevicollis* from eastern Africa while the third one is similar to the juveniles of *T. dichroma*. Moreover, the smaller size of adults as well as smaller dorsal scales, mentioned by FRITZ & SCHÜTTE (1988) for specimens of the populations from Dayr Duknah and Taiz (north-western Yemen), indicate differences to *T. brevicollis* and



Fig. 5: Two females of *Trachylepis dichroma* sp. nov. with distinct cross banding of the head and anterior body (Photo: P. HARBIG).

Abb. 5: Zwei Weibchen von *Trachylepis dichroma* sp. nov. mit deutlicher Querbänderung an Kopf und Vorderkörper.



Fig. 6: Younger female of *Trachylepis dichroma* sp. nov. (ZMB 61836), in which the cross banding reaches nearly to the centre of the back (Photo: N. HOFF).

Abb. 6: Jüngerer Weibchen von *Trachylepis dichroma* sp. nov. (ZMB 61836), bei dem die Querbänderung fast bis zur Rückenmitte reicht.



Fig. 7: A few days old specimen of *Trachylepis dichroma* sp. nov. (Photo: P. HARBIG).

Abb. 7: Wenige Tage altes Jungtier von *Trachylepis dichroma* sp. nov.

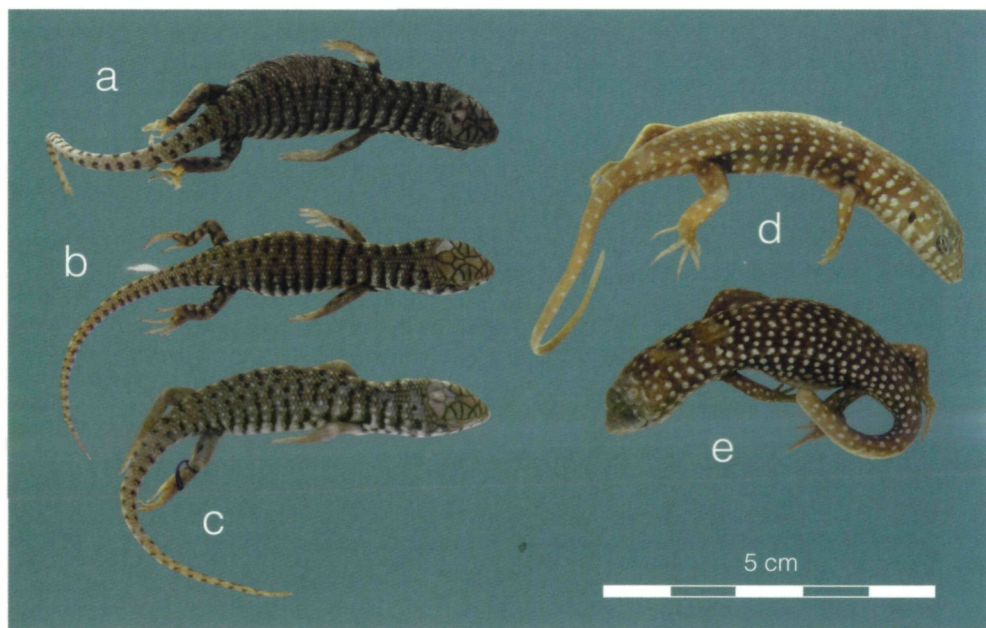


Fig. 8: Dorsal view of three preserved young of *Trachylepis dichroma* sp. nov. (a - ZMB 57531; b - ZMB 67019; c - ZMB 57532) and two preserved young of *Trachylepis brevicollis* (WIEGMANN, 1837) (d - ZMB 18301 from Kilimandjaro, Tanzania; e - ZMB 7088 from Keren, Eritrea) (Photo: N. HOFF).

Abb. 8: Dorsalansicht von drei konservierten Jungtieren von *Trachylepis dichroma* sp. nov. (a - ZMB 57531; b - ZMB 67019; c - ZMB 57532) und von zwei konservierten Jungtieren von *Trachylepis brevicollis* (d - ZMB 18301 vom Kilimandjaro/Tansania; e - ZMB 7088 von Karen Bogos/Eritrea).

possibly closer relations to *T. dichroma*. However, whether these similarities and differences reflect phylogenetic relationships remains to be explored.

The combination of the characteristics "mature individuals 100–120 mm SVL, dorsal scales bicarinate, 52–57 paravertebral scales in one longitudinal row, 36–38 midbody scale rows and juveniles with blackish crossbars on flanks" is characteristic for *T. dichroma* and unique among the hitherto known *Trachylepis*.

Taking into account all of the morphological characteristics, molecular data (see below), and available data on captive lifestyle and reproduction, *T. dichroma* appears to be most closely allied to *T. brevicollis*, with which it had been initially confounded. The features of the new species distinguish it from the types of *T. brevicollis* and *T. pyrrhocephalus* (table 3), as well as from specimens reported subsequently from Ethiopia (LANZA 1972), Somalia (PARKER 1942; LANZA & CARFI 1968), Uganda (LOVERIDGE 1936) and Kenya (STERNFELD 1912; LOVERIDGE 1929, 1936) as well as Yemen, Oman and Saudi Arabia (ARNOLD 1980; FRITZ & SCHÜTTE 1988, SCHÄTTI & DESVOIGNES 1999). LOVERIDGE (1929) reported bicarinate (vs tricarinate) dorsal scales in a specimen from Guaso Nyiro, Kenya (National Museum of Natural History, Washington DC, USNM 41976) and a weakly developed central keel and 38 midbody scale rows in a specimen from the Ulukeny Hills (USNM 40930), but these features appear to be exceptional for Kenyan populations. As noted above, there is substantial color pattern variation in *T. dichroma*. *Trachylepis brevicollis* is also notorious for its pronouncedly variable coloration, which has ontogenetic, sexual, and geographic components (PARKER 1942; LANZA & CARFI 1968; ARNOLD 1980; FRITZ & SCHÜTTE 1988; SPAWLS et al. 2002), however, the particular dichromatism noted for

T. dichroma has not been reported in any population of its more widespread relatives.

The distinctiveness of *Trachylepis dichroma* sp. nov. is also supported by molecular data. The uncorrected pairwise sequence divergence between *T. dichroma* and its sister taxon *Trachylepis brevicollis* for the three regions sampled are as follows: $\text{cyt } b = 0.11602$, $12S = 0.05147$, and $16S = 0.04076$. In comparison, the average uncorrected pairwise distance between the three samples of *T. affinis* are: $\text{cyt } b = 0.06258$, $12S = 0.0401$, and $16S = 0.0218$. In each case, the distance between *Trachylepis dichroma* and *T. brevicollis* is greater than the distance between the three specimens of *T. affinis*, which is a relatively variable species. This comparison is especially noteworthy as the specimen of *T. brevicollis* used in the study was from southern Kenya, close to the probable source of *T. dichroma* in Tanzania, whereas the samples of *T. affinis* were derived from much more widely separated localities in Gabon and Cote d'Ivoire. We consider these results, though limited, supportive of the morphological characters that serve to diagnose *Trachylepis dichroma* as a distinct species.

Thus far, molecular investigations into the relationships of African *Trachylepis* have been limited in taxonomic scope and have yet to investigate variation within widespread taxa (MAUSFELD et al. 2000; MAUSFELD & SCHMITZ 2003). MAUSFELD & SCHMITZ (2003), however, suggested that *T. brevicollis* and an undescribed species (*T. dichroma*, judging from the paratype ZFMK 71721) were allied to *T. socotranus* and MAUSFELD et al. (2004) found that both *T. affinis* and *T. maculilabris* represent at least two species each. We suspect that further phylogenetic and phylogeographic investigations of *Trachylepis*, combined with morphologically-based studies of variation will reveal additional new species in many, if not most, of the widespread members of the genus.

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