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## A new species of the genus *Tropicolotes* from Central Saudi Arabia (Reptilia: Sauria: Gekkonidae)

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**Abstract.** A new species of the genus *Tropicolotes* from central Saudi Arabia is described based on two specimens from the Ath-Thumamah region. The new species is a member of the subgenus *Tropicolotes* and belongs to the clade including *T. steudneri* and *T. nattereri*.

**Key words.** *Tropicolotes* sp. n., Ath-Thumama, Saudi Arabia.

### INTRODUCTION

The genus *Tropicolotes* Peters, 1880 comprises a group of small, nocturnal and ground dwelling geckos, rarely exceeding 35 mm snout-vent length. Biogeographically the distribution of these geckos follows a Saharo-sindian pattern, ranging from Morocco and Mauritania in the west to western India (Sindaco & Jeremčenco 2008; Agarwal 2009). About 13 nominal species are being distinguished within the genus *Tropicolotes*, but in addition there are published records of specimens which would possibly deserve specific recognition and which are not yet formally described (Arnold 1980; Kordges 1998; Anderson 1999; Baha el Din 2001, 2006; Sindaco & Jeremčenco 2008). Beside this the species composition of the genus is under debate since the taxa of the eastern part of the distribution area are assigned to *Microgecko* Nikolsky, 1907 and *Asiocolotes* Golubev, 1984 on a generic or subgeneric level by some authors (Kluge 1983; Kuge 1991; Szcerbak & Golubev 1996; Sindaco & Jeremčenco 2008) while others treat all of those taxa as belonging exclusively to the genus *Tropicolotes* (Anderson 1961, 1999). We prefer to follow the more inclusive interpretation of *Tropicolotes* and use the name in the broader sense encompassing also the taxa of Iran, Afghanistan, Pakistan and India.

There have been uncertainties concerning the taxonomy of some of the African and Arabian taxa within the genus, like *T. tripolitanus algericus* Loveridge, 1947, *T. t. apoklomax* Papenfuss, 1969, *T. steudneri* (Peters, 1869) and *T. nattereri* Steindachner, 1901 (Baha el Din 1994, 2001; Werner 1998; Shifman et al. 1999). The main taxonomic issues were related to the validity of certain taxa (e.g.,

*T. t. apoklomax*; Baha El Din 2001), the taxonomic rank of certain taxa (e.g., *T. t. algericus* which was assigned specific rank based on a proven sympatric occurrence with *T. t. tripolitanus* Peters, 1880; Baha El Din 2001), species delimitation (e.g., between *T. nattereri* and *T. steudneri*, Shifman et al. 1999; the type material of both species is untraceable and therefore neotypes should be designated and a thorough redescription of both taxa prepared) and to the existence of hitherto unknown species which were discovered recently (*T. nubicus* Baha El Din 1999, *T. bisharicus* Baha El Din 2001).

As already stated by Baha El Din (2001) the difficulty in finding and studying these diminutive animals, combined with their patchy geographical representation in scientific collections has led to a less than satisfactory taxonomic evaluation to date.

The specimens described as a new species in the present paper were collected in the Ath-Thumamah region in central Saudi Arabia, approximately 90 km northeast of Riyadh. According to Arnold (1986) the distribution of *Tropicolotes* in Saudi Arabia is confined to north-western Saudi Arabia, but already Tilbury (1988) recorded it from the Riyadh area. Thus the first specimen from Ath-Thumamah collected by Kordges was not the first published record of the genus in central Arabia (contra Kordges 1998), but nevertheless the first record of the genus from Ath-Thumamah (contra Cunningham 2010, who listed *Tropicolotes* as not yet confirmed for this area).

## MATERIAL

106 specimens of the genus *Tropicolotes* from the collections of the Zoologisches Forschungsmuseum A. Koenig, Bonn (ZFMK), the Senckenberg Museum Frankfurt (SMF), the California Academy of Science (CAS) and the Natural History Museum Geneva (MHNG) belonging to *T. algericus* (n=14), *T. depressus* (n=3), *T. helenae* (n=10), *T. nattereri* (n=14), *T. persicus* (n=12), *T. scortecchi* (n=4), *T. steudneri* (n=43), *T. tripolitanus* (n=4) and the new taxon described herein (n=2) were examined. For the species not available in the present study (*T. bishariensis*, *T. latifi*, *T. levitoni*, *T. nubicus*) morphological information were taken from Leviton & Anderson (1972), Szczerbak & Golubev (1996), Anderson (1999), Baha El Din (1999, 2001).

The following characters were collected from 59 specimens from Algeria, Egypt, Israel, Jordan and Saudi Arabia (belonging to *T. nattereri*, *T. steudneri* and the new taxon described herein): snout-vent-length, tail length (only intact tails), number and size of postmental scales, number of interorbitals (transverse scales across the interorbital region at mid orbits, excluding palpebral folds), num-

ber of upper and lower labials, number and characteristics of keels on subdigital lamellae, number and identity of scales bordering the nostril, number of scales around midbody. Beside this, data on colouration and pattern was collected. Additional data on morphological characters were taken from Baha el Din (1999, 2001) and Shifman et al. (1999). Measurements were taken with a digital caliper to the nearest 0.1 mm.

## Material examined

***Tropicolotes algericus*: Algeria:** SMF 8167, Algerian Sahara; **Mali:** MHNG 2678.087, north of Bombax; **Morocco:** MHNG 1553.065-067, Tarfaya; MHNG 993.027, Aouinet-Torkoz; SMF 73082-87, Goulimine; **Western Sahara:** MHNG 1545.076, El-Aioun. ***Tropicolotes depressus*: Pakistan:** SMF 64490-92, east of Chiltan-Mountains, Quetta. ***Tropicolotes helenae*: Iran:** MHNG 2627.011-16, MHNG 2641.100, MHNG 2646.056-058, Mehkuyeh. ***Tropicolotes nattereri*: Egypt:** MHNG 2710.017-018, Wadi Feran; SMF 8165, NW Sinai; ZFMK 70653-59, Ras Mohammed; **Israel:** SMF 47112, Wadi el Hedhira, Central Negev; **Jordan:** ZFMK 64673, Aqaba; **Saudi Arabia:** CAS 148526, Hagl [29 18 N; 34 57 E]; CAS 148616, Jabal as Sinfa [27 57 N; 35 47 E]. ***Tropicolotes persicus*: Pakistan:** SMF 63536-47, Hab Chauki. ***Tropicolotes scortecchi*: Yemen:** MHNG 2428.065, Al Mabraz, Wadi Zabid; MHNG 2428.065, MHNG 2553.041, Mafraq-Mocca; MHNG 2581042, Sayhut. ***Tropicolotes steudneri*: Algeria:** CAS 138660-63, 3 km. East of Tamanrasset; ZFMK 19853, 15 km S Terhenanet; ZFMK 33839, 90km S In Salah; **Egypt:** CAS 156660, Maadi-Wadi Gindali Rd. [29 59 N, 31 28 E]; MHNG 2710.019-020, Oasis Kharga; SMF 22119, Kosseir; ZFMK 2359, ZFMK 64633, Luxor; ZFMK 20537, Cairo, Mokatana Hills; ZFMK 64641, ZFMK 64643, 10 km NW Cairo; ZFMK 65477, Giza Abu Rawash; ZFMK 77765-67, between Beni Suef u. Korimat; **Sudan:** CAS 174014, Assalaya Pump Station 3; MHNG 1186.078-079, Tabo; ZFMK 33840-59, Wadi Half; ZFMK 38429, Erkowit. ***Tropicolotes tripolitanus*: Egypt:** SMF 22472, Heliopolis; SMK 22473, Cairo; **Tunisia:** MHNG 1335.04, Tozeur; SMF 8166, Tunisian Sahara. ***Tropicolotes* sp. n.:** Saudi Arabia: ZFMK 43668, ZFMK 87120, Ath-Thumama.

Despite the overall similarity of the taxa involved and the generally low level of character displacement, which is typical for geckoes, it became clear, that the specimens from central Saudi Arabia differ in several characters from all known taxa in the genus *Tropicolotes* and will therefore be described as a new species.



**Fig. 1.** Holotype of *Tropicolotes wolfgangboehmei* sp. n. from Ath-Thumamah, Saudi Arabia (Fig. 1a: dorsal view, Fig. 1b: ventral view, Scale: 1mm interline distance).





Fig. 2. Paratype of *Tropicolotes wolfgangboehmei* sp. n. from Ath-Thumamah (25° 16' N, 46° 37' E), Saudi Arabia in life.

### SPECIES DESCRIPTION

*Tropicolotes wolfgangboehmei* sp. n.

Type material: Holotype, ZFMK 43668, Ath-Thumama, Saudi Arabia, leg. T. Kordges, 1985; Paratype, ZFMK 87120, Ath-Thumama (25° 16' N, 46° 37' E), Saudi Arabia, leg. T. Wilms, 09.05.2001, 10:30 hrs

**Diagnosis.** A small gecko with a maximum snout-vent-length of 29.4 mm. The species possesses all diagnostic characters of the genus *Tropicolotes* (in the sense of Kluge 1967) including digits slightly angularly bent, not dilated, not fringed, not webbed, nor ornamented, covered below with a single series of transverse lamellae, pupil vertical, dorsal scales uniform, small, homogenous, imbricate to subimbricate, preanal and femoral pores usually absent.

*Tropicolotes wolfgangboehmei* sp. n. has two pairs of postmental shields and therefore differs from *T. latifi* (no postmentals), *T. helenae* (one pair of postmentals) and *T. depressus* (no postmentals or only one pair of very small postmentals). From *T. persicus* it differs by having only four scales in contact with the nostril instead of five.

It differs from *T. algericus*, *T. tripolitanus*, *T. scortecii*, *T. somalicus* and *T. bisharicus* by its smooth dorsal sculation. *T. wolfgangboehmei* sp. n. differs from *T. nattereri* by possessing clearly bi- or tricarinated subdigital scales (versus smooth subdigital scales) and from *T. steudneri* and *T. nubicus* by having two pairs of postmental shields of which the second is roughly a quarter of the size of the first (both pairs of roughly equal size in *T. steudneri* and *T. nubicus*).

**Description of the Holotype.** An adult female with intact tail. Body depressed. Snout-vent-length (SVL) 29.4 mm, Tail length 32.8 mm. Head narrow, 9.3 mm long (about 31.6 % of SVL). Neck distinct. Right limb 10.8 mm long. 5<sup>th</sup> digit of left manus lacking claw, all other digits complete. Tail 1.12 times SVL, cylindrical tapering evenly to its tip.

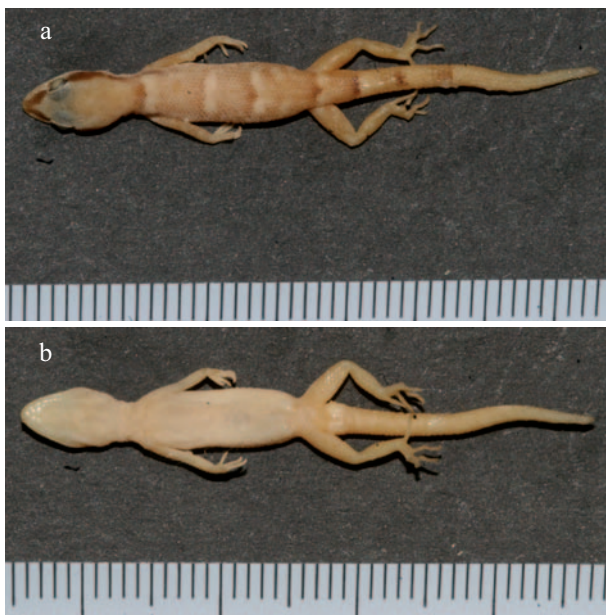


Fig. 3. Paratype of *Tropicolotes wolfgangboehmei* sp. n. from Ath-Thumamah, Saudi Arabia (Fig. 3a: dorsal view, Fig. 3b: ventral view, Scale: 1 mm interline distance).



**Fig. 4.** Habitat and Paratype locality of *Tropicolotes wolfgangboehmei* sp. n. at Ath-Thumamah (25° 16' N, 46° 37' E), Saudi Arabia.

Rostral 1.5 times as wide as high, divided partly by a median cleft. Nostril bordered by rostral, first upper labial and two small postnasals, which are separated by two large internasals. The internasals are followed by one pair of subequal scales. Snout and upper surface of the head covered by hexagonal scales which are juxtaposed. Loreal region covered with slightly swollen scales, which are somewhat smaller than the remaining scales on the head. 16 interorbitals, 10/10 upper labials, 8/8 lower labials. Occipital region covered by juxtaposed scales slightly smaller than the interorbitals, which become increasingly swollen in the neck. Mental slightly wider than rostral, pentagonal in shape extending posteriorly not to the level of the suture between first and second lower labials. One pair of



**Fig. 5.** *Tropicolotes nattereri* (SMF 47112), Wadi el Hedhira, Central Negev, Israel (Fig. 5a: dorsal view, Fig. 5b: ventral view, Scale: 1mm interline distance).

large postmentals, in contact with mental and the first two lower labials. Second pair of postmentals only about one fourth the size of the first postmentals, separated from each other by four granular scales. The second pair of postmentals is in contact with the second lower labials.

Body scalation homogenous, scales imbricate and smooth. 58 scales around midbody. Chest widely opened by an incision. Dorsal sides of forelimbs covered with imbricate scales, scales of ventral sides juxtaposed and slightly swollen, somewhat smaller than scales on dorsal side of forelimbs. Dorsal and ventral sides of hind limbs covered with imbricate scales, which are almost equal in size. Posterior surface of thigh with smaller granular scales. Subdigital lamellae strongly bi- or tricarinate. Lamellar formula (digit 1 to 5) for left manus: 9, 12, 14, 13, 11.

Dorsal and ventral scales of the tail homogenous and imbricate. Scales at tail base not carinate, but becoming increasingly so distally. Postanal sacs weakly developed with two enlarged tubercular scales on either side. A pair of slightly enlarged preanal scales present.

Measurements (in mm, from preserved specimen): Snout-vent-length 29.4; tail length 32.8; head length 9.3; maximum head width 5.1; maximum head height 2.7; orbit diameter 2.0; distance orbit – snouth 3.2; distance orbit – ear 2.3; ear diameter 0.6.

Colouration of preserved specimen: The specimen is preserved in 70% ethanol and has almost completely lost his coloration and pattern. Kordges (1998) depicted this specimen in black and white, and its pattern resembles the paratype almost exactly (in having six dark transverse bands on the back and twelve on the tail, as well as having exactly the same pattern of the head).

**Description of the Paratype.** Paratype similar in most respects to holotype, except as noted. An adult male with intact tail, which was broken during preservation near the tail base. Body depressed. Snout-vent-length 27.3 mm, tail length 31.1 mm. Head narrow, head length 8.2 mm (about 30 % of SVL). Neck distinct. Right limb 9.3 mm long. All digits intact. Tail 1.13 times SVL, cylindrical tapering evenly to its tip.

15 interorbitals, 10/10 upper labials, 7/8 lower labials. Second pair of postmentals only about one fourth the size of the first postmentals, separated from each other by three granular scales. The second pair of postmentals is in full contact with the second lower labials, and almost reaches the third labial on the left.

Body scalation homogenous, scales imbricate and smooth. 59 scales around midbody, 66 scales between a well





**Fig. 6.** *Tropicolotes steudneri* (ZFMK 33850), Wadi Halfa, Sudan. (Fig. 6a: dorsal view, Fig. 6b: ventral view, Scale: 1mm interline distance).

marked interruption between throat and chest and cloacal slit. Dorsal sides of forelimbs covered with imbricate scales, some of which show very slight carination, scales of ventral sides juxtaposed and slightly swollen, somewhat smaller than scales on dorsal side of forelimbs. Lamellar formula (digit 1 to 5) for left manus: 9, 11, 15, 13, 10.

Measurements (in mm, from preserved specimen): Snout-vent-length 27.3; tail length 31.1; head length 8.2; maximum head width 4.9; maximum head height 2.9; orbit diameter 1.7; distance orbit – snouth 2.9; distance orbit – ear 2.0; ear diameter 0.7.

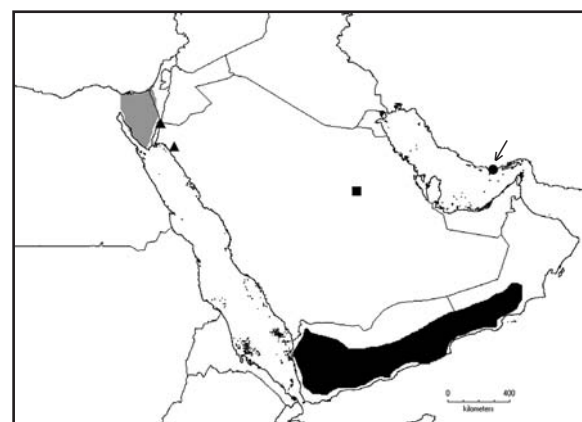
Colour in life: Head light brown with a broad dark brown band extending from the snout to just above the ear opening. A narrow yellow line extending axially from the rostral to the snout, up to the upper delimitation of the broad dark brown band. Palpebral fold yellow. Labials and underside of the head white. Dorsum light brown, with six broad, dark brown transverse bands. Colouration between those transverse bands yellowish brown. Ground colour of dorsal sides of limbs light brown. Hind limbs scattered with dark brown spots. Tail coloration light brown with ten dark brown transverse bands. Ventral side without any pattern, white.

**Derivatio nominis.** This species is named after Prof. Dr. Wolfgang Böhme in honour to his contributions to herpetology during his 39 years as curator of herpetology at the Zoological Research Museum A. Koenig, Bonn and as the academic mentor of two of the authors of the present paper.

**Habitat.** The holotype was found near a small village at the border of the Ath-Thumamah area (Kordges 1998). The paratype was found under a stone in a small canyon within the Buwayb-Escarpment which is a cretaceous coral reef consisting of sedimentary rock, mainly lime- and sandstone.

## DISCUSSION

*Tropicolotes wolfgangboehmei* sp. n. is known only from central Saudi Arabia. Because of the close proximity of Ath-Thumamah to the city of Riyadh we consider the *Tropicolotes* recorded by Tilbury (1988) likely to be conspecific with this new taxon. Based on the external morphology *T. wolfgangboehmei* sp. n. is a member of the group consisting of *T. nattereri*, *T. steudneri* and *T. nubicus* and is most probably the sister taxon of *T. nattereri*. Biogeographically the distribution pattern of the *Tropicolotes* of north-eastern Africa and Arabia is quite puzzling, not the least because of the involvement of at least two taxa which are not yet formally recognized (Guibé 1966, Arnold 1980, Anderson 1999). Due to the clarification on the taxonomic identity of *T. nattereri* and *T. steudneri* (Werner 1998, Shifman et al. 1999) and the description in the present paper, it is clear, that actually three nominal *Tropicolotes* species are known to occur on the



**Fig. 7.** Distribution of Arabian *Tropicolotes*: ▲ *Tropicolotes nattereri* from Saudi Arabia [upper ▲: CAS 148526, Hagl (29° 18' N; 34° 57' E); lower ▲ CAS 148616, Jabal as Sinfa (27° 57' N; 35° 47' E)], ■ *Tropicolotes wolfgangboehmei* sp. n., ● *Tropicolotes* spec. from Bandar-e-Lengeh (Anderson 1999), Black areas: approx. Distribution of *Tropicolotes scortecci*, grey areas: approx. distribution of *Tropicolotes nattereri*.

Arabian Peninsula (*T. nattereri*, *T. wolfgangboehmei* sp. n. and *T. scortecci*). *T. nattereri* is known from north-western Saudi Arabia and the adjacent areas in Jordan, Israel and Egypt while *T. scortecci* is an endemic species of southern Arabia (Oman and Yemen). *T. wolfgangboehmei* sp. n. is the only species distributed in central Arabia some 800–1000 km away from the nearest *Tropicolotes* localities in north-western Saudi Arabia, Oman/Yemen and Iran.

In the past, several authors (Tilbury 1988, Schneider 1990, Baha El Din 2006, Cunningham 2010) assigned the central Arabian *Tropicolotes* to *T. steudneri* or *T. nattereri*. Two specimens from Bandar-e Lengeh on the coast of the Arabian/Persian Gulf in Iran were also tentatively assigned to *T. steudneri* (Guibé 1966, Anderson 1999). Based on the current distribution of *Tropicolotes* it would zoogeographically be extremely unlikely that the Iranian specimens belong to either *T. steudneri* or *T. nattereri*. Based on the morphological data given by Guibé (1966) and Anderson (1999) and the photograph given by Anderson (1999) we are sure that these animals do not belong to *T. wolfgangboehmei* sp. n. but to a new, as yet undescribed taxon. Baha El Din (2001) suggested the investigation of the relationship of those Iranian specimens to two *Tropicolotes* from eastern Dhofar, Oman, which were tentatively assigned to *T. scortecci* by Arnold (1980) despite notable differences from *T. scortecci* specimens from further west in Dhofar and from the type locality of this taxon in Hadramaut, Yemen. The taxonomy of the genus *Tropicolotes*, especially in Arabia, is still in need of a thorough revision, not only to clarify the species composition within the genus but also to gain more data on the distribution of the respective taxa and to establish a hypothesis on their phylogenetic relationships.

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