

Six new records of Afrotropical lizard and snake species (Reptilia: Squamata) from the Republic of South Sudan

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Abstract. We report on reptilian specimens collected in southern Sudan (currently the Republic of South Sudan) in 1978 and stored at the Zoologisches Forschungsmuseum Alexander Koenig, Bonn. Six species (one lizard, *Leptosiaphos kilimensis*, and five snakes, *Hapsidophrys lineatus*, *Thrasops jacksoni*, *Toxicodryas pulverulenta*, *Amblyodipsas unicolor*, *Atheris squamigera*) are documented as new records for the fauna of South Sudan and are discussed in a biogeographical context.

Key words. Northeastern Africa, new country records, biogeography.

INTRODUCTION

The Herpetology Section of the Zoologisches Forschungsmuseum Alexander Koenig (ZFMK) in Bonn was founded in 1951 (Böhme 2014), but half a century earlier in several missions between 1897 and 1913, the founder of the museum, Alexander Koenig, had collected already amphibians and reptiles from all over the former Sudan, which is today divided into two countries: the Islamic Republic of Sudan in the north and the Republic of South Sudan. Between 1976 and 1984 Gerhard Nikolaus and Hans Rupp explored the avifauna of Sudan (Sudan and South Sudan) during several trips (Nikolaus 1987) and collected a large number of amphibians and reptiles, as well as birds and small mammals, from these countries that were deposited at the ZFMK. The latest acquisition of Sudanese (Sudan and South Sudan) amphibians and reptiles reached the ZFMK in the 1980's, collected by Hans-Erkmann Back and by Ulrich Joger. In total, specimens representing more than 150 herpetological species from all over the former entire Sudan are housed at ZFMK. As a first step we studied the preserved snake and lizard specimens of these collections and examined 485 lizards belonging to 49 species and 261 snakes belonging to 61 species. In this first note, we recorded and documented one lizard and five snake species from the Republic of South Sudan that were not known from this country before. Other results of our work on this material will follow in further publications.

All specimens cited in the present work were collected by Gerhard Nikolaus and Hans Rupp during their avifaunal surveys in Sudan in 1978. Furthermore, all collecting

sites of the six new country records (Yei, Katire, Gilo, Kinyeti and surroundings) are situated in the southern part of South Sudan, i.e. in the historical Equatoria Region (Fig. 1). Yei is situated in Central Equatoria (now Yei River state) near the border with Uganda and the Democratic Republic of the Congo (DRC), on the main road that leads from the South Sudanese capital Juba to Faradje, in the DRC. The Imatong Mountains, with their highest peak Mt. Kinyeti (3180 m a.s.l.) and Katire as the major settlement, are situated in Eastern Equatoria (now Imatong state), also near the Ugandan border. These parts of South Sudan are characterized by woodland, forests, and highland forests (Jackson 1956, Friis & Rasmussen 1981, Nikolaus 1987). The Imatong Mountains, in particular, have an important biogeographical role as a link between the highlands of East Africa and Ethiopia, and also as a shelter of some of the easternmost examples of the Guineo-Congolian rainforests, such as the Lotti and Talanga forests (Friis & Rasmussen 1981).

LIST OF THE NEW COUNTRY RECORDS OF SQUAMATA FOR SOUTH SUDAN

Order Squamata

Family Scincidae

Leptosiaphos kilimensis (Stejneger, 1891)

Proceedings of the United States National Museum 14 (802): 405–406. Type locality: Kilimanjaro, Tanzania, East Africa.

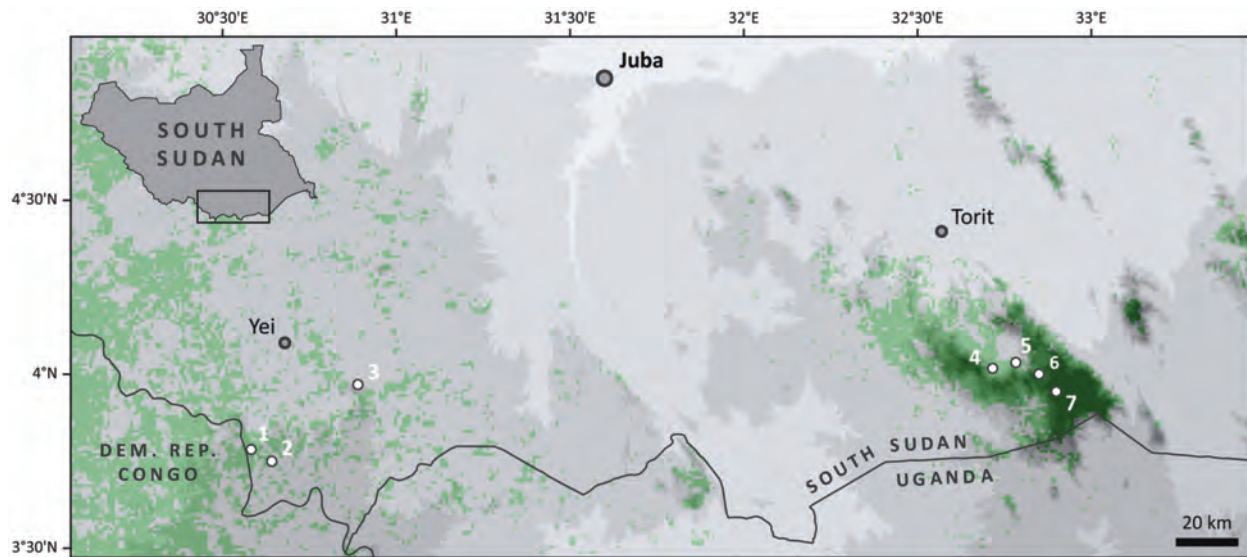


Fig. 1. Map of the Equatoria Region of South Sudan, showing the collection sites of the new records reported in the present study. 1. Kajiko North (03°47'N, 30°35'E, 1000 m); 2. Iwatoka/Watoka (03°45'N, 30°38'E, 1000 m); 3. Mt. Korobe (03°58'N, 30°52'E, 1590 m); 4. Talanga (04°01'N, 32°43'E, 950 m); 5. Katire (04°02'N, 32°47'E, 1000 m); 6. Gilo (04°00'N, 31°51'E, 1900 m); 7. Mt. Kinyeti (03°55'N, 32°55'E, 3180 m).



Fig. 2. *Leptosiaphos kilimensis* (ZFMK 26059) from Mt. Korobe, South Sudan (locality no. 3 on Fig. 1).



Fig. 3. *Hapsidophrys lineata* (ZFMK 2626072) from Kajiko North, South Sudan (locality no. 1 on Fig. 1).

Voucher specimen. South Sudan: south of Yei, Mt. Korobe, collected by G. Nikolaus, 28 July 1978 (ZFMK 26059; Fig. 2).

Remarks. Spawls et al. (2002) listed this leaf-litter skink for Tanzania, Kenya, Uganda and elsewhere south-west to Angola. Identification followed Perret (1982), Broadley & Howell (1991) and Spawls et al. (2002). Our specimen of *Leptosiaphos kilimensis* shows five toes and a lower eyelid with a central window in contrast to *Leptosiaphos blochmanni*, *L. meleagris* and *L. hackarsi* with three or four digits and the lower eyelid scaly, and *L. graueri* with the lower eyelid scaly, too. The frontoparietals are not fused with the interparietal as it is normally the case in *L. rhomboidalis*. Specimen ZFMK 26059 (Fig. 2) shows five digits on forefoot in contrast to *L. aloysiisabaudiae* with only four digits on forefoot.

Family Colubridae

Hapsidophrys lineata Fischer, 1856

Abhandlungen des Naturwissenschaftlichen Vereins Hamburg (3) 4: 79–116. Type locality: Elmina, Ghana.

Voucher specimen. South Sudan: south of Yei, Kajiko-North, collected by G. Nikolaus, 20 July 1978 (ZFMK 26072; Fig. 3).

Remarks. Spawls et al. (2002) listed this widely distributed forest species for Uganda, Kenya, DR Congo, elsewhere south-westwards to northern Angola and westwards to Guinea. Schmidt (1923), Pitman (1974) and Broadley & Howell (1991) reported this species also for Tanzania. In Uganda, this species is more widely distributed in the southwest of the country; otherwise there are only a few scattered records near Entebbe and in the Mabira and Budongo forests (Spawls et al. 2002). Our voucher specimen from south of Yei (Fig. 3) represents, therefore, a considerable range extension to the north and not simply a border-crossing continuation of the Ugandan distribution range.



Fig. 4. *Thrasops jacksonii* (ZFMK 26008) from between Katire and Talanga, South Sudan (localities nos. 4 and 5 on Fig. 1).



Fig. 5. *Toxicodryas pulverulenta* (ZFMK 26030) from Talanga Forest, South Sudan (locality no. 4 on Fig. 1).

Thrasops jacksoni Günther, 1895

Annals and Magazine of Natural History (London) (6) 15: 523–529.

Type locality. Kavirondo, Kenya.

Voucher specimens. South Sudan: between Katire and Talanga, collected by H. Rupp, 20–25 July 1978 (ZFMK 26008; Fig. 4); South Sudan: Gilo, collected by G. Nikolaus, 29 October 1978 (ZFMK 29573).

Remarks. Broadley & Wallach (2002) listed “southern Sudan” as part of the distribution range of this species and marked this also in a grid map, however, without providing locality data or a voucher specimen. Upon request, we were informed by D.G. Broadley (in litt.) that he had based this statement on an unpublished report by Friis & Rasmussen (1981), who collected one specimen of *Thrasops jacksoni* in the Imatong Mountains, South Sudan, between 29 October and 22 December 1980, also without any further data. Their voucher specimen is deposited in the Zoological Museum, University of Copenhagen under ZMUC R 601199 (the “60” being a code number for colubrid snakes). Our two specimens reported here are therefore, together with the ZMC specimen, the first documented records for the South Sudan. Spawls et al. (2002) listed this species only for Uganda, Rwanda, Tanzania, Kenya, and the Democratic Republic of Congo. According to these

authors, this species also seems to be absent from the northern half of Uganda, so there is a relatively large gap between the Ugandan records and our new records from the Imatong area in South Sudan.

Toxicodryas pulverulenta (Fischer, 1856)

Abhandlungen des Naturwissenschaftlichen Vereins Hamburg 3 (4): 79–116.

Type locality. Liberia; restricted or “corrected” to Sao Tomé by Hughes & Barry (1969).

Voucher specimen. South Sudan: Talanga-Forest (Kinyeti), collected by H. Rupp, July 1978 (ZFMK 26030).

Remarks. Spawls et al. (2002) listed this forest and woodland species (as *Boiga pulverulenta*) for Kenya, Uganda and the DR Congo, elsewhere westwards to Guinea and south-westwards to northern Angola. This confirms data from Pitman (1974) and Chippaux (2001). The Ugandan localities listed by Spawls et al. (2002, see also the map by these authors) leave the northern third of the country without records. Thus, again in this case, the geographic distance to the new South Sudanese locality of the specimen ZFMK 26030 (Fig. 5) is remarkable.



Fig. 6. *Amblyodipsas unicolor* (ZFMK 26088) from Gilo, South Sudan (locality no. 6 on Fig. 1).



Fig. 7. *Atheris squamigera* (ZFMK 26000) from Iwatoka/Watoka, South Sudan (locality no. 2 on Fig. 1).

Family Atractaspidae

Amblyodipsas unicolor (Reinhardt, 1843)

Danske Videnskabernes Selskabs Afhandling 10: 233–279.

Type locality. Guinea Coast = Ghana.

Voucher specimen. South Sudan: Imatong Mountains, Gilo, collected by G. Nikolaus, 20 June 1978 (ZFMK 26088).

Remarks. The distribution of this species is centred on West Africa (Spawls et al. 2002, Trape & Mané 2006) with a few records in East Africa (Tanzania, Kenya, Uganda) (Schmidt 1923, Pitman 1974). Its presence in the forested area of the Imatong Mountains in South Sudan, documented by ZFMK 26088 (Fig. 6), is therefore a remarkable range extension. The three Ugandan localities (Spawls et al. 2002: Kampala, Kinja, Masindi) are not close to the Ugandan-South Sudanese border.

Family Viperidae

Atheris squamigera (Hallowell, 1854)

Proceedings of the Academy of Natural Sciences Philadelphia 3(1): 193–194.

Type locality. “near the river Gabon, Guinea”. According to Loveridge (1957), the type locality is in the ‘French Congo’, a French colony which at one time comprised the present-day area of the Republic of the Congo, Gabon, and the Central African Republic.

Voucher specimen. South Sudan: Iwatoka (= Watoka, near Yeï), collected by H. Rupp, September 1978 (ZFMK 26000).

Remarks. In East Africa, this forest-dwelling species has been documented for Uganda, Kenya and Tanzania; elsewhere westwards to Nigeria, Ghana and Ivory Coast and south-westwards to northern Angola (Spawls & Branch 1995, David & Ineich 1999, Spawls et al. 2002). The Ugandan localities, mostly isolated from each other, are listed in Spawls et al. (2002), but none of them is close to the South Sudanese border. These data again highlight the importance of our new record (Fig. 7) from near Yeï.

DISCUSSION

Scale counts of all specimens mentioned above are within the known range characteristic of each species; hence they are not discussed here. Similarly, the single specimens on whom our new country records are based would not be relevant for any scale count comparisons.

All new records are forest species and belong in all cases to known, widely distributed species. Imatong Mountains also harbour endemics, such as the chameleon *Trioceros kinetensis* (Schmidt, 1943) (Böhme & Klaver 1980), whose relatives are distributed in East Africa, including the Eastern Arc Mountains. Only two species from our new records occur only in East Africa, viz. *Leptosiaphos kilimensis* and *Thrasops jacksoni*. The former has a patchy distribution in Uganda, Kenya and Tanzania (Spawls et al. 2002), the latter reaches also the eastern forests of the Congo Basin in DRC but is replaced further west by other, closely related species (Fischer & Hinkel 1992, Spawls et al. 2002). The other four species, viz. *Hapsidophrys lineata*, *Amblyodipsas unicolor*, *Toxicodryas pulverulenta* and *Atheris squamigera*, have a large distribution through the Congo Basin westwards to Cameroon, Ghana or even Guinea. Biogeographically, they may be regarded as Guineo-Congolian faunal elements and might indicate that the South Sudanese relic rainforests, including the Imatong Mountains, can be considered as northernmost outliers of the Guineo-Congolian realm, with some biogeographic connection to the Eastern Arc Mountains. There is also one lizard showing a similar biogeographic distribution, i.e. a Guineo-Congolian pattern,

viz. the forest-dwelling lacertid *Adolfus africanus* (Boulenger, 1906), which has been already recorded from the Imatong Mountains (Köhler et al. 2003).

These six reptile species newly recorded for the fauna of South Sudan have in common a wide separation from the nearest Ugandan records, which are not located just across the Uganda border but considerably further south. This underscores the importance of the South Sudanese relic forest patches, including the Imatong Mountains, as they have biogeographic relationships with both the East African Arc and the Guineo-Congolian forests. Certainly, the Equatoria Region of South Sudan is greatly understudied in terms of its biodiversity, and the number of squamates newly recorded in this study points out the potential for another hotspot of herpetological diversity in this country. We hope that the Republic of South Sudan will soon return to political conditions that make further basic research and nature conservation possible.

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REFERENCES

- Böhme W (2014) Herpetology in Bonn. *Mertensiella* 21: 1–256
- Böhme W, Klaver CJJ (1980) The systematic status of *Chamaeleo kinetensis* Schmidt, 1943 (Sauria: Chamaeleonidae) from the Imatong Mountains, Sudan, with comments on lung and hemipenial morphology within the *C. bitaeniatus* group. *Amphibia-Reptilia* 1: 3–17
- Broadley DG, Howell KM (1991) A checklist of the reptiles of Tanzania, with synoptic keys. *Syntarsus* 1: 1–70
- Broadley DG, Wallach, V (2002) Review of the Dispholidini, with the description of a new genus and species from Tanzania. *Bulletin of the Natural History Museum London (Zoology)* 68(2): 57–74
- Chippaux JP (2001) *Les serpents de l'Afrique occidentale et centrale*. Paris (Éd. IRD) 2nd edition, 292 pp
- David P, Ineich I (1999) *Les serpents venimeux du monde: systématique et répartition*. *Dumerilia* 3: 1–499
- Fischer E, Hinkel H. (1992) *Natur Ruandas*. Mainz (Rhein-Main-Druck), 452 pp
- Friis I, Rasmussen JB (1981) Flora and fauna of the Imatong Mountains, southern Sudan. Report of the botanical and zoological fieldwork in 1980. Unpublished report, University of Copenhagen, 48 pp
- Hughes B, Barry DH (1969) The snakes of Ghana: a checklist and key. *Bulletin de l'Institut Fondamental d'Afrique Noire* 31(3): 1004–1041
- Jackson JK (1956) The vegetation of the Imatong Mountains, Sudan. *Journal of Ecology* 44: 341–374
- Köhler J, Wagner P, Visser S, Böhme W (2003): New country records of *Adolfus africanus* (Sauria: Lacertidae) – a rain forest lizard with disjunct distribution? *Salamandra* 39: 241–248
- Loveridge A (1957) Checklist of the reptiles and amphibians of East Africa (Uganda; Kenya; Tanganyika; Zanzibar). *Bulletin of the Museum of Comparative Zoology* 117: 151–362 + i–xxxvi
- Nikolaus G (1987) Distribution atlas of Sudan's birds with notes on habitat and status. *Bonner zoologische Monographien* 25: 1–322
- Perret JL (1982) Le sous-genre *Leptosiphos* (Lacertilia, Scincidae) et ses implications. *Bulletin de la Société neuchâteloise des Sciences naturelles* 105: 107–121
- Pitman CRS (1974) *A guide to the snakes of Uganda*. London (Wheldon & Wesley), revised edition, 290 pp
- Schmidt KP (1923) Contributions to the Herpetology of the Belgian Congo based on the collection of the American Museum Congo Expedition 1909–1915, Part II – Snakes. *Bulletin of the American Museum of Natural History* 49(2): 1–146
- Schmidt KP 1943 Amphibians and reptiles from the Sudan. *Field Museum of Natural History (Zoology)* 24: 331–338
- Spawls S, Branch B (1995) *The dangerous snakes of Africa*. London (Blandford), 192 pp
- Spawls S, Howell K, Drewes R, Ashe J (2002) *A field guide to the Reptiles of East Africa*. San Diego, San Francisco, New York, Boston, London, Sydney (Academic Press), 543 pp
- Trape JF, Mané Y (2006) *Guide des serpents d'Afrique occidentale. Savane et désert*. Paris (IRD Éd.), 222 pp