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Second record of the West African hairy bush viper *Atheris hirsuta* Ernst & Rödel, 2002 (Serpentes: Viperidae)

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The African bush vipers of the genus *Atheris* Cope, 1862 currently comprises 15 species, this includes *A. barbouri* Loveridge, 1930 (often assigned to the genus *Adenorhinos*; but see Lenk *et al.* 2001). All species occur exclusively on the African continent with most species occurring in East and Central Africa. West Africa, defined as the eco-region including Nigeria and all countries westwards, excluding Cameroon (see Penner *et al.* 2011), currently harbours three species of *Atheris*. (i) *Atheris squamigera* (Hallowell, 1854) which has a wide range across Central Africa and can be found in south-eastern Nigeria (Spawls & Branch 1995; Luiselli *et al.* 2000). However, the taxonomy of central African *Atheris* is still under debate and several hidden species might be included (see Broadley 1998; Lawson 1999; Lawson & Ustach 2000; Lawson *et al.* 2001). Concerning distribution,we follow Chippaux (2006) and others in regarding all records of *A. squamigera* west of Nigeria as doubtful. A true West African species is (ii) *Atheris chlorechis* (Pel, 1851) which ranges from Guinea, through Sierra Leone, Liberia, Côte d'Ivoire and Ghana to Togo. Its occurrence in Nigeria is unclear. So far no records exist for Benin (Ullenbruch *et al.* 2010; Hughes 2013; C. Toudonou pers. comm.). The third species, (iii) *Atheris hirsuta* Ernst & Rödel, 2002, was described from a single specimen found near the ecological research station in the Taï National Park, Côte d'Ivoire. No further records existed until this study.

A short survey of the herpetofauna of Mt. Swa in Nimba County, Liberia (approximately 200km west of the type locality) revealed the second specimen of this species (leg. & det. J. Penner). The mountain does harbour good secondary forests and altitude remains below 600m a.s.l. The specimen was found around 9pm on the 26th of September 2012. The individual was observed climbing through secondary vegetation in ca. 2m height on the ridge of the mountain (585m a.s.l.). No water bodies of any kind were found on top of the ridge. Weather was windy, cloudy but without rain. Colouration and morphology of the specimen clearly resembles that of the holotype (see Fig. 1, Tab. 1, 2 & 3).

The specimen was collected, photographed on the following morning and then killed with an overdose of 20% benzocaine solution. Muscle tissue was taken from the ribs between the anterior two thirds and the posterior one third of the body (stored in 96% Ethanol, for genetic analysis). The specimen was fixed in formaldehyde (4%) with everted hemipenes and later transferred to ethanol (70%). It is now stored in the herpetological collection of the Museum für Naturkunde, Berlin (ZMB 78827).

TABLE 1. Measurements of the two known specimens of *Atheris hirsuta* in comparison with the measurements from *Atheris squamigera* taken by Ernst & Rödel (2002). Abbreviations are as follows: head length = HL, head width = HW, interorbital distance = IOD, snout-eye distance = SED.

	HL	HW	IOD	SED	HL/HW	IOD/SED	HW/IOD	SED/HL	Source
A. hirsuta (ZMB 78827)	15.1	11.6	5.7	3	1.3	1.9	2.0	0.20	
A. hrisuta (holotype, SMNS 11333)	14.3	10.7	6.9	3	1.3	2.3	1.6	0.21	Ernst & Rödel 2002
A. squamigera (range)	12.5–28.9	8.5–22.1	5.3–11.8	3.3–7.2	1.1–1.7	1.4–1.9	1.4	0.25–0.26	Ernst & Rödel 2002

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TABLE 2. Measurements of the currently recognised 15 species of *Atheris* plus the two sister taxa, *Montatheris hindi* and *Proatheris superciliaris*, formerly belonging to the genus *Atheris*. Measurements and nomenclature follow Broadley (1998) and Ernst & Rödel (2002). Abbreviations are as follows: Suprarostrals = SRO, Internasals = INS, Interorbitals = IOS, Maximum transverse head scales = MTHS, Circumorbital scales = COS, Interoculabials = IOL, Interocunasals = ION, Supralabials = SL, Infralabials = IL, pairs of sublinguals = PSL, Serration of keels on lateral scales = SLS, Elevated supraocular scales = ESO (= "horns"), dorsal scales at midbody =MSR, number of ventral scales = V, number of subcaudal scales = SC, maximum length with tail length in brackets if known = ML (TL). Comments included in the table are: (a) unclear taxonomy; (b) variation due to differences between left and right side; (c) depends on how this is defined, per definition [total number of scales between nasals and COS] should be 2 but it is obvious from drawings and photographs that previous investigators measured not the total number but rather how many scales are in between, then it would be 1; (d) estimated from photo of holotype; (e) from Phelps (2010); (f) estimated from Lawson (2001); (g) estimated from photos by Dobiey (2008); (h) estimated from photo; (i) estimated from photos by Menegon (2013), COS do not seem to go around eye completely; (*) mark variations with respective sources. *Atheris squamigera* is included twice because the paper by Broadley (1998) covers more specimens but might contain species described afterwards (see text). *Atheris hirsuta* is also included twice to show the variation between the two collected specimens. Both "double" records are marked in grey as well as *M. hindi* and *P. superciliaris*.

Species	SRO	INS	IOS	MTHS	COS	IOL	ION	SL	IL	PSL	SLS	ESO	MSR	V	SC	ML (TL)	Source
A. acuminata	2	3	5	10	11-12	0	1	6	7-8	1	-	-	14	160	54	44	Broadley 1998
A. anisolepis (a)	7-8	5	6–8	14–18	12–17	(0)1	2–4	10–13	10–14	3–8	NA	–	19–25	153–160 150–162*	47–55 46–55*	65	Broadley 1998; *Chippaux 2006
A. barbouri	7 (i)	0 (i)	4–5 (i)	NA	6 (i*)	0 (i)	0 (i)	5–6	5	3 (i)	– (i)	-	19–23	114–128	14–22	40 (e)	Broadley 1996
A. broadleyi	3–7	3–5	3–8	14–18 (f)	12–16	0	3	9–12	9–12	4 (h)	-	-	17–23	157–169	45–61 45–59*	77	Lawson 1999; * Chippaux 2006
A. ceratophora	5–9	4–5	7–11	19–20	13–19	0–1	2–4	7–11	8–12	1–3	+	+	19–27	134–152	46–58	64.2	Broadley 1998
A. chlorechis	7–8	5	8–14	25–27	15–20	(0)1 (2)	3–4	9–12	10–11	1–2	+	-	25–37	151–165	48–64	58.5	Broadley 1998; Chippaux 2006
A. desaixi	6–7	5	8–11	22	14–17	1–2	2–3	10–12	11–14	4–6	+	-	21–31	164–168 160–174*	41–54	68.2	Broadley 1998; * Spawls *et al*. 2002
A. hirsuta	6	5	9	14	14–15	0	1	9–10	8–9	3	–	-	16	160	58	48 (9.5)	Ernst & Rödel 2002 (b)
A. hirsuta	4	4	9 (?)	18	13–14	0	1 (c)	8–9	8	4	-	-	15	159	58	43.2 (8.7)	this paper
A. hispida	3	4–6	6–10	12	9–15	0	2	9–10	8–10	1–2	-	-	15–19	149–166	49–64	73.5	Broadley 1998
A. katangensis	3–6	5–6	9–11	20–22	14–17	0–1	2–3	9–12	11	3	+	-	23–31	133–144	38–49	39.7	Broadley 1998
A. mabuensis	3–4	4 (d)	6–8	20 (d)	14–16	0 (d)	1 (c & d)	7–9	8–10	3	-	-	22–26	128–137	38–46	38.4 (5.6)	Branch & Bayliss 2009
A. matildae	4	2–3 (d)	12	27–28	16	1–2	3–4	10	11	4 (d)	- (d)	+	26–27	142–150	44–50	64.3 (9.6)	Menegon *et al.* 2011
A. nitschei	3–7	4–5	6–12	18–20	10–17	(0)1 (2)	2–5	8–13	9–15	3–6	+	-	23–34	140–162	35–59	75	Broadley 1998
A. rungweensis	3–7	5–6	9–13	24–26	15–18	1–2	3–4	9–12	11–13	2–3	+	-	23–33	150–165	46–58	64.2	Broadley 1998
A. squamigera	3–7	3–5	5–11	15–22	10–18	0(1)	(1)2(3)	7–13	8–13	2–7	-	-	19	149–163 133–175*	50–63 45–67*	80*	Broadley 1998; * Chippaux 2006
A. squamigera	3–8	3–6	7–10	12–17	11–17	0–1	1–2	8–12	8–13	4–7	-	-	16–22	140–171	31–65	60.5	Ernst & Rödel 2002
A. subocularis	3	4	6–7	12–15	11–14	0 (d)	2–5	8–10	8–9	NA	- (d)	-	14–16	154–163	58–65	49.1	Lawson *et al.* 2001
M. hindii	7 (g)	4–5	7 (g)	9	11–13	0 (g)	2–3	8–9	8–10	NA	- (g)	- (g)	25–28 max. 28*	130–138 127–144*	27–36 25–36*	35 (e)	Broadley 1996; * Kramer 1961 & Spawls et al. 2002
P. superciliaris	0	1–3	6–8	20–25	8–14	0(1)	2	8–11	10–13	1	- (h)	-	27–29	137–156	32–43	59.8	Broadley 1998

All measurements as well as photographs of the everted hemipenes were taken in the lab. Measurements follow Broadley (1998) and Ernst & Rödel (2002). For a detailed comparison see table 1 and table 2. In summary our specimen is smaller (ca. 5cm) than the holotype but very similar in scale characters. The most prominent features are, as in the holotype, the heavily keeled scales, giving the snake its hairy appearance, as well as a relatively small head in comparison to the body. In addition the species boasts a short snout and huge eyes (Fig. 1 & Tab. 1).

FIGURE 1. Photographs of the second known specimen of *Atheris hirsuta* showing different aspects from left to right and bottom to top: entire specimen, right lateral side of head, frontal view of head, left lateral side of head showing tongue colouration, midbody dorsal aspects, ventral aspects at midbody, two different views on the fully everted hemipenes of *Atheris hirsuta* showing the characters described in the text and a map of the two known localities of the species (see text) with the Global Land Cover 2009 as background (dark green depicts lowland rainforest, light green a mosaic of vegetation and croplands).

More specifically the measures are (holotype, SMNS 11333, in brackets): 4 (6) suprarostrals, 4 internasals, 9 interorbitals, 18 (14) maximum transverse head scales, left 14 / right 13 (left 15 / right 14) circumorbital scales, 0 (0) interoculabials, 1 (1) interocunasals, left 9 / right 8 (left 10 / right 9) supralabials, left & right 8 (left 9 / right 8)

infralabials, 4 (3) pairs of sublinguals, no serrated lateral scales, no elevated suparoculars, 15 (16) dorsal scales around midbody, 159 (160) ventrals and 58 (58) subcaudals. A comparison to published characters from other species of the Atherini tribe is given in Table 2.

Though the holotype is a male, no hemipenes were described so far. We provide a description herein (see figure 2), following the terminology of Dowling & Savage (1960) and Branch (1986). Our specimen shows two divided hemipenes, each lobe with a bifurcate *sulcus spermaticus*. Forks run semi-centrifugally to the end of the lobes. The length is approximately 10mm and the apical lobes are curved in a 90° angle. A spiny ornamentation is visible with larger spines (basal hooks) at the base which become gradually smaller towards the apex (becoming papillae like at the terminus). An area round the *sulcus spermaticus* remains spine free. The apices show no special differentiation but smaller spines than the base. No calyces, fleshy protuberances or ridges are visible.

Concerning behaviour, we cannot confirm that *Atheris hirsuta* is more aggressive than sympatric *Atheris chlorechis*. According to the observations on the new specimen, coiling the anterior third of the body is not more frequent. The specimen only hesitantly coiled and despite an extensive photography session it never attempted to bite.

In summary, our finding is remarkable because the species does seem to be rare and at the same time it is not restricted to primary lowland rainforest nor to its type locality. Judging from the habitats of the two specimens and available land cover information there seems no reason why the species should not be much more widespread and occur in areas in between. The accompanying locals at Mt. Swa did not know the species. In addition other surveys in Liberia or other areas failed to detect the species. No conservation status is assigned at the moment but the only proposition for the IUCN Red List can be “Data Deficient”.

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