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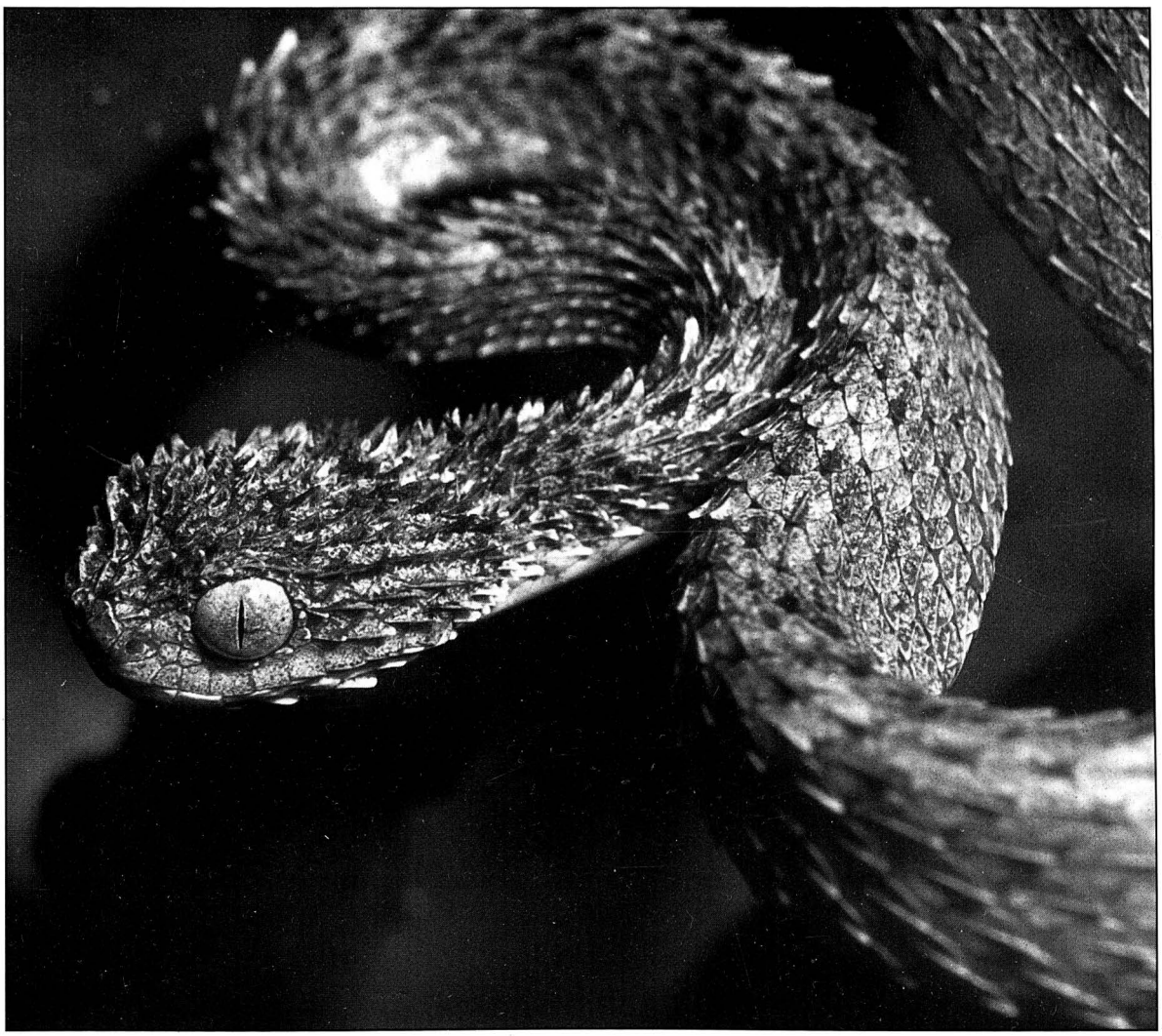

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A NEW *ATHERIS* SPECIES (SERPENTES: VIPERIDAE), FROM TAÏ NATIONAL PARK, IVORY COAST

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We describe a new species of the genus *Atheris* from Taï National Park, a large rainforest area in south-western Ivory Coast. *Atheris* sp. nov. shows close affinities to *A. squamigera*, but is distinguished from it by a combination of scale characteristics, as well as morphometric differences in head proportions.

Key words: Serpentes, Viperidae, *Atheris* sp. nov., Taï National Park, Ivory Coast;

INTRODUCTION

The genus *Atheris* has undergone several taxonomic revisions (Broadley, 1996, 1998). However, due to the huge variability within the genus (Jacobi, 2001), the taxonomic status of several taxa still remains to be settled. Very recently two new species of *Atheris* have been described: *A. acuminata* from Uganda (Broadley, 1998) and *A. broadleyi* from Cameroon (Lawson, 1999). The resurrection of *A. subocularis* from the synonymy of *A. squamigera* has currently been published (Lawson, Noonan & Ustach, 2001). The latter species is especially renowned for its variability (Spawls & Branch, 1995). However, previous papers may have inadvertently increased its known variation in many characters by combining distinct species (Lawson, 1999).

According to Hughes (pers. comm.), without a thorough re-examination of existing museum specimens, it cannot be decided whether *A. squamigera* is a geographically variable species or a species complex. However, there is good evidence of more than one species being involved. *Atheris hirsuta* sp. nov. from Taï National Park (TNP), Ivory Coast, is one of these species that shows close affinities to *A. squamigera,* but differs sufficiently to be recognized at the species level.

MATERIAL AND METHODS

For comparison, we investigated museum specimens of *A. squamigera* from the entire Central and West African range of the species (Fig. 1). Museum specimens under investigation originated from, and are deposited in, the following collections: Staatliches Museum für Naturkunde Stuttgart (SMNS), Zoologisches Forschungsinstitut und Museum Alexander Koenig Bonn (ZFMK), Zoologisches Museum der Humboldt Universität zu Berlin (ZMB), Zoologisches Institut und Zoologisches Museum der Universität Hamburg (ZMH), Zoological Museum, University of Copenhagen (ZMUC), and Zoologische Staatssammlung München (ZSM).

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The geographical co-ordinates were obtained from Geographic Names Processing System - Phase IV, and a portable GPS (Garmin 12XL). The map was drawn with the mapping program Versamap version 2.07.

In order to ensure comparability, we investigated the same characters used in recent treatments of the genus (Broadley, 1998; Lawson & Ustach, 2000): 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), dorsal scale rows at mid-body (MSR), ventrals and subcaudals. For discussion of the diagnostic significance of these characters, see Broadley (1998). In addition we investigated morphometric proportions of the head, as well as structure and shape of scales. Scale terminology is according to Broadley (1998).

Head width (HW) was always taken as the maximum head width possible. Head length (HL) was measured from snout to the quadratum. Interorbital distance (IOD) was measured between the circumorbital scale rows. Snout-eye distance (SED) was measured from the anterior corner of the eye to the snout tip. Scale and head measures were taken to the nearest 0.1 mm using a dial calliper. When scale counts differed between the sides of the head, we gave both values. Snout-vent length (SVL) was taken to the nearest mm using a metre rule. Results are summarized in Tables 1, 2 and 3. Scale microstructure was examined by means of a scanning electron microscope (SEM).

SPECIES ACCOUNT

ATHERIS HIRSUTA SP. NOV.

Holotype. SMNS 11333, male, about 6 km West of the "Station de Recherche en Ecologie Tropicale" (SRET 5°50'N 7°19'W), TaïNational Park, Ivory Coast, 20 September 2000, 07.00 hrs, R. Ernst leg.

Diagnosis. Slender tree viper with rather short head, IOD/SED 2.3; heavily carinated scales, especially on head and neck, giving the snake a bristly appearance; keels run in long curves towards a sharp tip; six suprarostrals; eight to nine infralabials; three pairs of sublinguals; elongate dorsal scales; 16 scale rows around mid-body.

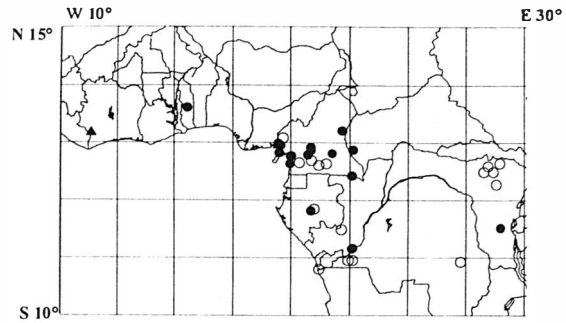

FIG. 1. West and Central African distribution of *A. squamigera* (circles) and type-locality of *A. hirsuta* sp. nov. (triangle). Closed symbols represent localities of checked specimens, open symbols represent unchecked literature records; sources: Blanc & Frétey, 2000; Broadley, 1998; Lawson & Ustach, 2000.

Description. Slender tree viper, 480 mm total length, tail 95 mm; very short and sturdy head, IOD/SED 2.3; rostral three times as wide as deep, surmounted by six suprarostrals; viewed from the front the three median suprarostrals in the lower row increase in size from left to right; the upper row consists of three scales, the lateral ones larger than the median (Fig. 2c); five internasals strongly carinated; nasals undivided; a single scale row separates nasals from circumorbital scales; head scales heavily carinated and lanceolate; nine interorbitals; 14 scales between posterior supralabials; eye large, 3.1 mm in diameter; eye diameter 2.5 times the eye-border to lip distance; no interoculabial; 14 and 15 circumorbitals, four in contact with supralabials; nine and 10 supralabials; mental twice as wide as long; eight and nine infralabials, first pair in contact posterior to mental; three pairs of sublinguals; three preventrals; two to three rows of keeled gular scales; dorsal scales heavily keeled, especially on head and anterior third of body; keels run curved to a sharp tip; lateral scales without serration; no reticulate microdermatoglyphic pattern of cell boundary lines; size of the scale keels decreases from head to tail; keels at mid-body shorter and with rather blunt tips; 16 scale rows around mid-body; 14 scale rows in the neck region; 14 scale rows anterior to vent; 160 ventrals, slightly keeled; 58 subcaudals.

Coloration. Dorsal coloration in life is bronze; several scale tips and keels being dark-brown, forming an irregular pattern of broken crossbars; ventrally cream-white to yellowish; iris yellow (Fig. 3). In preservative (3 % formaldehyde transferred to 70 % ethanol after two months), colour changed to reddish-brown dorsally; ventral scales turned uniform clear reddish brown, being more intense in posterior third of body and tail, fading anteriorly.

Etymology. The name refers to the hirsute appearance of the snake (lat. hirsutus = hairy, hirsute).

TABLE 1. Head-measurements and indices of specimens examined. Data for *Atheris squamigera* are based on all material examined (n=23). Damaged specimens were excluded from the analysis. Measurements in mm. For abbreviations see the material and methods section.

	HL	HW	IOD	SED	HL/HW	IOD/SED	HW/IOD
Atheris hirsuta sp. nov.	14.3	10.7	6.9	3.0	1.3	2.3	1.6
Atheris squamigera							
Mean	20.2	15.0	8.1	4.8	1.4	1.7	1.8
Mode	16.4	11.1	8.2	5.3	1.1	1.6	1.4
SD	4.1	3.3	1.4	1.0	0.1	0.1	0.2
Min	12.5	8.5	5.3	3.3	1.1	1.4	1.4
Max	28.9	22.1	11.8	7.2	1.7	1.9	2.2

TABLE 2. Head scalation of specimens examined. Data for *Atheris squamigera* are based on the entire material examined (n=44). Damaged specimens were excluded from the analysis. For abbreviations see the material and methods section.

	SRO	INS	IOS	MTHS	COS left	COS right	IOL	ION	SL left	SL right	IL left	IL right	PSL
Atheris hirsuta sp. nov.	6.0	5.0	9.0	14.0	15.0	14.0	0.0	1.0	10.0	9.0	9.0	8.0	3.0
Atheris squamigera													
Mean	4	4	8	14	14	14	0	1	10	10	11	11	5
Mode	3	4	8	15	14	14	0	1	10	10	11	11	5
SD	1.5	0.6	0.7	1.1	1.4	1.3	0.3	0.4	1.0	0.9	1.0	1.2	0.6
Min	3	3	7	12	11	11	0	1	8	8	8	8	4
Max	8	6	10	17	17	17	1	2	12	12	12	13	7

TABLE 3. Body scalation and SVL in mm of specimens examined. Data for *Atheris squamigera* are based on all material examined (n=44). Damaged specimens were excluded from the analysis. [a] = + anal. For abbreviations see the material and methods section.

	MSR	Ventrals[a]	Sub-caudals	SVL
Atheris hirsuta sp. nov.	16.0	160	58.0	480
Atheris squamigera				
Mean	19	154	52	428
Mode	20	158	55	450.0
SD	1.6	7.7	5.7	93.3
Min	16	140	31	220
Max	22	171	65	605

Habitat. The TNP (6°10'-5°10'N, 7°20'-6°50'W) is the largest protected rain forest area in West Africa. Annual precipitation reaches 2200 mm in the south-west and 1700 in the north-east of the park. Precipitation is highest from April-May to June-July and from September to October-November. A first dry period lasts from December to February. A second dry period normally occurs in August. Daily mean temperature varies between 20°C and 30°C; diurnal fluctuations in temperature are up to 10°C. Mean annual temperature is about 25°C. Humidity fluctuates from 85% during the day to 90-100% during the night. This area is situated within the equatorial climate zone, which is influenced by the southern passat (Riezebos, Vooren & Guillaumet, 1994). Floristically it belongs to the Guinea-Congo Region (Guillaumet, 1967). The holotype was found after heavy rain, on a dirt road between the small town of Taï and the SRET. This area is characterized by secondary rain forest.

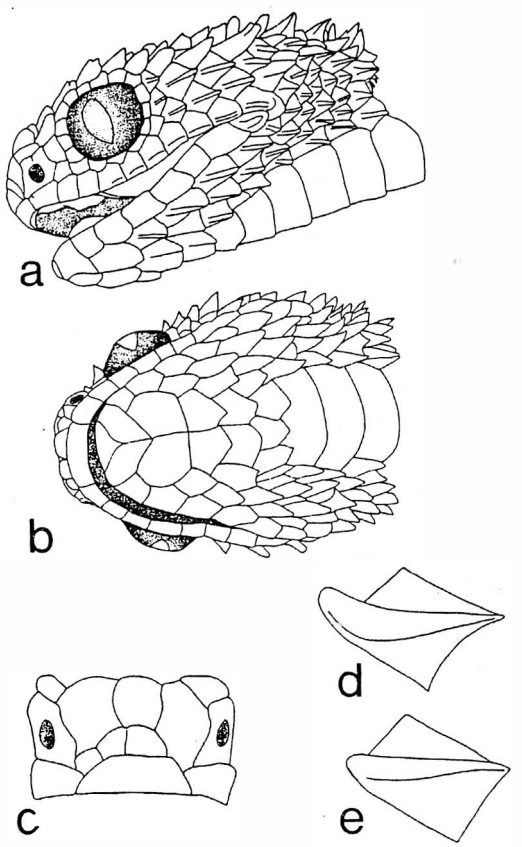

FIG. 2. Lateral (a) and ventral (b) aspect of *Atheris hirsuta* sp. nov. (holotype, SMNS 11333) from Taï-National Park, Ivory Coast; scalation of the snout (c); dorsal scales from *Atheris hirsuta* (d) and *A. squamigera* (e) (ZSM 375 / 1909).

Behavioural remark. Compared to the sympatric *A. chlorechis*, *A. hirsuta* seemed to be more aggressive. When disturbed, it immediately coiled the anterior third of the body in an S-shape, ready to strike.

Distribution. So far only known from the type locality (Fig. 1).

DIFFERENTIAL DIAGNOSIS AND DISCUSSION

Atheris hirsuta sp. nov. resembles *A. squamigera* in appearance but can be distinguished from the latter by several morphometric, and morphological characters. Its most intriguing difference is the elongated dorsal scalation, especially on the head and anterior body, which could not be observed to such an extent in any specimens of *A. squamigera*. Further distinguishing characters were: the number and arrangement of suprarostrals (SRO) (six in *A. hirsuta;* three or up to eight in *A. squamigera,* but usually odd numbers occur); the number of pairs of sublinguals (PSL) (three pairs in *A. hirsuta*; four to seven in *A. squamigera*); and the shape of the head and neck scales. Scales in *A. squamigera* are never as strongly bent as in *A. hirsuta* (Fig. 2 d, e), which in this respect appears similar to *A. hispida* and *A. acuminata*. *Atheris hirsuta* has a much shorter snout and larger eye than *A. squamigera*, giving the head a more blunt and stocky appearance. This is expressed by the IOD/SED index, which is 2.3 in *A.*

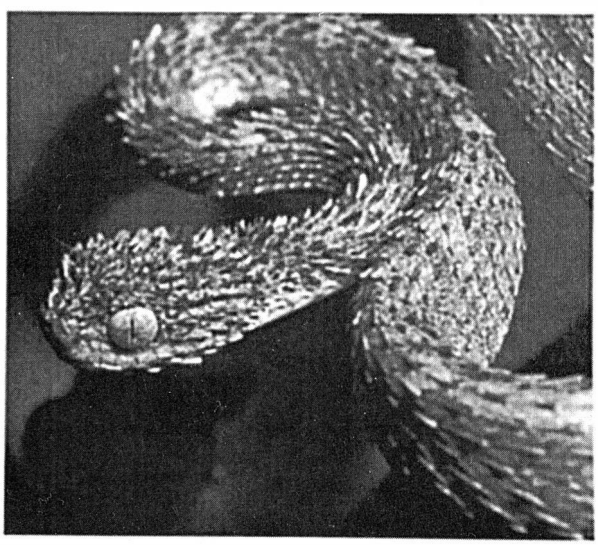

FIG. 3. *Atheris hirsuta* sp. nov. (holotype, SMNS.11333) from Taï National Park, Ivory Coast.

hirsuta, compared with a maximum of 1.9 (mean 1.7) in *A. squamigera*. The number of mid-dorsal scale rows (MSR) in the holotype of *A. hirsuta* is comparatively low – only 16, which equals the lowest counts found in *A. squamigera* (SMNS 4213; ZMB 20481).

Atheris hirsuta differed from the sympatric *A. chlorechis* by the number of suprarostrals (7-8 in *A. chlorechis*, arranged in a lower row of four and an upper row of three to four scales) and the maximum transverse head scale count (MTHS) between the posterior supralabials (SL) (25-27 in *A. chlorechis*; 14 in *A. hirsuta*). *Atheris chlorechis* has higher infralabial counts (IL) (10-11; 8-9 in *A. hirsuta*) and higher numbers of dorsal scale rows at mid-body (25-37). Scales of *A. chlorechis* are not as strongly keeled and the keel only stretches across two thirds of the entire scale, leaving a smooth, slightly depressed area uncovered. Our SEM-photos of *A. hirsuta* revealed no serration of keels on lateral scales, known to occur in some *A. chlorechis* (Groombridge, 1980, cited by Broadley, 1996, 1998).

Atheris hirsuta differs from the East African species *A. nitschei*, *A. rungweensis*, *A. desaixi*, *A. katangensis* and *A. ceratophora* by having fewer transverse head scales, fewer interocunasals (ION) and higher numbers of dorsal scale rows at mid-body. Dorsal scalation in these species is never as elongate as in *A. hirsuta*. The latter lacks serrated keels on lateral scales, present in the species mentioned above. The lack of elongate supraoculars that form horn-like projections above the eyes furthermore distinguishes *A. hirsuta* from *A. ceratophora*. Keels in *A. rungweensis* and *A. desaixi* end before the scale tip, whereas they reach the tip in the other members of this group, as well as in *A. hirsuta*. *A. rungweensis* and *A. desaixi* have more interoculabials (IOL), as well as higher numbers of infralabials. The number of pairs of sublinguals is higher in *A. desaixi*. *Atheris broadleyi* from Cameroon is distinguished from *A. hirsuta* by having more interoculabials, a higher number of scale rows at mid-body and fewer interorbitals (IOS), and by its consistent dorsal colour pattern, also used to distinguish it from the closely related *A. squamigera* (Lawson, 1999). Two distinctive East African species, *A. hispida* and *A. acuminata*, also posses acuminate or lanceolate dorsal scales, but differ from *A. hirsuta* by having fewer transverse head scales and a lower number of suprarostrals, as well as fewer pairs of sublinguals. In addition, *A. hispida* has a higher number of interocunasals. *Atheris acuminata* has a lower number of circumorbital scales, as well as lower numbers of supralabials. For a summary of differences between *A. hirsuta* and other *Atheris* species, see Table 4.

Several authors pointed out that the high variability within the genus *Atheris*, and especially *A. squamigera*, may at least partially be due to incorrectly combining distinct species within a single taxon (Lawson, 1999; Hughes pers.comm.). For example, *A. hispida* had long been taken as a synonym of *A. squamigera* (Laurent, 1955). The same is true for *A. broadleyi*, which had been referred to as a colour morph of *A. squamigera* (Perret & Mertens, 1957; Broadley, 1998), until its description by Lawson (1999). The resurrection of the species status of *A. subocularis* has recently been published (Lawson et al. 2001). We herein adopted the recognition of *A. anisolepis* as junior synonym of *A. squamigera* by Lawson & Ustach (2000). However, these authors do not consider the difference in suprarostral scale counts (seven to eight in *A. anisolepis*, three to seven in *A. squamigera*), mentioned in Broadley (1998). We found this character to be consistent in four museum specimens (SMNS 8361; ZMB 28987; ZSM 275/1996; ZSM 375/1909;) and an additional specimen (ZMUC R68269) previously recognized as *A. anisolepis* (Broadley, 1998). Referring to data presented by Broadley (1998), Hughes (pers. comm.) has pointed out the great range in ventral counts (males: 133-169, variation: 36 scales; females: 141-175, variation: 34 scales) in *A. squamigera*. In his opinion, a variation of more than 30 in ventral scale counts within one sex is suggestive of more than one species being involved.

TABLE 4. Comparison of characteristics among *Atheris hirsuta* sp. nov. and other *Atheris* species. Differences to *Atheris hirsuta* are marked bold. SLS = serrated keels on lateral scales; ESO = elongate supraoculars; * = no data; + = present; - = absent. For further abbreviations see the material and methods section. Data referring to *Atheris squamigera* represent mean values of specimens examined. Data referring to species other than *Atheris hirsuta* and *Atheris squamigera* adapted from: Broadley, 1998 and Lawson, 1999.

	SRO	INS	IOS	MTHS	COS	IOL	ION	SL	IL	MSR	PSL	SLS	ESO
hirsuta	6	5	9	14	14-15	0	1	9-10	8-9	16	3	-	-
squamigera	**4**	**4**	**8**	14	14	0	1	10	**11**	**19**	**5**	-	-
nitschei	3-7	4-5	6-12	**18-20**	10-17	0-2	**2-5**	8-13	9-15	**23-34**	3-6	+	-
rungweensis	3-7	5-6	9-13	**24-26**	15-18	1-2	**3-4**	9-12	**11-13**	**23-33**	2-3	+	-
desaixi	6-7	5	8-11	**22**	14-17	1-2	**2-3**	**10-12**	**11-14**	**21-31**	**4-6**	+	-
ceratophora	5-9	4-5	7-11	**19-20**	13-19	0-1	**2-4**	7-11	8-12	**19-27**	1-3	+	+
katangensis	3-6	5-6	9-11	**20-22**	14-17	0-1	**2-3**	9-12	**11**	**23-31**	3	+	-
chlorechis	**7-8**	5	8-14	**25-27**	15-20	0-2	**3-4**	9-12	**10-11**	**25-37**	**1-2**	+	-
broadleyi	3-7	3-5	**3-8**	*	12-16	0	**3**	9-12	9-12	**17-23**	*	-	-
hispida	**3**	4-6	6-10	**12**	9-15	0	**2**	9-10	8-10	15-19	**1-2**	-	-
acuminata	**2**	3	**5**	**10**	11-12	0	1	**6**	7-8	**14**	**1**	-	-

Characteristic threat displays involving stridulation, that have been reported for *A. desaixi* (Ashe, 1968) and erroneously for *A. nitschei* (Goetz, 1975), were not observed when handling A. *hirsuta*. The dorsal scales of *A. hirsuta* showed no micro-ornamentation, as has been illustrated by Price (1982, Fig. 6a) and Groombridge (1980, Figure 184, cited in: Broadley, 1996) for *A. squamigera*. In our opinion, it remains questionable whether this is really a feature of diagnostic value. Among the material examined in SEM-analyses, we found *A. squamigera* showing such ornamentation as well as specimens showing no ornamentation at all.

Atheris hirsuta clearly differs from the frequently observed colour patterns in *A. squamigera*. The latter are most often apple green to turquoise blue with yellow crossbands, occasionally uniform spectrum yellow (Lawson, 1993) or violet (Lawson, 1999), or a mottled combination of these colours, and sometimes light brown (this paper).

Another strong argument for the distinctiveness of *A. hirsuta* from *A. squamigera* is their allopatric distribution. The reports of the latter species from Senegal (Lawson, 1999) and the Ivory Coast (Spawls & Branch, 1995; McDiarmid, Campbell & Touré, 1999) are not substantiated by voucher specimens and are most probably repetitions of earlier misidentifications in the literature. The westernmost verified *A. squamigera* record is from "Togo" (Werner, 1897; Sternfeld, 1910), based on ZMB 13777. There were no precise locality data for Buettner's specimens, but they probably came from the forested Togo hills, which now lie on the border between Togo and Ghana, since former western Togo now constitutes the Volta Region of Ghana, accounting for the inclusion of Ghana within the range of this species by Leeson (1950) and Hughes & Barry (1969). Werner (1897) provided data for four uncatalogued specimens of *A. squamigera* with low counts for midbody scale rows (17-19), and a head which he assigned to the East African species *A. ceratophora*. However, Sternfeld (1910) only listed two *A. squamigera* from Togo, collected by Buettner, with the Berlin Museum number 13777, but claimed that the species was new for Togo. This "Togo" population is separated from populations in south eastern Nigeria east to Kenya by the "Dahomey Gap", an area well known to form a zoogeographic barrier for forest species (e.g. Schiøtz, 1967). This area is occupied by "forest-savanna mosaic", with only small patches of forest remaining, and has existed in its present form for some 10 000 years. The present situation may be the cumulative effect of successive Pleistocene dry periods, due to climatic oscillations (Moreau, 1963, 1969; Jahns *et al.*, 1999).

Although our description of *A. hirsuta* is based on a single specimen, we believe the differences to be sufficient to justify its description at the species level, thereby making the name accessible for further studies of the snake fauna of the Ivory Coast. Rödel & Mahsberg (2000) recorded 39 snake species from TNP. From their experience in other regions (Rödel, Grabow, Böckheler & Mahsberg, 1995; Rödel, Kouadio & Mahsberg, 1999) they suggest that approximately only two thirds of the snake fauna of TNP has been found so far. With this description the known species score of TNP rises to 40.

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APPENDIX

COMPARATIVE MATERIAL EXAMINED:

Atheris squamigera

BURUNDI: ZSM 275/1996, E:VIII.93-VI.96, Burundi, Musigati;

CAMEROON: ZMH R06316 old no. 1760, Cameroon; ZMH R06321 old no. 1861, Cameroon; ZMH R06311 old no. 4973, Jaundebezirk (Yaoundé) an der Kribistrasse, S Yaoundé, Cameroon; ZMH R06323 old no. 4493, Esosung, Bakossi Mountains, Bezirk Johann-Albrechts-Höhe (=Kumba) 1060 m a.s.l., Cameroon, Africa; ZMH R06313 old no. 4949, Kuti, Bamum Country, 1040 m asl, Cameroon; ZMH R06328 old no. 5131, Central Africa Molundu; ZSM 375/1909a, Dibongo bei Abdea Kamerun; ZSM 375/1909b, Dibongo bei Abdea Kamerun; ZSM 96/1978, Esosung, Bakossi Mountains, Kamerun; ZMB 20342, Douala, Yossplatte; ZMB 20481, Douala, Yossplatte; ZMB 15887-88, Joh.Albrechtshöhe; ZMB 21727, Longji, Kamerun; ZMB 28987, Longji, Kamerun; ZMB 24302, Njong, Neu-Kamerun; ZMB 30690, Ajoshöhe am Nyong; ZMB 30719, Ajoshöhe am Nyong; SMNS 4213, Acra, Kamerun; SMNS 4264, Malimba, W.Afrika; ZFMK15619, Kamerun & Fernando Pó, 1951/54 1963, Kumba; 1951/54 1963, Moka /Bioko; ZFMK5452-56, Kamerun+Fernando Pó, 1951/54 1963, Moka /Bioko; ZFMK 15618, Kamerun & Fernando Po, 1951/54 1963, Nyasoso/Kupe;

CONGO: ZMUC R68269 (800), Ménengué, 4°16'S-11°47'E, Congo; ZMUC R68270 (RJD 12),Tchissanga, 4°32'S-11°46'E, Congo; ZSM 130-137/1999 V.1995, Brazzaville umgeb.;

DEMOCRATIC REPUBLIC OF CONGO (ZAIRE): ZMH R06317 old 124, Belgisch Kongo, Democratic Republic of Congo; SMNS 8361, Zaire, Afrika, Prov.Kivu Station Irangi; ZMB 37709, Leopoldville; ZMB 37807, Leopoldville; ZMH R06326 old 184, Leopoldville: Kinshasa;

GABON: ZMH R06320 old 1098,Gabon;

TOGO: ZMB 13777,Togo.

Gazetteer (only localities of West and Central African distributional range of *A. squamigera* included):
CAMEROON: 34 km N of Lolodorf, 3°14'N 10°44'E; Njong, 3°17'N 9°54'E; Bitye, 3°1'N 12°22'E; Metet, 3°26'N 11°45E; Dibongo bei Abdea 3°47'N 10°6'E; Jaundebezirk (Yaoundé) an der Kribistrasse, S Yaoundé, 3°52'N 11°31'E; Longji, 3°5'N 9°58'E; Boumir Camp, Dja Forest Reserve, 3°9'N 13°0'E; Ajoshöhe am Nyong, 4°0'N 13°34'E; Fernando Pó, Kumba, 4°43'N 9°11'E; Southwest Province, 5°25'N 9°20'E; Esosung, Bakossi Mountains, Bezirk Johann-Albrechts-Höhe (=Kumba) 1060 m a.s.l. Africa, 5°59'N 14°26'E; Molundu, 2°2'N 15°13'E; Douala, Yossplatte, 4°3'N 9°42'E;
CONGO: Leketi, 2°34'S 14°17'E; Ménengué, 4°16'S 11°47'E; Tchissanga, 4°32,S 11°46'E; Lukolela, 5°23'S 24°32'E; Prov.Kivu Station Irangi, 2°30'N 28°0'E; Brazzaville umgeb., 4°16'S 15°17'E;
DEMOCRATIC REPUBLIC OF CONGO (ZAIRE): Banana, 6°1'S 12°24'E; Leopoldville: Kinshasa, 4°18'S 15°18'E; Leopoldville,4°19'S 15°13'E; Avakubi, Kinshasa,1°20'N 27°34'E; Niapu, Kinshasa, 2°25'N 26°28'E; Medje, Kinshasa, 2°25'N 27°18'E; Akenge, Kinshasa, 2°56'N 26°50'E; Rungu, Kinshasa, 3°11'N 27°52'E; Mbanza-Ngungu, Kinshasa, 5°15'S 14°52'E; Kinsuka, Kinshasa, 5°15'S 15°13'E;
GABON: Makandé, 0°47'S 11°58'E;
IVORY COAST: Taï NP, 5°50'N 7°19'W;
TOGO: Togo, no precise locality available.