

Original article

New species of *Hemidactylus* (Squamata: Gekkonidae) from Cameroon

AARON M. BAUER¹, MATTHEW LEBRETON^{2,4}, LAURENT CHIRIO³, IVAN INEICH³ AND MARCELL TALLA KOUETE²

¹Department of Biology, Villanova University, 800 Lancaster Avenue Villanova, Pennsylvania 19085, USA

²Cameroon Biodiversity Conservation Society, PB 3055, Yaoundé Messa, Cameroon

³Muséum national d'Histoire Naturelle, Département Systématique et Evolution UMS 602 (Reptiles), Case Courrier 30, 25 Rue Cuvier, F-75005 Paris, France

⁴Present address: Walter Reed Johns Hopkins Cameroon Program, CRESAR, PB 7039, Yaoundé, Cameroon

Abstract.—A new large (100 mm SVL) species of forest-dwelling gecko of the genus *Hemidactylus* is described from the Furu-Awa area in the Northwest Province of Cameroon. The species is distinguished from other equatorial West African members of the genus by its large size, 18-20 rows of small dorsal tubercles, 45 precloacal-femoral pores in males, transversely enlarged median subcaudal plates, reduced tail tuberculation and distinctive purplish colour pattern.

Key words.—*Hemidactylus*, Gekkonidae, Cameroon, description

The genus *Hemidactylus* is represented by at least 83 recognized species and is the second most speciose genus of gekkonid lizards in the world (Kluge 2001; Bauer & Pauwels 2002; Henle & Böhme 2003; Baha El Din 2003, 2005). The genus is widely distributed throughout much of the Old World tropics and subtropics as well as in the Mediterranean region and in the Americas. It constitutes a particularly important component of the gecko fauna of Africa, achieving its greatest species richness in the Horn of Africa and adjacent regions (Lanza 1983). It is more poorly represented in West Africa, but even in this region, which is relatively depauperate with respect to geckos in general (Bauer 1993), members of the genus *Hemidactylus* are the ecologically dominant group of nocturnal lizards.

The gekkonid fauna of Cameroon was first comprehensively reviewed by Nieden (1910), who recognized 15 species, eight of which were members of the cosmopolitan genus

Hemidactylus (*H. muriceus* Peters, 1870, *H. mabouia* Moreau de Jonnés, 1818, *H. brookii* Gray, 1845, *H. steindachneri* Tornier, 1902, *H. stellatus* Boulenger, 1885, *H. echinus* O'Shaugnessy, 1875, *H. fasciatus* Gray, 1842, and *H. richardsonii* Gray, 1845). Despite a series of major expeditions and reports on Cameroonian collections (Tornier 1902; Müller 1910; Angel 1930, 1940; Mertens 1938, 1940, 1968; Monard 1951) during the colonial period, no additional members of the genus were added to the national fauna, although species lists presented by various authors varied, chiefly due to differences in the taxonomy employed. Indeed, subsequent faunal lists (e.g. Loveridge 1947; Perret 1963; Thys van den Audenaerde 1967) included fewer species than Nieden (1910), owing to the subsequent synonymization of *H. stellatus* with *H. brookii angulatus* Hallowell, 1852 and differed from one another, chiefly in regard to the recognition of differing numbers of taxa in the *H. brookii* complex (Thys van den Audenaerde 1967;

Böhme 1975). Molecular evidence now strongly supports the recognition of *H. angulatus* as a full species, quite distinct from the Asian *H. brookii* (Carranza & Arnold 2006). Further confusion has been associated with changes in the taxonomy of the *H. muriceus* group (Schmidt 1919; Loveridge 1947; Dunger 1968; Burger *et al.* 2004). For example, Böhme (1975) and Ineich (2003) considered *H. longicephalus* Bocage, 1873 and *H. ansorgii* Boulenger, 1901 as synonyms of *H. muriceus*, whereas Perret (1975) presented evidence that *H. ansorgii* was a junior synonym of *H. intestinalis* Werner, 1897 and regarded *H. muriceus* as a senior synonym of *H. longicephalus*. Lawson (1993), however, regarded *H. ansorgii* as a valid species and was the first to explicitly include it in the fauna of Cameroon. This was confirmed by Henle & Böhme (2003) who noted several localities for this species in western Cameroon.

The most recent checklist of the Cameroon herpetofauna (LeBreton 1999) included eight species: *H. ansorgii*, *H. brookii angulatus*, *H. echinus*, *H. fasciatus fasciatus*, *H. longicephalus*, *H. mabouia*, *H. muriceus*, and *H. richardsonii*. Subsequently LeBreton *et al.* (2003) also included *H. intestinalis* in the fauna, although their specimens are now referred to *H. ansorgii*. Henle & Böhme (2003), as part of a broader revision, relegated *H. intestinalis* to the synonymy of *H. muriceus* and have considered *H. longicephalus* to be chiefly a southern African form, raising the possibility that records of this species from Cameroon may also be attributable to *H. muriceus* or *H. ansorgii*. If this indeed is the case, then the addition of the recently described *H. pseudomuriceus* Henle & Böhme, 2003, from Jingwe (Yingui), southeast of Nkongsamba (as well as from a locality in the Côte d'Ivoire), brings the current tally of *Hemidactylus* in Cameroon back to eight, the same number recognized by Nieden nearly a century ago. Bauer & Pauwels (2002) speculat-

ed that *H. kamdemtohami*, presently known only from Gabon and Equatorial Guinea, might also occur in Cameroon, but its presence has not been confirmed.

Although taxonomic difficulties have plagued the *Hemidactylus muriceus* and *H. brookii* groups, the identity of the larger-bodied species of the genus has been unambiguous. By far the largest of the *Hemidactylus* thus far recorded from Cameroon is *H. fasciatus*, which, elsewhere in its range, reaches a SVL of at least 95 mm (Schmidt 1919; Burger *et al.* 2004). This species has been recorded from forests (Loveridge 1947; Perret 1963; Lawson 1993) as well as from the walls of houses (Loveridge 1947; Romer 1953; Joger 1982; Ota *et al.* 1987; Lawson 1993). *Hemidactylus richardsonii* is also relatively large, reaching at least 70 mm SVL (Mertens 1938) and has been reported to be common in houses near forest (Perret & Mertens 1957). A third large *Hemidactylus* has recently been signaled from savanna habitat in Cameroon by LeBreton *et al.* (2003) and is presently represented by two specimens. We here describe this species as new.

MATERIALS AND METHODS

The following measurements were taken with Brown and Sharpe Digit-cal Plus digital calipers (to the nearest 0.1 mm): snout-vent length (SVL; from tip of snout to vent), trunk length (TrunkL; distance from axilla to groin measured from posterior edge of forelimb insertion to anterior edge of hindlimb insertion), crus length (CrusL; from base of heel to knee); tail length (TailL; from vent to tip of tail), tail width (TailW; measured at widest point of tail); head length (HeadL; distance between retroarticular process of jaw and snout-tip), head width (HeadW; maximum width of head), head height (HeadH; maximum height of head, from occiput to underside of

jaws), ear length (EarL; longest dimension of ear); forearm length (ForeaL; from base of palm to elbow); orbital diameter (OrbD; greatest diameter of orbit), nares to eye distance (NarEye; distance between anteriormost point of eye and nostril), snout to eye distance (SnEye; distance between anteriormost point of eye and tip of snout), eye to ear distance (EyeEar; distance from anterior edge of ear opening to posterior corner of eye), internarial distance (Internar; distance between nares), and interorbital distance (Interorb; shortest distance between left and right supraciliary scale rows).

Scale counts and external observations of morphology were made using a Nikon SMZ-1000 stereomicroscope. Radiographic observations were made using a Faxitron closed cabinet X-ray system.

SYSTEMATICS

(Reptilia: Squamata: Gekkonidae)

Hemidactylus makolowodei Bauer, LeBreton, Chirio, Ineich & Talla Kouete **sp. nov.**

Figs. 1-4

Holotype.—Muséum National d'Histoire Naturelle, Paris (MNHN) 2003.2910 (Field number 4502x), adult male; Cameroon, Northwest Province, Nser village, 6°50'30"N, 10°07'10"E, ca. 500 m elevation; collected by Paul Makolowode and Marcel Talla Kouete, 9-25 July 2001.

Paratype.—MNHN 2006.0294, (Field number 4503x), adult female; Cameroon, Northwest Province, along track ca. 5 km south of Furu-Awa, 6°55'0"N, 10°11'20"E, ca. 300 m elevation; collected by Paul Makolowode and Marcel Talla Kouete, 9-25 July 2001 (latitudes and longitudes estimated from maps in Breton 1995).

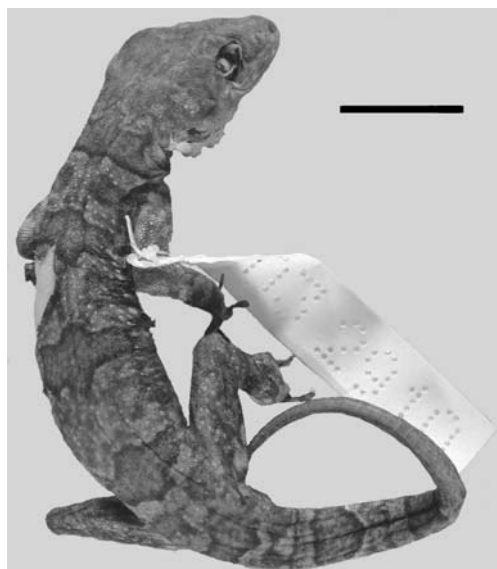


Figure 1. Dorsal view of the holotype of *Hemidactylus makolowodei*, **sp. nov.** (MNHN 2003.2910). Note the damage to the skin reflecting regional integumentary loss. Scale bar = 20 mm. Photo by A.M. Bauer.



Figure 2. Dorsal view of the female paratype of *Hemidactylus makolowodei*, **sp. nov.** (MNHN 2006.0294). Scale bar = 20 mm. Photo by A.M. Bauer.

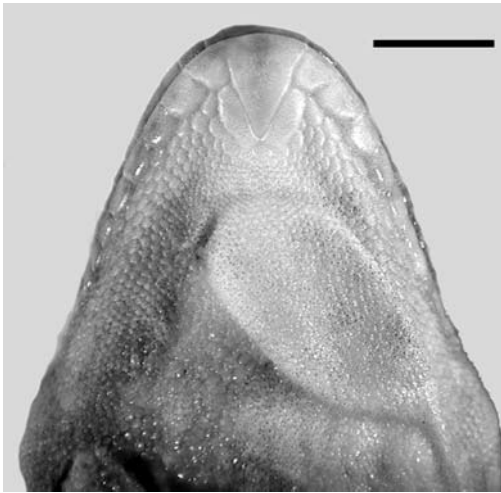


Figure 3. Ventral view of the chin and throat of the holotype of *Hemidactylus makolowodei* showing the greatly elongate mental scale and single pair of enlarged postmental scales. Scale bar = 5 mm. Photo by A.M. Bauer.

Diagnosis.—A large *Hemidactylus*, snout-vent length at least 100 mm. One pair of greatly enlarged postmentals, in contact or narrowly separated from one another. 18-20 rows of relatively small tubercles. 59 scale rows across venter between lowest rows of tubercles. Ten to eleven enlarged scapsors beneath fourth toes of both manus and pes. A single row of 45 precloacal-femoral pores in males. Body col-

oration purplish in life with a series of four complete, dark crossmarkings between nape and sacrum, alternating with incomplete transverse bands extending dorsally from the flanks but failing to meet along the dorsal midline.

Hemidactylus makolowodei may be distinguished from all other equatorial West African congeners on the basis of (sympatric taxa with differing or non-overlapping character states indicated parenthetically): 18-20 rows of dorsal tubercles (0-4 rows in *H. richardsonii*, 8-10 in *H. ansorgii*, 10-14 in *H. muriceus*, 6-14 in *H. pseudomuriceus*), digits not strongly webbed (webbed in *H. richardsonii* and *H. kamdemtohami*), precloacal-femoral pores in male in single row of 45 (fewer than 12 in *H. longicephalus*, *H. echinus*, *H. muriceus*, and *H. ansorgii*, 14-17 in *H. pseudomuriceus*, 32-40 in *H. f. fasciatus*, 34-36 in *H. greeffi*, lacking in *H. newtoni*), median subcaudal scale row greatly enlarged transversely (not enlarged or hexagonally enlarged in *H. longicephalus*, *H. echinus*, *H. kamdemtohami*, *H. pseudomuriceus*, *H. muriceus*, and *H. ansorgii*). Both *H. angulatus* and *H. mabouia* share overlapping precloacal-femoral pore counts and transversely enlarged subcaudal scales with *H. makolowodei*. However, both species are much smaller (maximum SVL approximately 70 mm versus at



Figure 4. Photo in life of the paratype of *Hemidactylus makolowodei* illustrating its purplish colour. Photo by M. LeBreton.

least 100 mm) and have fewer lamellae beneath the fourth toe (5-9 in *H. angulatus* and 6-11, usually 6-9, in *H. mabouia* versus 10-11 in *H. makolowodei*). In addition, all these taxa differ markedly in dorsal colour pattern from *H. makolowodei*. *Hemidactylus fasciatus ituriensis* Schmidt, 1919 of the eastern Democratic Republic of Congo is similar in colour pattern to *H. makolowodei* (see Schmidt 1919, pl. XV, fig. 2), but in this form only 16 precloacal-femoral pores have been recorded, the pale background colour in life is a yellowish-white (pale lavender in *H. makolowodei*), and the distal portions of the hindlimbs are mottled (versus distinctly banded).

Description (based on the holotype).—Adult male, SVL 100.2 mm. Head long (HeadL/SVL ratio 0.29), wide (HeadW/HeadL ratio 0.76), not depressed (HeadH/HL ratio 0.53), strongly distinct from neck. Lores and interorbital region slightly inflated, canthus rostralis prominent. Snout moderate (SnEye/HeadL ratio 0.44); approximately twice eye diameter (OrbD/SnEye ratio 0.51); scales on snout and forehead small, granular; scales on snout much larger than those on occipital region. Eye relatively large (OrbD/HeadL ratio 0.22); pupil vertical with crenelated margins; supraciliaries short, rounded, those at posterior of orbit slightly elongate, terminating in a small spine. Ear opening oval, obliquely oriented, relatively small (EarL/HeadL ratio 0.07); eye to ear distance much greater than diameter of eyes (EyeEar/OrbD ratio 1.40). Rostral more than twice as wide (4.6 mm) as deep (2.2 mm), incompletely divided dorsally by weakly developed rostral groove; two enlarged supranasals separated by two small internasals, these in turn bordered ventrally by a longitudinal series of similarly sized anterior internasals in rows of 1, 2, and 1 (dorsal to ventral), that extend into the middorsal depression of the rostral scale; rostral in contact with supralabial I, supranasals, and the three anteriormost internasals; nostrils oval, each surrounded by

supranasal, rostral, first supralabial (narrow contact), dorsal postnasal and crescentic nasal; nasal in turn bordered posteriorly by six postnasals; ~10 rows of scales separate orbit from supralabials. Mental triangular, much deeper (4.5 mm) than wide (3.6 mm) and much deeper than infralabials; one pair of greatly enlarged postmentals (Fig. 3), meeting at a point behind the mental, each postmental bordered anteriorly by first infralabial, medially by mental, and laterally and posteriorly by a series of 5 enlarged chin shields, the anteriormost also bordering first and second infralabials. Infralabials bordered by a row of enlarged scales, decreasing in size posteriorly. Enlarged supralabials to angle of jaws 15 (left)-16 (right); supralabials to angle of jaws 13 (right)-12 (left); infralabials 12 (left)-13 (right); interorbital scale rows across narrowest point of frontal 17, between supraciliaries 32.

Body robust, trunk relatively short (TrunkL/SVL ratio 0.38) with very feebly developed ventrolateral folds without denticulate scales. Dorsal scales heterogeneous, granular; regularly arranged, small (6-8 times size of granules), weakly conical to slightly keeled tubercles extending from behind occiput and temporal regions to tail base; tubercles more or less uniform across dorsum and flanks, somewhat smaller along dorsal midline; tubercles in approximately 18-20 rows at midbody. Ventral scales approximately same size as dorsal tubercles, weakly subimbricate; somewhat larger on abdomen than on chest, granular and smaller still in gular region; midbody scale rows across belly to lowest row of tubercles 59 (in paratype; skin of holotype damaged). Precloacal-femoral pores in a single row of 45, with two poreless scales in midline separating continuous series of 23 (left) and 22 (right) mostly deeply-pitted, pored scales, extending nearly to knees. Pored scales and adjacent scale rows somewhat enlarged relative to other ventral thigh scales. Scales on palm and sole smooth, rounded; scales on dorsal aspects of

limbs granular, intermixed with domed to weakly conical tubercles, continuing distally to ankles and wrists.

Fore- and hindlimbs moderately long, stout; forearm and tibia moderately long (ForeaL/SVL ratio 0.17; CrusL/SVL ratio 0.19); digits relatively short, strongly clawed; all digits of manus and digits I-IV of pes webbed proximally only; distal portions of digits curved, arising from distal portion of expanded subdigital pad; scansors beneath each toe divided, except for distalmost and a few, narrow, basal scansors (usually 1-2, more under digit I); scansors from proximalmost at least twice diameter of palmar scales to distalmost divided scansor: 10-11-10-11-12 (left manus), 10-11-11-11-11 (right manus), 9-11-10-10-9 (left pes), 6-11-11-11-10 (right pes); distal part of digit I of right pes missing. Relative length of digits of manus: IV > V > III > II > I; of pes: IV > V > III > II > I.

Original portion of tail slightly depressed; regenerated tail more slender; length of partly regenerate tail less than snout-vent length (TailL/SVL ratio 0.88); basal part of original portion of tail covered with small, rectangular, juxtaposed scales, with enlarged, weakly keeled tubercles continuing from body dorsum, becoming smaller and smooth on posterior pygal portion of tail; rectangular scales forming very regular transverse rows, about 10 such rows per distinct caudal segment (corresponding to underlying muscle segments); ventral scales much larger, smooth, imbricate, with a median row of greatly enlarged subcaudal plates. Regenerated portion of tail with more-or-less uniform, imbricate scales dorsally and much larger medial subcaudals. Two (left) and one (right) somewhat enlarged postcloacal spurs on each side of tail base.

Osteology. Parietal bones paired. Stapes imperforate. Premaxillary teeth loci 11, approximately 32 teeth on each maxillary bone, 36 on each

dentary. Phalangeal formulae 2-3-4-5-3 for manus and 2-3-4-5-4 for pes. Presacral vertebrae 26, including 3 anterior cervical (without ribs), 1 lumbar, and 2 sacral vertebrae; 5 pygal and 9.5 post pygal caudal vertebrae to point of regeneration. One pair of crescentic cloacal bones present in the holotype, lacking in the female paratype. Endolymphatic sacs enlarged extracranially, extending to level of fifth vertebra in both specimens. Radiographs reveal one very large egg in the female paratype, measuring 18.9 x 11.6 mm.

Mensural features (holotype/paratype). SVL 100.2/89.9 mm, ForeaL 16.9/15.7 mm, CrusL 18.8/17.8 mm, TailL 88.0 (44.8 regenerated)/55.0 (9.1 regenerated) mm, TailW 9.4/9.0 mm, TrunkL 38.0/35.9 mm, HeadL 29.0/25.8 mm, HeadW 22.2/18.5 mm, HeadH 15.3/12.6 mm, OrbD 6.5/6.2 mm, EyeEar 9.1/7.0 mm, SnEye 12.8/10.8 mm, NarEye 6.7/6.5 mm, Interorb 9.0/8.8 mm, EarL 2.1/3.0 mm, Internar 3.4/2.8 mm.

Coloration (in preservative). Body ashy brown with a series of mid-brown crossbands with darker brown borders; one across nape, one behind axilla, one just posterior of mid trunk, and one in lumbar position. These complete dorsal bands alternating with bands extending dorsally from flanks but not meeting in the dorsal midline, first over scapula. Parietal and temporal regions of head with a light brown marking without darker margins; scattered whitish markings in loreal region, on supralabials and between orbit and ear. Limbs mottled with ashy blotches in a matrix of mid-brown reticulations; ashy markings across digits at level of basal subdigital pads. Tail with alternating markings as on dorsum; three complete, dark-bordered brown bands on original portion of tail; regenerated portion of tail light brown with darker speckles, without distinct pattern. Venter grayish-cream under throat, becoming darker under trunk and especially under hindlimbs.

Cloacal region pale, tail venter dusky brown with a more weakly pigmented median line.

Colour (in life). Body with a purplish hue (Fig. 4). Ashy areas in preservative corresponding to pale lavender, brown areas corresponding to purplish-brown.

Variation.—The female paratype differs from the holotype in the following features: supranasals separated from one another by two pairs of internasals, the anterior oval and posterior rectangular; rostral bordered by first supralabial, supranasals, and two anterior internasals; nasals bordered posteriorly by 4-5 postnasals; mental only slightly deeper than wide; postmentals separated posteriorly by a single, enlarged chin shield; supralabials 14(L)-15(R); infralabials 13 (L&R); no precloacal-femoral pores; subdigital lamellae: (left manus) 11-10-11-10-11, (right manus) 10-10-10-10-11, (left pes) 10-10-11-11-11, (right pes) 10-10-11-11-11. Paratype similar in colour to holotype, but with four dark bands on original portion of tail and with venter paler and whitish markings on head more conspicuous.

Etymology.—The specific epithet is a masculine patronym in honor of Paul Makolowode, from Zimba, Central African Republic, who has worked as a field herpetologist in Cameroon and the Central African Republic. He has made significant contributions to a number of national collections and has collected many new species, including the *Hemidactylus* described in this paper.

Distribution.—At present known only from two localities in the savanna of Northwest Province, Cameroon (Fig. 5). The area lies adjacent to the Nigerian border and it is likely that this species occurs in that country as well.

Natural history.—The area around Nser and Furu-Awa is somewhat isolated and the area has been poorly characterised. Even the maps of the area are fairly inaccurate (Breton 1995).

The area slopes to the northwest towards Nigeria, draining into the Katsina River of the Niger River basin. The elevation varies from around 200 m to over 1100 m on Mt. Busung adjacent to Furu-Awa, and the vegetation is a mixture of Sudanian savanna, dense forest and wooded ravines. The Fungom Forest Reserve is south of Nser and outside the reserve, between Nser and Furu-Awa, there are pockets of forest that are under heavy pressure for agricultural clearing

The holotype of *H. makolowodei* was found during the day on the rafters of a mud-daub, tin roofed house with no plywood ceiling in Nser village. Locals indicated that they occasionally see this species in their houses. The vegetation surrounding Nser is mostly savanna, however, adjacent to the village there are some small pockets of forest. The paratype of *H. makolowodei* was found along the path between Furu-Awa and Nser (closer to Furu-Awa) and was seen during the early morning (ca. 9h00) on disturbed tree roots in a forest remnant. The gecko retreated into cavities around the excavated tree roots but was eventually flushed out. A number of specimens of the skink *Panaspis kitsoni* were found not far away in the same forest patch.

In the area surrounding Nser and Furu-Awa, 20 species of reptile were found. These included ten typical forest species (the lizards *Cnemaspis spinicollis*, *Hemidactylus ansorgii*, *Trachylepis affinis*, *Trachylepis maculilabris* and *Varanus ornatus*, and snakes *Afronatrix anoscopus*, *Hapsidophrys smaragdina*, *Philothamnus heterodermus*, *Thrasops flavigularis* and *Bitis gabonica*) six typical savanna species (the tortoise *Kinixys belliana*, the lizards *Hemidactylus angulatus*, *Agama paragama*, *Trachylepis perroteti*, and *Panaspis kitsoni*, and the snake *Lamprophis lineatus*), one forest savanna transition species (the snake *Prosymna ambigua bocagii*) and two pioneer species (the snakes *Crotaphopeltis hotamboeia*

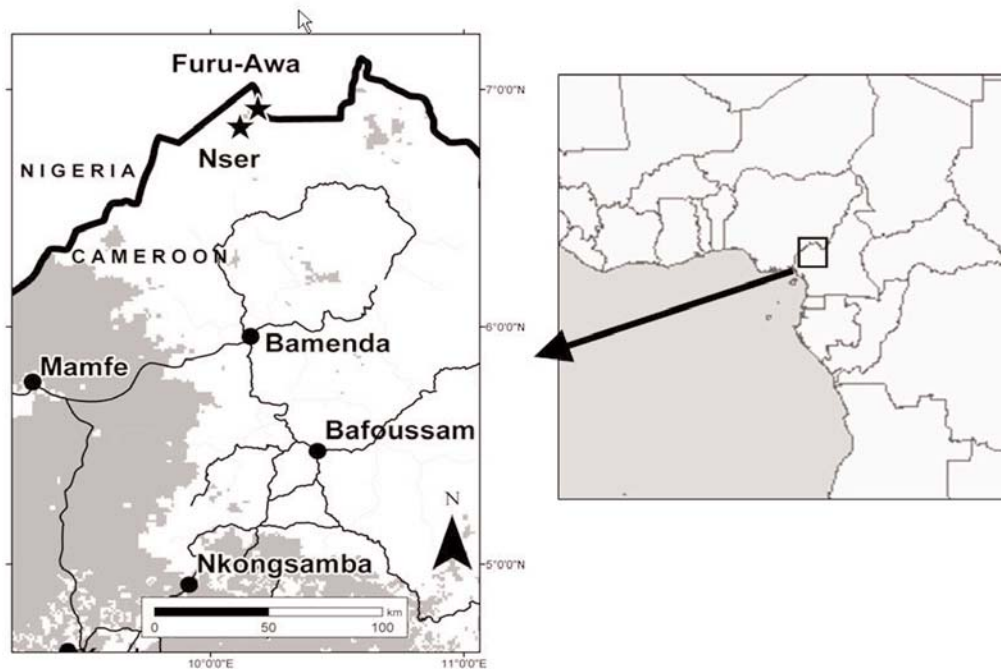


Figure 5. Map of Cameroon showing the type locality, Nser and locality of the paratype, Furu-Awa, of *Hemidactylus makolowodei* (shaded area is dense forest cover; based on Mayaux *et al.* 1997).

and *Causus maculatus*) and one generalist species (the lizard *Agama agama*).

The holotype exhibits extensive damage to the skin of the forebody (Fig. 1), whereas the paratype has damaged skin on the snout (Figs. 2, 4). This damage is indicative of mechanically weak skin, which is associated with regional integumentary loss, an escape mechanism employed against certain predators by a variety of geckos (Bauer *et al.* 1989, 1993).

DISCUSSION

Relationships within mainland African *Hemidactylus* remain largely unresolved, despite advances in the phylogenetics of other congeners (Carranza & Arnold 2006). Based on its large size, large number of preloca-

femoral pores, transversely enlarged median subcaudal scales, and dorsal colour pattern, however, *H. makolowodei* may be allied to *H. fasciatus*, which has a broad distribution from Liberia to the Democratic Republic of Congo (Loveridge 1947).

Increased field work in Cameroon, combined with more sophisticated approaches to the systematics of difficult groups have resulted in the recent addition of several lizards to the fauna of the region (e.g., Böhme & Schmitz 1996; Chirio & Ineich 2000; Henle & Böhme 2003; Ineich *et al.* 2004). Thus, it is not surprising that another new *Hemidactylus* should be added to the Cameroonian fauna. However, the large size and conspicuousness of *H. makolowodei* is striking and the discovery of such a species suggests that additional field work, particularly in understudied regions of

Cameroon and eastern Nigeria, will yield further herpetological novelties.

KEY TO THE *HEMIDACTYLUS* KNOWN OR EXPECTED TO OCCUR IN CAMEROON

- 1a. Median subcaudal scales enlarged, males with 14 or more precloacal-femoral pores.....2
- 1b. Median subcaudal scales not enlarged, males with 12 or fewer precloacal-femoral pores.....7
- 2a. Median subcaudal scales hexagonal in shape, digits not strongly webbed, males with 14-17 precloacal-femoral pores*H. pseudomuriceus*
- 2b. Median subcaudal scales forming broad transverse plates, males with 20 or more precloacal-femoral pores.....3
- 3a. Dorsal tubercles in 2-4 rows, digits strongly webbed, males with 40-48 precloacal-femoral pores.....*H. richardsonii*
- 3b. Dorsal tubercles in 9 or more rows.....4
- 4a. Large (adult SVL > 80 mm SVL), original tail (except for base) atuberculate or with very small, flattened tubercles.....5
- 4b. Small to moderate-sized (adult SVL < 70 mm SVL), original tail with prominent, raised tubercles along most of length.....6
- 5a. Scansors beneath digit I of pes 10, dorsal coloration purplish, without well-defined, white-edged nape band.....*H. makolowodei*
- 5b. Scansors beneath digit I of pes 8 or fewer, dorsal coloration dark brown, with well-

defined, white-edged nape band.....
.....*H. fasciatus*

6a. Dorsal tubercles strongly keeled, separated from one another by approximately the width of one tubercle; colour variable, but often with some reddish or orange markings when in light phase.....*H. angulatus*

6b. Dorsal tubercles not, or only weakly keeled, separated by one another by a distance greater than one tubercle width; colour variable, but typically without bright markings of any kind, usually ashy to pale grey-brown when in light phase.....*H. mabouia*

7a. Dorsal tubercles in 14 or fewer rows at midbody.....8

7b. Dorsal tubercles in 16 or more rows at midbody.....9

8a. Tail somewhat depressed, cyclotetragonal, with prominent dorsal and lateral spines.....*H. muriceus*

8b. Tail cylindrical in cross-section, lacking enlarged spines.....*H. ansorgii*

9a. Subcaudal surface with scattered enlarged spines.....*H. echinus*

9b. Subcaudal surfaces smooth, without enlarged spines.....*H. kamdemtohami*
(not confirmed for Cameroon)

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