

Original article

A new forest-dwelling *Hemidactylus* (Squamata: Gekkonidae) from Gabon, West Africa

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Abstract.—A distinctive new species of forest-dwelling gecko of the genus *Hemidactylus* is described from Mt. Iboundji in south central Gabon. The species is distinguished from other equatorial West African members of the genus by its 18-19 rows of small dorsal tubercles, well-developed digital webbing, and characteristic colour pattern, including dark venter and large white markings on the posterior surface of the thighs. The species is also known to occur in Equatorial Guinea and may be more widespread in montane forests of the region.

Key words.—*Hemidactylus*, Gekkonidae, Gabon, description, tropical forest.

Hemidactylus, with 79 recognised species, is the second most speciose genus of gekkonid lizards (Kluge 2001). Although the genus is widely distributed throughout much of both the Old and New World tropics and subtropics, it achieves its greatest species richness in the Horn of Africa and adjacent regions. In contrast, it is relatively poorly represented (as are geckos in general; Bauer 1993) in equatorial West Africa. Loveridge (1947) listed five species of *Hemidactylus* (*H. fasciatus* Gray, 1842; *H. brookii angulatus* Hallowell, 1852; *H. richardsonii* Gray, 1845; *H. longicephalus* Bocage, 1873; and *H. echinus* O'Shaugnessy, 1875) from localities now located in Gabon. Thys van den Audenaerde (1967) identified six species from equatorial West Africa, including *H. richardsonii*, *H. fasciatus*, *H. angulatus*, *H. brookii guineensis* Peters, 1868, *H. mabouia* (Moreau de Jonnés, 1818), and *H. muriceus* Peters, 1870. He did not specify localities for these taxa, but mentioned Gabon explicitly or

implicitly in the ranges of all but *H. b. guineensis*.

Perret (1963), in the only modern review of the geckos of a West African country, identified seven species in adjacent Cameroon, including all of those noted by both Loveridge (1947) and Thys van den Audenaerde (1967), except *H. brookii guineensis*, which is currently regarded as a synonym of *H. b. angulatus* (Kluge 2001). Perret (1975) subsequently considered *H. muriceus* Peters, 1870 as a senior synonym of *H. longicephalus* Bocage, 1873 but this interpretation has not been followed by subsequent authors (see Kluge 2001).

Although herpetological fieldwork in Gabon was minimal during the French colonial period and in the first decades following independence, it has recently been a focus of biodiversity research in the forested regions of equatorial Africa (Lötters *et al.* 2000). Seventy-two species of amphibians have been recorded with

certainty from Gabon (Frétey & Blanc 2000), reflecting a doubling of the known fauna in recent years (see Lötters *et al.* 2000). At present 95 species of reptiles are recognised from Gabon (Lötters *et al.* 2000), but this is certainly an underestimate of real diversity and is likely to increase in the near future when results of extensive field work by the Smithsonian Institution and World Wildlife Fund are published (Branch & Burger, in prep.; Pauwels & Kamdem Toham, in prep.). We here contribute to the inventory of the Gabonese herpetofauna by describing a highly distinctive new species of *Hemidactylus* from Mt. Iboundji.

MATERIALS AND METHODS

The following measurements were taken with Brown and Sharpe Digital 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 Wild M5A dissecting microscope. Radiographic observations were made using a Picker X-ray Corporation enclosed radiographic unit.

SYSTEMATICS

(Reptilia: Squamata: Gekkonidae)

Hemidactylus kamdemtohami Bauer & Pauwels, sp. nov.

Figs. 1-2

Holotype.—Institut Royal des Sciences Naturelles de Belgique (IRSNB) 2579 (Field number P684), adult female; Gabon, eastern slope of Mont Iboundji (near 01°10'32"S, 11°49'16"E [coordinates of Boussimbi, closest village to the type locality]), alt. ca. 520 m asl, 23 September, 2001. Coll. Olivier S.G. Pauwels.

Diagnosis.—A moderately sized *Hemidactylus*, snout-vent length at least 71 mm. One pair of enlarged postmentals, narrowly separated from one another. 18-19 rows of relatively small tubercles. 63 scale rows across venter between ventrolateral folds. Eleven enlarged scapulars beneath fourth toe of pes, digits with pronounced basal webs. Body grey with a paler, broad vertebral stripe, a pair of darker paravertebral stripes and a pair of diffuse, darker ventrolateral stripes.

Hemidactylus kamdemtohami 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): 18-19 rows of dorsal tubercles (0-4 rows in *H. richardsonii*, 10-14 in *H. muriceus*), and strongly webbed digits (unwebbed in *H. brookii angulatus*, *H. longicephalus*, *H. mabouia*, *H. muriceus*; very slightly webbed in *H. echinus*, *H. fasciatus*). Further, the combination of dark ventral coloration, dorsal longitudinal stripes, and white triangles on the thighs distinguish this species

from these and all other known *Hemidactylus*. Loveridge (1947), who provided accounts of all African *Hemidactylus* then recognised (48 taxa), characterised the ventral coloration of most species as whitish. Among other Equatorial West African species, a dark venter is found only in *H. muriceus* (whitish but almost obscured by brown infuscations) and *H. richardsonii* (gray tinged with yellow), both of which have fewer rows of dorsal tubercles and differ in dorsal colour pattern from the new species. Dark venters otherwise characterize only the East African *H. laticaudatus fossatii* (whitish or yellowish gray), *H. ruspolii* (dark brown or nearly black), and *H. tanganicus* (grayish tinged with pink), and the West African *H. ansorgii* (syn. *H. intestinalis*; whitish flecked with brown, or brownish). All of these taxa differ markedly in dorsal colour pattern and scalation from *H. kamdemtohami*.

Description (based on the unique holotype, IRSNB 2579).—Adult female, SVL 71.0 mm. Head long (HeadL/SVL ratio 0.28), wide (HeadW/HeadL ratio 0.69), not strongly depressed (HeadH/HL ratio 0.40), distinct from neck. Lores and interorbital region slightly inflated, canthus rostralis not prominent. Snout short (SnEye/HeadL ratio 0.39); longer than eye diameter (OrbD/SnEye ratio 0.62); scales on snout and forehead minute, granular, intermixed from interorbital region caudad with larger, rounded tubercles; scales on snout larger than those on occipital region. Eye relatively large (OrbD/HeadL ratio 0.24); pupil vertical with crenelated margins; supraciliaries short, rounded. Ear opening oval, obliquely oriented, relatively small (EarL/HeadL ratio 0.05); eye to ear distance greater than diameter of eyes (EyeEar/OrbD ratio 1.13). Rostral wider (3.3 mm) than deep (1.9 mm), incompletely divided dorsally by weakly developed rostral groove; two enlarged supranasals separated by a longitudinal series of two rounded internasals; rostral in contact with supralabial I, supranasals, and anterior internasal; nostrils oval, each sur-



Figure 1. Dorsal view of the holotype of *Hemidactylus kamdemtohami*, **sp. nov.** Note the white patches on the posterior face of the thighs. Scale bar = 10 mm. Photo by E. Daeschler & A.M. Bauer, Albert M. Greenfield Digital Imaging Center for Collections.

rounded by supranasal, rostral, first supralabial, dorsal postnasal and narrow crescentic nasal; nasal in turn bordered posteriorly by four postnasals, the largest dorsal to the three smaller; 3–6 rows of scales separate orbit from supralabials. Mental triangular, slightly wider (2.9 mm) than deep (2.4 mm); one pair of enlarged postmentals, each postmental bordered laterally by first infralabial and anteromedially by mental; a single small granule prevents the posterior contact of left and right postmentals. Infralabials

bordered by a row of enlarged scales, decreasing in size posteriorly. Supralabials (to midorbital position) 9 (right)-8 (left); supralabials to angle of jaws 13 (right)-12 (left); infralabials 11; interorbital scale rows across narrowest point of frontal 24.

Body relatively slender, elongate (TrunkL/SVL ratio 0.46) with very weakly developed ventrolateral folds with scattered denticulate scales. Dorsal scales heterogeneous, granular; regularly arranged, small, flattened to weakly conical tubercles extending from posterior interorbital and temporal regions to tail; largest tubercles with a rounded keel on the anterior-facing surface; enlarged tubercles surrounded by rosettes of smaller scales of varying sizes, the three largest being anterior to the tubercle; tubercles becoming more conical on flanks; tubercles in approximately 18-19 rows at midbody. Ventral scales somewhat larger than dorsal, weakly subimbricate; somewhat larger on abdomen than on chest, smaller still in gular region; midbody scale rows across belly to denticulate edge of ventrolateral fold 63; lower flanks and abdomen with scattered, enlarged, flattened, denticulate scales; gular region with few scattered enlarged scales among minute granules. No preloacal pores, but a chevron of 13 enlarged scales with weakly pitted surfaces in preloacal region, followed posteriorly by a chevron of 11 even larger scales. No femoral pores or enlarged femoral scales. Scales on palm and sole smooth, rounded; scales on dorsal aspects of limbs granular, intermixed with conical to moderately strongly keeled tubercles, more pronounced than those of body dorsum; tubercles continue on to metaphalangeal region of autopodium.

Fore and hindlimbs relatively short, stout; forearm short (ForeaL/SVL ratio 0.15); tibia short (CrusL/SVL ratio 0.17); digits moderately short, strongly clawed; all digits of manus and digits I-IV of pes partially webbed; distal portions of digits curved, arising from distal por-

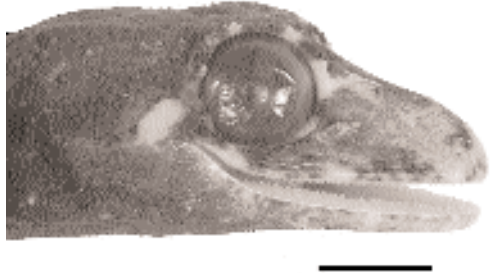


Figure 2. Lateral view of the head of the holotype of *Hemidactylus kamdemtohami*, **sp. nov.** Note the strongly contrasting pale markings. Scale bar = 5 mm. Photo by E. Daeschler & A.M. Bauer, Albert M. Greenfield Digital Imaging Center for Collections.

tion of expanded subdigital pad; scansors beneath each toe divided, except for distalmost; scansors from proximalmost at least twice diameter of palmar scales to distalmost divided scansor: 8-9-11-11-10 (right manus), 8-10-11-11-10 (right pes); distal portion of digit IV of left manus missing. Relative length of digits (manus; measurements in mm in parentheses): IV (5.1) > III (4.3) > II (4.1) > V (3.8) > I (3.2); (pes): IV (6.8) > V (6.0) > III (5.9) > II (4.9) > I (2.7).

Mostly regenerated tail short, stout, slightly constricted at base, with a blunt tip; regenerated tail much shorter than snout-vent length (TailL/SVL ratio 0.48); original portion of tail with enlarged, conical tubercles, continuing from body dorsum; ventral scales larger, smooth, imbricate. Regenerated portion of tail with more-or-less uniform, elongate, conical scales; without tubercles. One enlarged postcloacal spur on each side of tail base, several small but prominent, spiny scales on ventrolateral edge of pygal region.

Osteology.—Parietal bones paired. Stapes imperforate. Premaxillary teeth loci 9, approximately 42 teeth on each maxillary bone, 48 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 (with-

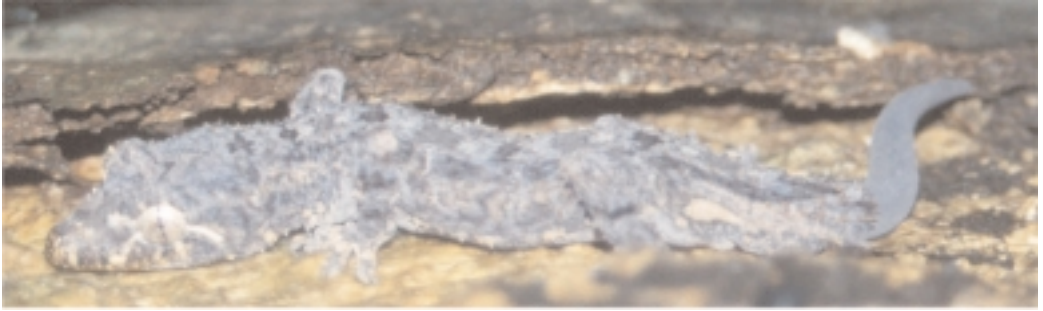


Figure 3. Living specimen (not collected) of *Hemidactylus kamdemtohami* from Monte Alen, Equatorial Guinea. Photo by Gilles Joffroy.

out ribs), 2 lumbar, and 2 sacral vertebrae; 5 pygal and 0.5 post pygal caudal vertebrae to point of regeneration. Cloacal bones lacking. Endolymphatic sacs enlarged extracranially, extending to level of fifth vertebra. The holotype contains two oviductal eggs, measuring 10.6 x 8.2 mm and 10.6 x 7.9 mm.

Mensural features.—SVL 71.0 mm, ForealL 10.7 mm, CrusL 12.3 mm, TailL 37.5 mm, TailW 5.8 mm, TrunkL 33.0 mm, HeadL 20.4 mm, HeadW 14.0 mm, HeadH 8.3 mm, OrbD 5.0 mm, EyeEar 5.6 mm, SnEye 8.0 mm, NarEye 5.8 mm, Interorb 7.1 mm, EarL 1.0 mm, Internar 2.4 mm.



Figure 4. Type locality of *Hemidactylus kamdemtohami*, eastern slope of Mt. Iboundji, September 2001. Photo by O.S.G. Pauwels.

Coloration (in preservative).—Base colour a dark greyish brown. Dorsum of head with a small dark chevron in posterior interorbital region; a narrow dark line across the occiput, interrupted medially by a small, elongate, dark, supraoccipital marking. Diffuse dark markings across anterior interorbital region, on canthal region, top of snout posterior to supranasals, and in front of orbit. A short, broad, white marking with narrow dark edges from posterior of orbit to behind corner of mouth, continuing in front of orbit and on to canthal region. Scales around orbit and labials with irregular alternating light and dark markings.

Dorsum with a pair of dark grey paravertebral stripes, merging into a chevron at base of tail; another pair of dark grey, diffuse longitudinal stripes along lower flanks. Three small dark markings along vertebral line at level of shoulder, midbody, and lumbar region; a set of faint, narrow (1-2 scale rows wide), pale lines perpendicular to vertebrae at midpoint between middle and posterior vertebral dark marks. A series of four whitish markings along dorsal midline in lumbar, sacral and pygal regions. Limbs mottled grey with a cream band with narrow dark brown borders across the base of all digits and another across the distal phalanges. Posterodorsal aspect of thigh with a large, white, triangular marking with narrow dark brown borders. Venter mottled grey-brown, with dark speckling on individual scales. Tail grey with diffuse lighter markings on both dorsum and ventrum.

Colour (in life).—Vertebral markings and paravertebral stripes black; vertebral region grey; flanks light brown. Light markings on the head, feet, and thigh white. Snout light brown with a black stripe between the nostrils and two black stripes surrounding the whitish stripe between the eyes. Subdigital lamellae light grey. Venter blackish with small brown speckles. Tail black with paler grey spots.

Etymology.—The specific epithet is a patronym honoring Dr. Andre Kamdem Toham, Cameroonian ichthyologist and landscape ecologist who serves as coordinator for the WWF Ecoregion Conservation Program in Central Africa. Dr. Kamdem Toham is spearheading a major biological assessment program focussing on key priority landscapes such as the Massif du Chaillu, which includes Mt. Iboundji.

Distribution.—In addition to the Gabonese holotype, this species is known from a sight record (Fig. 3) from Monte Alen (01°39'25"N, 10°16'10"E) in Equatorial Guinea, where it was observed on 27 June, 2001 under the bark of a *Dacryodes buettneri* (Burseraceae) at a height of about 1.5 m above the ground. Given its occurrence at these two localities, separated by approximately 380 km, it is probable that *Hemidactylus kamdemtohami* is relatively widely distributed in upland forested regions of Gabon and Equatorial Guinea, and may occur in parts of southern Cameroon and/or northern Congo.

Natural history.—The holotype was caught on a sunny afternoon in primary forest (Fig. 4). It was located in a small hole 1.6 m above the ground in a living tree locally known as nguignia in the Massango language (the identity of this plant remains unconfirmed). The tree was about 150 mm in diameter, with smooth bark. The hole containing the gecko was about 2 m below the leaf-bearing branches. When first observed, the gecko's head was extended out of the hole. When the collector approached to within about 3 m the head was quickly withdrawn. When captured by hand the specimen bit vigorously numerous times. The Massango name for this gecko is ngouta dibongui (ngouta = gecko, dibongui = forest). Massangos from the nearest village (Boussimbi) indicated that the gecko is not edible nor is it used in medicine or magic. The holotype was found sympatrically with its congeners *H. fasciatus*

(IRSNB 16271) and *H. muriceus* (IRSNB 16270).

DISCUSSION

Phylogenetic relationships within *Hemidactylus* are unresolved and the affinities of *H. kamdemtohami* are uncertain. However, the new species may be allied to *H. richardsonii*, with which it shares basal digital webbing and a predominantly grey colour pattern. The two forms also appear to share a common morphology of the regenerated tail (see Tornier 1902). Further resolution of relationships may be possible when additional specimens of *H. kamdemtohami*, including adult males and individuals with original tails, are available and the condition of the preloacal pores and lateral caudal scales can be evaluated.

The forests of Gabon are amongst the richest in Africa in terms of botanical diversity and endemism (Reitsma 1988; Sosef 1994). The high diversity of species in Gabon is attributed to the fact that several areas, including the Monts de Cristal, Monts Doudou, and Massif du Chaillu, have served as forest refuges during xeric periods that have repeatedly affected tropical Africa throughout the Pleistocene (Maley 1996). Pressure on forest resources in Gabon has increased greatly over the last decade, chiefly as a result of the expansion and intensification of logging activities. Forest reptiles are endangered both by such wholesale habitat destruction and by direct exploitation for food and other uses (Gramentz 1999). Although currently not formally protected, the Massif du Chaillu, including Mt. Iboundji, is currently being assessed for their possible inclusion in a network of protected areas in Gabon. The Massif du Chaillu is a region of diverse habitats at an elevational range of approximately 250 - 1000 m. The major rivers of the region are the Ogooué, Offoué, Mingoué, and Lolo and the vegetation consists of a mosa-

ic of forest types as well as an important island of relict savanna in the north. The area supports approximately 300 species of birds and encompasses the entire known geographic range of the recently described endemic sun-tailed monkey, *Cercopithecus solatus*. It also harbors several reptile species of conservation concern including the Nile monitor (*Varanus niloticus*), forest tortoise (*Kinixys erosa*) and two threatened crocodile species. The discovery of a new species of *Hemidactylus* from Mt. Iboundji further supports the conservation value of this area as a center of vertebrate species richness and regional endemism.

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