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A Revision of the *Pachydactylus serval* and *P. weberi* Groups (Reptilia: Gekkota: Gekkonidae) of Southern Africa, with the Description of Eight New Species

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The *Pachydactylus serval* and *weberi* groups constitute a clade of small to moderate sized (typically 40–50 mm SVL), mostly rupicolous geckos that are distributed widely in western South Africa and Namibia, with scattered populations in eastern Namibia and adjacent northwestern Botswana. The taxonomic status of many of the described members of these groups has long been unresolved, and numerous subtly divergent populations have been identified since the last revisionary work was undertaken. Examination of more than 1800 specimens referable to these species groups permits recognition of at least 21 species, clearly divisible into *serval* and *weberi* subclades. Within these clades, most species are highly morphologically conservative, although there are diagnostic differences in a number of characters, most notably juvenile color pattern. The species boundaries so revealed are supported by phylogenetic evidence from the cytochrome *b* mitochondrial gene. The validity of the currently recognized species in the *P. serval/weberi* clade (*P. serval, P. weberi, P. fasciatus, P. tsodiloensis, P. waterbergensis*) is confirmed, and the taxa *P. purcelli, P. acuminatus, P. werneri* are elevated from synonymy or subspecific rank to full species. *Pachydactylus robertsi*, recently removed from the synonymy of *P. scutatus*, and *P. kobosensis* are confirmed as valid members of the *P. weberi* group. *Pachydactylus sansteynae*, originally described as a subspecies of *P. serval*, is a valid species but is not a member of *P. serval/weberi* clade. *Pachydactylus montanus* is a senior subjective synonym of *P. onscepensis* and is raised from the synonymy of *P. serval*. A genetically diverse taxon, *P. montanus* may include more than one biological species. In addition, eight new species are described and the existence of two additional taxa, each currently known from limited material, is noted. The areas of greatest diversity for the clade as a whole are along the lower Orange River and in southern Namibia. Both the Richtersveld/Hunsberg region in the west and the Karasberge in the east harbor at least five species in the *P. serval/weberi* clade. The evolutionary history of the group is probably associated with the fragmentation of rocky substrates and the historical isolation of some regions by changing paleopositions of the drainage of the Orange River. Distribution patterns of geckos in this clade are coincident with those of cordylids and scorpions and together, these groups — all of which have explicit hypotheses of relationships — provide a possible basis for a fine-scaled biogeographic analysis of western portions of the southern African subcontinent.

KEY WORDS: Gekkonidae, *Pachydactylus*, systematics, species description, Namibia, South Africa, molecular phylogeny, biogeography

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The monophyly of the southern African *Pachydactylus* group of geckos has long been recognized on the basis of the unique hyperphalangic condition of digit I of the manus and pes (Haacke 1968, 1976; Russell 1972; Joger 1985; Bauer 1990; Kluge and Nussbaum 1995). Monophyly of *Pachydactylus* itself, however, has been questioned on the grounds that: 1) it is made paraphyletic by its inclusion of the highly specialized taxa *Colopus*, *Palmatogecko* (including *Kaokogecko*) and *Chondrodactylus*, and 2) the precloacal pore-bearing *P. tuberculosus* and *P. tetensis* are basal to the remainder of *Pachydactylus* plus *Rhoptropus* (e.g., Joger 1985). The latter hypothesis has been rejected on the grounds of morphological, allozyme, and molecular evidence that supports *Rhoptropus* as the sister group of *Pachydactylus* sensu lato (Bauer and Good 1996; Lamb and Bauer 2001, 2002). The paraphyly of *Pachydactylus* relative to the burrowing genera *Colopus*, *Palmatogecko*, and *Chondrodactylus* was raised as a possibility by Haacke (1976) and explicitly proposed by Joger (1985). Bauer (1990) and Kluge and Nussbaum (1995) accepted Joger's interpretation as likely, but their own analyses were at the generic level and thus incapable of corroborating generic paraphyly. Recently, however, a phylogenetic analysis of the southern African *Pachydactylus* group based on mitochondrial and nuclear DNA sequence data (Bauer and Lamb 2005; Lamb and Bauer 2006) has confirmed Joger's (1985) hypothesis and demonstrated that each of the burrowing gecko genera evolved independently within *Pachydactylus*. Among the taxonomic consequences of this work has been the allocation of several species of *Pachydactylus* to the genera *Elasmodactylus*, *Chondrodactylus* and *Colopus*. Nonetheless, *Pachydactylus* remains the most speciose genus of southern African geckos.

Within *Pachydactylus* sensu stricto, a number of species groups have been recognized on the basis of overall morphological similarity (e.g., McLachlan and Spence 1966; Broadley 1977). Several of these groups have been reexamined using combinations of morphological, allozyme, and DNA sequence data, resulting in both the confirmation of the monophyly of these groups and in the recognition of additional species level taxa. In particular, the *P. rugosus* group, *P. capensis* group, *P. scutatus* group, and *P. namaquensis* group have been the subject of recent reviews and revisions (Branch et al. 1996; Lamb and Bauer 2000; Bauer and Lamb 2002; Bauer et al. 2002; Broadley 2003). The monophyly of all of these groups has been corroborated in two recent molecular phylogenies (Bauer and Lamb 2005; Lamb and Bauer 2006). In these, the most complete phylogenetic analyses to date, the *Pachydactylus serval/weberi* group (McLachlan and Spence 1966) was revealed to be the sister group of the *P. capensis* group.

The *serval/weberi* group has been among the most problematic components of *Pachydactylus* and, until now, species boundaries within this group have defied resolution. Members of the group are relatively small (typically < 50 mm SVL), primarily rock-dwelling geckos with relatively flattened bodies, distributed from the Western Cape Province of South Africa through northern Namibia. Despite being widespread and locally abundant, these geckos have had a long history of taxonomic confusion, stemming in part from the poor sampling that characterized most southern African geckos until the middle third of the 20th century, when V. F. FitzSimons of the Transvaal Museum made important collections throughout much of the arid zones of southwestern Africa. At present only two species, *P. weberi* Roux, 1907 and *P. serval* Werner, 1910, are recognized by most authors (e.g., Branch 1998; Griffin 2003), and the non-nominate subspecies *P. serval purcelli*, *P. s. onscepensis*, *P. weberi acuminatus*, and *P. w. werneri* are sometimes regarded as valid (e.g., Kluge 2001). *Pachydactylus sansteynae* (formerly *sansteyni*, see Michels and Bauer 2004) was initially described as a subspecies of *P. serval* (Steyn and Mitchell 1967) but has long been recognized as specifically distinct (Branch 1988). Most recently, *P. robertsi*, formerly regarded as a subspecies of *P. scutatus*, has been demonstrated to be closely allied to the *P. weberi* complex (Bauer et al. 2002).

HISTORICAL RESUMÉ OF THE *P. SERVAL* AND *P. WEBERI* GROUPS TO 1943.— Prior to the major revisionary works of FitzSimons (1943) and Loveridge (1947), a great deal of taxonomic confusion existed with respect to various members of the *P. serval* and *P. weberi* groups and other small-bodied *Pachydactylus* (*sensu* Lamb and Bauer 2002). The first specimens referable to the *weberi* group were reported by Peters (1867), who identified two specimens (ZMB 5711) from Neu Barmen (now Gross Barmen, Namibia) as *P. capensis*. One of these was subsequently identified as *P. formosus* by Sternfeld (1911a) and was only much later (Loveridge 1947; Mertens 1955) correctly identified as *P. fasciatus.*

Roux (1907) described *Pachydactylus weberi* on the basis of four specimens (Fig. 1) from Klipfontein, Little Namaqualand. Based on comparisons with the few species then recognized in the genus, he considered the form to be intermediate between *P. capensis* and *P. formosus*. Werner (1910) recognized 17 species of *Pachydactylus* and described and illustrated *P. serval* from material from Farm Chamis, Great Namaqualand (Fig. 2). He considered the species to be closely allied to *P. ocellatus* (= *P. geijte*). Although he did not record *P. weberi* from the collection he described, his illustration of a juvenile *P. fasciatus* from Kammagas (Fig. 3; now MCZ R 21019) is, in fact, referable to this species.

Boulenger (1910) recognized 15 taxa of *Pachydactylus* in southern Africa. He described *P. purcelli* on the basis of material from Touwsrivier and Little Namaqualand. His key segregated *P. weberi* from *P. serval* and *P. purcelli* on the basis of tubercular vs. smooth dorsal scalation. The new species, *P. purcelli*, was characterized as having "rostral nearly twice as broad as deep, entering the nostril; snout a little longer than the orbit" as opposed to *P. serval*, which he described as "rostral but little broader than deep; snout much longer than the orbit."

Sternfeld (1911a) described *P. pardus* from Warmbad as a member of a group containing both *P. serval* and *P. purcelli*, separating his new form on the basis of the shape of the ear opening, length of the snout, width of the rostral, and size of the eye. Sternfeld (1911b) regarded *P. weberi* as a rare species closely allied to *P. capensis* and known to him only from Windhoek and Klipfontein. His view regarding the similarity of *P. capensis* and *P. weberi* stems in part from the fact that his specimens of "*P. capensis*" from Steinkopf were actually *P. weberi*. He considered *P. serval* to be rare, as it was still known only from the type material from Chamis.

Methuen and Hewitt (1914) recognized 18 species in *Pachydactylus* and added *P. montanus* from Lord Hill's Peak in the Great Karas Mountains to the *serval*/*weberi* group. These authors had not seen material of *P. fasciatus*, *P. serval*, or *P. weberi*. Nonetheless, they considered the new species related to *P. weberi*. They also provided a more extensive description and illustrations of *P. purcelli* (Fig. 4) and synonymized *P. pardus* with *P. purcelli*. Their key to the taxa, like that of Boulenger (1910), first grouped taxa by dorsal scalation. They distinguished *P. purcelli* from *P. serval* on the basis of the entry of the rostral into the nostril in the former only (in fact it enters in both forms). *Pachydactylus montanus* was distinguished from *P. weberi* by having the rostral and first labial entering the nostril (first labial but not rostral in *P. weberi*), the first labial being four-sided (pentagonal in *P. weberi*), and possessing 7 subdigital lamellae (5–6 in *P. weberi*).

Werner (1915) reported on two specimens of *P. weberi* from Karibib and Keetmanshoop, Namibia. Both he and Hewitt (1910) noted the similarity of *P. fasciatus* and *P. weberi*, and the latter author even considered *fasciatus*, *weberi* and *formosus* as subspecific forms of *P. capensis* (Hewitt 1910, 1911, 1927).

Hewitt (1927) recognized 27 species and subspecies of *Pachydactylus* and subsequently described several members of the *serval* and *weberi* complexes. In describing *P. capensis gariesensis*, Hewitt (1932) expressed the belief that its affinities lay with *P. weberi* (also regarded by him as a subspecies of *P. capensis*), which he believed had a more northerly distribution. Hewitt had not

examined typical *weberi*, but did compare his material to a specimen from Karibib that he believed to be *P. weberi* (this specimen is, in fact, referable to *P. fasciatus*). Hewitt (1932) also noted similarities between *gariesensis* and *affinis*, the latter a true member of the *capensis* group (Broadley 1977; Bauer and Lamb 2002). Hewitt (1935) suggested that Werner's (1915) specimens of "*P. weberi*" from Keetmanshoop and Karibib may have been misidentified representatives of another new subspecies, *P. c. werneri*, described from the Khan River in west central Namibia. He also described *P. montanus onscepensis*, which he considered a probable relative of *P. fasciatus*, from the southern bank of the Orange River. He further maintained his earlier view that *P. weberi* was best regarded as a subspecies of *capensis* and that it was closely allied to his *P. c. gariesensis*.

Parker (1936) reported *P. weberi* from several farms near Windhoek. He reviewed Hewitt's (1932, 1935) comments on the group and regarded the evidence for the inclusion of *P. weberi* as a subspecies of *P. capensis* as weak. Parker (1936) also synonymized Hewitt's *P. capensis werneri* with *P. weberi*.

FitzSimons (1935) identified a specimen from Vredendal, in the Western Cape as *P. fasciatus* and recorded several new localities for *P. purcelli* in the northern Cape (Pofadder, Kakamas, near Kenhardt, and Onseepkans). FitzSimons (1938) subsequently reidentified the Vredendal specimen (TM 15797) as *P. weberi gariesensis*, but cited new material of *P. fasciatus* from the Hantamsberg, north of Calvinia (TM 18180, 18182–83). He also added new localities in Namaqualand for *P. w. weberi* and questionably assigned several specimens from Konkiep (TM 17722) and Aus (TM 17689–95) in southern Namibia to this form as well. FitzSimons (1938) identified material from southwestern Namibia and from Goodhouse as *P. montanus onscepensis*, but noted that the Namibian specimens might be referable to *P. serval*, then still known only from the types and Werner's (1910) terse description.

FitzSimons (1938) also described two additional species, *P. kobosensis* from the Rehoboth district of central Namibia, which he regarded as allied with *P. capensis* and "associated forms," and *P. robertsi*, a strongly keeled gecko from the Great Karas Mountains, which he interpreted as allied to *P. scutatus*. FitzSimons (1941) later reevaluated his Namibian "*weberi*" specimens and described them as *P. weberi acuminatus.* He suggested that Werner's (1915) record of *P. weberi* from Keetmanshoop was referable to this form and that "*weberi*" from Windhoek and Gobabis (Sternfeld 1911a) and Windhoek and Hoffnung (Parker 1936) probably represented yet another undescribed subspecies of *P. weberi*.

***Pachydactylus serval* and *P. weberi* since 1943.—** FitzSimons (1943), in his *Lizards of South Africa*, reviewed the entire saurian fauna then known from the area now including South Africa, Namibia, Botswana, Swaziland, Lesotho, and Zimbabwe. In this work, which represents a transition to the "modern" era of lizard systematics in southern Africa, he recognized 40 species and subspecies of *Pachydactylus*. Among the taxa discussed above, he considered as valid the following: *P. purcelli*, *P. serval*, *P. kobosensis*, *P. m. montanus*, *P. m. onscepensis*, *P. werneri*, *P. robertsi*, *P. fasciatus*, *P. w. weberi*, *P. w. gariesensis*, and *P. w. acuminatus*. Thus, only *P. pardus* among the then existing names in the *P. serval/weberi* group was placed in synonymy.

Loveridge (1944) subsequently placed *P. robertsi* in the synonymy of *P. scutatus* as a valid subspecies. In his revision of African geckos, which represents an independent but essentially parallel revision of the same gekkonid taxa considered by FitzSimons (1943), Loveridge (1947) synonymized *P. montanus* and *P. m. onscepensis* with *P. serval* and regarded *P. werneri* as a subspecies of *P. weberi*.

Mertens (1955) recorded *P. kobosensis*, *P. fasciatus*, *P. scutatus robertsi*, *P. purcelli*, *P. serval*, *P. weberi acuminatus* and *P. werneri* from Namibia, following Loveridge's (1947) taxonomy except with respect to the last species. Wermuth (1965) recognized the same taxa as Mertens (1955) and

accepted Loveridge's (1947) usages for the forms restricted to South Africa.

The only subsequent concerted attempt to revise the *serval/weberi* group was that by McLachlan and Spence (1966), who reviewed some of the confusing taxonomic issues surrounding the group. They attempted to resolve the status of the several names then applied to different populations based on newly acquired collections made along the Orange River, where *P. purcelli*, *P. serval*, and *P. montanus onscepensis* were believed to occur in proximity. They considered dorsal color pattern to be uninformative and focused instead on dorsal tuberculation, identifying significant variation in this feature across the range of the *serval* complex as a whole. They found tuberculation to be absent in material from considerably south of the Orange River (typical *purcelli*), moderate in southern Namibian material (typical *serval*) and along the Orange River above Augrabies Falls, and generally strong in specimens from the South African side of the lower Orange Valley, increasing westward towards the Richtersveld (*onscepensis*). They interpreted these data as indicative of a single species composed of three subspecies.

Mertens (1971) accepted McLachlan and Spence's (1966) interpretation of the *serval* complex, but otherwise retained his earlier application of names. Branch (1981) recognized three forms as occurring in the then Cape Province. He followed McLachlan and Spence (1966) in regarding *P. s. onscepensis* and *P. s. purcelli* to be subspecifically distinct. Stuart (1980) and McLachlan (in Branch 1981) regarded *werneri* as a subspecies of *P. weberi*, and the latter regarded *gariesensis* as a synonym of *P. w. weberi*. Welch (1982) accepted some but not all of the previous synonymies, providing no justification for his actions (Table 1).

Visser (1984) recognized all three subspecies of *P. serval* but delineated slightly different distribution patterns for these forms compared to McLachlan and Spence (1966). He considered *P. s. serval* as a northern form, extending southwards to about 27°30'S and from the edge of the Namib east to about 19°E, *P. s. purcelli* as a southern form extending from the Little Karoo north to the Orange River and into south-central Namibia to about 27°S, and *P. s. onscepensis* as a lower Orange River form ranging from Augrabies to the Richtersveld and extending northwards towards Aus and Bethanie. He recognized a single form of *P. weberi*, distributed more or less continuously through Namaqualand, then discontinuously through Namibia, as far as 19°S.

Branch (1988, 1994a, 1998) did not recognize subspecies within *P. weberi* but did accept *P.s. onscepensis* and *P. s. purcelli* as subspecifically valid. Neither did he recognize *P. kobosensis*, which McLachlan considered as a synonym of *P. weberi* (*fide* Griffin 2003). Not all authors have followed Branch's use of names (e.g., Rösler 2000; Kluge 2001; Griffin 2003 — all of whom recognized as valid several additional taxa); however, as the result of the wide use of Branch's *Field Guide to the Snakes and Other Reptiles of Southern Africa*, these names have gained wide acceptence among herpetologists in southern Africa. Most recently Bauer and Branch (2003) signaled the incompatability between the names in use for the *P. serval* group and the realities of variation observed in much larger samples than were available to McLachlan and Spence (1966).

Although most recent authors have not confused *Pachydactylus fasciatus* with *P. weberi*, as did some earlier authors, Haacke (1965) noted the similarity in scalation between the two, and the similar color pattern of the juveniles. Haacke (1966) in describing *P. tsodiloensis* regarded it as a member of the *P. weberi* group, distinguished from other members by its larger size, stockier build, enlarged posterior supralabials and distinctive color pattern. Bauer and Lamb (2003a) described an additional representative to the *P. weberi* group, *P. waterbergensis*, and presented molecular data confirming that *P. fasciatus*, *P. tsodiloensis*, and *P. waterbergensis* are each others closest relatives and members of a more inclusive clade that also includes the *P. weberi* and *P. serval* complexes.

Molecular phylogenetic analyses based on the mitochondrial genes cytochrome *b* and 16SrRNA supported the union of *P. fasciatus* and *P. weberi* as a clade outside of the *P. capensis* and

P. formosus groups (Lamb and Bauer 2000; Bauer and Lamb 2002) and nested well within a larger clade including the smaller-bodied species of *Pachydactylus* (Lamb and Bauer 2002). Most recently, mitochondrial data have been combined with data from the nuclear RAG-1 gene revealing that *P. serval* + *P. weberi* are the sister group of *P. tsodiloensis* + *P. fasciatus* and that this group as a whole is the sister group of the *P. capensis* group (Bauer and Lamb 2005; Lamb and Bauer 2006).

We here use a combination of morphological and molecular evidence to revise the remaining members of the *Pachydactylus serval* and *P. weberi* groups. Our objectives are to identify species boundaries within these complexes, to evaluate the validity of all previously described forms, to resolve phylogenetic relationships within the groups, and to interpret the evolution of these geckos in light of historical biogeography. Incomplete genetic sampling and a lack of material, especially juveniles (which generally exhibit diagnostic color patterns), from some regions, however, dictate that our taxonomic and phylogenetic conclusions, though robust, are not definitive, and more work remains to be done within this difficult group.

Material and Methods

Specimens and Morphological Data.— 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), 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), snout to eye distance (SnEye; distance between anteriormost point of eye and tip of snout), nares to eye distance (NarEye; distance between anteriormost point of eye and nostril), orbital diameter (OrbD; greatest diameter of orbit), eye to ear distance (EyeEar; distance from anterior edge of ear opening to posterior corner of eye), ear length (EarL; longest dimension of ear), interorbital distance (Interorb; shortest distance between left and right supraciliary scale rows), forearm length (ForeaL; from base of palm to elbow), crus length (CrusL; from base of heel to knee), tail length (TailL; from vent to tip of tail), and tail width (TailW; measured at widest point of tail). Unless otherwise stated, counts and measurements were made on right side of specimens.

Scale counts and external observations of morphology were made using a Nikon SMZ-10 dissecting microscope. Preserved specimen photographs were taken with a Nikon CoolPix 990 digital camera. Radiographic observations were made using a Faxitron closed cabinet x-ray system. Museum symbolic codes follow Leviton et al. (1985), except for the National Museum of Namibia, Windhoek (formerly State Museum, Windhoek), for which we use the collection code employed by that institution (NMNW) in preference to SMW. Specimens for which molecular data were obtained are marked with an asterisk (*). Specimens were examined from the collections of Angelo J. Lambiris (AJL), Albany Museum (specimens now housed in Port Elizabeth Musuem, mostly recatalogued with PEM numbers (AM), Aaron M. Bauer (AMB), the American Museum of Natural History (AMNH), the California Academy of Sciences (CAS), Carnegie Museum of Natural History (CM), Field Museum of Natural History (FMNH), Institut Royal des Sciences Naturelles de Belgique (IRSNB), John D. Visser (JDV), Louisiana State University Museum of Natural Sciences (LSUMZ), Mirko Barts (MB), Museum of Comparative Zoology (MCZ), National Museum of Zimbabwe (former Umtali Museum collection [NMZB-UM]), Bayworld, Port Elizabeth Museum (PEM), South African Museum (SAM), Forschungsinstitut und Museum Senckenberg (SMF), National Museum of Namibia (SMW), Flagship Institution of the North,

Transvaal Museum (TM), University of Stellenbosch (USEC/H), Zoologisches Forschungsmuseum Alexander Koenig (ZFMK), Museum für Naturkunde, Berlin (ZMB), and Zoologisches Museum Hamburg (ZMH). Specimens from several of the personal collections referenced (AMB, MB) will be deposited in institutional collections or are currently awaiting registration numbers. In addition, original published descriptions and descriptions provided in broader faunal and taxonomic treatments (e.g., FitzSimons 1943; Loveridge 1947) have also been consulted.

Locality data have been taken from collection records. Latitude and longitude are generally given only when the collectors determined this themselves using a GPS or topographic map, or when an original locality was precise enough to warrant it. Regardless of the original form in which coordinates were recorded, we have presented them here in the form of degrees, minutes, seconds. For localities without precise coordinates we have determined quarter degree square references (QDS). The QDS system has been nearly universally used in large scale mapping of the southern African biota and remains a convenient approach to dealing with distributions. Under this system of notation, each single degree square is subdivided into four quarter degrees, designated A-D (A=NW quadrant, B=NE quadrant, C=SW quadrant, D=SE quadrant). Each quarter degree is in turn divided into four similarly designated divisions, yielding a basic unit one sixteenth of a degree square, or one quarter of a degree on a side (e.g., 3015Ac represents the unit bounded by 30°15'S and 30°30'S and 15°00'E and 15°15E). All QDS references in this paper are to degrees South and East. Distances were assumed to be along recognized roads unless otherwise specified or implied by the original locality. Several possible quarter degree squares are listed in some cases where direction from a fixed point could be interpreted in several ways. Ambiguous localities are not plotted on the accompanying maps. Precise but doubtful localities are noted by question marks. In some cases district names were included in the original locality data. These have been reported as originally given, even in cases in which district boundaries have changed. However, we have allocated all localities for which some locality data exist to the currently recognized provincial (South Africa) or district (Namibia) units to which the localities now belong.

Molecular Data.— Tissue samples were processed at field collection sites and preserved in a saturated salt-DMSO buffer (Amos and Hoelzel 1991) or 95% ethanol, or were initially preserved in liquid nitrogen and subsequently stored at -80°C. Genomic DNA was extracted from liver using the Qiagen QIAamp DNA Mini kit. Portions of the mitochondrial cytochrome *b* (cyt*b*) gene were used to assess sequence variation among specimens. The primers L14724 and H15149 (Meyer et al. 1990) were used to amplify a 400 bp segment of the cyt*b* gene. Fifty ul reactions were amplified for 32 cycles at 92° C for 45 sec, 55° C for 35 sec, and 72° C for 1 min. Amplification products were purified over Centri-sep columns and served as templates in cycle-sequencing reactions employing dye-labeled terminators (PRISM kit, Applied Biosystems, Inc.). PRISM reaction products were analyzed on an Applied Biosystems 373A automated DNA sequencer using dye-labeled terminators (BigDye™ Terminator kit, Applied Biosystems, Inc). Forward and reverse sequences were generated for each sample and their complementarity confirmed using the Sequence Navigator software (Applied Biosystems, Inc.). GenBank accession numbers for these sequences are presented in the Appendix. Sequences were aligned using the CLUSTAL X 1.81 program, applying default settings (Thompson et al. 1997). Pairwise sequence divergence estimates were derived using the Hasegawa-Kishino-Yano model (HKY85; Hasegawa et al. 1985), which assumes different evolutionary rates for transitions and transversions and unequal base frequencies.

Phylogenetic Analysis.— Our phylogenetic reconstruction is based on a partitioned Bayesian analysis. We used MrModeltest 2.0 (Nylander 2004) to identify appropriate models of sequence evolution for each codon position within cyt*b*, based on the Akaike information criterion (AIC). We used MrBayes 3.0b4 (Huelsenbeck and Ronquist 2001) to conduct a Bayesian analysis,

incorporating three discrete substitution parameters corresponding to each codon position within cyt*b*. The analysis was initiated with random starting trees and run for 1.0×10^6 generations, sampling trees every 100 generations. We used the Metropolis-coupled Markov chain Monte Carlo algorithm, engaging four incrementally heated Markov chains. To ensure Markov chains did not become entrapped on local optima, we analyzed the combined data in three separate runs. Burn-in was determined graphically; trees generated prior to burn-in (generally, the first 500 trees) were discarded. We used the MrBayes *sumt* command to create a majority rule consensus tree (*all compat*), generate an average likelihood score, calculate posterior clade probabilities (pP), and estimate average branch lengths across post burn-in trees. *Pachydactylus affinis* and *P. capensis* were used as outgroup taxa. Both are members of the *P. capensis* clade, the immediate sister group to the *P. serval/weberi* clade (Bauer and Lamb 2005).

SYSTEMATICS

Much of the confusion that characterized early work on the *P. serval* and *P. weberi* groups stems from the fact that virtually all members are morphologically conservative. Only *P. fasciatus* and *P. tsodiloensis* are readily distinguishable from all of their relatives because of their large size and somewhat more robust habitus. All remaining species are small to mid-sized *Pachydactylus* (< 50 mm SVL), exhibit a weakly to strongly depressed habitus, and are characterized by only a few major color pattern types. McLachlan and Spence (1966) regarded dorsal color pattern as an unreliable character but confirmed that several scale features had systematic value. In particular, they found that members of the *weberi* group were characterized by exclusion of the rostral from the nostril, whereas members of the *serval* group exhibited both rostral and first supralabial contribution to the nostril rim. Branch (1988, 1994a, 1998) also used the presence of enlarged, keeled tubercles on the thighs to distinguish *weberi* group geckos from *serval*. McLachlan and Spence (1966) documented geographic variation in dorsal tuberculation among members of the *P. serval* group but their results suggested only trends, not clear cut diagnostic differences among the subspecific forms they recognized.

We examined more than 1800 specimens in these species complexes from throughout their ranges, under the assumption that such comprehensive sampling would reveal clearer patterns and more useful characters than had earlier studies. Unfortunately, we discovered that most traditional scale features used to distinguish closely related gecko species were either invariant across several putative taxa or varied extensively within taxa. We did, however, confirm the utility of the rostral scale character and found that color pattern was indeed useful in distinguishing taxa. In particular, we found that juvenile color pattern was stereotypical for each taxon, even if adult pattern was variable. The potential utility of juvenile pattern had been suggested by Haacke (1965) and Visser (1984), but has not previously been explicitly employed in a systematic context. We also found that dorsal tuberculation was useful in some instances and that taxonomically meaningful variation is evident with regard to the shape of the digits and relative size of scales on the snout and interorbital regions.

There has been much recent interest in species delimitation and its relationship to species concepts (Wiens and Servedio 2000; Wiens and Penkrot 2002; Ferguson 2002; Hebert et al. 2003; Sites and Marshall 2003, 2004; Blaxter 2004; Watson 2005). In this paper we follow a lineage-based species concept (Mayden 1997; de Queiroz 1998), but from a practical viewpoint, we are chiefly concerned with the properties such lineages express that permit us to infer species boundaries — their diagnosability (Watson 2005). A variety of operational criteria for diagnosing species boundaries has been proposed (Sites and Marshall 2003, 2004). Wiens and Penkrot (2002) compared tree-

based approaches to species delimitation based on DNA data and both tree-based and character-based approaches based on morphological data. Although numerous studies have found congruence between character- and mtDNA tree-based approaches with respect to species boundaries (e.g., Hollingsworth 1998), Wiens and Penkrot (2002) found signficiant discordance in their analysis of *Sceloporus*. In such cases they favored the species limits suggested by mtDNA data, arguing that some taxa exhibit high levels of within species phenotypic variation and relatively low between species differentiation and that such circumstances represented a "worst-case scenario" for morphologically based species delimitation. In these cases haplotype differentiation may occur more rapidly than diagnostic morphological characters, providing a more accurate picture of lineage boundaries.

The *Pachydactylus serval/weberi* group includes a large number of putative taxa that exhibit little intraspecific variation with respect to most morphological characters, but displays extensive intraspecific variation for some characters (McLachlan and Spence 1966). Ideally we would have preferred to have complete taxon sampling for our mtDNA data set. However, this was not feasible, given the remote areas in which some of these geckos occur and their often patchy distributions. Likewise we would prefer to have had adequate samples of each putative taxon to reliably assess whether the characters we have used are truly fixed (Wiens and Servedio 2000). Although our sample sizes were satisfactory for many of the taxa we examined, some species were represented by just one or only a few individuals. As a consequence we were unable to employ the method of Wiens and Penkrot (2002) explicitly — a circumstance we suspect would apply to systematic studies of many African squamates, which are typically poorly sampled. Instead we have analyzed the mtDNA data that was available and the character-based species delimitations in light of each other. Thus, in some cases, subtle differentiation revealed by scale counts was supported by strong support of monophyly in the gene tree, while in other cases, tree-based delimitations convinced us that perceived morphological character variation was of little taxonomic value. Although distribution patterns were not used to erect hypotheses of species boundaries, we considered geographic concordance with both the tree- and character-based species limits to be supportive of our taxonomic decisions (Brown and Diesmos 2001).

Our mtDNA data are employed chiefly in the context of species delimitation as described above, but we consider our hypotheses of relationships among species to be preliminary. Our mitochondrial data represent a single gene tree which, through retention of ancestral polymorphisms and/or incomplete lineage sorting, may not be congruent with the "true" species phylogeny of the group (Avise 1989; Moore 1995).

Species in the *Pachydactylus serval* group

Based on morphological and molecular investigations, we recognize a total of 21 species in the *P. serval/ weberi* clade, making it by far the most speciose lineage in the genus. This includes the following previously described taxa: *P. serval*, *P. purcelli*, *P. montanus*, *P. weberi*, *P. acuminatus*, *P. werneri*, *P. robertsi*, *P. fasciatus*, *P. tsodiloensis*, *P. waterbergensis*, and *P. kobosensis*, as well as ten previously unnamed taxa. Eight of these are described herein, the two remaining will be described elsewhere. The members of the clade are chiefly rupicolous and share the following morphological features: body moderately to strongly depressed; nostril typically surrounded by supranasal, two postnasals, and first supralabial (except in *P. kobosensis* and rarely in other taxa); rostral variably excluded from nostril rim; 5–6 undivided adhesive lamellae beneath digit IV of pes (plus one terminal divided lamella); dorsal pattern of transverse bands or spots. All share the following skeletal features, which are plesiomorphic for *Pachydactylus* as a whole: phalangeal formula 3–3–4–5–4 for

manus and 3–3–4–5–4 for pes, 26 presacral vertebrae, a single pair of crescentic cloacal bones in males only. Below we provide new diagnoses for the previously named species and descriptions of the new taxa. Previously described taxa are presented in chronological order of original description. A partial phylogenetic analysis based on analysis of part of the cytochrome *b* gene is presented following the the descriptions and diagnoses.

Pachydactylus fasciatus Boulenger, 1888

Figures 5–9.

1867 *Pachydactylus capensis* Peters, *Mber. Akad. Wiss. Berlin* 1867:235.
1888 *Pachydactylus fasciatus* Boulenger, *Ann. Mag. Nat. Hist.* (6)2:138. (LECTOTYPE [designated by Bauer and Branch 1991]: BMNH 1946.8.25.99: "Namaqualand," don. L. Péringuey (see Bauer and Branch 1991 for a discussion of the type locality). PARALECTOTYPE: SAM 1052: same collection data as lectotype.)
1890 *Pachydactylus fasciatus* Boulenger, *Proc. Zool. Soc. London* 1890:78.
1898 *Pachydactylus fasciatus* Sclater, *Ann. S. Afr. Mus.* 1:103.
1910 *P*[*achydactylus*] *fasciatus* Boulenger, *Ann. S. Afr. Mus.* 5:461.
1910 *Pachydactylus fasciatus* Hewitt, *Ann. Transvaal Mus.* 2:79.
1911 *Pachydactylus formosus* Sternfeld, *Mitt. Zool. Mus. Berlin* 5:397.
1911 *Pachydactylus fasciatus* Sternfeld, *Mitt. Zool. Mus. Berlin* 5:397.
1911 *Pachydactylus fasciatus* [part] Sternfeld, *Fauna dtsch. Kolon.* 4(2):15.
1911 *P*[*achydactylus*]. *fasciatus* Hewitt, *Ann. Transvaal Mus.* 3:44.
1915 *Pachydactylus weberi* [part] Werner *in* Michaelsen, *Land und Süsswasserfauna Deutsch-Südwest Afrikas* I:334 (see Bauer and Branch 1991).
1927 [*Pachydactylus*] *fasciatus* Hewitt, *Rec. Albany Mus.* 3:400.
1929 *Pachydactylus fasciatus* Lawrence, *J. S.W. Afr. Sci. Soc.* 2:25.
1935 [*Pachydactylus*] *fasciatus* Hewitt, *Rec. Albany Mus.* 4:318.
1943 *Pachydactylus fasciatus* FitzSimons, *Mem. Transvaal Mus.* 1:87, pl. IX, fig. 1.
1947 *Pachydactylus weberi acuminatus* [part] Loveridge, *Bull. Mus. Comp. Zool.* 98:393.
1947 *Pachydactylus weberi werneri* [part] Loveridge, *Bull. Mus. Comp. Zool.* 98:394.
1947 *Pachydactylus fasciatus* [part] Loveridge, *Bull. Mus. Comp. Zool.* 98:395.
1947 *Pachydactylus bibronii turneri* [part] Loveridge, *Bull. Mus. Comp. Zool.* 98:405.
1955 *Pachydactylus fasciatus* Mertens, *Abhandl. Senckenberg. naturf. Ges.* 490:45.
1965 *Pachydactylus fasciatus* Wermuth, *Das Tierreich* 80:118.
1971. *Pachydactylus fasciatus* Mertens, *Abhandl. Senckenberg. naturf. Ges.* 529:39.
1982 *Pachydactylus fasciatus* Welch, *Herpetology of Africa*: 34.
1988 *Pachydactylus fasciatus* Branch, *Field Guide*:202, pl. 86, upper middle right, lower middle right.
1991 [*Pachydactylus*] *fasciatus* Kluge, *Smithson. Herpetol. Inform. Serv.* 85:23.
1993 [*Pachydactylus*] *fasciatus* Kluge, *Gekkonoid Lizard Taxonomy*:24.
1993 *Pachydactylus fasciatus* Bauer et al., *Madoqua* 18 :126, fig. 8, color plate (p. 145), fig. 8.
1994 *Pachydactylus fasciatus* Welch, *Lizards of the World* 1:93.
1994 *Pachydactylus fasciatus* Branch, *Field Guide*, 2nd ed.:202, pl. 86, upper middle right, lower middle right.
1998 *Pachydactylus fasciatus* Branch, *Field Guide*, 3rd ed.:253, pl. 86, upper middle right, lower middle right.
2000 [*Pachydactylus*] *fasciatus* Rösler, *Gekkota* 2:98.
2001 [*Pachydactylus*] *fasciatus* Kluge, *Hamadryad* 26:20.
2003 *Pachydactylus fasciatus* Griffin, *Namibian Reptiles*:33.
2003 *P*[*achydactylus*]. *fasciatus* Bauer and Lamb, *Cimbebasia* 19:3.
2005 *P*[*achydactylus*]. *fasciatus* Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

MATERIAL EXAMINED.— NAMIBIA: **Karasburg District**: TM 79074, Warmbad (28°26′S, 18°44′E); Bethanie District: ZMB 23374, Kuibis (2616Db); Walvis Bay District: ZMB 44031, Walvis Bay (2214Cd) [almost certainly in error]; Karibib District: ZMB 5710–11, 23451–52, Neu Barmen (2216Ba); SAM 14495–96, Karibib (2115Dd); TM 36388, Farm Gross Spitzkoppe (21°50′S, 15°12′E); CAS 206936*, 10 km

E Spitzkop turnoff, Hentiesbaai-Usakos (21°57′08″S, 15°16′48″E); ZFMK 66580–82, zwischen Swakopmund und Windhoek; Omaruru District: SMW R 7214, Brandberg Camp 3 (2114Ba); ZFMK 58579, Uis (2114Bb); Khorixas District: AJL 3440, 28 km W Khorixas (2014Bc); CAS 214672–77, 48 km W Kamanjab (19°39′14″S, 14°21′03″E); CAS 176280, 48.6 km W Farm Franken, Kamanjab (1914Cb); CAS 176147, 49.5 km W Kamanjab (1914Cb); CAS 176159–66, 54.3 km W Kamanjab (1914Cb); CAS 223929–31, 58 km W Kamanjab (19°39′29″S 14°21′10″E); CAS 193681*, 59.3 km W Kamanjab (19°39′06″S, 14°21′20″E); CAS 176286–89, TM 69251, 64.9 km W Farm Franken, Kamanjab (1914Cb); PEM R 5058, 55 km W Kamanjab (1914Cb); PEM R 6142, 55.3 km W Kamanjab (1914Cb); PEM R 5059, 64.5 km W Kamanjab (1914Cb); CAS 214690–92, 74.2 km W Kamanjab (19°45′40″S, 14°17′03″E); CAS 176093–95, 100.6 km W Kamanjab (1914Cc); CAS 176109, 108.9 km W Kamanjab (1914Cc); TM 68547, Palmwag (1913Dd); Outjo District: TM 39916, Farm Hoas (19°55′S, 14°46′E); Opuwo District: NMNW R 187–188, TM 29667, Warmquelle (1913Bb); TM 29667–29673, 48839–52, 45854, Sesfontein (1913Ba); SMF 46595, Kaokoveld; Imprecise Locality: SAM 1052 (paralectotype), Namaqualand. **Erroneous Locality**: SAM 1155, Natal. **No Locality**: ZMB 58364–67. **Additional literature record**: **Namibia**: **Khorixas District**: 8 km west of Khorixas (Haagner 1991).

Diagnosis.— A large (to 56.0 mm SVL, PEM R 6142) member of the *P. serval/weberi* clade that may be distinguished from all other members of this group by the combination of the following characters: rostral and sometimes first supralabial excluded from nostril; supranasals separated or in narrow to moderate contact anteriorly; scales on snout domed to conical, those on interorbital and parietal regions much smaller, granular, intermixed with tubercles approximately same size as snout scales; entire dorsum covered with enlarged, strongly keeled tubercles, regularly arranged in 16 (most commonly)–18 rows; thighs tuberculate; toe pads moderately broadly expanded, digits relatively long, slender; typically 5 undivided lamellae beneath digit IV of pes; tail to 115% SVL or more, bearing whorls of sharply keeled tubercles, often abutting one another; adult pattern consisting of well-defined broad, dark-edged, light saddle-shaped bands alternating with darker interspaces (Figs. 5–6; see also color photos in M. Griffin 1998, fig. 2.75; Barts 2002, figs. 1–2, 6). The lighter bands are cream to pinkish or grayish and the darker interspaces orange to russet to mid-brown, with dark brown edges separating the two; juvenile pattern as adults, but especially boldly contrasting bands usually cream to pale yellow and dark chocolate brown and often less obviously saddle-shaped than in adults (Figs. 7–9; see also Haacke 1965, plate 2; Bauer et al. 1993, fig. 8; Barts 2002, figs. 8–10).

Distribution.— The majority of records derive from the Khorixas, Omaruru, and Karibib districts of Namibia (Bauer and Branch 1991; Barts 2002; Griffin 2003), chiefly in areas above 1000 m elevation and north of the Swakop River (Figs. 10–11). However, there is a single verified record from Warmbad in the Karas District (Bauer and Lamb 2003b; Fig. 9). A record from the Bethanie District (Kuibis) may be valid, but one from Walvis Bay almost certainly reflects a point of shipment rather than of collection (Bauer and Branch 1991) and an old record from Natal (Boulenger 1910) has been shown to reflect incorrect data (FitzSimons 1943). All localities lie in or along the more mesic edge of the Nama-Karoo Biome (Irish 1994). Griffin (2000a) listed *P. fasciatus* as occurring on the plains around the Brandberg. We did not examine material from the Brandberg, but it is likely that the species occurs throughout the Omaruru District in appropriate habitats. All records from the Republic of South Africa (e.g., Boulenger 1910; Loveridge 1947) are incorrect. This species appears to be a strict Namibian endemic, although it may yet be found on the south bank of the Orange River, east of Goodhouse. Haacke (1965) noted that specimens of this species from Sesfontein may have escaped from captivity in Windhoek, but no evidence of an introduced established population has since come to light.

Natural History.— In the Khorixas District, this species is usually found by day under calcrete stones (Fig. 12) on sandy soil in savanna dominated by mopane (*Colophospermum mopane*)

and *Acacia* spp. (Bauer and Branch 1991; Bauer et al. 1993), and at Sesfontein it was taken under stones as well (Haacke 1965). A specimen from near Spitzkop (CAS 206936) was taken from under the bark of a fallen *Acacia* (Bauer et al. 1999). *Pachydactylus fasciatus* is chiefly terrestrial; reports of it being truly rupicolous (FitzSimons 1943; Loveridge 1947) probably stem from confusion with *P. weberi*.

Two eggs found in the wild measured 11.3 × 9.0 and 11.5 × 8.9 mm, respectively and contained near-term embryos. Eggshell structure was described by Röll (2001). Eggs are laid beneath stones and are partly covered by sand. Mating probably occurs in summer with oviposition in January-February and hatching in autumn (Bauer and Branch 1991). Feeding and reproduction in captivity have been reported by Barts (2002) and Rösler (2005) summarized data on incubation time and temperature, as well as egg and hatchling sizes.

Conservation Status.— *Pachydactylus fasciatus* is not known to occur in any Namibian national parks, except perhaps Gross Barmen Hot Springs, although it is present in a number of community-based conservancies which may offer some measure of protection. Griffin (2003) considered it likely to be present in the Etosha National Park, West Coast Recreation Area and the Namib-Naukluft Park. Where it occurs *P. fasciatus* is locally abundant and we do not consider it under any immediate threat. However, this is one of few members of the group that are offered for sale in the herpetocultural trade. A web search in October 2003 revealed adult (presumably captive-bred) specimens being sold for US $75 each.

Remarks.— We concur with Mertens (1955) in finding no evidence that *P. fasciatus* possesses as many as 9–10 subdigital lamellae under the fourth toe (contra Boulenger 1888; Loveridge 1947).

Pachydactylus weberi Roux, 1907

Figures 1, 3, 13–20.

1870 *Pachydactylus capensis* Peters, *Mber. Akad. Wiss. Berlin* 1870:110.

1907 *Pachydactylus weberi* Roux, *Zool. Jb. Abt. Syst.* 25:408, pl. 14, figs. 4–5 (Lectotype: ZMA 11046 [designated by Daan and Hillenius 1966] (Fig. 1): "Klipfontein, Kl.-Namaqualand;" coll. M. Weber, September 1894. Paralectotypes: ZMA 11047–48: same collection data as lectotype. A fourth paralectotype also does or did exist, probably in the NHMB collection in Basel (Daan and Hillenius 1966; van Tuijl 1995), although this specimen was not noted by Kramer (1979)).

1910 *Pachydactylus fasciatus* Werner, *Zool. Anthropolog. Ergebn. Forsch. west. zentr. Südafrika*:311, fig. 8 (Fig. 3).

1910 *P*[*achydactylus*] *weberi* Boulenger, *Ann. S. Afr. Mus*. 461.

1910 *Pachydactylus weberi* Hewitt, *Ann. Transvaal Mus.* 2:80.

1911 *Pachydactylus Weberi* [part] Sternfeld, *Fauna dtsch. Kolon.* 4(2):14.

1911 *Pachydactylus fasciatus* [part] Sternfeld, *Fauna dtsch. Kolon.* 4(2):15.

1911 [*Pachydactylus*] *weberi* Hewitt, *Ann. Transvaal Mus.* 3:44.

1914 *P*[*achydactylus*]. *weberi* Methuen & Hewitt, *Ann. Transvaal Mus.* 4:129.

1927 [*Pachydactylus*] *weberi* Hewitt, *Rec. Albany Mus.* 3:400.

1932 *Pachydactylus capensis gariesensis* Hewitt, *Ann. Natal Mus.* 7:124, pl. VI, figs. 8–9 (Syntypes: SAM 17953 (originally nine specimens) (Fig. 13): "Garies;" coll. B. Peers (see Remarks)).

1932 [*Pachydactylus*] *capensis weberi* Hewitt, *Ann. Natal Mus.* 7:124.

1935 *Pachydactylus capensis fasciatus* FitzSimons, *Ann. Transvaal Mus.* 15:528.

1935 *Pachydactylus capensis gariesensis* FitzSimons, *Ann. Transvaal Mus.* 15:528.

1936 *Pachydactylus weberi* [part] Parker, *Novit. Zool.* 40:130.

1936 *Pachydactylus capensis gariesensis* Lawrence, *Parasitology* 28:11.

1936 *Pachydactylus capensis weberi* Lawrence, *Parasitology* 28:38

1936 *Pachydactylus capensis fasciatus* Lawrence, *Parasitology* 28:38 (non *P. fasciatus* Boulenger, 1888)

1938 *Pachydactylus fasciatus* FitzSimons, *Ann. Transvaal Mus.* 19:170.
1938 *Pachydactylus weberi gariesensis* FitzSimons, *Ann. Transvaal Mus.* 19:179.
1938 *Pachydactylus weberi weberi* FitzSimons, *Ann. Transvaal Mus.* 19:180.
1941 1938 *Pachydactylus weberi gariesensis* FitzSimons, *Ann. Transvaal Mus.* 20:359.
1943 *Pachydactylus weberi weberi* FitzSimons, *Mem. Transvaal Mus*. 1:88, pl. IX, fig. 2, pl. XV, Fig. 5.
1943 *Pachydactylus weberi gariesensis* FitzSimons, *Mem. Transvaal Mus.* 1:90, pl. IX, fig. 3.
1947 *Pachydactylus weberi gariesensis* Loveridge, *Bull. Mus. Comp. Zool.* 98:390.
1947 *Pachydactylus weberi weberi* Loveridge, *Bull. Mus. Comp. Zool.* 98:391.
1947 *Pachydactylus fasciatus* [part] Loveridge, *Bull. Mus. Comp. Zool.* 98:395.
1951 *P*[*achydactylus*]. *weberi* Lawrence, *Ann. Transvaal Mus.* 21:452.
1965 *Pachydactylus weberi weberi* Wermuth, *Das Tierreich* 80:123.
1981 *Pachydactylus weberi weberi* Branch, *Ann. Cape Prov. Mus. (Nat. Hist.)* 13:145.
1982 *Pachydactylus weberi weberi* Welch, *Herpetology of Africa*:36.
1982 *Pachydactylus weberi gariesensis* Welch, *Herpetology of Africa*:36.
1984 *Pachydactylus weberi* [part] Visser, *Landbouweekbl*. 27 April 1984:53, fig. p. 51, bottom.
1988 *Pachydactylus weberi* [part] Branch, *Field Guide*:208.
1991 [*Pachydactylus*] *weberi* Kluge, *Smithson. Herpetol. Inform. Serv.* 85:24.
1993 [*Pachydactylus*] *weberi* Kluge, *Gekkonoid Lizard Taxonomy*:25.
1994 *Pachydactylus weberi* Welch, *Lizards of the World* 1:95.
1994 *Pachydactylus weberi* [part] Branch, *Field Guide*, 2nd ed.:208.
1998 *Pachydactylus weberi* [part] Branch, *Field Guide*, 3rd ed.:263.
2000 [*Pachydactylus*] *weberi weberi* Rösler, *Gekkota* 2:100.
2001 [*Pachydactylus*] *weberi* Kluge, *Hamadryad* 26:21.
2002 *Pachydactylus weberi* Bauer et al., *Proc. California Acad. Sci.* 53:25.
2003 *Pachydactylus* cf. *weberi* [part] Bauer and Branch, *Herpetol. Nat. Hist.* 8:134.
2003 *P*[*achydactylus*]. *w*[*eberi*]. *weberi* Bauer and Lamb, *Cimbebasia* 19:3.
2005 *P*[*achydactylus*]. *weberi* [part] Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

Material examined.— South Africa: **Western Cape Province**: TM 35020–22, Farm Waaikop, Ceres District (3220Ac); PEM R 12809, other side of Pakhuispas (3218Bb); SAM 44114 (3 specimens), TM 19612, 34311, Pakhuis Pass (3219Aa); USEC/H-2784, Pakhuis Pass (32°08′S, 19°02′E); SAM 44370, Algeria (3219Ac); JDV 2498, Algeria Forestry Station (3219Ac); USEC/H-3013, Zuurvlakte (32°58′08″S, 19°03′04E″); USEC/H-5562, Varsfontein, Tanqua Karoo National Park (32°11′00″S, 19°48′44″E); USEC/H-5589, Mount Ceder (32°38′38″S, 19°25′22″E); JDV 64778, 75678, Farm Boskloof, near Citrusdal (3219Ca?), TM 35027, Gannagas Pass, Roggeveld Escarpment (3220Aa); USEC/H-2178, Holrivier (3118Cb); JDV 2729, 7 km W Bitterfontein (3118Aa); AM 241, PEM R 14782, Van Rhynsdorp (3118Da); SAM 43592–93, TM 42380, N of Van Rhynsdorp (3118Da); PEM R12810–20, 23 mi. N Van Rhynsdorp (3118Bc); PEM R 14770–71, 14773–74, 147776–78, TM 33983, Nuwerus (3118Ab); AM 243 (7 specimens), (3118Ab); AM 244 (11 specimens), Nuwerus District; PEM R 14736–39, SAM 18156 (12 specimens), TM 33984, Bitterfontein (3118Ab); USEC/H-2780–83, Bitterfonein (31°02′S, 18°15′E); JDV 72378, 72578, 72678, 72778, 72878, 72978, 73078, 73178, 73278, 73378, 73478, 73578, 73678, 73778, just N and S Bitterfontein (3118Ab); JDV 78078, 78178, 78278, 80978, just S Bitterfontein (3118Ab); JDV 81278(2), 81378, 5 km N Bitterfontein (3118Ab); JDV 1130, a few km E of Nuwerus (3118Ab); JDV 2609–10, 30 km N Koekenaap (3118Ad); TM 15797, Vredendal (3118Da); USEC/H-413, Oudenwagen, Bulshoek (31°48′00″S, 18°54′58″E); USEC/H-428, Blinkvlei, Urionskraal District (31°44′16″S, 18°55′33″E); CM 119270–72, 16.6 km N Bitterfontein (3018Cc); JDV N18780, Bruintjieshoogte, 40 km S Garies (3018Cc); TM 35132–34, 2 mi N Kliprand (3018Da); ZMH R07637, 33 km SW Kliprand (3018Cd); JDV 1412–17, 33 km S Kliprand (3018Dc). **Northern Cape Province**: PEM R 12795–97, 12854, 35 mi. from Loeriesfontein on Calvinia Rd. (3119Bc); TM 35105, 19 mi NNE Nieuwoudtville (31°23′S, 19°02′E); PEM R 12861–62, Downes near Calvinia (3119Bd); TM 18180, 18183, Hantamsberg (3119Bc or 3119Bd); TM 18182, Calvinia (31°28′S, 19°47′E); TM 35060–62, Farm Groottoring, Calvinia District (3119Bc); TM 35053–59, Farm Agterhantam, Calvinia District (3119Ba); ZFMK 18336–38, Die Bos (3119Dc); TM 65920–21, Bloukrans Pass (31°40′S, 19°45′E); PEM R 12821–22,

25 mi. N Bitterfontein on Garies Rd. (3018Cc); AM 242 (27 specimens), Garies to 3018Ac; CAS 199997*–98*, 6 km S Garies on Hwy. N7 (3018Ca); JDV 1132–34, Farm Langdam, 18 km E Bitterfontein (3018Cd); JDV 5393, 81078(2), 81178(2), 50 km N Bitterfontein (3018Ca); IRSNB 11822, MCZ R 41842 (formerly TM 13719), 46815–16 (formerly TM 18147, 18153), 31573–74 (paratypes of *Pachydactylus capensis gariesensis*), SAM 17953 (13 specimens), 18053 (9 specimens), 43586, TM 18144–46, 18148–52, 18154, 18156–60, 33985–89, Garies (3017Db); JDV 71778, 72078, 72178, 72278, 72478, 78778, 81378, 5 km N Garies (3017Db); JDV 47080, 47280, 47380, 47480, 47580, N22180, 20 km W Garies (3017Db); TM 34035–38, 4 mi N Garies (3017Db); JDV 2558–59, 20 km past Molsvlei, Bitterfontein District (3017Dd); JDV 2631–33, 30 km past Molsvlei towards cost (3017Dd); JDV 2605–06, 2609, between Molsvlei and coast (3017); TM 15949–50, Soebatsfontein (3017Ba); SAM 18197 (2 specimens), TM 70092–93, Farm Leliefontein (30°18′S, 18°05′E); PEM R 14741, 14744, 14749, 14752–53, 14759, 14762–65, 14767–69, Garies-Kamiesberg (3018Ac); JDV 1386, 1390, 1519, MCZ R 163278, 57 km N Kliprand (3018Bb); JDV 1378, 8 km N Kliprand (3018Da); JDV N17480, 7 km S Kharkams (3017Bd); JDV 71978, 5 km S Kharkams (3017Bd); JDV 1418, 1458, 1463, 1465–74, 15378, 77678, 82078, MCZ R 163281, Kharkams, S Kamieskroon (3017Bd); JDV N18280, N18380, N18480, 5 km N Kharkams (3017Bd); TM 34039–42, 10 mi N Garies (3017Bd); TM 34043–44, 6 mi SW Kamieskroon (3017Bd); CAS 186368*, 186369–70, 186371*, 186372–73, JDV 15278, SAM 18144 (11 specimens), 44288, 44321, Kamieskroon (3017Bb); TM 35220, 35219, 12 mi N Kamieskroon (3017Bb); CAS 186378, Kamiesberg Pass, 3 km E Kamieskroon (3017Bb); TM 35212, Kamiesberg Pass (3017Bb); JDV N12180, N13380, N13480, Wallekraal (3017Bc); JDV 80978, 81778, 81878, 81978, 3–5 km N Kharkams (3017Bd); SAM 47707–10, Kotzesrus (30°46′59″S, 17°48′20″E); MCZ R 163279, Juliesberg, E Kamiesberg, Kamieskroon (3018Aa); TM 34045, 7 mi E Kamieskroon on road to Gamoep (3018Aa): TM 35193–200, 4 mi NW Leliefontein (3018Aa); JDV 1397–98, 15 km W Farm Gorap on rd to Kamieskroon (3018Aa); JDV 51280, N16780, N16880, N16980, N17080, N20180, 24 km E Kamieskroon (3018Aa); JDV 1400, 1402–05, 1419, 58 km W Kliprand-Gamoep-Kamieskroon intersection (3018Aa); JDV N15380, N15480, N15580, N15680, N15780, N15880(2), N15980, N16080, N16180, N16280, N20880, 54 km E Kamieskroon (3018Ab); MCZ R 163280, Farm Gorap, E Kamiesberg, Kamieskroon (3018Ac); TM 35188, Farm Wolfhok (3018Ac); JDV 1144, 1157–58, 1160, 1164–67, 1169–77, 22 km W Aalwynsfontein (3018Ad); JDV 1374–75, Farm Dirkmaatjie, intersection Kamieskroon-Kalkrand-Gamoep rds. (3018Ad); TM 35153–56, 30 mi W Loeriesfontein (3019Cc); JDV 48080, 48180, 100 km N Wallekraal (2917Ca); ZMH 07638, 38 km W Gamoep (2918Cc); TM 34266–68, Gamoep, 26 mi E Kamieskroon (29Cd); JDV 81478(2), 26 km E Port Nolloth (2917Ac); TM 18132–34, 8 km S Komaggas (2917Cd); MCZ R 21019, PEM R12786–93, TM 34176–78, ZMB 23125, Komaggas (2917Cd); JDV 66378, Kamieskroon-Springbok; TM 34179–80, 4 mi from Komaggas on road to Springbok (2917Da); TM 34181–83, 34278–85, Spektal Pass (2917Da); JDV 70478, 70578, 70678, 70778, 70878, 70978, 71078, 71178, 71278, 71378, 77778, 77878, 77978, past Komaggas turnoff on rd. to Kleinsee from Springbok (2917Da); TM 34184, Naries/Eselsfontein Pass, 13 mi W Springbok (2917Da); MCZ R 46814 (formerly TM 18117), PEM R 12808, TM 18107–08, 18110–16, 18118–19, 32 miles from Springbok on road to Kamaggas (29°44′S, 17°31′E); CM 130301–02, 11 km ENE Springbok (2917Db); JDV 74178, 74278, 74378, 74478, 74578, 74678, 74778, 74878, 74978, 75078, 81578(2), 81678(2), N40280, 10 km S Springbok (2917Db); TM 18061–65, between O′okiep and Springbok (2917Db); USEC/H-2785–86, Springbok District (2917Db); SAM 46921, Die Stasie, Messelpad (2917Dc); IRSNB 11823 (formerly TM 17915), MCZ R 46813 (formerly TM 17912), PEM R 12847–48, TM 17909–11, 17913–14, 17916–17, Klipfontein (2917Ba); CAS 206823–24, Brandberg, Farms Kourootje and Kap Vley, De Beers Consolidated Farms (29°49′52″S, 17°22′35″E); TM 65855–57, 65859, Sandhoogte, Farm Ezelsfontein 214 (29°41′S, 17°45′E); PEM R 12784–85, SAM 18538 (6 specimens), Kleinsee (2917Ca); CAS 206752–53, 206754*, 206755–60, Kleinsee, Nature Reserve (29°38′49″S, 17°05′02″E); SAM 47706, Ratelpoort (29°26′22″S, 17°50′00″E); CAS 193318–30, 206902–04, LSUMZ 57346*, PEM R 2853*, 11.5 km S Steinkopf, 0.55 km E Hwy. N7 (2917Bd); JDV 1186, 12 km S Steinkopf, 5 km E (2917Bd); CM 119382, 4 km E Steinkopf (2917Bd); JDV 2575–77, 2601, 5576, TM 52760, 53388, ZMB 22894, 22897 [one of two specimens bearing this number], Steinkopf (2917Bc); CAS 186301–06, 67 km E Port Nolloth (2917Bc); TM 27701–04, 27707–08, Anenous Pass (29°13′S, 17°37′E); TM 34094, 30 mi E Port Nolloth on road to Steinkopf (2917Ad); TM 18039–47, 20 miles E Port Nolloth (2917Ac); TM 35235–37, Farm Gemsbokvley (29°19′S, 17°08′E); PEM R 12803, SAM 18556, Lekkersing (2917Aa); TM 27914,

Lekkersing (29°00′S, 17°06′E); TM 53845, Kamma River above Springbokvlei (29°05′S, 17°05′E); SAM 47705, Kammarivier (29°05′04″S, 17°05′34″E); JDV N17880, 3 km W Springbok (2917Db); JDV 51180, N13980, N15080, 31 km E Springbok (2918Ca); TM 56211, Henkries (28°57′S, 18°06′E); CAS 186366, Lekkersing Rd., 30 km S jct. Eksteenfontein Rd. (2817Cc); TM 34206, 7 mi. SW Stinkfontein (2817Cc); TM 34273–74, 13 mi. E Stinkfontein towards Vioolsdrif (2817Cd); LSUMZ 57345, PEM R 11942, Uitpanspoortberg (28°57′S, 17°02′30″E); CAS 200056*, Lekkersing rd., 45.2 km S Alexander Bay-Sendelingsdrif Rd. (28°47′04″S, 17°00′24″E); TM 28065 11.2 km S of Dolomite Peaks (28°47′S, 17°03′E); TM 27871–72, Groenkloefrivier, 17.6 km SW Kubus (28°31′S, 16°58′E); PEM R12798, Kuboes (2816Bd); TM 34303, Hellskloof Pass, Richtersveld National Park (2816Bd); TM 22983, Sendelingsdrif, Richtersveld National Park (28°10′S, 16°53′E); TM 53850, Sendelingsdrif, Richtersveld National Park (28°05′S, 16°56′E); SAM 43749–50, 4 unnumbered specimens, Little Namaqualand; JDV 1675, 2610, N15280, TM 13716–18, Namaqualand. **Namibia**: **Lüderitz District**: TM 27737, Skerpioenkop, Lüderitz District (27°46′S, 16°30′E) [?]. **Unidentified/ambiguous localities**: SAM 18798 (6 specimens), 18799 (2 specimens), 18800 (2 specimens), Bowesdorp; SAM 46930, Nauchas (presumably not Nauchas, Rehoboth District, Namibia). **Unknown locality**: JDV 1056–57, 1230, 2171, 2601, 15180, 32080, 77578, N53580. **Additional records**: **South Africa**: **Northern Cape Province**: Goegap Nature Reserve (Girard 1997); Approximately 10 km W Garies on road to Hondeklipbaai (30°35′36″S, 17°52′06″E) (pers. comm., M. Burger, September 2005; photo vouchers).

Diagnosis.— To 50.0 mm SVL (JDV 1473, 81478). *Pachydactylus weberi* may be distinguished from all other members of the *P. serval/weberi* group by the combination of the following characters: rostral (and rarely first supralabial) excluded from nostril; supranasals in variable contact; scales on dorsum of head smooth and flat, those on snout much larger than those of interorbital and parietal regions; dorsal scalation strongly heterogeneous, flattened, conical, or weakly keeled tubercles in 16–22 rows; thighs bearing at least some enlarged, often keeled tubercles; toes moderately short, toe pads somewhat expanded; typically 5 undivided lamellae beneath digit IV of pes; tail to 131% SVL, annulate, bearing whorls of flattened to keeled, pointed tubercles; adult pattern light brown to russet or pale orange with three light (white, pale yellow, buff, pinkish or ashy) bands (one on nape, two on trunk) with brown borders variably evident, at least nape band usually apparent, traces of body bands usually persist, even in very large specimens, but pattern as a whole often obscured by break-up of dark edges on cross bands and presence of dark markings in interstices between bands (Figs. 1, 13–18; see also Girard 2002); original tail boldly banded; juvenile pattern bold, one nape and two body bands, each pale with dark edges, bands usually with slightly wavy margins, some stray dark markings between bands (Figs. 3, 18–20; see also Visser 1984:51; Seufer 1991:124 top).

Distribution.— Distributed more or less continuously throughout areas of suitable rocky substrate in the western Northern Cape and northwestern Western Cape. Populations occur in the Cederberg, Bokkeveldberge and throughout Namaqualand (Figs. 21–22). At Kleinsee the species' range nearly reaches the coast. Inland the species occurs near the Hantamsberg and along the western slopes of the Roggeveldberge. It is also present at suitable sites in the Knersvlakte and has recently been collected in the Tankwa Karoo. In the north *P. weberi* occurs along the western side of the Richtersveld, in and on the flanks of the Vandersterrberge, reaching the Orange River at Sendelingsdrif. This species is nearly strictly limited to the Republic of South Africa, although a single specimen from Skerpioenkop, a southern outlier of the Aurusberg Mountains of southern Namibia is here tentatively referred to this taxon as well. Griffin (2000a) considered *P. weberi* as occurring around the Brandberg in northwestern Namibia. We examined no material referable to the *P. weberi* group from this area, but would predict that if a *P. weberi* group gecko other than *P. fasciatus* does occur there, it would represent an undescribed species.

Natural History.— *Pachydactlyus weberi* is almost strictly rupicolous and is found chiefly in association with narrow horizontal cracks, capstones, or exfoliating flakes (Visser 1984; Branch

1998). Rocky areas occupied include large outcrops or cliff faces (Fig. 23), but they are also common in small boulder clusters (Fig. 24) or even groups of rocks of less than 1 m^3. They occur in sandstones, granites or other types of rocks, wherever erosion or fragmentation provides suitable shelter and thermal conditions. Visser (1984) reported that specimens were found on the ground under trash near Wallekraal.

Visser (1984) reported that the species generally lays eggs in January, but that near Bitterfontein, eggs (9.2×6.7 mm) are laid in August and that a very late group of eggs were found in May near Kharkams. Communal egg-laying sites have been reported (Visser 1984; Branch 1998). We have found many eggs in rock crevices or under capstones, but in captivity they are laid in sand (Girard 2002).

Mites (*Geckobia namaquensis* and *G. capensis hastata*) have been recorded from *P. weberi* (Lawrence 1936, 1951).

Diet in the wild is reported to include spiders, moths, and homopteran larvae (FitzSimons 1943; Branch 1998). Captive maintenance and reproduction, including copulatory behavior, as well as vocalization, have been reported on by Girard (2002) and Rösler (2005).

Conservation Status.— *Pachydactylus weberi* is a common species in most places where it occurs. Protected populations include those in the Cederberg Wilderness Area, Tankwa Karoo National Park, Goegap Nature Reserve, and Richtersveld National Park. The species may also occur in the Akkerandam and Oorlogskloof Nature Reserves. Effective protection is also afforded to this species on land controlled by DeBeers near Kleinsee and in the Spergebied of southern Namibia (Skerpioenskop population).

Remarks.— In specimens from the extreme northern portion of the range (Richtersveld localities: Hellskloof Pass, Groenkloofrivier, 13 km S Eksteenfontein) the dark margins of light bands are especially prominent and the adult pattern appears as alternating light and dark bands along the length of the trunk. Specimens from Calvinia are uniformly more robust than those from more coastal areas of Namaqualand. The status of these inland populations should be investigated further.

Barbour and Loveridge (1946) identified MCZ R 31573–74 as paratypes of *Pachydactylus capensis gariesensis*, with the locality "Garies to Kamiesberg, Little Namaqualand, South Africa." However, Hewitt (1932) indicated that specimens from this locality were received from Peers after the types. Thus, the MCZ specimens appear not to be true types. However, MCZ R 48142, which was not listed by Barbour and Loveridge (1946) as a type, was collected by B. Peers in October 1929 at Garies and may be one of the types, although this has not been confirmed. Hewitt (1932) had explicitly mentioned that there were nine syntypes under the number SAM 17953. In March 2005 we found a total of 13 specimens in two lots of ten and three, respectively, bearing this number. As measurements were provided for only a single specimen in the type description, it is not now possible to confirm the other types.

Pachydactylus serval Werner, 1910 (Figs. 2, 25–29)

1910 *P*[*achydactylus*]. s*erval* Werner, *Denkschr. Med.-Nat. Ges. Jena* 16:313, fig. 10 (Lectotype: ZMB 23121 [designated by implication by Loveridge 1947, see Bauer and Günther 1991] (Fig. 2): "Chamis, Groß-Namaland" (see Remarks), August 1905. Paralectotype: ZMB 23122: same collection data as holotype.)
1910 *P*[*achydactylus*] *serval* Boulenger, *Ann. S. Afr. Mus.* 463.
1911 *Pachydactylus serval* Hewitt, *Ann. Transvaal Mus.* 3:45.
1911 *Pachydactylus serval* Sternfeld, *Fauna dtsch. Kolon.* 4(2):16.
1911 *P*[*achydactylus*]. *serval* Sternfeld, *Mitt. Zool. Mus. Berlin* 5:398.
1913 [*Pachydactylus*] *serval* Hewitt, *Ann. Natal Mus.* 2:483.
1927 [*Pachydactylus*] *serval* Hewitt, *Rec. Albany Mus.* 3:398.

1929 *Pachydactylus serval* Lawrence, *J. S.W. Afr. Sci. Soc.* 2:25.
1936 *Pachydactylus purcelli* Parker, *Novit. Zool.* 40:130.
1936 *Pachydactylus serval* Lawrence, *Parasitology* 28:38.
1938 *Pachydactylus montanus onscepensis* [part] FitzSimons, *Ann. Transvaal Mus.* 19:173.
1943 *Pachydactylus serval* FitzSimons, *Mem. Transvaal Mus.* 1:74.
1943 *Pachydactylus purcelli* [part] FitzSimons, *Mem. Transvaal Mus.* 1:65.
1943 *Pachydactylus montanus onscepensis* [part] FitzSimons, *Mem. Transvaal Mus.* 1:84.
1947 *Pachydactylus serval* [part] Loveridge, *Bull. Mus. Comp. Zool.* 98:388.
1951 *Pachydactylus montanus onscepensis* Lawrence, *Ann. Transvaal Mus.* 21:453.
1955 *Pachydactylus serval* [part] Mertens, *Abhandl. Senckenberg. naturf. Ges.* 490:48.
1965 *Pachydactylus serval* [part] Wermuth, *Das Tierreich* 80:123.
1966 [*Pachydactylus serval*] *serval* [part] McLachlan and Spence, *Ann. Cape Prov. Mus.* 5:155.
1966 [*Pachydactylus serval*] *onscepensis* [part] McLachlan and Spence, *Ann. Cape Prov. Mus.* 5:155.
1971 *Pachydactylus serval serval* [part] Mertens, *Abhandl. Senckenberg. naturf. Ges.* 529:42.
1982 *Pachydactylus serval serval* [part] Welch, *Herpetology of Africa*: 36.
1984 *Pachydactylus serval serval* [part] Visser, *Landbouweekbl*. 27 April 1984:48, fig. p. 51, middle.
1988 *Pachydactylus s. serval* Branch, *Field Guide*:207.
1991 *Pachydactylus serval* Bauer and Günther, *Mitt. Zool. Mus. Berlin* 67:294.
1991 [*Pachydactylus*] *serval* Kluge, *Smithson. Herpetol. Inform. Serv.* 85:23.
1993 [*Pachydactylus*] *serval* Kluge, *Gekkonoid Lizard Taxonomy*:25.
1994 *Pachydactylus serval serval* Welch, *Lizards of the World* 1:95.
1994 *Pachydactylus s. serval* Branch, *Field Guide*, 2nd ed.:207.
1998 *Pachydactylus s. serval* Branch, *Field Guide*, 3rd ed.:260.
2000 [*Pachydactylus*] *serval serval* Rösler, *Gekkota* 2:99.
2001 [*Pachydactylus*] *serval* Kluge, *Hamadryad* 26:21.
2003 *Pachydactylus serval serval* Griffin, *Namibian Reptiles*:37.
2005 *P*[*achydactylus*]. *serval* [part] Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

MATERIAL EXAMINED.— NAMIBIA: **Lüderitz District**: JDV 1933, 22 km N Rosh Pinah (2716Dc); **Keetmanshoop District**: CAS 193656, 31.6 km S Dassiefontein River Crossing, S. of Keetmanshoop (2718Bc); TM 41907–08, Farm Florida (2718Bc); 17738, Seeheim (2617Dd); ZFMK 32925–28, Daweb-Süd (2618Bc); JDV 3677, just N Keetmanshoop (2618Ca); JDV N39960, 3 km N Keetmanshoop (2618Ca); SAM 46690, 46750–53, 10 km N Keetmanshoop (2618Ca); SAM 46688–89, 20 km N Keetmanshoop (2618Ac); TM 17780, 17782–86, 28255, 33290, 37350, 41821–22, 42972, MCZ R 46805 (formerly TM 17781), Brukkaros Mountain (2517Dd); NMNW R 10500, Brukkaros Mountain at 25°54′56″S, 17°46′56″E; NMNW R 136, TM 32866–67, Tses (2518Cc); **Karasburg District**: JDV 35880, btwn Noordover and Ai-Ais turnoff (2817Da or 2817Db); TM 42339, Fish River National Park (2717); NMNW R 8857*–58*, Ai-Ais Nature Reserve, ca. 3 km N Orange River (28°12′26″S, 17°16′43″E); TM 54439, Fish River Canyon viewpoint (27°35′S, 17°37′E); **Bethanie District**: TM 53214–15, Dam Huns 106 (2717Ac) TM 17717, 17719–21, 20 mi. E Konkiep (2617Dc); JDV 30780, 20 km N Bethanien (2617Aa); TM 17718, 32 km E Goageb Stn. (26°47′S, 17°32′E); PEM R 147, 222, 226, 2 mi from Konkiep on Rd. to Seeheim (2617Cc); AMB (MCZ Field) 38272–80, Konkiep (26°41′59″S, 17°13′16″E); TM 48375, Farm Kunjas (2516Dd); MCZ R 163287, 20 km SW Helmeringhausen (2616Ba); TM 28423–26, Farm Tiras, 49.6 km S of Helmeringhausen (26°10′S, 16°36′E); PEM R 278, 280–87, 289, 5 mi. N Chamis (2516Dd); ZMB 23121 (lectotype of *P. serval*), 23122 (paralectotype of *P. serval*), Chamis (2516Dd); TM 17678–79, 17681, MCZ R 46806 (formerly TM 17680), Barby (2516Dc); JDV 36080, Helmeringhausen (2516Dd); **Maltahöhe District**: PEM R 136, 139–40, Naudas (2516Bc); PEM R 129–30, 137, Osis (2516Bd); TM 48382, Farm Duisib (2516Bc); TM 17580, Maltahöhe (24°50′S, 16°59′E); **Swakopmund District**: TM 55490, within 40 km from Swakopmund-Usakos (2214Da) [probably in error]; **Mariental District**: TM 41791, 41823, Farm Hardap (2417Bd); PEM R 6035, 8862, Hardap Dam (24°23′S, 17°54′E); TM 53952, Hardap Dam (24°30′S, 17°50′E); TM 56656, Farm Keikanchab 91 (24°37′S, 17°52′E); SMF 45699, Gaitsabis (2417Da); TM 56657, Mariental (24°38′S, 17°58′E). **UNKNOWN LOCALITY**: JDV 31080, JDV 36180.

FIGURE 1. Lectotype of *Pachydactylus weberi* (ZMA 11046) from Klipfontein, Little Namaqualand (Northern Cape Province), South Africa as figured by Roux (1907) in the type description.

FIGURE 2. Lectotype of *Pachydactylus serval* (ZMB 23121) from Farm Chamis, Great Namaqualand (Bethanie District), Namibia as figured by Werner (1910) in the type description.

FIGURE 3. Juvenile *Pachydactylus weberi* (now MCZ R 21019) from Kammagas, Northern Cape Province, South Africa originally figured by Werner (1910) as *P. fasciatus*.

FIGURE 4. Specimens referred to *Pachydactylus purcelli* by Methuen and Hewitt (1914: text figure 15): adult (TM 3102, between Kraikluft and Alt Wasserfall, Keetmanshoop District, Namibia), juvenile (TM 3090, Farm Pieterskloof, Kraikluft, Keetmanshoop District, Namibia), and embryo (TM 3095, Farm Pieterskloof, Kraikluft, Keetmanshoop District, Namibia), ostensibly illustrating the ontogenetic change in color pattern in this species. In reality, only the adult specimen is referable to this species. The younger specimens are *P. montanus*.

FIGURE 5. Series of adult and subadult specimens of *Pachydactylus fasciatus* specimens illustrating variation in the boldness of the broad, saddle-shaped bands in this species. From left to right: CAS 214675 (48.0 km west of Kamanjab, Khorixas District, Namibia), CAS 176094 (100.6 km west of Kamanjab, Khorixas District, Namibia), CAS 206936 (10 km east of Spitzkop turnoff, Karibib District, Namibia), CAS 214677 (48.0 km west of Kamanjab, Khorixas District, Namibia). Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 6. Adult *Pachydactylus fasciatus* (CAS 214675) from 48.0 km west of Kamanjab, Khorixas District, Namibia in life. Photo by T. Lamb.

FIGURE 7. Subadult *Pachydactylus fasciatus* (CAS 214677) from 48.0 km west of Kamanjab, Khorixas District, Namibia in life. Photo by T. Lamb.

FIGURE 8. Hatchling *Pachydactylus fasciatus* (CAS 193681) from 59.3 km west of Kamanjab, Khorixas District, Namibia in life. Scale bar = 10 mm. Photo by A.M. Bauer.

FIGURE 9. Juvenile *Pachydactylus fasciatus* (TM 79074) from Warmbad, Karasburg District, Namibia. This specimen represents the only confirmed record of this species from extreme southern Namibia. Photo courtesy of W.D. Haacke.


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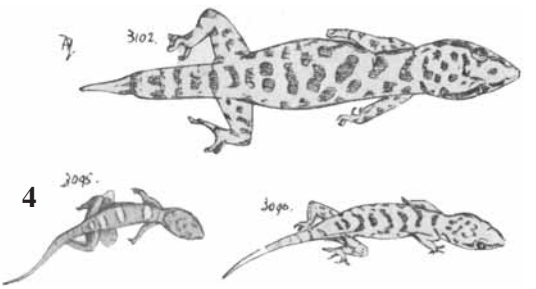
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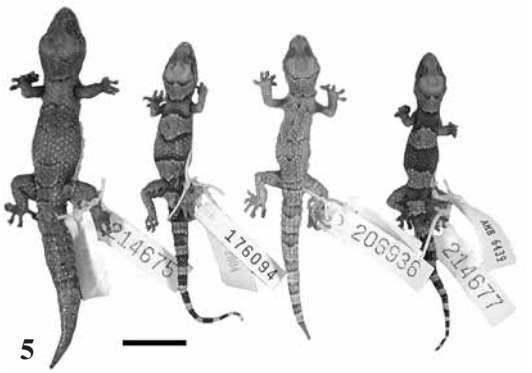
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FIGURE 10. Map of western southern Africa with selected reference points and regions mentioned in the text indicated. Black text: physical features, mountains (small font), mountain ranges, physiographic regions (small font, italics), large physiographic regions (large font, italics), countries (large font, all capitals). Blue lines and text: rivers (lower courses only shown). Red text: towns and other named places. MODIS imagery from the Global Land Cover Facility (http://www.landcover.org).

FIGURE 11. Distribution map for endemic Namibian and Botswanan species of the *Pachydactylus weberi* group and *P. sansteynae*: *P. fasciatus* (red), *P. acuminatus* (black), *P. kobosensis* (pink), *P. werneri* (dark blue), *P. reconditus,* sp. nov. (yellow), *P. waterbergensis* (light blue), *P. otaviensis,* sp. nov. (olive), *P. tsodiloensis* (bright green), *P. sansteynae* (white). Question marks indicate questionable but plausible localities (see respective species accounts for further comments). Base map from NOAA National Geophysical Data Center.

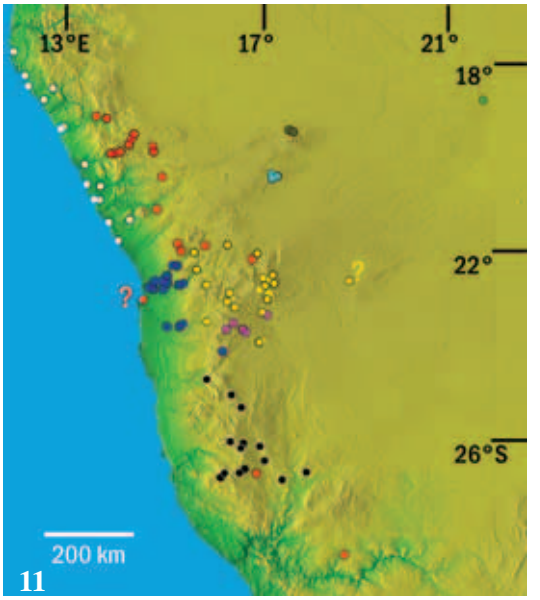
FIGURE 12. Typical habitat of *Pachydactylus fasciatus* in mopane (*Colophospermum mopane*) dominated savanna west of Kamanjab, Namibia. The species is terrestrial and often occupies daytime retreats under calcrete boulders (foreground). Photo by A.M. Bauer.

FIGURE 13. Syntypes of *Pachydactylus capensis gariesensis* (SAM 17953 part) from Garies, Northern Cape Province, South Africa as figured by Hewitt (1932: plate VI). Position of figures relative to each other has been modified in this reproduction.

FIGURE 14. Representative adult specimens of *Pachydactylus weberi* illustrating variation in dorsal color pattern. From left to right: CAS 193327 (11.5 km S Steinkopf, Northern Cape Province, South Africa), CAS 186366 (Lekkersing road, 30 km S junction Eksteenfontein road, Northern Cape Province, South Africa), CAS 206823 (Brandberg, Farms Kourootje and Kap Vley, Northern Cape Province, South Africa). Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 15. Adult *Pachydactylus weberi* from Kleinsee, Northern Cape Province, South Africa illustrating retention of the bold tail banding and some obfuscation of the juvenile three-banded pattern. Photo courtesy of R.D. Babb.


ANGOLA
Kunene
Cape Fria
Etosha Pan
Tsodilo Hills
Otavi Higlands
Waterberg
Huab
Brandberg
Ugab
Khan
Swakop
Swakopmund
BOTSWANA
Kuiseb
NAMIBIA
Namib
Kalahari
Tirasberge
Lüderitz
Fish
Richtersveld
Karasberge
Sendelingsdrift
Orange
Augrabies Falls
Springbok
Kamieskroon
Karoo
Clanwilliam
SOUTH AFRICA
Cedarberg
Cape Town
Little Karoo
Port Elizabeth
10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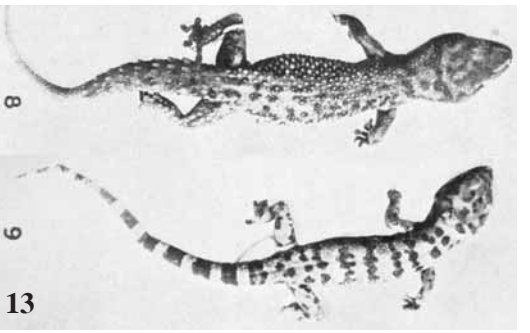
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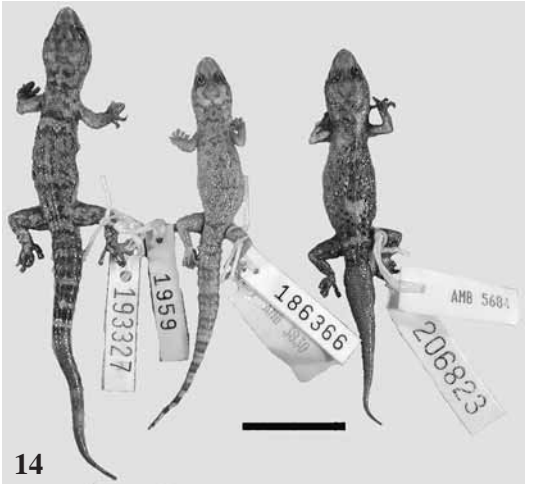
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FIGURE 16. Adult *Pachydactylus weberi* from approximately 10 km west of Garies, on road to Hondeklipbaai, Northern Cape Province, South Africa (30°35′36″S, 17°52′06″E) illustrating relatively faded dorsal pattern. Photo courtesy of M. Burger.

FIGURE 17. Adult *Pachydactylus weberi* from Boskloof, near Citrusdal, Western Cape Province, South Africa illustrating a multi-banded pattern seen only in some members of the southernmost populations of this species. Photo courtesy of J.D. Visser.

FIGURE 18. Adult and juvenile speciens of *Pachydactylus weberi* from Kleinsee, Northern Cape Province, South Africa (29°40′04″S, 17°04′36″E) illustrating clear retention of the juvenile three-banded pattern in the adult and relatively bright coloration. Photo courtesy of M. Burger.

FIGURE 19. Hatchling *Pachydactylus weberi* (TM 34273) from 13 mi (21 km) E Stinkfontein (Eksteenfontein), Northern Cape Province, South Africa illustrating the typical banded pattern of hatchlings and juveniles of this species. Scale bar = 10 mm. Photo by A.M. Bauer.

FIGURE 20. Hatchling *Pachydactylus weberi* with eggs of multiple clutches, from near Nigramoep, Northern Cape Province, South Africa. Photo courtesy of J.D. Visser.

FIGURE 21. Map of western South Africa with selected reference points and regions mentioned in the text indicated. Black text: physical features, mountain ranges, physiographic regions (small font, italics), provinces (large font, all capitals). Blue text: rivers. Red text: towns and other named places. Base map from NOAA National Geophysical Data Center.

FIGURE 22. Distribution map for South African and southern Namibian species of the *Pachydactylus weberi* group: *P. weberi* (dark blue), *P. robertsi* (light blue), *P. monicae*, sp. nov. (red), *P. visseri*, sp. nov. (white), *P. mclachlani*, sp. nov. (yellow), *P. goodi*, sp. nov. (brown). Base map from NOAA National Geophysical Data Center.


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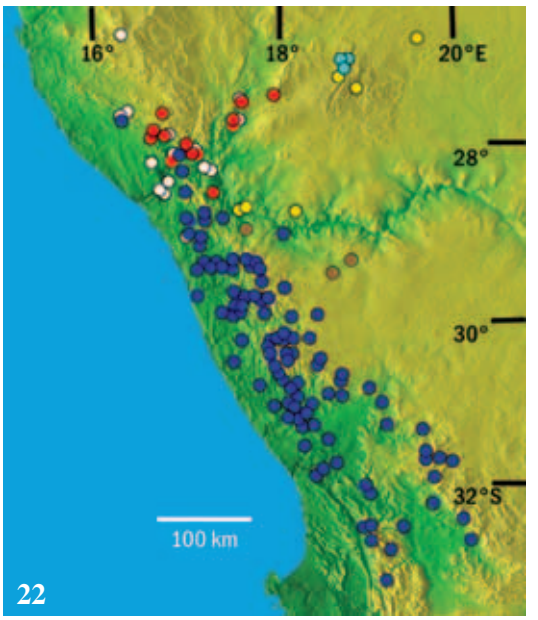
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30°
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Kalahari
Richtersveld
Augrabies Falls
Orange
Kamiesberg
NORTHERN CAPE
Knersvlakte
Great Karoo
Bokkeveldberge
Hantamsberg
Roggeveldberge
Nuweveldberge
Cederberg
Tankwa Karoo
Cape Town
Cape Fold Mountains
EASTERN CAPE
Little Karoo
WESTERN CAPE
Port Elizabeth
21

FIGURE 23. Habitat of *Pachydactylus weberi* near Van Rhynsdorp, Western Cape Province, South Africa. Here, and in the Cedarberg to the south, this species typically occupies crevices between blocks of sandstone or other narrow fissures. Photo courtesy of R.A. Sadlier.

FIGURE 24. Typical habitat of *Pachydactylus weberi* in low, exfoliating granite boulders in sandy plains south of the Richtersveld, on road to Lekkersing, Northern Cape Province, South Africa. Here the species typically uses downward opening exfoliations and capstones as retreat sites. Photo by A.M. Bauer.

FIGURE 25. Representative adult specimens of *Pachydactylus serval* illustrating variation in dorsal color pattern. From left to right: TM 48382 (Farm Duisib, Maltahöhe District, Namibia), TM 28423 (Farm Tiras, Bethanie District, Namibia), TM 41821 (Brukkaros Mountain, Keetmanshoop District, Namibia). Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 26. Adult *Pachydactylus serval* from southwestern Namibia. Photo courtesy of R.D. Babb.

FIGURE 27. Subadult *Pachydactylus serval* from Hardap Dam, Mariental District, Namibia illustrating transitional pattern from juvenile banding to adult spotting. Photo by W.R. Branch.

FIGURE 28. Juvenile specimens of *Pachydactylus serval* from Brukkaros Mountain, Keetmanshoop District, Namibia (left: TM 17786, right: TM 28255) illustrating the pale nape band and sacral/hindlimb marking typical of hatchlings and juveniles of this species. Scale bar = 10 mm. Photo by A.M. Bauer.

FIGURE 29. Hatchling *Pachydactylus serval* from Bethanie, Bethanie District, Namibia, illustrating contrasting black and ashy color pattern and dark tail and distal hindlimbs. Photo courtesy of J.D.Visser.

FIGURE 30. Map of Southern Namibia and adjacent regions with selected reference points and regions mentioned in the text indicated. Black text: physical features (small font), mountain ranges (small font, italics), large physiographic regions (large font, italics), countries (large font, all capitals). Blue text: rivers. Red text: towns and other named places. MODIS imagery from the Global Land Cover Facility (http://www.landcover.org).


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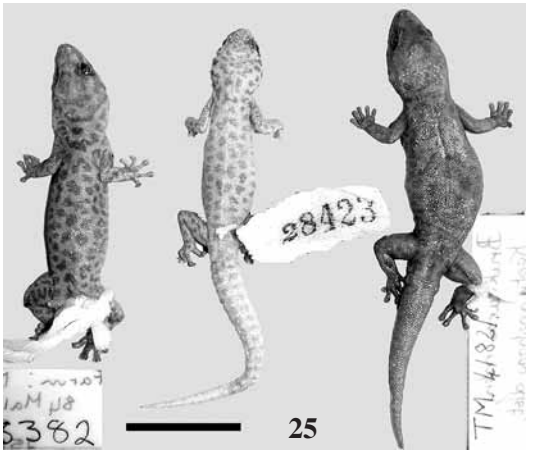

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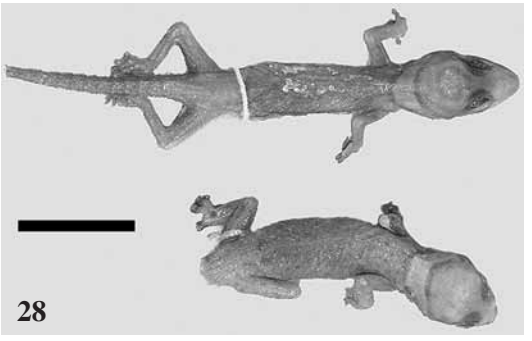
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FIGURE 31. Distribution map for species of the *Pachydactylus serval* group: *P. serval* (red), *P. purcelli* (dark blue), *P. montanus* (yellow), *P. griffini*, sp. nov. (pink), *P. carinatus*, sp. nov. (black). Question mark indicates questionable but plausible locality (see *P. purcelli* species account for further comments). Base map from NOAA National Geophysical Center.

FIGURE 32. Habitat of *Pachydactylus serval* near the type locality of the species, 10.1 km southeast of Helmeringhausen, Bethanie District, Namibia, with the Konkiep River valley beyond the end of the road and the Schwarz Rand in the distance at left and center. Photo by A.M. Bauer.

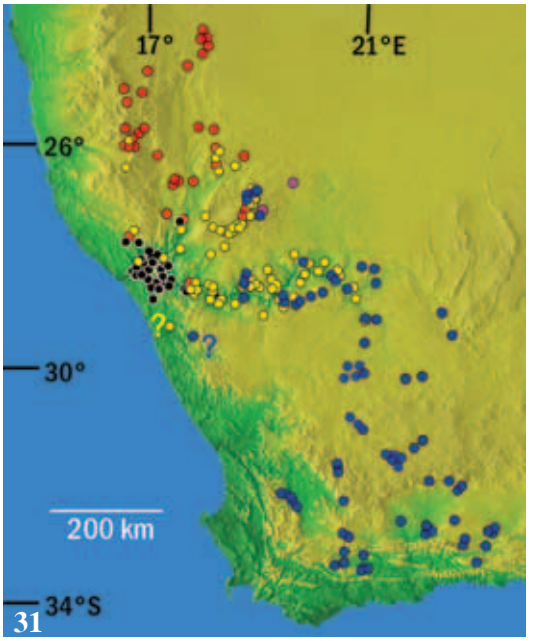
FIGURE 33. Syntypes (SAM 1260–61) of *Pachydactylus purcelli* from "Touw's River" (Touwsrivier), Western Cape Province, South Africa. Both specimens are extremely soft and in poor condition. Photo by A.M. Bauer.

FIGURE 34. Holotype (ZMB 23453) of *Pachydactylus pardus* from Warmbad, Karasburg District, Namibia. Scale bar = 10 mm. Photo by A.M. Bauer.

FIGURE 35. Representative adult South African specimens of *Pachydactylus purcelli* illustrating variation in dorsal color pattern. From left to right: CAS 198295 (Oukloof Pass, Western Cape Province, South Africa), CAS 199995 (15 km northwest of Fraserburg, Northern Cape Province, South Africa), CAS 198294 (Oukloof Pass, Western Cape Province, South Africa), CAS 180388 (2 km west of entrance to Anysberg Reserve, Western Cape Province, South Africa). The small specimen on the far right retains clear evidence of the juvenile banding pattern. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 36. *Pachydactylus purcelli* (CAS 231887) from Farm Narudas, Karasburg District, Namibia. Although this is the largest specimen of this species examined (50.8 mm SVL), elements of the juvenile banded pattern remain. This trait is highly variable but more common in northern populations than in those from the Karoo and Little Karoo. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 37. Adult *Pachydactylus purcelli* from Kokerboomwoud, 8 km south of Kenhardt, Northern Cape Province, South Africa (29°24′22″S, 21°06′18″E) exhibiting retention of the typical three-banded juvenile pattern. Photo courtesy of M. Burger.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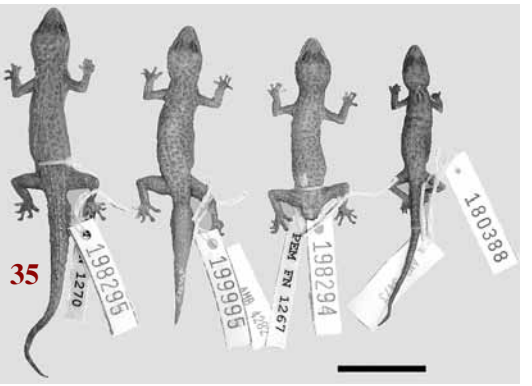
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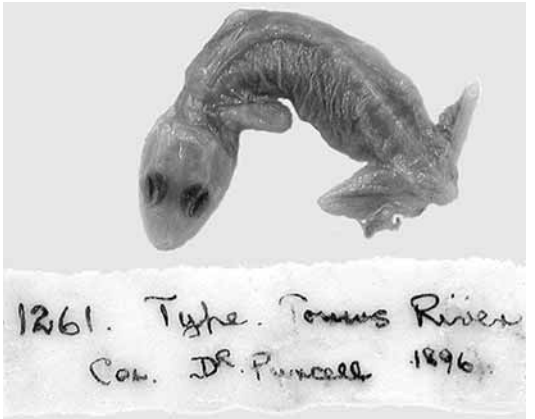
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1260. Type Tsomo River
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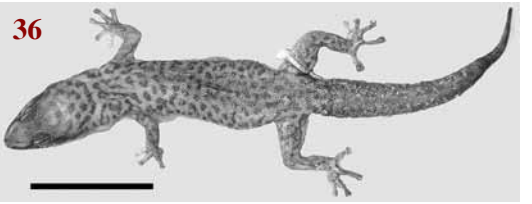
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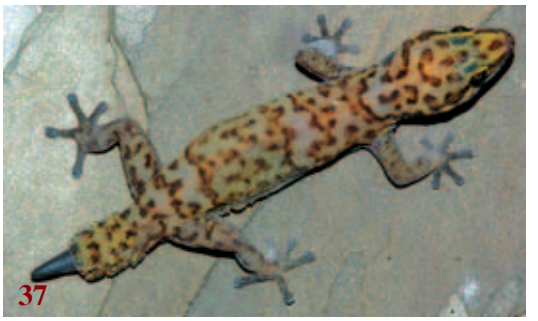
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FIGURE 38. *Pachydactylus purcelli* (CAS 231887) from Farm Narudas, Karasburg District, Namibia. As is typical for this species, the body is virtually atuberculate except for a few tiny tubercles in the sacral region. Photo by A.M. Bauer.

FIGURE 39. Subadult specimens of *Pachydactylus purcelli*. From left to right: CAS 126035 (19 miles southwest of Upington on road to Kiemoes, Northern Cape Province, South Africa), TM 82319 (10 km from Duine Municipal Site, Northern Cape Province, South Africa), TM 15921 (Kakamas, Northern Cape Province, South Africa). Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 40. Juvenile *Pachydactylus purcelli* from 28.3 km east of Pofadder, Northern Cape Province, South Africa (left: CAS 203490, right: CAS 203493). Hatchlings and juveniles bear three transverse bands and usually show little evidence of spotting. Scale bar = 10 mm. Photo by A.M. Bauer.

FIGURE 41. Especially vibrantly colored juvenile of *Pachydactylus purcelli* from Farm Karos, Northern Cape Province, South Africa (2821Bc). Photo courtesy of W.D. Haacke.

FIGURE 42. Habitat of *Pachydactylus purcelli* at Molteno Pass, Nuweveldberge, Western Cape Province, South Africa. Specimens were found in retreats within larger cliff faces as well as in crevices in the smaller boulder piles in the foreground. Photo by W.R. Branch.

FIGURE 43. Habitat of *Pachydactylus purcelli* at Farm Narudas, Karasburg District, Namibia. At this locality it was found under slabs of rock on rock in and adjacent to the dry river bed figured. Photo by A.M. Bauer.

FIGURE 44. Holotype of *Pachydactylus montanus* (TM 3080) from Lord Hill's Peak, Keetmanshoop District, Namibia, as illustrated by Hewitt (1927).


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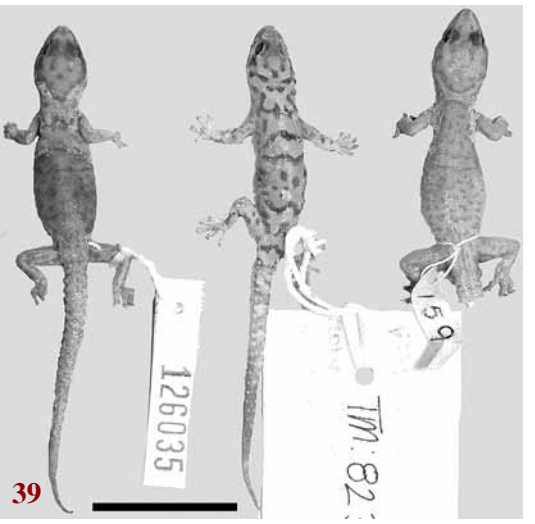

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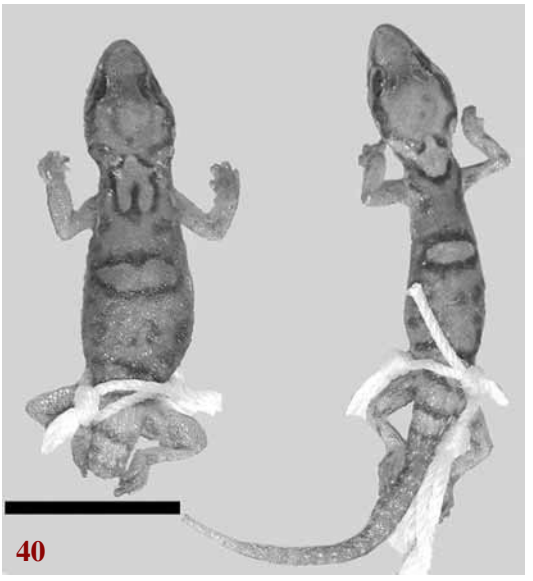
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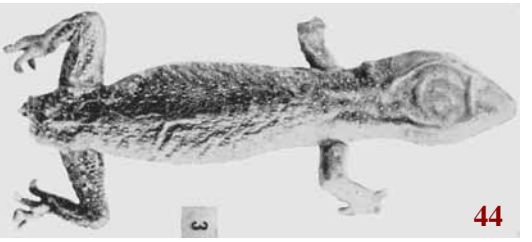
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FIGURE 45. Holotype (left, PEM 16050) and non-type specimen mentioned in type description (right, PEM 16051) of *Pachydactylus montanus onscepensis* from "Onscephans" (Onseepkans), Northern Cape Province, South Africa. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 46. Representative adult specimens of *Pachydactylus montanus* illustrating variation in dorsal color pattern. From left to right: CAS 176254 (7 km north of Grabwasser, Karasburg District, Namibia), CAS 201859 (5.0 km south of Onseepkans, Northern Cape Province, South Africa), TM 15920, TM 15916 (both Kakamas, Northern Cape Province, South Africa), TM 68557 (Riemvasmaak, Northern Cape Province, South Africa), CAS 201864 (Farm Kinderzitt, Karasburg District, Namibia), CAS 176253 (7 km north of Grabwasser, Karasburg District, Namibia). Note varying degree of tuberculation between specimens. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 47. Live specimen of adult *Pachydactylus montanus* from 79.5 km south of Keetmanshoop, Karasburg District, Namibia. Photo courtesy of P. Freed.

FIGURE 48. Live specimen of adult *Pachydactylus montanus* from between Grünau and Klein Karas, Karasburg District, Namibia. Photo courtesy of J.D. Visser.

FIGURE 49. Live specimen of adult *Pachydactylus montanus* from just south of Onseepkans, Northern Cape Province, South Africa. Photo by T. Lamb.

FIGURE 50. Juvenile specimens of *Pachydactylus montanus* illustrating the species-specific character of four pale, dark-edged transverse bands between nape and sacrum. From left to right: TM 36809 (Farm Eendoorn, Karasburg District, Namibia), TM 36758 (Farm Schuitdrif, Northern Cape Province, South Africa), CAS 201861 (3.5 km north of Tantalite Valley, Karasburg District, Namibia). Scale bar = 10 mm. Photo by A.M. Bauer.

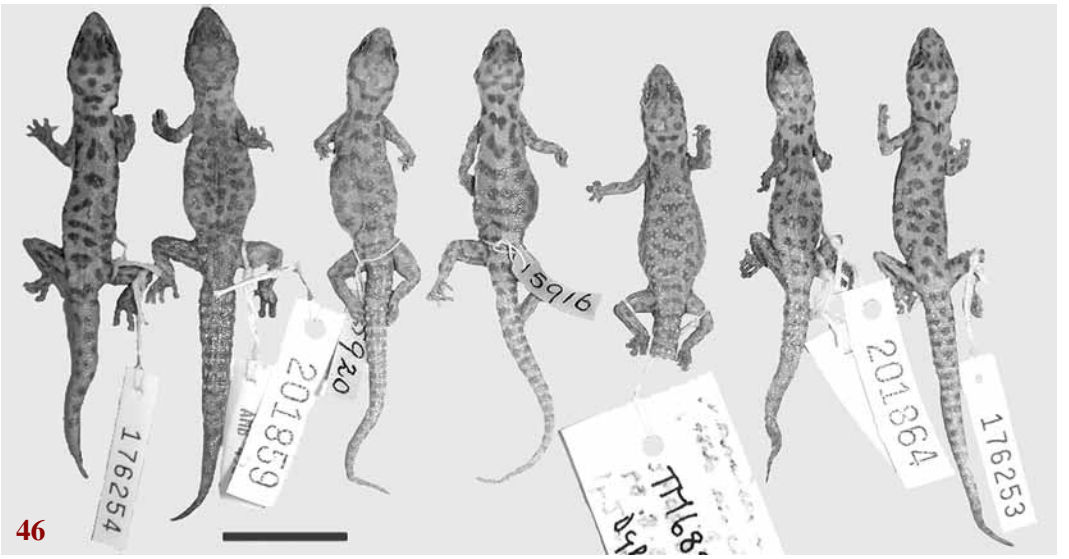

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FIGURE 51. Juvenile *Pachydactylus montanus* from Savanna Guest Farm, Keetmanshoop District, Namibia (2718Bc), exhibiting the series of four pale transverse bands typical of juveniles of this species. Photo courtesy of T. Gamble.

FIGURE 52. Habitat of *Pachydactylus montanus* in Great Karasberg Mountains, Keetmanshoop District, Namibia (2718Bc). At this locality *P. montanus* was found in crevices in the larger rock slabs and boulders along the base of the cliff. Photo by A.M. Bauer.

FIGURE 53. Habitat of *Pachydactylus montanus* on Savanna Guest Farm, Keetmanshoop District, Namibia (2718Bc). At this locality *P. montanus* was found under exfoliatiations and beneath large, thin, flat slabs in boulder piles and around isolated rocky hills. Photo courtesy of T. Gamble.

FIGURE 54. Lectotype (PEM 16049) and paralectotype (PEM 16048) of *Pachydactylus capensis werneri* from "Khan River," Swakopmund District, Namibia. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 55. Representative adult and subadult specimens of *Pachydactylus werneri* illustrating variation in dorsal color pattern. From left to right: TM 42901 (Gobabeb, Swakopmund District, Namibia), TM 31758, TM 31757 (both Palmenhorst on Swakop River, Swakopmund District, Namibia), TM 57276 (Farm Arbeid Adelt, Maltahöhe District, Namibia). Note the relatively long limbs, long head, and small, white tubercles. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 56. Adult specimen of *Pachydactylus werneri* (MCZ R 183707) from north bank of Swakop River at 22°38′14″S, 14°43′39″E. Note the long digits typical of this species. Photo by A.M. Bauer.

FIGURE 57. Juvenile *Pachydactylus werneri* from Homeb, Swakopmund District, Namibia. Note the raised scales around the nostrils. Photo courtesy of J. Boone.

FIGURE 58. Representative adult specimens of *Pachydactylus kobosensis* illustrating variation in dorsal color pattern. Top: CAS 223903 (5.0 km south of Kobos, Rehoboth District, Namibia), bottom: JDV 39880N (Rehoboth, Rehoboth District, Namibia). Note the very fine dorsal scalation and minute tubercles. Scale bar = 20 mm. Photo by A.M. Bauer.


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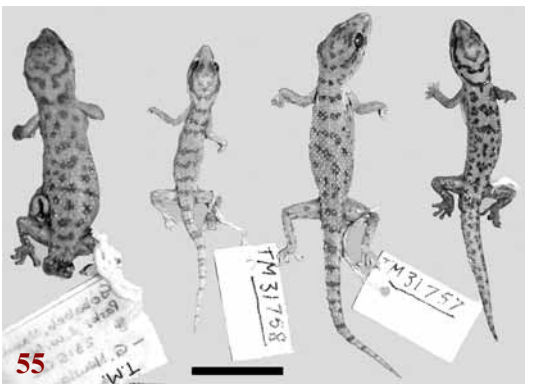

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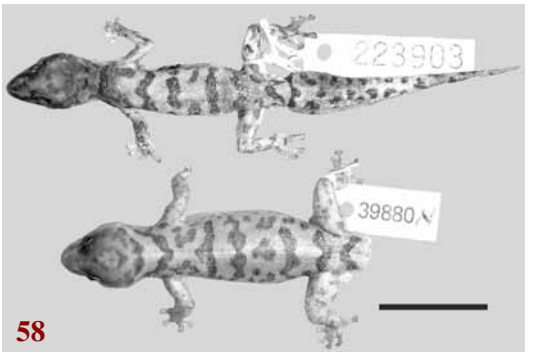

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FIGURE 59. Adult specimen of *Pachydactylus kobosensis* (CAS 223903) from 5.0 km south of Kobos, Rehoboth District, Namibia. This specimen and several others were found in crevices in isolated rock koppies in open savanna. Photo courtesy of R.A. Sadlier.

FIGURE 60. Adult specimen of *Pachydactylus kobosensis* from Nauchas, Windhoek District, Namibia. Photo courtesy of J.D. Visser.

FIGURE 61. Hatchling *Pachydactylus kobosensis* (left: JDV 54780, right: JDV 54680) from the vicinity of Kobos, Rehoboth District, Namibia exhibiting the very bold banded pattern. Juveniles begin to change to the adult pattern relatively early in life. Scale bar = 10 mm. Photo by A.M. Bauer.

FIGURE 62. Holotype of *Pachydactylus robertsi* (TM 17854) from Farm Kraikluft, Keetmanshoop District, Namibia. SVL of specimen 42 mm. Photo by A.M. Bauer.

FIGURE 63. *Pachydactylus robertsi* (NMNW 6697) from Farm Kuchanas, Keetmanshoop District, Namibia. The large, partly imbricating dorsal tubercles are diagnostic of this species. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 64. Life photograph of *Pachydactylus robertsi* (NMNW 6697) from Farm Kuchanas, Keetmanshoop District, Namibia. The yellowish rims of the orbit and bright white of the supralabials are clearly visible. Photo courtesy of M. Griffin.

FIGURE 65. Life photograph of *Pachydactylus robertsi* (CM 119308) from 79.5 km south of Keetmanshoop, Keetmanshoop District, Namibia. Photo courtesy of P. Freed.


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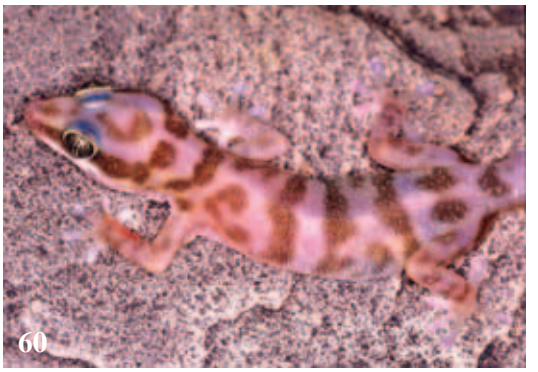
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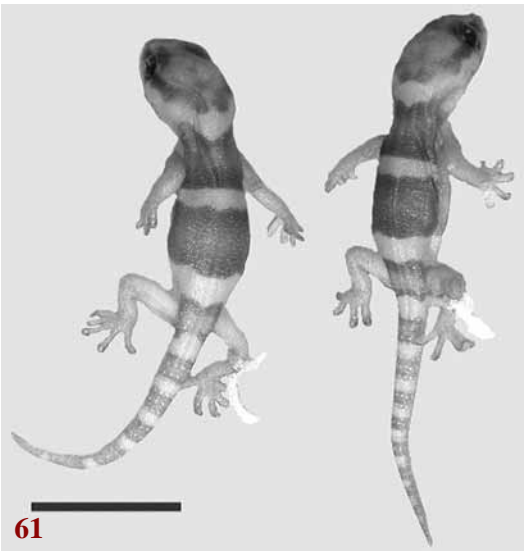
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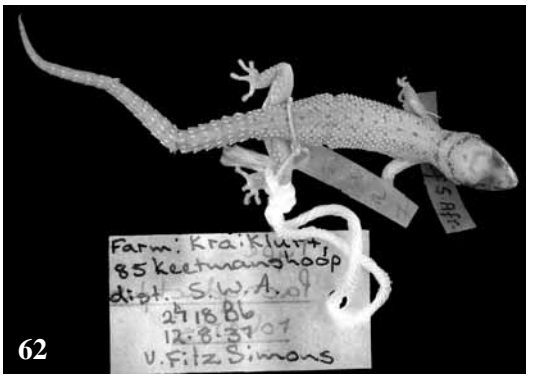

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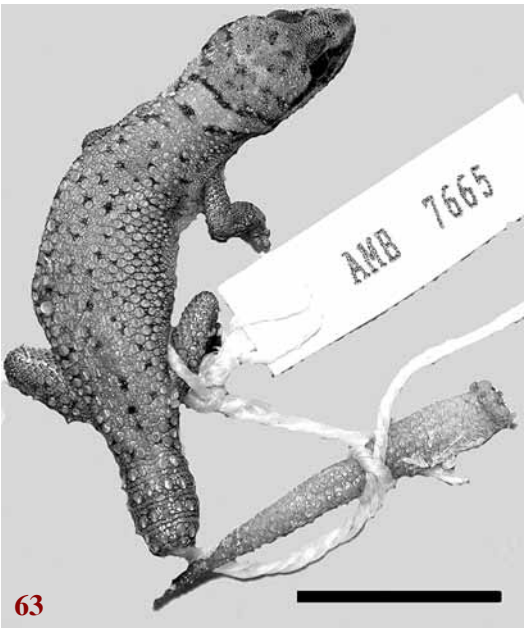

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FIGURE 66. Adult syntype (TM 17722) of *Pachydactylus weberi acuminatus* from Goageb Station, Bethanie District, Namibia. SVL of specimen 42 mm.The blank area near the tail base is masking an area of glare. Photo by A.M. Bauer.

FIGURE 67. Subadult syntypes (TM 17689–91, 17693–95) of *Pachydactylus weberi acuminatus* from 8 miles west of Aus. Approximate SVLs of specimens 30–37 mm. Photo by A.M. Bauer.

FIGURE 68. Adult and subadult specimens of *Pachydactylus acuminatus*. From left to right: JDV 30580 (5 km north of Aus, Lüderitz District, Namibia), JDV 1930, 1932 (both 158 km east of Lüderitz, Lüderitz District, Namibia). The three juvenile pale bands are still evident in all specimens, but the intervening spaces become spotted, complicating the dorsal pattern. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 69. Hatchling *Pachydactylus acuminatus*. From left to right: JDV 26380 (20 km southwest of Helmeringhausen, Bethanie District, Namibia), JDV 30980 (Farm Houmoed, Bethanie District, Namibia), JDV 26680 (20 km south of Helmeringhausen, Bethanie District, Namibia). The left and center specimens illustrate the typical three-banded pattern of hatchlings and young juveniles. That on the right has four bands. Scale bar = 10 mm. Photo by A.M. Bauer.

FIGURE 70. Juvenile *Pachydactylus acuminatus* (JDV 35280) from 20 km southwest of Helmeringhausen, Bethanie District, Namibia. Note the decrease in tubercle size on the anterior third of the body. The Photo courtesy of J.D. Visser.

FIGURE 71. Subadult *Pachydactylus tsodiloensis* (captive, from stock from Tsoldilo Hills, Botswana) showing the large tubercles and typical five-banded pattern of this species. Photo courtesy of M. Barts.

FIGURE 72. Life photograph of the holotype of *Pachydactylus waterbergensis* (NMNW R 6698) from Onjoka Settlement, Waterberg Plateau Park, Otjiwarongo District, Namibia, illustrating a five-banded pattern on the dorsum between nape and sacrum. Photo courtesy of M. Griffin.

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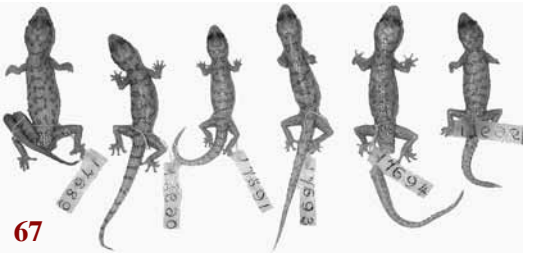

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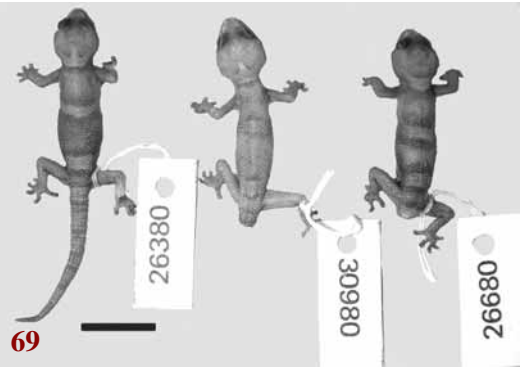

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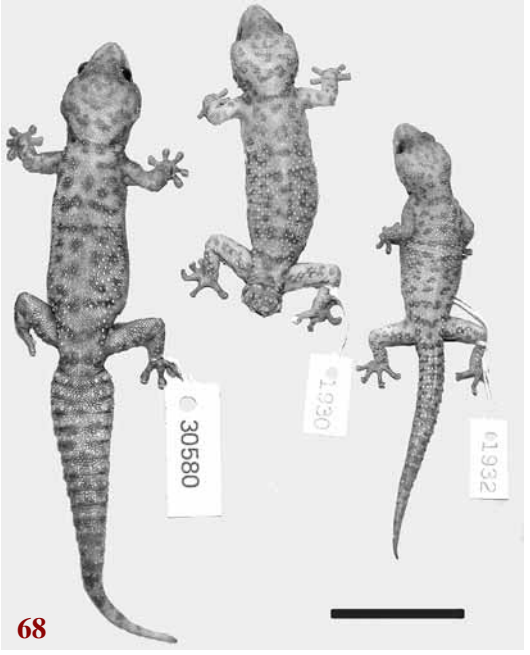

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FIGURE 73. Paratype of *Pachydactylus waterbergensis* (TM 38268) from the Waterberg, Otjiwarongo District, Namibia. Scale bar = 10 mm. Photo by A.M. Bauer.

FIGURE 74. Specimen of *Pachydactylus waterbergensis* from the Waterberg Plateau, Otjiwarongo District, Namibia illustrating a six-banded condition. Photo courtesy of M. Barts.

FIGURE 75. Holotype of *Pachydactylus reconditus*, sp. nov. (TM 32838), adult female, from Windhoek, Windhoek Distirct, Namibia, showing large, but non imbricating dorsal tubercles. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 76. Paratypes of *Pachydactylus reconditus*, sp. nov. From left to right: CAS 231886 (Oanab Dam, Rehoboth Distirct, Namibia), TM 41993, 41994 (both Farm Komuanab, Karibib Distirct, Namibia). The two adult specimens illustrate a less-strongly spotted individual with relatively discrete nape band (left), and a more strongly-spotted individual with a less discrete nape band (center). The juvenile at right has three very pale trunk bands, which do not appear to be present in hatchlings. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 77. Life photo of *Pachydactylus reconditus,* sp. nov. (CAS 231886) from Oanab Dam, Rehoboth Distirct, Namibia. Photo by W.R. Branch.

FIGURE 78. Life photo of *Pachydactylus reconditus*, sp. nov. from Windhoek, Windhoek Distirct, Namibia. Note the striking similarity to *P. robertsi* (FIGURE 65). Photo courtesy of M. Barts.

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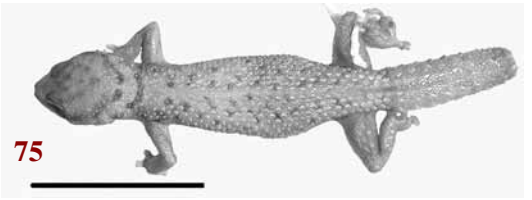

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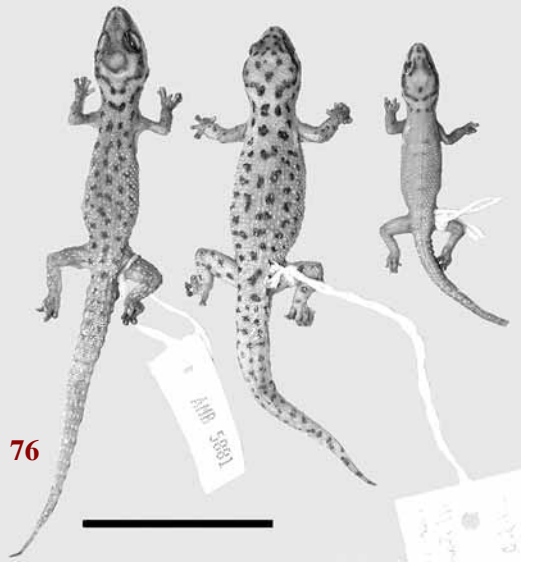

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FIGURE 79. Hatchling *Pachydactylus reconditus*, sp. nov. (NMNW R number pending) from Klein Windhoek, Windhoek Distirct, Namibia showing the typical pale nape band and patternless dorsum of the young of this species. Scale bar = 10 mm. Photo by A.M. Bauer.

FIGURE 80. Juvenile specimen of *Pachydactylus reconditus*, sp. nov. (JDV 3013) from junction Otjimbingwe road and Swakopmund-Windhoek road, Karibib District, Namibia. Photo courtesy of J.D. Visser.

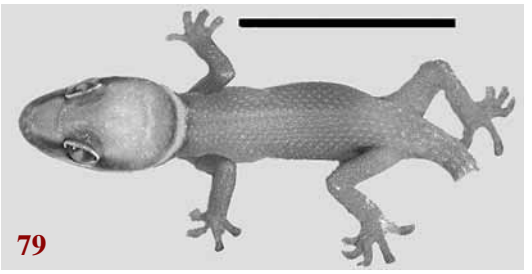
FIGURE 81. Juvenile specimen of *Pachydactylus reconditus*, sp. nov. (CM 115642) from Windhoek, Windhoek Distirct, Namibia. Photo courtesy of P. Freed.

FIGURE 82. Holotype of *Pachydactylus monicae*, sp. nov. (CAS 200034), adult male, from Sendelingsdrif, Richtersveld National Park, Northern Cape Province, South Africa. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 83. Life photo of holotype of *Pachydactylus monicae*, sp. nov. (CAS 200034) from Sendelingsdrif, Richtersveld National Park, Northern Cape Province, South Africa. The pale dorsal coloration is typical of most specimens of this species. Photo by W.R. Branch.

FIGURE 84. Adult paratype of *Pachydactylus monicae*, sp. nov. (left: TM 33806) from Swartpoort, Richtersveld National Park, Northern Cape Province, South Africa, and subadult specimen (right: TM 41854) from Farm Holoog, Karasburg District, Namibia. These specimens represent the extremes of fading and boldness, respectively, of the adult banding pattern of *P. monicae*. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 85. Juvenile specimens of *Pachydactylus monicae*, sp. nov. Left: CAS 200079 (paratype), Sendelingsdrif, Richtersveld National Park, Northern Cape Province, South Africa) and right: TM 41854, Farm Holoog, Karasburg District, Namibia. Juveniles from the Richtersveld accumulate dark markings in the spaces between the pale dorsal transverse bands whereas those from Farm Holoog retain nearly immaculate interspaces throughout life. Scale bar = 20 mm. Photo by A.M. Bauer.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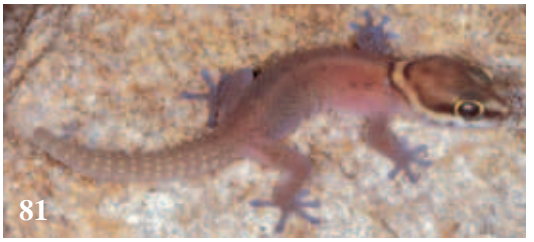
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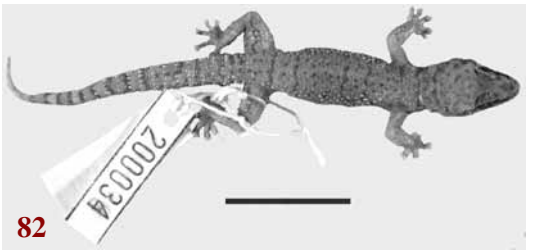

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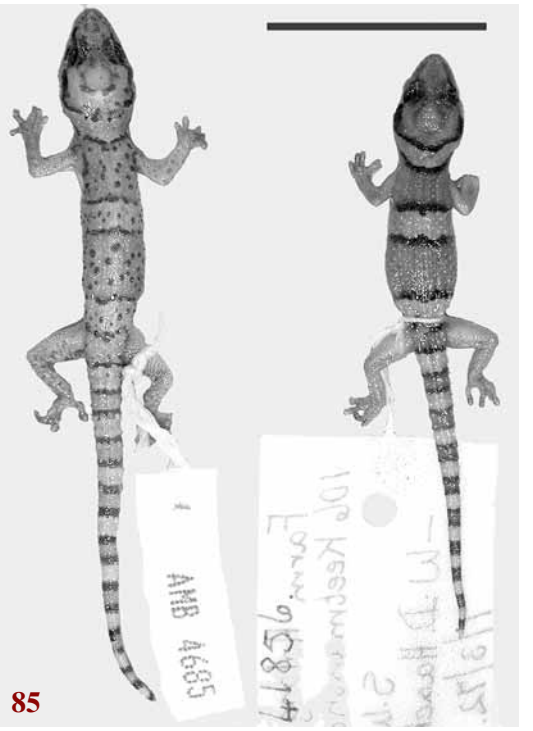

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FIGURE 86. Juvenile (left: CAS 193419, above Springbokvlakte, Richtersveld National Park, Northern Cape Province, South Africa) and hatchling (right: TM 32830, Ai-Ais, Karasburg District, Namibia) specimens of *Pachydactylus monicae*, sp. nov. The dark dorsal background color is typical only of hatchlings and younger juveniles. Older juveniles always exhibit the very bold, dark-edged banding seen on the specimen to the left. Scale bar = 10 mm. Photo by A.M. Bauer.

FIGURE 87. Freshly euthanized juvenile of *Pachydactylus monicae*, sp. nov. from the Fish River Canyon, Karasburg District, Namibia. The yellowish color of the pale transverse bands and grayish background color of the dorsum both fade in older specimens. Photo courtesy of W.D. Haacke.

FIGURE 88. Habitat of *Pachydactylus monicae*, sp. nov. along the south bank of the Orange River near Sendelingsdrif, Richtersveld National Park, Northern Cape Province, South Africa. In the Richtersveld this species is chiefly terrestrial and is found under natural and anthropogenic debris along the riverine corridor. Photo by A.M. Bauer.

FIGURE 89. Habitat of *Pachydactylus monicae*, sp. nov. in the Fish River Canyon, Lüdertiz and Karasburg Districts, Namibia. This species occurs chiefly in mesic habitats under debris or in boulder crevices near the valley bottom. Photo by A.M. Bauer.

FIGURE 90. Holotype of *Pachydactylus griffini*, sp. nov. (CAS 125855), subadult female, from 4 miles northwest of Aroab on road to Keetmanshoop, Keetmanshoop District, Namibia. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 91. Adult paratypes of *Pachydactylus griffini*, sp. nov. illustrating the range of variation in dorsal color pattern. From left to right: CAS 186294, adult male (Farm Narudas, Karasburg District, Namibia), CAS 125854, adult female (4 miles northwest of Aroab on road to Keetmanshoop, Keetmanshoop District, Namibia), MCZ R 163286, adult male (between Narubis and Aroab, Keetmanshoop District, Namibia). Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 92. Juvenile paratypes of *Pachydactylus griffini*, Left: CAS 186295 (Farm Narudas, Karasburg District, Namibia), right: TM 3099 (Narudas Süd, Karasburg District, Namibia). The spotted pattern of juveniles of this species is unique among members of the *Pachydactylus serval/weberi* clade. Scale bar = 10 mm. Photo by A.M. Bauer.

FIGURE 93. Holotype of *Pachydactylus mclachlani*, sp. nov. (NMNW R 10499), adult male, from Noordoewer, Karasburg District, Namibia. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 94. Adult female paratype of *Pachydactylus mclachlani*, sp. nov. (CAS 186293), from Farm Narudas, Karasburg District, Namibia. This specimen exhibits a particularly complex pattern in which the transverse banding pattern is obscure. Scale bar = 20 mm. Photo by A.M. Bauer.

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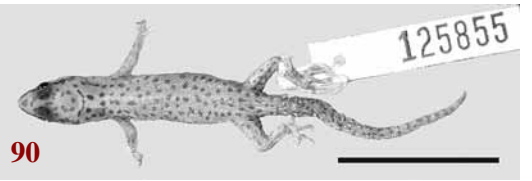

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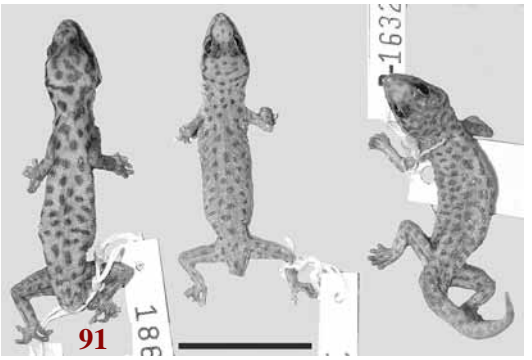
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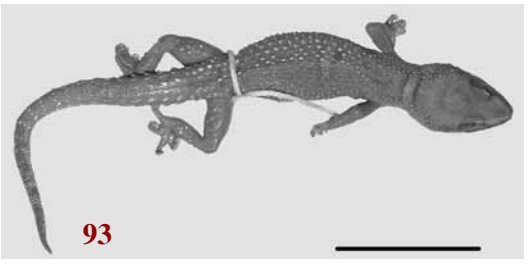
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FIGURE 95. Adult female paratypes of *Pachydactylus mclachlani*, sp. nov. Left: TM 54735 (Farm Sperlingsputs, Karasburg District, Namibia), right: CM 119309 (79.5 km south of Keetmanshoop, Keetmanshoop District, Namibia). Both specimens retain the pale nape band and some trace of the transverse body bands seen in juveniles. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 96. Life photo of adult female paratype of *Pachydactylus mclachlani*, sp. nov. (TM 54735) from Farm Sperlingsputs, Karasburg District, Namibia. The caudal tubercles are particularly pronounced in this and other specimens from near the Orange River. Photo courtesy of W.H. Haacke.

FIGURE 97. Life photo of paratypes of *Pachydactylus mclachlani*, sp. nov.: CM 119309 (adult female) and CM 119311 (juvenile) both from 79.5 km south of Keetmanshoop, Keetmanshoop District, Namibia. The color pattern of the juvenile is strikingly similar to that of *P. carinatus*, sp. nov. The nape and postaxillary bands and the pale scaral patch of the juvenile can still be discerned in the adult, despite the fragmentation of the dark interspaces. Photo courtesy of P. Freed.

FIGURE 98. Juvenile paratypes of *Pachydactylus mclachlani*, sp. nov. From left to right: CAS 186287 (Farm Narudas, Karasburg District, Namibia), CM 119310, 119311 (both 79.5 km south of Keetmanshoop, Keetmanshoop District, Namibia). All exhibit the narrow postaxillary band, wider nape band, and pale sacral region typical of hatchlings and juveniles of this species. Scale bar = 10 mm. Photo by A.M. Bauer.

FIGURE 99. Kokerboon-dominated habitat of *Pachydactylus mclachlani*, sp. nov. in the Orange River valley. This species occurs in association with a variety of rock types, often in small boulder piles or outcrops. Photo by A.M. Bauer.

FIGURE 100. Xeric habitat of *Pachydactylus mclachlani*, sp. nov. along the Orange River valley, Karasburg District, Namibia (Northern Cape Province, South Africa across river). Photo by A.M. Bauer.

FIGURE 101. Holotype of *Pachydactylus carinatus*, sp. nov. (CAS 201908), adult female, from 13.3 km east of Oenna Mine, Richtersveld National Park, Northern Cape Province, South Africa. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 102. Representative adult specimens of *Pachydactylus carinatus*, sp. nov. illustrating variation in dorsal color pattern. From left to right: CAS 201910 (adult male, Richtersveld National Park at 28°02′41″S, 17°05′40″E, Northern Cape Province, South Africa), CAS 201913 (adult male, 8.1 km south of Oenna Mine, Richtersveld National Park, Northern Cape Province, South Africa), TM 27949 (subadult male, 15 km northeast of Stinkfontein [Eksteenfontein], Northern Cape Province, South Africa). Scale bar = 20 mm. Photo A.M. Bauer.

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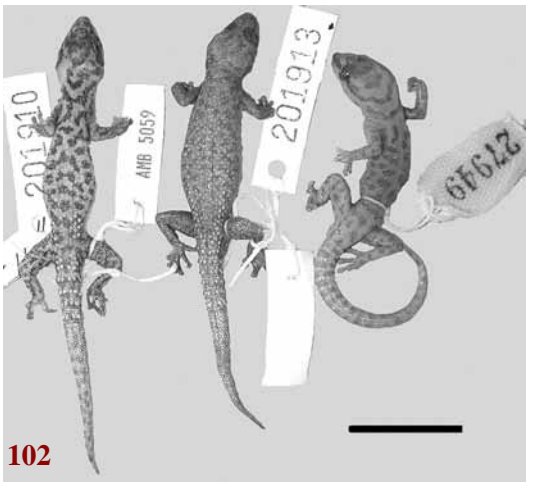

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FIGURE 103. Life photo of *Pachydactylus carinatus*, sp. nov. from Goodhouse, Northern Cape Province. The small, but prominent yellow tubercles typical of this species are clearly evident. Photo by T. Lamb.

FIGURE 104. Juvenile specimens of *Pachydactylus carinatus*, sp. nov. showing prominent nape band. Left: TM 25139 (Numees Mine, Richtersveld National Park, Northern Cape Province, South Africa, right: CAS 193392 (22.8 km east of Sendelingsdrif, Richtersveld National Park, Northern Cape Province, South Africa). Scale bar = 10 mm. Photo by A.M. Bauer.

FIGURE 105. Juvenile specimen of *Pachydactylus carinatus*, sp. nov. from the Richtersveld National Park, Northern Cape Province, South Africa showing the species-specific bright orange tail. Juveniles of this species are similar in color pattern to both *P. serval* (FIGURE 29) and *P. mclachlani* (FIGURE 97). Photo by W.R. Branch.

FIGURE 106. Habitat of *Pachydactylus carinatus*, sp. nov. near Halfmens Pass, Richtersveld National Park, Northern Cape Province, South Africa. Here the species occurs in narrow crevices and under capstones. Photo by A.M. Bauer.

FIGURE 107. Habitat of *Pachydactylus carinatus*, sp. nov. on road to Oenna Mine in the central Richtersveld National Park, Northern Cape Province, South Africa. It occupies all types of crevices as long as they are narrow and are protected from moisture. Photo by A.M. Bauer.

FIGURE 108. Holotype of *Pachydactylus visseri*, sp. nov. (CAS 201874), adult male, from Ai-Ais Nature Reserve, Karasburg District, Namibia. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 109. Paratypes of *Pachydactylus visseri*, sp. nov. Left: TM 50110, adult male (Ai-Ais, Karasburg District, Namibia), right: TM 35455, adult female (10 miles northwest of Fish River mouth, Karasburg District, Namibia). These specimens represent the seven- and six-banded patterns of this species, respectively. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 110. Life photo of *Pachydactylus visseri*, sp. nov. from the Fish River Canyon, Karasburg District, Namibia. Photo courtesy of W.D. Haacke.

FIGURE 111. Juvenile specimen of *Pachydactylus visseri*, sp. nov. (CAS 201877) from Ai-Ais Nature Reserve, Karasburg District, Namibia. Juvenile and adult dorsal patterns are identical in this species. Scale bar = 10 mm. Photo by A.M. Bauer.


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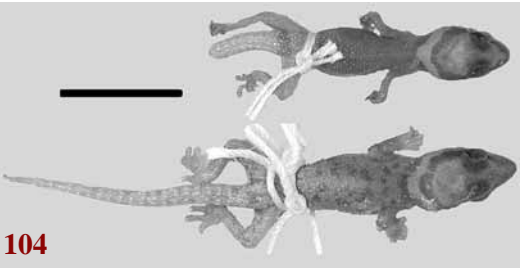
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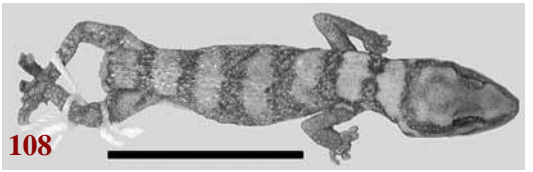
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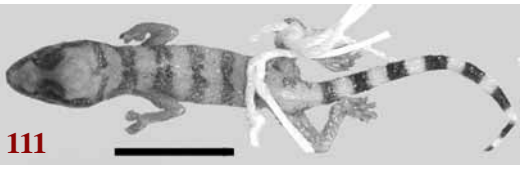
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FIGURE 112. Habitat of *Pachydactylus visseri*, sp. nov. along the lower Orange River. View from Skilpadberg, Lüderitz District, Namibia towards Brandkaross, Northern Cape Province, South Africa. Most specimens have been found under exfoliating flakes of granite or in narrow rock crevices. Photo by A.M. Bauer.

FIGURE 113. Holotype of *Pachydactylus goodi*, sp. nov. (TM 27962), adult male, from 10 km south of Vioolsdrif, Northern Cape Province, South Africa. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 114. Adult paratypes of *Pachydactylus goodi*, sp. nov. Left: TM 84505, female (Farm Aggenys, Northern Cape Province, South Africa), right: CAS 231878, male (77 km east of Springbok, Northern Cape Province, South Africa). Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 115. Adult male paratype of *Pachydactylus goodi*, sp. nov. (CAS 231878) from 77 km east of Springbok, Northern Cape Province, South Africa. Note the white patches on the proximal portions of the forelimbs. Photo courtesy of J.D. Visser.

FIGURE 116. Juvenile paratype of *Pachydactylus goodi*, sp. nov. (TM 29707) from 10 km south of Vioolsdrif, Northern Cape Province, South Africa. Scale bar = 10 mm. Photo by A.M. Bauer.

FIGURE 117. Holotype of *Pachydactylus otaviensis*, sp. nov. (TM 45097), adult male, from Farm Uithoek, Tsumeb District, Namibia. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 118. Paratypes of *Pachydactylus otaviensis*, sp. nov. Left: TM 85002, juvenile, right: TM 85000, adult male (both Farm Varianto, Tsumeb District, Namibia). Note the large, pointed cloacal spurs on the adult paratype. Scale bar = 20 mm. Photo by A.M. Bauer.


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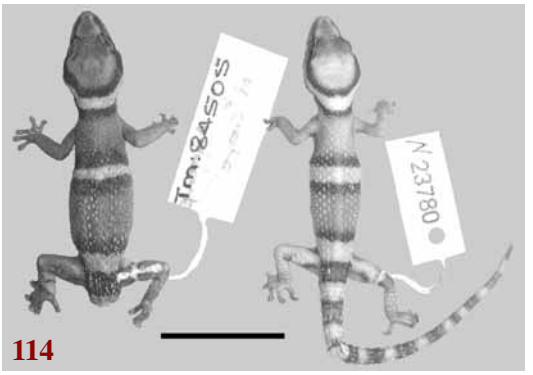

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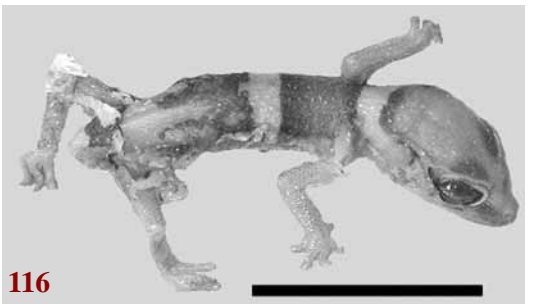
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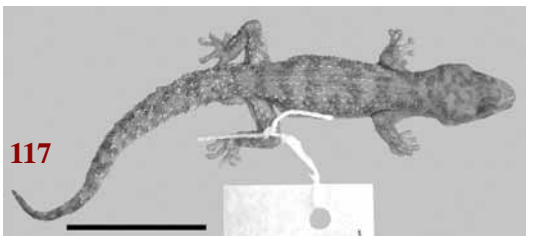
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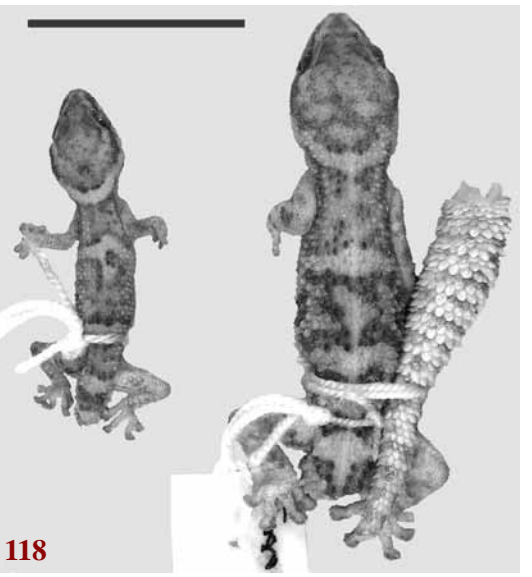
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FIGURE 119. Representative adult specimens of *Pachydactylus sansteynae* illustrating differences in degree of dorsal pigmentation. Left: CAS 214767 (north bank of Huab River at Huab River Bridge, Skeleton Coast National Park, Khorixas District, Namibia), right: CAS 214589 (1 km south of Huab River Bridge, Skeleton Coast National Park, Khorixas District, Namibia). Note the superficial similarity in dorsal pattern to some members of the *P. serval* group. Scale bar = 20 mm. Photo by A.M. Bauer.

FIGURE 120. *Pachydactylus sansteynae* (CAS 214589) from 1 km south of Huab River Bridge, Skeleton Coast National Park, Khorixas District, Namibia. Note the large, pointed cloacal spurs and the small, keeled tubercles. Photo courtesy of R.D. Babb.

FIGURE 121. *Pachydactylus sansteynae* (CAS 214589) from 1 km south of Huab River Bridge, Skeleton Coast National Park, Khorixas District, Namibia. Note the large head and the relatively pointed snout and the deep body profile. These are features shared with members of the Northwestern *Pachydactylus* clade, including *P. gaiasensis* and *P. oreophilus*. Photo courtesy of R.D. Babb.

FIGURE 122. Habitat of *Pachydactylus sansteynae* in shales and other friable rocks near the Huab River Bridge, Skeleton Coast National Park, Khorixas District, Namibia. Photo by A.M. Bauer.

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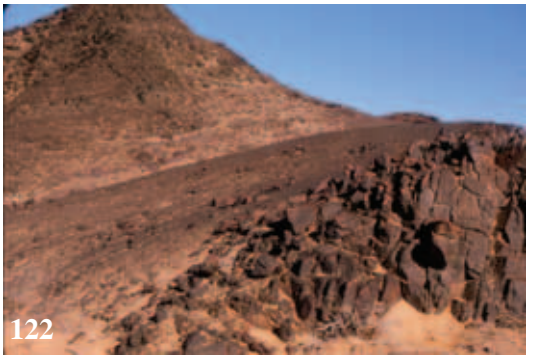
122

Diagnosis.— To 49.3 mm SVL (ZFMK 32925; Visser 1984 reported a maximum of 53.5 mm SVL but we examined no specimens in this size range). *Pachydactylus serval* may be distinguished from all other members of the *P. serval/weberi* group by the combination of the following characters: rostral enters nostril; supranasals in variable contact; scales on dorsum of head smooth and granular, those on snout larger than those of interorbital region; parietal scales tiny, granular, with no intermixed tubercles; dorsal scalation homogeneous, with only a few small, scattered flattened tubercles on sacrum and/or lumbar region; thighs without tubercles; toes relatively short with moderately wide pads; typically 5 undivided lamellae beneath digit IV of pes; tail to at least 107% SVL, moderately annulate, bearing whorls of small, rounded to pointed, unkeeled, white to yellow tubercles, widely separated form each other; adult pattern spotted (Figs. 2, 25–26), dark brown spots relatively large and arranged in more-or-less regular rows on a yellowish- to purplish-brown background, no nape band or nape band weakly evident; in some subadults adult spotted pattern and juvenile banding may cooccur (Fig. 27); juvenile pattern of a light (white to ashy) nape band and a similar broad band across posterior abdomen and sacrum and extending on to hindlimbs (although typically becoming more brownish or blackish distally on limbs), remainder of body dark, blackish in life (Figs. 28–29; see also Visser 1984:51), tail brownish.

Distribution.— *Pachydactylus serval* is a strictly Namibian endemic. Visser (1984) considered this form to range southward only as far as Bethanien and Aus. Griffin (2003) considered *P. serval* as limited to central Namibia, from Mariental to Keetmanshoop. Its core area of distribution is in central southern Namibia, but it has a more extensive distribution — from Mariental in the north to the Orange River in the south (Figs. 21, 30–31). Most records are from localities around 1500 m in the highland area stretching from the Tsarisberge and Schwarzrand south to the Huib Hochplateau and in areas bordering the Fish River. Outlying eastern localities include Daweb-Süd, Farm Florida in the Karasberge, and east of Keetmanshoop, whereas in the southwest, there is a single record north of Rosh Pinah. A record from near Swakopmund needs further investigation; on the basis of the habitat in this region and the disjunction from the contiguous portion of the range, we regard it as erroneous. However, the record is relatively recent and fairly precise and may represent an accidental translocation. Other localities of interest are along the Orange River and thus in sympatry or near sympatry with *P. purcelli, P. montanus* and a new species from the Richtersveld. One of these localities is between Noordoewer and Ai-Ais; this specimen appears to be unquestionably referable to *P. serval,* and specimens from relatively nearby (Ai-Ais) are clearly genetically distinct from any of these other species. A juvenile specimen (TM 36782) from the Farm Koboop (see Fig. 30) on the south bank of the Orange River, south of Onseepkans (2819Cd) has been tentatively referred to *P. serval*, but further investigation of this locality is required. Specimens here referred to *P. montanus* and *P. purcelli* have also been collected at this site.

Natural History.— *Pachydactylus serval* is typically found under exfoliating flakes or in narrow crevices in a variety of rock types. Road embankments (Fig. 32), borders of dry riverbeds, low exposures on ridge tops and cliff faces are all occupied if suitable retreats are present.

Visser (1984) reported that young near Bethanie hatch in mid-January and that egg size is 10.0–10.5 × 6.6–7.4 mm, with hatchlings measuring 19.2–22.6 mm SVL.

Conservation Status.— *Pachydactylus serval* is patchily distributed and although infrequently encountered in comparison to some other members of the *P. serval* group, it is locally common and under no specific threats. It is protected in the north of its range in the Hardap Recreation Resort and in the south in the Ai-Ais/Richtersveld Transfrontier Park. Griffin (2003) also indicated that it occurs in the Naute Recreation Resort.

Remarks.— Monard (1931, 1937) reported *P. serval* from from the Mbalé Stream, Indungu and Kuluï in Angola, where it was found under fallen trees. It seems likely that he was in fact refer-

ing to *P. punctatus*, which also has a spotted dorsum, and is one of relatively few *Pachydactylus* to occur in Angola.

The precise type locality of *Pachydactylus serval* has remained in doubt, as it is difficult as a result of years of farm consolidations and subdivisions to determine exactly where the Farm Chamis of 1910 is located today. At the suggestion of Mike Griffin (Ministry of Environment and Tourism, Windhoek), we visited the region near the present farm Chamis Süd and attempted to find the vantage point from which a panaoramic photo of the area near Chamis was taken in about 1905 (Schultze 1907). Based on our observations along the main (C14) road from Helmeringhausen to Bethanie, the closest match to this photo is the vista at a point approximately 10.1 km southeast of Helmeringhausen (25°56′56″S, 16°53′50″E, elevation 1375 m) on the Farm Goais (Fig. 32). However, the photo was taken on the Konkiep River itself, east of the existing main road. In all likelihood the precise location of Schultze's (1907) vantage point was on the existing farm Coruna at a point just north of the boundary with the farm Mooifontein. Although the type specimens could have been collected anywhere in the vicinity, we regard this locality, in QDS 2516Dd as the site of Werner's (1910) "Chamis."

Loveridge (1947) incorrectly stated that the juvenile pattern of this species was characterized by three cross bands.

Pachydactylus purcelli Boulenger, 1910

Figures 4, 33–41.

1910 *P*[*achydactylus*]. *purcelli* Boulenger, *Ann. S. Afr. Mus.* 5: 494 (SYNTYPES: SAM 1260–61 (Fig. 33): "Touw's River," coll. W.F. Purcell. SAM [not located]: "Little Namaqualand," coll. Schlechter. See Remarks regarding restriction of type locality. The description mentions several specimens from each locality, but we did not locate the Little Namaqualand types during a March 2005 visit to the South African Museum).
1911 *P*[*achydactylus*]. *Purcelli* Sternfeld, *Mitt. Zool. Mus. Berlin* 5:398.
1911 *Pachydactylus pardus* Sternfeld, *Mitt. Zool. Mus. Berlin* 5:398. (HOLOTYPE: ZMB 23453 (Fig. 34): "Warmbad [Deutsch Sudwest-Afrika]" [Namibia]; coll. Schmidt).
1911 *P*[*achydactylus*]. *purcelli* Hewitt, *Ann. Transvaal Mus.* 3:45.
1913 [*Pachydactylus*] *pardus* Hewitt, *Ann. Natal Mus.* 2:483.
1913 [*Pachydactylus*] *purcelli* Hewitt, *Ann. Natal Mus.* 2:483.
1914 *P*[*achydactylus*] *purcelli* [part] Methuen and Hewitt, *Ann. Transvaal Mus.* 4:131, fig. 15 [part] (Fig. 4 [part]).
1927 [*Pachydactylus*] *purcelli* Hewitt, *Rec. Albany Mus.* 3:397.
1929 *Pachydactylus pardus* Lawrence, *J. S.W. Afr. Sci. Soc.* 2:25.
1935 [*Pachydactylus*] *purcelli* Hewitt, *Rec. Albany Mus.* 4:320.
1936 *Pachydactylus purcelli* Lawrence, *Parasitology* 28:38.
1935 *Pachydactylus purcelli* [part] FitzSimons, *Ann. Transvaal Mus.* 15:529.
1938 *Pachydactylus purcelli* FitzSimons, *Ann. Transvaal Mus.* 19:176.
1941 *Pachydactylus purcelli* FitzSimons, *Ann. Transvaal Mus.* 20:359.
1943 *Pachydactylus purcelli* [part] FitzSimons, *Mem. Transvaal Mus.* 1:65, pl. VIII, fig. 3, Pl. XIII, fig. 5.
1947 *Pachydactylus purcelli* Loveridge, *Bull. Mus. Comp. Zool.* 98:362.
1951 *Pachydactylus purcelli* Lawrence, *Ann. Transvaal Mus.* 21:452.
1955 *Pachydactylus purcelli* Mertens, *Abhandl. Senckenberg. naturf. Ges.* 490:48.
1965 *Pachydactylus purcelli* Wermuth, *Das Tierreich* 80:122.
1966 *Pachydactylus* [*serval*] *purcelli* McLachlan and Spence, *Ann. Cape Prov. Mus.* 5:155.
1971 *Pachydactylus serval purcelli* Mertens, *Abhandl. Senckenberg. naturf. Ges.* 529:42.
1981 *Pachydactylus serval purcelli* Branch, *Ann. Cape Prov. Mus. (Nat. Hist.)* 13:145.
1982 *Pachydactylus serval purcelli* Welch, *Herpetology of Africa*:36.

1984 *Pachydactylus serval purcelli* Visser, *Landbouweekbl*., 27 April 1984:48, fig. p. 49, second from bottom.
1988 *Pachydactylus s. purcelli* Branch, *Field Guide*:207, pl. 86, top.
1990 *P*[*achydactylus*]. *serval purcelli* Branch, *J. Herpetol. Assoc. Afr.* 37:25.
1991 [*Pachydactylus*] *serval purcelli* Kluge, *Smithson. Herpetol. Inform. Serv.* 85:23.
1991 *Pachydactylus purcelli* Bauer and Günther, *Mitt. Zool. Mus. Berlin* 67:294.
1991 *Pachydactylus serval purcelli* Bauer, *J. Herpetol. Assoc. Afr.* 39:18.
1993 [*Pachydactylus*] *serval purcelli* Kluge, *Gekkonoid Lizard Taxonomy*:25.
1994 *Pachydactylus serval purcelli* Welch, *Lizards of the World* 1:95.
1994 *Pachydactylus s. purcelli* Branch, *Field Guide*, 2nd ed.:207, pl. 86, top.
1995 *Pachydactylus serval purcelli* Branch and Bauer, *Herpetol. Nat. Hist.* 3:57.
1998 *Pachydactylus s. purcelli* Branch, *Field Guide*, 2nd ed.:260, pl. 86, top.
2000 [*Pachydactylus*] *serval purcelli* Rösler, *Gekkota* 2:99.
2001 [*Pachydactylus*] *serval purcelli* Kluge, *Hamadryad* 26:21.
2003 *Pachydactylus serval purcelli* Griffin, *Namibian Reptiles*:38.
2005 *P*[*achydactylus*]. *serval* [part] Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

Material examined.— South Africa: **Western Cape Province:** PEM R 7081–83, 6.8 km NE Eierspoort on Anysberg Rd. (33°37′S, 20°37′E); CAS 180387–89, 2 km W entrance Anysberg Reserve (33°44′S, 20°27′ E); PEM R 6721, 7010, Anysberg Nature Reserve, Voorsteberg (3320Bc; 33°27′13″S, 20°35′08″E); PEM R 8553, NW Anysberg to Ladismith (33°28′02″S, 20°54′23″E); JDV 1522–24, 1527–28, 1533, 39078, SAM 7689, 44665, Matjiesfontein (3320Ba); TM 19505, 19552–54, 19579–80, 19582–83, Matjiesfontein (33°14′S, 20°35′E); IRSNB 11820 (formerly TM 31284), TM 31280–83, 31285–88, 2 mi N Matjiesfontein (33°12′S, 20°35′E);TM 34997–35001, 5 mi N Matjiesfontein (33°09′S, 20°35′E); CAS 175278, 60.9 km S Laingsburg on Hwy. 323 (33°29′S, 20°55′E); TM 66083, nr. Plathuis turnoff, Ladismith Dist. (33°42′S, 20°52′E); PEM R 7108; 8.6 km dirt rd. to Touwsrivier, Ladismith, Barrydale (33°38′S, 20°58′ E); PEM R 8559, Farm Plathuis, S slopes of Touwsberg (33°37′43″S, 20°56′19″E); TM 56426–27, Farm Combrinkskraal 93 (33°01S, 21°59′E); USEC/H-5715, Prins Albert (3322Ac); PEM R 3693, 3707, N slopes of Droekloofberg (33°16′S, 22°37′E); USEC/H-1291, Kromrivier A (32°31′37″S, 19°17′31″E); USEC-H-1300, Kromrivier B (32°32′13″S, 19°19′09″E); USEC/H-1278, Varkkloof, Grootrivier (32°38′09″S, 19°23′48″E); USEC/H-1195, Sonderwater, De Meul (32°47′00″S, 19°27′37″E); USEC/H-1184–85, Zuurvlakte (32°46′47″S, 19°29′48″); USEC/H-1179, Ceres District, Skurweberg (32°45′52″S, 19°26′15″E); JDV 7627–28, Farm Slagterhoek, 20 km N Prince Albert (3322Aa); USEC/H-2880, Botterkraal, Prins Albert District (33°06′S, 22°25′E); PEM R 4500–03, 4673, Bruinrante (3322Ba); PEM R 3707, Kammanasieberg, Elandsvlakte (3322Db); CAS 198294*–96*, Oukloof Pass, Farm Oukloof (32°11′36″S, 21°55′38″E); USEC/H-2879, Prins Albert Road (32°57′S, 21°39′E); MCZ R 46812, just S Beaufort West (3222Bc); SAM 1247–48, TM 19468, 20369–70, 20372–78, Beaufort West (32°21′S, 22°35′E); PEM R 3162–63, 3266–69, 4533, 4664–65, Karoo National Park (3222Ba). **Eastern Cape Province**: PEM R 4526–28, 2 km W Farm Lustfontein, Reitbron Dist. (3323Aa); PEM R 4525, 10 km W Farm Lustfontein, Reitbron Dist. (3322Bb); PEM R 6506–10, 12 km W Vondeling Stn. (33°19′S, 22°57′E); PEM R 4858–62, Farm Vleikop, Wolweboslaagte (3323Aa). **Northern Cape Province**: JDV 2136, 20 km S Sutherland (3220Da); SAM 43966, Middelpos (3120Cd); TM 35035–39, 3 mi W Middelpos (31°56′S, 20°21′E); TM 35046–47, 9 mi SE Middelpos (31°59′S, 20°21′E); TM 36156–59, Farm Gansvley (31°28′S, 21°58′E); TM 36160, Farm Tabaksfontein (31°38′S, 21°48′E); TM 36161–67, Farm Grootfontein, Fraserburg Dist. (31°50′S, 21°38′E); TM 36231, Farm Grootkolk, Williston Dist. (31°06′S, 20°54′E); TM 36174, 36188–90, 4 mi NE Fraserburg (31°50′S, 21°35′E); TM 36182–87, Farm Bamburgershoogte, 6 mi SE Fraserburg (31°59′S, 21°34′E); TM 36201–04, Farm Quaggasfontein, 10 mi N Fraserburg (31°50′S, 21°27′E); TM 36214–19, 36230, Farm Goedverwagting, Williston Dist. (31°50′S, 21°34′E): CAS 199995, Williston Rd., 15 km NW Fraserburg (31°47′06″S, 21°25′05″E); PEM R 4775, 4780, 40 km N Williston (3120AD); TM 36249–50, Farm Bleskrans, Williston Dist. (30°55′S, 20°36′E); SAM 47723, Verneukpan (Suid) (30°06′31″S, 21°02′13″E); TM 18218–24, 18226–27, 18229–31, 39108, Van Wyk's Vlei (30°21′S, 21°49′E); TM 18209–12, 18214, 18216–17, MCZ R 46811 (formerly TM 18213), 15 mi. from Van Wyk's Vlei (3021Bc); SAM 47715–16, Verdorskalk (30°05′11″S, 20°25′50″E); SAM 47721–22, Kareeboomleegte (30°04′27″S, 20°54′35″E); TM 62905,

Carolusberg, Namaqualand (29°38′S, 17°57′E) [locality questionable]; CAS 201843, 201844*, 201845–49, 203488–93, PEM R 12471*, 12475*, 28.3 km E Pofadder on Hwy. R64 (29°01′17″S, 19°39′06″E); TM 28031–32 21 mi NE Pofadder towards Kakamas (29°01′S, 19°40′E); JDV 2562–70, 34 km E Pofadder (2919Aa); JDV 2553–54, 2557, 26 km E Pofadder (2919Aa);TM 27628, Farm Rietfontein (29°25′S, 20°55′E); JDV 5492–94, 61 km S Kenhardt (2920Dd); SAM 47718–19, Bloubos (29°56′32″S, 20°48′13″E); SAM 47720, Bloubos (29°55′14″S, 20°57′07″E); TM 36732, Driekop, 8 km S Kenhardt (29°22′S, 21°06′E); PEM (number pending), Kokerboomwoud, 8 km S Kenhardt (29°24′22S″, 21°06′18″E); TM 28050, Farm Kaboom (2922Aa); TM 28053, Farm Witvlei, 25 mi. W Prieska (2922Cb); TM 15936, between Kenhardt and Prieska; TM 82319–21, 10 km from Duine Municipal Site (2821Ac); CAS 126035–37, 19 mi SW Upington on rd. to Keimoes (2821Ca); TM 28015, Farm Koboop (Coboboop) (28°53′S, 19°20′E); PEM R 217, 60 mls. From Onseepkans E. (2820Cb); PEM R 128, 133, 146, 155, 160, 25 mls. N Pofadder (2819Cd); JDV 2539–40, 2551–52, 2555–56, 36 km E Pofadder (2819Dc); ZFMK 52394, 70 km E Pofadder (2819Dd); CAS 186277, 81 km E Namibian border on Upington-Ariamsvlei Rd. (2820Bd); NMNW R 121, TM 15912, 15921, Kakamas (28°45′S, 20°33′E); TM 37593, Farm Rooidam, 11 km W Augrabies (2820Cb); SAM 17330 (2 specimens), Aughrabies Falls, N bank of river (2820Cd); TM 28040–41, 56195, Augrabies Falls Natl. Pk. (28°53′S, 20°20′E); SAM 3511–12, Naroep (2818Dc). **Namibia**: **Karasburg District**: JDV 2624, 20 km S Ariamsvlei (2819Bd); SAM 17016, Kalkfontein (2818Ba); PEM R 157, 180, TM 33289, ZMB 23453 (holotype of *P. pardus*), Warmbad (2818Bc); PEM R 121, 127, 159, 225, 16 mi. S Warmbad (2818Db); PEM R 214, 18 mi. S Warmbad (2818Db); TM 17855–56, 15 miles S Warmbad (28°37′S, 18°52′E); TM 79077, Warmbad (28°26′S, 18°44′E); CAS 231887, Farm Narudas, 7 km N of Road D201 (27°23′09″S, 18°52′26″E); **Keetmanshoop District**: PEM R 104–06, 108–115, 14561 (formerly AM 3089), Kraikluft (2718Ba); NMNW R 122, TM 3088, Alt Wasserfall (27°08′S, 18°39′E); PEM R 126, 158, 220, Kochena (2718Bb); TM 3102–03, between Kraikluft and Alt Wasserfall (2718Ba). **Unidentifiable/ambiguous locality**: SAM 3496, Kraaifontein, Namaqualand. **Unknown locality**: JDV 767. **Additional literature record**: **South Africa**: **Western Cape Province**: Karoo National Park (as *P. serval*; Girard 1997).

Diagnosis.— To 50.8 mm SVL (CAS 231887). *Pachydactylus purcelli* may be distinguished from all other members of the *P. serval/weberi* group by the combination of the following characters: head blunt, wide; rostral enters nostril; supranasals usually in broad anterior contact; scales on dorsum of head smooth and flattend, often polygonal rather than rounded, those on snout only slightly larger than those of interorbital region; dorsal scalation homogeneous, no tubercles on dorsum of body or thighs; toes moderately long and narrow with moderately wide pads; typically 5 undivided lamellae beneath digit IV of pes; tail to at least 120% SVL, moderately annulate, bearing whorls of very small, flattened, unkeeled, well-separated, white to yellow tubercles; adult pattern buff to beige or pastel yellow, orange or purple with small, irregular, closely-spaced brown spots covering entire dorsum and flanks, remnants of three pale (white, yellow or purplish-gray) cross bands may be retained in some adults, especially in northern populations (Figs. 35–38); juvenile pattern with three light (white to yellow) cross bands: one on nape, one on trunk and one over or just anterior to sacrum – that on nape often extended posteriorly along midline (Figs. 39–41).

Distribution.— Widely distributed in the western portions of the Great and Little Karoo of South Africa (Branch 1990; Branch and Bauer 1995) as far east as the western Eastern Cape Province, where it is the only member of the *P. serval/weberi* clade to occur. It occurs along the Orange River from the level of Upington to Warmbad. Its distribution in South Africa is largely complementary to that of *P. weberi*. A western locality, Carolusberg, is probably in error or perhaps represents an isolated population (Fig. 31, blue "?"). *Pachydactylus purcelli* extends into southeastern Namibia as far north as the Karasberg Mountains (e.g., Methuen and Hewitt 1914), although it is unclear if Namibian populations are continuously distributed or patchy (Figs. 21, 30–31). Griffin (2003) considered that most "*serval*" from southern Namibia (Karasburg, southern Bethanie and Lüderitz districts) were assignable to *P. purcelli*. Based on our studies, Karasburg records are based on both *P. purcelli* and *P. montanus* but *P. purcelli* does not occur further west in Namibia. Parker's

(1936) records of *P. purcelli* from Maltahöhe certainly refer to *P. serval*. *Pachydactylus purcelli* occurs in sympatry or near sympatry with *P. montanus* at Koboop on the south bank of the Orange and near Warmbad in Namibia. It occurs with both *P. montanus* and a new species of the *serval* group at Farm Narudas in the Karasberg. A record from Bechuanaland [Botswana] noted questioningly by Loveridge (1947) is clearly incorrect.

Natural History.— A rupicolous species which has been recorded from narrow cracks and under exfoliating flakes in shale, dolerite, Dwyka tillite, sandstone, and other outcrops in the Little Karoo (Branch 1990; Burger 1993; Branch and Bauer 1995) and in sandstone and dolerite, in particular, in the Great Karoo (Branch and Braack 1989; Haagner and Branch 1995; Fig. 42). In southeastern Namibia it appears to utilize similar retreats in rock crevices or under rock slabs (Fig. 43). FitzSimons (1943) reported some background color matching ability in this species. Lawrence (1951) described the parasitic mite *Geckobia capensis hastata* from *P. purcelli*.

Conservation Status.— *Pachydactylus purcelli* is widely distributed in western South Africa and is under no immediate threats. It is protected in the Karoo National Park, Anysberg Nature Reserve, and Swartberg Nature Reserve, and probably in the Sanbona Wildlife Reserve. Namibian populations do not occur in any parks or reserves but do not appear to be under threat.

Remarks.— Mertens (1955) restricted the type locality to "Townsriver [*sic*], Kap-Provinz." *Pachydactylus pardus* was synonymized with *P. purcelli* by Methuen and Hewitt (1914) and this interpretation was endorsed by FitzSimons (1938). The absence of tubercles in the holotype is consistent with this; however, there is extensive variation in this feature in *P. montanus* as well. We examined the holotype of *P. pardus* (Fig. 34), which is in moderately good condition, and concur that it is conspecific with *P. purcelli*. Methuen and Hewitt (1914) described the juvenile pattern of *P. purcelli* from the Karasburg as "dorsally five light transverse bars which have irregular dark edges." This pattern is, in fact, more consistent with that of *P. montanus* (the fifth band described by Methuen and Hewitt occurs on the tail base) and it is evident that their series was composite (Fig. 4).

We were unable to locate the "Little Namaqualand" syntypes in the collection of the South African Museum. Both M. Schlechter and F.R.R. Schlechter collected zoological and botanical specimens in Namaqualand around the turn of the century and it is unclear which was the collector cited by Boulenger (1910).

Pachydactylus montanus Methuem and Hewitt, 1914

Figures 4, 44–51.

1914 *P*[*achydactylus*]. *montanus* Methuen and Hewitt, *Ann. Transvaal Mus.* 4:129 (Holotype: TM 3080 (Fig. 44): "Lord Hill's Peak in the Great Karas Mountains, at an altitude of 7300 feet," coll. P.A. Methuen, 17 January 1913).

1914 *P*[*achydactylus*] *purcelli* [part] Methuen and Hewitt *Ann. Transvaal Mus.* 4:131, fig. 15.

1927 [*Pachydactylus*] *montanus* Hewitt, *Rec. Albany Mus.* 3:395, pl. XXII, fig. 3.

1935 *Pachydactylus montanus onscepensis* Hewitt, *Rec. Albany Mus.* 4:318 (Holotype: PEM R 16050 (formerly AM 6879) (Fig. 45): Adult female; "Onscephans [= Onseepkans] on the Orange River, not far from Pella," coll. Dr. H. Maughan Brown).

1935 *Pachydactylus purcelli* [part] FitzSimons, *Ann. Transvaal Mus.* 15:529.

1936 *Pachydactylus montanus* Lawrence, *Parasitology* 28:38.

1938 *Pachydactylus montanus onscepensis* [part] FitzSimons, *Ann. Transvaal Mus.* 19:173.

1943 *Pachydactylus purcelli* [part] FitzSimons, *Mem. Transvaal Mus.* 1:65.

1943 *Pachydactylus montanus montanus* FitzSimons, *Mem. Transvaal Mus.* 1:83.

1943 *Pachydactylus montanus onscepensis* [part] FitzSimons, *Mem. Transvaal Mus.* 1:84, pl. VIII, fig. 5, Pl. XV, fig. 3.

1947 *Pachydactylus serval* [part] Loveridge, *Bull. Mus. Comp. Zool.* 98:388.
1955 *Pachydactylus serval* [part] Mertens, *Abhandl. Senckenberg. naturf. Ges.* 490:48.
1965 *Pachydactylus serval* [part] Wermuth, *Das Tierreich* 80:123.
1966 [*Pachydactylus serval*] *onscepensis* [part] McLachlan and Spence, *Ann. Cape Prov. Mus.* 5:155.
1966 [*Pachydactylus serval*] *serval* [part] McLachlan and Spence, *Ann. Cape Prov. Mus.* 5:155.
1971 *Pachydactylus serval serval* [part] Mertens, *Abhandl. Senckenberg. naturf. Ges.* 529:42.
1981 *Pachydactylus serval onscepensis* [part] Branch, *Ann. Cape Prov. Mus. (Nat. Hist.)* 13:145.
1982 *Pachydactylus serval serval* [part] Welch, *Herpetology of Africa*:36.
1982 *Pachydactylus serval onscepensis* Welch, *Herpetology of Africa*:36.
1984 *Pachydactylus serval serval* [part] Visser, *Lanbouweekbl*. 27 April 1984:48, fig. p. 48, top.
1984 *Pachydactylus serval onscepensis* Visser, *Lanbouweekbl*. 27 April 1984:48, fig. p. 51, top.
1988 *Pachydactylus s. onscepensis* [part] Branch, *Field Guide*:207, pl. 86, upper middle left.
1991 [*Pachydactylus*] *serval onscepensis* Kluge, *Smithson. Herpetol. Inform. Serv*. 85:24.
1993 [*Pachydactylus*] *serval onscepensis* Kluge, *Gekkonoid Lizard Taxonomy*:25.
1994 *Pachydactylus serval onscepensis* Welch, *Lizards of the World* 1:95.
1994 *Pachydactylus s. onscepensis* [part] Branch, *Field Guide*, 2nd ed.:207, pl. 86, upper middle left.
1996 *Pachydactylus weberi* ex errore Branch, *Afr. Herp News* 25:27.
1998 *Pachydactylus s. onscepensis* [part] Branch, *Field Guide*, 3rd ed.:260, pl. 86, upper middle left.
2000 [*Pachydactylus*] *serval onscepensis* Rösler, *Gekkota* 2:99.
2001 [*Pachydactylus*] *serval onscepensis* Kluge, *Hamadryad* 26:21.
2003 *Pachydactylus serval onscepensis* Griffin, *Namibian Reptiles*:38.
2005 *P*[*achydactylus*]. *serval* [part] Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

Material examined.— South Africa: **Northern Cape Province**: JDV N26180, 100 km N Wallekraal (2917Ca)[locality questionable]; PEM R 119, 123, 18 mi. from Goodhouse on Pofaddder Rd. (2918Ab); TM 27654, 11 km SE Farm Aggenys (2918Bb); TM 15365, 15643–44, Pofadder (2919Ab); JDV N23580, 29 km S Onseepkans (2919Ab); TM 27634–39, 27644–46, Farm Olyvenkolk (29°26′S, 20°52′E); JDV 1929, 2035, 97 km E Octa Diamond Mine (2817Ab); CAS 167647, 10 km S Vioolsdrif on Hwy. N7 (2817Dc); SAM 46726–28, 8 km SE Vioolsdrif (2817Dc); SAM 43682, Vioolsdrif (2817Dc); TM 17864, Goodhouse (28°54′S, 18°14′E); JDV 1180–81, S outskirts of Goodhouse (2818Cc); TM 28016, Farm Koboop (Coboboop) (2819Cd); PEM R 120, 122, 221, 223, Mt. Stofel (2818Cc); JDV N20380, 47 km S Ariamsvlei (2819Bc); PEM R 16050 [formerly AM 6879, holotype of *P. montanus onscepensis*], PEM R 2390, 2476–78, CAS 231883–85*, Onseepkans (2819Cb); TM 15645, Onseepkans (28°44′S, 19°17′E); CAS 201859*–60*, 203498*, PEM R 12516*–17, 5.0 km S Onseepkans on Hwy. R358 (28°47′17″S, 19°19′31″E); PEM R 124, 141, 218, 20 mi from Onseepkans E. (2819Cb); SAM 17376, Baks Putz (Bak-se-puts), Gordonia (2820Ac); PEM R 125, 148, 219, 60 mi. from Onseepkans E (2820Cc); TM 36754–58, Farm Schuitdrif on Orange River (2819Da); TM 68557, Riemvasmaak (28°27′S, 20°19′E); TM 28042, CAS 126046, Augrabies Falls (2820Cb); JDV 34579, Aughrabies (2820Cb); TM 56194, Augrabies National Park (28°35′S, 20°20′E); PEM R 5775*–76, at entrance to Augrabies Falls National Park (2820Cb); PEM R 5774*, 6 km from Blouputs Rd. on Blouputs Approach Rd. (2820Ca); IRSNB 11817 (formerly TM 15190), PEM R 16051 [formerly AM 2593], MCZ R 41853–54, TM 15909, 15911, 15913, 15915–17, 15920, 15922, Kakamas (28°45′S, 20°33′E); CAS 176256*–58*, Kenhardt Rd., ca. 18 km SE Kakamas (2820Dc); TM 36768–69, Farm Onder Swartmodder (28°43′S, 19°42′E). **Namibia**: **Lüderitz District**: CAS 201892, NMNW R 8874*–75*, Witputz Annex (85), ca. 50 km N Rosh Pinah (27°39′33″S, 16°47′38″E); JDV 1905, btwn Ochta Mine and Rosh Pinah (2816Bb); CM 115705, 30 km E Aus (2616Da); **Bethanie District**: JDV 1819, 31380, Farm Houmoed (2616Ba); **Karasburg District**: NMNW R 10490, Noordoewer (28°39′48″S, 17°49′23″E); NMNW R 10491–92, Haib Mine (28°41′49″S, 17°53′26″E); JDV 34780, Noordoewer-Ai-Ais turnoff (2817Bd); PEM R 143, 5 mi. N Onseepkans (2819Cb); TM 28011–13, 13 km N Onseepkans (2819Cb); JDV N12980, 56 km N Onseepkans (2819Ac); PEM R 9290, Farm Velloor (28°35′S, 19°12′E); CAS 175320, 77.1 km E Karasburg on Hwy. B3 (2819Ba); SAM 46721–23, Norachaskop (2818Aa); CAS 201861, 3.5 km N Tantalite Valley, 12 km SW jct. Warmbad Rd. (28°42′08″S, 18°47′33″E); TM 33289, Warmbad (2818Bc); TM 17855–56, Farm Lugeck (28°37′S, 18°52′E); CAS 201864*, PEM R 12522, Farm Kinderzitt (28°39′34″S, 18°41′47″E); CAS 201865*,

Farm Haakiesdoorn (28°51′44″S, 18°14′38″E); PEM R 12526, N end Goodhouse'se poort, Farm Haakiesdoorn (28°44′47″S, 18°17′02″E); CAS 201867*, NMNW R 8846*, Farm Witputs (28°28′24″S, 17°57′53″E); NMNW R 8832*–33*, Farm Umeis (28°42′08″S, 18°47′33″E); TM 54733–34, Farm Sperlingsputs 259 (28°43′S, 18°13′ E); NMNW R 8841*, Farm Ramanspoort (28°47′23″S, 18°23′55″E); CAS 201870, PEM R 12527, Farm Witputs (28°36′29″S, 17°59′53″E); TM 36807–09, Farm Eendoorn (28°42′S, 18°57′E); JDV 2620, 20 km S Ariamsvlei (2819Bb); CAS 201876, Ai-Ais Nature Reserve, 82.4 km W Noordoewer (28°11′07″S, 17°14′58″E); TM 45786 (2 specimens), between Grünau and Noordoewer (2818Aa); TM 41873–80, Confluence Kanebis and Fish Rivers, Farm Fish River Canyon 381 (27°46′S, 17°36′E); CAS 167648–49, 8.3 km W of Hwy. 324 turnoff on Hwy. 97 (2717Dc); CAS 176252*, 176253, 176254*–55*, 7 km N Grabwasser on Hwy. C12 (2718Ca); CM 119306–07, 79.5 km S Keetmanshoop on Rte. B1 (2718Ba); JDV 30880, 35080(2), 35480, btwn Grünau and Klein Karas (2718Ca); JDV 1922–24, 1926(2), 14 km W Grünau (2718Cb); ZMB 54387–88, Grünau (2718Cb); PEM R 134, 138, 142, 10 mi. W. Grünau (2718Cc); **Keetmanshoop District**: JDV 31580, Holoog (2718Ac); TM 17841, Farm Kochena (27°03′S, 18°50′E); TM 3080 (holotype of *P. montanus*), Lord Hill's Peak, Great Karas Mountains (2718Ba); SAM 46446, 46452–54, 46468–71, Kraikluft (2718Ba); TM 3089–96, Farm Pietersklooof, Kraikluft (27°14′S, 18°45′E); CAS 126058–59, 23 mi N Grünau (2718Ad); CAS 175321–24, Hwy. 203, 39.1 km SE of Hwy. B1 (2718Bc); SAM 46711, 46717–19, 46732–33, Farm Goibib (2718Bc); PEM R107, SAM 46714–16, Dassiefontein (2718Bc); AMB (MCZ Field) A38332–41, Savanna Guest Farm (27°23′10″S, 18°29′30″E); AMB (MCZ Field) A38368–70, Savanna Guest Farm (27°22′56″S, 18°28′30″E); AMB (MCZ Field) A38375–78, Savanna Guest Farm (27°22′32″S, 18°29′33″E); SAM 46720, Noachabeb (2718Bc); CAS 214530, 35.0 km E Keetmanshoop on Aroab Rd. (26°36′17″S, 18°28′15″E); SAM 46708, 46729–30, 10 km N Keetmanshoop (2618Ac); TM 41936, 41938–40, 15 km N Keetmanshoop (2618Ac); SAM 46701–05, 20 km N Keetmanshoop (2618Ac); JDV 31680, 31780, 31880, 31980, 32080, 32180, 32480, 33980, 34080, between Narubis and Aroab (2618D or 2619C or 2619D); JDV N40180, Keetmanshoop (2618CA).

Diagnosis.— A small species, to 43.3 mm SVL (JDV 1923). *Pachydactylus montanus* may be distinguished from all other members of the *P. serval/weberi* group by the combination of the following characters: rostral enters nostril; supranasals in variable contact; scales on dorsum of head smooth, flattened to domed, those on snout much larger than those of interorbital region; scales of parietal region granular, homogeneous or with scattered conical tubercles scarcely larger than granules; dorsal scalation variable from nearly homogeneous to moderately heterogeneous, ranging from a few, small granular to flattened tubercles on sacrum, to slightly enlarged scattered tubercles on flanks and sacrum, to 10–12 regularly arranged rows of flattened, conical, or keeled tubercles across dorsum and flanks; toes moderately long with moderately wide pads; typically 5 undivided lamellae beneath digit IV of pes; tail to at least 115% SVL, moderately annulate, bearing whorls of relatively large, pointed, smooth to weakly keeled, well-separated, white to pale yellow tubercles; adult pattern buff, yellowish-brown or pinkish or purplish-gray with relatively large brown spots and/or cross bands, often retaining evidence of juvenile dark band edges (Figs. 46–49); juvenile pattern of four dark-edged light (cream, buff, or yellowish brown) bands: nape, immediately behind axilla, mid-trunk, and presacral (Figs. 50–51; see also Visser (1984:51).

Distribution.— Mertens (1971) considered *Pachydactylus montanus* as limited to South Africa based on data presented by McLachlan and Spence (1966). Visser (1984) and Griffin (2003), however, believed that it occurred on both sides of the Lower Orange River Valley. It is distributed along both banks of the Orange River from approximately Kakamas to Vioolsdrif. In Namibia it also occupies the area east of the Fish River, including the western and northern Karasberg Mountains, as far north as Keetmanshoop (Figs. 21, 30–31). There are also several localities in the Lüderitz District north of Rosh Pinah and many specimens from a far southeastern locality, Farm Olyvenkolk, near Kenhardt. A specimen from 30 km east of Aus (CM 115705) is tentatively referred to this species as is a disjunct record from Farm Houmoed in the Tirasberge. The former record is consistent with Visser's (1984) locality east of Aus. Despite their isolation, these records

appear to be valid, but one from north of Wallekraal, south of Anenous Pass in the western Northern Cape (Fig. 31, yellow "?") needs verification. *Pachydactylus montanus* occurs in sympatry or near sympatry with *P. purcelli* at several localities on the Orange River from Onseepkans upstream and in the Great Karasberg, with *P. serval* in the Bethanie District and near Noordoewer, and with a new *serval* group species at several localities between Goodhouse and Rosh Pinah.

The collection of the type of *P. montanus* at 7300 ft (2225 m) means that this species has the greatest elevational range of any member of the group, from near sea level in the Orange River Valley to the highest point of the Great Karasberg Mountains.

Natural History.— This species is variable in its use of habitat, but is always associated with rock crevices (Methuen and Hewitt 1914) or with rock flakes (Figs. 52–53).

Conservation Status.— *Pachydactylus montanus* occurs in the Ai-Ais/Richtersveld Transfrontier Park. It is locally abundant, especially along the Orange River, but is patchy in its distribution. It is under some threat because of the intensive agricultural use of portions of the Orange River Valley, but north of the river in Namibia it is subject to minimal human activity.

Remarks.— The description of Methuen and Hewitt (1914) provides sufficient information to identify *P. montanus* as specifically identical with *P. onscepensis* among the taxa recognized here and this has been confirmed by examination of the types associated with both names (Figs. 44–45). The dating of the paper by Methuen and Hewitt has been discussed by van Dijk (1996) and Branch (1996).

Loveridge (1947) synonymized both *P. montanus* and *P. m. onscepensis* with *P. serval*. Subsequent authors (Table 1) resurrected the latter from synonymy, but did not address the status of *P. montanus*, or accepted Loveridge's allocation of the unique specimen to *P. serval*. Although *P. montanus* has temporal priority over *P. onscepensis*, it has not been used as valid since 1947. The younger name, chiefly as a subspecies of *P. serval*, has been employed by numerous modern authors (Table 1). However, Article 23.9 of The International Code of Zoological Nomenclature (International Commission on Zoological Nomenclature, 1999) provides for the automatic reversal of temporal precedence only when 1) "the senior synonym or homonym has not been used as a valid name after 1899" (Art. 23.9.1.1) and 2) "the junior synonym or homonym has been used for a particular taxon, as its presumed valid name, in at least 25 works, published by at least 10 authors in the immediately preceding 50 years and encompassing a span of not less than 10 years" (Art. 23.9.1.2). Although the second provision is almost certainly fulfilled, the first is clearly not. Although the ICZN could be petitioned to use its plenary powers to set aside the older name, we see no compelling case for this as the name *onscepensis* has appeared chiefly in checklists or general faunal accounts and existing usage is not substantially disrupted by its abandonment in favor of *P. montanus*.

Hewitt (1927) considered *P. montanus* to be allied to *P. scutatus*. The variability of this taxon with respect to dorsal tuberculation was first alluded to by Hewitt (1935), who had difficulty assigning a specimen from Kakamas, which was weakly tuberculate. This species has remained perhaps the most problematic of all *Pachydactylus*. FitzSimons (1943) incorrectly stated that the juvenile color pattern of this species was almost indistinguishable from that of *P. purcelli*. In fact the juvenile color pattern of this species (Fig. 51) is unambiguously diagnostic, and many adults may also be identified on the basis of color alone. However, faded adult specimens from the Karasburg Region or from the adjacent Northern Cape may be difficult to distinguish from *P. purcelli*, and specimens from the Keetmanshoop district may be confused with *P. serval*. This species exhibits extensive genetic variation. Populations from Onseepkans are highly divergent from all others, forming the sister group to the remaining representatives of *montanus* in the Bayesian tree. Although genetic substructuring is apparent within the remainder of the *montanus* clade, it does not

appear to correspond to any obvious geographic pattern (see **Phylogenetic Relationships**). This taxon would be an ideal candidate for a more extensive phylogeographic analysis.

Pachydactylus werneri Hewitt, 1935

Figures 54–57.

1935 *Pachydactylus capensis werneri* Hewitt, *Rec. Albany Mus.* 4:315, pl. XXIX, fig. 3 (LECTOTYPE [here designated, see **REMARKS**]: PEM R 16049 (formerly AM 6613 [part]) (Fig. 54): "Khan River, South West Africa," coll. R. D. Bradfield. PARALECTOTYPE: PEM R16048 (formerly AM 6613 [part]): same collection data as lectotype. Stuart (1980) mistakenly referred to a single type).
1935 [*Pachydactylus capensis*] *weberi* Hewitt, *Rec. Albany Mus.* 4:315.
1935 [*Pachydactylus capensis*] *gariesensis* Hewitt, *Rec. Albany Mus.* 4:315.
1943 *Pachydactylus werneri* FitzSimons, *Mem. Transvaal Mus.* 1:85
1947 *Pachydactylus weberi werneri* [part] Loveridge, *Bull. Mus. Comp. Zool.* 98:394.
1955 *Pachydactylus werneri* Mertens, *Abhandl. Senckenberg. naturf. Ges.* 490:49, fig. 108.
1965 *Pachydactylus werneri* Wermuth, *Das Tierreich* 80:124.
1971 *Pachydactylus werneri* Mertens, *Abhandl. Senckenberg. naturf. Ges.* 529:43.
1980 *Pachydactylus weberi werneri* Stuart, *J. Herpetol. Assoc. Afr.* 24:6.
1981 [*Pachydactylus weberi*] *werneri* Branch, *Ann. Cape Prov. Mus. (Nat. Hist.)* 13:145.
1982 *Pachydactylus weberi werneri* Welch, *Herpetology of Africa*: 36.
1988 *Pachydactylus weberi* [part] Branch, *Field Guide*:208.
1991 [*Pachydactylus*] *weberi werneri* Kluge, *Smithson. Herpetol. Inform. Serv.* 85:24.
1993 [*Pachydactylus*] *weberi werneri* Kluge, *Gekkonoid Lizard Taxonomy*:25.
1994 *Pachydactylus weberi* [part] Branch, *Field Guide*, 2nd ed.:208.
1998 *Pachydactylus weberi* [part] Branch, *Field Guide*, 3rd ed.:263.
2000 [*Pachydactylus*] *weberi werneri* Rösler, *Gekkota* 2:100.
2001 [*Pachydactylus*] *weberi werneri* Kluge, *Hamadryad* 26:21.
2002 *Pachydactylus w*[*eberi*]. *werneri* Girard, *Gekko* 3(1):15, 2 figs. P. 16.
2003 *Pachydactylus weberi werneri* [part] Griffin, *Namibian Reptiles*:33.
2003 *P*[*achydactylus*]. *w*[*eberi*]. *werneri* Bauer & Lamb, *Cimbebasia* 19:3.
2005 *P*[*achydactylus*]. *weberi* [part] Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

MATERIAL EXAMINED.— NAMIBIA: **Maltahöhe District**: TM 57276–77, Farm Arbeid Adelt (24°06′S, 16°11′E); **Swakopmund District**: TM 34426, 42901, Gobabeb (2315Ca); TM 48179, Hudaob (2315Cb); TM 31346, 3 mi N Gorob Mine (23°29′S, 15°24′E); TM 57076, E Swakopmund (2214Da); PEM R 16048 (formerly AM 6613 [part], paralectotype of *Pachydactylus werneri*), PEM R 16049 (formerly AM 6613 [part], lectotype of *P. werneri*), Khan River (2214Db or 2215A); MB uncatalogued*, MCZ R 183707*, N bank of Swakop River (22°38′14″S, 14°43′39″E); TM 85001, Swakop River Bed (22°42′26″S, 14°57′50″E); TM 50376, Rössing Mt. (2214Db); NMNW R 5072, Stock Pile Site, Rössing Mine Area (22°28′S, 15°02′E); IRSNB 11824 (formerly TM 31761), TM 31757–60, 31762, Palmenhorst on Swakop River (2214Db); NMNW R 4175, 4178, 11 km S of Ostrich Gorge Mouth, Rössing, Khan River (22°38′S, 14°56′E); TM 85002, Swakop River Bed (22°42′26″S, 14°57′50″E); SMF 45605, Khan-Mine, 13 mi. E Arandis (2215Ac); NMNW R 3031, 8978 (2 specimens), TM 32850–52, Khanmine (2215Ac); NMNW R 4262, Panner Gorge nr Khan River (22°31′S, 15°01′E); TM 32280–81, Langer Heinrich Game Reserve 3 (2215Cd); **Karibib District**: NMNW R 4888, NW tributary 1.3 km from Khan River (22°20′S, 15°10′E); TM 32853, Vergenoeg 92, Khan River (2215Aa); TM 32302–06, Riet on Swakop River (2215Cb). **ADDITIONAL LITERATURE RECORD**: **NAMIBIA**: **Swakopmund District**: NMWR (as CR 3432), Khan Mine pumping station (2215Ac) (Stuart 1980).

DIAGNOSIS.— To 52.6 mm SVL (TM 31760). *Pachydactylus werneri* may be distinguished from all other members of the *P. serval/weberi* group by the combination of the following characters: rostral (and in some cases first supralabial) excluded from nostril; supranasals in variable contact; nostril rims distinctly raised; eyes very large, rostrum pointed; scales on dorsum of head granular, those on snout much larger than those of interorbital region; dorsal scalation heterogeneous,

with relatively small keeled tubercles arranged in 16–18 regular rows; tubercle tips and/or keels often white (Figs. 55–56); thighs with few, small, scattered, keeled to mucronate tubercles; limbs and toes very elongate, slender, toe pads wide; typically 5 undivided lamellae beneath digit IV of pes; tail to approximately 90% SVL; moderately annulate, bearing whorls of small, keeled, strongly pointed, white-tipped tubercles; adult pattern of diffuse, dark-edged light bands: one on nape, one behind axilla, one on mid-trunk, and one anterior to sacrum; pale bands often not, or barely, lighter than grayish- or pinkish-brown background coloration, pattern often disrupted and appearing as a series of irregular brown cross bands or spots; juvenile pattern similar to adult with four light cross bands (Girard 2002), although often only the nape band is prominent (Fig. 57).

Distribution.— Griffin (2003) considered this species as a Namibian endemic distributed in the Windhoek, Swakopmund, Okahandja, Karibib, Omaruru, Khorixas, Otjiwarango, and Outjo districts. We regard its distribution as being more limited (Karibib, Swakopmund, Maltahöhe districts), corresponding to the lowland areas (chiefly below 1000 m) north of the southern sand sea of the Namib to just north of the Khan River (Figs. 10–11). Specimens from other portions of Namibia are referable to several new species described herein.

Natural History.— The specimens of *Pachydactylus werneri* that we collected were active at night on rock faces along the north bank of the Swakop River, and Mertens (1955) found a specimen under a stone. However, according to Mirko Barts (pers. comm., May 2004) the species is not typically rupicolous and is chiefly active on riverine vegetation.

Conservation Status.— *Pachydactylus werneri* is a Namibian endemic with a rather limited distribution, chiefly along river courses in the Namib. Much of its range occurs within the Namib-Naukluft Park and West Coast Recreation Area. Griffin (2003) considered that *P. werneri* was also expected to occur in several other protected areas, but these areas (e.g., Waterberg Plateau Park, Daan Viljoen Game Park) are occupied by other members of the *P. weberi* complex. The species is subject to possible habitat degradation from human activities, including mining. It is also susceptible to periodic natural habitat loss associated with the rare flooding events of the Khan, Kuiseb, Swakop and other rivers.

Remarks.— We here designate PEM R 16049 (Fig. 54), an adult female and one of two original syntypes, as the lectotype of *Pachydactylus werneri*. Given the large number of species now recognized in the *serval*/*weberi* complex and the morphological similarity among many of them as well as the previous confusion between this taxon and others in central Namibia, we regard this action as advisable to help stabilize the usage of the name *P. werneri* as here newly re-diagnosed. The juvenile paralectotype, PEM R 16048, is in poor condition.

Pachydactylus kobosensis FitzSimons, 1938

Figures 58–61.

1938 *Pachydactylus kobosensis* FitzSimons, Ann. Transvaal Mus. 19:170 (Holotype: TM 17574: Adult male; "'Kobos', 40 miles south of Rehoboth, Great Namaqualand," coll. V. FitzSimons, 21 July 1937. Paratypes: TM 17517–17519, 17539–40, 17553, 17557–58, MCZ R 46804: same collection data as holotype).

1943 *Pachydactylus kobosensis* FitzSimons, *Mem. Transvaal Mus.* 1:74, pl. II, fig. 6, pl. VII, fig. 4, Pl. XIV, fig. 4.

1947 *Pachydactylus kobosensis* Loveridge, *Bull. Mus. Comp. Zool.* 98:363.

1955 *Pachydactylus kobosensis* Mertens, Mertens, *Abhandl. Senckenberg. naturf. Ges.* 490:46.

1965 *Pachydactylus kobosensis* Wermuth, *Das Tierreich* 80:119.

1971 *Pachydactylus kobosensis* Mertens, Mertens, *Abhandl. Senckenberg. naturf. Ges.* 529:39.

1982 *Pachydactylus kobosensis* Welch, *Herpetology of Africa*:34.

1984 *Pachydactylus kobosensis* Visser, *Lanbouweekbl*. 27 April 1984:49, fig. p. 49, middle.

1991 [*Pachydactylus*] *kobosensis* Kluge, *Smithson. Herpetol. Inform. Serv.* 85:23.

1993 [*Pachydactylus*] *kobosensis* Kluge, *Gekkonoid Lizard Taxonomy*:24.
1994 *Pachydactylus kobosensis* Welch, *Lizards of the World* 1:93.
2000 [*Pachydactylus*] *kobosensis* Rösler, *Gekkota* 2:98.
2001 [*Pachydactylus*] *kobosensis* Kluge, *Hamadryad* 26:20.
2003 *Pachydactylus kobosensis* Griffin, *Namibian Reptiles*:34.
2005 *P*[*achydactylus*]. *kobosensis* Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

Material examined.— **Namibia**: **Rehoboth District**: PEM R 12782–83, MCZ R 46804 (paratype of *P. kobosensis*, formerly TM 17539), FMNH 64521, TM 17574 (holotype of *P. kobosensis*), TM 17517–19, 17540, 17553, 17557–58 (paratypes of *P. kobosensis*), Kobos, 40 mi. S. Rehoboth (23°36′S, 16°44′E); CAS 223903*, 223904*, 223905*, 5.0 km S Kobos (23°37′20″S, 16°41′36″ E); JDV N54680, N54780, vic. Kobos (2316Da); JDV N39880, Rehoboth (2317Ac). **Windhoek District**: PEM R 12834, Borodino Ranch (2316Cb); JDV 4189–90, 4192, Nauchas (2316Cb); TM 48441–43, Farm Nauchas 14 (23°39′S, 16°18′E).

Diagnosis.— To 53.5 mm SVL (JDV N39880). This is the only member of the *P. serval/weberi* clade in which both the rostral and the first supralabial are typically excluded from the nostril. It may further be diagnosed by the following combination of characters: supranasals in broad contact anteriorly; scales on head flattened or granular, those on snout largest, gradually decreasing in size to small granules on interorbital and parietal regions, no tubercles on head; dorsal scalation largely homogeneous, velvety in appearance, but with scattered enlarged (4–8 times adjacent scales), smooth, flattened to feebly conical scales particularly evident on posterior portion of trunk, especially on sacrum; no tubercles on thighs, or thighs with small, smooth, unkeeled tubercles; digits moderately long, toe pads broadly dilated; typically 6 undivided lamellae under digit IV of pes; adult pattern of more-or-less regular dark bands (entire or broken) extending from flank to flank; tail to at least 113% SVL, bearing smooth, flattened, well-separated tubercles; both original and regenerated tail frequently thickened basally as a result of fat storage; adult pattern of chocolate brown crossbands and large spots on a pinkish-gray to pinkish-purple background; hatchling and young juvenile color pattern with three dark-bordered bold light bands: on nape, behind axillae and in presacral position (see Visser 1984:49).

Distribution.— This species remains known only from the immediate vicinity of Kobos in the Rehoboth District and from several farms in the southwest Windhoek District (Figs. 10–11). It is likely to be more widespread in granite koppies in central Namibia. All localities are > 1500 m elevation.

Natural History.— We have collected *P. kobosensis* from crevices in granite boulders and koppies, similar to those where FitzSimons (1938, 1943) found them.

Conservation Status.— *Pachydactylus kobosensis* is apparently highly restricted in its distribution, but under no obvious threat. Although not yet recorded, it may occur at Oanob Dam and/or in Daan Viljoen Game Park.

Remarks.— This species is among the most distinctive members of the *P. weberi* clade. Although it was never formally synonymized with any other taxon, it was not recognized as valid by Branch (1988) and with the exception of a brief mention by Visser (1984), it appeared only in species lists (e.g., Kluge 1991, 1993, 2001) until discussed more fully by Griffin (2003). In some specimens from Nauchas, the typical dark dorsal bands of adults are highly fragmented.

Pachydactylus robertsi FitzSimons, 1938

Figures 62–65.

1938 *Pachydactylus robertsi* FitzSimons, *Ann. Transvaal Mus.* 19:177 (Holotype: TM 17854 (Fig. 62): "Farm 'Kraikluft', Great Karas Mountains, Great Namaqualand," coll. V. FitzSimons, 12 August 1937).
1943 *Pachydactylus robertsi*, FitzSimons, *Mem. Transvaal Mus.* 1:85, pl. XV, fig. 4.

1944 *Pachydactylus scutatus robertsi* Loveridge, *Amer. Mus. Novit.* 1254:3.
1947 *Pachydactylus scutatus robertsi* Loveridge, *Bull. Mus. Comp. Zool.* 98:358.
1955 *Pachydactylus scutatus robertsi* Mertens, *Abhandl. Senckenberg. naturf. Ges.* 490:48.
1965 *Pachydactylus scutatus robertsi* Wermuth, *Das Tierreich* 80:122.
1971 *Pachydactylus scutatus robertsi* Mertens, *Abhandl. Senckenberg. naturf. Ges.* 529:42.
1982 *Pachydactylus scutatus robertsi* Welch, *Herpetology of Africa*:35.
1991 [*Pachydactylus*] *scutatus robertsi* Kluge, *Smithson. Herpetol. Inform. Serv.* 85:23.
1993 [*Pachydactylus*] *scutatus robertsi* Kluge, *Gekkonoid Lizard Taxonomy*:25.
2000 [*Pachydactylus*] *scutatus robertsi* Rösler, *Gekkota* 2:99.
2001 [*Pachydactylus*] *scutatus robertsi* Kluge, *Hamadryad* 26:21.
2002 *Pachydactylus robertsi* Bauer et al., *Proc. California Acad. Sci.* 53:25, fig. 1.
2003 *Pachydactylus robertsi* Griffin, *Namibian Reptiles*:34.
2005 *P*[*achydactylus*]. *robertsi* Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

Material examined.— Namibia: **Keetmanshoop District**: TM 17854 (holotype), Farm Kraikluft, Great Karas Mountains (2718Ba); NMNW R 6696–97*, Farm Kuchanas (2718Ba); CM 119308, 79.5 km S Keetmanshoop (2718Ba).

Diagnosis.— To 42.0 mm (TM 17854). *Pachydactylus robertsi* may be distinguished from all other members of the *P. serval/weberi* group by the combination of the following characters: rostral excluded from nostril; supranasals in broad contact; scales on snout flattened to weakly conical, much larger than those of interorbital and parietal regions, which consist of relatively small tubercles interspersed among granular scales; dorsal scalation heterogeneous, with approximately 22 rows of large, rounded, flattened, weakly imbricate tubercles bearing very prominent central keels; thighs bearing enlarged keeled or conical tubercles; toes relatively short, toe pads narrow; typically 5 undivided lamellae beneath digit IV of pes; tail to at least 114% of SVL, moderately annulate, bearing whorls of keeled tubercles, well-separated from one another; adult pattern with a dark-edged white nape band approximately 2–3 scale rows in width; remainder of dorsum uniform buff to pale brown with small dark flecks relatively uniformly distributed; supralabials white, bordered above by a thick dark brown line passing through orbit (Figs. 62–65); juvenile pattern unknown, probably similar to adult. *Pachydactylus robertsi* may be distinguished from the unrelated *P. scutatus*, with which it has been confused, on the basis of the exclusion of the rostral from the nostril and its wider nuchal band (typically 2–3 scale rows vs 1 scale row) (Bauer et al. 2002).

Distribution.— Apparently restricted to the Great Karas Mountains in southern Namibia (Karasburg District) (Figs. 21–22, 30).

Natural History.— FitzSimons (1938) reported the holotype was taken from a rock crack.

Conservation Status.— *Pachydactylus robertsi* is known from only a single quarter degree square in the Karasberg Mountains. Although no immediate threats to the species are evident, its restricted range make it vulnerable to habitat degradation.

Remarks.— The taxonomic history of *P. robertsi* has been discussed by Bauer et al. (2002) who resurrected the species from the synonymy of *P. scutatus* and considered it as a member of the *P. weberi* complex. The affinities of *P. robertsi* lie with an undescribed species currently known only from Augrabies in the Northern Cape and a single Namibian locality along the lower Orange (see **Phylogenetic Relationships**).

Pachydactylus acuminatus FitzSimons, 1941

Figures 66–70.

1915 *Pachydactylus Weberi* [part] Werner *in* Michaelsen, *Land und Süsswasserfauna Deutsch-Südwest Afrikas* I:334.
1938 *Pachydactylus weberi weberi* ? FitzSimons, *Ann. Transvaal Mus.* 19:181.

1941 *Pachydactylus weberi acuminatus* FitzSimons, *Ann. Transvaal Mus.* 20:274 (SYNTYPES: TM 17689–91, 17693–17695 (Fig. 67): "Aus," coll. V. FitzSimons, 31 July 1937. TM 17722 (Fig. 66): "Konkiep," coll. V. FitzSimons, August 1937. MCZ R 46817 (formerly TM 17692): "8 miles west of Aus, Great Namaqualand, South West Africa," coll. V. FitzSimons, 31 July 1937).
1943 *Pachydactylus montanus onscepensis* [part] FitzSimons, *Mem. Transvaal Mus.* 1:84.
1943 *Pachydactylus acuminatus* FitzSimons, *Mem. Transvaal Mus.* 1:90.
1947 *Pachydactylus weberi acuminatus* Loveridge, *Bull. Mus. Comp. Zool.* 98:393.
1955 *Pachydactylus weberi acuminatus* [part] Mertens, *Abhandl. Senckenberg. naturf. Ges.* 490:49.
1965 *Pachydactylus weberi acuminatus* [part] Wermuth, *Das Tierreich* 80:123.
1971 *Pachydactylus weberi acuminatus* [part] Mertens, *Abhandl. Senckenberg. naturf. Ges.* 529:43.
? 1981 *Pachydactylus w*[*eberi*]. *acuminatus* [part] Branch, *Ann. Cape Prov. Mus.* (*Nat. Hist.*) 13:145.
1982 *Pachydactylus weberi acuminatus* Welch, *Herpetology of Africa*:36.
1984 *Pachydactylus weberi* [part] Visser, *Landbouweekbl*. 27 April 1984:53, fig. p. 48, bottom, fig. p. 49, top.
1988 *Pachydactylus weberi* [part] Branch, *Field Guide*:208.
1991 [*Pachydactylus*] *weberi acuminatus* Kluge, *Smithson. Herpetol. Inform. Serv*. 85:24.
1993 [*Pachydactylus*] *weberi acuminatus* Kluge, *Gekkonoid Lizard Taxonomy*:25.
1994 *Pachydactylus weberi* [part] Branch, *Field Guide*, 2nd ed.:208.
1998 *Pachydactylus weberi* [part] Branch, *Field Guide,* 3rd ed.:263.
2000 [*Pachydactylus*] *weberi acuminatus* Rösler, *Gekkota* 2:100.
2001 [*Pachydactylus*] *weberi acuminatus* Kluge, *Hamadryad* 26:21.
2003 *Pachydactylus weberi acuminatus* Griffin, *Namibian Reptiles*:33.
2005 *P*[*achydactylus*]. *weberi* [part] Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

MATERIAL EXAMINED.— NAMIBIA: **Lüderitz District**: MCZ R 46877 (syntype, formerly TM 17692), TM 17689–91, 17693–95 (syntypes), 8 mi. W Aus (26°38′S, 16°08′E); JDV 30580, 5 km N Aus (2616Cb); SAM 46652, TM 37120–22, Aus (2616Cb); NMNW R 5408, Aus (26°37′S, 16°20′E); JDV 1930–32, 2038, 158 km E Lüderitz (2616Da); JDV 2191, 158 km E Kolmanskop (2616Da); **Bethanie District**: JDV 26080, 26680, 20 km S Helmeringhausen (2516Dd); JDV 30980, Farm Houmoed (2616Ba); JDV 26380, 33280, 35180, 35280, 35380, 36480, 39380, 20 km SW Helmeringhausen (2616Bb); JDV 30680, 30780, 20 km N Bethanien (2617Aa); TM 17722 (syntype), 20 mi E Konkiep (Goageb Station) (26°47′S, 17°32′E); TM 28422, Farm Tiras (2616Ba); JDV 3011, Namibia; **Keetmanshoop District**: ZMH 01873, railroad track near Keetmanshoop (2618Ca); **Maltahöhe District**: SAM 45524, 45528, Tsaris Pass (2416Cd); JDV 3351, Farm Duwisib (2516BC); SAM 44623, Sesriem (2415Bd); **Swakopmund District:** TM 32136, Amichab Mts. Game Res. No. 3 (2315Ba) [locality questionable]. **UNKNOWN LOCALITY**: JDV 2039, JDV 1065.

DIAGNOSIS.— A large species, to 50.2 mm SVL (TM 30580). *Pachydactylus acuminatus* may be distinguished from all other members of the *P. serval/weberi* group by the combination of the following characters: nostril rim not strongly inflated, rostral excluded from nostril; supranasals in contact anteriorly; scales on snout and canthus flattened to weakly domed, much larger than those of interorbital and parietal regions, which include tiny granules intermixed with small, weakly-conical tubercles; dorsal scalation highly heterogeneous, with small, oval, weakly to moderately keeled tubercles in 14–18 regular to irregular rows, smallest middorsally and on anterior third of body (approximately 3–5 times size of adjacent granules); thighs and shanks bearing enlarged conical to mucronate tubercles; toes relatively short, toe pads relatively wide (1.5–2.0 times width of proximal part of digit); typically 6 undivided lamellae beneath digit IV of pes; tail to at least 97% SVL, annulate, may be expanded greatly basally in association with fat storage, bearing whorls of small, rounded, very weakly-keeled, well-separated tubercles; adult pattern of yellowish- to pinkish-brown with traces of three wide transverse bands (on nape, trunk anterior to midbody, and sacrum) augmented by irregular brown blotches and spots, some with light centers, between bands, sometimes obscuring banding (Figs. 66, 68; see also Visser 1984:48); hatchlings and juveniles with broad, pale (white to grayish), dark-edged bands on the nape, just anterior to midbody, and over

lumbar region (Figs. 69–70; see also Visser 1984:49), occasionaly with one or more additional pale bands on trunk (Fig. 69, right).

Distribution.— This species appears limited to a roughly triangular area between Duwisib, Aus and Keetmanshoop (Figs. 10–11). However, the two easternmost localities, near Keetmanshoop and at Goageb Station, are associated with the same railroad line and it is possible that these animals may have been transported from the Aus region with ore or freight. A locality from the Amichab Mountains is far to the north of authenticated records and is here regarded as questionable and is not plotted on Fig. 11.

Natural History.— FitzSimons (1943) reported that egg size was 10.0×6.5 mm and that communal egg laying sites, with remains of 50–60 shells, were used by the species.

Conservation Status.— Nothing is known of the status of this species, but it seems unlikely that it is threatened within the sparsely populated area where it occurs. Griffin (2003) considered it confirmed or likely for the Namib-Naukluft Park, Naute Recreation Resort, and Ai-Ais/Hunsberg Reserve, as well as for the Sperrgebiet. However, we believe that the species as here interpreted may extend only into the Sperrgebiet.

Remarks.— Barbour and Loveridge (1946) referred to MCZ R 46817 as a paratype, but this is incorrect as no holotype was designated in the description of the species. However, TM 17722 (Fig. 66) is the only adult specimen in the type series and the bulk of the species description is based on this specimen.

Pachydactylus tsodiloensis Haacke, 1966

Figure 71.

1966 *Pachydactylus tsodiloensis* Haacke, *Arnoldia* (*Rhodesia*) 2(25):1, fig. 1, pl. 1 (Holotype: TM 30943: "Tsodilo Hills, N.W. Ngamiland, Bechuanaland [Botswana] (about 18°42′S., 21°45′E., altitude about 1,500 metres)," coll. W.D. Haacke, 17–19 April 1965. Paratypes: TM 30937–42, 30944–59: same collection data as holotype).
1987 *Pachydactylus tsodiloensis* Auerbach, *Amphib. Reptil. Botswana*:85, fig. p. 85.
1988 *Pachydactylus tsodiloensis* Branch, *Field Guide*, 1st ed.:208.
1991 [*Pachydactylus*] *tsodiloensis* Kluge, *Smithson. Herpetol. Inform. Serv*. 85:24.
1993 [*Pachydactylus*] *tsodiloensis* Kluge, *Gekkonoid Lizard Taxonomy*:25.
1994 *Pachydactylus tsodiloensis* Welch, *Lizards of the World* 1:95.
1994 *Pachydactylus tsodiloensis* Branch, *Field Guide*, 2nd ed.:208.
1998 *Pachydactylus tsodiloensis* Branch, *Field Guide*, 3rd ed.:262, pl. 112, upper right.
2000 [*Pachydactylus*] *tsodiloensis* Rösler, *Gekkota* 2:99.
2001 [*Pachydactylus*] *tsodiloensis* Kluge, *Hamadryad* 26:21.
2003 *P*[*achydactylus*]. *tsodiloensis* Bauer & Lamb, *Cimbebasia* 19:3.
2005 *P*[*achydactylus*]. *tsodiloensis* Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

Material examined.— Botswana: **Ngamiland**: MB uncatalogued*, SAM 43883–86, TM 30943 (holotype), 30937–42, 30944–59 (paratypes), 46168–72, 46176–81, 46285–86, NMZB-UM 16204, Tsodilo Hills (18°42′S, 21°45′E).

Diagnosis.— To 60.0 mm SVL (TM 46286; Haacke 1966). May be distinguished from all other members of the *P. serval/weberi* group by the combination of the following characters: rostral (and sometimes 1st supralabial) excluded from nostril; supranasals in broad contact anteriorly or separated by one or more granules; scales on dorsum of head granular, those on snout much comparable in size to largest scales of interorbital region; dorsal scalation heterogeneous, consisting of small flattened scales interspersed with much larger tubercles bearing a single central keel, tubercles becoming larger laterally and conical rather than keeled towards flanks; tubercles in 16–18

rows; thighs bearing enlarged keeled or conical tubercles; toes relatively short, toe pads relatively broad; typically 6–7 under digit IV of pes; tail to at least 125% of SVL, annulate, bearing whorls of relatively small, keeled, well-separated tubercles; adult pattern yellowish, grayish or russet with regular to irregular thick light (white, gray or yellow) bands with somewhat narrower dark brown borders, either extending across width of body or breaking up onto flanks; usually five (occasionally six) bands: one on nape, one across shoulders, two on mid trunk and one anterior to sacrum (Fig. 71; see also Haacke 1966: plate I; Barts and Haacke 1997, fig. 5; Barts et al. 2001, figs. 1, 5–6); juvenile pattern similar to adult (Haacke 1966, plate I; Barts et al. 2001, figs. 3–4). Dorsal bands may become obscured in larger adults, although a vague alternating light and dark pattern remains discernable.

Distribution.— Endemic to the Tsodilo Hills in Ngamiland, northwestern Botswana (Figs. 10–11). Auerbach (1987) suggested that the range of this species might extend beyond the Tsodilo Hills, but there is no evidence to support this. This is the only member of the group to occur outside of Namibia and South Africa.

Natural History.— Restricted to quartzite and sandstone outcrops (Barts et al. 2001, fig. 2) where they typically emerge at night onto rock surfaces, although they may descend to the ground to cross between boulders (Haacke 1966). Diet in the wild has been reported to include ants (Haacke 1966) as well as termites, spiders and other arthropods (Barts and Haacke 1997; Barts et al. 2001). Data on reproduction and diet in captivity have been reported by Barts and Haacke (1997, 2001) and Barts et al. (2001). *Pachydactylus turneri* co-occurs in the Tsodilo Hills and has been identified as a possible predator on *P. tsodiloensis*.

Conservation Status.— The Tsodilo Hills are remote and have been designated a World Heritage Site because of their many rock paintings. *Pachydactylus tsodiloensis* is probably under no serious threat from human activity.

Remarks.— Haacke (1966) placed the species in the *weberi* group without detailed explanation. Auerbach (1987) considered the taxonomic status of the species as "uncertain," but it is unambiguously distinct from all other members of the *P. weberi* group. Bauer and Lamb (2003a) presented evidence that *P. tsodiloensis* is closely related to *P. waterbergensis*.

Pachydactylus waterbergensis Bauer and Lamb, 2003

Figures 72–74.

1955 *Pachydactylus weberi acuminatus* [part] Mertens, *Abhandl. Senckenberg. naturf. Ges.* 490:49. fig. 104.
1971 *Pachydactylus weberi acuminatus* [part] Mertens, *Abhandl. Senckenberg. naturf. Ges.* 529:43.
2003 *Pachydactylus weberi werneri* [part] Griffin, *Namibian Reptiles*:33.
2003 *Pachydactylus waterbergensis* Bauer and Lamb, *Cimbebasia* 19: 5, figs. 1–3.
2005 *P*[*achydactylus*]. *waterbergensis* Bauer and Lamb, *Afr. J. Herpetol.* 54:116 (Holotype: NMWN R 6698 (Fig. 72): "Onjoka Settlement, Waterberg Plateau Park [Otjiwarongo District, Otjozondjupa Region, Namibia, 20°25′S, 17°21′E]," coll. K.P. Erb, 10 November 1993. Paratypes: TM 38268 (Fig. 73), 38285–86: "Waterberg, Otjiwarongo dist. [Otjozondjupa Region], S.W.A. [Namibia, (SE 2017 Ac, Ad, Ca, Cb); exact locality not specified]," coll. W.D. Haacke, 4 April 1970; TM 38285–86: "Waterberg, Otjiwarongo dist. [Otjozondjupa Region], S.W.A. [Namibia, (SE 2017 Ac, Ad, Ca, Cb); exact locality not specified]," coll. W.D. Haacke, 5 April 1970; SMF 45679: "Plateau des Grossen Waterberges bei der Farm Okatjikona," Otjiwarongo District, Otjozondjupa Region, Namibia (20°24′S, 17°24′E), coll. R. Mertens, 27 October 1952).

Material Examined.— Namibia: **Otjiwarongo District**: NMWN R 6698 (holotype), Onjoka Settlement, Waterberg Plateau Park (20°25′S, 17°21′E); TM 38265–67, 38268 (paratype), 38285–86 (paratypes), Waterberg, exact locality not specified (2017 Ac, 2017Ad, 2017Ca, or 2017Cb); SMF 45679

(paratype), "Plateau des Grossen Waterberges bei der Farm Okatjikona" (20°24′S, 17°24′E); TM 84477, Great Waterberg plateau, Farm Waterberg (20°20′24″S, 17°14′52″E).

PHOTOGRAPHIC VOUCHER: **NAMIBIA, Otjiwarongo District**.— Unnumbered specimen (Fig. 74), Waterberg Plateau, Otjiwarongo District, Otjozondjupa Region, Namibia (20°30′24″S, 17°14′52″E) (Bauer and Lamb 2003a). The tissue sample used in this study was derived from the specimen represented by the photographic voucher.

DIAGNOSIS.— To 49.3 mm (TM 38286). *Pachydactylus waterbergensis* may be distinguished from all other members of the *P. serval/weberi* group by the combination of the following characters: rostral excluded from nostril; supranasals very large and in broad contact; scales on dorsum of head flattened to weakly conical, those on snout larger than those of interorbital region; parietal table covered by small, conical tubercles intermixed with even smaller granules; dorsal scalation heterogeneous, smaller conical scales with larger, keeled tubercles in approximately 20 rows; thighs bearing enlarged conical tubercles; toes relatively short, toe pads moderately wide; typically 5 undivided lamellae under digit IV of pes; tail to at least 116% of SVL, annulate, bearing whorls of small, keeled tubercles, well-separated from one another; adult pattern of narrow, dark-bordered pale (white to yellow) bands on a reddish-brown background: one on nape, one at forelimb insertion, 2–3 on trunk, and one anterior to sacrum; tail with numerous narrow pale bands; juvenile pattern unknown, probably similar to adult.

DISTRIBUTION.— This species is known only from the Waterberg Plateau Park and the adjacent farms Onjoka and Okatjikona in north-central Namibia (Figs. 10–11).

NATURAL HISTORY.— Found in association with sandstone cliffs, boulders, or exposures.

CONSERVATION STATUS.— The bulk of the range of this species lies within the Waterberg Plateau Park and thus receives formal protection. The species is secure, but like any highly geographically restricted species, *P. waterbergensis* is potentially vulnerable to habitat destruction.

REMARKS.— Bauer and Lamb (2003a) identified this species as the sister species of *P. tsodiloensis*.

Pachydactylus reconditus Bauer, Lamb, and Branch, sp. nov.

Figures 75–81.

1911 *Pachydactylus capensis* [part] Sternfeld, *Fauna dtsch. Kolon.* 4(2):14.
1911 *Pachydactylus Weberi* [part] Sternfeld, *Fauna dtsch. Kolon.* 4(2):14.
1911 *Pachydactylus Weberi* Sternfeld, *Mitt. Zool. Mus. Berlin* 5:397.
1929 *Pachydactylus weberi* Lawrence, *J. S.W. Afr. Sci. Soc.* 2:25.
1936 *Pachydactylus weberi* [part] Parker, *Novit. Zool.* 40:130.
1938 *Pachydactylus weberi weberi*? FitzSimons, *Ann. Transvaal Mus.* 19:181.
1947 *Pachydactylus weberi werneri* [part] Loveridge, *Mem. Mus. Comp. Zool.* 98:394.
1955 *Pachydactylus weberi acuminatus* [part] Mertens, *Abhandl. Senckenberg. naturf. Ges.* 490:49.
1965 *Pachydactylus weberi acuminatus* [part] Wermuth, *Das Tierreich* 80:123.
1971 *Pachydactylus weberi acuminatus* [part] Mertens, *Abhandl. Senckenberg. naturf. Ges.* 529:43.
1984 *Pachydactylus weberi* [part] Visser, *Landbouweekbl*. 27 April 1984:53.
1993 *Pachydactylus weberi* [part] Branch, *Southern African Snakes*:121.
1988 *Pachydactylus weberi* [part] Branch, *Field Guide*:208, pl. 86, bottom.
1994 *Pachydactylus weberi* [part] Branch, *Field Guide,* 2nd ed.:208, pl. 86, bottom.
1998 *Pachydactylus weberi* [part] Branch, *Field Guide*, 3rd ed.:263, pl. 86, bottom.
2002 *Pachydactylus* cf. *weberi* Bauer et al., *Proc. California Acad. Sci.* 53:25.
2003 *Pachydatylus w*[*eberi*]. *acuminatus* Bauer and Lamb, *Cimbebasia* 19:3.
2003 *Pachydactylus weberi werneri* [part] Griffin, *Namibian Reptiles*:33.
2005 *P*[*achydactylus*]. *weberi* [part] Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

Type Material.— Holotype: TM 32838 (Fig. 75): Adult female; Namibia, Khomas Region Windhoek District, Windhoek (2217Ca), coll. W.J. Steyn and A. Mitchell, 27 February 1965. Paratypes: CAS 231886* (Figs. 76–77): Adult female; Namibia, Hardap Region, Rehoboth District, Oanab Dam, 7 km NW Rehoboth (2316Bb), coll. A.M. Bauer, 19 July 1998. TM 41993 (Fig. 76): Adult male, TM 41994 (Fig. 76): Juvenile female; Namibia, Erongo Region, Karibib District, Farm Komuanab 111 (2215Db), coll. W.D. Haacke, 14 March 1972. NMNW R 3745: Juvenile; Namibia, Khomas Region, Windhoek District, Avis Dam (22°33′S, 17°07′E), coll. H. Berger-Dell'mour, 8 February 1984. NMNW R 3462: Adult male; Namibia, Khomas Region, Windhoek District, Windhoek West, Hippocrates St. (22°33′S, 17°04′E), coll. H. Berger-Dell'mour, 1 July 1983. NMNW R 3465: Juvenile; Namibia, Khomas Region, Windhoek District, Windhoek West, Hippocrates St. (22°33′S, 17°04′E), coll. H. Berger-Dell'mour, 14 August 1983. NMNW R 10493*: Adult female; Namibia, Khomas Region, Windhoek District, Klein Windhoek (2217Ca), coll. M. Griffin, 18 February 2002.

Additional Material.— **Namibia**: **Rehoboth District**: JDV 3009, 80 km N Kalkrand, 26 km W Tsumis (2317Ca); SAM 46645, Gamgam, Tsumis (2317Ca); **Windhoek District**: TM 31638, Farm Rostock (2315Bd); SMF 45861, Djab (2316Ab); TM 25103, Farm Valencia (2316Ab); TM 57872, Farm Uruganus (22°51′S, 16°17′E); ZFMK 33102, Farm Frauenstein (2217Ad); NMNW R 7867, 7869, Otjompaue (2216Db); TM 41526, 12 km S Windhoek (2217Ca); CM 115642, PEM R 12845–46, NMNW R 133, TM 32829, 32832–37, 32839–42, ZFMK 18339, 21949, ZMB 22733, Windhoek (2217Ca); TM 28781–82, NMNW R 10495, number pending, Klein Windhoek (2217Ca); NMNW R 5387, Moltkeblick, Auas Mts. (22°39′S, 17°10′E); NMNW R 4684, Krupp St., Suiderhof, Windhoek, Krupp St. (22°34′S, 17°06′S); NMNW R 3744, Avis Dam, Windhoek (22°33′S, 17°07′E); NMNW R 3463–64, 3466, 3853–54, Hippocrates St., Windhoek West, (22°33′S, 17°04′E); NMNW R 1444, 1533, Goreangab Dam, Windhoek (2217Ca); TM 32826–28, Lichtenstein (2217Cc); TM 31138, Farm Oamites, 20 mi S Windhoek (2217Cc); **Karibib District**: TM 33650, Horebis Nord (2215Bc); TM 41992, 41995, Farm Komuanab 111 (2215Db); TM 29703, Usakos (2115Dc); JDV 3013, jct. Otjimbingwe and Swakopmund-Windhoek roads (2116Cd); **Gobabis District**: ZMB 18248, Gobabis (? 2218Bd); **Okahandja District**: SMF 45678, 65940–43, Okahandja (2116Dd); **Omaruru District**: SAM 47075, Ugab River at Rd. 76 (20°52′S, 14°57′E); **Imprecise Locality**: ZMB 29127, "Südwest-Afrika."

Etymology.— The specific epithet is the Latin word *reconditus*, meaning hidden or concealed. It refers to the fact that this species, which has long been known from specimens, and which is common in and around Windhoek, has escaped recognition as a distinct species for almost 100 years. The name is formed in the masculine.

Diagnosis.— A mid-sized species, to 44.7 mm SVL (TM 41993). *Pachydactylus reconditus* may be distinguished from all other members of the *P. serval/weberi* group by the combination of the following characters: nasal region moderately inflated laterally; rostral excluded from nostril; supranasals in broad or narrow contact, or completely separated by internasal granule; scales on snout granular, rounded to oval, domed to very weakly conical; interorbital scales smaller than those of snout, heterogeneous; posterior parts of head covered with small granules intermixed with many larger, rounded, conical tubercles regularly distributed across parietal and temporal regions, changing to dorsal trunk scalation on occiput; dorsal scalation heterogeneous, with large, strongly keeled rounded to oval tubercles arranged in 18–20 rows, largest on midflanks; thighs bearing enlarged conical tubercles; toes relatively short, toe pads relatively narrow; typically 5 undivided lamellae beneath digit IV of pes; tail to 115% of SVL, annulate, bearing whorls of moderately large, flattened, pointed, weakly-keeled tubercles, becoming conical distally; caudal tubercles usually separated from each other by a single scale; adult pattern pinkish-, yellowish- or reddish-brown or light brown with a dark-edged pale (white, pale yellow or grayish) nape band that may be entire or partially disrupted; remainder of dorsum patterned with regularly distributed, small dark brown markings; tail not banded, bearing scattered dark marks (Figs. 75–78; see also Girard 2002); hatchling pattern uniform light to mid-brown with a discrete pale nape band (e.g., NMNW number pending; Fig. 79); juvenile pattern similar to hatchling (Fig. 80–81) or with three vague pale trunk bands

(two on mid-trunk one presacral) (e.g.,TM 41994; Fig. 76). This species is most similar to *P. robertsi*, from which it may be distinguished by its slightly smaller, non-imbricating dorsal tubercles and wider toe pads.

Description (based on holotype).— Adult female. Snout-vent length (SVL) 42.2 mm. Body relatively depressed, relatively long (TrunkL/SVL ratio 0.44). Head elongate, large (HeadL/SVL ratio 0.29), narrow (HeadW/HeadL ratio 0.64), moderately depressed (HeadH/HeadL ratio 0.36), distinct from neck. Lores and interorbital region weakly inflated. Snout short (Sn-Eye/HeadL ratio 0.34), much longer than eye diameter (OrbD/Sn-Eye ratio 0.70); scales on snout and forehead smooth, domed to weakly conical; large on snout and canthus becoming smaller and heterogeneous; scales on snout much larger than tiny granules of parietal table. Enlarged, rounded, conical tubercles densely and regularly scattered across interorbital, parietal, and temporal regions as far posterior as occipuit. Eye moderately small (OrbD/HeadL ratio 0.24); orbits without extra-brillar fringes; 5 supracilliary scales at posterodorsal corner of orbit bearing small spines; pupil vertical, with crenelated margins. Ear opening rounded, small (EarL/HeadL ratio 0.07); eye to ear distance slightly greater than diameter of eyes (EyeEar/OrbD ratio 1.05). Rostral approximately 37% as deep (0.4 mm) as wide (1.1), no rostral groove, contacted by two enlarged supranasals and first supralabials; nostrils oval, oriented laterally, each surrounded by two postnasals, supranasal, and first supralabial; supranasals in contact anteriorly, separated by a single granule posteriorly; dorsal postnasals larger than ventral postnasals, separated by 2–3 granules; nostril rims weakly inflated, bordered posteriorly by a slight depression; one row of scales separate orbit from supralabials; mental wedge-shaped, tapering posteriorly, approximately 2.3 times deeper (1.5 mm) than wide (0.7 mm); no enlarged postmentals or chin shields. Supralabials to angle of jaws 10/8 (8/7 to mid-orbit); infralabials 8/8; interorbital scale rows at midpoint of orbit 21 (9 across narrowest point of frontal bone).

Dorsal tubercles large (10–12 times size of adjacent scales), largest on midflanks and smallest along dorsal midline, oval, with a pronounced median keel, forming 20 longitudinal rows on trunk; each tubercle surrounded by rosette of small granular scales; ventral scales flattened, imbricate, becoming larger posteriorly, approximately 37 between lowest tubercular rows at midbody; tubercular scales on dorsum at midbody larger than ventral scales at same level; chin granules approximately one sixth to one fourth size of ventral scales, increasing in size gradually on throat. No preanal or femoral pores. Scales on palm, sole, and ventral surface of forelimb smooth, granular; scales on ventral aspect of hindlimbs enlarged, continuous with enlarged scales of precloacal region; scales on dorsal aspect of forelimb smooth proximally, with small conical tubercles intermixed distally; scales on dorsum of thigh and crus greatly enlarged, conical or keeled.

Forelimbs moderately short, stout (ForeaL/SVL ratio 0.13); hindlimbs short (CrusL/SVL ratio 0.15); digits relatively short, claws absent; subdigital scansors, except for distalmost, entire, present only on distal portion of toes, 1.2–1.5 times wider than more basal (non-scansorial) subdigital scales; interdigital webbing absent. Relative length of digits (manus): III > IV > II > V > I; (pes): IV > III ~ V > II > I. Subdigital scansors (excluding small distal divided scansor) I (4), II (4), III (4), IV (4), V (4) – manus; I (4), II (5), III (5), IV (5), V (5) – pes.

Tail sub-cylindrical, depressed; partially regenerated tail longer than snout-vent length (TailL/SVL ratio 1.17; based on CAS 231886); tail relatively thin basally, tapering, with distinct whorls of scales; each transverse row of enlarged, oval, pointed, weakly keeled tubercles separated by 2–3 rows of smaller scales; adjacent keeled dorsal caudal tubercles generally separated by a single smaller scale; subcaudal scales imbricating; midventral caudal scales enlarged relative to adjacent scales (5–7 times size of dorsal caudal scales); one slightly enlarged, conical, posterodorsally-projecting postcloacal spur on each side of tailbase.

Coloration (in life): Dorsum pinkish-, yellowish- or reddish-brown to light brown with a dis-

tinct whitish, pale yellow or grayish band bordered anteriorly and posteriorly by narrow dark brown bands, the anterior of which extendining from posteroventral margins of orbit across nape. Remainder of dorsum bearing small, regular, mid- to dark brown spots or blotches, more pronounced anteriorly. A midbrown streak from postnasals to orbit, bordered above by a cream streak from nostril to anterodorsal margin of orbit. Infralabial and posterior supralabial scales white. Scales around orbit yellow. Limbs unpatterned or with faint darker or lighter markings. Tail same color as dorsum, uniform or with small, indistinct somewhat darker markings, caudal tubercles pale yellow. Venter white with very light scattered pigment, especially under limbs and post-pygal portion of tail.

Variation.— Variation in mensural characters of the holotype and most paratypes are presented in Table 2. Neck band broken in some specimens (e.g., paratype TM 41993; Fig. 76), but still clearly discernable. Limbs spotted in some individuals (e.g., TM 41993; Fig. 76). Hatchling (NMNW R number pending; Fig. 79) with uniform mid-brown dorsum and well defined white nape band. Juvenile (TM 41994; Fig. 76) with three very faint trunk bands (anterior and posterior of mid-trunk and presacral) in addition to prominent nape band. A juvenile specimen was illustrated by Seufer (1991:124 bottom), showing a yellowish tint to the nape band and dorsal pattern grading from pinkish anteriorly to grayish-brown posteriorly, with pale yellowish tubercle tips on the tail.

Distribution.— Griffin (2003) considered that the species (as *P. weberi werneri*) occurred in South Africa as well as Namibia, but our results suggest that it is a Namibian endemic. Griffin (2003) cited its occurrence in the Maltahöhe, Bethanie, Keetmanshoop, Lüderitz, and Karasburg districts. Our confirmed localities are all in central Namibia, chiefly at elevations above 1500 m in the Khomas Hochland and adjacent areas (Figs. 10–11). An old eastern record from Gobabis, (Fig. 11, yellow "?") is probably imprecise and may be from anywhere in the Gobabis district as it existed early in the 20th century.

Natural History.— This species is rupicolous and is also found in edificarian habitats in and around Windhoek.

Conservation Status.— *Pachydactylus reconditus* is widely distributed in central Namibia and is probably under no specific threats. It occurs in several protected areas such as Daan Viljoen Game Park and the Namib-Naukluft Park. In addition, it adapts well to human-altered habitats and occurs on buildings in and around Windhoek.

Remarks.— The first specimens of this form were noted, as *P. weberi*, from Windhoek and Gobabis by Sternfeld (1911a).

Pachydactylus monicae Bauer, Lamb, and Branch, sp. nov.

Figures 82–87.

1988 *Pachydactylus weberi* [part] Branch, *Field Guide*:208.
1994 *Pachydactylus weberi* [part] Branch, *Field Guide*, 2nd ed.:208.
1998 *Pachydactylus weberi* [part] Branch, *Field Guide*, 3rd ed.:263.
2003 *Pachydactylus* cf. *weberi* [part] Bauer and Branch, *Herpetol. Nat. Hist.* 8:134.
2005 *P*[*achydactylus*]. *weberi* [part] Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

Type Material.— Holotype: CAS 200034* (Figs. 82–83): Adult male; South Africa, Northern Cape Province, Richtersveld National Park, Sendelingsdrif (2816Bb), coll. A.M. Bauer, W.R. Branch and D.A. Good, 20 September 1995. Paratypes: CAS 200079* (Fig. 85): Juvenile mlae; South Africa, Northern Cape Province, Richtersveld National Park, Sendelingsdrif (2816Bb), coll. A.M. Bauer and D.A. Good, 30 September 1995. CAS 193406*: Adult male; South Africa, Northern Cape Province, Richtersveld National Park, Potjiespram, S bank of Orange River (2816Bb), coll. A.M. Bauer, H.E. Robeck, D. King and J.V. Vindum, 30 June 1993. CAS 193417: Juvenile; South Africa, Northern Cape Province, Richtersveld National

Park, Sendelingsdrif (2816Bb), coll. A.M. Bauer, H.E. Robeck, D. King and J.V. Vindum, 30 June 1993. PEM R 7626: Adult female; South Africa, Northern Cape Province, Richtersveld National Park, Reuning Mine (2816Bb), coll. H.H. Braack (no date of collection recorded). PEM R 11952: Adult female; South Africa, Northern Cape Province, Richtersveld National Park, Sendelingsdrif (28°07′S°, 16°53′E), 50 m, coll. W.R. Branch, A.M. Bauer and D.A. Good, 20 September 1995. TM 33806: Adult female; South Africa, Northern Cape Province, Richtersveld National Park, Swartpoort (2816Bb), coll. W.D. Haacke, 25 September 1967. TM 36367: Adult female; Namibia, Karas Region, Karasburg District, Fish River Canyon (bottom at viewing point) (2717Da), coll. W.D. Haacke, May 1963. TM 41852: Adult male; Namibia, Karas Region, Karasburg District, Farm Holoog (2717Bd), coll. W.D. Haacke, March 1972. TM 28297: Adult male; Namibia, Karas Region, Karasburg District, Fish River Canyon (27°35′S, 17°37′E), coll. W.D. Haacke, December 1962.

Additional Material.— South Africa: **Northern Cape Province**: PEM R 1959, above Springbokvlakte, Richtersveld National Park (2817Ca); CAS 193418*, 193419, 200049, LSUMZ 57343–44, PEM R 7324–25, 11952, Sendelingsdrif, Richtersveld National Park (2816Bb). **Namibia**: **Lüderitz District**: TM 35457, 10 mi. NW Fish River Mouth (2817Aa); CAS 201879*, 7.6 km W of Fish River Mouth (28°03′43″S, 17°07′25″E); NMNW R 178 (2 specimens), TM 35362, Farm Namuskluft (2716Dd); [?] PEM R 12866, Obib Mts. (2816Ba); CAS 201887*, NMNW 8869, Witputz Sud, ca. 40 km N Rosh Pinah (27°40′18″S, 16°43′10″E); TM 35384, Farm Spitzkop (2716Dc); **Karasburg District**: TM 41854–57, Farm Holoog (2717Bd); TM 27977, 28298, Fish River Canyon (27°35′S, 17°37′E); SAM 43488, TM 32830–31, 32865, Ai-Ais (2717Cd); NMNW 8856, Ai-Ais Nature Reserve, c. 3 km N Orange River (28°12′26″S, 17°16′43″E); TM 47014, 2 km NE Ai-Ais (2717Dc); JDV N26080, 20 km N Ai-Ais (2717Dc).

Etymology.— The specific epithet is a matronym honoring Monica Frelow Bauer, wife of the senior author, for her tolerance of long absences in the field and long hours in the laboratory and her support of systematic herpetology. The name is constructed in the feminine genitive.

Diagnosis.— A large species, to 47.9 mm SVL (TM 36367). *Pachydactylus monicae* may be distinguished from all other members of the *P. serval/weberi* group by the combination of the following characters: nostril rim not strongly inflated laterally; rostral excluded from nostril; supranasals in variable contact; scales on snout and canthus smooth, flattened to weakly domed; interorbital and parietal regions with smaller granules interspersed with domed to weakly conical tubercles; scales on snout comparable in size to interorbital tubercles, much larger than granular scales of parietal table; dorsal scalation heterogeneous, with moderately large, rounded, strongly keeled tubercles in 16–18 regular rows; thighs bearing scattered moderately enlarged conical to keeled tubercles; toes relatively short, toe pads relatively wide; typically five undivided lamellae beneath digit IV of pes; tail annulate, bearing whorls of moderately large, oval, strongly keeled tubercles, some with striated surfaces, usually separated from each other by a single narrow scale; adult pattern of three broad pale bands (one on nape, one anterior of midbody, one on lumbar region), each bordered by narrow dark edges, on a grayish- to yellowish-brown background; dark edges often fade with age/size and dark speckles in interspaces between bands, and within pale bands can result in obscuring of bands (Figs. 82–84); tail with alternating yellowish-brown and much narrower mid-brown bands; hatchling with dark brown body with pale transverse bands in same positions as adult, dark brown becoming paler in juveniles, yielding a bold banded pattern of alternating brown to grayish-brown and whitish to pale yellowish bands, separated by narrow dark brown to blackish borders; larger juveniles usually with stray dark markings between bands, as in adults (Figs. 85–87).

Description (based on holotype).— Adult male. Snout-vent length (SVL) 44.1 mm. Body relatively depressed, relatively short (TrunkL/SVL ratio 0.42). Head elongate, large (HeadL/SVL ratio 0.31), narrow (HeadW/HeadL ratio 0.61), moderately depressed (HeadH/HeadL ratio 0.36), distinct from neck. Lores and interorbital region somewhat inflated. Snout short (Sn-Eye/HeadL ratio 0.33), much longer than eye diameter (OrbD/Sn-Eye ratio 0.71); scales on snout and forehead smooth, flattened to domed; large on snout and canthus, becoming granular on interorbital region with larg-

er, weakly conical tubercles, approximately same size as snout scales, interspersed; scales on snout much larger than granular scales of parietal table. Enlarged conical tubercles regularly scattered across interorbital, parietal and temporal regions as far posterior as nape. Eye moderately small (OrbD/HeadL ratio 0.24); orbits without extra-brillar fringes; approximately 8 supracilliary scales at posterodorsal corner of orbit bearing small spines; pupil vertical, with crenelated margins. Ear opening oval, more-or-less horizontally oriented, moderate (EarL/HeadL ratio 0.08); eye to ear distance equal to diameter of eyes (EyeEar/OrbD ratio 1.00). Rostral approximately 50% as deep (0.8 mm) as wide (1.5), no rostral groove, contacted by two enlarged supranasals and first supralabials; nostrils oval, oriented laterally (L) or anteriorly (R), each surrounded by two postnasals, supranasal, and first supralabial; supranasals in contact anteriorly, separated by a single granule posteriorly; dorsal postnasals larger than ventral postnasals, separated by 3 granules; nostril rims very weakly inflated, bordered posteriorly by a slight depression; one row of scales separate orbit from supralabials; mental with nearly parallel sides, tapering only slightly posteriorly, approximately 2.6 times deeper (1.8 mm) than wide (0.7 mm); no enlarged postmentals or chin shields. Supralabials to angle of jaws 10/10 (8/8 to mid-orbit); infralabials 8/8; interorbital scale rows at midpoint of orbit 24 (7 across narrowest point of frontal bone).

Dorsal tubercles relatively small (4–6 times size of adjacent scales), largest on midflanks and smallest along dorsal midline, oval, with a pronounced median keel, forming 16 regular longitudinal rows on trunk; each tubercle surrounded by rosette of small granular scales; ventral scales flattened, oval, subimbricate to imbricate, becoming larger posteriorly, largest on posterior abdomen and in precloacal region, approximately 24 between lowest granular rows on flank at midbody; tubercular scales on dorsum at midbody larger than ventral scales at same level; chin granules approximately one third to one fourth size of ventral scales, increasing in size rather abruptly on throat. No preanal or femoral pores. Scales on palm, sole, and ventral surface of forelimb smooth, granular; scales on ventral aspect of thighs enlarged, continuous with enlarged scales of precloacal region; scales on dorsal aspect of forelimb smooth, juxtaposed to subimbricate proximally, with small conical tubercles intermixed distally; scales on dorsum of thigh and crus enlarged, conical.

Forelimbs moderately long, stout (ForeaL/SVL ratio 0.14); hindlimbs moderately long (CrusL/SVL ratio 0.17); digits relatively short, claws absent; subdigital scansors, except for distalmost, entire, present only on distal portion of toes, approximately 1.5 times wider than more basal (non-scansorial) subdigital scales; interdigital webbing absent. Relative length of digits (manus): III > IV > II > V > I; (pes): IV > III ~ V > II > I (most of digits I and II of right manus missing in holotype). Subdigital scansors (excluding small distal divided scansor) I (4), II (4), III (4), IV (4), V (4) – manus; I (4), II (5), III (5), IV (5), V (5) – pes.

Tail sub-cylindrical, somewhat depressed; partially regenerated tail longer than snout-vent length (TailL/SVL ratio 1.02); tail moderately thick basally, tapering, with distinct whorls of scales; each transverse row of enlarged, oval, strongly keeled tubercles separated by 3–4 rows of smaller scales; adjacent keeled dorsal caudal tubercles separated by a single smaller, often narrow and elongate scale; subcaudal scales subimbricating to imbricating, enlarged (3–5 times dorsal caudal scales), midventral scales not much enlarged relative to adjacent subcaudals; two enlarged, pointed, partly recurved postcloacal spurs on each side of tailbase, anterior considerably larger than posterior.

Coloration (in life): Dorsum beige or yellowish- or grayish-brown with three wide, pale transverse bands with narrow mid-brown borders. First band across nape and continuing anteriorly through ventral half of orbit. Second band on trunk anterior to midbody, third extending forward from anterior margin of hindlimb insertion. Scattered light to mid-brown flecks across the entire dorsum, both between and within pale transverse bands. Dorsum of head with small, scattered

brown spots and dashes. A thick midbrown line from nostril through orbit to above ear, continuous with anterior dark border of nape band. A faint brown streak from supranasals posteriorly along dorsal midline to level of anterior orbit. Dorsal circumorbital scales pale yellow, ventral circumorbital scales white. Anterior supralabials brown; posterior supralabials and all infralabials white with scattered brown pigment spots. Limbs same color as dorsum with scattered darker markings. Tail with alternating beige and mid-brown bands; the former 2–3 times width of latter. Caudal tubercles and those of flanks with whitish tips. Venter white to cream with very faint scattered pigment along edges of flanks, chin and limbs.

VARIATION.— Variation in mensural characters of the holotype and paratypes are presented in Table 3. Paratypes similar to holotypes in most scalation features. Three cloacal spurs on each side of tail base in TM 41852. Hatchlings (e.g. TM 32830, SVL 19.5 mm; Fig. 86) with dark brown trunk with dark-edged cream bands across nape, anterior midtrunk and presacral region. Tail with discrete alternating dark brown and cream annuli, cream annuli approximately twice width of brown. Larger juveniles (23.2–30.6 mm SVL; e.g. CAS 193417) with dorsal background coloration faded to light brown, transverse bands bold and strongly contrasting. Larger individuals with varying degrees of scattered brown markings on dorsum, always between pale transverse bands and in larger individuals within these bands as well. Bands faded to near background color, but still discernable, in largest specimens (e.g., TM 33806; Fig. 84). Color blanched in PEM paratypes. Specimens from Farm Holoog especially boldly patterned, with few if any stray markings between or within transverse bands (Figs. 84–85).

DISTRIBUTION.— *Pachydactylus monicae* is distributed in and around the lower Orange River Valley and lower Fish River Valley and its tributary, the Holoog River (Figs. 21–22, 30). In the west it reaches the Rosh Pinah area in the Lüderitz District. In the Northern Cape Province of South Africa it has thus far been collected only along the Orange River in the Richtersveld National Park. It is sympatric with another new species in the *weberi* group throughout much of its range, and with *P. weberi* at Sendelingsdrif in the Richtersveld.

NATURAL HISTORY.— This is one of the most terrestrial species in the *P. weberi* group. It is almost exclusively restricted to riverine environments (Fig. 88). At Sendelingsdrif it has been collected underneath trash and other debris some distance from rocky areas. The holotype was collected in a pile of logs. One specimen (CAS 200049) was found dessicated in an unused garage at Sendelingsdrif. Elsewhere it occupies boulder outcrops in relatively mesic low elevation areas (Fig. 89).

CONSERVATION STATUS.— Virtually the entire range of *P. monicae* occurs within the Ai-Ais/Richtersveld Transfrontier Park, where it is adequately protected. However, its restriction to riverine environments makes it susceptible to habitat damage from periodic floods, alluvial mining activity and other perturbations.

***Pachydactylus griffini* Bauer, Lamb, and Branch, sp. nov.**
Figures 90–92.

1914 *P*[*achydactylus*] *purcelli* [part] Methuen and Hewitt, *Ann. Transvaal Mus.* 4:131.
1947 *Pachydactylus purcelli* [part] ? Loveridge, *Bull. Mus. Comp. Zool.* 98:362.
2005 *P*[*achydactylus*]. *serval* [part] Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

TYPE MATERIAL.— HOLOTYPE: CAS 125855 (Fig. 90): Subadult female; Namibia, Karas Region, Keetmanshoop District, 4 mi NW Aroab on rd. to Keetmanshoop (2619Dc), coll. T.J. Papenfuss, 13 May 1970. PARATYPES: CAS 125854 (Fig. 91): Adult female; same collection data as holotype. CAS 186294* (Fig. 91): Adult male, CAS 186295 (Fig. 92): Juvenile; Namibia, Karas Region, Karasburg District, Farm Narudas, 0.5 km N of house (2718Bd), coll. A.M. Bauer, 10 July 1992. MCZ R 163286 (formerly JDV 31680) (Fig. 91):

Adult male; Namibia, Karas Region, Keetmanshoop District, between Narubis and Aroab (2619C, 2619D, 2719A or 2719B), coll. J.D. Visser, 4 August 1980. TM 3099 (Fig. 92): Juvenile; Namibia, Karas Region, Karasburg District, Narudas Süd (27°21′S, 18°51′E), coll. P.A. Methuen, 30 October 1912.

Etymology.— The specific epithet of this Namibian endemic is a patronym honoring Mike Griffin, Senior Support Specialist, Ministry of the Environment and Tourism, Windhoek, Namibia. Mr. Griffin has contributed greatly to the knowledge and conservation of the herpetofauna of Namibia and for many years has provided support and advice during our research expeditions to Namibia. The name is constructed in the masculine genitive.

Diagnosis.— A small species, to 39.4 mm SVL. *Pachydactylus griffini* may be distinguished from all other members of the *P. serval/weberi* group by the combination of the following characters: snout strongly inflated laterally; rostral enters nostril; supranasals in narrow or broad contact; scales on dorsum of head uniform and granular, those on snout larger than those of interorbital region; no tubercles on parietal table; dorsal scalation largely homogeneous, with small, scattered, flattened, weakly keeled tubercles in four rows, two on each dorsolateral margin of abdomen and sacrum; thighs without tubercles; toes relatively long, slender, toe pads relatively wide; five undivided lamellae beneath digit IV of pes; tail to at least 88% of SVL (no adult specimens with original tail), weakly annulate, bearing whorls of small, weakly keeled, pointed tubercles with striated surfaces, usually separated from each other by single scales; adult pattern of small, mostly rounded, spots evenly distributed across dorsum, with some trace of two transverse, thin, dark lines or rows of spots across occiput and nape (Figs. 90–91); juvenile pattern as adult, this is the only member of the group to have spotted hatchlings and juveniles (Fig. 92).

Description (based on holotype).— Adult female. Snout-vent length (SVL) 30.3 mm. Body relatively depressed, moderately long (TrunkL/SVL ratio 0.45). Head elongate, large (HeadL/SVL ratio 0.29), relatively wide (HeadW/HeadL ratio 0.68), somewhat depressed (HeadH/HeadL ratio 0.36), distinct from neck. Lores and interorbital region strongly inflated. Snout short (Sn-Eye/HeadL ratio 0.35), longer than eye diameter (OrbD/Sn-Eye ratio 0.73); scales on snout and forehead round to oval, flattened, granular becoming weakly conical near anterior border of orbits; scales on snout slightly larger than those of anterior interorbital area, much larger than those of parietal table. Eye moderately large (OrbD/HeadL ratio 0.26); orbits without extra-brillar fringes; 3–4 supracilliary scales at posterodorsal corner of orbit bearing small spines; pupil vertical,with crenelated margins. Ear opening oval, large (EarL/HeadL ratio 0.10), angled posterodorsally at 45% to horizontal; eye to ear distance less than diameter of eyes (Eye-Ear/OrbD ratio 0.87) [slightly greater than diameter of eyes in paratypes]. Rostral less than 50% as deep (0.6 mm) as wide (1.2); no rostral groove; contacted by two enlarged supranasals and first supralabials; nostrils oval, oriented laterally and slightly dorsally, each surrounded by rostral, two postnasals, supranasal, and first supralabial; supranasals in broad contact; dorsal postnasals twice size of ventral postnasals, separated by three granules; nostril rims weakly inflated; one row of scales separate orbit from supralabials; mental wedge-shaped, approximately 1.6 times deeper (1.2 mm) than wide (0.7 mm); no enlarged postmentals or chin shields. Supralabials to angle of jaws 10/10 (8/8 to mid-orbit); infralabials 10/9; interorbital scale rows at midpoint of orbit 22 (7 across narrowest point of frontal bone).

Dorsal scales small, granular. Tubercles small (2–3 times size of adjacent scales), rounded, with a weak median keel, in four rows – two on each dorsolateral margin of the trunk, chiefly over sacrum and abdomen; ventral scales flattened, imbricate, becoming somewhat larger posteriorly, approximately 29 between lowest rows of granular scales on flanks at midbody; scales on venter at midbody much larger than those on dorsum at same level; chin granules approximately one third to one fourth size of ventral scales, increasing gradually in size on throat. No preanal or femoral pores. Scales on palm and sole granular to weakly conical; ventral surface of shank and forearm with

smooth, imbricating scales with ctenate free margins; preaxial surfaces of basal limb segments with smooth, enlarged, imbricating scales grading into juxtaposed granules on postaxial surfaces; scales on ventral aspect of thighs enlarged.

Forelimbs moderately short, stout; forearm short (ForeaL/SVL ratio 0.16); hindlimbs relatively short, tibia moderately short (CrusL/SVL ratio 0.17); digits relatively long, claws absent; subdigital scansors, except for distalmost, entire, present only on distal portion of toes, 1.5–2.0 times wider than more basal (non-scansorial) subdigital scales; interdigital webbing absent. Relative length of digits (manus): III > IV > II ~ V > I; (pes): IV > III ~ V > II > I. Subdigital scansors (excluding small distal divided scansor) I (4), II (4), III (4), IV (4), V (4) – manus; I (4), II (5), III (5), IV (5), V (5) – pes.

Tail sub-cylindrical, weakly depressed; partially regenerated tail shorter than snout-vent length (TailL/SVL ratio 0.87); tail relatively thin basally, tapering, with distinct whorls of scales; each transverse row of smooth oval tubercles separated by 3 rows of smaller scales; smaller scales rectangular with rounded free margins; subcaudal scales rounded, pointed posteriorly, larger than dorsal caudal scales; scales of midventral row larger than adjacent rows; a single, slightly enlarged, rounded, dorsally-projecting postcloacal spur on each side of tailbase.

Coloration (in preservative): Dorsal color straw, with small, rounded, evenly distributed light brown spots arranged in 4–6 relatively regular longitudinal rows on trunk. A thin, transverse, light brown line across occiput and another shorter line and three spots forming an incomplete line across nape. Pareital table, interorbital area and snout with scattered brown spots and blotches. A brown line from nostril, through center of eye, over ear to level of transverse occipital line. Anterior supralabial scales midbrown; more posterior supralabials and all infralabials cream to straw with a tinge of brown pigment on labial margins. Limbs with scattered clusters of light brown scales, forming weakly defined spots. Tail with small brown spots, like dorsum, with white tubercles. Venter buff, without pigmentation. Methuen and Hewitt (1914) indicated that the color of the paratype TM 3099 in life was straw with black markings.

Variation.— Comparative mensural data for holotype and adult paratypes presented in Table 4. Paratypes CAS 186294 and MCZ R 163286 (Fig. 91) have larger dorsal spots than the holotype and have the occipital band incomplete. Male paratypes have cloacal spurs consisting of 2–3 enlarged, pointed, anterodorsally projecting scales. Juvenile paratypes CAS 186295 (22.1 mm SVL) and TM 3099 (27.9 mm SVL) with similar spotted pattern as holotype and adult paratypes (Fig. 92). TM 3099 with somewhat larger, darker spots, tail with incomplete brown crossbands as well as spots. CAS 186295 with both occipital and nape markings broken, limbs not spotted. Original tail in TM 3099 105% of SVL.

Distribution.— This species has been found at three localities in and around the Karasberg Mountains in southeastern Namibia (Figs. 30–31). All known localities are above 1000 m in elevation. The eastern-most locality, near Aroab, is essentially at the western edge of the Kalahari and is further east than any localities for *P. serval* sensu lato plotted by either Visser (1984) or Branch (1988, 1998). *Pachydactylus griffini* is sympatric with *P. purcelli* at Farm Narudas.

Natural History.— Methuen and Hewitt reported that TM 3099 was collected on sandy soil, as were CAS 186294–95. Although habitat details are lacking for the other members of the type series, they come from localities at the western edge of the Kalahari and may also be associated with sand.

Conservation Status.— *Pachydactylus griffini* has a highly restricted range, although it is undoubtedly more common than the existing collections suggest. Its known range does not encompass any protected areas within Namibia.

Remarks.— The presence of two forms of the *P. serval* group at Narudas was first signaled

by Methuen and Hewitt (1914), who noted that TM 3099 (Fig. 92) differed in appearance and habitat from the other *P. purcelli* (actually a composite series of *P. purcelli* and *P. montanus*) they collected in the Karasburg region. Loveridge (1947) also noted that this specimen was problematic and only tentatively allocated it to *P. purcelli*. In fact, three species of *serval*-type geckos (*purcelli*, *onscepensis*, *griffini*) as well as one *weberi*-type species cooccur in sympatry at the Farm Narudas. The one specimen of this species sequenced showed its greatest genetic affinities with *Pachydactylus carinatus*, but it is most similar morphologically to *P. serval* and *P. montanus*.

***Pachydactylus mclachlani* Bauer, Lamb, and Branch, sp. nov.**
Figures 93–98.

? 1981 *Pachydactylus w*[*eberi*]. *acuminatus* [part] Branch, *Ann. Cape Prov. Mus. (Nat. Hist.)* 13:145.
2005 *P*[*achydactylus*]. *weberi* [part] Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

Type Material.— Holotype: NMNW R 10499 (Fig. 93): Adult male; Namibia, Karas Region, Karasburg District, Noordoewer (28°39′48″S, 17°49′23″E), coll. M. Griffin, 11 April 1997. Paratypes: NMNW R 10496: Adult female, NMNW R 10497: Juvenile, NMNW R 10498: Adult male; Namibia, Karas Region, Karasburg District, Haib Mine (28°41′49″S, 17°53′26″E), coll. M. Griffin, 10 April 1997. CAS 186293 (Fig. 94): Adult female; Namibia, Karas Region, Karasburg District, Farm Narudas, 0.5 km N of house (2718Bd), coll. A.M. Bauer, 10 July 1992. CAS 125850, 125852: Adult females, CAS 125853: Adult male, CAS 125851: Juvenile; Namibia, Karas Region, Keetmanshoop District, 4 mi. NW Aroab on rd. to Keetmanshoop (2619Cc), coll. T.J. Papenfuss, 13 May 1970. CAS 186287: Juvenile; Namibia, Karas Region, Karasburg District, Farm Narudas at River (2718Bd), coll. A.M. Bauer, 10 July 1992. CM 119309 (Figs. 95, 97): Adult female, CM 119310–11: Juveniles; Namibia, Karas Region, Keetmanshoop District, 79.5 km S Keetmanshoop (2718Ba), coll. P. Freed, 28 March 1990. TM 54735 (Figs. 95–96): Adult female; Namibia, Karas Region, Karasburg District, Farm Sperlingsputs 259 (28°43′S, 18°13′E), coll. J. Lougher, July 1980.

Etymology.— The specific epithet is a patronym honoring the late Geoff McLachlan (1923–2005), ornithologist and herpetologist, former director of the Port Elizabeth Museum and later Curator of Herpetology at the South African Museum. Geoff devoted much of his later life to the study of *Pachydactylus* and his pioneering studies on *P. serval* and its relatives highlighted the taxonomic difficulties of this group. The name is constructed in the masculine genitive.

Diagnosis.— A moderately large species, to 48.7 mm SVL (NMNW R 10496). *Pachydactylus mclachlani* may be distinguished from all other members of the *P. serval/ weberi* group by the combination of the following characters: nasal region moderately inflated; rostral narrowly excluded from nostril; supranasals in broad or narrow contact anteriorly; scales on snout and canthus granular, rounded to oval, flattened to weakly domed, much larger than granular scales of interorbital and parietal regions; small, rounded, conical tubercles, smaller than snout scales, interspersed among granules of interorbital and parietal regions; dorsal scalation heterogeneous, with moderately large, oval, strongly keeled tubercles arranged in 14–18 regular rows; thighs bearing enlarged conical tubercles; toes relatively long, toe pads moderately broad; typically six undivided lamellae beneath digit IV of pes; tail to at least 112% of SVL, annulate, bearing whorls of slightly enlarged, oval, flattened to weakly keeled tubercles, each well-separated from one another; adult pattern mid-brown to purplish-brown with two thin light (cream to grayish- or purplish-brown) transverse bands, one on nape and one on trunk anterior to midbody. A broader pale band, just anterior to the hindlimb insertion, is less well developed or inconspicuous in some adults (Figs. 93–97). In some larger specimens the basic pattern is augmented by additional dark spots and incomplete bars; tail uniform brown to grayish-brown or with weakly contrasting alternating light and dark segments, caudal tubercles whitish; juvenile pattern very dark brown trunk with lighter head, a pale nape band and very thin anterior trunk band, area from just anterior to sacrum to tail base, including hindlimbs, ashy to pale purplish-brown, with or without a dark band across pygal portion of tail; tail orange.

DESCRIPTION (based on holotype).— Adult male. Snout-vent length (SVL) 43.0 mm. Body relatively depressed, moderately long (TrunkL/SVL ratio 0.39). Head relatively short (HeadL/SVL ratio 0.30), moderately wide (HeadW/HeadL ratio 0.67), somewhat depressed (HeadH/HeadL ratio 0.36), distinct from neck. Lores and interorbital region inflated. Snout moderately long (Sn-Eye/HeadL ratio 0.36), longer than eye diameter (OrbD/Sn-Eye ratio 0.72); scales on snout and canthus large, smooth, flattened to domed; scales of interorbital and parietal regions strongly heterogeneous, with tiny granules interspersed with larger, domed to conical, rounded tubercles, each 50–70% size of large snout scales. Enlarged conical tubercles regularly scattered across occipital and temporal regions as far posterior as nape. Eye moderate (OrbD/HeadL ratio 0.26); orbits without extra-brillar fringes; 4–5 supracilliary scales at posterodorsal corner of orbit bearing very small spines; pupil vertical, with crenelated margins. Ear opening oval, angled at 45% to horizonatal, large (EarL/HeadL ratio 0.11); eye to ear distance equal to diameter of eyes (EyeEar/OrbD ratio 1.01). Rostral approximately 55% as deep (0.8 mm) as wide (1.4), no rostral groove, contacted by two enlarged supranasals and first supralabials; nostrils oval, oriented laterally, each surrounded by two postnasals, supranasal, and first supralabial; supranasals in contact anteriorly, separated by a single granule posteriorly; dorsal postnasals much larger than ventral postnasals, separated by a single granule; nostril rims weakly inflated, bordered posteriorly by a distinct notch; 1–2 rows of scales separate orbit from supralabials; mental with nearly parallel sides, approximately 2.4 times deeper (1.9 mm) than wide (0.8 mm); no enlarged postmentals or chin shields. Enlarged supralabials to angle of jaws 13/13 (9/9 to mid-orbit); infralabials 8/8; interorbital scale rows at midpoint of orbit 22 (9 across narrowest point of frontal bone).

Dorsal tubercles large (8–10 times size of adjacent scales), largest on midflanks and smallest along dorsal midline and on anterior one third of trunk, rounded, with a pronounced median keel, forming 14 regular longitudinal rows on trunk, grading into conical granular scales on lower flanks; each tubercle surrounded by a regular to irregular rosette of small granular scales; ventral scales flattened, oval, subimbricate to imbricate, becoming larger posteriorly, largest on posterior abdomen and in precloacal region, approximately 35 between lowest conical granular rows on flank at midbody; tubercular scales on dorsum at midbody much larger than ventral scales at same level; chin granules approximately one fourth size of ventral scales, increasing in size rather abruptly on throat. No preanal or femoral pores. Scales on palm, sole, and ventral surface of forelimb smooth, granular; scales on ventral aspect of thighs enlarged, continuous with enlarged scales of precloacal region; scales on dorsal aspect of forelimb smooth, heterogeneous, subimbricate; scales on dorsum of thigh and crus greatly enlarged, conical.

Forelimbs short, stout (ForeaL/SVL ratio 0.16); hindlimbs short (CrusL/SVL ratio 0.17); digits relatively long, claws absent except for minute stylets on digits II and V of pes; subdigital scansors, except for distalmost, entire, present only on distal portion of toes, approximately 1.3 times wider than more basal (non-scansorial) subdigital scales; interdigital webbing absent. Relative length of digits (manus): III > IV > II > V > I; (pes): IV > III ~ V > II > I (distal portion of digit IV of left pes missing in holotype). Subdigital scansors (excluding small distal divided scansor) I (4), II (4), III (4), IV (4), V (4) – manus; I (5), II (5), III (5), IV (6), V (6) – pes.

Tail sub-cylindrical, weakly depressed; original tail longer than snout-vent length (TailL/SVL ratio 1.09; based on CAS 125850); tail smoothly tapering, with distinct whorls of scales; each transverse row of enlarged, pointed, oval, pointed, keeled tubercles separated by 3 rows of smaller scales; adjacent keeled dorsal caudal tubercles separated by 1–4 rectangular to oval, smooth to very weakly keeled, smaller scales (a few tubercles in direct contact); subcaudal scales subimbricate; midventral caudal scales enlarged relative to adjacent scales (6–8 times size of dorsal caudal scales); 2 enlarged, pointed, dorsally-projecting postcloacal spurs on each side of tailbase, anterior

considerably larger than posterior.

Coloration (in preservative): Dorsum mid-brown with three faded grayish-brown transverse bands bordered by thinner dark brown edges. Anterior band extending from posteroventral border of orbit, through ear and across nape. Trunk band thinner, anterior to midbody, just posterior to position of elbow of adpressed forelimb. A third, broader pale band just anterior to hindlimb insertion is less conspicuous than the anterior bands. Dark anterior border of nape band passes through ventral portion of orbit to nostril; a cream band extending from anterodorsal margin of orbit to nostril. Top of head light brown with a slightly darker "V" shaped marking from supranasals to above anterior part of orbit; relatively symmetrical mid-brown markings at frontoparietal border and across mid-parietal table. Labials brown with areas of reduced pigment, especially around sutures and on posterior scales. Limbs slightly more yellowish than body dorsum. Tail relatively uniform grayish-brown with tubercles with white keels. Venter grayish-beige with very light, scattered brown pigment, densest along margins of flanks, limbs, and chin.

Variation.— Variation in mensural characters of the holotype and adult paratypes are presented in Table 5. Juvenile paratypes: CAS 125851: 26.8 mm SVL + 26.2 mm TailL; CAS 186287: 25.4 mm + 25.0 mm; CM 119310: 25.1 mm + 26.4 mm; CM 119311: 24.4 mm + 21.4 mm; NMNW R 10497: 26.0 mm + 16.8 mm. Dorsal scales much more strongly keeled in TM 54735 (Figs. 95–96), keels sharp, raised, caudal tubercles especially strongly keeled, either contacting adjacent tubercles or separated by a single narrow, elongate intervening scale. Paratypes with 4–5 lamellae under digits of manus and 5–6 under digits of pes. Dorsal pattern variable. CAS 186293 (Fig. 94) with interspaces between pale cross bands with vague, irregular linear patterns of yellowish-brown markings and limbs mottled; CM 119309 (Figs. 95, 97) similar but with a purplish brown base color and with original tail with weakly defined alternating pattern of light and mid-brown bands of approximately equal width – some lighter bands fused along dorsal midline, regenerated portion of tail more-or-less uniform mid-brown. CAS 125850–53 pattern largely faded to a uniform yellowish-brown, with paler nape and trunk bands, as well as pale sacral region visible in CAS 125851, more weakly expressed in larger specimens in this series. NMNW R 10496 with head dorsum yellowish brown and transverse bands relatively weakly developed, NMNW R 10498 with bands very inconspicuous, body soft, in poor condition. CM 119310–11, juveniles, with dark brown trunks with yellowish-brown presacral and sacral regions, hindlimbs and somewhat paler tail (Figs. 97–98). Narrow transverse trunk bands and well-demarcated nape band clearly visible. Top of head yellowish-brown, without markings. NMNW R 10497 with a dark band across pygal portion of tail, separating pale lumbosacral and postpygal regions. Adult paratype TM 54735 (Figs. 95–96) yellowish-brown with faded juvenile pattern. In life the juvenile color is blackish brown with a bright white trunk band, an ashy white nape band, and grayish-brown sacral area and hindlimbs. The top of the head is golden brown and the tail is a bright orange (Fig. 97; see also Seufer 1991). In life adult paratype CM 119309 had pinkish-gray bands and other markings on a yellowish brown dorsum, and white tipped tubercles (Fig. 97).

Distribution.— This species appears to be a Namibian endemic and has thus far been found at scattered localities in the Karasberge (Narudas), at Aroab on the western edge of the Kalahari, and along the Orange River between Sperlingsputs and Noordoewer (Figs. 21–22, 30).

Natural History.— At Narudas this species was collected under stones (Fig. 43). The habitat at Aroab is chiefly Kalahari sand and seems inappropriate for a member of the *P. weberi* group. However, there are scattered rocky areas in the vicinity and the types may have been collected in such a microhabitat. The few known localities for this species preclude a definitive characterization of its habitat type, but it has been found chiefly in smaller rock outcrops in the Orange River valley and the Karasberge (Figs. 99–100).

Conservation Status.— The species does not occur in any protected areas but is not under any specific threat.

***Pachydactylus carinatus* Bauer, Lamb, and Branch, sp. nov.**
Figures 101–105.

1966 [*Pachydactylus serval*] *onscepensis* [part] McLachlan and Spence, *Ann. Cape Prov. Mus.* 5:155.
1981 *Pachydactylus serval onscepensis* [part] Branch, *Ann. Cape Prov. Mus. (Nat. Hist.)* 13:145.
1988 *Pachydactylus s. onscepensis* [part] Branch, *Field Guide*:207.
1994 *Pachydactylus s. onscepensis* [part] Branch, *Field Guide*, 2nd ed.:207.
1998 *Pachydactylus s. onscepensis*[part] Branch, *Field Guide*, 3rd ed.:260, pl. 112, left middle.
2003 *Pachydactylus* cf. *serval* Bauer and Branch, *Herpetol. Nat. Hist.* 8:133.
2005 *P*[*achydactylus*]. *serval* [part] Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

Type Material.— Holotype: CAS 201908 (Fig. 101): Adult female; South Africa, Northern Cape Province, Richtersveld National Park, 13.3 km E of Oenna Mine (28°05′11″S, 17°07′45″E), coll. A.M. Bauer, 4 July 1996. Paratypes: CAS 201910 (Fig. 102): Adult male; South Africa, Northern Cape Province, Richtersveld National Park (28°02′41″S, 17°05′40″E), coll. A.M. Bauer, 4 July 1996. CAS 201913 (Fig. 102): Adult male; South Africa, Northern Cape Province, Richtersveld National Park, 8.1 km S of Oenna Mine (28°06′40″S, 17°01′10″E), coll.A.M. Bauer, 5 July 1996. CAS 203501: Adult male; South Africa, Northern Cape Province, Richtersveld National Park (28°02′41″S, 17°05′40″E), coll. A.M. Bauer, 4 July 1996. CAS 203502: Adult male; South Africa, Northern Cape Province, Richtersveld National Park, 8.1 km S of Oenna Mine (28°06′40″S, 17°01′10″E), coll. A.M. Bauer, 5 July 1996. CAS 186340: Adult male; South Africa, Northern Cape Province, Richtersveld National Park, 20 km E Sendelingsdrif (2817Aa), coll. A.M. Bauer, 14 July 1992. PEM R 16629: Adult female; South Africa, Northern Cape Province, Richtersveld National Park, Hottentots Paradys Overlook (2816Bd), coll. W.R. Branch. TM 27949 (Fig. 102): Subadult male; South Africa, Northern Cape Province, 15 km NE Stinkfontein (2817Cd), coll. W.D. Haacke, H.D. Brown and W. Fürst, December 1962. Adult male; TM 34204, South Africa, Northern Cape Province, Richtersveld National Park, 2 mi E Swartpoort on Orange River (2816Bb), coll. W.D. Haacke, 24 September 1967. TM 81098: Adult male; South Africa, Northern Cape Province, Richtersveld National Park, Quiver Tree Camping Area (2817Ac), coll. M.J. Whiting and S.V. Nelson, August 1985.

Additional Material.— South Africa, Northern Cape Province: PEM R 224, CAS 231879–80*, 231881–82, Goodhouse (2818Cd); TM 34275, Devils Castle nr. Stinkfontein (2817Cd); TM 27943–48, 27950–52, 15 km NE Stinkfontein (2817Cd); TM 84535, 7 km from Lekkersing (29°00′43″S, 17°02′05″E); SAM 44700–01, 5 km E Vioolsdrif (2817Dd); TM 27963–68, 10 km S Vioolsdrif (2817Dd); TM 53839, Springbokvlakte (28°23′S, 17°14′E); TM 27819, 9km from Annisfontein (2816Bd); SAM 43604, 43666, 45019–23, 45042, 45552–4, Annisfontein and vicinity (2816Bd); TM 27798, 10 km SW Annisfontein (2816Bd); TM 27808, Bloeddrif (28°21′S, 16°49′E); TM 45073, Rosyntjesberg, Richtersveld National Park (2817Cb); PEM R7363, just N Ochta Mine, Richtersveld National Park (2816Bb); CAS 200050*, LSUMZ 57292*, Rd. to Nicodaemus, 0.5 km from jct. Hottentotsparadys Lookout, Richtersveld National Park (2816Bd); TM 25139–41, 27824–25, Numees Mine (28°17′S, 16°58′E); PEM R12560, Numees Spring, Richtersveld National Park (28°17′42″S, 16°58′05″E; TM 25159, Cornellskop (28°24′S, 16°53′E); CAS 201922, 203504, Richtersveld National Park (28°19′12″S, 16°58′30″E); TM 27833–35, Sendelingsdrif (2816Bb); TM 34203, 2 mi E Swartpoort, Richtersveld (2816Bb); PEM R12550, Richtersveld National Park (28°05′59″S, 17°01′32″E); CAS 193365*–67, main park rd., 12.6 km E Sendelingsdrif, Richtersveld National Park (2816Bb); CAS 193374, 193392, main park rd., 22.8 km E Sendelingsdrif, Richtersveld National Park (2817Aa); CAS 193631–32, main park rd., 23.5 km E Sendelingsdrif, Richtersveld National Park (2817Aa); TM 84536–37, along Brown Pass after Halfmens Pass (28°10′38″S, 17°01′53″E); CAS 200009, Swartpoort, Richtersveld National Park (28°03′59″S, 16°58′37″E); TM 34205, 2 mi E Swartpoort on Orange River, Richtersveld National Park (2816Bb); CAS 201918, 2.7 km S of Oenna Mine, Richtersveld National Park (28°04′42″S, 17°02′41″E); PEM R12547, 13.3 km E of Oenna Mine, Richtersveld National Park (28°05′11″S, 17°07′45″E); PEM R12548, Richtersveld National Park (28°02′41″S, 17°05′40″E); PEM R12544,

Sendelingsdrif Dump, Richtersveld National Park; PEM R7356, Akkedis Drive, Richtersveld National Park (2817Aa); LSUMZ 57293, Helskloof, Richtersveld National Park (28°19′46″S, 16°59′25″E, 695 m); PEM R153, Tatasberg, Richtersveld National Park (2817Ad); PEM R1270, S Tatasberg, Richtersveld National Park (2817Ac); PEM R1960,Vandersterrberge, Richtersveld National Park (2817Ac); PEM R1960, 28°15′34″S, 17°08′19″E, Richtersveld National Park (2817Ac); PEM R12573, Kuboes Spring (28°26′36″S, 16°59′36″E, 190 m); PEM R11965, 2.3 km NE Geigas River junction on Kook River Spring Road (28°41′16″S, 17°07′44″E, 440 m); PEM R9244, Aramanshoek (2817Ca); SAM 45034–5, E Eksteenfontein near trig beacon 2605 (2817Cd); SAM 47724, Sabiesies (28°37′54″S, 17°00′43″E); CDNC 4845, Tierhoek, Ploegberg (28°37′54″S, 17°00′43″E); TM 84537, Richtersveld National Park; TM 84537, Richtersveld; **Namibia, Lüderitz District**: TM 35383, Farm Spitskop (2716Dc); TM 35332, Farm Namuskluft (2716Dd); PEM R 12835, SAM 44435–36, Obib Mts. (2816Ba); TM 48351, Farm Plateau (2816); **Karasburg District**: JDV 2040, 62 km E Rosh Pinah (2817Aa); TM 28285–88, 28290, 28299, Fish River Canyon (27°35′S, 17°37′E); TM 27978–81, Fish River Canyon (27°37′S, 17°36′E); TM 36825, Fish River Canyon National Park (2717Da); CAS 201875, Ai-Ais Nature Reserve, ca. 3 km N Orange River (28°12′26″S, 17°16′43″E); JDV 3899, 38 km E of water pump on Orange River [across from De Hoop] (2817Aa).

Etymology.— The specific epithet *carinatus* is Latin for keeled and is in reference to the prominent keeled tubercles typical of this species. The name is in the masculine form.

Diagnosis.— A moderately sized species, to 45.7 mm SVL (CAS 201908). *Pachydactylus carinatus* may be distinguished from all other members of the *P. serval/weberi* group by the combination of the following characters: snout weakly inflated laterally; rostral enters nostril; supranasals in variable contact; scales on dorsum of head granular, flattened to very weakly domed, those on snout much larger than those of interorbital and parietal regions; very few small (2–3 times size of granules), round, conical tubercles on interorbital and parietal regions; dorsal scalation strongly heterogeneous, with small, oval, keeled tubercles arranged in 16 regular rows; no tubercles on thighs; toes moderately long, toe pads relatively narrow; typically five undivided lamellae beneath digit IV of pes; tail to at least 114% of SVL, strongly annulate, bearing whorls of moderately to very strongly keeled, pointed tubercles, well separated from each other; adult pattern of moderately small, irregular brown spots or larger markings more-or-less evenly distributed across light brown to grayish-brown dorsum, with some trace of a pale, dark-edged band across occiput and nape in some specimens; tubercular keels whitish to pale yellow, contrasting with darker spots on dorsum (Figs. 101–103); juveniles with dark brown to blackish body, with an wide, dark-edged ashy nape band and an thick ashy band covering lumbar and sacral regions as well as hindlimbs (Figs. 104–105), tail a bright orange (Fig. 105; see also Bauer and Branch 2003:133). Although similar to the juvenile pattern of *P. serval*, in the latter species the tail is dark rather than bright, the pale sacral area extends further anteriorly than in *P. carinatus* and the neck band is also broader.

Description (based on holotype).— Adult female. Snout-vent length (SVL) 45.7 mm. Body relatively depressed, long (TrunkL/SVL ratio 0.44). Head elongate, large (HeadL/SVL ratio 0.30), relatively narrow (HeadW/HeadL ratio 0.61), somewhat depressed (HeadH/HeadL ratio 0.30), distinct from neck. Lores and interorbital region moderately inflated. Snout short (SnEye/HeadL ratio 0.33), longer than eye diameter (OrbD/Sn-Eye ratio 0.74); scales on snout and forehead granular, round, flattened to slightly domed; scales on snout 2–3 times larger than those of anterior interorbital region, much larger than those of parietal table; a few small (2–3 times size of parietal granules) rounded, conical tubercles scattered on interorbital and parietal regions. Eye moderately large (OrbD/HeadL ratio 0.29); orbits without extra-brillar fringes; 1–3 posterior supracilliary scales bearing very small spines; pupil vertical with crenelated margins. Ear opening oval, small (EarL/HeadL ratio 0.08), more-or-less vertically oriented; eye to ear distance less than diameter of eyes (EyeEar/OrbD ratio 0.91) [greater than eye diameter in some paratypes]. Rostral approximately 60% as deep (1.0 mm) as wide (1.7); no rostral groove; contacted by two enlarged supranasals,

one small internasal granule, and first supralabials; nostrils oval, oriented laterally and slightly anteriorly, each surrounded by two postnasals, supranasal, and first supralabial; supranasals separated by a single small granule; dorsal postnasals approximately 1.5 times ventral postnasals, separated by two somewhat enlarged granules; nostril rims weakly inflated; 1–2 rows of scales separate orbit from supralabials; mental wedge-shaped, approximately 2.3 times deeper (2.0 mm) than wide (0.8 mm); no enlarged postmentals or chin shields. Supralabials to angle of jaws 11/10 (9/9 to mid-orbit); infralabials 10/9; interorbital scale rows at midpoint of orbit 27 (9 across narrowest point of frontal bone).

Dorsal scales small, granular, flattened to weakly conical, forming rosettes of scales around moderately sized (6–8 times size of adjacent scales), oval, relatively strongly keeled tubercles; tubercles largest on midflanks, smallest along dorsal midline and on anterior one third of body, arranged in 16 regular rows; ventral scales rounded, flattened, subimbricate to imbricate, becoming larger posteriorly, especially in precloacal region, approximately 24 between lowest rows of granular scales on flanks at midbody; scales on venter at midbody ⅓–½ size of tubercles on dorsum at same level; chin granules approximately one third to one fourth size of ventral scales, increasing in size gradually on throat. No preanal or femoral pores. Scales on palm and sole granular to weakly conical; ventral surface of shank and forearm with smooth, subimbricating scales; preaxial surfaces of basal limb segments with smooth, slightly enlarged subimbricate to imbricate scales grading into juxtaposed granules on postaxial surfaces; scales on ventral aspect of thighs enlarged, continuous with enlarged scales of precloacal region.

Forelimbs moderately short, stout (ForeaL/SVL ratio 0.14); hindlimbs moderately long (CrusL/SVL ratio 0.17); digits moderately long, claws absent; subdigital scansors, except for distalmost, entire, present only on distal portion of toes, approximately 1.5 times wider than more basal (non-scansorial) subdigital scales; interdigital webbing absent. Relative length of digits (manus): III > IV > II > V > I; (pes): IV > III ~ V > II > I. Subdigital scansors (excluding small distal divided scansor) I (4), II (4), III (4), IV (4), V (4) – manus; I (4), II (5), III (6), IV (5), V (6) – pes.

Tail sub-cylindrical, weakly depressed; partially regenerated tail equal to snout-vent length; tail thin basally, tapering, with distinct whorls of scales; each transverse row of oval, keeled tubercles separated by 3 rows of smaller, square to rectangular scales wit rounded free margins; subcaudal scales rectangular to oval, 2–3 times larger than dorsal caudal scales, imbricating; midventral caudal scales slightly larger than adjacent subcaudal scales; 2–3 small, raised, posterodorsally-projecting postcloacal spurs on each side of tailbase.

Coloration (in preservative): Dorsal color buff with small to moderately sized, evenly distributed mid-brown spots arranged in more-or-less longitudinal rows. A pale, wide, transverse band across nape, bordered anteriorly and posteriorly by a incomplete thin mid-brown edge. Keels of tubercles whitish to cream, contrasting with underlying brown spots. Parietal table, interorbital area and snout with symmetrical brown spots: a triangle pointing forward fro anterior border of orbits, a small rhomboid on anterior part of parietal table, surrounded by a roughly star-shaped brown outline. A brown line from rostral, through center of eye, over ear to level of dark anterior border of nape band, widened medially in the region to approach dorsal midline on the snout. First supralabial scales midbrown; more posterior supralabials and all infralabials buff tinged with brown pigment. Limbs with scattered irregular mid-brown spots and blotches. Tail with alternating light and dark bands; cream bands wider than dark bands, becoming subequal distally. Tail tubercles whitish. Venter buff with scattered diffuse pigmentation, especially on edges of flanks and chin and under limbs. Tail venter with faint alternating pattern.

VARIATION.— Variation in mensural characters of the holotype and adult paratypes are present-

ed in Table 6. Tail length is a maximum of 114% of SVL in TM 27949 (Fig. 102). Dorsal tubercle size and keeling vary considerably. Tubercles are especially small in TM 27949. Supralabial contact varies among the paratypes. Small claws are present on at least some specimens. Most paratypes with only 5 subdigital lamellae under digits II–V of pes. Adult color pattern variable. Nape band very well defined in TM 34204 and TM 27949. Dorsal pattern with large blotches instead of smaller spots in CAS 186340 and CAS 201910. Hatchlings (TM 25139 – 18.1 mm SVL, CAS 193367 – 19.7 mm SVL) dark brown with a wide pale neck band with dark edges (Fig. 104). A pale patch on sacral and presacral regions, also bordered by dark edges. In specimens as small as 20.71 mm (CAS 193374) the dark dorsal background color fades and spots become evident, with the light sacral-presacral area becoming obscured. Nape band remains bold in specimens up to approximately 34 mm SVL, then is variably distinct in larger specimens.

Distribution.— This species is distributed throughout the Richtersveld National Park and in adjacent parts of southern Namibia (Figs. 21, 30–31). It occurs in areas along the Orange River both to the east and west of the park boundaries — Annisfontein in the west and several localities in the east, at least as far upstream as Goodhouse, where it is replaced by *P. montanus*. It extends southwards to about the level of Kuboes and northwards as far as Namuskluft in the west and Ai-Ais in the east. *Pachydactylus carinatus* occurs sympatrically with *P. montanus* at several localities between Goodhouse and the Rosh Pinah area and with *P. serval* in the Fish River Canyon. Several specimens (TM 36783–85) from Farm Koboop (Coboboop) (2819Cd) on the south bank of the Orange River near Onseepkans (Fig. 30) are superficially similar to *P. carinatus*. Their identity remains uncertain, although it is possible that they could represent an easternmost locality for this species.

Natural History.— In most of its area of distribution, *P. carinatus* is rupicolous and occupies retreats under overhanging rock flakes and narrow cracks and crevices within and between rocks in bouldery areas (Figs. 106–107); however, along the Orange River it has been found on the ground under stones or refuse (Figs. 88–89; Bauer and Branch 2003). It has been found from about 40 m above sea level near the Orange River to approximately 720 m above Helskloof Pass.

Conservation Status.— This species is widely distributed in largely uninhabited areas. Most of its range is encompassed by the Ai-Ais/Richtersveld Transfrontier Park.

Remarks.— Bauer and Branch (2003) first signaled the distinctiveness of this form.

Pachydactylus visseri Bauer, Lamb, and Branch, sp. nov.

Figures 108–111.

1988 *Pachydactylus weberi* [part] Branch, *Field Guide*:208, pl. 86, lower middle left.
1994 *Pachydactylus weberi* Branch, *Herpetol. Nat. Hist.* 2:2.
1994 *Pachydactylus weberi* [part] Branch, *Field Guide*, 2nd ed.:208, pl. 86, lower middle left.
1998 *Pachydactylus weberi* [part] Branch, *Field Guide*, 3rd ed.:263, pl. 86, lower middle left.
2003 *Pachydactylus* cf. *weberi* [part] Bauer and Branch, *Herpetol. Nat. Hist.* 8:134.
2005 *P*[*achydactylus*]. *weberi* [part] Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

Type Material.— Holotype: CAS 201874 (Fig. 108): Adult male; Namibia, Karas Region, Karasburg District, Ai-Ais Nature Reserve, c. 3 km N Orange River (28°12′26″S, 17°16′43″E), coll. A.M. Bauer, 26 June 1996. Paratypes: TM 28289: Adult male; Namibia, Karas Region, Karasburg District, Fish River Canyon viewpoint (27°35′S, 17°37′E), coll. W.D. Haacke, December 1962. TM 35455–56 (Fig. 109): Adult females; Namibia, Karas Region, Lüderitz District, 10 mi. NW Fish River Mouth (2817Aa) [locality given in collection database as Kuamsib Mountain, 27°59′S, 17°05′E], coll.W.D. Haacke, 23 September 1968. TM 35363: Adult male; Namibia, Karas Region, Lüderitz District, Farm Namuskluft (2716Dd), coll. unknown; TM 57399: Adult female; Namibia, Karas Region, Karasburg District, Fish River Canyon viewpoint

(27°35′S, 17°37′E), coll. W.D. Haacke, February 1984. TM 50110 (Fig. 109): Adult male; Namibia, Karas Region, Karasburg District, Ai-Ais (2717Dd), coll.F. Odendaal, May 1977. NMNW R 8979: Adult male; Namibia, Karas Region, Lüderitz District, Rooilepel (28°14'51″S, 16°39'31″E), on upper slopes, 500 m, coll.W.R. Branch.

Additional Material.— South Africa, Northern Cape Province: PEM R 12804, Kubus (2816Bd); TM 35256, Brandkaross (2816Bc); TM 84560–62, Farm Richtersveld 11, between Baken and Bloeddrif along S bank of Orange R. (28°22′07″S, 16°48′19″E); TM 27836–37, Sendelingsdrif, Richtersveld National Park (2816Bb). **Namibia, Lüderitz District**: CAS 201899, PEM R 7395–96, Skilpadberg, Sperrgebiet (28°27′43″S, 16°40′05″E); [?] PEM R 7408–10, Rooilepel (28°14′51″S, 16°39′31″E); TM 35440, 10 mi. NW Fish River Mouth (2817Aa); [?] PEM R 7434–36, E slopes Aurusberg (27°38′55″S, 16°20′07″E); [?] PEM R 7441, 7449, NE slopes Aurusberg (27°38′S, 16°20′E); TM 27750, Signalberg, Auros Mts. (27°43′S, 16°17′E); JDV 3903, just S Aus (2616Cb); **Karasburg Distirct**: PEM R 4825, Ai-Ais (2717Dd); PEM R 4638, 4658, Fish River Canyon (2717Da); CAS 201877, Ai-Ais Nature Reserve, 82.4 km W Noordoewer (28°11′07″S, 17°14′58″E); NMNW 8854–55, Ai-Ais Nature Reserve, c. 3 km N Orange River (28°12′26″S, 17°16′43″E).

Etymology.— The specific epithet is a patronym honoring John D. Visser, an important contributor to southern African herpetology who kindly provided several hundred specimens from his personal collection for use in this study. The name is constructed in the masculine genitive. The epithet also reflects the occurrence of the species in the Fish (Vis) River Valley.

Diagnosis.— A relatively large species, to 48.5 mm SVL (PEM R 4638). *Pachydactylus visseri* may be distinguished from all other members of the *P. serval/weberi* group by the combination of the following characters: nasal region not inflated; rostral excluded from nostril; supranasals in broad or narrow contact; scales on snout and canthus granular, rounded to oval, flattened to weakly domed, much larger than granular scales of interorbital and parietal regions; small, rounded, conical tubercles, much smaller than snout scales, interspersed among granules of interorbital and parietal regions; dorsal scalation heterogeneous, with moderately large (6–9 times dorsal granules), oval, distinctly keeled arranged in 16–18 regular rows, largest on midflanks; thighs bearing enlarged keeled tubercles; toes relatively short, toe pads relatively narrow; typically five undivided lamellae beneath digit IV of pes; tail to at least 120% of SVL, annulate, bearing whorls of moderately large, pointed, weakly to strongly keeled tubercles; adult pattern a series of distinct, wide, pale (cream to beige) transverse bands separated by thinner dark brown bands. Six bands (rarely seven) anterior to sacrum (one on nape, one across shoulders, four evenly spaced between axilla and hindlimb insertion); tail with strongly contrasting cream and dark brown bands of approximately equal width (Figs. 109–110). Juvenile pattern similar to adult (Fig. 111).

Description (based on holotype).— Adult male. Snout-vent length (SVL) 38.6 mm. Body relatively depressed, relatively long (TrunkL/SVL ratio 0.45). Head elongate, large (HeadL/SVL ratio 0.32), narrow (HeadW/HeadL ratio 0.59), moderately depressed (HeadH/HeadL ratio 0.36), distinct from neck. Lores and interorbital region moderately inflated. Snout short (Sn-Eye/HeadL ratio 0.34), much longer than eye diameter (OrbD/Sn-Eye ratio 0.72); scales on snout and forehead smooth, flattened to weakly domed; large on snout and canthus becoming granular on interorbital region with larger (3–4 times parietal granules) weakly conical tubercles interspersed; scales on snout much larger (5–10 times parietal granules). Enlarged (2–3 times parietal tubercles), conical tubercles regularly scattered across temporal region and occiput, as far posterior as nape. Eye moderately small (OrbD/HeadL ratio 0.24); orbits without extra-brillar fringes; 5 supracilliary scales at posterodorsal corner of orbit bearing very small spines; pupil vertical, with crenelated margins. Ear opening oval, vertically oriented, small (EarL/HeadL ratio 0.07); eye to ear distance slightly greater than diameter of eyes (EyeEar/OrbD ratio 1.05). Rostral approximately 50% as deep (0.7 mm) as wide (1.4), no rostral groove, contacted by two enlarged supranasals and first supralabials; nostrils

oval, oriented laterally, each surrounded by two postnasals, supranasal, and first supralabial; supranasals in contact anteriorly, separated by a single granule posteriorly; dorsal postnasals larger than ventral postnasals, separated by 3 granules; nostril rims not inflated, bordered posteriorly by a slight depression; one row of scales separate orbit from supralabials; mental wedge-shaped, tapering posteriorly, approximately 2.2 times deeper (1.7 mm) than wide (0.8 mm); no enlarged postmentals or chin shields. Supralabials to angle of jaws 11/11 (8/9 to mid-orbit); infralabials 9/9; interorbital scale rows at midpoint of orbit 25 (7 across narrowest point of frontal bone).

Dorsal tubercles large (8–10 times size of adjacent scales), largest on midflanks and smallest along dorsal midline and on anterior one third of trunk, oval, with a pronounced median keel, forming 18 regular longitudinal rows on trunk; each tubercle surrounded by rosette of small granular scales; ventral scales flattened, oval subimbricate to imbricate, becoming larger posteriorly, largest on posterior abdomen and in precloacal region, approximately 35 between lowest granular rows on flank at midbody; tubercular scales on dorsum at midbody larger than ventral scales at same level; chin granules approximately one third to one fourth size of ventral scales, increasing in size gradually on throat. No preanal or femoral pores. Scales on palm, sole, and ventral surface of forelimb smooth, granular; scales on ventral aspect of hindlimbs enlarged, continuous with enlarged scales of precloacal region; scales on dorsal aspect of forelimb smooth, subimbricate proximally, with small conical tubercles intermixed among more strongly imbricate scales distally; scales on dorsum of thigh and crus greatly enlarged, strongly keeled.

Forelimbs moderately long, stout (ForeaL/SVL ratio 0.15); hindlimbs long (CrusL/SVL ratio 0.18); digits relatively short, claws absent; subdigital scansors, except for distalmost, entire, present only on distal portion of toes, approximately 1.5 times wider than more basal (non-scansorial) subdigital scales; interdigital webbing absent. Relative length of digits (manus): III > IV > II > V > I; (pes): IV > III ~ V > II > I. Subdigital scansors (excluding small distal divided scansor) I (3), II (4), III (4), IV (4), V (4) – manus; I (3), II (4), III (5), IV (5), V (5) – pes.

Tail (based on paratypes) sub-cylindrical, depressed; original tail longer than snout-vent length (TailL/SVL ratio 1.20; based on TM 35455); tail relatively thin basally, tapering, with distinct whorls of scales; each transverse row of enlarged, oval, pointed, strongly keeled tubercles separated by 3 rows of smaller scales; adjacent keeled dorsal caudal tubercles generally separated by a single smaller scale; subcaudal scales rhomboidal to pentagonal, imbricating; midventral caudal scales enlarged relative to adjacent scales (10+ times size of dorsal caudal scales); two enlarged, pointed, posterodorsally-projecting postcloacal spurs on each side of tailbase, anterior considerably larger than posterior.

Coloration (in life): Dorsum with alternating pale (cream to beige with pinkish tinge) and dark (mid-brown with darker margins) transverse bands, pale bands wider than dark, narrowing on flanks. Anterior most band across nape, second over shoulders, four remaining bands evenly distributed between axilla and hindlimb insertion. A mid-brown streak extending from nostril through middle of orbit and above ear to occiput, forming anterior border of pale nape band; a second, more diffuse brown stripe from labials, through ear to meet posterior dark border of pale nape band. Snout with diffuse, symmetrical brown markings, fading in interorbital region; diffuse brown markings over center of parietal table. Labials white with mid-brown pigment extensive on posterior labials, anteriormost labials with pigment limited to center of scales. Forelimbs relatively uniform light brown; hindlimbs with diffuse mid-brown barring basally. Tail (based on TM 35455) with alternating light (light brown or beige basally, cream to whitish distally) and dark (mid- to dark brown) bands of approximately equal width. Venter beige to cream, unpigmented except for scattering of fine brown speckles under limbs and at edges of chin and flanks.

Variation.— Variation in mensural characters of the holotype and most paratypes are present-

ed in Table 7 (measurements of juvenile paratype, CAS 201877, 24.2 mm SVL, not provided). The paratypes exhibit moderate variation in the degree of supranasal contact, degree of tubercle keeling, and labial counts. Coloration is very consistent across paratypes, including juvenile specimen. Specimens from the Orange River significantly below the Fish River confluence vary in pattern. Seven pale bands are present on the dorsum of TM 27836–37, from Sendelingsdrif. In TM 84560–61 and CAS 201899 the bands posterior to the nape are more diffuse and angled rather than transversely oriented.

Distribution.— This species is distributed throughout the Richtersveld and adjacent parts of southern Namibia, including the Fish River Canyon (Fig. 89), the Aurusberg, and near Aus (Figs. 21–22, 30; see **Remarks**). Branch (1994b) considered that its distribution in the Sperrgebiet of southern Namibia was limited by humidity requirements to only a few more mesic localities. Although broadly sympatric with *P. monicae*, *P. visseri* ranges farther northward and westward.

Natural History.— Branch (1994b) found this species (as *P. weberi*) sheltering in cracks on a limestone outcrop at Skilpadberg (Fig. 112) and under exfoliating flakes of granite in the Aurusberg. He considered it likely that the species requires a relatively mesic microclimate, thus limiting its distribution in the Sperrgebiet. Branch (1994b) reported egg size of one clutch as 10.3 × 7.2 mm, 0.2g and 9.7 × 7.3 mm, 0.2 g.

Conservation Status.— This species is distributed chiefly in uninhabited regions and does not appear to be under any particular threats. Most of its range occurs within the Ai-Ais/Richtersveld Transfrontier Park and the Sperrgebiet.

Remarks.— Specimens from the Aurusberg are tentatively referred to this species, but these animals typically have a more irregular dorsal pattern than those from the remainder of the range and require further study. Unfortunately no genetic material was available for these populations. A single specimen from "just south of Aus" (JDV 3903) would appear to be well out of the core range of the species. It is unclear if additional isolated populations occur in suitably rocky intervening areas of the Sperrgebiet, such as the Klinghardt Mountains.

***Pachydactylus goodi* Bauer, Lamb, and Branch, sp. nov.**
Figures 113–116.

2005 *P*[*achydactylus*]. *weberi* [part] Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

Type Material.— Holotype: TM 27962 (Fig. 113): Adult male; South Africa, Northern Cape Province, 10 km S Vioolsdrif (2817Dc), coll. W.D.Haacke, December 1962. Paratypes: TM 29707 (Fig. 116): Juvenile; South Africa, Northern Cape Province, 10 km S Vioolsdrif (2817Dc), coll. W.D. Haacke, December 1962. TM 84505 (Fig. 114): Adult female; South Africa, Northern Cape Province, Farm Aggenys 56 (29°12′26″S, 18°50′44″E), coll. E. Scott, 19 February 2003. CAS 231878 (Figs. 114–115): Adult male; South Africa, Northern Cape Province, 77 km E Springbok (2918Bc), coll. J.D. Visser, 13 September 1980.

Etymology.— The specific epithet is a patronym honoring our friend and colleague David A. Good who, with the first and third authors, performed a herpetofaunal survey of the Richtersveld and collected much of the material of the *P. weberi* group from along the lower Orange Valley during the mid-1990s. The name is constructed in the masculine genitive.

Diagnosis.— A large species, to 50.0 mm SVL. *Pachydactylus goodi* may be distinguished from all other members of the *P. serval/weberi* group by the combination of the following characters: nasal region not strongly inflated laterally; rostral excluded from nostril; supranasals in contact anteriorly; scales on snout and canthus flattened to weakly domed, those of interorbital and parietal regions tiny, granular, with larger, rounded, conical tubercles interspersed; scales on snout equal to or greater than size to interorbital tubercles; dorsal scalation heterogeneous, with relative-

ly large, oval, strongly keeled tubercles arranged in approximately 16–18 regular rows; large keeled to mucronate tubercles on thighs; toes relatively short, toe pads relatively narrow; five undivided lamellae beneath digit IV of pes; tail to at least 113% of SVL, annulate, bearing whorls of large, pointed, strongly keeled tubercles, separated from each other by a single, narrow scale row; adult pattern chocolate to purplish-brown with a series of three very bold, white, complete transverse bands with well-defined, thick, dark brown margins: one from posteroventral margin of orbits across nape, one at mid-body and one presacral; white markings also present on the dorsum of thighs and on proximal forelimbs and forelimb insertions; tail with alternating mid-brown and white to cream, dark edged bands (Figs 113–115); juvenile pattern as adult (Fig. 116).

Description (based on holotype).— Adult male. Snout-vent length (SVL) 50.0 mm. Body relatively depressed, relatively short (TrunkL/SVL ratio 0.41). Head elongate, large (HeadL/SVL ratio 0.28), wide (HeadW/HeadL ratio 0.71), not strongly depressed (HeadH/HeadL ratio 0.43), distinct from neck. Lores and interorbital region weakly inflated. Snout long (Sn-Eye/HeadL ratio 0.40), much longer than eye diameter (OrbD/Sn-Eye ratio 0.68); scales on snout and forehead smooth, domed; large on snout and canthus becoming granular on interorbital region, with larger, weakly conical tubercles interspersed; scales on snout much larger than those of parietal table. Enlarged, weakly conical tubercles regularly scattered across interorbital, parietal, and temporal regions as far posterior as nape. Eye moderately large (OrbD/HeadL ratio 0.27); orbits without extra-brillar fringes; 5–6 supracilliary scales at posterodorsal corner of orbit bearing small spines; pupil vertical, with crenelated margins. Ear opening rounded, moderately large (EarL/HeadL ratio 0.09); eye to ear distance greater than diameter of eyes (Eye-Ear/OrbD ratio 1.13). Rostral approximately 45% as deep (0.8 mm) as wide (1.8), no rostral groove, contacted by two enlarged supranasals and first supralabials; nostrils oval, oriented laterally and slightly dorsally, each surrounded by two postnasals, supranasal, and narrowly by first supralabial; supranasals in contact anteriorly, separated by a single granule posteriorly; dorsal postnasals larger than ventral postnasals, separated by 2–3 granules; nostril rims weakly inflated, bordered posteriorly by a distinct notch or pit; one row of scales separate orbit from supralabials; mental with nearly parallel sides, tapering only slightly posteriorly, approximately 2.3 times deeper (2.2 mm) than wide (1.0 mm); no enlarged postmentals or chin shields. Supralabials to angle of jaws 11/10 (9/9 to mid-orbit); infralabials 9/8; interorbital scale rows at midpoint of orbit 27 (7 across narrowest point of frontal bone).

Dorsal tubercles large (10–12 times size of adjacent scales), largest on dorsolateral surfaces and smallest along dorsal midline, rounded, with a pronounced median keel, forming 18 longitudinal rows on trunk; each tubercle surrounded by rosette of small granular scales; ventral scales flattened, subimbricate, becoming larger posteriorly, approximately 46 between lowest tubercular rows at midbody; tubercular scales on dorsum at midbody much larger than those on venter at same level; chin granules approximately one third to one fourth size of ventral scales, increasing in size rather abruptly on throat. No preanal or femoral pores. Scales on palm, sole, and ventral surface of forelimb smooth, granular; scales on ventral aspect of hindlimbs enlarged, continuous with enlarged scales of precloacal region; scales on dorsal aspect of forelimb smooth proximally, with small conical tubercles intermixed distally; scales on dorsum of thigh and crus greatly enlarged, conical or strongly keeled.

Forelimbs moderately short, stout (ForeaL/SVL ratio 0.14); hindlimbs moderately long (CrusL/SVL ratio 0.18); digits relatively short, claws absent; subdigital scansors, except for distalmost, entire, present only on distal portion of toes, 1.2–1.5 times wider than more basal (non-scansorial) subdigital scales; interdigital webbing absent. Relative length of digits (manus): III > IV > II > V > I; (pes): IV > III ~ V > II > I. Subdigital scansors (excluding small distal divided scansor) I (4), II (4), III (4), IV (4), V (4) – manus; I (4), II (5), III (5), IV (5), V (5) – pes.

Tail sub-cylindrical, very slightly depressed; partially regenerated tail shorter than snout-vent length (TailL/SVL ratio 1.12); tail relatively thin basally, tapering, with distinct whorls of scales; each transverse row of enlarged, pointed, strongly keeled tubercles separated by 3–4 rows of smaller scales; adjacent keeled dorsal caudal tubercles separated by a single narrow, elongate scale; subcaudal scales imbricating; midventral caudal scales enlarged (5–7 times size of dorsal caudal scales); two enlarged, pointed, posterodorsally-projecting postcloacal spurs on each side of tailbase.

Coloration (in preservative): Dorsum purplish-brown with a bold pattern of three beige transverse bands with thick, well-defined dark brown borders. Anterior band extending from orbit to orbit across occiput and nape. Light portion of band continuous with pale labial scales; dark anterior margins of band continue through orbit to nostrils, becoming lighter on snout. Second band at midbody, third in presacral position. Top of head uniform yellowish-mid-brown with pair of well-defined pale stripes from anterior of orbit to postnasal scales. Forelimbs uniform purplish-brown; hindlimbs purplish-brown with a single dark edged pale band on thigh, continuous with presacral trunk band when limbs are protracted. Original portion of tail with bold alternating pattern of purplish-brown and dark-edged cream bands of approximately equal size; regenerated portion of tail uniform purplish-brown. Venter grayish-cream, unpigmented.

VARIATION.— Variation in mensural characters of the holotype and paratypes are presented in Table 8. Paratypes TM 84505 (Fig. 114) and CAS 231878 (Figs. 114–115) have a similar pattern to the holotype, but have less faded colors, the dominant dorsal color is light to mid-brown, whereas the light bands are white, rather than cream. TM 84505 lacks the band on the thigh. Juvenile paratype TM 29707 (Fig. 116; SVL 18.8) has extensive skin and forelimb damage. Its dorsal pattern is similar to the adult pattern, but the dark brown borders of the white bands are not as strongly contrasting with the mid-brown dorsal coloration as in the adults. In life, the purplish dorsal color is a chocolate brown, the pale bands are bright white, and there are white markings on the dorsal surfaces of the thighs and of the forelimbs (Fig. 115).

DISTRIBUTION.— This species has been found at several localities across the extreme north of the Northern Cape Province of South Africa, between Vioolsdrif and Aggenys (Figs. 21–22, 30), but has not been found on the Namibian side of the Orange River. Its distribution thus complements that of the similar *P. mclachlani*.

NATURAL HISTORY.— Nothing is known of the natural history of this species.

CONSERVATION STATUS.— This species has a restricted range and its habitat requirements are unknown. It does not occur in any protected areas and should be considered vulnerable.

REMARKS.— No tissue samples were available from this species, but based on purely phenetic grounds, it would appear to be most closely related to *P. mclachlani*.

Pachydactylus otaviensis Bauer, Lamb, and Branch, sp. nov.

Figures 117–118.

1984 *Pachydactylus weberi* [part] Visser, *Landbouweekbl*. 27 April 1984:53.
2005 *P*[*achydactylus*]. *weberi* [part] Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

TYPE MATERIAL.— HOLOTYPE: TM 45097 (Fig. 117): Adult male; Namibia, Oshikoto Region, Tsumeb District, Farm Uithoek (1917Bc), coll. G. Voigt, 29 April 1974. PARATYPES: TM 85000 (Fig. 118): Adult male, TM 85002 (Fig. 118): Juvenile; Namibia, Oshikoto Region, Tsumeb District, Farm Varianto (on Elandshoek) (19°22′46″S, 17°44′27″E), coll. E. Scott, 4 January 2004.

ETYMOLOGY.— Named for the Otaviberge or Otavi Highlands, a low range of dolerite hills in northeastern Namibia to which this species appears to endemic.

DIAGNOSIS.— Snout-vent length to at least 42.9 mm (TM 85000). May be distinguished from

all other members of the *P. serval/weberi* group by the combination of the following characters: snout blunt; rostral excluded from nostril; supranasals in narrow anterior contact; scales on dorsum of head weakly conical, those on snout much larger than those of interorbital region; interorbital and parietal granules intermixed with scattered, conical tubercles, each smaller than scales of snout; dorsal scalation heterogeneous, consisting of small conical scales interspersed with larger strongly keeled to mucronate tubercles; tubercles becoming conical on flanks; tubercles in 18 rows; thighs bearing very large conical tubercles; toes moderately long, toe pads relatively narrow; five undivided lamellae beneath digit IV of pes; tail (partly regenerated) to at least 102% of SVL, annulate, bearing whorls of large, pointed, strongly keeled tubercles, narrowly separated from each other; cloacal spurs very large bearing dorsally-directed pointed scales with concave surfaces; adult pattern of three pale bands (nape, just posterior to adpressed elbow, and posterior trunk, anterior to lumbar region) separating broader areas of grayish-brown with darker brown edges — pattern may be obscured and appear as 5–6 dark brown bands on a pale background (Figs. 117–118); juvenile pattern as adult, with three pale bands (Fig. 118).

Description (based on holotype).— Adult male. Snout-vent length (SVL) 39.4 mm. Body relatively depressed, short (TrunkL/SVL ratio 0.40). Head elongate, large (HeadL/SVL ratio 0.30), relatively wide (HeadW/HeadL ratio 0.65), not strongly depressed (HeadH/HeadL ratio 0.42), distinct from neck. Lores and interorbital region inflated. Snout short (Sn-Eye/HeadL ratio 0.39), longer than eye diameter (OrbD/Sn-Eye ratio 0.66); scales on snout and forehead granular to conical, round to oval; scales on snout much larger than those of parietal table. Eye moderately large (OrbD/HeadL ratio 0.26); orbits without extra-brillar fringes; posterior supracilliary scales bearing small spines; pupil vertical,with crenelated margins. Ear opening oval, small (EarL/HeadL ratio 0.07), greatest diameter vertical; eye to ear distance much greater than diameter of eyes (Eye-Ear/OrbD ratio 1.51). A series of enlarged conical tubercles between posterior border of orbit and occiput. Rostral approximately 60% as deep (1.0 mm) as wide (1.6); no rostral groove; contacted by two enlarged supranasals and first supralabials; nostrils oval, each surrounded by two postnasals, supranasal, and first supralabial; supranasals in narrow contact anteriorly, separated posteriorly by a single granule; dorsal postnasals separated by three granules; nostril rims weakly inflated; one row of scales separate orbit from supralabials; mental wedge-shaped, approximately 1.8 times deeper (1.7 mm) than wide (1.0 mm); no enlarged postmentals or chin shields; Supralabials to angle of jaws 10 (8 to mid-orbit); infralabials 9; interorbital scale rows (at midpoint of orbit) 23 (11 across narrowest point of frontal bone).

Scales of snout much larger than those of forehead; scales grade from conical on parietal region to keeled or mucronate on nape; dorsal tubercles large (4–6 times size of adjacent scales), rounded, with a pronounced median keel and obliquely-oriented ridges laterally, forming approximately 18 rows; tubercles largest on mid-flanks, keels somewhat flattened over sacrum; each enlarged tubercle surrounded by rosette of smaller scales; ventral scales flattened, subimbricate, becoming somewhat larger posteriorly, approximately 38 between lowest tubercular rows at midbody; scales on dorsum at midbody much larger than those on ventrum at same level; chin granules approximately one half size of ventral scales, increasing gradually in size on throat. No preanal or femoral pores. Scales on palm, sole, and ventral surface of forelimb smooth, granular; scales on ventral aspect of hindlimbs enlarged, juxtaposed to subimbricate; scales on dorsal aspect of forelimb smooth proximally, with small conical tubercles intermixed distally; scales on dorsum of thigh and crus greatly enlarged, conical or keeled to mucronate, terminating in sharp points.

Forelimbs moderately short, stout; forearm short (ForeaL/SVL ratio 0.14); hindlimbs relatively short, tibia moderately short (CrusL/SVL ratio 0.17); digits relatively short, claws absent; subdigital scansors, except for distalmost, entire, present only on distal portion of toes, 1.5–2.0 times

wider than more basal (non-scansorial) subdigital scales; interdigital webbing absent. Relative length of digits (manus): III > IV > II > V > I; (pes): IV > III ~ V > II > I. Subdigital scansors, exclusive of divided distalmost scansor (manus): I (4), II (4), III (4), IV (4), V (4); (pes) I (4), II (5), III (5), IV (5), V (5).

Tail sub-cylindrical, somewhat depressed; partially regenerated tail longer than snout-vent length (TailL/SVL ratio 1.02); tail relatively thick basally, tapering, with distinct whorls of scales; each transverse row of enlarged, keeled tubercles separated by 2–3 rows of smaller scales; smaller scale rows continuous around tail; each row of enlarged tubercles replaced ventrally by two rows of smaller scales; each row of keeled dorsal caudal tubercles interrupted occasionally by 1–2 small granules; subcaudal scales pointed posteriorly, subimbricating; four greatly enlarged, pointed, concave, dorsally-projecting postcloacal spurs on each side of tailbase, subtended by two smaller rows of dorsolaterally projecting pointed scales.

Coloration (in preservative): Ground color of dorsum beige to light brown with six mid-brown cross bands: one behind light nape band, four on trunk on one on sacrum. Lateral surface of head with dark brown streak from nostril and anterior supralabials through eye and above ear, fusing with opposite side on nape to form anteriormost dark cross marking; dark V-shaped mark diverging from supranasal scales to dorsal aspects of orbits; scattered dark markings on frontal and parietal regions; diffuse, partly broken dark line from angle of jaws to retroarticular process. Limbs mottled, with light and dark markings roughly alternating. Tail banded with 13 somewhat irregular narrower dark bands alternating with lighter interstices. Venter beige with scattered dark punctuations, especially on scales near edges of flanks and under limbs and tail.

Variation.— Variation in mensural characters of the holotype and paratypes are presented in Table 9. Adult paratype (TM 85000) similar in scalation to holotype, including distinctive cloacal spurs. Tail broader and more depressed. Banding more distinctive, with clearly demarcated nape band and two trunk bands. Area between pale bands irregularly patterned but with distinctly paler center and dark brown edges (Fig. 118). Venter cream with little scattered pigmentation. Juvenile paratype (TM 85002) similar to adult paratype but with anterior pale trunk band asymmetrical—expanded on right side and containing a single dark blotch (Fig. 118).

Distribution.— The species is known only from Farm Uithoek in the Tsumeb District of northeastern Namibia (Figs. 10–11). This is one of the most isolated members of the *Pachydactylus weberi* group, occurring 125 km north-northeast of *P. waterbergensis* and almost 400 km west-southwest of *P. tsodiloensis*. The locality lies near the northern point of a relatively low range of hills that extends northward from the main body of the Otaviberge. It seems likely that the species is more widely distributed within the Otaviberge. Uithoek is very close to the farm Ghaub, where an isolated population of *Rhoptropus barnardi* has been reported (W.D. Haacke, pers. comm., 2004). The region as a whole has been poorly explored herpetologically, and may be expected to harbor other isolated populations and/or endemic species of lizards. A number of endemic invertebrates and fish are already known from the Otavi-Tsumeb-Grootfontein area (Barnard et al. 1998).

Natural History.— The area where *P. otaviensis* occurs may be characterized as mountain savanna and karstveld (Giess 1971). The paratypes were collected in broadleaf savanna on rocky dolerite mountains. Like most members of the *P. weberi* complex, *P. otaviensis* probably shelters in rock cracks. An undescribed congner (see below) co-occurs with this form in the Otavi Highlands.

Conservation Status.— *Pachydactytlus otaviensis* does not occur in any protected areas. Depending upon the extent of its actual range it may be under some threat from local mining activity.

Remarks.— The type locality of *Pachydactylus otaviensis* was plotted by Visser (1984) in his range map of *P. weberi.* Bauer and Lamb (2003) also mentioned the holotype and suggested that it

might represent a close relative of *P. tsodiloensis* and/or *P. waterbergensis*, perhaps separated as the result of movements of the Kalahari sands.

Undescribed species in the *Pachydactylus serval/weberi* group

In addition to the species recognized and described above, we have identified at two additional distinctive members of the *Pachydactylus serval/weberi* complex. These are presently known from only a few specimens and will be described elsewhere when additional material becomes available.

Pachydactylus sp. 1

Material Examined.— South Africa: **Northern Cape Province**: TM 84939, Aughrabies Falls National Park (2820Cb); TM 85286, Farm Zeekoe, Steek 9, Kenhardt district (28°29′17″S, 20°07′34″E); ZFMK 83354, Augrabies National Park. Namibia: **Karasburg District**: NMNW R 10494; Haib Mine (28°41′49″S, 17°53′26″E).

Remarks.— The first species is superficially most similar to *P. mclachlani* and *P. robertsi* and is known from two widely separated localities along the Orange River – Haib Mine in the west, where it is sympatric with *P. mclachlani*, and Augrabies in the east, where it occurs in large granitic slabs and is the only member of the *P. weberi* complex that is present.

Pachydactylus sp. 2

Material Examined.— Namibia: **Grootfontein District**: TM 84999, 85005, Farm Uisib, 15 km NW (straight line) Otavi (19°33′08″S, 17°14′07″E).

Remarks.— A second species, at present known from only a hatchling and a juvenile, has the tubercular dorsum and thighs typical of the *P. weberi* complex, but the rostral scale narrowly contacts the nostril rim, as is typical for the members of the *P. serval* complex. The juvenile pattern expressed by this species is unique and diagnostic. This species has been collected in thick woodland in dolerite mountains in the Otaviberge, in close proximity to *P. otaviensis*.

Incertae sedis

A number of specimens examined could not be unambiguously assigned to species. Some of these were either *P. serval* or *P. montanus,* which can share nearly identical adult patterns and occur in sympatry in parts of southern Namibia. Localitiies associated with these specimens, however, are of minor interest as they occur well within the confirmed ranges of the two species. However, several specimens in the *P. weberi* group proved to be problematic and will be discussed elsewhere. All have relatively large body scales and some evidence of a nape band, but no other body banding. These specimens are SAM 47075 (Ugab River at 20°52′S, 14°57′E), TM 52503 (Leerkrans Farm, Northern Cape Province, South Africa, 2821Bc) and PEM R 12857–60 (Aus, Lüderitz District, Namibia, 2616Cb). The first specimen is most similar to *P. reconditus*. Although its locality is precise, additional material from this area is necessary to confirm that geckos from this locality are conspecific with those from the Khomas Hochland. The specimen from the Leerkrans locality is superficially similar to both *P. robertsi* and the undescribed species from Augrabies (*Pachydactylus* species 1). Those from the last locality may assignable to *P. acuminatus*, but this also requires further inquiry. The Leerkrans record is significant as it represents the easternmost record of any member of the *P. weberi* group. A single specimen in the *P. serval* complex (TM 84999) is particularly perplexing. It is superficially identical to typical *P. montanus*, but was collected hundreds of kilometers away, indeed hundreds of kilometers north of the northernmost record of any member of the

P. serval complex in the Khumib River bed, approximately 30 km northwest of Puros (18°39′17″S, 12°39′27″E).

Excluded from the *Pachydactylus serval* group

Pachydactylus sansteynae Steyn and Mitchell, 1967

Figures 119–121.

1967 *Pachydactylus serval sansteyni* Steyn and Mitchell, Cimbebasia (21):11, figs. 1–2 (HOLOTYPE: NMNW R 1626 (formerly CR 4478/4): "the vicinity of Kuidas water-hole in the Southern Kaokoveld, (about 13°45′E., 20°38′S., altitutde about 1200′)," coll. C. Brits, 3 April 1966. PARATYPES: CR 4478/3: same locality as holotype, coll. P. Motonane, 3 April 1966; CR 4478/1–2, 4478/5–7: same locality as holotype, coll. W. Steyn, A. Visagie, P. Motonane, 3 April 1966; CR 3057: "ten miles inland from the Huab river mouth," coll. F. Brown, 28 June 1966; CR 2838: "5 miles north of the Huab river mouth, near the coast," coll. P. Motonane, 24 April 1966. See **REMARKS**).

1971 *Pachydactylus serval sansteyni* Mertens, *Abhandl. Senckenberg. naturf. Ges.* 529:43.
1982 *Pachydactylus serval sansteyni* Welch, *Herpetology of Africa*:36.
1988 *Pachydactylus sansteyni* Branch, *Field Guide*:207.
1991 [*Pachydactylus*] *sansteyni* Kluge, *Smithson. Herpetol. Inform. Serv.* 85:23.
1993 [*Pachydactylus*] *sansteyni* Kluge, *Gekkonoid Lizard Taxonomy*:25.
1993 *Pachydactylus sansteyni* Bauer et al. *Madoqua* 18:127.
1994 *Pachydactylus sansteyni* Welch, *Lizards of the World* 1:95.
1994 *Pachydactylus sansteyni* Branch, *Field Guide,* 2nd ed.:207.
1998 *Pachydactylus sansteyni* Branch, *Field Guide*, 3rd ed.:261.
2000 [*Pachydactylus*] *sansteyni* Rösler, *Gekkota* 2:99.
2001 [*Pachydactylus*] *sansteyni* Kluge, *Hamadryad* 26:21.
2002 *Pachydactylus sansteyni* Bauer et al., *Proc. California Acad. Sci.* 53:23.
2003 *Pachydactylus sansteyni* Griffin, *Namibian Reptiles*:38.
2004 *Pachydactylus sansteynae* Michels and Bauer, *Bonn. Zool. Beitr.* 52:87.
2005 *P*[*achydactylus*]. *sansteynae* Bauer and Lamb, *Afr. J. Herpetol.* 54:116.

MATERIAL EXAMINED.— NAMIBIA, Swakopmund District: TM 31374, 56 km N Cape Cross (2113Bc); TM 44171, Cape Cross (2113Dd); TM 24983–84, 63377–78, Messum Mts. (2114Ac); **Khorixas District**: CAS 214589*, Skeleton Coast National Park, ca. 1 km S of Huab River Bridge (20°54′03″S, 13°32′01″E); CAS 214767*, Skeleton Coast National Park, N bank of Huab River at Huab River Bridge (20°54′04″S, 13°31′30″E); NMNW R 1622, 5 miles north of the Huab River mouth, near the coast (2013Cc); NMNW R 1623–5, 1637 (paratypes), 1626 (holotype), Kuidas (2013Da); TM 56997, 35 km SE Torra Bay, Skeleton Coast National Park (20°35′S, 13°21′E); NMNW R 7690, 20 mi. N of Ugab River mouth on Coast (2013Cd); TM 32019, ± 20 mi N Ugab River mouth (2013Cd); TM 62988, Uniab River 6 km E dunefield (20°08′S, 13°19′E); **Opuwo District**: NMNW R 140, TM 57700, Möwe Bay (19°22′S, 12°41′E); TM 56998, 4 km NE Möwe Bay (19°20′S, 12°45′E); TM 57053, Sarusas (18°45′S, 12°23′E); TM 32849, Khumib River 13 km E dunefield, Skeleton Coast National Park (1812Dc); TM 63377–78, Cape Fria Hut (18°15′S, 12°01′E); TM 32503, NW Dunefields (1711Da).

DIAGNOSIS.— To 48.0 mm SVL (TM 63377). *Pachydactylus sansteynae* is not a member of the *P. serval/weberi* group, but is listed here because it was initially described as a subspecies of *P. serval* (Steyn and Mitchell 1967). Dorsal pattern usually consisting of dark vermiculations, but may be spotted (e.g., TM 24983, 32849, 56998). Juvenile pattern as adult. It may be distinguished from *P. serval*, *P. purcelli*, *P. montanus*, *P. kobosensis*, *P. carinatus*, and *P. griffini* by the presence of conical tubercles on the hind limbs and from all other members of the *P. serval/weberi* group by its rostral-nostril contact. In addition, *P. sansteynae* is characterized by an elongate head, a lack of tubercles on the interorbital and parietal regions, 14–16 rows of very small, keeled tubercles (usually evident only posterior of the axillae), typically 4 undivided lamellae beneath digit IV of the pes, and

greatly enlarged cloacal spurs in males, consisting of four enlarged, pointed, sharp-edged scales (Figs. 119–121).

Distribution.— Griffin (2003) reported the species from the Opuwo, Khorixas, Omaruru and Swakopmund districts in northern Namibia. Within this area it is limited largely to areas within 20 km of the coast, bounded by the Kunene River in the north and the Omaruru River in the south (Figs. 10–11). Given its occurrence in the far north of the Skeleton Coast, it is highly likely that *P. sansteynae* also occurs in southwestern Angola, although no specimens have been collected there to the best of our knowledge.

Natural History.— We have collected this species only near the Huab River mouth, where it was found sheltering in crevices in highly fragmented shale slopes (Fig. 122). It is uncommon for *Pachydactlyus* to occur in circumstances in which soil or mud is present in rock crevices, but this was the case for this species. Steyn and Mitchell (1967) reported that the types were associated with boulders or sandstone blocks and that they were found walking on the sand at night.

Conservation Status.— The species is certainly secure. Its entire range is in the uninhabited, hyperarid northern Namib and nearly all localities lie within the Skeleton Coast National Park or West Coast Recreation Area.

Remarks.— The description gives data for the holotype and eight paratypes, as well as three other specimens. Material in the National Museum of Windhoek bearing "CR" numbers have since been catalogued into the main collection. The holotype is present as NMNW R 1626 and there are four specimens labeled as paratypes, NMNW R 1623–5 and NMNW R 1637. The whereabouts of the other paratypes and three additional specimens could not be determined. There are no specimens in the Windhoek collection, or in the Transvaal Museum (where CR 2838/1, a non-type, was supposedly sent) that correspond to the missing material. However, NMNW R 1622, labeled as a paratype with the data "14 mi. N Swakopmund" collected 29 September 1965 by P. Motonane is likely, in reality, to correspond to CR 3871//2, a non-type, that was, according to Steyn and Mitchell (1967), collected on this date, by this collector, but from "5 miles north of the Huab river mouth, near the coast." The confusion of localities is probably associated with the switch from "CR" to SMW (and subsequently NMNW) numbers and labels when the original data were probably inadvertently exchanged between specimens. The locality near Swakopmund is outside of the range of this species and no appropriate habitat for this species occurs there, but the superficially similar *P. bicolor* is common at this place. A purported photograph of *P. sansteynae* (Branch 1998, pl. 112, upper left) actually illustrates a specimen of this northcentral Namibian coastal population of *P. bicolor*.

This species was named for "Mrs. Steyn, in acknowledgement of her collecting and voluntary curatorial activities on behalf of the State Museum" (Steyn and Mitchell 1967:11). Article 31.1.2 of the International Code of Zoological Nomenclature (1999) states that "A species-group name, if a noun in the genitive case … formed directly from a modern personal name, is to be formed by adding to the stem of that name *-i* if the personal name is that of a man, *-orum* if of men or of man (men) and woman (women) together, *-ae* if of a woman, and *-arum* if of women; the stem of such a name is determined by the action of the original author when forming the genitive." The original construction, *sansteyni*, was thus incorrectly formed. Following Article 33.3.3 of the Code, Michels and Bauer (2004) emended the name to *Pachydactylus sansteynae.* The need to correct the name probably escaped earlier notice because the species is restricted in range and seldom cited in the literature, the journal in which the description is held is not widely known outside of southern Africa, and the etymology of the name appears in the general introduction to the paper, rather than within the species description proper.

Steyn and Mitchell (1967) regarded this gecko as a subspecies of *P. serval*, with which it shares

a generally similar habitus and spotted dorsum. It was regarded as specifically distinct by Branch (1988) and all subsequent authors. A broader phylogenetic analysis reveals that it is only distantly related to the *P. serval/weberi* group. Its closest affinities lie with a number of small-bodied *Pachydactylus* that share a chiefly northwestern Namibian distribution (Bauer and Lamb 2005; Lamb and Bauer 2006).

Valid species of the *P. serval/weberi* complex

P. fasciatus Boulenger, 1888
P. weberi Roux, 1907
P. serval Werner, 1910
P. purcelli Boulenger, 1910
P. montanus Methuen & Hewitt, 1914
P. werneri Hewitt, 1935
P. kobosensis FitzSimons, 1938
P. robertsi, FitzSimons, 1938
P. acuminatus FitzSimons, 1941
P. tsodiloensis Haacke, 1966
P. waterbergensis Bauer & Lamb, 2003
P. reconditus sp. nov. Bauer, Lamb & Branch, 2005
P. monicae sp. nov. Bauer, Lamb & Branch, 2005
P. griffini sp. nov. Bauer, Lamb & Branch, 2005
P. carinatus sp. nov. Bauer, Lamb & Branch, 2005
P. mclachlani sp. nov. Bauer, Lamb & Branch, 2005
P. visseri sp. nov. Bauer, Lamb & Branch, 2005
P. goodi sp. nov. Bauer, Lamb & Branch, 2005
P. otaviensis sp. nov. Bauer, Lamb & Branch, 2005

Comparisons among taxa

One of the most distinctive members of the *Pachydactylus serval/weberi* group is *P. kobosensis*, which may be distinguished by the exclusion of both the rostral and first supralabial scales from the nostril rim, the increased number of subdigital lamellae (6 vs 5 undivided lamellae beneath digit IV of pes), and its velvety dorsal skin.

Within the *Pachydactylus serval/weberi* complex, the "*serval* type" species (*P. serval*, *P. purcelli*, *P. montanus*, *P. griffini*, *P. carinatus*) may be distinguished from all remaining forms by the condition of rostral-nostril contact and the absence of thigh tubercles. Among these forms *P. serval* and *P. carninatus* share a juvenile pattern characterized by a dark body with pale sacral and nape markings, whereas *P. purcelli* and *P. montanus* have banded juveniles (3 bands in the former, 4 in the latter), and *P. griffini* juveniles are spotted. Adults of *P. purcelli* and *P. montanus* often retain recognizable elements of the juvenile pattern, and adult spotting in the former is characteristically close-spaced and covers the whole of the dorsum and flanks. Further, original tails of *P. serval* and *P. purcelli* bear small, unkeeled tubercles, whereas these are typically keeled in *P. griffini* and *P. carinatus* and usually so in *P. montanus*. Only in *P. carinatus* is the dorsum always covered by keeled tubercles. In contrast, keeled tubercles (if present) in *P. montanus* are generally lacking form the mid-dorsum and there are maximally 12 (vs. 16) tubercular rows. Although juvenile (and usually smaller adult) specimens of all members of the group may be easily distinguished on the basis of color pattern, large adult specimens of *P. montanus* and *P. serval* may be difficult to distinguish, although in the former there is a greater difference in relative size between snout and interorbital scales and small parietal tubercles are often present.

All remaining members of the group possess the "*weberi* type" condition, in which the rostral (but usually not the first supralabial) is excluded from the nostril, and the thighs bear enlarged, usually-keeled or conical, tubercular scales. Within this group *P. visseri*, *P. tsodiloensis*, and *P. waterbergensis* possess five or more transverse body bands and juvenile patterns, when known, are essentially similar to the adult. Of these, *P. visseri* typically has 6–7 pale bands that are wider than the darker interspaces. *Pachydactylus tsodiloensis* and *P. waterbergensis* are most similar to one another, but the former has generally thicker and more irregular light body bands and is larger (maximum 60 vs 49 mm SVL) and has morer subdigital lamellae (6 vs 5 undivided beneath digit IV of pes).

Both *P. robertsi* and *P. reconditus* have a distinctive light nape band, but lack bands on the remainder of the trunk. These forms may be distinguished from one another by their dorsal tubercles, which are large, rounded and partly imbricating in the former and somewhat smaller, more elongate and juxtaposed in the latter. *Pachydactylus werneri* is distinguished by its elongate body and limbs, raised nostril rims and a juvenile pattern of four pale transverse bands (often highly modified in adults). All remaining species have three pale transverse bands as juveniles. *Pachydactylus fasciatus* is the most strongly tuberculate of these, has very wide bands, and is the only species in which caudal tubercles are typically in contact with each other, without intervening scales. In *P. mclachlani* there are two narrow bands — on the nape and anterior of midbody. In juveniles and most adults a broader pale band crosses the sacrum, but this fades and may be inconspicuous in some adults, giving the impression that only two bands are present. *Pachydactylus acuminatus* may be distinguished from the remaining taxa by its greater number of undivided subdigital lamellae (6 vs 5 beneath digit IV of pes) and by its highly heterogeneous tuberculation (typically much reduced on anterior third of trunk). In *P. otaviensis*, the three dorsal bands may be distinct or the centers of the interspaces between bands may be similar in color to the bands themselves, yielding a pattern of 5–6 narrow dark bands (the borders of the pale bands) on a light background. The dorsal, thigh and caudal tubercles are strongly keeled to mucronate and the cloacal spurs are especially well-developed. *Pachydactylus weberi*, *P. monicae*, and *P. goodi* all share the three-banded juvenile pattern, but this is typically greatly obscured in *P. weberi* adults, which usually possess a complex dorsal pattern. In the other two species, the three-banded pattern remains evident in the adults, being weakly contrasting and usually flecked with dark markings in *P. monicae* and boldly contrasting against a dark brown background in *P. goodi*.

Key to the Members of the *Pachydactylus serval* and *P. weberi* Groups

Unambiguous identification of some species, particularly in the *P. serval* complex, requires hatchling or juvenile specimens, which are distinctive with respect to dorsal patterning. However, subtle differences in adult pattern and scalation, as well as geographic information should permit the identification of adults in most instances.

1a. Rostral and first supralabial enter nostril . . . . . 2 (*serval* complex)
1b. Rostral excluded from nostril . . . . . 6 (*weberi* complex)
2a. Juveniles with spotted juvenile pattern, adults with small, rounded, evenly-spaced spots with trace of two transverse lines or rows of spots on nape, snout strongly inflated laterally . . . . . *P. griffini*
2b. Juveniles with banded dorsal pattern, adult pattern not as above, snout not strongly inflated . 3
3a. Juveniles dark-bodied with ashy nape and sacral bands. 4
3b. Juveniles with three or more cross bands 5
4a. Dorsal scalation largely atuberculate except for sacrum and lumbar region, tubercles not or feebly keeled, no tubercles on parietal table. . . . . *P. serval*

4b. Dorsal scalation strongly tuberculate, tubercles keeled, usually with whitish tips, conical tubercles on parietal table . . . . . *P. carninatus*
5a. Juveniles with three cross bands, adults with small, irregular, dense spots (southern populations) or retaining evidence of juvenile pattern (northern populations) adults usually without body tubercles . . . . . *P. purcelli*
5b. Juveniles with four cross bands, adults with relatively large spots and/or evidence of cross bands, adults with variably developed body tuberculation in 10–12 rows . . . . . *P. montanus*
6a. Rostral and first supralabial excluded from nostril, dorsal scalation largely homogeneous . . . . . *P. kobosensis*
6b. Rostral only excluded from nostril 7
7a. Nape band only or no body bands 8
7b. Two or more body bands present 9
8a. Dorsal tubercles rounded, partly imbricating . . . . . *P. robertsi*
8b. Dorsal tubercles oval, juxtaposed . . . . . *P. reconditus*
9a. Five or more body bands 10
9b. Three or four body bands 12
10a. Large, to 60 mm SVL, typically 6 undivided lamellae beneath digit IV of pes. . *P. tsodiloensis*
10b. Body size small to moderate (35–53 mm SVL), typically 5 undivided lamellae beneath digit IV of pes 11
11a. 16–18 rows of dorsal tubercles, 6–7 pale dorsal markings, wider than dark cross bands . . . . . *P. visseri*
11b. 20 rows of dorsal tubercles, 5–6 narrow pale bands on reddish-brown background . . . . . *P. waterbergensis*
12a. Body gracile, limbs long, slender, nostril rims inflated, 4 pale transverse bands (pattern often obscured in adults) . . . . . *P. werneri*
12b. Body and limbs relatively robust, nostril rims not inflated, 3 pale transverse bands in juveniles (may be obscured in adults) 13
13a. Body large (to 56 mm SVL), transverse bands wide, bold and strongly contrasting with background color in both juveniles and adults, caudal tubercles within a single tail whorl abutting . . . . . *P. fasciatus*
13b. Body moderate (to 50 mm SVL), transverse bands distinct in juveniles, variable in adults, caudal tubercles within a single whorl not in contact 14
14a. Anterior third of dorsum weakly tuberculate, typically 6 lamellae beneath digit IV of pes, all dorsal bands relatively broad . . . . . *P. acuminatus*
14b. Entire dorsum approximately equally tuberculate, 5 or 6 lamellae beneath digit IV of pes . 15
15a. Dorsal scales very large, strongly keeled to mucronate, dorsum pale with six dark cross bands . . . . . *P. otaviensis*
15b. Dorsal scales moderate, keeled but not mucronate 16
16a. Transverse bands all broad 17
16b. Anterior transverse bands narrow, sacral band may be inconspicuous in adults . *P. mclachlani*
17a. Background color of adult dorsum dark brown . . . . . *P. goodi*
17b. Background color of adult dorsum light (cream to light brown) 18
18a. Dorsal bands, except that on nape generally obscured in adults, dark margins of pale bands with slightly wavy margins, usually with extensive dark patterning on dorsum . . . . . *P. weberi*
18b. Dorsal bands generally retained in adult, dark margins of pale bands with straight edges, dark patterning limited to edges of cross bands and scattered dashes or blotches within and between bands . . . . . *P. monicae*

Discussion

Molecular Comparisons.— Intraspecific pairwise comparisons of cyt*b* sequence divergence, derived from Kimura's (1980) 2-parameter model, ranged from 0.0 to 18.5%. The greatest distances were observed in *P. montanus*, reflecting marked divergence between geckos collected south of the Orange River near Onseepkans and the remaining populations north through the Karasberg area (range =14.3-18.5%). Genetic divergence within the other species surveyed was significantly lower, ranging from 0.5 to 10.7%. Interspecific comparisons of sequence divergence, both within and between respective *weberi* and *serval* groups, fall in the middle to higher end of values reported for cyt*b* in reptile (and other vertebrate) congeners (Johns and Avise 1998). All interspecific comparisons exceed 12%, and some comparisons approach 30%. As might be expected, these high levels of divergence are reflected in near saturation of third position codon sites (substitutions for 124 out of 128). Thus, the *serval/weberi* clade exhibits sequence divergence comparable to that of other *Pachydactylus* clades, including small-bodied groups, e.g., the *capensis* (Bauer and Lamb 2002) and *rugosus* groups (Lamb and Bauer 2000), and large-bodied groups, e.g., the *namaquensis* group (Lamb and Bauer 2002). A higher order molecular phylogeny of *Pachydactylus* as a whole (Bauer and Lamb 2005; Lamb and Bauer 2006) reveals that the *weberi/serval* clade is sister taxon to the *capensis* clade.

Phylogenetic Relationships in the *Pachydactylus serval* Group.— Relationships among members of the *Pachydactylus serval* and *weberi* groups remain incompletely known as we were only able to obtain genetic samples from 15 of the 21 species we recognize within the group. Further, as noted earlier, our genetic data consist of a segment of a single mitochondrial gene (cyt*b*); thus, it is quite possible that the gene tree may differ topologically from species trees derived from sampling a larger set of independent characters

The Bayesian analysis (Fig. 123) retrieves a monophyletic *weberi* clade corresponding to that recognized on the basis of morphological characters (rostral excluded from nostril and thighs tuberculate, except *P. kobosensis*). Within this group, *P. fasciatus*, *P. waterbergensis* and *P. tsodiloensis* form a well supported subclade (pP = 0.99) that is sister to the subclade *P. weberi* sensu stricto (pP = 0.92). Together, these two subclades constitute the sister group to all remaining members of the *weberi* complex, which form a well supported assemblage (pP = 1.0) with the following relationships: ((((*P. werneri, P. reconditus*)*P. kobosensis*) (*P. robertsi, P.* "Augrabies")) *P. monicae*). Support for the entire *weberi* group, however, is weak (pP = 0.75). Unfortunately genetic material was not available for *P. acuminatus*, *P. visseri*, *P. goodi*, or *P. mclachlani*, but all exhibit morphological features consistent with the *P. weberi* group and we hypothesize that they are also members of this clade.

The *P. serval* group is retrieved but not strongly supported in the Bayesian analysis (posterior probability < 0.80). Within this group the clade ((*P. serval*, *P. griffini*) *P. carinatus*) is retrieved with strong support, although the clustering of *P. serval* and *P. griffini* is weak. The remaining *serval* group members, *P. montanus* and *P. purcelli*, are each other's sister taxon and constitute the sister group of the remaining species of the *serval* complex. Sampling within *P. montanus* was more extensive than in any other group and this taxon shows greater genetic variability than any other taxa sampled. In particular, specimens from the immediate vicinity of Onseepkans differed considerably from those elsewhere in the species range, including localities as little as 55 airline km away. Specimens from Kakamas and Augrabies (south and east of Onseepkans) are much closer to those from the Grünau region (north and west of Onseepkans) than either are to animals from the immediate vicinity of Onseepkans. Further, specimens from Farm Witputs, on the north bank of the Orange River, fell into two different subclades of *P. montanus* (Fig. 124).

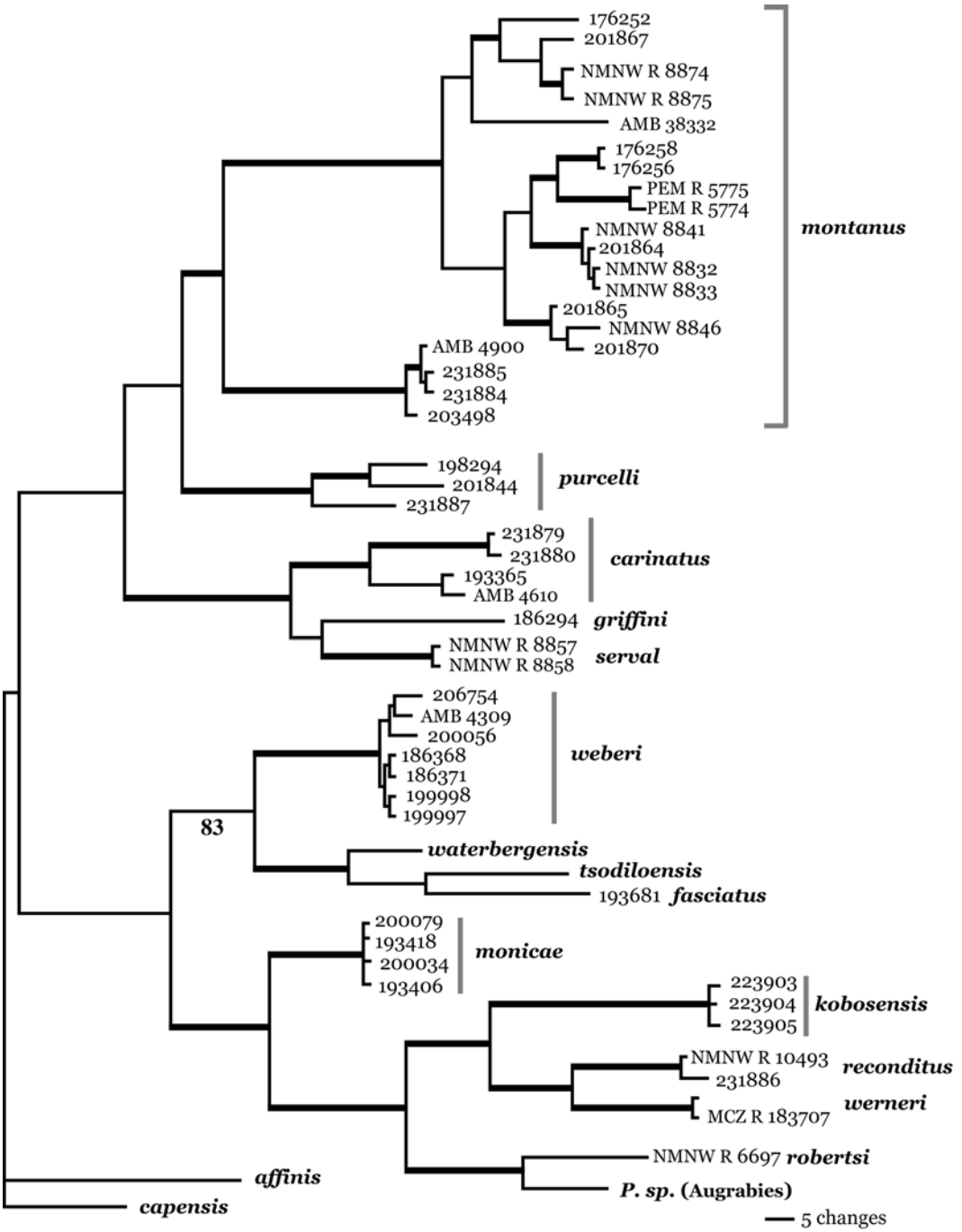

FIGURE 123. Bayesian gene tree of the *Pachydactylus serval/weberi* clade based on sequence data from a portion of the cytochrome *b* gene. Bold lines indicate posterior probabilities (pP) > 0.90. Unlabeled lines indicate pP < 0.80. Branches with 0.80 < pP < 0.90 indicated explicitly. Numbers refer to museum numbers. Unless otherwise indicated, specimens are in the collection of the California Academy of Sciences (CAS). See text for standard museum symbolic codes. See Appendix for GenBank accession numbers corresponding to these specimens. Additional specimens investigated, but with identical sequences to those shown here, are not indicated.

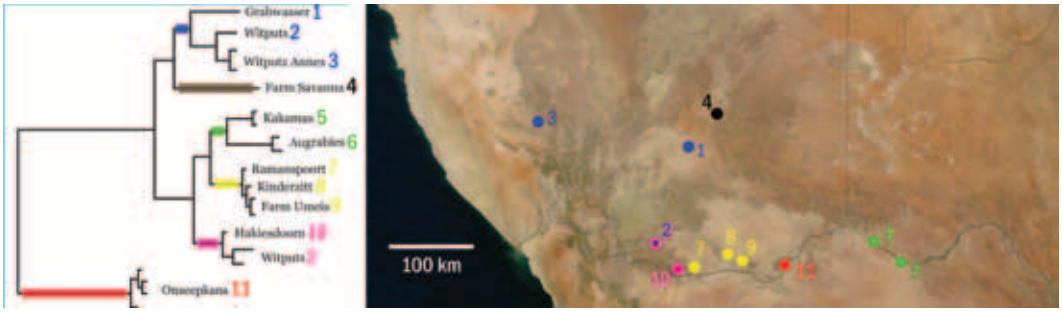

FIGURE 124. Detail of Bayesian gene tree of *Pachydactylus montanus* based on sequence data from a portion of the cytochrome *b* gene. Subclades are color-coded and localities are numbered to correspond to points plotted on the satellite image of the Orange River and adjacent areas of South Africa and Namibia. There is generally good fit between apparent relationships and geographic patterns, but specimens from Onseepkans are highly divergent from their nearest neighbors, despite exhibiting no obvious morphological differences. See text for further discussion. MODIS imagery from the Global Land Cover Facility (*http://www.landcover.org*).

Our results suggest congruence between mtDNA tree-based and morphological character-based methods for delimiting species boundaries in both the *serval* and *weberi* groups. The species identified in this study are all also geographically concordant, with ranges that are contiguous intraspecifically but largely allopatric or parapatric between taxa. The major exception to our concordant tree- and character-based delimitations is in respect to *P. montanus*. In this instance cyt*b* data suggest that the Onseepkans population forms a deeply divergent basal lineage within *P. montanus*. However, the genetic distinctiveness of the Onseepkans population is not corroborated by any morphological characters and appears to be at odds with distributional data as well. For these reasons, we have elected to treat all of these populations as members of a single species, but should additional molecular and/or morphological data substantiate the distinctiveness of the Onseepkans population, the name *P. onscepensis* remains available for it.

Our taxonomic conclusions differ substantially from those of earlier workers, reflecting in large part our extensive sampling effort (> 1800 specimens) throughout the range of the *Pachydactylus serval* and *weberi* groups. This includes material that we and our colleagues collected in the Richtersveld and adjacent southern Namibia and in the Karasberg region. These areas, which include several regional endemics, were poorly collected prior to the mid-1970s. In addition, our revision reflects the use of previously under-utilized characters, particularly juvenile coloration pattern, as well as the mtDNA data.

McLachlan and Spence's (1966) interpretation of the *serval* group represents the most recent explicit consideration of relationships and taxonomic boundaries in this species complex. They recognized a single species with three subspecies, *P. s. serval*, *P. s. purcelli*, and *P. s. onscepensis*. Their subspecific designations were based chiefly on perceived patterns in dorsal tuberculation, with *purcelli* possessing no tubercles, *serval* having few tubercles and *onscepensis* being moderately to strongly tuberculate. We agree that *P. purcelli* is virtually completely atuberculate throughout its range. Based on our conclusions, however, McLachlan and Spence (1966) misinterpreted their data on tuberculation from specimens along the length of the lower Orange River. They regarded the degree of tuberculation to be largely clinal in nature, with populations from Onseepkans downstream exhibiting greater tuberculation and being referable to *P. s. onscepensis*. Our data support the interpretation that the Richtersveld (175 airline km and more downstream from Onseepkans) is occupied by a strongly tuberculate species (*P. carinatus*), whereas *P. montanus*, which exhibits high variability with respect to tuberculation, occurs chiefly upstream from Goodhouse. The two species

appear to occur sympatrically, or nearly, so in several areas along the Orange River from Vioolsdrif to Onseepkans. McLachlan and Spence (1966) likewise regarded low to moderate tuberculation in the area near the Great Karas Mountains as reflecting the exclusive presence of *P. s. serval* in this region. Our data, however, indicate that three species, *P. serval*, *P. montanus* and *P. purcelli,* occur in the Karasberg area: *P. serval*, as currently defined, probably reaches the limits of its distribution in this region.

Biogeography and the Evolutionary History of the *Pachydactylus serval* Group

Ecological Correlates of Distribution.— With the exception of several problematic outliers, geographic patterns within the *Pachydactylus serval* and *weberi* complexes are coherent. The clade as a whole occupies much of western southern Africa exclusive of coastal areas, most of the Kalahari and the southwestern Cape. However, existing collections provide an incomplete picture of the geographic distribution of individual species. The distributional limits of even well-known forms represented by hundreds of specimens remain incompletely determined, and large areas of both Namibia and South Africa that may support members of this group remain to be surveyed adequately. In particular, the region between Keetmanshoop and Rehoboth in south central Namibia and Boesmanland in the Northern Cape have been undercollected.

Specific correlates of distribution with vegetation patterns (Giess 1971; Mucina and Rutherford 2004) are tenuous at best. However, the *P. serval* clade appears to be restricted largely to the Nama-Karoo Biome, with the Richtersveld and adjacent populations also occupying the Succulent Karoo and Desert biomes, although in the last case, populations are chiefly associated with the riparian Orange corridor (Jürgens 1991; Irish 1994). Interestingly, a single *P. montanus*- like animal was collected from the Kaokoveld, in the narrow corridor of the Nama-Karoo Biome that extends northwards to the Kunene River. Members of the *P. weberi* group are more broadly distributed across biomes, with several Savanna Biome species (*P. tsodiloensis*, *P. otaviensis*, *P. waterbergensis*, *P. recoditus* and *P. kobosensis*), a Desert Biome species (*P. werneri*), three Nama-Karoo Biome species (*P. robertsi*, *P. goodi* and *P. mclachlani*), a succulent Karoo species (*P. weberi*), and several others with distributions spanning biomes. This is especially true in the Richtersveld and adjacent southern Namibia, where many vegetation types and phytogeographic units meet in a relatively small area (Jürgens 1991; Mucina and Rutherford 2004).

Endemism.— The recognition of many resurrected and new taxa here provides the context for reassessing endemism within this group, which previously consisted chiefly of just a few widespread taxa (Branch 1998). Our revision reinforces views of Namibia as a country characterized by high biodiversity and endemism (Maggs et al. 1998). M. Griffin (1998) identified 55 reptile species as being strictly or primarily endemic to Namibia and emphasized the significance of the inselbergs of western Namibia as centers of endemism. This revision, together with other recent species descriptions (Bauer et al. 2002; Bauer and Lamb 2003a), underscores the contribution of *Pachydactylus* to overall endemism. In particular, two clades, the northwestern clade (*sensu* Bauer and Lamb 2005) and the *serval/weberi* clade, account for the majority of Namibian endemics. The latter clade is notably absent from northwestern Namibia along the Northern Namibian Escarpment (*sensu* Irish 2002), an area where the northwestern clade (*sensu* Bauer and Lamb 2005) has its greatest species richness. This region is also largely coincident with the Kaokoveld center of Floral Endemism (Volk 1966; van Wyk & Smith 2001) and is recognized as a regional center of endemism for reptiles in general (Crowe 1990; Simmons et al. 1998; Griffin 2000b).

Within the *serval/weberi* clade, areas of endemism include montane regions that have been

ranked as areas of high biodiversity importance (Irish 2002), e.g., the Karasberge, the Otavi Highlands, and the Waterberg. Although biotic diversity of the Waterberg is high, endemism is generally low (Simmons et al. 1998). The Waterberg's relatively low relief probably facilitates movement of terrestrial reptiles from surrounding areas, decreasing the likelihood of long-term isolation (and thus endemism), while promoting diversity through the commingling of western (Namib and central Namibian) and eastern (Kalahari) faunal components. As a result, the herpetofauna of the Waterberg Plateau region is diverse, with 13 frogs and a minimum of 82 reptile species (Schneider 1998; van den Elzen 1978), of which only the lacertid *Pedioplanis rubens* (Mertens, 1954) — one of only two rock-dwelling members of its genus (Mayer and Richter 1990) — and *Pachydactylus waterbergensis* are endemic. In both instances speciation was probably more a function of high substrate specificity (sandstone cliffs and boulders) than the result of isolation by distance or elevation.

Bauer (1999) emphasized substrate specificity as an important factor in the promotion of cladogenesis in the *Pachydactylus* Group as a whole. The historical interplay of sand and rock substrates has resulted in the isolation and subsequent speciation of obligate rupicolous species on inselbergs isolated by sandy substrates (Haacke 1982; Bauer 1993). For example, Bauer (1999) considered shifts in the Namib sand seas as causative in the diversification of *Rhoptropus*, whereas changes in the extent of the Kalahari sands (Thomas and Shaw 1993) have implicated in speciation of strictly rupicolous *Platysaurus* (Broadley 1978; Jacobsen 1994; Scott et al. 2003). Changing patterns of substrate distribution may be the result of orogenic events, such as the uplift of the great Western Escarpment about 18 MY (Moon and Dardis 1988; Partridge and Maud 2000), or of climatic shifts, such as cooling associated with the development of the south polar ice cap (Woodruff et al. 1981) and the initiation of the cold Benguela current system along the west coast in the Late Miocene (Siesser 1978, 1980; Coetzee 1993) or cooling and drying caused by the northward rift of the African continent and the closure of the Tethys seaway (Axelrod and Raven 1978; Tyson 1986; Tyson and Partridge 2000).

Within the *Pachydactlyus serval/weberi* clade, *P. tsodiloensis* is restricted to the remote Tsodilo Hills of northwestern Namibia. Like the Waterberg, these hills are not very high (to 330 m above the surrounding plains), but they provide the only extensive rocky habitat for rupicolus geckos for great distances in any direction. The same is true of the Otavi Highlands, from which we have identified two endemic *Pachydactylus — P. otaviensis* and an as yet undescribed species. Other northern Namibian inselbergs, such as the Aha Mountains, have not yielded *P. weberi* type geckos (Haacke 1966), but have not been adequately sampled. Most of the areas of endemism occupied by members of this group are also identified by other taxa; for example, the bothriurid scorpion *Lisposoma joseehermanorum* is restricted to the Otavi Highlands (Prendini 2003a).

Similar substrate mediated cladogenesis may have played a role elsewhere in the range of the *serval* and *weberi* groups. For example, the granitic Aus mountains are separated from the dolomitic Huib-Hoch Plateau in southern Namibia by a sandy corridor as little as 10 km wide. Nonetheless, this corridor appears to be a barrier between *P. acuminatus* in the north and *P. monicae* and *P. visseri* in the south. A similar barrier has been noted for scorpions, which are likewise substrate specific (Prendini 2001b, 2003b). In other cases, multiple montane units with contiguous corridors of suitable rocky substrate may support more widespread species. For example, *P. reconditus* occurs in the Swakop-Khan, Khomas Hochland, Auas, Gamsberg and other montane areas identified by Irish (2002).

The most significant areas of endemism and diversity for the *P. serval/weberi* clade are in the Karasberge and along the Orange River downstream from Augrabies Falls. Lawrence (1929) first regarded southeastern Namibia, including the Karas Mountains, as a recognizable area of reptile endemism, but until now this has been supported by few taxa. To the west, Bauer and Branch (2003)

and Scott et al. (2003) emphasized the high level of lizard endemism in the Richtersveld and immediately adjacent areas. They noted the role the Orange River plays as a barrier to gene flow for a few species, but also its more important role as a corridor for dispersal.

Bauer (1999) specifically suggested a role for the Orange River in the history of the *Pachydactylus serval* group, and the distribution of many of its constituent taxa (*P. carinatus*, *P. montanus*, *P. goodi*, *P. monicae*, *P. visseri*, *P. weberi*) along the river or with the river as an apparent barrier to dispersal, certainly suggests that this is the case. However, specific scenarios relating the changing position of the Orange drainage since the Cretaceous to the patterns observed today are not straight-forward. One purely speculative hypothesis is that the Oligocene position of the Orange far to the south of its present position, with its mouth at the Cape Canyon, near the modern Olifants River mouth (Dingle and Hendy 1984; Dollar 1998; Goudie 2005), may have allowed the expansion of a chiefly northern lineage well into South Africa. Subsequent capture of the Orange by the Koa River in the Late Miocene may have isolated one lineage in Namaqualand, whereas later establishment of the modern drainage pattern, following the failure of the Koa through tectonic agency or aridification (Dollar 1998; De Wit 1999), may have isolated another lineage east of Namaqualand and south of the modern course of the Orange. The proposed extensive Kalahari draining trans-Tswana River (McCarthy 1983) and changes in its drainage patterns over time offer another putative causative agent in isolating geckos.

Concordant areas of endemism may be expected among groups of organisms that respond similarly to historical ecological conditions. In addition to *Pachydactylus* geckos, cordylid lizards (Broadley 1978; Jacobsen 1994; Mouton and van Wyk 1994; Bauer 1999) and scorpions (R.E. Griffin 1998; Prendini 2000, 2001b, 2003b, 2004; Prendini et al. 2003) are groups that show high substrate specificity. As such, they are also likely to have historically been subject to vicariance which tends to result in elevated rates of localized speciation, and thus increased diversity and endemism. Under ideal conditions the identification of multiple groups sharing similar distributions sets the stage for the application of analytical biogeographic approaches, such as cladistic biogeography (Humphries and Parenti 1999; Cotterill 2004). However, this has been hindered by two factors. First, until recently, the absence of robust species-level phylogenies for virtually all southern African biota has precluded any meaningful attempt at testable biogeographic hypotheses (Bauer and Lamb 2005). Second, and even more fundamental, most southern African animals remain in the discovery phase of alpha taxonomy, so that the identification of the units of consideration, whether for phylogenetic or biogeographic analyses, is tentative at best.

The *Pachydactylus serval/weberi* clade illustrates this well. Until the present study, only a few constituent taxa were recognized and many of the newly described forms remain known from just a few localities, mostly based on specimens collected relatively recently. This revision follows a broader phylogenetic analysis of the genus *Pachydactylus* (Bauer and Lamb 2005; Lamb and Bauer 2006) and brings the total number of named valid species in the *Pachydactylus* group (including *Colopus*, *Elasmodactylus* and *Chondrodactylus*) to 54. Although some issues of specific identity remain to be resolved and distributions for some taxa are still incompletely known, *Pachydactylus* is certainly the most diverse genus of southern African reptiles for which explicit phylogenetic hypotheses exist and holds the promise of being a key to elucidating biogeographic patterns in the subcontinent when combined with data from other groups that share overlapping areas of endemism and for which phylogenetic hypotheses exist, such as lacertids (Arnold 1991; Harris et al. 1998; Lamb & Bauer 2003), some scincids (Daniels et al. 2002; Whiting et al. 2003), cordylids (Frost et al. 2001; Scott et al. 2004), and scorpions (Prendini 2001a; Prendini et al. 2003).

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Appendix

GenBank accession numbers for cyt*b* sequences used in this study.

Species	*Museum number*	*Accession number*	*Species*	*Museum number*	*Accession number*
P. affinis	AMB 6157	AY123414	*P. montanus*	PEM R 5775	DQ349147
P. capensis	CAS 214501	AF449133		NMNW R 8832	DQ349150
P. carinatus	CAS 193365	DQ349164		NMNW R. 8833	DQ349151
	CAS 231879	DQ349162		NMNW R 8841	DQ349148
	CAS 231880	DQ349163		NMNW R 8846	DQ349153
	AMB 4610	DQ349165		NMNW R 8874	DQ349141
P. fasciatus	CAS 193681	AF449128		NMNW R 8875	DQ349142
P. griffini	CAS 186294	DQ349166	*P. purcelli*	CAS 198294	DQ349159
P. kobosensis	CAS 223903	DQ349187		CAS 201844	DQ349160
	CAS 223904	DQ349188		CAS 231887	DQ349161
	CAS 223905	DQ349189	*P. reconditus*	CAS 231886	DQ349182
P. monicae	CAS 193406	DQ349180		NMNW R 10493	DQ349181
	CAS 193418	DQ349178	*P. robertsi*	NMNW R 6697	DQ349185
	CAS 200034	DQ349179	*P. serval*	NMNW R 8857	DQ349167
	CAS 200079	DQ349177		NMNW R 8858	DQ349168
P. montanus	AMB 4900	DQ349155	*P. tsodiloensis*	MB, No number	AY123408
	AMB 38332	DQ349143	*P. waterbergensis*	MB, No number	DQ349176
	CAS 176252	DQ349139	*P. weberi*	AMB 4309	DQ349170
	CAS 176256	DQ349145		CAS 186368	DQ349172
	CAS 176258	DQ349144		CAS 186371	DQ349173
	CAS 201864	DQ349149		CAS 199997	DQ349175
	CAS 201865	DQ349152		CAS 199998	DQ349174
	CAS 201867	DQ349140		CAS 200056	DQ349171
	CAS 201870	DQ349154		CAS 206754	DQ349169
	CAS 203498	DQ349158	*P. werneri*	MB, No number	DQ349183
	CAS 231884	DQ349157		MCZ R 183707	DQ349184
	CAS 231885	DQ349156	*P. sp.* “Augrabies”	MB, No number	DQ349186
	PEM R 5774	DQ349146			

TABLE 1. Historical application of names for previously described nominal taxa in the *Pachydactylus serval* and *weberi* groups since 1943. N = taxon not referred to; square brackets [ ] indicate implied synonymy based on distribution maps provided.

Taxon	*FitzSimons 1943*	*Loveridge 1947*	*Mertens 1955*	*Wermuth 1965*	*MacLachlan & Spence 1966*	*Mertens 1971*	*Branch 1981*	*Welch 1982*	*Visser 1984*	*Branch 1988, 1998*	*Kluge 1991, 1993, 2001*	*Rösler 2000*	*Griffin 2003*	*This Study*
P. fasciatus Boulenger,1888	*P. fasciatus*	*P. fasciatus*	*P. fasciatus*	*P. fasciatus*	N	*P. fasciatus*	*P. fasciatus*	*P. fasciatus*	N	*P. fasciatus*	*P. fasciatus*	*P. fasciatus*	*P. fasciatus*	*P. fasciatus*
P. weberi Roux, 1907	*P. weberi*	*P. weberi*	*P. weberi*	*P. weberi*	N	*P. weberi*	*P. weberi*	*P. weberi*	*P. weberi*	*P. weberi*	*P.weberi weberi*	*P. weberi weberi*	*P. weberi*	*P. weberi*
P. serval Werner, 1910	*P. serval*	*P. serval*	*P. serval*	*P. serval*	*P. serval serval*	*P. serval serval*	*P. serval serval*	*P. serval serval*	*P. serval serval*	*P. serval serval*	*P. serval serval*	*P. serval serval*	*P. serval serval*	*P. serval*
P. purcelli Boulenger, 1910	*P. purcelli*	*P. purcelli*	*P. purcelli*	*P. purcelli*	*P. serval purcelli*	*P. serval purcelli*	*P. serval purcelli*	*P. serval purcelli*	*P. serval purcelli*	*P. serval purcelli*	*P. serval purcelli*	*P. serval purcelli*	*P. serval purcelli*	*P. purcelli*
P. pardus Sternfeld,1911	syn. *P. purcelli*	syn. *P. purcelli*	syn. *P. purcelli*	syn *P. purcelli*	N	N	N	N	N	N	syn. *P. serval*	N	N	syn. *P. purcelli*
P. montanus Methuen & Hewitt, 1914	*P. montanus*	syn. *P. serval*	syn. *P. serval*	syn. *P. serval*	syn. *P. serval serval*	N	syn. *P. serval serval*	syn. *P. serval*	N	N	syn. *P. serval*	N	N	*P. montanus*
P. capensis gariesensis Hewitt, 1932	*P. weberi gariesensis*	*P. weberi gariesensis*	N	*P. weberi gariesensis*	N	N	syn. *P. weberi*	*P. weberi gariesensis*	N	N	syn. *P. weberi*	N	N	syn. *P. weberi*
P. capensis werneri Hewitt, 1935	*P. werneri*	*P. weberi werneri*	*P. werneri*	*P. werneri*	N	*P. werneri*	*P. weberi werneri*	*P. weberi werneri*	[syn. *P. weberi*]	[syn. *P. weberi*]	*P. weberi werneri*	*P. weberi werneri*	*P. weberi werneri*	*P. werneri*
P. montanus onscepensis Hewitt, 1935	*P. montanus onscepensis*	syn. *P. serval*	syn. *P. serval*	syn. *P. serval*	*P. serval onscepensis*	*P. serval onscepensis*	*P. serval onscepensis*	*P. serval onscepensis*	*P. serval onscepensis*	*P. serval onscepensis*	*P. serval onscepensis*	*P. serval onscepensis*	*P. serval onscepensis*	*P. montanus*
P. kobosensis FitzSimons, 1938	*P. kobosensis*	*P. kobosensis*	*P. kobosensis*	*P. kobosensis*	N	*P. kobosensis*	N	*P. kobosensis*	*P. kobosensis*	N	*P. kobosensis*	*P. kobosensis*	*P. kobosensis*	*P. kobosensis*
P. robertsi FitsSimons, 1938	*P. robertsi*	*P. scutatus robertsi*	*P. scutatus robertsi*	*P. scutatus robertsi*	N	*P. scutatus robertsi*	N	*P. scutatus robertsi*	N	N	*P. scutatus robertsi*	*P. scutatus robertsi*	*P. robertsi*	*P. robertsi*
P. weberi acuminatus FitzSimons, 1941	*P. weberi acuminatus*	*P. weberi acuminatus*	*P. weberi acuminatus*	*P. weberi acuminatus*	N	*P. weberi acuminatus*	*P. weberi acuminatus*	*P. weberi acuminatus*	[syn. *P weberi*]	[syn. *P. weberi*]	*P. weberi acuminatus*	*P. weberi acuminatus*	*P. weberi acuminatus*	*P. acuminatus*
P. tsodiloensis Haacke, 1966						N	N	N	N	*P. tsodiloensis*	*P. tsodiloensis*	*P. tsodiloensis*	N	*P. tsodiloensis*
P. serval sansteyni McLachlan & Spence, 1967						*P. serval sansteyni*	N	*P. serval sansteyni*	N	*P. sansteyni*	*P. sansteyni*	*P. sansteyni*	*P. sansteyni*	*P. sansteynae*
P. waterbergensis Bauer & Lamb, 2003														*P. waterbergensis*

TABLE 2. Mensural data for the adult types of *Pachydactylus reconditus*, sp nov. Abbreviations as in Materials and methods. All measurements in mm.

	TM 32838 holotype	TM 41993 paratype	TM 41994 paratype	CAS 231886 paratype	NMNW R 3462 paratype	NMNW R 3465 paratype	NMNW R 3745 paratype	NMNW R 10493 paratype
Sex	female	male	juv. female	female	male	juvenile	juvenile	female
SVL	42.2	44.7	30.3	42.3	38.7	25.6	28.7	37.9
ForeaL	5.6	5.9	4.0	5.5	5.3	3.7	3.8	5.0
CrusL	6.5	7.1	4.6	6.0	5.8	3.9	4.5	6.1
TailL	16.6	39.8	20.2	49.5	44.6	25.0	32.5	44.1
(regen.)	broken	31.4	broken	14.7	broken	N/A	N/A	17.9
TailW	5.2	4.3	2.1	4.2	4.1	1.9	2.9	3.1
TrunkL	18.5	18.3	12.0	17.4	16.7	8.2	11.0	13.4
HeadL	12.3	13.1	9.1	13.0	10.4	7.3	8.5	12.0
HeadW	7.8	8.5	5.7	8.4	8.1	5.7	5.7	7.8
HeadH	4.5	4.8	3.1	4.2	4.6	2.9	3.2	4.2
OrbD	3.0	3.2	2.2	3.1	2.7	2.0	2.7	2.7
EyeEar	3.1	3.5	2.5	3.1	3.0	1.9	2.0	3.2
SnEye	4.2	4.6	3.0	4.4	4.0	2.8	3.0	3.9
NarEye	3.1	3.4	2.2	3.1	3.0	1.7	2.1	3.2
Interorb	2.9	3.0	1.9	2.8	3.1	2.2	2.0	2.7
EarL	0.8	0.8	0.5	0.8	1.1	0.7	0.6	0.8
Internar	1.1	1.3	0.9	1.2	1.2	0.8	0.9	1.0

TABLE 3. Mensural data for the types of *Pachydactylus monicae*, sp. nov. Abbreviations as in Materials and methods. All measurements in mm.

	CAS 200034 holotype	CAS 193406 paratype	CAS 193417 paratype	CAS 200079 paratype	PEM R 7626 paratype	PEM R 11952 paratype	TM 28297 paratype	TM 33806 paratype	TM 36367 paratype	TM 41852 paratype
Sex	male	male	juv. fem?	juv. male	female	female	male	female	female	male
SVL	44.1	42.1	28.5	31.1	45.7	47.8	42.6	50.3	47. 9	42.9
ForeaL	6.3	6.1	3.8	4.6	6.5	6.9	5.6	6.4	6.9	6.2
CrusL	7.3	7.8	4.8	5.4	7.8	7.8	7.0	8.3	7.7	7.6
TailL	45.1	28.2	25.7	34.1	2.5	47.6	29.8	39.2	43.0	28.1
(regen.)	9.3	2.6	broken	N/A	broken	8.8	26.4	2.0	13.0	15.5
TailW	4.2	4.2	2.2	2.7	N/A	4.4	4.4	5.5	4.0	4.6
TrunkL	18.5	15.7	12.5	14.1	19.4	20.3	18.6	22.1	20.6	18.2
HeadL	13.8	12.9	8.8	10.0	13.3	15.0	11.9	13.6	12.9	12.7
HeadW	8.4	8.0	6.1	6.4	8.9	8.9	7.6	9.4	8.9	8.2
HeadH	5.0	4.5	3.3	4.0	5.2	5.3	5.0	6.4	6.0	5.0
OrbD	3.3	3.1	2.2	2.6	3.2	3.6	3.2	3.1	3.2	3.0
EyeEar	3.3	3.3	2.7	2.9	3.2	3.7	3.1	4.0	4.0	3.4
SnEye	4.6	4.4	3.4	3.9	4.8	5.1	4.9	5.2	4.8	4.3
NarEye	3.6	3.5	2.4	2.7	3.6	4.0	3.4	4.0	3.7	3.4
Interorb	3.3	3.1	2.1	2.6	3.1	3.2	3.4	3.9	3.6	3.2
EarL	1.1	1.1	0.5	0.8	1.0	0.8	0.8	0.9	0.9	0.5
Internar	1.3	1.2	1.0	1.0	1.4	1.2	1.1	1.4	1.3	1.1

TABLE 4. Mensural data for the adult types of *Pachydactylus griffini*, sp. nov. See Variation section for information regarding juvenile paratypes. Abbreviations as in Materials and methods. All measurements in mm.

	CAS 125855 holotype	CAS 125854 paratype	CAS 186294 paratype	MCZ R 163286 paratype
Sex	female	female	male	male
SVL	30.3	35.5	39.4	34.8
ForeaL	4.8	4.2	5.2	4.9
CrusL	5.1	5.4	6.4	5.2
TailL	26.7	2.2	2.3	27.3
(regen.)	3.3	broken	broken	24.0
TailW	2.5	N/A	N/A	3.8
TrunkL	13.8	14.3	16.3	15.9
HeadL	8.7	10.6	11.5	10.0
HeadW	6.0	6.3	8.0	7.4
HeadH	3.2	3.3	3.9	4.3
OrbD	2.2	2.3	2.6	2.3
EyeEar	1.9	2.4	3.0	2.5
SnEye	3.1	3.4	4.0	3.9
NarEye	2.3	2.4	2.7	2.7
Interorb	2.7	2.7	3.3	3.0
EarL	0.8	1.1	0.9	1.0
Internar	0.8	1.0	1.0	0.9

TABLE 5. Mensural data for the adult types of *Pachydactylus mclachlani,* sp. nov. Abbreviations as in Materials and methods. All measurements in mm.

	NMNW R 10499 holotype	NMNW R 10496 paratype	NMNW R 10498 paratype	CAS 125850 paratype	CAS 125852 paratype	CAS 125853 paratype	CAS 186293 paratype	CM 119309 paratype	TM 54735 paratype
Sex	male	female	male	female	female	male	female	female	female
SVL	43.0	48.7	48.1	40.4	37.8	41.0	46.0	44.3	38.4
ForeaL	6.7	7.5	6.7	5.2	5.2	5.6	5.9	5.9	5.4
CrusL	7.2	9.0	8.1	6.6	6.1	6.4	6.8	6.8	6.3
TailL	47.1	48.7	4.8	45.1	38.8	32.4	2.4	41.6	22.1
(regen.)	N/A	22.3	broken	24.9	N/A	31.2	broken	24.0	2.4
TailW	4.1	3.5	4.3	4.6	4.0	5.3	N/A	4.4	2.6
TrunkL	16.9	21.5	22.5	16.4	15.9	17.2	19.2	19.6	15.3
HeadL	13.0	14.0	13.7	11.9	11.5	11.6	13.1	12.5	12.1
HeadW	9.0	8.9	9.6	8.1	7.6	7.8	9.7	8.6	6.9
HeadH	4.7	5.6	5.5	4.0	4.1	4.0	4.8	4.9	4.0
OrbD	3.4	3.8	3.5	3.0	2.7	2.7	3.2	2.8	3.4
EyeEar	3.4	3.1	3.9	2.8	2.9	2.8	3.4	3.5	3.0
SnEye	4.7	5.5	5.2	4.5	4.2	4.4	5.0	4.5	4.6
NarEye	3.3	3.8	3.8	3.2	3.1	3.2	4.0	3.6	3.2
Interorb	3.5	3.5	4.0	3.2	3.0	3.1	3.4	3.5	2.7
EarL	1.4	1.3	0.8	0.9	0.7	0.8	1.4	0.8	0.8
Internar	1.2	1.3	1.4	1.1	1.0	1.3	1.4	1.4	1.1

TABLE 6. Mensural data for the types of *Pachydactylus carinatus*, sp. nov. Abbreviations as in Materials and methods. All measurements in mm.

	CAS 201908 holotype	CAS 186340 paratype	CAS 201910 paratype	CAS 201913 paratype	CAS 203501 paratype	CAS 203502 paratype	PEM 11966 paratype	TM 27949 paratype	TM 34204 paratype	TM 81098 paratype
Sex	female	male	male	male	male	male	female	male	male	male
SVL	45.7	42.0	44.0	42.5	42.5	41.4	43.5	37.2	39.6	40.7
ForeaL	6.2	6.2	6.2	5.6	6.0	6.2	5.9	5.7	5.9	6.3
CrusL	7.9	7.6	7.3	7.6	7.2	7.3	6.8	7.2	6.5	7.0
TailL	45.6	38.8	39.1	36.0	2.9	40.6	42.1	42.4	40.0	43.0
(regen.)	5.3	30.4	28.7	24.6	broken	5.2	N/A	22.3	1.6	N/A
TailW	3.6	4.3	4.3	3.8	N/A	4.4	4.3	3.2	3.5	3.5
TrunkL	20.2	15.4	17.6	18.3	15.7	17.9	18.8	16.3	16.4	15.7
HeadL	13.8	12.6	12.5	12.3	12.3	11.7	11.3	10.6	11.4	11.9
HeadW	8.4	8.0	7.5	7.4	8.1	8.3	8.5	7.8	8.4	7.6
HeadH	4.7	3.9	4.0	4.6	4.4	4.6	4.7	4.3	4.6	4.2
OrbD	3.4	3.0	3.0	2.8	3.1	2.9	2.9	2.6	3.0	3.1
EyeEar	3.1	2.5	3.1	3.2	3.0	3.5	3.1	2.9	2.9	3.1
SnEye	4.6	4.2	4.7	4.7	4.4	4.4	4.4	4.1	4.1	4.2
NarEye	3.4	3.1	3.1	3.3	3.3	3.0	3.2	3.1	3.1	3.1
Interorb	3.3	3.1	3.3	3.1	3.1	3.2	2.8	3.4	2.8	2.8
EarL	1.1	0.8	0.9	0.8	0.9	0.8	1.1	0.9	0.9	0.8
Internar	1.3	1.0	1.2	1.0	1.1	1.2	1.1	1.1	1.1	1.0

TABLE 7. Mensural data for the types of *Pachydactylus visseri*, sp. nov. Abbreviations as in Materials and methods. All measurements in mm.

	CAS 201874 holotype	NMNW R 8979 paratype	TM 57399 paratype	TM 35363 paratype	TM 50110 paratype	TM 28289 paratype	TM 35456 paratype	TM 35455 paratype
Sex	male	male	female	male	male	male	female	female
SVL	38.6	46.0	42.4	43.5	38.3	43.5	36.8	38.9
ForeaL	5.8	6.1	6.6	6.1	4.1	6.5	5.4	5.4
CrusL	7.0	7.1	7.0	7.4	6.9	7.3	6.4	6.3
TailL	3.0	47.3	38.4	3.0	41.0	44.8	41.1	46.7
(regen.)	broken	N/A	broken	broken	N/A	13.0	N/A	N/A
TailW	N/A	3.6	2.7	N/A	2.5	4.4	2.4	3.7
TrunkL	17.2	17.4	19.1	17.1	16.2	18.9	14.8	16.8
HeadL	12.3	13.3	13.3	12.0	10.6	12.4	10.1	10.9
HeadW	7.3	7.6	7.5	8.3	6.7	8.4	7.1	7.7
HeadH	4.4	4.2	4.7	5.1	3.6	5.4	4.7	5.3
OrbD	3.0	3.1	3.8	3.5	3.0	3.2	3.1	3.2
EyeEar	3.1	3.6	2.7	3.6	2.9	3.8	3.0	3.1
SnEye	4.1	4.3	5.6	4.2	3.9	4.6	3.8	4.4
NarEye	3.2	2.9	3.7	3.3	3.1	3.3	2.9	3.2
Interorb	2.5	3.3	3.3	3.6	3.1	3.6	2.7	3.4
EarL	0.8	1.0	1.1	0.9	0.8	0.8	0.6	0.8
Internar	1.1	1.2	1.8	1.5	1.0	1.2	1.2	1.1

TABLE 8. Mensural data for the adult types of *Pachydactylus goodi*, sp. nov. See Variation section for information regarding juvenile paratype. Abbreviations as in Materials and methods. All measurements in mm.

	TM 27962 holotype	TM 84505 paratype	CAS 231878 paratype
Sex	male	female	male
SVL	50.0	45.5	41.4
ForeaL	7.2	6.9	5.6
CrusL	8.8	8.8	5.9
TailL	55.8	2.5	47.0
(regen.)	37.3	broken	N.A
TailW	3.6	N/A	3.8
TrunkL	20.3	18.6	18.6
HeadL	14.0	13.7	11.5
HeadW	9.9	8.0	8.1
HeadH	5.8	4.9	4.8
OrbD	3.8	3.4	3.2
EyeEar	4.3	3.6	3.3
SnEye	5.6	4.8	4.7
NarEye	4.0	3.4	3.3
Interorb	4.0	3.3	3.2
EarL	1.2	1.0	1.0
Internar	1.5	1.5	1.3

TABLE 9. Mensural data for the types of *Pachydactylus otaviensis*, sp. nov. Abbreviations as in Materials and methods. All measurements in mm.

	TM 45097 holotype	TM 85000 paratype	TM 85002 paratype
Sex	male	male	juvenile
SVL	39.4	42.9	27.3
ForeaL	5.6	6.7	4.1
CrusL	6.6	7.8	4.4
TailL	40.1	35.2	3.8
(regen.)	3.9	tip cut	broken
TailW	5.4	6.6	2.3
TrunkL	15.7	17.1	10.8
HeadL	12.0	12.6	8.5
HeadW	7.8	9.2	6.1
HeadH	5.0	6.1	3.8
OrbD	3.1	3.2	2.4
EyeEar	3.5	4.0	2.5
SnEye	4.6	5.1	4.0
NarEye	3.2	3.9	2.6
Interorb	3.2	4.3	2.7
EarL	0.9	0.9	0.4
Internar	1.5	1.5	0.9