

THE HERPETOFAUNA OF THE RICHTERSVELD NATIONAL PARK AND THE ADJACENT NORTHERN RICHTERSVELD, NORTHERN CAPE PROVINCE, REPUBLIC OF SOUTH AFRICA

Aaron M. Bauer

Department of Biology, Villanova University, 800 Lancaster Avenue,
Villanova, Pennsylvania 19085-1699, USA
Email: aaron.bauer@villanova.edu

William R. Branch

Port Elizabeth Museum, P.O. Box 13147, Humewood 6013, South Africa
Email: pemwrb@upe.co.za

Abstract. The Richtersveld is an arid montane region in the extreme northwest of the Republic of South Africa. It is bordered by the Orange River to the north and is bisected into a more mesic, fog-affected western zone and a more xeric eastern zone by the Vandersterrberge. The northernmost part of the Richtersveld has been designated as a contractual national park and was the center of our regional herpetofaunal survey activity over a period of 5 yrs (1992–96). Seven amphibians and 57 reptiles have been recorded from the Richtersveld National Park (RNP). Most species are either rupicolous or are terrestrial or fossorial inhabitants of sandy soils. Geckos (18 species) are the most diverse group in the park. Reported diversity is greatest along the Vandersterrberge and in the vicinity of Sendelingsdrif on the Orange River. The fauna includes a small number of regional endemics (*Bufo robinsoni*, *Goggia gemmula*, *Pachydactylus haackei*), Namaqualand species reaching their northern limit in the RNP (e.g., *Homopus signatus*, *Pachydactylus labialis*, *P. namaquensis*, *Cordylus lawrencei*), Namibian xeric species reaching their southern limits in the Richtersveld (e.g., *Palmatogecko rangei*), and many, more widely distributed taxa. Eleven additional species of amphibians and reptiles occur in areas immediately adjacent to the RNP. The Orange River has served as a barrier to dispersal or an agent of cladogenesis for some species (e.g., *Typhlosaurus vermis*, *Narudasia festiva*) but not for others. It has played a role as a dispersal corridor for both psammophilous species moving upstream (*Palmatogecko rangei*, *Typhlosaurus meyeri*) and aquatic species moving downstream (*Afrana angolensis*, *Varanus niloticus*). Human resource utilization in the RNP includes alluvial diamond mining and small-stock grazing. The former appears to have minimal impact on the herpetofauna because the areas mined are relatively depauperate to begin with. Grazing, however, may negatively impact amphibians and reptiles by decreasing vegetative cover, compacting soil, and fouling springs and water points.

Key Words. Richtersveld; South Africa; Herpetofauna; Zoogeography; Conservation.

The Richtersveld National Park (RNP) occupies an area of 162,445 ha in the arid montane region bordering the lower Orange River in the Northern Cape Province of South Africa (Fig. 1). The Park was declared on 20 July 1991 and is unique among South

African National Parks in that it is a contractual park, leased from the local inhabitants. The Richtersveld also differs from most other parks in the country in that its recognition as an area of conservation concern was due chiefly to its botanical uniqueness

(Williamson 1990, 1995, 2000; Cowling et al. 1999), rather than its zoological richness, and despite the almost complete absence of megaherbivores.

Most herpetological research in the northwestern Cape, has focused on areas more easily accessed by road, such as Port Nolloth and Steinkopf (e.g., the Transvaal Museum Little Namaqualand Expedition of 1937; FitzSimons 1938). Nonetheless, the Richtersveld proper, especially the three permanent settlements of Kuboes (sometimes spelled Khubus), Lekkersing and Eksteenfontein (formerly Stinkfontein) have been

the sites of sporadic collecting activity by herpetologists throughout much of the 20th Century. Cornell (1920 [1986]) was among the first to discuss the reptiles of the region, noting the presence of some of the more common and conspicuous species (*Varanus niloticus*, *Ptenopus garrulus*, *Bitis arietans*, *Naja* sp., *Bitis* sp.) in his classic book *The Glamour of Prospecting*. V.F. FitzSimons collected in the area around Kuboes in November of 1933. Geoff McLachlan collected in the region in the 1960s and Wulf Haacke (Transvaal Museum) and Atherton de Villiers and Chris Stuart (Cape

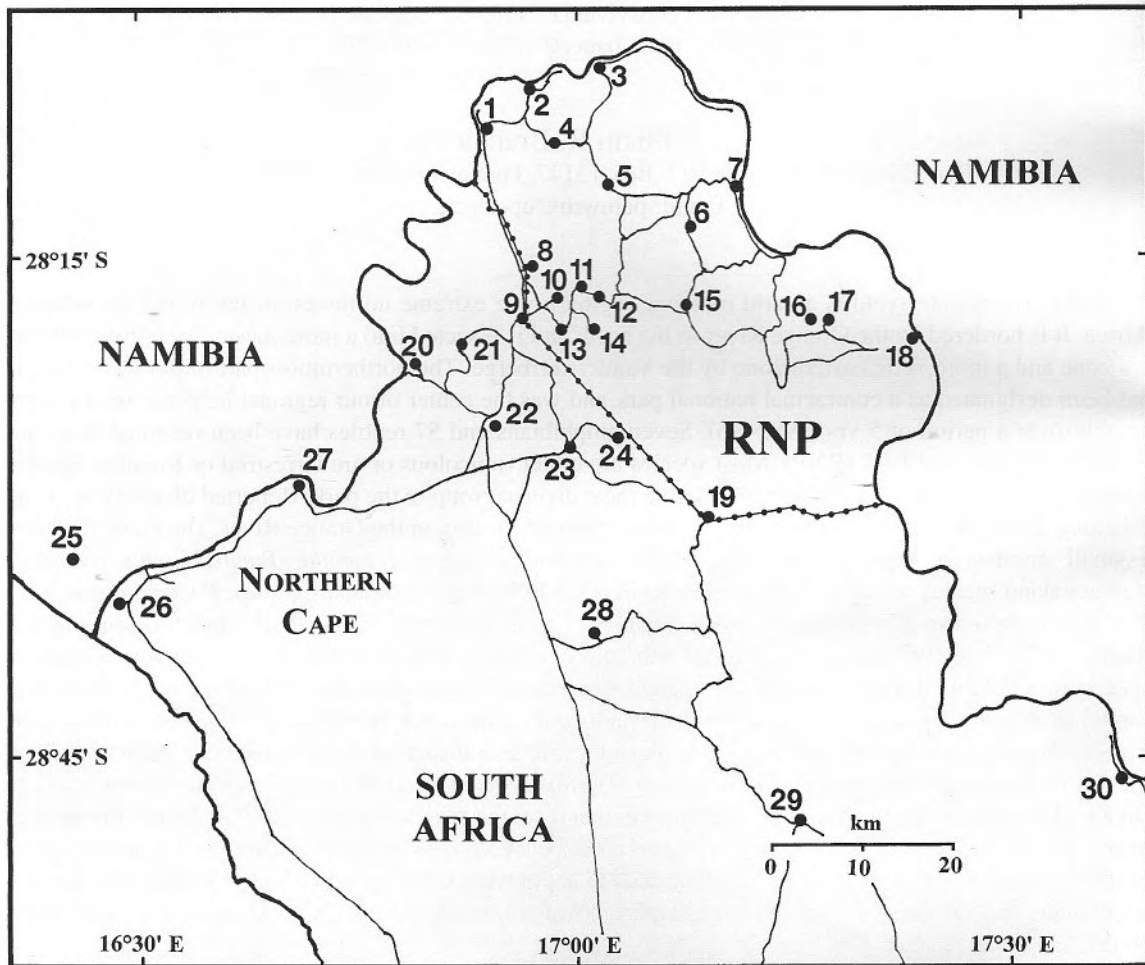


Figure 1. Reference map of the northern Richtersveld indicating the boundary of the Richtersveld National Park (RNP; solid line with dots), roads and trails used in our surveys (thin black lines), and important reference points (numbered dots). Most localities within or immediately adjacent to the RNP are presented in the text in the form of road distances from these points. Reference points: (1) Sendelingsdrif, (2) Pootjiespram, (3) Oena Mine, (4) Halfmens Pass, (5) Brown Pass, (6) Maerpoort, (7) De Hoop, (8) Kodas Mine Ruins, (9) Remhoogte, (10) Numees, (11) Die Koei, (12) Creswell's Prospect, (13) Helskloof Pass, (14) Paradyskloof, (15) Blackies Prospect, (16) Tatasberg, (17) Die Toon, (18) Grasdrif, (19) Gelykwerf, (20) Bloeddrif, (21) Wallekraal Mines, (22) Annisfontein, (23) Kuboes, (24) Nanoas Spring, (25) Oranjemund, (26) Alexander Bay, (27) Brandkaros, (28) Tierhoek, (29) Eksteenfontein, (30) Vioolsdrif.

Department of Nature Conservation) conducted surveys in the Richtersveld in the 1970s. However, most of this work has never been published.

Haacke (1974) was the first to remark on the herpetofaunal richness of the area, which at the time remained both remote and largely unprotected. More recent quantitative approaches to assessing biodiversity (e.g., Branch 1988a; Crowe 1990) have recognized the Richtersveld as a center of reptile diversity and endemism. Branch (1988a) identified the Richtersveld and the adjacent region of Little Namaqualand as one of seven sensitive areas with respect to amphibian and reptile conservation in South Africa. This was based on the presence of a number of regional endemics as well as the perceived threat from open-cast alluvial diamond mining, especially in coastal regions within the diamond concession areas. The Richtersveld has also been recognized as a center for snake diversity in the Northern Cape. A study of the optimal geography of nature reserves for protecting snake diversity in South Africa pinpointed quarter degree squares 2816BD and 2817AC, which include part of the RNP, as among the optimal areas to receive protection, regardless of the database or reserve-selection algorithm used (Lombard et al. 1995). The high rating for the region was due to the combination of high snake-species richness and the presence of relatively rare or endangered snakes in the region. Indeed, all analyses also suggested that additional reserves would be needed in the areas immediately to the south and southeast of the existing park in order to provide protection for all South African snakes within a minimal number of quarter degree squares. A similar analysis incorporating frog data (Lombard 1995) also highlighted quarter degree square 2816BD, as well as the adjacent coastal region (2916BB) as areas of high conservation concern.

Although it is certain that the Richtersveld is an area of high herpetofaunal diversity, most previous discussions of the region treated it as a single unit or broke the area down into its constituent quarter degree squares. With the establishment of the Richtersveld National Park, there is a need to distinguish between those species occurring in the Richtersveld in the broad sense and those that are actually protected by the RNP. Management decisions require a relatively fine-scale picture of amphibian and reptile distributions in the RNP and detailed records of material from land adjacent to the RNP will be relevant to the possible future

expansion of the National Parks Board areas of control in region. Van der Walt (1991) reported that earlier survey work, presumably that conducted in the 1970s, had yielded 60 lizard species, 25 snake species, and eight frog species, but these figures presumably represented totals for the Richtersveld *sensu lato* and not the area of the current RNP alone. More recently, Williamson (1995) noted the occurrence of 52 reptiles in the park itself, based chiefly on our field surveys up to that time. Neither of these sources, however, provided either a detailed list of these taxa, nor a discussion of their distributions within the Richtersveld. In this paper we report the results of fieldwork conducted in the period 1992–96 in the Richtersveld National Park and provide a summary of all known amphibian and reptile records for the region.

STUDY AREA

Physiography

The Richtersveld as a region is ill-defined. One interpretation (Van Jaarsveld 1981; Cole 1990) places the southern limit as the road between Steinkopf and Port Nolloth (roughly approximating Anenous Pass), with the eastern border formed by a line northwards from Steinkopf to Vioolsdrif on the Orange River. Hilton-Taylor's (1996) Richtersveld bioregion corresponds almost exactly to this, but excludes a sliver of flat, sandy, coastal plain that is considered the southernmost extension of the Namib Desert. Other interpretations are less inclusive, encompassing only the montane area to the east of Lekkersing and Sendelingsdrif. In this paper we limit our discussion to the northern Richtersveld, an area defined by the RNP and adjacent quarter degree squares (2816BB, BC, BD, DB, 2817AA, AB, AC, AD, CA, CB) falling within the Northern Cape Province of the Republic of South Africa (Figs. 1, 2). This excludes Vioolsdrif, Eksteenfontein, and the Alexander Bay (southern Namib) region, although we have mentioned certain records from these areas when pertinent.

The Richtersveld is geologically complex. The base of the area is formed by a sequence of pre-Gondwanan rocks that were intruded by granite and gneiss more than a billion years ago. More recently (900–500 mya) sedimentary rocks of the Gariep, Numees, and Nama formations were deposited (Cowling et al. 1999). These rocks were subjected to extreme folding and shearing during succeeding

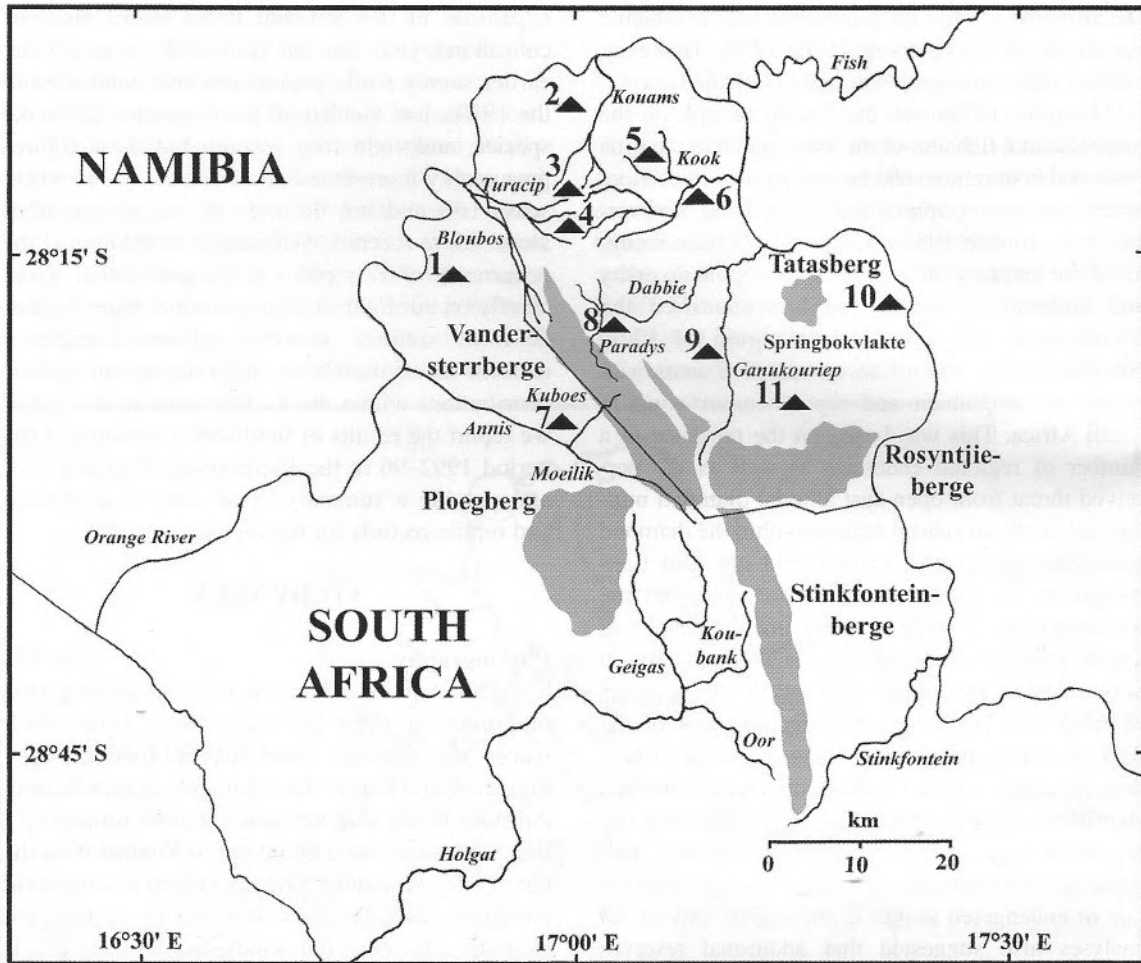


Figure 2. Mountains and rivers of the northern Richtersveld. River names are indicated in italics. The names the more or less continuous montane areas (shaded gray) are in bold print: the Ploegberg in the southwest, the Vandersterrberge along the western border of the RNP, the Rosyntjieberge along the southern border of the RNP, the Stinkfonteinberge extending southward towards Eksteenfontein, and the isolated Tatasberg in the arid eastern region of the RNP. Selected individual peaks are indicated by numbered triangles: (1) Gorab Mountain (538 m), (2) Great Bend (642 m), (3) Mount Dixon (918 m), (4) Kodas Peak (979 m), (5) Kisskop (924 m), (6) Rooiberg (882 m), (7) Kuboes Mountain (677 m), (8) Paradys Mountain (795 m), (9) Claim Peak (566 m), (10) Nabasberg (564 m), (11) Talus Peak (901 m).

tectonic episodes and their exposure today helps to give the Richtersveld its characteristic rugged appearance (Figs. 3, 4).

The RNP itself is bounded to the north and east by the Orange River (Fig. 5), to the south by the Rosyntjie-Oemsberge and to the southwest by the Vandersterr-Stinkfonteinberge (Fig. 2). The western boundary approximates the road from Remhoogte to Sendelingsdrif which crosses Grasvlakte, more or less paralleling the course of the Bloubos River (Figs. 2, 3).

The Stinkfontein formation, or Vandersterrberge, effectively divides the Richtersveld into eastern and western sections. The highest point is

Cornellsberg (1374 m), south of the park, although elevations within the RNP reach 1363 m along the southwestern border. The eastern portion of the park (Fig. 4) is in the rain and mist shadow of the Vandersterrberge and receives minimal precipitation. The most mesic areas of the park follow the higher elevations, passing to the north of Helskloof (Fig. 6) through Numees Mountain (812 m), Kodas Peak (979 m; Fig. 7), Mount Dixon (918 m), and Halfmens Pass (Fig. 8) to Great Bend (642 m) just south of Reuning Terrace on the Orange River.

To the south, the Vandersterrberge (max. elevation 1363 m) runs to the southeast, passing out of the park at Gelykwerf (Fig. 9) and continuing south

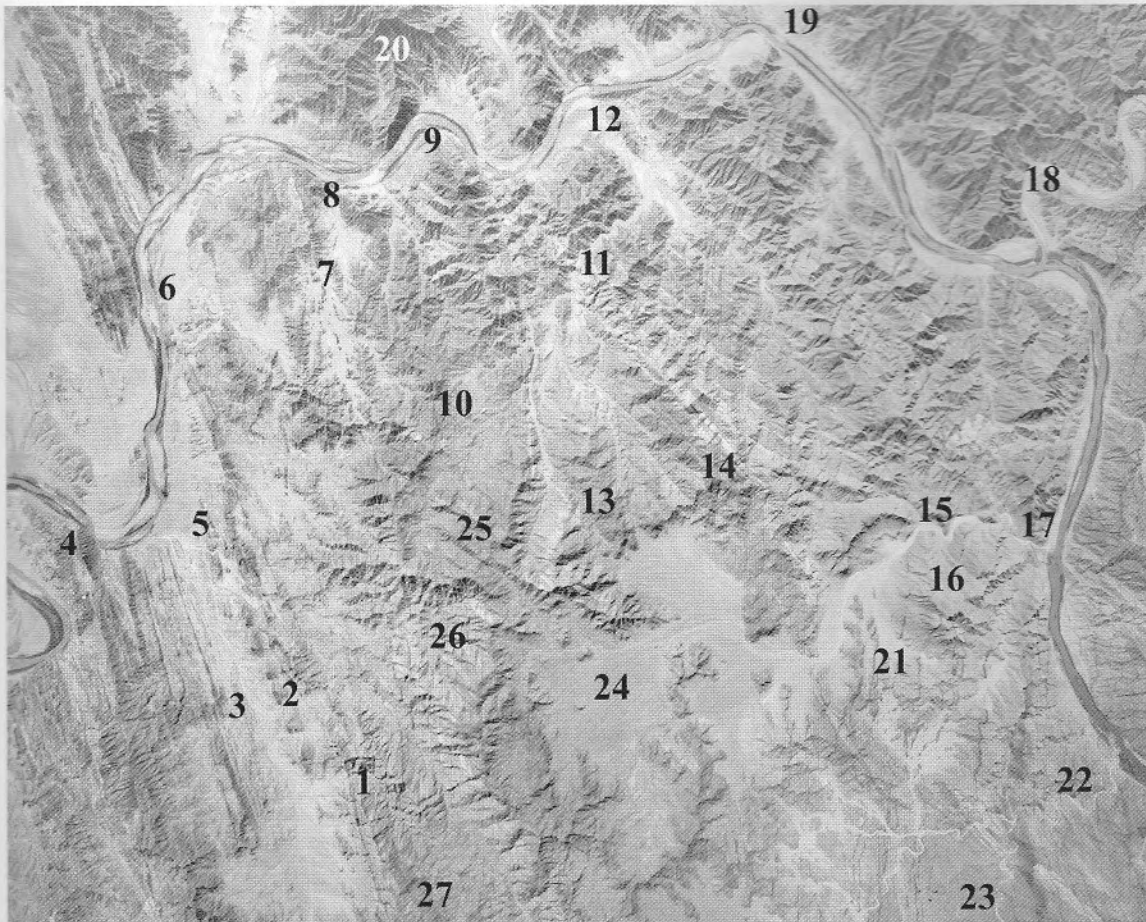


Figure 3. Aerial photograph of the northern RNP with landmarks indicated: (1) Kodus Mine Ruins, (2) Five sisters, (3) Bloubos River, (4) Jakkalsberg, (5) Turacip River, (6) Sendelingsdrif, (7) Swartpoort, (8) Pootjiespram, (9) Reuning Terrace, (10) Halfmens Pass, (11) Kouams River, (12) Oena Mine, (13) Brown Pass, (14), Kisskop, (15) Kook River, (16) Rooiberg, (17) De Hoop, (18) Fish River (Namibia), (19) Damimub River (Namibia), (20) Lorelei (Namibia), (21) Maerpoort, (22) Dabbie River, (23) Ganukouriep River, (24) Koeroegab Plains, (25) Mt. Dixon, (26) Kodus Peak, (27) northern end of Vandersterrberge. Base photograph courtesy of the Chief Directorate of Surveys and Mapping and the Government Printer (Republic of South Africa) and reproduced under South African Government Printer's Copyright Authority No. 10904 dated 6 December 2000.

as the Stinkfontein Mountains. Near the southwestern corner of the park, the Vandersterrberge intersects the Rosyntjebos Mountains or Rosyntjeberge (max. elevation 1329 m), which form the southern border of the park. Outlying mountainous areas are the Pootjiespramberg, Five Sisters, and Tswaies Mountain. The most significant outlier is the Tatasberg (1026 m), which dominates the drier eastern portion of the park (Figs. 10, 11). It has a different geology than much of the rest of the park, being composed chiefly of granites of the Kuboes Complex.

Permanent or semi-permanent sources of water are limited to the Orange River (Figs. 5, 12) and

several springs and seeps in the Vandersterrberge, the most important of which are accessed from the west via Remhoogte. From this point a road to the east passes Numees (Noemees) Spring, one of the few permanent water sources at low elevation in the park (Fig. 2). This road continues to Helskloof Pass (Fig. 6), which straddles the Vandersterrberge in the region of the Helsberg and Hottentots Paradys (Fig. 2). This region is drained by the Paradys River, which flows through Paradyskloof towards the Paradysberg before joining the Dabbie River. Within Paradyskloof lies Paradysfontein, a perennial spring in one of the most well-vegetated parts of the park (Fig. 13). Other permanent water sources



Figure 4. Aerial photograph of the eastern RNP with landmarks indicated: (1) Blackies Prospect, (2) Dabbie River, (3) Ganukouriep River, (4) Orange River, (5) Tatasberg, (6) Nabasberg, (7) Grasdrif, (8) Springbokvlakte, (9) Die Toon, (10) Oudannisiëp River, (11) Talus Peak, (12) Mt. Terror, (13) Rosyintjieberge, (14) Geleykwerf, (15) Vandersterrberge, (16) Claim Peak. Base photograph courtesy of the Chief Directorate of Surveys and Mapping and the Government Printer (Republic of South Africa) and reproduced under South African Government Printer's Copyright Authority No. 10904 dated 6 December 2000.

are Die Koie and Koeskop on the eastern flank of the Vandersterrberg.

Most of the land lying between the rocky spines of the park is characterized by arid plains and valleys through which dry river courses run. To

the south of the Tatasberg is the Springbokvlakte (Fig. 14), a flat plain stretching towards the Orange River and dominated by the Oudannisiëp River. Another large sandy region, the Koeroegab Plains (Fig. 15), lie in the central part of the RNP. Several



Figure 5. Orange River Valley, RNP facing southeastward. The well-vegetated and sandy valley forms a corridor permitting passage of psammophilous and arboreal reptiles as well as riverine frogs. Photo A.M. Bauer.



Figure 6. Helskloof Pass, RNP. The coastal fog can be seen in the background. The only Richtersveld specimen of *Psammophylax rhombeatus*, was taken in the stand of *Aloe pearsonii* at the left of the photo. The flat stony patch in the foreground is typical habitat for *Pedioplanis lineocellata*. Photo A.M. Bauer.



Figure 7. Kodas Mine ruins, RNP, with Kodas Peak in the background. Habitat of *Meroles suborbitalis*, *Pachydactylus punctatus* and other terrestrial lizards. Photo A.M. Bauer.



Figure 8. Halfmens Pass, RNP rocks in the foreground are habitat of *Phelsuma ocellata*, *Goggia gemmula*, and *Pachydactylus haackei*. Photo A.M. Bauer.



Figure 9. Gelekwerf, southwest corner of RNP. Habitat of *Pachydactylus labialis*, *Mabuya capensis* and other relatively mesic adapted reptiles. Photo A.M. Bauer.

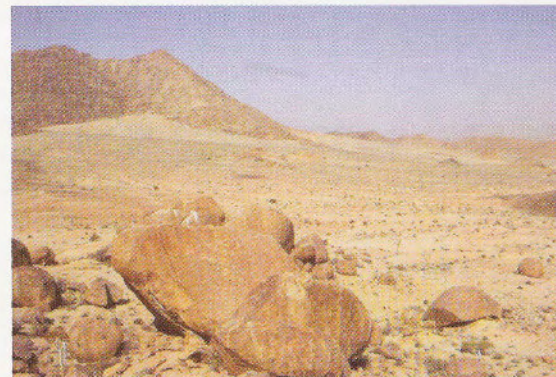


Figure 10. Vicinity of Die Toon, base of Tatasberg, in the arid eastern section of the RNP. The ground to the right of the photo slopes away to Springbokvlakte. Photo W.R. Branch.



Figure 11. Die Toon, southeastern RNP. The broad rock faces in this area support *Platysaurus capensis*. Photo A.M. Bauer.



Figure 12. Pool in floodplain of Orange River near Pootjiespram, RNP. Habitat of *Afrana angolensis*. Photo A.M. Bauer.



Figure 13. Pool in Paradyskloof, RNP. Habitat of *Bufo robinsoni*, *Cacosternum namaquense*, and *Strongylopus springbokensis*. This small area of springs and pools is heavily utilized by stock and the region closest to the opening into the kloof is typically trampled and the waters muddied. Photo W.R. Branch.



Figure 14. Quartz ridge in Springbokvlakte, RNP. Habitat of *Leptotyphlops occidentalis*. Photo A.M. Bauer.



Figure 15. *Aloe dichotima* in Domerog Pass overlooking the Koeroegab Plains in the central portion of the RNP. Photo A.M. Bauer.



Figure 16. Dabbie River valley in interior of RNP. Riverine trees provide habitat for *Pachydactylus turneri* and *Lygodactylus bradfieldi*. Photo A.M. Bauer.

other major drainages, including the Dabbie (Abiekwa) (Fig. 16), Ganukouriep, Kouams, Kook, and Turacip rivers, occur within the park (Figs. 2–4), although none are perennial.

Outside the park boundaries proper, the area along the Orange River and to the west of the Vandersterrberge is generally sandy and of low relief. Riverine trees are found along the course of the Orange (Fig. 5) and along and in the courses of smaller rivers, such as the Annis and the Gorab. Koppies and small rocky hills, including the well-known Cornellskop, dot the area.

Along the Alexander Bay road, much of the original riverine habitat, including small areas of dunes have been destroyed by large scale farming and irrigation (Figs. 17, 18). The area to the southwest of the park is dominated by the Ploegberg, which is separated from the Vandersterrberge by the Moeilik River Valley (Figs. 2, 19). The permanent spring at Kuboes retains a periphery of large trees, but has been greatly impacted by the relatively large human and stock populations based at the town of Kuboes (Fig. 20). The nearby Nanoas River area is characterized by stony pavement. Along the Lekkersing Road (Fig. 21) are several habitat types lacking in the park proper. In particular, small patches of red sand dunes are present ca. 37 km south of the Alexander Bay-Sendelingsdrif road, and blue schist koppies occur about 8 km further south.

Climate

Recent reconstructions of the history of the Namib Desert have proposed a Paleogene origin for



Figure 18. Irrigated land adjacent to the Orange River near Brandkaros, to the west of RNP as seen from the Skilpadsberg in Namibia. This location was previously a locality for *Palmatogecko rangei*. Photo W.R. Branch.



Figure 17. Aerial photograph of the Orange River to the west of the RNP showing the commercial agricultural activity in the area. (1) Grootdermberg, (2) Beauvallon, (3) Brandkaros, (4) Skilpadsberg (Namibia), (5) Sperrgebiet plains (Namibia). Base photograph courtesy of the Chief Directorate of Surveys and Mapping and the Government Printer (Republic of South Africa) and reproduced under South African Government Printer's Copyright Authority No. 10904 dated 6 December 2000.

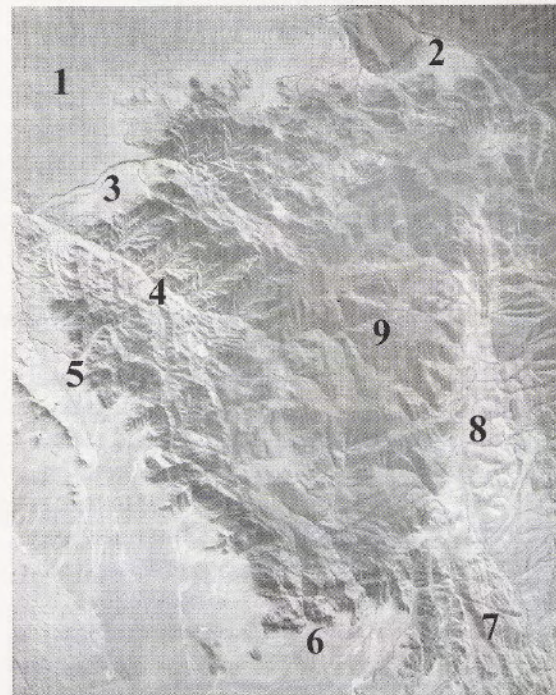


Figure 19. Aerial photograph of the Ploegberg and adjacent sandy plains with landmarks indicated: (1) Annisvlakte, (2) Moeilik River, (3) Groenkloof River, (4) Kook River, (5) Dooringpoort River and Dooringpoort, (6) Tierhoek, (7) The Black Hills, (8) Geigas river, (9) Ploegberg. Base photograph courtesy of the Chief Directorate of Surveys and Mapping and the Government Printer (Republic of South Africa) and reproduced under South African Government Printer's Copyright Authority No. 10904 dated 6 December 2000.



Figure 20. Village of Kuboes (left of photo), the only permanent settlement in the northern Richtersveld, and Kuboes Spring (indicated by group of trees in center of photo). Kuboes and its spring are historical localities for several amphibian and reptile records and may still be important as a mesic refuge for some taxa. Photo A.M. Bauer.

arid conditions, interrupted by more mesic, semi-arid conditions during the early to mid-Miocene. The formation of the modern Namib appears to have been initiated by the establishment of the cold Benguela Current in the Late Miocene, which produced arid conditions onshore (Ward and Corbett 1990).

The Richtersveld falls within the winter rainfall zone and experiences its greatest rainfall from May to September. Rainfall varies from approximately 50 mm/yr along the Orange itself to over 300 mm/yr in the Vandersterrberg, and as little as 15 mm/yr is typical of the Springbokvlakte, which lies in the rain shadow of the Vandersterrberge (Branch and Braack 1995). Particularly heavy rains fell during September 1995, during one of our



Figure 21. Sand plains along Lekkersing Road south of Kuboes. The loose sandy habitat here stretches west towards the coast and is not represented within the current confines of the RNP. Several reptiles not currently known from the park occur in this region (e.g., *Meroleos tenodactylus*, *M. knoxii*). Photo A.M. Bauer.

longest periods of collecting activity in the region. The western areas of the park are influenced by advective fogs (malmokkie) which creep inland as far as the western slopes of the Vandersterrberge (Fig. 6), approximately 80 km from the sea, as it did on 22 September 1995. Such fogs, which provide substantial dewfalls, are essential to the characteristic vegetation of the Richtersveld (von Willert et al. 1992; Cowling et al. 1999).

Ultraviolet radiation in the Richtersveld is the highest in southern Africa (Williamson 1990) and summer temperatures may reach 53°C in the sheltered valley of the Orange river (Williamson 1995), although highs of about 40°C are more typical (Cowling et al. 1999). Winter lows may reach freezing on the peaks and as low as 5°C at lower elevations. During September and October 1995, maximum and minimum temperatures were recorded at two sites near the Kodas Ruins (approx. elev. 240 m; Fig. 7). Nighttime lows reached 5°C (\bar{x} = 8.9°C, n = 19) and daily highs rarely reached 30°C (\bar{x} = 28.3°C, n = 19).

Vegetation

The Richtersveld is noted for its plant diversity. Approximately 500–700 species occur in the RNP, of which 40% are endemic to the region (Williamson 1995; Hilton-Taylor 1996; Hendricks 1998). In particular, the Mesembryanthemaceae is well represented (Van Jaarsveld 1981; Jürgens 1997), as are the Euphorbiaceae and Crassulaceae. One of the most characteristic plants of the region is the halfmens, *Pachypodium namaquanum* (Fig. 22). A variety of aloes of different growth form are also significant. These include large tree-like (*Aloe pillansii*, *A. dichotoma* — Fig. 15) and shrub-like (*A. ramosissima*) plants. River courses are dominated by plants such as wild tamarisk (*Tamarix usneodes*), whereas *Acacia karoo* is widespread in the flatter areas. Sheppard's trees (*Boscia albitrunca*, *B. foetida*) are prominent in dry valleys between the hills. Helskloof is characterized by large stands of *Aloe pearsonii* (Fig. 6), *Tylecodon peniculatum*, and *Sarostema* spp. on the drier northern slopes.

The vegetation of the Richtersveld has been classified in several different ways. Acocks (1953) considered the primary vegetational groupings to be west coast strandveld, Namaqualand broken veld, succulent Karoo, and western Mountain Karoo. White (1983) divided the region into succulent Karoo shrubland, Namib desert, and bushy



Figure 22. Halfmens (*Pachypodium namaquanum*) one of the typical Richtersveld arid-adapted plants. Rocky areas in which this species occurs in Halfmens Pass and Brown Pass are among the most reptile rich habitats in the Richtersveld.

Karoo-Namib shrubland. Most recently, Low and Rebelo (1996) classified Richtersveld vegetation types as lowland succulent Karoo, upland succulent Karoo, and north-western mountain Renosterveld. White (1983) treated the entire region as part of a single phytochorion, the Karoo-Namib biome, whereas Jürgens (1991, 1997) considered the boundary between the Cape Floristic Kingdom and the Palaeotropical Plant Kingdom to run through the Richtersveld, with the eastern portions being part of the East Gariiep Center of the Nama Karoo region (Paleotropical) and the western portion representing part of the Succulent Karoo region (Cape). The East Gariiep Center exhibits a number of floristic similarities with areas of the central and northern Namib and numerous plants have disjunct distributions in the two areas. Floral diversity is highest in Helskloof and other areas receiving of high levels of moisture from the advective fogs.

Succulent plants include a diversity of stapeliads, some of which are strictly regionally endemic.

Fauna

Arthropod diversity in the RNP is high, but except for certain groups, is woefully understudied. Tok-tokkie beetles (*Psammodes* spp.) are among the most frequently encountered insects. Scorpions are moderately common in most areas. Crustaceans and aquatic insects are encountered in temporary rock pools and in the permanent waters at Numees and in Paradyskloof. Fish diversity is predictably low, with only 14 species recorded from the lower Orange (Williamson 1995). Approximately 200 bird species are known from the RNP (Williamson 1995), but the area is not noted for high avian endemism except for a small radiation of *Certhilauda* larks (Ryan et al. 1998). Thirty-eight mammals have been recorded. Predators are uncommonly encountered but include Cape gray mongooses (*Galerella pulverulenta*), meerkats (*Suricata suricata*), black-backed jackals (*Canis mesomelas*), small spotted cats (*Felis nigripes*), and leopards (*Panthera pardus*), all of which are potential reptile predators. Large mammals are now uncommon in the park, with only small groups of mountain zebra (*Equus zebra*) and Vaal rhebok (*Pelea capreolus*). A large population of feral donkeys also inhabits the RNP and surroundings.

Human Activity and Conservation Threats

Human habitation of the RNP area dates back to at least 3400 ybp, although there is evidence of humans in adjacent northern Little Namaqualand for the last 250,000 years (Williamson 1995). The region, and especially the well-watered Orange Valley, has been occupied by hunter-gatherers more or less continuously since that time. Nama pastoralists subsequently (as early as 1900 ybp) moved into the region from the north, bringing livestock. European exploration of the region began in the 1770s, but it was not until 1830 that a permanent presence was established, and even well into the 20th Century the difficult topography, poor roads, and remoteness of the region ensured minimal European disturbance outside of mining operations and small-scale farming.

At present, the management of the RNP follows a model that fosters local community involvement and multiple use of park land, such as combining limited economic utilization of natural



Figure 23. Alluvial terrace diamond mining along the Orange River in the RNP. The three grooves in the terrace are pilot trenches. Photo A.M. Bauer.

resources with conservation goals (Van der Merwe 1991; Lusigi 1994). Tourism in the RNP remains limited and at present does not pose a serious threat to reptiles or amphibians. Public access is limited on a daily basis and no developed facilities are available outside of Sendelingsdrif. Most of the road system in the park is not accessible to two wheel drive vehicles and large areas of the RNP, especially in the southern and western mountains have no road access at all. Two other activities, however, may have at least local impacts on the fauna. The first of these is diamond mining. Previously negotiated diamond mining concessions still operate within the boundaries of the national park. Indeed, the settlement of Sendelingsdrif was founded as, and remains, chiefly a mining center, although portions of the settlement have been turned over to the park and eventually mining in the park itself will probably cease. The mining activity primarily affects the alluvial gravel deposits along the Orange River (Fig. 23). This includes the



Figure 24. Goats on steep south bank of Orange River near Grasdrif, RNP. Photo W.R. Branch.

Swartpoort area, Oena Mine, and Grasdrif, although other areas have been recently mined or are scheduled for mining activities in the near future. Heavy vehicle traffic also impacts other parts of the park, especially Sendelingsdrif itself and the main western park access road.

The other human impact comes from livestock grazing within the park. The arrangement with local land owners allows for the presence of up to 6,600 small stock within the park (Figs. 6, 24), although the actual number fluctuates and may often exceed this value (Hendricks 1998). At present about 85% of the stock are goats, 10% sheep, and the remainder cattle and horses (Hendricks 1998). Twenty-six herding families are licensed to use the park. Although some of these bring flocks into the park only at certain times of year, twelve herds are basically resident in the park. During September–October 1995, our longest period of continuous residence in the park, stock were concentrated in the more mesic areas of the park, including the region between Die Koei and the Koeroegeb Plains, the area between Tswaies Mountain and the Ganukouriep River, the Vandersterrberg, the Kook River, and the Orange River west of the outlet of the Fish River Mouth (Howard Hendricks, pers. comm. 1995). There is generally minimal use of the land surrounding the Tatasberg. Although the impact of small-stock on the native flora and fauna has not been studied explicitly, there has long been a recognition that goats and sheep may negatively effect the local ecology (Haacke 1974; Willis 1992).

MATERIALS AND METHODS

Collection

We collected in and around the RNP during October 1984 (WRB), July 1992 (AMB), August–September 1992 (WRB), June–July 1993 (AMB), April 1994 (WRB), September–October 1995 (AMB + WRB), and June–July 1996 (AMB + WRB). Our surveys total more than 150 person-days of searching and collecting. Our activities were concentrated in the northern two thirds of the park, largely owing to the difficulty of accessing the southern portion of the park, especially during the rainy winter season. We also collected along the western border of the park from the Wallekraal Mines and Bloeddrif south to Tierhoek and the Koubank River (Figs. 2–4, 19). Collections were also made at Gelykwerf at the southwestern corner

of the park and along the Nanoas and Moeilik Rivers, to the northeast and southeast of Kuboes, respectively. At both of the latter localities, collections were made within 1 km of the park boundary. Chiefly due to problems of access, the arid eastern areas of the RNP were not surveyed as completely as those in the west (Fig. 2), and we have probably underestimated the reptile diversity of this region of the park. Nonetheless, we made repeated trips to Die Toon, Springbokvlakte, De Hoop, and the mouth of the Dabbie River (Fig. 4). Every effort was made to locate both terrestrial and rupicolous species. The herpetofauna of adjacent southern Namibia directly to the north of the RNP was sampled during surveys of the Sperrgebiet (Branch 1994), and of the north bank of the Orange River (AMB + WRB, June–July 1996). The farms Ougrabies Wes and Klein Duin, lying west of the Vyfteenmylseberge and approximately 100 km southwest of the RNP, have been recently acquired by the National Parks Board of South Africa and include extensive sparsely vegetated white and red sand dune habitats. They were briefly surveyed (WRB, October 2000) and found to contain a number of arenicolous species that are absent or poorly represented in the existing RNP.

Road distances to localities were calculated from prominent landmarks in the Richtersveld. Whenever possible, coordinates were recorded with a Magellan Trailblazer or Magellan Pioneer handheld global positioning system (GPS). Elevations were determined using a Thomen altimeter. Many literature and museum records are presented with reference to quarter degree square (QDS) localities. QDS notation is widely used in southern Africa for the mapping of specimen localities and follows the form: degrees latitude, degrees longitude, quadrant within the degree square (A through D, with A the northwest, B the northeast, C the southwest and D the southeast), and 1/16 quadrant within each quarter degree (A-D, as above), e.g. 2716BC.

Most areas were searched opportunistically, but special effort was made to locate species with cryptic habits or specialized habitats. All areas of permanent water were searched for amphibians. Night searches were limited, but were conducted in most areas of the park if night time temperatures exceeded approximately 15°C. Three 15 m linear series of 15 cm high, plastic garden edging drift fences with 2 l plastic pitfall traps every 5 m were established along an east-west axis in the Swartpoort area in

alluvial gravel deposits that had never been mined and in a recently mined area. Five days of trapping and an additional 13.5 h of daylight and 9.0 h of nighttime searching revealed a single reptile, a *Pachydactylus* cf. *serval*, in a crevice in the side of a gravel terrace. Similar pitfall trap lines were also installed in a sandy area in the floodplain of the Orange River near Pootjiespram and in several areas near the Kodus Mine ruins (Fig. 7). These traps were checked daily for a period of 2 wk. Rocky substrates and the difficulty of returning to check traps regularly precluded pitfall-trapping as a sampling method in much of the RNP. We also used 10 cm x 20 cm Victor® mouse glue traps (Woodstream, Inc., Lititz, Pennsylvania) in arrays of 10 x 10, with 10-m spacings between traps, in order to sample nocturnal terrestrial reptiles on coarse sand hard-pack plains to the east of Sendelingsdrif.

Place names in the Richtersveld are chiefly Nama in origin (Reck 1994) and have been variously rendered in English and Afrikaans, the two most widely employed European languages in South Africa. Spellings vary widely (e.g., Khubus, Kuboes, Khuboes, Koboes), even in official documents and government issued maps. In this paper we have chosen to use the spellings we feel to be most commonly employed. These usually, but not always, follow the Afrikaans usage, as this language is far more widely used than English in the region. Common Afrikaans geographic terms are “kloof” (ravine), “drif” (ford), “fontein” (spring), “poort” (narrow pass), “vlei” (valley), “vlakte” (plain), and “berg(e)” (mountain[s]). Two place names we mention, “Nicodaemus” and “Akkedis Drive,” are not standard or official names. The former refers to a portion of the Helsberg adjacent to the Hottentots Paradys Lookout; the latter (literally “Lizard Drive”) refers to a stretch of park road through Halfmens Pass and Brown Pass.

Specimens Examined

When possible, voucher specimens of all species were taken at each locality visited on each trip. These were euthanized with intraperitoneal injections of pentobarbital and fixed in 10% neutral buffered formalin. In some cases liver tissue was excised and stored in 90% ethanol, DMSO buffer, or liquid nitrogen prior to fixation. Fixed specimens were transferred to 70–75% ethanol for storage. In addition to our own specimens (deposited chiefly in the Port Elizabeth Museum [PEM], California

Academy of Sciences [CAS], and Louisiana State University Museum of Natural Sciences [LSUMZ]), we also examined selected material from other collections, including the South African Museum (SAM), the University of Stellenbosch (USEC), the National Museum of Namibia (SMW), the Transvaal Museum (now Flagship Institution of the North; TM), and the Albany Museum (AM) and Cape Department of Nature Conservation (CDNC) collections, now both housed in the Port Elizabeth Museum. We have also recorded sight records based on our own observations and in a few instances, the observations of reliable park staff or field assistants.

SPECIES ACCOUNTS

Species are listed alphabetically within genera, and generic accounts are alphabetical by family. Only the original author and date of description are provided. More complete synonymies may be found in the literature for anurans (e.g., Poynton 1964; Frost 1985, 2000), lizards (e.g., FitzSimons 1943; Loveridge 1947), snakes (e.g., Broadley 1990; David and Ineich 1998), and turtles (e.g., King and Burke 1989; Wermuth and Mertens 1996). General descriptions, accounts of natural history, and color photographs of most species can also be found in Passmore and Carruthers (1995) and Branch (1998).

In the accounts that follow, only specimens collected in the RNP or adjacent QDSs during our surveys, or other museum specimens from this area examined by us, are listed under "Material examined." Localities are provided with reference to Richtersveld landmarks (Figs. 1–4) and/or coordinates or QDSs (see above for explanation). Localities within the boundaries of the RNP are listed first, followed by those in adjacent areas. Sight records, additional material from other collections, literature records, or extralimital records of significance are listed under "Other records." This section also furnishes general comments about the distribution of the species in the Richtersveld and neighboring areas of the Northern Cape and southern Namibia. Specimens with AMB and JVV field numbers are in the personal collection of the senior author and will be deposited in the public collection indicated by the institutional abbreviation indicated parenthetically. "Comments" provides information on the environmental correlates of distribution, natural history, and systematics.

Species that were not located in the park during our surveys or that have not been reported by prior works, but which may be expected to occur within the park or immediately adjacent QDSs, are listed separately following the confirmed records.

FROGS

PIPIDAE

Xenopus laevis (Daudin 1802)

Common Platanna

Material examined.—Armmanshoek, Vandersterrberge, RNP (28°24'45" S, 17°04'45" E): PEMA2789–90, 2912. *Other records.*—Kuboes: TM 15876; 10 km S Lekkering (29°03' S, 17°07' E): TM 27915. We also observed, but did not collect, specimens at Gelykwerf, RNP. *Xenopus laevis* has been recorded from QDS 2816BD in Namibia, adjacent to the RNP (Channing and Griffin 1993).

Comments.—*Xenopus laevis* is locally abundant in appropriate habitats across the Richtersveld (H. Braack, pers. comm. 2001) and is probably widely distributed in the park, chiefly along the Vandersterrberg and in the Rosyntjieberg. The availability of permanent water in the RNP limits the distribution of this obligate aquatic species to more mesic regions of the park where springs or seasonal rains may permit the persistence of permanent or semi-permanent pools. The establishment of isolated platanna populations in such arid regions probably results initially from individuals being swept downstream during periodic flooding (Channing 1976). However, migration to refugia in mountain springs during wet periods is also necessary. These frogs may be capable of surviving dry periods buried in moist riverbed sand, and may thus persist in areas that retain surface water only seasonally.

RANIDAE

Afrana angolensis (Bocage 1866)

Common River Frog

Material examined.—Orange River at Pootjiespram, RNP: AMB (CAS) 2019 (tadpoles), CAS 193393–402, 193469–73, PEM A2506, 2508–11, TM 25195.

Other records.—We also observed specimens at Swartpoort and De Hoop, both in the RNP on the Orange River. Specimens were also collected in Namibia at the confluence of the Dabimub and Orange Rivers (28°02'54" S 17°01'50" E): CAS 201882, AMB (SMW) 4983.

Comments.—*Afrana angolensis* and *A. fuscigula* are notoriously difficult to distinguish on morphological grounds. The specific assignment of the RNP material is supported by vocalizations (H.H. Braack, pers. comm. 1995). Within the RNP *A. angolensis* appears to be restricted to the immediate vicinity of the Orange River. It is common along the river at Pootjiespram and elsewhere where stony flats provide appropriate calling sites (Fig. 12). Earlier

records of *Afrana* from northern Namaqualand and southern Namibia were attributed to *A. fuscigula* (Channing and van Dijk 1976; Channing and Griffin 1993) and Passmore and Carruthers (1995) illustrated the range of *A. angolensis* in South Africa as approaching no closer to the Richtersveld than the vicinity of Augrabies on the lower Orange River. Based in part on the absence of historical records of *A. angolensis* from the Richtersveld, Branch and Braack (1995) hypothesized that the species might be a relatively recent colonizer of the region.

Cacosternum namaquense Werner 1910
Namaqua Caco (Fig. 25)

Material examined.—Paradyskloof, RNP (28°19'45" S, 17°00'15" E): CAS 193527–48, PEM A2259–64, 2271–72; Numees Spring, RNP (28°17'40" S, 16°58'07" E, 420 m): CAS 200054, LSUMZ 57358, PEM A3316–19, 4614.

Other records.—There are numerous records of the Namaqua caco from Steinkopf and elsewhere in northern Little Namaqualand (Passmore and Carruthers 1995). The species also occurs in southern Namibia (Channing and Griffin 1993).

Comments.—This species is probably widespread in the Richtersveld. In the RNP it is expected to occur in other springs and streams in the Vandersterrberg and Rosyntjieberg that would provide suitable breeding areas. Males were calling at both Numees and Paradyskloof (Fig. 13) in September 1995.

Strongylopus grayi (Smith 1848)
Clicking Stream Frog

Material examined.—None.

Other records.—Channing (1986) referred to specimens (TM 15804–09, 15860–62) of *S. grayi* from Kuboes (2816BD).



Figure 25. *Cacosternum namaquense*, Paradyskloof, RNP. Photo W.R. Branch.

Comments.—Channing (1986) suggested that the Kuboes specimens of this species might have moved up drainage lines from the Orange during wet periods. No recent specimens have been recorded from this area despite of directed searches. The record may reflect an introduction or invasion that was unsuccessful. The nearest portion of the species' contiguous range is several hundred kilometers to the south in the Western Cape Province.

Strongylopus springbokensis Channing 1986
Namaqualand Frog (Fig. 26)

Material examined.—Paradyskloof, RNP (28°19'45" S, 17°00'15" E, 466 m): CAS 193476–526, 193958, PEM A2265–70, 3589, LSUMZ 57207–10, AMB (LSUMZ) 4536 (tadpoles); 16.2 km W Gelykwerf: CAS 193956–57.

Other records.—Eksteenfontein: PEM A1271–73. A specimen from the Richtersveld (unspecified locality) is figured in Passmore and Carruthers (1995). There are no records of this species from southern Namibia (Channing and Griffin 1993). The species as a whole ranges through the mountainous areas of Namaqualand from the Knersvlakte to the Orange River.

Comments.—In describing the species, Channing (1986) reported no specimens from north of Eksteenfontein. The species was abundant in Paradyskloof but was not observed elsewhere in the RNP. *Strongylopus springbokensis* is almost certainly present along vegetated stream courses elsewhere in the montane south and west of the RNP, but rainy season inaccessibility makes this difficult to confirm. Calling males were encountered in June and July, and eggs were found on the farm Bovlei, south of the RNP, during the first week of July.

BUFONIDAE

Bufo gariiepensis Smith 1848
Karoo Toad

Material examined.—Sendelingsdrif, RNP (28°04'41" S, 16°56'57" E): CAS 193962–63, PEM A2207, 2512, 2517 (tadpoles), 2913; Sendelingsdrif Dump, RNP: CAS



Figure 26. *Strongylopus springbokensis*, Paradyskloof, RNP. Photo W.R. Branch.

201906; Orange River at Pootjiespram, RNP: AMB 2018 (tadpoles); Kuboes: CAS-SU 9532-34.

Other records.—Branch and Braack (1995) reported a sight record from Pootjiespram, RNP and there are additional records from Sendelingsdrif, RNP: CDNC 4831; Kuboes: TM 15810, 15812-14, 15858-59; between Kuboes and Lekkering: TM 15931; and Groenkloof River, 17.6 km SW Kuboes (2816DB): TM 27870. We observed, but did not collect, tadpoles 5.5 km N of Kuboes on Kuboes Spring Rd. (28°25'23" S, 17°00'40" E, 300 m). *Bufo garipeensis* occurs in southern Namibia at Oranjemund (Channing and Griffin 1993), but inland records are lacking.

Comments.—Despite its wide distribution and broad tolerances for temperature and breeding sites, this toad has only been collected in a few localities in the Richtersveld. It is probably more widespread in the RNP than indicated by collection records and may be expected to occur wherever breeding sites (permanent or not) are present, but is probably absent from interior regions of the RNP east of the Vandersterrberg. Channing and Griffin's (1993) record from "a little inland along the (Orange) river" (2816DA) has been questioned by Branch and Braack (1995), who, after inspection of the specimens involved (SMW 25884-85), referred them to *Bufo rangeri*. Richtersveld specimens of *B. garipeensis* are referable to the nominate subspecies. Branch and Braack (1995) have questioned the status of the montane form *B. g. nubicola*.

Bufo robinsoni Branch and Braack 1995
Paradise Toad (Fig. 27)

Material examined.—Paradyskloof, RNP (28°19'45" S, 17°00'15" E, 466 m): CAS 193549-71, LSUMZ 57205-06, PEM A2256-8, 2289-90, 2483-92, 2518 (tadpoles), 3421, SMW 26198-26202, TM 79426; Numees Spring, RNP (28°17'40" S, 16°58'07" E, 420m): PEM A 4637; Gannakouriep River, RNP (28°26' S, 17°08' E): PEM A2937; 16.2 km W Gelykwerf: CAS 193926-55.

Other records.—Passmore and Carruthers (1995) listed this species only from two localities within the park. In addition to the type locality at Paradyskloof (fig. 13), Branch and Braack (1995) reported specimens of *B. robinsoni* from Gelykwerf (Fig. 9) and Kuboes (Fig. 20), but did not cite specific material. A specimen tentatively assigned to this taxon has also been collected at Platklip Farm (2917DA) (Branch and Braack 1995). Based on photographic evidence, the species may also occur in the Rosh Pinah area of southern Namibia. Recent frog surveys in the Northern Cape indicate that *B. robinsoni* may have a much wider distribution in the region (Harrison et al. 2001).

Comments.—Until 1999 the distribution of this species appeared to be similar to that of the gecko *Goggia gemmula*, which is also a narrow regional endemic. *Bufo robinsoni*, however, has recently been discovered near

the Gamsberg Crater, Bushmanland (29°14'50" S, 18°58'30" E), and between Aggeneys and Pofadder (29°16' S, 19°07' E) approximately 200 km east of the Richtersveld localities (Baard 2000b). Both the bright red-orange coloration and the characteristic low calls of males of this toad are distinctive (Branch and Braack 1995). This species reaches a length of almost 68 mm SUL (CAS 193571) and females appear to be larger than



Figure 27. *Bufo robinsoni*, Paradyskloof, RNP. Photo W.R. Branch.

males. The Paradise toad is terrestrial and partially rupicolous. Its breeding appears to be relatively extended (winter and early spring) and clutches may contain 1500-2000 eggs (Branch and Braack 1995). Although toads are plentiful at Paradyskloof, the gorge itself is subject to periodic drying and is also used extensively as a watering point for small stock, making it vulnerable to degradation. The species remains poorly known and has a restricted and fragmented distribution. Its conservation status is problematic and considered "Data Deficient" (Harrison et al. 2001).

MICROHYLIDAE

Phrynomantis annectans (Werner 1910)
Red Marbled Frog

Material examined.—None.

Other records.—Branch and Braack (1995) noted that this species had been confirmed in the RNP, but there appear to be no museum vouchers from the park. In southern Namibia the nearest record is at Lüderitz (2717DC) (Channing and Griffin 1993), although this requires confirmation.

Comments.—Passmore and Carruthers (1995) mapped this species as occurring in the western part of the northern Richtersveld and Baard (2000a) also mentioned that the species was recorded from the region, but neither authors provided locality data. The status of this species in the Richtersveld is unclear. The tadpoles, which are ubiquitous in established areas of the range, have not

been found in the RNP, suggesting that *Phrynomantis*, if present, has a highly restricted range within the park, or that resident populations are very small.

TURTLES TESTUDINIDAE

Chersina angulata (Schweigger 1812) Angulate Tortoise

Material examined.—None.

Other records.—Williamson (1995) noted that local people reported the presence of this tortoise in the park, although no RNP voucher specimens exist. Among the nearest records supported by vouchers are 28.1 km S of Alexander Bay on the Port Nolloth road (28°48'52" S, 16°38'59" E, 95 m): PEM R11970 and 2816CB (Grieg and Burdett 1976). The species occurs north of the RNP, at the northern edge of the Obib Dunes (2617CD; Branch 1994), and at Rosh Pinah (TM 36364–65, 41771–72).

Comments.—*Chersina angulata* might be expected to occur in the lower elevation areas of the western RNP. However, this tortoise is conspicuous in most areas of its range and the paucity of Richtersveld records suggests that it is uncommon in the region.

Homopus signatus (Schoepf 1792) Speckled Padloper (Fig. 28)

Material examined.—Top of Paradyskloof, RNP: PEM R11866.

Comments.—Although in other features it is typical of this species, the single juvenile Paradyskloof specimen has a rich maroon background coloration that is atypical. This specimen is the only record for the RNP (Williamson 2000) and the northernmost record for the species, which was previously known only as far north as Anenous Pass, west of Steinkopf (TM 29827). Previous records from Namibia (e.g., Mertens 1955) are based on specimens of *Homopus "bergeri"* (Branch, Benn and Lombard 1995; see nonverified records section).



Figure 28. *Homopus signatus*, RNP. Photo W.R. Branch.

Psammobates tentorius (Bell 1828) Tent Tortoise

Material examined.—16 km E Arrisdrijf (28°27' S, 16°52' E): TM 34688–89; 5 km west Annisfontein (28°23' S, 16°51' E): TM 34935.

Other records.—We have collected this tortoise at Uitspanpoort se Berg (28°57'00" S, 17°02'30" E, 490 m): PEM R12204, 12458, and from 2.5 km N Steinkopf (CAS 173449–50). There is also a record from Lekkersing (TM 15997), and the species has been observed near Eksteenfontein at 28°51'54" S, 17°03'50" E (C.T. Stuart, Cape Department of Nature Conservation, field notes, June 1979).

Comments.—Richtersveld specimens are referable to the subspecies *P. t. trimeni* (Loveridge and Williams 1957), which also extends into southern Namibia (Mertens 1955), and is quite common along the Port Nolloth-Alexander Bay corridor (e.g., Orange River mouth: TM 14447–48). The tent tortoise may be expected to occur in the RNP along the western border of the park.

LIZARDS AGAMIDAE

Agama anchietae Bocage 1896 Western Rock Agama

Material examined.—Pootjiespram Road junction, RNP: CAS 193596; 23.5 km E of Sendelingsdrif (Kouams River north of Brown Pass), RNP: CAS 193643; Swartpoort, RNP (28°04'47" S, 16°57'04" E, 95 m): CAS 200010; Akkedis Drive, RNP (2816BB): PEM R7382; 500 m N Numees house, RNP (2816BD): PEM R9216, 9820; Numees Spring, RNP (28°17'42" S, 16°58'05" E, 380 m): CAS 201924; vic. Kodas Ruins, RNP (28°14'58" S, 16°56'41" E, 260 m): LSUMZ 57362; 4.5 km N Park sign 8, RNP (245 m): PEM R12419.

Other records.—Helskloof, RNP: SAM 45584; Helskloof Pass, RNP (2816BD): TM 34233; Northern Numees Mine, RNP (2816BD): TM 33928; De Hoop, RNP (2817AA): TM 34234; Grasdrift, RNP (2817AD): TM 35308; Bed of Abiekwa River, RNP (28°15'34" S, 17°08'19" E): CDNC 4836; Bloeddrift (2816BD): TM 27804; 24 km NE of Eksteenfontein (2817CB): TM 27938. There are sight records from Paradyskloof, RNP and 13.4 km SE Kuboes on Swartbank Rd. (elev. 350 m). There are numerous records along the Orange River on the Namibian side of the border and into the southern Sperrgebiet (Branch 1994).

Comments.—This agamid is ubiquitous in the RNP, occurring even in the arid east of the park. Although typically associated with rocks and broken ground, one individual was found in the lower branches of trees along the Orange River near Swartpoort. See *A. atra* species account for additional comments.

Agama atra (Daudin 1802)
Southern Rock Agama

Material examined.—8.7 km ESE Helskloof Gate, RNP: CAS 193434–36; between Helskloof Gate and Paradyskloof, RNP: USEC 2290; Hottentots Paradys Lookout, RNP (28°20'31" S, 16°58'36" E, 750 m): LSUMZ 57233; ca. 20 km ESE Sendelingsdrif, RNP: USEC 2291; Gelykwerf, RNP (28°31'04" S, 17°08'36" E, 830 m): CAS 193585; Kuboes Spring (28°26'36" S, 16°59'36" E, 190 m): CAS 200073, AMB (SMW) 5123; 16 km S Kuboes junction on Lekkersing Rd.: USEC 2292–94; 2.7 km N Kook River Spring Rd. on road to Koubank River (28°39'34" S, 17°09'52" E, 640 m): AMB (CAS) 4661, LSUMZ 57235; 1.1 km N Kook River Spring Road on road to Koubank River (28°40'11" S, 17°10'14" E, 565 m): PEM R11889; Tierhoek, Ploegberg (2817CA): PEM R1957; 21.6 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkersing Rd. (28°35'16" S, 16°56'41" E, 500 m): LSUMZ 57234.

Other records.—Other records include 3 km W Numees Mine, RNP (2816BD): TM 27826; Kuboes: SAM 11341, 48454, TM 15957–58; 16 km N Annisfontein (2816BD): TM 27843; Groenkloofrivier, 11.2 km SW Kuboes (2816BD): TM 27856; Richtersveld (2817): SAM 18782. Sight records were made 7.2 km W Creswell's Prospect junction, RNP (585 m) and 10.0 km SE Kuboes on Swartbank Rd. (290 m).

Comments.—This agamid is a conspicuous component of the Richtersveld herpetofauna, but appears to be absent from the drier areas east of the Vandersterrberg. RNP specimens are currently referable to *A. a. knobeli* (Williamson 2000). However, there remains confusion concerning the status of *A. atra* in Namaqualand. Boulenger and Power (1921) initially described *knobeli* from Aus, and treated it as a race of *A. anchietae*, as it shared with typical *A. anchietae* a medially-oriented imbrication of the dorsal scales. FitzSimons (1935) reported additional specimens of *A. anchietae knobeli* from southwestern Namibia, and also noted medially-oriented dorsal imbrication in specimens of *A. atra* from Kuboes (TM 15957–58) and Lekkersing (TM 15967). Mertens (1955) transferred *knobeli* to *A. atra*, but did not comment on the status of the Kuboes and Lekkersing specimens. Mouton and Herselman (1994), later noted that *A. atra* from the RNP and from elsewhere in Namaqualand exhibited significantly larger body size than do those from the southwestern Cape and also breed continuously rather than seasonally.

Agama anchietae is often difficult to distinguish from small *A. atra knobeli*. In the latter the characteristic enlarged dorsal crest on the middle third of the tail (not the nape as mistakenly recorded by Branch, 1988b) only develops in sexually mature males, although it does occur in reduced form in adult females. Branch (1994) noted that *A. anchietae* can be distinguished by the extensive black-tipped spines on the soles and beneath the digits, and by its shorter toes (in which, for instance, the outer digit on the forelimb has fewer subdigital lamellae). Further, *A. anchietae* is a small to medium-sized agama,

in which the dorsal crest on the tail is absent in both sexes; the crest on the nape is usually surrounded by region of spinose scales (usually smooth in *A. atra atra* and *A. atra knobeli*); and the paravertebral scales just behind the forelimbs are very spinose, often forming ridges pointing towards the backbone. Although *A. atra knobeli* occurs in northern Namaqualand and adjacent southern Namibia, a number of small agamas lacking a dorsal crest on the tail and with generally laterally-oriented dorsal imbrications are known from the region (e.g., Obib Dunes, Sperrgebiet: PEM R7420; Hochster Mountain, Sperrgebiet: PEM R7450; Klein Pella, Lower Orange River: PEM R12256; Augrabies, Lower Orange River: PEM R2409; and 5 km S Alexander Bay: PEM R9205) and may be referable to typical *A. atra atra*.

Agama hispida (Linnaeus 1758)
Spiny Agama

Material examined.—None.

Other records.—Near Kuboes: SAM 45561, 45581; between Kuboes and Numees 2816DB: SAM 43697, Richtersveld (2817): SAM 18781; 14 km W Dolomite Peaks (2816DB): TM 27874; 18 km SW Annisfontein: TM33924; S Ploegberg (2817CA): TM 53866; Arrisdrijf: CAS–SU 12097–99; 20 km NE Alexander Bay (2816DA): PEM R7394; between Alexander Bay and Port Nolloth (2816DD): PEM R9262. We also made a sight identification of this species in the Kook River valley on the Kuboes to Ploegberg Road (28°32'54" S, 16°55'12" E). There are numerous other records from the Eksteenfontein and Lekkersing areas (FitzSimons 1935), as well as from Oranjemund (TM 20945–46, 20955–56, 20960, 54403) and elsewhere in extreme southwestern Namibia (McLachlan 1981; Branch 1994).

Comments.—This species is common in the sandy plains to the west and south of the RNP (Williamson 2000), but there appear to be no confirmed records from within the park itself. The Kuboes to Numees record must lie within a few km of the western park boundary, however, and it is possible that *A. hispida* does enter the park somewhere along the sandy plains north of Remhoogte, although this area has been well surveyed.

CHAMAELEONIDAE

Chamaeleo namaquensis Smith 1831
Namaqua Chameleon

Material examined.—Near bottom of Helskloof Pass (2817AC): PEM R7309, R9261.

Other records.—Extralimital records occur to the south (Lekkersing: PEM R1314, R1318), west (Alexander Bay: PEM R1316), and north (near the Rooilepel Depression in the Sperrgebiet, Namibia: PEM R7398).

Comments.—The Namaqua chameleon is expected to occur in the northwestern portion of the park as well as throughout the more arid eastern regions. Its apparent rar-

ity probably reflects the cryptic nature of the species and the difficulty of collector access to many of the most suitable habitats in the RNP.

GEKKONIDAE

Chondrodactylus angulifer Peters 1870 Namib Giant Ground Gecko

Material examined.—Claim Peak, RNP (2816BD): PEM R7303–04; Pootjiespram Rd junction, RNP: JVV(CAS) 1979; 2.2 km N Main Park Road towards Pootjiespram, RNP (28°05'49" S, 16°56'46" E, 125 m): CAS 200011, 200089; Kodas Ruins, RNP (28°15'03" S, 16°56'49" E, 275 m): LSUMZ 57311; vic. Kodas Ruins, RNP (28°15'09" S, 16°56'19" E, 240 m): PEM R12426; E Sendelingsdrif, RNP (2816BB): PEM R9263; Die Toon, RNP (2817BD): PEM R9264; Nanoas Spring Road, 2 km N Kuboes (28°25'24" S, 17°00'14" E, 290 m): CAS 201935.

Other records.—10 km W Grasdrif, RNP: TM 53241; Groenkloof River: TM 27869; 8 km SW Annisfontein: TM 28066; Annisfontein: TM 35277; Jakkalsputs: SAM 43671; E of Eksteenfontein (2817CD): SAM 45050, 45053, 45064; Brandkaros 2816DC: TM 22264, 22657–58, 33769, 35257–58; 26 km E Alexander Bay on Kuboes Road: AMB(CAS) 3827; Lekkersing (2817CC): PEM R84, TM 27905. Nearby Namibian records include Oranjemund (2816CB): TM 21043; Obib Dunes (2816BA): TM 22676, 22678–79; 23 km E Oranjemund (2816BD): TM 27797; Farm Gemsbokberg (2817BC): 41892–93.

Comments.—*Chondrodactylus angulifer* is widespread in sandy substrates, especially in valley bottoms, where it co-occurs with *Ptenopus garrulus*. Specimens were most often collected while active at night. AMB(CAS) 3827 was found under debris in the alluvial sands of the Orange River. Branch (1994) indicated that *C. a. angulifer* and *C. a. namibensis* intergrade in the RNP, although Haacke (1976b) recorded intergrades only from Brandkaros and Lekkersing. The RNP material is mixed; an adult male from Die Toon (PEM R9264) and an adult female from Kodas Ruins (PEM R12426) are both referable to *C. a. namibensis*, as they lack sexual dichromatism, have conspicuous speckled coloration, and have lateral scalation typical of this race. Additional specimens from the adjacent Sperrgebiet (Signal Hill: PEM R7465; Sargedekkel: PEM R7569) also conform to *C. a. namibensis*. However, an adult pair from Claim Peak (PEM R7303–04) do show sexual dichromatism (albeit the enlarged white dorsal lateral spots characteristic of males are less pronounced than is often the case), lack speckled coloration, and have enlarged lateral tubercles adjacent to the ventrals, features of *C. a. angulifer*. Additional specimens conforming to the nominate race are known from Sendelingsdrif (PEM R9263) and Pootjiespram (CAS 200011, 200089). Branch (unpubl. obser.) has recorded karyological differences between the races of *C. angulifer* and a

reassessment of the status of *C. a. namibensis* is required.

Goggia gemmula (Bauer, Branch and Good 1996) Richtersveld Dwarf Leaf-Toed Gecko (Fig. 29)

Material examined.—Halfmens Pass, 6.5 km E Pootjiespram Rd. junction, RNP (28°08'18" S, 16°58'59" E, 340m): CAS 200090; Halfmens Pass, 6.5 km E Pootjiespram Rd. junction, RNP (28°08'20" S, 16°59'02" E, 375 m): LSUMZ 57323; 8.1 km S Oenna Mine on Oenna Mine Rd., RNP (28°06'40" S, 17°01'10" E, 220 m): CAS 201915–16, 203503, PEM R12549; Akkedis Drive (Brown Pass), RNP (28°08'02" S, 16°59'34" E): PEM R7372–73, 7378–80; Halfmens



Figure 29. *Goggia gemmula*, Akkedis Drive, RNP. Photo W.R. Branch.

Pass, 8.3 km E Pootjiespram Rd. junction, RNP (28°07'53" S, 16°59'51" E, 720m): PEM R11994; 12.6 km ESE Sendelingsdrif, RNP: CAS 193364; 16.3 km ESE Pootjiespram Rd. junction on main park road, RNP (28°09'51" S, 17°01'30" E, 475 m): LSUMZ 57324; 22.6 km ESE Sendelingsdrif, RNP: CAS 193645; 23.5 km ESE Sendelingsdrif, RNP: CAS 193641–42; ca. 22 km ESE Sendelingsdrif, RNP: CAS 186352; Brown Pass, RNP (28°09'52" S, 17°01'32" E, 480 m): CAS 200095, PEM R11992–94; near road turning to Pootjiespram (28°08'13" S, 16°58'14" E): PEM R9209; 15.4 km ESE Pootjiespram Rd. junction on main park road, RNP (28°09'48" S, 17°01'10" E, 490 m): CAS 200080, LSUMZ 57322, PEM R11993; Swartpoort (28°08'10" S, 16°59'34" E): PEM R7786–93

Other records.—Eksteenfontein (28°46' S, 17°17' E): PEM R10974–79; 10 km E Eksteenfontein (28°52' S, 17°21' E): TM 27935–36. Nearby Namibian records are: Witputs Süd (27°40'18" S, 16°43'10" E, 1165 m): CAS 201889, PEM R12536, AMB(SMW) 5005–07), and Macmillan's Pass, NE Rosh Pinah (27°15' S, 16°15' E): TM 35398–400.

Comments.—*Goggia gemmula* is a regionally endemic rupicolous species occurring from the southern

Richtersveld to the area around Rosh Pinah in southern Namibia. Within the park this species is especially common in the area between Halfmens Pass (Fig. 8) and Brown Pass, wherever appropriate rocky retreats are found (Bauer et al. 1996). It is sympatric, but not syntopic with *G. lineata* throughout its range. To the south of Anenous Pass it is replaced by another rock-living species, *G. rupicola* (Branch, Bauer, and Good 1995)

Goggia lineata (Gray 1838)
Striped Leaf-Toed Gecko

Material examined.—17 km ESE Sendelingsdrif, RNP: CAS 193623–27; 19.4 km SE Pootjiespram Road junction, RNP (28°11'02" S, 17°02'14" E, 580 m); CAS 200013, LSUMZ 57254, 57259, PEM R11912, 11958, AMB(CAS) 4763; Turacip Ruin Rd., near main park road, RNP (28°13'36" S, 16°59'19" E, 160 m); LSUMZ 57257, PEM R11960; Main park road, RNP (28°07'59" S, 16°59'20" E, 375 m); LSUMZ 57260; 22 km ESE Sendelingsdrif, RNP (28°12'03" S, 17°03'22" E, 540m); CAS 200015–16, LSUMZ 57258, PEM R11904; vic. Kodas Ruins, RNP (28°14'54" S, 16°57'06" E, 255 m); CAS 200027; 3.8 km NNW Park sign 3, RNP (28°10'47" S, 17°02'08" E, 595 m); LSUMZ 57255–56; 2.1 km ESE Creswell's Prospect, RNP (495 m); PEM R11956; 9.0 km W Blackies Prospect junction (445 m); PEM R12421; Kouams River Valley, RNP (2816BB): PEM R7589; Helskloof Pass, RNP (2816BD): PEM R7657; 1.9 km down Helskloof Pass, RNP (2816CD): PEM R7607; Helskloof Pass, RNP (2817AC): PEM R9253; Akkedis Drive, RNP (2817AA): PEM R7353, PEM R11955; Hottentots Paradys Lookout, RNP (28°20'31" S, 16°58'36" E, 750m); CAS 200045; 4.1 km ESE Creswell's Prospect, RNP (28°17'29" S, 17°03'53" E, 420 m); CAS 200126; 7.2 km W Creswell's Prospect junction, RNP (585 m); AMB(CAS) 4777; Kuboes (2816BD): SMW 2742; 6.4 km N Kook River Spring Road on road to Koubank River (28°37'53" S, 17°09'20" E, 690 m); AMB(CAS) 4662; 12 km E Ploegberg (2817CA): PEM R9235; 24 km NW Eksteenfontein (2817CA): SMW 98.

Other records.—Eggs were found at a water bore hole (28°17'14" S, 17°00'40" E) in the park and specimens were seen but not collected 0.5 km N park sign 14 on the road to Tsoaba Pass, RNP (28°17'19" S, 17°01'57" E, 475 m), 1.8 km up Nicodaemus from Hottentots Paradys Lookout Road junction, RNP (720 m), and at Uitspanpoort se Berg (28°57'00" S, 17°02'30" E, 490 m). Williamson (2000) figured a specimen from near Grasdrif.

Comments.—This species is widespread throughout the lower elevations of the Northern Cape and into extreme southern Namibia where there are numerous records from the area of the Namusberge (SAM 43615–16, SMW 2701) and the farms Witputs and Witputs Süd (SAM 43623, CAS 201888) and Zebrafontein (SAM 43623). The species reaches its northern limits in the Aurusberg (Branch 1994) and extends throughout lowland areas as far south as Saldanha Bay and the Little Karoo (Branch

and Bauer 1995; Branch, Bauer, and Good 1995). *Goggia lineata* is widespread in the western portion of the park, where it occupies fallen vegetation and may be found under bark, in rotted roots, or under logs. Near the Ploegberg one specimen (PEM R9235) was taken in a dead *Tylecaudon* stem. Although ecologically separated from its congener, *G. gemmula*, the two species may be found in sympatry.

Lygodactylus bradfieldi Hewitt 1932
Bradfield's Dwarf Gecko

Material examined.—0.5 km S Oenna Mine Rd. junction on main park road, RNP (28°07'35" S, 17°00'45" E, 325 m); CAS 200093; 0.7 km S Oenna Mine Rd. junction on main park road (28°07'36" S, 17°00'45" E, 320 m); PEM R12457; 1.4 km S Oenna Mine Rd. junction on main park road, RNP (28°08'05" S, 17°00'39" E, 320 m); LSUMZ 57361; 1.15 km N Brown Pass on main park road, RNP (28°09'20" S, 17°00'55" E, 385 m); CAS 200094; Numees, RNP (2816BD): PEM R2201–03; Nicodaemus campsite, Vandersterrberg, RNP (2816BD): PEM R7651; southeastern slopes of Nicodaemus, RNP (2816BD): PEM R7645; Helskloof Pass, RNP (2816BD): PEM R7654; 16.2 km W Gelykwerf: CAS 193583; E side of Ploegberg (2817CA): PEM R9227–28; Richtersveld (2816BD): PEM R2201a–b, 2202.

Other records.—Numees, RNP: SAM 45025.

Comments.—This tiny arboreal species is common on the trunks and branches of *Acacia*, and on the stems of *Pachypodium*, *Aloe*, and other larger plants in the park. It is probably absent from most of the eastern portion of the park, except from a few river courses where appropriate trees, such as *Boscia* spp., occur. It is easily overlooked, especially during periods of inclement weather, when it seeks retreat beneath bark or in tree hollows.

Pachydactylus barnardi FitzSimons 1941
Barnard's Thick-Toed Gecko (Fig. 30)

Material examined.—Hottentots Paradys Lookout (28°20'29" S, 16°58'32" E, 710m); CAS 200087, PEM R12432; 2.2 km from Helskloof on road to Nicodaemus, RNP (2816BD): PEM R9255.

Other records.—There are no other records of *P. barnardi* from the Richtersveld.

Comments.—The RNP is the northern range limit of this gecko, which may be considered a Namaqualand endem-



Figure 30. *Pachydactylus barnardi*, Helskloof Lookout, RNP. Photo A.M. Bauer.

ic. Although it has not been found in strict sympatry with *P. rugosus*, the two species occur less than 25 airline km apart within the park. The status of *P. barnardi* as a taxon specifically distinct from *P. rugosus* has recently been confirmed (Lamb and Bauer 2000). Within the RNP, all specimens have been found under cover on stony ground in areas of succulent vegetation in the fog zone of the Vandersterrberg. Elsewhere in its range it has been taken under debris in near coastal localities (e.g., Groenriviermond: CAS 206722).

Pachydactylus bibronii (Smith 1845)
Bibron's Thick-Toed Gecko

Material examined.—Richtersveld (2817AC): PEM R346; Sendelingsdrif, RNP (28°06'12" S, 16°56'38" E): PEM R1952; Numees Mine, RNP: PEM R374; Halfmens Pass, 6.5 km E Pootjiespram Rd. junction, RNP (28°08'18" S, 16°58'59" E, 340m): LSUMZ 57288, PEM R12429; 17 km ESE Sendelingsdrif, RNP: CAS 193615; Slope of Nicodaemus, Helskloof, RNP (28°21'03" S, 16°59'31" E, 775 m): LSUMZ 57285; Road to Nicodaemus, 0.5 km S Helskloof Pass Rd., RNP (720 m): CAS 200051, LSUMZ 57287, PEM R11897; Numees Mine, RNP (2816BD): PEM R374; 13 km from top of Helskloof, RNP (2816CD): PEM R7605; Akkedis Drive (Brown Pass), RNP (2816BB): PEM R7381; Gelykwerf, RNP (28°31'04" S, 17°08'36" E, 830 m): CAS 200072; 21.6 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkersing Rd. (28°35'16" S, 16°56'41" E, 500 m): PEM R11895; Kuboes (2817AC): PEM R334, SMW 369.

Other records.—Sight record from 1.8 km up Nicodaemus from Hottentots Paradys Lookout junction



Figure 31. *Pachydactylus haackei*, Halfmens Pass, RNP. Photo W.R. Branch.

(720 m), RNP. There are numerous additional records throughout the central and southern Richtersveld.

Comments.—Benyr (1995) reevaluated the confused state of the *Pachydactylus bibronii* group and provided evidence for the recognition of *P. bibronii* as a temperate species, reaching its northwestern limits in southwestern Namibia. This interpretation has subsequently been verified by molecular data (Lamb and Bauer 2002). The morphologically similar *P. turneri* (referred to as *P. laevigatus* by Benyr) co-occurs with *P. bibronii* in the Richtersveld. In sympatry the two taxa are usually easily distinguished on the basis of the larger, more heavily keeled scales of *P. bibronii*, although this characteristic is variable in *P. turneri* elsewhere in its range. Because of possible confusion of the two taxa, literature records are best regarded as questionable. Both species appear to be present throughout the RNP, although *P. bibronii* does not appear to be as widely distributed or as abundant in the drier, lowland areas of the park. The two species occur in strict sympatry on the slopes of Nicodaemus, the Ploegberg, and in koppies along the Kuboes-Alexander Bay road, where they may be found in the same rock cracks.

Pachydactylus haackei Branch, Bauer, and Good 1996
Haacke's Thick-Toed Gecko (Fig. 31)

Material examined.—12.6 km ESE Sendelingsdrif, RNP: CAS 193362–63; main park road, RNP (28°07'59" S, 16°59'20" E, 375 m): PEM R11899; 23.5 km ESE Sendelingsdrif, RNP: CAS 193640; lookout point off Nicodaemus Road, RNP (28°20'31" S, 16°58'36" E, 750 m): CAS 200125; road to Nicodaemus, 0.5 km S Helskloof Pass Rd., RNP (720 m): LSUMZ 57291, PEM R11937; Hottentots Paradys, 8.7 km E Helskloof Gate, RNP: CAS 193445; 13 km from top of Helskloof, RNP (2816CD): PEM R7606; Halfmens Pass, 6.5 km E Pootjiespram Rd. junction, RNP (28°08'18" S, 16°58'59" E, 340m): AMB(CAS) 4727, LSUMZ 57290; ca. 20 km ESE Sendelingsdrif, RNP: CAS 186341–42; ca. 22 km ESE Sendelingsdrif, RNP: CAS 186348–50, 189016; Akkedis Drive, RNP (2817AA): PEM R7350; Tierhoek, Ploegberg (28°37'59" S, 17°00'41" E, 425 m): AMB(CAS) 5091, PEM R12563.

Other records.—This species has also been seen at Brown Pass, RNP (28°09'52" S, 17°01'32" E, 480 m).

Comments.—*Pachydactylus haackei* is a regional endemic occurring in the northern Richtersveld and into southern Namibia. It was previously confused with *P. namaquensis*, which differs in color pattern, skin texture, and other features of pholidosis and skeletal morphology, and which approaches its northern range limit in the RNP (Branch et al. 1996). Analysis of mitochondrial DNA suggests that it diverged from its sister taxa, *P. namaquensis* and *P. kladaroderma*, a relatively long time ago (Lamb and Bauer 2002). All members of this species complex are capable of regional integumentary loss, an anti-predator escape strategy involving the loss of large patches of the epidermis and underlying dermis (Bauer et al. 1989, 1993; Branch et al. 1996). The mechanism is dependent on inherent weaknesses in the collagen net-

work of the dermis and the lizard's own movements; when handled these geckos twist their bodies to induce torsion and ripping of the skin.

Pachydactylus labialis FitzSimons 1938
Western Cape Thick-Toed Gecko

Material examined.—Gelykwerf, RNP (28°31'04" S, 17°08'36" E, 830 m): CAS 193594, 200069, PEM R1191.
Other records.—Farm Gembokvlei, ca. 6 km N Steinkopf-Port Nolloth road on Lekkersing road: CAS 186312. Numerous records exist from coastal and near-coastal localities of the Northern Cape.

Comments.—Within the park, this species has been recorded only in the extreme south, near Geleykwerf (Fig. 9), where it has been taken under stones on sandy soil. The RNP seems to be the northern limit of this species. Throughout its range it is primarily associated with rocky areas within succulent karroid vegetation types.

Pachydactylus mariquensis Smith 1849
Marico Thick-Toed Gecko

Material examined.—Koeroegais, RNP (28°17'39" S, 17°01'42" E): PEM R9257; 5.5 km N Kuboes on Kuboes Spring Rd. (28°25'23" S, 17°00'40" E, 300 m): CAS 200076.

Other records.—Visser (1984) mapped a locality in QDS 2816BD, immediately adjacent to our records.

Comments.—The distribution of this species is surprisingly spotty in the Richtersveld area. Both specimens examined were found under small stones, one near Nanoas, a few hundred meters from the southwestern park boundary. They have well banded coloration and are referable to the nominate subspecies, characterized by nasorostrals in contact and non-imbricate dorsals.

Pachydactylus namaquensis (Sclater 1898)
Namaqua Thick-Toed Gecko

Material examined.—Northwestern slopes of Nicodamus, Vandersterrberge, RNP (2816BD): PEM R7635.

Other records.—There are no other records of this species in the RNP or its immediate vicinity. There exists a single Namibian record (SAM 43639) from the southern end of the Huib-Hoch Plateau (2716DD).

Comments.—This species is restricted to areas of deep rock fissures. Most earlier records from the region are referable to *P. haackei* (Branch et al. 1996; see species account above).

Pachydactylus punctatus Peters 1854
Speckled Thick-Toed Gecko

Material examined.—0.18 km N Numees Spring, RNP (28°17'52" S, 16°57'55" E, 355m): LSUMZ 57308; 1.9 km S Pootjiespram, RNP: CAS 193474–75;

Pootjiespram Rd. junction with main park road, RNP: CAS 193597; 1.3 km N main park road on Pootjiespram Rd., RNP: CAS 193601; Sendelingsdrif, RNP: CAS 200078, LSUMZ 57307, PEM R12461; Sendelingsdrif Dump, RNP: CAS 201904, 203499, AMB(CAS) 5045, 5048, PEM R12545–46; vic. Kodas Ruins, RNP (28°14'54" S, 16°57'06" E, 255 m): CAS 200026; Kodas Ruins, RNP (28°15'03" S, 16°56'49" E, 275 m): LSUMZ 57310, PEM R11940; vic. Kodas Ruins, RNP (28°15'38" S, 16°56'18" E, 255 m): LSUMZ 57309; 19.4 km SE Pootjiespram Road junction, RNP (28°11'02" S, 17°02'14" E, 580 m): LSUMZ 57304, PEM R11962; Main park road, RNP (28°07'59" S, 16°59'20" E, 375 m): CAS 200023; Akkedis Drive (Brown Pass) (2816BB): PEM R7385; vic. Maerpoort (28°13'02" S, 17°07'20" E, 460 m): PEM R11881; 8.1 km S Oenna Mine on Oenna Mine Rd., RNP (28°06'40" S, 17°01'10" E, 220 m): CAS 201914; 2.7 km W Springbokvlakte Airstrip, RNP (28°21'34" S, 17°12'53" E, 525 m): CAS 200037; Die Toon Campsite, RNP (28°18'25" S, 17°17'24" E, 635 m): PEM R11936; Wallekraal Mines (28°19'37" S, 16°52'12" E, 230 m): CAS 200044; Kuboes Springvlei (28°26'05" S, 16°59'49" E): CAS 200074, PEM R11964; ca. 1 km N Kuboes (28°26'05" S, 16°59'49" E, 240 m): CAS 203506, PEM R12570; 2.7 km N Kuboes on Kuboes Spring Road (28°26'10" S, 16°59'43" E, 240 m): PEM R11926; Nanoas Spring Rd., ca. 2 km N Kuboes (28°25'24" S, 17°00'14" E, 290 m): CAS 201938, PEM R12570; 4.4 km N Kuboes on Kuboes Spring Rd. (28°25'31" S, 17°00'06" E, 265 m): CAS 200077, LSUMZ 57305–06; 2817CC: PEM R9589.
Other records.—Remhoogte, RNP (2816BD): SAM 45018; Tatasberg, RNP (2817AC): SAM 45024; Annisfontein (2816BD): SAM 45026, 45555.

Comments.—The southern edge of the range of this species as a whole does not extend much beyond the southern limits of the park. Within the RNP, *P. punctatus* is widely distributed, especially in areas of sandy flats. This was the most common species collected on sticky trap arrays and was also collected by hand at night while active in sandy or gravelly areas. All specimens collected in the RNP are the typical form of this species. *Pachydactylus punctatus* is also widespread in the gravel plains of the southern Sperrgebiet (Branch 1994). Bauer and Branch (1995) reviewed the status of the various named forms allied to *P. punctatus* and determined that *P. amoenoides*, a name applied to southern Namibian coastal specimens and those from the Klinghardt Mountains (Branch 1994), is a synonym of *P. punctatus*.

Pachydactylus rugosus Smith 1848
Rough Thick-Toed Gecko (Fig. 32)

Material examined.—Sendelingsdrif Dump, RNP: CAS 201905; Sendelingsdrif, RNP: PEM R7234, 9267–68.

Other records.—*P. rugosus* is known from scattered localities in the Northern Cape and adjacent southern Namibia, including Noordoewer (2817DC): SMW 199 (see also Lamb and Bauer 2000).

Comments.—Within the RNP this species has been



Figure 32. *Pachydactylus rugosus*, Sendelingsdrif, RNP. Photo W.R. Branch.

recorded only from Sendelingsdrif and Grasdrif (Williamson 2000). Elsewhere in its range *P. rugosus* is often associated with trees and is most often found under bark) but in the RNP it has been taken beneath an oil drum and in a wood pile. It appears to be widespread throughout the lower Orange River valley, but nowhere abundant. Although morphologically similar to *P. barnardi*, it is ecologically segregated and genetically distinct (Lamb and Bauer 2000). More records are likely to come from the riverine vegetation along the Orange River.



Figure 33. *Pachydactylus* cf. *serval*, juvenile, RNP. Photo W.R. Branch.

Pachydactylus cf. *serval* Werner 1910
Western Spotted Thick-Toed Gecko (Fig. 33)

Material examined.—Numees Spring, RNP (28°17'42" S, 16°58'05" E, 380 m): PEM R12560; RNP (28°05'59" S, 17°01'32" E, 180 m): PEM R12550; Sendelingsdrif Dump, RNP: PEM R12544; RNP (28°02'41" S, 17°05'40" E, 40 m): CAS 201910, 203501, PEM R12548; RNP (28°19'12" S, 16°58'30" E, 420 m): CAS 201910, 203504; Swartpoort, RNP (28°03'59" S, 16°58'37" E, 75 m): CAS 200009; 12.6 km ESE Sendelingsdrif, RNP: CAS 193365–67; 22.8 km ESE Sendelingsdrif, RNP: CAS 193374, 193392; 23.5 km ESE Sendelingsdrif, RNP: CAS 193631–32; ca. 20 km ESE Sendelingsdrif, RNP: CAS 186340; Akkedis Drive, RNP (2817AA): PEM R7356; 2.7 km S Oenna Mine Rd. junction on main park road, RNP (28°04'42" S, 17°02'41" E, 100 m): CAS 201918; 8.1 km S Oenna Mine on Oenna Mine Rd., RNP (28°06'40" S, 17°01'10" E, 220 m): CAS 201913, 203502; 13.3 km E Oenna Mine, RNP (28°05'11" S, 17°07'45" E, 60m): CAS 201908, PEM R12547; Helskloof, RNP (28°19'46" S, 16°59'25" E, 695 m): LSUMZ 57293; Hottentots Paradys Overlook, RNP (2816BD): PEM R11966; just N Ochta Mine, RNP (2816BB): PEM R7363; road to Nicodaemus, 0.5 km S Helskloof Pass Rd., RNP (720 m): CAS 200050, LSUMZ 57292; Tatasberg, RNP (2817AD): PEM R153; S Tatasberg, RNP (2817AC): PEM R1270; Vandersterrberg, RNP (2817AC): PEM R1960; 28°15'34" S, 17°08'19" E, RNP (2817AC): PEM R1960; Kuboes Spring (28°26'36" S, 16°59'36" E, 190 m): PEM R12573; 2.3 km NE Geigas River junction on Kook River Spring Road (28°41'16" S, 17°07'44" E, 440 m): PEM R11965; Aramanshoek (2817CA): PEM R9244.

Other records.—Annisfontein and vicinity (2816BD): SAM 43604, 45019–23, 45042, 45552–3; E Eksteenfontein near trig beacon 2605 (2817CD): SAM 45034–5; Sabiesies (2817CA): SAM 47724; Tierhoek, Ploegberg (28°37'54" S, 17°00'43" E): CDNC 4845.

Comments.—This species has a highly complex and convoluted nomenclatural history. It was reviewed by McLachlan and Spence (1966), who recognized three subspecies, *P. s. serval*, *P. s. purcelli*, and *P. s. onsceepensis*. The latter two forms have been regarded as occurring in the region, with *P. s. onsceepensis* being restricted to the Orange River Valley and its periphery and *P. s. purcelli* occurring both to the north and south. Although more than one taxon appears to be present in the RNP, the relationship of these geckos to the available names remains obscure, as the diagnostic features purported to distinguish the subspecies from one another do not appear to be consistent. Most specimens have been found in rock crevices or under rock flakes. However, at Sendelingsdrif, large specimens were found active terrestrially, usually beneath stones or refuse. A revision of the complex is in preparation (Bauer, Branch and Lamb, in prep.)

Pachydactylus turneri (Gray 1864)

Turner's Thick-Toed Gecko

Material examined.—RNP (28°18'22" S, 16°58'11" E, 375 m): PEM R12557; Pootjiespram, RNP: CAS 193403, 193407–10; 1.3 km N main park road on Pootjiespram Rd., RNP: CAS 193599–600; Nicodaemus Rd., RNP (28°20'47" S, 16°59'06" E, 700 m): CAS 200022, PEM R11903; Road to Nicodaemus, 0.5 km from junction of Hottentots Paradys Road (720 m): CAS 200052, LSUMZ 57337, AMB(PEM) 4614; Kodas Ruins (28°14'54" S, 16°57'06" E, 255 m): CAS 200025; Sendelingsdrif, RNP: CAS 193413–16, 200084, LSUMZ 57342, PEM R1952–53; Sendelingsdrif Dump, RNP: PEM R12543; Halfmens Pass, 6.5 km E Pootjiespram Rd. junction, RNP (28°08'18" S, 16°58'59" E, 340m): CAS 200091, PEM R12416, 12424; Halfmens Pass, 8.3 km E Pootjiespram Rd. junction, RNP (28°07'53" S, 16°59'51" E, 720m): LSUMZ 57338, PEM R12438, 12445; 1.9 km S Pootjiespram, RNP: AMB(CAS) 2049; Main park road, RNP (28°07'59" S, 16°59'20" E, 375 m): LSUMZ 57334, PEM R11874; Akkedis Drive, RNP (2817AA): PEM R7351; 1 km N Dabbie River turn at junction of Dabbie River (28°17'55" S, 17°07'18" E, 280 m): AMB(CAS) 4550; 2.7 km S Dabbie River junction, RNP (19°37'00" S, 19°07'44" E, 380 m): AMB(CAS) 4571; 2.1 km ESE Creswell's Prospect, RNP (495 m): AMB(CAS) 4539; Between Pootjiespram junction and Oenna Mine Rd. junction: AMB(CAS) 3847–48; 8.1 km S Oenna Mine on Oenna Mine Rd., RNP (28°06'40" S, 17°01'10" E, 220 m): CAS 201912; 13.3 km E Oenna Mine, RNP (28°05'11" S, 17°07'45" E, 60 m): CAS 203500; Hottentots Paradys, 8.7 km E Helskloof Gate, RNP: CAS 193433; Slope of Nicodaemus, Helskloof, RNP (28°21'03" S, 16°59'31" E, 775 m): LSUMZ 57333; ca. 20 km ESE Sendelingsdrif, RNP: CAS 186343; ca. 22 km ESE Sendelingsdrif, RNP: CAS 186347; 22.8 km ESE Sendelingsdrif, RNP: CAS 193377–82; 23.5 km ESE Sendelingsdrif, RNP: CAS 193630; 4.5 km N Park sign 8, RNP (245 m): LSUMZ 57340, PEM R12425; 15.4 km ESE junction Pootjiespram Road on main park road, RNP (28°09'48" S, 17°01'10" E, 490 m): LSUMZ 57339; vic. Brown Pass, RNP: CAS 186345–46; Waterhole near "Cave," 1.4 km W Dabbie River junction (310 m): LSUMZ 57336, PEM R12443; just N Ohta Mine, RNP (2816BB): PEM R7366; NW slopes of Nicodaemus, RNP (2816BD): PEM R7636; 1 km N Dabbie River turnoff at 2nd crossing of Dabbie River, RNP (28°17'55" S, 17°07'18" E, 280 m): CAS 200030; 4.7 km W Dabbie River junction on Brown Pass-De Hoop Rd. (28°12'39" S, 17°05'54" E, 455 m): PEM R11966; 9.9 km W Dabbie River junction on Brown Pass Rd. (28°09'57" S, 17°01'35" E, 500 m): LSUMZ 57335; Die Toon Campsite, RNP (28°18'25" S, 17°17'24" E, 635 m): CAS 200036; Richtersberg Camp, RNP (75 m): CAS 200101; 16.2 km W Gelykwerf: CAS 193581; 10.0 km SE Kuboes on Swartbank Rd. (290 m): AMB(CAS) 4783; 13.4 km SE Kuboes on Swartbank Rd. (350 m): CAS 200108, LSUMZ 57341; 16 km S Kuboes junction on Lekkersing Rd.: CAS 186357–65, LSUMZ 55310–11; 21.6 km S

Alexander Bay-Sendelingsdrif Rd. junction on Lekkersing Rd. (28°35'16" S, 16°56'41" E, 500 m): PEM R11896; Tierhoek, Ploegberg (28°37'59" S, 17°00'41" E, 425 m): CAS 201931, 203505, AMB(CAS) 5106–07; 2.3 km NE Geigas River junction on Kook River Spring Road (28°41'16" S, 17°07'44" E, 440 m): AMB(CAS) 4655; E side of Ploegberg (2817CA): PEM R9231; Aramanshoek (2817AC): PEM R9246.

Other records.—Sendelingsdrif: SAM 47731, PEM R1953–54; RNP (2817AC): CDNC 4837, 4841; Annisfontein (2816BD): SAM 43602, 43618, 43663–64, 151534 170819; Eksteenfontein (2817CD): PEM R353. This species was also collected at Kuboes by FitzSimons (1935) (TM 15877–78). Specimens were observed on the Sendelingsdrif Road north of the Bloeddrijf turning (28°22'31" S, 16°54'43" E, 260 m). Branch (1994) found *P. turneri* restricted to the lower slopes of the Aurusberg in the Sperrgebiet.

Comments.—This species is similar in habitat preference to *P. bibronii* but is perhaps less selective regarding sheltering sites. It is common throughout the RNP (contra Williamson 2000), especially in rocky areas in the more mesic zones. The species is very common south of the park in the isolated rocky outcrops on the Lekkersing plains where more than 200 individuals were observed under a single rock slab. Although typically found in rock crevices, one specimen was found under the bark of a living tree in the Dabbie River (Fig. 16) and another was found under a stone on sandy soil near a waterpoint.

This species was resurrected from the synonymy of *P. bibronii* by Benyr (1995), who considered it a subspecies of *P. laevigatus* (see also *P. bibronii* species account). However, the name *turneri* has temporal priority over *laevigatus*. Whether *laevigatus* is a valid taxon, separable from nominate *P. t. turneri*, requires further investigation (Lamb and Bauer 2002).

Pachydactylus cf. *weberi* Roux 1907

Weber's Thick-Toed Gecko

Material examined.—Above Springbokvlei, RNP: PEM R1959; Pootjiespram, RNP: CAS 193406; Sendelingsdrif, RNP: CAS 193417–19, 200034, 200049, 200079, LSUMZ 57343–44, PEM R11952; Numees, RNP (2816BD): PEM R200; Reuning Mine, RNP (2817AC): PEM R7626; Kuboes: PEM R12798, 12804.

Other records.—Sendelingsdrif (28°05'02" S, 16°56'30" E): CDNC 4833; Annisfontein (2816BD): SMW 2747; 30 km S junction of Eksteenfontein Rd. on Lekkersing Rd.: CAS 186366; Uitspanpoort se Berg (28°57' S, 17°02'30" E, 490 m): LSUMZ 57345, PEM R11942; 45.2 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkersing Rd. (Blue Schist Koppies) (28°47'04" S, 17°00'24" E, 400 m): CAS 200056; Lekkersing (2817Aa): SAM 18556, PEM R12803.

Comments.—This species may be confused with *P. cf. serval* and is similar in general habitat requirements. However, the two do not appear to occur in strict sympatry in the RNP. *Pachydactylus* cf. *weberi* appears to be more restricted to mesic microhabitats and may be absent

from much of the eastern region of the park. Branch (1994) recorded this species from rock cracks on the Skilpadsberg in Namibia, directly across the Orange River from the RNP (Fig. 17) and found a gravid female there in September 1992. One specimen was found desiccated in the garage of a house at Sendelingsdrif. Like *P. serval*, *P. weberi* has several named subspecies that are sometimes regarded as valid. The status of these forms and the extent and interpretation of variation within this species, or species complex, requires much further investigation (Bauer, Branch and Lamb, in prep.).

Palmatogecko rangei Andersson 1908
Web-Footed Gecko

Material examined.—None.

Other records.—South African records for this dune dwelling species are limited to near-coastal localities north of Gifkop, 35 km S Alexander Bay (Haacke 1976a), and extend inland along the Orange River as far as Sendelingsdrif. The only records from the study area are those from Sendelingsdrif (TM 22977–81, 34191–4), Brandkaros (PEM R12389–91, TM 22265–9, 22654–5, 22684–9, 25149, 25194, 26457–60, 35255–6), 11.2 km N Bloeddrif (TM 35263–4); Bloeddrif, 14.4 km N Annisfontein (TM 27807), and Jakkalsputs (SMW 2741, SAM 43661, 43672–7). Williamson (2000) figured a specimen from near Kortdoring, east of Alexander Bay. The species is quite common at Oranjemund and in the Obib Dunes.

Comments.—This species was listed as rare in South Africa due to its peripheral distribution (McLachlan 1978). Large scale irrigated farming along the Orange (Figs. 17, 18) may have wiped out inland populations of this species in recent years. Despite directed searching we did not find this species at or near Sendelingsdrif, nor at the few remaining undisturbed sandy habitats along the Orange between Brandkaros and the park boundary. Priority should be given to securing any RNP populations that may remain, as these would be the only *Palmatogecko* in South Africa protected within a national park.

Phelsuma ocellata (Boulenger 1885)
Namaqua Day Gecko (Fig. 34)

Material examined.—Pootjiespram, RNP: CAS 193405; Halfmens Pass, 6.5 km E Pootjiespram Rd. junction, RNP (28°08'18" S, 16°58'59" E, 340m): LSUMZ 57289, PEM R9275; NW slopes of Nicodaemus, Vandersterrberg, RNP (2816BD): PEM R7640; SE slopes of Nicodaemus, Vandersterrberg, RNP (2816BD): PEM R7643–44; 1.9 km down Helskloof Pass, RNP (2816CD): PEM R7611; Reuning Mine, RNP (2817AC): PEM R7627; Between Helskloof Gate and Paradyskloof, RNP: CAS 186338; ca. 22 km ESE Sendelingsdrif on main park road, RNP: CAS 186351; Halfmens Pass, RNP (2816BB): PEM R12455.

Other records.—Specimens were observed but not collected near the road to Nicodaemus, 0.5 km S Helskloof

Pass Rd., RNP (720 m). Nearby Namibian records include several from Witputs Süd (2716DA).

Comments.—This species has only been encountered in the more mesic portions of the park, especially on boulders along the Helskloof road. It probably also occurs in the Rosyntjieberge. This is one of only two primarily diurnal geckos occurring in the Richtersveld (the other being *Lygodactylus bradfieldi*). McLachlan (1978) regarded *P. ocellata* as rare in South Africa because of its small total distribution (McLachlan 1978), but at that time there were no published records from the Richtersveld. Our observations suggest that it is abundant in appropriate habitats.

The generic placement of this species has long been in question. It was originally described in the genus *Rhoptropus* by Boulenger (1885), based on its superficial similarity to the day geckos of Namibia. Roux (1907) subsequently recognized the affinities of the species to *Phelsuma* and Schmidt (1933) transferred it to that genus. Hewitt (1937) considered *ocellata* to be intermediate between the two genera and erected for it the new genus *Rhoptropella*. Although this combination was extensively used for many years (e.g., FitzSimons 1943; Loveridge 1947), data have been presented from digital morphology (Russell 1977; Russell and Bauer 1990) and allozymes (Good and Bauer 1995) to support the interpretation that the Namaqua day gecko is a *Phelsuma*, allied to the day geckos of the Indian Ocean islands. Röhl (1999), however, has recently resurrected *Rhoptropella* on the basis of unique features of the cutaneous sense organs found in the Namaqua day gecko. We regard Röhl's taxonomic action as unwarranted, as it emphasizes the autapomorphic traits of *P. ocellata* while obscuring the synapomorphies that link it to other *Phelsuma*.

Ptenopus garrulus (Smith 1849)
Common Barking Gecko

Material examined.—5.0 km W Dabbie River junction on Brown Pass-De Hoop Rd., RNP (28°12'40" S, 17°05'31" E, 475 m): CAS 200031, PEM R11930; 6.6 km S Brown Pass, RNP (28°11'09" S, 17°02'39" E, 570m): CAS 200097–200100, LSUMZ 57352–54, PEM R12433, 12451; Springbokvlakte (28°21'52" S, 17°14'12" E, 555m), RNP: CAS 200104; 5–7 km E



Figure 34. *Phelsuma ocellata*, Nicodaemus, RNP. Photo W.R. Branch.

Swartpoort, RNP (2816BB): PEM R7578–80; 5.7 km W Dabbaras River, RNP (2817AA): PEM R11030.

Other records.—Sendelingsdrif, RNP (2816BB): TM 22982, 34198, 34304–08; Swartpoort, RNP: TM 33779–81; Nabas, Grasdrif, on Orange River, RNP (2817AD): TM 35312–14; Maerpoort area, RNP: TM 53853; Springbokvlakte, S Tatasberg Beacon, RNP (2817AD): TM 35317; De Hoop, RNP (2817AA): TM 34108–09; 28°15'34" S, 17°08'19" E, RNP (2817AC) CDNC 4840; 28°17'54" S, 17°05'02" E, RNP (2817AC) CDNC 4842; Annisfontein (2816BD): TM 35270–75, 35278; 9 km N Bloeddrif (2816BD): TM 35266–67; 3 km N Bloeddrif (2816BD): TM 35265; Brandkaros: TM 22659, 26456; Eksteenfontein Mine: TM 27942; Daberas on the Holgat River: TM 34196–97, 34199. In addition, the following are localities based on calling activity: Pootjiespram Rd junction, RNP; 2.1 km ESE Creswell's Prospect, RNP (495 m); Road to Wallekraal Mines (28°20'01" S, 16°54'25" E, 310 m); Road to Wallekraal Mines (28°20'31" S, 16°54'50" E, 310 m); Sendelingsdrif Road N Bloeddrif turning (28°22'31" S, 16°54'43" E, 260 m); 37.1 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkersing Rd. (28°42'55" S, 16°59'38" E, 375 m); Oor River, 1.6 km N Modderfontein River on Geigas Road (28°42'44" S, 17°07'39" E, 420 m). Numerous other regional records were reported by Haacke (1975b).

Comments.—The barking gecko is very widely distributed in sandy plains and riverbeds throughout the interior of the park. Specimens were not collected or heard to call in the alluvial sands immediately bordering the Orange River during our studies, but other records (e.g., Brandkaros, Sendelingsdrif) suggest that *P. garrulus* does, or did, occupy this habitat as well. Cornell (1920[1986]) noted that this species was feared locally as being deadly poisonous. This species is typically extremely vocal and males may be heard calling from burrow entrances on most warm nights and occasionally even at temperatures approaching 10°C. There appeared to be reduced calling activity in areas that had been trampled by passing herds of small-stock, as at Nicodaemus and some of the approaches to Paradyskloof. Most specimens were dug out of burrows located and identified on the basis of entrance diameter. Namaqualand specimens are referable to the subspecies *P. g. maculatus* (Haacke 1975b), and those in the Richtersveld are generally smaller than most other populations and the males exhibit yellow areas on the anterior face of the femur (Haacke 1975b).

LACERTIDAE

Meroles ctenodactylus (Smith 1838) Smith's Desert Lizard

Material examined.—37.1 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkersing Rd. (28°42'55" S, 16°59'38" E, 375 m): CAS 200055, 200058–60, LSUMZ 57355–57, PEM R11870, 11893, 11933; just S of Ploegberg (2816DB): PEM R11870.

Other records.—Additional museum records include Jakkalsputs (2816BD): SMW 2734–6, SAM 43657–59, 43692; Grootderm (FitzSimons 1950); Kuboes (FitzSimons 1943); and Lekkersing (2817CC): PEM R2156. In southern Namibia Branch (1994) recorded this species from red sand flats in the Rooipeel Depression in the Sperrgebiet and it is also widely distributed in areas west of Rosh Pinah (2716DC) and near Oranjemund (2816CB).

Comments.—The extreme psammophily of this species probably excludes it from the current RNP, although it is present near the western and southern borders of the park (Fig. 21), wherever there are dunes or accumulations of loose sand. The Kuboes record of FitzSimons (1943) falls within our study area, but we suspect that this locality is imprecise and that the point of collection may have been considerably south of the settlement itself. Mayer and Richter (1990) mistakenly claimed that the distribution of *M. ctenodactylus* in Namibia was limited to the vicinity of Oranjemund.

Meroles cuneirostris (Strauch 1867) Wedge-Snouted Desert Lizard

Material examined.—None.

Other records.—The species occurs in suitable habitat in extreme southern Namibia, but South African localities are very restricted. Regional museum records include: between Gelykwerfberg and Doornpoort: TM 24183; Brandkaros: TM 22257–59; Kortdoorn: TM 25138; and ca. 14 km E Alexander Bay on Sendelingsdrif Rd. (28°32'49" S, 16°35'18" E, 45 m): CAS 200008, PEM R11948.

Comments.—In South Africa the species is distributed primarily in sandy habitats along the Orange River, and Branch (1994) reported it to be common in well-vegetated wind-blown sand hummocks of the Sperrgebiet of Namibia. Like *Meroles ctenodactylus*, this species is unlikely to be found within the confines of the existing RNP, owing to the absence of suitable loose sand habitats. We found this species only in the alluvial sands of the Orange River floodplain. It may now be very restricted in this region because of the irrigation of the south bank of the Orange and its conversion to agricultural use (Figs. 17, 18).

Meroles knoxii (Milne-Edwards 1829) Knox's Desert Lizard

Material examined.—16 km S Kuboes junction on Lekkersing Rd.: CAS 186356.

Other records.—Other regional records include: Jakkalsputs (2816BD): SMW2740; Visagiesfontein (28°45' S, 16°34'–37' E): SAM 47662–66; Holgat (28°55'52" S, 16°46'46" E): SAM 47667; and Lekkersing: PEM R2260, SAM 18547, SMW 2863.

Comments.—*Meroles knoxii* may perhaps occur in more mesic, sandy areas in the western region of the RNP. Branch (1994) described the typical coloration of specimens from the Klinghardt Mountains, and he and Haacke

(1965) discussed the equivocal status of *M. k. pequensis*, to which southern Namibian specimens have been referred.

Meroles suborbitalis (Peters 1870)

Spotted Desert Lizard

Material examined.—Bottom of Helskloof Pass (2816AD): PEM R7577; Kodas Ruins, RNP (28°15'03" S, 16°56'49" E, 275 m); CAS 200018; vic. Kodas Ruins, RNP (28°15'09" S, 16°56'19" E, 240 m); PEM R11951; vic. Kodas Ruins, RNP (28°15'38" S, 16°56'18" E, 260 m); PEM R11944, 11951; vic. Kodas Ruins, RNP (28°14'58" S, 16°56'41" E, 260 m); LSUMZ 57348; 10.7 km ESE Pootjiespram Rd. junction on main park road (28°07'37" S, 17°00'44" E, 345 m); PEM R7362; Main park road, RNP (28°07'59" S, 16°59'20" E, 375 m); PEM R11943; Akkedis Drive (Brown Pass), RNP (2816BB); PEM R7370–71, 7362; 17 km ESE Sendelingsdrif, RNP: CAS 193604–14; 18.8 km ESE Sendelingsdrif, RNP: CAS 193370; 1.15 km N Brown Pass on main park road, RNP (28°09'20" S, 17°00'55" E, 385 m); PEM 12430; Die Koei Campsite, RNP (28°16'28" S, 17°00'33" E, 525 m); PEM R11927; 2.3 km E Die Koei Campsite, RNP (28°17'12" S, 16°59'40" E, 525 m); PEM R11894; 4.1 km ESE Creswell's Prospect, RNP (28°17'29" S, 17°03'53" E, 420 m); LSUMZ 57347, PEM R12203; 2.1 km ESE Creswell's Prospect, RNP (495 m); CAS 200028; 6.6 km S Brown Pass, RNP (28°11'09" S, 17°02'39" E, 570m); LSUMZ 57351; Springbokvlakte, RNP (28°21'52" S, 17°14'12" E, 555m); LSUMZ 57349–50; Road to Wallekraal Mines (28°20'01" S, 16°54'25" E, 310 m); PEM R11938; 37.1 km S Alexander Bay–Sendelingsdrif Rd. junction on Lekkering Rd. (28°42'55" S, 16°59'38" E, 375 m); CAS 200061; Oor River, 1.6 km N Modderfontein River on Geigas Road (28°42'44" S, 17°07'39" E, 420 m); AMB(CAS) 4652; SE Ploegberg (2817CA); PEM R9237–38.

Other records.—Other museum records include: Kuboes: SAM 45556; Jakkalsputs (2816BD): SMW 2737; 2 km W Comellskop: SAM 43668; Dolomite Hills (2817CA): SAM 44045; "Blackhills" (2816DB): PEM R4453–54; Sabiesies (2817CA): SAM 45017; Eksteenfontein (28°51'54" S, 17°03'50" E): SAM 47679, CDNC 4826; Visagiesfontein (28°45'08" S, 16°35'07" E): SAM 47680; 7.3 km E Alexander Bay Airport Rd., 1 km S Alexander Bay-Kuboes Rd. (28°33'27" S, 16°34'45" E, 60 m): CAS 200081, AMB(PEM) 4690; Lekkering (2817CC): PEM R2096; and Violdsdrif: SAM 18528. In addition, we made sight identifications at Sendelingsdrif Road N Bloeddriif turning (28°22'31" S, 16°54'43" E, 260 m), 21.6 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkering Rd. (28°35'16" S, 16°56'41" E, 500 m), 37.1 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkering Rd. (28°42'55" S, 16°59'38" E, 375 m), 45.2 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkering Rd. (Blue Schist Koppies) (28°47'04" S, 17°00'24" E, 400 m), Halfmens Pass, 6.5 km E Pootjiespram Rd. junction, RNP (28°08'18" S, 16°58'59" E, 340m), 5.0 km W Dabbie River junction on Brown

Pass-De Hoop Rd., RNP (28°12'40" S, 17°05'31" E, 475 m), and 9.0 km W Blackies Prospect junction (445 m).

Comments.—This species is widespread in the Richtersveld, but more than one taxon may be represented. Specimens from 7.3 km E Alexander Bay differ significantly from all of those collected in the park itself and specimens from the western periphery of the park are clearly distinctive from those found further east. A similar apparent difference was noted by Branch (1994) on the Namibian side of the river. Branch (1994) found this to be the most common lizard of the gravel plains of the southern Sperrgebiet. This species was the most frequently captured lizard in a series of pit-traps placed near the Kodas mine ruins.

Nucras tessellata (Smith 1838)

Striped Sandveld Lizard

Material examined.—Hottentots Paradys Lookout, RNP (28°20'29" S, 16°58'32" E, 710m); PEM R12410; Hottentots Paradys Overlook, RNP (28°20'31" S, 16°58'36" E, 750 m); CAS 200048; 8.1 km S Oenna Mine on Oenna Mine Rd., RNP (28°06'40" S, 17°01'10" E, 220 m); CAS 201917; Helskloof Gate, RNP (2816BD): PEM R7629; Kouams River Valley, RNP (2816BB): PEM R7590.

Other records.—Broadley (1972) listed localities at: 15 km N Annisfontein: TM 27840–1; 15 km NW Dolomite Peaks: TM 27876; Hellskloof Pass: TM 35292; Sendelingsdrif: TM 27166; and 10 km E Stinkfontein: TM 34140. Other museum records exist from Sendelingsdrif (TM 27896) and Lekkering (SAM 18543, SMW2076). An additional sight record of this distinctive species was noted from Halfmens Pass, 6.5 km E Pootjiespram Rd. junction, RNP (28°08'18" S, 16°58'59" E, 340m). The nearest Namibian record is from 20 km N Rosh Pinah (TM 35404).

Comments.—*Nucras tessellata* is widespread in the more mesic parts of the RNP. Broadley (1972) referred specimens occurring south of the Richtersveld proper, at Steinkopf and elsewhere in Little Namaqualand to "variety T," which he placed in the synonymy of *N. t. tessellata*. He also recognized a southern race of the species, *N. t. livida*. Branch and Bauer (1995) recorded sympatry between both subspecies in the southern Cape, and elevated *N. livida* to specific status. They noted that the status of Namaqualand *N. tessellata* needed further investigation. Most RNP specimens were collected on stony slopes where loose rocks and succulent vegetation provided refuges. When disturbed these lacertids typically attempt to wriggle beneath or behind large rocks resting on, or buried in, soil.

Pedioplanis inornata (Roux 1907)

Plain Sand Lizard (Fig. 35)

Material examined.—Numees Spring, RNP (28°17'42" S, 16°58'05" E, 380 m); PEM R12559; RNP (28°18'22" S, 16°58'11" E, 375 m); CAS 203522; Numees Mine



Figure 35. *Pedioplanis inornata*, RNP. Photo W.R. Branch.

(2816CD): PEM R7612–14; Sendelingsdrif: TM 27838; 16.3 km ESE Pootjiespram Rd. junction on main park road, RNP (28°09'51" S, 17°01'30" E, 475 m); CAS 200012; 13.3 km E Oenna Mine, RNP (28°05'11" S, 17°07'45" E, 60m); CAS 201909; Brown Pass, RNP (28°09'52" S, 17°01'32" E, 480 m); CAS 200096; Pootjiespram, RNP: CAS 193404, TM 25181–83; 6.5 km E Pootjiespram Rd. junction, RNP (28°08'18" S, 16°58'59" E, 340m); LSUMZ 57217; 0.5 km S Oenna Mine Rd. junction on main park road, RNP (28°07'35" S, 17°00'45" E, 325 m); PEM R12444; 22.8 km ESE Sendelingsdrif, RNP: CAS 193391; 23.5 km ESE Sendelingsdrif, RNP: CAS 193636–38; Richtersberg Camp, RNP (75 m): CAS 200102; 2.7 km S Dabbie River junction, RNP (19°37'00" S, 19°07'44" E, 380 m); LSUMZ 57218; Akkedis Drive (Brown Pass), RNP (2816BB): PEM R7360, 7374, 7382–84; Bloeddrif (28°20'58" S, 16°48'45" E, 100 m): PEM R11931.

Other records.—Additional museum records include: Kuboes: SAM 11342, 11344, 11347, 11349, 18660–63, TM 15886–87, 25190; Bloeddrif, 24.4 km NW Annisfontein (2816BD): TM 27813–16; Cornellskop (2816BD): TM 25160; 2 km W Cornellskop: SAM 43669; E Eksteenfontein 2817CD: SAM 45031; Richtersveld 2817: SAM 18822–23, Richtersveld 2817AC: SMW 2217; Vioolsdrif: TM 27970; Uitspanpoort se Berg (28°57' S, 17°02'30" E, 490 m): CAS 200039, LSUMZ 57216, PEM R11925, 11939; 15 km N Steinkopf-Port Nolloth Rd. on Lekkersing Rd.: CAS 186336. Also seen at Springbokvlakte, RNP (28°21'52" S, 17°14'12" E, 555m) and 45.2 km S Alexander Bay-Sendelingsdrif Rd. junction on

Lekkersing Rd. (Blue Schist Koppies) (28°47'04" S, 17°00'24" E, 400 m). Numerous southern Namibian records include Rooilepel: TM 27730.

Comments.—Fairly widely distributed in rocky areas within the park and adjacent regions, especially in and adjacent to the Orange River Valley. *Pedioplanis inornata* appears to prefer more arid microhabitats than its congener, *P. lineocellata*.

Pedioplanis lineocellata (Duméril and Bibron 1837)
Spotted Sand Lizard

Material examined.—7.7 km E Helskloof Gate, RNP (28°19'17" S, 16°59'21" E, 645 m): AMB(CAS) 4778, LSUMZ 57325, PEM R11873–74; Top of Helskloof, RNP (2816CD): PEM R7601; Gelykwerf, RNP (28°31'04" S, 17°08'36" E, 830 m): CAS 200070.

Other records.—Additional regional museum records include Vioolsdrif (28°57'16" S, 17°40'35" E): SAM 47636; Vioolsdrif District: SAM 45590; Lekkersing: SAM 18548; Farm Gemsbokvlei, 6 km N Steinkopf-Port Nolloth Rd. on Lekkersing Rd.: CAS 186313–14, 186316; 12 km N Steinkopf-Port Nolloth Rd. on Lekkersing Rd.: CAS 186332–33. Specimens were also seen at 2.1 km ESE Creswell's Prospect, RNP (495 m).

Comments.—Our records appear to be the first published for the species within the RNP. The distribution of the species is limited in the park to the fog zone of the Vandersterrberg. It is restricted to open, rocky areas with good vegetative cover and high humidity (Fig. 6). Branch (1994) noted the relictual distribution of the species in the Sperrgebiet, where it was restricted to the fog belt of rocky mountains. Richtersveld specimens are referable to the subspecies *P. l. pulchella*. A modern revision of the species is required as pronounced morphological and ecological differences between *P. l. pulchella* and the nominate race suggest that they should be considered separate species.

Pedioplanis namaquensis (Duméril and Bibron 1839)
Namaqua Sand Lizard

Material examined.—Akkedis Drive (Brown Pass), RNP (2816BB): PEM R7369; Kouams River Valley, RNP (2816BB): PEM R7593–97; vic. Kodas Ruins, RNP (28°15'09" S, 16°56'19" E, 260 m): CAS 200032, LSUMZ 57220; vic. Kodas Ruins, RNP (28°14'58" S, 16°56'41" E, 260 m): CAS 200033; 18.8 km ESE Sendelingsdrif, RNP: CAS 193371; 23.5 km ESE Sendelingsdrif, RNP: CAS 193634–35; 1.8 km N Brown Pass on main park road, RNP (28°09'03" S, 17°00'51" E, 385 m): LSUMZ 57221; Paradyskloof Rd. (28°19'17" S, 16°59'56" E): PEM R11928; 2.7 km S Dabbie River junction, RNP (19°37'00" S, 19°07'44" E, 380 m): LSUMZ 57219; 5.0 km W Dabbie River junction on Brown Pass-De Hoop Rd., RNP (28°12'40" S, 17°05'31" E, 475 m): PEM R12441; 2.1 km ESE Creswell's Prospect, RNP (495 m): PEM R11967; 7.7 km E Helskloof Gate, RNP (28°19'17" S, 16°59'21" E, 645

m): PEM R12452; Helskloof Gate, RNP (2817AC): PEM R9251–52; 3.6 km SE junction Tatas River Camp Rd. on road to Springbokvlakte Airstrip, RNP (460 m): CAS 200105; South of Tatasberg, RNP (2817AC): PEM R7618; Die Toon Campsite, RNP (28°18'25" S, 17°17'24" E, 635 m): CAS 200036; Kuboes: PEM R9224; ca. 1.5 km N Kuboes (28°25'43" S, 17°00'03" E, 260 m): CAS 201936; ca. 1 km N Kuboes (28°26'05" S, 16°59'49" E, 240 m): PEM R12571; 8.4 km SE Kuboes on Swartbank Rd. (320 m): LSUMZ 57222; "Blackhills" (2816DB): PEM R4461; Tierhoek, Ploegberg (28°37'59" S, 17°00'41" E, 425 m): CAS 201928–30, 203518–20, PEM R9239–40, PEM R12564–66.

Other records.—Additional regional museum records: Die Koei, RNP: TM 34118; Springbokvlakte, S Tatasberg Beacon, RNP: TM 35319, 35321; De Hoop, RNP: TM 25142; 5 km SW Numees Mine, RNP: TM 34119, 34124; Doringpoort, RNP: TM 52657; Kuboes: SAM 18659, 18664, TM 15889–90, 27847; 5 km SW Annisfontein: TM 27802, 34084, 35279–80; 14 km NW Dolomite Peaks: TM 27878–82; Vioolsdrift (28°57'16" S, 17°40'35" E): SAM 47648. Sight records from 21.6 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkersing Rd. (28°35'16" S, 16°56'41" E, 500 m) and 45.2 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkersing Rd. (Blue Schist Koppies) (28°47'04" S, 17°00'24" E, 400 m).

Comments.—A conspicuous and common lizard of the sandy, flat, sparsely-vegetated valley bottoms and plains throughout the RNP, including the arid eastern regions of the park (Figs. 10, 11). It co-occurs with *P. inornata* at some localities, but may be the only member of the genus in the most open habitats in the park.

SCINCIDAE

Acontias lineatus Peters 1879 Striped Legless Skink

Material examined.—South eastern slopes of Nicodaemus, RNP (2816BD): PEM R7649; N end of Nicodaemus, RNP (2816CD): 11917; Road to Nicodaemus, 0.5 km S Helskloof Pass Rd., RNP (720 m): PEM R11941; Slope of Nicodaemus, Helskloof, RNP (28°21'03" S, 16°59'31" E, 775 m): CAS 200021, LSUMZ 57301, PEM R11917; 1.8 km up Nicodaemus from Hottentots Paradys Lookout junction (720 m): LSUMZ 57299; 19.4 km SE Pootjiespram Road junction, RNP (28°11'02" S, 17°02'14" E, 580 m): CAS 200014, LSUMZ 57302–03, PEM R11886, PEM R11886, 11908, 12428; vic. Kodas Ruins, RNP (28°14'54" S, 16°57'06" E, 255 m): CAS 200024; Gelykwerf, RNP (28°31'04" S, 17°08'36" E, 830 m): CAS 200071, LSUMZ 57300, PEM R11916, 11921; 10.0 km SE Kuboes on Swartbank Rd. (290 m): CAS 200111; Tierhoek, Ploegberg (28°37'59" S, 17°00'41" E, 425 m): CAS 201927.

Other records.—Kuboes (2816BD): TM 27851.

Comments.—Widely distributed in sandy soils in the park, especially around the periphery of the interior plains. Many specimens were located among the roots of

dead shrubs, whereas others were obtained under rocks resting on sandy soil. Richtersveld specimens are referable to the subspecies *A. l. tristis*.

Mabuya capensis (Gray 1831) Cape Three-lined Skink

Material examined.—19.4 km SE Pootjiespram Road junction, RNP (28°11'02" S, 17°02'14" E, 580 m): LSUMZ 57253; Base of Nicodaemus Rd., RNP (28°21'08" S, 16°59'14" E, 680 m): CAS 201921, 203514, PEM R12553; Hottentots Paradys Lookout, RNP (28°20'31" S, 16°58'36" E, 750m): PEM R11887; NW slopes of Nicodaemus, RNP (2816BD): PEM R7631; Gelykwerf, RNP: CAS 193588–91.

Other records.—Additional museum records: Helskloof Pass, RNP (2816BD): TM 35295–6; Die Koei, RNP: TM 34125; Devil's Castle near Eksteenfontein: TM 34136; Daberas on Holgat River: TM 34216. Also seen, but not collected: 13.4 km SE Kuboes on Swartbank Rd. (350 m). *Comments.*—*Mabuya capensis* is widely distributed from the southwestern Cape to northern Namibia in a wide range of habitat types (Branch 1998), but is uncommon in the RNP, where it is primarily restricted to the more mesic western regions of the park. At Gelykwerf (Fig. 9) it was relatively common in grassy flats surrounding a waterpoint

Mabuya occidentalis (Peters 1867) Western Three-Lined Skink

Material examined.—Richtersveld Natl. Park (2817AC): PEM R7615; Sendelingsdrif, RNP: CAS 203508; Sendelingsdrif Dump, RNP: PEM R12541; 1.4 km S Oenna Mine Rd. junction on main park road, RNP (28°08'05" S, 17°00'39" E, 320 m): PEM R12412; Helskloof Pass, RNP (2817AC): PEM R9250; Kuboes: PEM R9225.

Other records.—Additional regional museum records from: Kuboes: SAM 11343, 11345 and Richtersveld, near Alexander Bay (2816BD): PEM R3641–42. Sight records from 2.0 km S Sendelingsdrif (28°08'22" S, 16°53'41" E, 60 m), and 10.0 km SE Kuboes on Swartbank Rd. (290 m).

Comments.—*Mabuya occidentalis* has a patchy distribution in the RNP, including areas along the Orange River floodplain near Sendelingsdrif. It is known from numerous localities in southern Namibia and also in the plains around Alexander Bay. Most regional localities are from areas of alluvial sands or other sandy soils.

Mabuya spilogaster (Peters 1882) Tree Skink

Material examined.—Sendelingsdrif, RNP: PEM R7628, 9269.

Other records.—A specimen was observed at Bloeddrif (28°19'43" S, 16°47'09" E, 75 m) near the buildings of an abandoned mining site.

Comments.—Although in Namibia this species is sometimes found in association with rocky habitats (Hoffmann 1989; Bauer, Branch, and Haacke 1993), it is chiefly arboreal and in the RNP it appears to be restricted to regions along the Orange River supporting riverine trees (Fig. 5). The nearest records outside the park are from Vioolsdrif (TM 27969) and in QDS 2816CB in Namibia (several SMW records). The Sendelingsdrif and Bloeddrif specimens represent slight western range extensions of the species into the Richtersveld.

Mabuya sulcata (Peters 1867)
Western Rock Skink

Material examined.—Bottom of Helskloof Pass, RNP (28°18'22" S, 16°58'11" E, 375 m): PEM R12574; just N Ochta Mine, RNP (2816BB): PEM R7368; Kouams River Valley, RNP (2816BB): PEM R7599; 2 km N Numees Mine, RNP (2816BB): PEM R9210, 9213; Pootjiespram turning, RNP: PEM R9286, 9288; Nicodaemus, Vandersterrberg, RNP: PEM R7642, 7647–48; vic. Kodas Ruins, RNP (28°14'54" S, 16°57'06" E, 255 m): LSUMZ 57294; Pootjiespram, RNP: CAS 193411; Pootjiespram Rd. junction with main park road, RNP: CAS 193356–58; 1.9 km S Pootjiespram, RNP: AMB(CAS) 2050; 1.3 km N main park road on Pootjiespram Rd., RNP: CAS 193602; Sendelingsdrif, RNP: CAS 193412; Sendelingsdrif Dump, RNP: CAS 203511; Halfmens Pass, 6.5 km E Pootjiespram Rd. junction, RNP (28°08'18" S, 16°58'59" E, 340m): CAS 200092; 8.1 km S Oenna Mine on Oenna Mine Rd., RNP (28°06'40" S, 17°01'10" E, 220 m): CAS 201911; 15.4 km ESE junction Pootjiespram Road junction on main park road, RNP (28°09'48" S, 17°01'10" E, 490 m) : LSUMZ 57296; 12.6 km ESE Sendelingsdrif, RNP: CAS 193360–61; Main park road, RNP (28°07'59" S, 16°59'20" E, 375 m): PEM R11935; 17 km ESE Sendelingsdrif, RNP: CAS 193621–22; 18.8 km ESE Sendelingsdrif, RNP: CAS 193386; 22.8 km ESE Sendelingsdrif, RNP: CAS 193375–76; 23.5 km ESE Sendelingsdrif, RNP: CAS 193639; 7.3 km E main park on road to De Hoop (28°12'12" S, 17°06'37" E, 325 m): PEM R11868; Helskloof Gate, RNP (2816BD): PEM R7630, 7659; 13 km from top of Helskloof (2816CD): PEM R7603; Nicodaemus, 0.5 km S Helskloof Pass Rd., RNP (720 m): PEM R11875; 1.8 km up Nicodaemus from Hottentots Paradys Lookout junction (720 m): LSUMZ 57298; base of Nicodaemus Rd., RNP (28°21'08" S, 16°59'14" E, 680 m): PEM R12555; Hottentots Paradys, 8.7 km E Helskloof Gate, RNP: CAS 193427–32; 2.1 km ESE Creswell's Prospect, RNP (495 m): LSUMZ 57295, PEM R11932; between Helskloof Gate and Paradyskloof, RNP: CAS 186339; ca. 20 km ESE Sendelingsdrif, RNP: CAS 186344; Kuboes (2816BD): PEM R9223; Nanoas Spring Road, 2 km N Kuboes (28°25'24" S, 17°00'14" E, 290 m): AMB(CAS) 5116; 16.2 km W Gelykwerf: CAS 193578–79; 13.4 km SE Kuboes on Swartbank Rd. (350 m): CAS 200109, LSUMZ 57297; 16 km S Kuboes junction on Lekkersing Rd.: CAS 186354–55; E side of Ploegberg (2817CA): PEM R9233; Aramaneshoek

(2817CA): PEM R9249; Road to Wallekraal Mines (28°20'01" S, 16°54'25" E, 345 m): CAS 200043; 2.3 km NE Geigas River junction on Kook River Spring Road (284116 170744E, 440 m): PEM R11872; 6.4 km N Kook River Spring Road on road to Koubank River (28°37'53" S, 17°09'20" E, 690 m): PEM R12414; Tierhoek, Ploegberg (28°37'59" S, 17°00'41" E, 425 m): PEM R12568.

Other records.—Additional regional museum records from: Pokkiespram Mts., RNP (2816BB): TM 25175–76; Hellskloof Pass, RNP: TM 34214–15; Die Koei, RNP (2817AC): TM 34127; 3 km W Blackies Prospect: TM 34128; Ganukouriep River near Blackies Prospect, RNP: TM 35323–24; near Blackie's Prospect, RNP: TM 35326; 3 km W Numees Mine, RNP: TM 27827; Bloeddrif, 14.4 km NW Annisfontein: TM 27812, 27820; Kuboes (2816BD): TM 15863–74, 25178; Groenkloofrivier, 17.6 km SW Kuboes: TM 27873; 5 km N Sanddrift: TM 35276; Gelykwerfberg, Doornpoort: TM 24181; 5 km NE Beesbank: TM 35259–62; Andamp River 8 km from Nabas at Orange River: TM 35316; 12 km N Steinkopf-Port Nolloth Rd. on Lekkersing Rd.: CAS 186328–31; 15 km N Steinkopf-Port Nolloth Rd. on Lekkersing Rd.: CAS 186334–35; Uitspanpoort se Berg (28°57' S, 17°02'30" E, 490 m) : CAS 200038; Lekkersing (2817AA): SAM 18551–18552b, 18827; Sabiesies (2817BA): SAM 47583; just W of Eksteenfontein (2817CB): SAM 45557; Holgat River near Alexander Bay: TM 25152; 6.4 km W Brakfontein: TM 27892; Devil's Castle near Eksteenfontein: TM 34129–31; 22 km W Eksteenfontein: TM 34132. Sight records from: Brown Pass, RNP (28°09'52" S, 17°01'32" E, 480 m); 13.3 km E Oenna Mine, RNP (28°05'11" S, 17°07'45" E, 60 m); Sendelingsdrif Road N Bloeddrif turning (28°22'31" S, 16°54'43" E, 260 m); Tierhoek, Ploegberg (28°37'57" S, 17°00'43" E, 470 m); 5.5 km N Kuboes on Kuboes Spring Rd. (28°25'23" S, 17°00'40" E, 300 m); 4.4 km N Kuboes on Kuboes Spring Rd. (28°25'31" S, 17°00'06" E, 265 m); 21.6 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkersing Rd. (28°35'16" S, 16°56'41" E, 500 m); and 45.2 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkersing Rd. (Blue Schist Koppies) (28°47'04" S, 17°00'24" E, 400 m). Nearby Namibian records include: Boom River, Hunsberg Mts., 24 km E Rosh Pinah, Namibia: TM 35416; confluence of Boom and Orange Rivers, Namibia (2817AA): TM 35430; and confluence Fish and Orange Rivers, 32 km SE Rosh Pinah, Namibia: TM 35445.

Comments.—This skink is very widely distributed throughout the RNP and the Richtersveld in general, wherever appropriate rocky substrates occur. *Mabuya sulcata* is absent from the sandy plains of the park and is uncommonly encountered in the most arid portions of the RNP, even where rocky crevices are available. The status of named subspecies remains unclear (Bauer, Branch, and Haacke 1993), but Richtersveld specimens are unambiguously referable to the nominate race.

Mabuya variegata (Peters 1870)
Variegated Skink

Material examined.—Kouams River valley, RNP (2816BB): PEM R7591–92; 17 km ESE Sendelingsdrif, RNP: CAS 193616–20; 18.8 km ESE Sendelingsdrif, RNP: CAS 193369; Pootjiespram, RNP (2816BB): PEM R9207; Hottentots Paradys, 8.7 km E Helskloof Gate, RNP: CAS 193420–26; Hottentots Paradys Lookout, RNP (28°20'29" S, 16°58'32" E, 710m): LSMZ 57328, PEM R12431; 1.8 km up Nicodaemus from Hottentots Paradys Lookout junction, RNP (720 m): PEM R12448; Paradyskloof (2817CA): PEM R9241; Akkedis Drive (Brown Pass), RNP (2817AA): PEM R7352; 13 km from top of Helskloof, RNP (2816CD): PEM R7604; NW slopes of Nicodaemus, RNP (2816BD): PEM R7638; Lookout Point off Nicodaemus Road, RNP (28°20'31" S, 16°58'36" E, 750 m): CAS 200019, 200046; 2.1 km ESE Creswell's Prospect, RNP (495 m): PEM R11945; 2.6 km N Park sign 14, Tsoba Pass, RNP (28°16'35" S, 17°02'37" E, 620 m): LSMZ 57326; Gelykwerf, RNP: CAS 193586–87; 16.2 km W Gelykwerf: CAS 193572; Tierhoek, Ploegberg (28°37'59" S, 17°00'41" E, 425 m): CAS 201933–34, 203517, PEM R12567.

Other records.—Additional regional museum records: Creswell's Prospect, RNP (2817CC): TM 34123; De Hoop, RNP (2817AA): TM 25143; De Koei, RNP (2817CC): TM 34121; Helskloof Pass, RNP (2816BD): SAM 45585, TM 34217, 34221–22, 35285, 35293–94, 35297; Numees Mine, RNP (2816BB): TM 34122, 35283–84; 16 km N Kalkfontein, RNP: TM 27919; 28°15'34" S, 17°08'19" E, RNP (2817AC) CDNC 4838; Kuboes (2816BD): TM 15875, 25177; near Kuboes on road to Lekkering: TM 15856; 11 km SW Annisfontein: TM 34089; 24 km NE Eksteenfontein: TM 27941; 14 km NW Dolomite Peaks (2816DB): TM 27877; Devil's Castle (2817CD): TM 34134–35; Lekkering (2817CC): SAM 18550, TM 27897; Eksteenfontein area: TM 50050 Uitspanpoort se Berg (28°57' S, 17°02'30" E, 490 m): CAS 200040; 21.6 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkering Rd. (28°35'16" S, 16°56'41" E, 500 m): LSMZ 57329. Also seen at 9.0 km W Blackies Prospect junction, RNP (445 m); 13.4 km SE Kuboes on Swartbank Rd. (350 m); Sendelingsdrif Road N Bloeddrif turning (28°22'31" S, 16°54'43" E, 260 m); and 21.6 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkering Rd. (28°35'16" S, 16°56'41" E, 500 m).

Comments.—This species was found by Branch (1994) to be relatively rare in the southern Sperrgebiet, occurring mostly on broken ground on the slopes of higher mountains. In the Richtersveld it is widely distributed in rocky areas. It appears to be absent from the driest portions of the eastern RNP. Richtersveld specimens are referable to the nominate race.

Scelotes capensis (Smith 1849)
Western Dwarf Burrowing Skink (Fig. 36)

Material examined.—RNP (28°19'12" S, 16°58'30" E, 420 m): PEM R12554; Akkedis Drive, RNP (2816BB):

PEM R7377; Nicodaemus camp site, RNP (2816BD): PEM R7652; Helskloof Pass, RNP (2816BD): PEM R7658; Hottentots Paradys Lookout, RNP (28°20'31" S, 16°58'36" E, 750m): CAS 200047, PEM R11968; ca. 22 km ESE Sendelingsdrif, RNP: CAS 186353; Numees Spring, RNP (28°17'42" S, 16°58'05" E, 380 m): CAS 201920, 201923, 203513, PEM R12551, 12558, TM 22788; 1.8 km N Kook River Spring Rd. on Koubank River Rd. (28°39'53" S, 17°10'05" E, 600 m): LSMZ 57214.

Other records.—Lekkering: SAM 18688.

Comments.—Berger-Dell'mour (1987) first signaled the presence of this species from Numees (TM 22788). It is widespread in the park in more mesic microhabitats on vegetated rocky slopes and rises. It is often found in rotting aloe humus and in accumulated plant debris in rock crevices. Areas of boulders with *Pachypodium* and larger *Aloe* species are particularly favored by this species.

Typhlosaurus meyeri Boettger 1894
Variable Blind Legless Skink

Material examined.—None.

Other records.—Bloeddrif, 14.4 km NW Annisfontein: TM 27809, 27811; Jakkalsputs: SAM 43678 The species has been recorded from a number of appropriately sandy areas of extreme southern Namibia, including, the Obib Dunes (TM 27736, 43874, 47791–92, SMW) and the vicinity of Oranjemund 2816CB (TM 20834, 20983, 21044–45, 21061–62).



Figure 36. *Scelotes capensis*, Numees Mine, RNP. Photo W.R. Branch.

Comments.—Haacke (1986) reviewed the distribution of this sand burrowing species. The majority of records are from areas in Namibia to the north and west of the Richtersveld, in the belt of dunes between the Namusberge and the coast. Within the RNP only the alluvial sands along the Orange River might provide appropriate habitat.

CORDYLIDAE

Cordylus lawrencei (FitzSimons 1939) Lawrence's Girdled Lizard (Fig. 37)

Material examined.—8.7 km ESE Helskloof Gate, RNP: CAS 193444; 1.8 km up Nicodaemus from Hottentots Paradys Lookout junction (720 m); PEM R12423; 1.9 km down Helskloof Pass, RNP: PEM R7609; S slopes of Nicodaemus, Helskloof, RNP (28°21'03" S, 16°59'31" E, 775 m): CAS 200020, PEM R7646; above Springbokvlei, RNP: PEM R1951.

Other records.—Farm Gemsbokvlei: USEC 2263–67.



Figure 37. *Cordylus lawrencei*, Vandersterberge, RNP. Photo. W.R. Branch.

Comments.—Within the park, this species has been recorded only in mesic habitats on the summit of the Vandersterrberg. The species has a patchy and very localized distribution that appears to be relictual and dependent upon access to advective fog. The only other nearby localities are from the Vyfteenmylseberge in the vicinity of Farm Gemsbokvlei, just north of the Steinkopf-Port Nolloth Road (Visser 1979; Branch 1990). No recent specimens have been collected from the type locality, Lekkersing, which lies at the northern end of the Vyfteenmylseberge. The species is endangered by virtue of its extremely localized distribution, and the RNP population is of conservation importance. Recent acquisitions by National Parks Board (H. Hendricks, pers. comm. 2000) include the western slopes of the Vyfteenmylseberge near the Gemsbokvlei population, offering further protection to this very localized species.

Cordylus polyzonus Smith 1832 Karoo Girdled Lizard

Material examined.—Pootjiespram, RNP (2816BB): PEM R9289; 6.5 km ESE Pootjiespram Rd. junction on main park road (28°08'18" S, 16°58'59" E, 340 m): LSUMZ 57320; 15.4 km ESE Pootjiespram Rd. junction

on main park road (28°09'48" S, 17°01'10" E, 490 m): LSUMZ 57321; ca. 20 km ESE Sendelingsdrif, RNP: USEC 2287; 22.8 km ESE Sendelingsdrif (Kouams River), RNP: CAS 193383–84; ca. 22 km ESE Sendelingsdrif, RNP: USEC 2288–89; 23.5 km ESE Sendelingsdrif (Kouams River), RNP: CAS 193633; 2.1 km ESE Creswell's Prospect, RNP (495 m): CAS 200029, PEM R11877; 8.7 km ESE Helskloof Gate, RNP: CAS 193437–43; Slope of Nicodaemus, Helskloof, RNP (28°21'03" S, 16°59'31" E, 775 m): LSUMZ 57319; Helskloof Pass, RNP (28°18'16" S, 16°58'01" E): PEM R1949; 2.2 km from Helskloof to Nicodaemus, RNP (2816BD): PEM R9254; Helskloof Pass, RNP (2816BD): PEM R1949; 1.9 km down Helskloof, RNP (2816CD): PEM R7608; Road to Nicodaemus, 0.5 km from junction Hottentots Paradys Road (720 m): CAS 200053, PEM R11891; Gelykwerf: CAS 193592–93; 16.2 km W Gelykwerf: CAS 193580; 7.5 km W Gelykwerf: CAS 193584; Nanoas Spring Rd., ca. 2 km N Kuboes (28°25'24" S, 17°00'14" E, 290 m): PEM R12569; 16 km S Kuboes junction on Lekkersing Rd.: USEC 2297–98; Oor River, 1.6 km N Modderfontein River on Geigas Road (28°42'44" S, 17°07'39" E, 420 m): AMB(CAS) 4650, PEM R11869; Kuboes (2817AC): PEM R2814; E side of Ploegberg (2817CA): PEM R9229.

Other records.—Additional regional museum records: Helskloof Pass, RNP (28°17'41" S, 16°59'14" E) CDNC 4835; Hellskloof Pass, RNP (28°18'28" S, 16°59'10" E): CDNC 4843; Annisfontein (2816BD): SMW2739; 2 km S Remhoogte (28°19'58" S, 16°55'33" E) CDNC 4829; E Eksteenfontein (2817CD): SAM 45033; Uitspanpoort se Berg (28°57' S, 17°02'30" E, 490 m): CAS 200041, PEM R11876; 15 km N Steinkopf-Port Nolloth Rd. on Lekkersing Rd.: USEC 2281; 17 km S Lekkersing: USEC 2300; 12 km N Steinkopf-Port Nolloth Rd. on Lekkersing Rd.: USEC 2279–81; Farm Gemsbokvlei, 6 km N Steinkopf-Port Nolloth Rd. on Lekkersing Rd.: USEC 2268; 30 km S Eksteenfontein Rd. on Lekkersing Rd.: USEC 299; Lekkersing: SAM 18552a, 18690, CAS 106014; 7.3 km E Alexander Bay Airport (28°33'23" S, 16°34'45" E, 60 m): PEM R12436. Also seen at 2.6 km N Park sign 14, Tsoba Pass, RNP (28°16'35" S, 17°02'37" E, 620 m); Brown Pass, RNP (28°09'52" S, 17°01'32" E, 480 m); 1.8 km up Nicodaemus from Hottentotsparadys Lookout junction, RNP (720 m); 6.4 km N Kook River Spring Road on road to Koubank River (28°37'53" S, 17°09'20" E, 690 m); 13.4 km SE Kuboes on Swartbank Rd. (350 m); between first and second Wallekraal Mines (28°20'30" S, 16°52'34" E, 245 m); and 45.2 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkersing Rd. (Blue Schist Koppies) (28°47'04" S, 17°00'24" E, 400 m).

Comments.—One of the most widespread species in the park. *Cordylus polyzonus* is found in rocky areas and isolated outcrops throughout the western and southern portions of the RNP. It is absent from the broad sandy plains of the central regions of the park and has not been collected in the xeric eastern portions of the park, although it may occur patchily in more mesic microhabitat pockets.

Platysaurus capensis Smith 1844
Western Flat Lizard

Material examined.—Numees, RNP: CAS-SU 12089–90; Numees Mine, RNP: TM 35281–2; Pootjiespram Rd. junction, RNP: CAS 193359, 193595; 22.8 km ESE Sendelingsdrif (Kouams River), RNP: CAS 193385–90; ca. 22 km ESE Sendelingsdrif, RNP: USEC (cleared and stained specimen, no registration number); 23.5 km ESE Sendelingsdrif (Kouams River), RNP: CAS 193628, AMB(CAS) 2271–73; 13.3 km E Oenna Mine, RNP (28°05'11" S, 17°07'45" E, 60m): CAS 203512; 8.7 km E Helskloof Gate, RNP: CAS 193446–68; RNP (28°07'59" S, 16°59'20" E, 375 m): LSUMZ 57211–12; 1 km N Numees house, RNP (2816BB): PEM R9215; Nicodaemus camp site, RNP (2816BD): PEM R7650; Road to Nicodaemus, 0.5 km S Helskloof Pass Rd., RNP (720 m): PEM R12202; 13 km from top of Helskloof, RNP (2816CD): PEM R7602; Akkedis Drive, RNP (2817AA): PEM R7777; Devil's Playground, RNP (2817AD): PEM R7617; Nicodaemus Rd., RNP (28°20'47" S, 16°59'06" E, 700 m): PEM R12417; 5 km from De Hoop towards Numees, RNP: TM 34212–13; RNP (28°19'12" S, 16°58'30" E, 420 m): CAS 203515; Tatasberg: TM 52761; Groenkloof River (28°31' S, 16°58' E): TM 27857–60; 16.2 km W Gelykwerf: CAS 193573–77; between Gelykwerf and Doornkloof: TM 24176–80; Kuboes: SAM 11348, 18681–82, 18684, TM 15879–85, 15937, 27848–50; Granite Boss, Kuboes (2817CA): SAM 45027–28; Tierhoek, Ploegberg (28°37'57" S, 17°00'43" E, 470 m): AMB(CAS) 4638, CAS 201932, LSUMZ 57213, PEM R1955, R11882; Ploegberg (27°37' S, 17°00' E): TM 53846, 53855–64; Ploegberg (2817CA): TM 52584; 1.1 km N Kook River Spring Road on road to Koubank River (28°40'11" S, 17°10'14" E, 565 m): AMB(CAS) 4658; Lekkersing: TM 15854–55; Richtersveld 2817: SAM 18824; Richtersveld: SMW 2170.

Other records.—Further sight records are from Brown Pass, RNP (28°09'52" S, 17°01'32" E, 480 m); 5.5 km N Kuboes on Kuboes Spring Rd. (28°25'23" S, 17°00'40" E, 300 m); and 13.4 km SE Kuboes on Swartbank Rd. (350 m)

Comments.—*Platysaurus capensis* is widespread and common in boulder-strewn areas and broad rock faces throughout the Richtersveld. Although there are few specimens from the eastern areas of the park, it appears to be present wherever there are smooth rock surfaces with deep, narrow cracks. They are an obligate rupicolous species and the larger, more brightly colored males are easily observed from a distance on exposed rock surfaces during sunny periods.

Most of the specimens we examined had been used in earlier systematic studies of *Platysaurus* (Broadley 1978; Branch and Whiting 1997). Those *P. capensis* from the lower Orange River upstream from Goodhouse have recently been described as a new species, *Platysaurus broadleyi* (Branch and Whiting 1997) on the basis of distinctive scalation and color pattern.

GERRHOSAURIDAE

Cordylus subtesellatus (Smith 1844)
Dwarf Plated Lizard (Fig. 38)

Material examined.—22.8 km E Sendelingsdrif (Kouams River), RNP: CAS 193373; 23.5 km E Sendelingsdrif (Kouams River), RNP: CAS 193629; NW slopes of Nicodaemus, RNP (2816BD): PEM R7633; Nxodap (28°13'10" S, 16°49'26" E): USEC 3549; Uitspanpoort se Berg (28°57' S, 17°02'30" E, 490 m): LSUMZ 57215; Tierhoek, Ploegberg (28°37'59" S, 17°00'41" E, 425 m): CAS 203516; Oor River, 1.6 km N Modderfontein River on Geigas Road (28°42'44" S, 17°07'39" E, 420 m): PEM R11969.



Figure 38. *Cordylus subtesellatus*, Little Karoo. Photo W.R. Branch.

Other records.—A specimen was observed but not collected 45.2 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkersing Rd. (Blue Schist Koppies) (28°47'04" S, 17°00'24" E, 400 m). Another Richtersveld record is from Lekkersing: SAM 18544. The species has also been collected immediately adjacent to the RNP at Rooilepel in southern Namibia (Branch 1994).

Comments.—Although known from a relatively small number of localities within the park, this species is probably common in areas that provide relatively mesic microhabitats and appropriate sheltering sites (typically rocky areas with sand or soil-filled interstices). It has a vast distribution in western southern Africa (Branch and Bauer 1995) and appears to find appropriate microhabitats in virtually all macrohabitats except sand dune-dominated desert.

VARANIDAE

Varanus niloticus (Linnaeus 1766)
Water Leguaan

Material examined.—None.

Other records.—The staff of the park reliably report the presence of this species along the Orange River in areas where vegetation approaches the banks (see also

Williamson 1995). This lizard has also been reported on the Namibian side river adjacent to the park (Griffin and Channing 1991). Cornell (1920[1986]) reported seeing monitors "6 or 7 feet in length" plunging into the Orange on his return trip from the Tatasberg to Sendelingsdrif (around 1918).

Comments.—Leguaans may be at risk from hunting by poachers based on the Namibian side of the river who provide fish to the area mines. The mining activity itself is also disruptive to leguaans as it affects chiefly the riparian corridors occupied by these large lizards. The "rediscovery" of Cornell's (1920[1986]) early observations contradict Branch's (1991) suggestion, based on the lack of early records of water leguaans in the lower Orange River (e.g., FitzSimons 1943), that the species may have recently colonized the region.

SNAKES TYPHLOPIDAE

Rhinotyphlops lalandei (Schlegel 1844) Delalande's Beaked Blind Snake

Material examined.—None.

Other records.—Helskloof Pass, RNP (28°19' S, 16°58' E): TM 35290. Other localities plotted by Broadley (1990) included 2817CC and other QDSs extending southwards through Little Namaqualand (e.g., 2917AD: TM 27186).

Comments.—This small snake probably reaches the limits of its contiguous range in the Richtersveld. A number of Namibian records (Broadley 1990) probably represent relictual populations. Its cryptic habits make it difficult to survey under normal conditions without extensive excavation.

LEPTOTYPHLOPIDAE

Leptotyphlops occidentalis FitzSimons 1962 Western Worm Snake

Material examined.—Sendelingsdrif, RNP: unnumbered specimen in RNP Education Center; RNP (28°19'12" S, 16°58'30" E, 420 m): PEM R12556; Numees Spring, RNP (28°17'42" S, 16°58'05" E, 380 m): CAS 200103, PEM R12502; Numees Spring, RNP (28°17'40" S, 16°58'07" E, 420 m): PEM R11905, 12552; vic. Kodas Ruins, RNP (28°15'38" S, 16°56'18" E, 260 m): LSUMZ 57312, PEM R11915; Springbokvlakte, RNP (28°21'52" S, 17°14'12" E, 555 m): CAS 200103, PEM R12442; Kuboes Springvlei (28°26'05" S, 16°59'49" E): CAS 200075; 4.4 km N Kuboes on Kuboes Spring Rd. (28°25'31" S, 17°00'06" E, 265 m): PEM 11906; 10.0 km SE Kuboes on Swartbank Rd. (290 m): CAS 201925; ca. 1 km N Kuboes (28°26'05" S, 16°59'49" E, 240 m): CAS 201937; ca. 1.5 km N Kuboes (28°25'43" S, 17°00'03" E, 260 m): CAS 203507; 5.5 km N Kuboes on Kuboes Spring Rd. (28°25'23" S, 17°00'40" E, 300 m): LSUMZ 57313–14; Paradyskloof, RNP (28°19'45" S, 17°00'15" E): PEM R7624.

Other records.—E Kuboes (2816Db): TM 57560; 49 km

E Alexander Bay (2816Db): TM 71239; Farm Gemsbokberg (28°27' S, 17°47' E): TM 41891. Broadley (1990) listed localities at Kuboes (TM 25251) and Brandkaros (TM 27150). A "dark brown to black *Leptotyphlops*," almost certainly referable to this species, was collected by the Cape Department of Nature Conservation at 28°15'34" S, 17°08'19" E (between Maerpoort and Blackies Prospect, RNP) in 1979, but subsequently escaped (C.T. Stuart, field notes).

Comments.—Although the species reaches its southern limit along the South African side of the Orange River, our collections suggest that it is extremely common (contra Williamson 2000) in almost all habitats with some sandy soil along the lower Orange River Valley and south at least as far as the Moeilik River. Its occurrence in mesic areas, such as Numees, as well as exposed and arid sites, such as Springbokvlakte (Fig. 14), is noteworthy. *Leptotyphlops occidentalis* is the only truly fossorial reptile we encountered in the eastern portion of the RNP.

COLUBRIDAE

Dasypeltis scabra (Linnaeus 1758) Common Egg-eater

Material examined.—Lower NW-facing slopes of Nicodaemus, Vandersterrberg (28°21'09" S, 16°59'20" E, 627 m): PEM R7641.

Comments.—Gans (1959) reported no records of this species from the Richtersveld and the nearest locality plotted by Broadley (1990) was at Port Nolloth (2916BB). The nominate subspecies occurs in the region.

Dipsina multimaculata (Smith 1847) Dwarf Beaked Snake

Material examined.—Sendelingsdrif, RNP: CAS 200017; Helskloof, RNP: PEM R7318.

Other records.—Brandkaros (28°28' S, 16°41' E): TM 25320; Annisfontein (28°24' S, 16°54' E): TM 34110. Broadley (1990) reported material from several QDSs in the Rosh Pinah area of southern Namibia (TM 35329, 35539, 39708, 42407, 42742–43, 43881). We have observed this snake on several occasions near Alexander Bay.

Comments.—Despite the relatively few specimens collected, this small snake is well-known to local people and is probably common throughout the Richtersveld.

Lamprophis capensis (Boie 1827) Brown House Snake

Material examined.—Akkedis Drive (Brown Pass; 28°09'54" S, 17°01'33" E): PEM R7763; Numeesberg, RNP (2816BC): PEM R7314.

Other records.—Brandkaros (28°28' S, 16°41' E): TM 34092; 20 km N Steinkopf (2816DD): TM 79810; Farm Blesberg (28°38' S, 17°45' E): PEM R9426. Broadley (1990) mapped specimens (as *L. fuliginosus*) from QDS 2816BC, within the study area.

Comments.—This species is perhaps the mostly widely distributed snake in southern Africa and it is virtually certain that it is widespread in the Richtersveld. Southern populations have recently been separated from northern *L. fuliginosus* (Hughes 1997). Both the typical and “mentalis” morph (with pale coloration and large eyes) have been recorded in the RNP. Branch (1994) recorded typical *L. capensis* from Aurusberg in the Sperrgebiet.

Prosymna bivittata Werner 1903
Twin-Striped Shovel-Snout

Material examined.—None.

Other records.—A single record (Kimberly Museum, MMK/F 700) from Kuboes exists.

Comments.—Although Broadley (1980) felt that this record needed confirmation, the existence of other records from Little Namaqualand (e.g., Steinkopf) suggest that it is valid. The regional population of *P. bivittata* is apparently isolated from the bulk of the species range. This snake is rarely encountered in the Northern Cape and confirmation of its occurrence in the RNP will be dependent on long term collection of snakes by personnel based at the park itself.

Prosymna frontalis (Peters 1867)
South-Western Shovel-Snout

Material examined.—Between Swartpoort and Brown Pass, RNP (28°08'02" S, 16°59'34" E; 342m): PEM R7383.

Other records.—Kuboes: TM 81517–18.

Comments.—This is a northern species, with relatively few records in the Northern Cape. Broadley (1990) plotted localities at Rosh Pinah (TM 39709) and Steinkopf, bracketing the RNP. Another southern record for this species, which is widely distributed in Namibia, is Port Nolloth (TM 27187). The RNP snake was collected on sandy soil beneath a flat rock slab.

Psammophis namibensis Broadley 1975
Namib Sand Snake

Material examined.—None.

Other records.—Broadley (1990) plotted numerous localities both south of the park and on the Namibian side of the Orange. It is also common at Oranjemund (TM 20911, 20947, 20954, 20987, 54824) and has been taken at Daberas on the Holgat River (28°52' S, 16°56' E): TM 33788. The nearest plotted localities to the park are at 2816DD and 2716DD, both outside of the study area, but Williamson (1995) noted its occurrence in low-lying sandy areas of the RNP.

Comments.—Branch (1998) considered the northern Richtersveld to be an area of contact between the then recognized subspecies *P. leightoni namibensis* and *P. l. trinasalis*, whereas Brandstätter (1996) regarded records from the region to represent the former taxon only. Broadley (2002) raised *P. l. namibensis* to specific status and assigned all specimens from the region to this form.

Psammophis notostictus Peters 1867
Karoo Sand Snake

Material examined.—Richtersveld: PEM R1004; 4.5 km E Sendelingsdrif, RNP (28°07'02" S, 16°54'57" E, 145 m): PEM R12422; 2.7 km S Oenna Mine, RNP (28°04'42" S, 17°02'41" E, 100m): CAS 201919; Hottentots Paradys Lookout, RNP (28°20'29" S, 16°58'32" E, 710m): CAS 200086; 1.7 km from Paradyskloof turnoff in direction of Paradyskloof, RNP (585 m): PEM R12418; 9.9 km E Helskloof Gate, RNP (28°18'09" S, 16°59'03" E, 600 m): LSUMZ 57359; 16.2 km W Gelykwerf: CAS 193582; Oor River, 1.6 km N Modderfontein River on Geigas Road (28°42'44" S, 17°07'39" E, 420 m): AMB(CAS) 4653; Eastern slopes Ploegberg (2817CA): PEM R9234.

Other records.—Also seen 13.4 km SE Kuboes on Swartbank Rd. (350 m) and 45.2 km S Alexander Bay-Sendelingsdrif Rd. junction on Lekkersing Rd. (Blue Schist Koppies) (28°47'04" S, 17°00'24" E, 400 m). FitzSimons (1935) earlier recorded this species from Kuboes (TM 15891) and Branch (1994) considered this as the most common species of sand snake in the southern Sperrgebiet. Our records augment the many regional records, including several from the park plotted by Broadley (1990).

Comments.—The tail of one specimen was broken during capture, reflecting the fragility of this structure typical of this genus (Broadley 1987).

Psammophis trigrammus Günther 1865
Western Sand Snake

Material examined.—12.8 km E Sendelingsdrif, RNP: CAS 193603; 22.8 km ESE Sendelingsdrif (Kouams River), RNP: CAS 193372; 13.3 km E Oenna Mine, RNP (28°05'11" S, 17°07'45" E, 60m): CAS 201907; Kuboes campsite (28°15'55" S, 16°56'55" E; 319m): PEM R9222.

Other records.—13 km N Anniesfontein towards Sendelingsdrif (2816BD): TM 42448. The species is known from numerous localities on the north bank of the Orange River (Broadley 1990), as at the confluence of the Fish and Orange rivers (2817AA): TM 35444.

Comments.—Broadley (1990) reported only a single record from the Richtersveld and Brandstätter (1996) considered extreme southern Namibia as the limit of this species' distribution. Our additional localities verify that this species is relatively common throughout the northern Richtersveld. Several specimens were captured while actively foraging in rocky patches on sandy soil near river valleys in the RNP.

Psammophylax rhombeatus (Linnaeus 1758)
Spotted Skaapsteker

Material examined.—100 m from top of Helskloof Pass on road to Nicodaemus, RNP (28°20'12" S, 16°59'16" E, 635m): CAS 200088.

Other records.—Broadley (1977) gave the nearest localities as 2715DD in Namibia and 2917AB in

Namaqualand. Other than a single record from Bogenfels, the species is absent from the Sperrgebiet.

Comments.—Broadley (1990) referred to relict populations in Little Namaqualand (Kleinsee: TM 62809; 2 km E Port Nolloth [29°15' S, 16°53' E]: TM 62941) and Namibia. The single specimen obtained in the survey represents the first record for the park and for the Richtersveld as a whole. The snake was collected from a stand of *Aloe pearsonii* next to the Helskloof road (Fig. 6).

Pseudaspis cana (Linnaeus 1758)
Mole Snake

Material examined.—Top of Paradyskloof, RNP: PEM R7891.

Comments.—Broadley (1990) plotted localities at 2916BB, 2917AB, and 2917BB. Park staff have reported seeing other snakes that might be referable to this species. The Paradyskloof snake was swallowing a Karoo bush rat (*Otomys unisulcatus*) when caught.

Telescopus semiannulatus Smith 1849
Western Tiger Snake

Material examined.—Sendelingsdrif, RNP: PEM R9217

Other records.—Broadley (1990) plotted several localities to the east of the RNP as well as a single record from Grasdrif (2817AD: TM 55101) within the park.

Comments.—Richtersveld specimens are referable to the subspecies *T. s. polystictus*. Broadley's (1990) comment that this race is restricted to the highveld areas of southern Damaraland needs modification with the discovery of the species in the RNP.

ELAPIDAE

Aspidelaps lubricus (Laurenti 1768)
Coral Snake

Material examined.—Sendelingsdrif, RNP (28°04'41" S, 16°56'57" E): PEM R9277.

Other records.—Rosyntjiesberg, RNP (2817AC): TM 45058. Neighboring records in Namibia include several from Rosh Pinah (2716DD): TM 41704, 44719, 55979.

Comments.—Richtersveld specimens are referable to the nominate subspecies.

Naja woodi Pringle 1955
Black Spitting Cobra

Material examined.—Sendelingsdrif, RNP (28°04'41" S, 16°56'57" E): PEM R9276.

Other records.—Williamson (1995) reported a sight record from Kokerboomkloof (Die Toon), in the east of the RNP. FitzSimons (1962) recorded a specimen (TM 25179) from Kuboes, which was subsequently further discussed

by Broadley (1974) and Boycott and Haacke (1979).

Comments.—*Naja woodi* is primarily associated with vegetated riverine courses. Branch (1998) noted that the southern races (*nigricincta* and *woodi*) of spitting cobras of the western arid region are not conspecific with *N. nigricollis*. Moreover, *N. woodi* differs from *N. nigricincta* in being diurnal, not nocturnal. Although Boycott and Haacke (1979) noted intergradation between *nigricincta* and *woodi* in southern Namibia, recent studies (D.G. Broadley, pers. comm. 2001) confirm that the taxa are best treated as separate species.

Naja nivea (Linnaeus 1758)
Cape Cobra

Material examined.—None.

Other records.—We have collected this species 32.0 km N Port Nolloth-Steinkopf Rd. on Lekkersing Road: AMB(PEM) 4799, and have observed it outside of the park along the road to Lekkersing (21.6 km S Alexander Bay-Sendelingsdrif Rd. junction on the Lekkersing Rd. [28°35'16" S, 16°56'41" E, 500 m]. Other regional museum records are: 3 km NE Kalkfontein (2817CC): TM 35490; Oranjemund (2816CB): TM 21046; and Rosh Pinah (2716DD): TM 35538, 39774.

Comments.—In the Richtersveld, the Cape cobra is encountered mostly in areas of open sandy plains, often in association with riverine or other vegetation, or near koppies. Specimens observed on the Lekkersing Road were foraging around the edges of koppies or roadside boulders and when approached attempted to flee into mammal burrows or hollows under large boulders.

VIPERIDAE

Bitis arietans (Merrem 1820)
Puffadder

Material examined.—0.18 km N Numees Spring, RNP (28°17'52" S, 16°57'55" E, 355 m): AMB(CAS) 4720; Pootjiespram junction, RNP: CAS 193598; 23.5 km E Sendelingsdrif (Kouams River north of Brown Pass), RNP: CAS 193644; Nicodaemus camp site, Vandersterrberge, RNP (28°21'07" S, 16°59'43" E, 749 m): PEM R7653; 3.8 km S Brown Pass, RNP (28°10'19" S, 17°01'40" E, 520 m): PEM R12585.

Other records.—Another specimen was observed during September 1995 at Paradyskloof by visiting entomologists.

Comments.—Although the species ranges throughout Africa, there are relatively few localities plotted by Broadley (1990) in Namaqualand. The nearest locality mapped by Broadley (1990) is at 2917DB. This is the largest viperid in the park and is widespread, especially in the western, more mesic areas of the park. The specimen from 23.5 km E Sendelingsdrif contained a large rat. Specimens have been located while crossing park roads and on colder days in deep vertical rock cracks.

Richtersveld specimens are referable to the nominate subspecies.

Bitis caudalis (Smith 1849)
Horned Adder

Material examined.—Sendelingsdrif, RNP (28°04'41" S, 16°56'57" E): PEM R9265, 9817; Die Toon, (2817AD): PEM R9266.

Other records.—Springbokvlakte, RNP (2817AD): TM 63555; Nabas, Grafdrif, RNP: TM 35313; Cornellskop (2816BD): TM 45706; Kuboes (2816BD): TM 49582. Haacke (1975a) recorded several localities within the present confines of the park: 15 km NE Sendelingsdrif (TM 43012), Sendelingsdrif (SMW 5706), and Kodas Mine (TM 42354). An additional

Sendelingsdrif (28°05'02" S, 16°56'30" E) record is represented by CDNC 4830 and a specimen was observed by entomologists in September 1995 in Brown Pass. Other nearby localities include Violsdrif, 32 km N Steinkopf, and Rosh Pinah and the farms Namuskluft and Witputs on the Namibian side of the border.

Comments.—The species has a vast distribution and occurs in a variety of habitats, although it is typically absent from the rocky slopes where *B. xeropaga* occurs and from dune areas. Williamson (1995) noted its occurrence in sandy plains and low rock outcrops in the RNP.

Bitis cornuta (Daudin 1803)
Many-Horned Adder

Material examined.—Black Hills: PEM R4458, 12585.

Other records.—Haacke (1975a) recorded a single park record in Helskloof Pass (TM 36687). A southern Richtersveld locality is at Lekkersing: PEM R2151. The species is widespread in the more coastal regions of the northern Cape and southern Namibia and Broadley (1990) mapped numerous localities near the lower Orange River.

Comments.—Like *B. xeropaga*, *B. cornuta* appears to prefer rocky substrates, although it is perhaps less montane. With the recent revision of small *Bitis*, the species is monotypic (Branch 1999).

Bitis xeropaga Haacke 1975
Dwarf Mountain Adder (Fig. 39)

Material examined.—Hottentots Paradys Lookout (28°20'29" S, 16°58'32" E, 710 m): CAS 200085; Hottentots Paradys Lookout, RNP (28°20'31" S, 16°58'36" E, 750 m): PEM R11884.

Other records.—This regional endemic was initially described on the basis of specimens from southern Namibia (including Dreikammberg, Namibia, directly opposite the Richtersveld Park), and the Northern Cape, including Haib River 15 km NE Violsdrif (TM 45308).



Figure 39. *Bitis xeropaga*, Helskloof Lookout, RNP. Photo W.R. Branch.

We also collected a specimen (PEM R12660) approximately 3 km north of the Orange River (28°12'26" S, 17°16'43" E) in Namibia, and it has been found at the confluence of the Fish and Orange rivers (TM 64154).

Comments.—As first noted by Haacke (1975a) this species favors sparsely vegetated rocky hillsides. The specimens from the park were obtained on a rocky west-facing promontory. One specimen contained a specimen of the lacertid *Nucras tessellata* in its stomach.

UNVERIFIED SPECIES

The following taxa have not been recorded from the RNP or adjacent QDSs to the south of the Orange River but, on the basis of specimens collected in nearby areas, might be expected to be present in the region. The National Parks Board of South Africa has recently acquired the farms Ougrabies Wes and Klein Duin, which, if retained as park land would protect an area in the vicinity of 29°13' S, 17°00' E. This area, although not contiguous with the RNP, includes the sandy habitat types that characterize the region extending from Kuboes south to the vicinity of Lekkersing (Fig. 21) and west to the Port Nolloth-Alexander Bay Road. Among the species thus far recorded from these farms, but not confirmed for the RNP and adjacent QDSs are *Merolles ctenodactylus*, *Typhlosaurus vermis*, and *Cordylus cataphractus*. In addition, there is a recent (18 October 2000) sight record for *Homoroselaps lacteus* from Ougrabies Wes.

FROGS RANIDAE

Afrana fuscigula (Duméril and Bibron 1841)
Cape River Frog

Comments.—Passmore and Carruthers (1995) illustrated the range of this species as extending into the southern Richtersveld, although all Lower Orange River *Afrana*

records have been referred to *A. angolensis* by Branch and Braack (1995). *Afrana fuscigula* is very widespread in Namibia and has been considered by Griffin (1993) as the most common species along the Orange in the Sperrgebiet. A specimen record from 2816BC near the Orange has been cited by Channing and Griffin (1993). If present in the RNP, *A. fuscigula* would be expected along the main course of the Orange.

Tomopterna cryptotis (Boulenger 1901)
Common Sand Frog

Comments.—This species is common both north and south of the Richtersveld, but there appear to be no records from the park or adjacent areas on either side of the Orange River. Griffin (1993) believed that *T. cryptotis* probably occurs throughout the Sperrgebiet, but acknowledged that it was poorly documented. Strangely, Passmore and Carruthers (1995) mapped no *Tomopterna* anywhere in the northwestern Northern Cape.

BUFONIDAE

Bufo rangeri Hewitt 1935
Raucous Toad

Comments.—Channing and Griffin's (1993) record of *Bufo garipeensis* from "a little inland along the (Orange) river" on the Namibian side of the Orange (2816DA) has been questioned by Branch and Braack (1995), who, after inspection, referred the specimens involved (SMW 25884–85) to *Bufo rangeri*. Records also exist from the southern bank of the lower Orange (Branch and Braack 1995), but none have yet been recorded from the Richtersveld proper.

MICROHYLIDAE

Breviceps macrops Boulenger 1902
Desert Rain Frog

Comments.—This species occurs in coastal localities from Kleinsee (Channing and Van Dijk 1976) northwards into Namibia and is threatened by coastal mining of alluvial deposits. It has been recorded from Alexander Bay (TM 13572), Daberas (28°52' S, 16°56' E; 2816DD; TM 33997, 33979, 34200–01), near Holgat River Mouth (2816DC; TM 52666), and as much as 22 km inland (Berger-Dell'mour 1987) at Bogoeberg in the Sperrgebiet (SMW 25717). It is largely restricted to coastal dunes in the fog belt (Channing and Griffin 1993), but Branch (1994) noted an unidentified *Breviceps* calling in the fog belt on the vegetated slopes of the Aurusberg in the Sperrgebiet that may have been referable to this species. Although similar habitat exists in the RNP on the western slopes of the Vandersterberg, the distinctive call of *Breviceps* sp. has not been heard. The species is imperiled

by coastal mining of alluvial deposits, and has recently been assessed as Near Threatened (Harrison et al. 2001).

Breviceps namaquensis Power 1926
Namaqua Rain Frog

Comments.—Occurs as far north as Port Nolloth and Alexander Bay in coastal sands. It is highly unlikely that it reaches inland far enough to approach the park or its periphery, although possible future expansion of the RNP to the west might eventually incorporate eastern margins of its range.

TURTLES

TESTUDINIDAE

Homopus sp.

Comments.—An undescribed *Homopus* (sometimes incorrectly referred to as *H. bergeri*) is known from a number of localities throughout the arid southwest of Namibia (Branch 1998). Branch, Benn, and Lombard (1995) indicated the possibility of this species being found in the Richtersveld, although no records yet exist. It approaches the South African border at Rosh Pinah (TM 55040) and in nearby inselberg habitat (Megakop, 22 km S Rosh Pinah [2816BB]: PEM R8763).

LIZARDS

GEKKONIDAE

Afroedura africana namaquensis (Boulenger 1888)
Namaqua Flat Gecko

Comments.—The nearest confirmed record is from Springbok, but the very patchy distribution of this species (which is currently known from three widely separated localities) makes its occurrence in the Richtersveld possible. The Tatasberg, in particular, might provide suitable habitat for this rupicolous species.

Narudasia festiva Methuen and Hewitt 1914
Festive Gecko

Comments.—We have collected this species within 100 m of the Orange River in Namibia, and it is widespread in the Namusberge and adjacent regions (SAM 43641–42, 43645, 43651–53), but despite extensive searches in suitable habitat on the south bank of the Orange, it has not been found in the Richtersveld. Our nearest Namibian records are: Ai-Ais Nature Reserve, ca. 3 km from Orange River (28°12'26" S, 17°16'43" E, 250 m): CAS 201871, 203510, PEM R12529, and 7.6 km W Fish River Mouth (28°03'43" S, 17°07'25" E): PEM R12533, AMB(SMW) 4976–77. Other localities include: Farm Namuskluft (27°56' S, 16°50' E): TM 35333,

35364–66; and Macmillan's Pass, Rosh Pinah (27°56' S, 16°54' E): TM 35401–03, 35462. Although there are no confirmed records of *Narudasia* south of the Orange River, it may still be present in South Africa. Technically, the current political boundary between South Africa and Namibia occurs at the high water mark on the north bank of the Orange River. It is thus possible, under low water conditions, for *Narudasia* to enter South African and RNP territory without crossing the Orange River! This anomalous situation aside, *Narudasia* remains the only reptile genus strictly endemic to Namibia.

Pachydactylus austeni Hewitt 1923
Austin's Thick-Toed Gecko

Comments.—This small, terrestrial gecko is found in sparsely vegetated coastal dunes from the Western Cape to Little Namaqualand. The most northern locality is Holgat Mouth (2816DC; TM 50829) (Haacke 1976b). It may occur in sandy habitats on the western extremity of the RNP, but more likely, like *Breviceps namaquensis*, does not reach inland along the sandy riverine corridors appropriate for certain other species.

SCINCIDAE

Acontias gracilicauda namaquensis Hewitt 1938
Namaqualand Thin-Tailed Legless Skink

Comments.—The nearest known localities for this species are from QDSs 2916BB (SAM 18579) and 2917BB (AM 1413), both in the southern Richtersveld. This subspecies is nowhere particularly common and details of its habitat requirements are unknown. It is possible that it may occur along the southern margins of the RNP.

Acontias litoralis Broadley and Greer 1969
Coastal Legless Skink

Comments.—The nearest records are from Daberas on the Holgat River 2816DD (TM 33803, 34211). It is very unlikely that *A. litoralis* occurs in the RNP, but it may be present closer to the park, in association with alluvial sands along the Orange River.

Mabuya acutilabris (Peters 1862)
Wedge-Snouted Skink

Comments.—The species has a disjunct distribution from at least southern Namibia to the Democratic Republic of Congo (Castanzo and Bauer 1993). Among the nearest reliable records are several from 2617CA based on SMW specimens. There is an old record from O'okiep, south of the Richtersveld (FitzSimons 1943), but the validity of this record is in question (Branch 1998). *Mabuya acutilabris* is very lacertid-like in its ecology, morphology, and behavior (Castanzo and Bauer 1998). Where it does occur

it is typically highly conspicuous, so its absence from the Richtersveld may be real. If present in the region it would be expected to occur in sandy riverbeds, where the bases of grasses and other plants provide sites for burrows.

Scelotes sexlineatus (Harlan 1824)
Striped Dwarf Burrowing Skink

Comments.—A single record (TM 22285) of this sand burrowing species exists from the Holgat River (2816), but this is considerably north of the remainder of the species' range. If the specimen is truly conspecific with typical *S. sexlineatus*, it probably represents a disjunct, possibly relict population.

Typhlosaurus vermis Boulenger 1887
Blind Legless Worm Skink

Comments.—The distribution of this species was reviewed by Haacke (1986) and Bates et al. (1998). The nearest localities include: between Alexander Bay and RNP (28°33'25" S, 16°34'40" E): PEM R7575; Daberas on the Holgat River: TM 33804–5, 34210; Grootderm on the Orange River (2816DA): TM 22069; and Alexander Bay: TM 13167–9, 13568–70. Like *A. litoralis* it probably approaches the RNP from the west, perhaps along the course of the Orange River, but is excluded from the park itself by inappropriate substrates. It has been collected from Farm Klein Duin, recently purchased by NPB.

CORDYLIDAE

Cordylus cataphractus Boie 1828
Armadillo Girdled Lizard

Comments.—*Cordylus cataphractus* very closely approaches the southern park boundary, with a more or less continuous distribution to the south in appropriate areas providing rocky retreats. We have collected specimens at Uitspanpoort se Berg (28°57' S, 17°02'30" E, 490 m) in the vicinity of Lekkersing: CAS 200042, PEM R11878. Other Richtersveld localities are 15 km N Steinkopf-Port Nolloth Rd. on Lekkersing Rd.: USEC 2282–86; 3 km N Eksteenfontein (2817CD): PEM R9258; Lekkersing: SAM 18687; and Farm Gembokvlei, 6 km N Steinkopf-Port Nolloth Rd. on Lekkersing Rd.: USEC 2268. This species may enter the RNP in the southern slopes of the Rosyntjieberg, but appears to be truly absent from the Vandersterrberg.

GERRHOSAURIDAE

Gerrhosaurus typicus (Smith 1837)
Namaqua Plated Lizard

Comments.—This species has been taken at Lekkersing (2917AA) SAM 18545. It is a large but cryptic terrestri-

al species that is easily overlooked, and which is now known to have a much more extensive distribution in the southern and eastern karroid areas than previously thought (Branch 1998). Its occurrence in the RNP is perhaps more likely than many other unverified species.

SNAKES TYPHLOPIDAE

Rhinotyphlops schinzi (Boettger 1887) Schinz's Beaked Blind Snake

Comments.—The nearest locality plotted by Broadley (1990) is 2917BA. We collected a specimen somewhat closer, 11 km S Steinkopf (CAS 193340). Like other typhlopids, this species may be difficult to locate because of its burrowing habits. Anenous Pass, running west from Steinkopf is, however, a real distributional limit for certain reptiles (e.g. *Goggia* spp., Branch, Bauer, and Good 1995), so the occurrence of *R. schinzi* in the Richtersveld is by no means certain.

COLUBRIDAE

Lamprophis guttatus (Smith 1843) Spotted House Snake

Comments.—The nearest South African localities are south of Springbok (Broadley 1990). However, there are isolated records in southern Namibia, suggesting the possibility of occurrence in the Richtersveld. This species is often associated with rocky areas and might, therefore, find appropriate habitat along the vegetated portions of the Vandersterrberg.

Philothamnus semivariiegatus semivariiegatus (Smith 1847) Spotted Bush Snake

Comments.—Broadley (1980) plotted no localities within 500 km of the Richtersveld. However, recent records from Springbok (McLachlan 1984) and southwestern Namibia (Haacke 1985) have established that the species occurs in the region. This snake might be looked for at Kuboes Spring, Numees, or other well-watered sites with trees in and around the RNP.

Telescopus beetzi (Barbour 1922) Karoo Tiger Snake

Comments.—We have collected the species from near Erdwark, 36.5 km W Steinkopf (29°15' S, 17°21' E): PEM R7661, and 5 km S Onseepkans (28°47'17" S, 19°19'31" E; 540 m): PEM R12515. Other specimens are known from 10 km N Steinkopf (29°11' S, 17°49' E): TM

62792, and 7 km W Steinkopf (29°13' S, 17°40' E): TM 54411. Broadley (1990) records other Little Namaqualand specimens (Springbok and 7 km W Steinkopf) as well as material from southern Damaraland and Lüderitz. It is possible that the species also occurs in the RNP. Williamson (2000) figured a specimen from the northern Richtersveld, but did not specify a precise locality.

VIPERIDAE

Bitis schneideri (Boettger 1886) Namaqua Dwarf Adder

Comments.—Haacke (1975a) reported the nearest localities for this species as between Alexander Bay and the Holgat River (2816DC): TM 22075; Daberas on the Holgat River (2816DD): TM 33801; and Oranjemund (e.g., TM 32685, 54404). It also occurs in the Obib Dunes north of the RNP (Branch 1994). Haacke (1975a) characterized the habitat of this species as low irregular dunes often stabilized by a variety of grasses or shrubs. Appropriate substrate does not appear to exist within the park boundaries, although sand dunes south of the park on the road to Lekkersing appear to offer a suitable habitat, and the species may be present in areas adjacent to the park.

DISCUSSION

The confirmed herpetofauna of the RNP includes 64 species: six amphibians, two chelonians, 38 lizards and 18 snakes (Table 1). Among the lizards geckos are by far the most diverse family, comprising almost half (18) the lizard species recorded in the area. This includes a minimum of 11 species of the genus *Pachydactylus*, with several probable cryptic species remaining to be evaluated in the *P. serval*-*P. weberi* complex. Other diverse families include skinks (seven species) and lacertids (five species). Eleven additional species are known from areas immediately adjacent to the park, chiefly the sandy plains to the south and west of the park (Fig. 21), the vicinity of Kuboes and its spring (Fig. 20), and the Orange River valley just west of the current RNP boundary. On a per unit area basis, this diversity is one of the highest in for any region of the arid southwestern zone of southern Africa. It compares with a total of 91 confirmed species for the Brandberg region in Namibia (Griffin 2000b) and 102 species for the Kamanjab region (Bauer, Branch, and Haacke 1993), both much larger and more physiographically diverse areas of northern Namibia. The Little Karoo, a semiarid valley in the Cape Fold Mountains of the Western Cape with much higher

rainfall and a much larger area, has a herpetofauna of 79 species (Branch and Bauer 1995). With respect to gecko diversity, the Richtersveld ties the Kamanjab region and exceeds all other areas thus far surveyed in sub-Saharan Africa.

Our collections include some new records for both the RNP and the Richtersveld as a whole. These include *Homopus signatus*, *Pachydactylus barnardi* (Fig. 30), *Pachydactylus labialis*, *Dasypeltis scabra*, and *Psammophylax rhombeatus*. Although none of these are truly unexpected, our research in the RNP also revealed the presence of three new species: *Bufo robinsoni* (Fig. 27), *Pachydactylus haackei* (Fig. 31), and *Goggia gemmula* (Fig. 29) (Branch and Braack 1995; Branch et al. 1996; Bauer et al. 1996). Both of the new lizards are regional endemics with their ranges in South Africa limited to the northern Richtersveld, whereas the new toad may be limited to the mountainous region along the south bank of the Orange River between Upington and the RNP (Baard 2000b). Many of the other amphibians and reptiles recorded from the RNP or adjacent areas are of special conservation concern in South Africa (Table 1), some, like *Cordylus lawrencei* (Fig. 37), because of a small and restricted total range, and numerous others because they reach the periphery of their distributions (and have their only South African occurrences) in the Richtersveld (Branch 1988a).

The Richtersveld fauna as a whole shares much in common with the southern Sperrgebiet, the restricted access diamond mining area of southern Namibia immediately to the north. Branch (1994) collected amphibians and reptiles in this area, but the survey was limited in geographic and temporal scope. Further, the areas he investigated included the shifting dunes and gravel plains of the region that have no Richtersveld counterparts, as well as the isolated rocky Aurus and Klinghardt Mountains. Although these montane areas are similar in some regards to the Richtersveld, the Sperrgebiet in general is dominated by a Namib Desert fauna. The Richtersveld, on the other hand, reflects a mixture of these elements, along with numerous Cape forms that dominate in the fog belt, as well as a small number of true Richtersveld endemics.

Although there are numerous generalists in the park, many of the lizards can be conveniently divided into rock-living forms or sand-living forms. The distinction is not clear-cut, however, as rupicolous species, such as *Cordylus polyzonus*, may be

found in small rock piles in sandy plains and terrestrial species, such as *Mabuya capensis* occur in patches of sand or loose soil in very rocky habitat.

Expansion of the present RNP boundaries to the west and south, to include more area along the Orange River, as well as some of the sand plains along the road to Lekkersing (Fig. 21), would be highly desirable from the point of view of herpetofaunal conservation. Numerous species not now protected within the park, such as *Meroles ctenodactylus*, *M. knoxi*, and *Typhlosaurus meyeri* could be incorporated by an expansion of as little as 10 km westward. Although *Palmatogecko rangei* has been recorded from Sendelingsdrif within the RNP it appears to have been extirpated and is certainly threatened by the agricultural development of the Orange River downstream (Figs. 17, 18). If viable South African populations of this species remain elsewhere along the river it would be desirable to make efforts to include these in any expansion of the park. Likewise, the more coastal regions of the Richtersveld support a range of Namib and coastal dune species that are not currently protected by parks or reserves in South Africa. At present species such as *Breviceps macrops*, *B. namaquensis*, *Acontias litoralis*, and *Bitis schneideri* are at risk in the Richtersveld as they occur most commonly in the heavily mined region between Port Nolloth and Alexander Bay. Land recently obtained by the National Parks Board could provide protection for these species, which are unlikely to be incorporated into the RNP, unless its borders are significantly expanded. Any possibilities for expansion of protected areas in the Richtersveld, however, would be complicated by the need to balance conservation concerns with the conflicting interests of the diamond mining industry, regional commercial agriculture, and the land rights and grazing needs of the local Nama communities.

Several distributional trends are evident within the RNP and the northern Richtersveld in general. The more arid eastern regions (Eastern Gariiep subdivision of the Namib subdomain) of the park harbor a reduced herpetofauna consisting chiefly of widespread species. Indeed, only 12 taxa, all reptiles (Table 1), have thus far been recorded from the region of the park roughly corresponding to the area east of the Ganukouriep River and north of the Rosyntjieberge. This certainly underestimates local diversity, as collecting efforts (our own and those of earlier workers) have been minimal in the arid east-

Table 1. Taxa occurring or potentially occurring in the Richtersveld National Park, South Africa. Status reflects the status accorded to each species in the 1988 edition of the *South African Red Data Book—Reptiles and Amphibians* (Branch 1988a) or, for frogs, in *Conservation Assessment and Management Plan for Southern African Frogs. Final Report* (Harrison et al. 2001) and the following abbreviations are used: DD = data deficient; NT = near-threatened; V = vulnerable; P = peripheral; R = rare. Habits are Aquatic (Aq), Arboreal (Ar), Fossorial (Fs), Rupicolous (Ru), and Terrestrial (Tr). Many species could be considered to fall into more than one category and, in some instances in which multiple substrate types are used (e.g., *Mabuya variegata*) or in which daytime retreats are in burrows but nocturnal activity is on the surface (many geckos), more than one code has been used. The distribution of each species in the region is divided into: RNP (records from the Richtersveld National Park), ADJ (records from outside the RNP, but in adjacent QDSs as outlined under Physiography in the STUDY AREA section of this paper), and REG (regional records from the southern Sperrgebiet, adjacent to the RNP and/or from elsewhere in the Richtersveld). Occurrences supported only by sight records are recorded as "S." Habitats are broadly divided and refer specifically to habitats employed within the Richtersveld and southern Sperrgebiet. Abbreviations are AQU = any non-riverine aquatic habitats (springs, seeps, wells, etc.); ORR = the Orange River corridor, encompassing both riverine aquatic and terrestrial habitats (including riverine trees); MTN = montane areas, including the rocky habitat types of the Vandersterrberge and other ranges, as well as lower elevation areas not dominated by sandy plains; SND = sand plains, including Springbokvlakte, broad river plains within the RNP, and the plains to the west and southwest of the RNP; ARD = arid east, corresponding to the portion of the RNP occurring in the East Gariep Center of the Nama Karoo floristic region (see text). This zone includes the Tatasberg and Springbokvlakte and adjacent portions of the RNP east of the Ganukouriep River and north of the Rosyntjieberge.

Taxon	Status	Habits	Distribution			Habitat				
			RNP	ADJ	REG	AQU	ORR	MTN	SND	ARD
FROGS										
PIPIDAE										
<i>Xenopus laevis</i>		Aq	x	x		x	x			
RANIDAE										
<i>Afrana angolensis</i>		Aq	x		x		x			
<i>Afrana fuscigula</i>		Aq			x		x			
<i>Cacosternum namaquense</i>		Aq	x	x	x	x				
<i>Strongylopus grayi</i>		Aq		x		x				
<i>Strongylopus springbokensis</i>	DD	Aq	x	x		x			x	
<i>Tomopterna cryptotis</i>		Tr			x				x	x
MICROHYLIDAE										
<i>Breviceps macrops</i>	NT	Tr			x					x
<i>Breviceps namaquensis</i>		Tr			x					x
<i>Phrynomantis annectans</i>		Tr	x						x	
BUFONIDAE										
<i>Bufo gariiepensis</i>		Tr	x	x	x	x	x			x
<i>Bufo rangeri</i>		Tr			x					x
<i>Bufo robinsoni</i>	DD	Tr	x	x		x			x	
TURTLES										
TESTUDINIDAE										
<i>Chersina angulata</i>		Tr	S		x					x
<i>Homopus signatus</i>		Tr	x						x	x
<i>Homopus</i> sp.		Tr			x				x	
<i>Psammobates tentorius</i>		Tr		x	x					x
LIZARDS										
AGAMIDAE										
<i>Agama anchietae</i>		Tr	x	x	x		x	x	x	x
<i>Agama atra</i>		Ru	x	x				x		
<i>Agama hispida</i>		Tr		x	x					x
CHAMAELEONIDAE										
<i>Chamaeleo namaquensis</i>		Tr	x		x					x ?
GEKKONIDAE										
<i>Afroedura africana</i>		Ru								?
<i>Chondrodactylus angulifer</i>		Tr/Fs	x	x	x		x		x	x

Table 1 (cont.)

Taxon	Status	Habits	Distribution			Habitat				
			RNP	ADJ	REG	AQU	ORR	MTN	SND	ARD
GEKKONIDAE (cont.)										
<i>Goggia gemmula</i>		Ru	x	x	x			x		
<i>Goggia lineata</i>		Tr	x	x	x				x	?
<i>Lygodactylus bradfieldi</i>		Ar	x	x	x	x	x	x		?
<i>Narudasia festiva</i>		Ru			x	x	x			
<i>Pachydactylus austeni</i>		Tr/Fs			x				x	
<i>Pachydactylus barnardi</i>		Ru	x				x			
<i>Pachydactylus bibronii</i>		Ru	x	x	x	x	x			?
<i>Pachydactylus haackei</i>		Ru	x	x	x		x			
<i>Pachydactylus labialis</i>		Tr	x		x		x		x	
<i>Pachydactylus mariquensis</i>		Tr	x	x	x				x	
<i>Pachydactylus namaquensis</i>		Ru	x		x		x			
<i>Pachydactylus punctatus</i>		Tr	x	x	x	x			x	x
<i>Pachydactylus rugosus</i>		Tr/Ar	x		x	x				
<i>Pachydactylus cf. serval</i>		Ru/Tr	x	x	x		x			
<i>Pachydactylus turneri</i>		Ru/Ar	x	x	x	x	x		x	x
<i>Pachydactylus cf. weberi</i>		Ru	x	x	x	x	x			
<i>Palmatogeocko rangei</i>	P	Tr/Fs	x	x	x	x				
<i>Phelsuma ocellata</i>		Ru	x		x		x			
<i>Ptenopus garrulus</i>		Tr/Fs	x	x	x	x			x	x
LACERTIDAE										
<i>Meroles ctenodactylus</i>		Tr		x	x				x	
<i>Meroles cuneirostris</i>		Tr		x	x		x		x	
<i>Meroles knoxii</i>		Tr		x	x				x	
<i>Meroles suborbitalis</i>		Tr	x	x	x				x	x
<i>Nucras tessellata</i>		Tr	x	x	x		x			
<i>Pedioplanis inornata</i>		Tr	x	x	x	x	x		x	x
<i>Pedioplanis lineocellata</i>		Tr	x		x		x			
<i>Pedioplanis namaquensis</i>		Tr	x	x	x				x	x
SCINCIDAE										
<i>Acontias gracilicauda</i>		Fs			x				x	
<i>Acontias litoralis</i>		Fs			x		?		x	
<i>Acontias lineatus</i>		Fs	x	x	x				x	
<i>Mabuya acutilabris</i>		Tr			x		?		?	
<i>Mabuya capensis</i>		Tr	x	x	x			x	x	
<i>Mabuya occidentalis</i>		Tr	x	x	x		x		x	?
<i>Mabuya spilogaster</i>		Ar	x	x	x		x			
<i>Mabuya sulcata</i>		Ru	x	x	x			x		x
<i>Mabuya variegata</i>		Tr/Ru	x	x	x			x		
<i>Scelotes capensis</i>		Tr/Fs	x	x	x			x		
<i>Scelotes sexlineatus</i>		Fs			x					?
<i>Typhlosaurus meyeri</i>		Fs		x	x		x			
<i>Typhlosaurus vermis</i>		Fs			x		?			
CORDYLIDAE										
<i>Cordylus cataphractus</i>	V	Ru			x			x		
<i>Cordylus lawrencei</i>	R	Ru		x		x		x		
<i>Cordylus polyzonus</i>		Ru	x	x	x			x		x
<i>Platysaurus capensis</i>		Ru	x	x	x			x		
GERRHOSAUROIDAE										
<i>Cordylosaurus subtessellatus</i>		Tr/Ru	x	x				x		
<i>Gerrhosaurus typicus</i>	R	Tr			x					x
VARANIDAE										
<i>Varanus niloticus</i>		Tr/Aq	S		x		x			

Table 1 (cont.)

Taxon	Status	Habits	Distribution			Habitat				
			RNP	ADJ	REG	AQU	ORR	MTN	SND	ARD
SNAKES										
LEPTOTYPHLOPIDAE										
<i>Leptotyphlops occidentalis</i>	P	Fs	x	x	x		x		x	x
TYPHLOPIDAE										
<i>Rhinotyphlops lalandei</i>		Fs	x		x			x		
<i>Rhinotyphlops schinzi</i>	P	Fs			?			x	x	
COLUBRIDAE										
<i>Dipsina multimaculata</i>		Tr	x					x		
<i>Lamprophis capensis</i>		Tr	x	x	x				x	
<i>Lamprophis guttatus</i>		Tr	x	x	x		x	x	x	?
<i>Philothamnus semivareigatus</i>		Ar			?	?	?			
<i>Prosymna bivittata</i>		Tr		x				x	x	
<i>Prosymna frontalis</i>	P	Tr	x	x	x			x	x	
<i>Psammophis namibensis</i>		Tr	S		x				x	
<i>Psammophis notostictus</i>		Tr	x	x	x				x	
<i>Psammophis trigrammus</i>		Tr	x	x	x				x	
<i>Psammophylax rhombeatus</i>		Tr	x		x			x		
<i>Pseudaspis cana</i>		Tr	x		x			x	x	
<i>Telescopus beetzi</i>		Tr			x			x		
<i>Telescopus semiannulatus</i>		Tr	x				x			
ELAPIDAE										
<i>Aspidelaps lubricus</i>		Tr	x		x				x	
<i>Naja woodi</i>	R	Tr	x	x	x				x	x
<i>Naja nivea</i>		Tr		x	x				x	
VIPERIDAE										
<i>Bitis arietans</i>		Tr	x					x	x	
<i>Bitis caudalis</i>		Tr	x					x	x	x
<i>Bitis cornuta</i>		Tr	x	x	x			x		
<i>Bitis schneideri</i>	V	Tr			x				x	
<i>Bitis xeropaga</i>	P	Tr	x		x			x		

ern sector due to difficulty of access from the nearest source of food and fuel at Sendelingsdrif. Within this area rupicolous lizards and the more conspicuous terrestrial lacertids have been surveyed most effectively. On the other hand, fossorial species, and most snakes, regardless of habitat, are probably least well surveyed. Many of the species occupying this area are also widespread in the inland valleys and plains of the RNP. These include *Ptenopus garulus*, *Chondrodactylus angulifer*, *Pachydactylus punctatus*, *Acontias lineatus*, *Pedioplanis namaquensis*, and *Meroles suborbitalis*.

In contrast, the two richest areas in the park are Sendelingsdrif and the Vandersterrberge, particularly the region around Helskloof Pass (Fig. 6) and Paradyskloof (Fig. 13). The immediate vicinity of Sendelingsdrif incorporates riverine habitat along the Orange, and thus a number of psammophilous

species, such as *Palmatogecko rangei*, have been recorded there, as has a diversity of amphibians. There are also a disproportionate number of records of snakes and other relatively cryptic species from Sendelingsdrif. This probably reflects both a diversity of habitats in the area, and, more importantly, a continuous human presence and hence more sampling opportunities. The Vandersterrberge provides both a diversity of rocky substrates, and a variety of relatively mesic microhabitats of all types. It supports regional endemics (e.g., *Bufo robinsoni* [Fig. 27], *Pachydactylus barnardi* [Fig. 30], *Phelsuma ocellata* [Fig. 34], *Cordylus lawrencei* [Fig. 37], *Bitis xeropaga* [Fig. 39]) as well as a number of more mesic-adapted but widespread forms (e.g., *Mabuya capensis*, *Pedioplanis lineocellata*). Diversity is especially high around permanent water sources such as Numees Spring and

Paradyskloof. Rocky areas at lower elevation, as in Halfmens Pass and Brown Pass, are also very diverse. Although these areas lack some of the more mesic adapted species, the greater exposure of bare rock provides a diversity of substrates for rupicolous species (Bauer 2000).

The Richtersveld Park is bordered by the Orange River (Fig. 5), the longest river in southern Africa with, by far, the largest drainage basin (Van Zyl 1991). The Orange River system has been the major western outlet for the freshwater drainage of the southern Great Escarpment since at least the Cretaceous (Dingle and Hendy 1984; Dingle et al. 1983), and has thus remained a potential barrier to migration and gene flow for over 100 MY. For some taxa, such as the burrowing scincid *Typhlosaurus vermis*, the rupicolous gecko *Narudasia festiva*, and the toad *Bufo robinsoni*, the river appears to be a species boundary, as it does further inland for the Kalahari tent tortoise (*Psammobates oculiferus*) (Branch, Benn, and Lombard 1995). This suggests a role for the Orange in cladogenesis as a vicariant agent, or as a barrier to migration. Other taxa, however, such as the psammophilous web-footed gecko, *Palmatogecko rangei*, and even the narrow regional endemics *Goggia gemmula* (Fig. 29) and *Pachydactylus haackei* (Fig. 31) extend from Namibia into the northern Cape Province with no evidence of morphological variation on either side of the Orange. The Orange River has become highly regulated by virtue of 23 major dams and numerous weirs in its catchment. The total annual flow has been halved by retention in dams and water abstraction, and flow patterns have also changed from a pronounced seasonal flow, with greatly reduced flow in winter, to a current nearly even flow distribution. Together, these factors occasionally result in the closure of the estuary when northward longshore drift creates a sandbar across the mouth (Barnes 1998). The movement of terrestrial, particularly psammophilous, herpetofauna can thus occur in the lower Orange at these times.

The lower Orange has also served as a corridor for dispersal, bringing the aquatic *Afrana angolensis* and *Varanus niloticus* into the region from the east and psammophilous taxa, such as *Palmatogecko* and *Typhlosaurus meyeri* from the west. Tree or bark living species such as *Pachydactylus rugosus* (Fig. 32) and *Mabuya spilogaster* have also certainly used the river as a corridor for expansion, and the otherwise

rupicolous *Pachydactylus turneri* has colonized areas lacking rocky substrates by opting for an arboreal existence along the Orange and smaller rivers in the Richtersveld.

Although our primary aim was to survey the RNP, we also attempted to gauge the possible effects of the commercial utilization of the park on reptiles and amphibians. Our data suggest that the alluvial terraces that are mined for diamonds are depauperate with respect to reptiles. Searches and trapping on unmined terraces (Fig. 23) yielded only three specimens of two common species (*Pachydactylus* cf. *serval* and *Agama anchietae*). These terraces are largely devoid of vegetation and provide little shelter for most species. Thus, although mining greatly impacts the aesthetics of the Richtersveld and may have negative impacts on some flora and fauna, its influence on herpetofaunal diversity is probably minimal. On the other hand, activity peripheral to the mining itself, such as heavy vehicle traffic in parts of the park, may be more detrimental and has not been assessed.

In contrast to mining activity, small-stock grazing (Figs. 6, 24) appears to be a greater threat to the Richtersveld herpetofauna. Hendricks (1998) noted that the trampling effects of small-stock on vegetation and soil were the most important problem facing conservation agencies involved in the RNP. The movement and foraging of goats and sheep along established tracks in the park results in local reduction in plant cover and compaction of soil. The former effect may negatively influence mesic-adapted species, whereas the latter results in the destruction of fossorial reptile burrows along the routes used by large numbers of goats and sheep. Both trampling and water-fouling by stock waste were especially evident in natural springs and seeps, such as Paradyskloof (Fig. 13), and may have some impact on the local amphibians, including the recently-described *Bufo robinsoni*. The stock problem is exacerbated by the fact that local herders may be exceeding their stock limits by a substantial margin, as revealed by helicopter census of the flocks (H. Hendricks, pers. comm. 1995).

The effects of stock grazing on vegetation patterns and indigenous herbivorous mammals, birds, and some insects have been examined (Milton et al. 1994; Hayward et al. 1997) and may be significant, but the effect on reptile populations remains poorly documented. What research has been done has been limited chiefly to North American arid regions and

has focused on degradation of grassland vegetation (e.g., Jones 1981; Bock et al. 1990). The effect of such activity on reptiles in African arid habitats remains unknown, but the combination of high microhabitat and microclimatic specificity of some arid zone reptiles (Schlesinger and Shine 1994), combined with the significance of retreat sites in their biology (Bustard 1968), suggests that even sporadic land usage that effects vegetation and substrate characteristics may have lasting effects on the resident herpetofauna.

Long term studies of small vertebrate density are necessary to eliminate the effects of climatic variation on natural population fluxes and to avoid sampling error that might bias interpretations. Several types of livestock effects have been noted and appear, within the limited time frame observed, to be important for reptiles and amphibians in the RNP. Such effects may be direct, e.g. the trampling of burrows or the compacting of soil, whereas others may be indirect and result chiefly from the reduction of vegetative cover and thereby the quantity and diversity of retreat sites and prey types (Hayward et al. 1997). Our observations of *Ptenopus* indicate that calling activity, and thus probably burrow occupancy, is decreased in areas through which stock herds had recently passed and which showed obvious soil compaction. While we have no data directly bearing on other fossorial species, it seems likely that they to may be negatively impacted by stock movements.

Aquatic environments are often most severely effected by grazing because they are (1) often home to native fauna with specific sensitive habitat requirements, and (2) they are especially heavily used by livestock. Within the RNP this can clearly be seen in the Paradyskloof area, where the area around Paradys Spring (Fig. 13) has been trampled by livestock. Although we noted no obvious reduction in amphibian numbers, the uniqueness of this spot as a prime habitat for all amphibians, especially the regional endemic *Bufo robinsoni*, make it vulnerable to such livestock use.

The Richtersveld National Park is part of a transnational protected area that also includes the Ai-Ais/Hunsberg Reserve Complex and the privately protected Sperrgebiet in southern Namibia. Griffin (1993, 2000a) considered the region of the Sperrgebiet adjacent to the Richtersveld as the most diverse for amphibians and reptiles, and our own surveys in the Aurus Mountains (Branch 1994) and

the Hunsberg Reserve support this interpretation. Although this broader region is nominally protected, mining activity is present in protected areas on both sides of the border and largely uncontrolled use of resources by the local population is a potential problem in the Richtersveld. The mining activity in the RNP is restricted chiefly to the Orange River alluvial gravels. Although our results suggest that the areas affected have low diversity and no endemic species, the mining infrastructure along the sandy Orange corridor could impact the flow of psammophilous animals upstream and aquatic or arboreal animals downstream. More importantly for the region as a whole, the far more extensive mining activity in the coastal areas of Alexander Bay and Oranjemund severely impact areas occupied by numerous species of amphibians and reptiles that are not protected in the existing parks and reserves. The significance of this area for the herpetofauna is mirrored in other groups of organisms as well. The Orange River mouth is considered to be the sixth most important coastal wetland in southern Africa in terms of the overall numbers of wetland birds that it supports and various anthropogenic impacts resulting from mining activities in the estuary have led to the wetland being classified as threatened (Barnes 1998). Expansion of protected zones to include at least some coastal or near coastal lands would do much to mitigate these circumstances.

Finally, a long-term conservation concern in the Richtersveld and adjacent areas is the issue of security of tenure (Barnard et al. 1998). Changes in both human needs and policy may in the future elevate financial expediency over conservation concern, placing local habitats and organisms at risk. While this risk may exist for all protected areas around the world, it is the RNP's position as a contractual park that makes the threat greater. Contractual parks and reserves have a relatively long history in sub-Saharan Africa (Stuart et al. 1990), but have had mixed success from a conservation perspective.

ACKNOWLEDGMENTS

We thank the National Parks Board of South Africa and the permit issuing authorities of the Northern Cape province for their support of our research and for permission to collect in the Richtersveld. The National Geographic Society provided financial support for the survey of the RNP through a grant to the authors and David A. Good.

Additional funding came from Villanova University, and the California Academy of Sciences, and a Fulbright African Area Research Grant to AMB. Our work would not have been possible without the gracious hospitality and support of the previous wardens of the RNP, Harold Braack and Paddy Gordon, and their staff. Harold and Tony Braack, in particular, obtained many additional specimens from the region. We are grateful to the following individuals for providing specimens and data: Jens Vindum (CAS), Wulf Haacke and Martin Whiting (TM), Denise Drinkrow (SAM), Eryn Griffin (SMW), and le Fras Mouton (USEC). Jenny Senekal assisted with compilation of the PEM data. Rob Hall, Nick Arnold, Donvé, Matthew and Tom Branch, Ant Vlok, Mervin Mason, Craig Weatherby, Jens Vindum, le Fras and Yolande Mouton, David King, Heidi Robeck, and especially David Good provided field assistance and companionship during our many trips to the Richtersveld. Permission to use aerial photographs of the Richtersveld was provided by the Chief Directorate of Surveys and Mapping (sales@sli.wcape.gov.za; <http://w3sli.wcape.gov.za>) and the South African Government Printer.

LITERATURE CITED

- Acocks, J.P.H. 1953. Veld types of South Africa. Bot.—Surv. S. Afr. Mem. 28:1–192.
- Baard, E.H.W. 2000a. Geographic distribution: *Phrynomantis annectens*. Afr. Herp. News 31:19–20.
- Baard, E.H.W. 2000b. Geographic distribution: *Bufo robinsoni*. Afr. Herp. News 31:20–22.
- Barnard, P., C.J. Brown, A.M. Jarvis, A. Robertson, and L. van Rooyen. 1998. Extending the Namibian protected area network to safeguard hotspots of endemism and diversity. Biodiv. Conserv. 7:531–547.
- Barnes, K.N. (ed.). 1998. *The Important Bird Areas of Southern Africa*. Birdlife South Africa, Johannesburg, South Africa.
- Bates, M.F., N.J.L. Heideman, B.A. Wilson, M.G.J. Hendricks, N. Don, and C. Moses. 1998. Morphological variation and geographical distribution in the South African lizards *Typhlosaurus caecus* (Cuvier 1817) and *Typhlosaurus vermis* Boulenger 1887 (Scincidae: Acontinae). Afr. J. Herpetol. 47:35–41.
- Bauer, A.M. 2000. Evolutionary scenarios in the *Pachydactylus*-group geckos of southern Africa: new hypotheses. Afr. J. Herpetol. 48:53–62.
- Bauer, A.M. and W.R. Branch. 1995. Geographic variation in western populations of the *Pachydactylus punctatus* complex (Reptilia: Gekkonidae). Trop. Zool. 8:69–84.
- Bauer, A.M., W.R. Branch, and D.A. Good. 1996. A new species of rock-dwelling *Phyllodactylus* (Squamata: Gekkonidae) from the Richtersveld, South Africa. Occ. Pap. Mus. Nat. Sci. Louisiana St. Univ. 71:1–13.
- Bauer, A.M., W.R. Branch, and W.D. Haacke. 1993. The herpetofauna of the Kamanjab area and adjacent Damaraland, Namibia. Madoqua 18:117–145.
- Bauer, A.M., A.P. Russell, and R.E. Shadwick. 1989. Mechanical properties and morphological correlates of fragile skin in gekkonid lizards. J. Exp. Biol. 145:79–102.
- Bauer, A.M., A.P. Russell, and R.E. Shadwick. 1993. Skin mechanics and morphology of two species of *Pachydactylus* (Reptilia: Gekkonidae). S. Afr. J. Zool. 28:192–197.
- Beny, G. 1995. Systematik und Taxonomie der Geckos des *Pachydactylus bibronii-laevigatus* Komplexes (Reptilia: Squamata: Gekkonidae). Unpubl. Diplomarbeit, Naturwissenschaftliche Facultät, Universität Wien, Vienna, Austria.
- Berger-Dell'mour, H. 1987. Some new data on the herpetology of South West Africa. J. Herpetol. Assoc. Africa 33:5–8.
- Bock, C.E., H.M. Smith, and J.H. Bock. 1990. The effect of livestock grazing upon abundance of the lizard, *Sceloporus scalaris*, in southeastern Arizona. J. Herpetol. 24:445–446.
- Boulenger, G.A. 1885. Descriptions of three new species of geckos. Ann. Mag. Nat. Hist. (5)16:473–475.
- Boulenger, G.A. and J.H. Power. 1921. A revision of the South African *Agamas* allied to *Agama hispida* and *A. atra*. Trans. Roy. Soc. S. Afr. 9:229–287.
- Boycott, R.C. and W.D. Haacke. 1979. Note on the type-locality, distribution and juvenile coloration of *Naja nigricollis woodi* (Serpentes: Elapidae) and an account of the colour-pattern variation in intergrade populations. Ann. Cape Prov. Mus. (Nat. Hist.) 13:31–38.
- Branch, W.R. (ed.). 1988a. *The Revised South African Red Data Book—Reptiles and Amphibians*. South African National Scientific Programmes Report 151, Pretoria, South Africa.
- Branch, W.R. 1988b. *Field Guide to the Snakes and Other Reptiles of Southern Africa*. Struik Publishers, Cape Town, South Africa.
- Branch, W.R. 1990. The herpetofauna of the Cape Province, South Africa: new distribution records and zoogeography. J. Herpetol. Assoc. Afr. 37:17–44.
- Branch, W.R. 1991. The Regenia Registers of 'Gogga' Brown (1869–1909). "Memoranda on a species of Monitor or Varan". Early observations on the rock monitor *Varanus albigularis*, supplemented with additional notes on the biology of southern African monitors. In: W. Böhme and H.-G. Horn (eds.) *Advances in Monitor Research*, Mertensiella 2, pp. 57–110. Deutsche Gesellschaft für Herpetologie und Terrarienkunde, Bonn, Germany.
- Branch, W.R. 1994. Herpetofauna of the Sperrgebiet region of southern Namibia. Herpetol. Nat. Hist. 2(1):1–11.

- Branch, W.R. 1998. *Field Guide to the Snakes and Other Reptiles of Southern Africa*, 3rd Edition. Struik Publishers, Cape Town, South Africa.
- Branch, W.R. 1999. Dwarf adders of the *Bitis cornuta-inornata* complex (Serpentes: Viperidae). In: U. Joger and G. Nilson (eds.) *Systematics, Phylogeny and Biology of the Viperidae*. Kaupia 8, pp. 39–63. Hessisches Landesmuseum Darmstadt und Technische Universität Darmstadt, Germany.
- Branch, W.R. and A.M. Bauer. 1995. Herpetofauna of the Little Karoo, Western Cape, South Africa with notes on life history and taxonomy. *Herpetol. Nat. Hist.* 3(1): 47–90.
- Branch, W.R. and H. Braack. 1995. A new toad from Paradise. *Madoqua* 19:15–23.
- Branch, W.R. and M.J. Whiting. 1997. A new *Platysaurus* (Squamata: Cordylidae) from the Northern Cape Province, South Africa. *Afr. J. Herpetol.* 46:124–136.
- Branch, W.R., A.M. Bauer, and D.A. Good. 1995. Species limits in the *Phyllodactylus lineatus* complex (Reptilia: Gekkonidae), with the elevation of two taxa to specific status and the description of two new species. *J. Herpetol. Assoc. Afr.* 44:33–54.
- Branch, W.R., A.M. Bauer, and D.A. Good. 1996. A review of the Namaqua gecko, *Pachydactylus namaquensis* (Reptilia: Gekkonidae) from southern Africa, with the description of two new species. *S. Afr. J. Zool.* 31:53–69.
- Branch, W.R., G.A. Benn, and A.T. Lombard. 1995. The tortoises (Testudinidae) and terrapins (Pelomedusidae) of southern Africa: their diversity, distribution and conservation. *S. Afr. J. Zool.* 30:91–102.
- Brandstätter, F. 1996. *Die Sandrennattern: Genus Psammophis*. Westarp Wissenschaften, Magdeburg.
- Broadley, D.G. 1972. A review of the *Nucras tessellata* group (Sauria: Lacertidae). *Arnoldia* (Rhodesia) 5(20):1–36.
- Broadley, D.G. 1974. A review of the cobras of the *Naja nigricollis* complex in southwestern Africa (Serpentes: Elapidae). *Cimbebasia Ser. A.* 2:155–162.
- Broadley, D.G. 1977. A revision of the African snakes of the genus *Psammodromus* Fitzinger (Colubridae). *Occ. Pap. Nat. Mus. Monum. Rhodesia Ser. B* 6:1–44.
- Broadley, D.G. 1978. A revision of the genus *Platysaurus* A. Smith (Sauria: Cordylidae). *Occ. Pap. Natl. Mus. Monum. Rhodesia Ser. B*, 6:129–185.
- Broadley, D.G. 1980. A revision of the African snake genus *Prosymna* Gray (Colubridae). *Occ. Pap. Natl. Mus. Monum. Rhodesia, Ser. B* 6:481–556.
- Broadley, D.G. 1987. Caudal autotomy in African snakes of the genera *Natriciteres* Loveridge and *Psammodromus* Boie. *J. Herpetol. Assoc. Afr.* 33:18–19.
- Broadley, D.G. 1990. *FitzSimons' Snakes of Southern Africa*, revised edition with addendum. Jonathan Ball and Ad. Donker Publishers, Parklands, South Africa.
- Broadley, D.G. 2002. A review of the species of *Psammodromus* south of latitude 12° S (Serpentes: Psammophiinae). *Syntarsus*. In press.
- Bustard, H.R. 1968. The ecology of the Australian gecko, *Gehyra variegata*, in northern New South Wales. *J. Zool., London* 154:113–138.
- Castanzo, R.A. and A.M. Bauer. 1993. Diet and activity of *Mabuya acutilabris* (Reptilia: Scincidae) in Namibia. *Herpetol. J.* 3:130–135.
- Castanzo, R.A. and A.M. Bauer. 1998. Comparative aspects of the ecology of *Mabuya acutilabris* (Squamata: Scincidae), a lacertid-like skink from arid south western Africa. *J. Afr. Zool.* 112:109–122.
- Channing, A. 1976. Life histories of frogs in the Namib Desert. *Zool. Afr.* 11:299–312.
- Channing, A. 1986. A new species of the genus *Strongylopus* Tschudi from Namaqualand, Cape Province, South Africa (Anura: Ranidae). *Ann. Cape. Prov. Mus.* 16:127–135.
- Channing, A. and M. Griffin. 1993. An annotated checklist of the frogs of Namibia. *Madoqua* 18:101–116.
- Channing, A. and D.E. van Dijk. 1976. *A Guide to the Frogs of South West Africa*. University of Durban–Westville Press, Durban, South Africa.
- Cole, D.T. 1990. The Richtersveld. *Aloe* 27(2):40–43.
- Cornell, F.C. 1920[1986]. *The Glamour of Prospecting*, revised edition. David Philip, Claremont, South Africa.
- Cowling, R.M., K.J. Esler, and P.W. Rundel. 1999. Namaqualand, South Africa—an overview of a unique winter-rainfall desert ecosystem. *Plant Ecol.* 142:3–21.
- Crowe, T.M. 1990. A quantitative analysis of patterns of distribution, species richness and endemism in southern African vertebrates. In: G. Peters and R. Hutterer (eds.) *Vertebrates in the Tropics*, pp. 145–160. Zoologisches Forschungsinstitut und Museum Koenig, Bonn, Germany.
- David, P. and I. Ineich. 1998. Les serpents venimeux du monde: systématique et répartition. *Dumerilia* 3:1–500.
- Dingle, R.V. and Q.B. Hendey. 1984. Mesozoic and Tertiary sediment supply to the western Cape Basin (S.E. Atlantic) and palaeodrainage systems in southwestern Africa. *Mar. Geol.* 56:13–26.
- Dingle, R.V., W.G. Siesser, and A.R. Newton. 1983. *Mesozoic and Tertiary Geology of Southern Africa*. A.A. Balkema, Rotterdam, The Netherlands.
- FitzSimons, V.F.M. 1935. Notes on a collection of reptiles and amphibians made in the southern Kalahari, Bushmanland and Great and Little Namaqualand. *Ann. Transvaal Mus.* 15:519–550.
- FitzSimons, V.F.M. 1938. Transvaal Museum Expedition to South-West Africa and Little Namaqualand, May to August 1937. Reptiles and Amphibians. *Ann. Transvaal Mus.* 19:153–209, map.
- FitzSimons, V.F.M. 1943. The lizards of South Africa. *Mem. Transvaal Mus.* 1:1–528.
- FitzSimons, V.F.M. 1950. Notes on a collection of reptiles and amphibians from the west coast of southern Africa. *Ann. Transvaal Mus.* 21:253–259, pl. IV.
- FitzSimons, V.F.M. 1962. *Snakes of Southern Africa*. Purnell, Cape Town, South Africa.

- Frost, D.R. (ed.). 1985. *Amphibian Species of the World: A Taxonomic and Geographical Reference*. Allen Press, Inc. and The Association of Systematics Collections, Lawrence, Kansas.
- Frost, D.R. (ed.). 2000. *Amphibian Species of the World: An Online Reference*. V2.20 (1 September 2000). <http://research.amnh.org/herpetology/amphibia/index.html>.
- Gans, C. 1959. A taxonomic revision of the African snake genus *Dasypeltis* (Reptilia: Serpentes). *Ann. Mus. Roy. Congo Belge, sér. In-8°, Sci. Zool.* 74:i-ix, 1-237, pls. I-XIII.
- Good, D.A. and A.M. Bauer. 1995. The Namaqua day gecko revisited: allozyme evidence for the affinities of *Phelsuma ocellata*. *J. Herpetol. Assoc. Afr.* 44:1-9.
- Grieg, J.C. and P.D. Burdett. 1976. Patterns in the distribution of southern African terrestrial tortoises (Cryptodira: Testudinidae). *Zool. Afr.* 11:249-273.
- Griffin, M. 1993. Annotated checklist and conservation status of mammals, reptiles and amphibians of the Sperrgebiet, southern Namib Desert, Namibia, preliminary report. Unpubl. Report, NAMDEB, Oranjemund and Windhoek, Namibia.
- Griffin, M. 2000a. The species diversity, distribution and conservation of Namibian reptiles: a review. *J. Namibia Wiss. Ges.* 48:116-141.
- Griffin, M. 2000b. Annotated checklist of amphibians, reptiles and mammals of the Brandberg, central Namib Desert, Namibia. *Cimbebasia Mem.* 9:69-89.
- Griffin, M. and A. Channing. 1991. Wetland-associated reptiles and amphibians of Namibia - a national review. *Madoqua* 17:221-225.
- Haacke, W.D. 1965. Additional notes on the herpetology of South West Africa with descriptions of two new subspecies of geckos. *Cimbebasia Ser. A* 11: 1-40.
- Haacke, W.D. 1974. Richtersveld. *Afr. Wildlife* 28(2):16-20.
- Haacke, W.D. 1975a. Description of new adder (Viperidae, Reptilia) from southern Africa, with a discussion of related forms. *Cimbebasia Ser. A* 4:115-128.
- Haacke, W.D. 1975b. The burrowing geckos of southern Africa, 1 (Reptilia: Gekkonidae). *Ann. Transvaal Mus.* 29:197-243 + pls. 10-11.
- Haacke, W.D. 1976a. The burrowing geckos of southern Africa, 2 (Reptilia: Gekkonidae). *Ann. Transvaal Mus.* 30:13-28 + pl. 1.
- Haacke, W.D. 1976b. The burrowing geckos of southern Africa, 4 (Reptilia: Gekkonidae). *Ann. Transvaal Mus.* 30:53-70 + 4-8.
- Haacke, W.D. 1985. Occurrence of the spotted bush-snake (*Philothamnus semivariatus*) in the arid south-west of southern Africa. *J. Herpetol. Assoc. Afr.* 31:7-9.
- Haacke, W.D. 1986. Description of a new species of *Typhlosaurus* Wiegmann, 1834 (Reptilia: Scincidae) from the west coast of southern Africa, with new records of related species. *Ann. Transvaal Mus.* 34:227-235.
- Harrison, J.C.A., M. Burger, L.R. Minter, A.L. De Villiers, E.H.W. Baard, E. Scott, P.J. Bishop, and S. Ellis. 2001. *Conservation Assessment and Management Plan for Southern African Frogs. Final Report*. IUCN/SSC Conservation Breeding Specialist Group, Apple Valley, Minnesota.
- Hayward, B., E.J. Heske, and C.W. Painter. 1997. Effects of livestock grazing on small mammals at a desert cienega. *J. Wildl. Mgmt.* 61:123-129.
- Hendricks, H. 1998. Traditional stock farming in the Richtersveld. *Veld & Flora*, September 1998:86-87.
- Hewitt, J. 1937. Descriptions of South African lizards. *Ann. Natal Mus.* 8:199-209.
- Hilton-Taylor, C. 1996. Phytogeography and origins of the Karoo flora. In: R.M. Cowling and P.W. Roux (eds.) *The Karoo Biome: a Preliminary Synthesis. Part 2, Vegetation and History*, pp. 58-72. South African National Scientific Programme Report 142, Pretoria, South Africa.
- Hoffmann, L.A.C. 1989. An annotated list of amphibian and reptile observations from Etosha National Park. *Madoqua* 16:87-92.
- Hughes, B. 1997. *Dasypeltis scabra* and *Lamprophis fuliginosus*—two pan-African snakes in the Horn of Africa: a tribute to Don Broadley. *Afr. J. Herpetol.* 46:68-77.
- Jones, K.B. 1981. Effects of grazing on lizard abundance and diversity in western Arizona. *Southwest. Nat.* 26:107-115.
- Jürgens, N. 1991. A new approach to the Namib Region. Part I: phytogeographic subdivision. *Vegetatio* 97:21-38.
- Jürgens, N. 1997. Floristic biodiversity and history of African arid regions. *Biodiv. Conserv.* 6:495-514.
- King, F.W. and R.L. Burke. 1989. *Crocodylian, Tuatara, and Turtle Species of the World: A Taxonomic and Geographic Reference*. Association of Systematics Collections, Washington, D.C., USA.
- Lamb, T. and A.M. Bauer. 2000. Systematics of the *Pachydactylus rugosus* complex of southern African geckos (Squamata: Gekkonidae). *Afr. Zool.* 35:55-67.
- Lamb, T. and A.M. Bauer. 2002. Phylogenetic relationships of the large-bodied members of the African lizard genus *Pachydactylus* (Reptilia: Gekkonidae). *Copeia* 2002:586-596.
- Lombard, A.T. 1995. The problems with multi-species conservation: do hotspots, ideal reserves and existing reserves coincide? *Afr. J. Zool.* 30(3):145-163.
- Lombard, A.T., A.O. Nicholls, and P.V. August. 1995. Where should nature reserves be located in South Africa? A snake's perspective. *Conserv. Biol.* 9:363-372.
- Loveridge, A. 1947. Revision of the African lizards of the family Gekkonidae. *Bull. Mus. Comp. Zool.* 98:1-469.
- Loveridge, A. and E.E. Williams, 1957. Revision of the African tortoises and turtles of the suborder Cryptodira. *Bull. Mus. Comp. Zool. Harvard Coll.* 115:161-557.
- Low, A.B. and A.G. Rebelo. 1996. *Vegetation of South Africa, Lesotho and Swaziland*. Pretoria, Department of Environmental Affairs and Tourism.

- Lusigi, W.J. 1994. Socio-economic and ecological prospects for multiple use of protected areas in Africa. *Biodiv. Conserv.* 3:449–458.
- Mayer, W. and K. Richter. 1990. Die Wüstenrenner-Eidechsen Namibias—Vorkommen, Pflege und Zucht. *Herpetofauna* 12(66):21–30.
- McLachlan, G.R. 1978. *South African Red Data Book—Reptiles and Amphibians*. South African National Scientific Programmes Report 23, Pretoria, South Africa.
- McLachlan, G.R. 1981. Taxonomy of *Agama hispida* (Sauria: Agamidae) in southern Africa. *Cimbebasia Ser. A* 5:219–227.
- McLachlan, G.R. 1984. A bush-snake (*Philothamnus semivariiegatus*) from Springbok. *J. Herpetol. Assoc. Afr.* 30:11.
- McLachlan, G.R. and J.M. Spence. 1966. The genus *Pachydactylus* (Part 1). *Ann. Cape Prov. Mus.* 5:149–156.
- Mertens, R. 1955. Die Amphibien und Reptilien Südwestafrikas. Aus den Ergebnissen einer im Jahre 1952 ausgeführten Reise. *Abh. Senckenberg. Naturf. Ges.* 490:1–172.
- Milton, S.J., W.R.J. Dean, M.A. du Plessis, and W.R. Siegfried. 1994. A conceptual model of arid rangeland degradation, the escalating cost of declining productivity. *BioScience* 44:70–76.
- Mouton, P. le F. N. and Y.M. Herselman. 1994. Paradoxical reproduction and body size in the rock lizard, *Agama atra atra*, in Namaqualand, South Africa. *S. Afr. J. Zool.* 29:199–203.
- Passmore, N.I. and V.C. Carruthers. 1995. *South African Frogs: A Complete Guide*. Witwatersrand University Press and Southern Book Publishers, Johannesburg and Halfway House, South Africa.
- Poynton, J.C. 1964. The Amphibia of southern Africa: a faunal study. *Ann. Natal Mus.* 17:1–334.
- Reck, K.W. 1994. *Tracks and Trails of the Richtersveld*. K.W. Reck, privately published.
- Röll, B. 1999. Biochemical and morphological aspects of the relationship of the Namaqua day gecko to *Phelsuma* and *Rhoptropus* (Reptilia, Gekkonidae). *Zool. Anal. Compl. Syst.* 102:50–60.
- Roux, J. 1907. Beiträge zur Kenntnis der Fauna von Süd-Afrika. Ergebnisse einer Reise von Prof. Max Weber im Jahre 1894. VII. Lacertilia (Eidechsen). *Zool. Jb. Syst.* 25:403–444.
- Russell, A.P. 1977. The genera *Rhoptropus* and *Phelsuma* (Reptilia Gekkonidae) in southern Africa: a case of convergence and a reconsideration of the biogeography of *Phelsuma*. *Zool. Afr.* 12:393–408.
- Russell, A.P. and A.M. Bauer. 1990. Hypertrophied chondroepiphyses in the gekkonid lizard genus *Phelsuma*: their structure and relation to the adhesive mechanism. *J. Zool., London* 221:205–217.
- Ryan, P.G., I. Hood, P. Bloomer, J. Komen, and T.M. Crowe. 1998. Barlow's lark: a new species in the Karoo lark *Certhilauda albescens* complex of southwest Africa. *Ibis* 140: 605–619.
- Schlesinger, C.A. and R. Shine. 1994. Choosing a rock: perspectives of a bush-rock collector and a saxicolous lizard. *Biol. Conserv.* 67:49–56.
- Schmidt, K.P. 1933. The reptiles of the Pulitzer Angola expedition. *Ann. Carnegie Mus.* 22:1–15, pls. I–II.
- Stuart, S.N., R.J. Adams, and M.D. Jenkins. 1990. Biodiversity in Sub-Saharan Africa and its Islands. *Occ. Pap. IUCN Species Survival Comm. No. 6.* vi + 242 pp.
- Van der Merwe, S. 1991. Richtersveld word 'n nasionale park. [Richtersveld now finally a national park.] *Custos* 20(6):14–17.
- Van der Walt, P.T. 1991. Waarom die bergwoestyn bewaar? [Why conserve this rugged, mountainous desert land?] *Custos* 20(6):18–19, 21–22, 27–30.
- Van Jaarsveld, E. 1981. A preliminary report on the vegetation of the Richtersveld with specific reference to the trees and shrubs of the area. *Trees in South Africa* 33:58–85.
- Van Zyl, B.J. 1991. The lower Orange River. *Madoqua* 17:155–157.
- Visser, J. 1979. New and reconfirmed records for the Cape Province with notes on some 'rare' species. *J. Herpetol. Assoc. Afr.* 21: 40–50.
- Visser, J. 1984. Die Kwarts- en Marico-geitjie. *Landbouweekblad*, 6 April 1984:40–41, 43.
- Von Willert, D.J., M.J.A. Werger, E. Brinckmann, H.-D. Ihlenfeldt, and B.M. Eller. 1992. *Life Strategies of Succulents in Deserts: with Special Reference to the Namib Desert*. Cambridge University Press, Cambridge, United Kingdom.
- Ward, J.D. and I. Corbett. 1990. Towards an age for the Namib. In: M.K. Seely (ed.) *Namib Ecology: 25 Years of Namib Research*. Transvaal Museum Monograph 7, pp. 17–26. Transvaal Museum, Pretoria.
- Wermuth, H. and R. Mertens. 1996. *Schildkröten, Krokodile, Brückenechsen, mit einem ergänzenden Nachtrag von Fritz Jürgen Obst*. Gustav Fischer, Jena, Germany.
- White, F. 1983. *The Vegetation of Africa*. UNESCO, Paris.
- Williamson, G. 1990. The Richtersveld, a treasure-trove of succulent plants. *Aloe* 27(2):34–39.
- Williamson, G. 1995. *Richtersveld National Park*. Umdaus Press, Alexander Bay, South Africa.
- Williamson, G. 2000. *Richtersveld: The Enchanted Wilderness*. Umdaus Press, Hatfield, South Africa.
- Willis, C. 1992. Richtersveld: land of contrasts. *Veld & Flora*, March 1992:14–17.