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Diversity of reptiles in the bushveld of the Blouberg Nature Reserve (Limpopo Province, South Africa) (Reptilia)

Beitrag zur Artenvielfalt von Reptilien in der Buschsavanne des Blouberg Naturreservats (Provinz Limpopo, Südafrika) (Reptilia)

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KURZFASSUNG

Die Vielfalt der Reptilienfauna des Blouberg Naturreservates im nördlichen Südafrika, Provinz Limpopo wurde untersucht. Vegetationsformen und Bodentypen dieses 1983 ausgewiesenen Schutzgebietes zeigen die typische Ausprägung einer Buschsavanne ("bushveld"). Das 9360 ha große Schutzgebiet umfaßt in Teilen den Gebirgszug des Bloubergs, einen isolierten, 2051 m ü. M. hohen Inselberg. Insgesamt konnten über einen Zeitraum von 9 Jahren (1993 bis 2001) 62 Reptilienarten nachgewiesen werden (5 Schildkröten, 27 Eidechsen, 29 Schlangen, 1 Doppelschleiche). 29 Arten sind Erstnachweise für das Reservat. In Einzelkapiteln werden Fundorte und Verbreitung ausgewählter Arten beschrieben und durch ökologische, zoogeographische oder taxonomische Hinweise ergänzt. Vier Arten verdienen aufgrund ihres kleinräumigen Verbreitungsgebietes bzw. aufgrund ihrer Seltenheit besondere faunistische Beachtung (*Xenocalamus transvaalensis*, *Lycophidion variegatum*, *Scelotes limpopoensis albiventris*, *Bradypodion* sp.). Zwei an Felshabitate gebundene Arten sind endemisch für den Blouberg (*Lygodactylus nigropunctatus montiscaeruli*, *Platysaurus intermedius parvus*). Die Zahl von 29 nachgewiesenen Schlangenarten ist angesichts der vergleichsweise geringen Größe des Untersuchungsgebietes bemerkenswert hoch. Die hohe Artenvielfalt der Reptilienfauna wird unter Gesichtspunkten der naturräumlichen Zuordnung sowie unter Aspekten der Habitatvielfalt im Reservat diskutiert. Ergänzend werden alle im Gebiet nachgewiesenen Arten in ihrer relativen Häufigkeit durch die jährliche Nachweisrate und nach ihrer Zugehörigkeit zu Habitattypen in tabellarischer Form charakterisiert sowie weitere Arten des Blouberg-Gebietes aufgelistet, die außerhalb der Reservatsgrenzen nachgewiesen wurden.

ABSTRACT

An investigation of reptile diversity was carried out in the Blouberg Nature Reserve, Limpopo Province, South Africa. Vegetation and soil conditions in this reserve, established in 1983, represent the typical types of bushveld in northern South Africa. The 9360 ha reserve includes parts of the Blouberg mountain range, an isolated Inselberg of 2,051 m a.s.l.. During nine years of field survey from 1993 to 2001 a total of 62 reptile species were recorded within the reserve (5 chelonians, 27 lizards, 29 snakes, 1 amphisbaenid). Twenty-nine species represent first records for the reserve. The distribution of selected species is described, including ecological and taxonomical aspects as well as zoogeographical relationships. Because of their rarity or generally limited distribution, four species are of specific interest (*Xenocalamus transvaalensis*, *Lycophidion variegatum*, *Scelotes limpopoensis albiventris*, *Bradypodion* sp.). Two species that live in rocky habitats, *Lygodactylus nigropunctatus montiscaeruli* and *Platysaurus intermedius parvus*, are endemic to the Blouberg mountain range. In view of the comparatively small size of the area investigated the number of 29 recorded snake species is remarkable. The high species richness of the reptile fauna in the reserve is discussed with regards to different biotic zones and the diversity of habitat types. Habitat requirements, annual records and distribution of all recorded species as well as a list of additional species of the Blouberg area (outside the reserve's boundaries) are presented.

KEY WORDS

Reptilia, *Xenocalamus transvaalensis*, *Lycophidion variegatum*, *Hemirhagerrhis nototaenia nototaenia*, *Scelotes limpopoensis albiventris*, *Platysaurus intermedius parvus*, *Bradypodion* sp., *Lygodactylus nigropunctatus montiscaeruli*, diversity, zoogeography, conservation, faunistics, ecology, bushveld, Blouberg, Limpopo Province, South Africa

INTRODUCTION

The geographic and taxonomic database for most South African vertebrate groups (except for fish) is poorly developed (DRINKROW et al. 1994), and more than half of the protected areas lack species lists for these groups (SIEGFRIED 1989). Little information about species richness and biodiversity is available, and thus, species lists for

reserves are urgently required (DRINKROW & CHERRY 1995).

The Blouberg Nature Reserve is situated within the bushveld zone in the north of South Africa. Previously, no inventory of reptiles and amphibians of this reserve or the Blouberg Mountain has been published. JACOBSEN (1989) investigated the Blouberg area during his reptile survey of the Transvaal for a short period (few days). Some occasional collecting took place in the area of the Blouberg Mountain by different scientists (HAACKE pers. comm. 2000). Studies on the genus *Platysaurus* occurring in the western foothills of the mountain were published by JACOBSEN & NEWBERRY (1989) and JACOBSEN (1994).

The following paper documents the reptile diversity recorded during nine years of investigation (1993 -2001) inside the boundaries of the Blouberg Nature Reserve and discusses the reptiles' ecology and zoogeographic affinities. A list of species found in the Blouberg region, however outside the reserve boundaries, is added.

STUDY AREA AND METHODS

Study area

Topography: The Blouberg is an isolated inselberg west of the Soutpansberg range in the Limpopo Province of South Africa. The mountain range is 50 km long and its highest peak reaches 2051 m a.s.l. (fig. 1). The altitude of the surrounding plains is approximately 900 metres. The Blouberg Nature Reserve is situated in the eastern part of the mountain between 22°57' to 23°04' south and 29°02' to 29°10' east (fig. 2). Farms on the eastern tip of the mountain were purchased from farmers in the middle 1970's by the South African Development Trust and first proclaimed as a nature reserve during 1983. In June 1993, a Non-Governmental Organization environmental education and conservation programme (Blouberg Conservation Project) was established in the Blouberg Nature Reserve including an Environmental Education Centre inside the Reserve (fig. 3).

Currently, the reserve is 9360 ha in size, of which 2000 ha are mountainous. The reserve includes areas on the northern side as well as on the southern side of the mountains. The highest peak inside the reserve is 1491 m a.s.l.

The non-perennial Brak River flows through the southeastern part of the reserve. A dense *Ficus sycomorus* forest on heavy clay soil covers the northwestern foothills of the mountain and a swamp and marsh area stretches northwards. Large areas in the northern and northeastern parts of the reserve are covered with deep red Kalahari sand.

Vegetation: The Blouberg is situated in the arid sweet Bushveld. The vegetation of the mountain itself and the surrounding areas is different depending on altitude and local situation. Small patches of high-altitude Afromontane forest are found in valleys and moist basins throughout the mountains. The slopes are covered by mountain sour-bushveld with *Minusops zeyheri*, *Olea europaea*, *Bequaertiodendron magalismontanum*, *Kirkia acuminata*, *Combretrum apiculatum* and others as dominant tree species (SCHOLES 1978). The veld types in the surrounding areas belong to the arid sweet bushveld in the north and to the mixed bushveld in the south (ACCOCKS 1988).

The main part of the Blouberg Nature Reserve is situated in the northeast of the mountains with the veld types mainly belonging to the arid sweet bushveld. Depending on the soil structure vegetation varies from a *Grewia flava* veld with *Grewia flava*, *Acacia mellifera*, *A. tortilis*, *A. karroo*, *Dichrostachys cinera*, *Boscia albitrunca* as the dominant trees on harder compact reddish loam soil to a mixed *Terminalia* veld on deep, loose red sand (Kalahari sandveld) with *Terminalia sericea*, *T. prunoides*, *Sclerocarya birrea*, *Burkea africana*, *Combretum apiculatum*, *Grewia flava*, *Acacia nigrescens* and other dominant trees and shrubs.

A small dense forest with *Ficus sycomorus* and *F. ingens* and with a dense grass cover (mainly *Eragostris racemosa*, *E. rigidor* and *E. pallens*) is situated at the foot of the mountains in the northwestern part of the reserve on heavy clay soil. The lower parts

Fig. 1: Blouberg Nature Reserve during the dry season – in the background the mountain massif of the Blouberg (Limpopo Province, Republic of South Africa, July 1999).

Abb. 1: Trockenzeit–Aspekt des Blouberg Naturreservates mit dem Gebirgsmassiv des Blouberg im Hintergrund (Provinz Limpopo, Südafrika, Juli 1999).

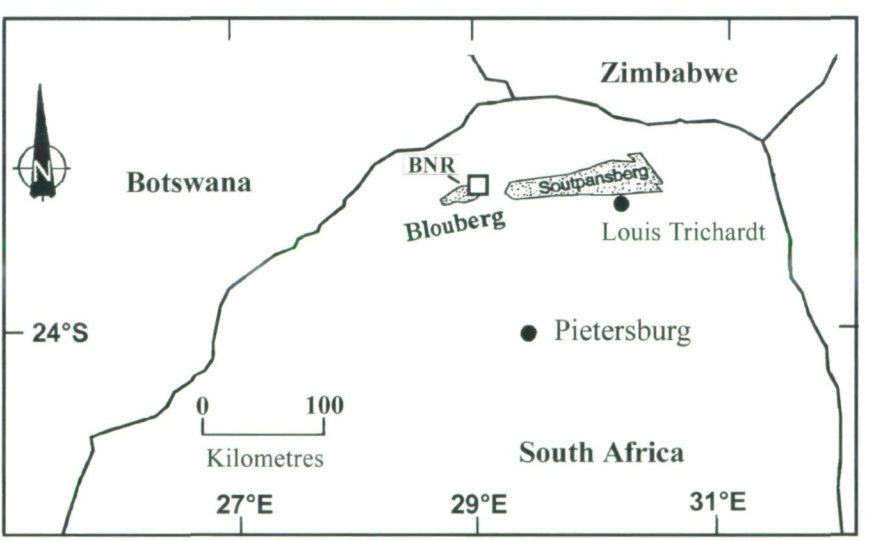

Fig. 2: Location of the Blouberg Mountains and the Blouberg Nature Reserve (BNR) in the north of South Africa.

Abb. 2: Geographische Lage des Blouberg Gebirgsmassivs und des Blouberg Naturreservates (BNR) im Norden Südafrikas.

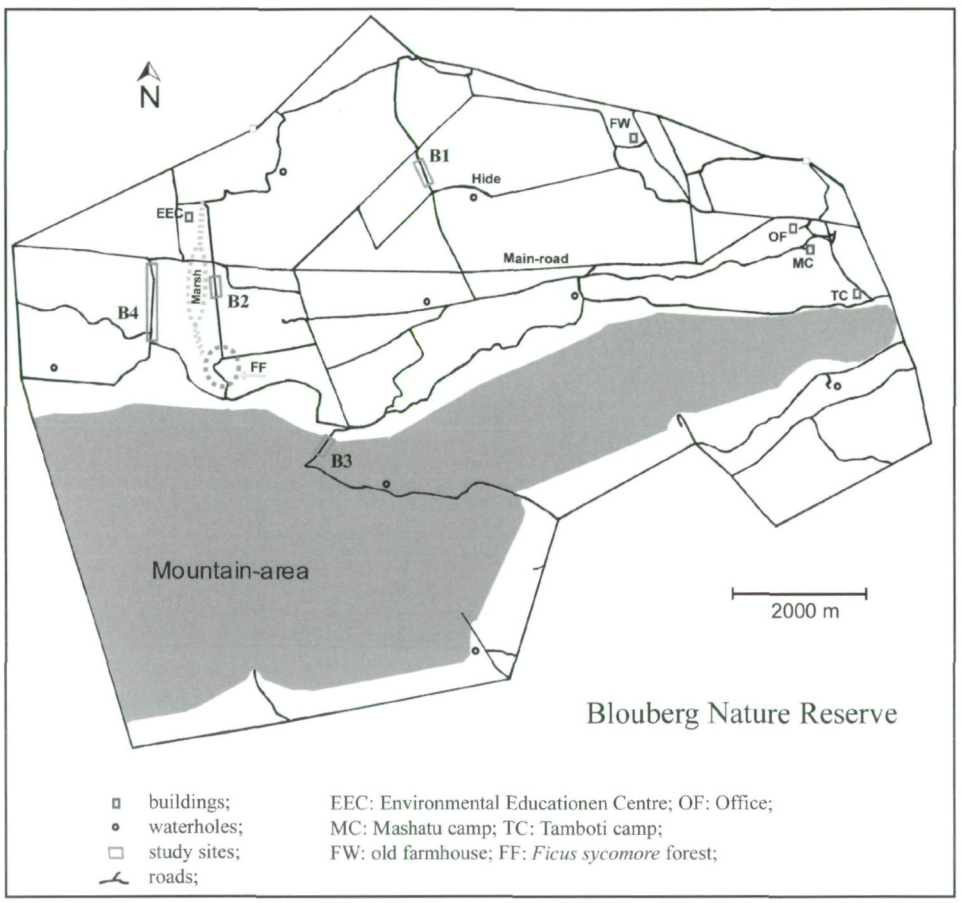

Fig. 3: Map of the Blouberg Nature Reserve (Limpopo Province, Republic of South Africa), with the locations of the study areas.

Abb. 3: Karte des Blouberg Naturreservates (Provinz Limpopo, Südafrika), mit der Lage der Probeflächen.

of the southern side belong to the reserve and get a higher average of annual rainfall than the northern side. Therefore the vegetation is much denser here, the dominant trees are *Acacia nigrescens*, *Combretum apiculatum*, und *Kirkia acuminata*.

Two-thousand ha of the reserve are mountainous and therefore covered with the described sour and mixed bushveld on the mountain slopes and grassveld with fynbos vegetation at the top of the mountains. The Blouberg occupies a unique geographical position between the central and southern African Afromontane floras; most of the Blouberg endemics (seven plant species) are found in the fynbos and montane grassland (SCHOLES 1978). Evergreen montane forest occurs only in small patches in the Transvaal. The Yellowwood forests (*Podocarpus latifolius*) on these isolated mountains are of considerable geographical and ecological significance as the north-westernmost outlier of evergreen montane forest in South Africa (SCHOLES 1978).

Climate: In the study area rainfall decreases gradually from East to West, the main rain-bearing winds are eastern to northeastern. This effect is accentuated by

the rain shadow of the mountains. The northern and north-western slopes of the mountains are much drier than the southern and eastern slopes. The average annual rainfall in the lowlands is between 350-450 mm in the North and 450-550 mm in the South. Usually rainfall comes with thunderstorms between November and February/ March. The average daily temperatures are maximum 29°C in January and 20°C in July and are minimum 16°C in January and 4°C in July. Frost is infrequent.

Geology: The Blouberg area is the only area where strata of the Waterberg and Soutpansberg group are developed in close proximity to each other (JANSEN 1976; BUMBY 2000). The Blouberg has a complex structural pattern and is made up of rock formations of three different groups (Soutpansberg group, Waterberg group, Blouberg formation) (BUMBY 2000). The tectonic model or the precise sequence of events which led to the deposition of the different strata is a matter of some controversy (JANSEN 1976; BARKER 1976; BUMBY 2000).

The Soutpansberg rock, as it exists today, is just the remains of a once very widespread basin which stretched as far north as Messina (northernmost South Africa) and as far west as Botswana. It is an interesting question for how long the Blouberg was effectively an isolated habitat and had lost the topographical link between the Blouberg and Soutpansberg mountains, along which the migration of species could have occurred. There are unfortunately no rocks of younger age preserved which could give a clue to the more recent palaeotopography (BUMBY pers. comm. 2001). There is no evidence of a bridge between the Soutpansberg and Blouberg within more recent times (there is no topographical structure in the Vivo area that may be the eroded root of a linking mountain). Any connections between the Blouberg and Soutpansberg that may have existed have been gone for many millions of years (probably at least for 20 million years) (BUMBY pers. comm. 2001).

Methods

During a period of nine years, continuous records and observations of the herpetofauna were made in the Blouberg Nature Reserve area. This survey is part of the field activities of the Nature Conservation Centre, situated within the reserve ("Blouberg Conservation Project"). Under the management of the second author, this project strives to conserve and protect biodiversity and endangered bird and reptile species of the Blouberg Mountain and surrounding areas, including different captive breeding programmes (for more information see GRUSCHWITZ & SCHMIDT 2001 and the internet site http://www.blouberg.org). Sampling and monitoring efforts are described as follows: The second author was permanently present in the reserve throughout the year during the whole nine years investigation period. The data of his observations, monitoring- and sampling activities on reptiles are completely part of the reptile list. During the nine-years investigation period, the first and third authors collectively spent 7.5 months in the reserve; seven months of these belonged to the rainy season and two weeks to the dry season.

There were two main points in the field work. First an intensive monitoring over a period of nine years, in different spots of herpetological interest in the reserve, such as swamp and marsh areas, the *Ficus sycomorus* forest, waterholes, deep sand areas, the foot and slopes of the mountains, roadsides and around the houses of the education centre, the office area, the camp sites, and the hide (compare fig. 3), mainly during the rainy season with the highest reptile activity, but generally throughout the year. Spotlight surveys were made during nights, especially after rainfall, in order to record nocturnal species during all years of the investigation.

Second a number of specific field studies on the reptile fauna were carried out by the first author and the third author (periodically) between 1999 and 2001. Within three representative study areas, different in vegetation, altitude and soil types, amphibians and reptiles were trapped by daily-controlled live traps over a period of nearly five months (3 December 1999 to 15 April 2000). The traps were situated in the northern part of the reserve in a deep sand area (Sandveld, B1, fig. 3) and in the western part next to the marsh area (Hardveld, B2, fig. 3) and at the foot of the mountain (B3, fig. 3). Eighteen

live traps systems were distributed over the study areas. Each trap system was made of four 10 or 20-liter buckets, which were dug in the ground and connected through 10 meter long, strong plastic fences, similar to classic amphibian fences. The size of these areas varied between 2 and 5 ha. Additionally these study areas were monitored about twice a day in the morning and afternoon by two to three people. This monitoring continued up to 2001 for some weeks during the rainy seasons. Within a fourth study area 17 spotlight surveys were made during the 5th of January and the 20th of February 2000 (B4, fig. 3). All together field work on trap systems and spotlight surveys accounted for about 244 person-days spent in the field.

Specimens were live-captured, studied, determined at species/subspecies level and released after taking photographs. Details of locality, habitat, date, sex and reproductive state were recorded. The study was permitted by the Nature Conservation Department of the Limpopo Province. Permits for the collecting of voucher specimens were not granted, but were issued only for special circumstances (e.g., for dead collected specimens). The voucher specimens are stored at the Transvaal Museum (TM), Pretoria and at the Education Centre in the Blouberg Nature Reserve. Due to the conservation status of the study area, the main goal of these field studies was the investigation of aspects of reptile ecology and population biology.

Scientific nomenclature and determination of species (except Chelonians) follows FITZSIMONS (1943, 1962) as modified by BALLETO (1968), BRANCH & BROADLEY (1985), BROADLEY (1968, 1972, 1977a,b,c, 1978, 1990), BROADLEY & BAUER (1998), BROADLEY & WATSON (1976), BROADLEY et al. (1976), HAACKE (1975, 1976), JACOBSEN (1987, 1989, 1992, 1994), JACOBSEN & NEWBERRY (1989) and LOVERIDGE (1957) and for the chelonians LOVERIDGE (1941) and LOVERIDGE & WILLIAMS (1957) as modified by BROADLEY (1981a,b, 1993) and BOUR (1983).

RESULTS

Species records in the Blouberg Nature Reserve

During a nine year field survey from 1993 to 2001 a total of 62 reptile species were recorded within the reserve, of which five species are chelonians, 27 are lizards, 29 are snakes and one belongs to amphisbaenians (fig. 4). All recorded species are listed in the tables 1 (Chelonia), 2 (Serpentes) and 3 (Sauria and Amphisbaenia), compiled by ecological aspects and zoogeographical relationships as well as the abundance (observation) in the reserve. The year-round observations were compiled (tab. 1-3) to provide at least an idea of the presence and abundance of wide-ranging species in the reserve (compare also RÖDEL et al. 1999). Nearly half of the reptile species (29 species) were continuously recorded in almost every year by the resident author. Eight species were recorded in five to seven years of the investigation period. Seven species were observed discontinuously only in three to four years, while 18 species were recorded just in one or two years of the survey. They will be mentioned in more detail in "Discussion".

Seven out of 62 reptile species recorded are of special biogeographical or herpetofaunal interest and are addressed below:

Xenocalamus transvaalensis METHUEN, 1919

We found three specimens of the slender fossorial Transvaal Quill-snouted Snake in the reserve; two on the main road early in the morning after rain in November 1996, a third at a depth of ca. 30 cm in deep sandy soil at the beginning of the mountain road, dug out during fieldwork in March 2000, (TM 83340 – fig. 5). This endemic species has a restricted distribution from the Limpopo Province through southern Mozambique and northern Natal. In the Limpopo Province, the species was known before from two other localities only (Njelele River, 25 miles south of the Limpopo River and Farm Weipe (47 MS) -

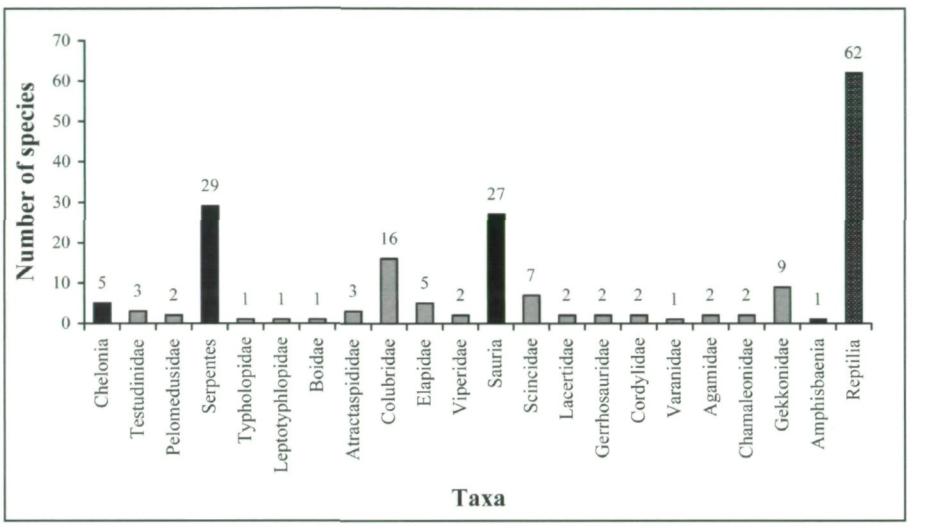

Fig. 4: Number of reptile species per family recorded in the Blouberg Nature Reserve (Limpopo Province, Republic of South Africa).

Abb. 4: Anzahl der im Blouberg Naturreservat (Provinz Limpopo, Südafrika) nachgewiesenen Reptilien-Arten, aufgeschlüsselt nach den Familien.

Fig. 5: *Xenocalamus transvaalensis* METHUEN, 1919 (Blouberg N.R., March 2000), a rare and restricted species of high priority in the South African Red Data Book (TM 83340).

Abb 5: *Xenocalamus transvaalensis* METHUEN, 1919 (Blouberg N.R., März 2000), eine seltene und in ihrer Verbreitung sehr begrenzte Art Südafrikas, mit höchster Schutzpriorität nach der Roten Liste (TM 83340).

Fig. 6: *Platysaurus intermedius parvus* BROADLEY, 1976, male (Blouberg N.R., March 2000), an endemic flatlizard of the Blouberg mountain area.

Abb. 6: *Platysaurus intermedius parvus* BROADLEY, 1976, Männchen (Blouberg N.R., März 2000), eine endemische Plattechse der offenen Felsformationen des Blouberg Gebietes.

Fig. 7: *Monopeltis infuscata* BROADLEY, 1997, (Blouberg N. R., March 2000), an entirely fossorial species, which is almost extinct in agricultural areas, (TM 83350).

Abb 7: *Monopeltis infuscata* BROADLEY, 1997, (Blouberg N.R., März 2000), eine unterirdisch lebende Art, die in landwirtschaftlich genutzten Gebieten nahezu ausgerottet ist (TM 83350).

JACOBSEN 1989). It is listed as a high priority species (rare, restricted) in the South African Red Data Book, recorded only from about six localities (BRANCH 1988). Following BROADLEY (1971, 1990) and BRANCH (1998) the species of the genus *Xenocalamus* exclusivly feed on amphisbaenians. In this respect the syntopic record of *Monopeltis infuscata* BROADLEY, 1997 (TM 83350, TM 83351) together with the specimen TM 83340 is of high interest.

Lycophidion variegatum
BROADLEY, 1969

One adult specimen of the rare Variegated Wolf Snake, 25 cm in length, was found in November 1999 near the house of the Education Centre after a late afternoon thunderstorm. This is the most western distribution record of the species in the Limpopo Province as well as South Africa. The nearest neighboring records of this species are south (Louis Trichardt) and north (Waterpoort) of the Soutpansberg (BRANCH 1976; BROADLEY 1990). The species is listed in the South African Red Data Book as a rare peripheral species which is only recorded from about 10 localities in South Africa since its description in 1969 (BRANCH 1988).

Hemirhagerrhis nototaenia nototaenia
(GÜNTHER, 1864)

Three observations of the Eastern Bark or Mopane Snake were made in the Blouberg Nature Reserve. Two adult specimens were found at about 1,100 – 1,200 m altitude on the mountain road in December 1994 and 1995; a third subadult specimen in the office-area in November 1999. The record of this savannah woodland species represents the south-easternmost record in the Limpopo Province. This snake is normally associated with areas where the dominant tree species is the Mopane tree (*Colophospermum mopane*) which is absent from the Blouberg Mountain. In an unusual manner, the records were made in a mountainous area at higher altitudes than elsewhere in the species' range. Further investigations seem to be necessary to better delimit the actual distribution of the species and to determine the systematic status of the Blouberg specimens.

Scelotes limpopoensis albiventris
JACOBSEN, 1987

Three specimens of the rare and endemic Limpopo Dwarf Burrowing Skink were found between January and March 2000. This skink is a fossorial and solitary species, living under logs and stones in the shade of trees and shrubs on sandy soils (JACOBSEN 1987, 1989). It is very locally distributed and has been recorded before only from 4 localities in two adjacent 0.25° grid squares in the Limpopo Province. One of these is the former farm area "Auf der Haard", which now belongs to the reserve. Two specimens had dropped into a pitfall trap installed in a deep sand area; the third was found near the road to the Sycomore-Fig-Forest (*Ficus sycomorus* - see fig. 3) on a hard compact sandy loam soil mixture. This soil condition is in contrast to the species' preferred habitats which are characterized by aeolian sand areas (JACOBSEN 1987). Probably the habitat requirements of *S. l. albiventris* are more variable and the species occurs also on harder soil structures. Three records in two different areas within one rainy season of this rare species indicate that the species is possibly more common and more widely distributed than believed. One reason for the scarcity is probably its secretive life. Further investigations are necessary. The subspecies *albiventris* inhabits a small area in the center of the distribution range of *S. l. limpopoensis* FITZSIMONS, 1930. Both have not been found in sympatry till now, although they occupy similar habitats (JACOBSEN 1987). BROADLEY (1994) therefore mentioned that *S. l. albiventris* is probably a full species. The species is listed in the South African Red Data Book as of restricted distribution (BRANCH 1988).

Platysaurus intermedius parvus
BROADLEY, 1976

Platysaurus intermedius parvus (fig. 6) is endemic to the rocky outcrops and cliff faces on the Blouberg Mountain

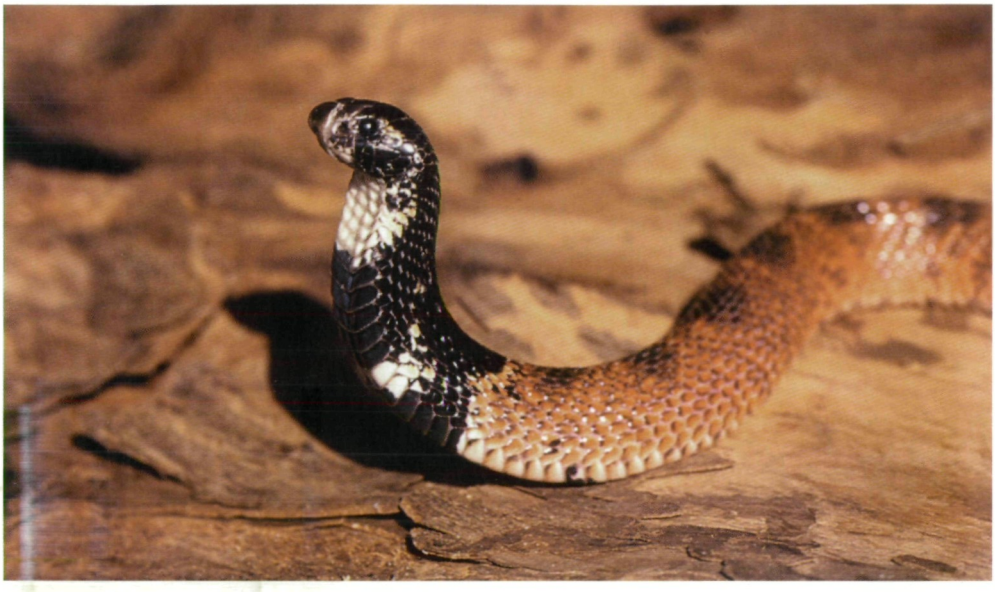

Fig. 8: *Aspidelaps scutatus scutatus* (A. SMITH, 1848), female (Blouberg N.R., November 2001), a small robust elapid snake, which uses the prominent rostral scale to push through loose soil.

Abb. 8: *Aspidelaps scutatus scutatus* (A. SMITH, 1848), (Blouberg N.R., November 2001), eine kleine robuste Giftschlange, die mit Hilfe ihres vorstehenden großen Rostralschildes im losem Substrat gräbt.

Fig. 9: *Causus defilippii* (JAN, 1862) (Blouberg N.R., Dezember 2002), a snake entirely specialized on small amphibian prey with a distinctive up-turned tip of the snout.

Abb 9: *Causus defilippii* (JAN, 1862) (Blouberg N.R., Dezember 2002), eine gänzlich auf Amphibiennahrung spezialisierte Schlangenart mit auffälliger nach oben gebogener Schnauzenspitze.

(BROADLEY 1976, 1978; JACOBSEN 1989, 1994). One population of this shy lizard was observed on the northern slopes of the mountains, close to the western border of the reserve. The lizard has been known only from six farm areas in the south-eastern and southern side of the mountains. Our record is the first on the northern side of the mountain and the first in a provincial Nature Reserve. Altogether, five *Platysaurus* taxa have been described from the south-eastern side of Blouberg (see below chapter "additional species' records in the Blouberg area"), its foothills and the low-lying hills extending to the Glen Alpine Dam (JACOBSEN & NEWBERRY 1989; JACOBSEN 1994). This is ecologically and systematically a unique situation, because the species do live parapatric, strictly separated from each other within very small distances between isolated rocky outcrops (JACOBSEN 1994). Three of these *Platysaurus* taxa are endemic to the Blouberg region (*P. monotropis* JACOBSEN, 1994, *P. intermedius inopinus* JACOBSEN, 1994, *P. intermedius parvus*).

Bradypodion sp.

The distribution of the large dwarf chameleon *Bradypodion transvaalense* (FITZSIMONS, 1930) is restricted to the vicinity of Haenertsburg and Woodbush Forest Reserve, in the Limpopo Province escarpment (JACOBSEN 1989; BRANCH 1999). Isolated populations of other dwarf chameleons occur along the Mpumalanga and Limpopo Province escarpment from Barberton north to the Soutpansberg (BRANCH 1999). Probably nine different species, which FITZSIMONS (1943) all included into "*transvaalense*", may occur, forming two different groups (JACOBSEN 1989; BRANCH 1999). Lynn RAW was the first to collect a specimen of dwarf chameleon (*Bradypodion* sp.) from the southern side of the Blouberg. It seems to be an undescribed species (HAACKE pers. com. 2001). Further investigation, including genetical studies are being carried out at the moment. We observed another specimen of this dwarf chameleon in January 2000 on the southern side of the mountain at an altitude of about 1,200 m a.s.l..

Table 1: Tortoises and terrapins (Chelonia) observed in the Blouberg Nature Reserve (Limpopo Province, Republic of South Africa) with remarks on their abundance, habitat preference, special requirements and distribution. SA - Southern Africa; SO - South to East Africa, SW - South to West Africa.

Tab. 1: Die im Blouberg Naturreservat (Provinz Limpopo, Südafrika) nachgewiesenen Schildkröten (Chelonia) mit Angaben zur relativen Häufigkeit, Habitatwahl, Lebensweise und Verbreitung. SA - Südafrika; SO – Süd- bis Ostafrika, SW – Süd- bis Westafrika.

Species Art	Annual records (years) Jahre mit Nachweis	Observation frequency Beobachtungshäufigkeit	Habitat Lebensraum	Special requirements besondere Ansprüche	Distribution Verbreitung
Geochelone pardalis (BELL, 1828)	93-01	35-50 per year	terrestrial	-	SO
Psammobates oculiferus (KUHL, 1820)	93/95-96/98/00-01	15	terrestrial	arenicolous	SA
Kinixys spekii GRAY, 1863	93-93	2	terrestrial	-	SO
Pelomedusa subrufa (LACÉPÈDE, 1788)	93-97/99-01	20-40 per year	terrestrial	-	SW
Pelusios sinuatus (A. SMITH, 1838)	95	3	aquatic	-	SO

Lygodactylus nigropunctatus montiscaeruli (JACOBSEN, 1992)

The rare endemic Black-spotted Dwarf Gecko is known only from the southern side of Blouberg and the adjacent lowlying Makgabeng Plateau (JACOBSEN 1992; BRANCH 1999). One juvenile specimen was found in the middle of March 2000 on the road to the Sycomores-Fig-Forest (see fig. 3) after a big flood. Following JACOBSEN (1992) this gecko is almost exclusively rupicolous occupying rocky outcrops and cliffs. Therefore our specimen was probably washed down the slopes during the flooding. The record inside of the reserve is new and extends the known distribution area to the northeastern side of the mountains.

Additional species' records in the Blouberg area

A number of species were recorded in the Blouberg area outside the reserve, however in its vicinity (table 4). The list is based on observations of the authors, collection data of the Transvaal Museum (Pretoria) and literature records (JACOBSEN 1989). Most species are expected to occur inside the reserve.

DISCUSSION

Currently, 62 taxa of reptiles and 17 species of amphibians (SCHMIDT et al. in prep.) have been recorded within the boundaries of the Blouberg Nature Reserve (tables 1-3, fig. 4). Sixteen species of reptiles observed during our studies represented first records for the Blouberg area: *Psammobates oculiferus*, *Kinixys spekii*, *Rhinotyphlops schlegelii*, *Xenocalamus transvaalensis*, *Lycophidion variegatum*, *Prosymna bivittata*, *Telescopus semiannulatus semiannulatus*, *Thelotornis capensis*, *Aspidelaps scutatus scutatus*, *Dendroaspis polylepis*, *Monopeltis infuscata*, *Bradypodion* sp., *Pachydactylus capensis capensis*, *Pachydactylus tigrinus*, *Ptenopus garrulus garrulus*. Seven more species were known before only from the southern side of the Blouberg mountain outside of the reserve: *Atractaspis bibronii*, *Causus defilippii*, *Platysaurus intermedius parvus*, *Chamaeleo dilepis*, *Homopholis wahlbergii*, *Lygodactylus nigropunctatus montiscaeruli*, *Pachydactylus punctatus*. From the literature, another six species of the reserve (*Pseudaspis cana*, *Hemirhagerrhis nototaenia nototaenia*, *Psammophis brevirostris brevirostris*, *Psammophis mossambicus*, *Crotaphopeltis hotamboeia*, *Elapsoidea sundevallii longicauda*) were known to occur in the 0,25° grid square, but Blouberg itself was not mentioned. Other records are of specific herpetofaunal interest (*Xenocalamus transvaalensis*, *Lycophidion variegatum*, *Scelotes limpopoensis albiventris*, *Bradypodion* sp.). The burrowing *Xenocalamus transvaalensis* was not encountered during JACOBSEN's (1989) survey in the whole Limpopo Province and is a remarkable rediscovery after METHUEN's (1919) original record.

The high species richness of reptiles (in comparison for example to the Kruger National Park – see below) is a result of the great habitat diversity in the reserve and the conjunction of different biotic zones. The presence of different habitats is caused by different soil conditions from deep Kalahari sand to loam and from heavy clay soil to rocky areas, at different altitudes and different humidity.

The mountain slopes and rocky outcrops offer ideal conditions for rock species. The reserve houses five species of rupicolous lizard of which two are endemic (*Lygodactylus nigropunctatus montiscaeruli*, *Platysaurus intermedius parvus*). Deep sand areas of Kalahari sand provide the substratum for areniocolous species. Ten species belonging to this group were recorded in the reserve, two of them are terrestrial - *Ptenopus g. garrulus* (A. SMITH, 1849), *Psammobates oculiferus* (KUHL, 1820) - and eight species are fossorial - *Monopeltis infuscata* BROADLEY, 1997 (fig. 7), *Scelotes limpopoensis albiventris*, *Lygosoma s. sundevallii* (A. SMITH, 1849), *Prosymna bivittata* WERNER, 1903, *Xenocalamus transvaalensis*, *Rhinotyphlops s.*

Table 2: Snakes (Serpentes) observed in the Blouberg Nature Reserve (Limpopo Province, Republic of South Africa) with remarks on their abundance, habitat preference, special requirements and distribution. SA - southern Africa; SO - South to East Africa, SW - South to West Africa.

Tab. 2: Die im Blouberg Naturreservat (Provinz Limpopo, Südafrika) nachgewiesenen Schlangen (Serpentes) mit Angaben zur relativen Häufigkeit, Habitatwahl, Lebensweise und Verbreitung. SA - Südafrika; SO – Süd- bis Ostafrika, SW – Süd- bis Westafrika.

Species Art	Annual records (years) Jahre mit Nachweis	Observation frequency Beobachtungshäufigkeit	Habitat Lebensraum	Special requirements besondere Ansprüche	Distribution Verbreitung
Rhinotyphlops schlegelii schlegelii BIANCONI, 1850	95	2	arenicolous	arenicolous	SA
Leptotyphlops scutifrons scutifrons (PETERS, 1854)	98-00	7	fossorial	-	SA
Python natalensis A. SMITH, 1840	93-01	15-20 per year	terrestrial	-	SW
Atractaspis bibronii A. SMITH, 1849	93-97/99-01	3-7 per year	fossorial	-	SO
Aparallactus capensis A. SMITH, 1849	94-95/97/00-01	10	terrestrial	-	SO
Xenocalamus transvaalensis METHUEN, 1919	96/00	3	fossorial	arenicolous	SA
Lamprophis capensis (DUMÉRIL & BIBRON, 1854)	93-01	2-7 per year	terrestrial	-	SW
Lycophidion capense capense (A. SMITH, 1831)	95/97/00-01	5	terrestrial	-	SO
Lycophidion variegatum BROADLEY, 1969	99	1	terrestrial	-	SA
Pseudaspis cana (LINNAEUS, 1754)	93-99/01	common	semifossorial	-	SO
Prosymna bivittata WERNER, 1903	94-00	2-6 per year	fossorial	arenicolous	SW
Hemirhagerrhis nototaenia nototaenia (GÜNTHER, 1864)	94-95/99	3	arboreal	-	SO
Psammophylax tritaeniatus (GÜNTHER, 1868)	93-97/99	7	terrestrial	-	SO
Psammophis subtaeniatus subtaeniatus PETERS, 1882	93-01	15-25 per year	terrestrial	-	SO
Psammophis brevirostris brevirostris PETERS, 1881	94/96-97/99/01	6	terrestrial	-	SA
Psammophis mossambicus PETERS, 1882	97-98/01	2	terrestrial	-	SO
Philothamnus semivar. semivariegatus (A. SMITH, 1840)	93/00-01	8	arboreal	-	SW
Dasypeltis scabra (LINNAEUS, 1758)	93-01	common	terrestrial	-	SW
Crotaphopeltis hotamboeia (LAURENTI, 1768)	95/98	3	terrestrial	semiaquatic	SW
Telescopus semiannulatus semiannulatus A. SMITH, 1849	93-99/01	2-7 per year	terrestrial	-	(SA)
Dispholidus typus typus (A. SMITH, 1829)	93-01	14	arboreal	-	SW
Thelotornis capensis capensis A. SMITH, 1849	95/00	2	arboreal	-	SO
Aspidelaps scutatus scutatus (A. SMITH, 1848)	95/01	3	semifossorial	arenicolous	SA
Elapsoidea sundevallii longicauda BROADLEY, 1971	93-01	abundant	semifossorial	arenicolous	SA
Naja annulifera annulifera PETERS, 1854	94/96-97/99-01	9	terrestrial	-	SA
Naja mossambica PETERS, 1854	93-01	abundant	terrestrial	-	SO
Dendroaspis polylepis (GÜNTHER,1858)	94-01	18	terrestrial	-	SW
Causus defilippii (JAN, 1862)	99	1	terrestrial	-	SO
Bitis arietans arietans (MERREM, 1820)	93-01	350, strong yearly fluctuations	terrestrial	-	SW

Table 3: Lizards and Worm Lizards (Sauria and Amphisbaenia) observed in the Blouberg Nature Reserve (Limpopo Province, Republic of South Africa) with remarks on their abundance, habitat preference, special requirements and distribution. R* - regularly found in camps and on buildings; RS* - regularly found in smaller numbers on certain places; B - Blouberg; LP - Limpopo Province, SA - southern Africa; SO - South to East Africa, SW - South to West Africa).

Tab. 3: Die im Blouberg Naturreservat (Provinz Limpopo, Südafrika) nachgewiesenen Eidechsen und Doppelschleichen (Sauria und Amphisbaenia) mit Angaben zur relativen Häufigkeit, Habitatwahl, Lebensweise und Verbreitung. abundant - sehr häufig; common - häufig; R* - regelmäßig an Häusern und festen Campinghütten; RS* - regelmäßig in kleinerer Zahl an bestimmten Standorten; B - Blouberg; LP – Provinz Limpopo, SA - Südafrika; SO – Süd- bis Ostafrika; SW – Süd- bis Westafrika.

Species Art	Annual records (years) Jahre mit Nachweis	Observation frequency Beobachtungshäufigkeit	Habitat Lebensraum	Special requirement besondere Ansprüche	Distribution Verbreitung
Monopeltis infuscata BROADLEY, 1997	00	2	fossorial	arenicolous	SA
Scelotes limpopoensis albiventris JACOBSEN, 1987	00	3	fossorial	arenicolous	LP
Lygosoma sundevallii sundevallii (A. SMITH, 1849)	95/97/99-00	common	subfossorial	arenicolous	SO
Trachylepis capensis (GRAY, 1830)	95-01	RS*	terrestrial	-	SO
Trachylepis margaritifera (PETERS, 1854)	93-01	common	terrestrial	rupicolous	SA
Trachylepis striata striata (PETERS, 1844)	93-01	abundant	arboreal	-	SO
Trachylepis varia (PETERS, 1867)	93-01	abundant	terrestrial	-	SO
Panaspis wahlbergi (A. SMITH, 1849)	94-95	2	terrestrial	-	SO
Heliobolus lugubris (A. SMITH, 1838)	93-01	abundant	terrestrial	-	SA
Nucras intertexta A. SMITH, 1838	99-01	6	terrestrial	-	SA
Gerrhosaurus flavigularis WIEGMANN, 1828	93-01	common	terrestrial	-	SO
Gerrhosaurus validus validus A. SMITH, 1849	95-96/99-01	RS*	terrestrial	rupicolous	SO
Cordylus tropidosternum jonesi (BOULENGER, 1891)	93-01	RS*	arboreal	-	SA
Platysaurus intermedius parvus BROADLEY, 1976	00-01	RS*	terrestrial	rupicolous	B
Varanus albigularis (DAUDIN, 1802)	93-01	common	terrestrial	-	SO
Agama armata PETERS, 1854	95-96/98-01	4-8 per year	terrestrial	-	SO
Acanthocerus atricollis (A. SMITH, 1849)	93-98/00-01	3-6 per year	arboreal	-	SO
Bradypodion sp.	00	1	arboreal	-	LP
Chamaeleo dilepis LEACH, 1819	93-01	common	arboreal	-	SO
Hemidactylus mabouia (MOREAU DE JONNES, 1818)	93-01	R*	arboreal	-	SW
Homopholis wahlbergii (A. SMITH, 1849)	94-01	RS*	arboreal	-	SA
Lygodactylus capensis (A. SMITH, 1849)	93-01	R*	arboreal	-	SO
Lygodactylus nigropunctatus montiscaeruli (JACOBSEN, 1992)	00	1	terrestrial	rupicolous	B
Pachydactylus capensis capensis A. SMITH, 1846	93/00	4	terrestrial	-	SA
Pachydactylus turneri GRAY, 1864	93-01	R*	arboreal	-	SO
Pachydactylus punctatus PETERS, 1854	00-01	21	terrestrial	-	SA
Pachydactylus tigrinus VAN DAM, 1921	00	1	terrestrial	rupicolous	SA
Ptenopus garrulus garrulus (A. SMITH, 1849)	93-01	RS*	terrestrial	arenicolous	SA

schlegelii BIANCONI, 1850, *Aspidelaps s. scutatus* (A. SMITH, 1848) (fig. 8), *Elapsoidea sundevallii longicauda* BROADLEY, 1971. Arenicolous fossorial reptiles are generally most abundant in the Kalahari sand and the coastal alluvium of the Mozambique Plain (POYNTON & BROADLEY 1978).

The habitat type representing the highest species diversity in the reserve is the mixed *Terminalia* veld on Kalahari sand (sandveld) with 46 species recorded. A reduced spectrum of 40 species inhabits the *Grewia flava* veld (hardveld) on harder compact reddish loam soil. A similar situation was found in the Langjan Nature Reserve, situated approximately 50 km west of Blouberg (SCHMIDT 2002). Nearly all species which occur in the hardveld are also distributed in the sandveld. The vegetation in the latter is much more diverse than in the former and therefore demonstrates larger environmental heterogeneity resulting in a higher diversity of reptiles. Vegetation of high structural complexity can accommodate higher animal species richness than vegetation of more simple structure (HEATWOLE & TAYLOR 1987).

Representing an isolated feature with forest, montane grassland and fynbos in an arid landscape, the Blouberg has an important function as a water catchment area for the region. The water collected in the mountain during the rainy season feeds the surrounding low-lying plains. There are higher humidity and "almost permanent" waterpools (especially after strong rainy seasons) within the reserve on the heavy clay soils north of the mountain. Most of the year the area is supplemented by water from the mountains which supports a swamp forest (*Ficus sycomorus* forest fig. 3) and a swamp and marsh area in the north. All other surficial water in the reserve is seasonal and dries up quickly in times of drought. The comparatively small swamp and marsh areas and the *Ficus sycomorus* forest are inhabited by 30 species (swamp area) or 15 species (forest area). The marsh and swamp area was partly drained before the establishment of the reserve, but has recovered in parts since, as most of the drain channels were destroyed.

The high diversity of snake species (29 species, see tab. 2) in the reserve can be explained among others by the existence of these humid habitats and "almost permanent" waterpools. These areas support high densities of amphibians and small mammals serving as prey, which makes the area attractive for predators like snakes. Snakes are supposed to be more food-dependent and less habitat specific than lizards. As predators they are forced to utilize habitats which have suitable prey densities to supply their energy requirements (ARNOLD 1972, REINERT 1993). Consequently, habitat selection by snakes may reflect the habitat selected by their prey. Many of the recorded snake species have very specific food preferences like *Crotaphopeltis hotamboeia* (LAURENTI, 1768), *Causus defilippii* (JAN, 1862) (fig. 9), *Dasypeltis scabra* (LINNAEUS, 1758), *Pseudaspis cana* (LINNAEUS, 1754), *Prosymna bivittata*, *Xenocalamus transvaalensis* and *Aparallactus capensis* A. SMITH, 1849. A commonly observed feature of reptile species richness is that snake species dominate the reptile fauna in humid regions with higher and denser vegetation, whereas in arid regions lizards reach higher species diversity than snakes (JOGER & LAMBERT 1997). Snakes account for ten of 15 reptile species in the *Ficus sycomorus* forest as well as 20 of 30 reptile species in the marsh area.

The high number of lizard species in the reserve (27 species recorded, see tab. 3) can be attributed to the occurrence of large rocky and sandy areas. All recorded rupicolous reptile species were lizards. Thirteen lizard species occur in the sandveld and are mainly terrestrial species, except for *Scelotes limpopoensis albiventris* and *Lygosoma s. sundevallii*, which are fossorial. Nine lizard species are mainly arboreal and distributed in different veldtypes. Lizards generally demonstrate more specific habitat preferences than snakes do. The soil structure, vegetation and microclimate conditions are major factors for habitat selection (PIANKA 1971; PIANKA et al. 1979). The Kalahari lizard species diversity is related primarily to plant species diversity and mean precipitation (PIANKA 1971).

Four basic biotic zones have been described for the former Transvaal (RAUTENBACH 1978). The recorded reptile species of the reserve are elements of three of them.

Table 4: Reptile species of the Blouberg area which were recorded only outside the reserve, however in its vicinity. Their presence within the reserve is to be expected. Data based on own observations [o. o.], Transvaal Museum records [TM], and JACOBSEN's (1989) publication [1989].

Tab. 4: Reptilienarten des Blouberg-Gebietes, die nur außerhalb jedoch in der Nähe des Schutzgebietes festgestellt wurden. Sie kommen wahrscheinlich auch innerhalb des Reservates vor. Die Angaben stützen sich auf eigene Beobachtungen [o. o.], Belege im Transvaal Museum [TM] und JACOBSENS (1989) Publikation [1989].

Fam. Leptotyphlopidae
Leptotyphlops longicaudus (PETERS, 1854) – [1989]
Leptotyphlops conjunctus incognitus BROADLEY & WATSON, 1976 – [1989]

Fam. Colubridae
Lamphrophis guttatus (A. SMITH, 1843) – [1989]
Mehelya nyassae (GÜNTHER, 1888) – [o.o.]
Prosymna sundevallii lineata (PETERS, 1871) – [1989]

Fam. Viperidae
Bitis caudalis (A. SMITH, 1838) – [1989], [o.o.]

Fam. Scincidae
Acontias plumbeus BIANCONI, 1849 – [1989], [TM]
Typhlosaurus cregoi cregoi BOULENGER, 1903 – [TM]
Trachylepis variegata punctulata (BOCAGE, 1872) – [1989]

Fam. Lacertidae
Nucras holubi (STEINDACHNER, 1882) – [1989]
Ichnotropis squamulosa PETERS, 1854 – [1989], [o.o.]
Pedioplanes lineoocellata lineoocellata (DUMÉRIL & BIBRON, 1839) – [1989], [o.o.]

Fam. Cordylidae
Cordylus vandami (FITZSIMONS, 1930) – [1989], [TM]
Cordylus vittifer vittifer (REICHENOW, 1887) – [1989], [TM]
Platysaurus monotropis JACOBSEN, 1994 – [TM], [o.o.]
Platysaurus minor FITZSIMONS, 1930 – [TM], [o.o.]
Platysaurus guttatus A. SMITH, 1849 – [TM], [o.o.]
Platysaurus intermedius inopinus JACOBSEN, 1994 – [TM], [o.o.]

Fam. Agamidae
Agama aculeata distanti BOULENGER 1902 – [1989]

Fam. Gekkonidae
Afroedura sp. – [TM – coll. by JACOBSEN]
Pachydactylus affinis BOULENGER, 1896 – [1989]

The main part of the reserve belongs to the Southern Savannah Woodland (ACCOCKS 1988; RAUTENBACH 1978) and most reptile species of the reserve belong to this biotic zone. Only one species (*Bradypodion* sp.) is an element of the Tropical Forest Zone of the mountain slopes and peaks to which it is restricted. Some of the arenicolous species (*Psammobates oculiferus*, *Monopeltis infuscata*, *Aspidelaps s. scutatus*, *Lygosoma s. sundevallii*, *Ptenopus g. garrulus*) belong to the Southwest Arid Zone which occupies only a limited area in the extreme southwestern part of the Limpopo Province. During the Pleistocene, aeolion sands were widely deposited as far as the eastern Kruger National Park and numerous species of this zone extended their ranges eastwards (BROADLEY 1968; JACOBSEN 1987). Coastal arenicolous species of the Mozambique Plains like *Xenocalamus transvaalensis*, *Elapsoidea sundevallii longicauda* and *Scelotes limpopoensis albiventris* moved inland and met the arenicolous fauna of the South-west Arid Zone in the north-east of the Province (POYNTON & BROADLEY 1978; JACOBSEN 1989). The Blouberg Nature Reserve attains its high species richness through a combination of Savannah and South-west Arid Zone species mixed with a number of specialized and rupicolous species.

Fourteen species of the 62 reptile species of the reserve (= 22.6 %) are endemic to southern Africa. Three of them are restricted to the Blouberg Mountain (*Platysaurus intermedius parvus*, *Lygodactylus nigropunctatus montiscaeruli*, *Bradypodion* sp.). Only one species (*Scelotes limpopoensis albiventris*) has a small distribution

Table 5: Endemic reptile species of the Blouberg area (Blouberg), Limpopo Province (Limpopo Prov.) and South Africa (SA) as found in the Blouberg Nature Reserve (BNR).

Tab. 5: Liste der endemische Reptilienarten der Blouberg Region (Blouberg), der Limpopo Provinz (Limpopo Prov.) und Südafrikas (SA) soweit sie im Blouberg Naturreservat (BNR) gefunden wurden.

Species Art	Recorded in / Nachweis im BNR	 Blouberg	Endemic to / Endemisch in Blouberg	 Limpopo Prov.	 SA
Psammobates oculiferus	X	-	-	-	X
Xenocalamus transvaalensis	X	-	-	-	X
Prosymna bivittata	X	-	-	-	X
Aspidelaps scutatus scutatus	X	-	-	-	X
Elapsoidea sundevallii longicauda	X	-	-	-	X
Acontias plumbeus	-	X	-	-	X
Typhlosaurus cregoi cregoi	-	X	-	X	-
Scelotes limpopoensis albiventris	X	-	-	X	-
Platysaurus monotropis	-	X	X	-	-
Platysaurus minor	-	X	-	X	-
Platysaurus guttatus	-	X	-	X	-
Platysaurus intermedius inopinus	-	X	X	-	-
Platysaurus intermedius parvus	X	X	X	-	-
Cordylus vandami	-	X	-	X	-
Cordylus vittifer	-	X	-	-	X
Nucras intertexta	X	X	-	-	X
Bradypodion sp.	X	-	X	-	-
Lygodactylus nigropunctatus montiscaeruli	X	X	X	-	-
Homopholis wahlbergii	X	-	-	-	X
Pachydactylus capensis capensis	X	-	-	-	X
Pachydactylus tigrinus	X	-	-	-	X
Ptenopus garrulus garrulus	X	-	-	-	X

range in the Limpopo Province. Most of the endemic species (9) are lizards, one is a tortoise and four are snakes. Including additional species outside of the reserve boundaries (see table 4) the number of endemic species for the Blouberg area increases to 21 (table 5). Five of these are restricted to the Blouberg and five others occupy a limited distribution in the Limpopo Province only. Responsible for the high endemism of the Blouberg is the occurrence and combination of isolated rocky and sandy habitats. Most endemic species are fossorial (7) or rupicolous (9), a habitat specialization which often results in limited distribution.

The non-endemic species of the reserve are distributed as far as East Africa (27 species) or West Africa (11 species) (see tables 1-3).

Without a doubt, knowledge about the reptile fauna of the Blouberg Nature Reserve still seems to be incomplete. There remain special areas of the reserve needing an intensive survey of its reptile fauna (for example the southern side of the mountains, the Brak River vicinity, and the top of the mountains). Taking into account all observations and other published records of reptile species of the Blouberg area outside of the reserve (table 5), more species could be expected because of similar suitable habitats. A number of about 70 to 75 reptile species for the reserve seems plausible. Compared, for example, to the Kruger National Park (19455 km^2) with 114 recorded reptile species (PIENAAR et al. 1983) the much smaller Blouberg Nature Reserve (93.6 km^2) possesses an unusual high species diversity, which demonstrates the ecological value and necessity for conservation of highly isolated inselbergs in an arid bushveld environment.

It seems obvious that all Nature Reserves should have inventories of the biodiversity represented within their boundaries (compare BATES 1997). The Blouberg Nature Reserve with 62 reptiles and 17 amphibian species (SCHMIDT et al in prep.), including four Red Data Book species, is of particular importance to conservation and is an emphatic instance for the establishment of a Nature Reserve in this area.

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