Genus *Phrynomerus* Noble

Phrynomerus Noble, 1926, *Amer. Mus. Novit.*, 237, p. 20 (new name for *Brachymerus* Smith after dividing *Phrynomantis* Peters). Type: *P. bifasciatus* (Smith).

Brightly coloured smooth skinned amphibians. Head small, eyes moderately developed. Pupil almost rounded. Teeth absent and gland-like patches on the roof of mouth. Body cylindrical to depressed. Procoracoid-clavicular bar absent. Limb slender and not shortened. Tips of fingers and toes usually dilated into discs which are abrupty truncate. Last phalanx of finger placed more or less out of linear alignment by an intercalary cartilage. Little to no webbing. Although active only when humidity is high the southern African species are arid to mesic savanna inhabitants. Seasonality is pronounced according to rainfall and temperature. Poor swimmers, females deposit the eggs in shallow water bodies. *Phrynomerus* shows a strong tendency to clamber, sheltering in holes in trees, among and under rocks, in burrows of other animals and in termitaria. The tendency to climb is mostly associated with hibernation. Only three species occur in Southern Africa, one of which, *P. bifasciatus*, reaches the Transvaal (Poynton 1964).

Phrynomerus bifasciatus bifasciatus (Smith, 1847)

Brachymerus bifasciatus Smith, 1847, *Illus. Zool. S. Afr.*, *Rept.*, pl. 63. Type locality: "Country to the east and north-east of the Cape Colony".
Phrynomerus bifasciatus (Smith). Wager 1965, p. 126, figs; Van Dijk, 1966, p. 271; Passmore & Carruthers 1979, p. 108, figs; Poynton 1980, p. 246; Frost, 1985, p. 392; Wager 1986, p. 96, figs; Branch 1988b, p. 3.

Phrynomerus bifasciatus bifasciatus (Smith). Poynton 1964, p. 85, fig. 44; Pienaar et al, 1976, p. 30, fig. x; Auerbach 1987, p. 39, pl. 4, fig. 5; Lambiris 1988, p. 113; Poynton & Broadley 1985a, p. 513.

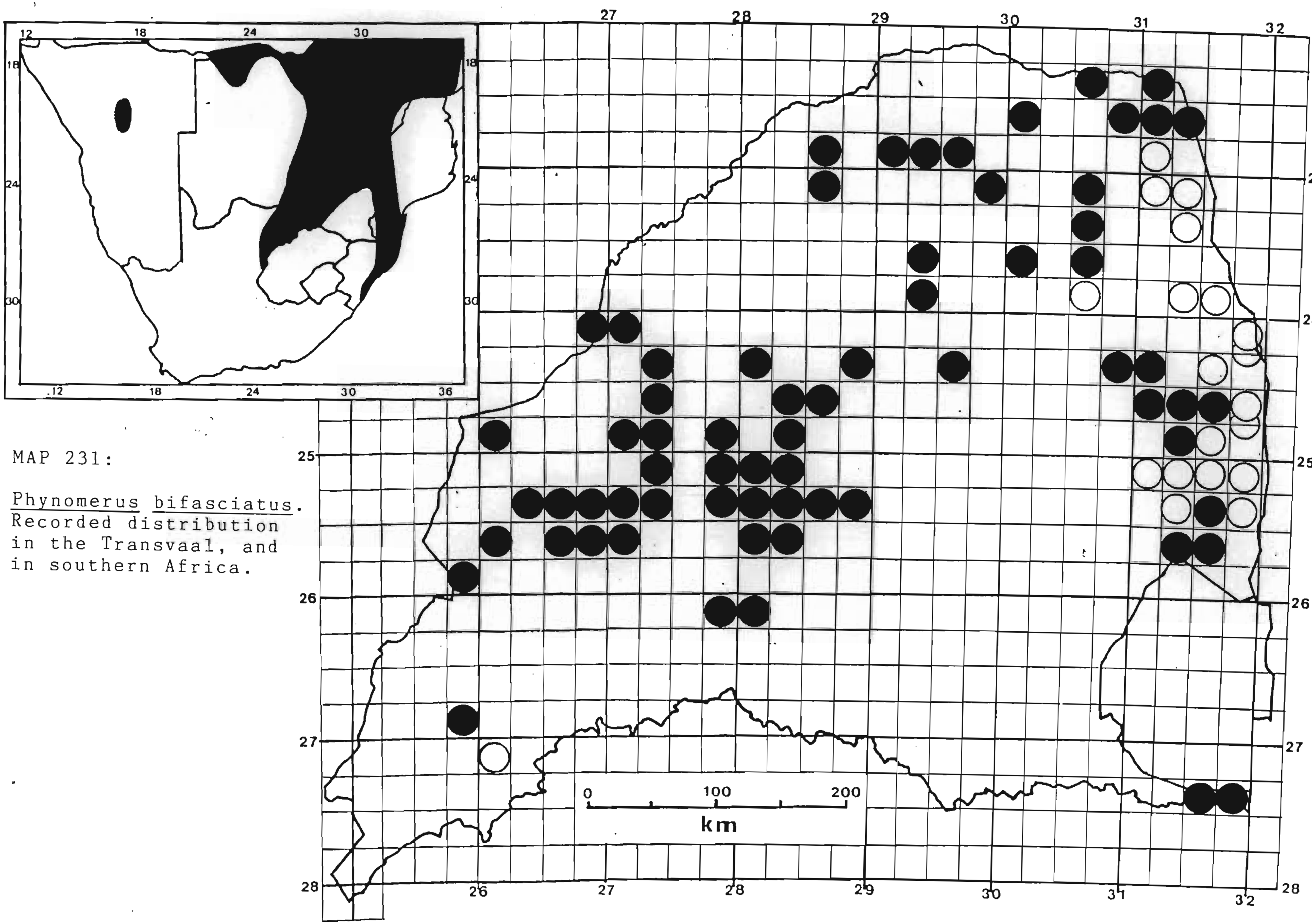
Diagnosis. 106 Specimens examined.
Colour: Black and shiny with pink to orange-red dorsolateral stripes extending from above the nostrils posteriorly to the pygeum. Limbs are black blotched with pink to orange-red above. Ventrally marbled dark grey-black with off-white.
Morphology: A distinctive frog. Largest male SVL = 53,0 mm (N5416 - Humanskraal 346IO), mass = 15,5 g (N5416); Largest female SVL = 63,0 mm (N5659 - Rolle 235KU), mass = 17,0 g (N5659). Mean male SVL (30,0 mm) = 43,47 mm $\pm$ 6,36 (1SD), n = 19, mass = 7,68 g $\pm$ 3,26 (1SD), n = 20; Mean female SVL (30,0 mm) = 39,18 mm $\pm$ 7,45 (1SD), n = 25, mass = 5,03 g $\pm$ 3,60 (1SD), n = 26. Skin smooth, able to exude an irritating mucus. Canthus rostralis angular. Tips of toes and fingers dilated into discs, truncated anteriorly and markedly out of alignment with rest of digit.

Distribution

KwaZulu north to Mozambique, Transvaal and northern Cape Province, thence through Botswana and Zimbabwe to central and east Africa. An apparently isolated population occurs in northern South West Africa.

Distribution in the Transvaal (Map 231).

Bokfontein 396JP; Buffelspoort 421KR; Bultfontein 178JQ; Dambale Hills; Donkerpoort 344KQ; Glen Alpine 304LR; Grootfontein 115JO; Hans Merensky Nature



MAP 231:

Phynomerus bifasciatus. Recorded distribution in the Transvaal, and in southern Africa.

Reserve; Hectorspruit; Hoedspruit; Houwater 54JQ; Humanskraal 346IO; Ireagh 263KU; Johannesburg, Nourse Mine; Johannesburg, Roodepoort Deep Mine; Kalkfontein 615LS; Kalkgat 554LS; Kent 57KU; Klipfontein 205JR; Langjan Nature Reserve; Louws Creek; Lydenburg, Glad River; Mabelikwa; Machayi Pan; Magamba; Malamala Buitepos, KNP; Manyeleti Game Reserve, Hermitage 205KU; Manyeleti Game Reserve, Main Camp; Medfordt Park 52JP; Modderpan 42KQ; Mooivlei 4LP; Moorddrift 289KR; Morgenrood 354LT; Naboomspruit 348KR; New Tar Road, north of Levubu; Nooitgedacht 614JQ; Nylsvley Nature Reserve; Onderstepoort 266JR; Pienaarsriver; Pietersburg; Pongola Nature Reserve; Potgietershoogte 134JQ; Pretoria North; Pretoria, French Tracking Station; Pretoria, Petronella; Pretoria, Pyramid; Pretoriuskop; Punda Milia; Rainpan 60KQ; Rhenosterspruit 59JQ; Rietfontein 179JP; Rietfontein 214JR; Rolle 235KU; Ross 55KU; Rust der Winter; Rust der Winter Nature Reserve; Rustenburg; Rustvoorby 383JP; Shamiriri; Shingwedzi Agricultural Station; Skukuza; Steenbokfontein 426JP; Sweet Home 322KQ; Syferfontein 178JP; Thornhill Farm 171JU; Tshidzi Hill; Tshipise, 40 km south; Vlakbult 450JU; Vlakplaats 535KS; Vogelstruiskraal 397KQ; Vygeboomspruit 29JQ; Warmbaths; Waterpoort; Waterval 220JQ; Waterval 561KQ; Welbekend 117JQ; Welgedacht 130JR; Witklip 100KR; Wonderboom 98KP; Zaagkuildrift 46JR; Zeerust; Zondagfontein 300MR; Zoutpan 104JR; Zwartkop 369KQ.

Literature Records

Gravelotte; Kraaipan; Leeudoringstad; Louis Trichardt; Newington (Poynton 1964).

Habitat and Ecology

Widespread in the wooded savannas of the Transvaal, inhabiting veld types 9, 10, 11, 13, 14, 15, 18, 19, 20, 48 and 67 at altitudes of 200-1450 m a.s.l. Nocturnal, the species is only active after sunset and its characteristic trilling call can be heard echoing from the close vicinity of shallow water bodies. Suitable ephemeral pans and pools must have abundant vegetation, mostly of grass around the fringes. During winter and dry summer weather the animals hibernate and aestivate in a variety of places frequently under rock on rock or on soil, in holes of other animals, hollows in trees and branches, under rotting logs and elsewhere. Frequently the frogs have to clamber extensively to reach a desired shelter. Although not recorded to date, these amphibians will also secrete a skin of mucous to prevent dehydration. This 'skin' gives the frog a bluish appearance (Jacobsen 1977). Further observations are required to determine how effective this is in reducing water loss. Mostly single, occasionally two animals may be found together often in the company of other amphibians, lizards, scorpions and whip scorpions usually when hibernating or aestivating. The aposematic coloration serves to identify the species as being inedible. Having accidentally rubbed my eyes subsequent to handling these frogs I can testify to the defensive efficacy of the mucus exuded. When molested, will stretch the hindlimbs and inflate its body, walking off in a swaggering manner. These frogs are also largely myrmecophagous, consuming mostly Hymenoptera-Formicidae, also Isoptera Orthoptera and Araneae (Jacobsen, 1982). Breeding takes place in summer once sufficient rain has fallen to provide the shallow water bodies needed for reproduction to take place. According to Lambiris (1988) about 600 eggs are laid together, entangled among the vegetation in shallow water.

Conservation Status

Unprotected, barring for export control from the province (Transvaal Nature Conservation Ordinance 12 of 1983). Occurs widespread in the Kruger National Park and several provincial nature reserves. Although the range of the species has been reduced through habitat destruction such as in the south western Transvaal and on the Springbok flats, it is secure.

Family RANIDAE

Genus *Pyxicephalus* Tschudi, 1838

Pyxicephalus Tschudi, 1838, *Classif*. *Batr*., pp. 46, 83. Type species by designation of Boulenger (1918): *P*. *adspersa*.

Large amphibians with the pupils of the eyes horizontal. Lower jaw with two large canine-like projections and a smaller central cusp. Vomerine teeth present lying between the choanae. A single gular pouch is present in males. Procoracoid-clavicular bars are ossified and the omosternum slightly forked. The toes are webbed and the inner metatarsal tubercle is large and well-developed. Fossorial frogs emerging from their burrows only during the breeding season and then only once sufficiently heavy showers of rain have fallen to permit the establishment of shallow ephemeral pools in which breeding and foraging take place. During lengthy dry periods, the frogs spend their time buried in the soil and form cocoons (Parry & Cavill, 1978, Parry 1982) which inhibit dessication. Two species are currently recognised and endemic to the African continent. Only one species *P*. *adspersus* Tschudi occurs in the Transvaal and is split up into two subspecies *adspersus* and *edulis*. The former prefers moister climates and the latter more arid conditions. Owing to an overlap in most characters they are difficult to separate but differ considerably in colour and size, *edulis* never reaching the large size of *adspersus*. Some overlap of the two subspecies occurs in the Transvaal including Pretoria and Pongola. Elsewhere the subspecies are largely allopatric.

Key to the Transvaal subspecies (after Parry, 1982 and Poynton & Broadley, 1985b).

1. Dorsal surface uniform; no interorbital bar present, no clear pattern on upper jaw, or if present blurred by light stippling. Head width more than 49% of SVL .... P. adspersus adspersus

Dorsal surface with pattern of round blotches; facial markings clear; throat immaculate and pale yellow, or with dark spots around the margins. Interorbital bar present. Head width 49-41% of SVL .... P. adspersus edulis

Pyxicephalus adspersus adspersus Tschudi, 1838

Pyxicephalus adspersus Tschudi, 1838, Classif. Batr. pp. 46 & 84. Type locality: "Promontorium Bonae Spei" = Cape Peninsula. Poynton 1964, p. 93 (part); Van Dijk 1966, pp. 245, 252, 258; Wager 1965, p. 130, figs; Stuckenberg 1969, p. 152; Van Dijk 1971(b), p. 114; De Waal 1980, p. 103; Passmore & Carruthers 1979, p. 115, figs (part).
Pyxicephalus adspersus adspersus Tschudi. Parry 1982, p. 285, fig. 2; Wager 1986, p. 84, figs; Poynton & Broadley 1985b, p. 122; Auerbach, 1987, p. 43, (part) pl. 5, fig. 2; Lambiris 1988, p. 144; Branch 1988b, p. 3.

Diagnosis. 48 Specimens examined.
Colour: Adults uniform olive- to dark-green dorsally, sometimes mottled blackish green. Underside cream to yellow, with orange-yellow armpits. Juveniles brightly marked dorsally with stripes of pale green between areas of dark green. Limbs also spotted or blotched with dark- green. Ventrally cream.

Morphology: Largest male SVL = 165,0 mm (N5507 - Holfontein 279IP), mass = 483,0 g (N5507); Largest female SVL = 188,0 mm (N5007 - Calais 563KS), mass = 590,0 g (N5007). Poynton & Broadley (1985) record maximum size up to 207,0 mm. A large obese frog when adult. Limbs thick and stocky. Snout tapered but head broad, more than 49% of body length (snout to urostyle). Dorsum with a number of longitudinal elevated skin folds. Three toothlike projections are present in the lower jaw.

Distribution

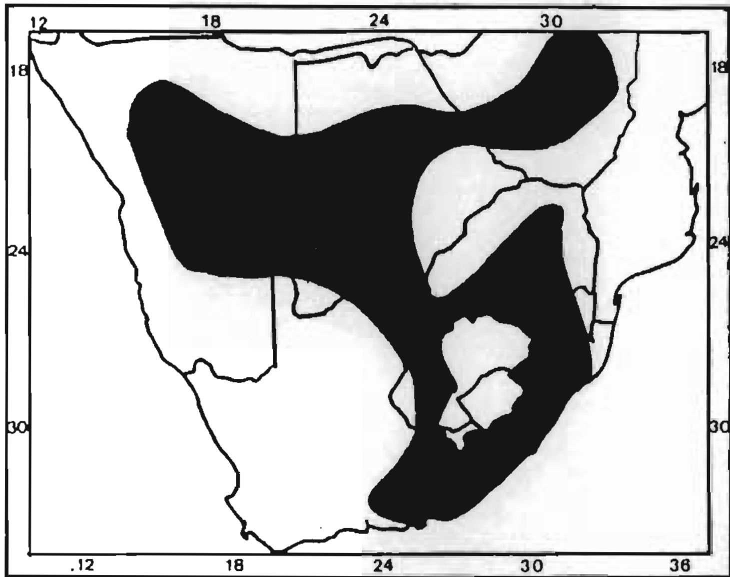
North-eastern and northern Cape Province, the western half of the Orange Free State, northern Natal/Kwazulu, the southern and central Transvaal and thence northwards including Botswana and central South West Africa.

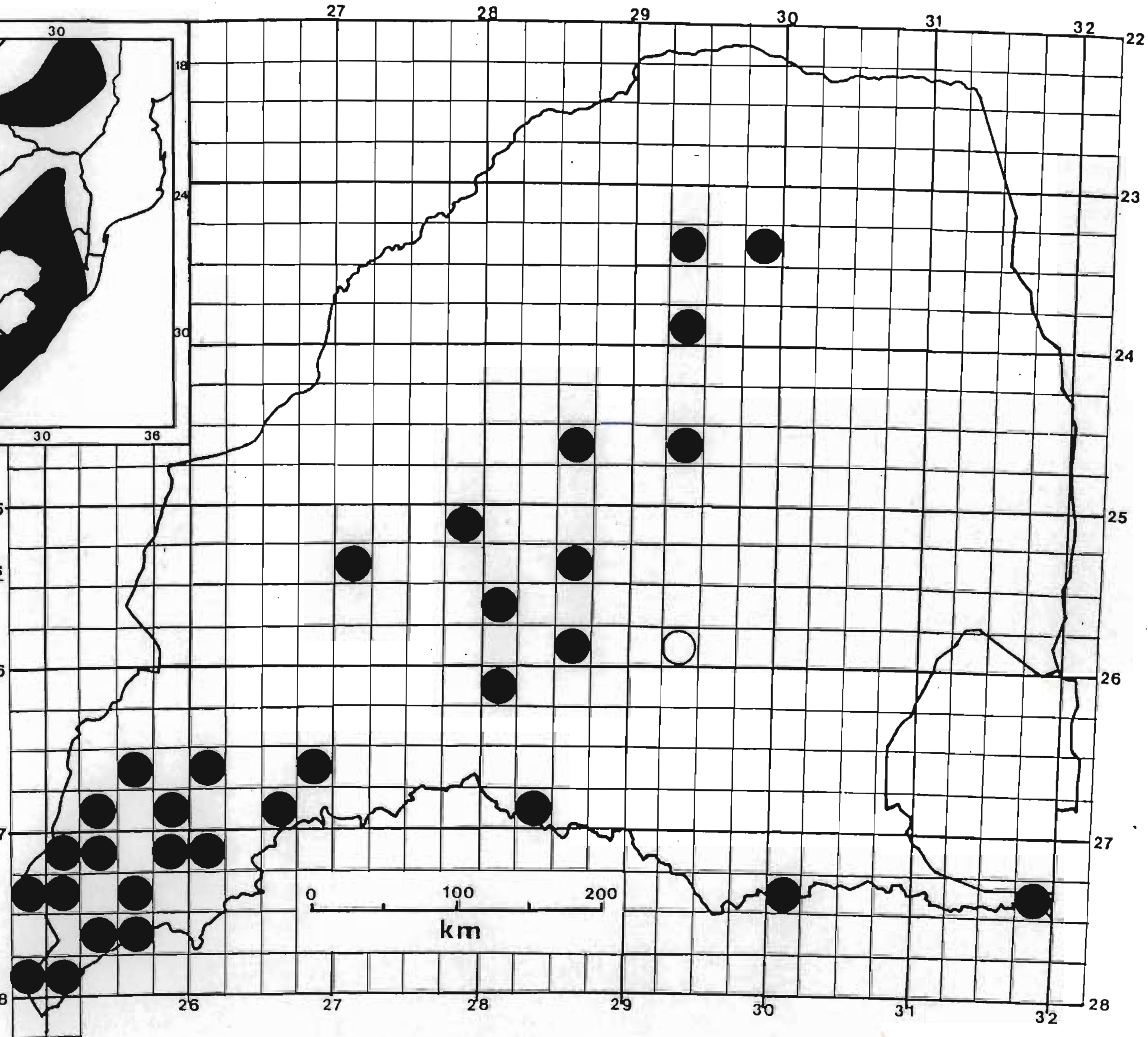
Distribution in the Transvaal (Map 232).

Amsterdam 116LS; Barberspan Nature Reserve; Beerlaagte 494IR; Bloemhof; Boschkopje 519LS; Boschrand 158HO; Calais 563KS; Christiana 325HO; De Grens 168JQ; Eleazar 377IP; Gezicht 265HO; Grootplaats 29HN; Holfontein 279IP; Hondsrivier 508JR; Humanskraal 346IO; Johannesburg; Kameelpan 276HO; Kareelaagte 70HO; Lot 19 20HO; Lot 43 250IO; Louwpan 41HP; Nylsvley Nature Reserve; Orkney 437IP; Pietersburg; Pongola Nature Reserve; Pretoria; Pretoria, Kilner Park; Pretoria, Zoological Gardens; Rietfontein 214JR; Uitvalskop 14HN; Vaalboschfontein 188HO; Wakkerstroom; Zuiverfontein 58JQ.

Literature Records

Middelburg (Parry, 1982); Suikerbosrand Nature Reserve (Carruthers, 1978).





MAP 232.

Pyxicephalus adspersus adspersus.
Recorded distribution in the Transvaal, and in southern Africa.

Habitat and Ecology

Pyxicephalus a. adspersus occurs in large concentrations mostly around the pans of the central highveld and to a lesser extent those of the south western Transvaal. It is also found in smaller numbers around ephemeral pools and sand pits in the bushveld of the central Transvaal. Occurs in veld types 6, 12, 14, 16, 18, 48, 50 and 61 at altitudes of 160-1700 m a.s.l. Distinctly seasonal, this frog does not emerge from hibernation until sufficient rain has fallen to provide shallow water bodies in which the species can reproduce. Frequently their emergence is triggered by high intensity storms, rapidly providing the necessary water bodies. Often associated with sandy areas, moving extensively to breeding pools often in abandoned sand excavation pits. Subadults and adults were only recorded from October to February. Most adults were only evident over a relatively short period of three months. The remainder of the year is spent in hibernation, at which time they form a cocoon to prevent excessive dehydration. Parry & Cavill (1978) and Loveridge & Craye (1979) have described the structure of the cocoon and discussed its formation. While the problems of nitrogenous waste excretion associated with a relatively impervious cocoon are still to be explained, this may not differ significantly from other seasonal amphibians which are also highly dependent on retaining moisture while in hibernation.
Pyxicephalus adspersus feeds on a variety of prey (Grobler 1972, Wager 1965, 1986, Broadley 1966c, Branch 1976). While this is in keeping with the short active period exhibited by these frogs, it also shows that they are able during favourable periods to ingest sufficient food to tide them over the extended period of hibernation. This is borne out by two adults bullfrogs

containing 17 new born rinkhals and a young chicken respectively, (Branch, 1976). Grobler (1972) discussed mating and spawning behaviour which are apparently initiated by a heavy downpour of rain. The ova hatch in two days (Wager 1965). Growth of young frogs appears to be rapid and dependent on an adequate food supply (Wager, 1965, Grobler, 1972). Juveniles usually reach a SVL of 50-80 mm by the time they enter hibernation (Grobler 1972, pers. obs.).

Conservation Status

Protected. Schedule 2, Transvaal Nature Conservation Ordinance 12 of 1983. The species is on the decline over much of its range. The large scale development of conurbations over much of the species' optimum habitat, particularly on the East Rand have had a dramatic impact on their traditional stronghold. Elsewhere the species is widespread but densities are low, owing to large scale habitat alterations, limited breeding habitat and a burgeoning human population. The species is vulnerable to habitat destruction and monitoring of highveld pans should be undertaken.

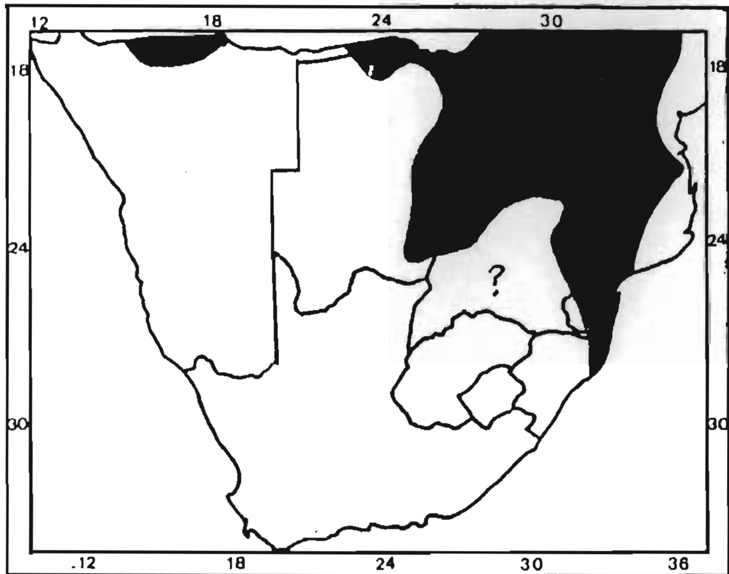
Remarks

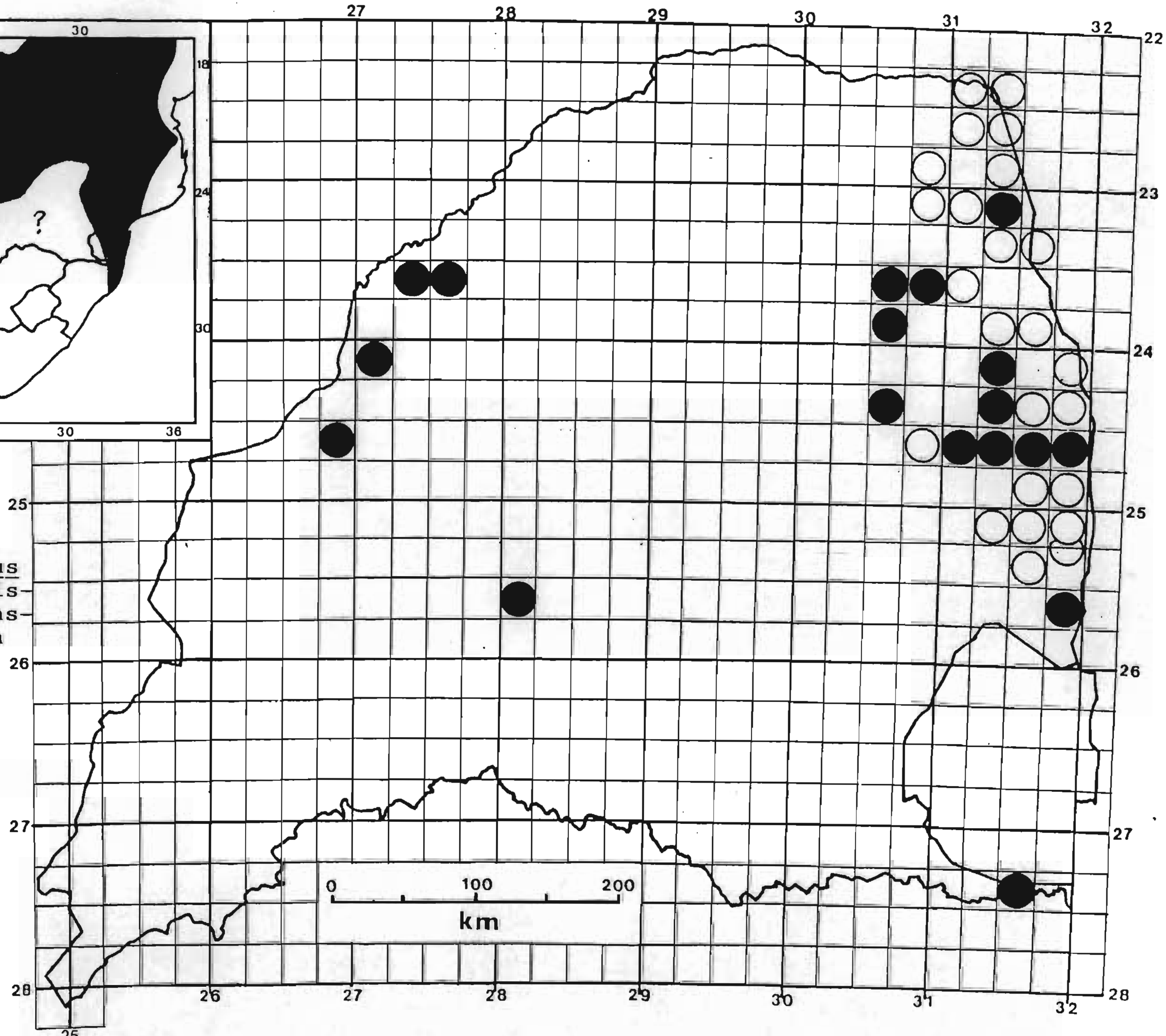
Lambiris (1988) remarks on the illustrations in Poynton (1964), Wager (1965) and Passmore & Carruthers (1979). In the latter the illustrations on p. 114 appear to have been transposed and the caption to the lower illustration should probably read subadult, Tshaneni, Swaziland. The upper picture is clearly that of a juvenile and not a subadult. Sympatry between <u>'adspersus'</u> and <u>'edulis'</u> appear at Pretoria but apparent overlap in markings (Poynton & Broadley, 1985b) may not support this diagnosis and further analysis may be needed. This would also apply to the Pongola specimen. However I echo Poynton & Broadley (1985b) in suggesting that the taxonomic and geographic separations presented here are tentative until the validity of the taxa and diagnostic morphological characters can be assessed over the total range of the species.

Pyxicephalus adspersus edulis Peters, 1854

Pyxicephalus edulis Peters 1854, *Monatsb. Akad. Wiss. Berlin*, p. 626. Type locality: Boror, Tete and Mozambique Island.
Pyxicephalus adspersus (non Tschudi). Poynton 1964, p. 93 (part, fig. 47); Wager 1965, (part, fig. 13); Broadley 1966c, p. 488 (part); Pienaar et al, 1976, p. 32, fig. xi; Passmore & Carruthers 1979, p. 114, (part, fig.).
Pyxicephalus adspersus edulis Peters. Parry 1982, p. 281, figs. 3 & 6; Poynton 1980, p. 246; Poynton & Broadley 1985b, p. 123; Wager 1986, p. 86; Auerbach 1987, p. 44, pl. 5, fig. 3; Lambiris 1988, p. 147; Branch 1988b, p. 3.

Diagnosis. 30 Specimens examined.
Colour: Dorsally brown to pale brown with dark blotches. A cream to pale yellow-brown vertebral stripe extends from the snout tip to the urostyle. A dorsolateral broad to narrow irregular pale stripe extends from the posterior margin of the eye to the inguinal region. Ventrally cream to yellow, the latter more pronounced ventrolaterally.
Morphology: Largest male SVL = 93,0 mm (J1881 - Kameellaagte 61KQ), mass = 78,2 g (J1769 - KaKheyi); Largest female SVL = 101,0 mm (J6519 - Helena 400JU), mass = 97,0 g (N5680 - Rolle 235KU). A much smaller form than *adspersus*. Snout more tapered than the former and





MAP 233.

Pyxicephalus adspersus edulis. Recorded distribution in the Transvaal, and in southern Africa.

head width from 41,0 - 49,0% of SVL. Dorsum less ridged than in adspersus.

Distribution

Zululand and Mozambique northwards and westwards through the Transvaal, Botswana, northern South West Africa to Zimbabwe and central, east and West Africa (Parry, 1982, Poynton & Broadley, 1985b).

Distribution in the Transvaal (Map 233).

Argyle 46KU; Dublin 218KT; Dzumeri; Ellisras; Griffin Mine; Helena 400JU; Ka Khayi; Kameellaagte 61KQ; Manyeleti Game Reserve, Buffelshoek 340KU; Manyeleti Game Reserve, Hermitage 205KU; Manyeleti Game Reserve, Hermitage Dam; Manyeleti Game Reserve, Main Camp; Manyeleti Game Reserve, Mohlwareng Hill; Nooitgedacht 614JQ; Pentonville 216LQ; Pretoria; Rolle 235KU; Ross 55KU; Satara - 30 km S.; Verpoort 161KP.

Literature Records

Mariepskop slopes (Parry, 1982). Beacon 7, Nyandu; Dakamila; Hildebrandtia Pan; Klopperfontein Dam; Levubu; Malonga; Masbambela Picket; Mbanyamidemond; Napi Road; Ngirivane; Nkwane Pan; Satara; Shingwedzi; 30 km S. of Satara on road to Tshokwane; 5 km W. of Shingwedzi; 12-17 km N. of Levubu (KNP Records).

Habitat and Ecology

Mainly restricted to low lying areas ranging from 200-1500 m a.s.l. in veld types 10, 11, 13, 14, 15 and 18. Usually found around shallow ephemeral pans in open woodland often along roads. One individual collected in burrow under a rock. Presumably also buries itself during the long dry winter months and forms a cocoon (Parry, 1982). Hibernation probably lasts longer than that of adspersus owing to the areas of greater aridity occupied by this subspecies in the Transvaal. Little is known of this taxon.

Conservation Status

Protected. Schedule 2, Transvaal Nature Conservation Ordinance 12 of 1983. An indeterminate species owing to the paucity of specimens and localities. Much of its habitat is secure and it is widespread in the Kruger National Park. Status appears secure, but the total distribution of the species needs to be clarified.

Remarks

The apparent overlap in markings between edulis and adspersus can be confusing and account for aberrant records at Pretoria in the case of the former or Pongola in the case of the latter. Pretoria is equally the home to many translocated species of South African herpetofauna. The edulis could therefore possibly have been translocated and may not reflect the true range of the subspecies. It is therefore suggested that this record be viewed with caution, particularly as so many typical adspersus have been observed around Pretoria (pers. obs.).

Genus *Tomopterna* Duméril & Bibron, 1841

Tomopterna Duméril & Bibron 1841, *Erpét*. *Gén*. 8, p. 443. Type by designation of Boulenger 1918: *Pyxicephalus delalandii* Tschudi 1838.

Small burrowing frogs with pupil of eye horizontal. Vomerine teeth are present. A single weakly developed gular pouch in males and exceptionally external longitudinal skin folds parallel to the jaw. Squamosal not articulating with the maxillary bone. Omosternum slightly to moderately forked. Metasternum ossified and slender. Clavicles straight, transverse and approaching each other medially. Feet well developed and toes webbed. Metatarsals bound into a fleshy sole. Inner metatarsal tubercle large and flange-like. A widespread genus in Africa south of the Sahara but also in India. Members are strong burrowers mostly found in arid regions although some forms occur in moister environments. Burrowing is facilitated by the enlarged inner metatarsal tubercle and is performed backwards and down. The eggs are laid in water and there is a short aquatic phase. These characteristics enable them to inhabit or even become the dominant element in arid areas. Thirteen species are currently recognised of which only six occur in Africa, four being found in the Transvaal.

Key to the Transvaal species.

1. Tubercles at base of thumb are single 2
   Tubercles at base of thumb are divided or only partly so .... *T. krugerensis*

2. Webbing reaching distal tubercles of fifth toe and therefore less than 2 phalanges of 5th toe free of web .... T. marmorata
   Webbing not reaching distal tubercle of fifth toe and more than 2 phalanges of fifth toe free of web 3

3. Webbing not reaching middle subarticular tubercle of fourth toe. A light occipital patch and frequently a pale thin vertebral line present .... T. cryptotis
   Webbing terminating at or near middle subarticular tubercle of fourth toe, with up to 4 phalanges free of webbing .... T. natalensis

Tomopterna cryptotis (Boulenger, 1907)

Rana cryptotis Boulenger, 1907, Ann. Mag. Nat. Hist., 20 (7), p. 109). Type locality: Mossamedes, Angola.
Pyxicephalus delalandii cryptotis (Boulenger). Poynton 1964, p. 96, fig. 49; Wager, 1965, p. 134, figs.; Broadley 1966, p. 490.
Pyxicephalus delalandei cryptotis (Boulenger). Van Dijk 1971b, p. 114.
Pyxicephalus delalandii (non Tschudi). Van Dijk 1966, p. 265 (part).
Pyxicephalus delalandei (non Tschudi). Stuckenberg 1969, p. 152.
Tomopterna delalandei cryptotis (Boulenger). Pienaar et al, 1976, p. 34, figs. xii-xiv.
Tomopterna cryptotis (Boulenger). Passmore & Carruthers 1979, p. 120, figs; Poynton 1980, p. 246; De Waal 1980, p. 104; Frost 1985, p. 523; Wager 1986, p. 86, figs;

Poynton & Broadley 1985b, p. 125; Auerbach 1987, p. 44, pl. 5, fig. 4; Lambiris 1988, p. 152; Branch 1988b, p. 3.

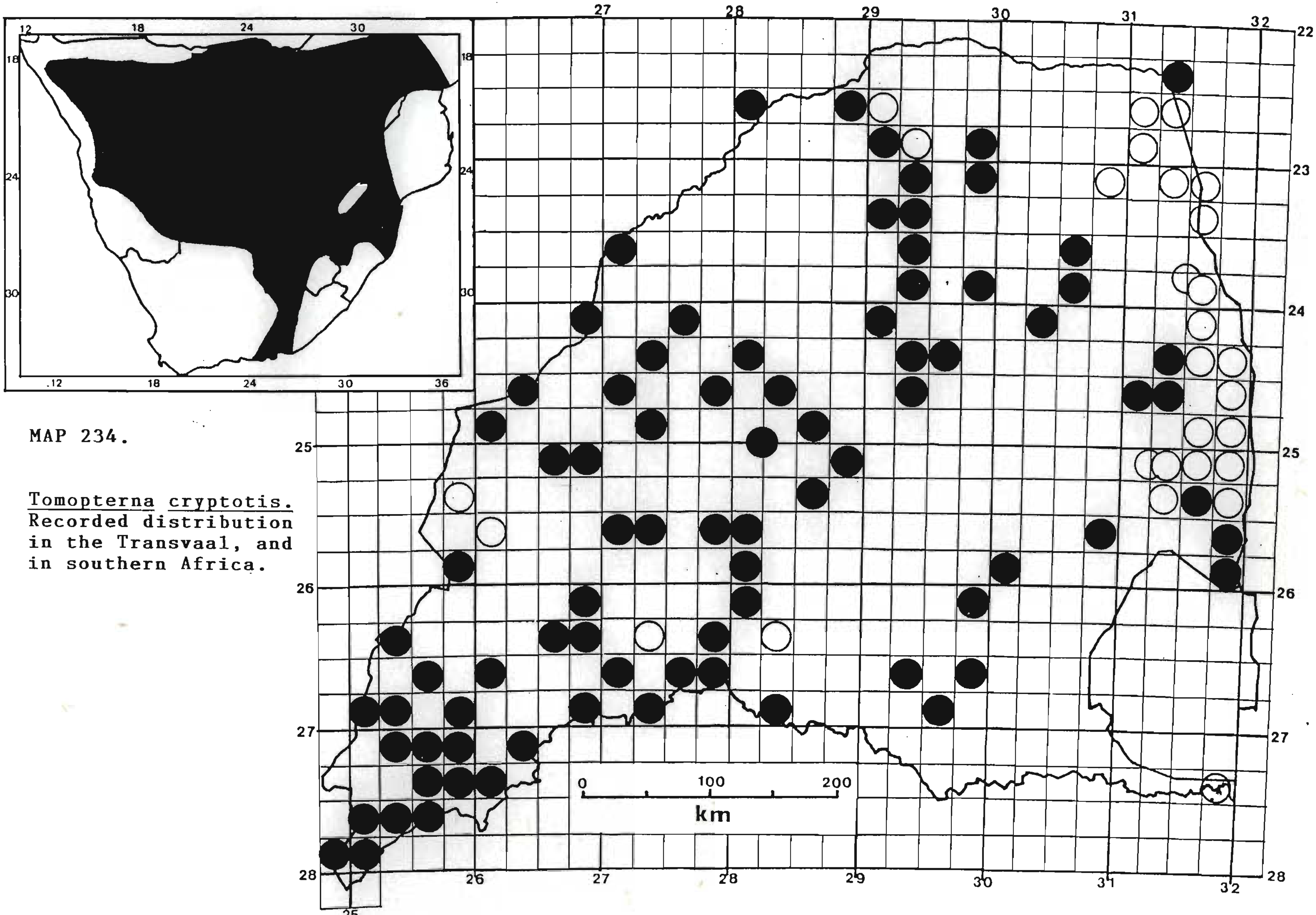
Diagnosis. 213 Specimens examined.
Colour: Marbled grey and brown to olive, frequently with a pale vertebral line and, or a pale occipital patch. Occasionally a pair of pale dorsolateral lines. Pinkish- or orange-brown dark edged ocelli scattered on dorsum. Ventrally white.
Morphology: Largest male SVL = 45,0 mm (N5910 - Vaalboschfontein 188HO), mass = 11,0 g (N3085 - Kalkgat 554LS); Largest female SVL = 58,0 mm (J1974 - Malmaniesrivier 236KQ); mass = 23,8 g (N2977 - Percy Fyfe Nature Reserve). Mean male SVL (25,0 mm) = 36,71 mm ± 4,16 (1SD), n = 34, mass = 5,45 g ± 2,20 (1SD), n = 30; Mean female SVL (25,0 mm) = 39,52 mm ± 9,17 (1SD), n = 48, mass = 8,70 g ± 6,07 (1SD), n = 46. Infratympanic gland tending to form a continuous ridge and usually white; subarticular tubercles of thumb single. Inner metatarsal tubercle more than 140% length of second toe. Webbing does not reach middle subarticular tubercle of fourth toe. Therefore at least 3 phalanges of fourth toe (usually 3,5) and 2 of fifth toe free of web.

Distribution

Most of subsaharan Africa in savanna areas. Appears to be absent from the southern and western Cape Province, southern Natal and parts of the Transkei.

Distribution in the Transvaal (Map 234).

Amsterdam 116LS; Andover 210KU; Appeldraai 182IP; Barberspan Nature Reserve; Beerlaagte 494IR; Ben Lavin



MAP 234.

Tomopterna cryptotis. Recorded distribution in the Transvaal, and in southern Africa.

Nature Reserve; Bleskop Siding; Bloemhof; Brits; Buffelsfontein 443IP; Buffelshoek 171IQ; Calais 563KS; Canterbury 254MR; Carpediem 76KT; Christiana 325HO; Clearwaters, Haenertsburg; Cumbrae 144LS; Eersteling 63HP; Eerstelingsfontein 406JT; Elandsfontein 335KQ; Ermelo; Essexvale 61MR; Glaudina; Goedgevonden 149JP; Griffin Mine; Groenfontein 458KQ; Grootplaats 29HN; Halfway House; Hans Merensky Nature Reserve; Hectorspruit; Helena 400JU; Holfontein 279IP; Humanskraal 346IO; Johannesburg; Kalkgat 554LS; Kameelpan 276HO; Kunana Location 4IO; Kwa Sipunu; Laaste Poort van Marico 86KP; Langjan Nature Reserve; Leeuwfontein 185HO; Lorasa 258IO; Lot 43 250IO; Lot 6 48HO; Malmaniesrivier 236KQ; Manyeleti Game Reserve, Hermitage 205KU; Mooifontein 597KR; Munnik's Farm; Naauwpoort 441KS; Nooitgedacht alias Vetpan 131IP; Orpen; Ottoshoop; Pafuri; Percy Fyfe Nature Reserve; Pietersburg; Platrivier, Waterberg; Potchefstroom; Pretoria; Pretoria, Gezina; Pretoria, Hornsnek; Pretoria, Mayville; Pretoria, Rietfontein; Pretoria, Roberts Heights; Pretoria, Rosslyn; Rainpan 60KQ; Rhenosterfontein 563IQ; Rietfontein 214JR; Rietfontein 219IP; Rietspruit 412KR; Rietspruit 91KQ; Rietvlei 33HS; Rolle 235KU; Ross 55KU; Ruighoek 169JP; Rustenburg; S.A. Lombard Nature Reserve; Sandilands 708MS; Steiltes, Nelspruit; Sterkfontein 299IS; Stompoorfontein 391IQ; Syferfontein 13HP; Syferfontein 293IQ; Syfergat 204HO; Tshipise, 5 km south-west; Tshipise, 35 km south-west; Uthla 239KJ; Vaalbank 163JR; Vaalboschfontein 188HO; Vaalkop 490IS; Van Stadenshoek 12KP; Ventersdorp Dorpsgebied; Vivo; Vlakplaats 535KS; Weltevreden 174IS; Weltevreden 176HO; Wildebeesthoek 310JR; Wintersveld 427MS; Witklip 100KR; Witkop 287LQ; Wonderboom 98KP; Zebediela; Zeerust; Zwartkop 369KQ.

Literature Records

Bridgewater; Ermelo; Gollel; Gravelotte; Haenertsburg; Linokana; Near Heidelburg; Near Nylstroom; Near Zeerust; Salt Pan; Sunningdale, (Poynton 1964). Fayi Roan Camp; Mafayini Waterhole; Marheya Windmill; Napi Road; Ngirivane Windmill; Nwaswitshaka Drift; Nwaswitshakamond; Pumbe Sandveld; Punda Milia; Satara; Shingedzene; Shirimantanga Dam; Skukuza; Stolznek, (KNP Records). Nylsvley Nature Reserve (Jacobsen 1977). Suikerbosrand Nature Reserve (Carruthers, 1978).

Habitat and Ecology

The species occurs throughout the Transvaal with the possible exception of the very high lying areas and along the Transvaal Drakensberg. It is found at altitudes of 200-1700 m a.s.l. and in all veld types. Emerge only during the rainy season and then only during or after showers of rain. The remainder of the time is spent in burrows dug with the aid of the large metatarsal tubercles. They prefer shallow water bodies in which to lay their eggs and and males call constantly from the perimeter of, or in very shallow water. On the Nylsvley nature reserve the species was commonest in the sandy Burkea woodland but moved out to breed in temporary shallow waterbodies. In the Burkea woodland savanna, they fed on Coleoptera, Isoptera, Araneae and Orthoptera (Jacobsen, 1982).

Conservation Status

Unprotected, with the exception of export restrictions (Transvaal Nature Conservation Ordinance 12 of 1983).

However it is widespread and occurs throughout the Kruger National Park and most provincial nature reserves. The status is secure.

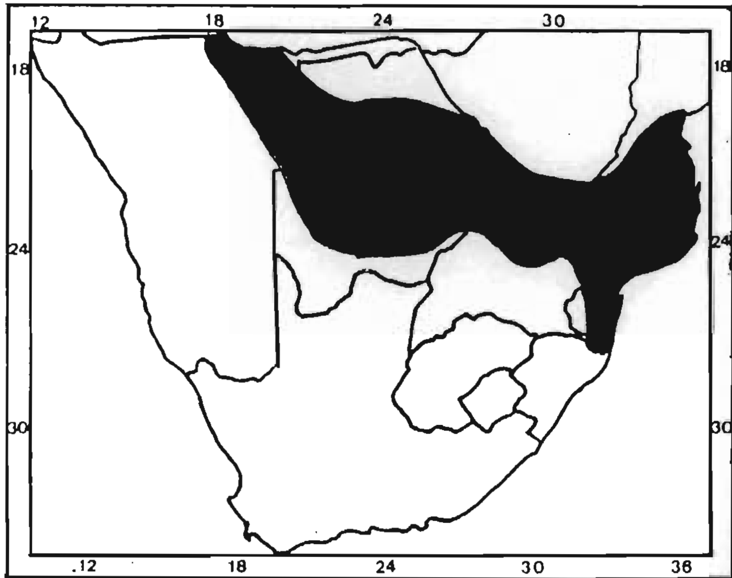
Remarks

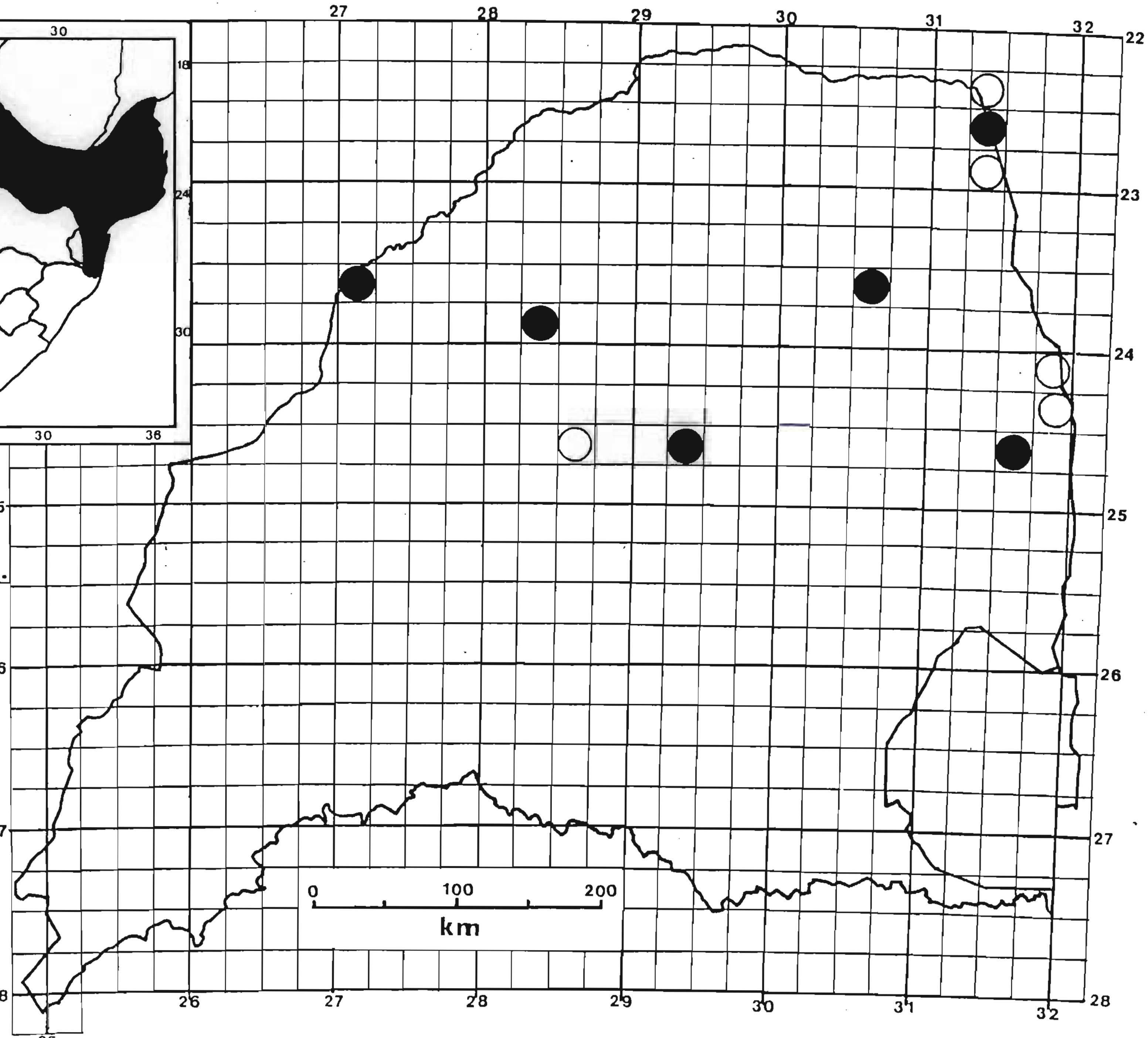
Difficulty is experienced in separating this species from *krugerensis* and *natalensis* on occasions.

Tomopterna krugerensis Passmore & Carruthers, 1975

Tomopterna krugerensis Passmore & Carruthers, 1975, Koedoe 18, p. 32. Type locality: Machayi pan, Kruger National Park. Pienaar et al, 1976, p. 38, fig. xv; Passmore & Carruthers 1979, p. 122, figs; Poynton 1980, p. 246; Frost 1985, p. 524; Poynton & Broadley 1985b, p. 127; Auerbach 1987, p. 45; Lambiris 1988, p. 154; Branch 1988b, p. 3.

Diagnosis. 20 Specimens examined.
Colour: Variable dorsally, greyish-brown with darker olive, irregularly shaped blotches which become even darker laterally. Scattered red-brown dark edged ocelli over back. A well developed dark interocular bar present, followed posteriorly by a light patch. Occasionally a pale line extends from the snout to the vent. Dorsolateral light lines only very rarely present. Ventrally white with grey pigmentation under the chin, becoming more pronounced in males.
Morphology: Largest male SVL = 51,0 mm (N2282 - Witkop 287LQ), mass = 13,0 g (N2282); Largest female SVL = 58,0 mm (N3998 - Calais 563KS), mass = 23,3 g (N3998). Mean SVL = 46,83 mm $\pm$ 7,76 (1SD), n = 6, mass = 12,38 g $\pm$ 6,78 (1SD), n = 5. Infratympanic gland tending to form a continuous ridge. At least the proximal subarticular tubercle of first finger (thumb) double. Inner





MAP 235.

<u>Tomopterna</u> <u>krugerensis</u>. Recorded distribution in the Transvaal, and in southernr Africa.

metatarsal tubercle more than 140% length of second toe. Webbing usually not reaching middle subarticular tubercle of fourth toe, with up to 3,5 phalanges free of web, and two phalanges of fifth toe.

Distribution

North-eastern South West Africa/Namibia eastwards through central Botswana, northern Transvaal to southern Mozambique, Swaziland and northern Natal/Kwazulu.

Distribution in the Transvaal (Map 235).

Calais 563KS; Groot Denteren 533LR; Hans Merensky Nature Reserve; Machayi Pan; Manyeleti Game Reserve, Buffelshoek 340KU; Witkop 287LQ.

Literature Records

Mosdene Private Nature Reserve (Passmore, 1976). Mwambiya Sandveld; Pumbe Pan, (KNP Records).

Habitat and Ecology

Shallow pans in open woodland particularly in areas with a sandy soil are frequented. According to Passmore & Carruthers (1979) the males call from partly concealed positions at the waters' edge, but in their description of '_krugerensis_' they say that some calling males were found up to 3 m from water and that most were within 1 m of the edge. During the day they live in burrows rapidly dug with the hind feet (for greater detail see Passmore & Carruthers, 1975).

Conservation Status

Unprotected except for limited export control (Transvaal Nature Conservation Ordinance 12 of 1983). A rare, patchily distributed species which is protected in the Kruger National Park and one or two provincial nature reserves. Status secure.

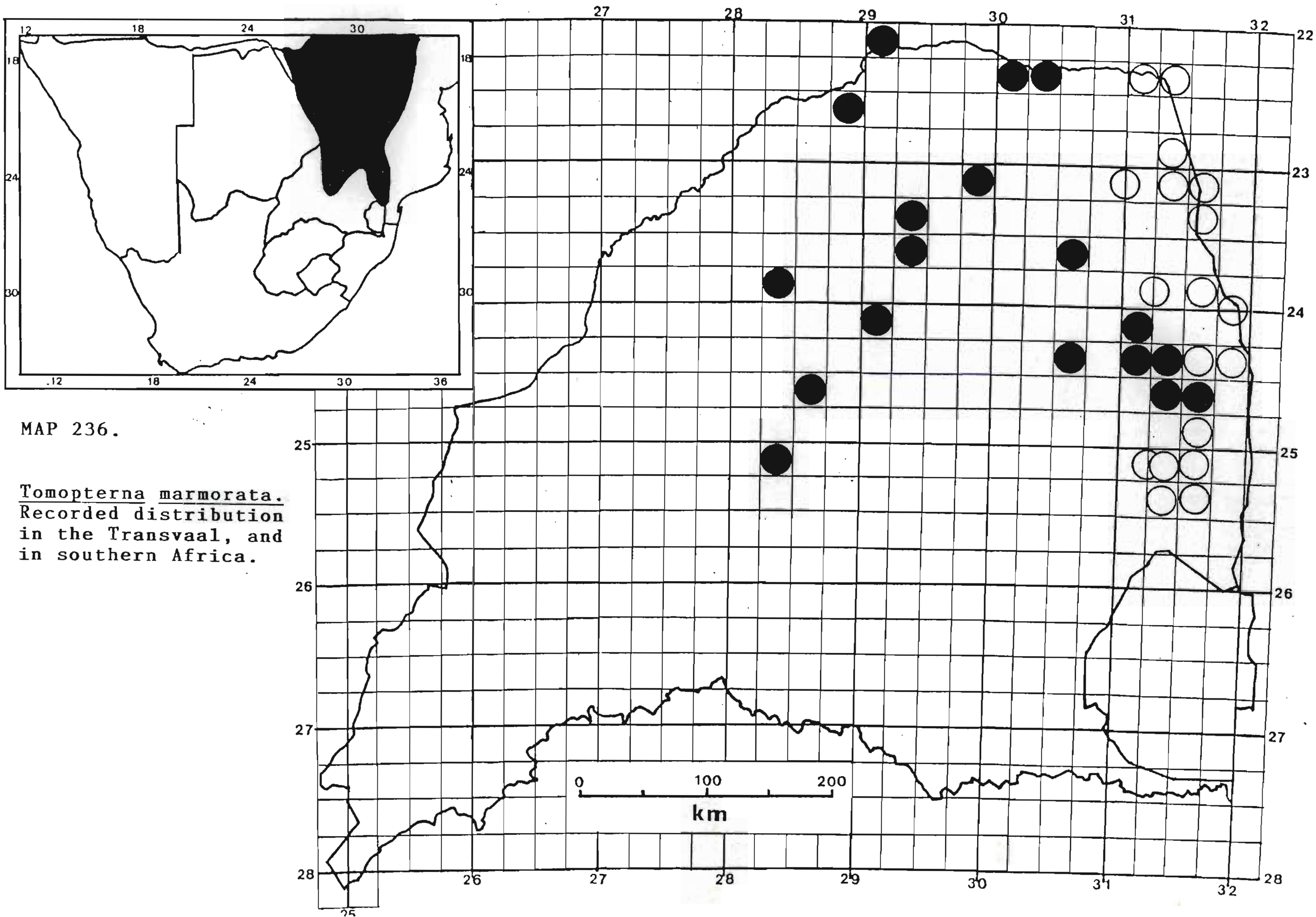
Remarks

Poynton & Broadley (1985b) refer to the great variability in the distinguishing morphological characters within the species. This is relevant to the degree of webbing between *krugerensis* and *cryptotis* as well as the subarticular tubercles. Concrete evidence separating *krugerensis* from other forms is only evident in the call.

Tomopterna marmorata (Peters, 1854)

Pyxicephalus marmoratus Peters, 1854, *Monatsb. Akad. Wiss. Berlin*, p. 627. Type locality: Boror, Mozambique. Poynton 1964, p. 99, fig. 50; Wager 1965, p. 137, fig.; Broadley 1966c, p. 491; Stuckenberg 1969, p. 152.
Tomopterna marmoratus (Peters). Van Dijk 1966, p. 258; Pienaar et al, 1976, p. 40, fig. xvi.
Tomopterna marmorata (Peters). Van Dijk, 1966, p. 276, 1971(b), p. 114; Passmore & Carruthers 1979, p. 124, figs.; Poynton 1980, p. 246; Frost 1985, p. 524; Poynton & Broadley 1985b, p. 129; Wager 1986, p. 89, fig.; Auerbach 1987, p. 46; Lambiris, 1988, p. 158; Branch 1988b, p. 3.

Diagnosis. 39 Specimens examined.
Colour: Highly variable but usually orange- to reddish-brown, although grey mottled specimens with



MAP 236.

Tomopterna marmorata.
Recorded distribution
in the Transvaal, and
in southern Africa.

red-brown black edged ocelli are also found. One specimen has a vertebral stripe, an occipital patch and obscure dorsolateral stripes. A pale occipital patch is usually present in the species. In the grey to olive-grey specimens a dark interocular bar is usually present. Ventrally white with dark grey mottling under the chin and gular becoming more dense in males.
Morphology: Largest male SVL = 40,0 mm (N3086 - Kalkgat 554LS, 8901 - Hans Merensky Nature Reserve), mass = 5,7 g (N3086); Largest female SVL = 48,5 mm (N511 - Doreen 108MT), mass = 10,8 g (N511). Mean SVL = 39,06 mm ± 5,06 (1SD), n = 8, mass = 6,11 g ± 2,96 (1SD), n = 7. Infratympanic ridge short, along angle of jaw. Subarticular tubercles of thumb (first finger), single. Inner metatarsal tubercle more than 140% length of second toe. Webbing extensive and not more than 3 phalanges of fourth toe and 1-1,5 phalanges of fifth toe free of web. Length of tibia subequal to width of head.

Distribution

Known from north-eastern Natal, northern and eastern Transvaal, Zimbabwe, eastern Botswana, Zambia, Malawi and Mozambique, (Poynton & Broadley, 1985b).

Distribution in the Transvaal (Map 236).

Amsterdam 116LS; Ben Lavin Nature Reserve; Canterbury 2[illegible]4MR; Doreen 108MT; Dublin 86KT; Groot Denteren 533LR; Guernsey 81KU; Hans Hoheisen Research Station; Hans Merensky Nature Reserve; Kalkgat 554LS; Manyeleti Game Reserve, Buffelshoek 340KU; Manyeleti Game Reserve, Hermitage 205KU; Manyeleti Game Reserve, Main Camp; Nylsvley Nature Reserve; Orpen; Percy Fyfe Nature Reserve; Pont Drift 12MS; Ross 55KU; Rust der Winter

Nature Reserve; Scrutton 23MT; Shingwedzi; Venice 40KU; Zeekoegat 12KU.

Literature Records

Crocodile Bridge; Near Kukumezane Pan; Matjulwana Fire break; Nwaswitshaka Drift; Sabie Bridge; Shingedzene; Shingwedzi; Tswiriri (KNP Records).

Habitat and Ecology

Occurs in veld types 8, 11, 12, 14, 15, 18, 19 and 67 at altitudes of 200-1500 m a.s.l. Found in the vicinity of shallow pools in woodland. Little is known of the habits of this species.

Conservation Status

Unprotected except for limited control of the export of these amphibians (Transvaal Nature Conservation Ordinance 12 of 1983). Found in the Kruger National Park and several provincial nature reserves. Status currently secure. Details of habitat requirements and abundance needed.

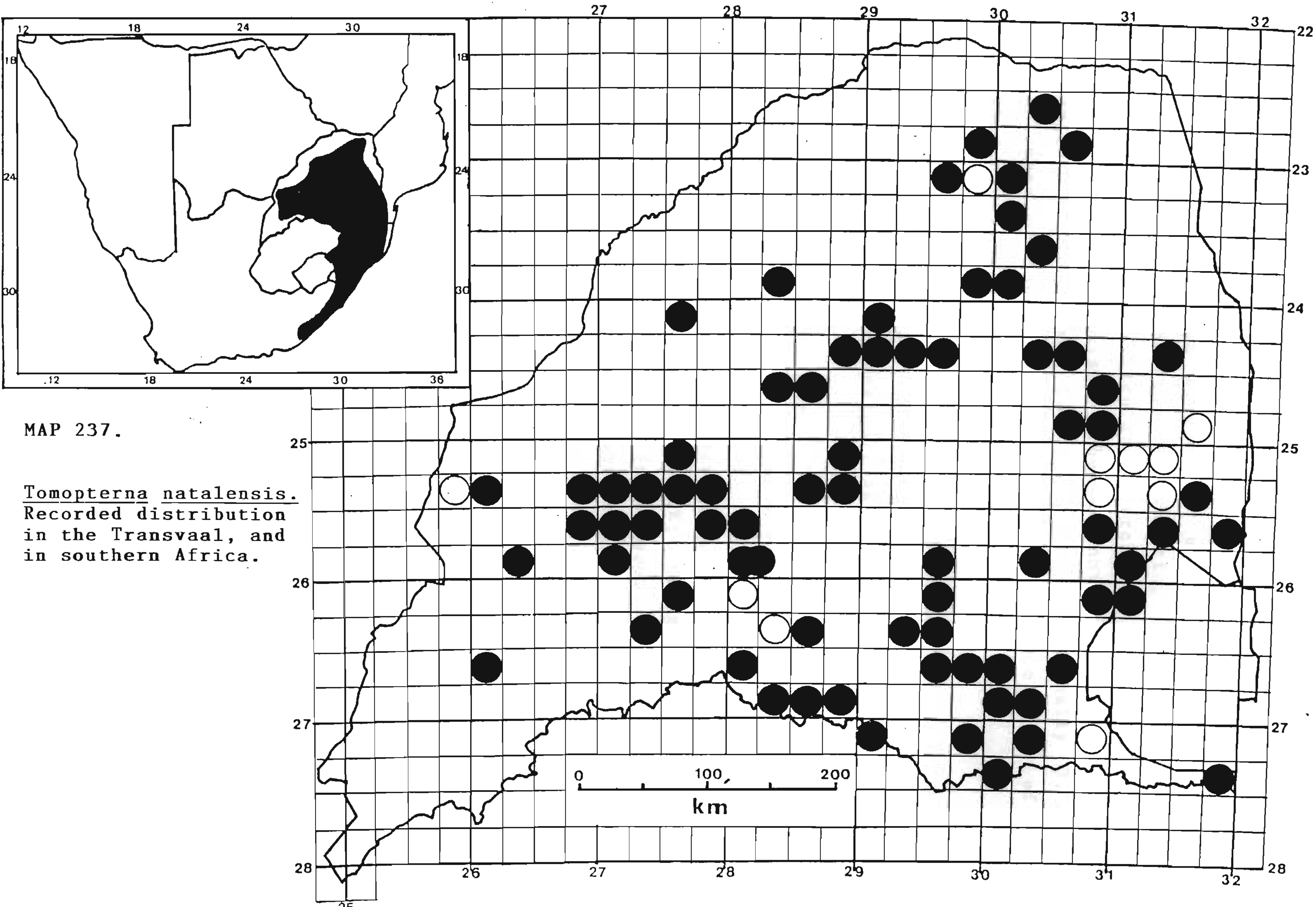
Remarks

Difficult to separate from *cryptotis*, *krugerensis* and even *natalensis* on occasions. The similarity in the degree of webbing and the variability in the subdivision of subarticular tubercles tend to be confusing. The toes also exhibit a lateral fringe of web even where the interdigital web does not reach. This could influence the interpretation of the degree of webbing present. Colour is shared with *natalensis* and also both cryptotis and krugerensis. The peculiar distribution manifested by the species in the Transvaal may possibly reflect the difficulty in separating preserved material.

Tomopterna natalensis (Smith, 1849).

Pyxicephalus natalensis Smith, 1849, Illus. Zool. S. Afr., Rept. App. p. 23. Type locality: eastward of the Cape Colony. Poynton 1964, p. 101, fig. 52; Wager 1965, p. 137, fig.; Broadley 1966, p. 493.
Tomopterna natalensis (Smith). Van Dijk 1966, p. 258, 1971b, p. 114; Pienaar et al 1976, p. 42, fig. xvii; Passmore & Carruthers 1979, p. 124, figs; Poynton 1980, p. 246; Poynton & Broadley 1985, p. 131; Frost 1985, p. 254; Wager 1986, p. 88, fig.; Lambiris 1988, p. 160; Branch 1988b, p. 3.

Diagnosis. 141 Specimens examined.
Colour: Variable above, ranging from a mottled olive grey to a rusty red-brown. A dark line extends from posterior margin of eye to the shoulder fringing a raised glandular area. Limbs banded. A dark continous interocular bar is usually present. A black patch or series of spots along the posterior abdomen anterior to the hind leg or either side. Ventrally white except for chin and gular which is grey in females and blackish in males.
Morphology: Largest male SVL = 39,0 mm (N7686 - Naudes Rust 272JU), mass = 6,9 g (N7686); Largest female SVL = 44,0 mm (P11000 - Marievale Nature Reserve), mass = 8,2 g (J1986 - Malmaniesrivier 236KQ). Mean male SVL (25,0 mm) = 33,75 mm ± 2,64 (1SD), n = 22, mass = 3,83 g ± 1,30 (1SD), n = 21; Mean female SVL (25,0 mm) = 35,68 mm ± 5,36 (1SD), n = 31, mass = 4,77 g ± 1,95 (1SD), n = 29. A relatively small slender frog with a pointed snout. A



MAP 237.

<u>Tomopterna natalensis.</u>
Recorded distribution
in the Transvaal, and
in southern Africa.

glandular ridge from behind the eye to the shoulder converges with a smaller one originating from the corner of the mouth. Subarticular tubercles of first finger single. Inner metarsal tubercle not more than 110% length of second toe but usually less. Usually 3,5 phalanges of fourth toe and two of fifth toe, free of web.

Distribution

Southern Mozambiqe, Transvaal, Natal and the eastern Cape Province.

Distribution in the Transvaal (Map 237).

Abe Bailey Nature Reserve; Arthursrust 219KT; Barberton Townlands 369JU; Beerlaagte 494IR; Bluegumsport 779MS; Blyde River Nature Reserve; Buffelspoort 421KR; Bulhoek 389JP; Clearwaters, Haenertsburg; De Kroon; De Roodepoort 435IS; Diepgezet 388JU; Doorndraai 282KR; Doorndraaidam Nature Reserve; Geelhoutboom 342IT; Groot Denteren 533LR; Haakbosch 79JQ; Haenertsburg; Halfgewonnen 190IS; Halfway House; Handsup 305JU; Hectorspruit; Helena 400JU; Holfontein 279IP; Houwater 54JQ; Irene; Irene Cave; Kalkoenkrans 366IT; Kameelpoort 202JR; Kroondal; Kuilfontein 324JP; Magaliesburg; Mahobieskraal 211JP; Malavuhe; Malemetsa; Malmaniesrivier 236KQ; Maloney's Eye 169IQ; Mara 38LS; Marievale Bird Sanctuary; Mezeg 77JP; Naauwpoort 441KS; Naudes Rust 272JU; Nylsvley Nature Reserve; Ohrigstad Dam Nature Reserve; Oostenryk 92KS; Paardekraal 135LT; Paardeplaats 101HT; Palmietfontein 110IS; Percy Fyfe Nature Reserve; Pongola Nature Reserve; Potberg 30HS; Pretoria, Brooklyn; Pretoria, Kameeldrift; Pretoria, Mayville; Redcliff 246IT;

Rietfontein 214JR; Rietpoort 83HS; Rivola Hill; Roodekrans 457IS; Roodepoort 598IR; Ross 55KU; Rustenburg Nature Reserve; Rustenburg, Kroondal; Speculatie 483JS; Stanley Bush Kop; Steiltes, Nelspruit; Steynsdorp; Suikerboschfontein 422JT; Suikerbosrand Nature Reserve; Trevenna 119MT; Tweerivier 197JQ; Vaalkop 192JQ; Van Oudtshoorn Stroom 261IT; Wakkerstroom Townlands 121HT; Waterval 220JQ; Wilgefontein 644IR; Witbank 236IS; Woodbush; Zandfontein, Rustenburg; Zandspruit 189JR; Zebediela; Zuurbron 132HT.

Literature Records

Graskop; Heidelburg; Hendriksdal; Johannesburg; Linokana; Louis Trichardt; Nelspruit; Piet Retief; Pretoriuskop; Sabie (Poynton, 1964). Outlook 789MS (NMZB).

Habitat and Ecology

Widespread in the Transvaal with the possible exception of the extreme north-west and north-east. Collected in veld types 8, 9, 10, 11, 15, 18, 19, 20, 48, 52, 54, 57, 61 and 63 at altitudes ranging from 200-1700 m a.s.l. Uusally found along shallow streams or amongst wet grass and other vegetation, sheltering in leaf litter or in holes and burrows. Occasionally found around open pans and even at cattle dips. Also takes refuge under rocks on soil.

Conservation Status

Unprotected barring for control in the export of individuals from the province, (Transvaal Nature

Conservation Ordinance 12 of 1983). Occurs in the Kruger National Park and in several provincial nature reserves. Although widespread it is not common. Status is secure.

Genus *Rana* Linnaeus, 1758

Rana Linnaeus, 1758, *Syst. Nat.*, ed. 10, p. 210.
Type by subsequent designation of Fitzinger: *Rana temporaria* Linnaeus.

Typical frogs with a horizontal pupil to the eye. Vomerine teeth present; A single weakly developed gular pouch in males which also lack external vocal apparatus. Omosternum entire, clavicles straight, approaching each other mesially. Length of foot not exceeding distance from tip of urostyle to axilla. Feet well developed and webbed. Outer metatarsal separated from rest of sole by a web; inner metatarsal tubercle compact and small. Ranas are mostly semi aquatic to aquatic frogs as evidenced by the well webbed feet and powerful hindlimbs used when being propelled through the water. Most species are found among rank vegetation, leaping into the water, diving to the bottom. Some are more aquatic and rarely emerge onto 'dry' ground. They appear to be active throughout the year and the calls of the males of some species are often heard even in winter. Almost cosmopolitan, four species occur in South Africa of which only two are found in the Transvaal. The taxonomy and systematics of the genus *Rana* are in need of extensive revision. Poynton (1964, p. 89) gives an extended account of the complexities involved and the genus *Rana* has been split into a number of genera the latest of which, *Strongylopus* has been long in being accepted.

Key to the Transvaal species.

1. Not more than one phalanx of
   4th toe free of web; width of
   head more than 66% of tibia length .... *R fuscigula*

More than one phalanx of
4th toe free of web; width of
head less than 66% of tibia length ... *R. angolensis*

Rana angolensis Bocage, 1866

Rana angolensis Bocage, 1866, *J. Sci. Lisboa*, 1, p. 73. Type locality: Duque de Braganca, Angola. Poynton 1964(a), p. 103-107, fig. 53; Van Dijk 1966, p. 231, figs; Pienaar, Passmore & Carruthers 1976, p. 44-45, fig. (xciii); Jacobsen 1977, p. 11; Passmore & Carruthers 1979, p. 130-131, figs; De Waal 1980, p. 106; Poynton & Broadley 1985(b), p. 132; Wager 1986, p. 66, figs.; Auerbach 1987, p. 46; Lambiris 1988, p. 146; Branch 1988b, p. 3.

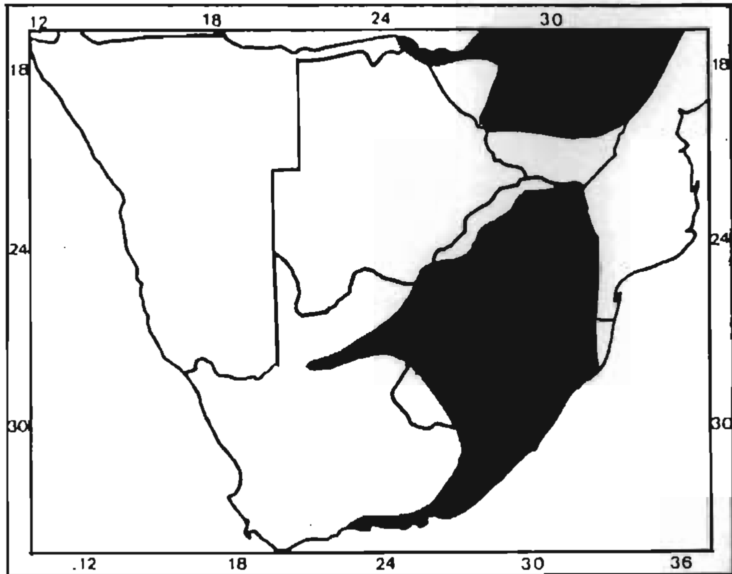
Diagnosis. 443 Specimens examined.
Colour: Variable from bright green dorsally to brown or olive-brown with scattered dark spots or blotches which extend even onto the limbs. A white stripe extends diagonally from below the eye to the axilla. A pale vertebral stripe is usually present. Ventrally white with grey marbling under the gular region and extending ventrolaterally to the inguinal region. Rarely is the entire ventrum marbled.
Morphology: Largest SVL = 82,0 mm (N7151 - Rolle 235KU), mass = 49,0 g (N7151, P8425 - Gillooly's farm); Mean SVL (35,0 mm) = 51,86 mm $\pm$ 10,55 (1SD), n = 35, mass = 14,56 g $\pm$ 10,01 (1SD), n = 35. A large frog, the snout is tapered to an obtuse point. Tympanum large. Feet extensively webbed with from one to two phalanges of fourth toe free of web. Lambiris (1988) records tibia length/SVL 0,55 - 0,72.

Distribution

Mainly upland areas of Ethiopia south to Shaba, Angola, east to Mozambique, most of South Africa excluding the south western Cape (Poynton & Broadley, 1985b).

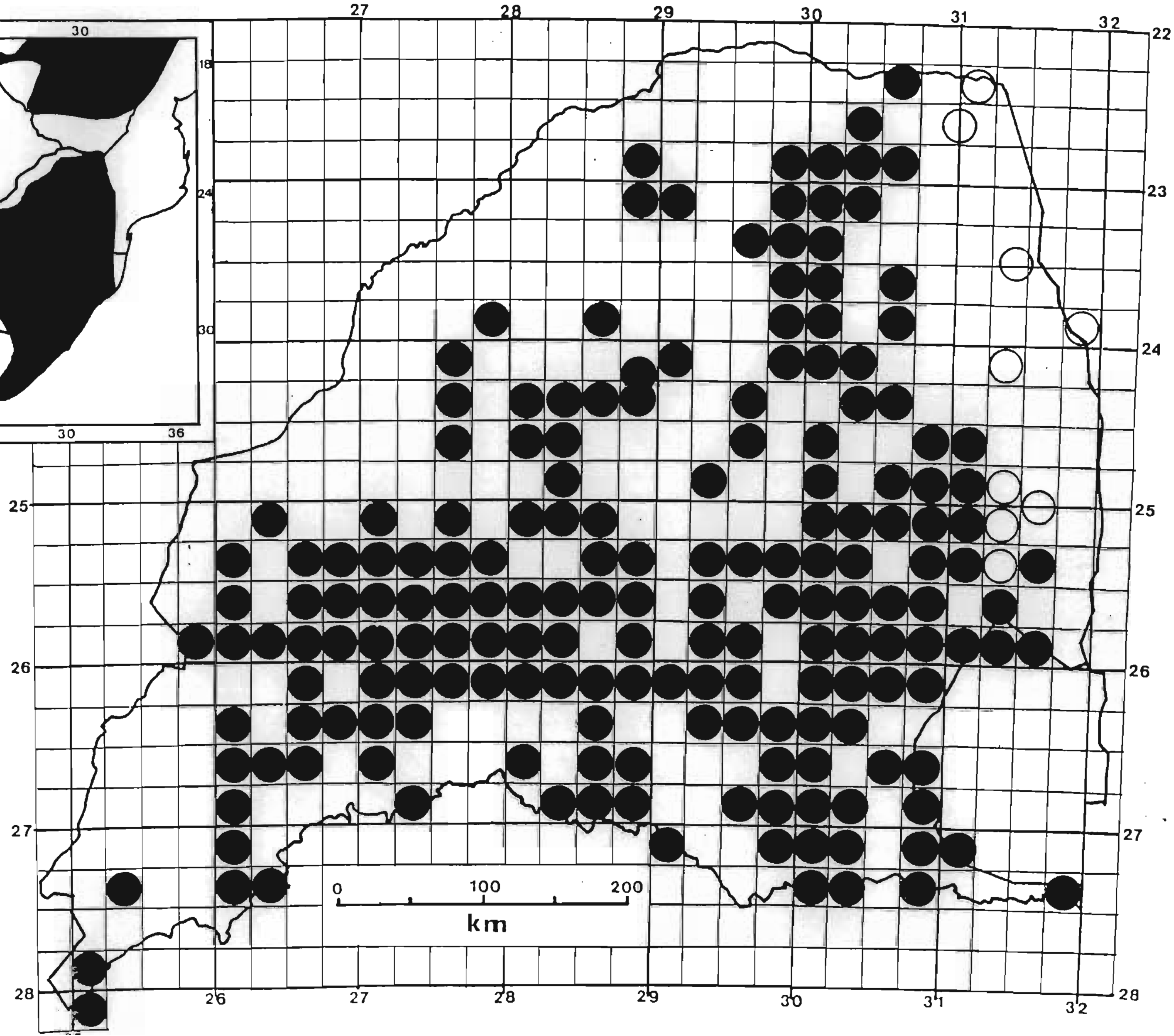
Distribution in the Transvaal (Map 238).

Bakenkop 152HT; Barberton Nature Reserve; Barberton Townlands 369JU; Beauley 260LR; Bellevue C 518JT; Bendor 211HT; Bergplaats 25HU; Bloemkrans 121IT; Blouberg; Bluegumspoort 779MS; Blyde River Nature Reserve; Boekenhoutskloof 187KR; Bokfontein 448JQ; Boschfontein 470JU; Boschhoek 36JT; Boschpoort 284JQ; Bovenste Oog van Mooi Rivier 68IQ; Britsville 483IR; Broederstroom, Haenertsburg; Buffesldoorns 315KR; Buffelsdrift 51JR; Buffelshoek 171IQ; Buffelshoek 446KQ; Buffelspoort 421KR; Bulhoek 389JP; Bungani Stockpens; Bushbuck River; Carpediem 76KT; Casa do Sol Hotel; Castle Rock Car Park, Sabie (AJL); Ceylon 4KT; Christiana 325HO; Clearwaters, Haenertsburg; Dap Naude Dam; De Berg 71JT; De Goedeverwachting 57IT; De Grooteboom 373KT; De Kroon; De Pan 51IQ; De Roodepoort 435IS; Debegeni Falls; Dome Pools, Magaliesberg; Doorndraaidam Nature Reserve; Doornfontein 345IP; Doornhoek 545KT; Dublin 86KT; Duiwelskloof; Duurstede 361JU; Dycedale 368JU; Elandsfontein 322JT; Elandsfontein 366JQ; Elandsfontein 36HT; Elandskop; Entabeni 251MT, Matiwa Lookout; Entabeni Forest Reserve, Forest Falls (AJL); Galakwyns Stroom 745LR; Garatouw 282KT; Gedult 270IP; Geelhoutkloof 195KR; Geluk 235IP; Gillooly's Farm; Glen Aggy 406IT; Goedvertrouwd 499JR; Goedverwacht 24IT; Gravelotte; Greylingsrus 101HP; Groot Nylsoog 447KR; Grootvlei Mine; Haenertsburg; Haffenden Heights 35KT; Hans Merensky Nature Reserve;



MAP 238.

<u>Rana angolensis.</u>
Recorded distribution in the Transvaal, and in southern Africa.



Hartbeestfontein 281KQ; Hartbeestpoort 482JQ; Hartebeespoortdam; Hectorspruit; Holfontein 126KT; Houdkop 475IT; Iron Crown; Johannesburg; Johannesburg, The Hill; Ka Bungeni; Kafferskraal 381IR; Kafferskraal 43JQ; Kafferskraal 513IS; Kafferskraal 618JT; Kalkoenkrans 366IT; Kameeldrift; Kameelpoort 202JR; Kastrolnek, Wakkerstroom; Klaserie River; Kleinkopje 15IS; Klipfontein 241IS; Klipnek 199JS; Klipplaatdrift 504IS; Klipspruit 89HP; Koedoespoort 402LS; Konigstein 625JT; Koster; Kosterfontein 460JP; Kraalkop 147IQ; Krokodildrift 217JP; Kromdraai 486JS; Kromdraai 520JQ; Kromdraai 712KS; Kromrivier 347JQ; Kroondal; Kuilfontein 324JP; Kwarriekraal 148JQ; Lake Fundudzi; Leeuwfontein 466JR; Leeuwklip 363JS; Legkraal 440LS; Leiden 340IT; Levubu; Lindleyspoort 220JP; Lochiel 192IT; Long Tom Pass; Loopfontein 298JT; Loskop Dam; Louwpan 41HP; M'Pefu 202MT; Mac Mac Pools; Makhutswi River, Leydsdorp; Maleshwane; Mollepoos Oog 332JP; Malmaniesrivier 236KQ; Maloney's Eye 169IQ; Malta 65KT; Mapochsgronde 500JS; Mariepskop; Matangari; Merriekloof 420IT; Merry Pebble Stream 246KU; Mezeg 77JP; Mgcobaneni; Middelburg Town and Townlands 287JS; Middelfontein 391KR; Middelkraal 50IS; Moorddrift 289KR; Munnik's Farm; Naudes Rust 272JU; Nelspruit; Nooitgedacht 471JQ; Ohrigstad Dam Nature Reserve; Onrust 332HO; Ottoshoop; Paardekraal 135LT; Paardeplaats 101HT; Paardeplaats 91JT; Palala River, Waterberg; Palmietfontein 110IS; Parkfield 725MS; Percy Fyfe Nature Reserve; Pongola Nature Reserve; Potberg 30HS; Potchefstroom; Potgietersrus; Pretoria; Pretoria North; Pretoria, Arcadia; Pretoria, Botanical Gardens; Pretoria, Garsfontein; Pretoria, Mayville; Pretoria, Plat River; Pretoria, Rietfontein; Ratombo; Redcliff 426IT; Rhenosterspruit 59JQ; Rietbult Estates 505IR; Rietfontein 179JP; Rietfontein 214JR;

Rietfontein 219IP; Rietfontein 255JT; Rietfontein 487JP; Rietpoort 83HS; Rietspruit 412KR; Rietspruit 83JQ; Rietvlei 375JT; Rolle 235KU; Roodepoort 598IR; Roodewal 270IT; Rooijantjesfontein 89IP; Rosehaugh; Rust der Winter Nature Reserve; Rustenburg; Rustenburg Kloof; Rustenburg Nature Reserve; Rustfontein 781LS; Sekororo; Shilowane; Solderia, Ermelo District; Steiltes, Nelspruit; Strehla 261IR; Suikerboschfontein 422JT; The Down 34KT; The Oaks 198KT; Toevlugt 269JS; Trevenna 119MT; Tshakhuma; Tweerivier 197JQ; Van der Waltspoort 81HT; Varkenskraal 93IQ; Ventersdorp Dorpsgebied; Vlakfontein 453JR; Vlakplaats 354JR; Vlakplaats 535KS; Vrouwensbrom 80MT; Vuurfontein 117HO; Vygeboomspoort 456KR; Vygeboomspruit 286LS; Wakkerstroom; Wanhoop 78JT; Waterval 220JQ; Waterval Boven; Waterval Onder; Weergevonden 173IT; Weimershoek 81JT; Welgelegen 107IT; Weltevreden 193IS; Weltevreden 596LQ; White River 64JU; Wilgefontein 644IR; Wilhanshohe 78LS; Winkelhaak 723JT; Witbank; Witbank 236IS; Witfontein 306IP; Witklipbank 202IR; Witkop 330IR; Witpoort 545IR; Witrand 457JP; Wolkberg;Woodbush; Zandfontein 447JQ (AJL); Zandfontein, Rustenburg; Zeerust; Zelikatskop 16JP; Zwartrand 123IP.

Literature Records

Graskop; Hendriksdal; Henley on Klip; Louws Creek; Piet Retief; Roodepoort; Tzaneen, (Poynton, 1964). Folly Dam; Letaba River; Matjulwana Firebreak; Numbi Kop; Shabeni Kop; Shipudza Fountain; Tsheri; Tshilavhila spruit; Western Boundary Bypass; 136 Waterfalls, Olifants River (KNP Records). Nylsvley Nature Reserve (Jacobsen, 1977). Suikerbosrand Nature Reserve (Carruthers, 1978). Komatipoort: Outlook 789MS; Klipfontein 53KR (NMZB).

Habitat and Ecology

A versatile species but usually associated with permanent water, along rivers, dams and other perennial sources. Well developed vegetation occurs along these water bodies, the frogs frequently emerging from the water to lie up in the humid shade under vegetation. Sometimes may be several metres from the waters edge. If disturbed they make prodiguous leaps towards the water and escape, frequently diving deep and burying themselves in the mud, lying still. Occurs in most veld types in the Transvaal wherever sufficient water is available, at altitudes of 200-2100 m a.s.l. A lack of specimens from the Limpopo trough needs further clarification.

Conservation Status

Unprotected barring the control of export of the species from the Transvaal (Transvaal Nature Conservation Ordinance 12 of 1983. Occurs in almost all provincial nature reserves and in the Kruger National Park. Status secure.

Remarks

Poynton (1964) has remarked on the difficulty of separating angolensis from fuscigula, a feature also remarked on by Lambiris (1988). The degree of webbing is useful for most specimens but is insufficient in the case of some specimens which have extensive webbing. Profile of head and, according to Lambiris (1988), ratio of head width to tibia length are an aid in these problematic cases.

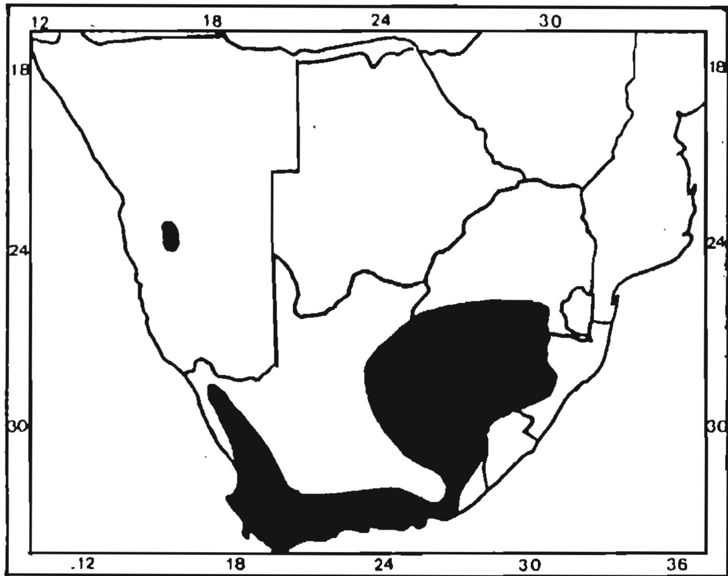
Rana fuscigula Duméril & Bibron, 1841

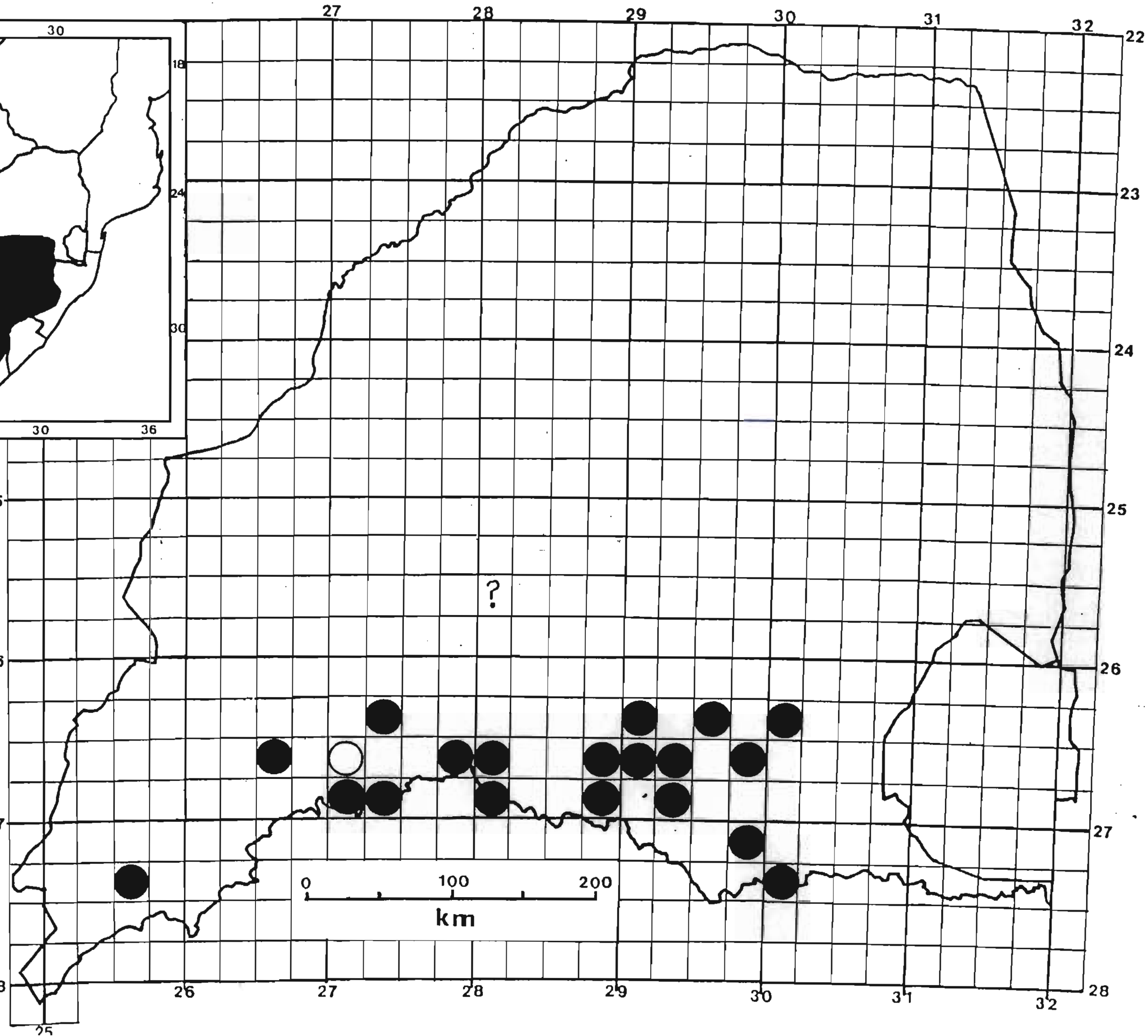
Rana fuscigula Duméril & Bibron, 1841, *Erpét*. *Gén*. 8, p. 386. Type locality: "environs du Cap de Bonne-Espérance". Poynton 1964(a), p. 108-109, fig. 54, Passmore & Carruthers 1979, p. 130-131, figs., De Waal 1980, p. 105. Van Dijk 1966, p. 231, figs; Wager 1986, p. 68; Lambiris, 1988, p. 194; Branch 1988b, p. 3.

Diagnosis. 25 Specimens examined.
Colour: Variable green to brown or olive-brown with dark blotches dorsally. A vertebral stripe is usually present. Limbs also heavily blotched and variegated. A pale stripe extends from below the eye to the angle of the jaw. Ventrally white with grey variegations particularly under the gular but also extending across the chest, fading posteriorly. Anterior edge of thighs heavily mottled.
Morphology: Largest male SVL = 75,0 mm (P10691 - Suikerbosrand Nature Reserve), mass = 51,0 g (P10691); Largest female SVL = 98,0 mm (N9859 - Blesbokspruit 305IS), mass = 83,5 g (N9859). Lambiris (1988) records specimens reaching 123,0 mm SVL. A large ranid with short stocky limbs. Head tapered to an obtuse point but appear more rounded than that of *angolensis*. Tympanum very large and distinct; feet extensively webbed with one or less phalanx of fourth toe free of web. Lambiris (1988) records tibia length/SVL 0,46-0,56.

Distribution

Southern Transvaal, western Natal, Lesotho, Orange Free State and the north-eastern Cape Province to the southern and western Cape. An apparent isolated population is found in south central South West Africa/Namibia.





MAP 239.

<u>Rana</u> <u>fuscigula</u>.
Recorded distribution
in the Transvaal, and
in southern Africa.

Distribution in the Transvaal (Map 239).

Abe Bailey Nature Reserve; Bosjesspruit 291IS; Buffelshoek 171IQ; De Krans van Blesbokspruit 305IS; De Roodepoort 435IS; Doornfontein 345IP; Doornhoek 577IR; Ermelo; Kareebosch 413IS; Potchefstroom; Pretoria, Apies River; Rietpoort 83HS; Rietspruit 91KQ; Roodepoort 598IR; Rooipoortje 453IQ; Simonsdal 88IT; Stryfontein 477IR; Suikerbosrand Nature Reserve; Vaalboschfontein 188HO; Wakkerstroom; Witbank 236IS; Zondagsfontein 124IS.

Literature Records

Ermelo; Potchefstroom (Poynton, 1964).

Habitat and Ecology

Mostly found along larger streams, rivers, dams and pans in grassland or open wooded savanna. Commonly found under rocks or clods of earth near the waters edge. Individuals will sometimes move some distance from water, lying up in the shade of dense vegetation only to leap for the water on being disturbed. Occurs in veld types 16, 48, 52, 54, 57 and 61 at altitudes of 1600-1700 m a.s.l.

Conservation Status

Unprotected, barring the control of the export of individuals from the province (Transvaal Nature Conservation Ordinance 12 of 1983). Occurs in a few provincial nature reserves. Currently secure, certain populations such as along the Blesbokspruit should be monitored to determine the effects of pollution on the species.

Remarks

See under *R. angolensis*. A record from the Aapies river, Pretoria is suspect and confirmation is needed. Records of the species concern almost exclusively the Vaal river system with only two records from tributaries flowing northwards.

Genus *Strongylopus* Tschudi, 1838

Strongylopus Tschudi, 1838, *Class*. *Batr*. *Rept*., p. 83. Type species to be designated (Dubois, 1981).

Grass frogs with a horizontal pupil in the eyes. Vomerine teeth are present. A single weakly developed gular pouch is present in males. Omosternum moderately forked; clavicles straight, approaching each other mesially. Feet long, length at least equal to distance from tip of urostyle to tympanum. Toes moderately to poorly webbed. Outer metatarsal separated from rest of sole by a web. Inner metatarsal tubercle compact and small. Mostly semi terrestrial species with only one, *S. hymenopus* being largely aquatic. Mostly found considerable distances from water, *S. f. fasciatus* prefers marshy areas with dense grass cover. *S. wageri* appears to frequent the edge of streams in forest while *S. g. grayii* in its many forms is an open grassland to forest species, usually some distance from open water. Channing (1979) discusses the ecological and systematic relationships of *Rana* and *Strongylopus* in southern Natal including eight frog species which have important bearings on the taxonomy of the genus. The group as a whole, mostly prefers, a relatively cool climate and in fact some species can tolerate extremely cold conditions, including frost, and even snow. Individuals can even be heard calling on a winter's night. The taxonomy and systematics particularly of the *S. g. grayi* complex needs to be urgently revised. The fact that some species with specific colour patterns inhabit grassland while others with different colour patterns inhabit forest is evidence of this. *S. wageri* has been recorded as occurring in the Transvaal at Sabie. Although this specimen, housed in the Albany Museum (Poynton 1964) has not been examined, it is felt that this actually belongs to the complex of forms belonging to _S_. _g_. _grayii_ and that _wageri_ is a Natal species. _S_. _wageri_ Wager has therefore been omitted from the present account until a thorough revision of these Transvaal frogs can be evaluated as to their proper affinity. The genus is mainly distributed along the eastern highlands of southern Africa extending northwards to the highlands of Tanzania. Five species occur in South Africa of which two occur in the Transvaal.

Key to the Transvaal species.

1. Dorsum yellow to buff (exceptionally brown), with a pair of bold dark paravertebral lines and dark obligue doroslateral lines .... _S_. _f_. _fasciatus_

   Dorsum plain grey brown, heavily blotched or with a broad red-brown to yellow vertebral band .... _S_. _g_. _grayii_

Strongylopus grayii grayii (Smith, 1849)

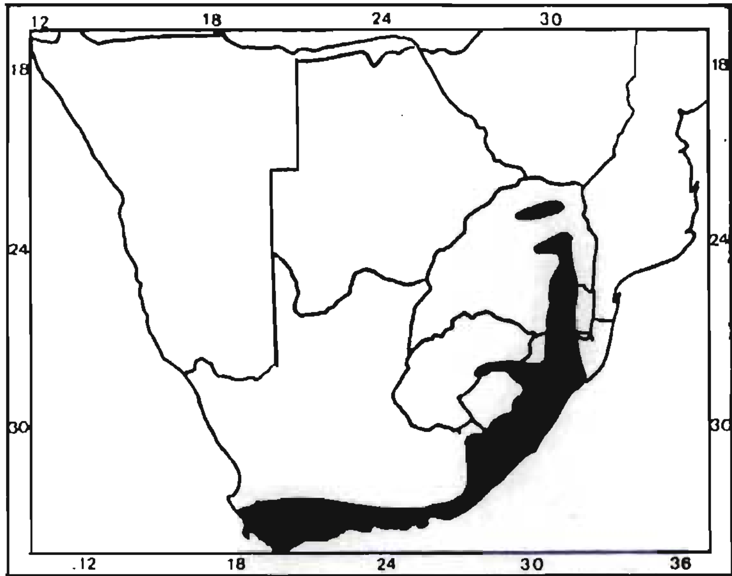
Rana grayii Smith, 1849. _Illus_. _Zool_. _S_. _Afr_., _Rept_., pl. 78, figs. 2, 2a, b, c. Type locality: "Western districts of the Cape Colony". Passmore & Carruthers, 1979, p. 138, figs. Wager 1986, p. 70, figs.
Rana grayi grayi Smith. Poynton 1964, p. 113, fig. 57.
Rana grayi Smith. Wager 1965, p. 148, fig.
Stronglopus grayi (Smith). Van Dijk 1966, p. 259.
Strongylopus grayi grayi (Smith). Van Dijk 1971a, p. 114; 1977, p. 178.

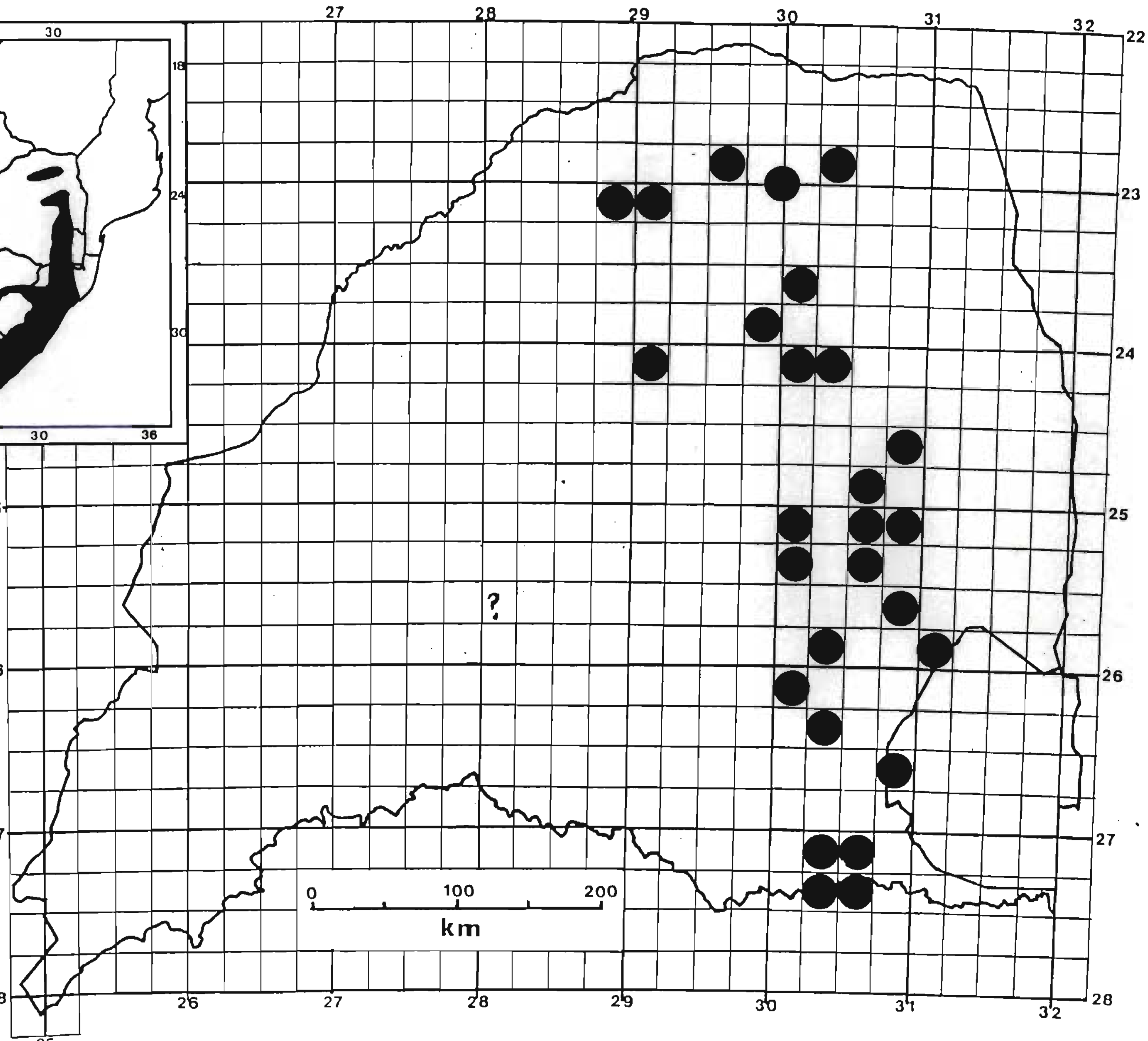
Strongylopus grayii grayii (Smith). Channing 1979, p. 797; Lambiris 1988, p. 208; Branch 1988b, p. 3.
Strongylopus grayii (Smith). Frost 1985, p. 522.
Rana grayii grayii Smith. De Waal 1980, p. 107.

Diagnosis. 78 Specimens examined.
Colour: Four colour phases are in evidence in the Transvaal, very similar to those pictured in Passmore & Carruthers (1979). (a) A grey-brown heavily spotted or blotched with dark-brown to blackish, with or without a thin whitish vertebral stripe. Ventrally white. A dark stripe extends from the posterior margin of the eye through the ear to the top of the shoulder. (b) Similar to (a) but vertebral band very broad and red-brown. Remainder of dorsum heavily blotched and spotted with blackish brown. Ventrally as above. (c) A pale grey frog, uniform above with pale crossbands on the limbs. A black stripe extends from the eye, through the ear to the shoulder. Ventrally white. (d) As above except for the broad golden yellow to orange vertebral stripe extending from the nostrils to the urostyle. Ventrally white.
Morphology: Largest SVL = 63,5 mm (J1136 - Entabeni), mass = 11,0 g (N7727 - Kaapsche Hoop 483JT). Mean SVL (25,0 mm) = 41,28 mm ± 7,40 (1SD), n = 25, mass = 5,97 g ± 2,56 (1SD), n = 25. Moderately slender to robust frogs with an obtusely round snout. Head may be broad and up to 0,37 times body length (Poynton, 1964). Inner metatarsal tubercle small, outer absent. Toes long and slender - head width/length of fourth toe greater than 84%. Webbing reduced and between 3,5 to 4 phalanges of 4th toe free of web.

Distribution

Mountain ranges of the northern and eastern Transvaal, eastern Orange Free State, most of Natal south along the coast to the southern Cape Province. Isolated





MAP 240.

Strongylopus grayii grayii
Recorded distribution in the Transvaal, and in southern Africa.

populations occur in the Central Cape Province and southern South West Africa/Namibia.

Distribution in the Transvaal (Map 240).

Acre 2KT; Barberton Nature Reserve; Barberton Townlands 369JU; Beauley 260LR; Bloemkrans 121IT; Blouberg; Blyde River Nature Reserve; Blyde River Nature Reserve, Bourkes Luck; Brooklands State Forest; Clearwaters, Haenertsburg; De Berg 71JT; De Goedeverwachting 57IT; Diepgelegen 945LS; Duiwelskloof; Dycedale 368JU; Entabeni Forest Reserve; Ermelo; False Cave, Tshirululami, Louis Trichardt; Groothoek 171HT; Joubertsdal 448JT; Kaapsche Hoop 483JT; Kastrolnek, Wakkerstroom; La Belle Esperance 191HT; Mac Mac Pools; Magalieskop; Malta 65KT; Mariebashoek 50KS; Mariepskop; Nerston 401IT; Ohrigstad Dam Nature Reserve; Paardeplaats 101HT; Peover 772MS; Pretoria; Sabie; Schelem 32KT; Sudwala Caves; Suikerboschfontein 422JT; Wakkerstroom; Wanhoop 78JT; Wonderwoud; Woodbush; Zuurbron 132HT.

Literature Records

Near Barberton; Pretoria; Sabie (Poynton 1964).

Habitat and Ecology

Occupy a variety of habitats from open montane grassland to forest in veld types 8, 9, 18, 19, 20, 57, 63 and 64 at altitudes of 1500-2300 m a.s.l. Usually found amongst grass tussocks frequently in moist seepage sites or among leaf litter on the floor of the forest. Occasionally found in hollows under rocks on soil. Often heard calling throughout the winter months. Jacobsen (1982) recorded individuals hundreds of metres underground in the Sudwala Cave, having presumably been washed in as tadpoles, where they metamorphosed. The adults are unable to survive in the pitch dark of the cave and dearth of prey items.

Conservation Status

Unprotected except for the control of export of amphibians from the province (Transvaal Nature Conservation Ordinance 12 of 1983). Both forest and grassland forms occur on one or other provincial nature reserve. However, owing to considerable habitat degradation of both montane grassland and montane forest, additional details of abundance on provincial nature reserves are needed. Status currently secure.

Remarks

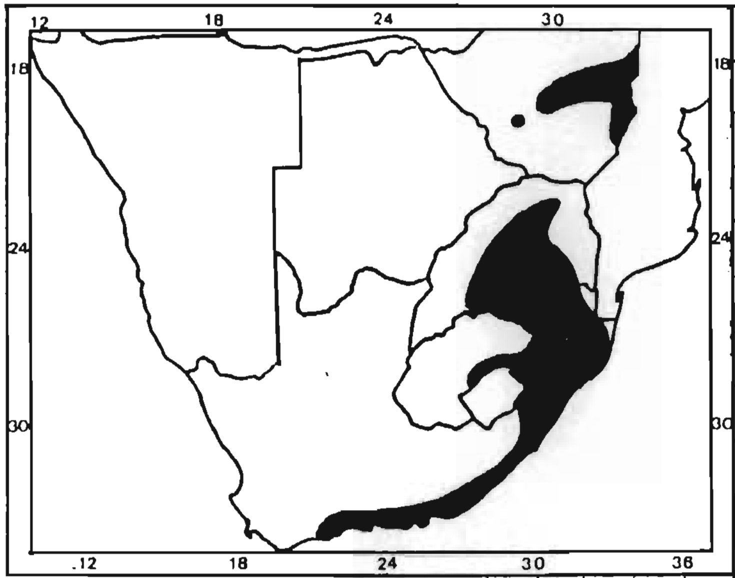
Poynton (1964), (1979, footnote to p. 138), Passmore & Carruthers (1979) and Poynton & Broadley (1985b, p. 137) have commented on the possibility of two taxa currently being included under 'grayii'. I am in agreement with this view as there is definite ecological separation between the forest forms and those occurring in open grassland. This is substantiated by differences in colour and probably also in call (Poynton 1964). Both ecotypes occur at Woodbush and at Mariepskop where the degree of sympatry or parapatry could be evaluated. Some specimens from the Soutpansberg are very similar in appearance to S. wageri, although lacking black on the flanks and having up to four phalanges of fourth toe free of web. Included here are two specimens UM 33372-3 from the farm Outlook 789MS which closely resemble other specimens from the eastern Transvaal escarpment.
Broadley (in litt) considers the latter to represent a

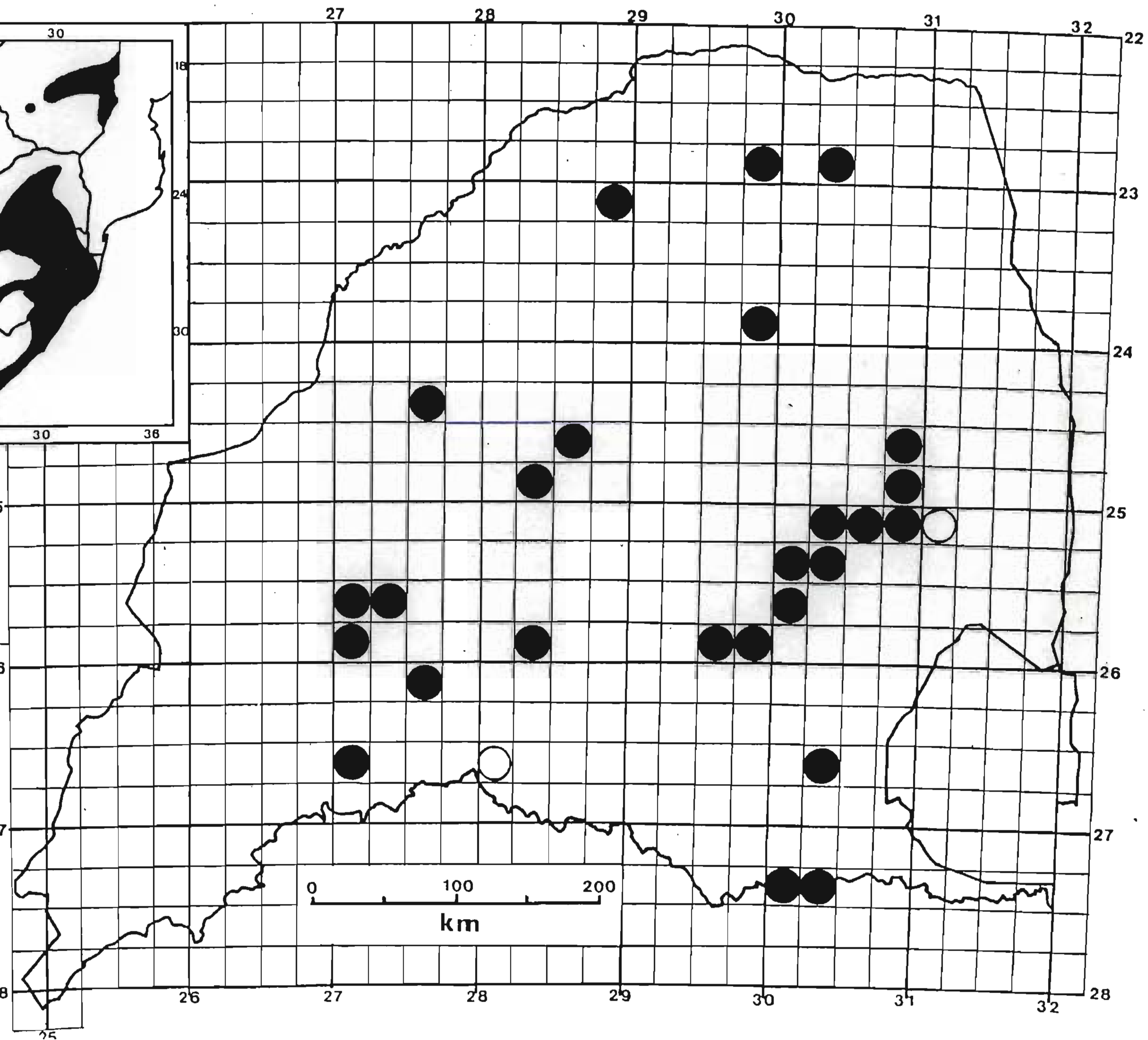
new *Rana* species. However I have currently incorporated them under *S. grayii* by virtue of the absence of webbing on the hindfeet, (see also discussion of the genus *Strongylopus* p.).

Strongylopus fasciatus fasciatus (Smith, 1849)

Rana fasciata Smith, 1849, *Illus. Zool. S. Afr. Rept.* pl. 78, fig. 1a, b, c. Type locality: Southern Africa. Passmore & Carruthers 1979, p. 140-141, figs. De Waal 1980, p. 108; Wager 1986, p. 71, figs.
Rana fasciata fasciata Smith. Poynton 1964, p. 115, fig. 58; Wager 1965, p. 153, figs; Pienaar et al, 1976, p. 46, fig. xix; Jacobsen 1977, p. 13; Poynton 1980, p. 246.
Strongylopus fasciatus (Smith). Van Dijk 1966, pp. 231, 259; Frost 1985, p. 522.
Strongylopus fasciatus fasciatus (Smith). Van Dijk 1971, p. 114, 1977, p. 178; Poynton & Broadley 1985, p. 137; Lambiris 1988, p. 212; Branch 1988b, p. 3.

Diagnosis. 61 Specimens examined.
Colour: A broad pale cream to creamy yellow vertebral stripe extends from the snout to the urostyle. Paravertebrally, this is flanked by a black stripe. Dorsolaterally a short but broad pale stripe is flanked above and below by a black stripe. A black stripe extends from the tip of the snout to the eye and through the lower half of the eye to the shoulder. Remainder of body yellow brown to brown dorsally. Ventrally white, inside of limbs pink to yellowish. Gular region in males, yellow.
Morphology: Largest male SVL = 37,0 mm (J6826 - Wanhoop 78JT), mass = 4,0 g (J6826); Largest female SVL = 46,0





MAP 241.

<u>Strongylopus fasciata fasciata.</u> Recorded distribution in the Transvaal, and in southern Africa.

mm (J1182 - Bluegumspoort 779MS), mass = 6,8 g (J1186 - Bluegumspoort 779MS). Mean male SVL (20,0 mm) = 32,6 mm ± 3,15 (1SD), n = 5, mass = 2,82 g ± 0,73 (1SD), n = 5; Mean female SVL (20,0 mm) = 37,3 mm ± 7,45 (1SD), n = 10, mass = 4,24 g ± 2,44 (1SD), n = 10. A slender frog with a relatively pointed snout. Hindlimbs and feet long and slender, with webbing very reduced. From 3,5 to 4 phalanges of fourth toe free of web. The length of the foot extends from the tip of the urostyle to the tympanum or even to the eye.

Distribution

South-eastern Cape Province northwards along the coast to Natal and Kwazulu, eastern Orange Free State and Transvaal. Also in east and central Zimbabwe with an isolated population in the south west.

Distribution in the Transvaal (Map 241).

Belfast; Bergfontein 277KQ; Blouberg; Bluegumspoort 779MS; Blyde River Nature Reserve; Boschhoek 36JT; Boschpoort 284JQ; Clearwaters, Haenertsburg; Dap Naude Dam; Diepgelegen 945LS; Elandsfontein 366JQ; Entabeni Forest Reserve; Generaalsdraai 423JS; Graskop; Hartebeestvlakte 163JT; Kromdraai 486JS; Nylsvley Nature Reserve; Ottoshalt, Haenertsburg; Potchefstroom; Pretoria, Garsfontein; Pretoria, Wilge River; Randfontein; Rustenburg Nature Reserve; Sabie; Sheepmoor; Vygeboomspoort 456KR; Wakkerstroom; Wanhoop 78JT; Weimershoek 81JT; Woodbush; Zuurbron 132HT.

Literature Records

Pretoriuskop (Poynton 1964). Suikerbosrand Nature Reserve (Carruthers, 1978). Castle Rock Caravan Park, Sabie (Lambiris, 1988b).

Habitat and Ecology

Marshy grasslands appear to be most frequented, but grassland fringing streams are also utilised. Sometimes enter forests along streams. Take refuge under grass tussocks and under rocks on soil in the vicinity of the water. Occurs in veld types 8, 18, 19, 20, 48, 57, 61 and 63 at altitudes of 1100-2100 m a.s.l. Usually heard calling during the night and on cloudy days, into winter.

Conservation Status

Unprotected except from exportation without a permit from the Transvaal, (Transvaal Nature Conservation Ordinance 12 of 1983). Sporadic in distribution and nowhere common, the species is only represented in a few provincial nature reserves. Status appears secure, although population estimates on various nature reserves needs to be undertaken.

Remarks

A widespread but highly sporadic species, occurring in a disjunct mosaic throughout the Transvaal barring the south-west, north-east and north, which appears to be too arid for the species. A specimen from the Blouberg is very dark in colour and additional material is needed from this area.

Genus *Hildebrandtia* Niedin, 1907

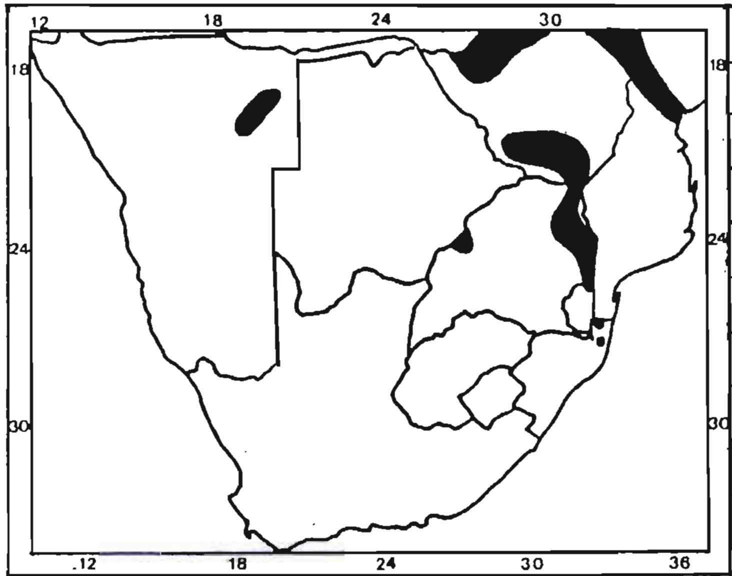
Hildebrandtia Nieden, 1907, *Sitzber*. *Ges*. *naturf*. *Freunde* *Berlin*, p. 229. Type: *Pyxicephalus* *ornatus* Peters, 1878, by subsequent designation of Boulenger, 1919.

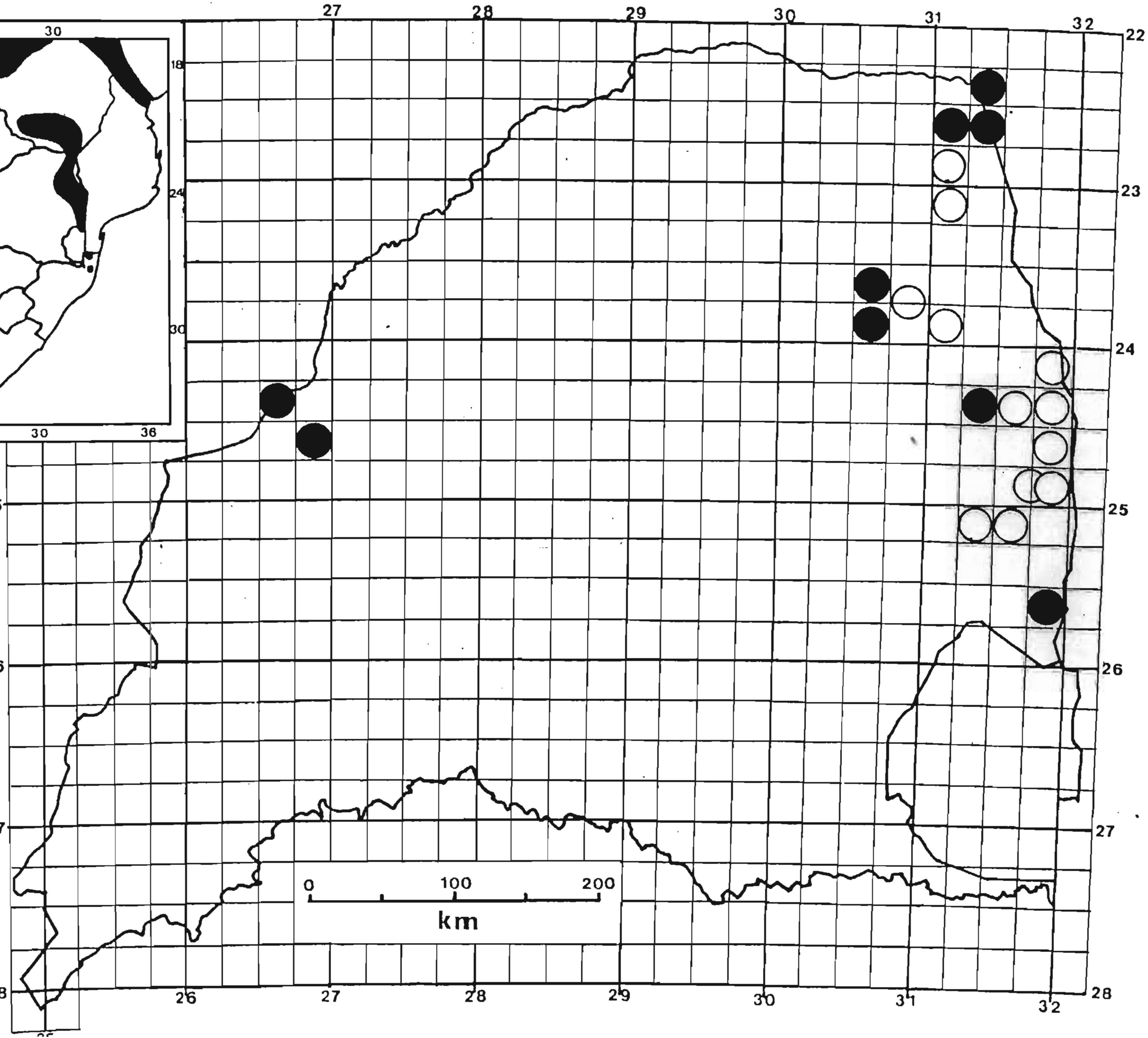
Attractive frogs characterised by squat bodies, short limbs and digits. Males have paired lateral, vocal sacs which are eversible. Vomerine teeth are present. Omosternum moderately forked, clavicles are curved and widely separated. Toes webbed. Inner metatarsal tubercle well developed while the outer metatarsals are incorporated into the fleshy sole. Widespread in Africa inhabiting open wooded savannas. Only one species occurs in South Africa namely *H*. *ornata* *ornata* (Peters).

Hildebrandtia *ornata* *ornata* (Peters, 1878)

Pyxicephalus *ornatus* Peters, 1878, *Monatsb*. *Akad*. *Wiss*. *Berlin* p. 207, pl. 2, fig. 7. Type locality: Taita, Kenya.
Hildebrandtia *ornata* *ornata* (Peters). Poynton 1964(a), p. 122-124, fig. 63; Pienaar, Passmore & Carruthers 1976, p. 48-51, figs. (xx, xxi); Passmore & Carruthers, 1979, p. 148-149, figs; Frost 1985, p. 460; Poynton 1971b, p. 115; Poynton & Broadley 1985(b), p. 141; Van Dijk 1966, p. 231, figs; Auerbach 1987, p. 47; Lambiris 1988, p. 164; Branch 1988b, p. 3.
Hildebrandtia *ornata* (Peters). Wager 1986, p. 82, fig.

Diagnosis. 13 Specimens examined.
Colour: Variable but green above with dark brown





MAP 242.

<u>Hildebrandtia</u> <u>ornata.</u>
Recorded distribution
in the Transvaal, and
in southern Africa.

blotches or a brown to dark-brown band extending from snout to urostyle with or without a green vertebral stripe. A pink dorsolateral stripe from snout to sacrum is present on each side. Laterally a green or pink diagonal stripe starts from above the tympanum, ending in the inguinal region. Ventrally white except for the gular region which is blackish-grey to black with paired white stripes.

Morphology: Up to 70,0 mm SVL in females and 65,0 mm SVL in males (Poynton & Broadley, 1985b). Largest specimen weighed was 20,5 g with a SVL of 52,5 mm (J6515 - Helena 400JU). Body robust and snout pointed. Limbs and digits short. Webbing reduced, just reaching middle subarticular tubercle of fourth toe. At least three phalanges of fourth toe free of web. Males have paired eversible vocal sacs ventrolaterally as in *Ptychadena*.

Distribution

Northern Namibia and southern Angola, at least southern and eastern Zambia, Zimbabwe, Mozambique, Transvaal, north to Kenya (Poynton & Broadley 1985b).

Distribution in the Transvaal (Map 242).

Dzundwini Waterhole; Gravelotte; Hans Merensky Nature Reserve; Helena 400JU; Jackalskraal 45KP; Machayi Pan; Pafuri; Ross 55KU; Verpoort 161KP.

Literature Records

Hildebrandtia Pan; Leeu Pan; Nkwane Pan; Nwanedzi West Windmill; Pumbe Pan (KNP Records).

Habitat and Ecology

Usually associated with very shallow ephemeral pans or sheets of water, often with grass growing in the water. During the rainy season the adults move around considerably searching for suitable breeding sites, sometimes being found in pools along vehicle tracks. Found in veld types 10, 11, 14, 15 and 18 at altitudes of 200-1000 m a.s.l.

Conservation Status

Widespread but localised in the lowveld, it is found throughout the Kruger National Park except possibly for the extreme north-east. Elsewhere it occurs in at least one provincial nature reserve. Status largely unknown owing to its sporadic occurrence. More detailed surveys including a census of the number of individuals per locality are needed.

Remarks

Metamorphosing tadpoles/froglets were recorded during this survey in level terrain along the Limpopo river and bushveld of the western Transvaal (Jacobsen & Newbery, 1988) indicating the possibility that access was achieved along the low lying Limpopo trough. It is therefore expected that the species will be found in the intervening area linking up with north eastern Transvaal populations. A specimen from close to the Swaziland border indicates that the species is likely to occur in the lowlands of Swaziland, possibly linking up with the Kwa Zulu/Natal records of Lambiris (1988).

Genus *Ptychadena* Boulenger, 1918

Ptychadena Boulenger, 1918, *Bull. Soc. Zool. France*, p. 114. Type by original designation: *Rana mascareniensis*. Duméril & Bibron.

Grass frogs, which are characterised by the presence of six or more longitudinal skin ridges down the back. Mostly sharp-snouted and with well developed hind limbs. The pupil of the eye is horizontal. Males have lateral, eversible, external vocal sacs. Vomerine teeth present. Omosternum forked. Toes variously webbed. Outer metatarsals separated from the rest by webbing. Inner metatarsal tubercle small, outer tubercle absent to well developed. Widespread in Africa and some oceanic islands including Madagascar, Seychelles and the Mascarene Islands. A large genus, many species are very similar resulting in confusion and numbers of species variable depending on the author. The genus is also very similar to *Rana* from which it is also separated with difficulty. However the dual eversible and external vocal sacs in males are diagnostic. Seven species are known from South Africa mainly along the eastern coastal plains decreasing southwards and westwards. Only six species occur in the Transvaal.

Key to the Transvaal species.

1. Less than 2 phalanges of 4th toe free of web 2

   Two or more phalanges of 4th toe, free of web 3

2. Posterior face of thigh mottled; distance from nostril to tip of snout, greater than internarial distance .... *P. oxyrhynchus*
Posterior face of thigh with definite longitudinal stripes; distance from nostril to tip of snout not more than internarial distance .... *P. anchietae*

3. Two phalanges of 4th toe free of web .... *P. m. mascareniensis*
Two and a third or more phalanges free of web 4

4. Not more than three phalanges of fourth toe free of web 5
More than 3 phalanges of fourth toe free of web .... *P. mossambica*

5. Light line running along length of upper surface of tibia .... *P. porosissima*
No light longitudinal line on upper surface of tibia .... *P. uzungwensis*

Ptychadena oxyrhynchus (Smith, 1849)

Rana oxyrhynchus Smith 1849, *Illus. Zool. S. Afr., Rept.* pl. 77, fig. 2, 2a, b, c. Type locality: "Kaffirland and the region of Port Natal, i.e. Durban.
Ptychadena oxyrhynchus (Smith). Poynton 1964(a), p. 124-126, fig. 64; Wager 1965, p. 155, figs; Pienaar, Passmore & Carruthers 1976, p. 52-53, fig. xxii; Passmore & Carruthers 1979, p. 152-153, figs; Poynton & Broadley 1985(b), p. 144; Van Dijk 1966, p. 231, figs, 1971(b), p. 112; Auerbach 1987, p. 48; Wager 1986, p. 77, figs; Poynton 1980, p. 246; Frost 1985, p. 474; Lambiris 1988, p. 168; Branch 1988b, p. 3.

Diagnosis. 7 Specimens examined.
Colour: A light triangular greyish to greyish pink patch on the snout. Body brown to reddish-brown with irregular patches of dark brown to blackish brown especially along the ridges running down the back. Dorsolaterally some of the ridges may be whitish. Ventrally white. Posterior surface of thigh irregularly mottled.
Morphology: Lambiris (1988) records a maximum of 60,0 mm. Largest male SVL = 52,0 mm (J6382 - Helena 400JU), mass = 16,3 g (J6382); Largest female SVL = 53,0 mm (J6381 - Helena 400JU, N5648 - Lothian 274KU), mass = 19,5 g (N7179 - Rolle 55KU). Stout frogs with a pointed snout and powerful limbs. Rostro-narial distance greater than internarial distance, equal to or greater than distance from nostril to eye. Length of foot less than length of tibia. No outer metatarsal tubercle, no row of tubercles under fourth metatarsal. Webbing extensive with only 1,5-2 phalanges of fourth toe and less than one phalanx of fifth toe free of web.

Distribution

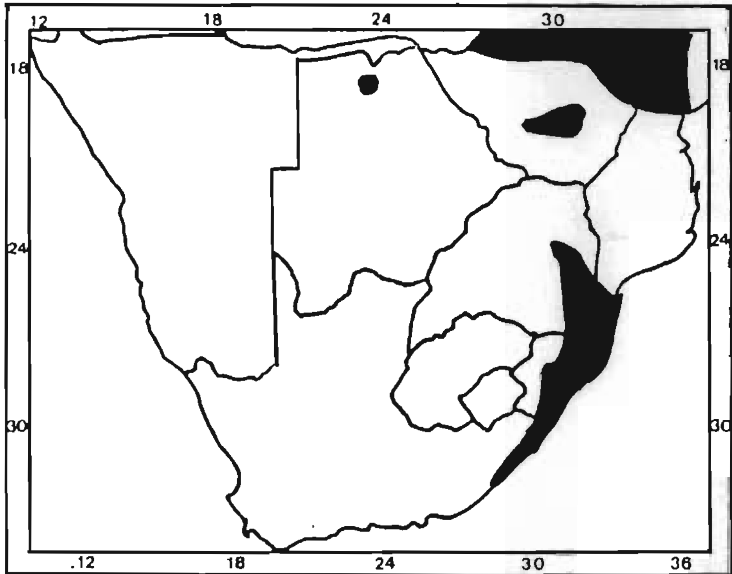
Savanna and woodland areas of subsaharan African from Senegal to the eastern Cape Province of South Africa, (Poynton & Broadley, 1985).

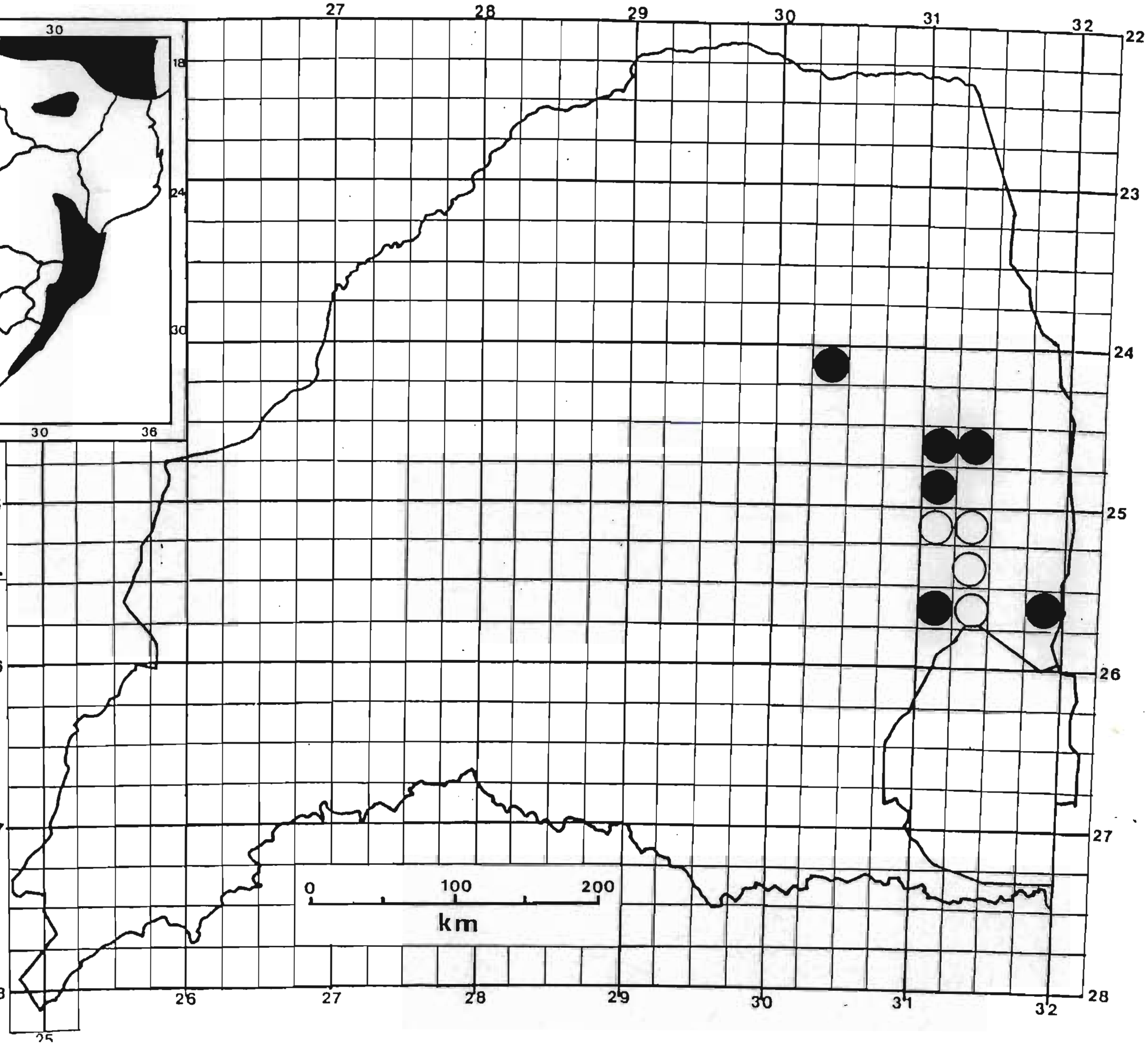
Distribution in the Transvaal (Map 243).

Helena 400JU; Lothian 274KU; Ludlow 227KU; Noordkaap; Rolle 235KU; Shilowane.

Literature Records

Louws Creek; Soutpansberg, (Poynton, 1964); Kambane Experimental Plots; Mannung Dam; Shabeni Fountain (KNP Records).





MAP 243.

Ptychadena oxyrhunchus. Recorded distribution in the Transvaal, and in southern Africa.

Habitat and Ecology

Usually found at pools along drainage lines in open wooded savanna or at other shallow depressions where water gathers. Occurs in veld types 9 and 10 at altitudes of 200-800 m a.s.l., apparently preferring moister areas.

Conservation Status

Unprotected barring for the control in the export of amphibians from the province, (Transvaal Nature Conservation Ordinance 12 of 1983). The species occurs in the southern Kruger National Park but no details of population size or abundance are available. Status, vulnerable owing to the large degree of habitat destruction in those areas in which it occurs. Additional surveys needed particularly in conservation areas.

Remarks

The record from the Soutpansberg (Poynton 1964) needs to be verified. A recent examination of Transvaal Museum specimens lacked this specimen. The Soutpansberg is far removed from the nearest other locality, although this is not necessarily diagnostic. Many other species exhibit such a disjunct distribution. It is possible that the specimen originates from the Soutpansberg district which in the early part of this century was much larger than it is today.

Ptychadena anchietae (Bocage, 1867)

Rana anchietae Bocage, 1867, *Proc. Zool. Soc. Lond.* p. 843, fig. 1. Type locality: Benguella, Angola.
Ptychadena anchietae (Bocage). Poynton 1964(a), P. 126-127, fig. 65; Wager 1965, p. 157, figs; Stuckenberg 1969, p. 152; Poynton 1980, p. 246. Pienaar, Passmore & Carruthers 1976, p. 54-55, fig. xxiii; Passmore & Carruthers 1979, p. 154-155, figs; Poynton & Broadley 1985(b), p. 145; Van Dijk 1966, p. 231, figs; 1971b, p. 115; Jacobsen 1977, p. 13; Auerbach 1987, p. 49; Wager 1986, p. 79, figs; Lambiris 1988, p. 171; Branch 1988b, p. 3.

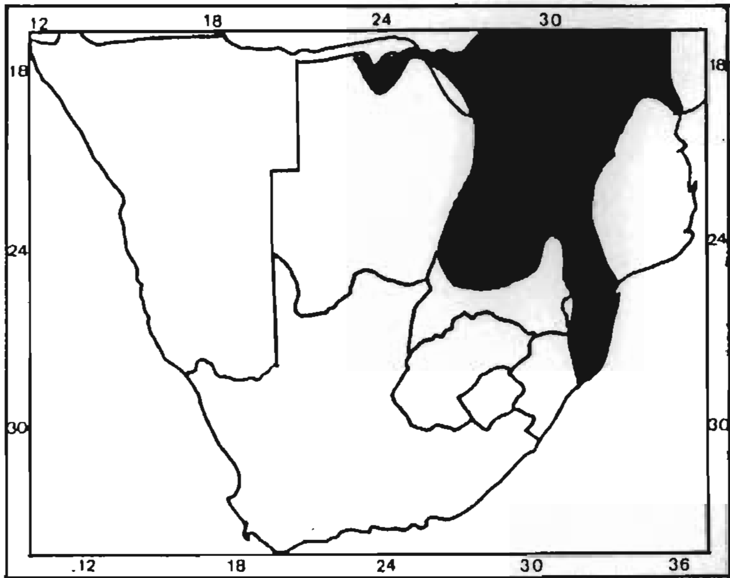
Diagnosis. 181 Specimens examined.
Colour: Variable, snout usually with a pale triangular patch. Adults mostly red-brown dorsally but some individuals mottled or spotted similar to *oxyrhynchus*. No dorsal lines evident. Posterior margin of thigh with parallel, continuous longitudinal bands.
Morphology: Largest male SVL = 50,5 mm (JN 249 - Vrouwensbrom 80MT), mass = 6,95 g (J6383 - Helena 400JU); Largest female SVL = 62,0 mm (N7214 - Pongola Nature Reserve), mass = 23,5 g (N7691 - Naudes Rust 272JU). Mean male SVL (25,0 mm) = 36,35 mm $\pm$ 4,87 (1SD), n = 26, mass = 4,47 g $\pm$ 1,39 (1SD), n = 25; Mean female SVL (25,0 mm) = 38,12 mm $\pm$ 9,10 (1SD) n = 30, mass = 6,98 g $\pm$ 5,32 (1SD), n = 27. Distance from nostril to snout tip subequal to internarial distance, and equal to, to less than distance from nostril to eye. Length of foot less than length of tibia. Outer metatarsal tubercle occasionally feebly developed, no row of tubercles under fourth metatarsal. Webbing on feet well developed with from 1,5 to 2 phalanges of fourth toe and one phalanx of fifth toe free of web.

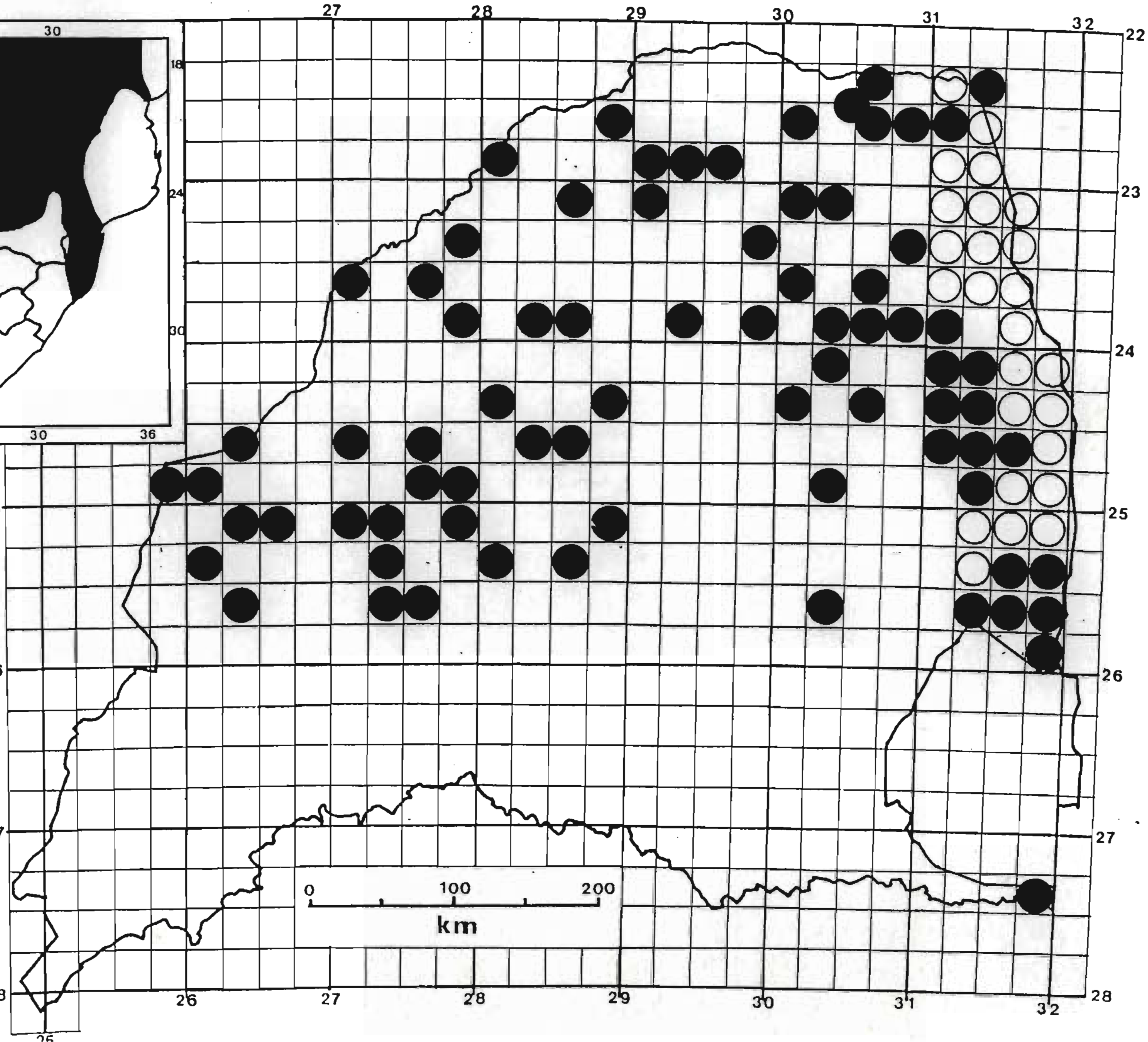
Distribution

Savanna from Ethiopia to Natal, across to Angola (Poynton & Broadley, 1985b).

Distribution in the Transvaal (Map 244).

Arthursrust 219KT; Avondstond 427JU; Bergwater 697MS; Bleskop, Rustenburg; Boschkopje 519LS; Broederstroom, Haenertsburg; Buffelshoek 334KQ; Buffelshoek 446KQ; Canterbury 254MR; Carpediem 76KT; De Bad 396KT; De Grens 168JQ; Doorndraai 282KR; Doreen 108MT; Driefontein 77LT; Dundee 32KU; Elandsfontein 335KQ; Ellisras; Fife 44KU; Galakwyns Stroom 745LR; Glen Alpine 304LR; Goedgevonden 149JP; Gravelotte; Groot Denteren 533LR; Guernsey 81KU; Haakbosch 79JQ; Hans Merensky Nature Reserve; Hectorspruit; Heimwehberg 121KP; Helena 400JU; Ireagh 263KU; Kafferskraal 43JQ; Klein Tshipise; Laaste Poort van Marico 86IP; Langjan Nature Reserve; Leeuwpoort 554KQ; Letsitele 652LT; Levubu; Lomati 466JU; Louws Creek; Ludlow 227KU; Machabezane, Komatipoort; Machayi Pan, KNP; Makhutswi River, Leydsdorp; Makushane Location 28LU; Manyeleti Game Reserve, Dixie Dam; Manyeleti Game Reserve, Hermitage Dam; Manyeleti Game Reserve, Main Camp; Marico Bosvelddam; Mdzabi Vlei; Mecklenburg 112KT; Mezeg 77JP; Morgenrood 354LT; Naudes Rust 272JU; Nazungongo 152LQ; Nsama River; Nwanetsi River; Nylstroom; Nylsvley Nature Reserve; Pafuri; Pietersburg; Pongola Nature Reserve; Punda Milia; Rietfontein 214JR; Rietspruit 412KR; Rolle 235KU; Rooiberg Mine; Ross 55KU; Skukuza, KNP; Stinkwater 97JR; Ten Bosch 162JU; Thornhill Farm 171JU; Tshidzi Hill; Urk 10LS; Vaalbank 163JR; Van Tondershoek 10KO; Vrouwensbrom 80MT; Vygeboomspruit 29JQ; Waaikraal 396JQ; Waterval 561KQ; Waterval Onder; Weihoek 540KQ;





MAP 244.

<u>Ptychadena</u> <u>anchietae.</u>
Recorded distribution
in the Transvaal, and
in southern Africa.

Weltevreden 596LQ; Wilhanshohe 78LS; Witklip 100KR; Witkop 287LQ; Worcester 131MR; Zelikatskop 16JP; Ziek 771LT; Zoutpan 459MS.

Literature Records

Louws Creek (Poynton, 1964). Boesmanspruit; Crocodile River; Dzundwini Waterhole; Fayi Roan Camp; Gadzingwe; Hutwini Pan; Klopperfontein Dam; Letaba Turnoff on E. Boundary; Makuleke; Malonga Fountain; Maseya Fountain; Mashadya Spruit; Matishibila Spring; Ngirivane Windmill; Papkuil Fountain; Pumbe Sandveld; Shalungwa Fountain; Shingwedzi Drift; Shipudza Spruit; Spokenyole; Stolznek; Tshokwane (KNP Records).

Habitat and Ecology

The most common and widespread grass frog in the province. Usually found in the grass fringing watercourses, pans, dams and even shallow depressions in open woodland. Occurs in veld types 6, 9, 10, 11, 13, 14, 15, 18, 19, 20 and rarely in 63 at altitudes of 200-1400 m a.s.l.

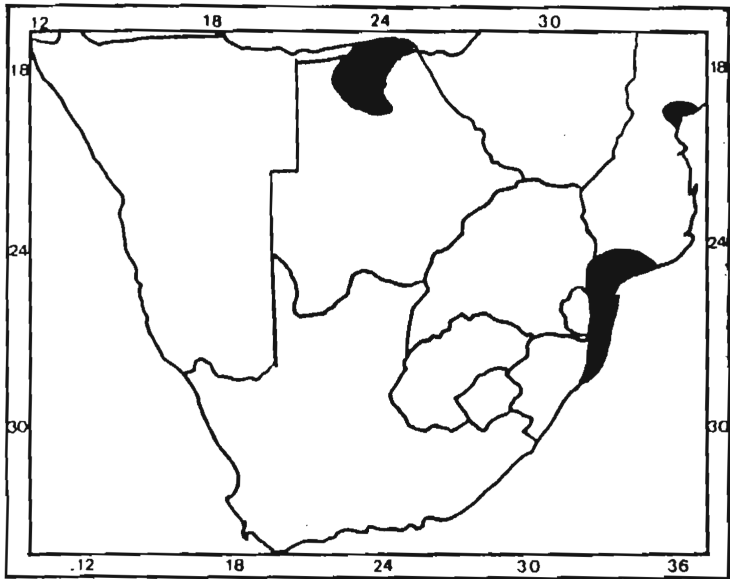
Conservation Status

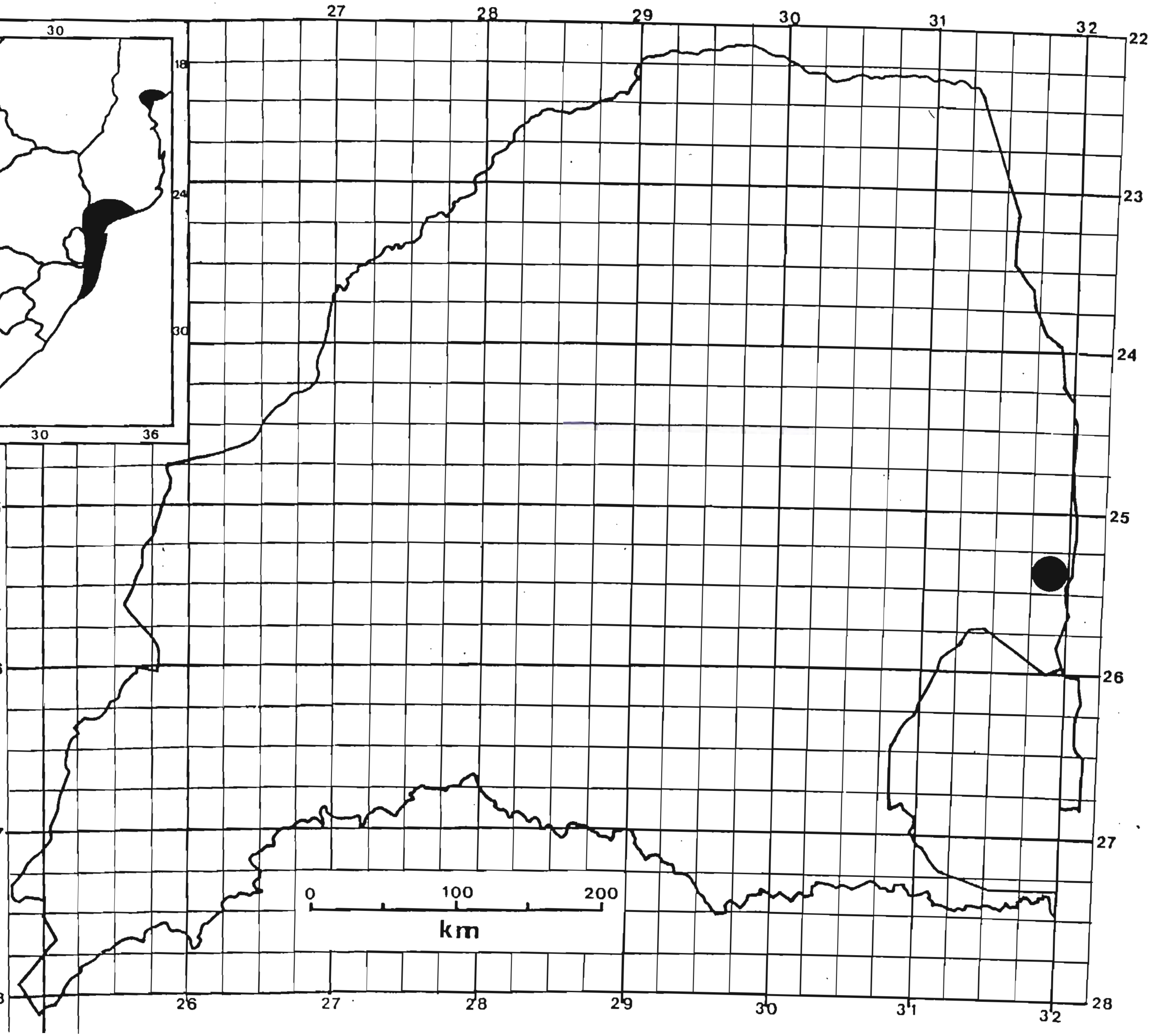
Unprotected, barring for the control of the export of amphibians from the province (Transvaal Nature Conservation Ordinance 12 of 1983). Occurs throughout the Kruger National Park and many provincial nature reserves. Status is secure.

Ptychadena mascareniensis mascareniensis (Duméril & Bibron, 1841).

Rana mascareniensis Duméril & Bibron, 1841, *Erpét. Gén.*, 8, p. 350. Type locality: Madagascar.
Ptychadena mascareniensis mascareniensis (Duméril & Bibron). Poynton 1964(a), p. 128-129, fig. 67, Passmore & Carruthers 1979, p. 156-157, figs; Poynton & Broadley 1985(b), p. 148; Van Dijk 1966, p. 231, figs; Auerbach 1987, p. 49; Lambiris 1988, p. 174; Branch 1988b, p. 3.
Ptychadena mascareniensis (Duméril & Bibron). Wager 1986, p. 81, fig.

Diagnosis. 1 Specimen examined.
Colour: A pale off-white to greyish vertebral stripe extends from snout to urostyle, flanked on either side by brown heavily spotted or blotched with dark brown. A thin pale dorsolateral stripe extends from above the nares to the junction of hind limbs. Posterior surface of thigh with a thin irregular yellow to greyish line, below which is a second interrupted stripe. Ventrally white with greyish mottling under the gular and upper chest.
Morphology: According to Poynton (1964) the species attains a SVL of 51,0 mm. A 44,0 mm SVL female had a mass of 7,6 g. A slender frog with well developed hind limbs and elongate toes. Length of foot equal to, or greater than tibia length. No outer metatarsal tubercle, or row of tubercles under fourth metatarsal. Webbing moderately extensive, with 2 to 2,5 (rarely) of the fourth toe and 0,5 to 1 phalanx of fifth toe free of web.





MAP 245.

<u>Ptychadena</u> <u>mascare-</u>
<u>niensis</u> <u>mascareniensis</u>.
recorded distribution
in the Transvaal, and
in southern Africa.

Distribution

Savannas from Sierra Leone and Egypt to Natal, but distribution patchy in areas where swamps are uncommon. Also Madagascar, Mascarene and Seychelles Islands, (Poynton & Broadley, 1985b).

Distribution in the Transvaal (Map 245).

The Hippos 192JU.

Habitat and Ecology

A new record for the Transvaal, it has only been found amongst grass at edge of pool in quarry. Veld type 10 at an altitude of 300 m a.s.l. Elsewhere appears to inhabit swamps and marshes in grasslands (Lambiris, 1988).

Conservation Status

Unprotected barring for the control of the export of the species from the Transvaal, (Transvaal Nature Conservation Ordinance 12 of 1983). The species does not occur in any provincial nature reserve but may occur in southern Kruger National Park. Status is peripheral and indeterminate.

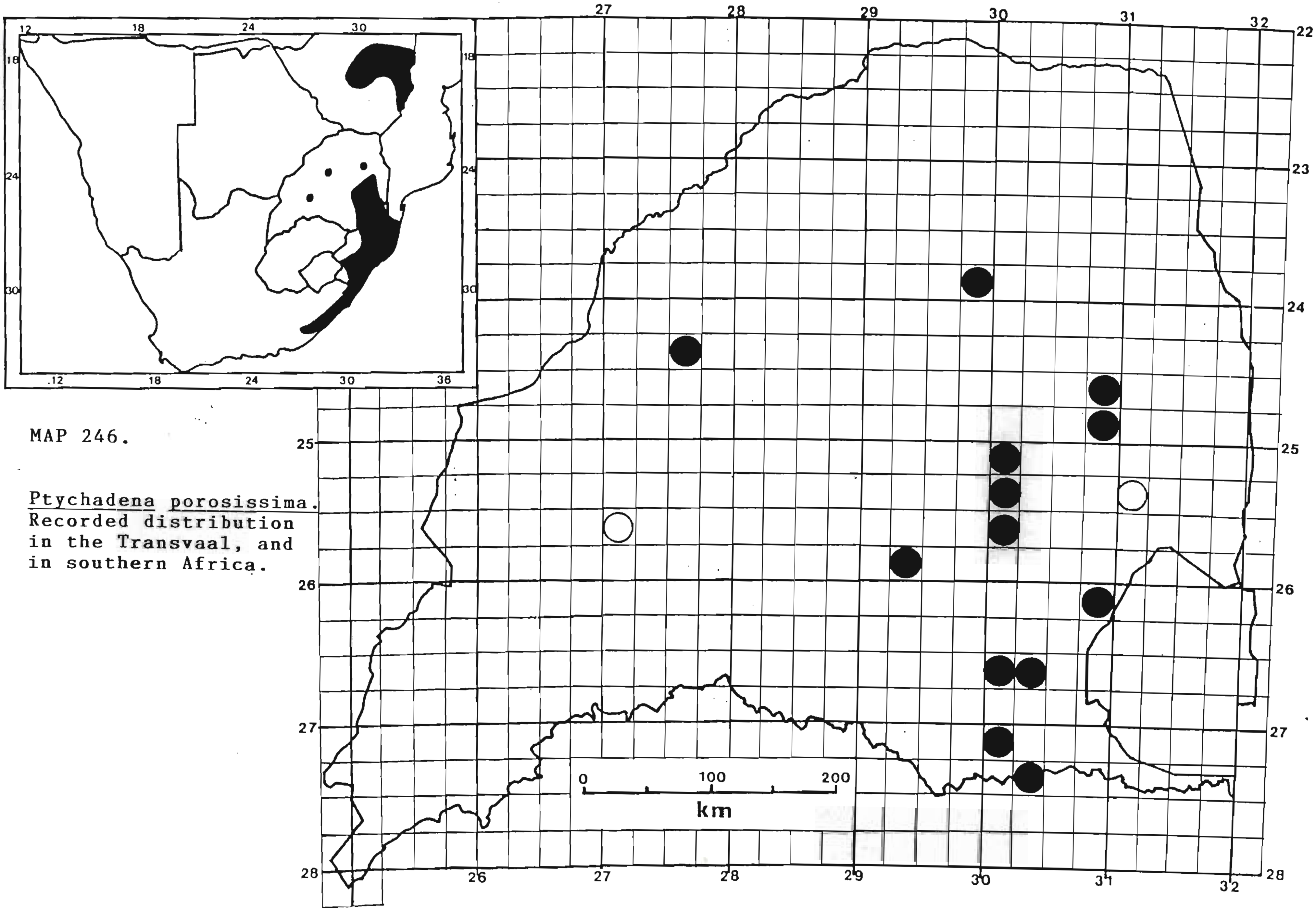
Remarks

Peripheral, the species will likely be found to be more widespread in the area between the Crocodile river and the Swaziland border.

Ptychadena porosissima (Steindachner, 1867)

Rana porosissima Steindachner, 1867, *Reise Novara*, *Amph.*, p. 18, pl. 1, figs. 9-13. Type locality: Angola.
Ptychadena porosissima (Steindachner). Poynton 1964(a), p. 129-131, fig. 68; Wager 1965, p. 158; Stuckenberg 1969, p. 152; Van Dijk 1971, p. 115; Passmore & Carruthers 1979, p. 158-159, figs; Poynton & Broadley 1985(b), p. 149; Wager 1986, p. 379, fig; Frost 1985, p. 474; Lambiris 1988, p. 176; Branch 1988b, p. 3.

Diagnosis. 19 Specimens examined.
Colour: A narrow to broad, white to pale greyish vertebral stripe from snout to vent. Two other stripes one on each side extends as a broad grey stripe from the nostrils above the eye to the shoulder, fading posteriorly. Overlying this stripe from above the shoulder to the inguinal region is a white stripe. Dorsum between the stripes brown to grey brown with dark brown blotches. Hindlimbs barred. A white stripe extends along the outside of the tibia. This is almost indistinguishable in some immature specimens. Ventrally white.
Morphology: Largest male SVL = 41,0 mm (J3039 - Hartbeesfontein 281KQ), mass = 7,95 g (J3039); largest female SVL = 48,0 mm (N9466 - Van der Waltspoort 81HT), mass = 10,3 g (N9466). Mean male SVL (25 mm) = 34,00 mm $\pm$ 6,04 (1SD), n = 5, mass = 4,97 g $\pm$ 2,23 (1SD), n = 5; Mean female SVL (25,0 mm) = 45,0 mm $\pm$ 4,24 (1SD), n = 2, mass = 9,05 g $\pm$ 1,77 (1SD), n = 2. Distance from nostril to snout tip equal to internarial distance, equal to, to slightly greater than, distance from nostril eye. Length of foot slightly less than length of tibia. Outer metatarsal tubercle absent or feebly developed and a row of tubercles under fourth metatarsal sometimes present. Webbing moderately developed with three phalanges of fourth toe and 1-1,5 of fifth toe free of web.



MAP 246.

Ptychadena porosissima. Recorded distribution in the Transvaal, and in southern Africa.

Distribution

Ethiopia and Uganda to the eastern Cape, across to Angola occurring more in cooler regions, (Poynton & Broadley, 1985).

Distribution in the Transvaal (Map 246).

19 km W. of Klaserie; Clearwaters, Haentertsburg; Elandsfontein 322JT; Erasmushoop 458KT; Graskop; Hartbeestfontein 281KQ; Ottoshalt, Haenertsburg; Roodewal 270IT; Sheepmoor; Tygerkloof 193IT; Van der Waltspoort 81HT; Wanhoop 78JT; Witbank; Woodbush; Zuurbron 132HT.

Literature Records

Rustenburg; White River (Poynton 1964).

Habitat and Ecology

An inhabitant of highveld and montane grassland occasionally in wooded grassland, mostly found concealed among or in grass tussocks. Frequently found in seepage areas, more rarely along streams. Found in veld types 8, 57, 61 and 63 at altitudes of 1500-2300 m a.s.l.

Conservation Status

Unprotected, with the exception of export control of amphibians from the province, (Transvaal Nature Conservation Ordinance 12 of 1983). Occurs in two provincial nature reserves but data concerning population sizes are lacking. The species is widespread, patchy and uncommon. The status is therefore indeterminate and surveys of populations in conservation areas are needed.

Remarks

Poynton (1964) in his discussion of the status of *P. poyntoni* Guibé indicated that specimens of this form, rather than being a new taxon, reflected the breakdown of reproductive barriers between *P. porosissima* and *P. uzungwensis*. It has now been established that *uzungwensis* is indeed present in South Africa but is allopatric to *porosissima*. The type locality of *poyntoni* is far removed from the current *uzungwensis* range and unless such hybrids are of very long standing, indicating a measure of sympatry possibly during the late Cretaceous or even more recently, these specimens may reflect the range of variation within *porosissima*. Immature individuals of *porosissima* often have very obscure lines on the tibia particularly after having been fixed in formalin and preserved for many years.

Ptychadena uzungwensis (Loveridge, 1932)

Rana mascareniensis uzungwensis Loveridge, 1932, *Bull. Mus. comp. Zool.* Harvard 72, p. 384. Type locality: Dabaga, Uzungwe Mountains, Tanzania.
Ptychadena uzungwensis (Loveridge). Poynton 1964, p. 131, fig. 69; Poynton & Broadley 1985(b), p. 151; Branch 1988b, p. 3.

Diagnosis. 8 Specimens examined.
Colour: A narrow pale vertebral line extending from tip of snout to urostyle. Dorsally pale brown to grey brown with an irregular series of dark staggered or incomplete crossbars extending from the occiput to the sacrum. A narrow pale stripe extends on each side from slightly above and posterior to the tympanum, to the lateral

inguinal region. Posterior of thighs spotted with whitish on a yellowish to yellow-brown background. Ventrally white.

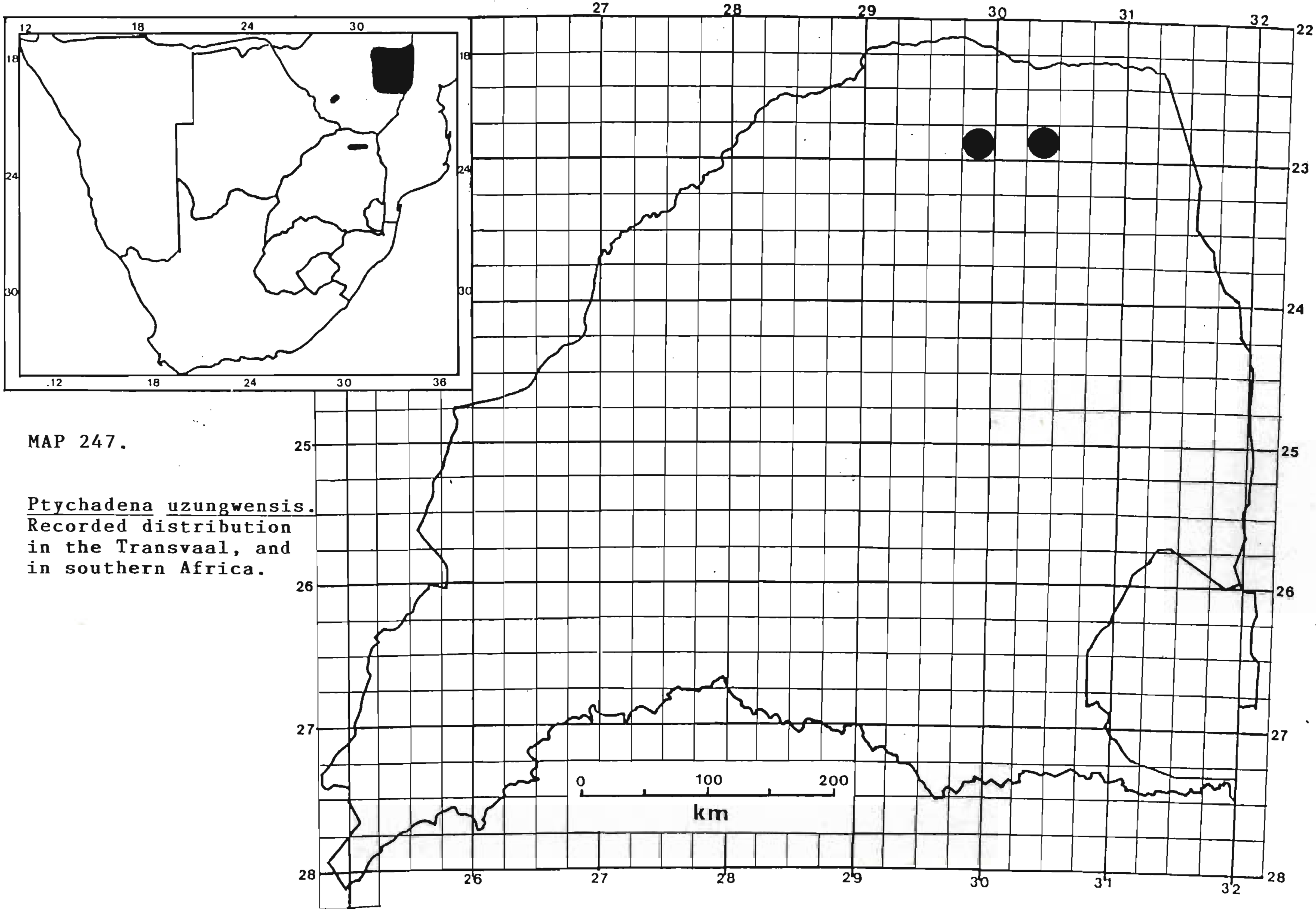
Morphology: Largest male SVL = 36,0 mm (J1134 - Entabeni Forest Reserve 215MT), mass = 4,25 g (J1134); Largest female SVL = 35,5 mm (J1181 - Bluegumspoort 779MS), mass = 4,95 g (J1058 - Entabeni Forest Reserve). Mean male SVL (25,0 mm) = 35,5 mm $\pm$ 0,71 (1SD), n = 2, mass = 4,13 g $\pm$ 0,18 (1SD), n = 2; Mean female SVL (25,0) = 32,0 mm $\pm$ 3,72 (1SD), n = 5, mass = 3,77 g $\pm$ 1,22 (1SD), n = 5. Distance from nostril to snout tip slightly greater than internarial distance, usually slightly greater than distance from nostril to eye. Length of foot equal to, to slightly less than length of tibia. Outer metatarsal tubercle usually absent, sometimes present as a small white nodule. A row of weakly developed tubercles under fourth metatarsal usually present. Webbing moderate with 3 phalanges of fourth toe and 1-1,5 of fifth toe free of web. A more slender frog than *porosissima* with a more pointed snout and slender legs. A pair of ill-defined skin folds anterior to upper eyelids converging towards the snout and usually continuous with the paravertebral folds.

Distribution

Upland areas of Mozambique through Zimbabwe and Zambia to eastern Angola, northwards to Rwanda, Burundi and Tanzania (Poynton & Broadley, 1985b). Also northern Transvaal.

Distribution in the Transvaal (Map 247).

Bluegumspoort 779MS; Entabeni Forest Reserve 215MT; Outlook 789MS.



MAP 247.

Ptychadena uzungwensis. Recorded distribution in the Transvaal, and in southern Africa.

Habitat and Ecology

Montane grassland sheltering among grass tussocks on dolerite outcrop. Also in seepage area above stream and at the edge of small pools in grassland. Found in veld type 8 at about 1500 m a.s.l.

Conservation Status

Unprotected, barring for control of the export of amphibians from the province, (Transvaal Nature Conservation Ordinance 12 of 1983). Does not occur in any provincial nature reserve although probably present in the Happy Rest Nature Reserve. Entabeni Forest Reserve is protected by the Department of Forestry. Elsewhere afforestation and agriculture have depleted habitats but the species currently still appears to be secure. However more detailed surveys on the Happy Rest Nature Reserve and the determination of population size is needed.

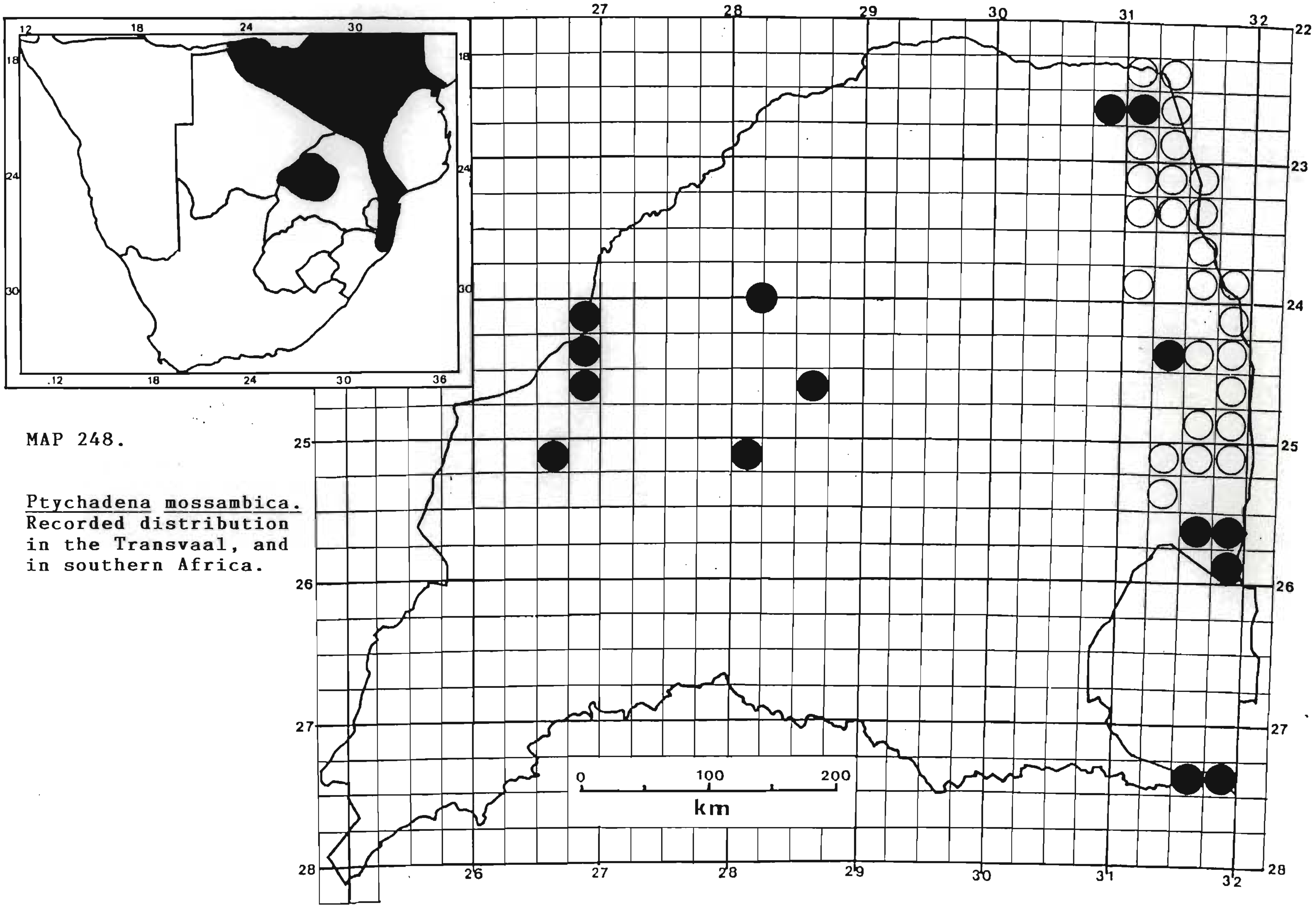
Remarks

Originally lumped with porosissima, Broadley (unpubl.) list of National Museum accessions) referred to the finding of uzungwensis by the Falcon College in the Soutpansberg during December, 1978. A re-examination of material showed that all specimens from the Soutpansberg are attributable to uzungwensis although the skin folds anterior to the upper eyelids are very feebly demarcated. However the different appearance of those frogs when compared to Transvaal porosissima is apparent (Diagnosis), and supports Broadley's previous identification.

Ptychadena mossambica (Peters, 1854)

Rana mossambica Peters, 1854, p. 626 (part). Type locality: Tete, Boror, Cabaceira, Quelimane, Mozambique. Lectotype in the Zoologisches Museum, Berlin.
Ptychadena vernayi (FitzSimons). Poynton 1964(a), p. 135-136, fig. 72; Wager 1965, p. 160, fig; Van Dijk 1966, p. 231, figs.
Ptychadena mossambica (Peters). Pienaar, Passmore & Carruthers, 1976, p. 56-57, fig. xxiv, Passmore & Carruthers 1979, p. 160-161, figs; Poynton & Broadley 1985(b), p. 155; Frost 1985, p. 473; Jacobsen 1977, p. 13; Auerbach 1987, p. 51, pl. 5, fig. 7; Wager 1986, p. 82, fig; Lambiris 1988, p. 181; Branch 1988b, p. 3.

Diagnosis. 34 Specimens examined.
Colour: Usually a pale broad vertebral stripe present, rarely absent extending from snout to urostyle. Two further raised pale stripes occur, one on each side, from slightly above but posterior to the eye to laterally to the inguinal region. Dorsally olive-brown to brown with dark blotches scattered irregularly. Limbs irregularly barred or banded. Rarely a thin irregular white stripe present on tibia this mostly in the east. Ventrally white with some yellowing on lower abdomen and inside of the thighs.
Morphology: Largest male SVL = 43,0 mm (J6385 - Helena 400JU), mass = 6,2 g (J6385); Largest female SVL = 45,0 mm (P11029 - Nooitgedacht 614HU, J6403 - Lomati 466JU), mass = 8,8 g (J6403). Mean male SVL (25,0 mm) = 38,5 mm ± 2,22 (1SD), n = 7, mass = 4,46 g ± 1,15 (1SD), n = 8; Mean female SVL (25,0 mm) = 37,42 mm ± 5,32 (1SD), n = 13, mass = 4,61 g ± 2,52 (1SD), n = 11. Distance from nostril to snout tip less than internarial distance, less than, to (rarely) equal to distance from nostril to eye. Length of foot less than length of



MAP 248.

<u>Ptychadena</u> <u>mossambica</u>.
Recorded distribution
in the Transvaal, and
in southern Africa.

tibia, usually less than half SVL. Outer metatarsal tubercle and row of tubercles under fourth metatarsal feebly to well developed. Webbing moderate to well developed with 2,75 - 3 phalanges of fourth and 1 of fifth toes free of web. A more stocky species, similar to porosissima but differing in the length of foot.

Distribution

Widespread, from Kenya and Uganda south through Botswana to the Transvaal and northern Natal.

Distribution in the Transvaal (Map 248).

Avondstond 427JU; Dzundwini Waterhole; Goedgevonden 149JP; Helena 400JU; Klein Engeland 9KP; Lomati 466JU; Mananga; Mdzabi Vlei; Nooitgedacht 614; Nylsvley Nature Reserve; Plat River; Pongola Nature Reserve; Ross 55KU; Smaldeel 36KP; Tshidzi Hill; Verpoort 161KP; Zaagkuildrift 46JR.

Literature Records

Pafuri, (Poynton, 1964); Beacon 5-1; Bobomeni; Dzundwini Waterhole; Klopperfontein Dam; Machayi Pan; Nwambiya Pan; Nyamyulo Pan; Nyawadi Pan; Ramiti Pan; Shingomeni Windmill; Shiteveteve Windmill; Skukuza; Tshokwane (KNP Records).

Habitat and Ecology

An open woodland savanna species which is usually found around the proximity of small temporary pans and seepage areas. Also found at dams and in swampy areas. Occurs in veld types 6, 9, 10, 11, 13, 14, 15, 18 and 20 at altitudes ranging from 200-1200 m a.s.l. Usually found sheltering under grass tussocks close to the water.

Conservation Status

Unprotected barring for the control in the export of amphibians from the province (Transvaal Nature Conservstion Ordinance 12 of 1983). Widespread throughout the Kruger National Park and is also found in several provincial nature reserves. Occurs in small numbers at any one locality. Surveys are needed to establish abundance particularly on nature reserves. Currently considered secure.

Remarks

Poynton & Broadley (1985b) discuss the variability of this species which exhibits a cline in size and degree of webbing from east to west. Transvaal specimens are mostly identifiable without difficulty although the eastern specimens exhibit a tibial line, and an appearance which can be confused with porosissima. Intraspecific variation needs to be examined on a broad scale with a large specimen base.

Genus *Phrynobatrachus* Günther, 1862

Phrynobatrachus Günther, 1862, *Proc*. *Zool*. *Soc*. *Lond*. p. 190. Type by monotypy: *Phrynobatrachus natalensis* Günther.

Mostly small frogs called puddle or cricket frogs. Characterised by having no vomerine teeth, a small papillum present in the middle of the tongue. A single vocal sac present which is seen as lateral creases formed by folds of skin under the chin. Omosternum ossified and forked posteriorly. A straight procoracoid-clavicular bar ossified along the anterior margin. Tarsus with a prominent mid-tarsal tubercle present. Toes fully to barely webbed. Puddle frogs are widespread in Africa south of the Sahara, some species of which are among the most abundant and wide-ranging of African amphibians. They are excluded only from the south-western Cape Province and very arid regions. However they are able to utilize extremely ephemeral water bodies including frequently, puddles in roads and at roadsides, hence the common name. On account of the great ranges occupied by several species they exhibit a great degree of intraspecific variation which makes identification difficult. In South Africa only three species are found, two of which occur in the Transvaal.

A key to the Transvaal species.

1. Broad web passing proximal subarticular tubercle of fourth toe on at least one side. Adults reach 35,0 mm SVL .... *P. natalensis*

   Broad web not passing proximal subarticular tubercle of fourth toe. Adults reach 21,0 mm SVL .... *P. mababiensis*

Phrynobatrachus natalensis (Smith, 1849)

Stenorhynchus natalensis Smith, 1849, *Illus. Zool. S. Afr. Rept. App.* p. 23. Type locality: "the country around Port Natal", ie. Durban.
Phrynobatrachus natalensis (Smith). Poynton 1964(a), p. 137-140, fig. 74; Passmore & Carruthers, 1976, figs; De Waal 1980, p. 110; Poynton & Broadley 1985(b), p. 160; Jacobsen 1977, p. 13; Auerbach 1987, p. 52, pl. 5 fig. 8; Wager 1986, p. 99, figs; Lambiris 1988, p. 221; Branch 1988b, p. 3.

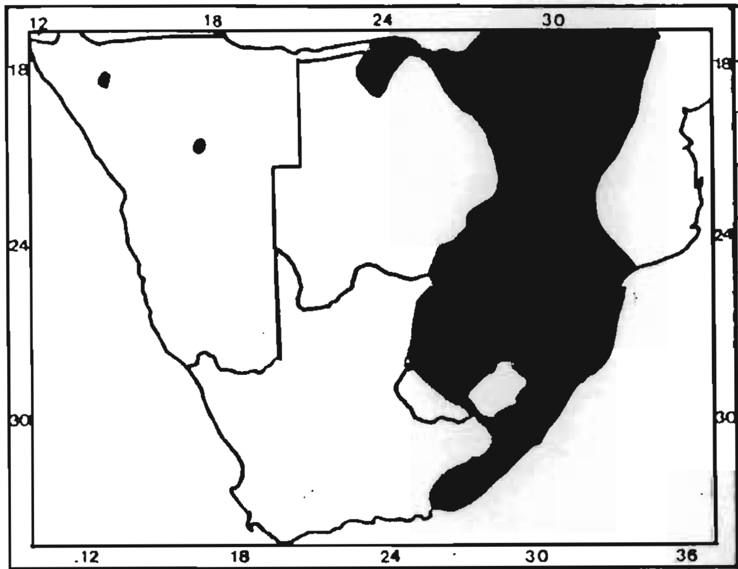
Diagnosis. 541 Specimens examined.
Colour: Variable olive-grey to black, olive-brown with green spots or with a broad green or brown vertebral stripe. Ventrally white, gular region speckled with grey in females to blackish in males.
Morphology: Largest male SVL = 33,5 mm (N5608 - Guernsey 81KU), mass = 3,45 g (N5608); Largest female SVL = 34,5 mm (J1686 - Paardekraal 135LT), mass = 5,17 g (J6363 - Helena 400J). Mean male SVL (20,0 mm) = 27,4 mm $\pm$ 2,90 (1SD), n = 25, mass = 1,98 g $\pm$ 0,64 (1SD), n = 25; Mean female SVL (20,0 mm) = 25,34 mm $\pm$ 4,15 (1SD), n = 25, mass = 1,86 g $\pm$ 0,86 (1SD), n = 25. Gular sac with deep lateral folds; femoral glands absent. Tips of fingers not expanded into discs. Feet variously webbed but broad web mostly extending to distal subarticular tubercle of the third toe, but passing halfway or more between proximal and middle tubercles of fourth toe, at least on one side, not quite reaching to just passing distal tubercle of fifth toe. Tarsal tubercle a transverse fold, with a stoutly developed spur.

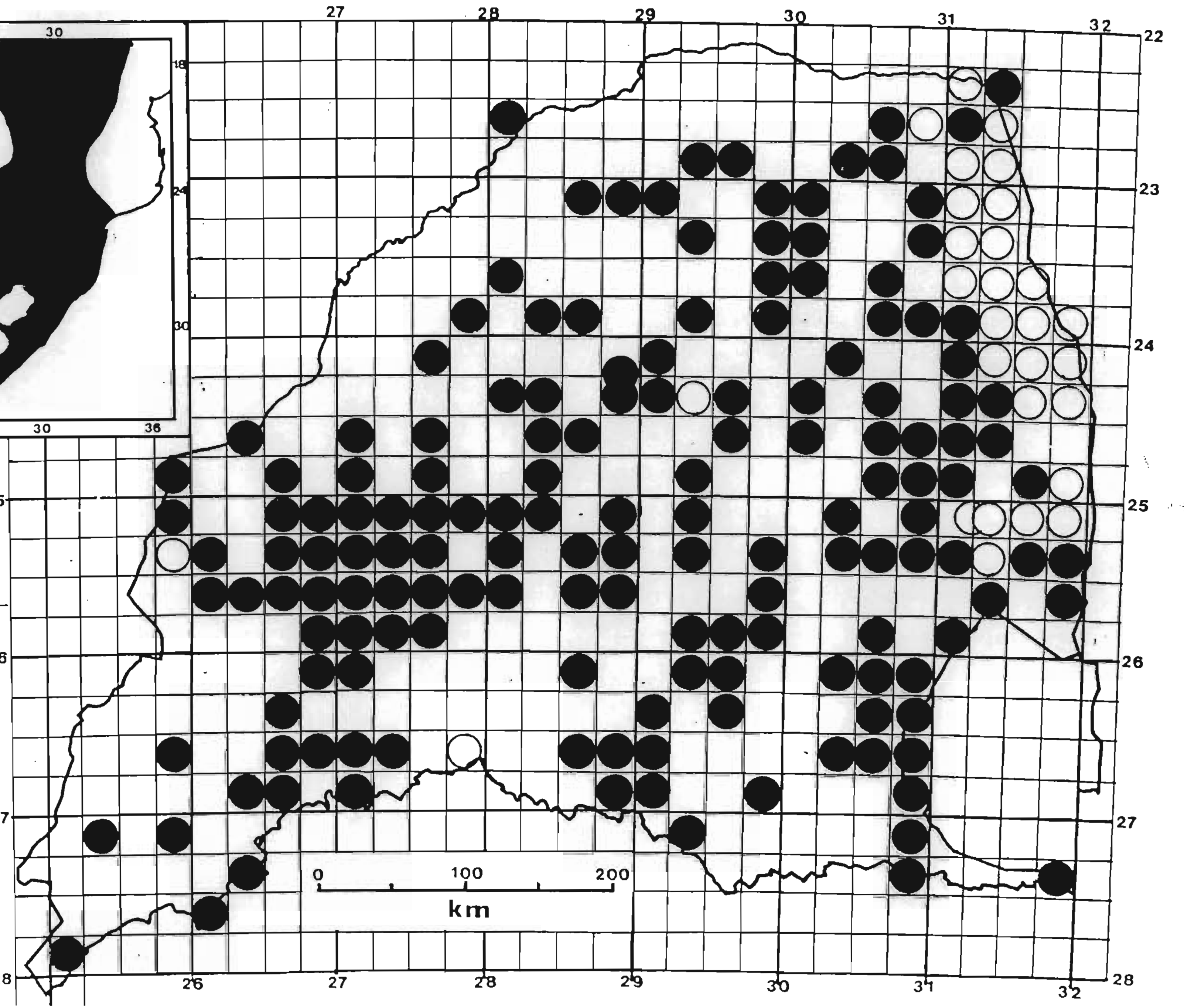
Distribution

South of the Sahara with the possible exception of the coastal lowlands of southern Mozambique.

Distribution in the Transvaal (Map 249).

Alten 222LT; Arthursrust 219KT; Bakenkop 152HT; Barberton Nature Reserve; Barberton Townlands 369JU; Beauley 260LR; Bendor 211HT; Bleskop Siding; Blouberg; Boekenhoutskloof 187KR; Bokfontein 448JQ; Boschhoek 36JT; Boschkopje 519LS; Bovenste Oog van Mooi River 68IQ; Buffelshoek 334KQ; Buffelspoort 421KR; Bulhoek 389JP; Bultfontein 178JQ; Christiana 325HO; Clearwaters, Haenertsburg; De Kraalen 160HT; Doornbult 123HP; Doorndraai 282KR; Doornfontein 345IP; Doornhoek 577IR; Driefontein 77LT; Duiwelskloof; Dundee 32KU; Galakwyns Stroom 745LR; Garatouw 282KT; Gestoptefontein 349IO; Glen Alpine 304LR; Goedgevonden 149JP; Goedverwacht 24IT; Graskop; Greylingstad; Griffin Mine; Groenkloof 464JQ; Groot Denteren 533LR; Groot Nylsoog 447KR; Guernsey 81KU; Haasfontein 28IS; Haenertsburg; Halfgewonnen 190IS; Hans Merensky Nature Reserve; Hectorspruit; Helena 400JU; Holfontein 138IS; Houdkop 475IT; Houwater 54JQ; Jachtdrift 190LT; Kafferskraal 400IP; Kafferskraal 43JQ; Kalkfontein 173LS; Kareepoort 202JR; Klein Tshipise; Klipdrift 395IQ; Klipplaatdrift 43HS; Klipplaatdrift 504IS; Klipspruit 89HP; Knoppieskraal 484KQ; Kommandonek; Koster; Krokodildrift 217JP; Kromdraai 325IS; Kromdraai 712KS; Kromrivier 347JQ; Kwa Lobatleng; Kwarriekraal 148JQ; Laaste Poort van Marico 86KP; Lake Fundudzi; Leek 769MS; Leeuwklip 363JS; Lindleyspoort 220JP; Lochleven 233IT; Loskop Dam; Lothian 274KU; Louws Creek; Ludlow 227KU; Machabezane, Komatipoort; Makhutswi River, Leydsdorp; Makushane Location 28LU; Malamala; Malelane 289JU; Maleshwane; Malmaniesrivier 236KQ; Mapochsgronde 500JS; Marico Bosveld Dam; Mariepskop; Matangari; Matchatengane, Komatipoort; Merriekloof 420IT; Mezeg 77JP; Middelburg Town and Townlands 287JS; Middelkraal 50IS; Moorddrift 289KR;





MAP 249.

<u>Phrynobatrachus natalensis.</u> Recorded distribution in the Transvaal, and in southern Africa.

Morgenrood 354LT; Mpafuri's Location; Naauwpoort 441KS; Naudes Rust 272JU; Nelspruit; Nerston 401IT; Nooitgedacht alias Vetpan 132IP; Nsama River; Nwanetsi River; Nylstroom; Nylsvley Nature Reserve; Ohrigstad Dam Nature Reserve; Ongezien 717KS; Oostenryk 92KS; Over Yssel 512LR; Paardekraal 135LT; Pafuri; Palmietfontein; Percy Fyfe Nature Reserve; Pietersburg; Pongola Nature Reserve; Potchefstroom; Pretoria; Pretoria, Apies River; Pretoria, Fairy Glen; Pretoria, Gezina; Pretoria, Roberts Heights; Pretoria, Skinners Court; Pretoria, Thorns; Punda Milia; Ratelhoek 158KR; Rhenosterpoort; Rietfontein 179JP; Rietfontein 214JR; Rietfontein 219IP; Rietfontein 255JT; Rietkuil 186HO; Rietkuil 491JS; Rietpoort 405IS; Rietspruit 412KR; Rietspruit 83JQ; Rolle 235KU; Roodekraal 45IQ; Roodepoort 598IR; Rooipoortje 453IQ; Ross 55KU; Ruighoek 169JP; Rust der Winter Nature Reserve; Rustenburg; Rustenburg Nature Reserve; Sabie; Schietpoort 507JR; Schoonkloof 273KP; Schweizer Reneke Town and Townlands 62HO; Sekororo; Sheepmoor; Shilowane; Speculatie 483JS; Spioenkop 252IS; Sterkspruit 412KT; Stinkwater 97JR; Sudwalaskraal 271JT; Sunningdale; Syferfontein 303IP; Tati 59MR; The Brock 162JU; The Chine 259IT; The Valley Farm 127JU; Thornhill Farm 171JU; Tivoli 98KT; Tweerivier 197JQ; Van Tondershoek 10KO; Vereeniging; Vergelegen 728JT; Vlakplaats 535KS; Vogelstruiskraal 397KQ; Vygeboomspoort 456KR; Vygeboomspruit 286LS; Vygeboomspruit 29JQ; Weergevonden 173IT; Weihoek 540KQ; Weimershoek 81JT; Weltevreden 596LQ; Welverdiend 24JS; White River 64JU; Wilgeboschfontein 818LS; Wilhanshohe 78LS; Winkelhaak 723JT; Witbank; Witklipbank 202IR; Witrand 457JP; Wolfhuiskraal 45JR; Woodbush; Zandfontein; Zandfontein, Rustenburg; Zandspruit 189JR; Zeerust, Marico River; Ziek 771LT; Zoutpan 104JR; Zoutpan 459MS.

Literature Records

Dinokana; Louws Creek; Rustenburg; Sunningdale; Vereeniging (Poynton, 1964). Gubyane Pothole; Hlaleni Drift; Klopperfontein Dam; Machayi Pan; Maseya Fountain; Matishibila Spring; Matjulwana Spruit; Munywini; Nyamnyulo Pan; Nzweni Pan; Pafuri River; Pumbe Pan; Shabeni Fountain; Shalungwa Fountain; Shingwedzi Drift; Shishakashanghondzo Dam; Tlapa-la-mokwena; Tshokwane, (KNP Records). Suikerbosrand Nature Reserve (Carruthers, 1978).

Habitat and Ecology

Throughout the Transvaal wherever permanent or temporary water bodies are found. Even puddles on quiet roads may be occupied. Found in all vegetation types at altitudes of 200-1800 m a.s.l., it is usually found in moist situations close to water sheltering among the vegetation or in holes and moist depressions in the banks of the stream. Instantly dive into the water on being disturbed but swim back in the same direction, stopping to cling to emergent vegetation. Will also shelter under rotting logs or other vegetable debris and under rocks. They appear to be opportumstic feeding on Hymenoptera (Formicidae), Isoptera, Araneae and Orthoptera on the Nylsvley nature reserve (Jacobsen, 1982).

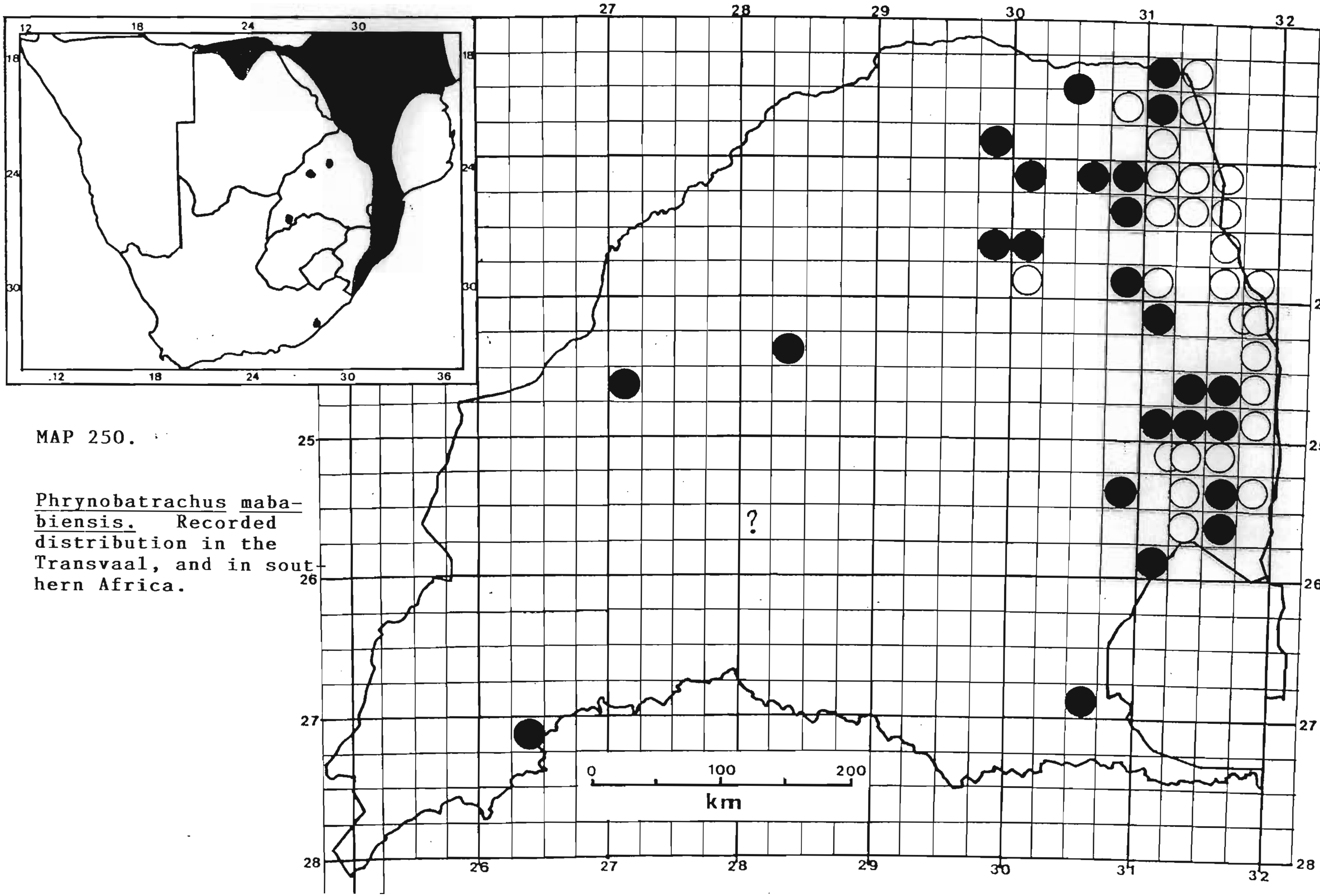
Conservation Status

Unprotected, with the exception of export control of amphibians in general from the province, (Transvaal Nature Conservation Ordinance 12 of 1983). Occurs in many provincial nature reserves as well as throughout the Kruger National Park. Status secure.

Phrynobatrachus mababiensis FitzSimons, 1932

Phrynobatrachus mababiensis FitzSimons, 1932, *Ann. Tvl. Mus.* 15, p. 40. Type locality: Tsotsoroga pan, Mababe Depression. Passmore & Carruthers 1979, p. 170-171, figs; Wager 1986, p. 100, figs; Poynton & Broadley, 1985(b), p. 165; Auerbach 1987, p. 52; Lambiris 1988, p. 227; Frost 1985, p. 447; Branch 1988b, p. 3.
Phrynobatrachus ukingensis mababiensis FitzSimons. Poynton 1964(a), p. 141-142, fig. 76; Pienaar, Passmore & Carruthers 1976, p. 60-61, fig. (xxvii).
Phrynobatrachus ukingensis (non Loveridge). Stuckenberg 1969, p. 153.

Diagnosis. 38 Specimens examined.
Colour: Variable but mostly brown, olive-brown to olive grey above with reddish to yellowish raised glands. Limbs barred with dark olive to olive brown. Ventrally white with dark speckling in the gular region becoming totally blackish in males. Upper and lower jaw with well marked, fairly regularly spaced light and dark barring.
Morphology: Largest male SVL = 17,0 mm (J1807 - Nsama River), mass = 0,50 g (J1807); Largest female SVL = 21,0 mm (J6404 - Lomati 466JU), mass = 1,0 g (J6404). Mean male SVL (11,0 mm) = 14,1 mm $\pm$ 2,23 (1SD), n = 10, mass = 0,24 g $\pm$ 0,18 (1SD), n = 10; Mean female SVL (11,0 mm) = 15,51 mm $\pm$ 3,31 (1SD), n = 14, mass = 0,39 g $\pm$ 0,29 (1SD), n = 15. Gular sac with a well-marked transverse posterior fold; flattened femoral gland present. Tips of digits sometimes slightly expanded. Tarsal tubercle prominent along tarsal fold; webbing reduced with approximately 3 phalanges of third and fourth, and 2,5 of fifth toes free of the main web. The degree of webbing appears to be variable (see Poynton & Broadley, 1985b).



MAP 250.

Phrynobatrachus mababiensis. Recorded distribution in the Transvaal, and in southern Africa.

Distribution

Total distribution uncertain at present owing to taxonomic uncertainties but the species is widespread in southern Africa with the exception of very arid areas, and most of South Africa. Occurs from the Transvaal to the eastern Cape Province.

Distribution in the Transvaal (Map 250).

Alten 222LT; Barberton Townlands 369JU; Buffelshoek 334KQ; Driefontein 77LT; Duiwelskloof; Dundee 32KU; Ireagh 263KU; Ishlelo 441IT; Komatipoort Townlands 182JU; Lomati 466JU; Lothian 274KU; Louws Creek; Ludlow 227KU; Mabyeni Hill; Mabyeni Hill, Swamp; Malamala; Manyeleti Game Reserve, Dixie Dam; Manyeleti Game Reserve, Hermitage Dam; Nelspruit; Nsama River; Nwanetsi River; Parkfield 725MS; Pretoria; Punda Milia; Ratelhoek 158KR; Shingwedzi Agricultural Station; Syferfontein 13HP; Thornhill Farm 171JU; Tzaneen 538LT; Wilgeboschfontein 818LS; Ziek 771LT.

Literature Records

Komatipoort; Louws Creek; Pafuri; Pretoria; Tzaneen, (Poynton 1964). Fayi Roan Camp; Matishibila Spring; Munywini; Ngirivane Windmill; Ngotso Waterhole; Nwatindlopfu Pan; Shabeni Fountain; Tshokwane, (KNP Records). Nylsvley Nature Reserve (Jacobsen, 1977).

Habitat and Ecology

Occurs mostly in more arid areas than natalensis and is mostly found around permanent and temporary shallow pans, but also along rivers and even in quarries and seepage areas. Usually found amongst grass close to water although also found on sandbanks. Occurs in veld types 6, 9, 10, 11, 14, 15, 18, 19 and 20 at altitudes of 200-900 m a.s.l.

Conservation Status

Unprotected, barring for the control of the export of amphibians from the province, (Transvaal Nature Conservation Ordinance 12 of 1983). Occurs throughout the Kruger National Park and most lowveld provincial nature reserves. Status currently secure.

Remarks

A highly variable species and as pointed out by Poynton & Broadley (1985b) difficult to finalise owing to the poor type specimens of two other closely allied or related species which may yet prove to be conspecific.

Genus *Cacosternum* Boulenger, 1887

Cacosternum Boulenger, 1887, *Ann. Mag. Nat. Hist.* 20, p. 51. Type by monotypy. *Cacosternum nanum* Boulenger.

Small frogs with an indistinct tympanum. The pupil of the eye is horizontal. They have an elongated body and small heads. Vomerine teeth absent; Omosternum small and cartilaginous and may be absent altogether. Procoracoid bar incomplete and cartilaginous. Metatarsals incorporated in the fleshy sole; midtarsal tubercle absent. Webbing absent. Some species are widespread eg. *boettgeri*, occurring in grassy wetlands, seeps, marshes, small streams, pans and pools, while others are rare including *capense* although also occupying shallow water bodies for breeding purposes. A small genus occurring mostly in southern Africa with a few isolated populations to the north. Four species are found in South Africa, of which two species occur in the Transvaal.

Key to the Transvaal species

1. Length of foot less than half body length .... *C. boettgeri*
   Length of foot equal to, to more than, half body length .... *C. nanum nanum*

Cacosternum boettgeri (Boulenger, 1882)

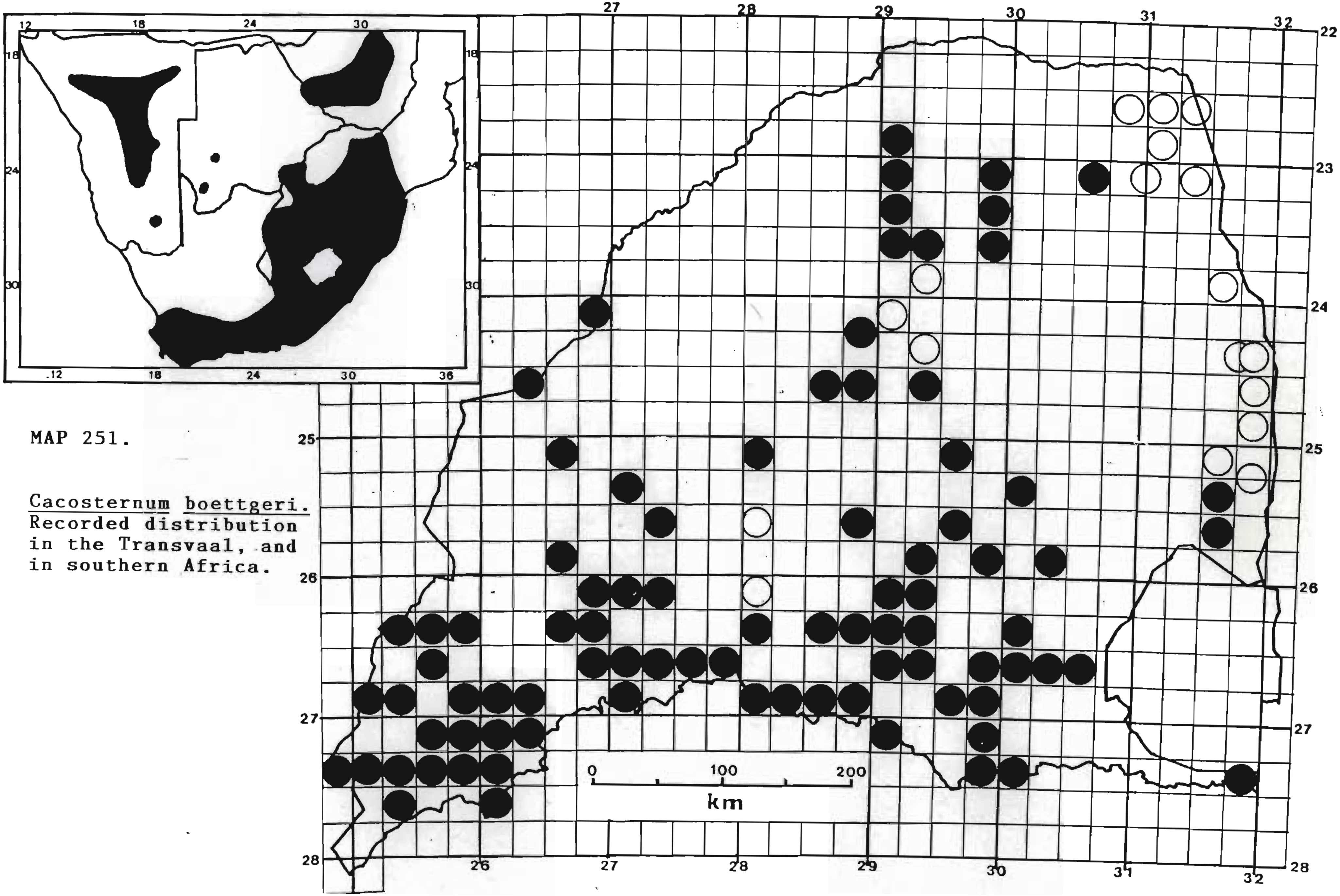
Arthroleptis boettgeri Boulenger, 1882, *Cat. Batr. Sal. Brit. Mus.*, p. 118, pl. 11, fig. 6. Type locality: Kaffraria, ie eastern Cape Province.
Cacosternum boettgeri (Boulenger). Poynton 1964(a), p.

146-147, fig. 79; Pienaar, Passmore & Carruthers 1976, p. 62-63, figs. (xxviii, xxix); Passmore & Carruthers 1979, p. 182-183, figs; De Waal, 1980, p. 111; Poynton & Broadley 1985(b); p. 165; Van Dijk 1966, p. 231, figs; Jacobsen 1977, p. 14; Auerbach 1987, p. 54, pl. 6, fig. 1; Wager 1986, p. 104; Lambiris 1988, p. 236; Branch 1988b, p. 3.

Diagnosis: 165 Specimens examined.
Colour: Very variable (see Passmore & Carruthers 1979) varying from green to brown, redbrown or dark brown with or without a pale narrow vertebral stripe. Sides of body dark except upper labial which is white to off-white from snout to axil of arm. Dorsum may also be spotted or blotched. Ventrally white with scattered large grey-black spots and blotches. Gular region in males orange-brown but only faintly spotted in females.
Morphology: Largest male SVL = 23,0 mm (P10277 - Klipgat 18IQ), mass = 0,7 g (P10277, J6302 - Uitvalskop 14HN); Largest female SVL = 23,0 mm (P10588 - Klein Kopje 15IS), mass = 0,85 g (N3106 - Kalkgat 554LS). Mean male SVL (13,0 mm) = 18,72 mm $\pm$ 1,96 (1SD), n = 25, mass = 0,38 g $\pm$ 0,15 (1SD), n = 25; Mean female SVL (13,0 mm) = 17,76 mm $\pm$ 2,75 (1SD), n = 25, mass = 0,42 g $\pm$ 0,21 (1SD), n = 25. A larger species than nanum. Omosternum absent or a small cartilaginous peg. Procoracoid bar incomplete or very tenuous. Toes without webbing. Foot less than half SVL; metatarsal and subarticular tubercles small and relatively indistinct.

Distribution

From Ethiopia south to the Cape Province excluding Namaqualand and the Mozambique Plain. Westwards to Zambia, Botswana and Zimbabwe.



MAP 251.

Cacosternum boettgeri. Recorded distribution in the Transvaal, and in southern Africa.

Distribution in the Transvaal (Map 251).

Barberspan Nature Reserve; Ben Lavin Nature Reserve; Blesboklaagte 181IR; Bleskop, Rustenburg; Boschkopje 519LS; Britsville 483IR; Buitenzorg 114HT; Bulskop 225IP; Calais 563KS; Ceres 599LS; Charl Cilliers 332IS; De Krans van Blesbokspruit 305IS; Eersteling 63HP; Generaalsdraai 423JS; Gezicht 265HO; Goedgevonden 149JP; Halfgewonnen 190IS; Holfontein 138IS; Holfontein 49IQ; Honingkrans 131HP; Humanskraal 346IO; Joubertsvallei 337IS; Kaalfontein 212IP; Kalkfontein 173LS; Kalkgat 554LS; Kinkelspruit 154IQ; Kleinkopje 15IS; Klipgat 181IQ; Klipplaatdrift 504IS; Kunana Location 4IO; Kwaggafontein 548IQ, Lapdoorns; Laaste Poort van Marico 86KP; Langjan Nature Reserve; Langzeekoegat 325IR; Lissa 161LS; Lomati 466JU; Lorasa 258IO; Lot 43 250IO; Mabalanes Location; Moorddrift 289KR; Mosdene Private Nature Reserve; Nylsvley Nature Reserve; Ongezien 365JS; Onverwacht 273IT; Palmietfontein 410IQ; Pietersburg; Plat River; Pleizer 113IO; Pongola Nature Reserve; Potchefstroom; Redcliff 426IT; Rhenosterfontein 494JP; Rhenosterfontein 563IQ; Rietfontein 219IP; Rietfontein 313IR; Rietkolk 99IO; Rietvlei 33HS; Rietvlei 433IS; Roodekopjes 67HS; Roodepoort 598IR; Rooipoortje 453IQ; Shingwedzi Agricultural Station; Simonsdal 88IT; Smitskraal 788LS; Stryfontein 477IR; Suikerboschfontein 422JT; Syferfontein 13HP; Syferfontein 303IP; Syfergat 204HO; Thornhill Farm 171JU; Uitvalskop 14HN; Vaalboschfontein 188HO; Vaalkop 490IS; Verpoort 161KP; Vetpan 131IP; Vlakfontein 37HP; Vlakfontein 453JR; Volksrust; Vryheid 134HO; Vuurfontein 117HO; Wakkerstroom; Wanhoop 78JT; Weltevreden 176HO; Wilhanshohe 78LS; Witbank; Witbank 262IT; Witfontein 306IP; Witrand 103IS; Wolfhuiskraal 45JR; Wolmaransstad; Wolwekrans 17IS; Zuiverfontein 58JQ.

Literature Records

Ermelo; Johannesburg; Lake Chrissie; Pietersburg; Potgietersrus; Pretoria; Sunningdale, (Poynton, 1964). Mahlakuza Pan; Munywini; Nwambiya Pan; Pretoria North (KNP Records). Suikerbosrand Nature Reserve (Carruthers, 1978).

Habitat and Ecology

Virtually throughout the Transvaal in all veld types except along the Transvaal Drakensberg and an area in the northwest. Found in veld types 6, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 48, 50, 52, 54, 55, 57, 61 and 63 at altitudes of 200-1700 m but most frequent on the highveld and south-western Transvaal. Occupy most water bodies, temporary or seasonal, usually found in or close to very shallow water with emergent vegetation. During dry periods they lie up under any available cover, particularly rotting vegetation but also in holes in banks, under rotting logs, rocks etc. In winter on the highveld they frequently utilise the burrows of *Cordylus giganteus*, being found 2-3 m in at the end of the tunnel. In the Burkea Savanna in the Nylsvley nature reserve many hibernate far from water (± 1 km) and must travel this distance to breed in the summer months. They appear to feed mostly on ants Hymenoptera - Formicidae and Istoptera - Termitidae and are therefore stenophagous (Jacobsen 1982).

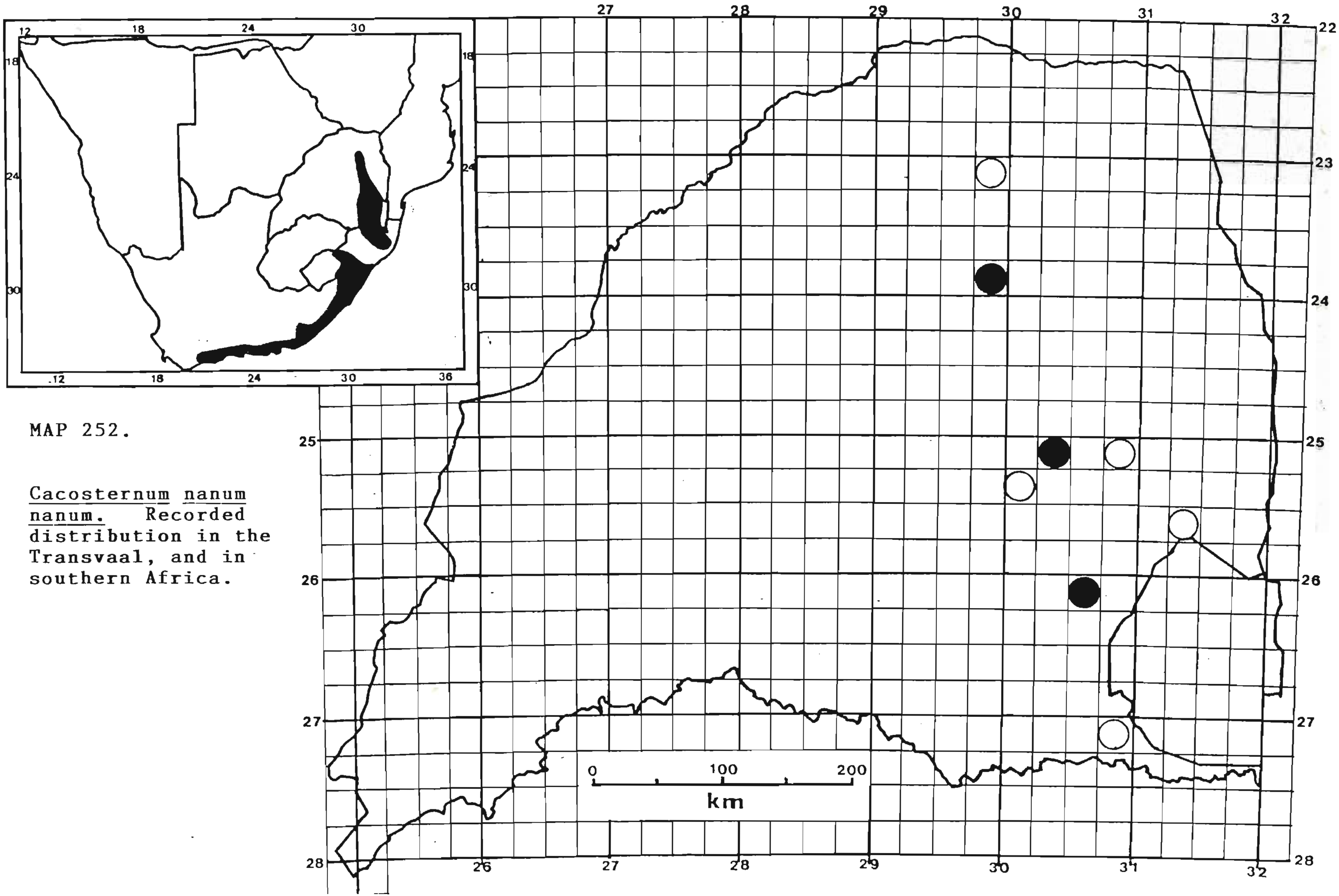
Conservation Status

Unprotected barring for the control in the export of amphibians from the Transvaal, (Transvaal Nature Conservation Ordinance 12 of 1983). Occurs widely in the Kruger National Park (Pienaar et al, 1976) and in many if not most provincial nature reserves. Status secure.

<u>Cacosternum nanum nanum</u> Boulenger, 1887

<u>Cacosternum nanum</u> Boulenger 1887, <u>Ann</u>. <u>Mag</u>. <u>nat</u>. <u>Hist</u>., (5) 20, p. 52. Type locality: Kaffraria i.e. eastern Cape Province.
<u>Cacosternum nanum nanum</u> Boulenger. Poynton 1964(a), p. 147-149, fig. 80; Passmore & Carruthers 1979, p. 184-185, figs; Poynton & Broadley 1985(b), p. 174; Van Dijk 1966, p. 231, figs; Wager 1986, p. 102, figs; Lambiris 1988, p. 242; Branch 1988b, p. 3.

Diagnosis. 24 Specimens examined.
<u>Colour</u>: Variable but mostly bronze to reddish-brown dorsally with or without a narrow vertebral stripe and scattered irregular black spots. A black mask extends from nostrils through the eyes to the shoulder. Posterior half of upper lip pale brownish to white. Ventrally white heavily mottled with black or grey black blotches; throat heavily spotted to blotched and in males almost totally dark-grey black to black.
<u>Morphology</u>: Largest male SVL = 16,0 mm (P10322 - Pittville 197IT), mass = 0,50 g (JN 2774 - 2329DD); Largest female SVL = 17,0 mm (JN 2942 - Rondefontein 974LS), mass = 0,50 g (JN 2942). Mean male SVL = 14,37 mm $\pm$ 1,38 (1SD), n = 4, mass = 0,20 g $\pm$ 0,2 (1SD), n = 4; Mean female SVL = 15,81 mm $\pm$ 0,80 (1SD), n = 8, mass = 0,34 g $\pm$ 0,10 (1SD), n = 8. Small frogs with a flattened appearance. Interorbital distance as broad to broader than upper eyelid. Length of foot not less than 44% of body length. Inner and outer metatarsal tubercles and subarticular tubercles well developed, spur-like. Palmar tubercles well developed and larger than subarticular tubercles.



MAP 252.

<u>Cacosternum nanum nanum.</u> Recorded distribution in the Transvaal, and in southern Africa.

Distribution

Southern and eastern South Africa and immediate adjacent Mozambique, (Poynton & Broadley 1985b).

Distribution in the Transvaal (Map 252).

Lydenburg; Ottoshalt, Haenertsburg; Piet Retief; Pittville 197IT; Rondefontein 974LS; Woodbush.

Literature Records

Dullstroom; Louis Trichardt; Louws Creek; Piet Retief; Sabie (Poynton 1964).

Habitat and Ecology

Mostly occurs in montane and highveld grassland in veld types 8, 10, 18, 57, 63 at altitudes of 1000-2000 m a.s.l. Inhabits similar habitats to that of boettgeri, particularly shallow seasonal pans with emergent vegetation but also in marshy terrain and even among vegetation fringing streams.

Conservation Status

Unprotected, except for the control in the export of amphibians from the province (Transvaal Nature Conservation Ordinance 12 of 1983). Does not appear to be found on a provincial nature reserve but likely to have been overlooked. Greater detail on the status of this species on provincial nature reserves is needed. Status indeterminate. More surveys are needed.

Remarks

Although Poynton (1964) recorded the subspecies parvum from the Transvaal, on a re-examination of the material it was concluded that only nanum was present despite the small size of specimens. This was based on the interorbital distance being broader than the upper eyelid which is at best extremely difficult to measure. Possibly an examination of typical parvum material from the Natal Drakensberg and foothills may show the differences between the two forms. The record from Louis Trichardt (Poynton 1964) may indicate a link with the Soutpansberg although this specimen was not found for re-examination and no corroborating material has turned up. Lambiris (1988), records both nanum and parvum from the same 1/4° squares indicating a degree of sympatry between the two forms. This would be untenable unless the two forms favoured different habitats and/or had different calls to avoid hybridization. In this case they may be different species or they may be conspecific. A critical examination of the species is called for.

Family ARTHROLEPTIDAE

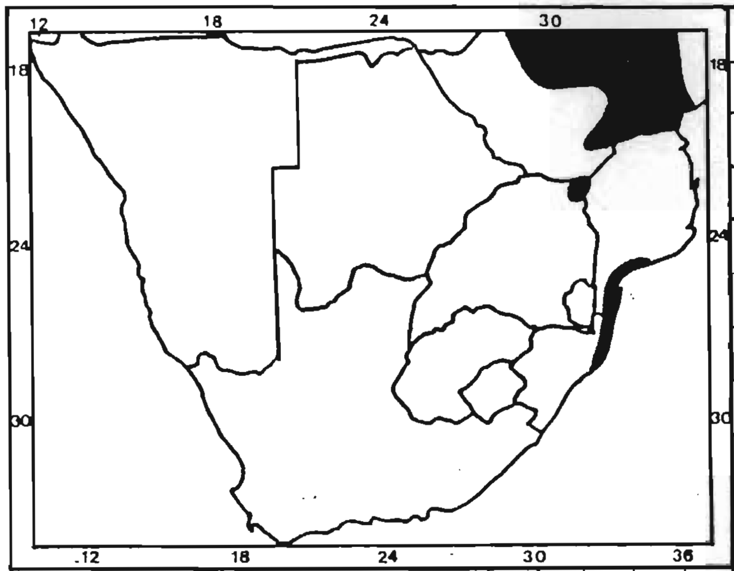
Genus *Arthroleptis* Smith, 1849

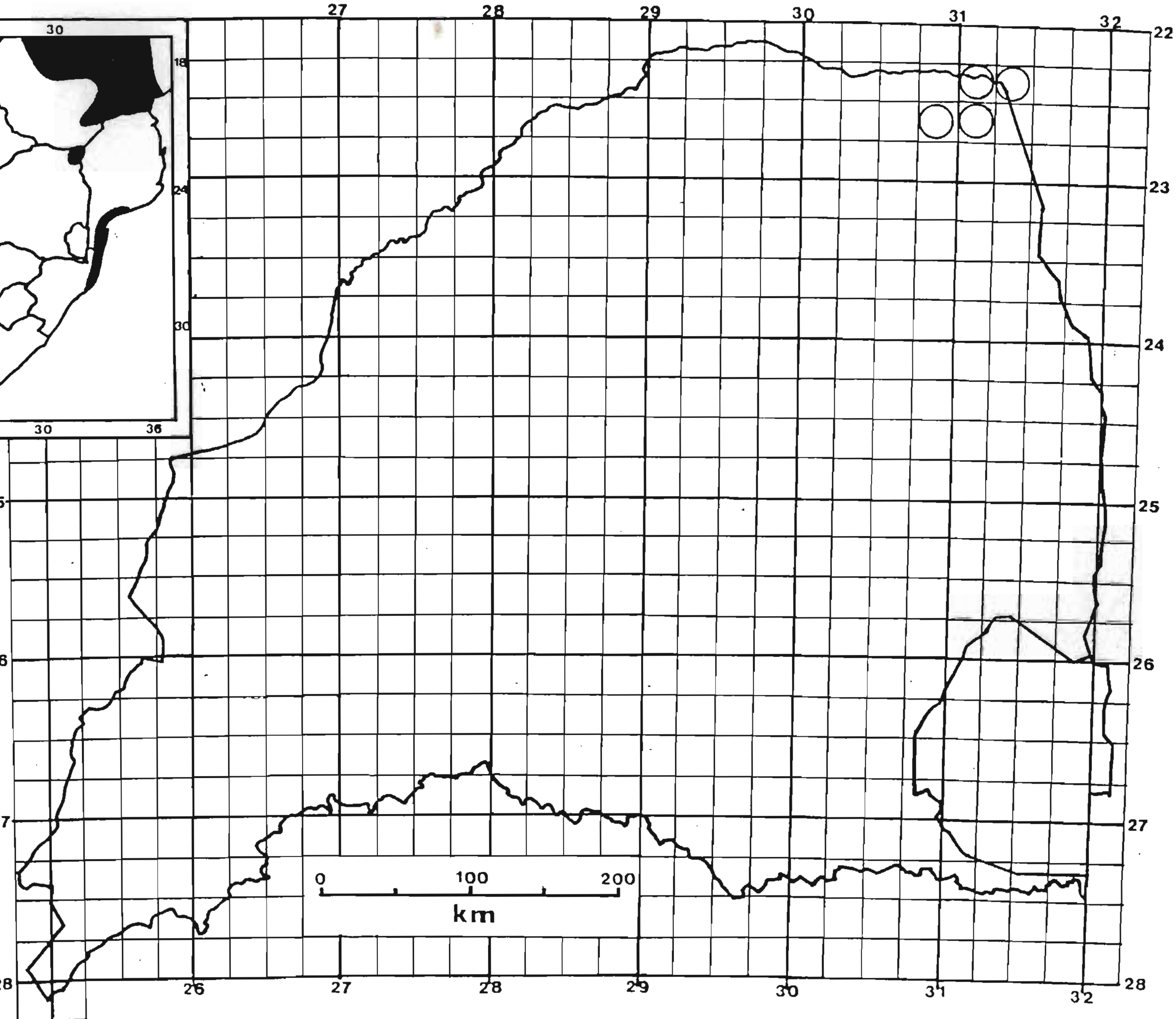
Arthroleptis Smith, 1849, *Illus. Zool. S. Afr., Rept.*, App., p. 24. Type by monotypy: *Arthroleptis wahlbergii* Smith.

Mostly small, largely terrestrial amphibians. Characterised by the absence of vomerine teeth; omosternum ossified and forked; procoracoid-clavicular bars fully ossified, metasternum cartilaginous and small. Limbs slender, third finger in males moderately to greatly elongated. Toes without webbing. The skin on the back exhibits an hour glass pattern and a ridge running from tip of snout to urostyle. The genus is widespread in subsaharan Africa with the exception of Botswana, South West Africa/Namibia and most of South Africa. Normally found in woodland and scrub but also in dense grassland, sometimes sheltering in caves or among rocks usually among leaf litter. The eggs are laid away from water, usually in litter or humus, the tadpole developing within the egg capsule. Mostly occurring in the tropics, two species reach eastern South Africa, of which one *A. stenodactylus* Pfeffer occurs in the north-eastern Transvaal.

Arthroleptis stenodactylus Pfeffer, 1893

Arthroleptis stenodactylus Pfeffer, 1893, *Jahrb. Hamburg Wiss. Anst.* 10, p. 93, pl. 1, fig. 11. Type locality: Kihengo, Tanganyika. Poynton, 1964a, pp. 163-165, fig. 92; Passmore & Carruthers, 1979, p. 108-209, figs; Pienaar, Passmore & Carruthers, 1976, p. 70, fig;





MAP 253.

Arthroleptis stenodactylus. Recorded distribution in the Transvaal, and in southern Africa.

Poynton & Broadley 1985(a), p. 536; Wager 1986, p. 111, figs; Lambiris 1988, p. 257; Branch 1988b, p. 4.

Diagnosis. No specimens examined in detail.
Colour: Variable, reddish-brown to yellow-brown dorsally with or without dorsal markings. A dark eye stripe present from nostril to tympanum. Ventrally immaculate white to spotted with grey.
Morphology: Maximum size 42,0 mm SVL. Stocky build, length of tibia a third to less than half length of body, equal to or less (in males and large females) than width of head. Metatarsal tubercle raised, flangelike with sharp edge, as long as, or shorter than outer toe. Third finger in male not more than three quarters width of head, usually less. No digital discs (Poynton & Broadley, 1985a).

Distribution

North-eastern South Africa, Mozambique to Kenya, westwards to Zambia and eastern Zaire.

Distribution in the Transvaal (Map 253).

Literature Records

Bobomeni; Shipudza Fountain, (KNP Records).

Habitat and Ecology

Acacia savanna in leaf litter (Passmore & Carruthers, 1979) in veld type 15 at an altitude of approximately 250 m a.s.l.

Conservation Status

Unprotected barring for the control of the export of amphibians from the province (Transvaal Nature Conservation Ordinance 12 of 1983). The total known distribution of the species in the Transvaal is in the Kruger National Park. A peripheral species its status is secure. Details of population size needed.

Remarks

It is likely that the species also occurs along the riparian fringe of the Limpopo river and surveys in this vicinity are needed.

Family RHACOPHORIDAE

Genus *Chiromantis* Peters, 1854

Chiromantis Peters, 1854, *Monatsb. Akad. Wiss. Berlin*, p. 626. Type by monotypy: *Chiromantis xerampelina* Peters.

Large arboreal frogs with vomerine teeth and a firmisternous pectoral girdle; metasternum long and bony. Fingers and toes webbed and a pronounced zygodactylus manus. Fingers and toes with intercalary cartilages and expanded discs at the tip. Uniquely adapted to a seasonal rainfall regime exhibiting uricotelism, a protective dry skin and ventral water absorption (Loveridge 1970, 1974). This enables the species to be able to tolerate the pre-rainy season dryness and heat in order to breed at the beginning of the rains, possibly before the temporary pools have become colonised by predators of the tadpoles. The species constructs a foam nest which adheres to branches overhanging pools or pans, in which the eggs are laid. On hatching the tadpoles wriggle through the foam and fall in the water below. Tropical frogs, only one species occurs in southern Africa including the northern and eastern Transvaal.

Chiromantis xerampelina Peters, 1854

Chiromantis xerampelina Peters 1854, *Monatsb. Akad. Wiss. Berlin*, p. 627. Type locality: Tete and Sena Mozambique. Poynton 1964(a), p. 157-158, fig. 88; Pienaar, Passmore & Carruthers 1976, p. 65-67, fig. (xxx, xxxi, xxxii); Passmore & Carruthers 1979, p. 202-203, figs; Poynton & Broadley 1987, p. 165; Loveridge 1970,

p. 1; Auerbach 1987, p. 57, pl. 6 fig. 2; Wager 1986, p. 139, figs; Lambiris 1988, p. 266; Branch 1988b, p. 3.

Chiromantis xerampelina xerampelina Peters. Jacobsen 1977, p. 14.

Diagnosis: 113 Specimens examined.

Colour: Overall grey to brownish with variable darker markings including a stripe from posterior margin of eye to above the shoulder. Limbs may appear barred. In strong light these frogs become white. Ventrally whitish with variable freckling of grey under the chin and throat.

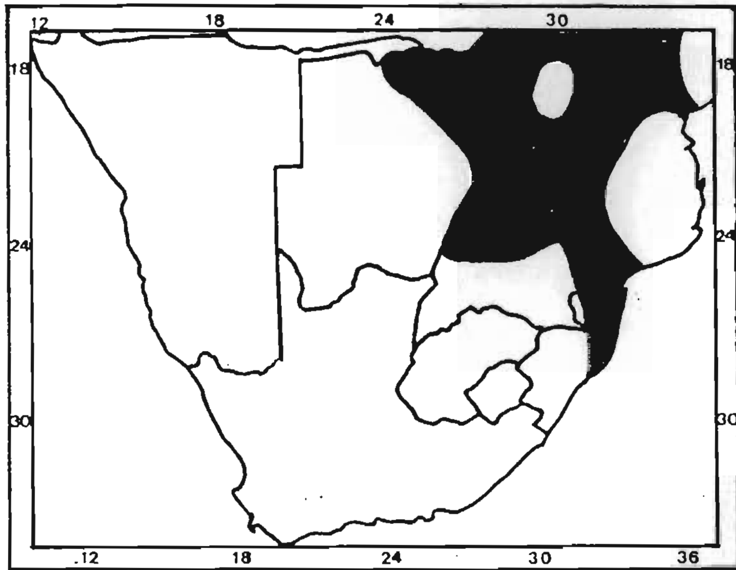
Morphology: Largest male SVL = 72,0 mm (JN 555 - Carpe Diem), mass = 28,4 g (JN 555); Largest female SVL = 78,0 mm (N3160 - Smitskraal 788LS), mass = 42,7 g (N3160). Mean male SVL (40,0 mm) = 57,4 mm ± 11,28 (1SD), n = 5, mass = 16,18 g ± 9,44 (1SD), n = 5; Mean female SVL (40,0 mm) = 60,79 mm ± 9,98 (1SD), n = 19, mass = 17,07 g ± 8,90 (1SD), n = 18. Poynton & Broadley (1985) record maximum size of 90,0 mm SVL. Therefore a large tree-frog. Other characters as for the genus.

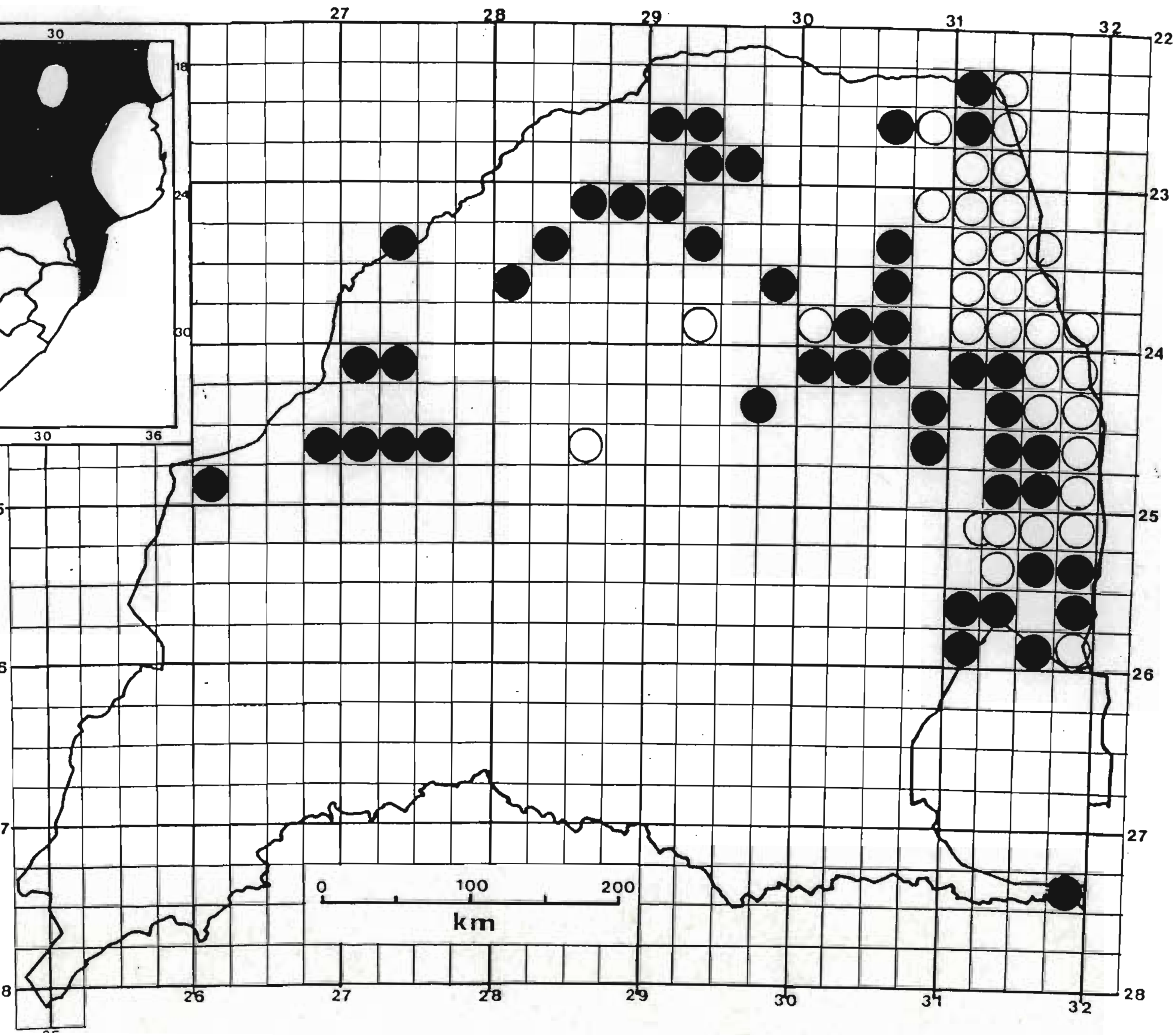
Distribution

Northern Natal, eastern and northern Transvaal across to north-eastern South West Africa/Namibia, Zambia, Zimbabwe, Mozambique, Malawi, Tanzania and coastal Kenya (Poynton & Broadley, 1985).

Distribution in the Transvaal (Map 254).

24 km ENE of Acornhoek; Alfa 448JU; Amsterdam 116LS; Argyle 46KU; Barberton Townlands 369JU; Ben Lavin Nature Reserve; Blouberg; Blyolifants Nature Reserve; Boschfontein 470JU; Bridgewater 263MS; Brombeek 272MS;





MAP 254.

Chiromantis xerampelina. Recorded distribution in the Transvaal, and in southern Africa.

Buffelshoek 334KQ; Buffelskraal 486LR; Carpediem 76KT; Coventry 56KQ; Donkerpoort 344KQ; Dublin 86KT; Furnasi Gold Mine, Giyani; Glen Alpine 304LR; Gravelotte; Grootdraai 429KS; Hans Merensky Nature Reserve; Harmony 140KT; Hectorspruit; Helena 400JU; Hoedspruit; Ireagh 263KU; Kaapmuiden 212JU; Kalkheuwel 454MS; Kempiana 90KU; Klein Tshipies - Tshamavudzi Road; Knoppieskraal 484KQ; Komatipoort Townlands 182JU; Kwaggadraai 137LR; Leipzig Mission; Letsitele 652LT; Ludlow 227KU; Mabyeni Hill; Manyeleti Game Reserve; Manyeleti Game Reserve, Hermitage 205KU; Manyeleti Game Reserve, Main Camp; Manyeleti Game Reserve, Sarabank 323KU; Mariepskop; Middlesex 205KT; Pongola Nature Reserve; Punda Milia; Rochdale 700MS; Ross 55KU; Sabi Sand Game Reserve; Sekororo; Selati; Smitskraal 788LS; Stockpoort 1LQ; Ten Bosch 162JU; Thornhill Farm 171JU; Urk 10LS; Verpoort 161KP; Vogelstruisfontein 32KQ; Wilhanshohe 78LS; Wonderboom 98KP; Zeekoegat 12KU.

Literature Records

Near Mananga; Newington; near Pietersburg; Thabazimbi; Tzaneen, (Poynton 1964). Nylsvley Nature Reserve, (Jacobsen 1977). Eastern boundary between Kukumezane Spruit and Olifants River; Kingfisherspruit; Malonga; Masbambela Picket; Nyandu Bush; Skukuza, (KNP Records). Nylsvley Nature Reserve (Jacobsen, 1977).

Habitat and Ecology

Mostly occurring in the drier parts of the Transvaal in veld types 6, 8, 9, 10, 11, 13, 14, 15, 18, 19 and 20 at altitudes of 200-1200 m a.s.l. During the breeding season these frogs are commonly found clinging to branches close to their nests. As the males assists the female in the construction of the nest as many as eight have been found in close proximity. During winter these frogs hibernate mostly under the bark of trees, in crevices between rocks or on branches of shady evergreen trees, sometimes even on the beams of houses where they stay for long periods of time. The ability to change from grey to white under conditions of increased insolation is a remarkable adaption towards reducing the amount of heat absorbed and therefore also a reduction in the amount of fluid needed to cool the body. While the grey body is largely cryptic, a white body is easily visible especially against a dark background. It is therefore clear that the loss of camouflage is the lesser of two evils to be adopted under the heat of the tropical sun. On one occasion one of these frogs was observed totally exposed, clinging to the side of a large black rock in a dry river bed (pers. obs.). In addition the ability to concentrate nitrogenous waste as uric acid which can be held for long periods in crystalline form within the body ensures that it can tolerate fairly long periods without rain. Rehydration is made possible through the posterior belly skin as is the case with Schismaderma carens and probably other bufonids (see Poynton 1964, p. 217-8).

Conservation Status

Unprotected, except for the control of the export of amphibians from the province, (Transvaal Nature Conservation Ordinance 12 of 1983). Widespread in the Kruger National Park and in several provincial nature reserves. The status is currently secure.

Remarks

Jacobsen (1977) reported on a specimen from the Nylsvley nature reserve. The fact that no nests or subsequent specimens were found, indicates that this frog was a hitchhiker probably from the Hans Merensky nature reserve in the Lowveld. Many apparent abnormal records can be attributed to the habits of this species. An ingenious, if accidental method of dispersal.

Family HEMISIDAE

Genus *Hemisus* Günther, 1858

Hemisus Günther, 1858, *Cat. Batr. Sal. Brit. Mus.*, p. 47. Type by monotypy: *Engystoma guttatum* Rapp.

Shovel-nosed frogs, characterised by their squat, depressed and stocky appearance. The tip of the snout is sharp edged. The pupil of the eye is vertical. Lower jaw recessed and upper jaw without teeth. Procoracoid-clavicular bar well developed. Limbs and digits are stout. The inner metatarsal tubercle is well developed. Mostly distributed over tropical and subtropical Africa south of the Sahara excluding South West Africa/Namibia and most of South Africa. Inhabitants of open to wooded savannas in mesic to moist climates. Only three forms occur in South Africa all of which have been recorded from the Transvaal, two species are peripheral.

Key to the Transvaal species.

1. Inner metatarsal tubercle shorter than free portion of second toe; dorsum brownish with scattered yellow spots .... *H. guttatus*
   Inner metatarsal tubercle longer than free portion of second toe; dorsum grey to grey-brown with or without a vertebral line, and yellowish to greenish yellow mottling 2

2. Mature males not normally exceeding 30,0 mm nor females 38,0 mm. Free part of fifth toe 77-160% of inner metatarsal tubercle .... *H. marmoratus marmoratus*

Mature males normally exceed 30,0 mm SVL and females 38,0 mm. Free part of fifth toe 45-77% of inner metatarsal tubercle .... H. guineensis broadleyi

Hemisus guttatus (Rapp, 1842)

Engystoma guttatum Rapp 1842, Arch. Naturgesch., 8, p. 290, pl. 6, figs. 3, 4. Type locality: Natal.
Hemisus guttatum (Rapp). Poynton 1964(a), pp. 165-166, fig. fig. 93, Passmore & Carruthers 1979, pp. 214-215, figs; Van Dijk 1966, p. 231, figs; Frost 1985, p. 169; 1986, p. 130, gis; Lambiris 1988, p. 343; Branch 1988b, p. 4.

Diagnosis. No specimens examined.
Colour: Uniform olive to dark-brown dorsally with scattered rounded yellow spots. Ventrally smooth and white. The gular region in males is dark (Poynton 1964).
Morphology: A large frog reaching 80,0 mm SVL (Poynton, 1964) with feet lacking webbing and length of inner metatarsal tubercle less than free portion of second toe.

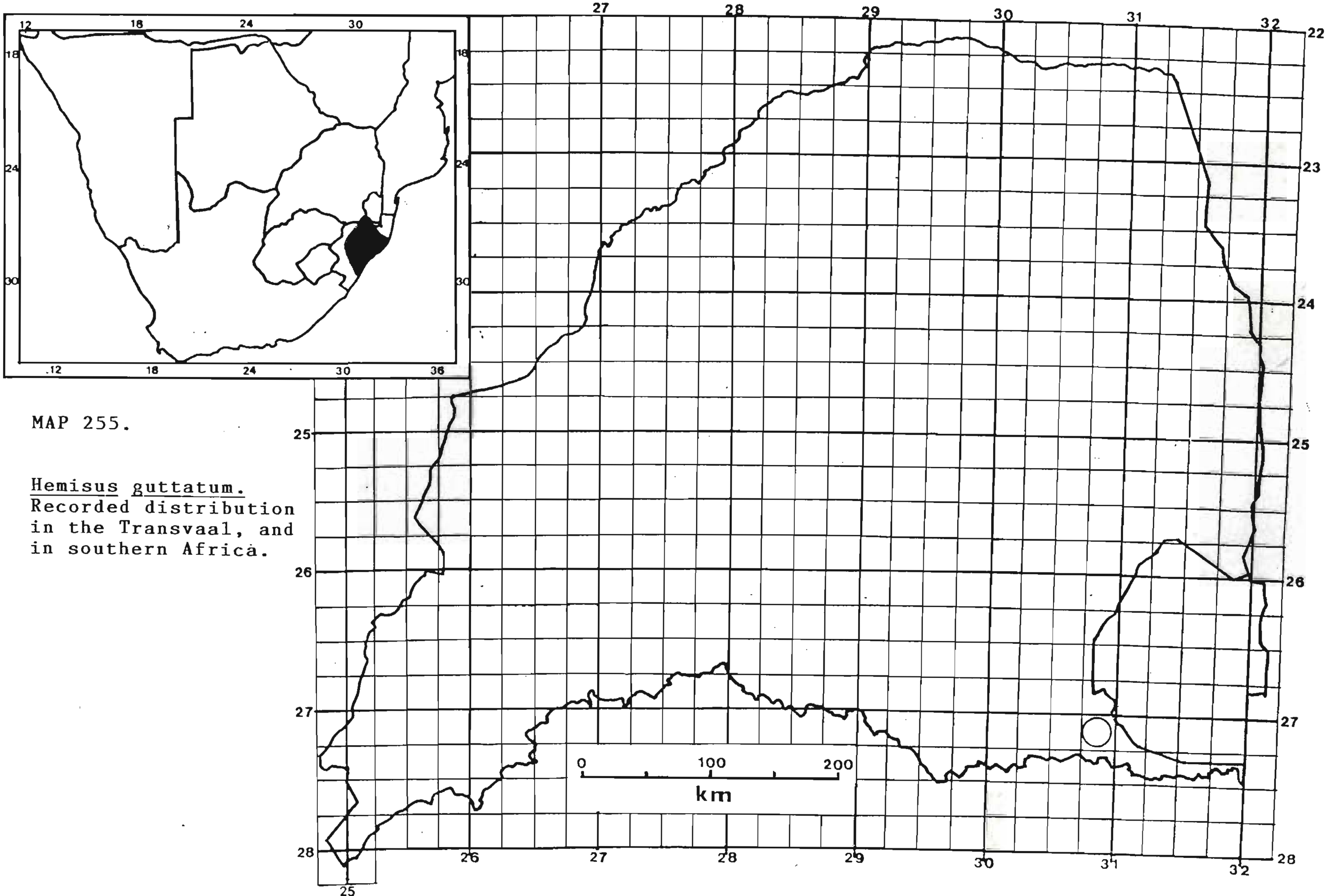
Distribution

Mainly coastal Natal but also northern Natal and the South-eastern Transvaal.

Distribution in the Transvaal (Map 255).

Literature Records

Piet Retief (Poynton, 1964).



MAP 255.

Hemisus guttatum.
Recorded distribution
in the Transvaal, and
in southern Africa.

Habitat and Ecology

Peripheral, the species has been recorded from veld type 63 at an altitude of 1300 m a.s.l. Lambiris (1988) mentions that it is found in burrows or under stones in open grassy areas or wooded grassland.

Conservation Status

Unprotected barring for the control of the export of amphibians from the province, (Transvaal Nature Conservation Ordinance 12 of 1983). Peripheral and apparently relatively rare. Lambiris (1988) only recorded one specimen from adjacent northern Natal. More detailed surveys of this particular species are needed, to establish the total distribution. As much of the area around Piet Retief is afforested and afforestation proceeding annually, such surveys are important to establish the true distribution of the species, and how it is being affected.

Hemisus marmoratus marmoratus (Peters, 1854)

Engystoma marmoratum Peters, 1854, *Monatsb. Akad. Wiss. Berlin*, p. 628. Type locality: Cabaceira, Mozambique.
Hemisus marmoratum (Peters). Poynton 1964(a), p. 166-167, fig. 94. Wager 1965, p. 178, figs; Pienaar, Passmore & Carruthers, 1976, p. 72-73, fig. (xxxiv); Van Dijk 1965, p. 209, 1966, p. 231, figs. Wager 1986, p. 128, figs.
Hemisus marmoratum marmoratum (Peters). Poynton & Broadley 1985(a), p. 529; Auerbach 1987, p. 55, pl. 5 fig. 1.

Hemisus marmoratus marmoratus (Peters). Lambiris 1988, p. 345; Branch 1988b, p. 4.

Diagnosis. 24 Specimens examined.
Colour: Variable grey to olive-grey to brown dorsally with darker mottling. Ventrally smooth and whitish. Males have a dark gular region.
Morphology: Largest male SVL = 33,0 mm (N2581 - Groot Denteren 533LR), mass = 4,0 g (N2581); Largest female SVL = 39,5 mm (JN 470 - Shingwidzi Agricultral Station), mass = 5,6 g (JN470). Mean male SVL (25,0 mm) = 29,75 mm ± 2,5 (1SD), n = 4, mass = 2,92 g ± 0,76 (1SD), n = 4; Mean female SVL (25,0 mm) = 30,7 mm ± 5,87 (1SD), n = 5, mass = 3,27 g ± 1,83 (1SD), n = 5. Toes slightly webbed at base and length of inner metatarsal tubercle greater than free portion of 2nd toe. Free part of fifth toe from 77-160% of inner metatarsal tubercle.

Distribution

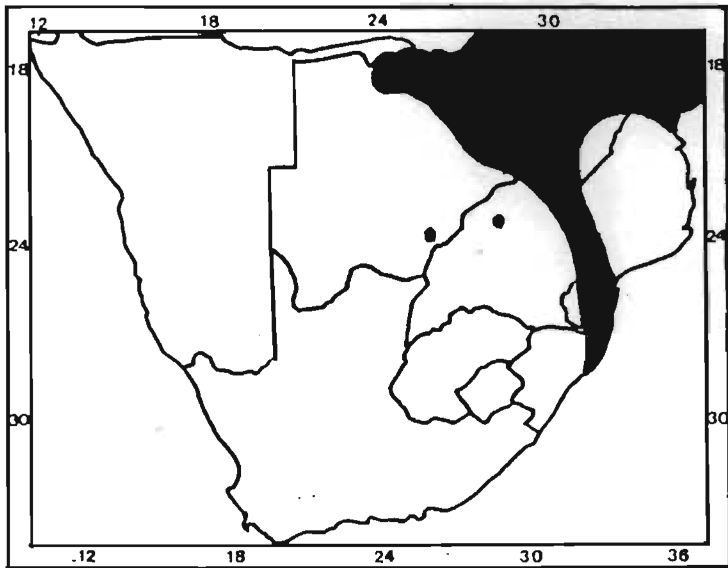
Northern Zululand, eastern and western Transvaal, eastern and northern Botswana, Zimbabwe and Mozambique northwards to southern Somalia (Poynton & Broadley 1985a).

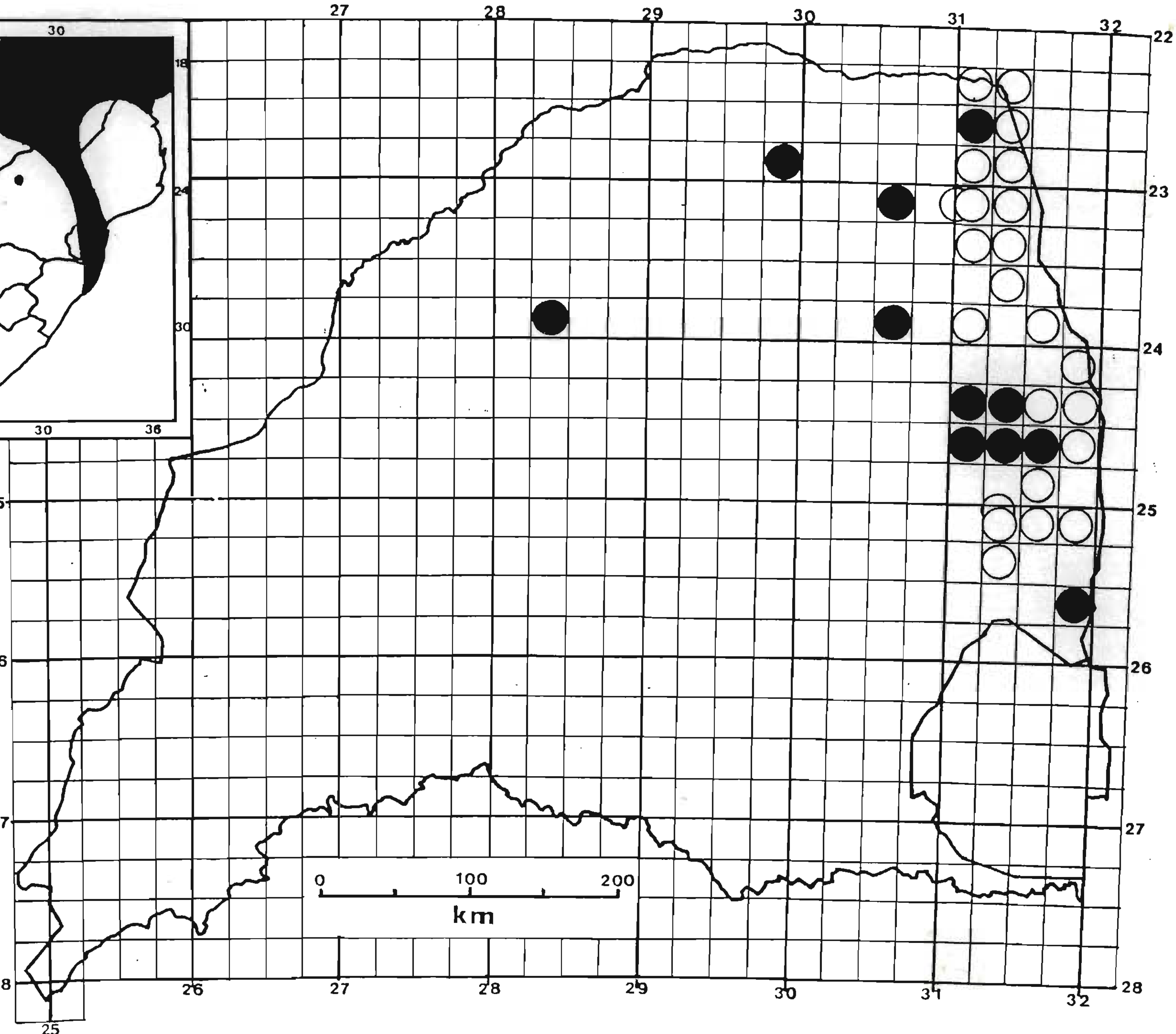
Distribution in the Transvaal (Map 256).

Gravelotte; Groot Denteren 533LR; Helena 400JU; Manyeleti Game Reserve, Hermitage 205KU; Manyeleti Game Reserve, Main Camp; Punda Milia; Rolle 235KU; Ross 55KU; Shingwedzi Agricultural Station; Tshipise, 35 km south-west; Uthla 239KU.

Literature Records

Crook's Corner; Hutwini; Kumana Dam; Lipape Dam; Magamba; Ngirivane Windmill; Nwatindlopfu Firebreak;





MAP 256.

<u>Hemisus marmoratum marmoratum.</u> Recorded distribution in the Transvaal, and in southern Africa.

Pafuri; Pumbe Picket; Pumbe Sandveld; Shabarumbe Spruit; Shingwedzi; Wetsatsu Waterhole (KNP Records).

Habitat and Ecology

Appear to inhabit more mesic bushveld areas in the Transvaal. Found in veld types 6, 10, 11, 15 and 18 at altitudes of 200-900 m a.s.l. Inhabit burrows frequently under rotting logs or stones. A male and female found together with a clutch of 222 tadpoles were 8 m from the water, which seems a bit far from water to dig a tunnel as mentioned by Wager (1965). Bourquin (1985) recorded an instance of marmoratus which had eggs and tadpoles adhering to its back. However in the nest found above, the eggs formed a roundish mass and did not adhere to the frog. Poynton & Broadley (1985a) mention that the frogs are "frequently found buried in damp sand beneath dry river beds in lowveld areas, this species tends to keep close to permanent or temporary pans or watercourses. It is found above ground only in wet weather". Several specimens collected during this survey were captured in walk-in-traps with drift fences, and others were found wandering above ground. They are presumably much like Breviceps in their activity pattern.

Conservation Status

Unprotected except for the control of the export of amphibians from the province, (Transvaal Nature Conservation Ordinance 12 of 1983). Infrequent and specialised, these frogs are found widespread in the Kruger National Park and probably in several provincial nature reserves. Status currently secure but details of population densities are needed.

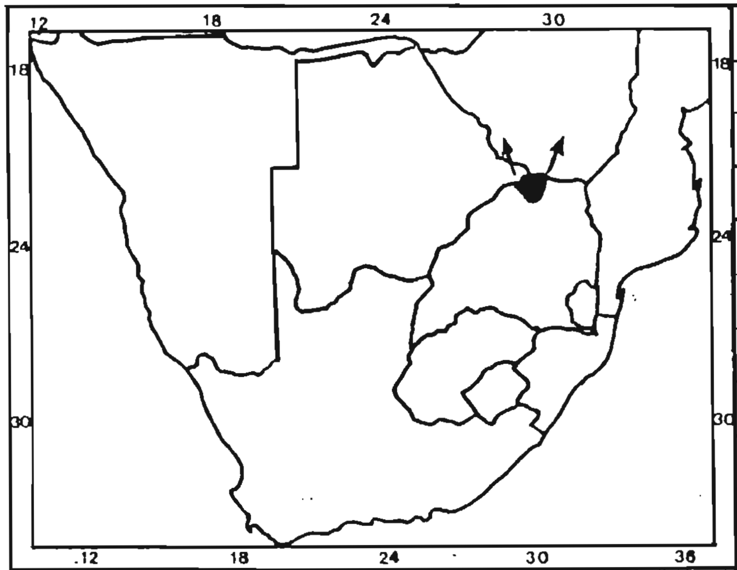
Remarks

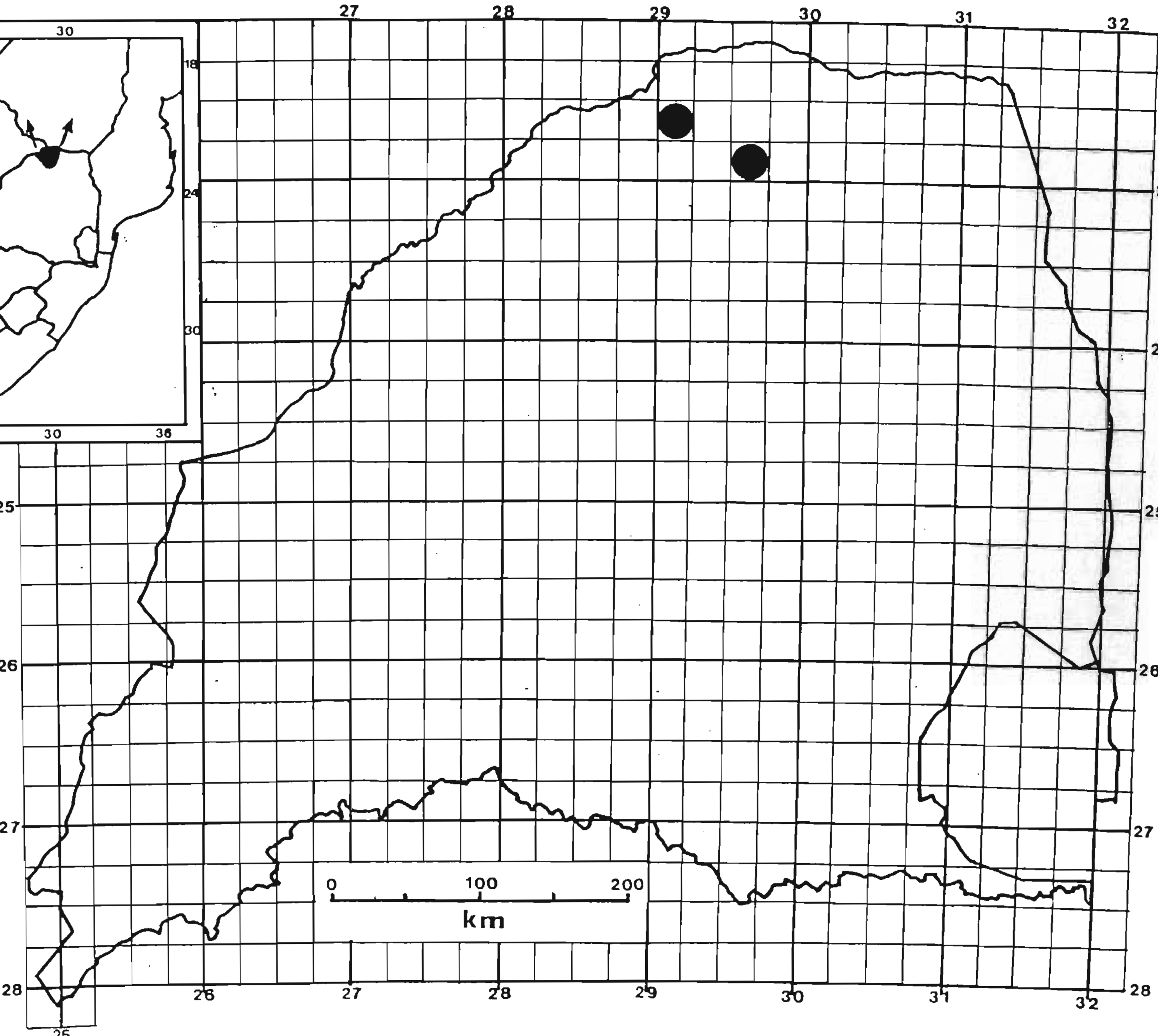
Difficult to separate from _H. guineensis broadleyi_ Laurent in some instances, which is borne out by the inclusion of TM 12659 - Bridgewater and TM 14045 - Transvaal _s. l._ under _marmoratus_ instead of _guineensis broadleyi_ (Poynton & Broadley, 1985a, p. 531). However based on the key characters, I follow Poynton & Broadley (1985a) in accepting _H. guineensis broadleyi_ and incorporating both TM accessions in this taxon. Until a sufficiently large specimen base from the northern Transvaal, especially in the north-west, is available, little else can be said.

Hemisus guineensis broadleyi Laurent, 1972

Hemisus guineensis broadleyi Laurent 1972, _Ann. Mus. r. Afr. cent. Ser._ in 8° _Sci. Zool._ 194 p. 1-67. Type locality: 51 km NE Mutoko, Zimbabwe. Poynton & Broadley 1985(a), p. 532-533, fig. 11; Branch 1988b, p. 4.
Hemisus marmoratum (not Peters) Poynton 1964(a), p. 166 (part).

Diagnosis. 3 Specimens examined.
Colour: Uniform dark grey to brown sometimes with a few light dots and/or (especially in Mozambique) a light vertebral line (Poynton & Broadley 1985a).
Morphology: A small to medium frog, males reach 36,0 mm SVL and females 46,0 mm. Internarial distance 50-85% of eye-nostril distance; eye-nostril distance 80-107% of length of upper eyelid. Width of upper eyelid 33-45% of interorbital distance; width of upper eyelid more than 60% of free part of fifth toe. Inner metatarsal tubercle longer than free portion of second toe. Free part of fifth toe 45-77% of inner metatarsal tubercle (Poynton & Broadley 1985a).





MAP 257.

<u>Hemisus</u> <u>guineensis</u> <u>broadleyi.</u> Recorded distribution in the Transvaal, and in southern Africa.

Distribution

Zambia, Zimbabwe, Mozambique and the northern Transvaal.

Distribution in the Transvaal (Map 257).

Bridgewater 263MS; Rochdale 700MS; Transvaal *s. l.*

Habitat and Ecology

Similar to *marmoratus* but the extent of any ecological differences is not known, (Poynton & Broadley 1985a). Occurs in veld type 15 at altitudes of 700-800 m a.s.l.

Conservation Status

Unprotected barring control of the export of amphibians from the province, (Transvaal Nature Conservation Ordinance 12 of 1983). Not known to occur in any provincial nature reserve or in the Kruger National Park. More extensive surveys are needed to establish the extent of the species and size of populations. The species appears to be peripheral to the Transvaal and in South Africa.

Remarks

See under *marmoratus*.

Family HYPEROLIIDAE

Genus *Leptopelis* Günther, 1859

Leptopelis Günther 1859, *Cat. Batr. Sal. Brit. Mus.* p. 89. Type by monotypy: *Hyla aubryi* Duméril.

Mostly "tree frogs" characterised by a vertical pupil in the well developed eye; vomerine teeth are present. Metasternum a narrow to broad cartilaginous plate; omosternum entire. Inner metatarsal tubercle very prominent. Digital discs absent to well developed and digital intercalary cartilages present. Vocal sac internal with no external manifestation. Fingers not or only partially webbed, toes moderately to weakly webbed. Although commonly referred to as tree frogs many species only clamber into trees and shrubs during the breeding season, spending the winter hibernating in underground burrows. *L. flavomaculatus* is a forest species while other species occupy wooded savanna. *L. xenodactylus* is an inhabitant of moist montane grassland. The genus is widespread in Subsaharan Africa excluding only very arid regions, and excluding most of South Africa, Botswana and South West Africa/Namibia. Five species occur in South Africa of which two have been recorded from the Transvaal.

Key to the Transvaal species.

1. Width of disc of fourth toe greater than width of toe's distal subarticular tubercle .... *L. mossambicus*
   Width of disc not greater than width of subarticular tubercle .... *L. bocagei*

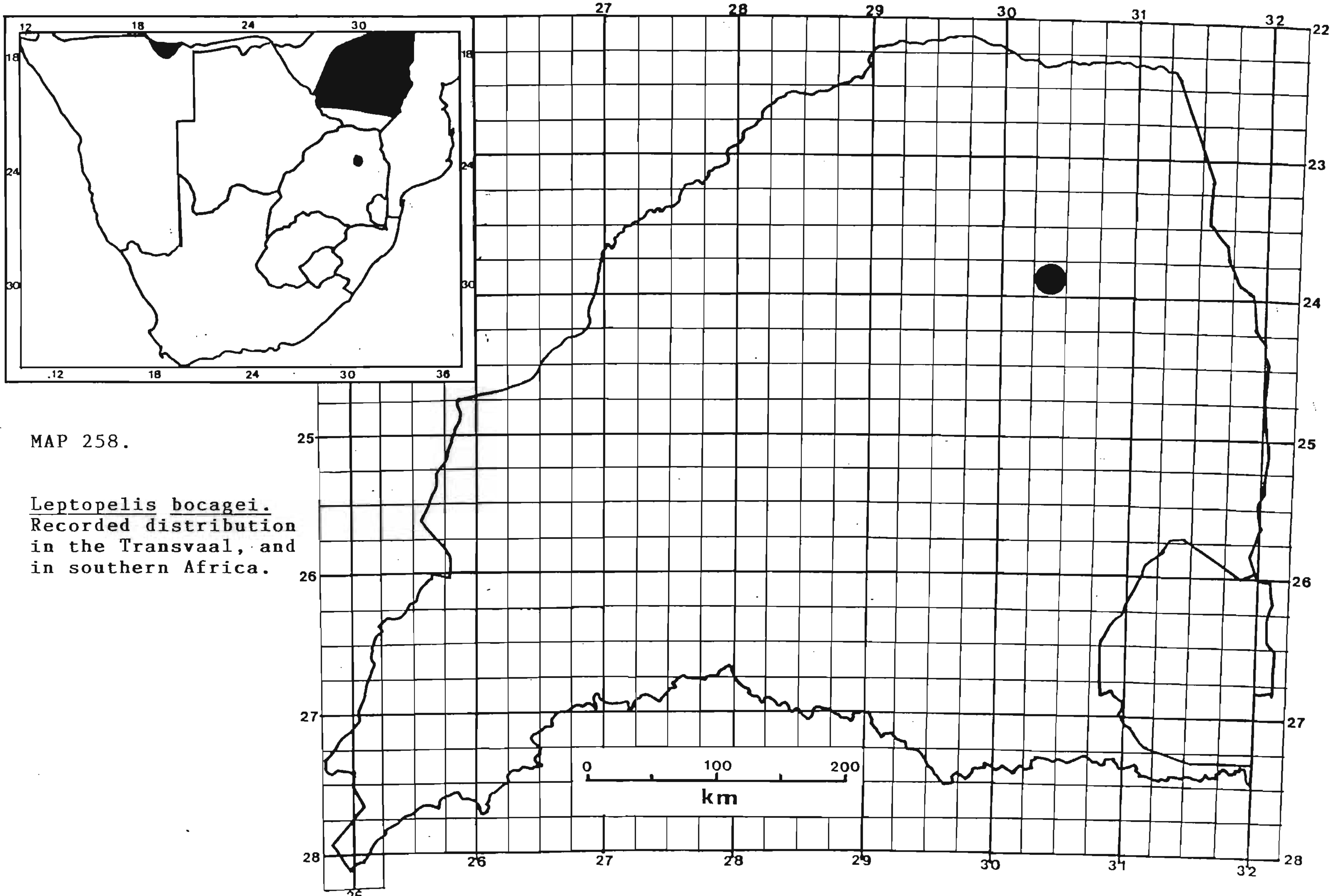
Leptopelis bocagii (Günther, 1864)

Cystignathus bocagii Günther, 1864, Proc. Zool. Soc. Lond., p. 481, pl. 33, fig. 2. Type locality: Duque de Braganza, Angola.
Leptopelis bocagei (Günther). Poynton 1964(a), p. 172, fig. 99. Poynton & Broadley 1987, p. 174; Auerbach 1987, p. 59, pl. 6, fig. 3.
Leptopelis bocagii (Günther). Branch 1988b, p. 4.

Diagnosis. 1 Specimen examined.
Colour: Pale brown to grey-brown with an irregular n or inverted u-shaped blotch usually containing lighter marbling. The blotch may be fragmented, but extends from the urostyle to above the level of the tympanum. Also a dark interorbital bar (Poynton 1964). The dorsal blotch is however variable (Poynton & Broadley, 1987). Juveniles have a uniform green to brown-green dorsum. Ventrally white.
Morphology: A moderately sized treefrog, males reach 50,0 mm SVL and females up to 58,0 mm SVL. Tympanum large, horizontal diameter is half or more than half the diameter of the eye. Interorbital distance/distance from nostril to tympanum not more than 36%. Webbing absent between fingers and rudimentary between the toes. Broad web between third and fourth toes just reaching, to falling short of, distal subarticular tubercle of third toe, between fourth and fifth toes reaching, to falling short of distal tubercle. Tips of fingers and toes tend to taper with weakly developed discs not broader than width of digits (Poynton & Broadley, 1987).

Distribution

Distributed mainly from Ethiopia to northern South West Africa/Namibia, Zimbabwe and the north-eastern Transvaal.



MAP 258.

Leptopelis bocagei. Recorded distribution in the Transvaal, and in southern Africa.

Distribution in the Transvaal (Map 258).

Letsitele.

Habitat and Ecology

According to Poynton & Broadley (1987), the species rarely climbs, and calls mostly from ground level but will ascend shrubs. Active only during wet weather, emerging from their burrows to call. Appears to have strong fossorial tendencies. Loveridge & Craye, 1979 discuss cocoon formation and efficacy during hibernation in this species. The single Transvaal record comes from the junction of two veld types namely 9 and 11 at an altitude of 500 m a.s.l.

Conservation Status

Unprotected, barring for the control in the export of amphibians from the province (Transvaal Nature Conservation Ordinance 12 of 1983). Not known to occur in any provincial nature reserve or in the Kruger National Park to date, but may well do so. More detailed surveys needed to establish its status. Currently considered indeterminate.

Remarks

The unusual single record from the Transvaal needs to be verified in order to ascertain if the specimen was a 'hitch hiker' or not.

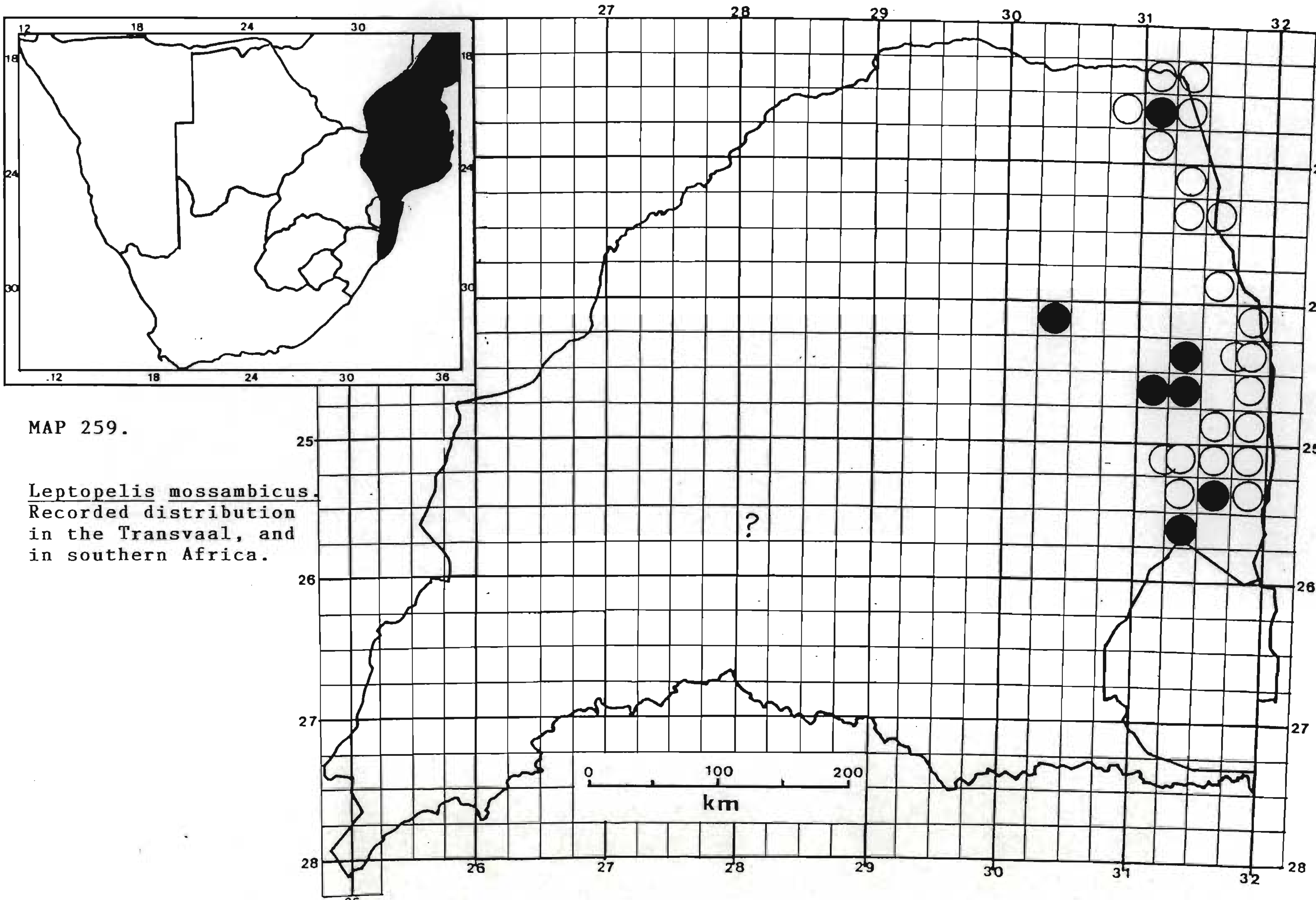
Leptopelis mossambicus Poynton, 1985

Leptopelis mossambicus Poynton 1985b, _S. Afr. J. Sci._ 81, p. 466-468. Type locality: Maputo, Mozambique. Poynton & Broadley, 1987, p. 169; Wager 1986, p. 146, figs; Lambiris 1988, p. 277; Branch 1988b, p. 4.
Leptopelis concolor (non Ahl (part). Poynton 1964a, p. 169, fig. 97. Van Dijk 1966, p. 231, figs.
Leptopelis cinnamomeus (Bocage). Pienaar, Passmore & Carruthers 1976, p. 74, fig. (xxxv).
Leptopelis sp. Passmore & Carruthers 1979, p. 220, figs.

Diagnosis. 11 Specimens examined.
Colour: Pale brown dorsally, usually with a distinct n-shaped dark brown blotch extending from urostyle to occiput. Blotch may be solid or pale centred. An interocular bar is rarely present, remnants on occasions forming dark ocular patches. Juveniles green dorsally. Ventrally fawn coloured to creamy white with darker markings on the throat.
Morphology: A medium to large tree frog, Poynton & Broadley (1987) record males up to 52,0 mm SVL; the largest female SVL = 67,0 mm (N5661 - Rolle 235KU), mass = 27,0 g (N5661). Tympanum large (horizontal diameter more than half diameter of eye). Fingers not or barely webbed and webbing limited between the toes with up to 3,5 phalanges of fourth and two of fifth toes free of web. Expanded discs on fingers and toes wider than subartucular tubercles.

Distribution

Lowlands of nortnern Natal, Swaziland, Transvaal, Mozambique, Zimbabwe and southern Malawi (Poynton & Broadley, 1987).



MAP 259.

Leptopelis mossambicus. Recorded distribution in the Transvaal, and in southern Africa.

Distribution in the Transvaal (Map 259).

Carpediem 76KT; Hectorspruit; Kaapmuiden 212JU; Manyeleti Game Reserve, Hermitage 205KU; Pretoria, Witfontein (transplant); Punda Milia; Rolle 235KU; Ross 55KU; Shilowane.

Literature Records

Crook's Corner; Kambeni Experimental Plots; Masbambela Picket; Mitomeni Pan; Nkwane Pan; Pumbe Sandveld; Shangoni; Shingwedzi Drift; Shipudza Fountain, (KNP Records).

Sight Records

Dover 23KU; Klaserie Private Nature Reserve (N. Zambatis).

Habitat and Ecology

Savanna woodlands of the lowveld in veld types 9, 10, 11 and 15 at altitudes of 200-650 m a.s.l. May be found close to streams or swamps but may also be found some distance away from water, in orchards. Call usually under moist conditions and at variable heights above the ground, from 1,5 to 2,4 m have been recorded in the Transvaal. Appear to be docile and unless handled roughly do not resist. If agitated they leap to the ground. A female was captured in a "walk in" trap on the farm Rolle 235KU.

Conservation Status

Unprotected barring for the control of the export of amphibians from the province, (Transvaal Nature

Conservation Ordinance 12 of 1983). Widespread in the Kruger National Park and likely to occur in several provincial nature reserves. Status appears to be secure.

Remarks

Poynton & Broadley, (1987) discuss the considerable degree of geographical variation within the species. Transvaal specimens do not exhibit great variability. A specimen, TM 53941 - Witfontein, Pretoria is likely to be a "hitchhiker" and the locality record cannot be accepted. The absence of calling individuals in the area during the summer months supports this conclusion.

Genus *Kassina* Girard, 1853

Kassina Girard, 1853, *Proc. Acad. Nat. Sci. Philad.*, p. 67. Type by monotypy: *Cystignathus senegalensis* Duméril & Bibron.

Terrestrial amphibians, medium to large frogs not exceeding 70,0 mm SVL. Pupil vertical; vomerine teeth present. Omosternum forked. A single vocal sac in males with a prominent gular disc or gland. Limbs slender, digital discs well developed to absent. Fingers free of webbing, toes poorly to moderately webbed. Widespread in Africa south of the Sahara although poorly represented in true forest. During the rainy season usually found near water, but after breeding may migrate at least 500 m to a kilometre from the water to hibernate. One species *K. maculata* is essentially semi-aquatic but apparently hibernates in wild or domestic banana leaf axils. Many other species are terrestrial and at least one *K. arboricola* is arboreal. They normally progress at a walk or run and hop reluctantly and not very effectively. Twelve species are found of which only three occur in the Transvaal.

Key to the Transvaal species.

1. Tips of fingers and toes expanded into flattened discs, broader than the width of the subarticular tubercles .... *K. maculata*
   Expanded disc not present 2

2. Not more than 1 phalanx of 3rd finger passing beyond elbow when hand and wrist flexed .... *K. senegalensis*
   Two phalanges of 3rd finger passing beyond elbow when hand and wrist flexed .... *K. wealii*

Kassina maculata (Duméril, 1853)

Hylambates maculatus Duméril 1853. Ann. Sci. nat. (3), 19, p. 165, pl. 7. Type locality: Zanzibar. Poynton 1964(a), p. 173-175, fig. 100. Van Dijk 1966, p. 231, figs.
Kassina maculata (Duméril), Pienaar, Passmore & Carruthers 1976, p. 78-79, fig. (xxxviii), Passmore & Carruthers 1979, p. 226-227, figs; Poynton & Broadley 1987, p. 178; Channing 1976, p. 19, figs; Wager 1986, p. 95, figs; Lambiris 1988, p. 284; Branch 1988b, p. 4.

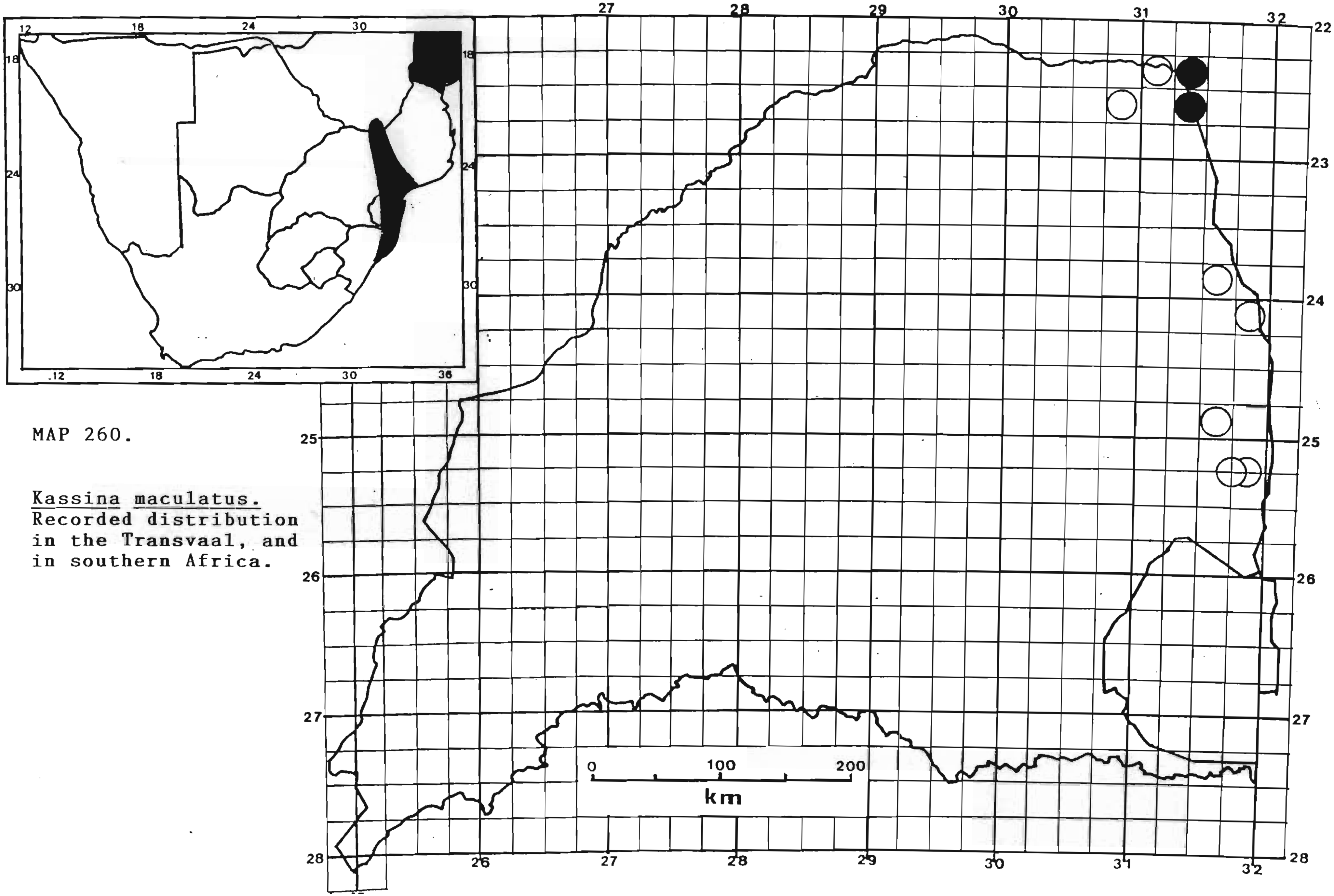
Diagnosis. 5 Specimens examined.
Colour: A speckled golden brown to brown or olive-grey above with numerous irregularly shaped, pale edged dark-brown blotches which extend onto the dorsal surface of the limbs. Scarlet infusions conspicuous on the inner thigh and axilla. Ventrally granular white. Gular disc in males deep yellow.
Morphology: Snout-vent length up to 68,0 mm (Lambiris, 1988). Large but with relatively short hind limbs. Gular gland or disc in males circular and free posteriorly. Digital discs present on fingers and toes, broader than subarticular tubercles. Webbing poor, reaching middle subarticular tubercle of fourth toe.

Distribution

Eastern lowlands from Kenya to Durban (Poynton & Broadley, 1987).

Distribution in the Transvaal (Map 260).

Machayi Pan; Pafuri.



MAP 260.

Kassina maculatus.
Recorded distribution in the Transvaal, and in southern Africa.

Literature Records

Hlaleni Drift; Leeu Pan; Nwambiya Pan; Pumbe Pan; Pumbe Sandveld; Ramiti Pan (KNP Records).

Habitat and Ecology

Mostly around pans with dense emergent vegetation but also dams with emergent vegetation such as reeds in the middle. Poynton & Broadley (1987) report that the frogs hibernate in the axils of banana and strelitzia leaves. Occur in veld types 10, 11 and 15 at altitudes of 200-300 m a.s.l. in the Transvaal.

Conservation Status

Unprotected barring for the control of the export of amphibians from the province, (Transvaal Nature Conservation Ordinance 12 of 1983). Occur scattered along the length of the Kruger National Park in suitable habitat, this peripheral species is well protected. Occurs in farm dams to the south provided the necessary emergent vegetation is present. Does not occur on any provincial nature reserve. Status appears secure.

Kassina senegalensis (Duméril & Bibron, 1841)

Cystignathus senegalensis Duméril & Bibron 1841, *Erpét Gén*, 8, p. 418. Type locality: Galam Lakes, Senegal.
Kassina senegalensis (Duméril & Bibron). Poynton 1964(a), p. 175-177, fig. 101; Pienaar, Passmore & Carruthers, 1976, p. 80-81, fig. (xxxviii); Passmore & Carruthers 1979, p. 228-229, figs; De Waal 1980, p. 113;

Poynton & Broadley, 1987, p. 180; Channing 1976, p. 19, figs; Jacobsen 1977, p. 14; Auerbach 1987, p. 60, pl. 6 fig. 4; Wager 1986, p. 90, figs; Lambiris 1988, p. 286; Branch 1988b, p. 4.
Hylambates senegalensis (Duméril & Bibron). Van Dijk 1966, p. 231, figs.

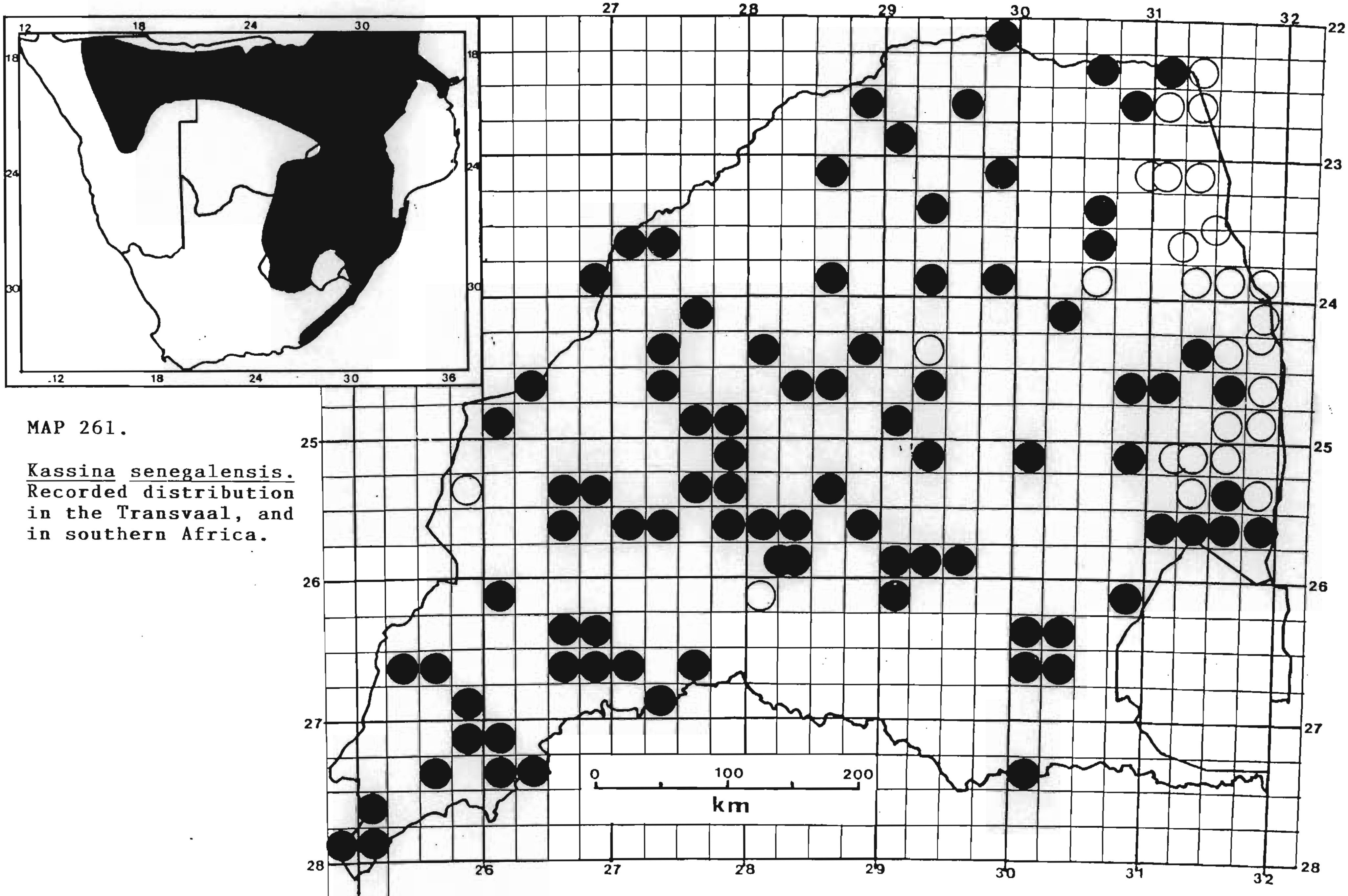
Diagnosis. 145 Specimens examined.
Colour: Variable from yellow-brown to olive, khaki or olive brown with a broad dark-brown vertebral stripe and a broken sometimes continuous dark-brown dorsolateral stripe on each side. Limbs blotched dorsally, blotches often pale centred. A brown stripe extends through the eye becoming interrupted laterally. Ventrally white. Gular disc in males grey with a grey-black vocal sac.
Morphology: Largest male SVL = 49,0 mm (J6231 - Grootplaats 29HN), mass = 8,3 g (J6231); Largest female SVL = 49,0 mm (J1993 - Malmaniesrivier 236KQ), mass = 7,75 g (J1993). Jacobsen (1982) recorded a female SVL = 53,5 mm from the Nylsvley nature reserve. Mean male SVL (30,0 mm) = 40,84 mm ± 5,24 (1SD), n = 25, mass = 4,88 g ± 1,61 (1SD) n = 23; Mean female SVL (30,0 mm) = 34,94 mm ± 4,39 (1SD), n = 25, mass = 3,13 g ± 1,42 (1SD), n = 24. Small to medium frogs with bulging eyes. Gular disc in males oval without a free posterior flap. Digits slightly swollen or expanded at the tips, not forming a disc. Webbing very poor to virtually absent, with 3 phalanges of fourth toe and two of fifth toe free of webbing.

Distribution

Virtually all savanna areas south of the Sahara excluded only from the arid south-west.

Distribution in the Transvaal (Map 261).

Amsterdam 116LS; Barberspan Nature Reserve; Ben Lavin Nature Reserve; Bleskop Siding; Blyde River Nature Reserve; Buffelshoek 171IQ; Buffelspoort 42KR; Buisfontein 367IP; Bulskop 225IP; Calais 563KS; Caledonia 97IT; Canterbury 254MR; Christiana 325HO; Clearwaters, Haenertsburg; Dambale Hills; Delarey Station; Doorndraai 282KR; Doorndraai Dam Nature Reserve; Dusseldorp 22KT; Eersteling 63HP; Ehlatini, Nelspruit; Fontainebleau 537MS; Freya 145MS; Galakwyns Stroom 745LR; Glen Alpine 304LR; Great Letaba River; Groblersdal Road; Grootplaats 29HN; Haakdoornlaagte 167JQ; Hans Merensky Nature Reserve; Hartebeespoort Dam; Helena 400JU; Houthaaldoorns 2IP; Humanskraal 346IO; Kameelpan 276HO; Kleinkopje 15IS; Kliprivier 73JT; Klipspruit 89HP; Laaste Poort van Marico 86KP; Langjan Nature Reserve; Leeuwfontein 185HO; Leeuwpoort 283JS; Lindleyspoort 220JP; Lochiel 192IT; Lomati 466JU; Loskop Noord 12JS; Louws Creek; Mabyeni Hill; Mahobieskraal 211JP; Malmaniesrivier 236KQ; Manyeleti Game Reserve, Main Camp; Mooivlei 4LP; Nylsvley Nature Reserve; Olievenbosch 506KQ; Pentonville 216LQ; Pietersburg; Pretoria East; Pretoria, Kameeldrift; Pretoria, Willow Glen; Pretoria, Wonderboom; Rainpan 60KQ; Rhenosterfontein 563IQ; Rietfontein 214JR; Rolle 235KU; Rooipoortje 453IQ; Ross 55KU; Rustenburg Nature Reserve; Sabie; Shamiriri; Simonsdal 88IT; Speculatie 483JS; Thornhill Farm 171JU; Tshidzi Hill; Tweerivier 197JQ; Vaalboschfontein 188HO; Van Oudtshoorn Stroom 261IT; Ventersdorp Dorpsgebied; Vlakfontein 37HP; Vlakfontein 453JR; Vlakfontein 723KS; Waaiheuwel 360JU; Waaihoek 286IT; Wakkerstroom; Waterval 220JQ; Waterval 561KQ; Wildfontein 210IP; Witbank; Witklip 100KR; Witkop 287LQ; Wonderboom 98KP; Woodbush; Zwartkop 369KQ.



MAP 261.

<u>Kassina</u> <u>senegalensis</u>. Recorded distribution in the Transvaal, and in southern Africa.

Literature Records

Gravelotte; Hendriksdal; Johannesburg; Linokana; Pafuri; Sunningdale (Poynton, 1964). Bangu Windmill; Malamala Rangers Post; Mkohlolo Spruit; Munywini; Napi Plot 11; Nsemani Windmill; Skukuza (KNP Records). Suikerbosrand Nature Reserve (Carruthers, 1978).

Habitat and Ecology

Widespread in the Transvaal occurring in all habitat types at altitudes of 200-1750 m a.s.l. breeding in shallow ephemeral to permanent water bodies. Also around dams. In winter they hibernate in holes in the ground, under and in rotting logs and under rocks, but also take refuge in rotting vegetation, often up to a kilometer from water, as on the Nylsvley nature reserve (Jacobsen, 1982). During the rainy season will usually be found concealed under grass tussocks, not far from the water. Common throughout its range, senegalensis was the most common amphibian species in the Burkea africana savanna of the Nylsvley nature reserve with a total lack of surface water. They feed mostly on Coleoptera, Orthoptera and Araneae but also take Lepidopteran larvae, Hymenoptera and Hemiptera (Jacobsen, 1982).

Conservation Status

Unprotected, barring for the control in the export of amphibians from the province, (Transvaal Nature Conservation Ordinance 12 of 1983). Widespread in provincial nature reserves and in the Kruger National Park. Status secure.

Remarks

Poynton & Broadley (1987) discuss the great variability within the species with apparent geographical connotations. Specimens from the Transvaal do not appear to differ greatly from one another within the province.

Subgenus *Semnodactylus* Hoffman, 1939

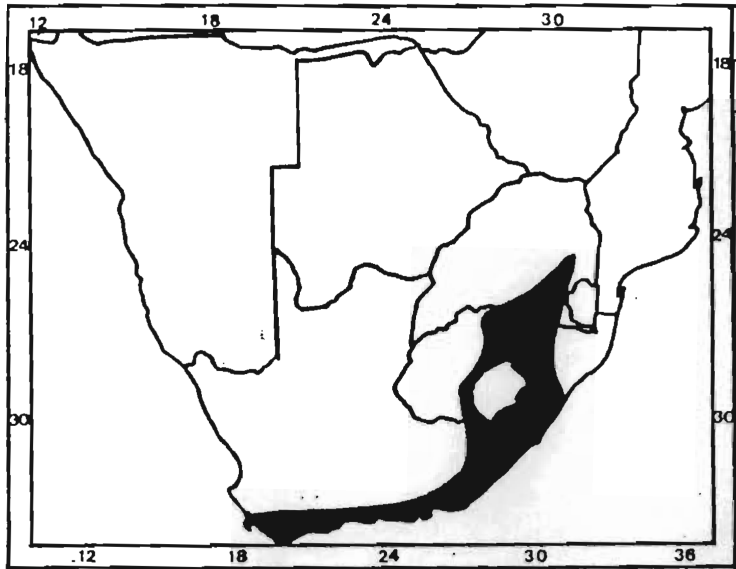
Semnodactylus Hoffman, 1939, *Soöl. Navors. Nas. Mus. Bloemfontein*, 1, p. 89. Type by original designation: *Semnodactylus thabachuensis* Hoffman.

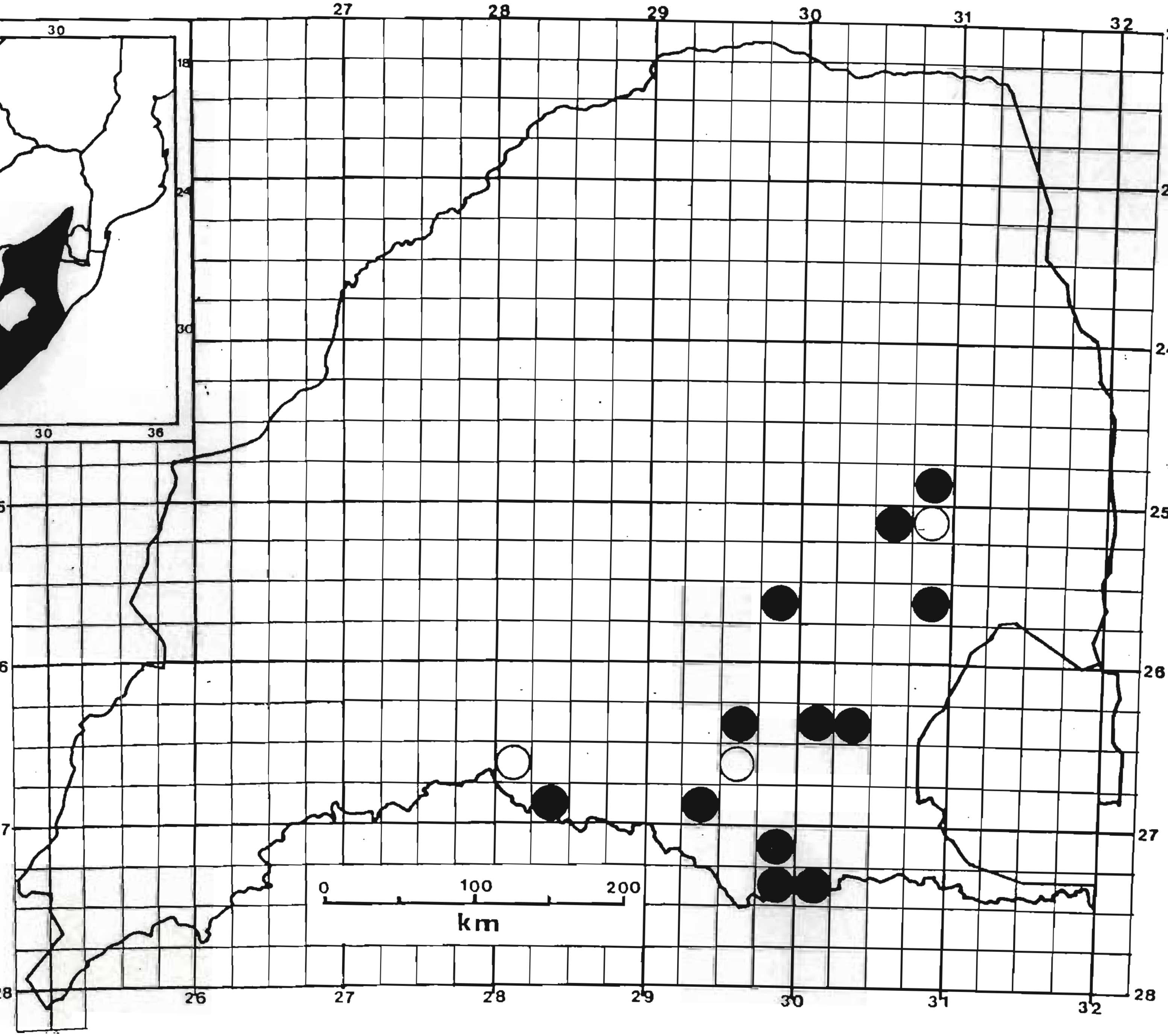
Small to medium sized frogs characterised by a zygodactylus manus. Shares with *Kassina* a vertical pupil, vomerine teeth and omosternum forked posteriorly. Metasternum a broad cartilaginous plate. Inner metatarsal tubercle poorly developed. Toes webbed at base and digits without expansions at the tips. Digital intercalary cartilages present. Endemic to South Africa, the monotypic subgenus occurs in the southern and eastern Cape Province north to the south-eastern Transvaal highveld. The separation of *wealii* from the genus *Kassina* and placed under *Notokassina* by Drewes (1985) on the basis of the zygodactylus manus, differences in call structure and electrophoresis is provisionally unacceptable. Drewes (1985) overlooked *Semnodactylus* Hoffman as being a senior synonym of *Notokassina*, and the former must be used, if *wealii* is to be given separate generic status. While the zygodactylus manus may represent an adaptation to a climbing lifestyle, this pertains only to the breeding season as *wealii* apparently calls while clinging to grass, reeds or sedges (Channing 1976). Passmore & Carruthers (1979), mention that *wealii* also call from exposed positions on the banks and even from well concealed partly submerged positions among emergent or floating aquatic vegetation several metres out from the edge. During the rest of the year _wealii_ is terrestrial, hibernating down holes or under rocks on soil. It therefore seems improbable that the zygodactylus manus is a manifestation of a current life style despite a similar condition in _heptopelis xenodactylus_. There are little better grounds for separating _wealii_ on this basis than _xenodactylus_ from _Leptopelis_. Remember the species is associated with grassland or grassy areas where it has little use for height as its call is well differentiated from that of _senegalensis_ (see Passmore & Carruthers, 1979). I therefore disagree with Lambiris (1988) in considering _wealii_ as representing the peak in climbing tendencies among Kassinoid taxa with _K_. _maculata_ showing an intermediate tendency. _K_. _maculata_ climbs well as pointed out by Poynton (1964), hibernating in the axils of banana leaves. A more recent discovery, _K_. _arboricola_ Perret probably represents a peak in arboreal tendencies. I however agree with Lambiris (1988) in his assessment of assumptions based on electrophoretic analysis as used by Drewes (1985). The sample size is small and there is no indication of the geographic distribution of the specimens. Variations in biochemical attributes within a species are as variable as are morphological characters, and should be compensated for with an adequate sample base. In conclusion I reiterate that the peculiar digital arrangement and other characters used by Drewes (1985) in placing _wealii_ in another genus have been insufficiently supported. The basic similarities between this species and others of the genus _Kassina_ outnumber and outweigh the differences. It is proposed that _wealii_ be retained within the genus _Kassina_ with _Semnodactylus_ possibly being retained at subgeneric level.

Kassina (Semnodactylus) wealii Boulenger, 1882

Kassina wealii Boulenger 1882, Cat. Batr. Sal. Brit. Mus. 2nd ed., p. 131, pl. 11, fig. 3. Type locality: Kaffraria. Passmore & Carruthers 1979, p. 230-231, figs; De Waal 1980, p. 114; Wager 1986, p. 91, figs.
Kassina wealei Boulenger. Poynton 1964(a), p. 178-179, fig. 102; Wager 1965, p. 84; Tandy & Drewes 1985, p. 191, figs 1 & 2; Channing 1976, p. 19, figs; Drewes 1985, p. 186; Wager 1986, p. 91, figs.
Hylambates wealei (Boulenger). Van Dijk 1966, p. 231, figs.
Notokassina wealei (Boulenger). Drewes 1985, p. 186, figs 1-8.figs.
Semnodactylus wealii (Boulenger). Lambiris 1988, p. 292; Branch 1988b, p. 4.

Diagnosis. 25 Specimens examined.
Colour: Silvery ochraceous to light olive or olive-grey with a pronounced dark-brown continuous hollow centred, rarely solid, vertebral stripe. A dark dorsolateral stripe, hollow centred rarely solid, is found on either side. A dark irregular stripe extends through the eye and intermittantly along the flanks. Dorsolateral and lateral stripes pale edged. Gular disc is dark grey. Ventrally coarsely granular and white. Hands and feet yellow to orange.
Morphology: Small to medium frogs. Largest male SVL = 37,0 mm (N8055 - Smalkloof 139HS), mass = 4,7 g (P10712 - Britsville 483IR); Largest female SVL = 39,0 mm (N7956 -





MAP 262.

<u>Kassina</u> <u>wealii.</u>
Recorded distribution in the Transvaal, and in southern Africa.

Kaapsche Hoop 483JT), mass = 4,85 g (N8167 - Welgedacht 82HS). Mean male SVL (30,0 mm) = 34,8 mm ± 1,48 (1SD), n = 5, mass = 3,88 g ± 0,89 (1SD), n = 5; Mean female SVL (30,0 mm) = 36,0 mm ± 4,24 (1SD), n = 2, mass = 4,47 ± 0,53 (1SD), n = 2. Gular disc in males broadly oval. Tips of digits slightly swollen and without discs. Webbing very limited.

Distribution

Southern Cape coastal zone, eastern and north-eastern Cape Province, southern Natal, Lesotho to the eastern Orange Free State and the eastern Transvaal.

Distribution in the Transvaal (Map 262).

Britsville 483IR; Caledonia 97IT; De Kuilen 205JT; Kaapsche Hoop 483JT; Kareebosch 413IS; Paradise Valley, God's Window; Schuilhoek 139HS; Simonsdal 88IT; Smalkloof 139HS; Vaalbank 233IS; Vlakplaats 317JT; Wakkerstroom; Welgedacht 82HS.

Literature Records

Morgenzon; Sabie (Poynton 1964). Suikerbosrand Nature Reserve (Carruthers, 1978).

Sight Records

Wanhoop 78JT.

Habitat and Ecology

Highveld and montane grassland in veld types 8, 48, 52, 54, 57 and 61 at altitudes of 1600-2300 m a.s.l. When active frequently found near small streams or vleis with shallow water. At one pan found in the company of many K. senegalensis. Apparently utilise raised tussocks to call from, although not exclusively (Passmore & Carruthers, 1979). When hibernating they may be found under rocks on soil in a hollow with the rock as roof. Here they lie curled up in a little ball with front limbs hooked over the eyes and hind limbs hunched up across the belly. Also frequently enter the burrows of Cordylus giganteus, hibernating at the deepest end (De Waal, 1978; Jacobsen et al, in press).

Conservation Status

Unprotected, barring for control in the export of the species from the Transvaal, (Transvaal Nature Conservation Ordinance 12 of 1983). Occurs in several provincial nature reserves. Details of population size are needed to assess true status. Rare, but secure.

Remarks

Much has already been said at generic level. The differences observed pertain more to subgeneric level than to either generic or species level.

Genus *Afrixalus* Laurent, 1944

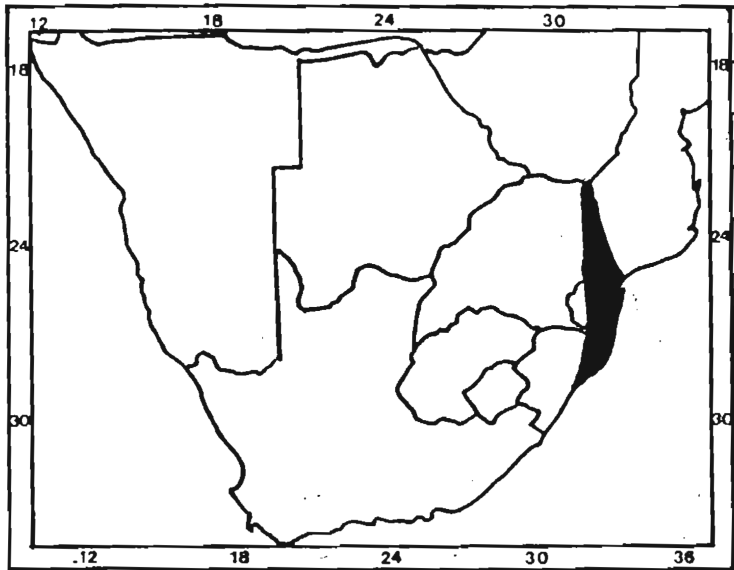
Afrixalus Laurent, 1944, *Rev. Zool. Bot. Afr.* 38, p. 113. Type designated by Loveridge 1957: *Megalixalus fornasinii congicus* Laurent = *Hyperolius dorsalis* Peters.

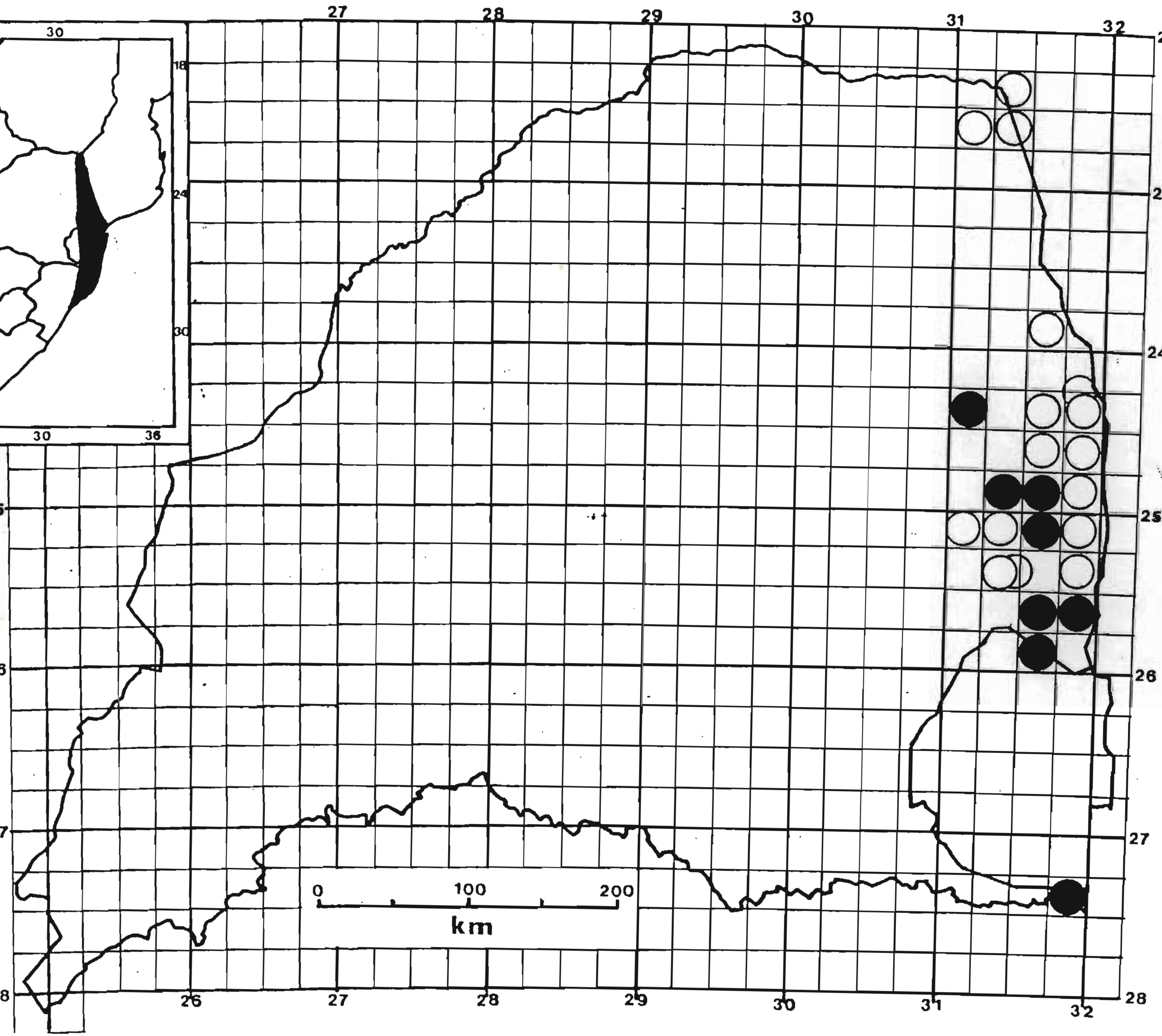
Small to moderately sized reedfrogs characterised by having a vertical pupil and a discoid gular gland, which is laterally and posteriorly free. Asperities or spinules are present on the body and limbs of males and frequently of females although these may be less obvious in the latter. Digits terminate in expanded discs. Usually inhabit open grassy areas around pans but some species prefer more densely vegetated areas including gardens. The ova are laid in a mass of jelly deposited in a folded leaf, hence the popular name of leaf folding frog. Widespread in Africa south of the Sahara but restricted in South Africa to the eastern, more tropical and moister parts. The taxonomy of the genus is in a shambles. Since Poynton (1964) recognised three species and one subspecies from South Africa, a further three species have been described (Pickersgill, 1984). Lambiris (1988) gives a well set out overview of the situation and I found that I am in agreement with his conclusions, namely that a return to the taxa recognised by Poynton (1964) would appear to be justified. In order to maintain continuity with the works of Poynton & Broadley (1987) and Lambiris (1988) I use the nomenclature of Pickersgill (1984) but it is imperative that order within this genus be brought about as soon as possible.

Afrixalus aureus Pickersgill, 1984

Afrixalus aureus Pickersgill 1984, *Durban Mus. Novit.* 13, p. 203-220. Type locality: Mhlatuze river valley, 6 km N. of Eshowe, Natal. Poynton & Broadley 1987, p. 191; Lambiris 1988, p. 303; Branch 1988b, p. 4.
Afrixalus brachycnemis brachycnemis (not Boulenger). Poynton 1964(a) (part), p. 180; Wager 1965, p. 196, figs. (part); Pienaar, Passmore & Carruthers, 1976, p. 82, fig. xxix; Passmore & Carruthers, 1979, p. 236, figs. (part).
Afrixalus brachycnemis (non Boulenger). Stuckenberg 1969, p. 153 (part); Wager 1986, p. 150, figs. (part).

Diagnosis. 14 Specimens examined.
Colour: Golden to light yellow dorsally with a dark lateral stripe from nostril to urostyle present with continuous or broken dark line extending onto sacrum. An irregular ill-defined dark interorbital-occipital patch, and/or an irregular patch in the lumbar region. A large irregularly shaped patch, or transverse to oblique band, is usually present on the tibia, continuing the dorsolateral band when the leg is folded (Poynton & Broadley, 1987).
Morphology: Largest male SVL = 21,5 mm (J6393 - Vlakbult 450JU, J6332 - Helena 400JU), mass = 0,65 g (J6393); Largest female SVL = 24,0 mm (J6390 - Vlakbult 450JU), mass = 1,1 g (J6390, J6391). Minute asperities abundant over dorsum in males, restricted to the head or absent in females and present ventrally only on gular disc of males.





MAP 263.

<u>Afrixalus</u> <u>aureus.</u>
Recorded distribution
in the Transvaal, and
in southern Africa.

Distribution

More inland areas of Natal from Eshowe, through Swaziland to the eastern Transvaal and southern Mozambique (Poynton & Broadley, 1987).

Distribution in the Transvaal (Map 263).

Helena 400JU; Lisbon Citrus Estates; Ross 55KU; S.A. Bantu Trust; Vlakbult 450JU; 14 km Skukuza to Lower Sabie; 27 km Skukuza to Malelane.

Literature Records

Crocodile Bridge; Faai Roan Camp; Nsemene Windmill; Tshokwane (Pickersgill 1984).

Habitat and Ecology

Occurs in open wooded savanna in veld types 6, 10, 11 and 15 at altitudes of 200-300 m a.s.ℓ. Usually found clinging to grass culms or the branches of shrubs and leaves above or close to water. Seasonal, shallow pans with emergent vegetation are favoured but dams and streams are also utilized. Some individuals were captured while calling, clinging to grass only 8 cm above the water.

Conservation Status

Unprotected, barring for the control of the export of amphibians from the province, (Transvaal Nature Conservation Ordinance 12 of 1983). Sporadic in the Kruger National Park but not occurring on any provincial nature reserves. Many be locally common but vulnerable to overgrazing. Currently secure.

Remarks

The great variability in markings tends to totally obscure their use. If the presence or absence of asperities on the ventrum are consistent then they could be diagnostic. Asperities tend to be removed through handling and may therefore not be all that reliable.

Genus *Hyperolius* Rapp, 1842

Hyperolius Rapp, 1842, *Archiv. für Naturg.* 8, p. 289. Type by monotypy: *Hyperolius marmoratus* Rapp.

Small frogs with a round to horizontal pupil and no vomerine teeth. A discoid gular gland in males, laterally and posteriorly free. Omosternum forked posteriorly. No skin asperities. Fingers and toes webbed and digits terminate in discs. Reedfrogs are widespread in subsaharan Africa and excluded only from high lying cold regions and very arid areas. Usually found clinging to waterlilies, reeds, grass and sedges, they frequently use shrubs close to water as well. Normally not found far from water, these frogs may move as much as a kilometre away in order to hibernate during the winter months. As much as 204 days have been recorded in hibernation. The taxonomic status of the genus is in a turmoil and little consensus has been reached concerning many species groups, including the superspecies *marmoratus* and *'viridiflavus'*. Schiotz (1975) incorporated the former in the latter, a move followed by Pienaar et al (1976), while most southern African workers consider them distinct. There are few consistant morphological characters and although colour is the most often used identification guide, this has only limited geographic application (Poynton & Broadley, 1987, Lambiris, 1988). The centres of distribution of the various forms generally exhibit true colour patterns, these becoming more eroded towards the peripheries where adopted patterns represent a composite of two adjacent forms and therefore difficult to place. However in the Transvaal *marmoratus* is represented only by the subspecies *taeniatus* and the region is far removed from contact zones in southern Zimbabwe on the one hand (broadleyi) and northern Natal/KwaZulu (marmoratus), on the other. It is therefore fairly consistant although fragmentation of the dorsolateral stripes take place. Eight species and three subspecies of Hyperolius occur in South Africa, of which three species occur in the Transvaal. A fourth species, H. tuberilinguis Smith was recently recorded (1989) from the Kruger National Park (Zambatis, pers. comm.). As this happened after the specimen analysis of this report, and is due to be published at a future date, a species account is not herewith included. The occurrence of this coastal species reflects on the unique biogeographical position of the Transvaal with its fauna and flora of varied origins.

Key to the Transvaal species.

1. Dorsum mostly uniform translucent green (exceptionally with faint dorsal stripes and small dark spots .... H. pusillus
   Dorsum usually striped although some individuals have plain backs, but this usually demarcated laterally 2

2. Dorsum green with a distinct cream to yellow dorsolateral stripe dark edged above and below and extending from above the eye to the inguinal region.... H. semidiscus
   Dorsum usually black with five yellow or cream longitudinal stripes, each stripe with a narrow red line down the middle. Limbs also striped. Some specimens exhibit interrupted lines. Other specimens are plain

whitish brown and even white according to colour change mechanisms and age .... H. marmoratus taeniatus

Hyperolius semidiscus Hewitt 1927

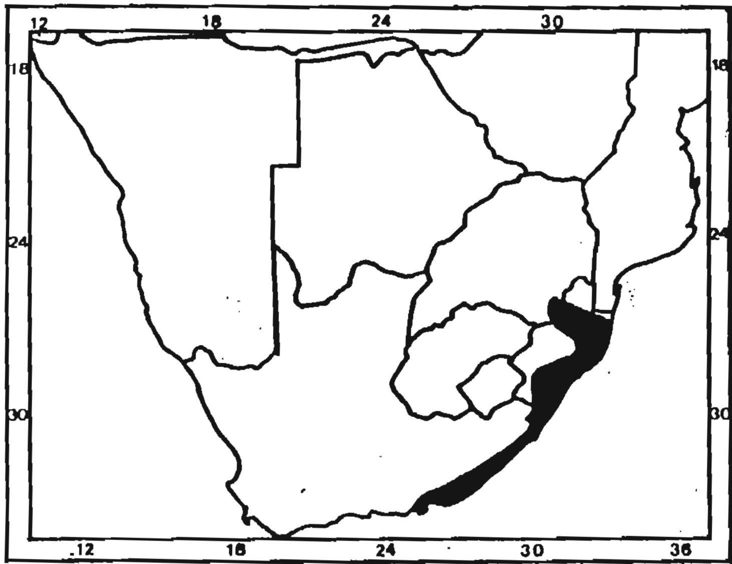
Hyperolius horstockii semidiscus Hewitt, 1927, Rec. Albany Mus., 3, p. 410, pl. 24, fig. 7. Type locality: Mariannhill, Natal.

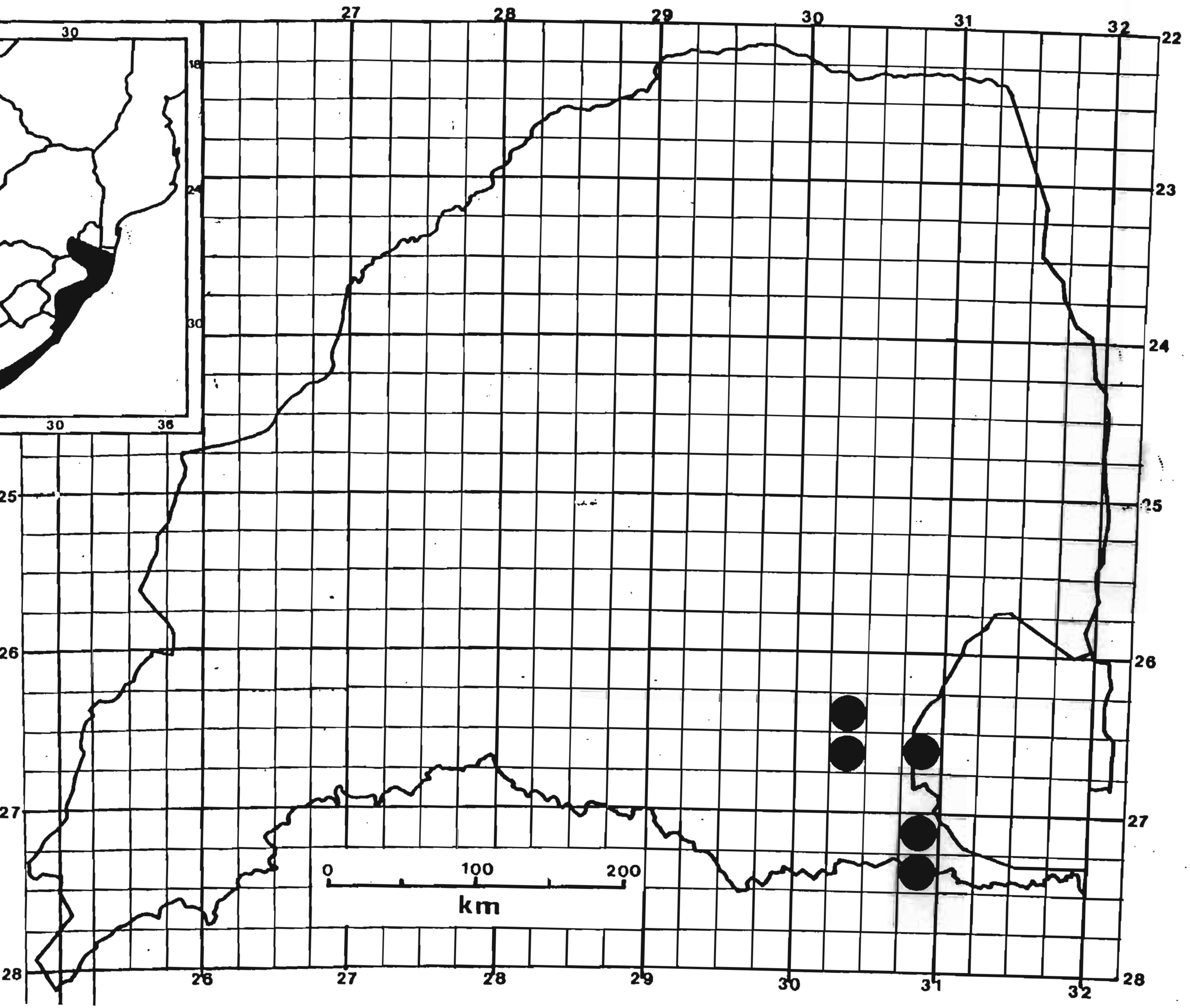
Hyperolius semidiscus Hewitt. Poynton 1964(a), p. 185-186, fig. 108; Wager 1965, p. 198, figs; Van Dijk 1966, p. 257, 1971, p. 116; Passmore & Carruthers 1979, p. 244-245, figs; Wager 1986, p. 152, figs; Lambiris 1988, p. 313; Drewes 1984, p. 53; Frost 1985, p. 217; Branch 1988b, p. 4.

Diagnosis. 12 Specimens examined.

Colour: Dorsum green or brown with two yellow black-edged dorsolateral stripes one on each side extending from just anterior to the eye, over the eye to the inguinal region. Thighs and feet orange-red. Markings may be absent in juveniles and sometimes in subadults. Ventrally cream to yellow. Gular disc in males dark yellow.

Morphology: Largest male SVL = 31,0 mm (N9530 - Bakenkop 152HT), mass = 1,6 g (N9530); Largest female SVL = 31,0 mm (N9562 - Bendor 211HT), mass = 1,3 g (N9531 - Bakenkop 152HT). Mean male SVL = 27,25 mm ± 2,53 (1SD), n = 4, mass = 1,27 g ± 0,25 (1SD), n = 4; Mean female SVL = 28,0 mm ± 4,36 (1SD), mass = 1,25 g ± 0,07 (1SD), n = 2. Canthus rostralis rounded, slightly concave; snout truncate. Fingers and toes moderately webbed, the web reaching middle subarticular tubercles of third and fourth toes respectively.





MAP 264.

<u>Hyperolius</u> <u>semidiscus</u>.
Recorded distribution in the Transvaal, and in southern Africa.

Distribution

Eastern Cape Province north along the Natal lowlands to the south-eastern Transvaal.

Distribution in the Transvaal (Map 264).

Bakenkop 152HT; Bendor 211HT; Caledonia 97IT; Jericho Dam; Piet Retief; Redcliff 246IT.

Habitat and Ecology

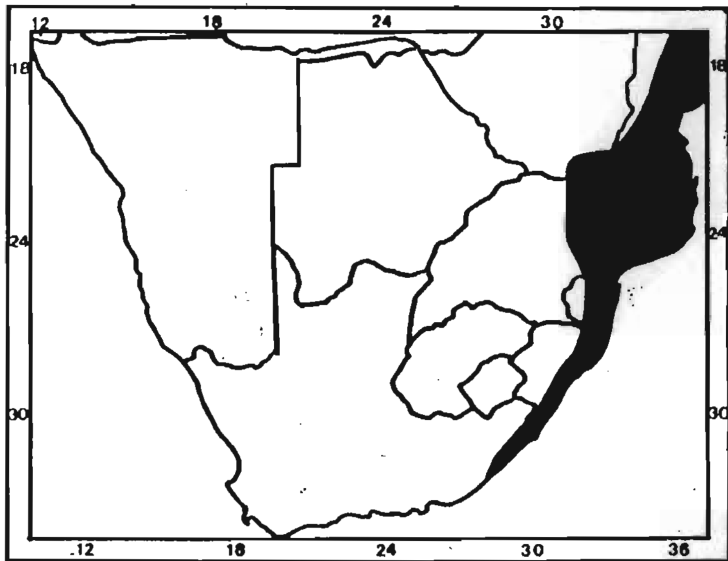
A moderately sized reedfrog found clinging to reeds and bullrushes alongside streams, canals, dams and pools in veld types 57, 63 and 64 at altitudes of 950-1700 m a.s.l. Appears to prefer quiet waters with adequate cover. Apprently congregate in great numbers at favourable sites.

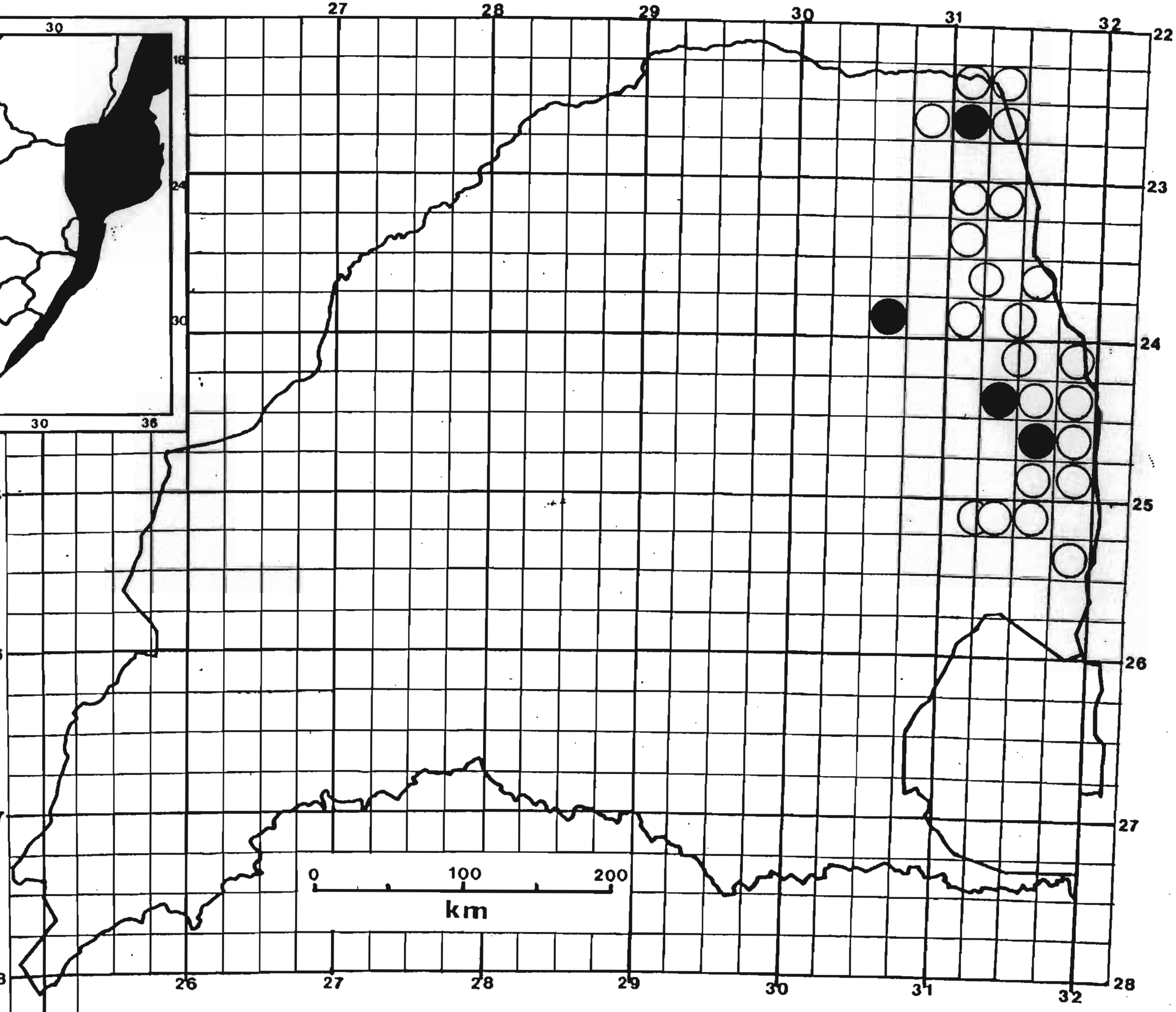
Conservation Status

Unprotected, barring for the control in the export of amphibians from the province (Transvaal Nature Conservation Ordinance 12 of 1983). Does not occur in a provincial nature reserves and its distribution in the Transvaal is peripheral. Status appears to be secure. More details of population size are needed.

Hyperolius pusillus (Cope, 1862)

Crumenifera pusilla Cope, 1862, *Proc. Acad. nat. Sci. Philad.*, p. 343. Type locality: Umvoti, Natal.
Hyperolius pusillus (Cope). Poynton 1964(a), p. 191-192, fig. 112; Pienaar, Passmore & Carruthers 1976, p.





MAP 265.

<u>Hyperolius pusillus.</u> Recorded distribution in the Transvaal, and in southern Africa.

84-85, fig. (x1); Passmore & Carruthers 1979, p. 250-251, figs; Poynton & Broadley 1987, p. 205; Van Dijk 1966, p. 231, figs; Wager 1986, p. 162, figs; Lambiris 1988, p. 321. Wager 1965, p. 204, figs; Drewes 1984, p. 52; Frost 1985, p. 216; Branch 1988b, p. 4.

Diagnosis. 12 Specimens examined.
Colour: Uniform translucent green, exceptionally with faint dorsal stripes and small gold to dark spots in some specimens. Ventrally white to translucent. The gular disc of males is yellow.
Morphology: Lambiris (1988), records a maximum SVL of 21,0 mm. Largest male SVL = 20,0 mm (N5535, N5598 - Ross 55KU), mass = 0,4 g (N5598). A small frog characterised by a truncate snout with a concave canthus rostralis. Webbing of fingers reduced, not reaching further than subarticular tubercle of outer finger. Only up to two phalanges of toes free of web.

Distribution

Lowlands from southern Somalia (Lanza 1981) to Transkei, (Poynton & Broadley, 1987).

Distribution in the Transvaal (Map 265).

Gravelotte; Manyeleti Game Reserve, Dixie Hill; Manyeleti Game Reserve, Main Camp; Punda Milia; Ross 55KU.

Literature Records

Fayi Roan Camp; Leeu Pan; Mannung Dam; Nkwane Pan; Nwambiya Camp; Nwambiya Pan; Nyamyulo Pan; Pumbe Pan; Shantangalane Waterholes, (KNP Records).

Habitat and Ecology

Usually found around shallow pans and seepages with emergent vegetation in open woodland. Found in veld types 6, 10, 11 and 15 at altitudes of 200-400 m a.s.l. Observed calling from grass and reeds in shallow water. Take refuge some distance from water when hibernating including under overhang of veranda. May be attracted to insects at lighted windows.

Conservation Status

Unprotected, barring for the control in the export of amphibians from the province, (Transvaal Nature Conservation Ordinance 12 of 1983). Occurs widespread in favourable habitat in the Kruger National Park. May possibly occur in one or two provincial nature reserves. Currently secure but details of local population sizes needed.

Hyperolius marmoratus taeniatus Peters, 1854

Hyperolius taeniatus Peters, 1854, *Monatsb. Akad. Wiss. Berlin*, p. 628. Type locality: Boror, Mozambique.
Hyperolius viridiflavus (Duméril & Bibron). Pienaar, Passmore & Carruthers, 1976, p. 86-87, fig. (xli).
Hyperolius marmoratus taeniatus Peters. Poynton, 1964(a), p. 197-198, fig. 116; Passmore & Carruthers 1979, p. 254-255, figs; Poynton & Broadley 1987, p. 214; Poynton 1985, p. 179, figs. 1 & 2; Broadley 1965, p. 23; Wager 1986, p. 159, fig; Wager 1965, p. 214; Lambiris 1988, p. 336; Branch 1988b, p. 4.

Diagnosis. 150 Specimens examined.

Colour: Variable, as individuals change colour if exposed to the direct rays of the sun and according to phase of maturity. Usually black with five white to green longitudinal stripes, each containing an orange-red to red line. Limbs longitudinally striped. Insides of thighs and feet orange-red to red. Gular disc of males usually dark grey. Ventrum white. Individuals turn white in strong sunlight. Inmatures may be uniform brown to brownish grey with darker wavy dorsolateral limits.

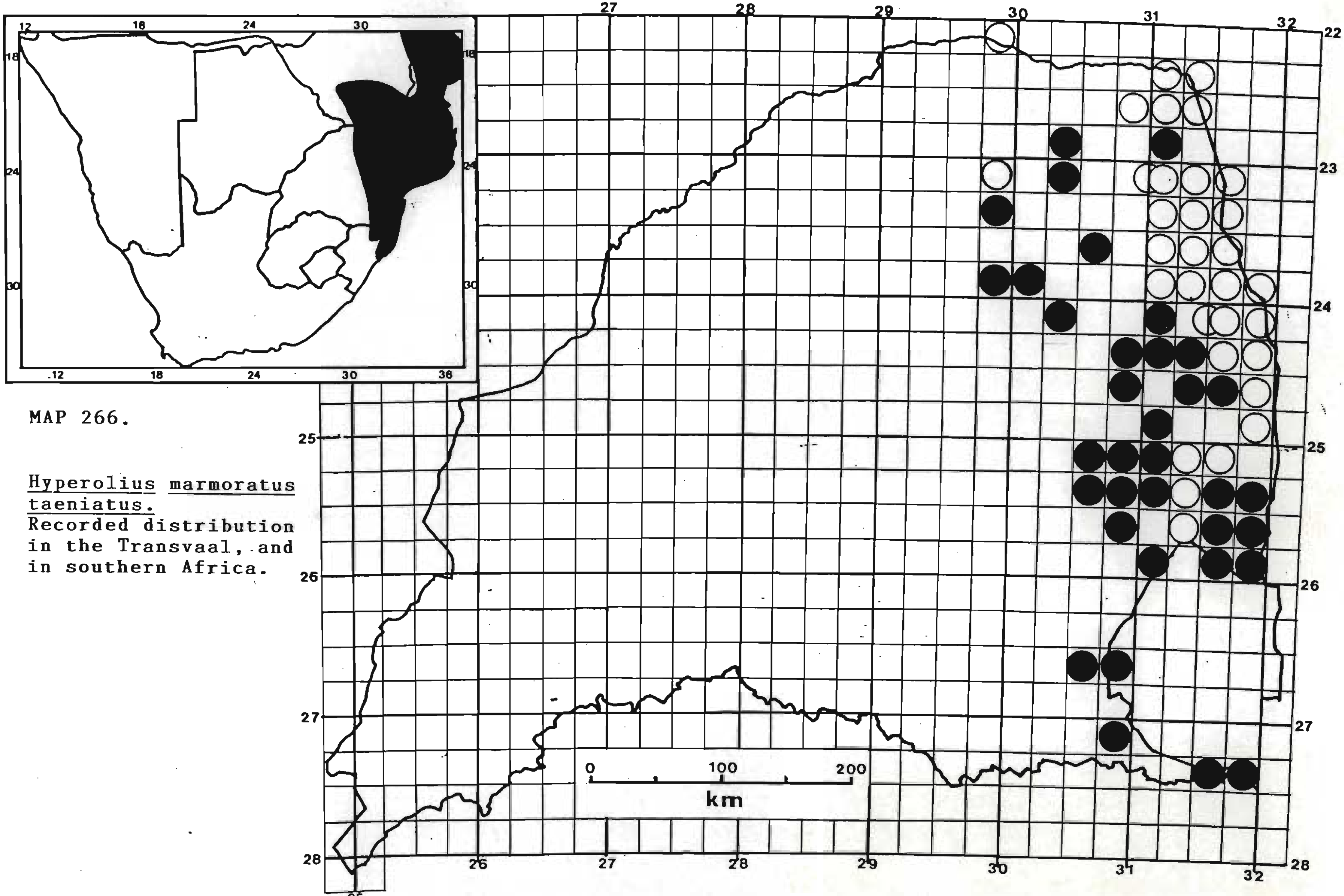
Morphology: Largest male SVL = 31,5 mm (P10385 - Nerston 401IT), mass = 2,1 g (J6389 - Vlakbult 450JU, N11369 - De Bilt 372JU); Largest female SVL = 30,0 mm (N3242 - Boschkopje 519LS), mass = 2,25 g (N3242). Mean male SVL = 26,17 mm $\pm$ 2,91 (1SD), n = 24; mass = 1,20 g $\pm$ 0,46 (1SD), n = 24; Mean female SVL = 29,0 mm $\pm$ 1,0 (1SD), n = 3, mass = 1,75 g $\pm$ 0,44 (1SD), n = 3. A small but moderately robust reedfrog with a slightly elongated body. Snout truncate, canthus rostralis curved. Webbing of fingers reduced, barely reaching the basal subarticular tubercle of third finger. Webbing of hindfeet more extensive with one to two phalanges of each toe free of web.

Distribution

Mozambique south to northern Natal/KwaZulu and westwards to Swaziland, eastern and north-eastern Transvaal, Zimbabwe and Malawi (Poynton & Broadley, 1987).

Distribution in the Transvaal (Map 266).

Avondstond 427JU; Barberton Nature Reserve; Boschkopje 519LS; Bushbuckridge; Carpediem 76KT; De Bilt 372JU; Doornhoek 236JT; Dzundwini Waterhole; Entabeni Forest



MAP 266.

Hyperolius marmoratus taeniatus. Recorded distribution in the Transvaal, and in southern Africa.

Reserve; Erasmushoop 457KT; Excelsior 266KU; Hans Merensky Nature Reserve; Hectorspruit; Komati River; Komati River, Carolina District; Lake Fundudzi; Levubu; Leydsdorp Dorpsgronde 779LT; Long Tom Pass; Lothian 274KU; Magoebaskloof; Mananga; Manyeleti Game Reserve; Manyeleti Game Reserve, Albatross; Manyeleti Game Reserve, Buffelshoek 340KU; Manyeleti Game Reserve, Main Camp; Manyeleti Game Reserve, Sarabank 323KU; Middlesex 205KT; Nelspruit; Nelspruit, Crocodile River; Nerston 401IT; Nooitgedacht 614; Normandie 178HT; Pongola Nature Reserve; Redcliff 426IT; Ross 55KU; S.A. Bantu Trust; Sabie; Sabie River; Salique 427KT; Sedula, Leydsdorp; Shilowane; Sihlangu; Sibasa; Spitskop Staatsbos; Steiltes, Nelspruit; The Hippos 192JU; Tshakhuma; Venice 40KU; Vlakbult 450JU; White River 64JU; Witklip Dam, White River; Zeekoegat 12KU.

Literature Records

Beit Bridge; Louis Trichardt; Louws Creek; Piet Retief; Tzaneen (Poynton, 1964). Beacon 7, Nyandu; Fayi Roan Camp; Hlaleni Drift; Makhadzi Stream, upper reaches; Mbyashishe, stream, upper reaches; Munywini; Napi Dam; Nsemane Windmill; Nswaswitsontso Drift; Nyamnyulo Pan; Pretoriuskop; Pumbe Pan; Pumbe Sandveld; Rabelais Dam; Shangoni; Shingomeni Trig. Beacon; Tshokwane (KNP Records).

Habitat and Ecology

Wherever water is available, mostly around dams, canals and other quiet water bodies, even around cement dams, usually clinging to reeds, sedges or grass but also utilizing trees and shrubs at the water's edge. Found in veld types 6, 8, 9, 10, 11, 15 and 63 at altitudes of

200-1600 m a.s.l., mostly in open woodland but also in montane grassland. During humid, overcast weather they call extensively, sometimes in chorus. It is significant that only four of 51 specimens collected were females, indicating their shyness while the males are exposed to predation.

Conservation Status

Unprotected barring for control in the export of amphibians from the province, (Transvaal Nature Conservation Ordinance 12 of 1983). Widespread in the Kruger National Park and occurs in a few provincial nature reserves. Common around farm dams and homesteads in the lowveld. Status secure.

CHAPTER 6

Ecology

It is difficult to discuss and compare the ecology of different vertebrate groups particularly when the amphibians on the one hand are largely water dependent while the reptiles are largely independent of water. Poynton (1964:207) has pointed out the wide ecological tolerances of amphibians, and this is equally so for most snakes and many lizards. Many of the latter are however much more localised according to specific habitat requirements. Reptiles and amphibians are less restricted to specific vegetation types than are the mammals or birds.

Rautenbach (1978a) assessed the distribution of mammals in the Transvaal according to 10 broad vegetation types indicating the presence of communities specific to these vegetation types. Although the herpetofauna also appear to form communities, it would appear that these are less determined by vegetation than by topography and climate, with pre-historical distribution a contributing factor. The latter especially accounts for various anomalies such as the presence of *Mabuya homalocephala smithii* on the Iron Crown, two hundred kilometres from the closest distribution to the south.

6.1 Biotic zones

Broadley (1966c) subdivided south-east Africa into two basic biotic zones, namely Evergreen forest and Savanna, including grassland in the latter. This is an oversimplification of the situation. According to Rautenbach (1978b) the region includes four biotic zones all of which are to a degree represented in the Transvaal. These are Southern Savanna Woodland, Southern Savanna Grassland, Forest and the South West Arid zones. The latter however occurs only marginally in the province.

Rautenbach's approach is followed here and the fauna in each biotic zone is subdivided according to its utilization of available habitats, after Broadley (1966c).

Forest

Indigenous forest is limited in the Transvaal to areas of high rainfall and low evaporation along the eastern escarpment and Soutpansberg. Small patches still occur in the Waterberg but are too restricted in area to be meaningful. On account of its fragmentary nature and limited extent, as well as its cool climate, there are relatively few species restricted to this vegetation type.

(a) arboreal forms: *Lygodactylus methueni*, *Bradypodion transvaalensis*.

(b) terrestrial/fossorial forms: *Breviceps s. sylvestris*, *B. s. taeniatus*; *Strongylopus grayii* (forest form).

(c) fossorial forms: *Acontophiops lineatus* (marginal).
Mostly a montane grassland species but frequents the fringes of the forest.

(d) aquatic/semi aquatic forms: Heleophryne natalensis mostly confined to deep, shaded ravines and waterfalls with permanent water.

Savanna

Savanna woodland occupies most of the Transvaal north of the Magaliesberg and below the escarpment. In more arid areas the vegetation is dominated by shrubs. Many species occur only in this biotic zone.

(a) arboreal forms: Thelotornis c. capensis; Philothamnus n. natalensis; P. n. occidentalis; P. semivariegatus; Lygodactylus c. capensis; Homopholis mulleri; Hemidactylus mabouia; Agama atricollis; Chamaeleo dilepis; Mabuya s. striata; Cordylus tropidosternum jonesi; Chiromantis xerampelina; L. mossambicus.

(b) terrestrial forms: Kinixys belliana spekii; K. natalensis; Psammobates oculifer; Bitis caudalis; Causus defilippi; Naja haje annulifera; Psammophis phillipsi; P. sibilans brevirostris; P. s. subtaeniatus; P. angolensis; P. jallae; Rhamphiophis oxyrhynchus rostratus; Lycophidion variegatum; Mehelya nyassae; Gerrhosaurus v. validus; G. nigrolineatus; G. m. major; Pedioplanis l. lineo-ocellata; Heliobolus lugubris; Ichnotropis squamulosa; I. c. capensis; Agama aculeata armata; Pachydactylus c. capensis; P. vansoni; Ptenopus garrulus; Bufo garmani; Schismaderma carens; Arthroleptis *stenodactylus*; *Phrynomerus bifasciatus*; *Hemisus m. marmoratum*; *Leptopelis bocagii*; *H. guineensis broadleyi*.

(c) rupicolous forms: *Philothamnus semivariegatus* (partially); *Afroedura t. transvaalica*; *A. l. langi*; *A. l.* "Shinokwen"; *A. l.* "Tshipise"; *A. l.* "Waterpoort"; *A. l.* "Soutpansberg"; *A. l.* "Waterberg"; *A. l.* "Leolo", *A.* "Matlala"; *A. pondolia marleyi*; *A. p.* "Godlwayo"; *A.* "Maripi"; *A. m. haackei*; *A. m. multiporis*; *A. m.* "Abel Erasmus"; *A.* sp. nov.; *Homopholis wahlbergii*; *Pachydactylus affinis*; *P. bibronii*; *Mabuya quinquetaeniata margaritifer*; *M.* sp. nov.; *Cordylus w. warreni*; *C. w. depressus*; *C. vandami*; *C. w. barbertonensis*; *C. w. breyeri*; *Platysaurus* spp.; *Bufo f. fenoulheti*.

(d) fossorial forms: *Monopeltis c. capensis*; *M. s. sphenorhynchus*; *Zygaspis quadrifrons*; *Z. violacea*; *Chirindia l. langi*; *C. l. occidentalis*; *Typhlops s. schlegeli*; *T. s. mucruso*; *Xenocalamus transvaalensis*; *X. b. bicolor*; *X. b. lineatus*; *X. b. australis*; *Amblyodipsas m. microphthalma*; *Aspidelaps s. scutatus*; *A. s. intermedius*; *Leptotyphlops longicaudus*; *L. n. nigricans*; *L. conjunctus incognitus*; *L. distanti*; *Elapsoidea sundevallii longicauda*; *Acontias percivalli occidentalis*.

(e) arenicolous forms: *Psammobates oculifer*; *Elapsoidea sundevallii longicauda*; *Typhlosaurus lineatus subtaeniatus*; *T. l.*

richardi; Mabuya homalocephala depressa; Scelotes l. limpopoensis; S. l. albiventris; Lygosoma sundevallii; Amblyodipsas m. microphthalma; Typhlosaurus aurantiacus fitzsimonsi; Monopeltis leonhardi; Dalophia pistillum. Broadley (1966) divided arenicolous forms into Kalahari and Coastal species. Some of them belong to the South West Arid biotic zone, but by virtue of the shifting Kalahari sands during the Pleistocene, they were able to expand their ranges as far as the eastern Transvaal. Coastal species moved inland, probably simultaneously, resulting in a meeting of these faunas in the north-east.

(f) aquatic forms: Crocodylus niloticus; Pelusios sinuatus; P. subniger; Lycodonomorphus whytii obscuriventris; Xenopus muelleri.

Grassland

Two slightly overlapping types are found, namely montane grassland and the Highveld, the difference mostly represented by differing grass species dominance, probably as a result of increasing rainfall along the escarpment and high lying mountainous areas. The cold season is at least a month longer than that in the savanna. Species inhabiting these grassland are mostly Cape temperate with some intrusions of a transitional nature.

(a) terrestrial form: Hemachatus haemachatus; Bitis atropos (rocky hillsides); Psammophylax rhombeatus; Psammophis crucifer; Amplorhinus multimaculatus; Duberria l. lutrix;

Elapsoidea s. sundevallii; *Leptotyphlops c. conjunction*; *Tetradactylus eastwoodae*; *T. breyeri*; *Chamaesaura macrolepis*; *C. anguina*; *C. aenea*; *Cordylus giganteus*; *Mabuya homalocephala smithii*; *Ptychadena porosissima*; *Cacosternum n. nanum*; *Strongylopus grayii* (grassland form); *Kassina wealii*; *Bufo g. nubicolus*; *Breviceps v. verrucosus*.

(b) rupicolous forms: *Pseudocordylus m. melanotus*; *Lygodactylus ocellatus* (except for Soutpansberg); *Pachydactylus vansoni* (highveld form); *Agama atra* (except for apparent relict population north of the Soutpansberg).

(c) fossorial forms: *Acontophiops lineatus* (also on forest margins); *Acontias g. gracilicauda*; *A. breviceps*.

(d) aquatic forms: *Rana fuscigula*

South West Arid zone

Limited to small areas in the extreme south western Transvaal, although several species inhabiting this biotic zone occur elsewhere in the Transvaal, a result of dispersion during the Pleistocene. These latter species tend to obscure relationships.

(a) terrestrial forms: *Homopus femoralis*; *Naja nivea*; *Bufo vertebralis*.

(b) rupicolous forms: *Cordylus polyzonus*.

Diversity of habitat within these biotic zones largely determines species richness. This is exemplified on the Nylsvley nature reserve where the relatively uniform microphyllous Acacia savanna with its turf soil, rich in nutrients and with a well developed field layer, has fewer species but a large biomass. The broadleaved Burkea africana savanna on leached sandy soils, poor in nutrients and with a poorly developed field layer, has numerous species but a low biomass (Tarboton 1980, Jacobsen 1982). Such communities may live side by side, but while some species in the Burkea savanna are exclusive, all the species from the Acacia savanna are shared.

Rautenbach (1978a) mentions a decline in the number of mammal species from north to south and from east to west. This is also reflected to a degree in the herpetofauna but it is not due to greater ecological complexity in the eastern and northern Transvaal when compared to the south and west, but to a combination of geographical location, climate, altitude, faunal region and habitat heterogeneity. However such declines are most marked in the Transvaal as one proceeds from one biotic zone to the other.

6.2 Adaptations to habitat

Specific habitat preferences are more marked among the lizards and amphibians than they are among the snakes and chelonians. Numerous morphological adaptations have developed in response to specific life styles. Jacobsen (1982) showed that a linear relationship exists between snout to vent length and tail length among snake species. Arboreal and swift moving terrestrial snakes have the smallest ratio and burrowing forms the greatest.

The advantages of a long tail in arboreal species assists the snake in crossing gaps between branches and trees, while a short tail assists in reversing along a burrow.

Many lizards show similar adaptations, as fossorial species have short tails and actively foraging species such as *Nucras* and *Gerrhosaurus* have long tails. Length of tail reaches its peak in *Chamaesaura* where it may be 2,5-3,0 times that of snout to vent length. These lizards are mostly inhabitants of montane and rocky grasslands. The grasses are robust and dense and consequently limb reduction has occurred to facilitate movement through the grass. The ultra long tail appears to give adequate purchase and stability as well as functioning as an anti predator device. These lizards represent parallel evolution to snakes. Limb reduction has evolved several times in the lizards for different life styles. Such reductions are exemplified by *Scelotes* species in Transvaal, with *S. mira* having four well developed pentadactyle limbs, being the least fossorial, merely taking refuge under stones in montane grassland. *S. l. limpopoensis* has reduced limbs, with the hind feet tetradactyle and the forelimbs tridactyle, becoming even didactyle in the subspecies *albiventris*. Both forms are found in shallow to deep sand under rocks and logs. Reduction proceeds further in *S. bidigittatus* with didactyle hindlimbs and *S. brevipes* which only has minute monodactyle hindlimbs. Both the latter species are inhabitants of sandy to humiferous soils among leaf litter, often finding refuge under stones and logs.

Fossorial adaptations in the lizards are pronounced in the genera Acontias, Acontophiops and Typhlosaurus, with total limb reduction, enlarged rostral shields and reduction in eye functionality, serving in Typhlosaurus merely to distinguish between light and dark. Those developments have been taken further in the amphisbaenians. Rostral development, cylindrical bodies and short, round tipped tails are essential for such a burrowing existence. Variations of these are indicative of the capability and degree of fossoriality a species has achieved.

The least advanced form of fossorial adaptation is shown by Mabuya homalocephala depressa, which has merely a depressed snout enabling it to dive into the sand when pursued, writhing to a depth of 5-8 cm below the surface. Similarly, Aspidelaps scutatus with its large rostral, thick cylindrical body and short but pointed tail is an inhabitant of burrows, loose sand and leaf litter at the base of trees. Acontias species are usually found in burrows under rocks and even in moribund termitaria but also in leaf litter and friable soils among the roots of trees. Some species prefer moist soil close to streams (A. g. gracilicauda). The genus Typhlosaurus has a rounded snout in some of the more primitive members, as for instance in T. cregoi, while this is depressed with an enlarged rostral in T. lineatus, indicating a greater burrowing capability. The primitive snake genus Typhlops also exhibits these features, while in the less fossorial genus Leptotyphlops the snout remains rounded and the tail is longer in proportion to snout to vent length. In this genus the slender body enables these snakes to follow root channels, soil cracks, insect burrows and to inhabit moribund termitaria as well as to dwell in its usual abode under stones. These snakes do not appear to form their own burrows.

Amphibian adaptations to a fossorial or partly fossorial life style is a result of the necessity to avoid periods of unfavourable climate. This has therefore only resulted in a modified digging apparatus on the hind feet in the form of enlarged tubercles. In Hemisus the snout is depressed and a hardened 'rostral' is present to permit these frogs to push through the soil. All other amphibian species rely on the proximity of water or take refuge where humidity is high enough during this period of hibernation to largely reduce water loss.

Some remarkable adaptions to avoid water loss are found in Transvaal amphibians. The ability to secrete a mucous coccoon by Pyxicephalus has been well documented (Parry & Cavill 1978, Parry 1982, Loveridge 1974, 1976, Loveridge & Craye 1979).

Some observations (Jacobsen 1982) indicate that Phrynomerus bifasciatus may also form a mucous layer under conditions of stress. This frog normally hibernates in holes in the ground or even low down in holes in trees. The ability of Chiromantis xerampelina to be uricotelic (Loveridge 1970), secreting nitrogenous waste products as a solid, thereby conserving water while clinging to the branch of a tree in the sun or shade, is unique. Its ability to alter skin colour, becoming white in full sunlight to reduce heat absorption and varying shades of grey or grey-brown in situations where more benefit would be derived by remaining cryptic, is well known. Such colour change is also demonstrated by Hyperolius marmoratus taeniatus, presumably for similar reasons.

Chiromantis xerampelina also has the ability to absorb water through the cloacal wall, an ability which many bufonids are able to do through the skin of the lower abdomen. Rehydration of dessicated amphibians (even dead specimens) by simply placing them in water has been observed. This appears to be by a process of osmosis.

Osteoderms are found in many lizard families, but nowhere have they produced such a functional armour as in the genus Gerrhosaurus. Four species occur in the Transvaal, all of which have this unique 'exoskeleton' formed by interlinked subepidermal osteoderms. Actively foraging species such as G. nigrolineatus and G. flavigularis have torpedo-shaped bodies with long tails, enabling them to bulldoze through thick vegetation or into holes in search of prey or refuge. G. m. major also has a cylindrical body but with a less pronounced tail, indicating a 'wait and see' foraging strategy and is usually found at the entrance to its burrow, which frequently is in a moribund termitarium. G. v. validus is rupicolous with a dorsoventrally flattened body and a tail slightly longer than snout to vent length. Although a 'wait and see' forager, the species is also herbivorous. It lives under rocks and takes refuge in crevices. The value of a strong 'exoskeleton' under such situations is apparent. Other defence strategies are displayed in the genus Cordylus, where the skull is well developed, forming a solid bony case in keeping with their mostly rupicolous lifestyle. In addition, most species use their occipital spines to wedge themselves in a crevice and inflate the body, preventing their extrication. Occipital spines are most pronounced in the terrestrial Cordylus giganteus, which also uses them to anchor itself at the terminal end of its burrow while flexing its extremely spiny tail as a safe predator deterrent.

A reduction in osteodermal development and a very flexible, dorso-ventrally depressed body has been the adaptation of the cordylid genus Platysaurus, which is able to enter crevices between and under exfoliating rock less than five millimetres high. Such strategies have also been developed by the gekkonid genus Afroedura. Adaptations to rupicolous and arboreal life styles have resulted in the development of expanded subdigital lamellae in the Gekkonidae and in some species even in subcaudal lamellae at the tail tip. Most arboreal amphibians also have expanded discs at the tips of the digits.

Only the snake genus Philothamnus displays modifications for an arboreal and rupicolous existence, in the form of keeled ventral and subcaudal scales.

6.3 Hibernation

Owing to the pronounced seasonality of the Transvaal climate, most reptiles and amphibians are inactive from May to September. For many amphibians this may extend from March or April to October or when the first heavy rains fall. The onset of most amphibian activity can with certainty be attributed to adequate rainfall. However some Bufo garmani males on the Nylsvley Nature Reserve, became active prior to the rain, possibly as a result of rising temperatures. Rainfall does not account for the cessation of activity and hibernation. Ehlers (s. d.) showed that 72-80% of rainfall falls in the Transvaal from November to March. Only from 6-9% of the mean annual precipitation falls in April, increasing from south-east to south-west. Only 2-3% of mean annual rainfall occurs during May, least in the north and most in the south-west. On the Nylsvley nature reserve amphibians were most active from September and October to February or March. During 1976 activity stopped in March despite the 34,1 mm of rain which fell over four days during April. In 1977, activity stopped in February, even though 178,7 mm fell over a period of 12 days in March. Rainfall and the amount thereof, appears to vary considerably after April, which may account for cessation of activity after March. It does not account for the drop in the numbers of active amphibia prior to this, as apparently occurred on the Nylsvley nature reserve.

Porter (1972) records that low temperatures can induce hibernation in Rana pipiens. In the laboratory this frog goes into hibernation at temperatures of below 8°C. In the Transvaal mean minimum July temperatures range from 8°C in the warm north-eastern Transvaal to 0°C on the highveld. Porter (1972) also pointed out that frogs can survive temperatures of 0°C-9°C while hibernating. Some cold adapted frogs can even endure below zero temperatures. The mean minimum July temperature on

the Nylsvley Nature Reserve over a period of three years was 3,6°C, well within the limits exhibited by *Rana pipiens*. However hibernation among the amphibians on the Nylsvley Nature Reserve began during March at a time when mean minimum temperatures are still about 15°C, indicating that temperature is not responsible for the induction of hibernation among Transvaal amphibia.
Poynton (1964) suggested that some sort of a 'biological clock' is involved. This may be associated with reproduction. Species such as *Pyxicephalus adspersus* emerge after the first heavy rains, reproduce and disappear into hibernation after being active for only four months. Other species may be active for up to six months before disappearing. This lends support to such a theory. Neither temperature nor rainfall appear to provide conclusive evidence to the contrary. It is suggested that hibernation in the amphibia is under hormonal control, which is influenced by climatic variables and possibly food availability.

Reptiles are mostly adapted to the climates in which they live but according to Porter (1972: 294) are able to acclimatise provided that they are gradually exposed to greater or lesser temperature extremes. They are therefore able to withstand seasonal variation but not diurnal fluctuations. Lizards and snakes may go into torpor if they become too cold, but gradual warming will revive the animals. However if exposed for several hours at around 0°C, death will result. Variation in cold tolerances exist between and within species according to their adaptation to the climate of their environment.

On the Nylsvley Nature Reserve, reptile activity diminished during May, probably as a result of the lower minimum temperature. Mean minimum temperatures for April and May were 11,5°C and 6,8°C, and 12,8°C and 7,2°C for 1976 and 1977 respectively. This difference heralded the start of hibernation. The imposition of several days with a minimum temperature below 10°C appears to be sufficient inducement for the reptiles to become dramatically less active. Whether this initiates hormonal control is not known. Temperature is however at least responsible for the induction process and may even represent the timer of a biological clock.

Emergence from hibernation by most amphibians occurs after the onset of the rains. This is usually during October but varies from year to year and from place to place according to geographical position. On the Nylsvley Nature Reserve in the central Transvaal, peak emergence occurred during November and December 1975 and October and November in 1976 (Jacobsen 1982). These periods coincide with a rise in the number of rainy days from five, with a rainfall of 22,3 mm in October to 13 and 57,7 mm in November and to 18 days and 203,4 mm in December, 1975. During 1976, 8,9 mm over two days fell in September while 35,0 mm were recorded over eight days in October, followed by 142,6 mm over 11 days in November.

Poynton (1964: 213) suggested that the main factor determining diurnal quiescence or aestivation among amphibians was a result of predation pressure. While this may be partly true, it is evident that amphibians suffer from heat stress and dehydration.

Even toads must not be exposed to the sun for any length of time, before dehydration seriously affects locomotor ability. Specimens of *Kassina senegalensis* and *Tomopterna* have succumbed to heat stress inside an outhouse of brick and zinc, in spite of being kept moist. Another possible reason for amphibian activity at night is the higher relative humidity. This is lowest at 14h00 and highest in the early morning. On the Nylsvley nature reserve the mean relative humidity at 08h00 rose from 57% in September to a peak of 85% during March, while mean relative humidity at 14h00 rose from 30% in September to 61% in March although being mostly 50% in the intervening period (Jacobsen 1982).

Taylor (1982) observed a daytime refuge of *B. garmani* in a moribund termitarium which contained more than 30 individual toads. Although this could be a safe haven from predation it is more likely to have presented a relatively stable microclimate particularly as a result of the numbers of toads present.

While it is possible for amphibians to select an adequate microclimate during the day and aestivate, such selections do on occasion prove to be inadequate. Amphibians have been found moving about by day in a highly dehydrated condition. If water for resorption is not found in time, death rapidly ensues. Loveridge (1976) provides an indepth assessment of water conservation strategies of South African anurans.

Contrary to the amphibians, the reptiles are not influenced by rainfall to enter or emerge from a state of hibernation. The end of hibernation is signalled by the minimum temperature rising to 10°C or more for several days. These phases occur around the middle of May and mid-September varying from year to year (Jacobsen 1982). It is likely that the duration of hibernation and temperatures at which it is induced, varies according to latitude and how temperature adapted individual species respond. E. Pietersen (pers. comm.) for instance observed Cordylus giganteus a highveld species, basking in an ambient temperature of 7°C. Rainfall influences daily activity patterns of reptiles indirectly by a concomittant lowering of the ambient temperature. Being heterothermic the reptiles are influenced by such changes while also responding to high temperatures. Aestivation may occur so that the reptiles spend the hottest time inactive in a thermally suitable environment. Behavioural avoidance of unfavourable climatic conditions is but one facet of a reptiles' lifestyle.

6.4 Food

The assumption is usually made that reptiles and amphibians are opportunistic feeders. However studies on the Nylsvley Nature Reserve (Jacobsen 1982) and elsewhere (Broadley 1980, 1983) indicate that this is only partly true. a considerable degree of specialisation is evident among snakes, lizards and frogs. Unfortunately, data of stomach contents for most species is lacking. Jacobsen (1982) has listed the food of the snakes, some lizards and some amphibians within the Burkea africana - Eraprostis pallens savanna. Most of the snake species concentrate on single prey groups, either lizards, amphibians, mammals, other snakes or invertebrates. Some species will include up to four prey groups in their diet.

Further specialisation occurs within these groups, with snakes such as Leptotyphlops species feeding almost solely on Isoptera and Hymenoptera. It is possibly at this level of specialisation that opportunism may be more prevalent and that a snake species will feed on what is available. Most watersnakes will not feed on toads but consume only frogs, mostly of the Ranidae and Hyperoliidae, which are ubiquitous and frequently common.

This is largely true of the lizards also. Most lizard species feed on invertebrates, although some skinks may include small lizards in their diet (Broadley 1966c, Jacobsen 1982). Most species feed on from six to 18 different invertebrate orders. While this appears to remove competition, a closer look at the two to seven most important orders show a considerable overlap. Differences between lizard species is manifest in the proportions of which each order forms part of the diet (see also Jacobsen 1982, Fig. 31). Avoidance of competition for the same resource is manifest in prey species selection, temporal selection and spatial selection.

Broadley (1967b, 1979a) and Jacobsen (1987) have discussed the staggered life cycles of Ichnotropis capensis and T. squamulosa. It is likely that competitive exclusion among these species happened in the past but is less pronounced at present. Further work needs to be undertaken to elucidate this phenomenon.

Broadley (1966c) and Auerbach (1987) maintain that Varanus albigularis is primarily carnivorous. However, Transvaal specimens and one examined DOR from the northern Cape Province revealed that they mostly consume Tenebrionid beetles and millipedes with vertebrates forming a relatively small part of the diet. It is likely that this may also apply to the water monitor with larger adults becoming progressively more carnivorous. It is therefore imperative that details of prey items of all species are made available. There are too many misconceptions which are repeated in the literature. A vast reservoir of museum specimens is available for such analyses, and would increase our understanding of indigenous species, and their habits. Competition for the same resource is avoided by feeding at different times of the day (Jacobsen 1982, Fig. 34). In this respect many Transvaal snakes (53%) are nocturnal, that is feeding usually takes place at night although some opportunistic individuals may feed during the day. This excludes the burrowing Typhlops and Leptotyphlops about which little is known. Of these nocturnal snakes about 12 species (26,67%) are amphibian feeders while the remainder feed mostly on lizards, other snakes and rodents.

Among the lizards the situation is quite different with relatively few species being nocturnal, most restricted to the family Gekkonidae, only one lizard, Lygosoma sundevallii, adopting such habits. It is therefore evident that at any one site there may be several species competing for available resources.

Jacobsen (1977) and Snyders (1987) have attempted to delineate the microhabitats of various lizard species at two localities in the Transvaal. Through a separation of microhabitats much of the competition for food is eliminated. Most amphibians are nocturnal as a direct result of accelerated moisture loss during the day. The exceptions are those species which are aquatic or semi-aquatic and are not threatened by dehydration. Activity takes place only during summer although _Strongylopus grayii_ and _S. f. fasciatus_ may call well into the winter. However most amphibians feed during the summer spending the adverse time of the year in hibernation (p. 1455). As amphibians are greatly influenced by rainfall, surface moisture and to a lesser degree by temperature, many species only feed very irregularly when the climate is suitable and when habitats are available. However, the amphibians compensate by having greatly distensible stomachs so that the individuals can indulge themselves before aestivating until conditions are suitable again. _Pyxicephalus adspersus_ for example has a very brief active period when feeding can take place. This is usually initiated by a heavy thunderstorm in October and lasts as long as sufficient water such as shallow pans are available. During the following three months, adults are still sporadically observed but thereafter disappear and only juveniles may exceptionally be observed. _Breviceps_ species are astonishing in their capacity to consume large quantities of food. Many amphibians are stenophagous but most appear to be euryphagous (Barbault 1974, Jacobsen 1982). A comparison of the diets of three widely divergent amphibian species (Jacobsen 1982, Fig. 41) shows that although there is considerable overlap between the kind of prey consumed, each species has its own

Isoptera, Coleoptera, Orthoptera, Hemiptera and Araneae. These occur in varying combinations in the diet of most amphibians. These orders are also the main source of food to the lizards (Jacobsen 1982, Fig. 31, Table 19). A detailed investigation of stomach contents, prey size and frequency from a specific locality of all lizard and amphibian species, would shed some light on competition or the lack of it.

6.5 Reproduction

Transvaal herpetofauna exhibit some peculiar anomalies including reproductive bimodality. Reproduction is seasonal, between the months September to May. This coincides with the period of greatest rainfall and highest temperature, both important in ova and neonate development.

One or two clutches or broods per season is in keeping with the seasonality of reproduction in the subtropics. In contrast, in the tropics many species breed throughout the year or have an extended breeding season (Barbault 1975, 1976). This is the result of two climatic factors, namely temperature and rainfall. Balinsky (1969) recorded that on the Highveld, most amphibians were stimulated to spawn at the onset of the breeding season by 2-3 days of rain accompanied by a simultaneous rise in temperature, followed by a pronounced drop in rainfall intensity and amount and a concomittant lowering of the ambient temperature. Later in the breeding season, other factors were responsible for inducing breeding. However some species including _Bufo gutturalis_, _Schismaderma_ carens and Kassina senegalensis exhibit different profiles. Bufo gutturalis appears able to breed much earlier in the season, ie, before heavy rain has fallen. Xenopus species appear to be controlled by other external or possibly even intrinsic factors.

It is also evident during the breeding season, that reproductive activity does not cease during the day, especially among toads and among bullfrogs, while many species may call during overcast, humid weather.

Balinsky (1969) mentioned that spawning in most Highveld species take place at night and the eggs are laid by morning. An exception to this was the Bullfrog Pyxicephalus a. adspersus which mated and spawned in broad daylight.

Taylor (1982) observed that courtship and mating in B. garmani was observed to begin at night and continue for up to 48 hours. Egg laying took place in early to mid-morning at a time when the adults would be most vulnerable to predation. Similar observations have been recorded for Schismaderma carens and others. Breviceps adspersus appears to be activated by a change in atmospheric pressure as suggested by Poynton & Pritchard (1976). Adults begin calling in captivity up to a day or more prior to a change in the weather occurring (pers. obs.). These frogs are active above ground at night, although also moving about in the late afternoon under overcast and humid conditions. This tends to conflict with the theory of predation pressure (Poynton 1964). However it is a fact that most amphibians are active at night. Chiromantis and Hyperolius species have developed methods of combatting water loss, which enable these species to sit totally exposed to the sun and their natural enemies. Only fully mature *Hyperolius marmoratus* have aposematic coloration, the immatures being a grey to grey-brown or olive-brown colour, indicating the importance of the reproductively functional adult.

Amphibians are capable of covering large distances, particularly between the breeding grounds and sites of hibernation. On the Nylsvley Nature Reserve most amphibians had to move at least one kilometre from the sandy *Burkea* savanna which had sufficient hibernation sites and permitted easy burrowing, to the low-lying floodplain to find sufficient surface water in which to breed. Of the 11 species living in the Burkea savanna, all but one, *Breviceps adspersus*, must move out to breed. The low recapture rate of adults returning to the *Burkea* savanna is indicative of the effect of predation, coupled with 'natural' mortality. This would include dehydration which is as powerful a selection pressure as predation is suggested to be. Taylor (1982) experimented with the homing instincts of *Bufo garmani* and found that they were capable of homing up to a kilometre from their retreat. Most successful individuals were males.

An increase in minimum temperature and therefore insolation appears to stimulate activity and reproductive behaviour in reptiles. Most Transvaal species are oviparous. Some species such as those of the genus *Cordylus* and some skinks are viviparous, while three species exhibit a reproductive bimodality. Brown-Wessels (1989) has reported on this feature in

Mabuya capensis which is live bearing on the highveld and in an area north of the Soutpansberg, but is oviparous in the bushveld. _Mabuya varia_ also shows this bimodality, viviparous on the highveld and in the Orange Free State, as well as along the Transvaal Drakensberg and on the hills at Thabazimbi. Elsewhere in the bushveld and lowveld the species is oviparous. An undescribed sibling but rupicolous species apparently also shows a similar bimodality. Our conception of bimodality may possibly be due to our inability to recognise other sibling species within the complexes and detailed morphometric and character analyses should be conducted to assess the validity of these anomalies.

Broadley (1966c) made a brief mention of the rationale for oviparity and viviparity. Oviparity being less threat to the breeding population in warm climates and viviparity being more important in cold climates where the female is responsible for the successful development of the young and can manipulate incubation temperatures behaviourally. While many of the viviparous Transvaal reptiles occur in cooler climates such as on the highveld and escarpment, temperature does not explain some of these anomalies. Such populations are probably relicts of past climatic events and isolations and have little bearing on current climates. The area north of the Soutpansberg where viviparous _Mabuya capensis_ have been found, is the same as that where relict populations of two other lizard species occur. These are _Typhlosaurus lineatus subtaeniatus_ and _Scelotes limpopoensis albiventris_, both local endemics. This area therefore has a history of changing conditions which may have included a period of relative coolness.

Broadley (1966c) mentions that many south temperate reptiles are viviparous but excludes Bitis as having such origins. However it is apparent that most Bitis species occur in the South Temperate and South West Arid zones with low winter temperatures. The other members of the genus, with two exceptions occur along the eastern escarpment of Africa, along which many other temperate species occur. It is therefore considered that Bitis conforms to the patterns exhibited by the other temperate genera.

Many of the reptile species on the highveld are oviparous, indicating a response to the current more moderate climate. In Chapter 1 mention was made of the variability of the climate during the Pleistocene, including a drop in temperature of 4-6°C. Such a drop would probably be sufficient to exclude oviparous species from the highveld and promote viviparous species. Subsequent amelioration of the climate over the past 5000-6000 years could have permitted the re-establishment of oviparous species.

At any one site in the Transvaal, there are more snake species than there are lizard or amphibian species. In the eastern lowveld there may be more amphibian species than lizard species but this situation changes westwards. However, in biomass per unit area the amphibians appear to dominate under all situations. They are highly successful in their colonisation of land. In areas where there is much water and shade the eggs may be laid out of water or in a specially constructed nest. In areas where surface water is scarce, subterranean nests with fewer but more yolky eggs have been the adaptation made. Within the two extremes of climate and water availability, the amphibians produce large numbers of ova with small yolks of which only a relatively small percentage will survive to reproduce. On the Nylsvley Nature Reserve, large concentrations of immature frogs and toads enter the *Burkea* savanna during January and February. Far fewer adult individuals return to hibernate. Despite this, recruitment is adequate, epitomising the r-selected species. Sexual maturity is attained in one year, and as many species are perennial, have ensured the survival of the species. Should even a whole generation of young not survive it is likely that sufficient adults will be able to survive to breed during the following summer.

Most lizards and snakes with their cleidoic, large yolked eggs have cut down on egg production, resembling amphibian species such as *Breviceps* and *Hemisus*. However despite being laid in a sheltered place, they are also to all intents and purpose left to the elements, predators and diseases. The ova take far longer to hatch than do those of the amphibians and are therefore as vulnerable to climatic vagaries and predation pressures. The reptiles, like the amphibians, lay from one to two clutches per season. Although the reptiles skip the metamorphic stage, the environmental factors operating on them are much the same as those on the amphibia.

Some lizards and snakes are 'annual' species with a rapid turnover of population. These include *Ichnotropis capensis*, *I. squamulosa* and possibly

Psammophis sibilans brevirostris (Broadley 1967b, 1979a; Jacobsen 1982, 1987). Such species are vulnerable to environmental changes which result in large scale fluctuations in population size. Such species are very similar to many amphibians in their adaptation to their environment.

Poynton (1964) stated that the amphibians "have succeeded in exploiting a plastic way of life to its fullest possibilities". In this, the writer fully agrees but feels that selection pressures are still present under environmental extremes including those presented by man. The rapidly changing face of the earth is leading to large scale extinctions as a result of specialisation and the inflexibility of many life cycles. Such considerations pertain equally to the reptiles, of which *Crocodylus niloticus* (Jacobsen 1984) and *Cordylus giganteus* (Jacobsen et al, in press) are examples. Responses to rapid change are only possible in a few species which show a flexibility in life style and habitat. These species will be the ancestral stock of tomorrow.

CHAPTER 7

Biogeography

The Transvaal is an integral part of southern Africa and difficult to view in isolation owing to the meaninglessness of artificial political boundaries. These cut through species and community distributions, necessitating a southern African approach. The Transvaal occupies an unique position in this respect as it contains four major biotic zones. These were discussed in Chapter 6 and reflect the diversity of the herpetofauna. It appears that the distributions and species composition of the herpetofauna are manifestations of responses to prehistoric events although considerable speciation has subsequently taken place. From the works of Poynton (1960, 1962, 1964a), Balinsky (1962), Broadley (1966c) and Poynton & Broadley (1978), it appears that three faunal groupings are represented in Southern Africa. These include a Tropical fauna according to the definition of Poynton (1964a), which ranged southwards and northwards across southern Africa as determined by the climates of that time, but did not reach the south western Cape. In this area an unique South temperate fauna envolved, as a result of past climatic events, which was able to expand and contract its range northwards under favourable conditions, frequently overlapping with that of the Tropical fauna. This zone of overlap induced the development of an unique fauna referred to as a Transitional group.

7.1 Historical influences

The origins of the Transvaal fauna can only be speculated upon. After the great African planation in the early Tertiary, climatic and continental upheavals were frequent during the late Tertiary and early Quarternary, resulting in the start of a new erosion cycle and possibly of the origins of these faunas. A widely held view is that the temperate elements were more continuous during hypothermal phases but became fragmented during warmer periods, hence numerous relict populations, particularly along the eastern African escarpment developed. Two opposing points of view are offered to explain these relict faunas and floras (Poynton 1983, 1985a). The first involves the vicariance theory, which states that relict faunas are remnants of a much greater distribution, which had survived in suitable habitats as the climate changed. The second is based on the dispersal theory, which suggests that these isolated remnants were formed by migration along climatically suitable pathways. Many plant species owe their dispersion to birds and mammals and are able to appear in areas far from their normal distribution, provided that the climate is suitable. Jacobsen & Moss (1987) reported on the occurrence of _Sclerocarya birrea_ and _Rhus leptodictya_ on a granite hill only 40 km from the sea in the northern Namib desert, presumably transported by stone age man. Plant species with light seeds or spores are able to traverse large distances as a result of wind transport. Many fern species exhibit totally disjunct distributions in the Transvaal (Schelpe & Anthony 1986, Jacobsen & Jacobsen 1985, 1988).

Palynological evidence (Scott 1984) indicates that fluctuations in the species composition of vegetation communities in Southern Africa were manifold from 35 000 years BP to the present. However whether this involved whole floras or only some species is not clear. It is difficult to comprehend the movement of whole floras and faunas along specific pathways. A particular objection to the dispersalist theory is a physiographical barrier such as that of the Limpopo and Zambesi troughs, formed through downfaulting and erosion. The latter forms part of the rift valley system (King 1967) and is therefore of considerable age.

The presence of species such as *Bitis atropos*, *Bufo gariepensis inyangae*, *Typhlosaurus cregoi bicolor* and *Lygodactylus bernardi* in eastern Zimbabwe far removed from their nearest relatives, is indicative of a wider distribution of a temperate fauna during cooler climates in the Pliocene. Climatic events during the Pleistocene were not of sufficient magnitude to permit migration routes across the Limpopo gap and it is considered that these faunas are relicts of a former wider distribution. *Lygodactylus bernardi* and *L. ocellatus* are very closely related. No doubt they had a single ancestor during the Pliocene which developed into two taxa after the development of the Limpopo trough. A relict population of *L. ocellatus* exists in the Soutpansberg which appears to have been isolated from the typical form in more recent times. This form occurs at different altitudes and appears morphologically distinct, at least at subspecific level.

Current concepts of the rate of speciation vary. One wonders whether there is need for morphologic change, if a species is cut off from its own kind Such change should also involve physiological change but this is not always manifest in the phenotype. It is evident that rates of change differ. Such differences are not very apparent in the case of sibling species, characteristic of the genera Afroedura, Platysaurus, Cordylus and others. Robinson & Gibbs Russell (1982) suggest that allopatric speciation is the most common form of speciation, occurring when populations of a species become spatially isolated and differentiating by genetic rearrangements. If reproductive isolation follows then speciation has taken place. Similarly parapatric speciation is also possible, by separation, but based on niche or habitat differences in the same geographical area. Typhlosaurus lineatus is a south west arid species, of transitional origin, which was able during the Pleistocene to expand its range as far as the eastern Transvaal. This was possible during arid interpluvials when wind borne sands were deposited widely in the Transvaal (King 1967). How many times this did occur is not known, as two relict subspecies of T. lineatus were probably formed during intervening pluvials when such sands were eroded and washed away leaving only remnants in protected areas. T. l. richardi resembles T. l. lineatus in colour, but differs in the number of head shields and body scales but appears to be closer to the type than T. l. subtaeniatus. The latter has a pigmented ventrum which both T. l. lineatus and T. l. richardi do not have. It is therefore indicated that 'richardi' is a more recent phenon while 'subtaeniatus' was more likely derived during an earlier interpluvial. It would appear that pre-historical distributions of some reptiles were widespread and that subsequent climatic events fragmented populations which in later, more favourable climes permitted dispersal and recolonisation. It is evident that the aeolian sands involved at least one such formative period.

Scott (1982 a, b, c 1984a, 1987a) has shown that palynological evidence indicates wide dispersal over the Transvaal of a Cape temperate flora during the Pleistocene. Genera include _Podocarpus_, _Stoebe_, _Helichrysum_ _Myrica_ and many others. Most of these genera currently do not occur at all in many of these areas, or are represented by only a few species outside of areas of temperate climates such as the Transvaal escarpment. It is noteworthy that in most instances the prevalence of these genera relate to mountain ranges throughout the Transvaal. The support of a vicariant distribution for temperate and for tropical species appears well grounded. Dispersals have and are still acting on the original palaeo-distributions.

The eastern African escarpment has been of great interest to biogeographers because of the high degree of endemism and fragmented areas of temperate flora ranging from Ethiopia to the Cape. Such endemism could have arisen as a result of geological events. During the Tertiary, Africa was undergoing planation and achieved a relatively even surface, a feature which would encourage uniformity of vegetation. However late in the Tertiary, during the Pliocene the downflexing of the margins of the continent took place with a concomittant rise of the escarpment to, in most places, higher than that of the present (Chapter 1). This would have placed selection pressures on such species as then existed. Climatic change followed, and vacillated throughout the Pleistocene which paved the way for such high degrees of endemism, especially so in the areas closer to the equator, where climates were more stable (as they are now), than further south, where climatic extremes prevailed and ranged from cool to cold. Species were possibly more cold adapted in the south and therefore less susceptible to change. Table 4 lists the endemic or mostly endemic Transvaal species. Most are lizards (80,8%) with two amphisbaenians, six snake and two amphibian species. Most lizard endemics are rupicolous (73,8%), while 16,7% of the others are semifossorial to fossorial and only 7,1% are arboreal. Only a single terrestrial species is endemic. Among the snakes five species (83,3%) are semi fossorial to fossorial, only one being terrestrial/semi aquatic. The only two amphisbaenians are primarily fossorial while the amphibians are fossorial.

TABLE 4 Endemic Transvaal species

Sauria
Homopholis mulleri
Lygodactylus ocellatus
L. methueni
Pachydactylus vansoni
Afroedura m. haackei
Afroedura m. 'Abel Erasmus'
Afroedura m. multiporis
A. langi langi
A. l. "Lillie"
A. l. 'Shinokwen'
A. l. 'Tshipise'

A. l. 'Waterpoort'
A. l. 'Soutpansberg'
A. l. 'Waterberg'
A. l. 'Leolo'
A. p. 'Godlwayo'
A. 'Maripi'
A. 'Matlala'
A. 'Lebombo'
Bradypodion transvaalensis
Scelotes limpopoensis albiventris
Scelotes mira
Acontophiops lineatus
Typhlosaurus lineatus subtaeniatus
T. l. richardi
T. aurantiacus fitzsimonsi
T. cregoi cregoi
Lacerta rupicola
Cordylus warreni depressus
C. w. breyeri
C. vandami
Pseudocordylus melanotus transvaalensis
Platypaurus i. intermedius
P. i. parvus
P. i. 'Glen Alpine'
P. i. wilhelmi
P. guttatus
P. minor
P. 'Orange'
P. relictus
P. o. orientalis
P. o. fitzsimonsi
Tetradactylus eastwoodae
Chirindia P. langi
C. l. occidentalis

Serpentes
Leptotyphlops nigricans
L. distantii
Amblyodypsis microphthalma nigra
Xenocalamus bicolor australis
Aspidelaps scutatus intermedius

Amphibia
Breviceps s. sylvestris
Breviceps s. taeniatus

White (1978) in his description of the vegetation types of Africa included seven mountain systems on which Afromontane flora occurred. More than 38% of the endemic trees of this vegetation type occur in at least four of the mountain systems, 25% in two or three of these systems and 37% are confined to a single system. This indicates degree of relationship between these mountains. Closer to home, Fourie et al (1988) have identified at least 53 endemic floral and faunal species and found five main centres of endemism along the Transvaal Escarpment, namely The Woodbush/Wolkberg region, The Downs/Cyprus region, Mariepskop/Blyde River Complex, Graskop/Pilgrims Rest Region and the Barberton mountain land. Each of these areas are separated from one another by topographical, climatic and possibly man induced barriers. Topographical barriers include gaps such as that formed by the Crocodile River, Olifants River and Blyde River and the escarpment area between the Soutpansberg and Woodbush. These have severed populations of such genera as *Bradypodion*, *Lygodactylus*, possibly *Afroedura*, and species such as *Bitis atropos* and

Pseudocordylus melanotus. In some genera this has resulted in speciation. *Bradypodion* with nine recognisable forms can be divided into two groups. Those north of the Olifants River normally have black, white and orange colouration in males although the form from The Downs is normally green and very distinct. The Soutpansberg form is very closely allied to that of the Woodbush, both in morphology and in colour, indicating a recent separation, probably during the recent drying up of the climate about 5 000 years BP. The differences between the Woodbush form and that from The Downs are more difficult to reconcile as the latter more closely resembles southern populations than that of the Woodbush. Nevertheless on character analysis it appears allied to the northern group (Figure 12).

South of the Olifants river, *Bradypodion* populations are fragmented and at least in the Sabie/Graskop/ Pilgrims Rest and Lydenburg areas are possibly due to the activities of man. This makes it difficult to discern what is currently taking place. Three forms are found here but some overlap in distribution and morphology is apparent. There appear to be grounds for separation on the basis of the character analysis but further studies are required. Another form occurs on Mariepskop which also appears to warrant at least subspecific distinction. The separation of Maripi and Mogale Mountains from the escarpment are also shown by an *Afroedura* which occurs on Maripi and has also recently been found at Graskop in similar habitat. Such links indicate that these species occurred together in the past, becoming separated perhaps during the Pliocene when the escarpment rose, accompanied by increasing erosion by east flowing rivers originating on the escarpment. Such events resulted in river capture, including that of the Olifants (King 1967) and has resulted in the isolation of fish species (Fourie et al, 1988).

7.2 Environmental influences

Most of the limitations of current species distributions can be attributed to climatic and habitat restrictions together with dispersal ability.

Habitat

Rupicolous species are confined to suitable outcrops or bedrock, mostly of sandstone, granite and rhyolite because of the availability of suitable fissures. The degradation of granites consists chiefly of exfoliation or spheroidal weathering in which thin sheets of rock lift off from the bedrock along planes of weakness. In sandstone, joints in the bedrock become leached out or the rock splits along these planes to form crevices. Distributions of most species of Platysaurus and Afroedura are limited to these rock types. However the total distribution of the genera indicate a possible ancient Pliocene pattern. Subsequent erosion together with the advance and retreat of aeolean sands are responsible for current largely allopatric populations. The inability of these rupicolous forms to cross areas lacking in rock is exemplified in the north western Transvaal. Here one Platysaurus species is separated by a mere 50 m of sand and vegetation from another hill with two other species. However, for these species to have established such a distribution, one of two possibilities must have existed. One is that areas of bedrock were contiguous enabling a continuous population to exist or at least permitting dispersal from a centre of origin. Such areas were later isolated by large scale erosion as well as by the deposition of aeolian sands across which individuals could not venture.

Alternately the parental stock was only partially rupicolous, permitting a large degree of terrestriality, which ability became further restricted under separation by loose aeolian sands, which are today inhabited only by psammophilous species. It is difficult to conceive of such vast areas of rock being available without retreating very far into geological time. The poor degree of morphological differentiation between the different forms indicates a possibly recent separation. Greatest change is likely at the periphery of the distribution (Poynton 1964) as these populations would be separate from one another and be subjected to local selection pressures of a climatic nature. Such outliers, possibly bound by narrow corridors to the parental stock could easily have been cut off by unfavourable conditions and through isolation differentiated according to the selection pressures operating. Climatic restrictions are largely responsible for current distribution patterns, redefining historical distributions, on more than one occasion. Influential climatic parameters include rainfall and temperature, but there are probably others which are more subtle.

Temperature

Temperature has been suggested as the most important delimiter of distributions. Various authors have attempted to fit current distribution patterns to isotherms or their derivatives, based on mean temperatures. Poynton (1964) pointed out that Tropical amphibian species experienced a pronounced subtraction zone below a mean temperature of 18°C for the coldest month. Similarly the Temperate amphibians are restricted to below the 13°C isotherm for the coldest month. The area between the two faunas exhibit many unique or transitional species. Stuckenberg (1969) disagreed with Poynton (1964) and attempted to explain distributions of various reptiles and amphibians on the bases of effective temperature (ET). Stuckenberg's (1969) reservations are unfounded as he illutrates his answer by reference to mean annual temperature, which does not ellicit a recognisable response in both reptiles and amphibians. In fact on the Nylsvley Nature Reserve Jacobsen (1982) showed that while temperature maxima were similar, it was the minima which were responsible for dramatic shifts in reptilian activity patterns. In this case a continuous minimum temperature below or in excess of 10°C over a period of several days was responsible. Non - Tropical species appear correlated in distribution with those areas where the nights on average have a minimum temperature of 16,7°C. This applies to the lowland areas of northern Natal (Poynton 1964). Conceivably elsewhere other temperatures are likely to be important, as for instance on the Highveld. Effective temperature (ET) isolines compare well with frequency of warm nights. According to

Stuckenberg (1969) most tropical snakes do not range beyond an ET of 15°C and most South African species do not range beyond the 16°C isoline. This also appears to include amphibians, although Lambiris (1988) has reservations towards this approach on ecological grounds. Such reservations are largely unfounded, as most reptiles including snakes are as terrestrial as most amphibians. It is however true that reptiles and amphibians differ with respect to thermoregulation and water conservation. Such a comparison would present a fruitful area of research.

Poynton & Broadley (1978) refer to the complex relationship between environment and distribution along the coastal zone from Zululand to the eastern Cape. Here a transition from an East African fauna and flora to a southern non-tropical fauna and flora is evident in a subtraction zone that shows only gradually changing environmental conditions. Stuckenberg (1969) suggested that this is correlated to the width of the coastal plain. Correlations between number of species of plants and area have been demonstrated to follow a parabolic curve (Raunkaier, 1905, Braun-Blanquet, 1932, Jacobsen unpublished manuscript). It appears that faunal assemblages also demonstrate this rule. Deviations from this are attributable to temperature, rainfall and habitat diversity. In a counter argument, Poynton & Broadley (1978) point out that north of Zululand in Mozambique, the same amphibian species occur on high ground. This implies that the climate is responsible for the increased distribution. While this is so, it also indicates the degree of ecological tolerance of these species, as well as a similar habitat diversity between the two areas. Habitat diversity is an important determinant of species richness. Competition for space is related to food and reproduction. However the amphibians have adapted to limitations in these, behaviourly by becoming active at different times of the night and to a lesser degree in choice of microhabitat. It is therefore apparent that the uniformity of habitat to the north, similar to that in the south may contribute to the subtraction in species numbers. This could therefore explain the subtraction of 'tropical' species in Zululand. However two different temperature parameters are now suggested to limit tropical amphibians in southern Africa, the one based on mean July isotherm and the other, on the average annual frequency of nights with the minimum temperature above 20°C. While somewhat divergent, these variables still pertain to temperature as being responsible for restrictions in distribution.

Rainfall

Van Dijk (1971) showed the distribution of various amphibians to be correlated with rainfall while Haacke (1984) refers to some reptiles in the southern Kalahari which are likewise restricted. Jacobsen (1982) exhibited the reactions of hibernating amphibians to rainfall. However such effects may arise largely from current ecological conditions while temperature may in addition also reflect historical limitations. Increased rainfall in itself need not necessarily mean an increase in amphibian species but coupled with an increase in temperature, could result in an increase in the number of tropical species. In the Transvaal, the highest rainfall is along the escarpment, decreasing sharply eastwards and more gradually westwards. However most amphibian species occur in the lowveld and especially in the lowlands fringing the Swaziland/Mozambique border as well as some low-lying areas in the Kruger National Park (see also Poynton 1964, Map 3).

Although the findings of De Waal (1978) seem to contradict the previous paragraphs, it is evident that mean isotherms do not reflect changes in herpetofaunal distributions per se. Other temperature parameters as discussed, are more influential and may together with rainfall provide the answer to many distributions. It is difficult to reconcile the exact correlations between rainfall and species distributions as shown by De Waal (1978). According to this author, the effect is on the incubating ova, which would indicate differential permeability of the shell between species accounting for greater or lesser hatching success. Although this may be true of arid adapted species, it is not likely to be clinal. Also it would be easy for reptiles to locate suitable laying sites. Selection pressures would select for individuals whose ova were laid in the best suited sites. Topography and physiographical properties of an area would provide ample diversity of sites to suit all inhabitants. Rainfall is also extremely variable over time, more so in drier areas, with the result that too much or too little rain might fall at any one time during the months October to March. Both would affect the viability of the ova. Such a simple explanation is insufficient to account for all the varied distribution patterns reflected by the herpetofauna.

Despite the reported correlation between species and areas (Stuckenberg 1969) or rainfall (De Waal 1978), which presents an oversimplification, it must be remembered that poikilotherms are likely to be more sensitive to temperature extremes, particularly, the lower ones which coincide with other unfavourable situations. These include a shorter day length and a lack of food as well as a reduction in water availability and at least for the amphibians, a reduction in habitat diversity. High temperatures fluctuate daily and are of limited occurrence permitting a change in the activity regimen of the herpetofauna. Low temperatures are seasonal and with the decrease in day length, of lengthy duration, less easily compensated for. Together with a lack of food, low temperatures are no doubt the most important restriction on the current distribution of the herpetofauna under conditions of optimum habitat diversity.

It is therefore indicated that the single most important climatic variable with respect to the herpetofauna of southern Africa including the Transvaal appears to be temperature, upon which all other variables such as rainfall, day length, soil, bedrock, altitude and latitude play a role, in the mosaic of current distributions.

Chapter 8

Conservation

The current state of conservation of Transvaal herpetofauna is surprisingly good, considering the small areas (o,7% of the Transvaal) under the jurisdiction of the Provincial Administration. The diversity of habitats within the approximately 50 nature reserves and field stations and the distribution of these reserves together with the Kruger National Park is largely responsible for this (Table 5).

8.1 Conservation status

In a comparison of the total herpetofauna of the Transvaal and that occurring in conserved areas it is evident that several species are not found in these areas. Table 6 provides a list of species which to date have not been recorded from a specific conservation area. Incorporated here are most of the newly described taxa, many of which have a highly restricted range in the Transvaal and are endemic to the province. The likelihood of some of these species occurring in nature reserves, as discussed in each species account, is here emphasized.

Table 5: Numbers of species and subspecies of reptiles and amphibians in Southern Africa (after Branch et al, 1988) and those occurring in conservation areas in Transvaal, (after Pienaar et al 1978, 1983, Jacobsen et al 1986).

Region	Anura	Reptilia						Total
		Chelonii		Crocodylia	Squamata			
		Cryptodira	Pleurodira		Sauria	Amphis-baenia	Serp-entes	
Southern Africa	142	23	6	1	323	15	162	672
South Africa	106	21	5	1	223	9	119	488
Transvaal	53	5	3	1	111	8	84	265
Undescribed forms in this report	0	0	0	0	17	0	0	17
Conserved areas	45	4	3	1	90	6	76	225

Table 6: List of herpetofauna not found to date in Transvaal conservation areas.

Anura

Bufo vertebralis
Breviceps s. sylvestris
B. s. taeniatus
Ptychadena m. mascareniensis
Hemisus guineensis broadleyi
Leptopelis bocagei

Chelonii

Cryptodira

Homopus femoralis

Squamata

Sauria

Homopholis mulleri
Lygodactylus methueni
Afroedura multiporis haackei
Afroedura 'Matlala'
A. langi 'Tshipise'
A. l. 'Waterpoort'
A. l. 'Waterberg'
A. l. 'Leolo'
A. multiporis 'Abel Erasmus'
A. 'Maripi'
A. p. 'Godlwayo'
Eremias burchellii
Cordylus giganteus
C. polyzonus
Platysaurus intermedius parvus
P. i. natalensis
P. i. ssp. nov 1
P. i. ssp. nov 2
P. orientalis fitzsimonsi
P. 'Orange'
Tetradactylus eastwoodae
T. breyeri

Amphisbaenia

Chirindia langi occidentalis
Dalophia pistillum

Serpentes

Typhlops schlegelii mucruso
Lamprophis fuscus
Xenocalamus transvaalensis
X. b. bicolor
Atractaspis duerdeni
Elapsoidea s. sundevallii

There is a total of 265 species and subspecies of reptiles and amphibians, to be found in the province. This survey has attempted to outline their distributions and attempts to make a statement on the conservation status of each species. The results of this survey have indicated a large number of undescribed taxa, the total and status of which are not yet fully known. Incorporated in this report are 17 forms which are described for the first time. Several species groups including *Bradypodion*, *Lygodactylus* and *Pedioplanis* have yet to be sorted out once a sufficiently large specimen base has been achieved. It is therefore difficult to provide accurate figures of the total number of forms of the herpetofauna to be found in the Transvaal.

Branch (ed.) (1988c) recorded a total of 488 recognised taxa from South Africa, but this does not include the undescribed forms, mentioned previously. The Transvaal therefore roughly incorporates 50% of the species and subspecies found in South Africa, and although only half the size of the Cape Province has almost as many species.

According to Branch (ed.) (1988c), 256 of the 488 taxa known from South Africa are endemic to the region (i.e.

have more than 90% of their range in the region). The Transvaal has two amphibians, three snakes, two amphisbaenians and 29 lizard taxa endemic to the province. An additional 17 newly described taxa in this report elevate the proportion of lizards considerably. Therefore 18% of the Transvaal herpetofauna is endemic. This is considerably less than the 52,46% of the overall South African herpetofauna, which is greatly influenced by the high level of endemicity shown by the herpetofauna of the southern and south western Cape Province.

Branch (ed.) (1988c) attributes the high level of endemicity to be partly due to the low mobility of many amphibians and rock-living and burrowing reptiles. While such an observation is true in part, it precludes input by faunal origin which may be more important. Certainly in the Transvaal, with its composite fauna of several origins, endemic species are largely a result of a rupicolous or fossorial way of life.

In determining the conservation status of the herpetofauna of the Transvaal a subjective approach based on five criteria was used, similar to that employed by Lambiris (1988) but slightly modified (Table 7). I have only weighted two of the criteria, namely endemicity and degree of conservation, as it is felt that these two criteria are not in a continuum whereas the other three criteria are scored according to a continuum of conditions.

According to this scheme taxa scoring the highest, indicate a greater need of conservation support and investigation (Table 8). This system however does not incorporate to what degree a taxon is threatened but largely underscores the known range of a species, highlighting those taxa with a very limited but possibly safe distribution. However it does focus attention on these species, from which a priority list can be compiled for further monitoring and evaluation. Threats can be evaluated and species requiring greater conservation effort can then be identified. Such taxa are incorporated in the South African Red Data Book.

The current Red Data Book - Reptiles and Amphibians (Branch, 1988c) lists a total of 32 Transvaal herpetofauna ranging in conservation status from Extinct (1), to Vulnerable (4), Rare (7), Restricted (12) and Peripheral (8). Despite a greatly broadened approach from that adopted by McLachlan (1978), the latest RDB-RA will have to be updated in the not too distant future. Additions to the last three categories are needed, thereby identifying all those species which are at risk. This, it seems to me, is the ultimate goal of the RDB system, and not only identifying species in crises. The latest RDB has largely succeeded in doing so.

Table 7: Criteria for the evaluation of Conservation status.

	Criteria	Score
1.	Endemicity	
	Occurring only in the Transvaal	5
	Occurring in the Transvaal and one other province and/or neighbouring country	3

Criteria	Score
Occurring in the Transvaal and in two other provinces	2
Occurring in the Transvaal and in three other provinces	1
Widespread in Southern Africa	0

2. Habitat specificity

Specific to a particularly restricted habitat	5
Found in more than one habitat but restricted in distribution within those habitats	4
Found in more than one habitat including suburbia	3
Widespread in the Transvaal excluding suburban areas	2
Widespread in the Transvaal including suburban areas	1

3. Distribution

Recorded in the Transvaal from less than 10 1/4° squares	5
Recorded in the Transvaal from 11-20 1/4° squares	4

Criteria	Score
Recorded in the Transvaal from 21-50 1/4° squares	3
Recorded in the Transvaal from 51-150 1/4° squares	2
Recorded in the Transvaal from 151 or more 1/4 ° squares	1

4. Abundance

Very localised and rare within its distribution in the Transvaal ..	5
Widespread within the Transvaal but sparse	4
Within its distribution in the Transvaal it is uncommon	3
Within its habitat it is common	2
Common within its distribution in the Transvaal	1

5. Conservation

Not known to occur in the KNP or any provincial nature reserve ...	5
Localised in the KNP and/or occurs in less than seven provincial nature reserves	3

Criteria	Score
Occurs over half the KNP or in 7-20 provincial nature reserves	2
Occurs over 75% of the KNP or 21-31 provincial nature reserves ...	1
Occurs over at least 75% of the KNP and/or in more than 31 provincial nature reserves	0

Table 8: Conservation status of Transvaal herpetofauna

	Ende-micity	Habitat specifi-cation	Distri-bution city	Abun-dance	Conser-vation	Total
CLASS: AMPHIBIA						
ORDER: ANURA						
Family: Pipidae						
X. laevis laevis	1	2	2	2	0	7
X. muelleri	3	4	4	2	1	14
Family: Heleophrynidae						
Heleophryne natalensis	3	5	5	3	3	19
Family: Bufonidae						
Bufo fenoulheti fenoulheti	2	5	2	2	0	11
B. gariepensis nubicolus	3	5	5	5	3	21
B. garmani	0	1	2	2	0	5
B. gutturalis	0	1	1	2	0	4
B. maculatus	3	2	3	3	0	11
B. rangeri	1	3	2	4	0	10
B. vertebralis	2	4	5	5	5	21

	Ende-micity	Habitat specifi-cation	Distri-bution city	Abun-dance	Conser-vation	Total
Family: Microhylidae						
Breviceps adspersus adspersus	0	2	2	2	0	6
B. adspersus pentheri	1	4	4	3	4	15
B. mossambicus	3	4	5	4	3	19
B. sylvestris sylvestris	5	5	5	3	5	23
B. sylvestris taeniatus	5	4	5	4	5	23
B. verrucosus verrucosus	2	4	5	5	3	19
Phrynomerus bifasciatus	2	2	2	2	0	8
Family: Ranidae						
Cacosternum boettgeri	0	1	2	2	0	5
C. nanum nanum	2	4	5	5	3	19
Phrynobatrachus mababiensis	2	4	2	4	1	13
P. natalensis	0	2	1	1	0	4
Hildebrandtia ornata ornata	3	4	3	5	1	16
Ptychadena anchietae	3	2	2	1	0	8
P. mascareniensis	3	4	5	5	5	22
P. mossambica	3	4	3	4	1	15
P. oxyrhynchus	2	4	5	5	3	19
P. porosissima	2	4	4	4	5	19
P. uzungwensis	3	4	5	4	5	21
Pyxicephalus adspersus adspersus	0	3	3	2	2	10
P. adspersus edulis	3	4	3	3	1	14
Rana angolensis	0	2	1	1	0	4
Rana fuscigula	1	2	4	3	3	13
Strongylopus fasciatus fasciatus	1	4	3	4	2	14
S. grayii grayii	1	4	3	3	3	14
Tomopterna cryptotis	0	1	2	2	0	5
Tomopterna krugerensis	3	4	4	4	3	18
Tomopterna marmorata	3	4	3	3	1	14
Tomopterna natalensis	2	2	2	2	0	8

	Endemicity	Habitat specification	Distribution city	Abundance	Conservation	Total
Family: Rhacophoridae						
Chiromantis xerampelina	3	4	2	2	0	11
Family: Hyperoliidae						
Afrixalus aureus	3	4	3	4	2	16
Hyperolius marmoratus taeniatus	3	4	2	2	1	12
H. pusillus	2	4	3	3	1	13
H. semidiscus	2	4	5	5	3	19
H. tuberilinguis	3	5	5	5	3	21
Kassina maculata	3	4	5	5	2	19
K. senegalensis	0	2	2	2	0	6
K. wealii	1	4	4	5	3	17
Leptopelis bocagii	3	4	5	5	5	22
L. mossambicus	3	4	3	4	1	15
Family: Arthroleptidae						
Arthroleptis stenodactylus	3	5	5	5	3	21
Family: Hemisidae						
Hemisus guineensis broadleyi	3	4	5	5	5	22
H. guttatus	3	4	5	5	5	22
H. marmoratum marmoratum	3	4	3	3	1	14

	Endemicity	Habitat specification	Distribution city	Abundance	Conservation	Total
CLASS: REPTILIA						
ORDER: CHELONII						
Family: Pelomedusidae						
Pelomedusa subrufa	0	2	3	2	0	7
Pelusios sinuatus	3	4	2	2	1	12
P. subniger	3	5	5	5	3	21
Family: Testudinidae						
Subfamily: Testudininae						
Geochelone pardalis	0	2	2	2	0	6
Homopus femoralis	2	5	5	5	5	22
Kinixys belliana spekii	3	2	2	2	0	9
K. natalensis	3	4	5	4	3	19
Psammobates oculifer	2	4	4	4	3	17
ORDER: CROCODYLIA						
Family: Crocodylidae						
Crocodylus niloticus	3	4	2	2	0	11

	Ende-micity	Habitat specifi-cation	Distri-bution city	Abun-dance	Conser-vation	Total
ORDER: SQUAMATA						
SUBORDER: LACERTILIA						
Family: Gekkonidae						
Subfamily: Gekkoninae						
Afroedura Matlala	5	5	5	4	5	24
A. langi Soutpansberg	5	5	5	3	3	21
A. l. Waterberg	5	5	5	4	5	24
A. l. Lillie	5	5	5	3	3	21
A. l. Tshipise	5	5	5	4	5	24
A. l. Shinokwen	5	5	5	5	3	23
A. l. Leolo	5	5	5	5	5	25
A. multiporis haackei	5	5	5	4	3	22
A. m. multiporis	3	5	5	4	3	22
A. m. Abel Erasmus	5	5	5	4	3	22
A. langi langi	5	5	5	3	3	21
A. l. Waterpoort	5	5	5	3	5	23
A. pondolia marleyi	3	5	5	4	3	22
A. sp. nov.	5	5	5	5	5	23
A. p. Maripi	5	5	5	4	3	22
A. p. Godlwayo	5	5	5	4	5	24
A. transvaalica transvaalica	3	5	5	2	3	18
Hemidactylus mabouia mabouia	3	1	2	2	0	8
Homopholis wahlbergii	3	2	2	4	0	11
H. mulleri	5	5	5	5	5	25
Lygodactylus capensis capensis	2	1	1	1	0	5
L. methueni	5	4	5	5	5	24
L. ocellatus	3	5	3	4	3	18
L. stevensoni	3	4	5	4	3	19
Pachydactylus bibronii	0	1	2	1	0	4
P. capensis capensis	2	2	2	4	1	11
P. affinis	3	1	2	4	2	12

	Ende-micity	Habitat specifi-cation	Distri-bution city	Abun-dance	Conser-vation	Total
P. vansoni	3	2	2	4	2	13
P. maculatus maculatus	2	4	5	5	3	19
P. punctatus punctatus	3	4	2	1	2	12
P. tigrinus	3	4	5	4	3	19
Ptenopus garrulus garrulus	3	4	5	5	3	20
Family: Varanidae						
Varanus albigularis	0	2	2	4	0	8
V. niloticus niloticus	0	4	2	4	0	10
Family: Chamaeleonidae						
Bradypodion transvaalense	5	5	5	2	5	22
Chamaeleo (Chamaeleo) dilepis dilepis	1	2	2	3	0	8
Family: Agamidae						
Agama armata armata	3	4	4	3	3	17
A. aculeata distanti	2	2	2	3	0	9
A. atra atra	1	5	2	2	2	12
A. atricollis	3	2	2	3	0	10
Family: Lacertidae						
Heliobolus lugubris	3	2	2	2	1	10
Ichnotropis capensis	3	4	3	2	3	15
I. squamulosa	2	2	2	1	0	7
Lacerta rupicola	5	5	5	5	3	23

	Endemicity	Habitat specification	Distribution city	Abundance	Conservation	Total
Nucras caesicaudata	3	5	5	5	3	21
N. intertexta	2	2	3	3	2	12
N. lalandii	1	4	4	5	3	17
N. taeniolata holubi	2	2	2	3	0	9
N. ornata	3	4	3	4	3	17
Pedioplanis burchellii	1	3	5	2	5	17
P. lineoocellata lineoocellata	2	2	3	4	3	14
P. lineoocellata pulchella	3	4	4	3	3	17
Family: Scincidae						
Acontias breviceps	3	4	5	4	3	19
A. gracilicauda gracilicauda	2	4	4	3	2	15
A. plumbeus	3	4	3	3	2	15
A. percivali occidentalis	3	2	4	4	3	16
Acontophiops lineatus	5	4	5	2	3	19
Typhlosaurus aurantiacus fitzsimonsi	5	5	5	4	3	22
T. cregoi cregoi	5	4	4	2	3	18
T. lineatus subtaeniatus	5	4	5	4	3	21
T. lineatus richardi	5	5	5	5	5	25
Lygosoma sundevallii sundevallii	3	2	2	2	0	9
Mabuya capensis	0	2	2	4	1	9
M. homalocephala depressa	3	5	5	2	3	18
M. homalocephala smithii	1	4	5	5	3	18
M. quinquetaeniata margaritifer	3	5	1	1	0	10
M. striata striata	3	3	2	1	0	9
M. striata punctatissima	1	1	1	1	1	5

	Endemicity	Habitat specification	Distribution city	Abundance	Conservation	Total
M. varia	0	2	1	1	0	4
M. sp. nov.	3	5	2	2	3	15
M. variegata punctulata	2	4	3	2	3	14
Panaspis wahlbergii	2	2	1	1	0	6
Scelotes bidigittatus	3	4	4	4	1	16
S. brevipes	3	4	5	4	3	19
S. limpopoensis limpopoensis	3	4	3	3	3	16
S. limpopoensis albiventris	5	4	5	3	3	20
S. mira	3	4	3	2	2	14
Family: Cordylidae						
Subfamily: Cordylinae						
Chamaesaura aenea	1	4	4	3	3	15
C. a. anguina	2	4	4	3	3	16
C. m. macrolepis	3	4	5	4	3	19
Cordylus giganteus	2	5	5	2	5	19
C. polyzonus polyzonus	2	5	5	5	5	22
C. tropidosternum jonesii	3	4	2	2	0	11
C. vittifer vittifer	2	5	1	1	0	9
C. warreni warreni	3	5	5	4	3	20
C. warreni barbertonensis	3	5	5	4	3	20
C. warreni breyeri	5	5	3	3	3	19
C. warreni depressus	5	5	3	3	3	19
C. vandami	5	5	3	3	0	16
Platysaurus guttatus	5	5	4	5	3	22
P. intermedius intermedius	5	5	3	2	3	18
P. intermedius natalensis	3	5	5	5	5	23
P. intermedius parvus	3	5	3	4	5	20
P. intermedius rhodesianus	5	5	4	2	3	19

	Endemicity	Habitat specification	Distribution city	Abundance	Conservation	Total
P. intermedius wilhelmi	3	5	5	5	3	21
P. intermedius subsp. nov. 1	5	5	3	2	5	20
P. intermedius subsp. nov. 2	5	5	5	3	5	23
P. orange	5	5	5	5	5	25
P. minor	5	5	3	3	3	19
P. orientalis orientalis	5	5	5	3	3	21
P. orientalis fitzsimonsi	5	5	5	3	5	23
P. relictus	5	5	5	2	3	20
Pseudocordylus melanotus melanotus	2	5	3	4	3	17
P. melanotus transvaalensis	5	5	4	4	3	21
Gerrhosaurus flavigularis flavigularis	0	2	1	1	0	4
G. major major	3	4	3	4	3	17
G. nigrolineatus	3	4	3	3	2	15
G. validus validus	3	5	2	2	0	12
Tetradactylus breyeri	2	4	5	5	5	21
T. eastwoodae	5	5	5	5	5	25
SUBORDER: AMPHISBAENIA						
Family: Amphisbaenidae						
Chirindia langi langi	5	4	5	2	3	19
C. langi occidentalis	5	4	5	3	5	22
Dalophia pistillum	3	5	5	5	5	23
Monopeltis capensis capensis	2	4	3	3	3	15
M. leonhardi	3	5	5	3	3	19
M. sphenorhynchus sphenorhynchus	3	4	4	3	3	17
Zygaspis quadrifrons	3	4	3	2	3	15
Z. violacea	3	4	4	4	3	18

	Ende-micity	Habitat specifi-cation	Distri-bution city	Abun-dance	Conser-vation	Total
SUBORDER: SERPENTES						
Family: Typhlopidae						
Typhlops bibronii	1	2	2	3	0	8
T. lalandei	1	2	2	3	2	10
T. schlegelii schlegelii	3	4	3	2	1	13
T. schlegelii mucruso	3	4	5	4	3	19
Family: Leptotyphlopidae						
Leptotyphlops conjunctus conjunctus	1	4	2	3	3	13
L. conjunctus incognitus	2	2	2	3	1	10
L. distanti	3	2	3	3	2	13
L. longicaudus	3	4	3	4	2	16
L. nigricans nigricans	3	4	4	4	3	18
L. scutifrons scutifrons	0	2	2	3	1	8
Family: Boidae						
Python sebae natalensis	2	2	2	4	0	10
Family: Colubridae						
Amblyodipsas concolor	3	4	5	5	3	20
A. microphthalma microphthalma	3	5	5	5	3	21
A. microphthalma nigra	5	4	5	5	5	24
A. polylepis polylepis	3	2	3	4	2	14
Aparallactus capensis	1	2	1	1	0	5
A. lunulatus lunulatus	3	4	4	4	3	18
Atractaspis bibronii	1	2	2	3	0	8
A. duerdeni	3	4	5	5	5	22

	Endemicity	Habitat specification	Distribution city	Abundance	Conservation	Total
Homoroselaps dorsalis	2	4	5	5	3	19
H. lacteus	1	4	4	4	3	16
Xenocalamus bicolor bicolor	3	4	5	5	5	22
X. bicolor australis	5	4	5	5	3	22
X. bicolor lineatus	3	4	4	4	3	18
X. transvaalensis	3	4	5	5	5	22
Lamprophis aurora	1	2	3	3	3	12
L. guttatus	1	4	3	3	3	14
L. fuliginosus	0	1	1	3	0	5
L. fuscus	1	4	5	5	5	20
L. inornatus	2	4	3	4	3	16
L. swazicus	3	4	5	5	3	20
Lycodonomorphus laevissimus fitzsimonsi	3	4	5	5	3	20
L. rufulus	1	2	2	3	1	9
L. whytii obscuriventris	3	4	5	5	3	20
Lycophidion capense capense	1	2	2	3	0	8
L. variegatum	3	2	4	4	3	16
Mehelya capensis capensis	3	4	3	4	3	17
M. nyassae	3	4	4	4	3	18
Duberria lutrix lutrix	1	2	3	3	3	12
Pseudaspis cana	0	2	2	3	2	9
Crotaphopeltis hotamboeia	0	1	2	1	0	4
Dipsadoboa aulica aulica	3	4	4	4	3	18
Telescopus semiannulatus semiannulatus	2	2	2	3	0	9

	Ende-micity	Habitat specifi-cation	Distri-bution city	Abun-dance	Conser-vation	Total
Dispholidus typus typus	0	2	2	1	0	5
Thelotornis capensis capensis	3	2	2	2	0	9
Meizodon semiornatus semiornatus	3	4	5	5	5	22
Dasypeltis inornata	2	4	5	5	5	21
D. scabra	0	1	1	1	0	3
Philothamnus hoplogaster	2	2	3	3	0	10
P. natalensis natalensis	3	4	5	5	3	20
P. natalensis occidentalis	1	4	3	3	3	14
P. semivariegatus semivariegatus	2	2	2	1	1	9
Hemirhagerrhis nototaenia nototaenia	3	4	3	3	1	14
Psammophis angolensis	3	4	3	4	3	17
P. crucifer	1	4	3	3	2	13
P. jallae	3	4	5	5	3	20
P. leightoni trinasalis	2	4	3	4	3	16
P. phillipsii	3	4	3	4	1	15
P. sibilans brevirostris	2	2	2	1	2	9
P. subtaeniatus subtaeniatus	3	2	2	2	0	9
Psammophylax rhombeatus rhombeatus	1	4	2	3	2	12
P. tritaeniatus	2	2	2	3	0	9
Rhamphiophis oxyrhynchus rostratus	3	4	3	4	3	17
Amplorhinus multimaculatus	2	4	5	5	[illegible]	19

	Ende-micity	Habitat specifi-cation	Distri-bution city	Abun-dance	Conser-vation	Total
Prosymna ambigua stuhlmannii	3	2	3	3	1	12
P. bivittata	1	2	4	4	3	14
P. sundevallii sundevallii	2	4	4	4	3	17
P. sundevallii lineata	3	4	4	4	3	18
Aspidelaps scutatus scutatus	3	4	3	4	3	17
A. scutatus intermedius	5	4	3	3	2	17
Family: Elapidae						
Elapsoidea semiannulata boulengeri	2	2	4	4	3	15
E. sundevallii sundevallii	3	4	5	5	5	22
E. sundevallii longicauda	3	4	4	3	3	17
E. sundevallii media	2	4	4	4	3	17
Hemachatus haemachatus	1	2	2	3	2	10
Naja haje annulifera	3	2	2	1	0	8
N. mossambica	3	2	2	1	0	8
N. nivea	2	4	4	4	3	17
Dendroaspis polylepis	2	2	2	3	0	9
Family: Viperidae						
Causus defilippii	3	2	3	3	2	13
C. rhombeatus	1	1	2	3	2	9
Bitis arietans arietans	0	2	1	1	0	4
B. atropos	2	4	3	4	3	16
B. caudalis	3	4	3	3	3	16

8.2 Threats

Branch (ed.) (1988c) has highlighted the problems facing South African herpetofauna according to broad categories recognised in the IUCN World Conservation Strategy (1980). In the following discussion these categories will be discussed with reference to the Transvaal. Unfortunately little quantifiable data has been published and the account is therefore largely subjective.

8.2.1 Habitat destruction:

This category is the most important threat facing not only reptiles and amphibians but all other plant and animal communities. Causes of habitat destruction include agricultural development, afforestation, industrialisation, road and dam development, urbanisation, mining and pollution.

<u>Agricultural development</u>

The single most important factor contributing to habitat destruction. During 1975 it was estimated that 65% of the land in the Transvaal was in use for agricultural purposes (National Physical Development Plan, 1975 - Department of Planning and the Environment). Vast areas of the Transvaal have been and are being transformed, extensively fragmenting populations and in some areas, such as the south-western Transvaal, Springbok Flats and central Highveld, forming almost floral and faunal deserts. During this survey, collecting of specimens in these areas took place along road verges in order to determine what was still present. The action of ploughing hundreds of hectares continously to minimise harvesting problems, without growing intervening windbreaks, has resulted in extensive wind erosion, permitting the build up of sand along fences. During this survey one such sandstorm was 40 kilometres long and towered about 150 m or more and was several kilometres wide.

On the southern highveld extensive maize farming has destroyed much of the habitat of Cordylus giganteus (Newbery et al 1983, Jacobsen et al, in press). These areas incorporate Acocks (1975) Veld types 52,53 (very little) and 54. all of these represent Themeda grassland or transitional zones thereof and all are extensively, 79%, 59% and 64% respectively, degraded (Johnston 1979). Cordylus giganteus will only inhabit relatively undisturbed grasslands, rejecting fallow lands, and has therefore suffered a considerable reduction in range.

Although there are no local studies indicating a direct adverse effect of overgrazing on our reptiles and amphibians, studies in the United States have shown that ungrazed areas have twice the numbers and three times the biomass of adjacent overgrazed areas (Busack and Bury, 1974), while also affecting diversity or species richness (Jones 1981).

Apart from the lack of food, the absence of cover due to overgrazing and fire exposes many species of the herpetofauna to predation. It also has an affect on food availability, and exposure to unfavourable temperatures. This pertains particularly to the highveld where the grasslands may be subjected to one or more fires annually as well as having subzero temperatures for up to 120 nights (Chapter 1) of the year. Such regular fires may even be responsible for the maintainance of the Highveld grassland, producing a fire subclimax. The herpetofauna on the highveld escape this by hibernating in termitaria.

Lynch (1986) recorded 32 species of vertebrates taking refuge within moribund termitaria, an observation substantiated during this survey. He also observed that on average 23,3% of the dead mounds, contained reptiles, making them very important refuges. Of the 26 squamate species found in these termite mounds the most frequent were egg-eaters Dasypeltis scabra and centipede-eaters Aparallactus capensis (Lynch, 1988). These termitaria are formed by the snouted termite Trinervitermes trinervoides. When the colonies die or move off, the termitaria gradually weather until the openings to the internal passages are exposed, providing access to invertebrates and vertebrates alike. Lynch (1986) recorded that on average 6,7% of termitaria were dead while Nel & Malan (1974) in Lynch (1986) recorded that dead mounds varied annually within an area, from 6% to 24% with a mean of 11,3% over a period of four years.

Only considerably decomposed antheaps are inhabited and are essential to the fauna of the highveld as protection against climate and fire. However, farmers regard these termites in the same light as harvester termites (*Hodotermes mossambicus*) and may raze whole fields of termitaria to the ground, thereby removing an essential hibernating site of the highveld fauna. Similarly the activities of amateur herpetologists in destroying moribund termitaria in their quest for reptiles can have tremendous local impact which cannot be ignored.

The drainage of wetlands and the frequent filling in, or use of pans as dumping sites have a major effect on the herpetofauna and amphibians in particular (Lambiris, 1988). More than 65% of the highveld pans have been affected in some way by habitat degradation including the total destruction of 45 pans or 3% of all the pans sampled (Allan & Sharpe 1985).

Fire

The injudicious use of fire by farmers seeking grazing for their livestock throughout the year has resulted in the destruction of many reptiles particularly tortoises. Death results from burns (Stuart & Meakin 1983b) and from asphyxiation (pers. obs.). Snyders (1987) observed that of 41 reptiles recorded in an area of 1,4 ha of mountain grassland, 6 individuals (14,6%) were killed by a fire. A week after the fire only 14 reptiles were observed in the burnt area, indicating that 24 individuals (51,3%) had emigrated or had been consumed by predators. Disappearances included rupicolous species which are normally very habitat - specific and territorial. Together with the ploughing of lands, fire is no doubt responsible for the scarcity of species such as *Tetradactylus breyeri*, possibly also *T. eastwoodae* and *Lamprophis fuscus*. Braithwaite (1987) analysed the effect of fire on the abundance of common lizard species in Australia. He found that the lizards selected habitats produced by fires of different types and not of different stages of regeneration. Barbault (1971, 1973, 1974) mentions a drastic decline in the herpetofauna after the passage of a fire but shows that a rapid recovery rate is possible. However, the effect of a winter burn when the reptiles are hibernating can be severe as evidenced on nature reserves when burning firebreaks (Hoffman pers. comm).

Irrigation

Large-scale irrigation is practised along all the major rivers, resulting in the pumping out of vast quantities of water, and, together with dams, totally reducing and even stopping the flow of water for months. This has been devastating to aquatic species especially *Crocodylus niloticus*. Fragmented populations of this species exist only in the Limpopo, Olifants, Letaba and Komati rivers, (Jacobsen 1984). More recently the newspapers discussed the problem of water provision for the Kruger National Park, when large rivers like the Levuvhu and Letaba ceased to flow because of the large-scale removal of water upstream for

The construction of dams has led to the inundation of sensitive habitats, threatening some populations of species. A population of _Afroedura multiporis haackei_ was inundated by the construction of the Ebenezer dam. Changes in the flow regimes of rivers have affected the survival of species, including crocodiles, which have also suffered heavily from human competition for the same resource. Dams also accumulate pollutants, a possible reason for the large-scale decline in crocodile numbers in Loskop dam where, during 1959, up to 80 crocodiles could be seen in a day, but a recent Survey (1988) indicate a decline to less than 20 individuals in 1988, including several re-introduced from the Marble Hall area. Such re-introductions should not be considered until the reasons for the decline of the Loskop dam population have been solved.

Not all agricultural development has a negative impact as the development of farm dams and weirs have promoted populations of some amphibian species at the expense of others, and some reptiles such as _Varanus niloticus_ have been able to establish themselves more widely or have relocated themselves as a result of the drying up of rivers.

Weirs along the Limpopo river, have permitted the continued existence of crocodiles which would have ceased to exist under the current large scale removal of water for irrigation. Such irrigation often occurring in areas far removed from produce markets and often in soils incompatible with irrigation practices. This has destroyed large areas of natural habitat.

Afforestation

By the end of March 1977 there were over 500 000 ha of afforestation in the Transvaal (about 2% of the area of Transvaal), mostly under private ownership (Johnston 1979). Although influencing in area a much smaller proportion of the Transvaal, afforestation has had a greater effect on the herpetofauna than has agriculture. The reason for this is that sylviculture is mostly practised in high rainfall areas where two very limited plant associations, namely forest and montane grasslands, are found. Afforestation has supplanted most of the two vegetation types, with concomittant fragmentation of the herpetofaunal communities. This pertains particularly to *Bradypodion* spp. but may have resulted in the extinction of *Tetradactylus eastwoodae* (Branch 1988c).

A more insidious result is the large-scale reduction in the flow of water leading down to the rivers which, together with the removal of water for irrigation, is drying up the rivers. Such reductions may influence the survival of *Heleophryne natalensis* which has rigid habitat requirements.

Industrial development

The construction of power stations and their support systems are of concern. At Majuba for instance, the power station development may affect as much as 2% of the population of *Cordylus giganteus* in the Transvaal.

The large quantities of SO_2 released by these coal burning power stations has resulted in considerable acidification of the south-eastern highveld, to the extent that further industrialization in this area has largely been curtailed. This acidification is likely to be detrimental to the herpetofaunal community by influencing water quality and affecting the vegetation.

Mining

One of the most important economic activities in the Transvaal is mining, and the Transvaal is richly endowed with gold and coal fields. These coal fields are concentrated in a large area of the south-eastern Transvaal (Johnston 1979). In fact, the total distribution of Cordylus giganteus in the Transvaal is underlain by coal. This lizard is very sensitive to habitat change and despite a currently large population is considered vulnerable (Van Wyk 1988).

While the habitat destruction which goes hand in hand with mining is self evident, the more insidious leaching of mining talus can be severe. The Klipspruit near Witbank is lifeless as a result of acidification from old gold mines in the vicinity. The pH of the water and even of the Olifants river between the Klipspruit/Olifants junction and the Olifants/Wilge river junction is about 3,5-4,0 (Kleynhans pers. comm.). The leaching of old slimes dams and ashing dumps no doubt also has an effect on the herpetofauna by influencing water quality.

Road mortalities

There are no estimates of the impact of road traffic on the indigenous herpetofauna. Ehmann and Cogger (1985) calculated that nearly 5,5 million reptiles and amphibians per annum may be killed on tar roads in Australia. Petersen (1982) recorded 36 snake species dead on Transvaal roads during this survey. Many other species of reptiles and amphibians including *Varanus albigularis* and *Pyxicephalus a. adspersus* are especially vulnerable. The highly seasonal casualty rate of bullfrogs particularly in the Kempton Park/Benoni area is horrific and is, together with urbanization and waste dumping in breeding pans, likely to result in the total extirpation of the species in this area. Oxley et al (1974) reported on the effects of roads on populations of small mammals, suggesting that divided highways with clearances of 90 m or more may be barriers to the dispersal of small forest mammals as effective as bodies of water twice as wide. This has decided implications for the movement of the herpetofauna and this effect should be studied. Cursory observations of the presence of bullfrogs around Hartebeeshoek and Krauseville during 1978/9 and their subsequent total disappearance during the past few years are added testimony to the effect of roads.

Many other amphibian species indulge in spawning migrations, including *Bufo gutturalis*, *B. garmani*, *Schismaderma carens* and *Tomopterna cryptotis*, of which large numbers are killed on roads in urban and peri-urban areas.

Urbanization

Urbanization has resulted in the large-scale decrease in the diversity of the herpetofauna, as well as the large-scale reduction in abundance. Species such as *Pachydactylus affinis*, *Lygodactylus capensis*, *Mabuya striata punctatissima*, *Bufo gutturalis*, *B. garmani* and *Schismaderma carens* are able to adapt to a degree of urbanization. Some snakes such as *Lamprophis fuliginosus* and *Crotaphopeltis hotamboeia* may also occur but other species are very limited in abundance, and in many instances are transient. Variety is associated with available habitat, most of which increases away from the city centre.

On a 2,1 ha plot 23 km from the Pretoria City centre only *Pachydactylus affinis*, *Lygodactylus capensis*, *Mabuya striata punctatissima* and *Panaspis wahlbergii*, *Psammophis sibilans brevirostris*, *Lamprophis fuliginosus*, *Crotaphopeltis hotamboeia*, *Philothamnus semivariegatus* and *Dasypeltis scabra* occur. Infrequent visitors include *Dispholidus typus*, *Naja mossambica* and even more rarely *N. haje annulifera*. Amphibians include *Schismaderma carens*, *Bufo gutturalis*, *B. garmani*, *Tomopterna cryptotis*, and more rarely *Breviceps adspersus* and *Tomopterna natalensis*. This paucity, despite many patches of veld and a range of hills close by, illustrates the effect of urbanization. According to survey records a total of 66 species have been recorded from this area (Figure 1).

Pollution

Although an aspect of industrial pollution was briefly mentioned (p. 1513), the effects of chemical pollutants and other waste products needs further comment and is on the increase. Road verges and lay-byes exemplify the extent of the problem. Recently a Water Monitor at the Roodeplaat Dam Nature Reserve was photographed walking about with a tin can over its head, while other incidences of mechanical injury have been noted.

The production of human and industrial effluent and its subsequent disposal, particularly of toxic waste, has grave implications for the South African environment. Recent events in Natal regarding the pollution of the Umgeni river and the dumping of toxic waste in the Midlands pose grave threats to the amphibian as well as some reptile populations. Such incidences are mostly associated with urban environments and appear from time to time in the PWV area.

Sewage and industrial effluent have poisoned many rivers, of which the Crocodile River (west) and Hartebeespoort Dam in particular with its Microcystis blooms, are prime examples. Less obvious is the effect of water eutrophication as a result of agricultural fertilizer washed into rivers from adjacent areas. The Crocodile River (east) is a prime example of such a river. Water hyacinth (Eichornia crassipes) flourishes under these conditions, to the detriment of the river and its fauna and flora.

More serious and lethal are the effects of chemical pollutants, including pesticides. Wager (1986) has documented the effects of DDT spraying on a marshy area in Durban Bay. The effect of the locust control programmes in the central regions of South Africa on the herpetofauna, is unknown, but one which will endure for some time to come. During the monitoring of Red-billed Quelea (Quelea quelea) control spraying with the chemical Parathion, several reptiles including Philothamnus hoplogaster, Crotaphopeltis hotamboeia, Psammophylax rhombeatus, Lycodonomorphus rufulus and Thelotornis capensis were found dead following more detailed searches (Internal Reports, Directorate: Nature & Environmental Conservation). However the thickness of the reedbeds precluded quantifiable analyses. What the effect is on the amphibians can only be speculated on, but is likely to be severe.

8.2.2 Overexploitation

Branch (1988c) mentioned that there is little indication of overexploitation of South African reptiles or amphibians. While this may currently be true, it should be remembered that at one stage, (1978/79) one individual was illegally exporting possibly in excess of 10 000 reptiles (mostly lizards) and amphibians from the Transvaal per annum. Many of the species involved had localised distributions with severe implications for some populations of Platysaurus relictus and Cordylus warreni depressus. Containers contained up to 120 lizards eg. Cordylus tropidosternum jonesii, and many other species were involved. A single consignment investigated contained approximately 4 000 animals. Should such exploitation go unchecked, serious inroads into the status of many species would result. Most species are exploited for the pet trade. Cordylus giganteus has also been illegally exported overseas in the past, although most individuals probably came from the Orange Free State. Smuggling is still taking place and animals appear regularly on reptile dealers price lists in Europe and North America. While it is fair to say that most people keeping reptiles and amphibians as pets are no threat to the population, there are individuals who lack integrity and are quick to exploit the available market even to the extent of smuggling out indigenous species and smuggling in alien species.

During 1981, a survey of reptiles kept under permit in the Transvaal revealed that 349 permit holders had a total of 2282 animals. Of these 38,78% were snakes, 11,44% lizards and 49,78% tortoises. While this reflects on the number of animals in captivity it does not incorporate the numbers kept illegally, which may be as much as, or in excess of, the abovementioned figures.

Serum production

The effects of milking of venomous snakes for the production of serum may have serious implications for certain species. These include Dendroaspis polylepis and most species with limited venom availability including Dispholidus typus, Aspidelaps spp., Elapsoidea spp. and others, all of which are being currently kept in captivity, to be milked.

On account of disposition, low venom production and usually inadequate housing, the life expectancy of these snakes is less than six months. Considering only venom extraction in the Black Mamba Dendroaspis polylepis, which results in an estimated minimum turnover of 24 indivisuals per annum, is equivalent to the total population of at least two good sized farms. What about other mortality factors, and the resultant inability of individuals to locate conspecifics for reproduction.

Translocations

Translocation of indigenous herpetofauna is a considerable problem in the Transvaal. While some translocations are accidental, such as the occurrence of Chiromantis xerampelina and Acontias g. gracilicauda on the Nylsvley Nature Reserve, others are not (Jacobsen 1977).

Tortoises are especially susceptible to translocations. It was mentioned previously that 49,78% of reptiles kept under permit were tortoises. Only three species of tortoise were involved, namely Geochelone pardalis, Kinixys belliana and Pelusios sinuatus, but species such as Chersina angulata, Homopus areolatus, Psammobates oculifer and P. tentorius also crop up from time to time in localities outside their natural range.

Most captive tortoises are Geochelone pardalis, mostly originating from the eastern Cape Province. They are picked up on roads while people are on holiday, many are donated to zoos, which, overstocked, pass them on to the Nature Conservation authorities. Others escape or are released far from their origins and may therefore contaminate local gene pools. This situation has reached serious proportions and needs urgent attention from the authorities. At least one translocation to a nature reserve has been made, fortunately in an areas naturally devoid of such animals. Other species such as Kinixys belliana and Chersina angulata have been found far from their usual haunts (Pooley, 1965).

Similar translocations of the Psammobates and Bradypodion complexes may cause taxonomic difficulties (Branch, 1988c). There is reason to believe that translocations have taken place, such as the occurrence of dwarf chameleons at Amersfoort.

The tropical house gecko Hemidactylus mabouia has extended its range through dispersal and translocation to the environs of Pretoria and appears to be thriving. Other translocations which have taken place include the release of Cordylus polyzonus at Rivonia. Whether any survived, has not been examined recently. The finding of a juvenile Crotalus atrox, again in the environs of Johannesburg, is also cause for grave concern as this species breeds easily in captivity and may be released on impulse.

Newbery (1984) has reported on the occurrence of feral Red-eared Terrapin in the streams and dams of the P.W.V. area. Should the species become established and breed, it could have serious implications for the indigenous aquatic fauna (De Moor & Bruton 1988).

8.2.3 Overpopulation

The growth of the human population in South Africa is by 1 214 136 individuals per annum, mostly in the Transvaal. Most of this growth takes place in rural areas. Pressure has intensified on the natural resources to such an extent that large areas of Lebowa and Gazankulu have been subjected to desertification. The removal of wood for fuel is of grave concern. The absence of Cordylus tropidosternum jonesi from large areas of Gazankulu underscores this. The absence of reptiles from overgrazed areas has already been commented on.

The increased pressure on our natural resources by a burgeoning human population is the most important factor, as it influences and enhances all the previously named threats. The indiscriminate killing of our herpetofauna, especially snakes but indirectly most other species also, has not been documented but must be of alarming proportions. The killing of crocodiles, python and monitor lizards in protection of livestock are still being undertaken. The recent poisoning of three crocodiles near the Fisheries Station at Marble Hall is testimony of this. Should the growth of the human population not be curtailed, then radical changes to the environment will occur, namely the disappearance of terrestrial and arboreal species from many areas. Rupicolous species will however continue to survive, possibly in reduced numbers.

8.3 Conservation Recommendations

From the foregoing report it is evident that several recommendations should be made.

1. Survey for those species which were not recorded in the field during this survey. This includes the following species:

   Colopus w. wahlbergii
   Tetradactylus eastwoodae
   Dalophia pistillum
   Xenocalamus transvaalensis
   Atractaspis duerdenii
   E. s. sundevallii
   Hemisus guttatus

2. Monitoring those species which are endemic or habitat specific, and are rare with a limited distribution in the Transvaal. Such species include all those which had a score of 15 or more in Table 5. These include the following species:-

   Amphibia

   Heleophryne natalensis
   Bufo gariepensis nubicolus
   B. vertebralis

<u>Breviceps</u> <u>adspersus</u> <u>pentheri</u>
<u>B</u>. <u>mossambicus</u>
<u>B</u>. <u>s</u>. <u>sylvestris</u>
<u>B</u>. <u>s</u>. <u>taeniatus</u>
<u>B</u>. <u>v</u>. <u>verrucosus</u>
<u>Cacosternum</u> <u>n</u>. <u>nanum</u>
<u>Hildebrandtia</u> <u>o</u>. <u>ornata</u>
<u>Ptychadena</u> <u>m</u>. <u>mascareniensis</u>
<u>P</u>. <u>mossambica</u>
<u>Afrixalus</u> <u>aureus</u>
<u>Hyperolius</u> <u>semidiscus</u>
<u>H</u>. <u>tuberilinguis</u>
<u>Kassina</u> <u>maculata</u>
<u>K</u>. <u>wealii</u>
<u>Leptopelis</u> <u>bocagii</u>
<u>L</u>. <u>mossambicus</u>
<u>Arthroleptis</u> <u>stenodactylus</u>
<u>Hemisus</u> <u>guineensis</u> <u>broadleyi</u>

Reptilia

<u>Pelusios</u> <u>s</u>. <u>subniger</u>
<u>Homopus</u> <u>femoralis</u>
<u>Kinixys</u> <u>natalensis</u>
<u>Psammobates</u> <u>oculifer</u>
<u>Afroedura</u> sp. Matlala
<u>A</u>. <u>langi</u> Soutpansberg
<u>A</u>. <u>l</u>. Waterberg
<u>A</u>. <u>l</u>. Lillie
<u>A</u>. <u>l</u>. Tshipise
<u>A</u>. <u>l</u>. Shinokwen
<u>A</u>. <u>l</u>. Waterpoort
<u>A</u>. <u>l</u>. Leolo
<u>A</u>. <u>l</u>. <u>langi</u>
<u>A</u>. <u>multiporis</u> <u>haackei</u>
<u>A</u>. <u>m</u>. <u>multiporis</u>

A. m. Abel Erasmus
A. sp. nov.
A. pondolia marleyi
A. Maripi
A. p. Godlwayo
A. t. transvaalica
Homopholis mulleri
Lygodactylus methueni
L. ocellatus
L. stevensoni
Pachydactylus m. maculatus
P. tigrinus
Ptenopus g. garrulus
Bradypodion transvaalensis
Agama aculeata armata
Ichnotropis capensis
Lacerta rupicola
Nucras caesicaudata
N. lalandii
N. ornata
Pedioplanis burchellii
P. lineoocellata pulchella
Acontias breviceps
A. g. gracilicauda
A. plumbeus
A. percivallii occidentalis
Acontophiops lineatus
Typhlosaurus aurantiacus fitzsimonsi
T. cregoi cregoi
T. lineatus subtaeniatus
T. l. richardi
Mabuya homalocephala depressa
M. h. smithii
M. sp. nov.
Scelotes bidigittatus

S. brevipes

S. l. limpopoensis

S. l. albiventris

Chamaesaura aenea

C. a. anguina

C. m. macrolepis

Cordylus giganteus

C. p. polyzonus

C. w. warreni

C. w. barbertonensis

C. w. depressus

C. w. breyeri

C. vandami

Platysaurus guttatus

P. minor

P. o. orientalis

P. o. fitzsimonsi

P. i. intermedius

P. i. rhodesianus

P. i. wilhelmi

P. i. parvus

P. i. natalensis

P. i. ssp. nov. 1

P. i. ssp. nov. 2

P. Orange

Pseudocordylus m. melanotus

P. m. transvaalensis

Gerrhosaurus m. major

G. nigrolineatus

Tetradactylus breyeri

Chirindia l. langi

C. l. occidentalis

Monopeltis c. capensis

M. leonhardi

M. s. sphenorhynchus

Zygaspis quadrifrons
Z. violacea
Typhlops schlegelii mucruso
Leptotyphlops longicaudus
L. n. nigricans
Amblyodipsas concolor
A. m. microphthalma
A. m. nigra
Aparallactus lunulatus
Homoroselaps dorsalis
H. lacteus
Xenocalamus b. bicolor
X. b. australis
X. b. lineatus
Lamprophis fuscus
L. inornatus
L. swazicus
Lycodonomorphus laevissimus fitzsimonsi
L. whytii obscuriventris
Lycophidion variegatum
Mehelya c. capensis
M. nyassae
Dipsadoboa a. aulica
Meizodon s. semiornatus
Dasypeltis inornata
Philothamnus n. natalensis
Psammophis angolensis
P. phillipsii
Rhamphiophis oxyrhynchus rostratus
Amplorhinus multimaculatus
Prosymna s. sundevallii
P. s. lineata
Aspidelaps s. scutatus
A. s. intermedius
Elapsoidea semiannulata boulengeri

E. sundevallii longicauda

E. s. media

Naja nivea

Bitis caudalis

B. atropos

While this list appears to be a daunting one, it must be remembered that rupicolous species including the genera *Afroedura*, *Cordylus* and *Platysaurus* have been incorporated largely because they are found mostly outside conservation areas and in limited habitats. However, a further subdivision, in order of priority, can be formulated which will identify those species most urgently in need of attention. Such monitoring actions should incorporate non habitat destruction methods, where available habitat may be a limiting factor. I refer in particular to rupicolous species but termitaria also represent a limited resource of crucial importance.

3. Ecological studies of threatened reptiles and amphibians are needed, particularly of high priority species listed in the RDB-Reptiles and Amphibians (Branch 1988c).

4. Liaison with, and environmental education of top government and private company personnel, to instigate and promote, the need for greater cooperation between departments and businesses, concerned with environmental degradation. Only such cooperation and united effort can result in the sustained use of our natural resources. Prevention is always better than the cure, particularly as many changes are irreversible.

5. Protection of threatened species.

(a) Legislation governing indigenous herpetofauna has been promulgated in the Nature Conservation Ordinance 12 of 1983, and provides some legal protection to the reptiles and the bullfrog _Pyxicephalus a. adspersus_ but not for other amphibians. In fact the common platanna _Xenopus l. laevis_ may be used as live bait for fishing. There is however little pressure on the amphibians, necessitating amendments to the Ordinance.

To bridge the gap between the terms of the Ordinance and the public, a sound, workable policy is necessary in order to accommodate and not alienate the public. This will ensure not only that a knowledge of the number of animals in captivity is acquired, but also will reveal what success in the breeding and maintainance of the species in captivity has been achieved.

(b) Protected areas.

In the Transvaal there are some 50 nature reserves administered by the Nature Conservation Directorate, as well as a few forestry reserves under the control of the Department of the Environment. Together with the Kruger National Park they cover approximately 8,37% of the Transvaal (Greyling & Huntley 1984). These areas afford protection to 83% of the amphibians species , 87,5% of the chelonians, 76% of the lizards, 75% of the amphisbaenians, 92% of snakes and the Nile crocodile. It is however very likely that these percentages may be higher as many species are very rare and difficult to locate.

The mere presence of a species on a reserve does not mean its survival is assured. The numerical status of species with a high conservation rating should be ascertained in each reserve to determine the viability of the population. Habitats pertaining to these species should be considered when drawing up management plans of the reserves and adequate provision made for maintaining population viability. Monitoring of such species is essential to establish population structure and trends.

Some species are marginal, only just entering the Transvaal in limited areas of suitable habitat. However they must be accorded sufficient conservation importance if their occurrence in South Africa is limited to the Transvaal. Lambiris (1988) has pointed out that it is not practical to protect each population of a widespread but threatened species. Rather protect those populations which best represent the extremes of variation. While I agree with this, it is difficult to obtain the necessary funding for the purchase or hire of ground. In order to maximise the benefit of such purchases it is necessary to acquire areas with the maximum habitat diversity and of sufficient area to incorporate viable populations of such threatened species, but also to include as many other species of a community or association as is practically possible. In this way it may be possible to conserve the genetic variation within populations of many species.

The Kruger National Park is large enough to incorporate viable populations of all herpetofaunal species which occur within its boundaries. Nature reserves in many instances fail in this task, frequently being too small. For instance most reserves of 2000-3000 ha in suitable areas may only contain 10-15 Black mambas Dendroaspis polylepis, which may not represent a viable population.

Although a correlation between species richness and area exists, such relationships are significant for the same habitat and climatic conditions, and ignore population size (Theron 1987). Muller & Bratton (1987) showed that when considering rare and endangered plants only, several small reserves (each 18400 ha) were more cost effective and conserved more of these plants than a single large reserve. However, when considering faunal elements as well, such benefits fall away on account of the mobility of many faunal species. It is therefore vital to have sufficiently large areas representing the main biomes of the Transvaal (Chapter 1). Such reserves would cater for the vast majority of species. Those excluded by virtue of highly restricted distributions could be protected by a network of smaller but more specific reserves. The size of the biome reserves would depend on the vegetation type, carrying capacity and habitat diversity. That of species reserves would incorporate optimum habitat and population viability as guidelines.

In Chapter 7, endemism was discussed in greater detail. It suffices to state that along the escarpment five important endemic areas were highlighted by Fourie et al (1988). Such areas are of great conservation importance and highlight the need for protection of the Transvaal escarpment. Branch (ed.) (1988c) also pointed out that the distribution of threatened herpetofauna in South Africa was not random, and that there is grouping into a few highly sensitive areas. Such areas in the Transvaal include the Soutpansberg and adjacent region to the north, and the Woodbush forest. It is safe to say that all mountainous areas have a high conservation rating because of the species richness and uniqueness of the fauna and flora. This alone, apart from all the other functions of such areas, identify them as priorities.

Margules & Nicholes (1988) pointed out that in order to conserve maximum biological diversity the areas needed are in excess of the 10% land surface currently considered to be an objective of conservation agencies. They showed that between 12-44,9% of two specific habitat types needed to be conserved in order to represent 95% of species and communities of plants at least once. A single representation is no guard against extinction, and if one considers intraspecific variation, which population does one select? If the percentages reflected above are applicable to other situations, any hope of maintaining biological diversity in the face of competing land use looks dismal.

However, nothing can supplant the maintainance of a network of natural veld between and on farms permitting the free dispersal of individuals and maintaining linkages throughout a population. Such ecological planning is absolutely vital in areas of monoculture (including sylviculture), and would permit a wide diversity of species to exist in what would otherwise be faunal and floral deserts. Proof of this is the finding of many species, albeit of very low population density, at road verges in the south-western Transvaal. If the lands had not been contiguous but interrupted by strips of natural veld, the viability and diversity of these populations would be ensured and species richness greatly enhanced. Simultaneously soil erosion would be considerably reduced. It is absolutely vital that all government departments which control or advise on development should have, as a basis, ecological principles incorporated in their charter ensuring that development, whether urban, agricultural, industrial, mining or afforestation, is carried out rationally and with the absolute minimum impact on the environment. Through the maintainance of a system of dispersal corridors the viability of species will be greatly enhanced.

Together with a balanced network of nature reserves the future of the fauna and flora of the Transvaal would be assured. Time is however running out. Miller & Bratton (1987) pointed out that within the next 50 years, landscape patterns in many regions of the United States will be established, to the degree that any natural areas not previously set aside for conservation purposes, will be developed. I concur with their view, particularly with respect to South Africa where a trebling of the human population is envisaged over the same timespan. The time to plan and conserve is now; in another 10 years it may be too late.

This report and survey has outlined the need for a more in depth look at the determination of conservation status of many reptile and amphibian species. Such a species by species approach will permit the compilation of management plans. Newbery et al (1983) and Jacobsen (1985) have prepared management plans for *Cordylus giganteus* and *Crocodylus niloticus* respectively. The incorporation of such documents in the decision making and planning of conservation matters related to these species in the Transvaal, by the Nature Conservation Directorate, is essential for the survival of these species. It is envisaged that additional plans relating to Transvaal herpetofauna will be formulated and submitted in the near future. Hopefully this report will serve to point the way to improved conservation of Transvaal herpetofauna particularly with regard to the maintainance of habitat and of species diversity.

/FH

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GAZETTEER OF REPTILE SURVEY LOCALITIES

Farm names from "Alphabetical List of Farms in the Province of Transvaal" Government Printer, PRETORIA. 1975

Other names mostly from "Official Place Names in The Republic of South Africa and in South West Africa" Government Printer, PRETORIA. 1978

Locality	Quarterdegree
01,5km East of Tseri Spruit	2431AB
01.5km W.N.W. Black Hill, Pilgrims Rest Dist.	2430DD
01km North of Diepgezetmyn	2531CC
01km North-east of Tshamavhudzi Peak	2230DA
01km from Hazyview	2531AA
01km from Pretoriuskop	2531AB
02,5km North of Middle Beacon, KNP	2331DC
02,5km past Lynnwood Drive-In, Pretoria	2528CD
02.5 - 5km North of Middle Beacon, KNP	2331DC
02km Leslie, Bethal Dist.	2626BD
02km Naboomspruit - Roedtan	2428DA
02km North of Mt. Sheba	2430DC
02km from Lone Creek	2530BB
03km East of Faerie Glen, Pretoria.	2528CB
03km East of Lukale Hill	2230DD
03km East of Mwamatatau	2330AB
03km North of Bon Accord Dam	2528CA
03km South-east of Sibthorpe Station	2530BD
03km South-east of Sterkfontein (Krugersdorp)	2527DD
03km West of Masisi	2230BD
03km from Lydenburg	2530AB
04km Messina - Tshipise	2230CA
04km North of Tshamavhudzi Peak	2230DA
04km S.E. Dinokana	2525BD
04km South of Tshamavhudzi Peak	2230DB
04km West of Dinokana	2525BD
05km East of Kempton Park	2628AB
05km East of Zi[illegible]	[illegible]

05km North of Vereeniging	2627DB
05km South of Haenertsburg	2329DD
05km South-east of Bangazi North, St. Lucia	2332DA
05km South-west of Tshipise	2230CA
05km West of Lukale Hill	2230DD
05km from Pretoria - Delmas	2528CD
05km from Skeerpoort, Brits District	2527DD
06km East of Thengwe	2230DA
06km Rayton - Cullinan	2528DA
06km West of Punchbowl Hotel	2229DD
07km North of Louis Trichardt	2229DD
07km South of Leeudoringstad	2726AB
07km West of Lukale Hill	2230DD
08km East of Bronkhorstspruit	2528DD
08km East of Lydenburg	2530BA
08km Malelane - Jeppes Reef	2531DA
08km North of Alma	2428AC
08km North of Welverdiend, Potchefstroom	2627CA
08km North-west of Rooiberg	2427DA
08km South of Rustenburg Kloof	2527CA
08km West of Dinokana	2525BD
08km West of Pongola	2731BC
08km from Hammanskraal	2528AD
10km East of Witbank	2529CD
10km North of Onderstepoort, Pretoria District	2528CA
10km North of Rosslyn	2528CA
10km North of Settlers	2428DC
10km North-west of Messina	2229BD
10km Skukuza - Tsokwane	2431DC
10km South-east of Trichardtsdal	2430AA
10km West of Mazithi Pan, KNP	2431DD
10km from Amsterdam	2630DA
10km from Messina on Tshipise Road	2230AC
10km from Orpen Gate, KNP	2431AD
12km East of Pretoria	2528CD
12km Machodorp - Middelburg	2530CA
12km North of Newington	2431CD
12km North-east of Tzaneen	2330BB
12km Parys - Sasolburg	2627DC
13km North-east of Messina	2229BB
13km North-east of Turfloop	2329DD
13km South-east of Messina	2230AC
13km West of Thabazimbi	2426CA
13km from Kaapsche Hoop	2530CA
14km from Zeerust	2526CA
15km East of Krugersdorp	2627BB
15km East of Langjan	2229CC
15km East of Pretoria	2528CD
15km East of Sabie	2530BB
15km East-south-east of Mopane	2229DB
15km North of Louis Trichardt	2229DD
15km South-east of Pretoria	2528CD
15km South-west of Pretoria	2528CD
15km West of Pretoria, North of the Daspoort Range	2528CA
16km East of Nelspruit - Komatipoort	2531AC
16km Lichtenburg - Koster	2626AB
16km North-east of Carolina	2530CD

16km West of Kaapmuiden	2531CA
16km West of Pretoria	2528CA
16km from Hoedspruit	2430BD
16km from Messina on Tshipise Road.	2230AC
17km North of Middelburg on the Groblersdal road	2529DA
17km West of Pretoria	2528CA
19km East of Pretoria	2528CD
20km North of Crocodile Bridge	2531BD
20km North-east of Nylstroom	2428DA
20km South of Pretoria	2528CC
22km Krugersdorp - Pretoria	2527DD
22km South-west of Pretoria	2528CC
22km from Brits-Pretoria	2527DB
22km from Iron Crown	2429BB
24km East-north-east of Acornhoek	2431AD
24km North-east of Pretoria	2528CB
24km Pongola to Mkuze	2731BD
24km Rustenburg - Swartruggens	2527CA
25km Bandelierkop - Pietersburg	2329DA
25km West of Pretoria, Saartjies Nek	2528CA
26km North of Thabazimbi	2427AD
26km Sabie - Lydenburg	2530BA
26km South of Rustenburg	2527CD
27km North of Pietersburg.	2329CB
27km Tzaneen - Strydom Tunnel	2330CD
30km North of Pietersburg, on the Vivo road	2329CB
30km South of Satara, KNP	2431DB
32km East of Pretoria	2528DA
33km Wolmaranstad - Klerksdorp	2626CC
35km North-east of Mafeking, on the Zeerust road	2525DB
35km South-west of Tshipise	2229DD
35km South-west of Tshipise on Njelele River	2229DD
35km Vaalwater - Ellisras	2327DD
35km from Pongola to Piet Retief	2731AD
40km North of Roossenekal	2429DD
40km North-east of Sibasa	2230DA
40km South of Tshipise	2229DD
40km West-south-west of Hoedspruit	2430DA
45km North of Pietersburg	2329CD
48km Vaalwater - Ellisras	2327DD
52km Rustenburg - Hartebeespoortdam	2527DA
58km North of Marble Hall, on the Pietersburg road	2429BC
72km East of Gravelotte	2430BA
Aandeblom, Middelburg	2529CD
Aarnhemburg 115IT	2630BB
Abe Bailey Nature Reserve	2627AD
Abek 6JU	2531AA
Abel Erasmus Pass	2430DA
Abjaterskop 107KP	2426CC
Acornhoek 212KU	2431CA
Acre 2KT	2430AA
Aden 1KT	2430AA
Airlie Waterfall on Godwan River	2530DA
Alberton	2628AC
Alfa 448JU	2531DB
Alfred 383MS	2229CC
Alkmaar 286JT	2530BD
Allandale 237KU	[illegible]

Aloe Fjord Holiday Resort Vaaldam	2628CC
Alsace 74KT	2430AB
Alten 222LT	2330BB
Altever 103MR	2228CB
Altyd Mooi 379LT	2330CA
Ameland 11LS	2329AA
Amersfoort	2729BB
Amo 259JU	2531CB
Amsterdam	2630DA
Amsterdam 116LS	2329AD
Amsterdam 208KT	2430BD
Andalusia	2724DD
Andover 210KU	2431CA
Anlage 225KT	2430BC
Antioch 240KT	2430BD
Anysspruit 139HT	2330BA
Apollo Power Station	2528CC
Appeldraai 182IP	2626BD
Archie 156KT	2430BB
Argyle 46KU	2431AB
Armistice 120MT	2230CB
Armoedsvlakte 281HO	2725CA
Arnot Siding	2529DD
Aronsfontein 722LS	2429AA
Arthursrust 219KT	2430BC
Arundel 788LT	2430BA
Athol 238KU	2431CB
Athole 392IT	2630DA
Auf Der Haard 445MS	2229CC
Aurora 148LQ	2327BD
Avondstond 427JU	2531DB
B.V.B. Ranch 776LT	2330DD
Babelegi, Hammanskraal	2528AC
Backwood 348LQ	2327CC
Badimong River	2330DA
Badplaas	2630BA
Bakenkop 152HT	2730BB
Baklykraal 265MR	2228DB
Balfour	2628DA
Balmoral	2528DD
Bambata 33MR	2228CB
Bandelierkop 416LS	2329BD
Bandur Halt	2229DB
Bangu Gorge, KNP	2331DD
Bangu Windmill, KNP	2331DD
Bankop (=Bankkop)	2630CB
Bapsfontein	2628AB
Barberspan Nature Reserve	2625DA
Barberton District	2531BD
Barberton Nature Reserve	2531CC
Barberton Townlands 369JU	2531CC
Barend 523MS	2229DB
Bastaardspad 790LR	2328DC
Bath 100LQ	2327BD
Baviaanspoort 330JR	2528CB
Beacon 1-3, KNP	2331BA
Beacon 2-5, KNP	2331BA

Beacon 6-3, Shamiriri, KNP	2331DC
Beacon 7, Nyandu, KNP	2231CB
Beacon R.5, KNP	2231CD
Beauley 260LR	2329AA
Bedford 419KT	2430BD
Bedford View	2628AA
Beerlaagte 494IR	2628CD
Beit Bridge	2229BB
Bekaf 650MS	2229DD
Belfast	2530CA
Belfast area	2530CA
Bellevue 298MR	2228DC
Bellevue 74LT	2330AD
Bellevue C 518JT	2530DB
Belvedere 184MS	2229BC
Ben Lavin Nature Reserve	2329BB
Ben Lavin Nature Reserve, Klipspruit Camp	2329BB
Ben Lavin Nature Reserve, Thobajwane Camp	2329BB
Bendor 211HT	2730BD
Benoni	2628AB
Benoni, Rynfield	2628AB
Berg en Dal 378JT	2530CA
Berg-en-dalen 53MR	2228CD
Bergfontein 277KQ	2427BC
Bergfontein 32LS	2329AB
Bergfontein 574LQ	2327DD
Bergplaats 25HU	2731AA
Bergvliet 192HT	2730BC
Bergwater 697MS	2229DC
Berlin 209KT	2430BD
Berlin State Forest	2530DA
Berlyn 506KT	2330CD
Berlyn 670LT	2330CD
Bethal	2629AD
Bethel 431LS	2329BC
Bethesda 208LS	2329AD
Bettysgoed 213IT	2630BB
Between Bandelierkop and Louis Trichardt	2329BB
Between Eendrag windmill and Mabodheleni, KNP	2331AD
Between Johannesburg and Hartebeespoortdam	2527DD
Between Johannesburg and Pretoria	2528CC
Between KaMotsotsotsela and KhaXani	2330DB
Between Lake Fundudzi and Entabeni	2230CD
Between Letaba and Mala Mala, KNP	2331DD
Between Malembane and Magovani, KNP	2231CA
Between Mapangu and Bvumanyundo, KNP	2231AC
Between Mariepskop and Magalieskop	2430DB
Between Ngwenyeni and Kangwane, KNP	2331DB
Between Nwambiya and Mahlagunza Pans, KNP	2231CB
Between Pienaars River Dam & Wallmansthal turn-off	2528CB
Between Pretoria and Witbank	2528DD
Between Rietvlei Dam and Irene	2528CC
Between Roedtan and Potgietersrus	2429CA
Between Saselandonga Spruit and Pafuri, KNP	2231CB
Between Tsumanene and Madzaringwe turnoff, KNP	2331AB
Beynespoort 335JR	2528CB
Bezuidenhoutkraal	2528AC
Bezuidenhoutskraal 166JR	

Bhokweni	2732AC
Biesjesvallei 149IO	2625BD
Bievack 14MR	2228BD
Bilton 2LQ	2327AD
Biltong 434JU	2531DB
Birmingham 198KU	2431CA
Bismarck 116MS	2229BA
Blaauwbank 515KQ	2427DD
Blaauwbloemetjeskloof 428KS	2429BD
Blaauwboschkraal 346JT	2530CB
Blaauwkop 514MS	2229DB
Blackhill 317LR	2328BB
Blauwkrans 80KS	2429AB
Blesboklaagte 181IR	2628AC
Bleskop, Rustenburg	2527CB
Blinkwater 680LR	2328DB
Bloemfontein	2530CD
Bloemfontein 63JP	2526AC
Bloemheuvel 327HO	2725CC
Bloemhof	2725DA
Bloemhofdam Nature Reserve	2725DA
Bloemkrans 121IT	2630AD
Bloempoort 39JS	2529AA
Blouberg	2328BB
Blouberg, Leipzig Mission	2328BB
Bluegumsport 779MS	2229CD
Blyde River Nature Reserve	2430DB
Blyde River Nature Reserve, Bourkes Luck	2430DB
Blyde River Nature Reserve, Gods Window	2430DD
Blyde River Nature Reserve, Watervalspruit	2430DD
Blyolifants Nature Reserve	2430BD
Bobomeni, KNP	2231AC
Bochem 145LS	2329AC
Boekenhout 706KR	2428DA
Boekenhoutkloof	2528CB
Boekenhoutkloof 129JR	2528AD
Boekenhoutskloof	2528BC
Boekenhoutskloof 187KR	2428AC
Boekenhoutskloof 284JR	2528CB
Boekenhoutskloofdrift 286JR	2528DA
Bognafuran 318LR	2328BB
Bokfontein 396JP	2526DB
Bokfontein 448JQ	2527DA
Boksburg	2628AB
Bolotlwa	2429DB
Boompan 237LQ	2327CB
Boomplaats 24JT	2530AB
Bordeaux 555MS	2229DA
Border 136MS	2229BB
Border Gate, Barberton District	2531DD
Borkum 143LS	2329AC
Boschdraai 340MR	2228DC
Boschfontein 330JQ	2527CD
Boschfontein 445KQ	2427DA
Boschfontein 470JU	2531DC
Boschhoek 36JT	2530AB
Boschjeskop 250JT	2530BD
Boschkom 272JT	[illegible]

Boschkop, Bronkhorstspruit District	2528DC
Boschkopje 519LS	2329BD
Boschmanskrans 22IS	2629AB
Boschplaats 138HO	2725AD
Boschpoort 284JQ	2527CB
Boschpoort 473KR	2428CC
Boschrand 158HO	2725BB
Boschrand 283JT	2530BD
Bosjesspruit 291IS	2629CA
Bosmanslaagte 181IS	2629BA
Boston 61KU	2431AC
Bothwell 90IT	2630AC
Botsabelo (=Botschabelo), Middelburg	2529CB
Bottellang 115MR	2228CD
Boulders 187KR	2531CB
Bourkesluck 454KT	2430DB
Bovenste Oog van Mooi Rivier 68IQ	2627AA
Brak River, Northern Transvaal	2229
Brakpan 251IP	2626CB
Braksloot 734LS	2329CC
Brakvallei 347KQ	2427CB
Bramley	2628AA
Brandhoek 78HP	2726AD
Brandwag - 25km North of Vaalwater	2428AA
Breslau 2MS	2229AC
Bridgewater 263MS (= Bridgewater)	2229CA
Bridgewater 307KQ	2427CA
Bristol 760MS	2229DC
Brits	2527DB
Brits - Crocodile River	2527DB
Brits area	2527DB
Britsville 483IR	2628CD
Brockham 50MT	2230AC
Broedershoek 129JU	2531AC
Broederstroom 481JQ	2527DD
Broederstroom 48HT	2730AA
Broederstroom, Haenertsburg	2329DD
Brombeek 272MS	2229CB
Brondal, Nelspruit	2530BD
Bronkhorstfontein 42LR	2328AB
Bronkhorstkloofdrift	2528
Bronkhorstspruit	2528DC
Bronkhorstspruitdam	2528DC
Brooklands State Forest	2530BA
Brosdoornhoek 433KQ	2527AB
Buffelsdoorns 315KR	2428BC
Buffelsdrift 51JR	2528AA
Buffelsfontein 443IP	2626DD
Buffelshoek 171IQ	2627BA
Buffelshoek 261LR	2328BB
Buffelshoek 277KR	2428BC
Buffelshoek 334KQ	2427CA
Buffelshoek 351KQ	2427CB
Buffelshoek 403LS	2329BD
Buffelshoek 445KQ	2427DA
Buffelshoek 471IQ	2627CD
Buffelshoek 91JS	2529AC

Buffelspoort 459KQ	2427DB
Buffelspruit 443KR	2428CC
Buffelsvley 388KT	2430CD
Buisdorp 37LS	2329AB
Buisfontein 367IP	2626DA
Buisfontein 451KR	2428CD
Buiskop 464KR	2428CD
Buitenkuil 11KO	2425DD
Buitenzorg 114HT	2730AC
Bulge Rivier 198KQ	2427BA
Bulhoek 389JP	2526DB
Bulhoek 75JQ	2527AD
Bulskop 225IP	2626DB
Bulskop 299MR	2228DC
Bultfontein 174JR	2528BA
Bultfontein 178JQ	2527BB
Bultfontein 92JO	2525DD
Burgersdorp 19KT	2430AB
Burgersfort	2430CB
Bushbuckridge	2431CC
Busizi Hills	2330BD
Cabora Bassa Beacon 11, KNP	2231CB
Cabora Bassa Line to end of Sandveld, KNP	2231CB
Calais 226KT	2430BC
Calais 563KS	2429CB
Caledonia 97IT	2630AD
California 228KT	2430DA
Calitzdorp 221LS	2329BA
Camelot 320JU	2531CA
Canterbury 254MR	2228DA
Capesthorne 219LS	2329BA
Carnethy 113MS	2229AD
Carolina Dist.	2630AA
Carolina Town and Townlands 43IT	2630AA
Carpediem 76KT	2430AB
Casa do Sol Hotel	2531AA
Casketts 65KU	2431AC
Castle Rock Caravan Park, Sabie	2530BB
Cato Smuts 113MT	2230CB
Cavan 508MS	2229DB
Cawoods Hope 324HO	2825AA
Celine 547MS	2229DA
Ceres 599LS	2329CA
Ceylon	2431AB
Ceylon 4KT	2430AA
Chalons KNP	2431AD
Charl Cilliers 332IS	2629CA
Charloscar 43KU	2431AC
Chester 235KT	2430BD
Christiana 325HO	2725CC
Claudina 602MS	2229DC
Claudius Hoop 106LS	2329AB
Cleadon 90LS	2329AA
Clearwaters, Haenertsburg	2329DD
Cleveland	2626AA
Clewer	2529CC
Cliffside 225MT	2230CC

Commandonek, Rustenburg District	2527DB
Commondale	2730BD
Concordia 560KT	2430DC
Confidence	2730BB
Confidence 17HU	2731AA
Constantia 122LQ	2327BC
Cookham 186MR	2228DA
Copenhagen 58KU	2431AA
Corea 96MS	2229AC
Coventry 261MS	2229CA
Coventry 56KQ	2427AB
Crecy	2428DB
Crewe 771MS	2229DC
Crimea 747MS	2229DC
Crocodile Bridge, Hippo Pool, KNP	2531BD
Crocodile Bridge, KNP	2531BD
Crocodile Pool Shingwedzi, KNP	2330BB
Crocodile River, Brits	2527DB
Crocodile River, KNP	2530BC
Crocodile River, Pretoria	2527DB
Crocodile River, Rustenburg	2527DB
Crocodile/Marico confluence	2426BB
Crook's Corner, KNP	2231AD
Crossroads	2530CB
Crystal Salt Works	2229CD
Cullinan	2528DA
Cumbrae 144LS	2329AC
Cyferfontein 434KR	2428CC
Cyferfontein 457KR	2428CD
Cyfergat 38JP	2526AB
D'Nyala Nature Reserve	2327DB
D.R. De Wet Forest Station	2530BB
Daggafontein 125IR	2626BC
Dakamila, KNP	2231AD
Dal Josaphat 461KS	2429BD
Dambale Hills	2230BC
Damwal	2529AD
Dansfontein 40LR	2326AB
Dantzig 3LS	2329AA
Dap Naude Dam	2329DD
Dardanellen 203MR	2228DB
Daspoort 319JR	2528CA
Daspoort Range	2528CA
Davel	2629BD
Dawn 71MT	2331AD
De Bad 396KT	2430CD
De Beer 448KS	2429BC
De Berg 71JT	2530AA
De Bilt 372JU	2531CC
De Deur 539IQ	2628CA
De Deur, Evaton	2627DB
De Gladde Kliphop 763LS	2329DA
De Goedeverwachting 57IT	2630AA
De Grens 168JQ	2527BB
De Grooteboom 373KT	2430CC
De Hoop 135MR	2228CC
De Hoop 203JU	2531CA
De Kraalen 160HT	2730BB

De Kroon	2527DB
De Kroon 363JT	2530CA
De Kroon 442JQ	2527DB
De Kroon 444JQ	2527DB
De Kroon, Brits	2527DB
De Kroon, Crocodile River	2527DB
De Kuilen 205JT	2530BA
De Kuilen 460IR	2628CD
De Loskop 205LS	2329AD
De Nyl 28km Dullstroom - Tonteldoos	2529BD
De Nyl Zyn Oog 423KR	2428CA
De Oude Stad van Sekwati 765KS	2429DA
De Pan 51IQ	2627AB
De Putten 56JO	2525DB
De Roodepoort 435IS	2629DB
De Ruigte 27LS	2329AB
De Rust 12JU	2531AA
De Villiersdale 313LR	2328BB
De Wagendrift 79JS	2529AD
De Wildt	2527DB
Debegeni Falls	2330DC
Deelkraal 412LT	2330CA
Deelkraal 561KR	2428DA
Deelpan 106IO	2525BC
Delamere 731MS	2229DD
Delarey Station	2627BB
Delareyville	2625CB
Delft 499MS	2229DB
Delmas	2628BA
Den Staat 27MS	2229AA
Dendron	2329AD
Derby, Koster District	2527CC
Derdekraal 352KR	2428BD
Derdepoort	2528CB
Desire 563KT	2430DD
Devils Knuckles, Barberton	2530DD
Devils Knuckles, Long Tom Pass	2530BA
Dick, KNP	2531BD
Die Bron	2529AC
Die Hoekie, Brits Dist.	2527DB
Die Vesting, 32km North of Pretoria	2528AD
Dientje 453KT	2430DB
Diepdal 244IT	2630BD
Diepgelegen 945LS	2329DD
Diepgezet 388JU	2631AA
Diepkloof 186JS	2529BC
Diepkloof 44JS	2529AB
Diepkuil 135KO	2427AD
Diepspruit 414IS	2629CD
Dinokana	2525BD
Dirleton 276MS	2229CB
Dome Pools, Magaliesberg	2527DC
Donald 37KP	2426BD
Dongadzivha, KNP (= Dongadziba)	2230DB
Dongola	2229AC
Donkerhoek 172HT	2730BA
Donkerhoek 365JR	2528CD
Donkerhoek, Rustenburg District	[illegible]

Donkerkloof 435JQ	2527DB
Donkerkloof, Middelwater 436JQ	2627DB
Donkerkloof, Vissershoek 435JQ	2527DB
Donkerpoort 344KQ	2427CB
Doornbult 123HP	2726CA
Doornbult 624LS	2329CD
Doornbult 81IP	2626AC
Doorndraai 282KR	2428BD
Doorndraaidam Nature Reserve	2428BD
Doornfontein 345IP	2626DA
Doornhoek 236JT	2530BC
Doornhoek 284KR	2428BB
Doornhoek 341JT	2530CB
Doornhoek 46IP	2627AB
Doornhoek 480LS	2329BD
Doornhoek 545KT	2430DC
Doornhoek 577IR	2628DB
Doornhoek, Komati River	2530DC
Doornkop	2428CA
Doornkop 356JS	2529BD
Doornkop 420JT	2530CC
Doornkop School, Witpoort	2529BD
Doornkraal 420JR	2528DA
Doornplaat 106JO	2525DD
Doornplaat 177IP	2626BB
Doornpoort 262IP	2626CA
Doornpoort, Wonderboom, Pretoria	2528CA
Doornrug 302JS	2529CC
Doornspruit 215KQ	2427BB
Doornvlei 426LS	2329BC
Dordrecht 190KP	2426DB
Doreen 108MT	2230AC
Dorstbult 387LT	2330CA
Dover 44MT	2230AC
Draaikraal 48JT	2530AA
Drakenstein 77LQ	2327BC
Driefontein 30HP	2726AA
Driefontein 387KR	2428CB
Driefontein 77LT	2330AA
Driefontein Gold Mine	2627BC
Driefontein, Johannesburg (146IR?)	2628AC
Driekop 387JT	2530CC
Drinkpan 301KQ	2427CA
Droogedal 120KP	2426CC
Droogekloof 471KR	2428CC
Droogespruit 416IP	2626DD
Drummondlea	2428BD
Du Plessis 18MR	2228CB
Du Toit's Kraal 532KR	2428DB
Dublin 218KT	2430BC
Dublin 86KT	2430AA
Dublin Mine	2430AA
Duikerhoek 489JU	2531DB
Duivelskloof 436LT	2230CA
Duiwelskloof	2330CA
Duilstroom	2530AC
Duma 201JU	2531AC

Dunottar	2628AD
Durham 30KU	2431AB
Dusseldorp 22KT	2430AB
Duurstede 361JU	2531CD
Dwaalboom 217KP	2426DB
Dwaalpan 297KQ	2427AC
Dwarsriver	2430CC
Dwarsvlei 503JQ	2527DC
Dycedale 368JU	2431CC
Dzumeri	2330DA
Dzundwini Waterhole, KNP	2231CC
Dzuweni Pan, Bolope, KNP	2531BD
E.P. Helm (Trichardtsdal)	2430AB
East of Pretoria	2528CA
Easter Kloof, Magaliesberg	2527DC
Eastern Boundary Nchindo & Tabaglovu Beacons, KNP	2331DA
Eastern Transvaal, Godwan River	2530DA
Eden 425KT	2430DB
Edinburgh 439IT	2630DC
Edleen , Kempton Park	2628AA
Eendracht	2628AD
Eendracht 95LQ	2327BD
Eendrag Windmill, KNP	2331AD
Eerste Geluk 600LS	2329CA
Eerste Geluk, 14 kms South of Nelspruit	2531AC
Eerste Rivier 232MR	2228DA
Eersteling 63HP	2726AC
Eerstelingsfontein 406JT	2530CC
Ehlatini, Nelspruit	2531CA
Eikenhof 323IQ, (Lido Hotel)	2627BD
Elandsdoorns 144JP	2526BA
Elandsfontein 115IQ	2627AD
Elandsfontein 290KQ	2427BD
Elandsfontein 308IQ	2627BD
Elandsfontein 322JT	2530CA
Elandsfontein 335KQ	2427CA
Elandsfontein 352JR	2527CC
Elandsfontein 366JQ	2527CC
Elandsfontein 36HT	2730AB
Elandsfontein 440JQ	2527DB
Elandsfontein 471JT	2530DA
Elandsfontein 727JT	2530DC
Elandsfontein, 16km West of Pretoria	2528CA
Elandskop	2530CC
Elandskraal 71JR	2528AD
Elandskuil 208IP	2626BD
Elandslaagte 30JQ	2527AB
Elandspruit 115JT	2530AD
Eleazar 377IP	2626DB
Elim Hospital	2330AA
Ellisras	2327DA
Ellisras Area	2327DA
Engeland 183KP	2426DB
Engelbrechtshoop 55JU	2531AA
Enkelgoorn 35JT	2530AB
Enkeldoorn, Houtbosdorp	2329DD
Enkeldoornoog 219JR	2528BD

Entabeni Forest Reserve	2230CD
Erasmus	2528CA
Erasmushoop 457KT	2430DB
Ermelo	2629DB
Esselen Park, Kempton Park	2628AA
Essexvale 61MR	2228CA
Eureka City	2531CA
Eureka, Barberton	2531CA
Evelyn 159MS	2229BD
Evergreen 425IT	2630DA
Excelsior 211JU	2531CB
Excelsior 266KU	2431CC
F.C. Erasmus Nature Reserve	2431CC
Fairfield 238JR	2528BC
Farm 387 = Olifantskraal?	2430CD
Farnel 473MS	2229CD
Farrefontein 349JT	2530CA
Fayi Roan Camp, KNP	2531AB
Fayi, KNP	2531AB
Fayi/Shimangwana Fire Break, KNP	2531BB
Fernie 243IT	2630BD
Fife 44KU	2431AA
Flamingopan 40KQ	2427AA
Fletcher, Nelspruit	2530BD
Fleur-de-Lys 194KU	2431CA
Flynn 217KS	2429BB
Fochville	2627AD
Folly Dam, KNP	2531AA
Fontainebleau 537MS	2229DA
Forest Falls	2530BA
Fourieskloof 557LQ	2327DC
Frankfort State Forest	2530BB
Frederikstad, Potchefstroom	2627CA
Freya 145MS	2229BB
Friedenheim 282JT	2530BD
Ga Chweni	2531AA
Ga Sekororo	2430AB
Gadzingwe, KNP	2331BA
Galakwyns Stroom 745LR	2328DC
Gana Hoek 111KQ	2427AC
Garatouw 282KT	2430CA
Garstfontein 374JR	2528CD
Geduld 270IP	2626CB
Geelhoutboom 342IT	2630CD
Geelhoutkloof 195KR	2428AD
Geelhoutkop	2428AD
Gegund 679KR	2428DD
Geluk 235IP	2626CA
Geluk 42HN	2624BB
Geluks Location	2429DB
Gemsbokfontein 199JR	2528BD
Gemsbokfontein 290IQ	2627BC
Generaalsdraai 423JS	2529DD
Germiston	2628AA
Gestoptefontein 349IO	2625DB
Gewenscht 562KS	2429CA
Gezicht 265HO	2725CB

Giyani	2330BC
Glen Aggy 406IT	2630DA
Glen Alpine 304LR	2328BA
Glen Austin, Halfway House	2528CC
Glengarry 652IT	2530DD
Glenover 371LQ	2327CC
God's Window, Paradise Camp	2430DD
Godleni, KNP	2531BD
Godlwayo	2731AD
Godwan River	2530DA
Goed Geluk 444JT	2530DA
Goede Hoop 490JP	2526DD
Goedehoop 152JS	2529BA
Goedehoop 290IS	2629CA
Goedehoop 31KS	2429AB
Goedehoop 622JT	2530DC
Goedehoop 749KS	2429CD
Goedemoed 373IT	2630CC
Goedeverwachting 334JT	2530CB
Goedewil	2530AD
Goedgedacht 38HS	2729AB
Goedgedacht, Amersfoort	2629DC
Goedgelegen 194LR	2328AD
Goedgevonden 104KR	2428AB
Goedgevonden 134HT	2730AD
Goedgevonden 149JP	2526BA
Goedvertrouwd 499JR	2528DD
Goedverwacht 152JT	2530BA
Goedverwacht 24IT	2630AB
Goedverwachtinge 333JT	2530CB
Goedvooruitzicht 242IP	2626CB
Goevernements Plaats 417KQ	2427CD
Gollel 73HU	2731BD
Gollel Border Post	2731BD
Goodenough 266MS	2229CB
Gopane Mine	2525BC
Goudplaats 340LT	2330CA
Government Ground 846KS	2429DD
Graaf Reinet 71MR	2228CC
Granite Hill 452JT	2530BD
Graskop	2430DD
Graskop 564KT	2430DD
Graspan 230HO	2725BD
Grassvalley, Northern Transvaal	2330DC
Gravelotte	2330DC
Gravelotte 783LT	2330DC
Great Letaba River	2330DB
Greefswald 37MS	2229AB
Green Valley 213KU	2431CA
Greenfield 333MS	2229CC
Greylingsrus 101HP	2726AC
Greylingstad	2628DB
Grietjie 6KU	2431AA
Griffin Mine	2430BA
Groblersdal	2529AB
Groblersrecht 175IS	2629BB
Groenbult	2329DB

Groenfontein 227KR	2428BB
Groenfontein 254KR	2428BA
Groenfontein 429JP	2526DD
Groenfontein 458KQ	2427DB
Groenfontein 526JR	2528DC
Groenfontein, Warmbad District	2528AA
Groenkloof 358JR	2528CC
Groenkloof 464JQ	2527DC
Groenvlei 353JT	2530CA
Groenvlei 37HS	2729AB
Groningen 779LR	2328DD
Groot Denteren 533LR	2328CD
Groot Marico	2526CB
Groot Marico Dam	2526CB
Groot Nylsoog 447KR	2428CD
Groot Spelonken	2329BD
Grootdoorn 292LQ	2327CA
Grootdraai 429KS	2429BD
Grootdraai Dam, Standerton District	2629CD
Groote Zwart Bult 290LQ	2327CB
Grootfontein	2330AC
Grootfontein 115JO	2525DD
Grootfontein 352KQ	2427CB
Grootfontein 47LT	2330AA
Grootfontein, Palala Post Office	2428AB
Groothoek 106KS	2429AD
Groothoek 129LS	2329AD
Groothoek 171HT	2730BA
Groothoek 278KQ	2427BC
Grootpan 7KQ	2427AA
Grootpan 90LQ	2327BD
Grootplaats 29HN	2724DD
Grootpoort 123KP	2426CC
Grootvlei 160KP	2426DA
Grootvlei 272JR	2528CB
Grootvlei 293IS	2629CB
Grootvlei 684MS	2229DC
Grootvlei Mine	2628AB
Grootvley 558LQ	2327DC
Gruisfontein 40IP	2626AB
Gruysbank 5JS (=Gruisbank)	2529AB
Gubyane Waterhole, KNP	2331AB
Guernsey 81KU	2431AC
Gulliver 237MS	2229BD
Gumbani	2331AA
Gumela	2230CB
Gunfontein 71KR	2428AA
Gwaai 62MR	2228CA
Gwalala, KNP	2231AD
Ha Madzhiga	2330AB
Ha Mwametatau	2330AB
Haakbosch 79JQ	2527AD
Haakdoorn Draai 711LR	2328DA
Haakdoorndraai 758LR	2328DC
Haakdoornlaagte 167JQ	2527BB
Haakdoringdraai	2430DA
Haarlem 443IT	2630DD

Haddon 27MT	2230AD
Haenertsburg	2329DD
Haenertsburg, Ottoshalt	2329DD
Haffenden Heights 35KT	2430AA
Halfgewonnen 190IS	2629BA
Halfkroonspruit KNP	2531BD
Halfkroonspruitmond KNP	2531BD
Halfway House	2528CC
Halfway House, Noordwyk	2528CC
Hamanskraal 346IO	2625DD
Hammanskraal	2528AD
Hammanskraal area	2528AD
Handsup 305JU	2531CA
Hangasine River turnoff, Letaba River, KNP	2331CD
Hanglippunt 253KR	2428BA
Hanover 181KQ	2427BB
Hans Hoheisen Research Station	2431AD
Hans Merensky Nature Reserve	2530DA
Hapi Pan, KNP	2231AC
Happy Rest Nature Reserve	2329DD
Happyland 241KT	2430BD
Hardekoolbult 548KQ	2427DC
Harlem 443IT	2630DD
Harmony 140KT	2430BA
Harnham 793MS	2229DD
Harriet's Wish 393LR	2328BD
Hartbeestfontein 281KQ	2427BC
Hartbeestfontein 297IP	2626CD
Hartbeestlaagte 325JS	2529CC
Hartbeestlaagte 66JQ	2527AB
Hartbeestpoort 482JQ	2527DD
Hartebeesfontein 281KQ	2427BC
Hartebeeshoek 303JR	2528CA
Hartebeeshoek Provincial Nursery	2528CA
Hartebeeshoek, 18 km North-west of Pretoria	2528CA
Hartebeespoort	2527DD
Hartebeespoort 410JQ	2527DA
Hartebeespoort, Pretoria	2527DB
Hartebeespoort, Rustenburg District	2527DB
Hartebeespoortdam	2527DD
Hartebeespoortdam, North-western area of	2527DB
Hartebeestfontein	2626DD
Hartebeestfontein	2527DA
Hartebeestfontein 437IQ	2627CB
Hartebeestfontein 473IR	2628CC
Hartebeestfontein 516KR	2428DA
Hartebeesthoek 502JQ	2527DC
Hartebeestlaagte 325IS	2529CC
Hartebeestpoort B 410JQ	2527DA
Hartebeestpoort E 215JQ	2527BC
Hartebeestpoortje 451IQ	2627CD
Hartebeestvlakte 163JT	2530BA
Hartsnoogte 17HN	2724BD
Hartz 233MS	2229BC
Havercroft 99KT	2430AC
Hazyview	2531AA
Hectorspruit	2531BC
Hectorspruit 164JU	[illegible]

Heidelberg	2628AD
Heidelbergkloof	2628AD
Heimwehberg 121KP	2426CC
Hekpoort 504JQ	2528CA
Helena 400JU	2531DB
Hendriksdal	2530BB
Hendriksplaats 281KT	2430CA
Hendrina	2629BA
Henly-on-Klip	2628CA
Hennopsrivier 489JQ	2527DD
Hermansburg	2430DD
Hermanusdoorns 204KQ	2427BB
Hexrivier 634IR	2628DC
Highfield 797MS	2229DD
Hilda 23MS	2229AC
Hildebrantia Pan, KNP	2531BA
Hlahlenidrif, KNP	2431BB
Hlanganine Sandsteen Rif	2331AA
Hlaralumi	2431AB
Hlaralumi River, KNP border	2431AB
Hoedspruit	2430DB
Hoedspruit 346JS	2529DA
Hoedspruit 82KU	2431BD
Hoedspruit Air Base	2430BD
Holdrift 94MR	2228CD
Holfontein 126KT	2430AD
Holfontein 138IS	2629AC
Holfontein 279IP	2626CA
Holfontein 49IQ	2627AB
Holland 237KP	2426DD
Holme Park	2428DC
Holmwood 315MR	2228DD
Holworth 783MS	2229DD
Hondsrivier 508JR	2528DC
Honesty 43HN	2824BB
Honeymoon 80KQ	2427AC
Honingkrans 131HP	2726CA
Honingspruit 32HO	2725AA
Hoogeleegen 82MR	2228CD
Horo Forest	2531CB
Houdkop 475IT	2630DD
Houtbosch River 307KR	2428BC
Houtbosdorp	2329DD
Houtbosloop	2530BC
Houthaaldoorns 2IP	2626AA
Houtkop 152IP	2626BA
Houtkop 43IQ	2627AB
Houwater 54JQ	2527AC
Hull 59KU	2431AC
Humanskraal 346IO	2625DD
Humansrust 192KS	2429BB
Huntleigh	2229DB
Hutwini Pan, KNP	2231AC
Illovo 187MR	2228DA
Impala 486JU	2531BC
Ingwe Motel	2229DD
Inhambane 802LR	2328DD

Inkerman 10KQ	2427AB
Inkom 305MR	2228DD
Invicta 255MS	2229CA
Inyoku 159KT	2430BB
Ireagh 263KU	2431CD
Irene	2528CC
Irene Agricultural Research Station	2528CC
Irene Cave	2528CC
Irene, Hennops Spruit	2528CC
Iron Crown, Wolkberg	2429BB
Ishlelo 441IT	2630DC
Isipingo 37MR	2228CB
Islet 137MS	2229BB
Italie 123HO	2725AC
Jaagbaan 291KR	2428BD
Jachtdrift 190LT	2330AC
Jackalskraal 45KP	2426BC
Jacob 191LT	2330AC
Jagersfontein 55JO	2525DA
Jakhalsdraai 102LS	2329AD
Jakhalsfontein 528JR	2528DD
Jakkalsdans 243JR	2528BC
Janniesrust 284MR	2228DC
Jeppes Reef 334JU	2531CB
Jeppes Rust 469JU	2531DC
Jericho 304IT	2630CB
Jericho Dam 304IT	2630CB
Jerome 287MT	2230DC
Jessievale 200IT	2630BA
Johannesburg	2628AA
Johannesburg 91IR	2628AA
Johannesburg, Between Forest Hill and Glenanda	2628AA
Johannesburg, Blairgowrie	2628AA
Johannesburg, Bryanston	2628AA
Johannesburg, Bryanston 39IR	2628AA
Johannesburg, Buccleugh	2628AA
Johannesburg, Craighall	2628AA
Johannesburg, Delta Sewage Works	2628AA
Johannesburg, Die Eike	2628AA
Johannesburg, Edenvale	2628AA
Johannesburg, Fountain Blue Township	2628AA
Johannesburg, Glenanda	2627BB
Johannesburg, Honeydew	2627BB
Johannesburg, Honeydew area	2628AA
Johannesburg, Jukskei River	2628AA
Johannesburg, Jukskei River, Alexandra	2628AA
Johannesburg, Mondeor	2628AC
Johannesburg, Mountain View	2628AA
Johannesburg, Nourse Mine	2628AA
Johannesburg, Orange Grove	2628AA
Johannesburg, Parktown	2628AA
Johannesburg, Rietfontein	2628AA
Johannesburg, Rivonia	2627BB
Johannesburg, Robin Acres	2628AA
Johannesburg, Roodepoort Deep Mine	2627BB
Johannesburg, The Hill	2628AA
Johannesburg, Uncle Charlies	2628AA

John Marcus 336LQ	2327CC
Jongmanspruit 234KT	2430BD
Josefsdal 382JU	2531CC
Jouberts Hoop 67KU	2431AD
Joubertsdal 448JT	2530DB
Joubertsvallei 337IS	2629CB
Jozini Dam	2732AC
Juliana 647MS	2229DD
Junction of Olifants and Selati River	2431AA
Junction of Pienaars and Crocodile River	2527BA
Jutland 536MS	2229DA
Ka Khayi	2330DB
Ka Mininginisi	2330BB
Kaal Kraal 100MS	2229CB
Kaalberg	2628CA
Kaalbult 349JP	2526CD
Kaalfontein	2528DC
Kaalfontein 212IP	2626BD
Kaalfontein 44IQ	2627AB
Kaalkraal 113IP	2626AD
Kaalplaas, Onderstepoort	2528CA
Kaalplaats 194IO	2625CA
Kaalplaats 451MS	2229CC
Kaapmuiden 212JU	2531CB
Kaapsche Hoop 483JT	2530DB
Kafferskraal 168KR	2428AD
Kafferskraal 381IR	2628CA
Kafferskraal 400IP	2626DC
Kafferskraal 43JQ	2527AA
Kafferskraal 47HS	2729AB
Kafferskraal 513IS	2629DC
Kafferskraal 55LQ	2327BB
Kafferskraal 618JT	2530DC
Kafferstad 195IS	2629BA
Kaffir Creek	2531CA
Kalkfontein	2725DA
Kalkfontein 1001LS	2329DC
Kalkfontein 111KP	2426CD
Kalkfontein 173LS	2329AD
Kalkfontein 1JP	2526AA
Kalkfontein 215LS	2329CB
Kalkfontein 367KT	2430CC
Kalkfontein 49JS	2529AB
Kalkfontein 589KR	2428DB
Kalkfontein 615LS	2329CB
Kalkfontein 64LR	2328AB
Kalkgat 554LS	2329CB
Kalkneuwel 454MS	2229CD
Kalkneuwel 493JQ	2527DD
Kalkoenkrans 366IT	2630CC
Kalkpan 683KR	2428DD
Kambane Experimental Plots, KNP	2531AB
Kameeldoorn 71JS	2529AD
Kameeldrift	2528CB
Kameeldrift 298JR	2528CB
Kameeldrift, East of Pretoria	2528CA
Kameellaagte 61KQ	2427AA
Kameelpan 276HC	

Kameelspruit 29KQ	2427AA
Kampersrus, Hoedspruit	2430BD
Kamslubana Kop 335JU	2531CB
Kanana 426IP	2625AD
Kapsteel 81IQ	2625BA
Kareeboomput 286HO	2725CA
Kareebosch 413IS	2629CD
Kareefontein 340HO	2725DA
Kareehoek 274KQ	2427BC
Kareekuil 356IO	2625DD
Kareelaagte 45JO	2525DA
Kareelaagte 70HO	2725AC
Kareepan HO	2725BB
Karino Farm 134JU	2531AC
Karoobult 126KQ	2427AD
Kasteel 766LT	2330DD
Kastrolnek, Wakkerstroom	2730AD
Keerom 449JU	2531DB
Kees Zyn Doorns 708JT	2530DC
Kelvin, Randburg	2628AA
Kempiana 90KU	2430AD
Kempton Park	2628AA
Kempton Park Technical College	2628AA
Kempton Park, Beech Rd., Cresslawn	2628AA
Kempton Park, Bloupan	2628AA
Kendall	2628BB
Kent 57KU	2431AC
Ketting 368LR	2328BD
Keulen 669LT	2330CD
Kgoloko Location	2429DB
Khandizwe	2531AD
Khavagari Mountain	2330BC
Kiepersol	2531AA
Kildare 277KU	2431CD
Killaloe 235MS	2229BD
Kindergoed 332JT	2530CB
Kingfisherspruit, KNP	2431AD
Kingston Vale 125JU	2531AC
Kinkelspruit 154IO	2625BD
Klaserie	2431CA
Klaserie River	2430AC
Klaserie River Valley, Mariepskop	2430DB
Klaserie Siding	2431CA
Klavervalley 671KS	2429CC
Klawerpan, KNP	2231CB
Klein Denteren 495LR	2328CB
Klein Engeland 9KP	2426BB
Klein Letaba	2330AB
Klein Letaba, Giyani Bridge	2330BC
Klein Tsnipise	2230DA
Klein Tshipise, Tshamavudzi Road	2230DA
Kleinelandfontein, Waterberg District	2428CA
Kleinfontein 203JS	2529BC
Kleinfontein 3HT	2730AA
Kleinfontein 68JR	2528DD
Kleinkopje 15IS	2629AA
Kleinzuikerboschkop 93JT	2530AC
Klerksdorp	[illegible]

Klerkskraal 65IQ	2627AA
Klipbank 406LS	2329BD
Klipbankfontein 44LQ	2327BB
Klipdraai 3KT	2430AA
Klipdrift	2528BD
Klipdrift 395IQ	2627CB
Klipdrift 62JS	2529AC
Klipfontein 11KQ	2427AB
Klipfontein 12IR	2628AA
Klipfontein 205JR	2528BD
Klipfontein 241IS	2629BD
Klipfontein 256JS	2529CA
Klipfontein 429JR	2528DA
Klipfontein 53KR	2428AB
Klipfontein 566JR	2528DD
Klipfontein 9JO	2525BA
Klipgat 18IQ	2627AA
Klipheuwel 573KS	2429CB
Klipkoppies Rangers Post, KNP	2331DC
Klipkuil 352JP	2526CC
Klipnek 199JS	2529BC
Klippan 140IP	2626BB
Klipplaat 108JO	2525DD
Klipplaatdrift 193JR	2529AA
Klipplaatdrift 343JS	2529DA
Klipplaatdrift 43HS	2729AB
Klipplaatdrift 43JR	2528AA
Klipplaatdrift 504IS	2629DD
Klipplaatdrift 787LR	2328DC
Kliprivier	2229DC
Kliprivier 692MS	2229DC
Kliprivier 73JT	2530AA
Kliprivier, Lido Hotel, Johannesburg	2628AC
Klipriviersberg	2627BD
Klipriviersberg 106IR	2628AC
Klipspruit 255KR	2428BA
Klipspruit 714KS	2429CD
Klipspruit 89HP	2726AD
Klipvoor 159JQ	2527BB
Kloofsig, Verwoerdburg	2528CC
Klopperfontein Dam, KNP	2231CA
Klopperfontein, KNP	2231CA
Kloppersdam 187JR	2528BB
Knapdaar 92JT	2530AD
Knopjeslaagte 385JR	2528CC
Knoppiesfontein 87IP	2626AC
Knoppieskraal 484KQ	2427DA
Knoppieskraal 537KQ	2427DC
Koeberg 52MR	2228CB
Koedoesdraai 49HP	2725AB
Koedoeskop	2427DC
Koedoespoort 325JR	2528CB
Koedoespoort 402LS	2329BD
Koedoesvlei 47LS	2329AB
Koestersfontein 45IQ	2627AB
Komapiti windmill, KNP	2531AB
Komati/Crocodile River Confluence	2531BD

Kommandonek	2527DB
Konigstein 625JT	2530DD
Koningsmark 117MS	2229BC
Koppieskraal 157IR	2628AC
Korannafontein 350IO	2626CC
Kosmos, Brits District	2527DB
Koster	2526DD
Kosterfontein 460JP	2526DD
Kraaipan	2625AD
Kraalhoek 269JQ	2527CA
Kraalkop 147IQ	2627AD
Krabbefontein	2330CA
Kralingen 395KR	2428CA
Kransberg 357KQ	2427CC
Kransfontein 403LT	2330BA
Kranskloof 554KT	2430DC
Kranskop	2428DA
Kranskop 422IT	2630DA
Kranspoort 248IS	2629BD
Kransville Farm Uitsicht	2528CA
Krige 495MS	2229DA
Krokodildraai 18KP	2426BB
Krokodildrift 217JP	2526BD
Krokodilpoort	2526BD
Krokodilrivier, KNP	2531CA
Krokodilspruit 290JR	2528CB
Kromdraai 106MT	2230CA
Kromdraai 115JR	2528AD
Kromdraai 263IR	2628BB
Kromdraai 325IS	2629CA
Kromdraai 338IO	2625DA
Kromdraai 352IP	2626DB
Kromdraai 486JS	2529DC
Kromdraai 520JQ	2627BB
Kromdraai 712KS	2429CD
Kromdraai, Plot 66, 32km North of Pretoria	2528AD
Kromrivier 347JQ	2527CD
Kroondal	2527CB
Krugersdorp	2627BB
Krugerskraal 583KR	2428DB
Krugersport 550KT	2430CD
Kruidfontein 40JQ	2527AA
Kruidfontein 470JP	2526DC
Kruisfontein 262JR	2528CA
Kruisrivier 270JP	2526CA
Kuilfontein 324JP	2526CD
Kukumezane Pan, KNP	2231DD
Kukumezane Spruit, KNP	2231DD
Kumana Dam, KNP	2431DB
Kunana Location 4IO	2525AD
Kwa Kouletsi	2327BB
Kwa Seane	2527BA
Kwa Sipunu	2531DD
Kwaggadraai 137LR	2325AD
Kwaggafontein 548IQ (= Lapdoorns)	2627DB
Kwarriefontein 280JP	2526CA
Kwarriehoekpoort 108MR	2228CD

La Rochelle 310LR	2328BA
Laaste Poort van Marico 86KP	2426CB
Ladismit 761MS	2229DC
Lake Chrissie 92IT	2630AC
Lake Denysville Yacht Club, Vaal Dam	2628CC
Lake Fundudzi	2230CD
Lakenvlei 355JT	2530CA
Langalanga 141KT	2430BA
Langbaken 342KS	2429BA
Langjan Nature Reserve	2229CC
Langkloof 356JT	2529DB
Langlaagte	2628AA
Langzeekoegat 325IR	2628BC
Lanseria Airport, Krugersdorp District	2527DD
Lavhalisa	2230CA
Lavhengwa Hills	2330BA
Lawley	2627BD
Leamington 207KU	2431CA
Leankloof	2528CB
Lebombo Beacons A.B.	2531BD
Lebombo Siding 184JU	2531DB
Ledovine 507KT	2430DD
Ledzee 559LT	2330CC
Leek 769MS	2229DC
Leeudoringstad	2726AA
Leeupan	2625DA
Leeupan, KNP	2431DD
Leeuwbosch 129KQ	2427AD
Leeuwdorings 607KR	2428CD
Leeuwenhoek 112KP	2426CD
Leeuwfontein 185HO	2725BB
Leeuwfontein 188JR	2528BB
Leeuwfontein 228JS	2529CA
Leeuwfontein 299JR	2528CB
Leeuwfontein 466JR	2526DB
Leeuwfontein 61JP	2526AC
Leeuwfontein 67IP	2626AD
Leeuwfontein 750KS	2429CD
Leeuwklip 363JS	2529DB
Leeuwkop 299IR	2628BD
Leeuwkop 425KS	2429BD
Leeuwkraal 50HS	2629DC
Leeuwkraal 92JR	2528AD
Leeuwpoort 263JS	2529CC
Leeuwpoort 373KR	2428CB
Leeuwpoort 554KQ	2427DC
Leeuwpoort, N.Tvl.	2427DC
Leeuwwater 251KQ	2427BD
Legkraal 440LS	2329BC
Legogote	2531AA
Leiden 340IT	2630CD
Leipsig 264LR	2328BB
Leipzig Mission	2328BB
Lekkergoed 160KT	2430BB
Leonard 360IO	2625DC
Leonardi Sandveld	2231AC
Letaba Camp, KNP	2330CD

Letsitele 652LT	2330CD
Levubu	2330AB
Levubu 15LT	2330AA
Levubu, KNP (= Luvhuvhu)	2231AC
Leydsdorp Dorpsgronde 779LT	2330DC
Leydsdorp, Maklutswi River	2430BA
Liamule Hill	2330BA
Lichtenburg Town and Townlands 27IP	2626AA
Lillie 148KT	2430BB
Lilliput 246MS	2229AC
Lilliput Station	2229DB
Lily 47LQ	2327BB
Lilydale 324JU	2531CB
Limpopo River, North of Beauty	2327BB
Limpopodraai	2327BA
Lindeques Drift	2627CC
Lindleyspoort 220JP	2526DA
Linokana (= Dinokana)	2525BD
Lisabon 262JT	2530BA
Lisbon 19LQ	2327AD
Lisbon Citrus Estates	2430BD
Lisbon Falls	2530BB
Lisbon State Forest	2530BC
Lissa 161LS	2329AC
Little Muck 26MS	2229AB
Lochiel 192IT	2630BB
Lochleven 233IT	2630BC
Logies Farm 42JU	2531AA
Lolamontes 682KS	2429DC
Lomati 466JU	2531DA
London 112HO	2725AD
London 29KP	2426BD
Long Tom Pass	2530BA
Long Tom State Forest	2530BA
Loopfontein 298JT	2530DA
Loopleegte 302LQ	2327CB
Lorasa 258IO	2625CC
Loretto 264MS	2229CA
Loskop Dam	2529AD
Loskop Noord 12JS	2529AB
Loskop Suid 53JS	2529AD
Loskopdam Nature Reserve	2529AD
Loskopdam Nature Reserve, Onwerf	2529AD
Lot 19 20HO	2725AB
Lot 43 250IO	2625CD
Lot 6 48HO	2725AB
Lothair 124IT	2630AD
Lothian 274KU	2431CC
Lotteringskop 115KP	2426CD
Lotteringskraal 243JP	2526CA
Loubad	2428CA
Louis Moore Gold Mine	2330BA
Louis Trichardt	2329BB
Louis Trichardt, above	2229DD
Louwpan 41HP	2726AC
Louws Creek	2531CB
Louws Creek 271JU	2531CB

Lower Sabie, KNP	2531BB
Lucerne 198MS	2229BD
Ludlow 227KU	2431CB
Lukin 643LS	2229DB
Lunsklip 7KS	2429AA
Luphephedam	2230CB
Luphisi	2531AD
Luphisi Village, near	2531AD
Lydenburg	2530AB
Lydenburg Area	2530AB
Lydenburg Fisheries	2530AB
Lydenburg, Glad River	2530AB
Lyttelton 381JR	2528CC
M'Pefu 202MT	2230CC
M'Phatlelaskraal 377KS	2429BD
Maandagshoek 254KT	2430CA
Maasstroom	2228CB
Mabalanes Location	2526DC
Mabelikwa	2231AC
Mabofuta Ridge	2330AD
Mabopane, Pretoria District	2528CA
Mabyeni Hill	2231AC
Mabyeni Hill, Swamp	2231AC
Mac Mac Falls	2430DD
Mac Mac Mountain Hut	2430DD
Mac Mac Pools	2530BB
Machabezane, Komatipoort	2531CD
Machadodorp	2530CB
Machayi Pan, KNP	2231CB
Macouwkuil 45KR	2428AB
Madimbo	2230BD
Madrid	2431AA
Mafayini Waterhole, KNP	2331AA
Magalakynsoog 199KR	2428AD
Magaliesburg	2627BA
Magalieskop	2430DB
Magalieskruin 323JR	2528CA
Magamba, KNP	2231CC
Magazynskraal 3JQ	2527AA
Magdala 9MT	2230AC
Magoebaskloof	2330CC
Magovani Ridge, KNP	2231CA
Mahamba 7HU	2731AA
Mahembane, KNP	2231CA
Mahemsvlei 365IP	2626DA
Mahlaguza, KNP	2231CB
Mahobieskraal 211JP	2526BD
Mahubatswane	2429DA
Mahulule	2431AA
Maiepo, Letaba Drift 727LT	2330DA
Makalali 167KT	2430BA
Makapansgat 39KS	2429AA
Makhadzi Stream upper reaches, KNP	2331DA
Makhohlola Spruit, KNP	2531BB
Makhutswi River, Leydsdorp	2430BA
Makluva	2330DB
Makokskraal 203IP	2626BC

Makuleke, KNP	2231AD
Makushane Location 28LU	2331CC
Makwanekop, Eerste Hölle, Oshoek	2630BB
Makwens, The Downs	2430AA
Malala Drift 83MT	2230BC
Malamala	2431DC
Malamala 359KU	2431DC
Malamala Buitepos, KNP	2431DC
Malamala Spruit	2431DC
Malavuhe	2230DC
Malelane 289JU	2531BC
Malelane Road, Kruger National Park	2531BC
Malelane TSB Sugar Mill	2531BC
Malelane, KNP	2531BC
Malemetsa	2330CB
Maleshwane	2429DA
Mallepoos Oog 332JP	2526CC
Malmaniesrivier 236KQ	2427BA
Malok Zyn Kop 58JS	2529AC
Malokong 784LR	2328DD
Maloney's Eye 169IQ	2627BA
Malonga Flats	2230BC
Malonga Fountain, KNP	2230BC
Malonga, KNP	2230BC
Malopeni Road, KNP	2331CC
Malopenyana Windmill, KNP	2331DA
Malta 65KT	2430AA
Mamiaanshoek 279KQ	2427BC
Manamela	2329CA
Mananga	2531DD
Mandandeka Hill, Barberton District	2531CB
Mangombe	2330BD
Manlakusa Pan, KNP (= Mahlaguza)	2231CB
Mannung Dam, KNP	2531AB
Manutsa 233KT	2430BC
Manwayingwe	2330AD
Manyeleti Game Reserve	2431CB
Manyeleti Game Reserve, Albatros	2431CB
Manyeleti Game Reserve, Buffelshoek 340KU	2431DA
Manyeleti Game Reserve, Dixie 240KU	2431DA
Manyeleti Game Reserve, Dixie Dam	2431DA
Manyeleti Game Reserve, Dixie Hill	2431DA
Manyeleti Game Reserve. Hermitage 205KU	2431CB
Manyeleti Game Reserve, Main Camp	2431CB
Manyeleti Game Reserve, Main Dam	2431DA
Manyeleti Game Reserve, Sarabank 323KU	2431DA
Manyeleti Game Reserve, Snuifspruit	2431CC
Mapochsgronde 500JS	2529BD
Mara 38LS	2329AB
Mara River, Nelspruit	2530BD
Marakeli 437KQ	2427CB
Marble Hall 29JS	2429CD
Marble Hall, Fisheries	2429CD
Margate 215KT	2430BC
Marheya Windmill, KNP	2431DB
Maribashoek 50KS	2429AA
Marico Bosveld Dam	2526AD

Mariepskop 420KT	2430DB
Mariepskop Forest Station	2430DB
Marievale Bird Sanctuary	2628BC
Marikana	2527CB
Marius	2229DD
Marken 457LR	2328CB
Marken, near	2328CB
Maroelesfontein 602KR	2428DC
Marokane 1HN	2725AA
Martins Drift	2228CC
Maryvale 248IT	2630BC
Masalal 722LT	2330DB
Masekwas Location	2230CC
Masequa 714MS	2229DD
Maseri Pan 520MS	2229DB
Maseyafontein, KNP	2231CA
Mashadya Spruit, KNP	2331AA
Mashatukop, KNP	2431BA
Mashatumond, KNP	2431BA
Masisi	2230BD
Masleroems Oude Stad 840KS	2429DD
Masogoro Hill	2330DA
Matabula	2531DD
Mataffin	2530BD
Matalas Location 591LS	2329CC
Matane's Location 695KR	2428DD
Matangari	2230DC
Matchatengane, Komatipoort	2531BD
Matibaskraal	2329DC
Matishibila Warmbron, KNP	2231CC
Matjeskraal 1047LS	2329DC
Matjesspruit 101HO	2725AC
Matjesspruit 19HP	2726AB
Matjulwana Firebreak, KNP	2531AD
Matjulwana Spruit, KNP	2531AD
Matlabas Location	2329CC
Matlala Hill	2329CC
Matlala Location	2329CC
Matlapitsi River	2430AA
Matloes Location	2329BC
Matukwala Dam, KNP	2230DB
Matukwane, KNP	2231CA
Mauchsberg	2530BA
Mazibambela Picket, KNP	2231CD
Mazila 97LR	2328AD
Mazithi Dam, KNP	2431DB
Mbandywe Dam	2431BA
Mbanyamidemono, KNP (= Mbyamithi)	2531BA
Mbyashishe Bolope, KNP	2331AC
Mdzabi Vlei	2531DC
Meadowbank 429LT	2330CB
Meanderthal 188LS	2329AC
Mecklenburg 112KT	2430AC
Medforodt Park 52JP	2526AD
Meidingen 398LT	2330CA
Melinda 164LR	2328AC
Meliodora	2626CC
Melkboomfontein [illegible]	[illegible]

Melkrivier	2428AB
Melrose Estate 54IR	2628AA
Merinovlakte 495KR	2428CD
Merribeek 424JU	2531DB
Merriekloof 420IT	2630DA
Merry Pebble Stream 246KU	2431CC
Messina 4MT	2230AC
Messina Landbou Proefplaas	2229BD
Messina area	2230AC
Messina, Sonskyn Spa.	2230AC
Mestel Dam, KNP	2531AA
Mestelspruit	2531AA
Mezeg 77JP	2526AC
Mgcobaneni	2531AA
Miami 732LT	2330DA
Mica Siding, Junction Olifants & Letaba Rivers	2430AB
Middelbosch 139HO	2725AD
Middelbult 41MT	2230AC
Middelburg District	2529CD
Middelburg Nature Reserve	2529CB
Middelburg Town and Townlands 287JS	2529CD
Middelfontein 391KR	2428DA
Middelfontein turnoff, North of Nylstroom	2428DA
Middelkraal 50IS	2629AB
Middelwit	2427CC
Middlesex 205KT	2430BD
Mietjesfontein 220MR	2228DB
Mitomeni Pan, KNP	2531BA
Mizpah	2531BB
Mkuhlu	2431CD
Mlawula Estates	2631BD
Mlembe Hill, Barberton District	2531CC
Mmaboleta Estate North-west of Maarstroom	2228CB
Mnanopi 980	2330CD
Mnanopi, Ritavi 2	2330CD
Modderbee Prison, Benoni	2628AB
Modderfontein	2628AA
Modderfontein 35IR	2628AA
Modderkop, Potchefstroom District	2626DB
Modderpan 42KQ	2427AA
Modjadjes Location 424LT	2330CB
Moedig Station	2530CC
Moepel	2328CD
Moerdyk 593LP	2328CD
Mogatles Location	2527CB
Mogomane Hill	2525BA
Mohlaletsi	2429BD
Moilwas Location	2525BC
Mokeetsi 376LT	2330CA
Molepos Location 187KS	2429BA
Moletsi Location	2329CB
Mollepoos Oog 332JP	2526CC
Molototsi River, Giyani	2330D[illegible]
Mondplaisier 494MS	2229DA
Monte Christo 336LR	2328BC
Montrose 406MS	2229DC
Mooifontein 285JS	2329CD

Mooimeisjesfontein 77HS	2729BA
Mooinooi area	2527DA
Mooiplaas, Delmas	2628BA
Mooiplaats 242JS	2529CB
Mooiplaats 355JR	2528CC
Mooiplaats 65KP	2426BC
Mooiville, Rustenburg	2527CA
Mooivlei 4LP	2326DD
Mooiwater Estates 145KR	2428AC
Moolman	2730BB
Moolman, Piet Retief	2730BB
Moonlight 111LR	2328AA
Moorddrift 289KR	2428BD
Moorddrift 470LQ	2327DA
Mopane Station	2229DB
Mopani 527MS	2229DB
Morakane 1HN	2725AA
Morgendal 216KS	2429BB
Morgenrood 354LT	2330CA
Morgenzon	2629DA
Morgenzon 107HT	2730AD
Morgenzon 525KT	2430DC
Morgenzon 533KQ	2427DD
Morgenzon State Forest	2430DC
Moria 83KU	2431AC
Moriah 238KT	2430BD
Moscow 41KU	2431AA
Mosdene Private Nature Reserve	2428DB
Mossiesdal, Middelburg	2529BC
Motsotsotsela	2330DB
Motswedi	2525BD
Motswedi, above	2525BD
Mount Denny 223IT	2630BC
Mpafuri's Location	2230DC
Mphome 949LS	2329DD
Mt. Anderson	2530BA
Mt. Sheba	2430DC
Muiskraal 127IQ	2627AC
Mukula	2230DC
Muldersdrift	2627BB
Munnichshausen 151MS	2230AC
Munnik	2329DB
Munywini Drift, KNP	2431DD
Munywini, KNP	2431DD
Murrayfield 343JR	2528CB
Mutale Picket, KNP	2231AC
Mutale River Middle Beacon	2231AC
Mutalepoort	2231AC
Mutshenzheni	2230CD
Naauwpoort 106KR	2428AB
Naauwpoort 363LD	2327CD
Naauwpoort 441KS	2429BA
Naboomspruit 348KP	2428DA
Nachtwacht 492LR	2328CA
Nahala 75HU	2731BD
Napi Dam, KNP	2531AB
Napi Plot 11, KNP	2531AB

Narina, Duiwelskloof	2330CA
Natalshoop 151JT	2530BA
Nationaal 29KT	2430AB
Naudes Rust 272JU	2531CB
Naudesbank 172IS	2629BB
Nazungongo 152LQ	2327BD
Nederhorst Station	2530AC
Nelshoogte Plantation	2330DD
Nelspruit	2530BD
Nelspruit Citrus Research Station	2530BD
Nelspruit Nature Reserve	2530AC
Nelspruit, Crocodile River	2530BD
Nelspruit, Godwan River	2530BD
Nelspruit, Steiltes	2530BD
Nelspruit, near	2530BD
Nerston 401IT	2630DB
New Agatha Forest Station	2330CC
New Belgium 608LR	2328CC
New Forest 234KU	2431CA
New Tar Road, North of Levhuvhu, KNP	2231AC
New York 490LQ	2327DB
Newgate 802MS	2229DD
Newington 255KU	2431CD
Ngirivane Sandpad, KNP	2431BC
Ngirivane Sandsteenkoppies, KNP	2431BC
Ngirivane Windmill, KNP	2431BC
Ngodwana	2530DA
Ngotso Waterhole, KNP	2431BA
Nieuwpoort 516KQ	2427DD
Nigel Dorpsgebied	2628AD
Niklaas 148MT	2230CA
Nil Desperandum 419JU	2531DB
Njelele Dam	2230CC
Njelele River	2230CA
Njelele River, 40km South of Limpopo River	2230CA
Nkungwini	2531DC
Nkwane Pan, KNP	2431DD
Nooitgedacht	2430BC
Nooitgedacht 176IR	2628AC
Nooitgedacht 17JP	2526AB
Nooitgedacht 227KT	2430BC
Nooitgedacht 237IS	2629BD
Nooitgedacht 253MR	2228DC
Nooitgedacht 332JP	2526CC
Nooitgedacht 333JR	2528CB
Nooitgedacht 345JS	2529DA
Nooitgedacht 392KT	2430CD
Nooitgedacht 471JQ	2527DC
Nooitgedacht 508IQ	2627CC
Nooitgedacht 614JQ	2527AB
Nooitgedacht alias Vetpan 131IP	2626BB
Nooitgedachtdam Nature Reserve	2530CC
Noordkaap	2531CA
Normandie 178HT	2730BB
Normandy 312LR	2328BB
North of Cabora Bassa Line	2231AD
Northumberland 31KU	2431AA
Northwards	

Nsemani Windmill, KNP	2431BC
Nshawu Dam, KNP	2331CB
Nswaswitsontso Drift, KNP	2431DD
Ntlaveni 2MU	2230DC
Ntsweletau	2429DB
Num Num 568KR	2428DA
Numbi Kop, KNP	2531AA
Numbi Road, KNP	2531AA
Nuwelust 482MS	2229DA
Nwambiya Kamp, KNP	2231CB
Nwambiya Pan, KNP	2231CB
Nwambiya Sandveld, KNP	2231CB
Nwambiya Windmill, KNP	2231CB
Nwanebi River turnoff, Letaba River, KNP	2331CD
Nwanedzi West Windmill, KNP	2431BD
Nwanetsi River	2230BC
Nwanetsi, KNP	2431BD
Nwanetsi, eastern boundary, KNP	2431BD
Nwarihlangari, KNP	2231CD
Nwaswishaka Drift, KNP	2531BA
Nwaswitshaka River, KNP	2531BA
Nwaswitshaka, KNP	2531BA
Nwaswitshakamond, KNP	2531BA
Nwatindlopfu Firebreak, KNP	2431DD
Nwatindlopfu Veldpan, KNP	2431DD
Nyamnyulo Pan, KNP	2331AA
Nyandu Bush, Wambiya Sandveld, KNP	2231CB
Nyandu Sandveld, beacon 7	2231CD
Nyandu Sandveld, beacon 9	2231CB
Nyawadi Pan, KNP	2231AC
Nylstroom	2428CB
Nylsvley Nature Reserve	2428DA
Nzulase	2531BC
Oatlands 79IQ	2627AC
Ofcolaco	2430AB
Ogies	2629AA
Ohrigstad 443KT	2430DA
Ohrigstad 443KT, 8km on road to Lydenburg	2430DA
Ohrigstaddam Nature Reserve	2430DC
Okkernootboom 211KU	2431CA
Olienhoutpoort	2628AA
Olievenbosch 506KQ	2427DC
Olievenhoutfontein 111KR	2428AB
Oliewenhoutpoort	2527DD
Olifants Camp, KNP	2431BA
Olifants River, Middelburg	2529CB
Olifantsfontein	2528CC
Olifantsgeraamte 198JT	2530BB
Olifantspoort 414KR	2428DA
Onderhoek 595LT	2330CA
Onderstepoort 266JR	2528CA
Ongezien 365JS	2529DA
Ongezien 717KS	[illegible]
Onrust 332HO	2826AA
Onverwacht 1311LS	[illegible]
Onverwacht 273IT	2630CB
Onverwacht 532JR	2528DD
Oorbietjiesfontein 293IR	[illegible]

Oostenryk 92KS	2429AC
Oriental 60MS	2229AD
Orkney 437IP	2626DC
Orpen Gate, KNP	2431AD
Orpen, KNP	2431AD
Oshoek 212IT	2630BB
Oshoek 69JT	2530AA
Ostend 104KT	2430AD
Ostend 63MT	2230AC
Ostrolenka 107MS	2229AD
Othawa 242KU	2431CD
Othobothini	2732AC
Ottosdal	2625DD
Ottoshalt, Haenertsburg	2329DD
Ottoshoop	2525DB
Oude Zwaanskraal 542JR	2528DC
Outlook 789MS	2229DD
Over Vaal	2630CA
Over Yssel 512LR	2328CA
Overwinning 713MS	2229DD
Oxford 183KT	2430BB
P.O. Hope, Vaalwater	2428AC
Paardedood 186LT	2330AC
Paardedrift 303KR	2428BC
Paardefontein 35HO	2725AA
Paardekop 76HS	2729BA
Paardekraal 135LT	2330AC
Paardeplaats 101HT	2730AB
Paardeplaats 101HT, Ntombe Forest	2730AB
Paardeplaats 154JT	2530BA
Paardeplaats 177IQ	2627BB
Paardeplaats 91JT	2530AD
Paardevlei 201KS	2429BB
Paarl 102LQ	2327BD
Pacdafontein 375KQ	2427CB
Pade Hill	2330DA
Pafuri Rangers Post, KNP	2231AC
Pafuri River, KNP	2231AD
Pafuri W.N.L.A., KNP	2231AD
Pafuri, KNP	2231AD
Pafuri, Saselandonga	2231AD
Palala	2428BC
Palala 35KR	2428AB
Palm Springs, KNP	2231AC
Palmary Ville 254MT	2230CD
Palmford Station	2729BA
Palmietfontein	2330AA
Palmietfontein 110IS	2629AD
Palmietfontein 24KS	2329CD
Palmietfontein 337IR	2628BC
Palmietfontein 410IQ	2627CB
Panamaria	2529DA
Panfontein 270HO	2725CB
Pankoppen 36JR	2528AB
Papkuil, KNP	2231CA
Paradise 724MS	2229DD
Paradise Bend, Pretoria/Krugersdorp Road	2527DD

Paris 206KT	2430BD
Parkfield 725MS	2229DD
Patagonia 349MS	2229CD
Pauls Kop, Hoedspruit	2430BD
Peach Tree 544KT	2430DC
Pelindaba	2528CA
Penge 108KT (= Penge)	2430AD
Pentonville 216LQ	2327CB
Peover 772MS	2229DC
Percy Fyfe Nature Reserve	2429AA
Perkeo 223KT	2430BC
Perth 242LS	2329BB
Perth 303KT	2430CB
Petershof 131MS	2229BA
Phalaborwa	2331CC
Phayizani	2330DB
Pheizier 113IQ	2625BD
Philipstown 390MS	2229CD
Phugwane, KNP	2230DD
Picket Road, Tseri River, KNP	2431AB
Pienaarspoort 339JR	2528CB
Pienaarsriver	2528AB
Pienaarsriver 83JR	2528AB
Piet Retief	2730BB
Pieterman 445LR	2328CB
Pietersburg	2329CD
Pieterskraal 190JR	2528BB
Pijlkop 593MS	2229DB
Pilanesberg	2527AA
Pilgrim's Rest	2430DC
Pilgrim's Rest District	2430DD
Pilgrim's Rest District, Hebronberg	2430DB
Pilgrim's Rest District, on Main Road	2431AC
Pilgrim's Rest Nature Reserve	2430DD
Pimlico 305JT	2530BD
Pinedene	2528CC
Pipe Klip Berg 21HU	2731AC
Pittville 197IT	2630BA
Planknek 43KS	2429AA
Plaston	2531AC
Plat River	2528AA
Platjan 198MR	2228BD
Platrivier, Waterberg	2428CC
Pleizer 113IO	2625BD
Plot 105 Rietgat 105JR	2528AC
Plot 158 Rietgat 105JR	2528AC
Plot 164 Rietgat 105JR	2528AC
Plot 19 Klipfontein, Wonderboom, Pretoria	2528CA
Plot 216 Vlakplaas	2528CC
Plot 22 Welgevonden, Hammanskraal	2528AC
Plot 24 Olympus, Pretoria	2528CD
Plot 25 Kameeldrif, Pretoria	2528CB
Plot 34 Kromdraai, Pretoria	2528AD
Plot 41 North of Krugersdorp	2627BB
Plot 93 Kameeldrif, Pretoria	2528CB
Plot Pomona, Benoni	2628AB
Plot Waterlands	2628AC
Politsi	2330CA

Pongola Nature Reserve	2731BD
Ponieskrans 543KT	2430DD
Pont Drift 12MS	2229AA
Potberg 30HS	2729AA
Potchefstroom	2627CA
Potchefstroom Townlands	2627CA
Potchefstroom, Mooibank	2627CA
Potgieters Hoop 151HT	2730BB
Potgietershoogte 134JQ	2527AD
Potgietersrus	2429AA
Potloodspruit 30JT	2530AB
Potosenyane	2429DB
Praktiseer 275KT	2430CB
Preezburg 400LR	2328BC
Premier Mine, Cullinan	2528DA
Pretoria	2528CA
Pretoria 25KT	2430AB
Pretoria District	2528CA
Pretoria District, Windhorn	2528CA
Pretoria East	2528CA
Pretoria North	2528CA
Pretoria West	2528CA
Pretoria West, Drive-In	2528CA
Pretoria, Annlin	2528CA
Pretoria, Apies River	2528CA
Pretoria, Arcadia	2528CB
Pretoria, Ashlea Gardens	2528CD
Pretoria, Bashewa Agricultural Holdings	2528CD
Pretoria, Boekenhout	2528AD
Pretoria, Bon Accord	2528CA
Pretoria, Botanical Gardens	2528CB
Pretoria, Botanical Lab	2528CA
Pretoria, Brooklyn	2528CC
Pretoria, Brummeria	2528CC
Pretoria, Capital Park	2528CA
Pretoria, Claremont	2528CA
Pretoria, Clubview	2528CC
Pretoria, Clubview East	2528CC
Pretoria, Colbyn	2528CB
Pretoria, Constantia Park	2528CD
Pretoria, Crocodile River Pleasure Resort	2528CA
Pretoria, Danville	2528CA
Pretoria, Daspoort	2528CA
Pretoria, Dely Road, Hazelwood	2528CD
Pretoria, Derdepoort	2528CB
Pretoria, District, Magaliesberg	2528CA
Pretoria, East Lynne	2528CB
Pretoria, East Lynne Quarry	2528CB
Pretoria, Eerste Fabrieke	2528CB
Pretoria, Eldoraigne	2528CC
Pretoria, Eloffsdal	2528CA
Pretoria, Erasmia	2528CC
Pretoria, Fairy Glen	2528CD
Pretoria, Florauna	2528CA
Pretoria, Fountains	2528CC
Pretoria, Fountains Grove	2528CC
Pretoria, French Tracking Station	2528CB
Pretoria, Gardens	2528CA

Pretoria, Gezina	2528CA
Pretoria, Glenferness Agricultural Holdings	2528CA
Pretoria, Groenkloof N.P.	2528CC
Pretoria, Hartbeeshoek	2528CA
Pretoria, Hatfield	2528CA
Pretoria, Hazelwood	2528CD
Pretoria, Hercules	2528CA
Pretoria, Hornsnek	2528CA
Pretoria, Iscor	2528CA
Pretoria, Iscor Headquarters	2528CC
Pretoria, Iscor/Police College	2528CA
Pretoria, Kameeldrift	2528CB
Pretoria, Kilner Park	2528CB
Pretoria, Kloof Snake Park	2528CB
Pretoria, Koedoespoort	2528CB
Pretoria, Kwaggaspoort	2528CC
Pretoria, Kwaggasrand	2528CC
Pretoria, Lazaretto	2528CC
Pretoria, Leper Asylum	2528CA
Pretoria, Les Marais	2528CA
Pretoria, Lynnwood	2528CD
Pretoria, Lynnwood Drive In	2528CD
Pretoria, Lynnwood Glen	2528CD
Pretoria, Lynnwood Ridge	2528CD
Pretoria, Magaliesberg	2528CA
Pretoria, Magaliesberg above Sinoville	2528CB
Pretoria, Magaliesberg, Ster Drive-In	2528CA
Pretoria, Marabastad	2528CA
Pretoria, Maroelana	2528CD
Pretoria, Mayville	2528CA
Pretoria, Meintjieskop	2528CA
Pretoria, Menlo Park	2528CD
Pretoria, Menlo Park Extension	2528CD
Pretoria, Meyerspark	2528CB
Pretoria, Monavoni	2528CC
Pretoria, Montana	2528CB
Pretoria, Montana Estate	2528CB
Pretoria, Monument Park	2528CC
Pretoria, Mooiplaats	2528CD
Pretoria, Moreleta Park	2528CD
Pretoria, Moreleta Spruit	2528CD
Pretoria, Mountain View	2528CA
Pretoria, Muckleneuk	2528CC
Pretoria, Murrayfield	2528CD
Pretoria, New Muckleneuk	2528CC
Pretoria, Olympus	2528CD
Pretoria, Onderstepoort	2528CA
Pretoria, Petronella	2528CA
Pretoria, Pienaarsrivierdam	2528CB
Pretoria, Pierneefrand	2528CB
Pretoria, Pinedene	2528CC
Pretoria, Proclamation Hill	2528CC
Pretoria, Pumulaan, Kameeldrif	2528CB
Pretoria, Pyramid	2528CA
Pretoria, Queenswood	2528CB
Pretoria, Rietfontein	2528CA
Pretoria, Rietondale	2528CA
Pretoria, Rietvlei Dam	2528CD

Pretoria, Riviera	2528CA
Pretoria, Roberts Heights	2528CC
Pretoria, Roseville	2528CA
Pretoria, Rosewood	2528CA
Pretoria, Rosslyn	2528CA
Pretoria, Sandfontein	2528CA
Pretoria, Shere Plots	2528CD
Pretoria, Silverton	2528CB
Pretoria, Sinoville	2528CA
Pretoria, Skinners Court	2528CA
Pretoria, Sunnyside	2528CC
Pretoria, The Willows	2528CD
Pretoria, Thorns	2528CA
Pretoria, Uitspan Drive-In	2528CA
Pretoria, Union Buildings	2528CA
Pretoria, University	2528CC
Pretoria, University Farm	2528CD
Pretoria, Val de Grace	2528CB
Pretoria, Valhalla	2528CC
Pretoria, Valley Farm	2528CD
Pretoria, Victoria Bridge, Sunnyside	2528CC
Pretoria, Villieria	2528CA
Pretoria, Voortrekkerhoogte	2528CC
Pretoria, Waltloo	2528CB
Pretoria, Wapad Nek, The Willows	2528CD
Pretoria, Waterkloof	2528CC
Pretoria, Waterkloof Agricultural Holdings	2528CC
Pretoria, Waterkloof Air Base	2528CC
Pretoria, Waterkloof Glen	2528CC
Pretoria, Waterkloof Park	2528CC
Pretoria, Waterkloof Ridge	2528CC
Pretoria, Waverley	2528CA
Pretoria, West End	2528CA
Pretoria, Wierda Park	2528CC
Pretoria, Wilge River	2528DC
Pretoria, Willow Glen	2528CD
Pretoria, Wingate Park	2528CD
Pretoria, Witfontein	2528CA
Pretoria, Wonderboom	2528CA
Pretoria, Wonderboom Airport	2528CA
Pretoria, Wonderboom Suid	2528CA
Pretoria, Wonderboompoort	2528CA
Pretoria, Wonderboomspruit	2528CA
Pretoria, Zoo Hill	2528CA
Pretoria, Zoological Gardens	2528CA
Pretoria, Zwartkop	2528CC
Pretoria, Zwartkops Airport	2528CC
Pretorius 531MS	2228DB
Pretoriuskop - Faai Roan Camp, KNP	2531AB
Pretoriuskop, KNP	2531AB
Primkop 116JU	2531AC
Prince's Hill 704MS	2228DD
Prospect 315HO	2725CC
Pumbe Pan, KNP	2431BB
Pumbe Picket, KNP	2431BB
Pumbe Put, KNP	2431BB
Pumbe Sandveld, KNP	2431BB
Punda Milia, KNP	2231AC

Putney 110KT	2430AC
Pylkop 26JQ	2527AB
Rabelais Dam, KNP	2431AD
Radium Station	2528AB
Radon, 20km South of Pretoria	2528CC
Rainpan 60KQ	2427AD
Ramiti Pan, KNP	2331DD
Ramsgate 543MS	2229DA
Randburg	2628AA
Randburg, Bush Hill	2627BB
Randburg, Noordwyk	2528CC
Randfontein	2627BA
Randfontein, Kloof Mine	2627BC
Rankins Pass	2427DB
Ratelhoek 158KR	2428AD
Ratho 1MS	2229AA
Ratomba (= Ratombo)	2330AA
Ratzegaaiskraal 204IP	2626BC
Ravenscourt 257KU	2431CD
Rayton	2528CC
Redcliff 426IT	2630DB
Reguit 530KQ	2427DD
Renosterkop	2531CA
Retief 290LR	2328BA
Rhenoster Spruit	2527DD
Rhenosterdrift 172JQ	2528AA
Rhenosterfontein 494JP	2626BB
Rhenosterfontein 514JR	2528DC
Rhenosterfontein 560IQ	2627DA
Rhenosterfontein 563IQ	2627DA
Rhenosterkop 195JU	2531CA
Rhenosterkop 452JR	2528DB
Rhenosterpoort 283KQ	2427DB
Rhenosterpoort 325IR	2428CA
Rhenosterpoort 402KR	2428CA
Rhenosterpoort 442KQ	2427DB
Rhenosterpoort 452KR	2428CA
Rhenosterpoort, Nylstroom	2428CB
Rhenosterspruit 326IP	2626CD
Rhenosterspruit 59JQ	2527AC
Richmond 4LQ	2327AD
Riekerts Laager 165JR	2528BB
Riekertsvraag 593KR	2428DD
Riet 182MT	2230CA
Rietbult Estates 505IP	2626DA
Rietfontein 1029LS	2329DD
Rietfontein 115IP	2626AD
Rietfontein 178JP	2526BC
Rietfontein 214JR	2528BC
Rietfontein 219IP	2626BC
Rietfontein 21IR	2528BC
Rietfontein 240IQ	2626CC
Rietfontein 255JT	2530BD
Rietfontein 274JT	2530BD
Rietfontein 301IQ	2627BD
Rietfontein 313IR	2628BD
Rietfontein 365JT	2530CB
Rietfontein 40HS	2729AB

Rietfontein 446JR	2528DB
Rietfontein 487JP	2526DC
Rietfontein 536KQ	2427DD
Rietfontein 62IO	2625BA
Rietfontein Plantation	2530BB
Rietfontein State Forest	2530AB
Rietfontein, Derdepoort	2528CB
Rietfontein, Krugersdorp	2627BB
Rietgat 105JR	2528AC
Rietgat 224JQ	2527BD
Rietkolk 99IO	2625BC
Rietkraal 129HP	2726DA
Rietkuil 186HO	2725BB
Rietkuil 491JS	2529DD
Rietpan 479JP	2526DC
Rietpoort 193IR	2628BC
Rietpoort 405IS	2629CC
Rietpoort 83HS	2729BB
Rietput 60HO	2725AB
Rietspruit 385MS	2229CC
Rietspruit 412KR	2428CB
Rietspruit 83JQ	2527AD
Rietspruit 91KQ	2627DB
Rietvalei 285IP	2626CC
Rietvallei 130IQ	2627AC
Rietvallei 180IQ	2627BB
Rietvallei 256JT	2530BC
Rietvlei 33HS	2729AA
Rietvlei 375JT	2530CB
Rietvlei 433IS	2629DB
Rietvly 271JQ	2527CA
Ripape Dam, KNP	2431DA
Rissik 637MS	2229DB
Rissik P.N.R., 8km East of Warmbaths	2428CD
Ritakop, Ritavi 2	2330CD
River 141MS	2229BB
Riverhead 755LT	2330DC
Riversdale 246KT	2430BD
Rivola Hill	2330AA
Rivulets	2530BD
Robertson 748MS	2229DC
Rochdale 700MS	2229DC
Roedtan	2429CA
Roerfontein 465JP	2526DD
Rolf Quarry, Halfway House	2528CC
Rolfontein 536IS	2629DD
Rolle 235KU	2431CA
Rolvark 350LT	2330CA
Rondavelskraal 290JP	2526CD
Rondebosch 287LS	2329BB
Rondefontein 974LS	2329DD
Roode Kopjes Put 32JP	2526AA
Roodekopjes 67HS	2729BA
Roodekopjesfontein 15JP	2526AB
Roodekraal 454IQ	2627CC
Roodekrans 457IS	2629DA
Roodekuil 183JQ	2527BA

Roodeplaat 293JR	2528CB
Roodeplaat Agricultural Research Station, Pretoria	2528CB
Roodeplaat Dam Area, Pretoria.	2528CC
Roodeplaat Dam Nature Reserve	2528CB
Roodeplaat Dam turnoff	2528CB
Roodepoort	2627BB
Roodepoort 302IQ	2627BD
Roodepoort 314KR	2428BC
Roodepoort 598IR	2628DD
Rooderand 41JP	2525AB
Roodevlakte 632KR	2428DD
Roodewal 102HS	2729BA
Roodewal 117JT	2530AD
Roodewal 251JT	2530BD
Roodewal 270IT	2630CA
Roodewal 322JQ	2527CC
Roodewal 364IO	2625DC
Roodewal 454JQ	2526DA
Rooiberg	2429DD
Rooiberg Mine	2427DC
Rooiberg, Waterberg District	2427DC
Rooibok 707KS	2429CD
Rooibokbult 330LQ	2327CC
Rooibokkop 744KS	2429CD
Rooiboklaagte 112KS	2429AD
Rooiboschfontein 576KS	2429CB
Rooidraai 85IQ	2627AC
Rooigrond 464MS	2229CD
Rooihuiskraal	2528CC
Rooijantjesfontein 89IP	2626AC
Rooikop 181JR	2528BA
Rooikopjes 483JR	2528DA
Rooikoppen 408IS (= Standerskop)	2629CC
Rooikoppies, Pretoria District	2528DA
Rooikoppiesput 32JP	2526AA
Rooikraal	2529BC
Rooipoort 354IP	2626DB
Rooipoortje 453IQ	2627CA
Rooiwal 270JR	2528CA
Rooiwal Power Station	2528CA
Roossenekal	2529BB
Roosterlaagte 594KR	2428DD
Rooy Hoogte 347MR	2528DC
Rooykrars 538KQ	2427DC
Rosehaugh	2530BD
Rosehaugh State Forest	2530BD
Rosehaugh Station	2530BD
Rosendal 32HU	2737AD
Ross 55KU	2431AD
Rubbervale 784LT	2330DC
Rudolph 17LS	2329AA
Rudyard 244LS	2329BB
Ruhrord 324MS	2229CB
Ruigdraai 809LS	2229DA
Ruighoek 169JP	2526BB
Rust der Winter	2528AB
Rust der Winter Nature Reserve	2528BA
Rustenburg	2527CA

Rustenburg East	2527CB
Rustenburg Kloof	2527CB
Rustenburg Nature Reserve	2527CA
Rustenburg Platinum Mine	2527CB
Rustenburg Townlands 272JQ	2527CA
Rustenburg, Kroondal	2527CB
Rustfontein 1030LS	2329DD
Rustfontein 548IR	2628DA
Rustfontein 781LS	2329DB
Rusticana 660IR	2628DD
Rustkraal 129HP	2726CA
Rustvoorby 383JP	2526DA
S.A. Bantu Trust	2531DC
S.A. Lombard Nature Reserve	2725CB
Sabi Bridge, KNP	2431DC
Sabi Sand Game Reserve	2431CD
Sabie	2530BB
Sabie, Castle Rock Caravan Park	2530BB
Sabie-Sand loop road	2431DC
Saddleback Hill, Barberton	2531CC
Sagan 217MS	2229BD
Sais 277MR	2228DD
Salique 427KT	2430DB
Sand River Bridge	2431DC
Sandbult 300LQ	2327CB
Sandfontein via Marahelni (= Zandfontein 315KQ)	2427AD
Sandilands 708MS	2229DD
Sandnek north of Levhuvhu	2231AC
Sandringham 197KU	2431CA
Sandsloot 214JQ	2527BC
Sandton	2528AA
Saselandonga Gorge, KNP	2231CB
Saselandongaspruit, KNP	2231CB
Satara, KNP	2431BD
Schaapplaats 664LS	2329CD
Schagen 273JT	2530BD
Scheiding 746LT	2330DD
Schelem & Malta	2430AB
Schelem 32KT	2430AB
Scherp Arabie 743KS	2429CD
Schietpoort 507JR	2528DC
Schiettocht 25LU	2331CC
Schilderkrans 1041LS	2329DD
Schoemansdal 333JU	2531CB
Schoemanskloof	2530A[illegible]
Schoongezicht 124IP	2526BA
Schoongezicht 364JT	2530CA
Schoongezicht 65KU	2431AC
Schoonheid 2HN	2724BB
Schoonkloof 273KP	2426DD
Schoonoord 326KT	2429DD
Schoonoord 380JU	2531CC
Schots 196KP	2426[illegible]
Schrikfontein 715LP	2328DA
Schroca 46MS	2229AB
Schuilhoek 139HS	2729BD
Schuinsdrift 75JP	2526AD
Schweizer Reneke Town and Townlands 62HO	2725AB

Scrutton 23MT	2230AD
Sedula, Leydsdorp	2430AB
Segop's Location 821LS	2329DB
Sekale	2429DA
Sekororo	2430AB
Sekororo Mountains	2430AA
Sekukuniland on Lapilane River	2429DB
Selati	2430BA
Selati Ranch 143KT	2430BA
Selati River	2430BA
Sentinal Hill	2231AC
Serala 5KT	2430AA
Serolle 204MT	2230CC
Seshwane 436LT	2330CA
Sesmylspruit - Hennops River	2528CC
Settlers	2428DC
Seville 224KU	2431CB
Sewefontein	2530BC
Shabaku	2231AC
Shabaku, near	2231AC
Shabarumbe Spruit, KNP	2231CB
Shabeni Borrow pit, KNP	2531AA
Shabeni Kop, KNP	2531AA
Shabenifontein, KNP	2531AA
Shaholle, Gravelotte	2330DC
Shamela	2330BD
Shamiriri	2330BC
Shangoni, KNP	2330BB
Shantangalani Waterholes, KNP	2231CA
Sharpeville, Vereeniging District	2627DB
Shavavunga Hill, Giyani.	2330BA
Sheba 219JT	2530BB
Sheepmoor	2630CB
Sheiding 746LT	2330DD
Sheila 10KU	2431AA
Sheldrake 239MS	2229BD
Shelton Hall 182MS	2229BC
Shidzidzi, KNP	2431BD
Shidzivani, KNP	2231CA
Shilowa Picket, KNP	2331BC
Shilowane (= Shiluvane)	2430AB
Shinenen: Spruit, KNP	2431BD
Shingomeni Trig Beacon, KNP	2231CD
Shingomeni Windmill, KNP	2231CD
Shingwedzi Agricultural Station	2330BA
Shingwedzi Drift, KNP	2331AB
Shingwedzi, KNP	2331AB
Shinobyeni Spruit, KNP	2331DD
Shinokwenfontein, KNP	2231AC
Shipudza Fountain, KNP	2230DB
Shipudza Spruit, KNP	2230DB
Shirhombe Picket, KNP	2231CB
Shirimantanga Dam, KNP	2531BA
Shishakashanghondzo Dam, KNP	2431BA
Shishengedzini, KNP	2431DD
Shiteveteve Windmill, KNP	2431DC
Shitsongweni, KNP	2431BB
Shiyalongubo Dam	2531CA

Shlaralumi River, KNP Boundary	2431AB
Shylock 256JQ	2527CA
Siabushwe, 30km South-west of Marble Hall	2529AA
Sibasa	2230CD
Silonque 23LU	2331CC
Silverbank 611IR	2628DD
Silverleaves Farm, Tzaneen	2330CC
Silwana's Location 719LT	2330DB
Simonsdal 88IT	2630AC
Sionwe Mountain	2330AD
Skeerpoort	2527DD
Skilpadfontein	2528BB
Skukuza 57	2431DA
Skukuza to Malelane KNP	2431DC
Skukuza, 14km to Lower Sabie, KNP	2431DC
Skukuza, 27km to Malelane, KNP	2431DC
Skukuza, KNP	2431DC
Skukuza, Sabie River Bridge	2431DC
Slagboom 7JS	2529AA
Slangfontein 641LQ	2327DC
Smaldale 225KP	2426DC
Smaldeel 36KP	2426BD
Smalkloof 122HS	2729BD
Smithfield 44IS	2629AA
Smithfield 456MS	2229CD
Smitskraal 788LS	2329DB
Solomondale, Pietersburg District	2329DC
Somerkomst	2626AA
Somerset 150JT	2530AD
Sonskyn Spa, Messina	2230CA
Spaarwater 171IR	2628AD
Speculatie 483JS	2529DC
Spioenkop 252IS	2629BC
Spitskop 276IS	2630CB
Spitskop 502JR	2528DD
Spitskop Staatsbos	2530BB
Spitzkopjes, Lydenburg District	2530AB
Spokonyole, KNP	2231AC
Springbokfontein 107IO	2625BC
Springbokpan 61IO	2625BB
Springfield 337LQ	2327CC
Springs	2628AD
Springs Dist.	2628AD
Springvalley 200KU	2431AD
Squamans 416JU	2531DB
St Agnesfontein 347LQ	2327CC
Standerton	2629CD
Stanley Bush Kop	2430DD
Stateland	2430BA
Steamboat 306MR	2228DD
Steelpoort	2430CA
Steenbokfontein 426JP	2526DB
Steenbokpan 295LQ	2327CB
Steilpoort 615KR	2428DC
Sterkfontein 173IQ	2627BA
Sterkfontein 282KQ	2427BD
Sterkfontein 299IS	2629CB
Sterkfontein Caves	2627BA

Sterkspruit 412KT	2430DA
Sterkspruit 508IS	2629DD
Sterkstroom 216IP	2626BC
Sterkstroom 411JP	2526DA
Sterkstroom 565KR	2428DA
Sterkstroom, Rustenburg District	2527CB
Sterkwater, Potgietersrus	2630BB
Steynsdorp	2629BD
Steynsdrift 145JS	2529BB
Steynskraal 399IR	2628CB
Stilfontein, Klerksdorp District	2626DD
Stinkwater 97JR	2528AC
Stockpoort 1LQ	2327AD
Stoffberg	2529BD
Stolznek, KNP	2531AD
Stompiesfontein, P.K. Strijdom, Germiston	2628AA
Stompoorfontein 391IQ	2627CA
Stratford 309KQ	2427CB
Streatham 100KT	2430AD
Strehla 261IR	2628BB
Stroomdrift 124HP	2726CA
Strydfontein 320IP	2726AB
Strydfontein 442KT	2430DA
Strydfontein 84, Hornsnek, Pretoria District	2528CA
Strydkraal 477IT	2630DD
Stryfontein 477IR	2628CC
Sudbury 392MS	2229CD
Sudwala Caves	2530BC
Sudwalaskraal 271JT	2530BC
Suikerboschfontein 422JT	2530CD
Suikerboschkop 361JS	2529DB
Suikerbosrand Nature Reserve	2628CA
Suikerbosrand Nature Reserve, Keyterskloof	2628CA
Suikerkop 62KU	2431AC
Sunkelsdrif	2730BC
Sunningdale	2429AD
Sunnymead 600JT	2530DD
Sunnyside 532LQ	2327DB
Suurbekom (= Zuurbekom)	2627BC
Suzette 32MT	2230AD
Swadini	2430DB
Swadini Dam	2430DB
Swadini Snake Park	2430BD
Swanepoelsdrift 166MR	2228DA
Swartkop 383JR	2528CC
Swartkops Windmill, KNP	2431BA
Swartruggens	2526DA
Swartwater	2228CC
Swavelpoort 373JR	2528CD
Sweethome 315LR	2328BB
Sweethome 322KQ	2427CA
Swelpan 245LQ	2327CA
Swinburne 68LQ	2327BD
Syferfontein 13HP	2726AB
Syferfontein 178JP	2526BD
Syferfontein 293IQ	2627BD
Syferfontein 303IP	2626CD
Syferfontein 767JP	2526AD

Syfergat 204HO	2725BD
Syfergat 56HP	2726AD
Tafelkop 100KR (100KR is Witklip, Tafelkop is 46)	2428AC
Tafelkop 126HT	2730AD
Tafelkop 270IS	2629BD
Tafelkop 46KR	2428AB
Takane	2431CA
Tamboetipan 176JR	2528BA
Tambootie Pan 175JR	2528BA
Tambootierand 366KR .	2428CA
Tambotierand 356KR	2428CA
Tar Road North of Levhuvhu, KNP	2231AC
Tata 7LR	2328AA
Tati 59MR	2228CA
Tautesberg	2529BB
Teivate E. Shore St. Lucia, Natal	2832BA
Tempelhof 150MS	2229BB
Ten Bosch 162JU	2531BD
Tevrede 178JT	2531AA
Tevreden 56IT	2630AA
Thabazimbi	2427CB
Thambandou, Sibasa District	2230DA
Thankerton 144KT	2430BB
The Brock 162JU	2531AC
The Brook 196IT	2630BA
The Chine 259IT	2630DA
The Crows Nest, The Downs Nature Reserve	2430AA
The Curlews 103JU	2531AC
The Downs 34KT	2430AA
The Grange 471LS	2329BC
The Hippos 192JU	2531BD
The Moss 763MS	2229DC
The Oaks 198KT	2430BC
The Ranch 66JU	2430AC
The Rest 454JT	2530DB
The Staircase, Mauchsberg	2530BA
The Valley Farm 127JU	2531AC
The Willows 197KT	2430BC
The Willows 340JR	2528CB
Theespruit 156IT	2630BB
Theunispan 293LQ	2227CB
Thohoyandu	2230DA
Thonondo Peak	2230CC
Thor 147MS	2229BB
Thornhill Farm 171JU	2531BC
Three Rivers	2627DB
Three Sisters Louws Creek	2531CB
Thulemahashi 235KU	2431CA
Tiegerpoort 371JR (= Tierpoort)	2528CD
Tienie Louw Nature Reserve	2531CC
Tierfontein 61IS	2629AA
Tilburg 145LQ	2327BD
Timbavati Nature Reserve	2431AB
Timbavati Nature Reserve, Sohobele	2431AB
Timbavati, Ngoka	2431AB
Tivoli 98KT	2430AC
Tjakastad 730JT	2530DD
Tlapa-la-mokwena, KNP	[illegible]

Tolwe	2228DC
Tonga 475JU	2531DB
Tonkwanekloof, 80km West of Pretoria	2527DC
Tonteldoos	2529BD
Tooyskraal 531KQ	2427DD
Tovey 154MS	2229BD
Transport 145KT	2430BB
Trehowel 133KR	2428AD
Trekpad 455MS	2229CD
Trevenna 119MT	2230CB
Troya 151JR	2528BB
Tsama River, Letaba District (= Nsama River)	2330BD
Tseri River, KNP	2431AB
Tshakhuma	2330AB
Tshalungwafontein, KNP	2231CA
Tshamavhudzi Peak, North-eastern slope	2230DA
Tshamavhudzi Peak, Northern slope	2230DB
Tshenzhelani	2230BD
Tsheri, KNP	2431AB
Tshidzi Hill	2230DB
Tshikuyu	2230BD
Tshilavhila Spruit, KNP	2230DB
Tshipise 105MT	2230CA
Tshitangenzhe	2230CB
Tshokwane, KNP	2431DD
Tswiriri	2431DC
Tugela 171MR	2228DA
Tuinplaats 678KR	2428DC
Tuli 56MR	2228CA
Turbine Waters	2330CA
Turffontein 126IQ	2622AC
Turfsloot 81KP	2426CA
Tuscanen 17MS	2229AA
Twee Rivier 197JQ	2527BC
Tweeddale 262MS	2229CA
Tweefontein	2528AC
Tweefontein 467IS	2629DA
Tweefontein 491JR	2528DD
Tweefontein 523JQ	2527DD
Tweefontein 58JQ	2525DB
Tweefontein 97HS	2729BB
Tweelingspruit 152IQ	2525BD
Tweerivier 197JQ	2527BC
Twilight 15MT	2230AC
Tygerfontein 93MR	2228CB
Tygerkloof 193IT	2630BB
Tzaneen	2330CC
Tzaneen 538LT	2330CC
Udney 321LR	2328BB
Uitenpas 2MT	2230AC
Uitkomst 499JQ	2527DD
Uitkomst 769LS	2329DB
Uitkyk Nature Reserve	2531CA
Uitlanderskraal 125JP	2526BA
Uitschot 233IP	2626CA
Uitsoek 63KP	2425AA
Uitspan 65LC	2327BA

Uitvalskop 14HN	2724BD
Uitzicht 314JR	2528CA
Uitzoek 63KR	2428AA
Umkaya 428JU	2531DB
Umkonyaan 42HU	2731AC
Umzinto 36MR	2228CB
Umzumbi 21MR	2228CB
Uniondale 756MS	2229DC
Urk 10LS	2329AA
Uthla 239KU	2431CB
Vaalbank 110IP	2626AD
Vaalbank 163JR	2528BB
Vaalbank 233IS	2629BC
Vaalbank 355HO	2725DB
Vaalbank, Elands R.	2528BB
Vaalboschfontein 188HO	2725BC
Vaaldam	2628CC
Vaalharts Settlement A	2724DD
Vaalhoek, Dientjie	2430DB
Vaalkop 104IS	2629AD
Vaalkop 192JQ	2527BA
Vaalkop 222IO	2625CD
Vaalkop 490IS	2629DC
Vaalkop Dam	2527AD
Vaalpenskraal 726LR	2328DB
Vaalwater	2428AC
Vaalwater 162LT	2230AD
Val	2628DD
Valley View	2531CB
Van Collers Pass, Waterpoort	2229DC
Van Deventer 641MS	2229DB
Van Oudtshoorn Stroom 261IT	2630CA
Van Stadenshoek 12KP	2426BB
Van Tondershoek 10KO	2425DD
Van Wyksfontein 3LR	2327BB
Van der Waltspoort 81HT	2730AA
Vanderbijlpark	2627DB
Varedig 265LR	2328BB
Varkenskraal 93IQ	2627AC
Varkenskuil 605KR	2428DC
Varkfontein 141KQ	2427BA
Veekraal 1031LS	2329DD
Venice 40KU	2431AA
Ventersdorp Dorpsgebied	2626BD
Venterskroon	2627CC
Verbaard 53MT	2230AC
Vereeniging	2627DB
Vergelegen 728JT	2530DC
Vergelegen 819KS	2429DD
Vergenoeg 177JT	2530BB
Vergeval 64HU	2731BC
Verguide Helm 316LQ	2327CB
Verkyk 88HS	2729BB
Verlief	2330AC
Vermaas	2625DB
Verpoort 161KP	2426DB
Verwoerdburg	2528CC

Vetfontein 360MS	2229CD
Vetpan 131IP	2626BB
Vhembe	2229AB
Vhurivhuri Plantation	2230DB
Vhuswinzhe	2230CC
Victoria 552LR	2328CA
Vienna 207KT	2430BD
Vier en Twintig Rivier 701LR	2328DB
Vierfontein 61IS	2629AA
Viljoenshoop 299KT	2430CB
Virginia 6LQ	2327AD
Vivo	2329AB
Vivo area	2329AB
Vlakbult 450JU	2531DA
Vlakfontein	2527DD
Vlakfontein 213IP	2626BD
Vlakfontein 315IP	2626CC
Vlakfontein 37HP	2726AA
Vlakfontein 453JR	2528DB
Vlakfontein 457JR	2528DB
Vlakfontein 522KR	2428DA
Vlakfontein 558IR	2628DA
Vlakfontein 723KS	2429CC
Vlaknek 392KQ	2427CC
Vlakplaats 112IQ	2625BD
Vlakplaats 113KQ	2427AC
Vlakplaats 268IR	2628BB
Vlakplaats 283KP	2426DD
Vlakplaats 317JT	2530CA
Vlakplaats 354JR	2528CC
Vlakplaats 535KS	2429BC
Vlakspruit 308IS	2629CB
Vlakspruit 42HS	2729AB
Vlamboom Station, Nelspruit District	2530BD
Vliegepoort, Rustenburg	2527CA
Vluchtkraal 420LS	2329BD
Vogelfontein 400JP	2526DB
Vogelstruisfontein 32KQ	2427AA
Vogelstruisfontein 765LR	2328DD
Vogelstruiskraal 397KQ	2427CC
Vogelstruispan 189JQ	2527BA
Volksrust	2729BD
Vooruitzicht 374JU	2531CC
Voorwaarts 28MT	2230AD
Vredeburg 256IO	2625CC
Vreedzaam 822LS	2329DB
Vrieskraal 4JS	2529AA
Vrischgewaagd 226JR	2528BD
Vrouwensbrom 80MT	2230CD
Vryheid 134HO	2725AC
Vryheid 97HT	2730AB
Vulcanus 584LS	2329CA
Vuurfontein 117HO	2725AD
Vygeboom	2428CB
Vygeboom 619JT	2530DC
Vygeboompoort 456KP	2428CD
Vygeboomspruit 286LS	2329BB
Vygeboomspruit 29JQ	2527AB

Waaihoek 286IT	2630CB
Waaikraal 396JQ	2527DA
Wachtenbietjeskop 506JR	2528DD
Wadeville, Alberton	2628AA
Waerkum 302LS	2329BA
Wagendrift 64LT	2330AB
Wakkerstroom	2730AC
Wakkerstroom Townlands 121HT	2730AC
Wanhoop 485JU	2531DB
Wanhoop 78JT	2530AC
Warmbad 18HU	2731AC
Warmbaths	2428CD
Warmbaths area	2428CD
Waschbank 1HT	2730AA
Waterhoutboom 567KT	2430DD
Waterpan 292IQ	2627BC
Waterpoort	2229DC
Waterpoort 694MS	2229DC
Waterpoort 695MS	2229DC
Waterval 128HS	2729BC
Waterval 138HS	2729BC
Waterval 205KS	2429BB
Waterval 220JQ	2527BD
Waterval 273JR	2528CB
Waterval 273KU	2433CC
Waterval 297KR	2428BD
Waterval 561KQ	2427DC
Waterval 601LQ	2327DC
Waterval 793LS	2329DD
Waterval Boven	2530CB
Waterval Onder	2530CB
Waterval, West of Warmbad	2527BD
Weenen 47 (= Prinzenhage 47MT)	2230AC
Weergevonden 173IT	2630BB
Weihoek 540KQ	2427DC
Weimershoek 81JT	2530AD
Weipe 47MS	2229AB
Welbedacht 382IS	2629CD
Welbekend 117JQ	2527AD
Welgedacht 130JR	2528AD
Welgedacht 82HS	2729BB
Welgegund 375IQ	2627CA
Welgegund 491JQ	2527DD
Welgelegen 107IT	2630AC
Welgemeend 206IS	2629BB
Welgevonden 312IQ	2626DA
Welgevonden 36LT	2330AA
Welgevonden 444LQ	2327DA
Wellust 267MR	2228DB
Weltevreden 174IS	2629BB
Weltevreden 176HO	2725BA
Weltevreden 193IS	2629BA
Weltevreden 596LQ	2327DD
Weltevreden 81MS	2229AC
Weltevreden 822KS	2429DC
Welverdiend	2627AD
Welverdiend 243KT	2430BD
Welverdiend 249JR	2528BD

Wemmershoek 81JT	2530AD
Wemmersvlei 185LR	2328AC
West of Shitlave on Nalupe Road, KNP	2531AB
Wetsatsu Waterhole, KNP	2231CD
Whisky Spruit	2530BA
White River 64JU	2531AC
Whitecliff 30HU	2731AD
Wildebeesthoek 310JR	2528CA
Wildeboschdrift 599LR	2328CD
Wilderne Ranch 176JU	2531BC
Wildfontein 201IP	2626BC
Wilgeboom Plantation, Pilgrims Rest District	2430DD
Wilgeboschfontein 818LS	2329DB
Wilgefontein 644IR	2628DC
Wilhanshohe 78LS	2329AA
Wilkenshof 252JT	2530BD
Willemsoord 476KT	2430DB
William Porter 90MS	2229AC
Willie 787LT	2330DC
Willows Drive-In, North-west of Johannesburg	2627BB
Windhoek 127LQ	2327BC
Windhoek 649MS	2229DD
Winkelhaak 723JT	2530DC
Wintersveld 417KS	2429BD
Wintersveld 427MS	2229CC
Witbank	2529CC
Witbank 236IS	2629BC
Witbank 262IT	2630CA
Witbank 647LQ	2327DC
Witfontein 18LS	2329AA
Witfontein 306IP	2626CC
Witfontein 521JR	2528DC
Witfontein 526KQ	2427DD
Witgatboom 316KT	2430CB
Witklip 100KR	2426AC
Witklip Dam, White River	2530BB
Witklipbank 202IR	2628BA
Witkop 180IR	2628AC
Witkop 287LQ	2327CA
Witkop 330IR	2628BC
Witkoppen 194IQ	2627BB
Witkoppies 382IQ	2527CA
Witpan 20IP	2626AB
Witpoort 192KP	2426AC
Witpoort 216JS	2529BD
Witpoort 545IR	2628DB
Witpoort Dorpsgebied	2726AA
Witpoortjie 245IQ	2627BB
Witrand 103IS	2629AD
Witrand 457JP	2526DD
Witrandsfontein 348IP	2626DB
Wodin 149MS	2229BB
Wolfhuiskraal 45JR	2528AA
Wolhuterskop 452JQ	2527DA
Wolkberg	2330CC
Wolkberg - Haenertsburg	2329DD
Wolkberg Foothills approx. 50km S.E. of Tzaneen	2330CC

Wolmunster 108LQ	2327BC
Wolvekrans 17IS	2629AB
Wolvenfontein 149KR	2428AC
Wolvengaten 255JR	2528BD
Wolvenkraal 13JS	2529AB
Wonderboom 532KS	2429DA
Wonderboom 98KP	2426CC
Wonderboomhoek 550LQ	2327DA
Wonderfontein	2529DD
Wonderfontein 103IQ	2627AD
Wonderfontein 258JP	2526CB
Wonderfontein 341IR	2628BD
Wonderwoud	2429BB
Woodbush	2329DD
Woodbush Forest Reserve	2329DD
Woodlands Farm	2528CD
Woodstock 397JP	2526DB
Worcester 131MR	2228CC
Worcester 5LP	2326DD
Worcester Mine, Barberton	2530DB
Worthing 511KR	2428CD
Woudkop	2328BC
Wyliespoort 725MS	2229DD
York 108LS	2329AB
York 188KT	2430BD
Zaagkuildrift 46JR	2528AA
Zaailand 662LS	2329CD
Zandfontein	2527DB
Zandfontein 160LQ	2327BC
Zandfontein 317JR	2528CA
Zandfontein 447JQ	2527DB
Zandfontein, Rustenburg	2527CC
Zandkraal 99HT	2730AB
Zandput 202LS	2329AC
Zandrivier 138KR	2428AC
Zandrivierspoort 442KQ	2427DA
Zandrivierspoort 851LS	2329DA
Zandspruit 189JR	2528BB
Zandspruit 287KR	2428BB
Zanzibar Border Post	2228CB
Zebediela	2429AD
Zebediela Estates 101KS	2429AD
Zeekoefontein 573IQ	2627DA
Zeekoegat 12KU	2431AA
Zeekoegat 296JR	2528CB
Zeekoegat 421KS	2429BD
Zeekoegat 673LR	2328DA
Zeerust	2526CA
Zeerust Townlands	2526CA
Zeerust, Marico River	2526CB
Zelikatskop 16JP	2526AB
Zevenfontein 388JT	2430CC
Zevenfontein 407JR	2528CC
Ziek 771LT	2330DD
Zinnshoek 140KQ	2427BA
Zoekmakaar 773LS	2329B[illegible]
Zoetendalsvallei 125HS	2729B[illegible]

Zoetfontein 137LT	2330AC
Zoetfontein 154MR	2228CD
Zondagfontein 300MR	2228DC
Zondagsfontein 124IS	2629AC
Zondagsloop 50KR	2428AB
Zonderhout 523IS	2629DC
Zonkolol 473JR	2528DA
Zooihuis 148IO	2625BD
Zoutpan 104JR	2428AC
Zoutpan 301HO	2725CB
Zoutpan 459MS	2229CD
Zoutpansspruit, 30km North of Pretoria	2528AC
Zuid Holland 773LR	2328DD
Zuikerboschkop 361JS	2529DB
Zuiverfontein 58JQ	2527AC
Zuleika 238MS	2229BD
Zuni Zuni 96KP	2426CB
Zusterstroom 447JR	2528DB
Zuurbron 132HT	2730AD
Zuurfontein	2628AA
Zuurfontein, Johannesburg	2628AA
Zwartfontein 34JP	2526AA
Zwartkloof 470KR	2428CC
Zwartkloof 60HU	2731BC
Zwartkop 356JR	2528CC
Zwartkop 369KQ	2427CD
Zwartkopfontein 7KO	2425DD
Zwartkopje 329JT	2530CB
Zwartkoppies 364JR	2528CD
Zwartkrans 172IQ	2627BA
Zwartrand 123IP	2626BA
Zwartruggens	2526DA
Zwartwater 288IT	2630CA
Zwavelpoort 373JR	2528CD
Zyferfontein 293JP	2526CB
eManzini, West of Numbi Gate	2531AA

TRANSVAAL REPTILE SURVEY

LOCALITIES FOR WHICH QUARTER-DEGREE SQUARES CANNOT BE DETERMINED

Locality

Arbeidsgenot, Waterberg
Banana Siding
Between Acornhoek and Ohrigstad
Between Messina and Louis Trichardt
Boesmanspruit, Lebombo
Broederstroom
Buffelshoek
Bungani Stockpens
Bushbuck River
Carolina District, Komati River
Eastern Transvaal
Ermelo District
False Cave, Tshirululami, Louis Trichardt
Furnasi Gold Mine, Giyani
Goedehoop, Carolina District
Grobersdal Road
Hartebeestpoort
Jakkalspruit, Rustenburg District
Ka Bungeni
Komati River, Carolina District
Krantzview, Carolina District
Lebombo, KNP
Letaba River
Magalakwin River, Potgietersrus District
Magaliesberg
Magaliesberg Range
Malabuke
Munnik's Farm
North Western Transvaal
Northern Transvaal
Oosgrens-Letaba Afdraai
Palala River, Waterberg
Pietersburg District
Pongola River
Probably Waterberg
Rhenosterpoort
Rustenburg District
Sabie Game Reserve
Sabie River
Sanor, 1km above bridge
Santa Estates, Belfast District
SiHlangu

South-east of Johannesburg
Soutpansberg
Soutpansberg District
Soutpansberg, North of
Spekboom River
Syferfontein, Bramley
Tolstoy Farm, Laaivley Station, Johannesburg
Transvaal
Usutu River, Eastern Transvaal
Waterberg
Waterberg District
Watervalle, Olifants
Western Boundary Firebreak, KNP
Wilge River
Zoutpansberg
Zoutpansberg District