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TAXONOMY OF *AGAMA HISPIDA* (SAURIA: AGAMIDAE) IN SOUTHERN AFRICA

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(With 3 figures)

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ABSTRACT

The taxonomy of *Agama hispida* is discussed. It is shown that two species are involved, *Agama hispida* and *A. aculeata*. A new species, *Agama etoshae*, is described to cover populations in northern South West Africa/Namibia.

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I. INTRODUCTION

As pointed out by Mertens (1955) the classification of the Agamas of the "*hispida*" group, is in urgent need of revision. Boulenger & Power (1921) carried out a major review of *Agama hispida* and in addition to their *forma typica,* recognised four "varieties". These were *brachyura, distanti, aculeata* and *armata.* FitzSimons (1932, 1935, 1943) followed a similar arrangement but raised the varieties to subspecific rank and added a fifth, *Agama h. makarikarica.* Steyn, Finkeldey & Buys (1936) drew attention to the presence of *A.h.makarikarica* in the Etosha Pan area while Steyn & Steyn (1970) treated *makarikarica* as a full species and noted that the South West African material merited recognition as a race of *makarikarica.* In the writer's opinion, for reasons which will appear later, this population should be treated as full species.

The classifications of Boulenger & Power (1921) and FitzSimons (1943) are not tenable because the two taxa, *brachyura* and *aculeata,* are given as occurring sympatrically over most of the central and western Karoo. Clearly at least two species must be involved in this vast area. Furthermore several localities in Zimbabwe are credited with three forms, *aculeata, distanti* and *armata.*

II. MATERIAL AND METHODS

This study is based mainly on specimens in the collections of the following museums: Albany Museum, Grahamstown; Transvaal Museum, Pretoria; the Port Elizabeth Museum; the State Museum Windhoek; the National Museum, Bloemfontein; the South African Museum, Cape Town; the Natal Museum, Pietermaritzburg; and the private collection of Mr. L. Raw.

In addition live specimens were studied in the field and also kept in captivity to study their gular markings. These were found to be present even in newly born young and are therefore of great taxonomic value. Unfortunately, in adult males in active breeding condition, the gular pattern may be obscured by a dense suffusion of green, red or blue covering the head and chest. After a short period of captivity this colour disappears and the gular pattern can be evaluated.

A few localities in the literature caused some trouble. Grassmund of FitzSimons (1943) is believed to be Gamsmund, just east of Noordoewer. Vaalhoek is near Kakamas, 2820Da, and Krantzkop is in the same quarter-degree square.

The following abbreviations are used in the text:

AM	Albany Museum, Grahamstown
LR	Collection of Lyn Raw
NM	Natal Museum, Pietermaritzburg
NMB	National Museum, Bloemfontein
SAM	South African Museum, Cape Town
SAM-ZR	South African Museum, Zoology – Reptiles
SMF	Senckenberg Museum, Frankfurt
SW	State Museum, Windhoek
TM	Transvaal Museum, Pretoria

III. TAXONOMIC CHARACTERS

To arrive at a more natural classification, the writer examined a large number of specimens using various criteria, of which the following four gave the best results:

(1) SIZE OF EARHOLE: In *Agama aculeata, A. distanti* and *A. armata,* the earhole is large and the tympanum exposed. In *A. hispida* and *A. brachyura* the earhole is small and the tympanum deepset, usually invisible. In *A. makarikarica* and *A. etoshae,* the earhole is also minute, sometimes appearing almost closed. The taxa thus fall naturally into two groups, one with large earhole and exposed tympanum, the other with earhole less than half the diameter of the closed eye and tympanum deepset or invisible.

(2) GULAR MARKINGS. These markings are of great importance. Being used in courtship they act as an isolating mechanism between species. In *Agama hispida* and *A. brachyura* the gular pattern consists of large oval or circular white markings on a green, blue or orange background (see fig. 1). This pattern may extend over the whole ventral surface even onto the hind legs. In *A. makarikarica* the pattern is similar but shows a tendency for the background colour to narrow into a coarse reticulation. However, specimens from Bothaville have some patterns typical of nominate *A. hispida,* TM 4338 and 4340, and some typical of *A. makarikarica,* TM 4339.

In *Agama aculeata, A. distanti* and *A. armata* the pattern is quite different, consisting of three parallel lines on either side of a central area to a greater or lesser extent filled with broken lines, reticulation and diffuse clouding (fig. 1). In Rhodesian material the lines at the side may join in chain-like patterns and in some cases this extends over the whole throat giving a fine network. All intermediates are seen and the linear and reticulate patterns occur in the same localities.

(3) PARIETAL IMBRICATION: Grandison (1968) has shown the importance of imbrication in the classification of agamas and used it in the temporal region. In *Agama hispida,* nominate *A. hispida* and *A. brachyura,* the large head scales behind the pineal eye, overlap towards the rear (posterior imbrication). In *A. aculeata,* particularly where it occurs sympatrically with

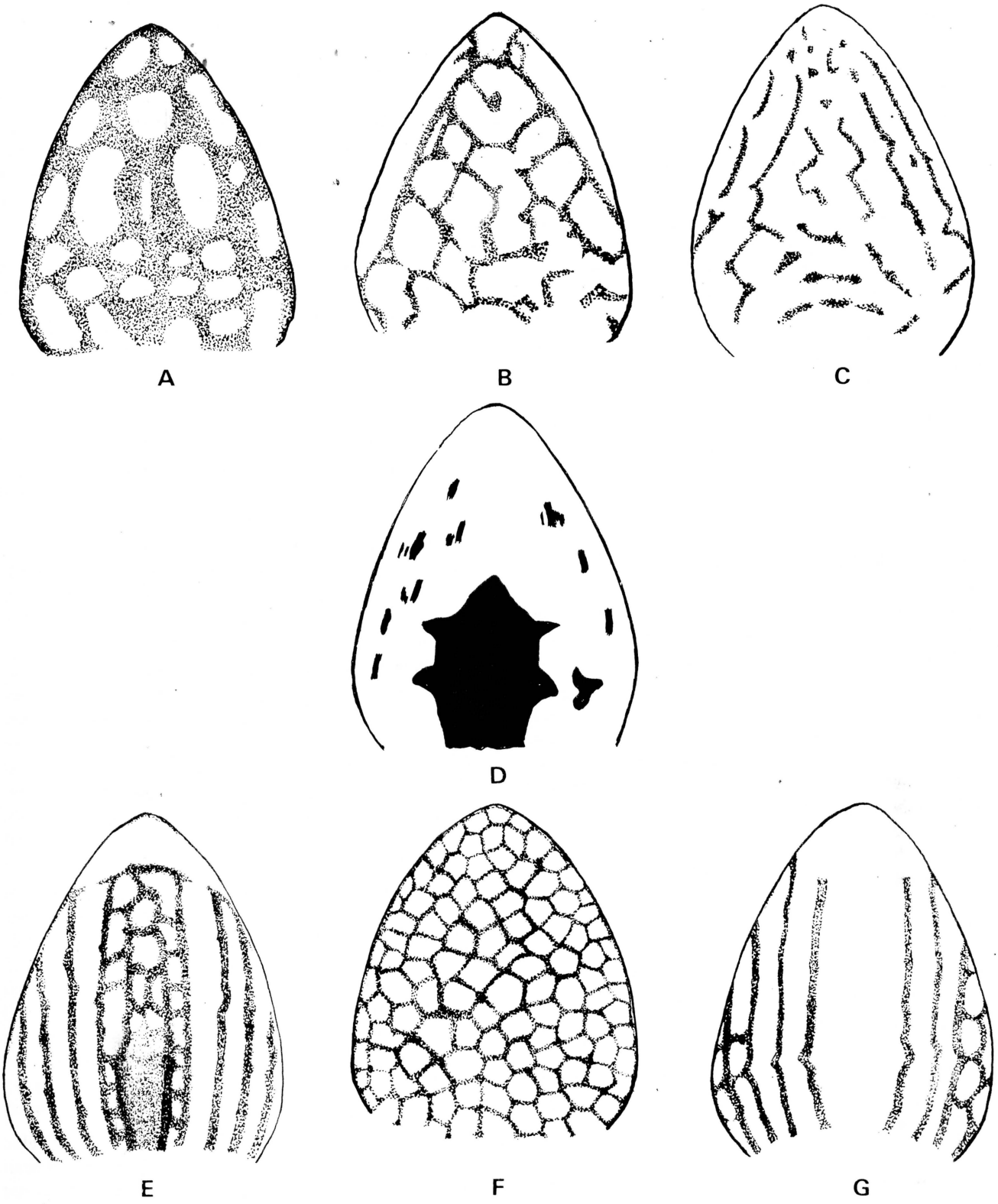

Figure 1. Gular markings of Agamas. A. *Agama hispida hispida*. B. *Agama hispida hispida* from Bothaville. C. *Agama hispida makarikarica*. D. *Agama etoshae*. E. *Agama aculeata aculeata*. F, G. *Agama aculeata armata*.

A. hispida, the scales overlap forwards (anterior imbrication). In the other forms this feature is not so marked and is of less value taxonomically but in the area of geographical overlap this feature is of the greatest value and indicates the presence of two *species* over most of the Karoo.

(4) LENGTH OF FIFTH TOE: In *Agama etoshae* and *A. makarikarica* the fifth toe is short, reaching only to the base of the first toe, or a fraction beyond. In nominate *A. hispida* and *A. brachyura,* this feature is not so reliable as some specimens have the fifth somewhat longer but still shorter than the first when laid parallel. In *A. aculeata, A. distanti* and *A. armata* the fifth toe is long and reaches to the end of the first.

In addition to the above four criteria, the writer spent a great deal of time examining the "hair-bearing" sense organs. However, there was found to be so much variation over different parts of the body and such large differences among individuals of the same taxon that no firm conclusions could be arrived at, except that *Agama distanti* is characterised by very long sensory "hairs". In any case it seemed more important to evolve a macroscopic key rather than having to resort to the microscope every time a specimen of *Agama* requires identification.

TEMPERAMENT: In captivity and when first captured *Agama h. hispida* and *A. a. aculeata* show completely different temperaments. The former is comparatively slow moving and becomes tame almost immediately, whereas the latter is extremely fast moving, nervous and takes weeks to become confiding.

IV. DISCUSSION

Judged by the criteria 1, 3 and 4 above, the seven taxa fall naturally into two groups:

Group A. The "*hispida*" group; characterised by small earhole, posterior parietal imbrication and short fifth toe. In this group fall *Agama hispida, A. brachyura, A. makarikarica* and *A. etoshae.*

Group B. The "*aculeata*" group characterised by large earhole, anterior or neutral imbrication and long fifth toe. Includes *Agama aculeata, A. distanti* and *A. armata.*

Within the "*hispida*" group the gular markings suggest that two species are involved. In figure 1 the gular markings are shown of nominate *Agama hispida, A. makarikarica* and the specimens from Bothaville, mentioned by Steyn & Steyn (1970) under *A. makarikarica.* The gular markings of the Bothaville specimens are intermediate between *A. hispida* and *A. makarikarica.* Indeed, two specimens TM 4340 and 4338 have markings very like *A. hispida* while TM 4339 closely resembles *A. makarikarica.* Clearly one species is involved and *A. makarikarica* is best treated as a race of *A. hispida* as originally proposed by FitzSimons (1932). On the other hand the gular markings of *A. etoshae* are quite different, as shown in figure 1, although there are one or two specimens where the black mark is not developed and the surrounding flecks form a vague network. Although the two taxa are obviously closely related, the normal gular markings are so strikingly different that it is suggested that *A. etoshae* be treated as a full species at least until intermediates are found in the central Kalahari.

As hinted by Boulenger & Power (1921) the race *Agama brachyura* is poorly differentiated from nominate *A. hispida;* the character of the third and fourth toe being unreliable and the roughness of the dorsal lepidosis very variable. It is therefore suggested that *A. brachyura* be synonymised with *A. hispida.*

In group B, the gular markings vary very little (except in Zimbabwe) indicating that only one species is involved. As *Agama aculeata* is the oldest name, it is suggested that *A. distanti* and *A. armata* be treated as subspecies of *A. aculeata.* It is further suggested that the name *distanti* be used only for the small, squat, almost toad-like agamas found on the highveld of southern Transvaal, the Orange Free State and the north-eastern Cape Province. In these the tail of the female is shorther than the head and body while the dorsal spines become quinquecarinate and stand out at a high angle to the body. Broadley (*pers. comm.*) suggests that the difference between *A. aculeata* and *A. armata* may be summarised as follows:

Dorsal head shields smooth; ventrals smooth (in adults); usually 14—19 lamellae below 4th finger and 18—24 below 4th toe; 4th toe longer than 3rd; maximum snout-vent length 120 mm in males, 105 in females . . . . . *A. aculeata*

Dorsal head shields rugose; ventrals more or less keeled and mucronate; usually 9—13 lamellae beneath 4th finger and 11—17 beneath 4th toe; 3rd toe usually longer than 4th; maximum snout-vent length 95 mm . . . . . *A. armata*

Steyn & Steyn (1970) drew attention to the remarkable "eye-popping" behaviour of South West African Agamas which he considered to be examples of *Agama h. makarikarica* (here called *A. etoshae*). The writer has also seen this behaviour in a specimen of *A. hispida* collected near Kuboos in the Richtersveld. However, as explained by Bruner (1907) this habit of extruding the eyes is quite common in various genera particularly *Phrynosoma, Sceloporus* and *Anolis.* He showed that the habit can be induced by painting the heads of such

lizards with an artificial skin of plaster and that the eye-popping appears to assist in divesting the head of its skin during ecdysis.

To summarise, therefore, the various taxa formerly treated as "varieties" or sub-species of *Agama hispida* are considered to belong to three species as follows:

1. *Agama etoshae*
2. *Agama hispida hispida*
   Agama hispida makarikarica
3. *Agama aculeata aculeata*
   Agama aculeata distanti
   Agama aculeata armata

As pointed out by FitzSimons (1943), the type of *Agama aculeata* Merrem was probably a specimen of *A. hispida*. However, in the absence of the type, this can never be proved and since the name *A. aculeata* has been used consistently for more than 150 years, it would seem to be an unwarranted taxonomic disturbance to change to some later name on purely hypothetical grounds.

Wermuth (1967) maintains that *Agama armata* Peters, 1854 is preoccupied by *Agama armata* Hardwicke & Gray, 1827. He therefore proposed *Agama hispida mertensi* as a replacement. Broadley (*pers. comm.*) suggests that this is incorrect because *Agama armata* Hardwicke & Gray became the type species for the genus *Acanthosaura* Gray, 1831 and the two genera have never been merged. *Agama armata* must therefore be revived under article 59(c) of the International Code of Zoological Nomenclature.

V. *AGAMA ETOSHAE* n. sp.
(Fig. 1)

HOLOTYPE

Adult male SAM-ZR 16624 in the South African Museum collection. Collected by K. H. Barnard, R. F. Lawrence and A. White during the Museum Expedition to the Kaokoveld, January – April 1923. Type – locality Onoholongo (18° 28′ S, 15° 43′ E).

DESCRIPTION

General proportions similar to *Agama h. hispida*. Ear-hole circular, minute, diameter approximately one-quarter of eye-cleft. Fifth toe reaching just beyond base of first. Scales under 3rd finger: left 11, right 11. Under 3rd toe: left 13, right 14. Under 4th toe: left 11, right 11. Third toe slightly longer than fourth.

Nuchal crest with four enlarged spines. Dorsal crest irregular, large spines alternating with smaller ones not larger than scales on back; spines extending onto base of tail. Dorsal spines not in definite longitudinal rows and extending onto dorsal surface of upper forelimb and dorsal surface of whole hindlimb. Spines on temporal region long and slender. Parietal imbrication feebly posterior. Ten pre-anal pores.

Length: Head and body 68 mm. Tail 85 mm.

Colour: Gular pattern consists of a large sub-pentagonal black mark at the base of the throat, surrounded by short streaks and dots of black. Dorsum uniform but with two darker markings parallel to the nuchal crest, ending in front of the shoulders.

ALLOTYPE

Adult female SAM-ZR 43982 from the same locality as the holotype. Similar in general appearance to the holotype but tail shorter than head and body. Head and body 70 mm. Tail 57 mm. Scales under 3rd finger 13. Under 3rd toe: left 15, right 14. Under 4th toe: left 15, right 15. Fourth toe slightly longer than third.

INTRASPECIFIC VARIATION

There is considerable variation among the specimens mentioned below. The dorsal spines may be numerous or relatively scarce, in rough longitudinal rows or scattered. The parietal region may or may not bear spines. The ground colour varies from pale yellowish white to darker rust with or without a distinct pattern. When developed, the pattern consists of two V-shaped marks between the eyes, two curved longitudinal marks, one on either side of the neck, and six large dorsal ocelli. Two dark bars extend from the eyes onto the cheeks against a white background. A series of paired semicircular markings extends down the tail, the curved edges facing inwards but not joining in the midline. These patterns are well illustrated by Steyn & Steyn (1970: 41, pl. 2).

Variation also occurs in the gular markings. The dots, streaks and short lines surrounding the black sub-pentagonal mark, may rarely coalesce to form a rough network rather similar to that found in *Agama makarikarica*. This is well shown by SW 1253.

DISTRIBUTION

Agama etoshae appears to be restricted to northern South West Africa from the neighbourhood of the Etosha Pan northwards to Ondongua and westwards to Opuwo. From the descriptions of Steyn & Steyn (1970) it is clearly an inhabitant of sandy localities and has the habit of burying itself in the sand. These writers also mentioned the habit of eye-popping discussed above.

RECORDED LOCALITIES

SAM 16624, 43982 (Types) Onoholongo; TM 17154 west edge of Etosha Pan; TM 3979 Namutoni; SW 1164 NE. Namutoni; TM 16993 110 km N. Namutoni;

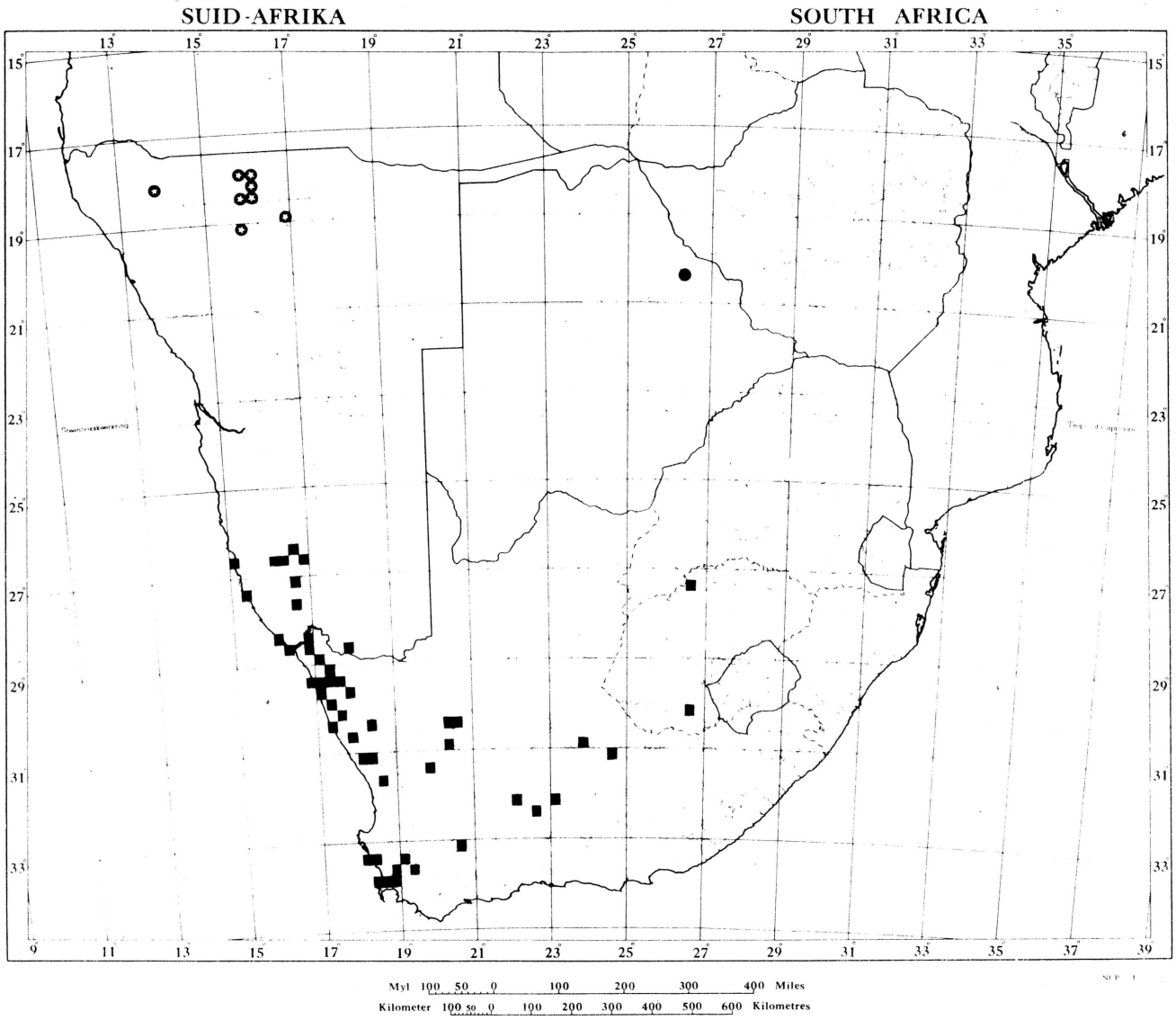

Figure 2. Distribution of *Agama hispida hispida,* ■, *Agama hispida makarikarica* ● and *Agama etoshae* ❀.

TM 26023 Opuwo; TM 28686-8, 34319, SW 1220-1 Ondangua; TM 17133-4 70 km south of Ondangua; TM 46769, 46771 22 km and 10 km south-east of Ondangua; SW 1225-6, 1228-46, 1248-52, 1254-6 Ondjanjo; SW 1126, 1129, 1166, 1168-75, 1177-8, 1180, 1182-87, 1189-93, 1195-1200, 1202-19 Onguediva.

From the literature SMF 66956-8 Onandjokwe near Ondangua.

VI. KEY TO THE *AGAMA HISPIDA* COMPLEX

1. Earhole small, less than half eye cleft; 5th toe reaching base of first 2
– Earhole larger, more than half eye cleft; 5th toe reaching to end of first 4
2. Gular markings a black central pentagonal spot surrounded by short black streaks . . . *A. etoshae*
– Gular markings round, oval or irregular pale marks on a darker background 3
3. Background colour on throat diffused . . . . . *A. hispida hispida*
– Background colour on throat restricted to network . . . . . *A. hispida makarikarica*
4. Dorsal head shields smooth; 18–24 lamellae under 4th toe; 4th toe longer than 3rd . . . . . *A. aculeata aculeata*
– Dorsal head shields rugose; 11–17 lamellae under 4th toe; 3rd toe longer than 4th 5

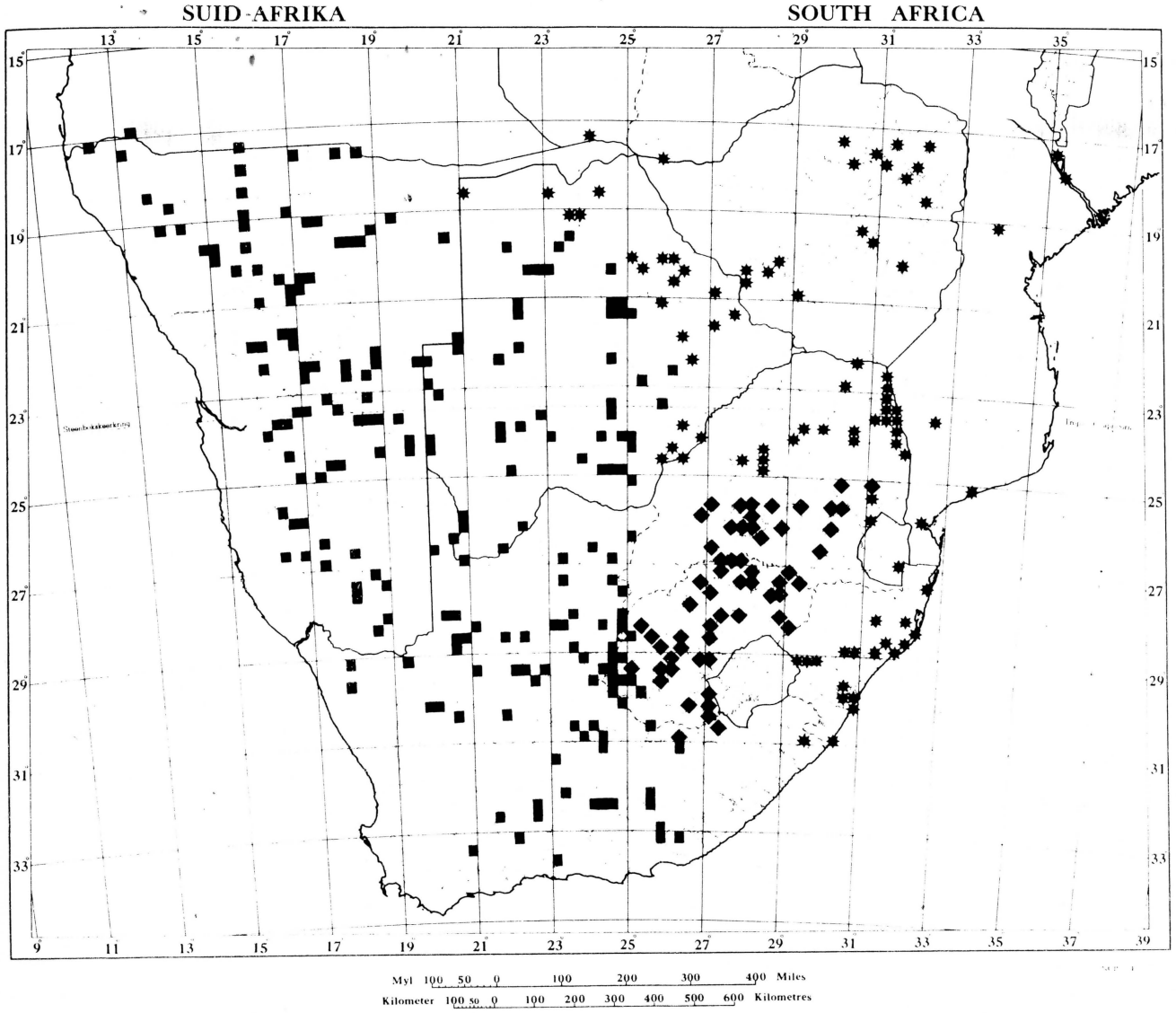

Figure 3. Distribution of *Agama aculeata aculeata* ■, *Agama aculeata armata* ★ and *Agama aculeata distanti* ◆.

5. Tail shorter than head and body in females; ventrals smooth or slightly keeled . . . . *A. aculeata distanti*
– Tail longer than head and body in females; ventrals keeled and mucronate . . . . . *A. aculeata armata*

VII. SPECIMENS EXAMINED AND LITERATURE RECORDS

Figure 2 giving the distribution of *Agama hispida* and *Agama etoshae* is based on the following specimens and records from the literature:

Agama hispida hispida: SAM 1036 Anenous; SAM 14347-8, 17731 Aus; SAM 43555 Beaufort West; PEM 1506 Beaufort West – Fraserburg; SAM 44401 Bogenfels; TM 4336–4345 Bothaville; PEM 1487/3 Brandvlei; SAM 14509 Calvinia; SAM 3949 Cape Flats; AM 4965 Cape Town; SAM 611-2 Claremont; SAM 2550-1 Gamsmund; SAM 2651 Garies; PEM 1491/60-1 Kamaggas; SAM 43974 Klaver; SAM 18634 Klipfontein; PEM 1498/29 Komkans; SAM 7676 Matjiesfontein; SW 1962a Neisip 34, Luderitz; SAM 993 Nelspoort; AM 5016 Plaatjiesfontein, Dwaal Stn.; SAM 43974 Platbakkies; SW 1963 Pockenbank 68, Luderitz; SAM 11448, 12172, 18630, 11399 Port Nolloth; SAM 18526, 18633 50 km ex Port Nolloth; SAM 11333 65 km ex Port Nolloth; SAM 18781 Richtersveld; SAM 43599 Sak Rivier; SAM 13984 Smithfield; AM 1374, SAM 2112, 18709 Steinkopf; AM 1605 PEM 1444/23 Stellenbosch; AM 1605 Tulbagh; SAM 608-9 Worcester; SAM 43629 Zebrafontein 87, Luderitz; NMB 699-700 Moirton.

Literature records: Bitterfontein; Kleinzee; Kuboos; Kuboos-Lekkersing; Oranjemund; Somerset Strand; Springbok, ex Fitz-Simons (1943). Luderitz, Mertens (1955). Mittag, Haacke (1965). Darling and Yzerfontein (*pers. obs.*).

Agama hispida makarikarica: TM 14451-4 Makarikari Pan.

Agama etoshae: see above, under description of the types, for list of specimens.

The map showing the distribution of *Agama aculeata aculeata* (fig. 3) is based on the following specimens and literature records:

TM 20365 Aberdeen–Graaff-Reinet; SAM 11023 Albany Division; SAM 18778 Aminuis; SAM 14204 Areb; SAM 19248 Auop-Nossob confluence; SAM 1736 Beaufort West; TM 19454-5 15 km S. Beaufort West; SW 1077-81, 1163 Blumenfelde 95, Mariental; SW 1133 Boskop 324, Otjiwarongo; NMB 802-3 Bozrah, Fauresmith; SW 1108 Brakwater, Windhoek; PEM 1487/3 Brandvlei; PEM 1487/28-9 Buitepos, Gobabis; SAM 827 Burghersdorp; SW 1095, 6, 1106 Cauas 119, Outjo; SW 1074 Compromise 58 Rehoboth; AM 1958 Cradock; SAM 11004, 13936 De Aar; SW 1972 De Hoek 878, Gobabis; SW 1154-6 Eava 383, Gobabis; SW 1137 W. Etengua; SW 1064 Etosha; SW 1103-5 S. Etosha; PEM 1507/55 Granaatboskolk; SW 1101 16 km E. Grootfontein; NMB 787 Gruisrand, Fauresmith; NMB 2230 Heenenweerskop, Fauresmith; SW 1066 Herrenhofen 79, Gobabis; SW 1134-5, 1139, 1144-5 Hoasas 16, Otjiwarongo; TM 19440-1 Hopetown; SAM 18705-7 Hughes 7 on Nossop River, Gobabis; SW 1099 Kalkveld; SW 1118 Kameeldoorn 417, Mariental; SW 1087 Kanovlei; SAM 44216 & 8 Kanye, Botswana; SAM 17497 Kaoko Otavi; SAM 16145 Karasburg; SW 1119, 1151 Karibib; PEM 1507/54 Katkop, Bushmanland; SAM 12326 Kimberley; SAM 17543 Kowares; SW 1132, 1160 Kuringkuru; SAM 11444 Kuruman; NMB 1166 Langhoek, Jacobsdal; SAM 17385 Langklip Station; NMB 4725-6, 4812-5 Lemoenboord, Philippolis; SW 1090-4 Leonardville; NMB 1191, 1196 Luiperskop, Jacobsdal; SW 1143 Marienhof 49, Rehoboth; SAM 44750 Mentz 65, Gobabis; SW 1073 Moedersrus 72, Rehoboth; SW 1152 Mpungo; SAM 16619 Namakunde; SW 1102 Namutoni; SW 1069 NE. Namutoni; SW 1150 Nkongo; SW 1141-2, 1153 Nog Verder 427, Otjiwarongo; SAM 14784 Nurugas (1918Bd), Grootfontein; SW 1061, 1113 Okahandja; SW 1067-8, 1263-4 Okaukuejo; SW 1114 W. Okaukuejo; TM 33322 Okondeka; TM 16873, SW 1088 Okosongomingo 149, Otjiwarongo; SW 1082-3 Onguediva; SAM 654-5 Okiep; SW 1140, 1147 Otjikaru 27, Okahandja; SAM 17263 Otjikoto-Kamanjab; SW 1148-9 60 km S. Otjinungua; SAM 17290 Otjitambe; SAM 17533 Otjitundua; SW 1146 Otjituua; SW 1120, 1159 Otjovasandu; SAM 17270, 17512-5 Outjo; SW 1109-11, 1115-7 Perdepan 516, Gobabis; PEM 1440/54 Prince Albert; PEM 1498/48 W. Rehoboth; SW 1131 Rooiduin 309, Mariental; SAM 15943 Sandfontein 468, Gobabis; SW 1059-60 Sandverhaar 80, Bethanien; SW 1089 Sinclair Mine; SW 1122-4, 1126-9 Tsumkwe Pan; SAM 17643 Uniondale; SAM 15840, 17309 Upington; SAM 17318 Vaalhoek; AM 993 Victoria West; SAM 14142 Voigtsgrund; SW 1121 Warmquelle; NMB 3155 Welteverden, Jacobsdal; SW 1021, 1025, 1072, 1076, 1094-5, 1097-8, 1102, 1136 Windhoek; NMB 2198 Wolwekop, Fauresmith; NMB 151 Zwartfontein, Philippolis.

From the literature: Abbabis-Nauzerus; Aberdeen; Albrechts; Auasberge; Barby; Belmont; Boshof; Britstown; Campbell; Damara Pan; Danielskuil; Deelfontein; Delport's Hope; Douglas; Draghoender – Marydale; Dry Harts Siding; Fish River Albany; Fort Richmond; Fourteen Streams; Friersdale; Genesa; Gobabis; Graaff-Reinet; S. of Graaff-Reinet; Gomodimo Pan; Griquatown; Grootfontein; Grundorn; Grundorn-Nakeis Mine; Halesowen; Hanover-Philipstown; Hoffnung; Honeynestkloof; Itota Dune; Jacobsdal; Jakhalswater; Jagersfontein; Kakamas; Kalkveld; Kamanjab; Kaotwe Pan; Karibib; Keetmanshoop; Keimoes; Kenhardt; Kobos; Kooa; Kraikluft; Krantzkop near Kakamas; Kubub; Kuibis; Kuke Pan; Ky ky; Lake Guinas; Lake Ngami; Lokanong-Sevrelela; Longhope; Magersfontein; Maltahöhe; W. of Mariental; Marydale; Maun; Mashowing; Modder River Station; Molepolole-Kuke; Mookane; Namutoni-Ondonguá; Narudas Süd; Nauchas; Nelspoort-Murraysburg; Neudamm; Niekerkshoop; Okahandja; Okowakuatjiwi; Okwa; Okaukuejo-Outjo; Orange River Station; Oshikango; Otjikondo – Kamanjab; Otikoto-Nakusib; Otjimbingwe; 20 m. S. Otjiwarongo; Pofadder; Postmasburg; Prieska; Putzonderwater-Koegas; Ramathlabama; Rehoboth; Rietfontein; Ripon; Riverton; Setlagoli; Shaleshonto; Shorobe; Sinclair Mine; Spreeuwfontein; Sunnyside–Machumi Pan; Swartmodder; Taungs; Tsumeb; Tygerkop; van der Byl's Kraal; van Wyksvlei; Vlei Topan; Vryburg; Warmbad; Warrendale; Windhoek; Witputs; Witsands; Zweizwei River (FitzSimons 1943, including localities in bibliography). Etosha Pan; Epupa; Gaitsabis; Gamis; Helmeringhausen; Herrenhofen, Gobabis; Omongongua; Farm San Remo, Gobabis; Farm Silurian 272, Mariental; Sandmund; Wasserfall (Mertens, 1955, 1971); Verwoerd Dam, north bank (de Waal, 1978).

Dr D. Broadley, who has examined eight specimens from the northern Kruger Park, including the three from the Nwambiya sandveld identified by FitzSimons and mentioned by Pienaar (1966: 50) assures me (*pers. comm.*) that they are all *Agama a. armata*; in addition he doubts whether there are any *A.a.aculeata* present in the northern Transvaal. He also supplied the following Botswana localities for *A. aculeata:*

Chukutsa Pan; Dikgomo di Kai; Gemsbok Pan; Kalkfontein; Kang; Lehututu; Lephepe; Letlaking; Murwamusa; Nhane; Sehitwa; Sekhuma Pan; Tshabong; Tshane. Also the following quarter-degree squares: 1922Cc; 2023Ac; 2024Bc; 2123 Bb; 2124Ba, Bb, Bc, Bd; 2125Ba; 2221Ba; 2220Ac; 2220Cc; 2223Ad; 2224Bc, 2226Ca; 2225Cd; 2320Ab; 2324Bc; 2324Da; 2322Cd; 2420Aa&Ac; 2424Ab; 2425Ac; 2422Cc; 2520Dd; 2620Dd; 2621Db.

The Narugas locality, mentioned by FitzSimons (1943) should read Nuragas or Nurugas, South West Africa (1918Bd) while the Bakputs, Kaross and Otjiwarongo specimens are actually *A. anchietae.*

Agama aculeata armata: SAM 894 Barberton; AM 8187, 7512 Bikita; SAM 13289, 13299 Bindura; LR 797 Botha's Hill; SAM 14-490 Bulawayo; AM 5840 Chilimanzi; AM 6990, SAM 14000, 14042, 14044 Chishawasha; SAM 903, 897 Delagoa Bay; AM 5826, 6067, 6967 Driefontein nr. Gwelo; AM 5675 Emfundisweni; SAM 5897, 5881 Empandeni; LR 800 Gillits; AM 5588 Glentig; TM 2525 Giant's Castle; LR 216-7 Greytown; LR 795 Hammarsdale; AM 5618 Ingwavuma; SAM 11220-2 Insiza; LR 801 Jameson's Drift, Tugela River; AM 6435, 6606 Kutamas Makwiro; NM 57 Kwambonambi; SAM 9404-5 Livingstone; AM 1505, 1546, 1654 Marianhill; SAM 1945 Mazoe; SAM 13622 Mochudi; AM 7144 Mtoko; AM 4603 Ntambana; AM 6157 Nylstroom; AM 1488 Rankin's Pass; 2055 Salisbury; TM no number Sibasa; AM 5618 St. Lucia; AM 1422 White River.

From the literature: Amatongas; Birchenough Bridge; Caia; Charre; Clansthal; Crocodile-Marico Junction; Eldorado; Eshowe; Estcourt; Figtree; Griffin Mine, Leydsdorp; Honingfontein; Hluhluwe Drift; Indukuduku; Krantzkop; Kwaai; Gr. Letaba River; Mabeleapudi; Mahalapye; Marandellas; Margate; Masieni; Mazambo; Musami; Nkate; Nwanedzi River, N.Tvl.; Pietersburg; Plumtree; Rikatla; Rusape; Selati; Sibayi; Vygeboompoort; Weenen; Woodbush (FitzSimons 1943).

Various localities in the central Kruger Park are quoted by Pienaar (1966) and the three specimens of *Agama a. aculeata* from the Nwambiya sandveld are also considered by Broadley (*pers. comm.*) to belong to *A.a.armata.* In addition he kindly furnished the following Botswana localities: Debeeti; Francistown; Gaberones; Mosu; Mumpswe; Nata River; Selinda spillway;

Serowe; W. of Tsodilo; also quarter-degree squares 2025Aa&Ad; 2026Ca; 2027Cc; 2127Ca; 2126Cd.

Agama aculeata distanti: AM 1980, NMB 149, 741 Bloemfontein; SAM 10947, 10958 Burghersdorp; AM 1251, 1402, 1577 Doornkop near Belfast; NMB 2648 Evenston, Ventersburg; NMB 1121 Glenisla Harrismith; NMB 1638 Gruiskop, Bloemfontein; NMB 3952 Hartebeestfontein, Boshof; SAM 9186 Johannesburg; SAM 13576 Kendal; NMB 2406-7 Klipplaat, Vrede; SAM 3535, 3537-8 Kroonstad; NMB 354, 377 Krugersdrift Dam; NMB 1679 Leeukuil, Boshof; NMB 2744 Littlecote, Wepener; SAM 6055 Luipaardsvlei; NMB 4175 Mierdam, Boshof; NMB 1279 Morgenzon; AM 1102 Potchefstroom; NMB 816 Rietfontein, Vrede; NMB 3466 Rusthof, Heilbron; SAM 13564, 13569, 10993-5 Smithfield; NMB 894 Spitzkop, Zastron; SAM 43255, 10945 Sterkspruit; NMB 4261 Stoffelfontein, Lindley; NMB 782 Stoltzkop, Reitz; NMB 3912 Sweet Home, Bloemfontein; SAM 5278-9 Vredefort Road; NMB 1606 Uitzicht, Harrismith; NMB 3784 Venus, Parys; NMB 866 Weltevreden, Heilbron; NMB 4584 Willem Pretorius Game Reserve; NMB 3455 Wolwefontein, Heilbron; NMB 2455 Woudzicht, Vrede; NMB 3371 Zoetbron, Vrede.

From the literature: Bethany; Botsabelo nr. Middelburg; Brandfort; Brits; Carolina; Ermelo; Glen; Heidelburg; Irene; Lydenburg; Odendaalsrust; Parys; Premier Mine; Pretoria; Rayton; Rustenburg; Thaba 'Nchu; Tweespruit; Waterval Onder; Wolmaransstad — Bloemhof (FitzSimons, 1943); Pretoriuskop (Pienaar, 1966); Winburg (de Waal, 1978).

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