

Appendix 1

Material examined: (PEM = Port Elizabeth Museum) *Psammobates tentorius*: PEM × 574, Abbotsbury, Graaff Reinet; PEM × 162, Farm Request, Somerset East District; PEM × 590, between Steytlerville and Willowmore; PEM × 576, Valk River, near Lake Mentz, Eastern Cape; PEM × 54, × 161, × 186, × 193 Adendorp, Graaff Reinet; PEM × 208, Farm Mayfair, Albany District; PEM × 588, Droegkloof near Klaastroom, Prince Albert District; PEM × 136, Nelspoort, Beaufort West District; PEM × 207, Fish River Valley near Fort Brown, Eastern Cape; PEM × 211, × 29, Farm Moedersonskraal, Jansenville District; PEM × 248, Carlisle Bridge, Grahamstown; PEM × 338, × 573, × 591 Graaff Reinet; PEM × 60, Farm Hopewell, Louisvale, Kennhardt District; PEM × 575 and × 572, no locality; three uncatalogued specimens without locality data.

Morphological variation in the girdled lizard *Cordylus mclachlani* Mouton 1986

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Received 18 October 1990; accepted 3 October 1991

The girdled lizard *Cordylus mclachlani*, previously known only from the type locality in the south-western Cape, South Africa, was found at several new localities as far north as Nieuwoudtville. The external morphology of the 32 additional specimens thus obtained was investigated to establish the nature of geographical variation. Specimens from the type locality, which lies on the southern periphery of the known distribution range, differ from the rest in the number of suboculars, the shape of the interparietal scale and in the presence of a post-interparietal scale. Because of some overlap in these characters, separate taxonomic status for the specimens outside the type locality is not considered. The diagnostic character set for the species is updated and additional ecological information is supplied.

Die gordelakkedis *Cordylus mclachlani*, voorheen slegs bekend vanaf die tipelokaliteit in die suidwes-Kaap, Suid-Afrika, is by verskeie nuwe lokaliteite, so ver noord as Nieuwoudtville, gevind. Die uitwendige morfologie van die 32 bykomende eksemplare wat so verkry is, is ondersoek om die omvang van geografiese variasie te bepaal. Eksemplare vanaf die tipelokaliteit, wat die suidelike grens van die bekende verspreidingsgebied uitmaak, verskil van die ander eksemplare in die aantal subokulêre skubbe, die vorm van die interpariëtale skub en in die teenwoordigheid van 'n postinterpariëtale skub. A.g.v. ooreenstemming in hierdie eienskappe word aparte taksonomiese status vir eksemplare buite die tipelokaliteit nie oorweeg nie. Die stel diagnostiese eienskappe vir die spesie word op datum gebring en aanvullende ekologiese inligting word verskaf.

Mouton (1986) described a new girdled lizard, *Cordylus mclachlani*, from the Koue Bokkeveld in the Cape Province. It was believed to have a very limited range and accordingly

was listed under the restricted category in the updated SA RDB (Branch 1988). After the description of the new species, private collection material of a similar cordylid collected during 1975 in the Nieuwoudtville and Clanwilliam districts, 200 km to the north of the type locality of *C. mclachlani*, came to light. A preliminary analysis of this additional material showed that these specimens display most of the diagnostic characters of *C. mclachlani*, but that there are also some distinct differences. The limited material, however, did not allow any firm conclusions regarding the taxonomic status of the northern population to be reached. This prompted a more intensive survey of the area between the two localities which resulted in additional material from several new localities.

A detailed analysis of geographical variation was now possible. The purpose of this study was to determine whether the geographical variation in *C. mclachlani* is categorical or clinal in nature. This is seen as a prerequisite for any taxonomic decision. Furthermore, the additional material allowed elaboration of the descriptive character set supplied for the species by Mouton (1986).

Forty-two specimens from ten localities (Figure 1) were investigated for 15 meristic, 11 two-state and seven morphometric characters. These are the external morphological characters which discriminate either among populations of *C. mclachlani* or between *C. mclachlani* and other *Cordylus* species Mouton (1986). The considerations followed in taking measurements and scale counts were the same as those followed by Mouton & Van Wyk (1989).

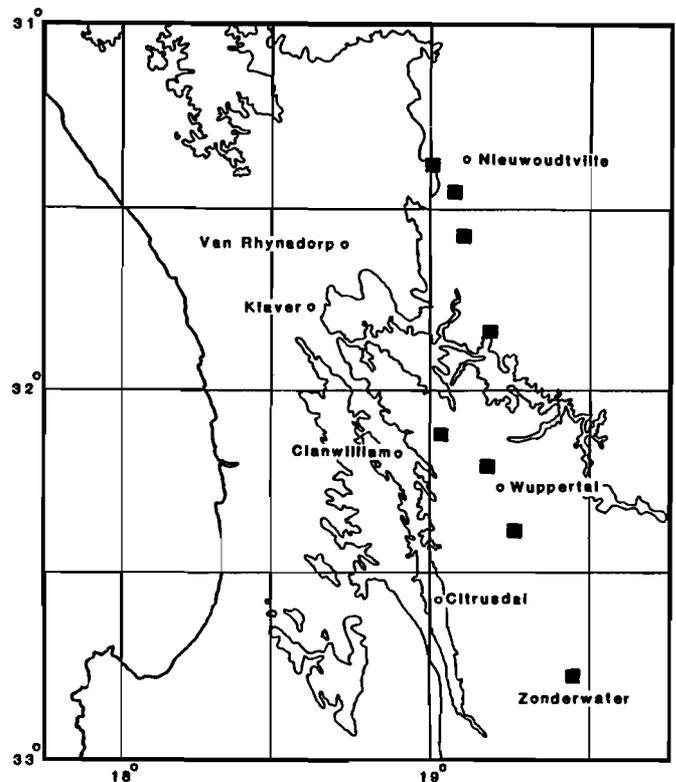


Figure 1 Localities in the south-western Cape where *Cordylus mclachlani* has been collected to date (the 300 m contour line is indicated).

Geographical variation

Most of the characters showed greater intralocality than interlocality variation and these characters failed to discriminate among the sampled localities. The following characters, however, did show variation of a categorical nature and moreover did so in concert, delimiting the type locality, Zonderwater (Figure 1), from the new localities.

Post-interparietal scale: The presence of a post-interparietal scale in nine out of the 10 type specimens (Mouton 1986) pointed to this character as a good diagnostic character for the species as this condition has until recently not been recorded in any other *Cordylus* species. Of the 32 specimens investigated from outside the type locality, however, only one displayed this character trait.

Number of suboculars: Mouton (1986) described the type series as invariably having two suboculars per side as well as a small scale separating the postocular from the last upper labial. In the new material investigated, the number of suboculars was usually three. Furthermore, the small scale separating the postocular from the last labial was often absent.

Interparietal scale: In the type series the interparietal scale is produced anteriorly and in three cases separates the anterior parietals from each other. Outside the type locality the produced condition was recorded in only nine of the 32 specimens of which the anterior parietals were separated in seven.

Diagnostic character set

Meristic characters: Variation in meristic characters for *Cordylus mclachlani* is listed in Table 1. We would like to point out the difficulty of discriminating between true occipitals and the first row of dorsal scales. The difficulty of delimiting the occipitals deprives this character of value and the range quoted here for *C. mclachlani* should be used with caution in studies on intrageneric relationships.

Of the 42 specimens examined only eight had more than two supraciliaries per side. Of these eight, four specimens

Table 1 Variation in meristic characters for *Cordylus mclachlani* ($n = 42$)

Character	Range	Most common state
1 Occipitals	5–8	8
2 Supraciliaries	2–3	2
3 Upper labials	4–6	4
4 Lower labials	5–7	5
5 Longitudinal series ventrals	12 or 14	12
6 Transverse series ventrals	23–27	24
7 Longitudinal series dorsals	21–25	22
8 Transverse series dorsals	26–28	27
9 Scales under 4th toe	9–14	12
10 Scales under 4th finger	9–11	11
11 Femoral pores	7–12	10
12 Sublabials	5–6	5
13 Sublinguals	11–15	14
14 Suboculars	2–4	3

had three supraciliaries on each side while the other four had three on one side and two on the other side. In other *Cordylus* taxa the number of supraciliaries ranges from 3–5. The occurrence of only two supraciliaries per side in more than 80% of the individuals investigated, suggests that this is a good diagnostic character for the species.

The number of upper labials given by Mouton (1986) for *C. mclachlani* is 5–7, the smaller scales bordering the lip behind the large upper labial also counted as labials. To avoid any confusion we have not counted these as labials and the large labial below the posterior corner of the eye was taken as the last upper labial.

Mouton (1986) cites the number of longitudinal rows of ventrals for this species as 12, with no variation noted. The additional material dealt with here shows that some specimens might have 14 rows. We found with the new material that the ventral scales are not always clearly delimited from the lateral body scales. The outermost row of scales on each side is in most cases too small and granular to be considered as ventrals, but in some cases it may be larger and could be counted as ventrals. The situation is further complicated by the difficulty to unfold the lateral fold. Twelve rows would seem to be the normal number for this species.

Qualitative characters: In all the specimens investigated the nasals and supranasals are swollen and tubular in appearance, the prefrontals in contact with the loreals which are slightly smaller to much smaller than the preoculars, the anterior pair of parietals usually slightly larger than the posterior pair, the dorsal body scales subequal in size to the laterals, rectangular in form and obliquely keeled outwardly except for the vertebral rows of dorsals which are trapezoid to rectangular and longitudinally keeled, and unlike in most *Cordylus* taxa, the two vertebral rows of dorsals not or only slightly enlarged. In only three of the 42 specimens did the sublinguals not terminate anteriorly in a single sublingual partly separating the first pair of sublabials. Femoral glands and glandular scales are absent in females of *C. mclachlani*. A row of shallow pits in small scales are, however, present.

Morphometric characters: The ranges for seven morphometric characters given for the species by Mouton (1986) did not change much after examination of the additional material. With a maximum snout-vent length of 73 mm recorded to date, this species is one of the several small species characteristic of the western and southern regions of the subcontinent.

Distribution

The range of *C. mclachlani* has now been established as stretching from the Koue Bokkeveld in the south along the eastern fringes of the Cedarberg and Bokkeveld Mountains to Nieuwoudtville in the north. Localities from which *C. mclachlani* has been collected to date and the material available in museum and private collections are given below.

Zonderwater: 32°49'03"S/19°27'58"E; 3219CD De Meul, SAM 47100–47109 (type specimens); Keurbosfontein: 32°28'44"S/19°19'00"E, 3219AD Grootberg, JEM 1780–1782; Sandwerf: 32°09'50"S/19°11'13"E, 3219AA Pakhuis, JEM 1756–1757; Pakhuis Pass: 32°08'S / 19°02'E,

3219AA Pakhuis, JEM 2004; Moedverloor: 31°50'49"S/19°10'33"E, 3119CC Doringbos, JEM 1751–1753; De Hoop: 31°32'42"S/19°09'09"E, 3119CA Lokenberg, JEM 1744–1750; Oorlogskloof Nature Reserve: 3119AC Calvinia, JEM 1724; 1949; Nieuwoudtville district: 3119AC Calvinia, JV 856, 1356–1359, 1494, 1542–1543, 1594–1595, 1597, 6605; Van Rhyns Pass: 3119AC Calvinia, TM 35097; Clanwilliam district: 3218BB Clanwilliam, JV 1593. (SAM = South African Museum, Cape Town; JEM = J. Eilermann Museum, University of Stellenbosch; TM = Transvaal Museum, Pretoria; JV = private collection of J.D. Visser.)

Fieldnotes

Mouton (1986) described this species from rock outcrops of the Witteberg Formation and pointed out its absence in the adjacent Cedarberg Mountains. The recent survey established that it is not restricted to the Witteberg range as individuals were collected as far west as Pakhuis Pass in the Cedarberg Mountains. Our data confirm the observations of Mouton (1986) that this species prefers low profile rock formations and avoids high cliffs or the huge piled up rock formations typical of the Cedarberg. In this regard it is very similar to *C. polyzonus* with which it occurs sympatrically. Except for *C. cataphractus* mentioned by Mouton (1986), *C. mclachlani* must also occur sympatrically or at least parapatrically with *C. cordylus* as the latter species has been recorded from the Wuppertal area, i.e. within the range of *C. mclachlani*. *C. mclachlani* is a relatively shy species and is seldom seen out in the open. It prefers to bask in a sheltered position near its retreat.

The much higher frequency of occurrence of a post-interparietal scale, two suboculars per side and an anteriorly produced interparietal scale in the type specimens indicates that gene flow between the type population and the rest could have been disrupted for some time. The type locality being at present the southernmost point in the range of the species, the distinctiveness of this population may also be interpreted in terms of the founder effect. Because of its close proximity to the other localities, its small size (Mouton 1986; Mouton, Oelofsen & Mostert 1987; Mouton 1988) and the overlap in discriminating characters, we are hesitant to consider this population taxonomically distinct. Furthermore, there seem to be no differences in the eco-physiological requirements of the two sets, bearing the implication that during any future range expansion complete introgression will in all probability take place. The significance of the geographical variation as discussed above, will, however, only become clear when the true range of the species, especially towards the south, has been established. To date numerous searches for this species to the east and south of the type locality have, however, proved fruitless.

Prior to this report *C. mclachlani* was known only from the type locality, the farm Zonderwater in the Koue Bokkeveld (Figure 1) (Mouton 1986, 1988; Mouton *et al.* 1987). Fear was expressed that overzealous collecting by scientists at this locality might pose a threat to the survival of the species. With the new information available it is now clear that this species has a relatively large distribution range in comparison with many other *Cordylus* species occurring in the western Cape such as *C. niger*, *C. oelofseni*, *C. lawrenci* and *C. peersi*. Being a rupicolous form and therefore safe from most agricultural activities, this lizard species does not seem to be threatened by human activities. The relatively restricted range of *C. mclachlani* ties in with the general tendency of western forms to have more restricted ranges than eastern forms (Hewitt 1910; Poynton 1964).

Within its range it seems to be fairly common and it is incomprehensible that it could have escaped the notice of man for so many years. Perhaps it serves as an indication that much collecting still has to be done before our knowledge of the distribution of South African lizards will be near complete.

Acknowledgements

The authors thank A.J. Lintvelt, N.C. Badenhorst and S. Jacobs for assistance with fieldwork, the farmers in the Wuppertal-Nieuwoudtville area for permission to collect on their properties and the Transvaal Museum, Pretoria, for the loan of specimens.

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