Short Communications

A re-evaluation of the taxonomic status of Xenocalamus bicolor concavorostralis Hoffman, 1940 (Serpentes: Atractaspidinae)

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Received 5 June 1990; accepted 18 September 1990

The taxonomic status of Xenocalamus bicolor concavorostralis Hoffman, 1940, represented only by the holotype collected near Bloemfontein in 1939, is re-evaluated. The holotype of X. b. concavorostralis, two specimens of X. bicolor recently collected within 11 km of the type locality of X. b. concavorostralis and a specimen from Barkly West were examined in detail. Hoffman’s diagnostic characters for X. b. concavorostralis were found to be untenable, with all four specimens referable to X. b. bicolor Günther, 1868.

The taxonomenie status van Xenocalamus bicolor concavorostralis Hoffman, 1940, verteenwoordig deur alleenlik die holotipe wat naby Bloemfontein in 1939 versamel is, word herwaarin. Die holotipe van X. b. concavorostralis, twee eksemplare van X. bicolor wat 11 km van die tipe-lokalisie van X. b. concavorostralis versamel is, en ’n eksemplaar van Barkly-West is in detail bestudeer. Hoffman se diagnostiese kenmerke vir X. b. concavorostralis is onaanspraaklik, en al vier eksemplare word beskou as X. b. bicolor Günther, 1868.

The African snake genus Xenocalamus Günther contains five species, namely X. bicolor Günther, X. mechiowii FitzSimons, X. michelli Müller, X. sabiensis Broadley and X. transvaalensis Methuen. All species are nocturnal, fossorial, oviparous and feed mainly on amphibians (Broadley 1971; 1983).

The genus Xenocalamus was founded by Günther in 1868, on a single specimen (X. bicolor) collected in Damaraland, Namibia (Broadley 1971; 1983). X. b. var. lineatus Roux, 1907 was found to differ sufficiently from typical bicolor to allow subspecific status (FitzSimons 1946). In 1915, Werner described Micaëla pernasuа, later placed in the genus Xenocalamus by Hewitt (1926) and treated as X. b. pernasuа by FitzSimons (1946; 1962) and Witte & Laurent (1947). X. b. maculatus was described by FitzSimons in 1932. Hoffman (1940) then described X. b. concavorostralis from a single specimen collected at Kelly’s View near Bloemfontein in 1939. Hoffman (1940) noted that concavorostralis ‘is closely allied to bicolor, but distinguished therefrom in the shape of the rostral and the length of the parietal suture’. FitzSimons (1946) later examined this specimen, noting that Hoffman’s ventral count of 215 was incorrect and should have been 198. He also pointed out that Hoffman’s text figures, one of which depicts a distinctly downward projecting rostral, were not accurate. FitzSimons (1946) nevertheless retained concavorostralis as a subspecies of X. bicolor, and described a new subspecies, X. b. australis. In 1954, Lauren& described X. b. maehadoi from Dundo, Angola. In his revision of the genus, Broadley (1971) retained the subspecies australis FitzSimons, maehadoi Laurent and lineatus Roux, but placed pernasuа (Werner), maculatus FitzSimons and concavorostralis Hoffman in the synonymy of X. bicolor bicolor.

FitzSimons (1946; 1962) considered the occurrence of the Bloemfontein specimen to be somewhat inexplicable as it was collected so far south of the general range of the genus (see also Broadley 1983, map 45), and expressed the hope that further specimens would be collected from the area to confirm or refute its validity as a distinct form. Broadley (1971) did not examine the holotype of X. b. concavorostralis, but considered it representative of a peripheral population clinally linked to typical bicolor populations to the northwest. Despite De Waal’s (1978) intensive survey of the reptiles of the Orange Free State, no additional specimens of Xenocalamus were collected. However, in February, 1983, a specimen of X. b. bicolor was collected on the farm Pniel Estate near Barkly West (2824 Cb) (Bates 1988a). This record bridges the gap between X. b. bicolor populations elsewhere in the northern Cape Province and the Bloemfontein population (2926Aa) (Figure 1). In December 1985, a second X. b. bicolor was collected near Bloemfontein, from a disused termitarium on the farm Cecilia, only 7 km from the type locality of X. b. concavorostralis (Kelly’s View) (Lynch 1986a; b; Bates 1988b). In April, 1989, a third specimen was found in a drained pond at the Bloemfontein Zoo, 10,5 km from Kelly’s View and 3 km from Cecilia. The latter specimen may have originated in soil taken from a quarry near Cecilia and used during building operations at the Bloemfontein Zoo, as it seems unlikely that it would have survived in such an actively utilized area.

The holotype of X. b. concavorostralis and the three new specimens listed above, in the collection of the National Museum, Bloemfontein, have been examined to re-evaluate the taxonomic status of X. b. concavorostralis Hoffman and investigate variation in specimens from the southernmost part of the subspecies’ range.

The four specimens were examined and compared with descriptions of X. b. concavorostralis (Hoffman 1940; FitzSimons 1946; 1962) and X. b. bicolor (Broadley 1971; 1983). Colour patterns, ventral counts (using the method of Dowling 1951) and snout-vent length / midbody diameter ratios were compared with those of three specimens from the northern Cape Province examined by Broadley (1971) (see Table 1). The following measurements were taken on all specimens using vernier calipers (0,02 mm): head length (from tip of rostral to posterior border of parietals), greatest width of head, parietal length (greatest length on right side measured in a straight line), and third lower labial length (as a mean of left and right sides), whereas the following were measured using an optic micrometer (0,1mm): rostral length and posterior width (dorsally), length of parietal suture and length of scale postcing parietal suture (median nuchal scale). These measurements were used to calculate ratios relevant in comparing head shield proportions (cf. FitzSimons 1946; 1962).
Figure 1 Distribution of the quill-snouted snake, *Xenocalamus bicolor* in southern Africa (Broadley 1983; Auerbach 1987; Bates 1988a,b). ■ *X. b. bicolor*; ● *X. b. lineatus*; ★ *X. b. australis*.

Table 1 Data on *X. b. bicolor* from the northern Cape Province and Orange Free State (specimens examined are in bold print; *l* = length)

<table>
<thead>
<tr>
<th>Locality</th>
<th>Museum catalogue number</th>
<th>Sex</th>
<th>Ventrals (Dowling)</th>
<th>Subcaudals</th>
<th>SVL + tail <em>l</em> = total <em>l</em> (nm)</th>
<th>Total <em>l</em> / tail <em>l</em> ratio</th>
<th>SVL/midbody diameter</th>
<th>SVL/ head <em>l</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kelly’s View,</td>
<td>NMB</td>
<td>male</td>
<td>197</td>
<td>29</td>
<td>341 + 47 = 388</td>
<td>8,26</td>
<td>34*</td>
<td>31,6</td>
</tr>
<tr>
<td>Bloemfontein</td>
<td>A.2077</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cecilia,</td>
<td>NMB</td>
<td>male</td>
<td>199</td>
<td>30</td>
<td>409 + 46 = 455</td>
<td>9,89</td>
<td>59</td>
<td>41,7</td>
</tr>
<tr>
<td>Bloemfontein</td>
<td>R5318</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Bloemfontein</td>
<td>NMB</td>
<td>male</td>
<td>191</td>
<td>27</td>
<td>456 + 48,5 = 504,5</td>
<td>10,4</td>
<td>53</td>
<td>41,8</td>
</tr>
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<td>Zoo</td>
<td>R5904</td>
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<tr>
<td>Mareetsane</td>
<td>NMSR</td>
<td>male</td>
<td>204</td>
<td></td>
<td></td>
<td></td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Pniel Estate,</td>
<td>NMB</td>
<td>female</td>
<td>217</td>
<td>24/25</td>
<td>391 + 31 = 422</td>
<td>13,6</td>
<td>65</td>
<td>40,5</td>
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<tr>
<td>Barkly West</td>
<td>R5063</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Zoet Vlei</td>
<td>AM</td>
<td>female</td>
<td>228</td>
<td></td>
<td></td>
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<tr>
<td>Falls</td>
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</tr>
</tbody>
</table>

* Determined as 36 by FitzSimons (1946).

Snout-vent length (SVL) / midbody diameter ratio was first used by FitzSimons (1946) to separate subspecies of *X. bicolor*. However, Broadley (1971) stated that geographical variation in this 'slenderness ratio' is obscured by individual variation owing to contents of the digestive tract, developing ova, general condition of the specimen and probably also shrinkage following preservation. To determine whether or not a recent meal was the cause of the seemingly atypically robust form of *X. b. concavorostris*, incisions were made through the belly and the gut examined. SVL / midbody diameter ratio is determined on preserved specimens and the girth of snakes may be exaggerated if an excess of fixative was injected into the body cavity prior to preservation. The Barkly West specimen was somewhat emaciated before being injected with fixative, possibly resulting in a smaller girth than normal and therefore a slightly larger SVL / midbody diameter ratio.

To determine the sex of specimens, incisions were made...
through the belly and examined for the presence of testes or ovaries. The holotype of X. b. concavorostralis (NMB A2077) is a male (with an everted hemipenis), as are the Cecilia (NMB R5318) and Bloemfontein Zoo (NMB R5904) specimens, whereas the Barkly West snake (NMB R5063) is a female.

Examination of the holotype of X. b. concavorostralis was generally consistent with FitzSimons's (1946; 1962) description. Hoffman's (1940) description and illustration of the rostral of concavorostralis as being very hooked in profile is erroneous, as pointed out by FitzSimons (1946). The three Bloemfontein snakes have very slightly hooked rostra, whereas that of the Barkly West specimen is straight in profile. The holotype of X. b. concavorostralis differs from the other specimens in having a long head relative to SVL and a far more robust body (Table 1). The head was slightly wider than the neck in all specimens. Examination of the gut of concavorostralis showed it to be undistended with a little sand present in the hindgut only. The robust appearance of concavorostralis may be the result of injection of an excessive quantity of fixative.

All specimens had six upper and five lower labials, except for the Barkly West specimen, which had only four lower labials on the right side. The third and fourth upper labials enter the orbit, but only the fourth enters the orbit on the left side in the Barkly West specimen. Dorsal scales are in 17 rows. Median dorsal scales are as broad as long or middle of back anteriorly (cf. FitzSimons 1946; 1962). Variation in number of ventrals and subcaudals, size, total length / tail length ratio, SVL / midbody diameter ratio and SVL / head length ratio is shown in Table 1. The three Bloemfontein snakes are all males with similar low ventral and subcaudal counts, but the SVL / midbody diameter ratio ranged from 34–59. There was little variation in head shield proportions, with the greatest variation being in length of parietal suture relative to length of median nuchal scale (parietal suture / median nuchal scale length ratio): NMB A2077 = 0.61; NMB R5318 = 0.52; NMB R5904 = 0.50; NMB R5063 = 0.64.

Broadley (1971; 1983) described four basic colour patterns in populations of X. b. bicolor. The type of concavorostralis and three Cape Province specimens are described as 'reticulate', where the dorsum is brown or grey, each scale with a pale border and outer three or four scale rows and ventrum white. The type of concavorostralis is grey dorsally, has light-edged dorsal scales, three pale lateral scale rows (scapes of first — most dorsal — row are dark above, pale below, all rows with occasional dark blotches) and has a white ventrum with very occasional small dark blotches. The Barkly West specimen is similar, but has a chocolate brown dorsum and four pale lateral scale rows (upper half of top row is dark). The latter two specimens therefore have the 'reticulate' pattern. The other two Bloemfontein snakes have a grey-black dorsum with less easily discernable pale edges to the dorsal scales, three pale lateral scale rows (top scales dark dorsally, second row with more blotching than third) and ventrum with numerous dark blotches. These two species are close to the 'bicolor' pattern described by Broadley (1971; 1983) (uniform black above, outer 1–3 scale rows and ventrum white, sometimes with dark blotches or infusciation). All specimens had pale grey head shields (cf. Broadley 1971: 677).

Hoffman (1940) distinguished X. b. concavorostralis from typical bicolor on account of the rostral shape (hooked) and length of the parietal suture (distinctly shorter than scale behind) (Figure 2). Examination of the type of concavorostralis indicated that FitzSimons' (1946; 1962) diagram of the head is more accurate, the rostral being only slightly hooked in profile. The length of the median nuchal scale relative to length of the parietal suture (parietal suture / median nuchal scale length ratio) showed much variation among the four specimens examined (0.52–0.90), indicating that this character is too variable for use as a diagnostic feature.

Broadley (1971: 678) noted that X. b. bicolor includes some very diverse populations, but that none seem to warrant subspecific status. Broadley (1971) categorized these populations into six geographical groups based on colour morphs, ventral counts and SVL / midbody diameter ratios, although much variation in these characters occurs throughout the range of X. b. bicolor.

Broadley's (1971) suggestion of a clinal increase in ventral counts from east to west is supported by the material examined here, but SVL / midbody diameter ratio showed much variation (34–65). The two colour patterns 'reticulate' and 'bicolor' identified in the four specimens examined indicates that this character also varies in the southern part of the subspecies' range. The type of X. b. concavorostralis differs from other X. b. bicolor in that it has a more robust form, and has a distinctly longer head (relative to SVL) than the other three specimens examined (i.e. SVL / head length ratio = 31.6; compared to 41.7, 41.8 and 40.5). Numerous affinities between the holotype of X. b. concavorostralis and the other three specimens from the southernmost part of the species' range do, however, support Broadley's (1971) decision to place X. b. concavorostralis in the synonymy of X. b. bicolor.

*Figure 2* Dorsal view of the head of the holotype of *Xenocalamatus bicolor* concavorostralis Hoffman. Note that the parietal suture (PS) is shorter in length than the median nuchal scale (N).
Acknowledgements

I wish to thank Dr C.D. Lynch and Mr A.F. Flemming of the National Museum, Bloemfontein, for commenting on the manuscript. I also thank the two anonymous referees for their valuable comments.

References


The distribution of Bufo poweri in southern Africa

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Received 13 March 1990; accepted 18 December 1990

Bufo poweri is shown to be distinguishable from B. garmani on the basis of different male advertisement calls. A survey of published and unpublished sonagrams, and data summarizing sonagrams of calls, was used to determine the geographic ranges of the two species. B. garmani is found in the north and east, and B. poweri in the south and west of Africa. Further fieldwork is required at the boundary between the two species.

Bufo poweri kann V. garmani onderskei word op grond van die verskil in hul manlike advertensieroepe. 'n Opname van gepubliseerde en ongepubliseerde sonagramme, en data wat sonagramme opsom, is gebruik om die geografiese verspreiding van die twee spesies te bepaal. B. garmani kom in die noorde en ooste voor, en B. poweri in die suide en weste van Afrika. Verdere veldwerk word benodig by die grens tussen die twee spesies.

The cosmopolitan genus Bufo has been divided into a number of species groups (Frost 1985). The Bufo regularis species group is African and, along with other species of the regularis complex, is remarkable for its chromosome number of 2n = 20, while all other species of Bufo examined have 22 chromosomes (Bogart 1968). The regularis species group presently consists of B. brauni, B. garmani, B. guturalis, B. kisoloensis, B. poweri, B. rangeri, and B. regularis (Frost 1985).

Bufo garmani was described from Somalia (Meek 1897), while the morphologically similar B. poweri was described from Kimberley (Hewitt 1935). A long-standing problem has been to determine the status of B. poweri, based on preserved material. These two species are so similar in body proportions and colour pattern, characters often used to identify toads, that previous workers have been unable to separate them reliably. It is not surprising that until 1972 B. garmani and B. poweri were regarded as one species, Bufo garmani (Poynton 1964a; Tandy & Keith 1972). However, Tandy subsequently regarded them as distinct, largely on the basis of different advertisement calls (Tandy 1972; Tandy, Bogart, Largen & Feener 1982; Largen, Tandy & Tandy 1978). The call of B. garmani was described by Tandy et al. (1982), and that of B. garmani from Kenya by Largen et al. (1978). Most later workers have retained only the name B. garmani for southern African material (Passmore & Carruthers 1979; Poynton & Bradley 1988; Lambiris 1989).

The problem of how many species comprised ‘B. garmani’ and their distribution, was investigated by analysing available advertisement calls. Although the members of the regularis species group are morphologically very similar, each species possesses a distinct call (Poynton 1964a: 11). Advertisement calls of male frogs have been demonstrated