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TWO ADDITIONAL SPECIMENS OF *NAJA (BOULENGERINA) NANA* (SERPENTES: ELAPIDAE) WITH NOTES ON CAPTIVE HUSBANDRY AND BEHAVIOUR

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Two additional specimens of *Naja (Boulengerina) nana* (Serpentes: Elapidae) with notes on captive husbandry and behaviour

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Abstract

Two additional specimens of the newly described species of water cobra *Naja* (*Boulengerina*) *nana* Collet & Trape, 2020, from Lac Mai-Ndombe in the western Democratic Republic of the Congo are described. Since both specimens are longer than any of the type series and both also exhibit some variation from the type series, this paper serves to draw attention to this variation while also providing additional information on the captive husbandry and biology of the species. Both specimens have unusual anal arrangements. The female also has unusual fusions of the 6th supralabials with the anterior and lower posterior temporals and only two rather than three supralabials in contact with the nasal. Observations on the husbandry, diet, reproduction and behaviour of captives are also provided.

Key Words

Naja (*Boulengerina) nana*, water cobra, aberrant lepidosis, reproduction, captive behaviour, husbandry.

Introduction

This paper describes two additional specimens of the recently described *Naja* (*Boulengerina*) *nana* Collet & Trape, 2020. While generally conforming to the descriptions by Collet & Trape (2020) they both show differences deemed to be worth noting.

Two frozen specimens of what was at the time an undescribed aquatic cobra, genus Naja (Boulengerina), were donated to the LRG Raw Herpetological Collection (LRC Sabaj (2016), but referred to here by the label designation as LR) after dying in captivity. According to the importer (Ralph Braun, Serpentarium Calden) who sold the snakes to Ross Deacon in March 2017, the snakes originated from Lac Mai-Ndombe, Bandundu Province, Democratic Republic of the Congo (roughly 2° S, 18° E), but further collection details are not available. There were originally two males and one female, however the female killed and ate the second male.

Wallach, Wüster & Broadley (2009) relegated *Boulengerina* to a subgenus of the genus *Naja* Laurenti, 1768 while transferring the Forest Cobra *Naja melanoleuca* Hallowell, 1857 (s.l.) and the burrowing cobra *Paranaja multifasciata* (Werner, 1902) to the subgenus. The observed characters of the two specimens confirm that the snakes are members of the subgenus *Boulengerina.* The subgenus is diagnosed by "Intracranial (dorsal) anterior Vidian canal position, 2–4 solid maxillary teeth, penultimate (sixth) supralabial high, combination of one preocular and one anterior temporal (except *N. christyi*, which sometimes has two anterior temporals), rostral much broader than deep, internasals shorter than prefrontals, dorsal scales highly polished, fangs not modified for spitting" (Wallach, Wüster & Broadley, 2009).

Materials and methods

The two frozen specimens mentioned above were thawed and subsequently preserved by immersion in 70% ethanol. Some time later they were transferred to 50% isopropanol for permanent storage. The two specimens were accessioned on 15 October, 2017 as LR 2895, a female and LR 2896, a male, both from Lac Mai-Ndombe, Bandundu Province, Democratic Republic of the Congo, Central Africa. This locality is believed to be reliable and is in agreement with that given in Collet & Trape (2020).

Examination of the specimens was undertaken using a Wild M5 stereo-microscope; measurements were taken with a Mitutoyo dial caliper, metal ruler or flexible tape measure as appropriate. Digital photographs were taken before making the counts from enlarged images facilitated ventral and subcaudal counts. Ventral counts were made using the Dowling system (Dowling, 1951).

Description of the two specimens

With only two specimens available, dissection was not attempted so the first and second characters of Vidian canal position and number of solid maxillary teeth were not checked. However there are at least three solid teeth on the right maxilla of the female and the fangs are not modified for spitting. The specimens have the 6th or penultimate upper labial high, one preocular, rostral much broader than deep, internasals shorter than the prefrontals and dorsal scales highly polished. The male specimen has one anterior temporal, however, the female has the 6th upper labial fused with the anterior temporal and lower second temporal on both sides. Abnormal fused head shields were observed is some specimens by Collet & Trape (2020) while they also occasionally occur in other snake species (Raw, 2021).

Head: Rostral visible from above, wider than high; internasals wider than long, extending laterally to contact preocular; prefrontals longer than internasals, wider than long with anterior edges longer than posterior; frontal shield-shaped with anterior margin widest; supraoculars longer than wide, slightly shorter than frontal, narrower anteriorly; parietals slightly longer than combined length of frontal and prefrontals (Fig. 1).

Fig 1. Dorsal view of head: female on left, male on right.

Nostril pierced between two nasals, anterior approximately twice as long as posterior; 1 preocular and 2 postoculars; 7 upper labials, 1st and 2nd in contact with nasal in the female (the male has the normal *Naja* condition with the first 3 in contact), 2nd and 3rd in contact with preocular, 3rd and 4th in contact with orbit, vertical diameter of eye subequal to distance from lip; 4^{th}, 5^{th} and 6^{th} upper labials in contact with lower postocular, the 6^{th} by far the largest labial, separated from parietals by 1^{st} temporal in the male while the female has the 6^{th} upper labial with the upper margin about twice the length of the lower margin, in broad contact with the adjacent parietal, semi-divided on right side, apparently the fusion of the 6^{th} upper labial, first and lower second temporals; temporal formula 1+2 on both sides in the male but fused on the left and partly fused on the right in the female (Figs. 2 & 3).

Fig 2. Left side of head: female on left, male on right.

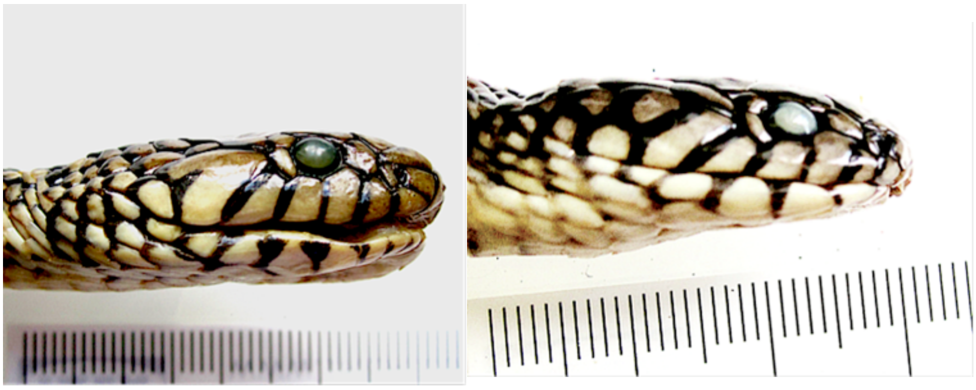

Fig 3. Right side of head: female on left, male on right.

Mental small, triangular; 8 lower labials, 1^{st} in broad contact with opposing side labial behind mental, anterior chin shields in broad contact, median chin shields narrowly separated by narrow contact between anterior and posterior chin shields (Fig. 4).

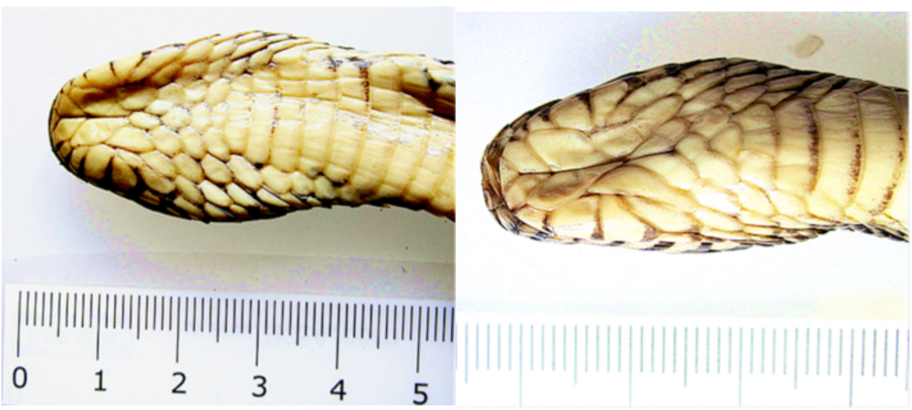

Fig 4. Ventral view of head: female on left, male on right.

Scale counts: Scale rows at one head length behind head 21, midbody (MBSR) 19, one head length before vent male 13 and female 15; ventrals male 194 and female 205, anal in male entire posteriorly, partly divided anteriorly and in the female it is divided with one long scale opposite two shorter scales (see fig. 5), subcaudals paired, male count is 69 and female count 79 pairs. Table 1 compares four characters, midbody scale rows, ventral counts, subcaudal counts and anal shield. The female specimen has a higher subcaudal count while the male has a higher ventral count than any mentioned by Collet &Trape (2020). Although single anal shields are the normal arrangement for both *Naja* and the subgenus *Boulengerina* both specimens in this case described here have abnormal anal shields.

Fig. 5. Ventral view of anal region: female on left, male on right.

Taxon	MBSR	Ventrals	Subcaudals	Anal
LR 2895 (f)	19	194	79	*divided 1+2
LR 2896 (m)	19	205	69	*semi-divided
nana (males)	19 (17-20)	186-202	65-74	entire
nana (females)	19 (18-21)	192-209	64-76	entire
a. annulata	23 (21)	199-226	70-77	entire
a. stormsi	21-23	192-218	67-78	entire
christyi	17	206-209	69	entire

Table 1. Comparison with Aquatic Species of *Naja* Subgenus *Boulengerina*. Data compiled from Boulenger (1904); Collet & Trape (2020); Loveridge (1944); Pitman (1974); Schmidt (1923); Spawls & Branch (1995); Spawls et al. (2002); Spawls et al. (2018); Werner (1902) and Wüster et al. (2018). *See fig. 5.

Size: Both specimens are longer that any in the type series.
LR 2896 (male): snout - vent 777 mm; tail 197 mm; total = 974 mm. Tail length is 20,23% of total length. Total length/tail length = 4,94 - within the range of the male paratypes).
LR 2895 (female): snout - vent 960 mm (longest female paratype 930 mm); tail 237 mm (longest female paratype 174 mm); total = 1107 mm (longest female paratype 930 mm). Tail length is 21,41% of total length length (total length/tail length = 5,05 - slightly lower than the range of the female paratypes).
DNA Sequencing: The female specimen was sampled for DNA while still alive. Sequencing of the mtDNA strangely showed that it was not distinguishable from that of *N. annulata* (W. Wüster, pers. comm. 2021).
Colour in alcohol: Base colour yellowish brown with most dorsal and head scales dark-edged, indications of lighter indistinct bands on sides, upper dorsum more

uniform giving a network pattern (male darker overall than female). Ventral scales pale with darker posterior edges becoming more pronounced caudally, subcaudals with wider dark edges, uniformly dark towards the end of the tail (Figs. 6 & 7).

Fig. 6. Dorsal view, female on left, male on right.

Fig. 7. Ventral view, female on left, male on right.

Captive Observations: A slender *Naja* species, that will swim and climb, but seems to prefer a terrestrial habitat although it will hunt and defecate in water where possible. The acclimatisation process for wild caught specimens is critical to the captive success of the species, the general quality of the health of the animals from the Congo is highly variable and most of the imported samples come in to the importer in very poor condition. Specimens surviving the initial acclimatisation process will readily take fish from early on in captive care. Once acclimatised many captive specimens have been converted on to a mainly rodent-based diet - however it is unknown if this will have an effect on the long-term health of the specimens, and therefore a varied diet is recommended. One case of cannibalism of a conspecific snake is known.

Captive breeding of this species has been successful within Europe, with multiple reports of captive breeding and incubation with varied success with neonate survival. The original breeding by Peter Pastor (2015 and pers. comm. 2020) produced 4 viable eggs after a successful mating of one of his two pairs. The eggs were relatively large, elongate, approximately 70 x 24mm (estimated from a photograph of an egg next to a tape measure). Incubation at 29° C was exactly 70 days (laid June 17, first hatching August 26).

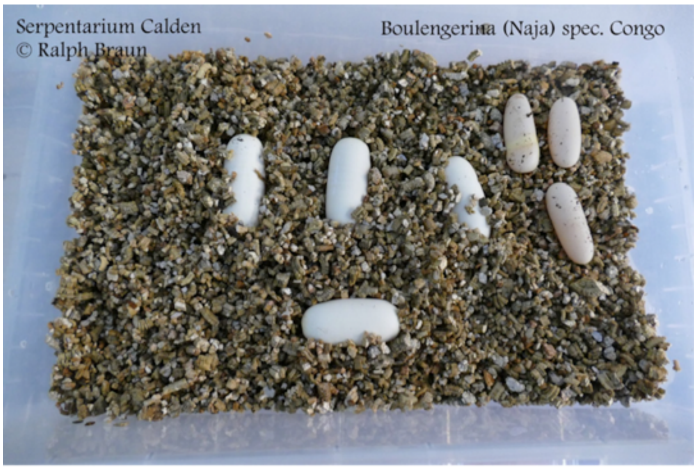

Fig. 8. Incubating eggs, four apparently viable and three thought to be infertile (Photograph © Ralph Braun).

More recently, Ralph Braun of Serpentarium Calden (pers. comm. 2020) was successful in breeding his specimens and at the time of writing was incubating 4 viable eggs while another 3 were believed to be infertile (fig. 8).
The captive behaviours of *Naja nana* are remarkably similar to young snakes of the *Naja melanoleuca* species complex. When cornered on land, captive examples raise a slender hood and make short forward rushes with mouth wide-open. However, if the snakes were in water when approached, they would attempt to swim away.

Fig. 9. Female in life (Photograph © W. Wüster).

Conclusions

Although the two specimens described above are undoubtedly examples of *Naja* (*Boulengerina*) *nana* this paper provides additional information on the species in terms of maximum length, variation in lepidosis, reproduction and captive behaviour .

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