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DISTRIBUTION RECORD OF A XANTHIC ZAMBEZI FLAP-SHELLED TERRAPIN *CYCLODERMA FRENATUM* AT THE RUFIFI RIVER, TANZANIA

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Introduction

The Selous Game Reserve is located in southern Tanzania and is one of the largest protected areas in Africa and the world. It has a surface area of more than 50 000 km² (Baldus 2009), and includes several river and lake systems, of which the Rufiji is one of largest rivers in Africa and is an important corridor within the Selous and surrounding areas. The Rufiji River has an 800 m³/s annual flow, and the lower floodplains are subjected to bi-annual flood peaks (Duvail and Hamerlynck 2007). Other rivers of interest, with reference to *Cycloderma frenatum* (Peters 1854), are the Kilombero or Ulanga River, which flows into the Rufiji, and the Ruaha River. Of the three there are records of *C. frenatum* occurring in the Kilombero or Ulanga River (Loveridge 1942) and, due to its flowing into the Rufiji, there has been an assumption that *C. frenatum* is present in both the Ruaha and Rufiji River systems, although not yet recorded in the latter (Spawls *et al.* 2011).

This article arises from a discovery by the Leyendecker family, and in particular their son Martin Leyendecker. On 1 July 2014, whilst in the northern photographic area of the Selous Game Reserve, they were making their way from Kisasi village, just outside the western gate called Matambwe, heading to Mbega Camp outside Mtemere Gate

(eastern gate), when they noticed a freshwater turtle or terrapin within the Selous Game Reserve at the Mtemere Airstrip (Figure 3). Martin Leyendecker has a passion for chelonians, so they stopped the vehicle to take a closer look and photograph their discovery. The Leyendecker family asked around if anyone had an identification of the species and if it had been seen before, with no success. So a mutual friend, Rolf Baldus, sent images to Walter Jubber who later confirmed a Zambezi Flap-shelled or Soft-shelled Terrapin *Cycloderma frenatum* (Peters 1854), which had made its way onto land from the Rufiji River.

Confirmation that *C. frenatum* is present in the Rufiji River, and its being a xanthic individual, made it an interesting discovery.

Species description

Cycloderma frenatum (Peter 1854) belongs to the family Trionychidae (the name refers to the presence of three claws on each foot), commonly known as the Soft-shelled Terrapins. They are further divided into the subfamily Cyclanorbinae (Branch 2008; Spawls *et al.* 2011).

C. frenatum received its common or vernacular name from its defence when exposed on land. It will retreat into the soft shell, pulling in head, tail and feet. Flexible edges of the carapace deform and two semi-circular flaps close the openings over the hind feet, preventing attack. If further harassed or handled, they secrete a foul smelling musk from Rathke's gland, found at the hind feet, or may bite and scratch (Branch 2008; Spawls *et al.* 2011).

The species has a characteristic projecting, tubular proboscis, and papilla-like nostrils project upwards from the infra-median corner. Eyes are bright yellow, which appear more prominent in juveniles, with the upper lips meeting anteriorly to form a flat, lateral arch, with a sharp vertically angled aspect. Forefeet have four or five sharp-edged crescentic skin folds on the dorsal surface, and a weal-like thickening

on the outer surface. Hind feet have sharp, crescentic folds on the underside of the heel, posterior to the base of the fifth toe. The tail is longer in males and extends beyond the carapace. The carapace (dorsal shell) is smooth in adults, but has a slight vertebral keel and numerous wavy, longitudinal ridges in juveniles. The plastron (ventral shell) has femoral and caudal flaps, which close and conceal the hind limbs and tail. Juveniles have smooth plastrons, whereas adults have plastron callosities present (Loveridge and Williams 1957; Broadley & Sachsse 2011; Branch 2008; Spawls *et al.* 2011).

Geographically there are colour variations and measurement differences of adults and hatchlings, and this has been described in detail by several authors. With reference to the individual in question, I have used the description pertaining to Ruvuma and Lake Malawi individuals (Loveridge & Williams 1957; Loveridge 1942):

Carapace and plastron:

- **Hatchlings** have a carapace that is light grey to lead in colour, with the plastron pale green or lead, in some cases almost white. An irregular black blotch occurs at the umbilical region, with an elongated, oblique blotch near each forelimb. Rounded anterior blotches are present near each hind leg, with a final 6th spot at the anal region.
- **Adults** have a dark olive-brown carapace (same colouration seen in individuals from south-eastern Zimbabwe), and it is believed the females have a China-white, flesh-pink plastron, with pearly-grey reticulations. These reticulations are believed to be absent in males.

Head and neck:

- **Hatchlings** have light edged, dark inter-orbital crossbars, with five longitudinal, wavy or broken lines from close to the occiput to the base of the neck, which tends to be grey in colour. Underside is usually a uniform pure white, but some show dusky streaks.

- **Adults** have necks of dark olive, with obscured or absent longitudinal lines.

Measurements and weight:

- **Carapace length:** average 560 mm (female from Lake Malawi sampling)
- **Carapace width:** 418 mm (females from Lake Malawi)
- **Body disc length and width:** length 390 mm (female from Ruvuma) and width 310 mm
- **Head and neck length:** 420 mm (measurement obtained from one individual)
- **Hatchling measurements:** length 40-48 mm and width 30-36 mm
- **Weight:** 11.4 kg (largest female collected in the Ruvuma River).

Xanthic, leucism, albinism, hypomelanism and piebaldism definition, occurrence and relevance

There are several terms used to describe different or abnormal colour patterns and variations in species, and these colour variants are not restricted to reptiles. The main ones discussed here, are: leucism, hypomelanistic/xanthic albinism, albinism and partial albinism (piebaldism). None of these are common in the wild, and are sort after in, and often bred for, the pet trade.



Figure 1a: Side view of *Cycloderma frenatum* showing uniform yellow colouration (©M. Leyendecker).

Xanthism, in which the colour is yellow, due to dominance of yellow pigment.

Leucism is a deficiency in all skin pigments, with eye colour remaining normal.

Hypomelanism is where there is a low level of dark pigments in the skin.

Albinism is a deficiency in the production of melanin, by melanocytes, and thus the eyes are pink and the whole body lacks colour.

Partial albinism (piebaldism) is a condition where only certain skin pigments and body regions are effected, giving the individual a pied appearance (Kornilios 2014; Betchel 1991 and 1995; Veena *et al.* 2011).



Figure 1b: Top view of *Cycloderma frenatum*, showing uniform yellow colouration (©M. Leyendecker).

In the wild, individuals with these colour variations usually have a low survival rate, for several reasons:

- Individuals hatching with these abnormalities may be still born, or if not, will be easy prey for predators (Krecsák 2008).
- Albino species have vision problems, which impair perception of signals by conspecifics, and spotting danger in the form of predators (Garipis & Hoffmann 2000).
- Melanin functions as a sun protection and also has a thermoregulatory function, thus albino and leucistic individuals cannot thermoregulate properly and are also heliophobic (sun-sensitive) (Betchel 1978).

In the case of the *Cycloderma frenatum* discovered (Figures 1a,b), the eye colour was still yellow and not pink or red as would be the case in albinism, and this is the normal eye colouration of this species. However, the body and shell colouration was yellow instead of the colourations described above, which indicated dominance of yellow pigment or xanthism (Peter 1882; Loveridge & Williams 1957; Loveridge 1942; Branch 2008; Spawls *et al.* 2011). The colouration was uniform across the entire body, ruling out piebaldism.

Distribution of *Cycloderma frenatum* (Peters 1854)

Cycloderma frenatum is found in streams, rivers and lakes, mainly in Malawi, Mozambique and Tanzania (Branch 2008; Broadley & Sachsse 2011; Spawls *et al.* 2011). Within its Mozambique distribution, *C. frenatum* has been found in the Save River, and also the Ruvuma River system on the boundary between Tanzania and Mozambique (Loveridge 1942).

A contributing discovery was that a fisherman had caught a large specimen with an approximate carapace size of 40cm, in the Lugenda River, Niassa Game Reserve. This record fills a distribution gap for *C. frenatum*'s Mozambique range (Branch *et al.* 2005).

As for Tanzania, this species distribution is limited to southern Tanzania, with records in Kilombero and Ruvuma River systems (Loveridge 1942). It is also said to possibly be in the Mbwemburu River in the Lindi region of Tanzania, but there are no records yet. As for individuals occurring within the Kilombero River, the potential and probability of their being found within the Rufiji and Ruaha River systems has always been good and assumed to be the case due to their all being linked, but without any confirmation until this recent discovery (discovery by Leyendeker 2014; Spawls *et al.* 2011).



Figure 2: Google Earth image showing plotted approximate locations of individuals found.

New record distribution for Tanzania

The co-ordinates for the sighting are S: 7.750728°, E: 38.202594°, which is on the edge of the Mtemere airstrip within the Selous Game Reserve, close to the Rufiji River (Figures 2 and 3).



Figure 3: Area where specimen was found, with the Rufiji River in the background (©M. Leyendecker).

Discussion

This specimen confirms the distribution and occurrence of *Cycloderma frenatum* within the Rufiji River system, as was expected and thought to be the case (Spawls *et al.* 2011). The fact that this was a xanthic individual found in the wild, and had survived for so long, is a rarity. Looking at the images received, and in particular the ones where Martin Leyendecker has the individual in hand (Figure 4), using the camera as a rough measuring guide of 100mm, the carapace length was approximately two camera lengths, so around 200 mm, just shy of the average adult size of 300–500 mm, and with a rough estimate of 150 mm (Branch 2008). This means this individual had been relatively successful in terms of survival, although it was still a juvenile.



Figure 4: Martin Leyendecker with *Cycloderma frenatum* individual in hand, with its head shot out in defence.

Also of interest is that the individual was seen crossing land, which is not common, although there have been records and reports of their doing so from Gorongosa National Park (Mozambique) and south-eastern Zimbabwe (Broadley & Sachsse 2011). Normally *C. frenatum* spends the vast majority of time in water, hence they are not seen as regularly as other species of terrapin. They will even bask in warm surface waters, rather than coming to land to bask. Females do, however, come ashore in the evening to lay eggs. A clutch normally comprises 15–25 hard-shelled, almost spherical eggs, laid over a 10-week period, between the months of January and April, with an incubation period of 8–11 months (Mitchell, 1959; Branch 2008; Spawls *et al.* 2011).

The chances of survival of this juvenile individual are questionable, but it had done well thus far, despite the odds stacked against it.

Acknowledgements

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