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A remarkable case of malformation in a free-living individual of *Furcifer pardalis* (Cuvier, 1829) from northern Madagascar

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Abstract. A highly malformed panther chameleon (*Furcifer pardalis*) was found in a garden in Sambava, north-eastern Madagascar. Although the chameleon showed several noticable signs of physical malformations, it appeared in a surprisingly good condition and survived with these extreme deformations since at least three to four months. Causation of the skeletal deformities remains unknown. This appears to be the first reported malformation in a free-living chameleon.

Keywords. Chamaeleonidae, *Furcifer pardalis*, osteological deformation, Sambava, north-eastern Madagascar.

The panther chamaeleon (*Furcifer pardalis*) is one of largest chamaeleons of Madagascar with a total lenght in males up to 520mm (Glaw & Vences, 2007). It is widespread along the northern and northeastern parts of Madagascar and shows within its distribution area high population densities. For the *F. pardalis* population on Nosy Be, Andreone et al. (2005) estimated a density of 42.21 individuals per ha. Males are very colourful and bigger then the females. *Furcifer pardalis* is regularly found in primary rainforest, but is generally much more abundant in secondary habitats like plantations, low degraded scrub and furthermore in gardens within villages.

Herein, I report on osteological deformities in a juvenile *Furcifer pardalis* that I found on the 27th October 2006 in a garden in Sambava, north-eastern Madagascar (14°15´41´´ S 50° 09´52´´E; 4 m above sea level). This *F. pardalis* showed several noticeable signs of physical malformations, but despite this significant handicap it appeared in a surprisingly good condition (Fig. 1). The chameleon had a snout-vent lenght of 65 mm and a tail lenght of 75 mm. The spinal column was frontocaudally highly deformed with a hump at the end of the thorax and a kink in the lumbar spine and the pelvis. The hindlimbs were stretched under the body and movable only from the level of the knee downwards. The forelimbs showed no obvious deformation and a normal flexibility. The tail had a "accordion"-like shape and was twisted in itself. Only the tip of the tail was flexible whereas the rest of the tail was more or less stiff and inflexible. The individual could not use it for adherence on twigs or branches. The movement in the specimen was noticeably limited. Although climbing with the forelimbs did not seem to be affected, movement on horizontal branches appeared to be obstructed by the kink in the lumbar spine and the pelvis and the immobility of the hindlimbs. I estimated the age of this *F. pardalis* to three to four months, due to the body size and the presence of blue and yellow hues on the cheeks, flanks and the dorsal crest (Fig. 2), which is characteristic for specimen of this age (Müller et al., 2007, own observation on captive bred *F. pardalis*).

Since the present case represents only a single observation and due to the fact that the specimen was not collected for further examinations, it is nearly impossible to determine the causation of the skeletal aberrations seen in this juvenile *F. pardalis*.

Observations of malformed offspring in reptiles have been regularly described from captive bred specimens, e.g. *Varanus prasinus* (Mendyk, 2008), *Varanus timorensis* (Géczy, 2009) and some few records exist on observations of natural populations, e.g. *Varanus bengalensis nebulosus* (Lang & Böhme, 1991), *Vipera berus* (Madsen et al., 1992), *Lacerta agilis* (Olsson et al., 1996), *Podarcis muralis* (Ji & Braña, 1999), and *Anolis sagrei* (Norval et al., 2009). Some studies emphasize the the role of inbreeding as a cause of malformations in natural sub-populations with low genetic diversity (Madsen et al., 1992; Olsson et al., 1994; 1996). The proportion of malformed hatchlings within these populations (of sand lizards) was ca. 10% (Olsson et al., 1996). The high population density of *F. pardalis* in the Sambava region and the wide distribution along the whole north-eastern coast, without any obvious biogeographic barriers to gene flow among populations makes it highly unlikely that inbreeding induced this deformity. Biochemical substances like pesticides or herbicides are not used in this area, and can probably

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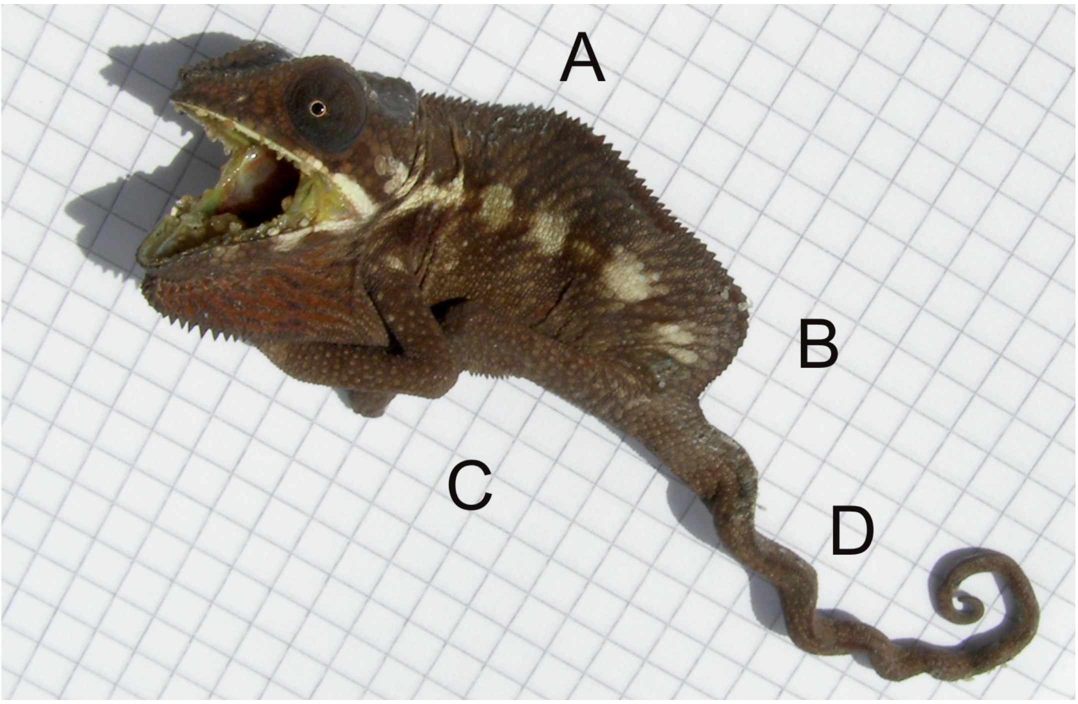

Figure 1. The *Furcifer pardalis* described in this report, lateral view. Note the deformed spinal column (A), the kink in the lumbar spine and the pelvis (B), the position of the hindlimbs (C), and the "accordion"-like shape of the tail (D).

Figure 2. The malformed *Furcifer pardalis* in sitting position. Note the blue and yellow hues on the cheeks, flanks and the dorsal crest.

be excluded as potential elicitor of this malformation as well.

Although incubation environment of reptile eggs (e.g. temperature, substrate moisture) has been shown to affect the phenotypes of hatchlings in some species (Phillips & Packard, 1994; Chao-Hua, 2001), other studies were unable to find any significant correlation between the rate of deformed hatchlings and the thermal and hydric environment during the incubation time (Ji & Braña, 1999). Since I have no information about the incubation conditions of this specimen, it seems plausible to assume either a genetic determining factor or the influence of inappropriate incubation conditions of the egg as a likely cause for this case.

However, the comparative longevity of this highly malformed *F. pardalis* is remarkable. Malformed embryos may die mostly in early pre-hatching developmental stages or will be naturally selected soon after hatching, due to organic disfunctions or their incapability to avoid predators or to successfully forage. Chameleons are well-known for their camouflage, are mostly sit-and-wait predators and move in general very slowly, therefore I assume these characteristic chameleon behavioural patterns are responsible for the possibility of survival of this deformed specimen. After hatching the deformed *F. pardalis* may have somehow reached a shrub and hid in the vegetation, where it remained difficult to be discovered by predators (especially birds), and its long tongue enabled it to catch insects over long distances, without moving.

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