

First report of flavinistic albinism in the Checkered keelback, *Fowlea piscator* (Schneider, 1799), from Nepal

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The Checkered keelback, *Fowlea piscator* (Schneider, 1799)⁴, is a fairly commonly encountered component of the ophidiofauna of Nepal. In addition to an extensive distribution throughout South Asia, the species occurs in the India-Nepal border region and further north into Nepal at elevations up to 700 m (Schleich and Kästle, 2002; Shah and Tiwari, 2004; Whitaker and Captain, 2004). These highly aquatic snakes are active both during the day and by night, and their habitat includes bodies of freshwater and the immediately surrounding area but rice paddies and other types of marshy areas. Keelbacks are generalist predators known to feed on insects, frogs and their tadpoles, frog eggs, fish, and, occasionally, birds and rodents (Shah and Tiwari, 2004; Whitaker and Captain, 2004). The normal body colouration (Fig. 1) of *F. piscator* is dark olive green or olive brown to lighter shades of these colours, usually with a checkered body pattern that includes two oblique black streaks with one below and the other behind the eye (Schleich and Kästle, 2002; Shah and Tiwari, 2004).

Perhaps as few as one in 30,000 individuals in a wild reptile population exhibits the recessive genetic condition called albinism, characterised by a lack of the pigment melanin, which is thought to confer reduced fitness compared to non-albinos (e.g., Bechtel, 1991, 1995; Krecsák, 2008). However, in some species dorsal colour is not only a function of melanin and a variety of other pigments, including pteridines and carotenoids,

may render a melanin-deficient epidermis yellow, orange, or even red (Bechtel, 1995). As a consequence, it is possible to differentiate between white albinos and chromatic (i.e., coloured) albinos, and the term flavinistic albinism⁵ can be applied to individuals with an overall yellow colouration, who display flavochromism (also known as xanthochromism; e.g., Cardoso and Parpinelli, 2006; Ceacero Herrador and Pedrajas Pulido, 2006; Stephenson and Drace, 2014).

The snake rescue group we are associated with was called at 12:05 h on 9 December 2017 to rescue an unspecified snake from a plastic water container in Bateshwar, Aurahi Rural Municipality, Dhanusha District, Province No. 2, Nepal (26.7296°N, 85.9951°E; elevation 81 m). Upon inspection of the container, a flavinistic albino *F. piscator*⁶ was located and removed. During the encounter, the snake, which measured ca. 39 cm in total length based on a ruler placed alongside it, was quite active and aggressive. It had a yellowish body that included the characteristic checkered pattern of *F. piscator* in an orange-red coloration, and its eyes were without the usual pigmentation (Fig. 2). The snake was photographed, removed from the residential area, and released nearby into its natural habitat.

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⁴ The species *piscator* was recently reassigned from *Xenochrophis* to the genus *Fowlea* by Purkayastha et al. (2018) and we follow their recommendations.

⁵ There are two terms that can be applied to a condition wherein the main body colour is yellow, flavinistic (from Latin *flavus*, yellow) or xanthic (from Greek *xanthos*, yellow). Given that the derivation of the term albinism is from the Latin *albus* (white), we prefer to match languages as opposed to mismatching them.

⁶ Differentiation from *F. schnurrenbergeri* (Kramer, 1977), a species with which *F. piscator* may overlap geographically, is based on supralabial scales. In *F. schnurrenbergeri* the 3rd and 4th supralabials are in contact with the eye, whereas in *F. piscator* and in the flavinistic individual the 4th and 5th supralabials are in contact with the eye.

Our observation is the first record of a snake with flavinistic albinism from Nepal, and also the first record of an albinistic *F. piscator* from the country. We have located four additional records of this phenomenon in India, all under the name *Xenochrophis piscator*. The first report was from Odisha State, published in the *New Indian Express* newspaper (Anonymous, 2011). Scientific reports were subsequently published for records in Gujarat by Mahabal and Thakur (2014), Maharashtra by Deshmuk et al. (2020), and West Bengal by Mahapatra et al. (2020).

The example of flavinistic albinism in *F. piscator* clearly shows the independence of different pigments in the formation of body colour. The combination of melanin and yellow pigmentation appears to create

the dark greenish brown overall body colouration, and the absence of melanin leaves no trace of the usual dark stripes on the side of the head. The black spots that create the characteristic checkered lateral pattern in *F. piscator* must be a combination of melanin and pteridines (or perhaps carotenoids derived from the diet), and the absence of melanin leaves only orange-red pigmentation in those areas (Fig. 2C). As records of albinism in Nepal accumulate (e.g., Devkota et al., 2020a, b), there is an opportunity to study not only the prevalence of an aberrant genetic condition in wild reptiles but also how the interplay of pigment molecules creates an interesting natural colour palette and how the changed colouration may affect species' behaviour and ecology.



Figure 2. A Checkered Keelback (*Fowlea piscator*) from Dhanusha District, Province No. 2, Nepal, displaying flavistic albinism. (A) The entire body shows a yellowish hue along with some pronounced reddish patterning laterally. This individual also presents with a subcutaneous parasitic infection as indicated by the raised skin (orange arrows) in at least four places. (B) There is no ventral coloration. (C) Close-up of the head and neck region of the trapped snake, taken in situ before it was liberated from a large plastic container, from which it was unable to escape. The yellowish colouration is uniform, and the eyes show the typical reddish albino colour. Photos by Dev Narayan Mandal.



Figure 1. A normally coloured individual of *Fowlea piscator* from Ramnagar, Butwal-10, Rupandehi, Nepal. Photo by Kamal Devkota.

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