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43/2 Varadarajulu Nagar, 5<sup>th</sup> Street West, Ganapathy, Coimbatore, Tamil Nadu 641035, IndiaPh: +91 9385339863 | [www.threatenedtaxa.org](http://www.threatenedtaxa.org)

Email: sanjay@threatenedtaxa.org

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Cover: Common Silverline *Spindasis vulcanus vulcanus* in poster colours adapted from photograph by Kalpesh Tayade. © Pooja R. Patil.



## Is trade the reason for the unusual colour morph of Cobra from Goa? Response to Sawant et al.

Raju Vyas<sup>1</sup>  & Harshil Patel<sup>2</sup> 

<sup>1</sup>Shashwat Apartment, 23 Anandnagar Society, BPC Road, Alkapuri, Vadodara, Gujarat 390007, India.

<sup>2</sup>Thackeray Wildlife Foundation, Mumbai, Maharashtra 400051, India.

<sup>1</sup> razoovyas@hotmail.com (corresponding author), <sup>2</sup> harshilpatel121@gmail.com

Recently, Sawant et al. (2022) published a record of an unusual colour morph of the Indian Cobra *Naja naja* (Linnaeus, 1758), based on a specimen rescued from Modelo wado, Assonora (15.618°N; 73.897°E), Goa, India. Also, the authors provided three coloured figures, and some basic scalation data for this interesting case of the colour morph of a cobra. The colour description was provided as the dorsal body colour is brownish-black and brownish-grey on the ventral side, and with a scarcely visible spectacle mark on the hood. Sawant et al. (2022) state that the colour morph usually inhabits northwestern India (Whitaker & Captain 2004), and there is less chance that such animal would have come through transportation from the region where they are commonly found; hence, the authors interpreted this as the first report of such pigmentation in the species, which they reported for the first time from the region.

The record of this unusual colour morph and published images of Indian Spectacle Cobra by Sawant et al. (2022) indicates that the specimen is not from Goa but elsewhere, most probably from states of northwestern India. Such typical colour morph of cobra is found widely in parts of Gujarat State (Patel et al. 2019b), and published cobra images show it is not a typical normal specimen, especially the head portion behind the eyes. In a typical specimen of the species, this portion is slightly developed and appears like a bulge/swelling

because it is the site of the venom gland in the species (Image 1). This portion is not enlarged but depressed in the published images of the cobra (see Images 1–3 of Sawant et al. 2022). Such cobra is usually found in snake charmers' baskets because snake charmers remove fangs and the venom glands from that portion, which later results in a depression in the temporal region. Also, the scalation data provided by the authors (Sawant et al. 2022) is not complete and not at par with that of which was used by researchers for the genus *Naja* (see Wüster 1998). Sawant et al. (2022) provide the dorsal scalation as counted at neck, midbody, and tail; however, the authors do not provide the scales around the hood, which is an important count while studying the genus. Wüster (1998) has provided the dorsal scales at midbody of the northwestern population of *N. naja* as 19–21 scales and the rest of the Indian population have 23–25 scales. The specimen reported by Sawant et al. (2022) also had 21 dorsal scales at midbody, falling in the range of the northwestern population. Sawant et al. (2022) have said that cuneate scale is present on both sides but did not provide the numbers of cuneate scales; based on the images provided (Figure 2 of Sawant et al. 2022), the specimen had one cuneate scale on the right side and two cuneate scales on the left side. Sawant et al. (2022) have reported that the specimen had 25 undivided subcaudal scales. However, the subcaudal scales range reported in

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literature is 50–67 (Wüster 1998). The subcaudal count reported by Sawant et al. (2022) is very less but they fail to mention any plausible reason for the same; we believe that the specimen reported by them had incomplete tail. Wüster (1998) had provided a detailed account of the species along with the morphological variations of different populations; however, Sawant et al. (2022) did not refer to this publication and relied solely on a field guide for their observation. Field guides and popular books are useful for preliminary observations and may help in identification of a species but when it comes to scientific studies, authors should refer to scientific publications. Based on the limited data provided by Sawant et al. (2022) and studying the available literature, we believe that the specimen reported by them is a typical specimen found in the northwestern part of the country.

We believe that the specimen might have ended up in Goa via some sort of transport activity; it may have been brought illegally by some snake charmer or trader and it escaped from the snake charmer's basket or from an unknown captive facility. In recent years, several youngsters keep snakes illegally in the house as a hobby without the knowledge of the authorities. Such snakes come to the notice when they escape or the local forest officials take some legal action. In the last decade, we came across three such rescues of snakes by locals in the state of Gujarat; including two deadly venomous snakes (Banded Krait *Bungarus fasciatus* and Monocled Cobra *Naja kaouthia* [Image 2]) and a non-native species (Ball Python *Python regius* [Image 3]). Details of the rescue of such cases are provided in Table 1. All such instances of non-native species are a result of either escape from custody or pet trade or coming through some sort of transportation. The two venomous snakes belonging to the family Elapidae are found in the new urban areas, out of their natural distribution range, requires immediate attention due to their medical importance (Whitaker & Martin 2015)

The best example of illegal suspected activity in the state is confiscated partial albino specimen of Indian Red Sand Boa *Eryx johnii* along with a few normal morphs of the same species at Surat railway station from snake charmer of Rajasthan (Vyas et al. 2012; Parmar & Kaiser 2022). This incidence indicates the activity of illegal keeping and transporting snakes from one state to another.

However, the records of three non Indian reptiles from Gujarat show such invasive species distributed in Gujarat are the result of anthropogenic activities, including the Robust Rock Gecko *Hemidactylus robustus*



Image 1. Hood of the dark morph of the Indian Spectacle Cobra *Naja naja*, the posterior eye portion is always well developed and bulges due to venom glands.



Image 2. An adult Monocled Cobra *Naja kaouthia* rescued from the urban area of Bharuch city, Gujarat, India. © Nitin Bhatt.



Image 3. A non-native species Ball Python *Python regius* rescued from the urban area of Vadodara city, Gujarat, India. © Harshil Patel.

**Table 1. Details of significant snake species recorded from Gujarat, India, being a non-native form and species.**

	Common and scientific name	Age group	Date	Name of location site of record	Native distribution range	Source
1	Banded Krait <i>Bungarus fasciatus</i>	Adult	25 January 2013	Sarkhej, Ahmadabad City,	The states of northern and eastern India	Sivbhadrasinji Jadeja
2	Monocled Cobra <i>Naja kaouthia</i>	Adult	09 February 2013	Bharuch City, Bharuch District	Northern and eastern India	Nitin Bhatt
3	Ball Python <i>Python regius</i>	Juvenile	17 May 2021	Manjalpur, Vadodara City, Vadodara District	Western and central Africa	Nitin Patel

(Bauer et al. 2012), Striped Bronzeback Tree Snake *Dendrelaphis caudolineatus* (Patel et al. 2019a), and Red-eared Sliders *Trachemys scripta* (Munjpara 2014; Patel & Vyas 2019; Vyas 2019).

The Robust Rock Gecko is present in the new seaport complex at Porbandar, Gujarat. This gecko species was earlier known as *Hemidactylus porbandarensis* (Sharma 1981), and its DNA sequences indicated that it was in fact an introduced population from Abu Dhabi (Bauer et al. 2012). The Striped Bronze-back Tree Snake *Dendrelaphis caudolineatus* is a native species of Thailand to Sundaland (Peninsular Malaysia, Sumatra, Billiton, and Borneo), but a single specimen was found in an urban industrial complex from Udhana, Surat, India (Patel et al. 2019b). The Red-eared Slider is a native species of the eastern United States, but now it is widely found in many freshwater habitats of India, thanks to popular pet demands in national and international markets (Vyas 2021). Two of them, the gecko and the turtle, are now well established and breeding in the natural habitats in India.

The state of Goa is situated on the west coast of India, a maritime state and a well-known tourist destination for many national and international tourists. There were reports of invasive turtles found in the freshwater habitat of Goa (Jadav et al. 2018), which supports our prediction that the cobra would be the result of escape from the captive condition. So the unusual colour morph cobra is not a case of higher melanism in that individual snake as quoted by Sawant et al (2022), but it is a result of some illegal anthropogenic activities in the area.

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c/o Wildlife Information Liaison Development Society,  
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Tamil Nadu 641035, India  
ravi@threatenedtaxa.org

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