Herpetology Notes, volume 13: 817-825 (2020) (published online on 08 October 2020)

First report of leucism for the kraits *Bungarus walli* Wall, 1907 and *B. niger* Wall, 1908, with updates on their geographic distribution in Nepal (Serpentes, Elapidae)

Kamal Devkota[1], Dev Narayan Mandal[2], Ganesh Sah[2], Mark O'Shea[3], and Hinrich Kaiser[4,*]

Six species of kraits, genus *Bungarus*, have been recorded in Nepal (e.g., Schleich and Kästle, 2002; Sharma et al., 2013), including *B. bungaroides* (Cantor, 1839), *B. caeruleus* (Schneider, 1801), *B. fasciatus* (Schneider, 1801), *B. lividus* Cantor, 1839, *B. niger* Wall, 1908, and *B. walli* Wall, 1907. These species occur from the lowland habitats of the Terai Plains along the Nepal-India border into habitats at intermediate elevations in the Siwalik Hills and into the Mahabharat Range (Joshi et al., 2019), extending in the case of *B. caeruleus*, the most commonly encountered krait in Nepal, up to elevations of at least 1525 m, and up to 1730 m in *B. bungaroides* (Schleich and Kästle, 2002; Sharma et al., 2013). All of these species appear to be of medical importance as a cause of snakebite mortality and morbidity (e.g., Bhetwal et al., 1998; Pandey, 2015). It is noteworthy that confirmed records of kraits in Nepal display a patchiness consistent with intermittent sampling: while some species probably have a country-wide distribution, records tend to exist primarily for areas of high human population concentration where sampling and the incidence of snakebite can be expected at greater frequency (e.g., *B. caeruleus*, *B. fasciatus*, *B. lividus*). On the other hand, some species cluster only in the southeasternmost extreme of the country (*B. bungaroides*, *B. walli*), and given their distribution in neighbouring countries, this sampling may reflect reality.

The Greater Black Krait, *B. niger* Wall, 1908, ranges from the Himalayan foothills of Nepal, Bhutan, and Arunachal Pradesh, India, into the tea plantations and wildlife sanctuaries of Assam, and south to the low-lying deltas of Bangladesh and Rakhine, Myanmar (Fig. 1). However, there are only two confirmed records for this species in Nepal (Tillack and Grossmann, 2001; Pandey, 2015) and its presence in Bangladesh and its medical importance were only recently recognised (Faiz et al., 2010; Ahsan and Rahman, 2017). In contrast, Wall's Krait, *B. walli* Wall, 1907 has an apparently disjunct range that extends from Uttar Pradesh and Maharashtra, India eastwards and northeastwards into Bangladesh and just into the southeastern corner of Nepal (Fig. 1). In the taxonomic history of the genus *Bungarus*, *B. walli* had at one point been placed into the synonymy or considered a subspecies of the Sind Krait, *B. sindanus* Boulenger, 1897[5], with which it

[1] Nepal Toxinology Association, Major Chowk, Kawasoti-8, Nawalpur, Nepal; and Save The Snakes, 2929 35th Street #5402, Sacramento, California 95817, USA.

[2] Mithila Wildlife Trust, Dhanusa, Nepal.

[3] Faculty of Science and Engineering, University of Wolverhampton, Wulfruna Street, Wolverhampton WV1 1LY, United Kingdom.

[4] Department of Vertebrate Zoology, Zoologisches Forschungsmuseum Alexander Koenig, Adenauerallee 160, 53113 Bonn, Germany; and Department of Biology, Victor Valley College, 18422 Bear Valley Road, Victorville, California 92395, USA.

[*] Corresponding author. E-mail: hinrich.kaiser@vvc.edu

[5] Wall (1907) described *B. walli* at the species level. Subsequently, Khan (1984) placed *B. walli* into the synonymy of *B. sindanus*. However, this arrangement was short-lived and adjusted when additional specimen work led the same author (Khan, 1985) to resurrect the nomen *walli* at the level of subspecies and apply it to a group of *B. sindanus* populations in central India, forming the new combination *B. s. walli*. This taxonomy was followed by other workers (e.g., Das and Chaturvedi, 1998; Das et al., 1998; David and Ineich, 1999; Schleich and Kästle, 2002), but most recently, and without apparent formal reasoning, the nomen is now once again used as a full species (Sharma et al., 2013; Wallach et al., 2014; Pandey, 2015; Uetz et al., 2020).

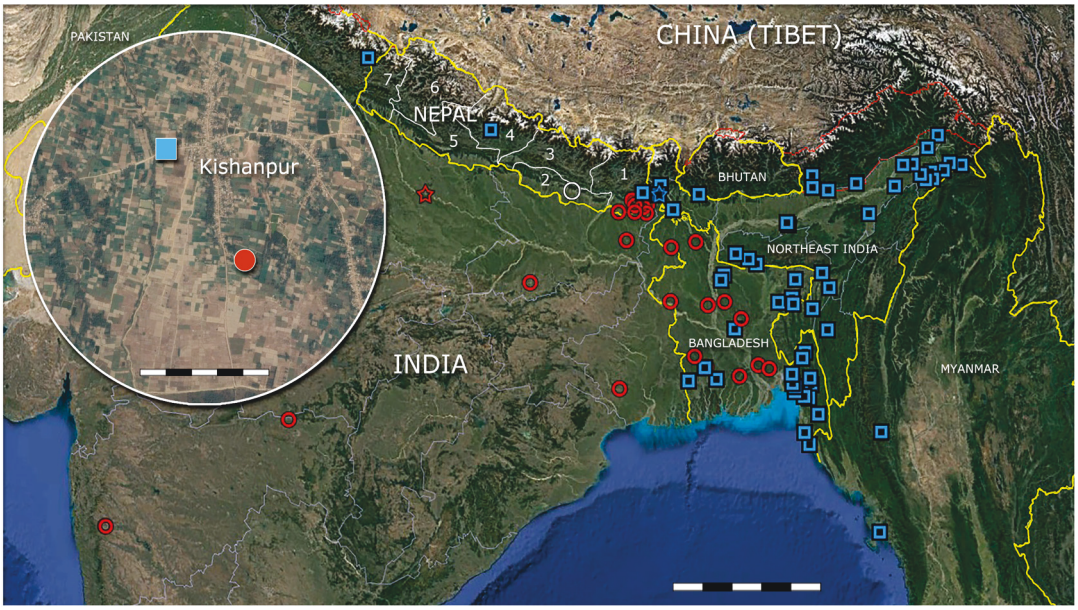

Figure 1. Map of Nepal and surrounding countries, showing the distributions of *Bungarus niger* (blue squares) and *B. walli* (red circles). The white circle marks the location of Kishanpur, Dhanusha District (inset) where the leucistic animals were observed. Provinces of Nepal labelled by numbers include (1) Province No. 1, (2) Province No. 2, (3) Bagmati, (4) Gandaki, (5) Province No. 5, (6) Karnali, and (7) Sudurpashchim. The blue star indicates the type locality of *B. niger* at Tindharia, West Bengal, India, while the red star marks the type locality of *B. walli* in Faizabad, Uttar Pradesh, India. Scales measure 5 km in the inset map and 500 km in the main map. Please note that the size of the white circle on the main map is not drawn to scale but serves only to indicate the location of the area where these snakes were observed.

shares a trait unusual for the genus: *B. sindanus* and *B. walli* both possess 17 midbody dorsal scale rows (Wall, 1907; Slowinski, 1994; Sharma et al., 2013). In Nepal, *B. walli* has been reported for the southeastern region (Sharma et al., 2013), and this has been confirmed by 13 records obtained via snakebite occurrences (Pandey, 2015). All records are from the southern part of the country's easternmost province, currently known by the placeholder name Province No. 1.

Leucism is a genetic condition, in which the complete or near-complete lack of colour in the skin combines with pigmented irises (Fleck et al., 2016). It has, on occasion, been confused with albinism (e.g., Sazima and Di-Bernardo, 1991; Vyas, 2009; Thombre and Dhande Abhishek, 2015) but in albinos, body pigmentation is completely lacking, and the eye appears pink due to the colouration of blood vessels shining through the eyeball. In particular, leucism is characterised by a partial or complete lack of melanin pigments (Mahabal and Thakur, 2014), but there is always good pigmentation of the eye and other dark pigmentation may be present. This condition has been observed in a variety of snakes (Table 1), but it appears to be generally scarce in nature. We here report on two observations of leucistic kraits in Nepal.

Results

Observation 1.—During a snake rescue call on 25 April 2020 at 18:50 h in Matiarba, Dhanusadham Municipality, Dhanusha District, Province No. 2, Nepal (26.8611°N, 86.0471°E, elevation 120 m; Fig. 1), an aberrantly coloured snake was discovered inside a clay pot in a traditional homestead (Fig. 2B, inset). The unidentified snake was considered a potential threat to the safety of the local community. Once the snake had been encouraged to leave its container (Fig. 2B), it was identified as a member of the genus *Bungarus*, but with pink skin and black eyes (Fig. 3B) and with some of the interior regions of the skull providing the only darker features along the body. The snake was captured, photographed, removed from the premises, and released

Table 1. Literature reports of leucism in snakes based on online searches conducted in June 2020. We here list only those reports we were able to verify with either a photograph or a description that specifically mentioned the colouration of the eyes. This is why we are not including the information listed by Krecsák (2008), even though it is an important reference. The records for *Pantherophis alleghaniensis*, *Pituophis catenifer*, and *Zamenis longissimus* are based on images we found on a website listing animals in primarily European zoos; there is no information to determine whether these leucistic snakes are captive-bred or were collected in the wild. Several of the observations listed here were erroneously considered albinistic, which is sometimes reflected in the title of the paper announcing their discovery.

Species	Country	Reference
Amerotyphlops brongersmianus (Vanzolini, 1976)	Argentina	Garcia and Tedesco, 2020
Atractus reticulatus (Boulenger, 1885)	Brazil	Entiauspe-Neto et al., 2018
Boa i. imperator Daudin, 1802	Nicaragua	Villa and Rivas, 1971 (as *B. imperator*)
Bungarus caeruleus (Schneider, 1801)	India	Vyas, 2009; Chaudhuri et al., 2018; Mohalik et al., 2019
Bungarus lividus Cantor, 1839	India	Ray and Pandey, 2020
Coelognathus h. helena (Daudin, 1803)	India	Thakur and Trivedi, 2018 (as *C. helena*)
Crotalus adamanteus Palisot de Beauvois, 1799	USA	Bechtel, 1991
Crotalus durissus terrificus (Laurenti, 1768)	Brazil	Sazima and Di-Bernardo, 1991 (as *C. durissus*)
Daboia russelii (Shaw & Nodder, 1797)	India	Patel and Tank, 2014; Adimallaiah and Vyas, 2015
Diadophis punctatus edwardsii (Merrem, 1820)	Canada	Gilhen et al., 2013
Drymarchon caudomaculatus Wüster et al., 2001	Venezuela	Vargas, 2015 (as *D. corais*)
Eryx conicus (Schneider, 1801)	India	Whitaker, 1971
Eryx johnii (Russell, 1801)	India	Vyas et al., 2012; Mahabal and Thakur, 2014
Fowlea piscator (Schneider, 1799)	India	Ashaharraza et al., 2020
Hemachatus haemachatus (Bonnaterre, 1790)	South Africa	Schmidt, 1999
Lampropeltis c. calligaster (Harlan, 1827)	USA	Pisani, 2003 (as *L. calligaster*)
Lycodon aulicus (Linnaeus, 1758)	India	Thombre and Dhande Abhishek, 2015; Deshmuk et al., 2020
Naja kaouthia Lesson, 1831	breeder	San Diego Zoo, 2015; Truskot, 2016
Natrix helvetica lanzai Kramer, 1971	Italy	Bruni, 2017 (as *N. natrix*)
Nerodia s. sipedon (Linnaeus, 1758)	USA	Mitchell, 1994 (as *N. sipedon*)
Oxyrhopus p. petolarius (Linnaeus, 1758)	Venezuela	Esqueda et al., 2007 (as *O. petolarius*)
Pantherophis alleghaniensis (Holbrook, 1836)	USA	Graf et al., 2020
Pituophis catenifer (Blainville, 1835)	USA	Graf et al., 2020
Pseudoboa nigra (Duméril et al., 1854)	Brazil	Noronha et al., 2013
Python b. bivittatus Kuhl, 1820	India	Lahiri, 1955 (as *P. molurus*)
Python molurus (Linnaeus, 1758)	India	Lobo and Sreepada, 2016; Narayana et al., 2016
Rena unguirostris (Boulenger, 1902)	Argentina	Garcia and Tedesco, 2020
Rhabdophis p. plumbicolor (Cantor, 1839)	India	Deshmuk et al., 2020; Amjad et al., 2016
Xenodon merremii (Wagler, 1824)	Brazil	Andrade et al., 2020
Zamenis longissimus (Laurenti, 1768)	Europe	Graf et al., 2020

into natural habitat at a safe distance away from human habitations.

Observation 2.—During a subsequent snake rescue call on 3 June 2020 at 16:30 h in Kishanpur, Dhanusadham Municipality, Dhanusha District, Province No. 2, Nepal (26.8687°N, 86.0406°E, elevation 103 m; Fig. 1), another aberrantly coloured snake was discovered by the inhabitants of a traditional homestead (Fig. 2A). Once again, the snake was identified as a member of the genus *Bungarus* and, due to the proximity of the earlier locality for Observation 1 (ca. 1.1 km by air), this snake was initially considered to be a recapture of the first individual. However, closer inspection of the shape and arrangement of lateral head scales (Fig. 3A) and the number of dorsal scales (Fig. 4) revealed that this

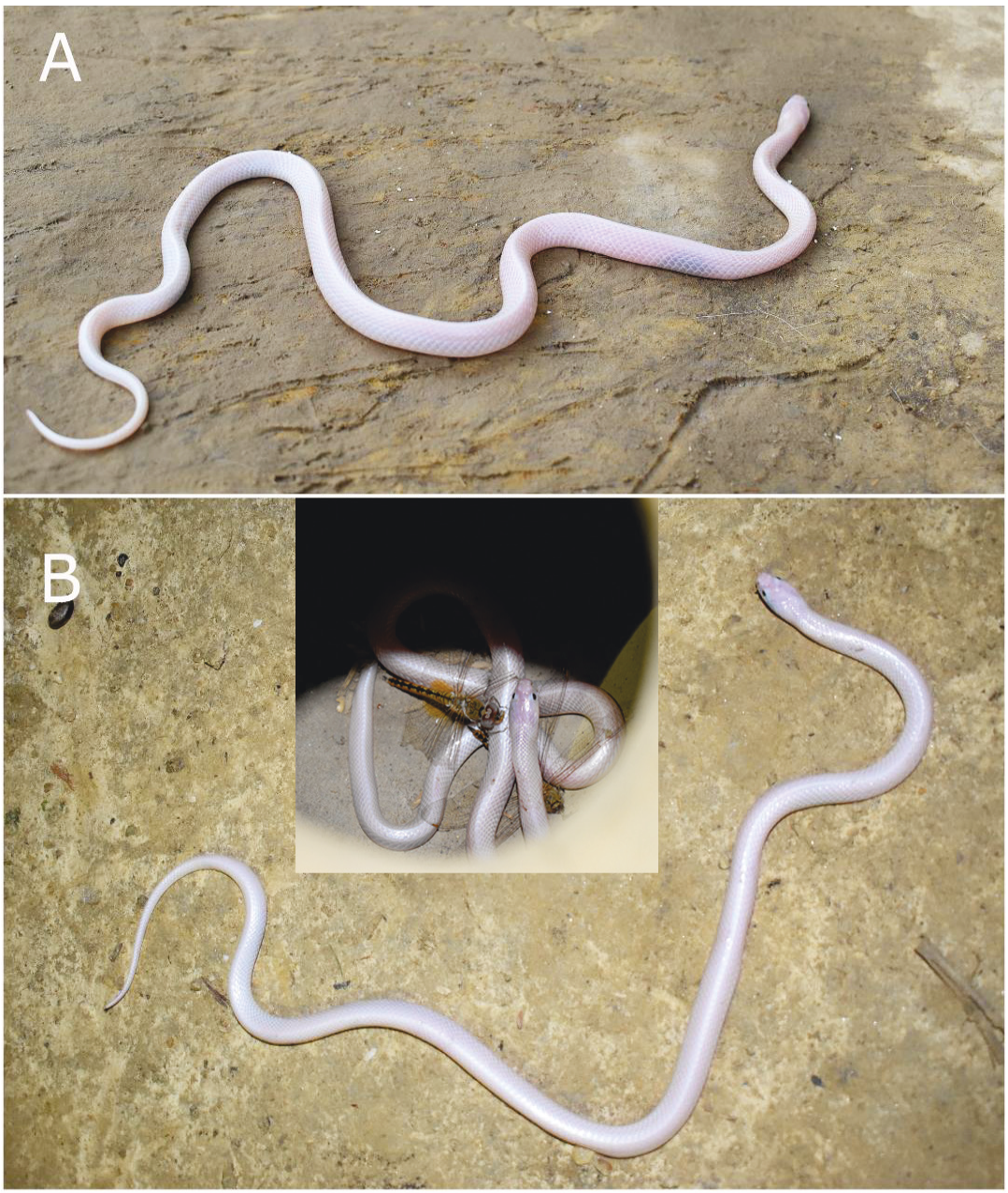

Figure 2. Two leucistic kraits rescued in Dhanusadham Municipality, Dhanusha District, Province No. 2, Nepal, shown in full body views. (A) *Bungarus niger*. (B) *Bungarus walli*. The inset in (B) shows how the individual of *B. walli* was first encountered by the rescuers: among dragonflies in a small clay pot. It is unsurprising, given the similarity in colour and overall morphology, that the rescuers initially thought these two individuals were the same snake.

was not only a different individual, but it represented a different species of krait. As before, the snake was captured, photographed, and relocated.

Species identification.—Among the species of *Bungarus*, characteristic colour patterns are very helpful in the identification of living snakes, and none

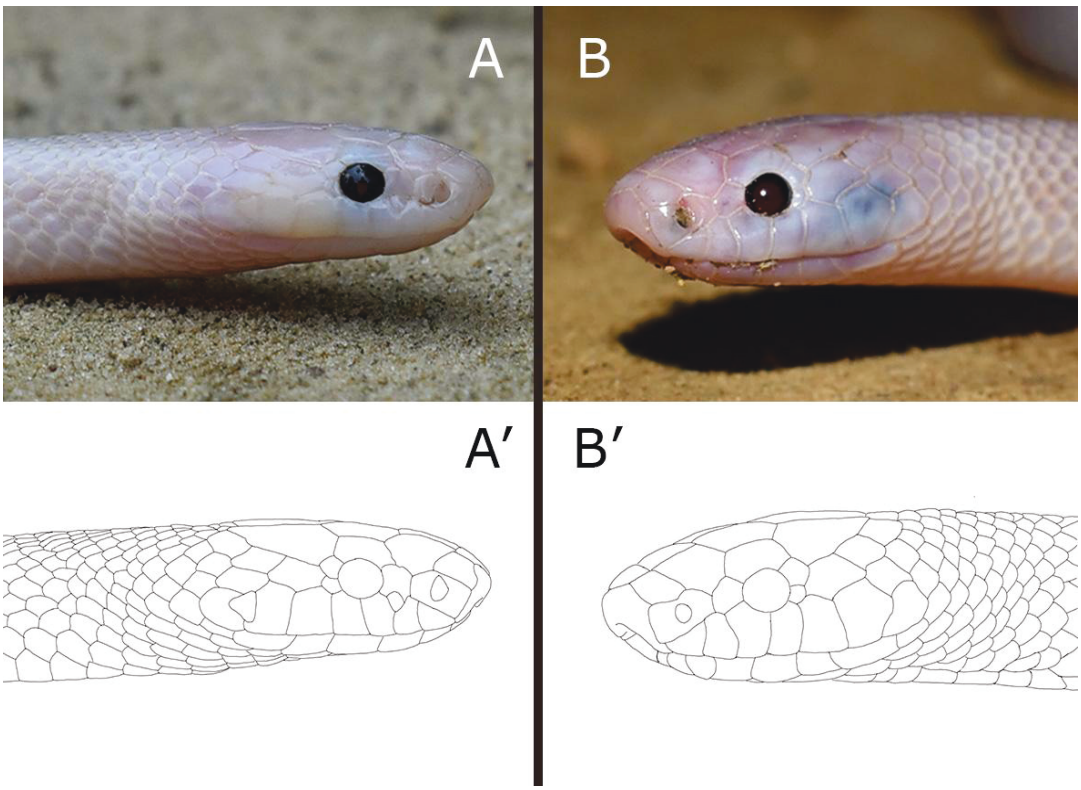

Figure 3. Lateral head portraits of *Bungarus niger* (A, A') and *B. walli* (B, B') rescued at Dhanusadham Municipality, Dhanusha District, Province No. 2, Nepal. Both photos and their respective illustrations represent the right side of the specimens; the image of *B. walli* was mirrored to allow easier comparisons. The drawings (A', B') clearly illustrate that these are not the same individual: aside from minor differences in shape, a small, additional preorbital scale and a small, additional triangular supralabial scale are present only in *B. niger* (A'). Lastly, the diagnostic count of six infralabial scales in *B. niger* can be seen in A'.

of these were visible in the snakes we encountered. However, dorsal scale counts from photographs (Fig. 4) showed that the individual in Observation 1 had 17 middorsal scale rows, as calculated by a direct count of the ascending scale row (eight scales; Fig. 4B), to which the enlarged vertebral scale row (V) and the descending count of eight scales on the opposite side of the snake are added (8 + V + 8 = 17). Only one species of *Bungarus* occurring in Nepal has 17 dorsal scale rows[6], *B. walli*, and the locality of our observation fits the known distribution of this species. For the snake in Observation 2, the middorsal count was 15 scales (7 + V + 7; Fig. 4A). In combination with the characteristics of single subcaudal scales (eliminating *B. bungaroides*), an enlarged vertebral scale row (eliminating *B. lividus*), a point-tipped tail (eliminating *B. fasciatus*), this individual would have to be either *B. caeruleus* or *B. niger* (using the dichotomous key in Schleich and Kästle, 2002). The key in the original description of *B. niger* (Wall, 1908) lists as a difference between these two species the condition of the second supralabial scale, which is the same width as the first and third supralabials in *B. caeruleus* and much narrower in *B. niger*. However, among a variety of specimens we have seen, this character does not hold, with some width variation in these scales in both species. There are two other characteristics that can assist in differentiating

[6] Two other species of *Bungarus* have 17 middorsal scale rows, *B. sindanus* and *B. persicus* Abtin et al., 2014. Both of these species are clearly extralimital to our investigation.

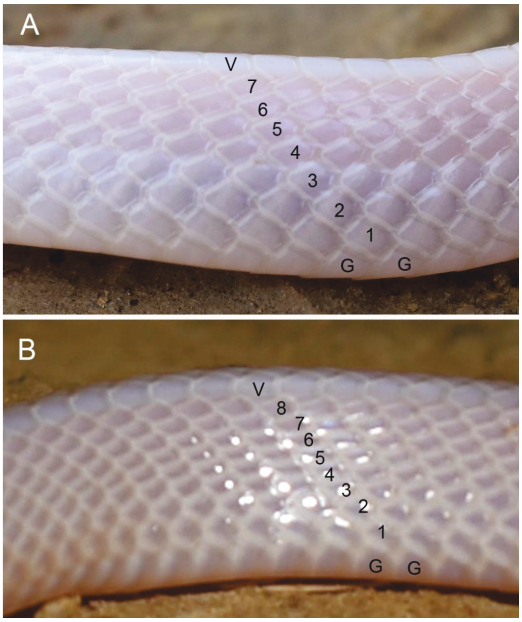

Figure 4. Dorsal scale counts of two rescued kraits, genus *Bungarus*. (A) The individual identified as *B. niger* has a count of seven dorsal scales (numbered 1–7) on one side, beginning at the gastrosteges (G) and ending at the vertebral scale row (V). The ascending count plus the descending count on the other side of the body, plus the enlarged vertebral scale, results in a dorsal scale count of 15 (7 + 7 + 1). (B) Similarly, the dorsal scale count is 17 in *B. walli* (8 + 8 + 1).

B. caeruleus and *B. niger* when colour is absent. One is the relative size of the vertebral scales, which are generally wider in *B. niger* than in *B, caeruleus*. In our individual, these scales are conspicuously broad, and broader than in specimens of *B. caeruleus* we have seen. Lastly, in all reports we are aware of, seven or eight infralabial scales are documented for *B. caeruleus*. In the case of *B. niger*, the number of infralabial scales was given as seven in the original description (Wall, 1908), seven or eight by Purkayastha (2013), and there are some images of this species we have seen, in which the count is seven. However, Tillack and Grossmann (2001) and Schleich and Kästle (2002) document six infralabial scales, which is the count in our snake (Fig. 3A, A'). These two scale characters, broadly enlarged vertebral scales and six infralabials, allows us to unambiguously assign this snake to the species *B. niger*.

Discussion

Among over 1000 snake rescues carried out by the rescue teams, less than 1% involved kraits (81 encounters). Of these, 72 rescued snakes were *B. caeruleus* and nine *B. fasciatus*. The two individuals described here are not only the first rescues involving these two species, they are also the only abnormally coloured snakes encountered during snake rescue activities. The limited appearance of these two species in the rescue statistics in the area is unsurprising, given that the record of *B. niger* is only the third for Nepal and the one for *B. walli* is the northwesternmost for the country, in both cases well outside of areas where these species have been encountered previously (Fig. 1). In the case of *B. niger*, the locality near Kishanpur adds another disjunct record to the ones from near Naudanda, Gandaki Province (Tillack and Grossmann, 2001; ca. 260 km to the northwest from Kishanpur) and Ilam, Province No. 1 (Pandey et al., 2016; ca. 185 km west of Kishanpur). For *B. walli*, the new record represents a northwestward range extension of ca. 130 km from the closest locality near Biratnagar (Pandey, 2015).

There are several possibilities for explaining the observed distribution of *B. niger* and *B. walli* in Nepal. These include, in no particular order, (1) the natural range of each species is wide but human encounter rates are low, or they experience competition or predation resulting in low population densities; (2) the range was wide historically but due to a variety of factors (e.g., competition, predation, habitat loss, human encroachment) the population density is much reduced, or populations survive in scattered refugia outside the main range; (3) large areas remain unsampled between places where serendipitous encounters occurred, and studies of snakes have generally occurred less frequently in western Nepal vs. eastern and central Nepal; or (4) the outlying records are of translocated animals or even based on erroneous identifications. We do not believe that individual snakes make long journeys that take them hundreds of kilometres beyond a species' normal range. Instead, the most likely scenario is that some krait species, including *B. niger* and *B. walli* in most of Nepal, are simply much less frequently encountered or are perhaps misidentified as the commonly seen *B. caeruleus*.

The relatively small set of reports documenting leucism in snakes (Table 1) shows that this condition is relatively rare in nature. It is even rare in herpetoculture, where colour abnormalities in general and albinism in particular have gained quite a following. Both of the

observations we present are the first documented cases of leucism in their respective species. The only other krait species for which leucism has been documented are *B. caeruleus* (Vyas, 2009; Chaudhuri et al., 2018; Mohalik et al., 2019) and *B. lividus* (Ray and Pandey, 2020).

Leucism or albinism in venomous snakes makes for a potentially deadly combination, particularly when it concerns species outside of their known ranges. In the case of our observations involving both *B. niger* and *B. walli*, the snakes appeared in locations where they had not been encountered before. It is therefore essential that snake rescuers and individuals involved in snakebite treatments carefully study the morphology of snakes with aberrant colouration to ensure that the proper treatment is provided (Bhetwal et al., 1998; Faiz et al., 2010; Pandey et al., 2016). Lastly, snake rescues and snake conservation awareness programmes are beginning to have a positive impact on the relationship between snakes and local residents, as attested by both of our observations, when villagers called for a rescue instead of placing themselves in danger by attempting to kill or remove discovered snakes themselves.

Acknowledgements. We thank the rescue teams of Mithila Wildlife Trust and the villagers of Dhanushadham, Dhanushadham Protected Forest, for their cooperation, and the Division Forest Office Dhanusha for giving permission to rescue and relocate snakes (Ref. Nos. 1531/076/77 and 1567/069/070). We greatly appreciate the thorough pre-peer review by Wolfgang Wüster (Bangor University), whose comments regarding *Bungarus* morphology were instrumental in verifying our species identifications. KD wishes to thank the Rufford Foundation and the Save The Snakes organisation. The snakes described herein were collected while KD was working on a "Save Snakes Save Nature" project.

References

Abtin, E., Nilson, G., Mobaraki, A., Hosseini, A.A., Dehgannejhad, M. (2014): A new species of krait, *Bungarus* (Reptilia, Elapidae, Bungarinae) and the first record of that genus in Iran. Russian Journal of Herpetology **21**(4): 243–250.

Adimallaiah, D., Vyas, A. (2015): Cases of albinism in Russel's Viper *Daboia russelii* from Mumbai, Maharashtra, India. Reptile Rap **17**: 25–26.

Ahsan, M.F., Rahman, M.M. (2017): Status, distribution and threats of kraits (Squamata: Elapidae: *Bungarus*) in Bangladesh. Journal of Threatened Taxa **9**(3): 9903–9910.

Amjad, H., Joshi, P.S., Tantarpale, V.T. (2016): Record of leucism in green keelback *Macropisthodon plumbicolor* (Cantor, 1839) in Amravati District, Maharashtra, India. Weekly Science **3**(29): 1–5.

Andrade, H., dos Santos Carvalho, G.D., Santos Oliveira, J.J., dos Reis Dias, E.J. (2020): First record of leucism in *Xenodon merremii* (Wagler, 1824) in Brazil. Herpetology Notes **13**: 297–299.

Ashaharraza, K., Lalbiakzuala, Lalremsanga, H.T. (2020): A leucistic checkered keelback, *Fowlea piscator* (Serpentes: Natricidae), from Mizoram, India. IRCF Reptiles & Amphibians **27**: 42–43.

Bechtel, H.B. (1991): Inherited color defects. Comparison between humans and snakes. International Journal of Dermatology **30**: 243–246.

Bhetwal, B.B., O'Shea, M., Warrell, D.A. (1998): Snakes and snake bite in Nepal. Tropical Doctor **28**: 193–195.

Bonnaterre, P.J. (1790): Tableau Encyclopédique et Méthodique des Trois Règnes de la Nature. Ophiologie. Paris, France, Panconoke. xliv + 76 pp.

Boulenger, G.A. (1885): Second list of reptiles and batrachians from the province Rio Grande do Sul, sent to the Natural History Museum by Dr. H. van Ihering. Annals and Magazine of Natural History, Series 5 **16**: 85–88.

Boulenger, G.A. (1897): A new krait from Sind (*Bungarus sindanus*). Journal of the Bombay Natural History Society **11**: 73–74.

Boulenger, G.A. (1902) List of the fishes, batrachians, and reptiles collected by the late Mr. P.O. Simons in the Provinces of Mendoza and Cordova, Argentina. Annals and Magazine of Natural History, Series 7 **9**(53): 336–339.

Bruni, G. (2017): A leucistic grass snake *Natrix natrix* (Linnaeus, 1758) (Serpentes: Natricidae) from Tuscany, Central Italy. Herpetology Notes **10**: 313–316.

Cantor, T. (1839): Spicilegium serpentium indicorum. Proceedings of the Zoological Society of London **7**: 32–34.

Chaudhuri, A., Chakraborty, K., Chowdhury, S. (2018): First report of leucism in *Bungarus caeruleus* (Serpentes: Elapidae) from West Bengal, India. Phyllomedusa **17**: 161–163.

Das, I., Chaturvedi, N. (1998): Catalogue of herpetological types in the collection of the Bombay Natural History Society. Hamadryad **23**(2): 150–156.

Das, I., Dattagupta, B., Charan Gayen, N. (1998): History and catalogue of reptile types in the collection of the Zoological Survey of India. Journal of South Asian Natural History **3** (2): 121–172.

Daudin, F.M. (1802): Histoire Naturelle, Génerale et Particulière des Reptiles; Ouvrage Faisant Suite aux Oeuvres de Leclerc de Buffon, et Partie du Cours Complet d'Histoire Naturelle Rédigé par C.S. Sonnini, Membre de Plusieurs Sociétés Savantes. Tome Cinquième. Paris, France, F. Dufart. 365 pp.

Daudin, F.M. (1803): Histoire Naturelle, Génerale et Particulière des Reptiles; Ouvrage Faisant Suite aux Oeuvres de Leclerc de Buffon, et Partie du Cours Complet d'Histoire Naturelle Rédigé par C.S. Sonnini, Membre de Plusieurs Sociétés Savantes. Tome Sixième. Paris, France, F. Dufart. 447 pp.

David, P., Ineich, I. (1999). Les serpents venimeux du monde: systématique et répartition. Dumerilia **3**: 3–499.

Deshmukh, R.V., Deshmukh, S.A., Badhekar, S.A., Rewatkar, J., Pachare, V.P., Kawale, S.B. (2020): First records of albinism or leucism in six species of snakes from central India. IRCF Reptiles & Amphibians **26**: 174–179.

Duméril, A.-M.-C., Bibron, G., Duméril, A.-H.-A. (1854): Erpétologie Générale ou Histoire Naturelle Complète des

Reptiles. Tome Septième, Première Partie. Paris, France, Librairie Encyclopédique de Roret. 780 pp.

Entiauspe-Neto, O.A., Abegg, A.D., Quintela, F.M., Mario-da-Rosa, C., Malta-Borges, L., Loebmann, D. (2018): First record of leucism for *Atractus reticulatus* (Serpentes: Dipsadidae). Brazilian Journal of Biology **78**: 174–175.

Esqueda, L.F., La Marca, E., Soriano, P. (2005): Partial albinism in a Venezuelan specimen of false coral snake, *Oxyrhopus petola petola* (Linnaeus, 1758). Herpetotropicos **2**(2): 114–115.

Faiz, M.A., Ghose, A., Ahsan, M.F., Rahman, M.R., Amin, M.R., Hassan, M.M.U., et al. (2010): The Greater Black Krait (*Bungarus niger*), a newly recognized cause of neuro-myotoxic snake bite envenoming in Bangladesh. Brain **133**: 3181–3193.

Fleck, K., Erhardt, G., Luehken, G. (2016): From single nucleotide substitutions up to chromosomal deletions: genetic cause of leucism-associated disorders in animals. Berliner und Münchener tierärztliche Wochenschrift **129**(7–8): 269–281.

García, J.A.R., Tedesco, M.E. (2020): Leucism in *Rena unguirostris* and *Amerotyphlops brongersmianus* (Serpentes: Scolecophidia) from northeastern Argentina. Boletín del Museo Nacional de Historia Natural del Paraguay **24**(1): 47–51.

Gilhen, J., Caswell, G., Drake, C., MacDonald, M., McKinnon-Ramshaw, H. (2013): A partial albino hatchling northern ring-necked snake, *Diadophis punctatus edwardsii*, from Big Tancook Island, Mahone Bay, Lunenburg County, Nova Scotia, Canada. The Canadian Field-Naturalist **126**(4): 336–339.

Graf, R., Pfleiderer, J., Fritsche, M., Schmidt, J., Mantei, R., Peter, S.P., Spangenberg, F. (2020): Zootierliste. Available at http://www.zootierliste.de. Accessed on 15 July 2020.

Harlan, R. (1827): Genera of North American Reptilia, and synopsis of the species. Journal of the Academy of Natural Sciences, Philadelphia **5**: 317–372.

Joshi, A., Farquhar, S., Assareh, N., Dahlet, L., Landahl, E. (2019): Climate change in Lamjung District, Nepal: meteorological evidence, community perceptions, and responses. Environmental Research Communications **1**: 031004.

Khan, M.S. (1984): Rediscovery and validity of *Bungarus sindanus* Boulenger. The Snake **16**: 43–48.

Khan, M.S. (1985): Taxonomic notes on *Bungarus caeruleus* (Schneider) and *Bungarus sindanus* Boulenger. The Snake **17**: 71–78.

Kramer, E. (1971): Revalidierte und neue Rassen der europäischen Schlangenfauna. Lavori dellaSocietà Italiana di Biogeografia, Nuova Serie, Forli **1**: 667–678.

Krecsák, L. (2008): Albinism and leucism among European Viperinae: a review. Russian Journal of Herpetology **15**(2): 97–102.

Kuhl, H. (1820): Beiträge zur Zoologie und Vergleichenden Anatomie. Frankfurt am Main, Germany, Hermannsche Buchhandlung. 152 pp.

Lahiri, P.K. (1955): A white python. Journal of the Bombay Natural History Society **53**: 135–136.

Laurenti, J.N. (1768): Specimen Medicum, Exhibens Synopsin Reptilium Emendatam cum Experimentis Circa Venena et Antidota Reptilium Austracorum, Quod Authoritate et Consensu. Vienna, Austria, Johann Thomas von Trattner. 217 pp.

Lesson, R.P. (1831): Catalogue des reptiles qui font partie d'une collection zoologique recueille dans l'Inde continentale ou en Afrique, et apportée en France par M. Lamare-Piquot. Bulletin des Sciences Naturelles et de Géologie **25**(2): 119–123.

Linnæus, C. (1758): Systema Naturæ per Regna Tria Naturæ Secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymis, Locis. Tomus I. Editio Decima, Reformata. Holmiæ, Sweden, Salvius. 4 + 824 pp.

Lobo, J.V., Sreepada, K.S. (2016): First report of leucism in *Python molurus molurus* (Serpentes: Pythonidae) from Mangalore, Karnataka, India. Phyllomedusa **15**: 199–200.

Mahabal, A., Thakur, S. (2014): Instances of aberrant colors and patterns among the Indian herpetofauna: a review. Russian Journal of Herpetology **21**(2): 80–88.

Merrem, B. (1820): Versuch eines Systems der Amphibien. Marburg, Germany, Johann Christian Krieger. 191 pp.

Mitchell, J.C. (1994): An unusually colored northern water snake (*Nerodia sipedon sipedon*) from Giles County, Virginia. Banisteria (4): 32–33.

Mohalik, R.K., Sahu, S.B., Arif, M., Kar, N.B. (2019): Natural history notes. *Bungarus caeruleus* (Common Krait). Coloration and diet. Herpetological Review **50**: 150–151.

Narayana, B.L., Rao, V.V., Nagulu, V. (2016): A leucistic Indian Rock Python, *Python molurus* (Linnaeus 1758), from Andhra Pradesh, India. IRCF Reptiles & Amphibians **23**: 99–101.

Noronha, J.C., Barros, A.B., Miranda, R.M., Almeida, E.J., Rodrigues, D.J. (2013): Record of leucism in *Pseudoboa nigra* (Serpentes: Dipsadidae) in Southern Amazon, Brazil. Herpetology Notes **6**: 81–82.

Palisot de Beauvois, M. (1799): Memoir on amphibia. Serpents. Transactions of the American Philosophical Society **4**: 362–381.

Pandey, D.P. (2015): Venomous snakes of medical relevance in nepal: study on species, epidemiology of snake bite and assessment of risk factors of envenoming and death. Unpublished PhD Thesis, Goethe-Universität, Frankfurt am Main, Germany.

Pandey, D.P., Sharma, S.K., Alirol, E., Chappuis, F., Kuch, U. (2016): Fatal neurotoxic envenomation following the bite of a greater black krait (*Bungarus niger*) in Nepal: a case report. Journal of Venomous Animals and Toxins including Tropical Diseases **22**(19): 1–4.

Patel, H., Tank, S.K. (2014): Cases of unusual colour morph in Russell's Viper *Daboia russelii* (Shaw & Nodder, 1797) from Gujarat, India. Reptile Rap **16**: 27–30.

Pisani, G. (2003): Natural history notes. *Lampropeltis calligaster calligaster* (Prairie Kingsnake). Pigmentation. Herpetological Review **34**(2): 150.

Purkayastha, J. (2013): Reptiles of Assam. Guwahati, Assam, India, EBH Publishers

Ray, P., Pandey, S. (2020): A leucistic lesser black krait, *Bungarus lividus* (Squamata: Elapidae), from West Bengal, India. IRCF Reptiles & Amphibians **27**(1): 103–104.

Russell, P. (1801): A Continuation of an Account of Indian Serpents; Containing Descriptions and Figures, from Specimens and Drawings, Transmitted, from Various Parts of India, to the Hon. the Court of Directors of the East India Company. London, United Kingdom, W. Bulmer and Co. Shakespeare Press. 84 pp.

San Diego Zoo (2015): San Diego Zoo announces name of white monocled cobra. San Diego Zoo Global Zoonooz, 5 January

2015. Available at https://zoonooz.sandiegozoo.org/ 2015/01/05/ san-diego-zoo-announces-name-of-white-monocled-cobra. Accessed on 23 June 2020.

Sazima, I., Di-Bernardo, M. (1991): Albinismo em serpentes neotropicais. Memórias do Instituto Butantan **53**: 167–173.

Schleich, H.H., Kästle, W., Eds. (2002): Amphibians and Reptiles of Nepal: Biology, Systematics, Field Guide. Ruggell, Liechtenstein, Gantner Verlag. 1201 pp.

Schmidt, W.R. (1999): *Hemachatus haemachatus*. Rinkhals. Leucism. African Herp News (28): 38–39.

Schneider, J.G. (1799): Historiae Amphibiorum Naturalis et Literariae. Fasciculus Primus, Continens Ranas, Calamitas, Bufones, Salamandras et Hydros. Jena, Germany, Frommanni. 266 pp.

Schneider, J.G. (1801): Historiae Amphibiorum Naturalis et Literariae. Fasciculus Secundus, Continens Crocodilos, Scincos, Chamaesauras, Boas, Pseudoboas, Elapes, Angues, Amphisbaenas et Caecilias. Jena, Germany, Frommanni. 374 pp.

Sharma, S.K., Pandey, D.P., Shah, K.B., Tillack, F., Chappuis, F., Thapa, C.L., Alirol, E., Kuch, U. (2013): Venomous Snakes of Nepal: a Photographic Guide. Dharan, Nepal, B.P. Koirala Institute of Health Sciences. viii + 77 pp.

Shaw, G., Nodder, F.P., Eds. (1797): The Naturalist's Miscellany. Volume VIII. London, United Kingtom, Nodder & Co. 180 unnumbered pages.

Slowinski, J.B. (1994): A phylogenetic analysis of *Bungarus* (Elapidae) based on morphological characters. Journal of Herpetology **28**: 440–446.

Thakur, M., Trivedi, K. (2018): Albinism in snakes rescued in Surat, India. IRCF Reptiles & Amphibians **25**: 63–67.

Thombre, R., Dhande Abhishek, R. (2015): A case of albinism in common wolf snake *Lycodon aulicus* (Linnaeus, 1758) from Chalisgaon Tehsil, Dist. Jalgaon, Maharashtra. International Journal of Life Sciences, Special Issue **A3**: 107–108.

Tillack, F., Grossmann, W. (2001): Ein neuer Nachweis zur Schlangenfauna Nepals: *Bungarus niger* Wall, 1908 (Reptilia: Serpentes: Elapidae). Sauria **23**(1): 3–9.

Truskot, J. (2016): Meet Lucy: a leucistic cobra at the Monterey Zoo. The Salinas Californian, 20 October 2016. Available at https://eu.thecalifornian.com/story/life/2016/10/19/meet-lucy-leucistic-cobra-monterey-zoo/92436552. Accessed on 23 June 2020.

Uetz, P., Freed, P., Hošek, J., Eds. (2020): The Reptile Database. Accessible at http://www.reptile-database.org. Accessed on 24 June 2020.

Vanzolini, P.E. (1976): *Typhlops brongersmianus*, a new name for *Typhlops brongersmai* Vanzolini, 1972, preoccupied (Serpentes, Typhlopidae). Papeis Avulsos de Zoologia **29**(24): 247.

Vargas, C. (2015): Leucismo em la serpiente rabo amarillo (*Drymarchon corais*) (Boie, 1827), (Serpentes: Colubridae), Estado Lara, Venezuela. Boletín del Centro de Investigaciones Biológicas **49**: 174–178.

Villa, J., Rivas, A. (1971): Tres serpientes albinas de Nicaragua. Revista de Biología Tropical **19**: 159–164.

Vyas, R. (2009): Albinism in the Common Krait, *Bungarus caeruleus* (Schneider, 1801). Sauria, Berlin **31**(4): 49–50.

Vyas, R., Prajapati, V., Parmar, D. (2012): The case of incomplete albinism in Indian Red Sand Boa *Eryx johnii johnii* (Russell, 1801) (Reptilia: Serpentes: Boidae). Russian Journal of Herpetology **19**: 299–302.

Wagler, J. (1824): Serpentum Brasiliensium Species Novae, ou Histoire Naturelle des Espèces Nouvelles de Serpens, Recueillies et Observées Pendant le Voyage dans l'Intérieur du Brésil dans les Années 1817, 1818, 1819, 1820, Exécuté par Ordre de Sa Majesté le Roi de Bavière. Munich, Germany, Jean de Spix. vii + 75 pp.

Wall, F. (1907): A new krait from Oudh (*Bungarus walli*). Journal of the Bombay Natural History Society **17**: 608–611.

Wall, F. (1908): A popular treatise of the common Indian snakes. Part VIII. Journal of the Bombay Natural History Society **18**: 711–735.

Wallach, V., Williams, K.L., Boundy, J. (2014): Snakes of the World: a Catalogue of Living and Extinct Species. New York, USA, CRC Press. 1237 pp.

Whitaker, R. (1971): Notes of Indian snakes. Journal of the Bombay Natural History Society **68**: 461–463.

Wüster, W., Yrausquin, J.L., Mijares-Urrutia, A. (2001): A new species of Indigo Snake from north-western Venezuela (Serpentes: Colubridae: *Drymarchon*). The Herpetological Journal **11**: 157–165.

Accepted by Maximilian Dehling