

# A Comparative Study of Kraits (Squamata: Elapidae: *Bungarus*) Found in West Bengal, India

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**Abstract-** A collective data on kraits (genus *Bungarus*) showed the presence of six different species of kraits in West Bengal, India. The recorded krait species are- Common Krait or Indian Krait (*B. caeruleus*), Banded Krait (*B. fasciatus*), Wall's Krait (*B. walli*), Greater Black Krait (*B. niger*), Lesser Black Krait (*B. lividus*) and North-eastern Hill Krait (*B. bungaroides*). There was a constant debate over the existence of some of those species, and some misconceptions too, but based on the recent data collected from various authentic sources as well as based on our field study, it is confirmed that six species of kraits are available, although their distribution differs significantly. The unique pattern of envenomation and subsequent symptoms of krait bite are the major reasons to understand the kraits in depth. This study is mainly aimed to prepare a comparative data on the general morphology with special reference to their identifying features and distribution in West Bengal.

**Keywords-** Bungarus, Distribution, Kraits, Morphology, Snakes.

## I. INTRODUCTION

Kraits belong to the genus *Bungarus* and family Elapidae. These are highly venomous snakes and cause for high human mortality especially in slum areas. There are 16 recorded species of *Bungarus* [1], of which only one is restricted to Iran [1,2] and the rest are found in south and south-eastern Asia [3,4]. Six species are found to exist in West Bengal [5], but not all the species are easily available for study. Banded Krait, Wall's Krait and Common Krait are found in plentiful amount, whereas Greater and Lesser Black Kraits are found in moderate numbers, and the North-eastern Hill Krait is rare to be found. In spite of their uneven distribution there is a high mortality due to krait bites, which is mainly for their nocturnal habit and painless bite [6]. There is an ecological perspective to the distribution of the kraits in West Bengal. No other state in India has the krait community as varied as it is in West Bengal [7]. That is why the bite cases are expected to be caused by a more speciose community of kraits, resulting in a more complex clinical outcome. West Bengal acts as a bridge between Indo-Malayan and oriental ophiofaunal community turning almost the entire state into an ecotonal area. This explains the unique krait fauna of West Bengal (edge effect). This is distinct from the overall map (Figure-1) showing distribution of the kraits in the state.

Though there are several venomous species of snakes other than kraits, a special focus should be given on kraits due to the unique pathophysiological consequences of their venoms. The principal reason for this is that the kraits are

nocturnal and do not cause painful bites, and many people do not notice their bite while sleeping and it leads to delay in starting treatments [8]. Krait venom containing bungarotoxins, has neurotoxic activity (both pre-synaptic and post-synaptic) and act on neuromuscular junction, resulting in blockage in synaptic transmission [9]. Severe envenomation leads to prolonged period of paralysis, and may mimic brain death [10]. Such neurotoxic envenoming can also cause life threatening respiratory paralysis for prolonged period [11], and for this reason the krait bites have very high mortality (as high as 77%) in the rural areas [12]. The biting is often associated with abdominal pain, ranging from minutes to hours. Unlike other venomous snakes including cobra envenomation, local signs are absent in neuroparalytic features caused by krait envenomation [13]. There is a usual time gap of 4-12 hours between the bite and onset of neuroparalytic symptoms. The paralysis in the muscles of palate, jaw, tongue, larynx, neck and muscles of deglutition often cause difficulty or even failure in speech; this leads to another level of difficulty [14]. The aforementioned points are the reasons which lead to highlight the kraits in West Bengal.

## II. RELATED WORK

Previously, there have been some related works in this field, which mainly focused on the snake bite cases and how to deal with them. The work done by Ahsan and Rahman focused on the distribution, status and threats of the kraits in Bangladesh [4]. There was a similar work

done in the 1990's by Ahmed and Dasgupta [5]. No such works were taken place for the last 20 years in West Bengal, specifically for kraits. Although a snakebite management data was published in 2012 for medical officers from the Government of West Bengal [7]. More or less similar works have been undertaken in other states as well as other countries. So, our work mainly aims-

- i) To know the present status of the kraits in West Bengal;
- ii) To give a clear identifying picture of the available kraits;
- iii) To develop a better understanding over their distribution;
- iv) The importance of worrying about specifically the kraits in West Bengal.

**III. METHODOLOGY**

This comparative study is based on field works as well as collected data. The whole study was completed within 10 months starting from November, 2019. Most of the data are collected from published journals, books, authentic web sources, published and some unpublished reports, and by discussing with local snake rescuers, researchers of this

field, and renowned wildlife photographers. As the kraits are predominantly nocturnal, the field visits were done mostly during nights (between 18:00 and 22:00 IST). In cases where the live specimens were not found, we collected the data from local experts who had proof of the snakes being present in the locality. The status of the six species is given based on the availability from our visits (Table-2). The distribution pattern is put into the map in Figure-1, based on previous published records of the snakes [15,16,17,18,19,20,21,22], as well as based on our field study. Another table is made with the data on scales and morphology of those snakes (Table-1). The importance of focusing on kraits is obtained from some case studies related to krait envenomation and the typical unidentifiable signs associated with krait bite.

**IV. RESULTS AND DISCUSSION**

The whole study can be grouped into two tables which are given here. The first table gives an easy way to identify the krait species found in West Bengal, India. For better clarification, individual species are described in brief with clear photographs.

Table 1- Comparative data on the kraits [23]

	<i>B. caeruleus</i>	<i>B. fasciatus</i>	<i>B. walli</i>	<i>B. niger</i>	<i>B. lividus</i>	<i>B. bungaroides</i>
<b>2 head lengths behind head</b>	15	15	17 or 19	15	15	15
<b>2 head lengths before vent</b>	15	15	17	15	15	15
<b>Ventrals</b>	200-218	200-234	192-207	216-231	209-215	220-238
<b>Midbody</b>	15	15	17 or 19	15	15	15
<b>Vertebrae broader than long</b>	Yes	Yes	Yes	Yes	No	Yes
<b>Subcaudals</b>	38-50	23-39	48-55	47-57	35-42	44-51
<b>Compressed body</b>	No	No	Yes	No	No	No
<b>Bands on body</b>	Many white lines in pairs	Complete yellow and black bands	Many equidistant white beaded lines	None	None	Many equidistant white lines
<b>2<sup>nd</sup> supralabial narrower than 3<sup>rd</sup></b>	No	Yes	Yes	Yes	Yes	Yes

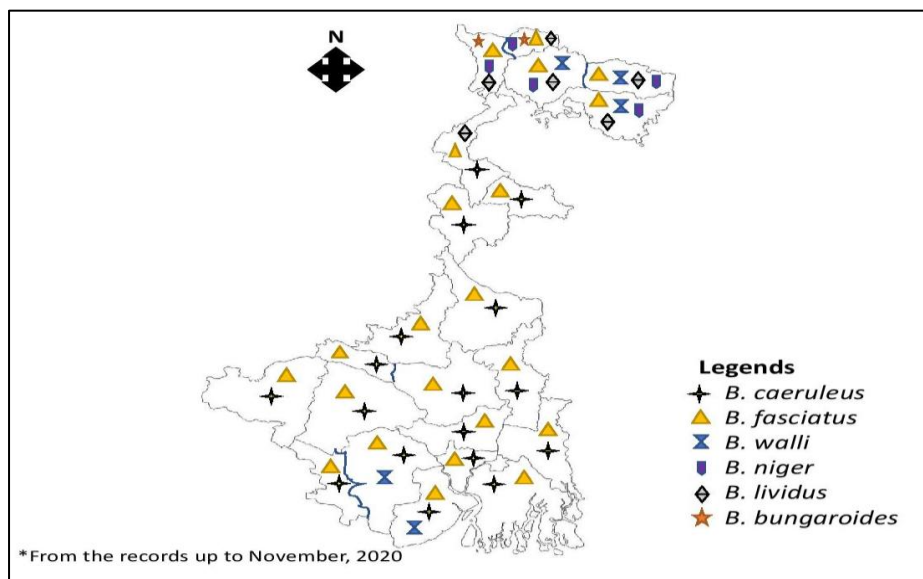


Figure1- Distribution of kraits in West Bengal

There are also other distinctions and morphological features, which are as follows-

1. ***B. caeruleus* Schneider, 1801:** The Common Krait (Figure-2) is one of the most common venomous snakes in the state. The black on the back is glazing and in bright lights it appears to be bluish, hence the name *caeruleus* [23]. At the midbody, the white paired bands gradually fade especially laterally and become replaced by white dots or may disappear completely. The bands are also present on tail. The head is black, fading to white on lips. Belly is completely white in colour [24].



Figure 2- Common Krait (*Bungarus caeruleus*) [©Vivek Sharma]

2. ***B. fasciatus* Schneider, 1801:** It is probably the most easily recognizable krait due to its unique external morphology (Figure-3) of having distinct black and yellow bands. It is found in every district of West Bengal, and known for feeding on each and every kind of snakes present in its vicinity. There is no distinction between head and neck. The eyes are relatively small. The head has complete scalation, but without loreal scale. Tail end blunt and finger like. The bands completely encircle the body. The back is ridged which is not seen in other species [25].



Figure 3- Banded Krait (*Bungarus fasciatus*) [©Arindam Ghatak]

3. ***B. walli* Wall, 1907:** Wall's Krait (Figure-4) is restricted to northern part of Bengal as of current records. This species is often confused with Sind Krait (*B. sindanus*), which is not found in West Bengal. In *B. sindanus*, the bands are disposed in pairs, broader and less interrupted, where as in *B. walli*, these are finer and not disposed in pairs. Furthermore, the ventrals are fewer in number (198-207) in *B. walli* than in *B. sindanus* (220-237). In *B. sindanus*, the vertebrales are

longer than broad; first four supralabials are equally broad [26]. The distinctly compressed body is unique to the Wall's Krait [27].



Figure 4- Wall's Krait (*Bungarus walli*) [©Arindam Ghatak]

4. ***B. niger* Wall, 1908:** The Greater Black Krait (Figure-5) is moderately found in West Bengal (Fig-1). This is confused with *B. lividus* from which it differs in having broader vertebral row of scales and greater number of ventrals and subcaudals [28]. The dorsal portion is black and without bands. Underside of the body is yellowish. Apart from scale counts, it differs from *B. lividus* in shape and size of vertebral scales. The scales are larger than adjacent ones and of hexagonal shape, whereas that of *B. lividus* is significantly narrow [29].



Figure 5- Greater Black Krait (*Bungarus niger*) [©Tirthankar Biswas]

5. ***B. lividus* Cantor, 1839:** The Lesser Black Krait (Figure-6) is more common in northern regions than the southern part [26]. Morphologically it looks quite alike to Greater Black Krait. It has also a uniform body without any pattern and yellowish underside. Very little is known about its natural history [28]. The vertebrales are narrower and longer than broad, and narrower than the adjacent scales [30].



Figure 6- Lesser Black Krait (*Bungarus lividus*) [©Arindam Ghatak]

6. *B. bungaroides* Cantor, 1839: The North-eastern Hill Krait (Figure-7) is being considered rare according to the availability of this species [30]. It has brownish or light greyish-blue coloured belly. Head not much depressed with a rounded snout, slightly broader than neck. Upper lip colour dark brownish or dark blackish-brown. The bands may be faint or absent on neck, but clearly visible on above and below the tail [31].



Figure 7-North-eastern Hill Krait (*Bungarus bungaroides*)  
[©Animish Mandrekar]

Table 2- Status of the kraits according to their availability

No.	Species	Status
1.	<i>B. caeruleus</i>	Very common (Observed more than 30 times)
2.	<i>B. fasciatus</i>	Very common (Observed more than 50 times)
3.	<i>B. walli</i>	Very common (Observed more than 20 times)
4.	<i>B. niger</i>	Uncommon (Did not observe in our study period)
5.	<i>B. lividus</i>	Fairly common (Observed once in our study period)
6.	<i>B. bungaroides</i>	Rare (Did not observe in our study period)

## V. CONCLUSION AND FUTURE SCOPE

It is evident from our study that the mostly available krait in West Bengal is the Banded Krait. Although the status of North-eastern Hill Krait is not evaluated by IUCN, our study displays a clear picture of the snake being rarest among other kraits. This study also explains the usual doubts of identification of the kraits, such as between *B. walli* and *B. sindanus*, between *B. walli* and *B. caeruleus*. The distribution of *B. walli* is mainly focused in the northern regions, but it can be present all over as one specimen was found in Midnapur districts. *B. niger* is recorded to be found in various parts of northern parts of West Bengal, but we could not observe any live species during the period of our study. In case of *B. lividus*, we can conclude it saying that this species is fairly common as we had found one, and there were many records of the snake being sighted. There is still considerable debate over the existence of some of the species, but our work has omitted most of the conflicts. A common misconception of the *B. sindanus* being present in the West Bengal is also washed away. True identification is necessary for effective medication and misidentification often leads to fatal climax.

More than one krait species has been recorded from almost every district, which is a crucial point for developing this comparative morphological data. Although krait envenomation is one of the leading cause of death due to snake bite in West Bengal, there is a little or no knowledge at all over the venom profiles of each and every available krait species. Further works on the kraits are required for deeper understanding of their habits, and this would be a huge impact factor for decreasing krait bite mortality in West Bengal.

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## AUTHOR CONTRIBUTIONS

Both the authors in this manuscript have made substantial contributions towards conception, design, acquisition of data, analysis, and interpretation of the data.

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