A REPORT ON

HABITAT OF KING COBRA IN KUMAUN HIMALAYAS

Habitat of King Cobra in Kumaoun Hills of Uttarakhand

Introduction: King cobra (***Ophiophagus hannah***) belonging to the family Elapidae is the third largest snake in India and is world's largest venomous snake, capable of growing upto 5.49- 5.79 m (Aagard, 1924; Mehrtens; Daniel,2002). It is threatened by habitat destruction and has been listed as Vulnerable on the IUCN Red List since 2010. It chiefly preys on other snakes sometimes on lizards and rodents.

The king cobra is a prominent symbol in the mythology of India and is the national reptile of India.

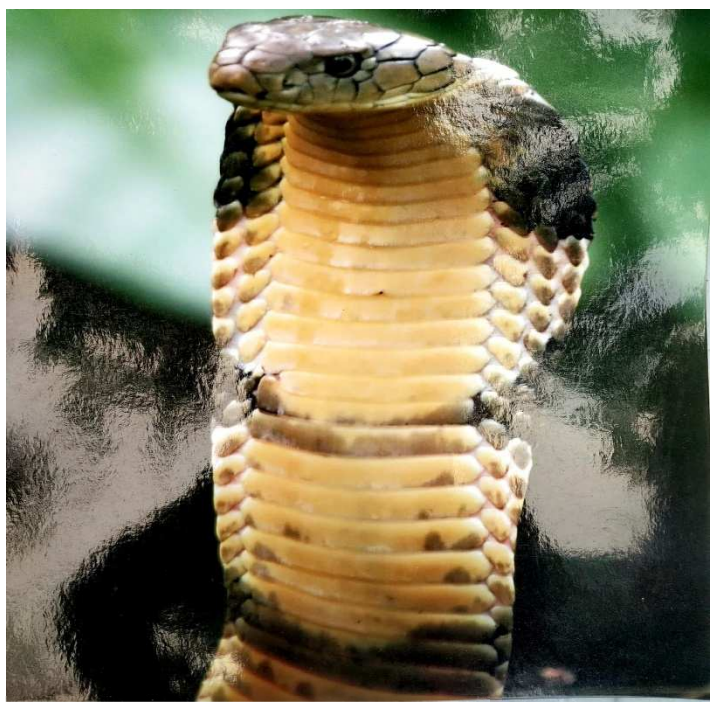

Fig 1, 2 : Images of King Cobra
PC (Anoop Shah)

Distribution : The king cobra is distributed across the Indian subcontinent, Southeast Asia and Southern areas of East Asia in Bangladesh; Bhutan; Brunei Darussalam; Cambodia; China; Hong Kong; India , Indonesia , Lao People's Democratic Republic; Malaysia Myanmar; Nepal; Philippines; Singapore; Thailand; Vietnam.

In India it is found in Uttar Pradesh, Arunachal Pradesh, Orissa, Mizoram, Meghalaya, Karnataka, Manipur, Sikkim, Nagaland, Kerala, Uttarakhand, Jharkand, Goa, Tripura, West Bengal, Andhra Pradesh, Assam, Tamil Nadu, Andaman Islands, Bihar.

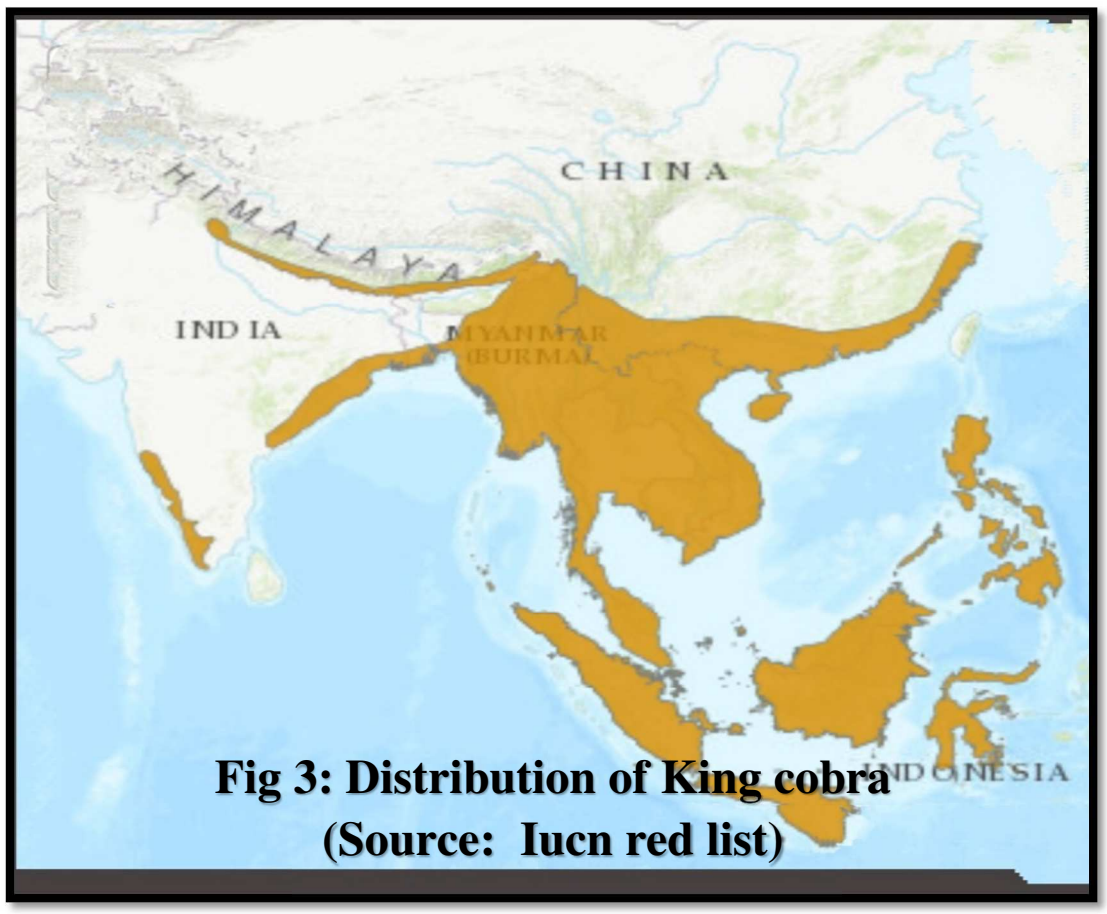

Fig 3: Distribution of King cobra
(Source: Iucn red list)

Facts about King Cobra:

- The name 'Ophiophagus' means 'snake eater' and refers to the King Cobra's ability to devour other snakes as food.
- The King Cobra is quite popular in India and is revered on an advantageous day known as 'Nag Panchmi'.
- The King Cobra follows the rhythmic movements of a snake charmer's hand and not the music since they're potentially deaf.
- The King Cobra is the longest venomous snake in the world.
- A female King Cobra can hoard the male's sperms inside the body even after the breeding season is ended to impregnate herself during consecutive seasons.
- The King Cobra has the longest forked tongue of all snake species.
- A unique physical adaptation of the King Cobra is its ability to jump which can be a distance of one-third of its body length.

Habitat of King Cobra: King Cobra movement patterns are strongly influenced by ambient temperature, relative humidity, and wind direction. King Cobra did not show strong preferences for any particular habitat type. The King Cobra occurs in a wide variety of habitats from littoral, mangrove swamps to broad leafed alpine forests (Bashir et al. 2010).

Areas preferred by King Cobra for nesting:

- King Cobras likely prefer areas close to streams with abundant fallen logs as retreat sites. Animal burrows were also used as shelter sites.

- Areas with a leaf litter depth of 10–17 cm were preferred sites for nest construction. During the month of April or early May, the female King Cobra produces several eggs in a nest that she builds particularly using twigs and leaves.

- It resides in burrows or thick bushes. It prefers dense highland forests that are dotted with streams or lakes and can also be found in grasslands.

- Generally, King Cobras occupy bamboo thickets brimming with potential prey or dense mangrove swamps where nesting grounds are abundant.

- They prefer a humid climate where the temperature is around 35 degrees Celsius (95 Fahrenheit). The nesting mound can measure 3 to 5 meters in radius in which the female will lay around 21 - 40 eggs. The incubation period carries forward for 11 to 12 weeks wherein the female ensures that the temperature remains stable (28 degrees of Celsius) for the eggs to hatch. The female King Cobra sits on top of her nest while the male remains close by. The female King Cobra abandons the nest after the incubation period to avoid the temptation of devouring the young snakes.

- From the year 2006–2017, 18 King Cobra nests and numerous (>40) sightings of adult King Cobras were recorded the Nainital district of Uttarakhand. Most sightings of the snake were near human habitation, and nests often occurred in disturbed/degraded forests, some even in private fruit orchards (Dolia, unpublished data).

"**These distribution and nest occurrence records show that the world's longest venomous snake inhabits and breeds in the Kumaon hills, at elevations ranging from 900 m to 2000 m, where winter temperatures are often close to freezing, resulting in snowfall in some areas (Gupta et al., 2016) .**

Studies have been done on the distribution of King Cobras from Nainital district in Uttarakhand state.

1. **Some of the sightings of King Cobra recorded are as under:**

I. In the year 2006 a King Cobra nest was located in Talla Ramgarh village Bhowali (Nainital) (by Manoj Chandran).

II. In the year 2009 King Cobra nest was discovered in Jeolikote.

III. In the year 2011 a female King Cobra's nest of pine leaves was found in Beluwakhan Jeolikote Nainital. The nest contained 22 eggs.

IV. In the year 2012 a King Cobra hatching was observed at 2303 m in the IVRI Mukteshwar, Nainital.

V. King cobra was also seen in Kohinoor Ground , Sattal, Uttarakhand.

2. Sightings of King Cobra's nest in and around Nainital:

I. Ramgarg- Talla Ramgarh to Nathua khan.

II. Mona Lewsal, Darmoli- 3 Nest.

III. Sakuna- 2 nest.

IV. Baliyanala- 1nest.

V. Gethia-2 nest (1 was tracked).

VI. Chunji- 3nest.

VII. Ghorakhal (vinayak)- 2 nest.

- Places other than Nainital from where King Cobra has been sighted in Uttarakhand: Other than Nainital King Cobra has been sighted from **Almora and Mussorie**.

Fig 4, 5, 6, 7, 8 : King Cobra's nest in different regions in Nainital

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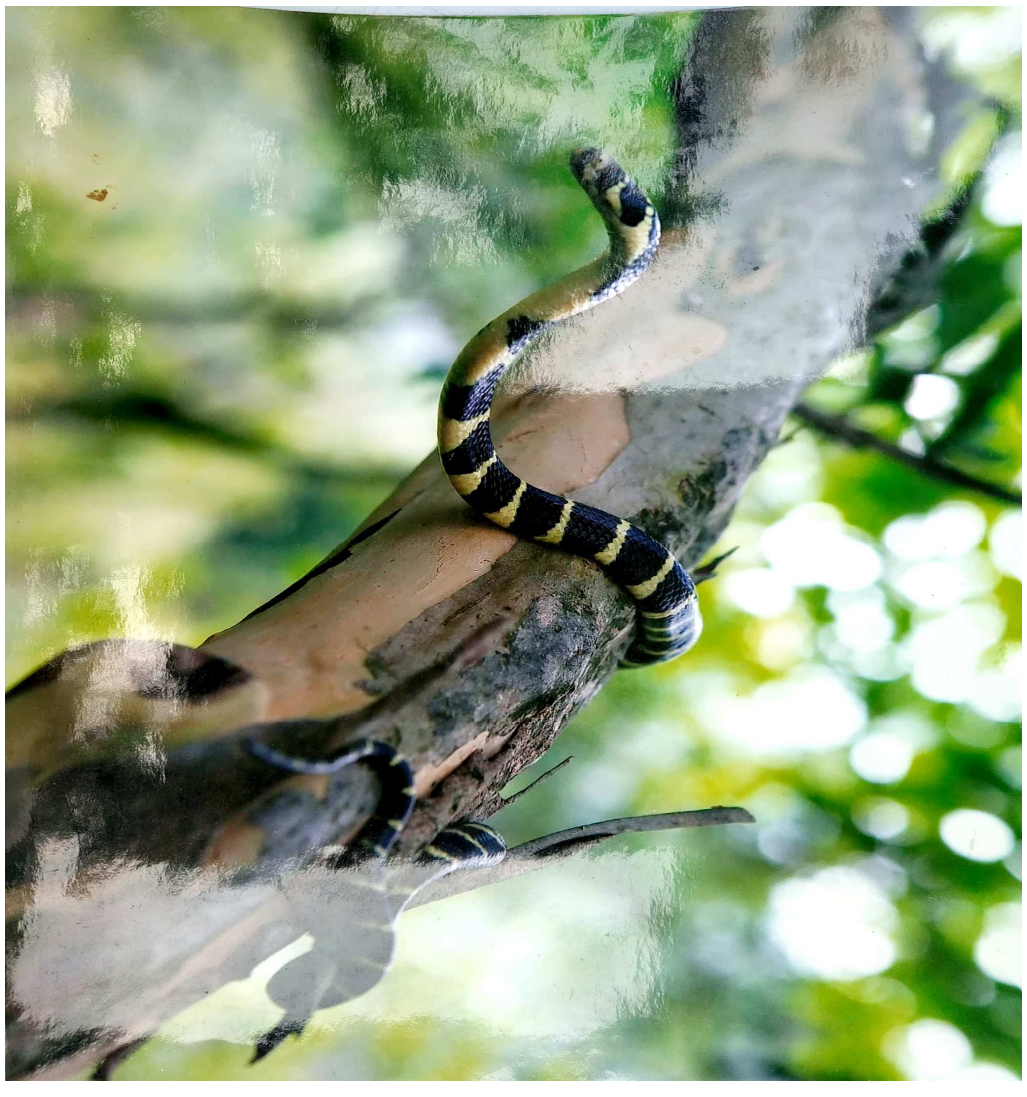

King Cobra's Fig 9: Eggs in the nest, Fig 10, 11: Newly born King Cobra

- **Threats to King Cobra in the region:**

  - **Forest Fire:** It is one of the biggest threat to the nest of King Cobra as their nest building seasons coincide with the forest fire in the Kumaon Hills.
  - **Loss of habitat:** With more of the forest land being converted to agricultural land the habitat of King cobra is shrinking.
  - **Lack of awareness:** The nest are being destroyed by the local people. As the world's largest venomous snake, it is also suffers high levels of persecution by humans throughout its range.
  - **Deforestation:** It is likely to exert strong pressure at local scales, particularly where snakes are also hunted, and is likely to lead to declines in many of the snakes on which this species feeds (R.P.H. Lilley pers. comm. 2011)

- **Conservation measures**: Conservation measures are required to reduce the rate of habitat destruction occurring within its range and to manage the trade levels of this species. Further research into, and monitoring of the population status of, this species is required, as well as research into sustainable harvesting levels. Taxonomic research is also needed to determine if this species actually consists of a complex of species. Educational programmes may help to minimise the persecution of the species.

Brief of few of the sightings:

1. **In Mukteshwar by Jignasu Dolia**: In October 2012, a King Cobra hatchling was found at 2303 m (29.4725° N; 79.6494° E) in the Indian Veterinary Research Institute's (IVRI) campus at Mukteshwar, Nainital. This sighting marks the highest recorded altitude for the King Cobra in its worldwide range. This, coupled with distribution records from northeastern India (Das et al., 2008), suggests that the species may be well adapted to survive in the sub-tropical/temperate forests of India. Given that the average minimum temperature during December-February (from the years 1953–1979) was below 5 degreeC (http://www.imd.gov.in/section/climate/ climateimp.pdf; (https://www.euttaranchal.com/ tourism/nainital-weather.php), and snow and frost are common during winters (http://www.nainitaltourism. com/About_Kumaon.html).
2. **In Ramgarh Block.** A King Cobra's nest composed of pine leaves in Kumaon, Uttarakhand. Note the female cobra lying on top of the nest . There is anecdotal evidence of an adult King Cobra that was seen basking at regular intervals during December–January, at an altitude of above 2000 m near Gagar, Kumaon (M. Rai pers. comm).

On 28 June 2009, a King Cobra nest was discovered in the Ramgarh Block of Nainital, at an altitude of 1615 m.The coordinates of the nest were: 29.4438° N and 79.5722° E (Model: Garmin GPSMAP 76CSx, Garmin Ltd., Kansas, U.S.A). This was the second King Cobra nest found in the Kumaon region (see Rasaily et al., 2008 for an account of the 1st nest). The nest was primarily composed of Baanj oak (*Quercus leucotrichophora)* leaves, and the female was seen guarding the nest for 2–3 weeks, after which she abandoned it. On 7 October 2009, after approximately 100 days since the first observation, the first King Cobra hatchling of this nest was spotted, and subsequently monitored and measured all the emerging hatchlings during the following days. On 10 October 2009, In all, there were 32 eggs, 28 of which had hatched successfully. However, the interesting fact was that 29 living hatchling King Cobras had emerged from only 28 eggs. It was concluded that the most likely explanation for this anomaly was that two snakes had hatched from a single egg; in other words, a case of 'twinning' had occurred. To corroborate this finding, It was noticed that two hatchlings were unusually smaller and lighter in weight than their siblings. These two individuals, in all likelihood the single-egg twins, weighed 12 g (total length=40 cm) and 9 g (total length=37.5 cm) respectively, whereas the mean weight of their siblings was 22.7 g (standard deviation or SD=1.9 g, range=17.0–25.0 g, n=26 as one individual was

not weighed), little more than the combined weight of both. The mean total length of their siblings was 50.8 cm (SD=2.1 cm, range= 46.7–55.9 cm, n=27). Singh and Thapliyal (1973) also reported a reduced weight in twin embryos of Natrix piscator (current name: Xenochrophis piscator). Among the four unsuccessful eggs from this nest, two were found to be rotten; one hatchling died soon after birth, and one hatchling was stillborn.

3. **In Jeolikote:** A second observation that was reported concerns a female cobra with her nest of pine leaves. In June 2011, a King Cobra's nest was found (29.3671° N, 79.4729° E; elevation 1481 m) near Jeolikote, Nainital, Uttarakhand. The nest was mainly composed of Chir pine (Pinus roxburghii) leaves and the female was present on the nest when first seen .

   On 22 July 2011, approximately one month later, seven rotten/unfertilized (i.e. unviable) eggs were found separated from the main clutch of healthy eggs (S. Ramachandran pers. comm.), and were visible at the base of this nest . Prior to abandoning the nest for good, the female cobra was observed moving in the bottom section of the nest, close to where the eggs are usually located (S. Ramachandran pers. comm.). While the female cobra was not actually observed separating the seven unviable eggs, it is likely to have been a deliberate action on her part for the following reasons: (1) Nest sanitation or 'nest cleaning' has been observed in several species of invertebrate and vertebrate animals (e.g., Rothenbuhler, 1964; Lang et al., 2002; Guigueno and Sealy, 2012; Diez et al., 2014), and separation of unviable eggs from viable eggs could be an evolutionary adaptation for animals such as King Cobras with large brood sizes and/or long incubation periods, and (2) there was no evidence of this nest having been disturbed or invaded by any other human or animal during the entire time that it was observed. This is the first report of potentially hygienic behaviour or 'nest sanitation' from a nesting female King Cobra. This nest contained 22 eggs in all, 11 of which hatched on 21 September 2011, two months after the discovery of the separated unviable eggs. Out of the 15 eggs remaining in the nest chamber (i.e. excluding the seven unviable eggs that were removed), four eggs were found to be rotten. The mean total length of the 11 hatchlings was 52.7 cm (SD=3.3 cm, range= 45.5–58.0 cm) and the mean weight was 18.3 g (SD=2.2 g, range= 15.0–22.0 g).

4. **In Talla Ramgarh Village by Manoj Chandran:** On 1st September 2006, a King Cobra nest was located on a slope overgrown with a rich crop of Kumaria grass (Heteropogon contortus), Chadi grass (Apluda mutica) and Godia grass (Chrysopogon serrulatus) and interspersed with small trees of Banj Oak (Quercus leucotrichophora), Khinna (Sapium insigne) etc. The nest was at a distance of 4.57 m (15 feet) from the path, nestled at the base of a small Oak tree. On examination it was found that the nest consisted of a highly compacted and rotting mass of dead leaves, twigs and other assorted vegetative materials. The eggs were pale yellow in colour and looked fresh and healthy. In order to stop the newly hatched snakes from crawling into people's homes and thereby become victim of people's wrath, the authors raised up a metre high polythene sheet barricade around the nest. The temperature within and outside the nest was regularly measured with a mercury thermometer.````

Location : Talla Ramgarh Village, Nainital Distt. (Uttarakhand) (N29°27'11.5", E79°31'53.4")
Altitude : 1398 ± 15 m
Clutch size : 26 eggs
Shape : Roughly circular
Size of the nest : 1.80 x 1.30 m dia. And ≈0.80 m deep at the centre.
Nesting material : Mostly dry leaves and twigs of Banj Oak (Quercus leucotrichophora) and Kilmora.

Colour : Ivory white
Size of egg : 58 x 36 mm ± 5 mm
Clutch size : 26 eggs
Total No. that hatched : 19
Dead & Piped : 2
Survival : 17 (Survival % on hatching
65.38%
Average length : 50 ± 01.50 cm
Average weight : 22.32 g