Project Title: Distribution, threat assessment and conservation of King Cobras in the Kumaon Region of Uttarakhand, northern India

Project ID: 31295-2

Primary Investigator: Mr. Jignasu Dolia


***2nd Interim Report: April 2021***

## 1. Snake-awareness programmes

The main field activity during this phase of the project was to carry out snake-awareness cum sensitization programmes for key stakeholder groups, (e.g. forest department personnel, NGOs working in environmental conservation etc.). These programmes consisted of the primary investigator (PI) of this project, Jignasu Dolia, conducting detailed audio-visual presentations (via a projector and screen) at select venues within the study area. The primary aim of these outreach programmes was to educate the various stakeholders regarding snakes in general, and King Cobras in particular. When the audience comprised of forest department field staff, these programmes also included basics of snake-rescue, including demonstration with live snakes when possible. Listed below are some of the main topics covered during these programmes:

- Brief introduction and evolutionary history of snakes
- Overview of snake diversity of the world/India
- Snakes commonly found in Uttarakhand (detailed summary of individual species)
- Venomous *vs* non-venomous snakes, and tips for their proper identification
- The importance of snakes in the environment, and laws in place to protect them
- Professional ways to rescue & release snakes (stressing on the scientific/ethical aspects)
- Concepts of danger and whether our fear of snakes is justified
- What to do if snakes are accidentally encountered
- How to avoid attracting snakes near homes/workplaces
- Common snakebite symptoms and appropriate first-aid measures

Till date, we have conducted ten such awareness programmes, including for two local environmental NGOs, one school and several forest ranges within the study area. This is an ongoing effort, but due to the Covid-19 pandemic, things did not quite go as per the original schedule. Although schools were one of the main intended audiences, we were unable to carry out programmes in schools due to the ongoing pandemic. Moreover, because I contracted the Covid-19 virus in mid-November 2020, I lost a fair amount of time as a result. However, I plan to at least meet, if not exceed, the original target of 15 awareness programmes before the end of the project period. We are also exploring the option to carry out these programmes remotely for schools in the region (e.g. through Skype, Zoom etc.). However, at present, the Covid-19 situation in India is dire, and the country may go into a lockdown again.

**Image 1.** Forest department staff attending a snake-awareness programme at Nandhaur WLS, Uttarakhand

**Image 2**. The PI showing forest department staff how to use a snake tong correctly

**Image 3**. Imparting training to forest department staff regarding how to use a snake-hook for rescuing and handling snakes. The snake in picture is a 7-foot long, non-venomous, Indian Rat Snake (Ptyas mucosa)

**Image 4**. The PI showing shed snake-skin samples to forest department staff, and explaining the difference between similar looking species based on scalation patterns

**Image 5**. Group photograph with students, teachers and staff of Mangoli Intercollege (Nainital District) after completing the snake-awareness programme

**Image 6**. The PI carrying out an interview to assess snake diversity and distribution of King Cobras and other snakes within the study area

## 2. Discovery of two King Cobra nests from the previous (i.e. 2020) nesting season

In March 2021, I got to know from a villager (Mr. Gangola) about at least one, possibly two, previously undetected King Cobra nests that he and his wife accidentally found while out in the forest. Upon interviewing the couple about a week later, I learnt that they had first spotted these nests sometime in the first week of March 2021. As this was too early for nesting to begin in King Cobras (nesting usually occurs between May-July in the study area), I realized that the mound of leaves they reported must have been 'old nests', i.e. remnants from the previous year's nesting season.

This was exciting and novel news indeed, because we usually get information on occupied nests during the nesting season, which we then monitor until hatching. But, this was the first time I got to know of a previous season's nest. As these nests were not detected when active, they were good potential candidates as 'control nest' sites, in which hatching had presumably occurred months ago (i.e. Aug-Sep 2020), without any human disturbance or intervention. In other words, these nests were completely natural. I was therefore eager to study their structure, record their dimensions and find out their clutch size, if possible.

Thus, on the 14$^{th}$ of March 2021, my field assistant and I visited the site to check these nests out. While Nest 1 was fully intact (Image 5), Nest 2 seemed to have been badly disturbed/damaged (Image 12), most likely by some natural egg-predator/scavenger. Both nests were primarily composed of Chir Pine (*Pinus roxburghii*) leaves. We GPS-marked the location of both nests but were only able to record nest dimensions for the intact nest (see Table 1 for details), prior to carefully excavating it. We were unable to count the number of empty egg-shells, as these were firmly embedded within the nest bowl, and I was unwilling to tamper with this rare find. The entire nest was completely dry and very tightly packed. We successfully managed to excavate the inner chamber of this nest (which contained the egg-receptacle or nest-bowl; Images 10, 11). As this was such a mind-boggling and well-preserved natural structure, I decided to hand it over to the Research Wing of the Uttarakhand Forest Department, Haldwani, where it is now elegantly displayed.

**Image 7**. (Top): Photograph of a King Cobra's nest from 2020 (indicated by the yellow arrow), which went undetected until March 2021. This undisturbed nest, found at an elevation of approx. 1005 m, was mainly composed of pine needles, a common nesting material used by this species in the study area. (Bottom): field assistant and nest informant measuring the 'straight' nest diameter using stakes and a measuring tape

**Image 8**. Profile picture of a partially excavated King Cobra's nest. The field assistant is measuring the height of the nest from the ground, with his right index finger pointing towards the nest chamber structure

**Image 9**. Top view of the nest bowl (or nest cup), a depression within which the eggs are securely contained. The empty egg-shells were firmly embedded within the base of this cup

**Image 10**. Field assistant and nest informant holding the carefully excavated 'inner chamber', akin to an upturned lady's hat, of the abandoned nest of a King Cobra

**Image 11**. A close-up photograph of the structure from below

**Table 1**. Nest dimensions of a King Cobra's nest from 2020 season, which was only found several months later

| **Nest dimensions** | **Values (cm)** |
|---|---|
| East-west (curved/straight) diameter | 152; 112 |
| North-south (curved/straight) diameter | 147; 121 |
| Circumference | 355 |
| Avg. height [#] | 42.5 |
| Nest-bowl diameter | 19 |
| Nest-bowl depth | 14 |

Note:

# indicates average of four separate height measurements (i.e. 43, 42, 27, 58 cm), taken on the eastern, western, northern and southern sides of the nest respectively, as the nest was not located on flat ground

Nest 2 (also made of pine needles) was damaged (flattened out) and the nesting material all spread out. Despite extensive searching for the egg-shells, we were unable to find them. This suggests either of the following scenarios for this abandoned nest: (1) eggs were laid by the female King Cobra but were subsequently consumed by some animal; (2) eggs may have successfully hatched, but the egg-shells subsequently consumed by some animal; (3) no eggs were laid in the first place, and the nest only partially built and abandoned. Although the first scenario is the most likely, and the third scenario the least likely, it is sometimes possible that a female King Cobra begins to build a nest but abandons it halfway to build another one nearby. This is possible if the snake was disturbed by humans or if the initial location of nest construction was unsuitable for some reason. But, judging from the volume of nest material that had been gathered, it seemed as though this was a fully constructed nest indeed.

**Image 12**. Photograph of the remains of a disturbed/damaged King Cobra's nest (Nest 2), approximately 20 m away from the intact nest. This strewn nest seemed to have been damaged by some wild animal


**Image 13**. Mr. Gangola and his wife, who first informed us about these two inactive nests from 2020

### 3. King Cobra sightings (April 2021)

Thanks to our network of local contacts/informants, we were informed of three recent King Cobra sightings from our study area. The first sighting was from Bhimtal, where an adult (9-10 ft long) King Cobra was spotted by a local school teacher on the afternoon of 14 April 2021. He promptly shared with me photographs of the snake (Image 14), which he captured on his mobile phone. This was the same teacher who, last year, found a King Cobra hatchling inside the campus of a private school. The following day, I went to Bhimtal to GPS-mark the exact location of the sighting and to also briefly interview the teacher, who had observed the snake for about 15 minutes the previous day. He told me that, although several people saw this large venomous snake, nobody dared to disturb it.

**Image 14**. An adult King Cobra seen beside a temple in Bhimtal, Nainital District

Two days later (i.e. 16 April 2021), a friend of mine sent me four video clippings of an adult King Cobra seen feeding on an Indian Rat Snake (*Ptyas mucosa*), also from Bhimtal. Given the location and dates of these consecutive sightings, it is highly probable that these two sightings involved the same individual King Cobra. These amazing action-packed videos (recorded on a mobile phone by an anonymous person and shared over Whatsapp), shot on the shore of Bhimtal lake, capture the tussle between a King Cobra (predator) and an Indian Rat Snake (prey). In the videos, one can see the entwined bodies of both snakes (Image 15- A, B), both twisting and turning rapidly. In retaliation, the captured Rat Snake can be seen trying to bite the King Cobra several times, but in vain. Eventually, the prey succumbs to the predator

and the King Cobra can be seen consuming the Rat Snake (Image 15- C), which seems to be this snake-eater's preferred prey item in many parts of its distribution.

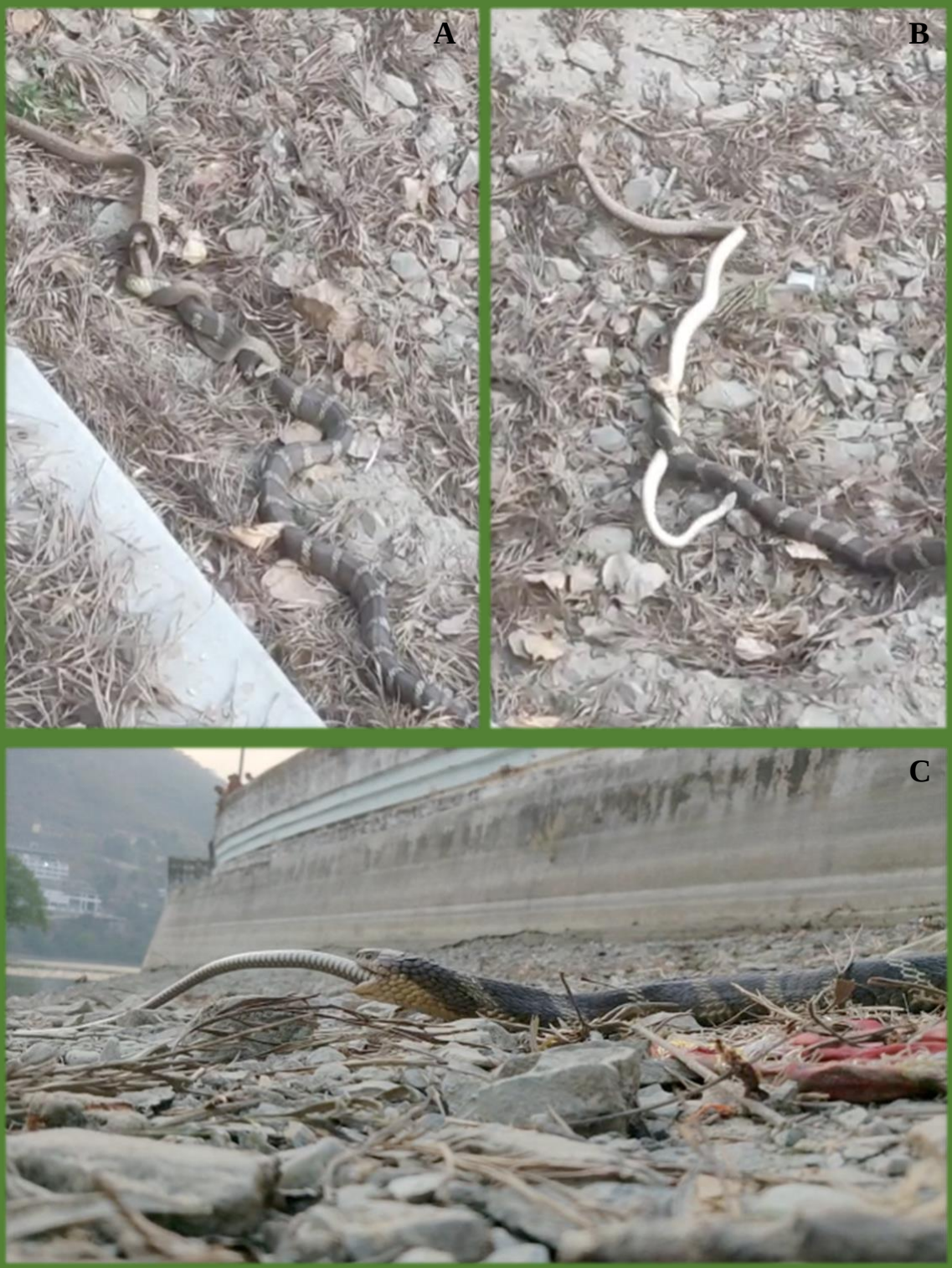


**Image 15**. King Cobra hunting and consuming an Indian Rat Snake, Bhimtal (Nainital District). In images A & B, one can see the Rat Snake trying to bite the King Cobra in self-defence

The third sighting of this month was of an adult King Cobra (approx. 9-10 ft long), which was first seen by a local person on the afternoon of 25 April 2021 (Image 16). The location of this sighting was the same as where we had successfully monitored a nest last year. Thanks to our awareness and sensitization efforts at the grassroots level, local villagers informed us of this sighting, and also shared a video of the same with me over Whatsapp. It is indeed reassuring to know that the snake was left alone and not disturbed.

**Image 16**. An adult King Cobra sighted by a local person on 25 April, 2021, Nainital District, Uttarakhand

Apart from these three sightings from the Kumaon region, one adult King Cobra was recently rescued in Doiwala, Dehradun district, Garhwal region. These sightings provide us with distributional and behavioural data (e.g. activity patterns, feeding behaviour) for this rather elusive species. In the hilly regions of Uttarakhand, where winter temperatures are near freezing, King Cobras seem to become active by end March/early April, looking for food and/or potential mates. Nesting is likely to begin soon, and we look forward to locating and monitoring a few nests in 2021. However, it is important to note that rampant forest fires, especially in pine forest, took place in the study area during March-April 2021; this possibly will reduce the available nesting habitat, and nest-building material for this important but vulnerable species.