

A first record of the King Cobra *Ophiophagus hannah* (Reptilia: Squamata: Elapidae) nest from Garhwal Himalaya, northern India

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The King Cobra *Ophiophagus hannah* is one of the largest and rarest venomous snakes found across the world, and has a wide distribution across India, Nepal, Bangladesh, Bhutan, Myanmar and most parts of Southeast Asia (David & Vogel 1996; Selich & Kestle 2002; Stuart *et al.* 2012). In India, it is distributed in the Western Ghats, Shivalik and Terai regions of Uttarakhand and Uttar Pradesh states, Bihar, Odisha, West Bengal, northeastern India and the Andaman islands (Whitaker & Captain 2004; Ahmed *et al.* 2009). Previously thought to be a semi-evergreen specialist, *Ophiophagus hannah* is now known to occupy a wide variety of niches (Whitaker *et al.* 2013). In terms of altitudinal distribution, the species is known to inhabit from 150–1,530 m in Nepal (Sleich & Kastle 2002), sea level to 1,800m in Sumatra (David & Vogel 1996) and has also been reported up to 2,181m in the Mussoorie Hills (Waltner 1975). Das *et al.* (2008) recorded its presence at an altitude of 1,700m in Konoma Village, Nagaland. It was recently recorded from Yuksam Village, bordering Khangchendzonga Biosphere Reserve in the West Sikkim District in Sikkim at an altitude of 1,820m and from the West Kameng District in Arunachal Pradesh at an altitude of 2,005m, which were the new altitude records for northeastern India (Bashir *et al.* 2010; Sangha *et al.* 2011). King Cobras are the only snakes in the world known to build nests, though pythons and other snakes may coil about and even incubate egg masses (Whitaker 1978). However, very little work seems to have been carried out on the nesting ecology of King Cobra, especially in Uttarakhand State.

On 05 July 2015 (12:20 hrs), a nest of King Cobra was sighted in the Chamasari forest of the Mussoorie Forest Division (30°23'9.8"N & 78°07'27.2"E, elevation 885.1m) (Fig. 1 & 2). The spot was near the Sahastardhara motor road. A total of 29 eggs were observed from the nest, however, no adult male or adult female snake was sighted near the nest. Discussions held with some local people revealed that a female cobra abandoned the nest 3–4 days prior to the first sighting. King Cobras are known to feed upon snakes, hence nature has designed the hatchlings process in such a grand manner that the mother cobra generally abandons the nest before the eggs are ready to hatch. The nest was prepared at the base of a *Eucalyptus obliqua* (eucalyptus) tree having drained slope, near a narrow footpath. The nesting materials mainly consist of dried leaves of *Pinus roxburghii* (Chir Pine) and *Eucalyptus obliqua* (Eucalyptus) trees. Vegetation of the spot consists of *Murraya koenigii* (Curry Tree), *Pinus roxburghii*,



Fig 1. King Cobra's nest at Chamasari forest of the Mussoorie Forest Division, nest is being protected by a net.



Fig 2. A closer view of the nest, eggs are clearly visible in the nest chamber

Eucalyptus obliqua, *Lantana camara* (Lantana), *Citrus* spp. (wild lemon), and others.

The shape of the nest was hemispherical, mounted with a thicket of leaves, covering 401.3cm area. The height of the nest was 38.1cm from the ground and the diameter was 129.5cm. Nest temperature averaged from 18.2–28.4 °C (mean 23.08 °C). During 07–12 July 2015, the temperature of the nest was recorded lower because of the monsoon rains (18.2–20.4 °C). The surface and mid layers of a typical King Cobra's nest facilitate in maintaining the

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Fig 3. A hatchling of King Cobra upon release in Chilla forest of the Rajaji National Park



Fig 4. A baby King Cobra upon release in Haridwar forest of the Rajaji National Park

humidity and temperature within the nest chamber, and play an important role in protecting the nest from excess heat and water entering from the outer environment or escaping from the inner environment (Hrima *et al.* 2014). Since the footpath was frequently being used by the local people, anthropogenic activities near the nest were completely stopped by the forest department until completion of the incubation. Besides this the nesting site was also covered with a net (Fig. 1) to protect the eggs from predators like *Herpestes auropunctatus* Hodgson, 1836 (Small Indian Mongoose) and *Varanus bengalensis* Daudin, 1802 (Bengal Monitor Lizard). Of the total clutch size of 29 eggs, 24 (82.75%) hatched successfully on 22 August 2015 at 8.10 hrs, after the observed incubation period of 49 days. On the same day, the temperature during the incubation period was measured at 28.4°C. Out of total 24 hatchlings, we measured six hatchlings (one-fourth) randomly, which averaged 47.54±4.37 cm (range 41.4–53.6 cm). Results have revealed that the eggs were not much affected although it rained three to four times during the incubation period. Notably, during the

period, Dehradun received a maximum 114.7mm of rain (Indian Express 2015).

Releasing of the hatchlings

On 22 August 2015, with a view to providing a completely human free natural environment to the hatchlings, all the hatchlings were released in two different locations in the Rajaji National Park (Fig. 3 & 4). Twelve hatchlings were released in the Chilla forest (29°57'35.9"N & 78°12'44.7"E and 29°56'59.0"N & 78°13'31.0"E) and the remaining 12 were released in the Haridwar forest (29°59'37.7"N & 78°03'55.6"E). Rajaji National Park falls under the Gangetic plains biogeographic zone and upper Gangetic plains province (Rodgers *et al.* 2002) and a major portion of the area is dominated by tropical moist deciduous forests. Both the sites were suitable habitats for the King Cobra with natural water sources, annual rivers, and thick vegetation cover with huge leaf litter on the forest floors.

In Uttarakhand State, King Cobra's nests were previously recorded from Talla Ramgarh area, Nainital District, Uttarakhand at an altitude of 1,398m (Rasaily *et al.* 2008), and from an adjacent area (Jeolikot, Nainital District) at around 1,300m altitude (Wild Himalayas 2011). Thereafter, the highest altitudinal record for its nest in the state was recorded by Whitaker *et al.* (2013) in 2009 in Nainital Forest Division, which was 1,980m. This report is the fourth documentation of King Cobra's nest from the state, although the first ever record from the Garhwal region. All previous records of sightings of the King Cobra's nests were made from the Kumaun region of the state. Rajaji National Park has been considered as the north-western limit of distribution of many Endangered species like *Elephas maximus* Linnaeus, 1758 (Asian Elephant), *Panthera tigris* Linnaeus, 1758 (Tiger), *Anthracoseros albirostris* Shaw, 1808 (Oriental Pied Hornbill) and *Ophiophagus hannah* Cantor, 1836 (King Cobra) (Kumar & Subudhi 2013), however, sufficient geographical distributional information on even such a threatened species is lacking mainly because of a paucity of herpetological surveys. Documentation of the King Cobra and its nests from a few higher altitudes authenticates that the species is also distributed in some temperate regions of the state.

The King Cobra is listed under Schedule II of the Indian Wildlife (Protection) Act, 1972 (Anonymous 2003), Appendix II of the CITES (CITES 2015) and as Vulnerable in IUCN Red List of Threatened Species (Stuart *et al.* 2012). Increasing development and anthropogenic activities across the riparian corridors of the Ganges, shrinkage of natural water sources inside protected areas, expansion of the road network across a long chain of protected habitats, and lack of awareness among the local people

regarding the species' ecological role were some threats observed in the study area. This study constitutes the first record of the King Cobra's nest in the Garhwal region, which forms an important repository of diverse fauna and is home to several threatened herpetofaunal species; however, long-term scientific studies are needed to map the distribution of the King Cobra in different ecosystems in the state.

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