

## A case of unilateral anophthalmy in the Burmese python, *Python bivittatus* Kuhl, 1820 (Squamata: Pythonidae) from Nepal

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### Abstract

Abnormalities in reptiles have been mostly reported from captive individuals. Here, we report a case of unilateral anophthalmy in the Burmese python *Python bivittatus* for the first time from Chitwan National Park, Nepal. Reptiles exposed to various pollutants, such as pesticides, can develop morphological abnormalities. The present report from a human-dominated landscape is an opportunistic observation of a rescued snake. We suggest a more systematic, collection-based, research program to reveal the possible causative agents and the degree of their effect on herpetofauna in Nepal.

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Morphological abnormalities are commonly reported in herpetofauna across the world including congenital malformations in snakes, mainly related to osteological deformities (Khan and Law, 2005; Sant'Anna et al., 2013; Da Silva et al., 2015; Mester et al., 2015). In reptiles, the congenital deformities are induced during the period of early developmental stage in the egg, possibly due to exposure of the developing embryo to abnormal temperature, nutritional deficiencies, toxins or infectious agents (Sabater and Pérez, 2013; Da Silva et al., 2015; Mingo et al., 2016).

Anophthalmy is the absence of one or both eyes, and the position of the affected eye may differ from individual to individual (Jablonski and Mikulíček, 2015). In snakes, most of the cases of anophthalmy have been reported from captive bred individuals, (e.g. the Rainbow Boa *Epicrates cenchria* (Linnaeus), Eastern Pine snake *Pituophis melanoleucus* (Daudin), Burmese Python *Python bivittatus* Kuhl, Ball Python *Python regius* (Shaw), Nose-horned Viper *Vipera ammodytes* (Linnaeus) (Heimes, 1994; Sabater and Pérez, 2013; Da Silva et al., 2015). More recently, Jablonski and Mikulíček (2015) reported a unilateral anophthalmia in *Coronella austriaca*

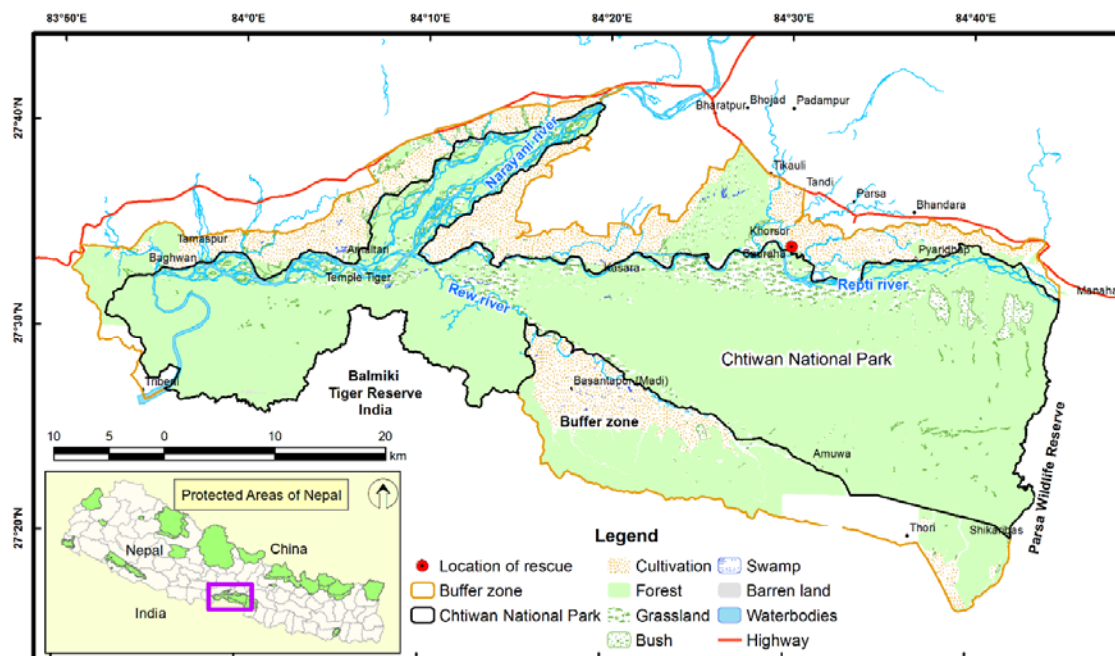
Laurenti from Šúr Nature Reserve near Bratislava in south-western Slovakia. In Nepal, both dicephalism abnormalities (two heads) in the Common Krait, *Bungarus caeruleus* (Schneider 1801) and in the Banded Kukri, *Oligodon arnensis* (Shaw 1802) (Devkota et al., 2020 a, b) and tail bifurcation in the Yellow-bellied House Gecko, *Hemidactylus flaviviridis* (see Bhattarai et al., 2020) have been recorded.

Human-python conflict is frequently observed in the buffer zone around the Chitwan National Park, but it is not well documented (Bhattarai et al., 2017). This case of anophthalmy in a Burmese Python, *Python bivittatus*, was observed during its rescue from Sauraha village in the buffer zone of Chitwan National Park (CNP). To date, anophthalmia has not been reported for any herpetofauna species from Nepal and so here we report the first case of unilateral anophthalmy in a Burmese python from the buffer zone of Chitwan National Park.

The CNP (952.63 km<sup>2</sup>) is the oldest National Park in Nepal, established in 1973 and it is a World Heritage Site, situated along the foothills of the Himalayas (Fig. 1). The Park has global significance

with a high diversity of flora and fauna. Due to the high density of wildlife in the CNP, some of the wildlife is pushed out into the fringe areas and

sometimes inside adjacent human settlements. Such animals are required to be rescued promptly to save their life and reduce the threat to local people.



**Figure 1:** Map showing location of the Chitwan National Park, Nepal and rescue location of the anophthalmic Burmese python, *Python bivittatus*.

Annually, over 100 animals are rescued in the proximity of the CNP. The National Trust for Nature Conservation – Biodiversity Conservation Center (NTNC-BCC) situated in the eastern sector of the CNP, supports the CNP in rescue and management of such vagrant wildlife, including: Bengal tiger *Panthera tigris* (Linnaeus), Greater one-horned rhino, *Rhinoceros unicornis* (Linnaeus), Common leopard *Panthera pardus* (Linnaeus), mugger crocodile, *Crocodylus palustris* (Lesson), Gharial, *Gavialis gangeticus* (Gmelin) and other smaller animals including snakes. The NTNC-BCC rescued 62 individuals of reptiles from January to

July, 2020 (Table 1). The first author inspected all the rescued reptiles and released them to the wild. During one inspection, a single case of unilateral anophthalmy was detected in a sub-adult Burmese python. It was rescued from the kitchen of a house on 23 June 2020 and brought to the NTNC-BCC. The abnormal individual was photographed, morphometric measurements taken with the aid of a measuring tape and then it was released into the wild in Chitwan National Park. We also made inquiries of snake researchers, conservationists and rescuers ( $n=12$ ) about such anophthalmic case previously observed in Nepal.

**Table 1:** List of rescued reptile species from January 2020 to July 2020 from the buffer zone of the Chitwan National Park, Nepal.

Common name	Scientific name	Number of specimens
Burmese python	<i>Python bivittatus</i> Kuhl	35
Siamese cat snake	<i>Boiga siamensis</i> Nutaphand	2
Common wolf snake	<i>Lycodon aulicus</i> (Linnaeus)	1
Twin spotted wolf snake	<i>Lycodon jara</i> (Shaw)	2
Common Kukri snake	<i>Oligodon arnensis</i> (Shaw)	2
Banded krait	<i>Bungarus fasciatus</i> (Schneider)	2
Bronze backed tree snake	<i>Dendrelaphis tristis</i> (Daudin)	2
Checked keelback	<i>Fowlea piscator</i> (Schneider)	1
Rat snake	<i>Ptyas mucosa</i> (Linnaeus)	4
Common trinket snake	<i>Coelognathus helena</i> (Daudin)	1
Copper-headed trinket snake	<i>Coelognathus radiatus</i> (Boie)	2
Ornate flying snake	<i>Chrysopelea ornata</i> (Shaw)	4
Golden monitor lizard	<i>Varanus flavescens</i> (Hardwicke and Gray)	1
Peacock soft-shell turtle	<i>Nilssonina hurum</i> (Gray)	1
Mugger crocodile	<i>Crocodylus palustris</i> (Lesson)	2
<b>Total</b>		<b>62</b>

The sub-adult individual (total length 260 cm, Snout-vent length (SVL) 225 cm, tail length (TL) 35 cm, weight 6.1 kg) lacked the left eye, but apart from this malformation had no other apparent physical injury or old scars (Fig. 2). The abnormality of the left eye appeared as if the eye had popped out or failed to develop and appeared to be a congenital problem as the left eye region was covered with additional scales (Fig. 3A). The right eye of the snake (Fig. 3B), however, was normally developed.

We did not find other anophthalmic cases from rescued reptiles in this area. However, after enquiries with snake researchers, conservationists and rescuers we identified a single record of anophthalmia in a Many-banded cat-snake or Himalayan cat-snake, *Boiga multifasciata* (Blyth) from Chhomrung village of Annapurna Conservation Area in 2003 (Karan Bahadur Shah, pers. comm.); which is ca. 125 km north of the current observation site.

In reptiles, various congenital disorders such as microphthalmia, anophthalmia, cystic globe, cyclopia/synophthalmia, coloboma or aphakia and teratogenic lesions have been reported and such disorders can occur during organogenesis or after

organogenesis during tissue differentiation (Wallach, 2007; Sabater and Pérez, 2013; Jablonski and Mikulíček, 2015; Garcês et al., 2020). Da Silva et al. (2015) reported seven cases of unilateral microphthalmia and anophthalmia in *Python bivittatus* and one case in the Ball python *P. regius* in captive-bred individuals. However, no authenticated reports of such abnormalities in *P. bivittatus* were documented from wild populations.

This unilateral anophthalmy in the wild individual of *P. bivittatus* is likely due to exposure to various types of toxic compounds in the human-modified landscape where extensive use of pesticides is common. Therefore, it is possible that the increased use of pesticides in agriculture in the vicinity of the CNP might have attributed to this unilateral anophthalmy in *P. bivittatus*. However, the true cause of this malformation is not known.

The Burmese python is one of the most charismatic snakes of the CNP and is the only snake which has been listed with the highest degree of protection under the National Parks and Wildlife Conservation Act, 1973 of Nepal (Bhattarai et al., 2018; Rawat et al., 2020). Further studies are suggested to investigate the effects of hazardous pollutants on reptilian populations in Nepal.



**Figure 2:** Dorsolateral view of the entire specimen of a unilateral anophthalmic individual of *Python bivittatus* from Chitwan National Park, Nepal.





**Figure 3:** A unilateral anophthalmic individual of *Python bivittatus* from Chitwan National Park, Nepal: Left frontolateral view of head showing the malformed eye (A); right lateral view of head with normal eye (B).



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## Conflict of interest

All the authors declare that there are no conflicting issues related to this short communication.

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