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continued on the back inside cover

Cover: Mauve Stinger *Pelagia noctiluca* by Swaathi Na. Medium used is soft pastels and gelly roll.

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COMMUNICATION

Westward range extension of Burmese Python *Python bivittatus* in and around the Ganga Basin, India: a response to changing climatic factors

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Abstract: The range extension of animals is influenced by various factors, particularly environmental variables and ecological requirements. In this study, we have attempted to quantify the potential current distribution range of the Burmese Python *Python bivittatus* in and around the Ganga Basin. We collected the Burmese Python sightings between 2007 and 2022 from various direct and indirect sources and recorded 38 individuals, including eight females and five males; the rest were not examined for their sex. Out of these, 12 individuals were rescued from human habitations. Most python sightings were observed in Uttarakhand and Uttar Pradesh (n = 12 each), followed by Bihar (n = 6). The expanded minimum convex polygon (MCP) range was calculated as 60,534.2 km^2. In addition, we quantified the potential current distribution status of this species using 19 bioclimatic variables with the help of MaxEnt software and the SDM toolbox in Arc GIS. The suitable area for the python distribution was calculated as 1,03,547 km^2. We found that the following variables influenced the python distribution in the range extended landscape: Annual Mean Temperature (20.9 %), Precipitation of Wettest Quarter (6.4 %), Precipitation of Driest Quarter (30.1 %), Precipitation of Warmest Quarter (0.3%), Isothermality (0.1%), Temperature Annual Range (18.7 %), Mean Temperature of Wettest Quarter (11.4 %), Mean Temperature of Driest Quarter (2.2 %), Land use/land cover (3.3 %), and Elevation (6.6 %). These results will support the field managers in rescuing individuals from conflict areas and rehabilitating them based on the appropriate geographical region.

Keywords: Distribution, expansion, habitat, prediction, reptiles, suitability, survivorship, temperature, topography, vulnerable.

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Author contributions: SAH and RB supervised the study. PG and SAH conceived the idea. PG, AAU, and CSV collected field data. PG prepared the initial draft, and CSV wrote the final draft. SAH reviewed the manuscript. CSV did the analysis and visualization. All authors revised subsequent versions. All authors agreed upon the final version.

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नमामि गंगे

भारतीय वन्यजीव संस्थान
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INTRODUCTION

Reptiles are poikilothermic and are extremely sensitive to the thermal features of the environment (Carranza et al. 2018); hence highly vulnerable to climate change (Sinervo et al. 2016). Minute changes in the environmental temperatures also affect their daily activities, biology, and survival (Wilms et al. 2011; Ribeiro et al. 2012). Several studies have recorded the influence of climatic variables in the distribution of species, i.e., altitude (El-Gabbas et al. 2016), precipitation (Sanchooli 2017), temperature (Javed et al. 2017), and vegetation cover (Fattahi et al. 2014). Studies have concluded that reptiles are more influenced by climate-related variables rather than topographical variables (Guisan & Hofer 2003). Reptiles are being threatened for many reasons, including conversion and loss of habitat, invasive species, and the pet trade, apart from the changes in climate and topographical features, which adversely disturb their spatial distribution (Cox et al. 2012). Pythons, one of the largest reptile groups and apex predators, perform a significant role in the ecological system like other carnivores (Pearson et al. 2005), by controlling the population of ungulates, reptiles, birds, and other small mammals (Bhupathy et al. 2014). Identifying the potential distribution range of species and predicting future potential distribution based on changing environmental conditions have become necessary due to population declines and expansion (Todd et al. 2010; Urban 2015). Many species appear to adapt to rising temperatures associated with climate changes by shifting their ranges to higher latitudes or elevations (Chen et al. 2011; Jose & Nameer 2020)

The Burmese Python *Python bivittatus* is considered one of the largest snake species in the world (Barker & Barker 2008), and it can grow up to a length of 6 m (20 ft) (Clark 2012). Kuhl (1820) has formally distinguished the Burmese Pythons from other python species. *P. bivittatus* is a squamate reptile of the Pythonidae family, the top of the body is dark brownish- or yellowish-grey, with a series of 30 to 40 large irregular squarish, black-edged, dark chocolate-grey blotches on the top and sides of the body; it has dark and dark grey dorsal and lateral spots; it has a sub-ocular stripe; and the belly is greyish with dark spots on the outer scale rows (Das 2012). The body is thick and cylindrical; the head is lance-shaped and distinct from the neck; sensory pits can be found in the rostrals as well as on some supralabials and infralabials (Das 2012). The spurs are small; the tail is short and prehensile; and there are cloacal spurs (Das 2012).

Python bivittatus is one of three native python species found in India along with *Python molurus* and *Malayopython reticulatus* (Rashid & Khan 2018). The Burmese Python is native to the tropical rainforests and subtropical jungles of India, Myanmar, southern China, southeastern Asia, and some extent of the Indonesian archipelago (McDiarmid et al. 1999). The distribution of *P. bivittatus* in Southeastern Asia encompasses eastern parts of India, Nepal, Bhutan, Bangladesh, Myanmar, Thailand, Cambodia, Vietnam, northern Malaysia, and southern China (Barker & Barker 2008, 2010). Some isolated observations in the Gangetic plain have recently been reported by Rashid & Khan (2018). The *P. bivittatus* is an invasive species in the United States. Due to climatic suitability, the pythons in the everglades might spread quickly into many parts of the U.S. (Dorcas et al. 2012; McCleery et al. 2015; Sovie et al. 2016). Global warming trends were predicted to increase suitable habitats significantly that promotes the range expansion among them (Pyron et al. 2008).

In the native range, *P. bivittatus* has been listed under the 'Vulnerable' category by the IUCN Red List of Threatened Species (Stuart et al. 2012). Also, they are included in Schedule-I (Part II) of the Indian Wild Life (Protection) Act, 1972 (IWPA) and Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Burmese Pythons occupy habitats ranging from hardwood forests to mangrove swamps in the introduced range in the USA (Walters et al. 2016), however in the native range, they dwell in the tropical lowlands, grassland forests and within areas modified for human use (Barker & Barker 2008; Cota 2010; Rahman et al. 2014).

In this study, we have attempted to quantify the potential current distribution range of Burmese Pythons in and around the Ganga Basin. Also, identified the bioclimatic variables that contributed to their range expansion.

MATERIALS AND METHODS

Study Area

The *P. bivittatus* live in subtropical or tropical forests, which include dry forests, mangrove vegetation, swamps, moist montane grasslands, wetlands, and permanent freshwater marshes/pools (Stuart et al. 2012). According to the IUCN, the Burmese Python's distribution range as being in northeastern states of India, including West Bengal. The current study focuses on six major Indian states: Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, West Bengal, and Odisha; all apart from Odisha are situated in the Gangetic Basin, however, some Burmese Python sighting records have gathered from the Odisha as well, since it is a neighbouring state of West Bengal.

Ganga is the national river of India which passes through three separate biogeographic zones, the Himalaya, the Gangetic Plain, and the eastern coast, which has a unique biodiversity assemblage (NMCG-WII GBCI 2019). The Ganga River Basin occupies nearly one-third of the geographical area of India (Jain et al. 2007). Presently this region is experiencing a high urbanisation rate and almost 45% of India's population lives in the Ganga basin (Quadir 2022). The temperature of the Gangetic plain doesn't fall under an average of 21°C, the daily maximum temperature in the warmest month rises to 40°C (EMSF 2019); thus, the atmospheric temperature is very suitable for *P. bivittatus*. Here, we report the extended native range of *P. bivittatus* in and around the Gangetic Basin.

Methods and Analysis

The direct sightings of Burmese Pythons have been obtained with photographic evidence from various parts of the study area, with the help of forest staff, researchers, and local people (Image 1). Also, we collected secondary pieces of information from the published works (Table 2). With the available coordinates, a range extension map has been made and the expansion area was estimated by the minimum convex polygon (MCP) in Arc GIS (Supplementary Figure 4). Additionally, the current potential distribution status of this species has been identified with 19 bioclimatic layers, which were obtained from Worldclim dataset. Further, the layers were prepared with the SDM toolbox in Arc GIS and run the model with the help of MaxEnt (Figure 1).

Species distribution for the Burmese Python was modelled using MaxEnt (version 3.4.1.; Phillips et al. 2004, 2006) because it is the most widely used and popular choice for species distribution modelling, providing high extrapolative accuracies even with low presence-only data (Bosso et al. 2018; Soucy et al. 2018; Zhang et al. 2018). This study has only used presence data and to generate pseudo-absences, 10,022 background points were randomly selected by the MaxEnt model.

The presence data was split into 75% random samples for calibrating the model and 25% for evaluating model performance. We used a subsampling technique to generate a stable model because of its advantages over cross-validation (Anderson & Raza 2010), and bootstrap (Rospleszcz et al. 2014), and three replications were chosen to run the model. Regularization multipliers are used to prevent overfitting of predicted values and to balance the model fit (Phillips & Dudík 2008). The model provides settings for assessing model complexity by varying feature classes and regularisation multipliers. Threshold selection was done, the logistic output format ranging between 0 (unsuitable) and 1 (maximum suitability), was used for the model results, which shows habitat suitability (presence probability) of

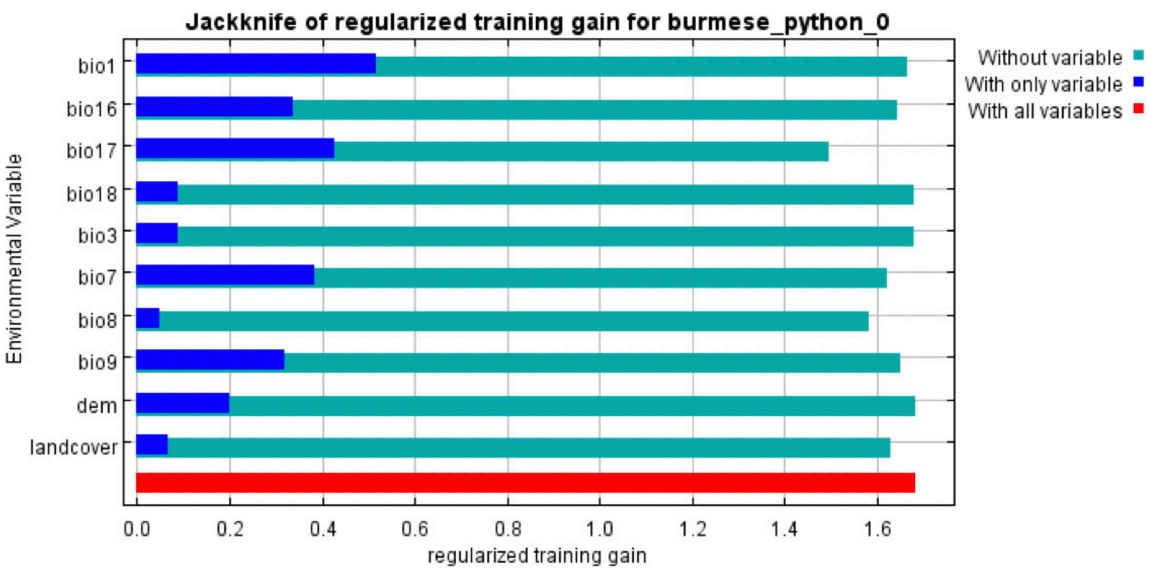

Figure 1. The Jackknife test for evaluating the relative importance of environmental variables for *P. bivittatus* in and around Ganga Basin. (Note: "Bio1" is Annual Mean Temperature; "Bio16" is Precipitation of Wettest Quarter; "Bio17" is Precipitation of Driest Quarter; "Bio18" is Precipitation of Warmest Quarter; "Bio3" is isothermality; "Bio7" is Temperature Annual Range; "Bio8" is Mean Temperature of Wettest Quarter; "Bio9" is Mean Temperature of Driest Quarter; "Land Cover" is land cover layer; "Dem" is Elevation.

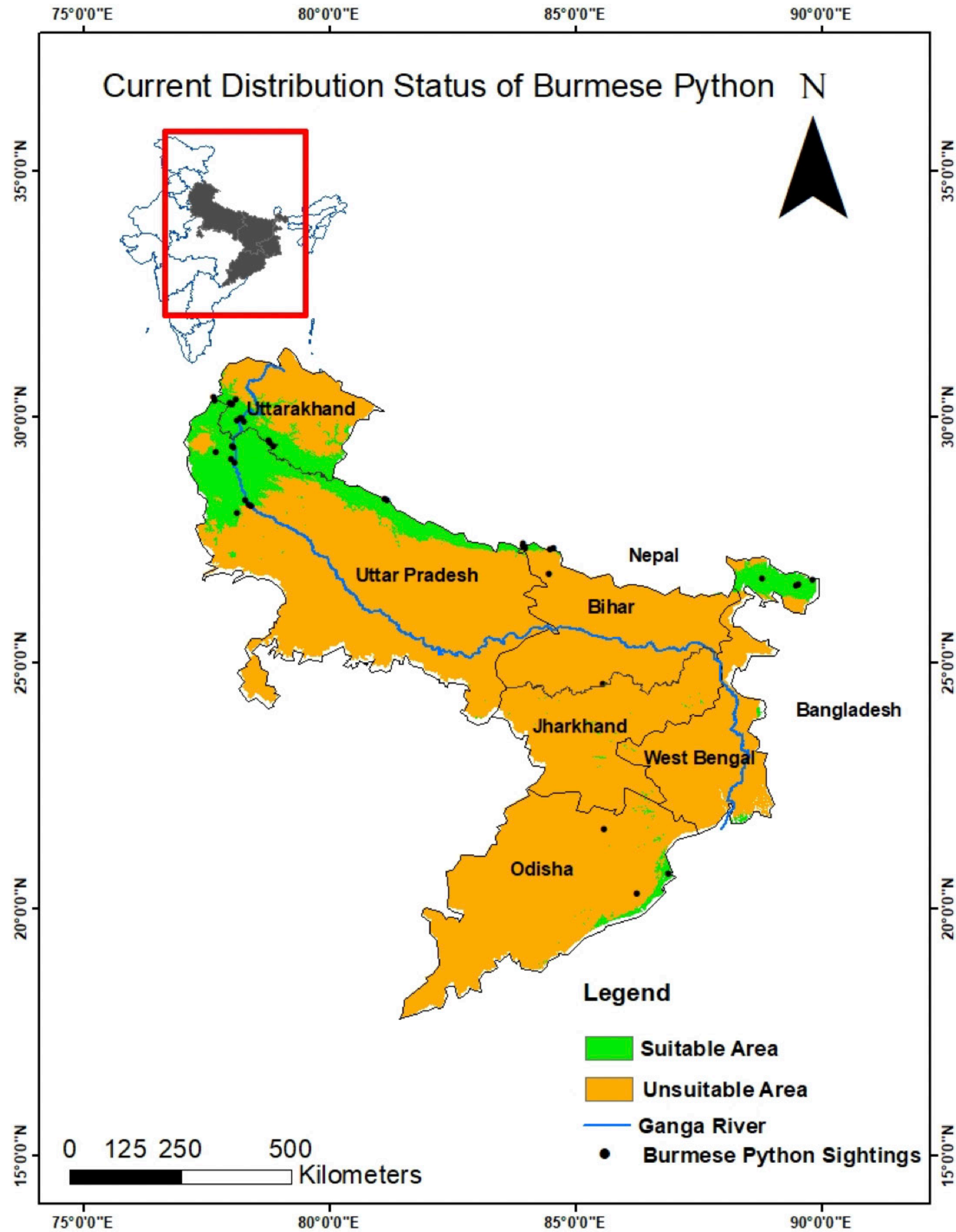

Figure 2. Westward range extension of Burmese Python *P. bivittatus* in and around the Ganga Basin.

targeted species (Phillips et al. 2004). Binary suitable/unsuitable map was prepared accordingly.

RESULTS AND DISCUSSION

We collected the details of Burmese Pythons in the Ganga Basin and adjacent areas. The data has been collected from both direct and indirect sources (Table 2). A total of 38 sighting records were obtained, including eight females, five males, and the remaining unsexed. The pythons were identified using photographs and morphological features from the field guide by Whitaker & Captain (2004).

The Burmese Pythons are known as the sister species of Indian Rock Python *P. molurus* and the Burmese Python differs from the Rock Python in several ways. Supralabials touching the eye, the tongue, and some parts of the head are pale pinkish in Indian Rock Python. The supralabials are separated from the eye by subocular scales in the Burmese Python and the tongue is bluish-black with no pink colour on the head (Whitaker & Captain 2004). Also, the Indian Python being 'yellowish' while the Burmese Python is 'greyish' in colour (Whitaker & Captain 2004).

From these, 10 individuals were rescued from human habitations. Also, a mating event was observed in August by the NMCG Team of WII, and a brooding female was observed by Rashid & Khan (2018) in May. Das et al. (2012) reported earlier breeding records of Burmese Python such as egg shell remains and earlier nesting activities in the Gangetic Basin, at the Katerniaghat and Dudhwa regions. Most of the python sightings were recorded from the state of Uttarakhand and Uttar Pradesh (n = 12 each), followed by Bihar (n = 6), West Bengal (n = 4), Odisha (n = 3), and Jharkhand (n = 1) respectively. The expanded MCP range was calculated as 60,534.2 km^2 (Supplementary Figure 4). The most python sighting records were obtained in the year of 2017 (n = 8), followed by the year 2021 (n = 6) (Figure 3).

In addition, we found that some environmental variables have a considerable role in the distribution of *P. bivittatus* (Table 1 and Supplementary Table 1). The suitable area for the potential distribution of *P. bivittatus* was predicted as 1,03,547 km^2. The Gangetic Plain and its adjacent places have a favourable temperature for the species rapid expansion.

From the Jackknife evaluation, these results were consistent. The model output yielded satisfactory results with the training and test data; the final model had accuracy with an AUC value of 0.865.

The present model outputs show that 10 variables influence the python distribution. Some variables, however, have a high proportion. Temperature and precipitation both play a significant role in their distribution.

An optimum temperature is essential for their survival and dispersal. According to research, excessively cold temperatures make it difficult for pythons to survive (Mazzotti et al. 2011). The reported lethal temperature in the low land species is approximately 38–42°C (Brattstrom 1968; Snyder & Weathers 1975), and the increased temperatures can affect the population sex ratios of reptiles (Bickford et al. 2010). A study conducted in China among 50 snake species found that the distribution of species was related to changes

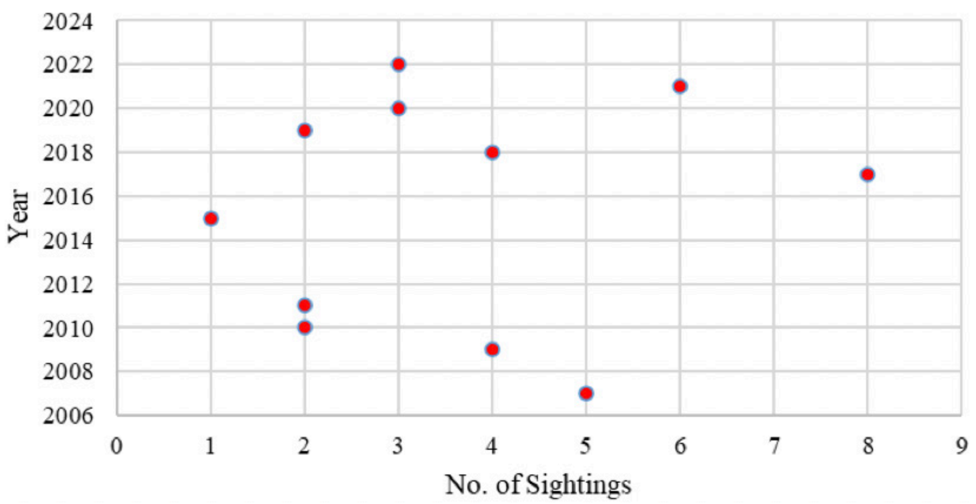

Figure 3. Annual sighting frequency of Pythons *P. bivittatus*.

Table 1. The list of environmental variables used in the model and their percent contribution and permutation importance in the model.

Variable	Description	Unit	Percent contribution (%)	Permutation importance (%)
bio17	Precipitation of Driest Quarter	mm	30.1	17.7
bio1	Annual Mean Temperature	°C	20.9	22
bio7	Temperature Annual Range (bio5-bio6)	°C	18.7	8.9
bio8	Mean Temperature of Wettest Quarter	°C	11.4	36.3
dem	Digital Elevation Model	m	6.6	1.8
bio16	Precipitation of Wettest Quarter	mm	6.4	2
landcover	Land Cover	-	3.3	3.2
bio9	Mean Temperature of Driest Quarter	°C	2.2	3.3
bio18	Precipitation of Warmest Quarter	mm	0.3	2.9
bio3	Isothermality (bio2/bio7)(×100)	-	0.1	2.1

in the thermal index and precipitation or potential evapotranspiration (Wu 2016).

The Jackknife evaluation results revealed that the Wettest Quarter Mean Temperature, Annual Mean Temperature, and Driest Quarter Precipitation were the primary factors influencing the *P. bivittatus* distribution (Figure 1). The percent contribution values are given in Table 1. A proper field survey in the remaining area would yield more sightings across the basin.

According to the findings, the Driest Quarter Precipitation (30.1%) is a significant influencing factor for the range extension of the Burmese Python in the Gangetic Basin, however, Penman et al. (2010) discovered that the Driest Quarter Precipitation is a major bioclimatic variable that has a significant impact on the distribution of the most endangered *Hoplocephalus bungaroides* snake species in Australia.

Similarly, Annual Mean Temperature is a significant variable that influences species distribution. Annual Mean Temperature contributed 20.9% to the Burmese Python distribution in the study area. Annual Mean Temperature is a significant bioclimatic factor for the species (Gül et al. 2015); according to a study on *Xerotyphlops vermicularis* from the western and central Black Sea Region, Annual Mean Temperature contributed 55.3% of the species' distribution (Afsar et al. 2016).

Rödder & Lötters (2010) has reported that the annual mean temperature contributes to the distribution of Greenhouse Frog *Eleutherodactylus planirostris* (13.8%). Mean Temperature of the Wettest Quarter (11.4 %) plays an important role in the distribution of the *P. bivittatus*. Studies on the invasive California Kingsnake *Lampropeltis californiae* in the Canary Islands have reported that the Mean Temperature of the Wettest Quarter and the Mean Temperature Driest Quarter have influenced its distribution.

The contribution of elevation was 6.6% and landcover was found to have 3.3%. The elevation also plays a role ecologically since it affects the temperature (Ananjeva et al. 2014; Hosseinzadeh et al. 2014). Studies have concluded that with a gain in elevation, species richness among reptiles would decline (Chettri et al. 2010).

Our findings show a trend in the westward range extension of the Burmese Python in the study area, which could be attributed to a response to changing climatic factors. In the United States, some studies have proven that less body temperature during the cold snap leads to physiological stress on this species and may lead to mortality (Mazzotti et al. 2011; Stahl et al. 2016). Jacobson et al. (2012) observed that the Burmese Pythons are projected to spread northward in response to warming winter temperature regimes. Nevertheless, Van Moorter et al. (2016) stated that animal movement is directly connected to resource use, such as habitat selection. However, recent records justify that this species having a good population along the Gangetic plain (Rashid & Khan 2018; Shafi et al. 2020).

Scarce SDM studies were conducted among reptile species in India; the primary reason is the only way to know about the occurrence localities of their collections is through publications of researchers. In many cases, a direct visit to the particular institutes is the only way to get the required data, which takes considerable time (Das & Pramanic 2018). In addition, finding them in the field is very difficult due to their highly camouflaged behaviour.

Table 2. Burmese Python location details.

	Place	Latitude	Longitude	Date	Observers
1	Rajaji National Park, Uttarakhand	29.8974	78.26666667	31-03-2007	Joshi & Singh 2015
2	Chilla Forest, Haidwar-Chilla-Rishikesh, Uttarakhand	29.9710	78.21327778	09-08-2007	Joshi & Singh 2015
3	Haridwar Forest Range, Rajaji National Park	29.9397	78.12827778	09-08-2007	Joshi & Singh 2015
4	Katerniaghat WS, Railway Station, Uttar Pradesh	28.3069	81.15638889	00-02-2009	Das et al. 2012
5	Katerniaghat WS, Uttar Pradesh	28.3373	81.12080833	00-06-2009	Das et al. 2012
6	Hastinapur Range, Uttar Pradesh	29.0809	78.06425	14-11-2009	Yadav et al. 2017
7	Forest Rest Hosue, Hastinapur Range, Uttarakhand	29.1546	77.99613889	28-12-2009	Yadav et al. 2017
8	Rispna River, Jakhan, Uttarakhand	30.3660	78.0829	15-09-2010	Joshi & Singh 2015
9	Bhitarkanika, Wildlife Sanctuary	20.7355	86.87741667	18-08-2010	Gopi 2010 (Unpubl.)
10	Timli Forest Range, Kalsa Forest Division, Uttarakhand	30.3333	77.67332778	14-10-2011	Joshi & Singh 2015
11	Lacchiwala Forest Range, Uttarakhand	30.2553	78.01666667	08-11-2011	Joshi & Singh 2015
12	Sanghagara Forest, Odisha	21.6323	85.55245278	00-00-2015	Nayak 2015 (Unpubl.)
13	Manguraha Range, Valmiki Tiger Reserve, Bihar	27.3288	84.53578611	11-03-2017	Shafi et al. 2020
14	Bijaligarh, Jawan, Aligarh, Uttar Pradesh	28.0407	78.11541667	18-05-2017	Rashid & Khan 2018
15	Narainapur village, Bihar	27.3387	83.96441667	11-08-2017	Shafi et al. 2020
16	Manor River, Ganauli Range, Bihar	27.3570	83.92586111	14-08-2017	Shafi et al. 2020
17	Dhaltangarh Forest, Odisha	20.3118	86.23827778	00-09-2017	Dwibedy 2017
18	Gautam Buddha, Wildlife Sanctuary, Bihar, Jharkhand	24.5797	85.54165556	00-09-2017	WII team 2017(Unpubl.)
19	Gandak barrage, Valmiki Nagar Range, Bihar	27.4333	83.92374444	04-11-2017	Shafi et al. 2020
20	Buxa, North Bengal	26.5667	89.45494444	00-11-2017	Dash 2017 (Unpubl.)
21	Udaipur Wildlife Sanctuary, Bettiah, Valmiki Tiger Reserve, Bihar	26.8137	84.43378056	14-01-2018	Shafi et al. 2020
22	Manguraha Range, Valmiki Tiger Reserve, Bihar	27.3189	84.46808333	24-01-2018	Shafi et al. 2020
23	WII, Campus, Chandrabani, Dehradun, Uttarakhand	30.2810	77.97494167	13-03-2018	Singh 2018 (Unpubl.)
24	Rooth Bangar, Anupshahr, Uttar Pradesh	28.3129	78.289875	14-10-2018	NMCG-WII 2019 (Unpubl.)
25	Gorumara, North Bengal	26.7185	88.77230278	00-08-2019	Dash 2019 (Unpubl.)
26	Buxa, North Bengal	26.6000	89.51839444	00-10-2019	Dash 2020 (Unpubl.)
27	Amangarh, Bijnor, Uttar Pradesh	29.4027	78.85969167	09-12-2020	Hushangabadkar 2019 (Unpubl.)
28	Barkala Range, Shivalik Forest Division	30.3946	77.63166667	20-02-2020	Pawar 2020 (Unpubl.)
29	Bijnor barrage, Uttar Pradesh	29.3733	78.03776944	26-07-2020	NMCG-WII 2020 (Unpubl.)
30	Dhumpara forest, West Bengal	26.6983	89.80184444	11-04-2021	Sarkar 2021 (Unpubl.)
31	Narora, Ganga Bas, Bulandshahr, Uttar Pradesh	28.1973	78.40184444	18-08-2021	NMCG-WII 2021 (Unpubl.)
32	Rajaji National Park, Uttarakhand	29.9685	78.20027778	12-11-2021	Kumar 2021 (Unpubl.)
33	Nawalpur, Bijnor, Uttar Pradesh	29.4037	78.02267778	20-11-2021	NMCG-WII 2021(Unpubl.)
34	Narora, Bulandshahr, Uttar Pradesh	28.2079	78.35157778	27-11-2021	NMCG-WII 2021(Unpubl.)
35	Narora, Barrage downstream, Bulandshahr, Uttar Pradesh	28.1891	78.39691389	19-12-2021	NMCG-WII 2021(Unpubl.)
36	Khatauli, Muzaffarnagar, Uttar Pradesh	29.2860	77.67954722	21-01-2022	Yadav 2022 (Unpubl.)
37	Corbett Tiger Reserve	29.5335	78.77368	10-10-2022	NMCG-WII 2022(Unpubl.)
38	Corbett Tiger Reserve	29.4924	78.762801	11-10-2022	NMCG-WII 2022(Unpubl.)

CONCLUSION

According to prediction results, the potential distribution of the Vulnerable Burmese Python has expanded westward from the northeastern region to the Ganga Basin. The Burmese Python's expanding range can be interpreted as a bioindicator of changing climate. A comprehensive study on future predictions, habitat suitability, and phylogeny will aid their conservation in the range-extended landscape and reveal the population

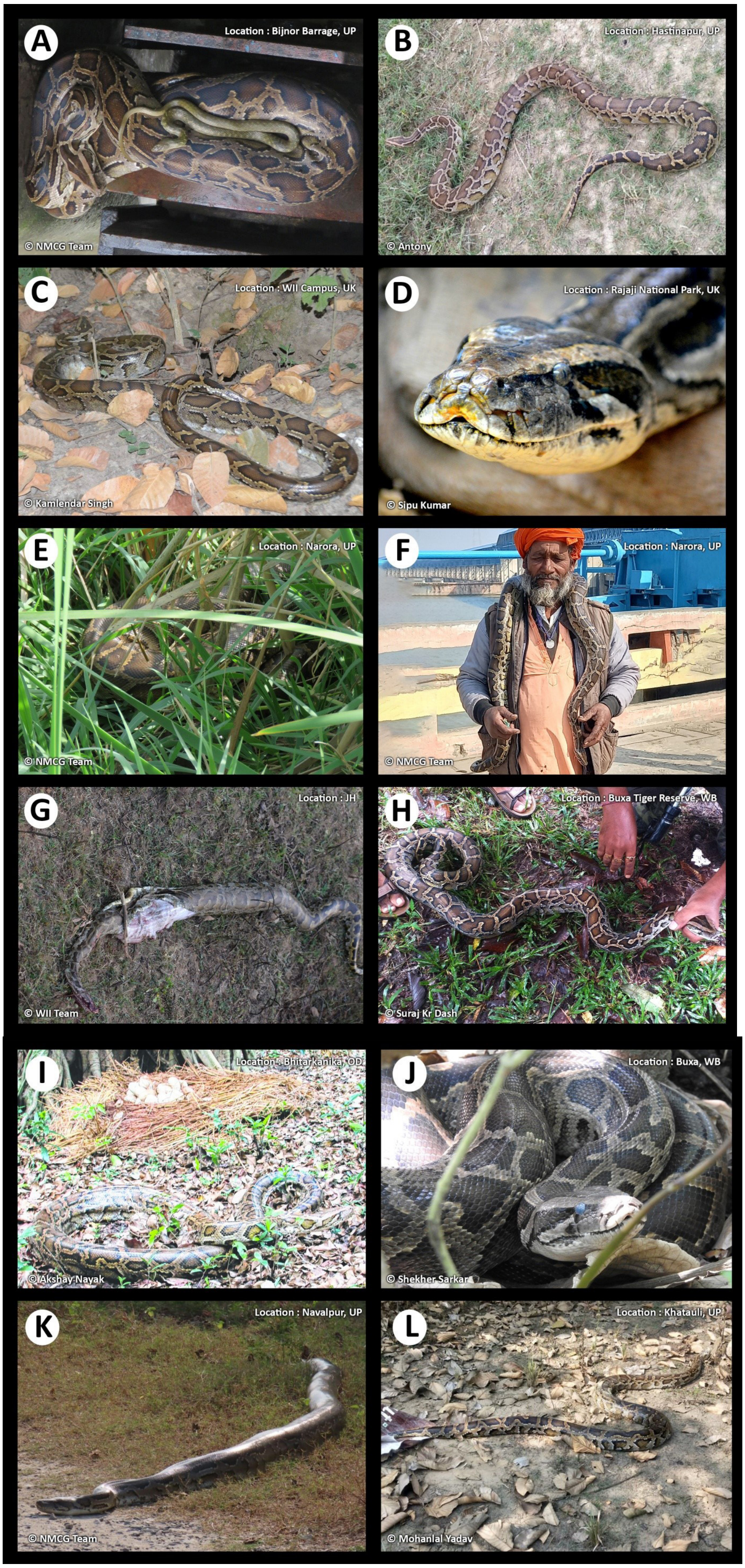

Image 1. Photographs of Burmese Pythons from the range extended landscape in and around the Ganga Basin.
© A,E,F,K - NMCG Team | B - Johny Valayil Jusappan | C - Kamalendar Singh | D - Sipu Kumar | G - WII Team | H - Suraj Kumar Dash | I - Akshay Nayak | J - Shekher Sarakar | L - Mohanlal Yadav.

divergence. This research will also assist field managers in successfully reintroducing Burmese Pythons into suitable habitats.

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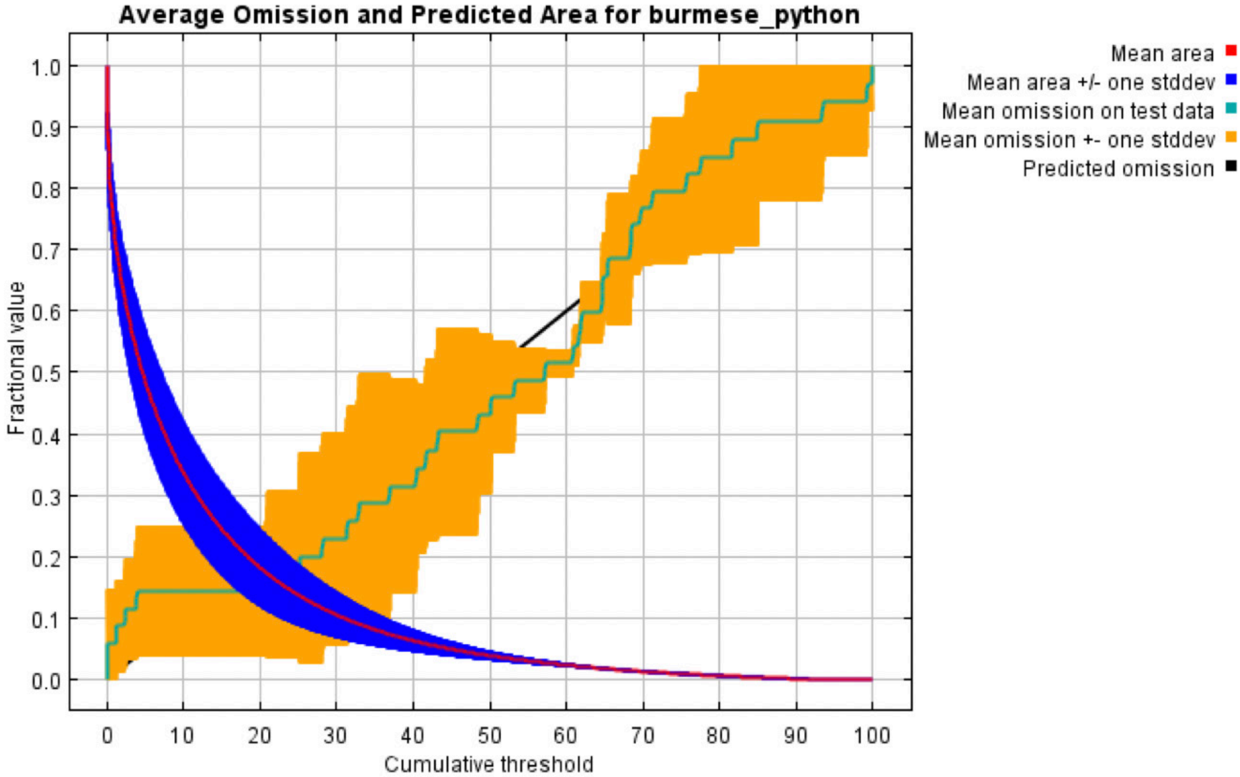
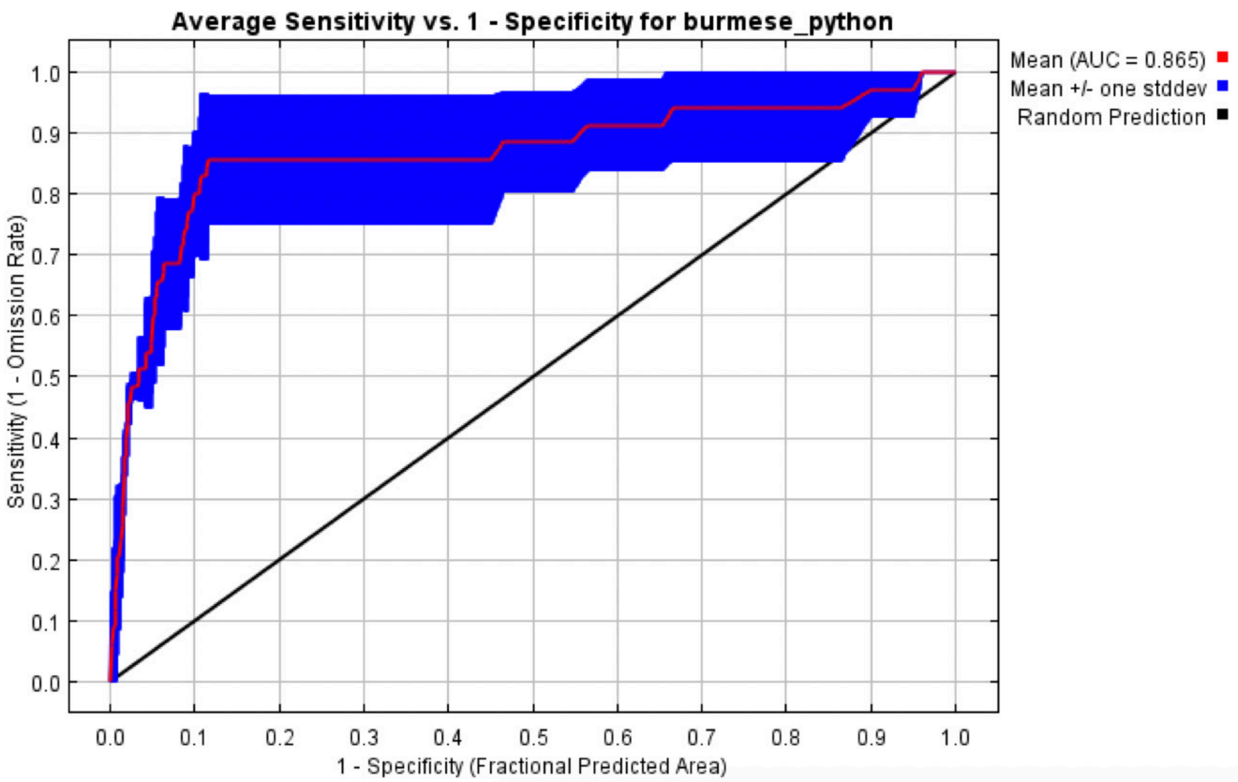
Supplementary Table 1. Correlation matrix of 19 bioclimatic variables for the study area.

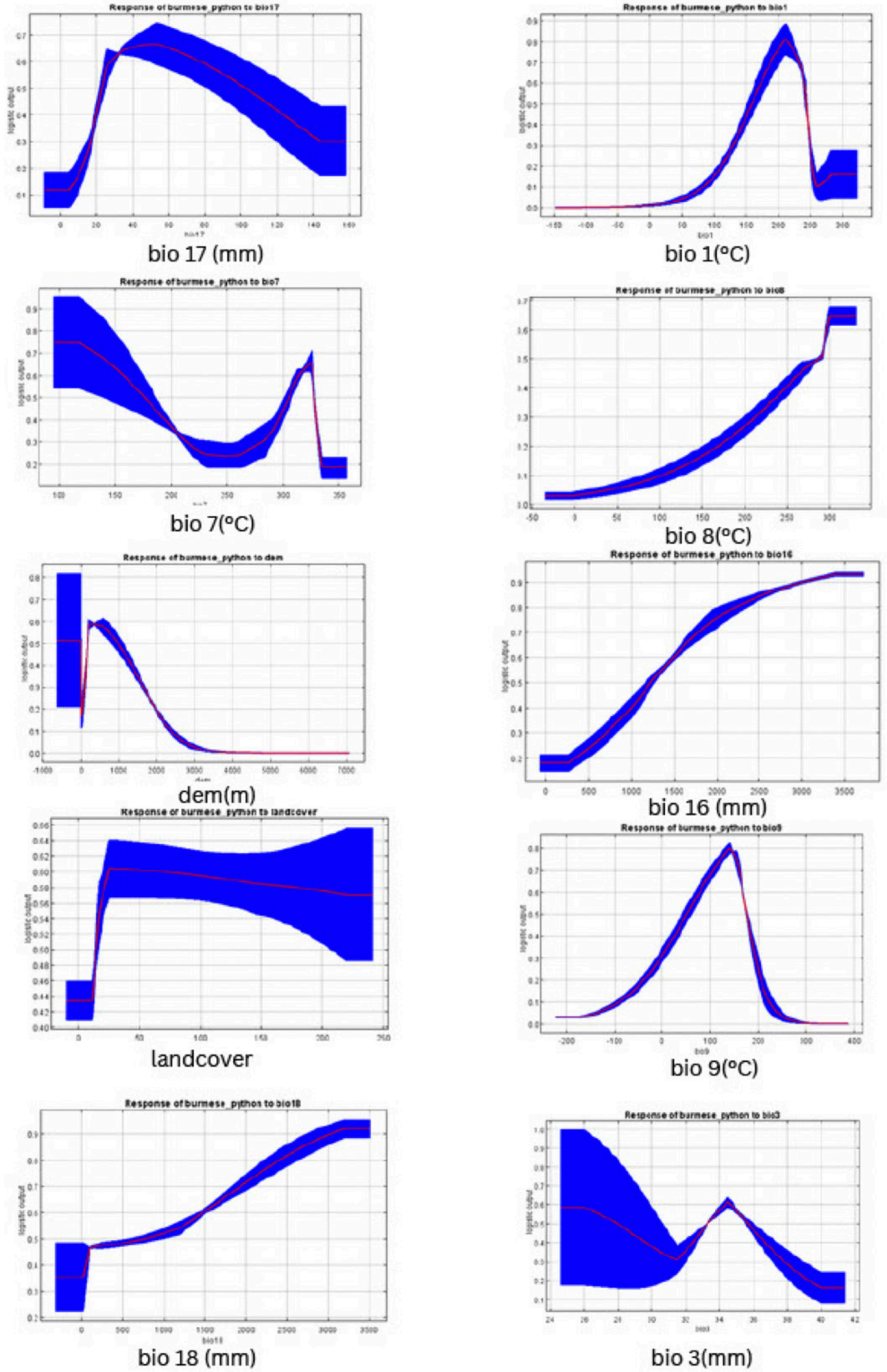
	bio1	bio2	bio3	bio4	bio5	bio6	bio7	bio8	bio9	bio10	bio11	bio12	bio13	bio14	bio15	bio16	bio17	bio18	bio19
bio1		-0.14779	0.08760	-0.42869	0.90153	0.92267	-0.14922	0.93389	0.81279	0.95163	0.95119	-0.21245	-0.16153	-0.81734	0.34291	-0.17860	-0.81841	-0.51654	-0.88703
bio2			-0.31464	0.81630	0.26648	-0.46219	0.95392	0.04286	-0.08663	0.12559	-0.37663	-0.54222	-0.20902	-0.11059	0.71472	-0.20688	-0.13034	-0.24952	0.31944
bio3				-0.67003	-0.09922	0.33385	-0.57486	-0.15161	0.02123	-0.06728	0.31439	0.44121	0.31085	0.08710	-0.43401	0.31909	0.14107	0.05773	-0.20499
bio4					-0.07045	-0.73224	0.90814	-0.13176	-0.31550	-0.17097	-0.68083	-0.43057	-0.17476	0.11897	0.55119	-0.17553	0.10056	0.09052	0.57134
bio5						0.70464	0.26739	0.89828	0.77905	0.98525	0.76266	-0.47444	-0.27734	-0.81398	0.66332	-0.29209	-0.84760	-0.65693	-0.72143
bio6							-0.49526	0.74698	0.74665	0.78795	0.99414	0.02268	-0.03898	-0.64307	0.04283	-0.05124	-0.64382	-0.41728	-0.89227
bio7								0.08541	-0.06010	0.13623	-0.41631	-0.61165	-0.28660	-0.12328	0.75396	-0.28802	-0.16343	-0.23760	0.32843
bio8									0.73185	0.93858	0.79022	-0.30953	-0.20348	-0.84934	0.47888	-0.22488	-0.83284	-0.42588	-0.76364
bio9										0.80841	0.76968	-0.22410	-0.13860	-0.64973	0.38786	-0.15809	-0.66989	-0.44216	-0.71539
bio10											0.83473	-0.38515	-0.22971	-0.82624	0.58044	-0.24640	-0.84637	-0.59264	-0.78426
bio11												-0.03064	-0.06362	-0.69210	0.11125	-0.07652	-0.68949	-0.45954	-0.90313
bio12													0.89080	0.33208	-0.47576	0.89701	0.38875	0.74506	0.08170
bio13														0.19523	-0.06113	0.99339	0.23411	0.67848	0.10474
bio14															-0.51010	0.21465	0.89777	0.43282	0.77657
bio15																-0.07259	-0.57791	-0.34106	-0.17024
bio16																	0.25888	0.67644	0.12540
bio17																		0.47692	0.80538
bio18																			0.39553
bio19																			



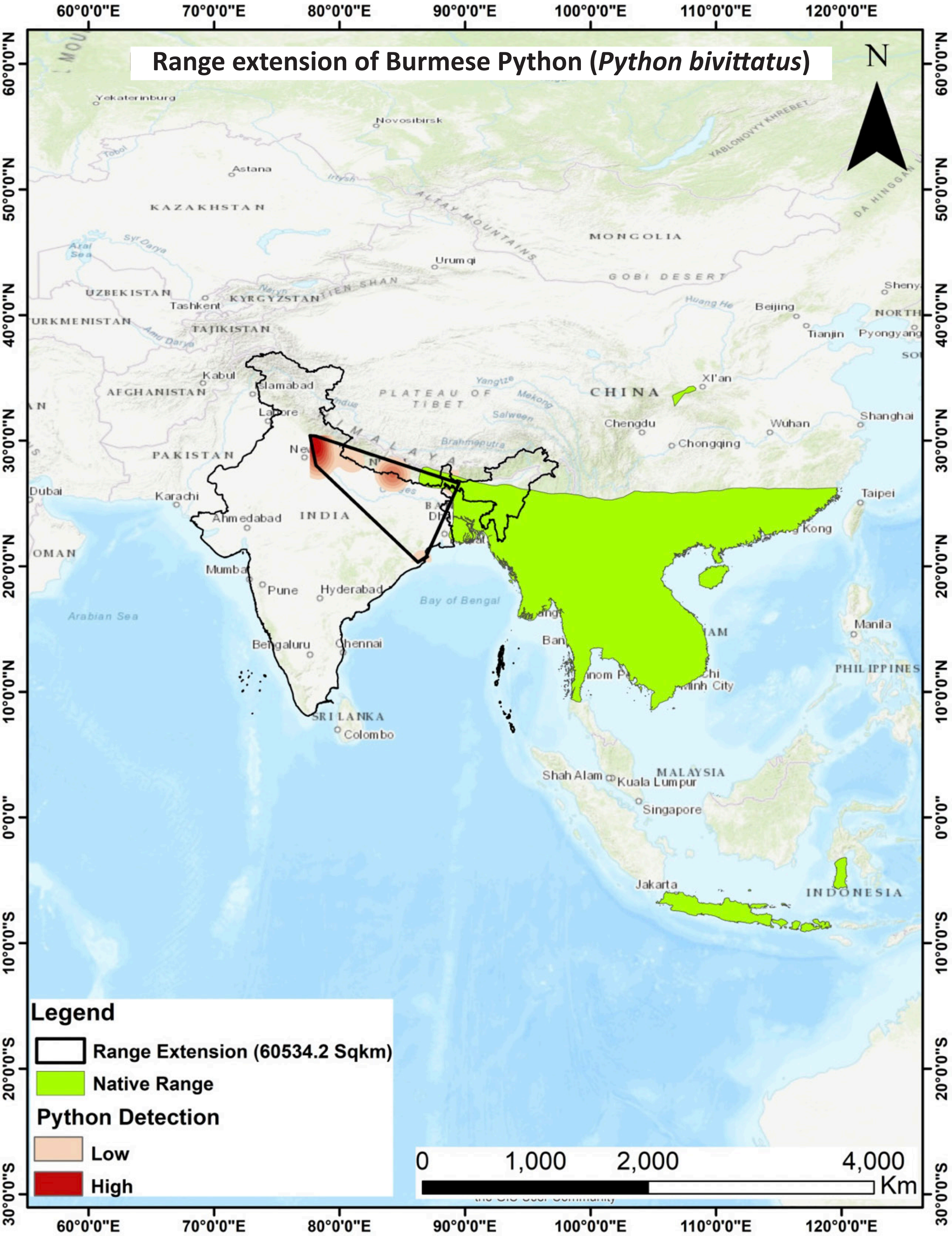
Supplementary Figure 1. Average Omission and Predicted Area for Burmese Python.



Supplementary Figure 2. Average specificity curve of Burmese Python (AUC=0.865).



Supplementary Figure 3. Probability of Response curves (Logistic Output).



Supplementary Figure 4. MCP range of the Burmese Python in the range extended landscape.

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Articles

Inventory and abundance of non-volant mammals and birds in the unprotected regions of the Mount Apo Range, Philippines
– Jhonnel P. Villegas, Jireh R. Rosales, Giovanne G. Tampos & Jayson C. Ibañez, Pp. 22927–22939

Floral biology of *Baccaurea courtallensis* – an endemic tree species from peninsular India
– Karuppiah Nandhini, Vincent Joshuva David, Venugopal Manimekalai & Perumal Ravichandran, Pp. 22940–22954

Plant species diversity in the riparian forests of the Moyar River in southern India
– Muthu Karthick Nagarajan & Avantika Bhaskar, Pp. 22955–22967

Diversity of bracket fungi (Basidiomycota: Agaricomycetes: Polyporaceae) in Jammu Division, Jammu & Kashmir, India
– Brij Bala, Pp. 22968–22989

Identification, prioritization, and management of biodiversity hot specks: a case study of Western Ghats of Maharashtra, India
– Shivam Trivedi & Erach Bharucha, Pp. 22990–23004

Communications

Mammalian diversity of Debrigarh Wildlife Sanctuary, Odisha, India
– Nimain Charan Palei, Bhakta Padarbinda Rath & Sudeep Nayak, Pp. 23005–23015

Vertebrate road kills on State Highway 26 in Khandwa Forest Division, central India
– Kamran Husain & Prachi Mehta, Pp. 23016–23028

Terrestrial vertebrate and butterfly diversity of Garbhanga Landscape, Assam, India
– Pranjal Mahananda, Shah Nawaz Jelil, Sanath Chandra Bohra, Nilutpal Mahanta, Rohini Ballave Saikia & Jayaditya Purkayastha, Pp. 23029–23046

The avian diversity of Chemmattamvayal Wetlands and adjacent areas of Kasaragod District, Kerala, India
– Sreehari K. Mohan, R. Anjitha & K. Maxim Rodrigues, Pp. 23047–23060

Westward range extension of Burmese Python *Python bivittatus* in and around the Ganga Basin, India: a response to changing climatic factors
– Pichaimuthu Gangaiamaran, Aftab Alam Usmani, C.S. Vishnu, Ruchi Badola & Syed Ainul Hussain, Pp. 23061–23074

First record of *Tanaorhinus viridiluteata* Walker, 1861 (Lepidoptera: Geometridae: Geometrinae) from Mizoram, India
– B. Lalnghahpuii, Lalruatthara & Esther Lalhmingliani, Pp. 23075–23082

The giant clam commensal shrimp *Anchistus miersi* (de Man, 1888) (Decapoda: Palaemonoidae) new to Lakshadweep Sea, India
– Manu Madhavan, Purushothaman Paramasivam, S. Akash, T.T. Ajith Kumar & Kuldeep Kumar Lal, Pp. 23083–23090

Earthworm (Annelida: Clitellata) fauna of Chhattisgarh, India
– M. Nurul Hasan, Shakoor Ahmed, Kaushik Deuti & Nithyanandam Marimuthu, Pp. 23091–23100

Recent Foraminifera from the coast of Mumbai, India: distribution and ecology
– Ganapati Ramesh Naik, Manisha Nitin Kulkarni & Madhavi Manohar Indap, Pp. 23101–23113

Short Communications

Additional breeding records of Hanuman Plover *Charadrius seebohmi* E. Hartert & A.C. Jackson, 1915 (Aves: Charadriiformes: Charadriidae) from southeastern coast of India
– H. Byju, N. Raveendran, S. Ravichandran & R. Kishore, Pp. 23114–23118

A study on the breeding habits of Red-wattled Lapwing *Vanellus indicus* Boddaert, 1783 (Aves: Charadriformes: Charadridae) in the agricultural landscape of Muzaffarnagar District, Uttar Pradesh, India
– Ashish Kumar Arya, Kamal Kant Joshi, Deepak Kumar & Archana Bachheti, Pp. 23119–23122

Rediscovery and redescription of *Urolabida nilgirica* Yang (Hemiptera: Heteroptera: Urostylididae) from India
– Pratik Pansare, H. Sankararaman & Hemant V. Ghate, Pp. 23123–23130

The perception of bee and wasp fauna (Hymenoptera: Aculeata) by the inhabitants of Mangdi Valley, central Bhutan
– Kinley Tenzin, Pp. 23131–23135

Note

Breeding record of Little Ringed Plover *Charadrius dubius* jerdoni Legge, 1880 (Charadriidae: Charadriformes) from Tamil Nadu, India
– H. Byju, Yoganathan Natarajan, N. Raveendran & R. Kishore, Pp. 23136–23138

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