

## **Biogeography of *Bangarus carcerulus* in Snake Land-Tapakara, Jashpur, Surguja, CG, India**

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### **Abstract**

An investigation was carried out to assess the impact of quality of soil on snake abundance at the snake land “Tapakara” in Jashpur district in C.G. India. It was done during summer season (June, 2016) in at atm. temp. 40<sup>0</sup>C. Soil samples were collected from 07 villages of snake land, Soil testing of collected soil samples from snake land was done. The average value of soil elements is compared with the average value of soil elements of five villages of common land (out of snake land). The differences in average soil parameters, between snake land and common land were determined, and result reveals a cause of snake abundance. An unnatural behavior of snake *Bangarus carcerulus*, with respect to biting sleeping human for thermal sensing, increased biting case. For combating such problem, application of snake repellent plant and fumigation repellent and other precautions are discussed.

### **Key words**

*Bangarus carcerulus*, Snake-world, Human- snake conflict, Poisonous snakes, Serpent ecosystem, Snake-repellents.

## Introduction

Geo-diversity affects to the biological diversity of any ecosystem (1, 2). The type of earth *e.g.* ocean, volcano, desert, mountain, meteorite, hot water spring, forest, Iceland *ect.* are the variety of the land (3, 4). Geo diversity affects to biodiversity of plant cultivation (5), as well as animal population. *E.g.* ‘Snake Valley’ is a north-south trending valley in the central Great Basin, and Snake River is the largest tributary of the Columbia River. both Snake Valley and Snake River are named for its serpentine shape *i.e.* geomorphology (6, 7) But, there are Snake City and Snake Island on the earth named such, due to snake abundance. There is a *Snake land* in Tapakara, District Jashpur, Surguja division, CG India. The objective of the paper is to compare soil chemistry and soil microbiology to find out possible cause of snake abundance in Tapakara snake land in India and find out simplest biological precaution by growing snake repellent plant and doing snake- repellent fumigation.

Durban is known as snake city in South Africa. It coordinates: 29°53'S, 31°03'E and 29.883°S, 31.050°E. It is the third largest city, in South Africa after Johannesburg and Cape Town. It is also the second most important manufacturing hub in South Africa after Johannesburg. Area of the City is 225.91 km<sup>2</sup> (87.22 sq mi). Some of the world's most dangerous snakes snake *i.e.* tiepins, vipers, rattlesnakes, kraits and mambas are found in this city and its surrounding area. Siouxsie Gillett and Simon Keys are professional snake-handler and Herpetologist, working a dangerous business of catching snakes. They have a passion to rescue snakes from human conflict and also to educate the population to change their attitudes and phobia's towards these misunderstood animals. Their mission is to not only save and protect the snakes, but to also educate the city's inhabitants and help them understand and respect this hugely persecuted predator. to which they love (8, 9, 10)

“Queimada Grande” is Snake Island, about 90 miles from the city of São Paulo, a place so filled with venomous serpents that it's been called one of the "world's deadliest islands." Scientists estimate that up to 4, 000 snakes live on the 110-acre island, with some reports indicating to be one snake for every six square yards. The island is "More packed with snakes than the Spanish midfield is with talent, " It is located at 18 nautical miles (33 km) distance the coast of the state of São Paulo, Brazil, the island is approximately 430, 000 square metres (110 acres) in area. The island ranges in elevation from sea level to 206 metres (676 ft) above sea level. The island has a temperate climate that is similar to its neighbouring island Nimer.(11, 12, 13)

Queimada Grande is the only known home of the golden lance head (*Bothrops insularis*), one of the most venomous vipers in the world. Its venom is said to be three to five times stronger

than that of any land snake, and it is capable of "melting human flesh". It is the species of snake which gives the island its unofficial name. Snake Island (14, 15, 16)

A Snake land is explored in Tapakara, in Jashpur district, CG, India located between 22° 20' and 23° 15' North latitude and 83° 45' and 84° 10' East longitude and 500m altitude. It is 55 km long in north south direction It is surrounded by Datali hill and Satpuri hill in west, having altitude at peak up to 950m. There is Mahee hill in south having altitude at peak up to 650m. It's origin of Jorad rivulet, which confluent to Kokiya river. There are Sonajori rivulet and Utiyal rivulet flowing as a confluent of Eeb river, they both originated from Sonajori hill in east, having altitude at peak up to 575m. About 40% of snake land is dense tropical deciduous Sal tree (*Sorea robusta*) dominated forest. Max. temp. reaches up to 45°C in summer (May-June) and 300-400mm precipitation in rainy season (July-August).

Population density is 130 human per square Km on snake land, and they are mostly tribal depending upon traditional farming and living in row clay home. Tapakara is deadly snake land and snake bite is 10 time more than other districts of India. An encircled portion in fig1 represents to snake land and fig 2 is the common crate excessively found in this area. (17, 18)



Fig.1 Snake effected area



Fig.2 Common Krait

### Taxonomy of *Bangarus carcerulus*

Kingdom: Animalia: Heterotrophs, cell wall absent  
 Phylum: Chordata: Notochord present

Subphylum-- Vertebrata:      Vertebral column present  
 Class:      Reptilia, :      Dorsiventral flat  
 Order:      Squamata:      Body covered with scales  
 Suborder:      Serpents:      Leg less  
 Family:      Elapidae:      Poisonous snake  
 Genus:      *Bungarus*      (Krait)  
 Species:      *B. caeruleus* (*Common Krait*)

Snakes do not have especially keen senses of sight or hearing. They rely instead on special sense organs to provide them with information about their environment. Snakes have an eye on each side of the head, giving them a wide field of view, but they cannot focus them well and have sharp vision for only a short distance. Snakes lack outer ears and eardrums, but they do have inner ears and can hear a limited range of sounds carried in the air. Certain bones in a snake's head respond to sound waves and transmit them to the inner ear. (19)

A snake's tongue has few taste buds. It is used with an organ of smell called the *Jacobson's organ*, which, along with the nostrils, provides snakes with a keen sense of smell. The Jacobson's organ consists of two hollow sacs in the roof of a snake's mouth, each of which has many nerve endings that are extremely sensitive to odours. A snake sticks out its tongue to pick up scent particles in the air or on the ground or some other surface. When the snake pulls its tongue back into the mouth, these particles enter the Jacobson's organ. The organ enables a snake to follow the scent trail of its prey. (20)

This is specific character that this snake (*B. caeruleus*) searches to deep slept human for the sake of body temperature in spite of normal behaviour of food physiology. When, normally after 3-4 hours a slept human takes a turn, this snake bites by afraid of human. Smallest toxic teeth and strongest venom at already slept condition led to human silent death.

### **Methodology**

1. Visit of the snake land was done from Ambikapur HQ in east direction on NH 43 up to 40Km reaching Sitapur Town Then North directions up to Ludeg Village, then turned to east on SH-22 reaching to Tapakara Village *Via* Farsabahar Block HQ. All the seven villages of among snake land are situated the way of Ludeg to Tapakara.

2. From 07 villages of Snake land, namely, Farsabahar, Tapakara, Bagbahar, Kothari, Ludeg, Pandaripani and Lawakera and from 05 places of common land. Soil samples collection, chemical and microbial analyses were done in district biotech lab. Ambikapur, CG, India. (21)

3. Average values of soil parameters of snake land and common land was compared.

4. A Snake charmer was searched to see the response of snake to pot of basil plant and irritation of snake was observed. Basil plant, as a snake repellent plant is taxonomic identified to be simplest solution of human- snake conflict in this land.

5. Fumigation of oil cack of *Madhuca indica* (Sapotaceae) is tested and found snake repellent

## Result and Discussion

Table 1 represents soil testing of snake affected area. Chemical analysis is done in district biotech. lab. (established for agriculture service). Soil samples of seven villages of Tapakara snake land of Jashpur district are analyzed. Average values of the soil parameters are calculated for further comparison with average parameters of soil samples of less snake area.

Table 2 represents soil testing of common area Manendragarh, Ambikapur, Balrampur, Tatapani, and Pratappur. These places are at the distance from centre of snake area respectively 200 Km. (in west direction), 87Km (in west direction), 120Km (in west-north direction), 200 Km (in north direction) 250Km (in west direction). Average values of the soil parameters are calculated for further comparison with an average parameters of soil samples of snake affected area.

Table 3 represents the differences of soil parameters between snake affected area and non-snake affected area. Both areas are comparative average chemical composition of samples. The result shows that pH, Electrical conductivity, Nitrogen, Potassium, Boron and colony forming unit of micro-organisms are positive in the difference. Carbon and Phosphorus are negative. While, difference of Zinc and Iron are negligible.

In microbiology, a colony-forming unit (CFU) is a unit used to estimate the number of viable bacteria or fungal cells in a sample. Viable is defined as the ability to multiply via binary fission under the controlled conditions. Counting with colony-forming units requires culturing the microbes and counts only viable cells, in contrast with microscopic examination which counts all cells, living or dead. The visual appearance of a colony in a cell culture requires significant growth, and when counting colonies it is uncertain if the colony arose from one cell or a group of cells. Expressing results as colony-forming units reflects this uncertainty. Snake effected area has high CFU of micro-organisms as it is represented in table 3.

Table 1. Chemical property of soil in Snake Land

Sr.	Villages	pH	Electric Conductivity (D.S./m)	C %	N Kg/H	P Kg/H	K Kg/H	Zn mg/Kg	Fe mg/Kg	Bo mg/Kg	Microbes in CFU
1	Farsabahar	6.14	0.19	0.35	154.0	13.0	260.0	0.4	2.4	0.2	4.8x10 <sup>6</sup>
2	Tapakara	6.06	0.36	0.42	168.0	12.0	339.0	0.3	3.2	0.2	4.5x10 <sup>6</sup>
3	Bagbahar	6.88	0.48	0.20	86.0	11.3	330.0	0.2	2.0	0.2	4.6x10 <sup>6</sup>
4	Kothidih	6.30	0.22	0.36	144.0	9.0	306.0	0.3	3.4	0.2	4.2x10 <sup>6</sup>
5	Ludeg	5.60	0.20	0.18	96.0	10.0	392.0	0.3	1.8	0.2	4.5x10 <sup>6</sup>
6	Pandripani	5.85	0.21	0.33	137.0	20.0	362.0	0.2	0.9	0.2	4.8x10 <sup>6</sup>
7	Lawakera	6.16	0.18	0.60	286.0	22.0	266.0	0.2	2.0	0.1	4.6 x10 <sup>6</sup>
-	<b>Average</b>	<b>6.14</b>	<b>0.262</b>	<b>0.348</b>	<b>153.0</b>	<b>13.9</b>	<b>321.85</b>	<b>0.27</b>	<b>2.242</b>	<b>0.1857</b>	<b>4.57 x10<sup>6</sup></b>

Table 2. Comparative chemical property of soil in common Land (other districts of Surguja Area)

Sr.	Villages	pH	Electric-Conductivity (D.S./m)	C %	N Kg/H	P Kg/H	K Kg/H	Zn mg/Kg	Fe mg/Kg	Bo mg/Kg	Microbes in CFU
1	Manendra-garh	5.90	0.11	0.42	168	26.0	303.00	0.3	2.4	0.02	4.8x10 <sup>6</sup>
2	Ambikapur	6.11	0.06	0.43	160	25.0	182.0	0.2	2.2	0.02	4.0x10 <sup>6</sup>
3	Balrampur	6.13	0.07	0.36	152	12.81	270.05	0.3	2.0	0.02	4.0x10 <sup>6</sup>
4	Tatapani	6.12	0.06	0.43	158	25.0	182.0	0.3	2.0	0.02	4.0x10 <sup>6</sup>
5	Pratappur	5.88	0.15	0.31	215	15.20	263.0	0.2	2.6	0.02	4.5x10 <sup>6</sup>
--	<b>Average</b>	<b>6.028</b>	<b>0.09</b>	<b>0.39</b>	<b>139</b>	<b>20.80</b>	<b>240.0</b>	<b>0.26</b>	<b>2.240</b>	<b>0.02</b>	<b>4.26x10<sup>6</sup></b>

Table 3. Comparative average chemical composition of snake effected area and non snake affected area.

Sr.	Area	pH	Electric-Conductivity (D.S./m)	C %	N Kg/H	P Kg/H	K Kg/H	Zn mg/Kg	Fe mg/Kg	Bo mg/Kg	Microbes in CFU
1	Snake Land	6.14	0.262	0.348	153.0	13.9	321.85	0.27	2.242	0.1857	4.57 x10 <sup>6</sup>
2	Common Land	6.028	0.09	0.39	139	20.80	240.0	0.26	2.240	0.02	4.26x10 <sup>6</sup>
3	<b>Difference</b>	<b>0.112</b>	<b>0.028</b>	<b>0.042</b>	<b>14</b>	<b>-6.9</b>	<b>81.85</b>	<b>0.01</b>	<b>0.002</b>	<b>0.1652</b>	<b>0.31 x10<sup>6</sup></b>

On 15-09 2016, top ten dangerous snakes in India, Animal Planet-TV Chanel IST 05.0-06.0 pm top ten dangerous snakes in India, was shown. Last tenth number of poisonous snake is shy full gentle but high poisonous Sea crate. but first most dangerous is attacking and run behind to bite i.e. Russell Viper snake, while second most dangerous snake is this crate. It is so hazardous to tribe having, land-bed and nocturnal Crate snake has habit to search sleeping human to touch in length for sake of thermal sense, but, whenever sleeping human takes a turn, it got afraid and bites. The top ten venomous snakes are: 10. Sea crate (Tidal snake with flat tail), 09. Andaman pit viper, 08. Bamboo pit Viper, 07. Malabar pit viper, 06. Harp nosed viper, 05. King Cobra 04 Spectacle Cobra, 03 Viper snake, 02. Crate, 01. Russell viper (named after Herpetologist, Dr. Patric Russell) .

Fig3 and fig, 4 represent side and ventral view of sense organs respectively. The sense organs of snakes are uniquely different than those of mammals and other animals. Unlike mammals, which mainly rely on their sight and hearing, snakes rely primarily on their senses of smell and touch. They do not have moveable eyelids, but transparent caps called "brille" as protective eye coverings. Because of this, their eye movement is fairly limited. They also do not have an external ear, middle ear, or tympanic membrane (eardrum). Instead, they use a small ossicle (ear bone), called the "Columella, " to detect vibrations of sound waves conducted through the ground. They are able to pick up some sound waves conducted through the air, but only at very low frequencies.(19)

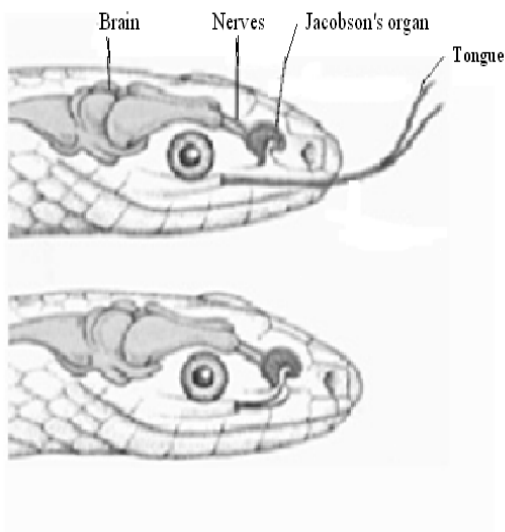


Fig.3 Side view of snake sensors

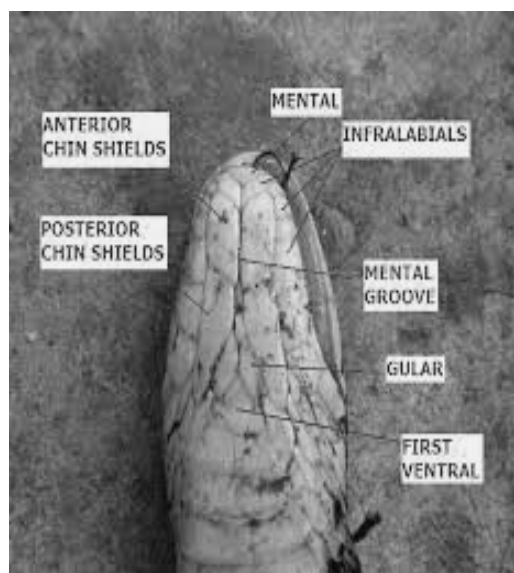


Fig.4 Ventral view of snake sensors

Snakes also smell in a very different way than mammals. Mammals bring air particles into contact with the olfactory (smelling) nerves by breathing them into the nasal cavities through the nostrils. Snakes have both nostrils and nasal cavities, but they are not used to smell. Instead, the flicking tongue is actually a smelling device. There is a small organ on the roof of the oral cavity called the "vomeronasal organ", or "Jacobson's organ." The forked tongue is used to bring minute air particles into contact with this organ, and the snake then perceives and identifies the smell as prey, predator, or otherwise. So, unlike mammals, the tongue is not used to taste or aid in swallowing, but simply as an accessory smelling organ (20).

### Snake repellent plant

Basil is good snake repellent plant the leaves may taste somewhat like anise, with a strong, pungent, often sweet smell. There are many varieties of *Ocimum basilicum*, as well as several related species or species hybrids also called basil. (22, 23, 24, 25) Fig 5 and fig 6 represent Basil plant, it grows between 30–130 cm (12–51 in) tall, with opposite, light green, silky leaves 3–11 cm (1.2–4.3 in) long and 1–6 cm (0.39–2.36 in) broad. The flowers are small, white in colour and arranged in a terminal spike. Unusual among Lamiaceae, the four stamens and the pistil are not pushed under the upper lip of the corolla, but lie over the inferior lip. After entomo-philous pollination, the corolla falls off and four round achenes develop inside the bilabiate calyx.

### Bentham and Hooker's Taxonomy of *Ocimum basilicum* L.

**Group- Dicotyledonae;**- Tap root system and Reticulate leaf venation

**Class – Gamopetalae:** Petals fused

**Series-Bicarpillatae:** Ovary superior i.e. hypogynous flower and carpel two syncarpous with axial placentation

Order – Lamiales: Flower Zygomorphic, Corolla Billabiate, Epipetalous Stamen 4 didynamous

Family- Lamiaceae (Labiatae): Verticillaster Inflorescence, Special fragrance and Gynobasic Style, Carcerulus fruits

**Floral Formula ;-**  $\text{Br.} \frac{\%}{\text{♀}} \text{K}_{(1/4)} \text{C}_{(4/1)} \text{A}_{2+2} \text{G}_{(2)}$



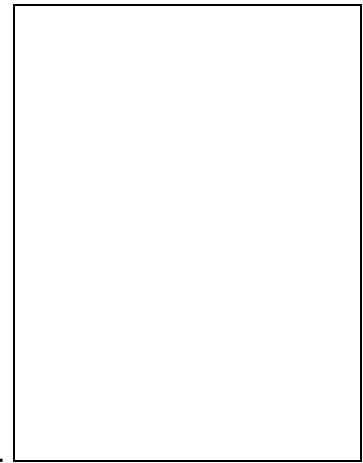


Fig.5 Basil sprout at an early stage    Fig.6 Flowering basil plant    Fig.7 Snake catcher at Durban

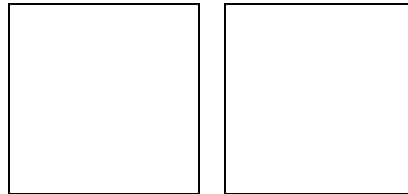


Fig. 8 Snake Charmer showing a Snake    Fig. 9 Snake Charmer and Snake

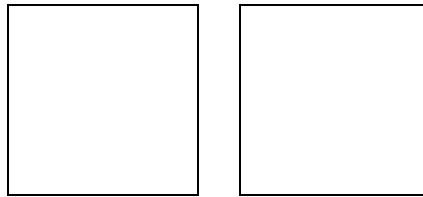


Fig. 10 Snake, cage and child handler    Fig. 11. Local News (Snake bite case, in 3 moth died 17).

Fumigation by burning of dry oil cack of *Madhuca indica* (*Sapotaceae*) is seen causing irritation to the snake inside its cage. It is confirmed with the help of a snake handler. Fig7 represents Snake Catcher showing a snake in snake city Durban. Fig 8 and Fig 9 represent a snake pet by a snake charmer Mr. Tripunda Nath Bairagee. Fig 10 represents that a pet snake friendly behaves to baby and they play fearless. Snake charmers bear specific ornament suck skull shape garlands and seeds of Rudraksh i.e. *Elaeocarpus granites*. Indian Snake charmers worship the God Shiv, who is suggested to wear many garlands of deadly poisonous snakes, and have longest meditation as deep sleep. Ditto the behaviour of *Bangarus carcerulus* is to search human body slept and stable to touch in parallel for only thermal sense. Fig 11 represents local Hindi news stating that in three months, seventeen people died in snake land.

**Cause of abundance snake bite**

1. Snake abundance is due to soil property, dense forest and heavy rain and agricultural area nursing mice (*Rattus rattus*), which is main prey of snake
2. Poorness of public compelled to floor bed sleep to be easy reach of snake causing bite case.
3. Raw home of people, made of soil with grasses, bamboos and clay-tiles. These materials attract Krait snake to ride on roof and hide in day and nocturnal physiology fall from roof in to bed of slept person.
4. Tribal tradition of drunk sleep, tribal people may not identify of snake bite in deep sleep
5. Minimum size of venom teeth and maximum power of toxicity (Nervous poison).
6. Social orthodoxy and herbal home remedy make sure death of patient. Since, anti venom injection is only treatment yet. Some miracles are exceptional which have only traditional snake charmers. Although, snake repellents plant and fumigation are proved scientific. But after snake bite, only and only anti venom injection is its treatment. Crave snake victim is sure to death bethought anti venom injection.

### **Precautions**

1. Awareness and plantation of snake repellent basil plant
2. Cleanliness to not providing place to hide for snake.
3. Rat eradication by cat or by rat killing chemical or rat catcher instrument.
4. Foods waste management and should not provide food chain. Human food waste is used by rats, and squirrels, which attract Snake to prey in an ecosystem of food chain.
5. Avoid earth bed, always use high bed to sleep.
6. Iron Net covering to bed room. at least mosquito cover be properly used.
7. Grow snake-repellent Basil plant of *Lamiaceae* family.
8. Herbal medicines must be strictly banned in spite of it, strictly recommended for anti venom injection as soon as possible.

### **Conclusion**

1. The soil parameters *i.e.* pH, Electrical conductivity, Nitrogen, Potassium, Boron and colony forming unit of micro-organisms are more present while Carbon and Phosphorus are less present in snake land, in comparison with common land.
- 2 Snake land has  $0.31 \times 10^6$  CFU more micro organisms and more metallic elements than common surrounding land but Carbon and Phosphorus are.

3 Thermal biosensors are high developed in *Bangarus carcerulus* (Indian common crate). it is in abundance in Tapakara land, causing snake problem due to its specific behaviour to search human, in deep sleeping position in night causes of increasing bite cases.

4 *Ocimum basilicum* was tested that the pot with this plant make irritation to krait snake and it runs far from Basil plant. And also, from fumigation of *Maduca indica* oil cack (26).

There is a further scope of this study, that snake city Durban and snake land Tapakara, both are Gold mine area. The relation of gold mine and snake abundance is unsolved yet. Significance of snake is that nova day is electronic world. Since rates cause agricultural loss, therefore Snake saves cereals by eating to rats. Rats also damage to wires of vehicles planes and instruments. Therefore, non poisonous snakes should be popularized.

### **Acknowledgement**

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