



## Ecology of *Ichthyophis bombayensis* (Gymnophiona : Amphibia) from Koyana region, Maharashtra, India

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**ABSTRACT :** The survey was conducted in Koyana region of northern Western Ghats of Maharashtra from June 2004 to October 2008. Western Ghats of India is well known biodiversity hotspot. *Ichthyophis bombayensis* was encountered in different habitats of Koyana region at altitude between 500 to 630 m above the sea level. We studied the rain fall, temperature of soil and air, pH of soil, altitude, latitude, longitude and different habitats, in which *Ichthyophis* inhabited and analyzed the soil samples of three spots and found that soil become red and porous due to rich iron content and exclusively become acidic.

**Keywords :** *Ichthyophis bombayensis*, ecology, Western Ghats, Koyana,

### INTRODUCTION

The order Gymnophiona includes limbless, girdle less and burrowing amphibians commonly called as caecilians. They are reported from several areas in Asia, Africa and South and Central America (Taylor 1968). India is suppose to be home of many caecilians, it includes four genera belong to three families. Caecilians have exclusively secretive and burrowing life in soil for in search of food (Gundappa *et. al.*, 1981), it makes them difficult to study and make them rare (Pillai and Ravichandran, 1999). They are mainly forest creature's lives in burrows, later found in cultivated lands nearby forest. They are generally mistaken as earthworms or even as snakes (Bhatta 1997). Caecilians are dominant terrestrial amphibians, till not properly surveyed from northern Western Ghats. A very little information is available on habitats and its related ecological parameters from Northern Western Ghats.

The Western Ghats of India is recognized as world biodiversity hotspot and it is home for many Indian and regional endemic species, especially amphibians including caecilians (Oommen *et. al.*, 2000), The Western Ghats with heavy rainfall, moderate temperature, well grown vegetations with short dry season, provide the ideal environment for the occurrence of the amphibians specially caecilians in perticular (Bhatta 1997). Caecilians are more explored in South and Central Western Ghats of India than northern Western Ghats of Maharashtra, might be enrich the caecilian diversity (Bhatta and Prashanth 2004).

Previous studies on Indian caecilians were mostly concerned to taxonomy, morphology and some part on reproductive biology and ecology. Due to absence of clear information on their distribution pattern and systematic, it is difficult to evaluate the present status of caecilians from India. To assess the present status of caecilians, study the habitats, soils analysis and their relative parameters are highly essential (Ravichandran and Pillai 1996). We

investigate here the new habitats and studied its related ecological parameters of *Ichthyophis bombayensis* of northern Western Ghats of Maharashtra from Koyana region.

### MATERIAL AND METHODS

We conducted survey in Koyana region of Patan Tehsil from June 2004 to October 2008 as a part to the study of caecilians *i.e.*, *Ichthyophis*. We randomly selected 20 spots run parallel to Koyana River and Chiplun- Karad state highway *viz.*, Helwak, Koyana, Ghoshatwadi, Maneri, Marul, Shiral, Yerad, Tamkade, Kaloli, Ramapur, Patan, Mulgaon, Katawadi, Mhavashi, Adul, Marali, Naralwadi, Nisare, Shitalwadi and Vihe. Selected spots were red porous soil, shadow places and deep layer of leaf litters.

Surveys were carried out about 55 km parallel to Koyana River and Chiplun- Karad state highway at altitude 500 to 630 m above sea level. We surveyed various habitats such as grasslands, mixed forest and cultivated fields such as paddy, sugarcane, groundnuts, nachani, Jowar, while we encountered most of specimen of caecilians in field of sugarcane. Hence, we selected to survey only sugarcane fields to get maximum chances of caecilians.

Surveys were carried out each selected spot fifteen days intervals during rainy season. We studied caecilians by digging the soil upto depth 10 to 30 cm, rolling the stones, logs, leaf litters and also surveyed the road accident specimens on Chiplun- Karad state highway. The rain fall, temperature of soil and air, PH of soil, altitude, latitude and longitude of selected spots were measured Table 1. We analyzed chemical composition of soils from Maneri, Yerad and Katawadi in Govt. laboratory, Islampur; the results are shown in Table 2.

### RESULTS AND DISCUSSION

It is interesting to note that *Ichthyophis* found in Koyana region at altitude of ranging from 500 to 630 m above sea level are different form that of reported earlier

Table 1 : Localities, geography and climate inhabiting *Ichthyophis bombayensis* from Koyana region of Patan Tehsil of Maharashtra.

Sr.No.	Locality	Latitude (°N)	Longitude (°E)	Altitude (M)	Rainfall (mm/yr.)	pH of soil	Temp Soil (°C)	Temp Air (°C)	Habitats
1	Helwak	17° 26 <sup>1</sup>	74° 44 <sup>1</sup>	630	6072	5.9	22	21.4	Mixed forest
2	Koyana	17° 24 <sup>1</sup>	73° 44 <sup>1</sup>	610	6000	5.8	22	21.2	Mixed forest
3	Ghoshatwadi	17° 24 <sup>1</sup>	73° 44 <sup>1</sup>	595	5500	6.2	23	23	Cultivated field-Sugarcane
4	Maneri	17° 23 <sup>1</sup>	73° 59 <sup>1</sup>	570	4000	6.43	25	24.5	Cultivated field-Sugarcane
5	Marul	17° 23 <sup>1</sup>	73° 59 <sup>1</sup>	570	3500	5.9	24	24	Cultivated field-Sugarcane
6	Shiral	17° 23 <sup>1</sup>	73° 59 <sup>1</sup>	560	3000	5.9	24	23.5	Cultivated field-Sugarcane
8	Yarad	17° 22 <sup>1</sup>	74° 54 <sup>1</sup>	560	3000	6.18	26	25	Cultivated field-Sugarcane
9	Tamkade	17° 22 <sup>1</sup>	74° 54 <sup>1</sup>	560	2500	6.2	24	24	Grassland with small mixed vegetation
10	Kaloli	17° 22 <sup>1</sup>	74° 54 <sup>1</sup>	550	2500	6.1	25	24	Cultivated field-Sugarcane
11	Ramapur <sup>4</sup>	17° 22 <sup>1</sup>	74° 54 <sup>1</sup>	530	2225	6.3	26	26	Cultivated field-Sugarcane
12	Patan	17° 22 <sup>1</sup>	74° 54 <sup>1</sup>	530	2215	6.3	26	26	Cultivated field-Sugarcane
13	Mulgaon	17° 22 <sup>1</sup>	74° 54 <sup>1</sup>	530	2215	6.2	25	24.5	Cultivated field-Sugarcane
14	Katawadi	17° 23 <sup>1</sup>	73° 53 <sup>1</sup>	545	2000	6.63	25	25.6	Mixed forest
15	Mhavashi	17° 22 <sup>1</sup>	74° 54 <sup>1</sup>	520	1800	6.1	25	25	Cultivated field-Sugarcane
16	Adul	17° 22 <sup>1</sup>	74° 53 <sup>1</sup>	520	1500	5.9	25	25.7	Cultivated field-Sugarcane
17	Marali	17° 18 <sup>1</sup>	73° 57 <sup>1</sup>	535	1510	6.2	26	25	Cultivated field-paddy
17	Naralwadi	–	–	520	1261	6.0	26	25	Cultivated field-Sugarcane
18	Nisare	–	–	500	1100	6.3	25	24.2	Cultivated field-Sugarcane
19	Vihe Ghats	17° 20 <sup>1</sup>	74° 0 <sup>1</sup>	570	1050	5.9	26	26.5	Mixed forest
20	Shitalwadi	17° 22 <sup>1</sup>	74° 2 <sup>1</sup>	575	1050	6.2	27	26	Grassland and Rice field

(Taylor, 1968; Gundappa *et. al.*, 1981). Average rainfalls (6072 -1050 mm/year) of selected spots shows wide range of variation, within 55 km distance of Patan Tehsil and we found that *Ichthyophis* were found in all selected localities but more frequencies at higher rainfall than the lower rainfall, it indicate that rainfall play important role for inhabiting caecilians. Temperatures of soil of selected spots at various depths were measured and we found that little bit variation in temperature, an average temperature 24°C appears to be mostly favourable for *Ichthyophis*. The PH of soils of all selected spots were positively acidic, most of species of the apodans are prepared to live in acidic soil. From 2004 to 2007 explored various habitats such as grasslands, open land, mixed forest and cultivated fields such as paddy, sugarcane, groundnuts, nachani, Jowar, while we encountered most of specimen of *Ichthyophis* nearby cultivated field of sugarcane, here we found that there is perennial water in sugarcane fields and in nearby brooks, it indicates that these

area are favourable places for hiding of caecilians.

In 2004, adults of *Ichthyophis bombayensis* were collected from Maneri, Yerad and Katwadi of Patan Tehsil, Maharashtra. The chemical compositions of the soils from above three localities were analyzed at Government laboratory, Islampur. The data are presented in Table 2. It is found that the textures of soils in which *Ichthyophis* were found become porous and red due to rich iron content; as compared to soils of plain regions of South Maharashtra and Karnataka [Gundappa *et. al.*, 1981, Balkrishna *et. al.*, 1982]. Soil contain medium humus, organic carbon and organic matter due to its thin layer and slopes to the lands, it indicate that the water holding capacity of soils become comparatively low. All soil samples are exclusively acidic; contain very low amount of free calcium carbonate and rich value of potash in the soil. As far as C/N ratio is concerned, it is favourable for bacterial growth and help in nitrogen fixation in soil, means it clearly indicate that, these soils are good for *Ichthyophis* inhabiting.

**Table 2 : Chemical composition of soil in which *Ichthyophis bombayensis* inhabited.**

Sr. No.	Constituents	Localities Katawadi	Yerad	Maneri
1.	pH	6.63	6.18	6.43
2.	Specific Conductivity (mm mhos/cm)	0.11	0.06	0.04
3.	Organic Carbon (%)	0.74	0.79	0.75
4.	Available Nitrogen (%)	0.074	0.079	0.075
5.	Available Phosphorus (Mg/100gm soil)	1.80	2.60	1.35
6.	Available Potash (Mg/100gm soil)	73.60	193.20	53.36
3.	Free calcium carbonate (%)	1.00	2.00	1.00
8.	Organic matter (%)	1.28	1.36	1.29
9.	C/N ratio	10.00	10.00	10.00
10.	Water holding capacity (%)	57	55	54

*Ichthyophis* exclusively burrower, skull, nuchal collar and skin secretion helps to burrow deep of soil to get right position during month of November to June. The red, porous and moist soil highly essential for survival. It indicates that's caecilians mostly prefers acidic soils associated with certain other chemical and physical factors as reported earlier (Gundappa *et. al.*, 1981, Bhatta 1997, Jadhav *et. al.* 2007a). It is interesting to conclude that the combination of ecological factors could be resemblance to the group.

The adult female *Ichthyophis* lays eggs nearby stream in the pit. We collected female with egg clutch, 10 feet away from stream in moist soil in 20cm depth in month of September 2004 from Katwadi of Patan Tehsil. Female 591 mm long and its egg clutch contain 144 eggs in advanced stage of embryonic development. We found that female always coiled around the egg clutch. Further egg development, hatching and larval development took place in laboratory (Jadhav *et. al.* 2007a,b).

It is interesting to note that the larval habitats are totally different from adult *Ichthyophis*. Larvae were found in shallow water at periphery and depend on aquatic creatures as food and Larvae mostly prepare to live under object in water rather than swimming, after 8 to 10 months migrate to muddy places contain little water and after 12 to 14 months prepare to live in muddy soil<sup>9</sup>. In that transition phase larvae prepare to live in mud become acidic and contain rich organic matter.

It seems to clear that both larvae and adult of *Ichthyophis* prefers to live in acidic soils and gives idea about ecological parameters in which *Ichthyophis* inhabiting. It clearly indicates that ecological factors governing the restrictions of distribution of caecilians.

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