

## SOME ECOLOGICAL ASPECTS, SYSTEMATICS, THREATS AND CONSERVATION STATUS OF MONITOR LIZARD, *VARANUS BENGALENSIS* FROM KARACHI AND THATTA, SINDH, PAKISTAN

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### ABSTRACT

*Varanus bengalensis* is safeguarded in most of its area by the IUCN and the Government of Sindh. Still, there are few studies, and little is known of its status and ecology. We studied *V. bengalensis* in the Karachi metropolitan and Thatta district in Sindh to get information on its habitat, status, threats, distribution, and some aspects of ecology of this species. We used both direct field observations and indirect information collection from the locals in the studied areas. *V. bengalensis* is found to be distributed throughout the study areas. These observations suggest that habitat alteration is less significant as a threat than previously believed, and the species appear capable of adapting to habitat modification. The population of Bengal monitor is less in Karachi Metropolitan as compared to the Thatta district due to dense human population and diverse urbanization in Karachi. The habitats of *V. bengalensis* are mostly associated with water bodies, dunes, small tunnels, building trenches, areas, and a few large trees. Different conservation programs centering, but it focusing only on forest protection and assurance may not offer assistance to conserve this species on a priority basis.

**Key word:** Ecological aspects, Threats, conservation, Bengal Monitor, *V. bengalensis*.

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### INTRODUCTION

Pakistan is truly rich in its reptilian diversity as reptiles of Pakistan are rich, diverse, and interesting due to their unique zoogeographic location, located in the transition zone of three zoogeographic zones of the Palearctic, Ethiopian, and oriental regions of the six major realms of the world (Safi *et al.*, 2024). Reptiles are a diverse group that live in all natural environments of the world except Antarctica. Reptiles are in decline worldwide (Gibbons *et al.*, 2000) and are more feared than birds, with threat rates numerically similar to mammals. Currently, more than 70 monitor lizard species are known (Bohme *et al.*, 2013). Although the family Rosadae is a relatively very small group of lizards as compared to others, still, this modest and small group has been the subject of nearly 250 years of scientific discovery. This was achieved only through progress. Monitor lizards of the family Monitoridae are representatives of a group of ancient anguimorph reptiles and, along with crocodiles and pythons, are the largest extant cold-blooded predators on Earth. Monitor lizards inhabit Africa, the Arabian Peninsula, the Near East subcontinent, and Indo-China. *V. bengalensis* is diurnal, These monitors are active throughout the entire year in warm tropical areas, but their activities cease during cooler months in temperate regions (Wickramanayaka and Dryden, 1993). Inactivity periods are longest in the coldest areas (Pianka *et al.*, 2004). Sexual maturity may require 5 years or more in natural environments, but is reached in 3 to 4 years in captivity (Koch *et al.*, 2013).

Most of the *Varanus* spp. has an elongated head and neck, a notably heavy body, an extended tail, and well-advanced legs. Their tongues are long, forked, and snake-like (Hashmi *et al.* 2013). Bengal Monitor (*V. bengalensis*) can cope with many climatic conditions and habitats. They are often found in different residential areas, so this type can be called a habitat builder. The Bengal Monitor Lizard (*V. bengalensis*) is usually found on the ground, solitary. *V. bengalensis* has a greater ability to climb trees, and most of the juveniles are often seen on trees. There are three species of monitor lizards in Pakistan, of which the *V. bengalensis* wide spread throughout Pakistan. It is very common in the Thatta district of Sindh (Hashmi and Khan, 2013). It reaches up to 100 cm in length from the nostril to the tail. Adults crawl and can climb on trees and catch flying bats. It commonly feeds on small vertebrates such as birds and their eggs, fish, frogs, mice, lizards, and snakes etc. They even eat invertebrates such as beetles, grubs, scorpions, snails, ants, and other terrestrial invertebrates (Hashmi *et al.*, 2013). This species (*V. bengalensis*) shelters in holes or burrows and cracks in rocks, houses, and buildings. This species is usually hunted for its meat and skin. Some people consider it a dangerous animal, and so they kill it in many areas (Hashmi *et al.*, 2013; Hashmi, 2017). The monitor lizard is known as "biscobra" in western India, "guishaap" or "goshaap" in West Bengal and

Bangladesh, "Goh" in Punjab, Sindh (Pakistan) and also in Bihar, and "ghorpad" in Maharashtra, India. Popular misconception and belief is that they are poisonous, and in Sri Lanka, their breath is considered poison (Journals of India.com / June 2021). In Rajasthan, they are thought to be venomous only during the rainy season. The belly skin of the Bengal Monitor is traditionally used to make the head of the "kanjira", a musical instrument from South India. Lizards are hunted for their eyes and their fat, which is extracted by boiling, and is used in many folk medicines. In Pakistan, most people believe that this species is harmful and venomous; generally, people kill them, as they believe it is dangerous for human beings. Some of the religious beliefs also involve killing this species (Hashmi, 2017). These lizards are now being targeted because of their oil and genitalia, being sold to local consumers for a myth that these can improve and boost their aphrodisiac power and libido for sexual activities (Hashmi *et al.*, 2014).

According to the IUCN (IUCN, 2025), more than one in five of the world's reptiles are threatened species (<https://www.iucn.org/news/species/202204/worlds-reptiles-comprehensively-assessed-iucn-red-list>). Some main reasons for threats are climate change, poaching, habitat destruction, and some other anthropogenic activities (Khan *et al.*, 2015, 2016; Safi and Hashmi, 2021; Safi *et al.*, 2025). As the main goal, the purpose of this article is to study and record the current status, distribution, conservation, natural habitat, and threats to the Bengal monitor in Karachi and Thatta districts of Sindh.

### Geographic Range

The Bengal monitor lizard (*V. bengalensis*) is widely found in South Asia compared to other lizards. The species is widely distributed from Afghanistan to Java, including southeastern Iraq, Iran, Afghanistan, Pakistan, India, southern Nepal, Bhutan, China, northern and southern Vietnam, Laos, the islands of the Strait of Malacca, and the Greater Sunda Islands (Auffenberg, 1994).

### Habitat

The Bengal monitor lizard can adapt to a wide range of environments, from deserts to rainforests to seasonally snowy winter habitats, unlike other varanid lizards. However, it is usually found in areas with a temperate climate, where the average annual temperature is around 24°C. Most regions of South Asia have seasonal monsoon and wind patterns that are influenced by nearby oceans and mountains. Therefore, rain fall varies widely across much of the Bengal monitor lizard's range. Parts of the habitat are relatively dry, with an average annual rainfall of less than 200 mm. Other habitats are humid, with annual rainfall of 2,200 mm. This species is most commonly found in tropical rainforests, deciduous, semi-deciduous, evergreen tropical forests, and thorn forests (Auffenberg, 1994).

### Physical Description

Fully developed monitor lizards are normally gray or aquamarine with a pattern of silver to black parallel lines on the abdomen from the chin to the tail. These patterns are typically darker in the western part of the geographic range and lighter in the eastern part. Typically, these belly markings become lighter and the base color darker as the lizards age. Therefore, adults exhibit clearer, less contrasting patterns than young Bengal monitor lizards. The heaviest known male Bengal monitor weighed 7.1 kg in the wild, it weighs 18 kg, but in captivity, it is said to have reached 10.2 kg in the wild. Males weigh 42% more than females. Males with the same snout-to-back length (SVL) as females typically weigh 9.2% more. The average weight of a young Bengal lizard is 0.078 kg (Auffenberg, 1994).

### Behavior

Bengal monitor lizards are mostly found solitary in the wild. They are on the move most of the day, constantly looking for food. Bengal lizards interact more during the breeding season when males compete for mates (Auffenberg, 1994).

### Conservation status

*V. bengalensis* is a species of minor concern due to its widespread geographical distribution. The level of threat to their population is likely to increase in the future as it is hunted for its meat, skin, and medicinal purposes, and with the development of human settlements and urbanization (Hashmi *et al.*, 2013). A species classified as a "species of least concern" (IUCN, 2009 Red List of Threatened Species; listed in Appendix I of CITES.). Only two shipments have been recorded in the CITES trade database in the last three decades. In 2000, 14 skins (probably *V. nebulosus*) from Indonesia to Portugal, and in 2010, leather products were exported from the USA to Germany (UNEP-WCMC.CITES trade database). Today, the leather trade appears to be much less of a concern than in the early 1980s, when thousands of hides were recorded and exported to Japan from Bangladesh and Pakistan

(Luxmoore and Groombridge, 1990). Hunted or killed animals were viewed in the study area during surveys. In addition to this, some local tribes also eat the meat of *V. bengalensis* (Hashmi, 2017).

## MATERIALS AND METHODS

Field Studies of *Varanus bengalensis* were done in two areas of Sindh, viz. Karachi and Thatta. Population assessment, natural habitat, distribution, and threats of the species were observed in these two selected study areas in Sindh. Field surveys were conducted fortnightly from January 2021 to August 2022 (20 months) (Fig. 1). More than 40 visits were made, and data/information were collected on the selected studied areas of this species.

A collection of data on the Indian lizard (*V. bengalensis*) was studied using the catch-release and recapture method, and Sex was properly monitored to estimate the population in selected fields of study areas of Karachi and Thatta. The study area has a tropical climate; despite being located slightly above the tropics, it is located on the coast of the Arabian Sea of Pakistan, and the climate is relatively mild. In some cases, the region is classified as semi-arid due to its mild climate with a short but distinct rainy season and a long dry season (Hashmi *et al.*, 2024).

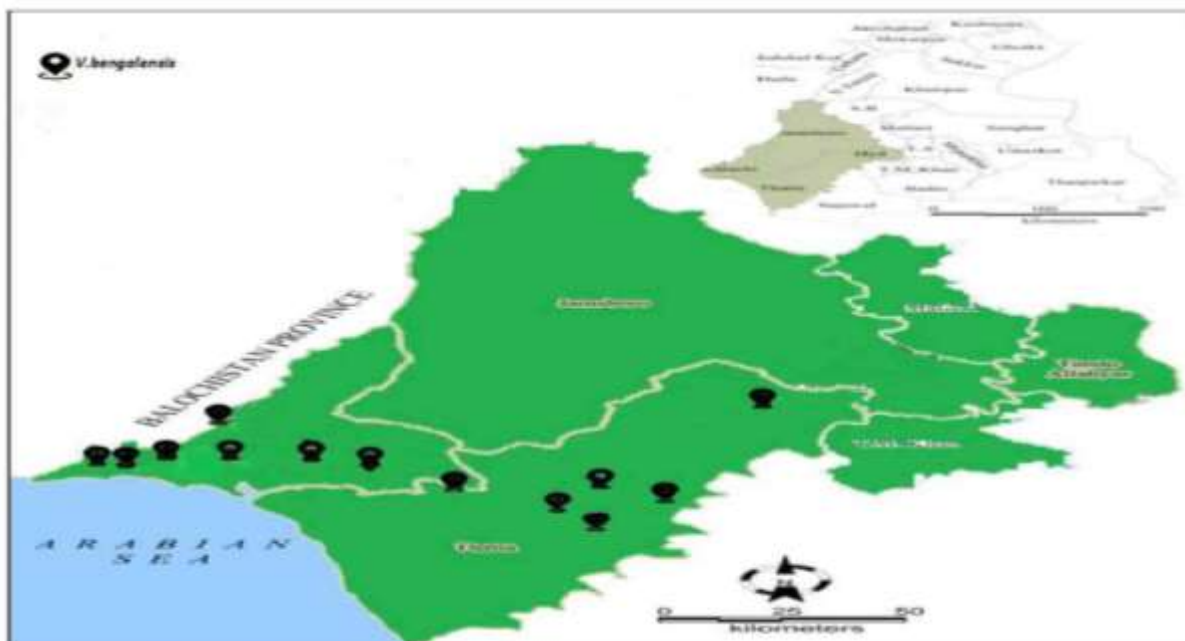


Fig.1. Distribution map of *Varanus bengalensis* in study areas, Karachi.

**Calculation methods:** - The following methods were used:

### A. Direct methods.

**1. Habitat search:** - Many hours of search at each location of *Varanus* spp. Each habitat search area consisted of approximately 20 ha in size (within a radius of 250m from observation or sampling locations).

**2. Random observations:** - Random observations are also helpful and can be used to determine their occurrence and population status of species, date, time, place, and habitat were recorded.

**3. Manual capture:** - Manual capture was also used to count or capture the *Varanus* spp.

**4. Lurking:** - Lurking is used for most reptiles or lizards. Many lizards are most visibly active; however, they are cautious when approached too closely. Loops were used to capture the lizard by luring some meat. A loop consists of a long stick with a loop of string at the end, which may be tightened around the neck or the body before the hind limbs.

**5. Confinement:** Confinement has been used to trap several reptiles. The most used trap is the trap that consists of an iron cage built-in grind so that the door is flush with the surface. A small layer of leaf litter or grass cover should be provided for the animal to fall into an iron cage. It also has an attraction advantage, fresh meat, dead fish, and caught arthropods that can be fed to *Varanus* spp.

## B. Indirect calculation methods

1. **Information from various sources:** - The information was collected from colleagues, field workers, and local community/villagers from different localities in the study areas.

2. **Traces, etc.** Prints of the finger claws, footprints, or tails were observed in the territory of the species.



Fig. 02. *V. bengalensis*, Courtesy by Hashmi.M.U.A



Fig.03. *V. bengalensis*, Courtesy by Hashmi.M.U.A.



Fig. 04. *V. bengalensis*, Courtesy by Hashmi, M.U.A.



Fig. 05. *V. bengalensis*, Courtesy by Hashmi, M.U.A

## SYSTEMATICS OF *V. BENGALENSIS*

*V. bengalensis* (Daudin, 1802) (Fig. 2-5); *Tupinambis bengalensis*, (Daudin, 1802); Natural, general and special history of reptiles, 3:67. – Enterthelocation: “Suriname”(incorrect). 1802 *Tupinambis cepedianus* DAUDIN, Natural, general and detailed history of reptiles; 3:43– Enterlocation: unknown (Daudin, 1802), Natural, general and detailed history of reptiles, 3:117. – Enterlocation: “Suriname” . *punctatus* (MERREM,1820); Tentamen Systematis Amphibiorum: 59. – Sitetype: Bengal 1820 *V. taraguira* MERREM (partial), Tentamen Systematis Amphibiorum: 59. – Indicate the location: “In South America” 1829 Monitor gemmatus GUERIN-MENEVILLE, Iconographie du Règne Animal, Rept1: Pl. 3. - 1838 Rep. 3:7, 24. – Enterthelocation: “Indus Orientales”. 1831 Waranheraldicus GRAY in GRIFFITH, Animal Kingdom 9 Synopsis.:27. – Enterlocation: Bengal. 1842 *V. bibronii* BLYTH, (Jr. Asia. Soc. Bengal 11:869). – Location of the species: unknown 1844 Waraninornatus SCHLEGEL, illustrations Amphibian: 72– Enterlocation: “New Holland” 1845 *V. lunatus* GRAY, Catalog of lizards in the British Museum: 10. – Enterlocation: India 1 *V. irawadicus* YANG & LI, (Herp.Res. Chinese) 1:60. – Enterthelocation: Wanding Valley, Yunnan Province, Southern China.

Table 1. Studied points for *V. bengalensis* in Karachi and Thatta (Sindh).

S.No	StudyArea	Species Captured	Co-ordinates	Total
A	<b>KARACHI</b>			
1	Sandspit	07	N 24.50723 E 066.54104	07
2	Cape monze	09	N24.50091 E066.39393	09
3	Hawks bay	02	N24.51288 E066.52762	02
4	Manora	10	N 24.477547 E066.58592	10
5	University of Karachi	05	N24.94284 E067.12708	05
6	MalirCantt	02	N24.92541 E067.17989	02
7	Safari Park	05	N24.922382 E067.10875	05
	<b>Total no. in Karachi</b>	<i>V. bengalensis</i>		<b>40</b>
B	<b>THATTA</b>			
1	Hali jee	05	N24.825447 E067.74503	05
2	Gajju / Gaja	20	N24.72888 E067.76830	20
3	Gogaboti	03	N24.74196 E067.81345	03
4	Siddique Shoroo	25	N24.74222 E067.83917	25
5	Dargah Shah Hussain	20	N24.73942 E067.83416	20
6	Dargahh Shaikh Aali,	02	N24.72758 E067.89098	02
	<b>Total no. in Thatta</b>	<i>V. bengalensis</i>		<b>75</b>

## RESULTS AND DISCUSSION

*V. bengalensis* is the most common species of monitor lizards in Pakistan and is also found throughout the Sindh province. The populations of various lizard species, including *V. bengalensis* have declined significantly as a result of hunting and urbanization, in some tribes of Sindh (such as the Kolis, Beers, Baris, Tanians, and Jogis tribes), male monitor lizard are rarely used for meat or for medicinal purposes to relieve rheumatic pain (Hashmi *et al.*, 2013). The genitalia of this species are used in black magic, and it is also used for sexual desire (The Asian Age, 2017). Leather is also used in the manufacture of ear drums. Use abdominal fat as an ointment for skin infections. Fatty oil is used as a medicine for piles. The fats are also used as an aphrodisiac and lubricant. The most common threat to this species is the use of their skin in the leather industry (Hashmi *et al.*, 2013). Some ethnic groups kill *Varanus* species because of their morphological shape and gigantic (long-bodied) size, snake-like forked tongue, and villagers, hunters extract the reserves to use the oil. It is believed of locals that meat of lizards specially spiny tailed lizard provide heat for temperature maintenance (Hashmi *et al.*, 2014). They were killed, and the fat from the skin was used primarily as an oil to treat chronic pain. A small amount will be used as a university museum for specimens and research (Hashmi *et al.*, 2013). Several life guards in a vehicle were killed while crossing a road in the Thatta district (Hashmi *et al.*, 2013). In this study, we recorded the monitor lizard *V. bengalensis*, whose numbers are declining in Karachi due to its high population density and increasing urbanization. *V. bengalensis* has been reported in all types of habitats. However, with increasing urbanization, the loss of habitat for this species is increasing, and because of this animal enters homes and people are killing it due to various orthodox beliefs (Hashmi, 2017). Large-scale urban development, rapid industrialization, and road and rail networks have fragmented diverse natural habitats into small areas. These changes are putting extra ordinary pressure on the survival of this species. Isolated small animal populations in fragmented habitats cause inbreeding depression, which leads to

genetic poverty, which is another cause of the decline of this species. *V. bengalensis* is found and recorded throughout Sindh, but faces the challenge of shrinking habitat and continuous adaptation to new niches. In contrast to other lizards of the family, the habitat of the *V. bengalensis* ranges from desert areas to floodplains, scrub lands, and forests. Preferred habitats include dry land with thick bushes, ponds, canals, and lakes (Hashmi and Khan, 2014). *V. bengalensis* has a wide range of habitat preferences, but rapid urbanization is depriving this species of its natural habitat. Currently, urban area *V. bengalensis* also inhabits rain water gutters that meet its temperature requirements. These animals bask in the sun and move through dry drains (Hashmi and Khan, 2013). *V. bengalensis* is a pure carnivore, feeding on insects, fish, frogs, mice, crustaceans, bird eggs and chicks, and animal carcasses (Auffenberg, 1989). However, they have been observed eating household vegetables and fruits, and this is thought to be due to the heavy use of pesticides, which has reduced the number of potential prey. *V. bengalensis* has also been found to be disturbed by vehicles, traffic, and busy roads. Increasing annual temperatures are another important factor influencing the behavior and habitat selection of *V. bengalensis*.

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