

Original Research Article

Habitat Preference Of Tokay Gecko (*Gekko gekko*) In Barak Valley Of Assam, India

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Abstract : Study of habitat characteristics and distribution pattern of Tokay Gecko (*Gekko gekko*) was carried out in Barak valley of southern Assam by transect method. 112 individuals were recorded during the study period. Out of which, highest individuals were found in Irongamara of Cachar district. In the study area, the average encounter rate was 6.92/km. *Gekko gekko* is distributed throughout the Barak valley. In addition, it was found in houses like mud house, pucca house and RCC buildings, irrespective of trees which is its natural habitat. Mud house as their most preferred habitat as they were mostly found perching on the mud walls, individuals were found perching at medium level height i.e., 2m above the ground. Trees with good canopy cover are their other suitable habitat. Among plants, the species was more abundant in *Ficus* sp. due to moderately high temperature and moderate moisture inhabiting in the hole. Most of the calls were given during evening hours, which is the peak hour for feeding by clinching on the outside wall of the house at night. The species mainly feed on the insects. Cockroach, moth and spider are recorded as their favourite prey. The local village men have a social taboo for the species and it is believed that its occurrence in houses bring 'good fortune' for the family. Of late, severe illegal trading of the animal has brought about drastic decline of the species from the study area.

Key words: Assam, Conservation, *Ficus* sp., Gecko, Herpetofauna, Mud house

Introduction

Tokay Gecko is an Old World species (Wilson and Porras, 1983; Meshaka, 2011) and second largest extant Gecko species (Manthey and Grossmann, 1997), second only to the skinks (Pough *et al.*, 2001). Males are generally larger than females. The body is blue-mauve, along with scattered small red and orange spots on the body (Meshaka, 2011). The skin is warty in texture and characteristic territorial vocalisation which gives rise to the Tokay Gecko's colloquial name in English ("to-kay") (Das, 2010). It is variously known as "Ko-ko", "to-to", "thok-kok" or "ko-kok shap" in Barak valley. The vocalisation is uttered in a loud, barking crescendo and can be heard from several metres away.

Tokay Gecko is distributed in South-east Asia (Peninsular Malaysia, the Philippines, Singapore, Thailand,

Vietnam Cambodia and Indonesia (excluding territory in Borneo and New Guinea), north eastern India, Southern China, Hong Kong (special administrative region (SAR) and Nepal (Das, 2010; Caillabet, 2013). Tokay Geckos have also been introduced to Belize (Meerman and Garel, 2005), the Lesser Antilles (Powell and Henderson, 2005), Madagascar (Lever, 2003), Martinique (Henderson *et al.*, 1993), Southern Brazil (Junior *et al.*, 2015) and the United States of America (Hawaii and Florida) (Lever, 2003; Meshaka, 2011). In India, it is mostly distributed in north eastern states of Assam (Das *et al.*, 2009), Mizoram (Lalrinchhana and Solanki, 2015), Tripura (Majumdar *et al.*, 2012).

They are arboreal and can be found in lowland and sub-montane primary and secondary forests as well as heavily

modified human landscapes (Manthey and Grossmann, 1997). The species is nocturnal, feeding chiefly on moths, grasshoppers, beetles, termites, crickets, cockroaches, mosquitoes and spiders (Das, 2010). This species has also been known to prey on other geckos, small rats and mice and snakes (Love, 2000; Meshaka *et al.*, 2004; Das, 2010). The study was designed to throw light on the habitat preference of the species. As the species is mostly arboreal but during the past few years it has been found to shift to human habitation (Meshaka *et al.*, 2004). This compelling situation has led us to know the reason behind its shift of habitat.

Materials and methods

Study area

The study of Tokay Gecko (*Gekko gecko*) was carried in selected villages of Dargakona Hills in Barak valley of southern Assam, where it is abundantly found. The Dargakona Hills is situated at the low spurs of Inner Line Reserve Forest (ILRF) of Barak valley. The area had dense forest represented by tropical semi evergreen type (Dutta *et al.*, 2008). The climate of the study area is sub-tropical warm and humid with average rainfall of 2700 - 2800 mm, most of which is received from the northeast monsoon during May to September. The mean maximum temperature ranges from 25°C to 38°C during July-August, while the minimum is about 10°C during December and January. The vegetation in the area is dominated by *Artocarpus chama* and *Tetrameles nudiflora* in the top canopy layer, *Ficus* spp. and *Artocarpus lacucha* in the middle layer and the lower layer is dominated by *Shizostachyum dulooa*, saplings of *Goniothalamus* sp., *Cyclostemon* sp., *Mimosa himalayana* etc. The undergrowth is dominated by *Desmodium trifolium*, saplings of *Calamus guruba*, *Daemonorops* sp., *Homalonema* sp. and seedlings of *Artocarpus chama*. Disturbance in the area has resulted in the growth of some early successional and invasive species like *Mikania mikrantha*, *Eupatorium odoratum*, *Ageratum conyzoides*, *Combretum* sp., *Desmodium trifolium*, *Borreria hispida*, *Melastoma* sp. and *Mimosa pudica*. Grass species like *Chrysopogon* sp. and *Saccharum* spp. are also present along with scattered presence of plants like *Pandanus* sp. and *Licuala* sp. (Dutta *et al.*, 2008).

The area is home to an impressive array of animals ranging from microscopic zooplanktons to some endemic primate species like the Spectacle monkey, Western Hoolock Gibbon and the white lipped pit viper. Some sympatric species of Gekkonidae family are also found in this region such as Assamese Day Gecko (*Cnemaspis assamensis*), Flat-tailed Gecko (*Cosymbotus platyurus*), Khasi Hill Bent-toed Gecko (*Cytodactylus khasiensis*), Tokay Gecko (*Gekko gecko*) and Asian House Gecko (*Hemidactylus frenatus*) (Dutta *et al.*, 2008).

The study was carried out at certain villages viz. "Irongmara" and "Borojalenga", the adjoining villages of the Assam University premises as the marker point. Irongmara is located 13.5 km away from Silchar, the district headquarter of Cachar district and 2 km away from the University. The area has an altitude of 50-58 meter above the MSL and falls under latitude of 24°41'51" and 24°46'13" N and longitude of 92°44'87" and 92°55'62" E. "Dargakona" is situated adjacent Assam University, Silchar campus. It is located one km away from the Assam University campus and lies between latitude of 24°41'34" N and longitude of 92°45'33" E. The Hills of Dargakona is in the close vicinity of numerous villages and also the Silcorie tea estate. It is also situated adjacent to the Chatla beel area of Cachar District (Dutta *et al.*, 2008). "Borojalenga Part-I" is an area located around 5 km away from the Assam University Campus and lie between 24°40'14" N latitude and 92°43'46" E longitude. The area has secondary vegetation and is having human habitations. It is also a part of the Borojalenga Tea Estate. The area has good diversity of avian fauna. Another study area named, "Dwarbond Grant" is situated around 8 km away from the Assam University campus, Silchar and lies between latitude of 24°37'52" N and longitude of 92°42'32" E. This area also has secondary vegetation and is surrounded by some monoculture areas (tea garden). The road near Dwarbond is the connective link between the two adjoining districts (i.e. Silchar and Hailakandi) and the road leads to the neighbouring state, Mizoram.

Another study area, "Irongmara" is located around 9 km away from Assam University, Silchar campus of Assam.

It lies between 24°37' 34'' N latitude and 92°41' 37'' E longitude. It is a small village surrounded by hills and tea Estate. It has a moderate weather with both semi-tropical and secondary forest. "Nakshatila" is another study area situated around 15 km away from the Assam University campus and lie between latitude of 24°33' 44'' N and longitude of 92°44' 8'' E. It is a small village adjacent to the Inner Line reserve forest and thus it has a characteristic of the dense forest near by the area. It has many lakes and ponds too. The area has many bamboo clump and dense cover of tall trees. Since the area is adjoining to Inner Line Reserve Forest, has high diversity of both flora and fauna. Most of these adjoining villages are located within Inner Line Reserve Forest Area, while some are situated in the fringe areas.

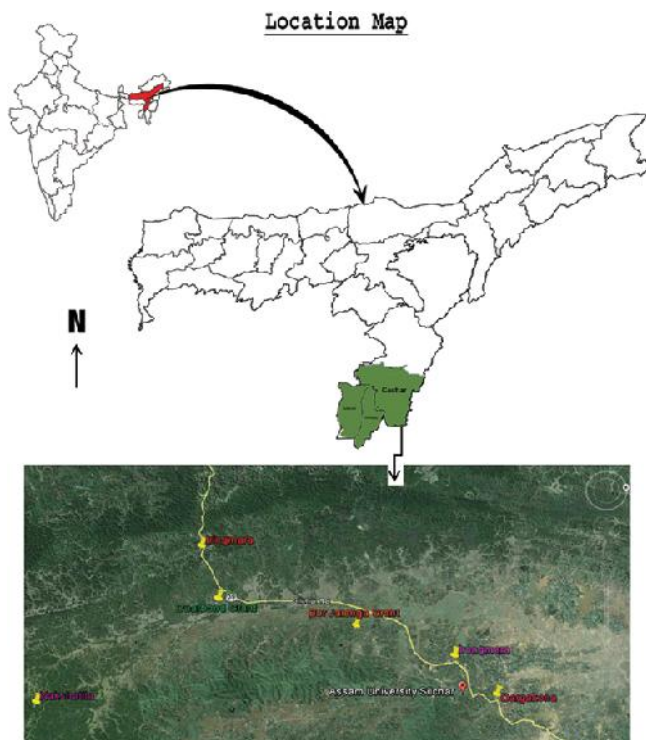


Fig. 1. Study area map of Barak valley (Cachar, Karimganj and Hailakandi) showing the location of study sites (on a satellite image from Google earth).

Survey

The study was carried out by line transect method (Singh *et al.*, 2006), considering each transect of 1 km area. A total of 14 transects were taken, i.e., 3 transects in Assam University campus, 6 transects in Irongmara, 1 transect each in

Dargakona, Borjalenga, Dwarbond Grant, Iringmara and Nakshatila (Fig. 1). Initially, a pilot survey was done to measure the area and to know the trail. Presuming there is no presence of the species, information from people were collected and subsequently the species were searched extensively. Both direct and indirect sighting (call record) were used to count the number of individuals for each transect. As Tokay Gecko is a nocturnal species, so in addition to the survey during day hours, night time survey was also conducted at desired places for 3-4 consecutive. During field study the equipment's like GPS, Data Sheets, high power charging light and torch light etc. were used.

Habitat analysis was done to measure the different characteristic of the habitat through data sheets. Parameters like as perching height (Loos *et al.*, 2012) was taken into account. Equipments like Lux meter, measuring tape and thermometer were used.

Questionnaire survey was initially conducted for understanding availability of the species and later on to know the level of threats, so that need based, remedial conservation measures could be taken.

The data was collected from February, 2014 to April, 2014. Due to the seclusive nature of Tokay Gecko and absence of their call in the month of February, extensive survey was done during March and April, 2014. Data sheets were prepared to collect all the required field information like locality, date, time, GPS points, microhabitat characteristics like,

Table 1. Showing the number of transects, number of individuals found in different study area and its sex ratio. A total of 14 transects were taken with respect to their area size. Highest individuals were recorded in Irongmara.

Study area	Number of Transects	Number of Individuals	Sex ratio		
			Male	female	unknown
Assam University, Silchar	3	29	1	17	11
Irongmara	6	59	7	13	20
Dargakona	1	5	1	4	0
Borjalenga	1	7	1	3	3
Duarbond Grant	1	3	0	2	4
Iringmara	1	4	0	3	0
Nakshatila	1	5	1	2	1

temperature, humidity etc. of each individuals was recorded. Collection of data were done by transects as well as questionnaire survey in the villages on presence of Gecko with subsequent record in the data sheets. Acoustic searching was also done; individual animal, wherever seen, were photographed. Call sound was recorded using Samsung Galaxy Fit and Micromax Canvas audio recorder whenever possible. Data was analysed to find out the encounter rates and density of the species. Identification of Tokay Gecko was done using different field guide (Ahmed *et al.*, 2009; Das, 2010)

Results

Total number of individuals found throughout the study in all transect is 112 (Table 1). Their density was found to be more in Assam University Campus followed by Borojalenga. Encounter rate was found to 6.92/km (Table 2). Tokay Gecko is distributed throughout this region and is comparatively more abundant in village areas.

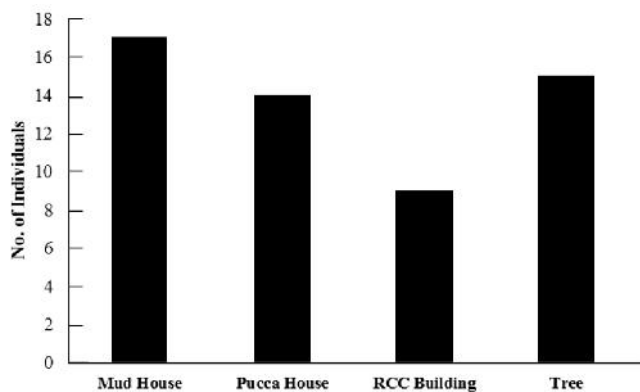


Fig. 2. Preference of habitat amongst different habitat. Gekko gecko were found both in houses and tree. Among houses, most numbers of individuals were recorded in mud house.

Tokay Gecko was found in different type of house (mud house, pucca house and RCC building). Among all these, their most preferred habitat was found to be mud house followed by RCC building (Fig. 2). Household areas were their preferred habitat preference than tree. In the village areas, it was found in the mud houses and trees. In the villages it is mostly found in mud houses due to availability of better

microhabitat as required by the species. Mud house provides moderate temperature ($\sim 32.13^{\circ}\text{C}$) and humidity ($\sim 58.30\%$) and have high chance of food availability as many insect species occur in this type of houses.

Table 2. Number of individuals and population density of *Gekko gecko* in each studied area. The population density was found highest in Irongmara followed by Assam University, Silchar. The overall population density was found to be 6.92/km

Studied area	Number of Individuals	Population Density (n/Km)
Assam University, Silchar	29	4.83
Irongmara	59	19.66
Dargakona	5	5
Borojalenga	7	7
Duarbond Grant	3	3
Iringmara	4	4
Nakshatila	5	5
	112	6.92

Tokay Gecko was found to perch on place like walls, roof and tree holes and were mostly found to perch on the walls. The average perching height in houses was found to be 2.14m with the lowest perching height as 0.41m and the highest perching area as 3.67m (Fig. 3). During the study it was found that the ratio of female is more as compared to that of male (Table. 1). Some of the individuals could not be enumerated as they were counted through call count. However, in such cases the number was considered as one. Tokay Gecko was also found in RCC buildings and 'pucca' houses in Assam University and also on trees in the Assam University premises.

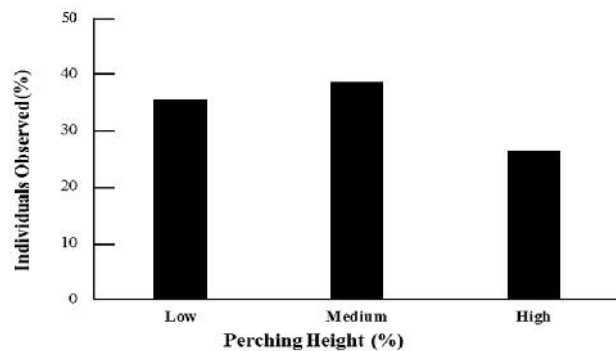


Fig. 3. Percentage of perching height of the *Gekko gecko*. Here, the variable is height and the levels were categorized as Low: 1m above the ground; Medium: 2m above the ground; High: 3m above the ground.

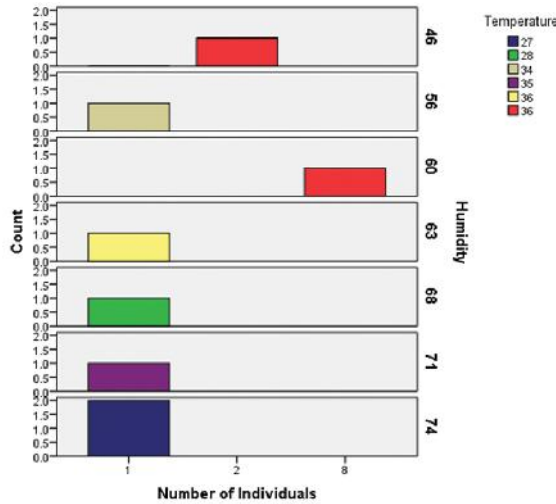


Fig. 4. Number of individual with respect to temperature and humidity. The individuals were found to be high with moderately high temperature and moderate humidity i.e., 8 individuals were found at ~36°C temperature and at ~60% humidity.

A total of 7 tree species were recorded where Tokay Gecko was found to occur. It was mostly found in the *Ficus religiosa* followed by other *Ficus* sp. and *Artocarpus* sp. The temperature was found highest and humidity was found to

be lowest in the *Ficus* sp. which means that Tokay Gecko is most significantly found in trees with high temperature and moderate humidity (Fig. 4). The basal is highest for *Ficus* Sp. has a significant relation to its abundance in this tree. Thus, the individuals were mostly found to occur in *Ficus religiosa*. It was also found in *Artocarpus* sp. due to its high canopy cover. In tree, the perching height of individuals were found to be highest to 13.7 m on *Gmelina arborea* due to presence of tree hole at great height. The phenophase of the tree were also recorded and was found that they tree were in their stage of high leaf cover in *Ficus* sp. and reproductive phase was also recorded with flowering and fruiting stage in *Mangifera indica* and *Tamarindus indica*. Habitat preferences of this reptilian species is presented in Fig. 5(A-D).

The advertisement calls was recorded throughout the day and it was found that in morning period it gives most calls at 8 am to 9 am and in the evening period it gives most calls in between 9 pm to 10 pm. They frequency of calls was found to be highest in the evening.

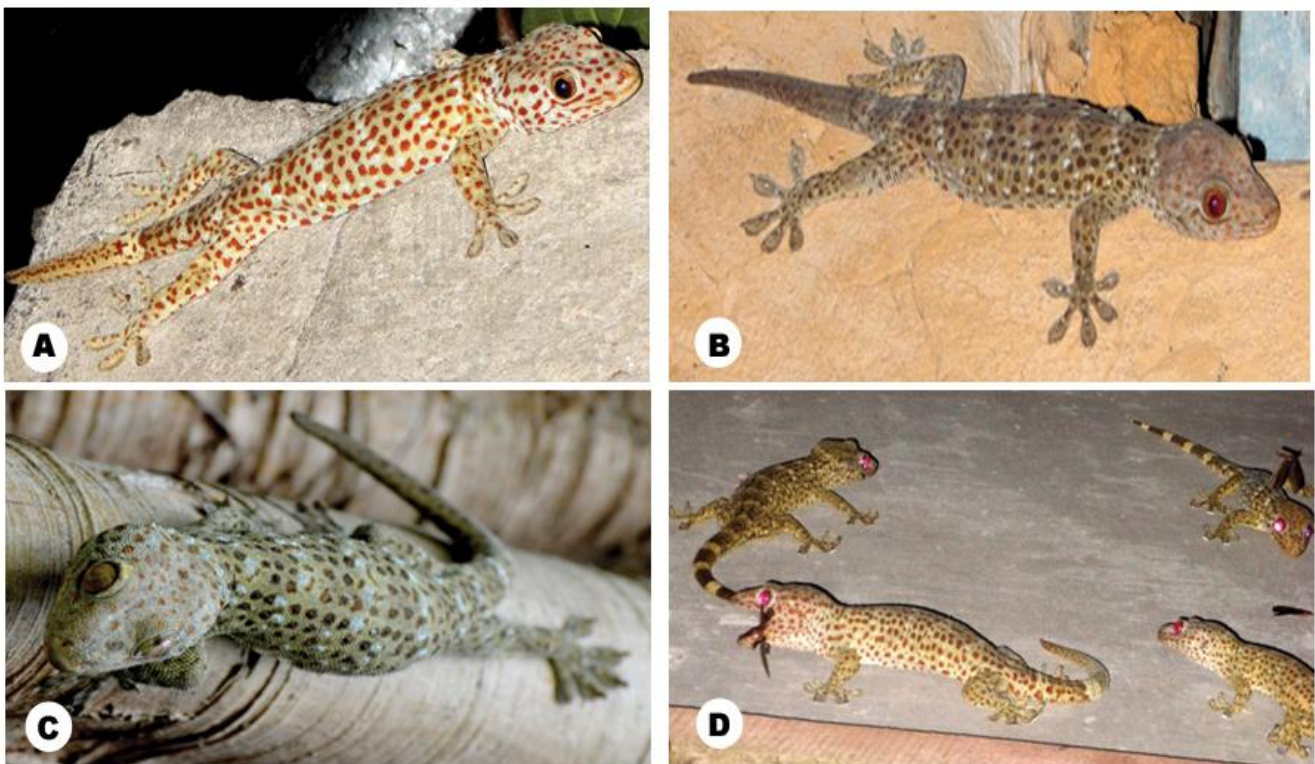


Fig. 5 . Habitat preferences of Tokay Gecko : (A) Ceilings and walls of RCC house, (B) Crevices of mud house, (C) Holes and crevices of trees, (D) Capturing preys (insects) at night on walls of house.

Discussion

The study area is located in a forest fringe and harboured a good number of Tokay Gecko population. Comparatively more population in the Assam University areas may be due to its vegetation types and the good level of protection. The area earlier had dense forest represented by tropical semi evergreen type (Dutta *et al.*, 2008) due to the species is still found in some segments of the university. Tokay Gecko was found mostly in the abandoned buildings of the university where zero level disturbances are there. It is also found in good number in other houses with human population, where they might migrated from the adjacent forest areas. Among the adjoining villages, Tokay Gecko was found mostly in Irongmara due to habitat suitability. The reason may be that the village area has a good primary food than the Assam University which is a secondary forest area. All other study sites reveal almost similar type of distribution patterns of Tokay Gecko population. The species is widely distributed in Barak valley from dense forest to even occupying the space within Institutional area and human habitat in general.

This may be that it perching height give more safety from the human if it is higher than its possible enemy. During the present study, most of the Gecko were observed at outdoor during night hours. Tokay Gecko was found outdoor then indoor at night. The reason may obviously be attributed to the nocturnal habit of the species, as during night they come out for feeding on their prey.

Habitat alteration is a big problem for the survival of the species as they prefer to live on trees with high basal area and canopy cover, but due to continuous decrease in the no. of such trees, they shift to human habitation. With the increase in the urbanisation, the mud house are also converted to pucca house and RCC buildings which give less chance of survival. Deforestation and conversion of primary forest into secondary plays a major threat. Cutting of large canopy covering trees are also affecting its population.

As mentioned, most of the calls were given during evening hours, which is the peak hour for feeding on prey

mostly insects, clinching on the outside wall of the house at night. As Tokay Gecko is mostly an insectivores and the study shows that feed on different insects, mostly the cockroach and spiders and other insects. It prefers to stay in the wall to prey the insect.

Conservation initiative is the urgent necessity, as of late, the species has become a subject of special attention for the illegal traders. The use of reptile body parts (fat, skull, bone, organs and blood) is very specific for fetish practices, as each body part is considered to be essential in traditional pharmacopoeia for various diseases (e.g., convulsions, malaria, fever, HIV-AIDS, liver problems, tetanus, induce vomiting, etc.) (SeGniaGbeto *et al.*, 2013).

Till date, Tokay Gecko is given less important from the conservation point of view. The species is not being listed in International Organization like in IUCN; not even listed as data deficient. In CITES there is a proposal to put Gecko in its Appendix but still it is not evaluated. Recently in India, there is an amendment in Wildlife (Protection) Act, 1972 and under this amendment the *Gekko gekko* is enlisted under schedule IV. Such negligence in the policy making decision has become one of the grey areas for conservation of the species. It is apprehended that if immediate attention is not given to the species, it is quite likely that the species will soon come under the endangered category.

Although, the local people have a social taboo that its presence is good for the health, wealth and welfare for the family, which is a good conservation indication from conservation point of view. Our study give us an information that mud house provide a good habitat for the species. So, people must be encouraged about the value of this kind of housing. Some conservation initiative could be taken like giving incentives to those people who have Gecko in their house so that they get encouragement to protect the species. People must be educated and make aware about the important of this species. Since, it is a first kind of work to know the habitat preference of the species, we encourage for more such work in future in broader context.

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