



Research Article

MOTION DAZZLE CAMOUFLAGE AS AN ESCAPE STRATEGY IN *HEMIDACTYLUS FRENATUS*, (COMMON HOUSE LIZARD) OF CHENNAI, TAMIL NADU

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ABSTRACT

Hemidactylus frenatus, is the common house lizard, which is frequently found in almost all Indian households. This lacertilian member is a warm blooded reptile and had been a triumphant lizard species on earth. The success of these lizards, in evolution, may be attributed to their unique ability to disguise as according to the backgrounds they inhabit. Quite a number of studies, on different species, of lizards have revealed that geckos are known to engage in "motion dazzle camouflage" to avoid predation. The present investigation was conducted to ascertain, if common house wall lizards actually engage in a similar kind of dazzle camouflage to evade aggression. Observational studies, for a period of two years spanning from 2019-2021, showed that the common wall lizards, indeed engage in one form or the other type of crypsis to avoid human or animal encounters. Results showed that, geckos which were generally found on lighter backgrounds such as light colored walls had a paler skin hue, matching to their lighter environment, and thus concealing them to certain extent. However it was interesting to note that, the lizards, which were adapted to run on the floor or adapted to move on patchy backgrounds, showed a molted appearance on their skin. They had alternate dark and light patches, on the dorsal side, extended from the neck till the tip of the tail, aiding these lizards, to conceal and avert any conflict. The molted appearance on the lizards may be because of opsin proteins present in their skin, which act as photo sensors, capable of adapting accordingly to the light intensities and there by assisting in defensive pigmentation. The blotched appearance of geckos implies that it causes the motion dazzle camouflage there by confusing the predator, about its exact location and avoids the threat. The present study, precisely suggests, that the common wall lizards of the species, *Hemidactylus frenatus* indulges in motion dazzle camouflage, as an efficient game plan to avoid and evade any adversaries.

Keywords: *Hemidactylus frenatus*, Geckos, Motion dazzle camouflage, Opsin proteins, Reptilia, Lacertilia.

INTRODUCTION

Lizards belong to Lacertilia of reptilia of the animal kingdom which play an important role, in ecosystem, as insect predators. However, not much is known about the common house gecko, *Hemidactylus frenatus*, which commonly inhabits the walls and darker corners of houses. This species, of gecko are mostly nocturnal and feed upon the insects such as mosquitoes, spiders etc. and occupy an important position in the food web. Reptiles in general, which are mostly found in tropics, seem to play an important role in effective functioning of ecosystem, by involving in gene dispersal, nutrient cycling etc., (Miranda,

2017). Wall lizards have evolved in India some 36 million years ago (Kulkarni, 2019) and it is quite interesting to note that they have been successful in evolution, without becoming extinct. House lizards ideally lay only two eggs, (Murthy, 1990) but are quite fruitful in preserving their clan. There are instances, where in certain gecko species, such as *Cyrtodactylus jeyporensis* which is ground gecko once considered to be extinct, until recently when a single male specimen resurfaced in eastern Ghats of India (Agarwal *et al.*, 2012). Unlike, this species, it is impressive to indicate that common house geckos, are victorious in surviving the harshest of the changing environmental

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conditions, all through the ages, and are able to maintain their population. Their success may be attributed, to factors, such as selection of habitat, effective camouflage strategies, due to adaptable keratinized skin (Allam *et al.*, 2019), autotomy of tails (Domínguez-López *et al.*, 2015) and may also be due to certain religious beliefs, (Sathyanarayanan, 2015) where they have been spared and not eliminated, in spite of their gross appearance and unpleasant presence. Studies by authors, like Allam *et al.*, 2019, Aubret *et al.*, 2004, strongly advocate that the success of the lizard species, in evolution, may largely be attributed to their ability to camouflage according to their habitat, due to micro ornamentation, found on their keratinized scales (Crowe and Riddle *et al.* 2016). Apart from this in another study, on agean wall lizards, by authors Kate, Marshall *et al.*, (2015) propose, that the changes in dorsal coloration, so as to match to the background of rocks, was found to be advantageous, to the lizards and therefore escape predation. Camouflage studies, involving computer simulation, by Steven, *et al.*, (2011) reveals, that most of the defensive coloration mechanisms, such as , mimicry, startle displays and warning signals, all are anti predator mechanism, so as to avoid capture and death. Related studies, on lizards, by Murali and Kondadaramaih, (2017), suggest that, a dazzling pattern on the skin of lizards, seem to distract the predator and thus avoid being captured. Based upon these studies, it is quite evident that, camouflage seems to be quite an effective approach to avoid predation, among lizards. Therefore the present study, is an attempt to understand if indeed, the house gecko of the species. *Hemidactylus frenatus* which are common in all the Indian households do actually engage in camouflage to escape and elude predation.

MATERIAL AND METHOD

Magnifying glass, mega pixel camera of the make Sanyo 24 mega pixel (VPCS1275): Observational Studies

Geckos of the species, *Hemidactylus frenatus*, are the common species, which inhabits the houses of the south India, Chennai. The behavior of these geckos was observed in the different households in the area of K.K Nagar, in Chennai. These reptiles are quite shy animals, and were found only during the night time. They were mostly visible in the house, on the walls, in very close vicinity of artificial lights. Some lizards, inhabited the darker corners of the houses, and were venturing out only during the night time during certain months of the year. My observations, spanned for two years between 2019-2021. It was often, observed that they would venture on the substrate /floor, either for mating or for foraging. Observations were made, when they were moving on the substrate and also on the wall, without interfering with their movements. They were mostly nocturnal, and were often out of their hideouts, only during the night, between 11pm-2amIST. High resolution photographs were taken, using camera of the make, Sanyo 24 mega pixel (VPCS1275) without disturbing their natural activity, during this period.

RESULTS AND DISCUSSION

In the present study, geckos, were observed, when moving on the ground, where these lizards, evidently showed the "Motion Dazzle Camouflage-Confusion Effect". My experiment on the house lizards, showed that, geckos, which live in dark places, and running on the floor for foraging, or for mating have effectively adapted to dazzle camouflage, causing an confusion effect. A distinct pattern of markings are quite visible on the gecko, of Figure 1, 2, 3 and 4. The dorsal surface of the body is marked by the specific block pattern, extending from the neck to the tip of tail. This block like pattern on the dorsal side of the skin, evidently illustrates adaptation by camouflage, employed by the common house lizards. This pattern perfectly matches with the background, in which they inhabit. As the bandings on the lizard, have very much blended with the background, of their habitat, they seem to create a motion dazzle camouflage causing a confusion effect upon predators. The markings on the gecko are extending from neck to tail, and therefore, even if the predator, seeks to grab the lizard, the motion of the gecko can cause dazzling effect, and if at all, the predator happens to catch the prey, it would be at the tail region, where in the lizards employs the technique of caudal autotomy of the tail and thus escape, the attacker. Another set of geckos, which are depicted in Figure 5 and Figure 6 show that these geckos which are light in color and do not show any contrasting banding or stripes. This may be because; these lizards are mostly adapted to vertical walls, and quite agile in escaping the predator. They feed upon the insects, mostly mosquitoes, and spiders which come in the vicinity of artificial light.

In the present observational study, I had observed, the wall lizards which have inhabited various spots in the different households of Chennai. I found them on the floor, on the exterior walls of the buildings and also on the interior vertical walls. My observations, had revealed that, the lizards, which were adapted to running on the floor, or moving on a dark background showed a molted appearance (dark patched pattern) on their dorsal surface. (Figure 1- 4). unlike the lizards which were moving on the vertical walls in the interior of the households, which were pale in appearance. (Figure 5 and 6). Geckos which were found on darker backgrounds, with poor light source or illumination, seem to show a characteristic markings, as " polygonal patches" on their dorsal surface, extending from the neck to the tip of the tail. This seems to be an adaptation to evade predation, as these lizards are more susceptible to attack, either by the humans who may accidentally bump in to them, or they may be prone to attack from external avian predators. Presence of these patches, on the dorsal surface, seem to create a confusion effect, known as the " motion dazzle camouflage" as suggested by (Steven, *et al.*, 2011). This escape strategy shown by hemidactylus may perplex the predator, by distracting the precise judgment of hunting by the predator, thereby escaping the assault. (Stevens *et al.*, 2008, 2011; Scott-Samuel *et al.*, 2011; Hughes *et al.*, 2014; Hämäläinen *et al.*, 2015; Hughes *et al.*, 2015). The ability of geckos, to change their skin pattern, to match with their background may be

attributed, to opsin proteins, present in their skin, which are known to act as photosensors (Kelly *et al.*, 2016 and Ramirez *et al.*, 2011) and aid in adaptive coloration. A study by Fulgione *et al.*, (2014) has reported the presence of opsins in the skin, of moorish gecko, *Tarentola mauritanica* which was able to blend according to the background, either becoming dark or pale accordingly. A similar kind of observations has been reported by various authors about adaptive crypsis in many vertebrates, (Rafael

et al., 2018) and in particularly observed in lizards (Kate Marsall *et al.*, 2015). From these studies it is evident, that the common house hold lizard, *Hemidactylus frenatus* which is frequently found on the walls or on the floor, seems to show adaptive coloration or molted pattern based upon the backgrounds they move and inhabit. The probable, explanation, may be that the photosensitive, opsin proteins, present in their skin, are stimulated by the light impinged on the pale and dark backgrounds, they lay upon.



Figure 1. Molted appearance seen on the dorsal surface



Figure 2. Molted appearance seen on the dorsal surface



Figure 3. pattern on the dorsal side of the skin



Figure 4. pattern on the dorsal side of the skin



Figure 5. Pale appearance of the lizards which live on a light



Figure 6. Pale appearance of the lizards which live on a light

CONCLUSION

The intensity of light is communicated to the micro ornamentation of the keratin scales, which modify or align accordingly to match the background, as molted patches if the background is dark and patchy, or they may become pale if the geckos are moving on the light background such as vertical walls. In the present study, geckos, which were observed, moving frequently upon, dark and patchy backgrounds, seem to have adapted an intelligent escape strategy, known as the "motion dazzle camouflage confusion effect" with the aid of opsins and micro ornamentation as explained before, thereby causing bewilderment to the predator. In summary it may be said, that the successful elusion and escape from predators, of these obsolete reptiles, may be attributed to the "motion dazzle camouflage" initiating a confusion reflex and causing a judgmental error of its presence to the predator's eye and there by escaping the mishap.

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