

Activity Pattern of *Tropidurus Torquatus* (Sauria: Tropiduridae) in an Urban Area of Uberlândia – MG

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Lizard termoregulation in urban environments is not well known. *Tropidurus torquatus*, a heliotherm, is common in the Campus Umuarama of the Universidade Federal de Uberlândia. After direct field observations, a transect was established to visit the shelters during 29 sunny days from March to July 1997 (65 hours of observation). Data about temperature, moisture, cloud aspects, substrate used by the lizards and solar incidence. Activity of *T. torquatus* begins at 08:00 with a peak between 10:00 and 15:00. A greater number of individuals stayed in the sun in relation to shadow. *T. torquatus* significantly preferred areas with wood and concrete to termoregulate. There was a significant correlation between the number of observed individuals and environmental temperature. Abundance of individuals was mainly affected by the temperature, despite the correlation with humidity. *T. torquatus* activity is also affected by structural aspects of study area, as shady places shift during the day.

Index terms: Thermoregulation. Environmental factors. Lizards. *Tropidurus torquatus*.

Padrão de atividade de *Tropidurus torquatus* (Sauria: Tropiduridae) na área urbana de Uberlândia – MG. A termoregulação de lagartos em ambientes urbanos ainda não é bem conhecidos. *Tropidurus torquatus* é heliotérmico e abundante no Campus da Universidade Federal de Uberlândia. Após observações diretas no campo, foi estabelecido um transecto onde se visitou abrigos dos lagartos durante 29 dias ensolarados, de Março a Julho de 1997 (65 horas de observação). Foram feitos registros de temperatura, umidade, aspectos de nebulosidade, tipos de substratos utilizados pelos lagartos e incidência solar. A atividade de *T. torquatus* se inicia por volta das 08:00 com um pico entre 10:00 e 15:00h. Verificou-se um maior número de indivíduos ao sol em relação à sombra. Os lagartos preferiram significativamente termoregular em áreas de madeira e concreto. Notou-se uma correlação significativa entre o número de indivíduos observados e a temperatura do ar. O número de avistamentos foi influenciado principalmente pela temperatura do ar, apesar de haver correlação com a umidade. A arquitetura da área estudada também influenciou o período de atividade de *T. torquatus*, pela variação das manchas de sol nos diferentes horários do dia.

Descritores: Termoregulação. Fatores ambientais. Lagartos. *Tropidurus torquatus*.

Behavior is an outcome of physiologic processes that depend mainly on biochemical reactions to occur (Slater & Halliday, 1994). In ectothermic animals, the chemical and biochemical reactions depend on the temperature as the main factor affecting the behavior (Bennett, 1980). Lizards modify the corporal temperature varying its exposure to sunny and shaded places or hot and cold microhabitats (Bogert, 1949; Huey & Slatkin, 1976; Pough, Heiser, &

Mcfarland, 1993). They usually modify their position and posture in relation to the sun and the background to termoregulate (Crowley & Pietruszka, 1983; Heath, 1965; Teixeira-Filho,

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Rocha, & Ribas, 1995). The lizard activities demand time and energy, what makes termorregulation a difficult process when the gain of temperature of the atmosphere is slow (Huey, 1974). Therefore, lizards are animals that use the background to optimize their metabolic processes for its activity. Its dynamics of use of the substrate is specific in relation to the climate of the area, influencing its metabolic reactions directly and therefore its development (Crowley & Pietruszka, 1983; Hardy, 1981; Prosser, 1973; Rocha, 1995).

Tropidurus torquatus is heliothermic and abundant in its habitat (Van Sluys, 1992). They are found in open areas of tropical savannas (cerrado), caatingas and sandbanks of Brazil (Rodrigues, 1987), where there are higher insolation rates, however this lizard can also be found in urban area. *T. torquatus* can be sighted on the different types of structural habitat: rocks, logs of trees, fallen logs, firewood piles, wood fences, brick fences, outdoors house walls, in the ground, etc (Rocha, 1991; Rodrigues, 1987). Species of *Tropidurus* present "sit down and wait" foraging strategy (Huey, 1974; Rocha & Bergallo, 1994; Van Sluys, 1993; Vanzolini, 1980) what increases its dependence in relation to the substrate. Although common in Brazil (Rodrigues, 1987), even in urban areas, and of relative easiness for the observation, *Tropidurus* is not very studied in the urban ecosystem.

In this study we investigated the period of activity of *T. torquatus* in an urban area relating it with climate and substrate type in the Campus Umuarama of the Universidade Federal de Uberlândia (UFU).

Material and methods

The study was conducted in the urban area of Uberlândia (18°55 ' S; 48°17 ' W), state of Minas Gerais, at the Universidade Federal de Uberlândia. The studied campus is placed in the Umuarama quarter, an outlying neighborhood where, although there is prevalence of buildings (mainly houses), there are many arboreous squares and unused plots

of land where grasses and bushes of the cerrado prevail.

The climate in the study area is rainy tropical, characterized by a dry winter and rainy summer. The winter (June to August) presents a monthly mean temperature of 18°C and pluviosity around 60mm, while the summer (December to February), presents monthly mean temperatures from 20,9°C to 23,1°C, and pluviosity between 1500 to 1600 mm.

We made a previous study of the campus area in which we got up data about the existence of shelters of *Tropidurus torquatus* to settle down a transect. The total traveled area was of approximately 1000 meters and it included 12 shelters. Beside each shelter there were at least two different substrata that could be used by lizards: earth and concrete; concrete and wood; wood and earth; wood, earth and iron; wood, concrete and earth.

To know if lizards have preference by some type of substrate we quantified randomly the disponibility of different material in the habitat. So, 140 random sites in transect were chosen by calculator in a random sequence and observed in the field to characterize the type of material disponible in each of 140 points. The data on disponibility of materials used by lizards to termorregulate was analyzed by G-test.

The transect and so, the shelters, were visited between March and July of 1997, covering, for 5 times, the thirteen hours of daily insolation (06:00 to 19:00h) totaling 65 hours of observation (each visit = one man for 1000m for 1h).

In each hour of observation the shelters and its surroundings were inspected and when the lizards were sighted out of the shelters, these were considered in activity (termorregulation or foraging). Before investigating the transect we collected data of air temperature and humidity (collected through a thermometer of humid bulb) and took the percentile of cloud cover of the sky (Tubelis & Nascimento, 1980). The meteorological data were collected daily (Posto Agroclimático do Campus Umuarama - Uberlândia). In the shelters where the lizards

were in activity we observed the substrate type and the occurrence or not of insolation. We used Pearson correlation (Zar, 1984) in the analysis of the data.

Results and discussion

The study area presents different types of substrate with different dynamics of thermal conductivity. The heat of the substrate influences the temperature of the saurios (Hardy, 1981; Pough et al., 1993) and the heliothermic character of the genera *Tropidurus* make possible many supposition about its ecology in different substrates. In the studied urban area, the period of activity of *T. torquatus* began about 08:00 h, with a peak among 10:00 and 15:00 h, when the number of individuals began to decrease (Figure 1), coinciding with the hottest hours of the day (between 22 and 25°C) (Figure 2). This result corroborates studies facts of another *Tropidurus* species in natural conditions (Van Sluys, 1992).

The study showed that although earth predominate in the studied area (55,12%) followed by concrete (40,94%), wood (3,15%) and metal (0,79%), lizards significantly preferred to termoregulate in wood (48,98%) followed by concrete (43,88%), earth (4,08%) and finally metal (3,06%) ($G = 49,2924$; $p < 0,001$) (Figure 3). So, *T. torquatus* significantly preferred wood instead of the other possible choices.

The capacity of conservation of heat by the substrate can determine its use viability for termoregulation by *T. torquatus*, as members of this genus needs relatively high temperatures for the beginning of the activity (Rodrigues, 1987). In that sense, the wood conductivity of heat ($K = 0,0002 \text{ cal/cm-seg}^\circ\text{C}$) and that of concrete ($K = 0,0004 \text{ cal/cm-seg}^\circ\text{C}$) (Goldemberg, 1968) make these materials favorites for these animals. Wood and concrete become quickly warm with the reception of atmosphere calorific energy, what makes them very important to the beginning of activity of ectothermic animals, since it facilitates the gain of heat for the individual when in activity on the same ones. However, this physical property of wood and concrete brings a fast

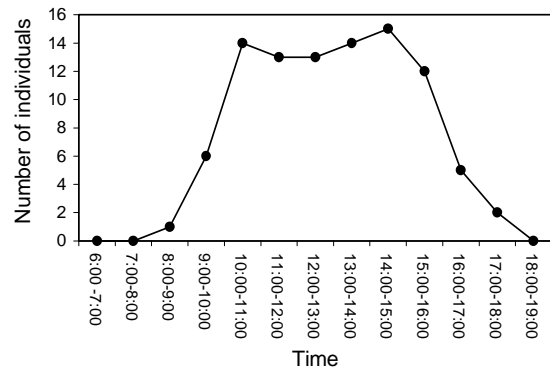


Fig. 1 – Abundance of *T. torquatus* in different hours of the day (N = 5 observations for each hour and in different days).

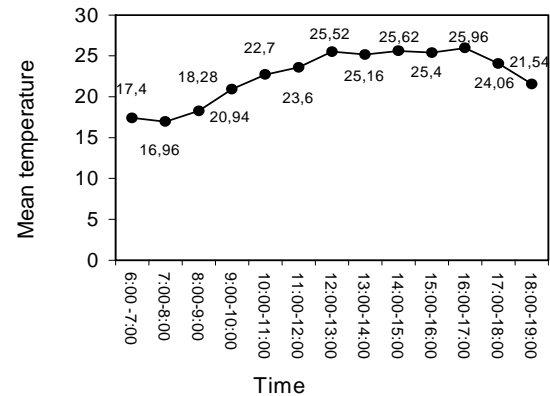


Fig. 2 - Temperature average in different days of observation (N= 5 observations for each hour).

cooling of the substrate after the insolation period. The good conductivity of heat of the substrate used by *T. torquatus* in the campus was perhaps mainly responsible for the observed abrupt increase in number of observations of lizards, until reaching an activity plateau (10:00-14:00), with posterior accentuated fall (15:00).

Tropidurus itambere is a close relative of *T. torquatus* and both tend to overlap in geographical distribution in extensive areas in Central Brazil (Rodrigues, 1987). *T. itambere*, in the winter (dry season), has a unimodal standard activity, presenting a gradual increase in the number of individuals that reaches its top around 13:00h,

and decrease between 14:00 and 17:00h (Van Sluys, 1992).

The characteristics of the *T. torquatus* chosen substrate, wood, promotes a concentrated distribution and an increase on observation earlier, at least in the winter, in comparison to *T. itambere* studied in the field in the same season of year (Van Sluys, 1992). Besides, it demonstrates the importance of the environmental substrata in the termorre-gulation of those animals.

The concentration of activity at noon observed in the studied lizards can also be related with the architecture of the studied area, that presents high buildings reducing areas of sun spots and making long shade periods during the day, if compared to the open savanna neighbors areas. So the change in sun position reduces shadow areas between 10:00 and 14:00h, enhancing the heliotherm behavior of the genera *Tropidurus*. This was verified by the largest number of individuals in the sun (69,2%) in relation to shadow (38,8%) in this period (Figure 4). In terms of climatic effects, there was no significant correlation between the period of activity of the lizards and the percentile of cloud cover, because every type of cloud (Tubelis & Nascimento, 1980) allow sun light passage enough to *T. torquatus* termorre-gulate.

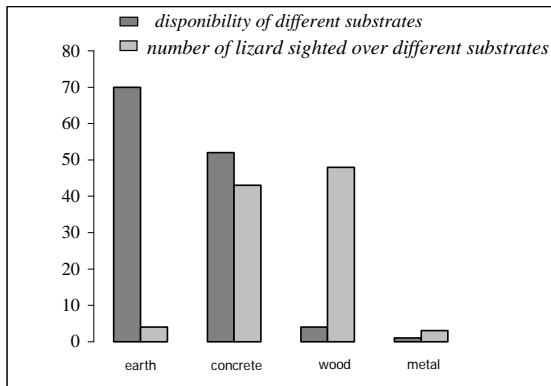


Fig. 3 – Number of *T. torquatus* observed in different substrates (totaling 98 observations) in comparison with substrate disponibility.

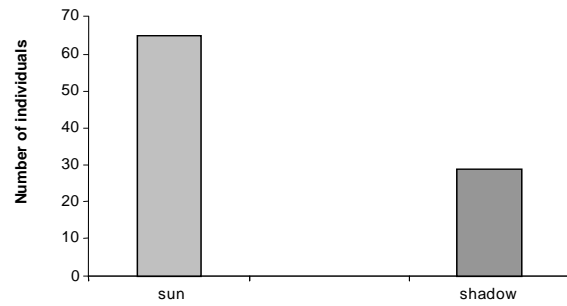


Fig. 4 – Number of *Tropidurus torquatus* observed in activity in sun and shadow at Campus Umuarama of Universidade Federal de Uberlândia, from March to July of 1997 (N= 98).

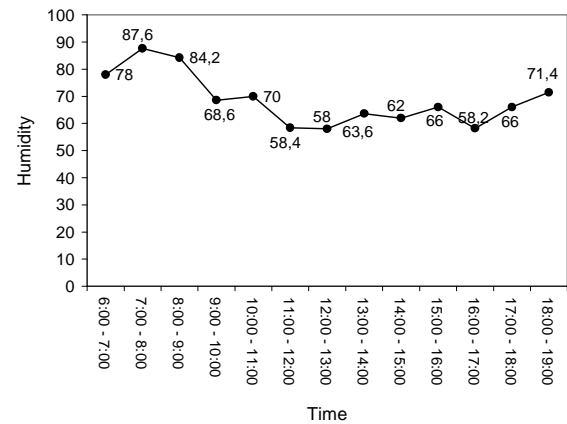


Fig. 5 – Humidity average in each hour of observation, in differents days (N= 5 observation for each hour).

As temperature increases, air humidity decreases (Figure 2 and 5). Humidity is significantly correlated to the highest number of lizards observed (Figure 06). There was a positive correlation between the number of individuals of *T. torquatus* observed and the temperature (Figure 7). This was verified by the concomitant decrease of the temperature and the decrease of the number of individuals, what turns the temperature the most important factor to determine the activity of those lizards.

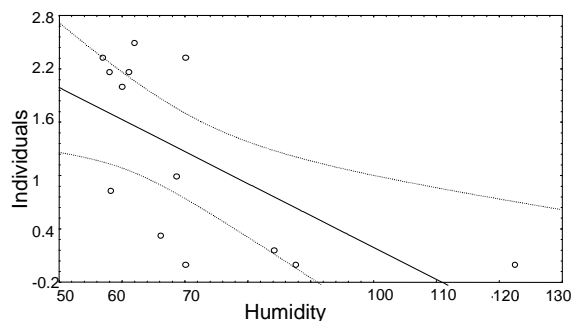


Fig. 6 – Correlation (Pearson) between the average number of *T. torquatus* and the humidity average (lizard = $3.814 - 0.036 \text{ humidity}$; $r = -0.635$; $p < 0.05$).

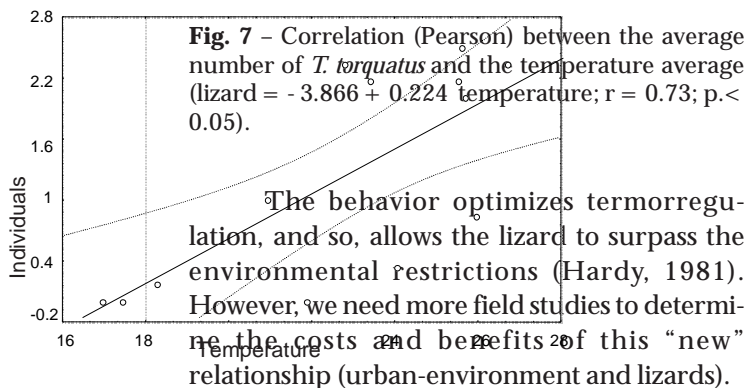


Fig. 7 – Correlation (Pearson) between the average number of *T. torquatus* and the temperature average (lizard = $-3.866 + 0.224 \text{ temperature}$; $r = 0.73$; $p < 0.05$).

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