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OBSERVATIONS ON THE NATURAL HISTORY OF THE MEDITERRANEAN GECKO, *HEMIDACTYLUS TURCICUS* (SAURIA; GEKKONIDAE) IN NORTHWESTERN ARKANSAS

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ABSTRACT

The Mediterranean gecko, *Hemidactylus turcicus*, is a small nocturnal lizard introduced into the U.S. A stable population on the campus of Westark Community College in Fort Smith, Sebastian County, Arkansas represents the northernmost U.S. population presently known. We report data on microhabitat usage, feeding behavior, reproduction, and activity patterns. This gecko is active on the outside of buildings during warm months of the year and occasionally inside buildings during the winter. It is most abundant on buildings with many crevices that are used as daytime retreats. It avoids direct illumination of artificial light and usually perches at heights greater than 7.5 meters. Geckos are not territorial during their nocturnal foraging period and employ a sit-and-wait tactic to capture insect prey. Eggs are laid in mid-June and hatch in mid-August; this reproductive season is later and shorter than it is in more southern populations. Communal nesting may be employed. A nightly bimodal activity pattern was observed with peaks of activity at 2300 and 0300 after which activity declined rapidly.

INTRODUCTION

The Mediterranean gecko, *Hemidactylus turcicus*, (Gekkonidae), is a small, nocturnal lizard native to the Mediterranean area. It has been introduced into the western hemisphere and has colonized many areas; typically inhabiting buildings and other structures. In the United States, it occurs in scattered populations along the Gulf Coast from Florida to Texas, and in Arizona (Robinson and Romak, 1973; Davis, 1974; Conant, 1975). There is also a population in northern Texas (Selcer, 1986) and one in Norman, Oklahoma descended from released animals (Sievert and Sievert, 1988).

A population of *Hemidactylus turcicus* has existed on the campus of Westark Community College in Fort Smith, Arkansas (Sebastian County) since at least 1972 (T.M. Buchanan, *pers. obs.*). This is the northernmost U.S. population recorded and is the first recorded for Arkansas (Paulissen and Buchanan, 1990). There are only a few studies of the natural history of *H. turcicus* and these were on populations in the southernmost parts of the U.S. range (Rose and Barbour, 1968; Selcer, 1986, 1987). Data collected from a northern population add to the natural history information available for *H. turcicus* and permit comparison with southern populations which may help elucidate the factors that limit the range of this species.

MATERIALS AND METHODS

The central campus of Westark Community College occupies approximately 8 ha in northeastern Fort Smith. The ten buildings are one or two stories tall and are constructed of brick and cement; all have outside lights. Geckos were found on all buildings except the library which was built in 1987. Geckos were active on outside walls at night and generally hid during the day; they were occasionally found inside buildings during both day and night.

Most observations were made of geckos inhabiting the Science Building, a two story brick building with a large lecture room addition made of stucco and small rock. The south side of the building faces a lighted parking lot and a greenhouse is connected to the middle of the wall. The north wall faces an unlighted lawn. The east and west walls

both have doors and are lit by outside lights on the building; there is also a lighted entrance on the south side.

Data were collected in September and October 1988 and April through June 1989. Additional observations made over several years are also reported. Geckos were censused three to five times a month between 2130 and 2330 CDT. These censuses consisted of walking slowly around the building and locating geckos with a flashlight. For each gecko seen, the following data were recorded: time, exposure (north, south, east, west), approximate height on building (<1.5 m, 1.5-4.5 m, 4.5-7.5 m, >7.5 m), amount of illumination on the lizard (total darkness, partial illumination, full illumination, or illumination from a light fixture upon which the gecko was resting), and substratum (brick, stucco and rock, cement, glass). The entire nocturnal activity pattern was quantified on 4-5 June 1989 by counting lizards at the beginning of each hour from 2000 to 0600 CDT. Data on snout-vent length (SVL), weight, and reproductive condition of females were obtained by capturing geckos from several buildings during fall 1988 and spring 1989. All lizards were examined at the time of capture and released.

RESULTS AND DISCUSSION

Adult male and female geckos did not have significantly different SVL in Fall 1988 (mean \pm 1 SD: males 51.9 mm \pm 2.30, n=8; females 50.4 mm \pm 7.74, n=8; t-test P=0.31). Measurements were therefore pooled for the 1989 sample (mean SVL 54.1 mm \pm 3.64, n=22; mean weight 3.5 g \pm 0.81, range 2.3-4.5 g, n=13). These SVLs are similar to those reported for geckos in Florida (Frankenberg, 1984) and Texas (Selcer, 1986).

Geckos were more abundant on buildings with outside features that could be used as daytime retreats such as fuseboxes, pipes, vents, plates supporting light fixtures, and crevices formed at the angles where walls come together. Buildings that had relatively few of these features had fewer geckos. Geckos on the Science Building occupied some microhabitats more than others (Table 1). They were found less frequently on the south wall than other walls despite the fact that this wall was longer than either the east or west walls. This is probably because geckos avoid exposure to direct illumination. Geckos usually moved to cover when exposed to a flashlight beam and only 1% of geckos were found in direct light (Table 1). The south wall of the Science Building is well illuminated; the few geckos seen on the south wall were on or near the greenhouse which cast shadows in which the geckos could be found. The majority of geckos were at heights of greater than 4.5 m, very few were found 1.5 m or

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lower; probably because most of the daytime retreats were located higher up on the Science Building. Nearly 75% of the geckos perched on brick and most of the remainder were on stucco and rock. Geckos were seldom found on glass, metal, or smooth cement possibly because these surfaces do not provide good footing. When these smooth surfaces are omitted from consideration, the abundance of geckos on brick and stucco parallels the relative area of these two substrata on the Science Building.

Table 1. Distribution of Mediterranean geckos among features on the Science Building on the campus of Westark Community College. Percentages refer to the percentage of geckos found associated with that feature, N=100 observations.

EXPOSURE	HEIGHT (m)	LIGHTING	SUBSTRATUM
North 20%	<1.5 7%	Total Darkness 33%	Brick 72%
East 27%	1.5-4.5 24%	Partial Light 55%	Stucco 22%
South 18%	4.5-7.5 31%	Direct Light 1%	Cement 1%
West 35%	>7.5 38%	Light Fixture 11%	Glass 5%

Geckos were occasionally found on light fixtures projecting from the walls of the Science Building. The lights were designed to shine light vertically but not horizontally so a lizard perched at the base of the light was not illuminated. Presumably geckos near lights were hunting insects, though heat from light and the crevice formed by the attachment of the light to the wall may also attract geckos.

Other studies suggest that male geckos are highly territorial and defend preferred foraging areas (Behler and King, 1979); however, there was no evidence of territoriality or agonistic behavior among geckos in this study. Geckos were often found very close together, sometimes within two body lengths of each other. Similar results were noted in a study of *H. turcicus* in Florida (Frankenberg, 1982; 1984) in which there were very few agonistic interactions during the night foraging period and geckos were often found together in groups of three to five. He also noted that vocal activity, presumably a form of social communication, occurs in late afternoon while lizards are still in daytime retreats and that this species exhibited male dominance. It is not known if this is true for the Westark population.

The Mediterranean gecko is a classic sit-and-wait forager (Huey and Pianka, 1981). Most geckos appear to move little during their night activity period; it is common to find a gecko in the same spot one or two hours after initial observation. One gecko observed during the all night census stayed within an area of about 900 square cm for six consecutive hours. Prey capture involves moving slowly to within two centimeters of an insect then quickly rushing at it and catching it in the mouth. Though no diet studies were made, several geckos had 2 cm moths in their mouths. Moths are attracted to lights but some cease flying and rest on walls one to two hours after sunset and so are available to geckos.

Only two gravid females, indicated by large eggs seen through the transparent ventral skin, were captured during spring 1989. The first was found on 28 May and during handling, the tail was accidentally broken making this female easy to identify since no other female found during the study had a broken tail. She was recaptured on 9 June and was still gravid; the two eggs had acquired shells as indicated by their white color visible through the skin. On 23 June she was recaptured again and no eggs were present. The second gravid female was captured only once on 9 June; two large white shelled eggs were visible in her abdomen. These observations suggest that oviposition in the Westark population occurs in mid-June. Hatchlings appeared the third week of August in 1988 and 1989 and the second week of August in 1990. This indicates an incubation period of seven to eight weeks, slightly longer than the 40 day incubation period reported in a Louisiana population by Rose and Barbour (1968). The entire reproductive season appears to be slightly later in the Westark population than in southern populations; Selcer (1986) reported most hatching occurs in July in southern Texas, and Rose and Barbour (1968) reported the reproductive season as April to August in Louisiana.

Previous studies indicate *H. turcicus* females produce two and perhaps three clutches a year in southern populations (Rose and Barbour, 1968; Selcer, 1986; 1987). We do not know if the Westark geckos produce multiple clutches, however, a gravid female was caught on 7 August 1987 suggesting either a second clutch or a late first clutch is produced.

One nest was located in June 1986 between two bales of peat moss inside the greenhouse. There were six eggs, five of which were healthy (the sixth was dried). Because *H. turcicus* produces two eggs per clutch (Selcer, 1986), the presence of six eggs in one nest indicates communal nesting. Southern populations of this species also nest communally (Davis, 1974; Trauth, 1985; Selcer, 1986; Dundee and Rossman, 1989).

The hourly activity of *H. turcicus* on the Science Building on 4-5 June is shown in Figure 1. Lizards were not active until after sunset. Peak activity occurred from 2300-2400 and remained high to a second peak at 0300-0400; after 0400, lizard activity dropped rapidly so that all geckos had retreated to daytime retreats before sunrise. The bimodal activity pattern of the Westark population is reminiscent of that of diurnal lizards in summer (Kay, 1972; Vitt and Ohmart, 1977; Paulissen, 1988). However the second peak in diurnal lizard activity patterns is correlated with the drop in ambient temperatures to within the "preferred temperature" range during the late afternoon. The ambient (air) temperature profile did not parallel the gecko's bimodal activity pattern (Fig. 1) suggesting that temperature was not the primary determinant of activity patterns. The pattern of activity observed in the Westark population differs from that observed in other populations. In Florida, peak activity occurred between 2000 and 2200 and all activity ceased by 2400 (Frankenberg, 1984); in Louisiana peak activity occurred just after dark (Rose and Barbour, 1968). These differences may reflect seasonal alterations in activity patterns; the data from Florida were collected in September and the Louisiana data were collected over several months.

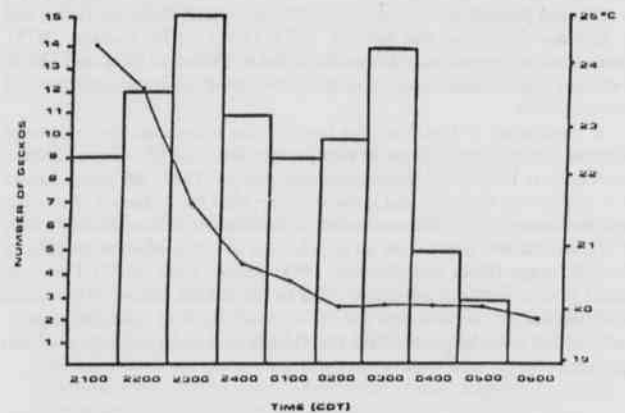


Figure 1. Night activity pattern of the Mediterranean gecko on the Science Building on the night of 4-5 June 1989. Number of geckos is shown by the histogram bars using the left vertical scale; air temperature is shown by the line using the right vertical scale. Air temperature was recorded at the beginning of each hourly census. Sunset was at 2040; sunrise at 0610.

In spring 1989, geckos were first seen on the outside of buildings on 18 April; they remained active outside until about the first week of October. During the winter, juvenile geckos were occasionally encountered inside heated buildings, usually in secluded places such as janitor's closets and behind cabinets. The number of geckos seen during the winter was much lower than the number seen on outside walls during the warmer months. This contrasts with southern populations of *H. turcicus* which may be active more or less year round, though activity is reduced during the winter (Rose and Barbour, 1968; Davis, 1974; Selcer, 1986).

Overall, the natural history of the Mediterranean gecko population at Westark Community College is very similar to that of other populations. The major differences are that the Westark geckos reproduce slightly later in the year and are less active in the winter than southern conspecifics. The Mediterranean gecko's ability to live on and in buildings should allow it to become established in any city in Arkansas to which it is introduced.

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