Hindawi Publishing Corporation
International Journal of Zoology
Volume 2014, Article ID 698216, 4 pages
http://dx.doi.org/10.1155/2014/698216

Research Article

The Diet and Sexual Differences of the Caspian Bent-Toed Gecko, *Tenuidactylus caspius* (Squamata: Gekkonidae), in Northern Iran

Vida Hojati and Reza Babaei Savasari

Department of Biology, College of Biological Sciences, Damghan Branch, Islamic Azad University, Damghan 3671639998, Iran

Correspondence should be addressed to Vida Hojati; vida.hojati@gmail.com

Received 29 July 2014; Revised 24 August 2014; Accepted 1 September 2014; Published 8 September 2014

Academic Editor: Eugene S. Morton

The Caspian bent-toed gecko, *Tenuidactylus caspius*, is one of the most common nocturnal lizards of Iran with widespread distribution especially in the northern provinces. This research was done in order to study the diet and sexual dimorphism of this species in Sari County from 5 May to 20 October. During this research, 40 specimens of them including 20 males and 20 females were studied for diet and 140 specimens including 70 adult males and 70 adult females were studied for sexual dimorphism. Prey items identified were insects that belong to 15 species of 8 families and 6 orders. The most common prey items were *Culex pipiens* and *Musca domestica*. There is no significant difference between diets of males and females. Results show that the adult males in addition of having the apparent femoral and preanal pores are heavier than females and have larger body, head, and tail length.

1. Introduction

Sexual dimorphism in size, morphology, coloration, and aggression is widespread among lizard species and may result from three mechanisms: sexual selection, reproductive role mechanisms (e.g., fecundity selection), and intersexual food competition [1, 2].

Variation among male lizards in sizes of bodies, heads, and other structures in coloration and in courtship and aggression displays may be related to differences among males in reproductive success [3]. Larger male lizards win male-male aggressive encounters and gain greater access to females or they are chosen as mates either because of their size or characteristic that is correlated with large size [4]. However, sexual body size dimorphism may have causes other than sexual selection. The differential mortality between the sexes may cause an apparent size dimorphism because of unequal age of the sexes [5]. Males moving out in search of females must have a high rate of encounter with predators, so large body size of males would enhance their changes of evading some predators and of being too large for other. Two other possible reasons for males being larger than females are intersexual food resource partitioning [6] and forcible insemination of females [7].

The Caspian bent-toed gecko, *Tenuidactylus caspius*, is one of the most common lizards in northern Iran. This species is nocturnal and oviparous. Recently, some studies have been done on sexual dimorphism of lizards of Iran [8, 9]. Also, there is no work on the diet of this species.

This study was conducted to provide information on sexual dimorphism and food habits of *T. caspius* in northern Iran.

2. Material and Methods

2.1. Study Area. The study locality was Sari County (36°32 N, 54°7 E), in the Mazandaran province in northern Iran, located on the southern coast of the Caspian Sea. Sari is situated inland from the Caspian Sea in the semitropical coastal plain to the north of the Alborz Mountains. The rainy season lasts about seven months, with an annual precipitation of more than 1,110 mm, giving the countryside a green and lush appearance. The climate of this area is wet and temperate (during this study, the mean temperatures of the coldest

and warmest seasons were 1.6°C and 22.5°C, resp.), with the most dominant plants being grassy species belonging to the families Asteraceae and Poaceae [10].

2.2. Sampling. Sampling took place periodically during the activity period of this species from 5 April to 20 October 2011. Sex determined on the basis of preanal and femoral pores which were present in males and absent in females. All specimens were collected by hand, with the aid of a torch, at midnight. Most of the specimens were collected from the walls of the old buildings and gardens. In total, 70 adult and mature females were captured (five specimens per sampling period). Our observations show that males and females reached to the sexual maturity when the body length (SVL) approached 42 and 45 mm, respectively, but we tried to capture specimens which had attained a larger SVL to be sure they were sexually mature adults. Some of specimens were kept in terrarium in order to study food habits.

2.3. Methods. The specimens were transferred alive to the zoology laboratory of Islamic Azad University, Damghan Branch. *W* (weight), SVL (south-vent length), TL (tail length), and HL (head length) were measured by caliper 0.02. Body coloration and scales patterns were studied. Some of them were anaesthetized by chloroform and anatomized. Materials were extracted from their stomach. Insects were identified by valid keys [11]. Data were analyzed by SPSS 18 software, descriptive and t-test ($P < 0.05$).

3. Results

The main food sources for *T. caspius* are insects (Figure 1). Also, cannibalism was observed sometimes between specimens, but if the ingested prey is too large, they will vomit it by the next day. Prey items identified and number of items found in the stomachs of males and females are shown in Table 2. The most common prey item in this species was *Culex pipiens*. Diet composition shows no differences between males and females. Individual lizards may only need two or three significant prey items throughout a month. The neonates of this species will take young/small insects.

Sexual dimorphism is distinguishable by larger weight, size of body (SVL), head (HL), and tail (TL) of males (Figure 2). There was no significant difference in body coloration or scales patterns. Results of histological studies on ovaries and testes of some specimens show that males reach to sexual maturity in smaller size than females. Statistics analyses of characters in males and females of *T. caspius* are shown in Table 1. Results show that there is a significant difference in measured characters in *T. caspius* ($P < 0.05$).

4. Discussion

Earlier, it has been reported that the ants are the most common prey item for most of insectivorous lizards of Iran such as *T. caspius* [12], but, in this research, we observed that the ants are not the favorite items for this species and they prefer other items.

Figure 1: Capturing the prey by *T. caspius* at midnight in Sari, Iran Babaei Savasari, 2011.

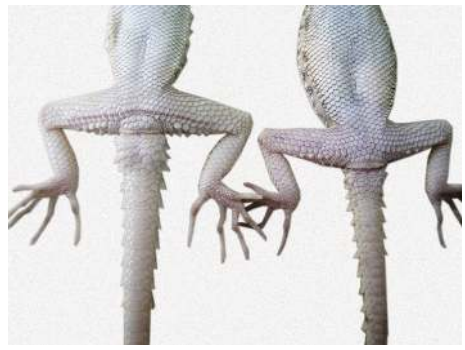

Figure 2: The ventral surface of *T. caspius*. Femoral and preanal pores are present in males, the left side one Babaei Savasari, 2011.

Male biased sexual dimorphism in head size is common in lizards and is thought to evolve through not mutually exclusive, selection pressures [13]. In *T. caspius* of studied region sexual dimorphism of head size was observed. In other study on *T. caspius* in Mashhad County located in Khorasan-Razavi Province of Iran, there was no any significant sexual dimorphism [14]. This difference is probably because of different the localities or morphometrical differences between two populations of this species.

There is a little study on sexual dimorphism of gekkonids of Iran. In *Tropiocolotes helenae*, an endemic gecko of the western Iranian plateau, males are much smaller than females, but with relatively longer tails and more colour bars on the tail, together with more subtle shape differences [8].

Sexual dimorphism in head size was reported in a small gekkonid lizard, *Hemidactylus turcicus* that is native to the Middle East and Asia [15]. Males exhibited a mixture of isometric and positively allometric patterns of head size increase, whereas females exhibited isometric and negatively allometric patterns. There were no differences in average meal size or in any single dimension of prey size for similar sized males and females. In *H. turcicus*, sexual dimorphism in head size is not the result of diet partitioning but instead of differential growth patterns following sexual maturity in males and females [15]. In fact, females devote their energy to

Table 1: Statistics analyses of characters in males and females of *T. caspius*.

Characters	Sex	*N*	Mean ± SE	Std. deviation	*t* value	*P* value
Weight (g)	Female	70	4.68134 ± 0.129584	1.084181	−5.055	0.000
	Male	70	5.74601 ± 0.166060	1.389358		
SVL (mm)	Female	70	58.4993 ± 0.473824	3.964295	−4.976	0.000
	Male	70	62.4266 ± 0.63125	5.281432		
Tail length (mm)	Female	70	80.2981 ± 0.645305	5.399010	−4.037	0.000
	Male	70	84.7251 ± 0.88669	7.418561		
Head length (mm)	Female	70	11.5347 ± 0.239040	1.999955	−2.542	0.012
	Male	70	12.4289 ± 0.258000	2.158581		

Table 2: The number of prey items identified in the stomachs of males and females of *T. caspius*.

Order	Family	Scientific name	Numbers of prey items	
			Males (n = 20)	Females (n = 20)
Diptera	Culicidae	*Culex pipiens*	8	10
	Muscidae	*Musca domestica*	6	5
Lepidoptera	Noctuidae	*Plusia gamma (Autographa gamma)*	2	1
	Noctuidae	*Pseudaletia unipunctata*	1	1
	Pyralidae	*Chilo suppressalis*	1	1
Orthoptera	Gryllidae	*Gryllus desertus*	1	1
	Gryllidae	*Gryllus domesticus*	1	1
Blattaria	Blattidae	*Periplaneta americana*	1	1
Hemiptera	Cicadellidae	*Cicadella viridis*	1	1
Hymenoptera	Formicidae	*Cataglyphis nodus*	1	1
		Camponotus sp.	2	1
		Tetramorium sp.	2	3
		Crematogaster sp.	2	2
		Messor sp.	2	2
		Monomorium kusnezov	2	2

reproduction after maturation whereas males devote it to the continuing of the growth [15].

Butler and Losos investigated two hypotheses about why a relation between habitat use and extent of sexual dimorphism in shape might occur: (1) sexes adapt differently to the environment, and (2) intersexual niche partitioning occurs with sexes that are similarly adapted [16].

These correlations between sexual behavior and size dimorphism in terms of sexual selection theory were interpreted as follows: males are larger than females when large male size evolves as an adaptation to increase success in male combat, or to enable forcible insemination of females. In contrast, males are usually smaller than females where small size in males evolves to increase mobility (and hence the ability to locate females) or because selection for increased fecundity may result in increased female size [17].

Our results show that there are significant differences in weight, SVL, HL, and TL between males and females of *T. caspius*, which are not related to diet. Since, all specimens were collected from the same location; hence, the climate variations, altitude and latitude have no different effect on them. Therefore, larger size of males could be because of their advantage in sexual selection and mating.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

Acknowledgments

The authors wish to thank the Department of Environment of Mazandaran Province for permitting the collection of the specimens and Afshin Faghiri for his help with sampling.

References

[1] M. Andersson, *Sexual Selection*, Princeton University Press, Princeton, NJ, USA, 1994.

[2] M. Olsson and T. Madsen, "Sexual selection and sperm competition in reptiles," in *Sperm Competition and Sexual Selection*, A.

P. Muller and T. R. Birkhead, Eds., pp. 503–577, Academic Press, San Diego, Calif, USA, 1998.

[3] R. L. Trivers, "Sexual selection and resource accruing abilities in *Anolis garmani*," *Evolution*, vol. 30, no. 2, pp. 253–269, 1976.

[4] R. L. Trivers, "Parental investment and sexual selection," in *Sexual Selection and the Descend of Man, 1871–1979*, B. Campbell, Ed., pp. 1871–1979, Aldine Publishing, Chicago, Ill, USA, 1972.

[5] A. E. Dunham, "Populations in a fluctuating environmental: the comparative population ecology of *Sceloporus merriami* and *Urosaurus ornatus*," *Miscellaneous Publications of the University of Michigan Museum of Zoology*, vol. 158, pp. 1–62, 1981.

[6] T. W. Schoener, "The ecological significance of sexual dimorphism in size in the lizard Anolis conspersus," *Science*, vol. 155, no. 3761, pp. 474–477, 1967.

[7] J. F. Berry and R. Shine, "Sexual size dimorphism and sexual selection in turtles (order testudines)," *Oecologia*, vol. 44, no. 2, pp. 185–191, 1980.

[8] F. Torki, "Sexual dimorphism in the Banded Dwarf Gecko, *Tropiocolotes helenae fasciatus* (Gekkonidae) on the western Iranian plateau," *Zoology in the Middle East*, vol. 40, pp. 33–38, 2007.

[9] H. Oraei, A. Khosravani, N. Rastegar-Pouyani, and S. K. Ghoreishi, "Analysis of sexual dimorphism in the Persian long-tailed desert lizard, *Mesalina watsonana* (Stoliczka, 1872; Sauria : Lacertidae)," *Amphibian and Reptile Conservation*, vol. 5, no. 1, pp. 75–87, 2011.

[10] M. Assadi, A. A. Maasoumi, M. Khatamsaz, V. Mozzafarian, and Z. Jamzad, *Flora of Iran. Vol : 1–52*, Research Institute of Forests and Rangelands, Tehran, Iran, 2005.

[11] D. J. Borror, C. A. Triplehorn, and N. F. Johnson, *An Introduction to the Study of Insects*, Saunders College Publications, 1989.

[12] S. C. Anderson, *The Lizards of Iran. Society for the Study of Amphibians and Reptiles*, Ithaca, New York, NY, USA, 1999.

[13] D. Verwaijen, R. Van Damme, and A. Herrel, "Relationships between head size, bite force, prey handling efficiency and diet in two sympatric lacertid lizards," *Functional Ecology*, vol. 16, no. 6, pp. 842–850, 2002.

[14] F. Molavi and N. Tehrani, "The morphometrical and kariological study of the Caspian benttoed gecko, *Cyrtopodion caspium* (Sauria: Gekkonidae) in Mashhad district," *Journal of Animal Biology*, vol. 4, no. 1, pp. 75–88, 2011 (Persian).

[15] J. B. Johnson, L. D. McBrayer, and D. Saenz, "Allometry, sexual size dimorphism, and niche partitioning in the Mediterranean gecko (Hemidactylus turcicus)," *Southwestern Naturalist*, vol. 50, no. 4, pp. 435–439, 2005.

[16] M. A. Butler and J. B. Losos, "Multivariate sexual dimorphism, sexual selection, and adaptation in greater *Antillean anolis* lizards," *Ecological Monographs*, vol. 72, no. 4, pp. 541–559, 2002.

[17] A. V. Hedrick and E. J. Temeles, "The evolution of sexual dimorphism in animals: hypotheses and tests," *Trends in Ecology and Evolution*, vol. 4, no. 5, pp. 136–138, 1989.