

---

## ORIGINAL ARTICLES

---

### Seasonal variation in dietary preferences of a Hispaniolan anole, *Anolis longitibialis*

BRIAN E. FONTENOT<sup>1,3</sup>, MATTHEW E. GIFFORD<sup>1,4</sup>, and ROBERT POWELL<sup>2</sup>

<sup>1</sup>*Department of Biology, University of Texas at Tyler, Tyler, Texas 75799, USA.*

E-mail: *bufo@uta.edu* [corresponding author].

<sup>2</sup>*Department of Biology, Avila University, Kansas City, Missouri 64145, USA*

<sup>3</sup>*Present address: Department of Biology, University of Texas at Arlington, Arlington, Texas 76019, USA*

<sup>4</sup>*Present address: Department of Biology, Washington University, St. Louis, Missouri 63130, USA*

SEASONAL differences in activity patterns among animals living in temperate areas are readily observed, and many animals living in tropical areas also exhibit seasonal variation in various life history parameters. However, most studies of the natural history of the Caribbean herpetofauna have been conducted on abbreviated trips during only one season.

Hispaniolan *Anolis* are separated by a wide range of morphological, geographical, and ecological differences. *Anolis longitibialis* is a member of the *A. cybotes* species complex and is endemic to Isla Beata and the lower Barahona Peninsula (Powell et al., 1999; Schwartz & Henderson, 1991). This species inhabits rock crevices and the lower portions of trees in xeric scrub forests, and presumably feeds primarily on arthropod prey (Gifford et al., 2003).

Members of the genus *Anolis* typically are characterised as opportunistic sit-and-wait foragers and generally exploit a wide range of dietary items (Pough et al., 1998). However, in June 1999, *A. longitibialis* preyed upon an unusually narrow range of items, with lepidopteran larvae comprising the primary food source (Gifford et al., 2003). The authors hypothesised that the narrow dietary range was

due primarily to the abundance of lepidopteran larvae in the summer months, and that *A. longitibialis* might have been taking advantage of an abundant food source in order to prepare for reproduction prior to the upcoming rainy season. We returned to the Barahona Peninsula in January 2002 and collected a sample of *A. longitibialis* to further evaluate that hypothesis.

All specimens were captured approximately 3 km south of Los Tres Charcos, Pedernales Province, Dominican Republic. Hoppe (1989) described the vegetation of this area as xeric, subtropical thorn forest and listed a mean annual temperature of 27°C and annual precipitation of 500–700 mm. The site is characterised by little or no herbaceous cover, dense thickets of *Acacia* scrub, and a substrate of dry, sandy soil interspersed with reef limestone outcrops. Erosion of the limestone resulted in deep crevices that provide excellent habitat for *A. longitibialis*.

We captured lizards by noosing or by hand and immediately placed them on ice. We euthanised specimens by lethal injection and placed stomach contents in 95% ethanol for analysis. Specimens were euthanised because samples of this species taken at this time of year are sparse in museum collections. In addition to the dietary data

presented herein, these specimens will also serve in a comprehensive study of reproductive activity investigating seasonal patterns in the *Anolis cybotes* complex on the island of Hispaniola.

When possible, we identified arthropodan prey to order or family. We used methods of Milstead (1957) for volumetric analysis and calculated relative importance values for each prey type according to methods of Powell et al. (1990). We used relative importance values to determine dietary niche breadths (Levins, 1968) and dietary niche overlap (MacArthur & Levins, 1967) between males and females, standardising the latter on a scale of 0–1 (Pianka, 1973), and used a two-sample Kolmogorov-Smirnov test to evaluate differences between seasons. Specimens were deposited in the Bobby Witcher Memorial Collection, Avila University, Kansas City, Missouri, 64145, USA (BWMC 06868–06870, 06872–06876).

Snout-vent lengths (SVL) did not differ significantly between males ( $n = 4$ ,  $= 44 \pm 6.4$  mm) and females ( $n = 4$ ,  $= 49.2 \pm 4.1$  mm;  $\chi^2 = 12.5$ ,  $df = 10$ ,  $P = 0.75$ ). All females contained either one shelled egg and one yolked ovarian follicle ( $n = 3$ ) or two shelled eggs ( $n = 1$ ). Gifford et al. (2003) found that all of the females they sampled contained shelled eggs or yolked ovarian follicles, and they hypothesised that the disproportionate amount of lepidopteran larvae in their diets could be the result of the females 'stockpiling' an abundant and energy-rich food resource to prepare for reproduction during the upcoming rainy season. That all of our females were gravid suggests that *A. longitibialis* has an extended reproductive season not tied strictly to the rainy season.

Excised stomach contents contained 35 prey items distributed among ten orders of invertebrates (Table 1). Spiders and flies showed the highest relative importance values among males, whereas ants and crickets were highest among females. Male anoles actively defend territories and could potentially encounter different types of prey than females in the same environment (Carpenter,

Stomach Contents	All $n = 8$	Males $n = 4$	Females $n = 4$
Arachnida (Araneae)	8/0.325/7 0.301	5/0.270/4 0.396	3/0.055/3 0.186
Coleoptera (larvae)	1/0.060/1 0.047	1/0.060/1 0.109	0/0/0 0.0
Diptera	2/0.020/2 0.053	2/0.020/2 0.107	0/0/0 0.0
Formicidae	5/0.120/4 0.149	1/0.030/1 0.068	4/0.090/3 0.239
Isoptera	1/0.005/1 0.024	0/0/0 0.0	1/0.005/1 0.048
Blattaria	1/0.050/1 0.043	1/0.050/1 0.082	0/0/0 0.0
Orthoptera (Gryllidae)	2/0.100/2 0.086	0/0/0 0.0	2/0.0100/2 0.189
Isopoda	1/0.010/1 0.027	1/0.010/1 0.054	0/0/0 0.0
Misc. Arthropod Parts	5/0.080/2 0.107	3/0.030/1 0.109	2/0.050/1 0.112
Gastropoda	1/0.005/1 0.024	0/0/0 0.0	1/0.005/1 0.048
Plant/other	3/0.005/3 0.069	2/0.005/2 0.096	1/trace/1 0.043
Fruits/Seeds	5/0.020/1 0.069	0/0/0 0.0	5/0.020/1 0.134

**Table 1.** Results of stomach content analysis of *Anolis longitibialis* from Hispaniola. The first line in each entry contains the total number of each prey item, total volume of each prey type ( $\text{cm}^3$ ), and the frequency of occurrence of each prey type among the individuals sampled. The second line in each entry contains the relative importance value of each prey item in the diet with larger numbers indicating greater dietary importance. All volumes and relative importance values are rounded to the nearest 0.001.

1967). For all individuals, spiders had the highest relative importance value, followed by ants and crickets. Gifford et al. (2003) had found lepidopteran larvae to be the most important dietary component in *A. longitibialis*. We found no lepidopteran larvae.

Our standardised dietary niche breadth for all individuals of 0.51 suggests a fairly diverse diet and a relatively low dietary niche overlap between males and females probably can be explained by our small sample size and the apparent diversity of available prey. Gifford et al. (2003) found *A. longitibialis* to have an uncharacteristically narrow niche breadth (0.16) and a very high dietary niche overlap between males and females (0.94), both of which they attributed to exploitation of seasonally abundant prey.

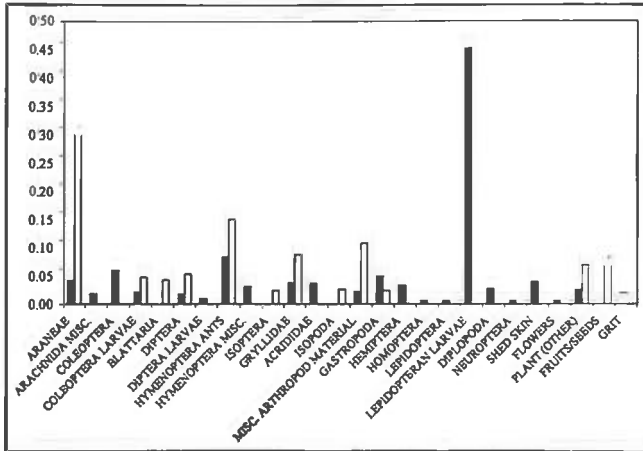


Figure 1. Relative importance values for prey items consumed by *Anolis longitibialis* from the Barahona Peninsula, Dominican Republic, summer 1999 (Gifford et al., 2003; black bars) and winter 2002 (present study; white bars).

Several seasonal differences in the types of prey eaten were obvious. Spiders, ants, and crickets showed higher relative importance values in January than in June (Fig. 1). Lepidopteran larvae and beetles, two of the most important prey types in June, were not found in January. Several other food items were observed in one season or the other but not in both. The January sample contained considerably more plant material, which may reflect seasonal availability or merely a greater dependence on plants when no single arthropodan resource is extremely abundant. The relative importance values of prey items for individuals sampled during January were significantly different from those of individuals sampled during the summer season (Kolmogorov-Smirnov,  $Z = 1.39$ ,  $P = 0.04$ ,  $n = 26$ ). The relatively small sample size could potentially have influenced the results, but we feel that the absence of lepidopterans at the study site support the hypothesis that *Anolis longitibialis* is an opportunistic feeder that utilises seasonally abundant food resources.

**ACKNOWLEDGEMENTS**

David Nieves provided us with valuable assistance in the field. Jose A. Ottenwalder facilitated our research efforts. Don Killebrew and Ron Gutberlet provided helpful comments on analysis of data and preparation of the manuscript. Permits were issued

by the Departamento de Vida Silvestre and the Dirección Nacional de Parques. Field work was supported by the President's Fund for Excellence, University of Texas at Tyler.

**REFERENCES**

Carpenter, C. C. (1967). Aggression and social structure of iguanid lizards. In *Lizard Ecology: A Symposium*, pp. 87-105. W.W. Milstead (Ed.). Columbia: University of Missouri Press.

Gifford, M. E., Ramos, Y. M., Powell, R. & Parmerlee, J. S., Jr. 2003 ('2002'). Natural history of a saxicolous anole, *Anolis longitibialis*, from Hispaniola. *Herpetol. Nat. Hist.* **9**, 15-20.

Hoppe, J. (1989). The National Parks of the Dominican Republic. Santo Domingo, Dominican Republic: Ed. Corripio.

Levins, R. (1968). *Evolution in Changing Environments: Some Theoretical Explorations*. Princeton, New Jersey: Princeton University Press.

MacArthur, R. H. & Levins, R. (1967). The limiting similarity, convergence, and divergence of coexisting species. *Am. Natur.* **101**, 377-385.

Milstead, W. W. (1957). Some aspects of competition in natural populations of whiptail lizards (genus *Cnemidophorus*). *Texas J. Sci.* **9**, 410-447.

Pianka, E. R. (1973). The structure of lizard communities. *A. Rev. Ecol. Syst.* **4**, 3-74.

Pough, F. H., Andrews, R. M., Cadle, J. E., Crump, M. L., Savitzky, A. H. & Wells, K. D. (1998). *Herpetology*. Upper Saddle River, New Jersey: Prentice Hall. 577 pp

Powell, R., Parmalee, J. S., Jr., Rice, M. A. & Smith, D. D. (1990). Ecological observations of *Hemidactylus brokii hatianus* Meerwath (Sauria: Gekkonidae) from Hispaniola. *Carrib. J. Sci.* **26**, 67-70.

Powell, R., Ottenwalder, J. A. & Inchaustegui, S. J. (1999). The Hispaniolan herpetofauna: diversity, endemism, and historical perspectives, with comments on Navassa Island. In *Caribbean Reptiles and Amphibians*. Crother, B. I. (Ed.) New York: Academic Press.

Schwartz, A. & Henderson, R.W. (1991). *Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History*. Gainesville: University of Florida Press.