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Observations on the Diets of an Anuran and Eight Lizard Taxa from Sonora, Chihuahua,and Coahuila, Mexico, with Some Notes on Clutch Sizes

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Abstract.

We examined the diets of one species of anuran (*Gastrophryne olivacea*) and eight taxa of lizards (*Phrynosoma cornutum*, *P. orbiculare*, *Sceloporus albiventris*, *S. cyanostictus*, *S. jarrovii*, *Uma paraphygas*, *Uta stansburiana elegans*, *U. s. stejnegeri*) from the Chihuahuan Desert and surrounding regions. Insects dominated the diets of all of the species examined. We also provide observations on clutch size for *P. cornutum*, *S. albiventris*, *S. jarrovii*, and *U. s. stejnegeri*.

Resumen

Examinamos la dieta de una especie de anuro (*Gastrophryne olivacea*) y ocho taxa de lagartijas (*Phrynosoma cornutum*, *P. orbiculare*, *Sceloporus albiventris*, *S. cyanostictus*, *S. jarrovii*, *Uma paraphygas*, *Uta stansburiana elegans*, *U. s. stejnegeri*) del Desierto de Chihuahua y áreas cercanas a éste. Los insectos dominaron las dietas de todas las especies examinadas. También proporcionamos observaciones sobre el tamaño de camada para *P. cornutum*, *S. albiventris*, *S. jarrovii*, y *U. s. stejnegeri*.

Mexico has a highly diverse herpetofauna. For some of these species we know a good deal about their ecology and natural history. For others, we know very little. Even for some of the better known species, the knowledge often comes from one or a few populations. Here we report on the diets of one anuran and eight lizard taxa, as well as some observations on clutch size, from the Chihuahuan Desert and surrounding areas of Mexico based on specimens collected as part of a distributional and taxonomic survey of the Chihuhaun Desert and neighboring areas (Lemos-Espinal et al., 2002, 2004a; Smith et al., 2005)

Materials and Methods.

Lizards were collected by hand, preserved shortly after collection (initially in 10% formalin, and finally in 70% ethanol; specimens deposited in the Laboratorio de Ecologia of the Unidad de Biología, Tecnología y Prototipos), measured (snouth-vent length [SVL] to the nearest mm), and dissected to examine stomach contents and reproductive status. Diet items were identified to the lowest taxon possible, and measured for length and width using dial calipers to the nearest 0.1 mm. We then used BugRun 1.7 software to calculate prey volume (using the equation for a prolate spheroid) (see Vitt et al., 2005)

Results and Discussion.

Gastrophryne olivacea (Sonora).—Of the 22 individuals we examined, only two (9.1%) contained identifiable stomach contents. One individual contained a single beetle, and the other individual contained three ants. Previous work has suggested that *G. olivacea* is an ant specialist, but has also been known to eat beetles (Freiburg, 1951; Nelson, 1972).

Phrynosoma cornutum (Coahuila, Chihuahua).—Of the 6 individuals examined, four (66.7%) had identifiable stomach contents and two (33.3%) had empty stomachs. Termites and ants were equally important in the diet of *P. cornutum*, both numerically and volumetrically (Table 1). Lemos-Espinal et al. (2004b) found that ants dominated the diet of *P. cornutum* numerically, but that non-ant insects were important volumetrically. The diet of *P. cornutum* from the Chihuahua Desert was made up almost entirely of ants (Barbault and Maury, 1981; Blackshear and Richerson, 1999). Pianka and Parker (1975) reported 69% of prey items of *P. cornutum* were ants. Bott et al. (2001) observed *P. cornutum* feeding on termites in Arizona. These results are consistent with observed foraging (Whitford and Bryant, 1979) and morphological (Montanucci, 1989; Meyers et al., 2006) adaptations for consuming ants.

Table 1. Diet of *Phrynosoma cornutum* from Chihuahua and Coahuila.

Taxon	Number (%)	Volume (%) mm^3	Frequency
Coleoptera	2 (0.5%)	55.6 (0.6%)	1
Hymenoptera			
Formicid	184 (49.2%)	4289.7 (45.5%)	3
Other	1 (0.3%)	21.0 (0.2%)	1
Isoptera	187 (50.0%)	5395.9 (53.7%)	2

One female (SVL = 100.3 mm) contained 33 enlarged follicles. This is within the range of clutch sizes found throughout the distribution of *P. cornutum* (20 – 40; Parker, 1973; Ballinger, 1974; Pinka and Parker, 1975; Owens et al., 2002; Sherbrooke, 2002).

Phrynosoma orbiculare (Chihuahua).-- Both of the stomachs we examined contained identifiable stomach contents. We found a variety of insects in the two stomachs of *P. orbiculare* (Table 2). Numerically, ants were most important, however, beetles were a close second. Volumetrically, the diet of *P. orbiculare* was dominated by beetles. Pianka and Parker (1975) reported

Table 2. Diet of *Phrynosoma orbiculare* from Chihuahua.

Taxon	Number (%)	Volume (%) mm^3	Frequency
Coleoptera			
Adult	10 (32.3%)	1578.0 (77.1%)	2
Larvae	1 (3.2%)	59.0 (2.9%)	1
Hymenoptera			
Formicid	19 (61.3%)	363.1 (17.7%)	1
Other	1 (3.2%)	47.9 (2.3%)	1

67.5% of the prey items of *P. orbiculare* were ants. These observations are consistent with the generalist morphology of *P. orbiculare* and other "short-horned" species (Meyers et al., 2006).

Sceloporus albiventris (Chihuahua).—All eight of the *S. albiventris* contained identifiable stomach contents. The diet of *S. albiventris* is made up of a variety of insects (Table 3). Beetles were by far the most important prey item both numerically and volumetrically. We are not aware of any other reports on the diet of *S. albiventris*.

Four females contained eggs or follicles. The mean clutch size was 11.25 ± 0.48 eggs (range = 10-12). Mean SVL of these 4 females was 83.8 ± 5.0 mm (range = 72.1 – 94.0 mm).

Table 3. Diet of *Sceloporus albiventris* from Chihuahua.

Taxon	Number (%)	Volume (%) mm3	Frequency
Coleoptera			
Adult	23 (59.0%)	2013.5 (53.7%)	5
Larvae	1 (2.6%)	46.8 (1.2%)	1
Diptera	1 (2.6%)	179.3 (4.8%)	1
Hemiptera	1 (2.6%)	15.2 (0.4%)	1
Homoptera	1 (2.6%)	34.4 (0.9%)	1
Hymenoptera			
Formicid	6 (15.4%)	78.2 (2.1%)	2

Sceloporus cyanostictus (Coahuila).—The one individual of *S. cyanostictus* that we observed contained 4 prey items: 3 beetles, and 1 bee. We are not aware of any other reports on the diet of *S. cyanostictus*.

Sceloporus jarrovii (Chihuahua, Sonora).-- Eleven of the twelve *S. jarrovii* we examined had identifiable prey items. The other individual had stomach contents, but they were not identifiable. The diet of *S. jarrovii* was made up of a variety of insects (Table 4). Numerically, ants and beetles were the most important prey items. Volumetrically, beetles and orthopterans were the most important. Caterpillars, orthopterans, and beetles were important prey items numerically and volumetrically in *S. jarrovii* from Durango, Mexico (Barbault et al., 1985). Ballinger and Ballinger

Table 4. Diet of *Sceloporus jarrovii* Chihuahua and Sonora.

Taxon	Number (%)	Volume (%) mm3	Frequency
Coleoptera			
Adult	14 (31.8%)	934.6 (43.5%)	7
Larvae	3 (6.8%)	84.0 (3.9%)	3
Ant Lion	1 (2.3%)	26.7 (1.2%)	1
Hymenoptera			
Formicid	18 (40.9%)	69.0 (3.2%)	4
Other	1 (2.3%)	55.6 (2.6%)	1
Lepidoptera	1 (2.3%)	27.1 (1.3%)	1
Orthoptera	5 (11.4%)	854.4 (39.8%)	4
Unident. Larva	1 (2.3%)	94.8 (4.4%)	1

(1979) found that preferred diet items of *S. jarrovii* from Arizona included hymenoptera, coleoptera, homoptera, orthoptera, and diptera. *Sceloporus jarrovii* from Arizona consume a variety of insects, with ants and beetles being the most important during the summer (Goldberg and Bursey, 1990).

We found a single female (SVL = 76 mm) containing 9 embryos. *Sceloporus jarrovii* from north-central Mexico had a mean litter size of 7.8 (Ramírez-Bautista et al., 2002). Mean litter sizes of *S. jarrovii* from Arizona ranged from 6.8 to 8.4 (Goldberg, 1971; Parker, 1973; Ballinger, 1979).

Uma paraphygas (Chihuahua).—All 4 individuals had identifiable prey in their stomachs. The diet of *U. paraphygas* was made up entirely of insects (Table 5). Termites were the most im-

Table 5. Diet of *Uma paraphygas* from Chihuahua.

Taxon	Number (%)	Volume (%) mm3	Frequency
Coleoptera			
Adult	1 (6.2%)	30.6 (9.1%)	1
Larvae	1 (6.2%)	24.9 (7.4%)	1
Hymenoptera			
Formicid	4 (25%)	238.0 (70.6%)	1
Isoptera	10 (62.5%)	43.6 (12.9%)	1

portant prey item numerically, but ants were the most important prey item volumetrically. In the sand dunes of the Bolsón de Mapimí, Chihuahua, *U. paraphygas* primarily eat ants for most of the year, but during the fall, hemipterans become important (Gadsden E. and Palacios-Orona, 1997).

Uta stansburiana elegans (Sonora).—All six individuals had identifiable stomach contents. The diet of *U. s. elegans* was made up entirely of insects (Table 6). Numerically, ants dominated the diet, followed by beetles. However, volumetrically beetles dominated the diet, followed by ants and coleopteran larvae. In Baja California Sur, *U. s. elegans* eat primarily insects and arachnids, with dipterans being the most important prey category (Galina-Tessaro et al., 1997). Asplund (1967) found ants and termites made up a large portion of the diet of *U. stansburiana* from Baja

Table 6. Diet of *Uta stansburiana elegans* from Sonora.

Taxon	Number (%)	Volume (%) mm3	Frequency
Coleoptera			
Adult	16 (27.1%)	372.4 (54.3%)	5
Larvae	3 (5.1%)	91.1 (13.3%)	2
Diptera	1 (1.7%)	54.5 (7.9%)	1
Hemiptera	1 (1.7%)	46.2 (6.7%)	1
Hymenoptera			
Formicid	36 (61.0%)	118.3 (17.2%)	5
Isoptera	2 (3.4%)	3.7 (0.5%)	1

California. In southeastern New Mexico, *U. stansburiana* eats a variety of insects and spiders (Best and Gennaro, 1984). Ants, orthopterans, and beetles are important prey for *U. stansburiana* from the Great Basin Desert (Parker and Pianka, 1975). Termites play a bigger role in the diets of *U. stansburiana* from the Mojave and Sonoran Deserts (Parker and Pianka, 1975).

Uta stansburiana stejnegeri (Coahuila).—Ten of the eleven *U. s. stejnegeri* had identifiable stomach contents. The other individual had an empty stomach. Insects made up the bulk of the diet of *U. s. stejnegeri*, but spiders were also found (Table 7). Termites made up almost two-thirds of the prey items observed. The next most numerically important taxa were beetles and ants. Volumetrically, termites and beetles were most important. In southeastern New Mexico, *U. stansburiana* eat a variety of insects and spiders (Best and Gennaro, 1984). Palacios-Orona and Gadsden-Esparza (1995) also found ants and termites were a numerically major component of the diet of *U. s. stejnegeri*, but larger prey types, such as beetles, caterpillars, and bugs, were important volumetrically. Ants, orthopterans, and beetles are important prey for *U. stansburiana* from the Great

Table 7. Diet of *Uta stansburiana stejnegeri* from Coahuila.

Taxon	Number (%)	Volume (%) mm3	Frequency
Araneae	2 (2.0%)	51.0 (7.4%)	2
Coleoptera	11 (11.2%)	203.4 (29.6%)	5
Ant Lion	1 (1.0%)	26.2 (3.8%)	1
Hymenoptera			
Formicid	17 (17.4%)	94.9 (13.8%)	6
Isoptera	65 (66.3%)	231.2 (33.6%)	2
Lepidoptera	1 (1.0%)	8.0 (1.2%)	1
Orthoptera	1 (1.0%)	72.4 (10.5%)	1

Basin Desert (Parker and Pianka, 1975). Termites play a bigger role in the diets of *U. stansburiana* from the Mojave and Sonoran Deserts (Parker and Pianka, 1975).

A female *U. s. stejnegeri* (SVL = 52 mm) contained a clutch of 3 eggs. Mean clutch size of *U. s. stejnegeri* from Durango, Mexico was 2.8 eggs (Gadsden et al., 2004). These values are at the lower end of the range of mean clutch sizes found throughout the distribution of *U. stansburiana* in the US (2.85 – 4.82; Hoddenbach and Turner, 1968; Parker and Pianka, 1975; Nussbaum and Diller, 1976; Goldberg, 1977; Bakewell et al., 1983; Ferguson et al., 1990; Zani, 2005).

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