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Relationship of Diet and Prey Availability in *Aristelliger cochranae*, a Gecko from Navassa Island, West Indies

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Aristelliger cochranae Grant is a relatively small gecko with maximum snout-vent lengths (SVL) of 63 mm for males and 53 mm for females. It is endemic to Navassa Island, West Indies (Powell, 1999), and is typically arboreal, with individuals frequently found within the twisted branches of *Ficus* trees or under bark. Thomas (1966) also noted their association with fan palms (*Thrinax morrisii*). In 1998, we collected this predator and its potential prey in fan palms on Navassa. This tiny island, with an area of approximately 5.2 km^2, is located about 60 km west of the southwestern tip of the Haitian Tiburon Peninsula (Thomas, 1966).

Although *A. cochranae* was described by Grant (1931) nearly 70 years ago, very little is known about its natural history (Lynxwiler and Parmerlee, 1993). Because energy acquisition is a fundamental aspect of any species' niche, we examined food habits in relation to potential prey present in the lizards' habitat. Previous studies of the West Indian geckos *Hemidactylus haitianus* (Powell et al., 1990), *Aristelliger lar* (Burns et al., 1992), and *Sphaerodactylus difficilis, S. altavelensis, S. clenchi*, and *S. asterulus* (Cunningham et al., 1993) indicated that all of these lizards consume a wide range of prey. However, none of these studies compared prey items taken by geckos with available prey.

Twenty-two (9 males and 13 females) geckos and associated arthropods were collected on 29 July and 2 August 1998 from fan palms in a savanna just south of the lighthouse on Navassa. Predators and presumed prey were acquired by shaking dead fronds over an insect net. Arthropods were placed in a killing jar and preserved in 80 % ethyl alcohol. Lizards were killed by lethal injection of T-61 (a veterinary drug no longer available), preserved in 10 % formalin, and transferred to 75 % ethyl alcohol upon return to the laboratory. Stomachs were removed and contents identified to the lowest possible taxonomic level. Insect collections made during the biological inventory of Navassa facilitated identification of the often fragmented prey. Prey items were counted and volumes determined using the formula for the volume of a prolate spheroid (Vitt and Zani, 1996). The intact size of lizard ova, fragments of which were found in some stomachs, was estimated by using the mean size of 11 intact eggs (Powell, 1999). The resultant data were used to calculate dietary importance values (Powell et al., 1990; Birt et al., in press), which consider numbers, volumes, and frequencies of occurrence for each type of prey. Prey types were defined as species for vertebrates and order for arthropods to facilitate comparisons with other dietary studies of West Indian lizards. Importance values then were used to calculate dietary niche breadths standardized on a scale of 0-1 (Levins, 1968; Hurlbert, 1978) and dietary niche overlaps (Pianka, 1973) between males and females and between potential prey found in palm fronds and actual prey consumed by geckos.

Statistical analyses were made using StatView 5.0 (SAS Institute, Inc., Cary, North Carolina). All means are presented ± one SE; for all tests, $\alpha = 0.05$. Lizards are in the Bobby Witcher Memorial Collection, Avila College, Kansas City, Missouri (BWMC 06199-220). Insect specimens are deposited in the U.S. National Museum of Natural History, Smithsonian Institution, Washington, DC, and, in addition to locality information, bear the label "Taken by beating dead leaves of *Thrinax* in open rocky savanna and forest edges."

A total of 576 arthropods was collected (Table 1). The most abundant taxa were Psocoptera (32 %), Coleoptera (20 %), and Araneida (17 %). Psocoptera were not found in lizard stomachs, but the combination of small size and soft bodies could have resulted in such rapid digestion that they appeared to be absent from stomach samples. Araneida (20 %) and Coleoptera (12 %) were well represented in the lizards' diets. The most common prey items were ants (Formicidae; 32 %), which were far less commonly represented among potential prey (6 %).

Hatchling *A. cochranae*, egg shell fragments, or both were found in five females, all of which contained an oviductal egg. Ova and hatchlings had importance values of 0.271 and 0.082, respectively, in a pooled sample of all lizards (Table 2). In females alone, ova had an importance value of 0.318 and were the most important item. Three stomachs were empty and two contained unidentifiable fragments.

Consumed ova and hatchlings presumably represented the greatest energy source available. That they were taken only by females is likely due to the high energy demands of reproduction. At least 37 species of geckos feed on other vertebrates (Bauer, 1990), with other geckos and conspecifics (mostly juveniles) the most frequent victims. Consumption of intact eggs had not been reported previously (A.M. Bauer, pers. comm.), but we could not determine whether intact ova were consumed or hatching triggered a feeding response in the females.

Standardized niche breadths of 0.612 for males and 0.516 for females are substantially larger than for other West Indian geckos. Males consumed only 3 of 10 prey types (Table 2), but all were taken in large quantities. Females consumed 9 of 10 prey types. Dietary overlap between males and females (0.282) was surprisingly low, but it increased to 0.462 when ova and hatchlings were excluded from the calculation. These low values and a sexual size dimorphism index (M:F) of 1.19:1 (based on maximum male and female SVL; Roughgarden, 1995) suggest resource partitioning. However, the largest food items were taken by the smaller females and mean food item size of males (26.7 ± 13.2 mm^3, 1.0-62.2 mm^3, $N = 5$) and females (64.2 ± 19.9 mm^3, 0.8-202.0 mm^3, $N = 12$) did not differ significantly when ova and hatchlings were included (Mann-Whitney U, $Z = -0.95$, $P = 0.34$) or excluded ($Z = -0.11$, $P = 0.92$). Similarly, SVL and mean food item size were not significantly correlated (Spearman correlation; males: $Z = 0.60$, $P = 0.55$; females: $Z = 1.89$, $P = 0.06$;

TABLE 1. Numbers of potential prey compared to prey consumed by *A. cochranae* found in dead, pendant palm fronds of *Thrinax morrisii*. Percentages are in parentheses; dashes indicate that a particular type of prey item was not found.

Prey	Number present	Number consumed
Arachnida: Araneida	96 (16.7)	10 (20.0)
Arachnida: Pseudoscorpionida	9 (1.6)	1 (2.0)
Diplopoda: Polyxenida: Polyxenidae	2 (0.3)	—
Insecta: Cleoptera: Carabidae, Elateridae, Lathridiidae, Aderidae, Curculionidae, Anobiidae, Mordellidae, Oedemeridae, Melyidae, Bruchidae, Nitidulidae	116 (20.1)	6 (12.0)
Insecta Diptera: Ceratopogonidae, Cecidomyiidae, Sciaridae	7 (1.2)	1 (2.0)
Insecta: Heteroptera: Reduviidae, Anthocoridae	4 (0.7)	—
Insecta: Homoptera: Achilidae, fulgoroid (immature)	2 (0.3)	—
Insecta: Hymenoptera: Formicidae, Bethylidae, Halictidae, Agaonidae	37 (6.4)	16 (32.0)
Insecta: Isoptera	—	5 (10.0)
Insecta: Lepidoptera: Gelechiidae, Tineidae, undet. larvae	35 (6.1)	5 (10.0)
Insecta: Orthoptera: Gryllidae, Blattidae	61 (10.6)	1 (2.0)
Insecta: Psocoptera	182 (31.6)	—
Insecta: Thysanura: Lepismatidae	1 (0.2)	—
Reptilia: Squamata: Gekkonidae (hatchling)	4 (0.7)	1 (2.0)
Reptilia: Squamata: Gekkonidae (ova)	20 (3.5)	4 (8.0)

TABLE 2. Dietary importance values (I) (see text) of male and female *A. cochranae* taken from dead, pendant palm fronds of *Thrinax morrisii* on Navassa Island. Each entry contains four items: in line one the three figures represent relative numbers, relative volume, and relative frequency of occurrence, respectively; the figure in the second line is the importance value of that type of prey item in the diet. Dashes indicate that a particular type of prey item was not found.

Prey item	I (all)	I (males)	I (females)	I (females w/o ova)
Arachnida: Araneida	0.200/0.092/0.300 0.197	0.444/0.556/0.400 0.465	0.146/0.030/0.261 0.145	0.167/0.307/0.462 0.312
Arachnida: Pseudoscorpionida	0.020/0.002/0.033 0.018	0.111/0.003/0.200 0.104	—	—
Insecta: Coleoptera: Anobiidae, Scolytidae, Tenebrionidae	0.120/0.001/0.067 0.063	—	0.146/0.001/0.087 0.078	0.167/0.006/0.154 0.109
Insecta: Diptera	0.020/0.004/0.033 0.019	—	0.024/0.001/0.044 0.023	0.028/0.012/0.077 0.039
Insecta: Hymenoptera: Formicidae	0.320/0.029/0.200 0.183	—	0.390/0.036/0.261 0.229	0.444/0.347/0.462 0.418
Insecta: Isoptera	0.100/0.013/0.033 0.049	—	0.122//0.015/0.044 0.060	0.139/0.157/0.077 0.124
Insecta: Lepidoptera: Gelechiidae and others	0.100/0.055/0.133 0.096	0.444/0.441/0.400 0.427	0.024/0.005/0.044 0.024	0.028/0.032/0.077 0.455
Insecta: Orthoptera: Blatellidae	0.020/0.011/0.033 0.021	—	0.024/0.013/0.044 0.027	0.028/0.138/0.077 0.081
Reptilia: Gekkonidae (hatchling)	0.020/0.193/0.033 0.082	—	0.024/0.215/0.044 0.094	—
Reptilia: Gekkonidae (ova)	0.080/0.599/0.133 0.271	—	0.098/0.683/0.174 0.318	—

females without ova and hatchlings: $Z = 0.73$, $P = 0.46$).

Overlap between potential prey available and actual prey taken (0.182) was much lower than anticipated, although the overlap is greater (0.475) when ova and hatchlings are excluded. However, overlap was zero when prey were identified to species. In addition, the species actually consumed by geckos are known to be associated with dead standing wood and were not found in the palm frond assemblage. These data suggest that lizards forage away from the palm fronds, a conclusion that raises the question of why geckos would forage elsewhere when the palms offer so much potential prey and shelter from predators.

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