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Food Habits of Green Tree Frogs (*Hyla cinerea*) from Arkansas

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Running Title: Food Habits of Green Treefrogs

Abstract

We analyzed stomach contents of 120 Green Tree Frogs, *Hyla cinerea*, collected between May 1956 and October 2014 in Arkansas. Beetles and arachnids were the predominant prey item; the next most abundant groups were Diptera and Hemiptera. Vegetable matter was also found in several frogs. All identifiable vegetable matter was determined to be of the genus *Persicaria*, colloquially known as smartweed. Our data suggests that Green Tree Frogs in Arkansas predominantly feed on beetles and arachnids, but occasionally ingest plant matter when actively foraging.

Introduction

Most amphibians are opportunistic carnivores stimulated by movement and will eat anything they can swallow (Duellman and Trueb 1986, Stebbins and Cohen 1995). The ingestion of non-prey material may be deliberate or incidental during foraging. Any non-prey item that appears to be prey may be ingested.

Amphibians often ingest vegetable or mineral matter during foraging (Korschgen and Moyle 1955, Linzey 1967, Hedeon 1972, Silva et al. 1989, Hirai and Matsui 1999). Fishing lures (Stebbins and Cohen 1995), stones (Engelbert et al. 2008), and vegetable matter (Hamilton 1948, Oliver 1955, Silva et al. 1989, Fialho 1990, Stebbins and Cohen 1995 and Thigpen et al. 2015) have been found in anuran stomachs. Silva et al. (1989) and Fialho (1990) believe frogs could act as seed dispersers.

Herein, we present findings of the food habits of Green Tree Frogs from Arkansas. This study is intended to describe the diet of the Green Tree Frog in Arkansas and encourage further studies of amphibian diets to produce a better understanding of their natural history within the state.

Materials and Methods

One hundred and twenty individuals collected between May 1956 and October 2014 were accessed from the Arkansas State University Museum of Zoology Herpetological Collection. The frogs were measured from snout to vent and stomachs were excised. The stomachs were emptied and placed into 70% v/v ethanol along with the contents. Stomach contents were photographed, categorized into animal, vegetable, or mineral categories, and identified to lowest achievable taxonomic level.

Results

Of the 120 stomachs examined, 74 (62%) contained food items. Of those 74 stomachs, 60 contained animal matter, 42 contained vegetable matter and one contained mineral matter.

Table 1. Food Items Removed from Stomachs

Food	Freq. in Stomachs (n = 120)	Number of Items
Unidentified Animal Matter	0.033	4
Arachnida	0.133	16
Coleoptera	0.242	29
Collembola	0.008	1
Diptera	0.100	12
Dermaptera	0.008	1
Hemiptera	0.092	11
Hymenoptera – others	0.042	5
Hymenoptera - Formicidae	0.033	4
Lepidoptera	0.067	8
Malacostraca	0.008	1
Orthoptera	0.075	9
Unidentifiable Veg. Matter	0.333	40
<i>Persicaria</i> sp.	0.025	3
Mineral Matter	0.008	1

Food Habits of Green Treefrogs

Many stomachs contained multiple items of animal matter and plant matter and often contained several individuals of each order. Animals were identified in 56 of the stomachs. Plant material was identified in 2 of the 42 stomachs containing vegetable matter. The plant items were identified as the fruits of *Persicaria*, a common emergent aquatic plant colloquially known as smartweed. All of the unidentifiable plant material consisted of pieces of leaves, stems, or flowers. No intact plant material, other than the fruits of *Persicaria* sp., was found. The single mineral was miniscule and could not be identified. However, it appeared to be a small translucent stone most likely from a sandy substrate.

Discussion

In the cases of many of the empty stomachs, food could be seen in the intestines, but was not retrieved as it was degraded by digestion. Volume was not determined for the stomach contents as digestion had begun in many stomachs and many prey items were not intact. The common occurrence of vegetable matter in the stomachs might be caused by incidental ingestion during foraging, but the frequency warrants further study. Plants may be ingested during times of low prey abundance as seen by Silva et al. (1989) as a means to supplement the diet. These frogs may ingest vegetable matter when prey is scarce to supplement their diets, similar to the findings Silva et al. (1989). Further studies throughout the year may provide some insight. The lack of ingested minerals is likely caused by the arboreal nature of the species. However, mineral ingestion may be common during the breeding season when the animals are foraging. Lithophagy is fairly common in ranid frogs (Hirai and Matsui 1999, Engelbert et al. 2008) and accidental ingestion may be increased in hylids with terrestrial foraging. It is likely that green treefrogs do ingest vegetable matter fairly often, but future studies are needed to quantify the phenomenon.

Overall, the diet of Green Tree Frogs in Arkansas is similar to the diets of Green Tree Frogs in other areas. Spiders and beetles were commonly found in frog stomachs in other studies (Haber 1926, Kilby 1945, Freed 1982, Meshaka 2001, and Leavitt and Fitzgerald 2009) and were also a common prey item in this study. Hymenopterans, ants or otherwise, also seem to comprise much of the diet of Green Tree Frogs in Texas (Leavitt and Fitzgerald 2009), Florida (Kilby 1945, Freed 1982, and Meshaka 2001), and Georgia (Haber 1926) and in Arkansas (this study).

Hemipterans are also a common prey item in Florida (Freed 1982 and Meshaka 2001), Georgia (Haber 1926), and Arkansas (this study). Comparisons of the diets of these frogs from 4 states indicate that spiders, beetles, and ants/wasps might be a staple in the diet of Green Tree Frogs throughout their range.

However, these studies also suggest that the frogs will supplement their diets with other prey items dependent upon prey availability. Dipterans were a common prey item in Florida (Kilby 1945 and Meshaka 2001) but less common in Georgia and Texas. In this study, they were found in 10 percent of the stomachs. Lepidopterans were common in stomachs of frogs from Georgia (Haber 1926), but rare in Florida (Kilby 1945, Freed 1982, and Meshaka 2001) and Arkansas (this study). Orthopterans were common in Arkansas (this study), Georgia (Haber 1926), and Texas (Leavitt and Fitzgerald 2009) but rare in Florida (Kilby 1945, Freed 1982, and Meshaka 2001).

Based on these occurrences, it is likely Green Tree Frogs have common staple prey items, supplemented with other prey items abundant in their habitat, and these supplemental prey items should vary between different habitats, states, etc.

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