

An Assessment of a Reproducing Population of the Oustalet's Chameleon (*Furcifer oustaleti*) in South Florida

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Introduction

Florida is home to more nonnative reptiles than anywhere in the world, with the majority of species found in South Florida near the Everglades. In 2010, a breeding population of a large chameleon species, the Oustalet's chameleon (*Furcifer oustaleti*), was documented in southern Miami-Dade County in an avocado grove.

Furcifer oustaleti is an arboreal lizard native to Madagascar where it is found in a variety of habitats and climate regimes, including dry deciduous forests and human-impacted areas. Its large size (snout-vent length up to ~ 280 mm) and attractive coloration have made it an appealing species in the pet trade. Oustalet's chameleons are sexually dimorphic; females are varying shades of green and the males brown with dark brown or black banding. Females grow to a smaller overall body size than males.



Adult female with juvenile



Adult male

University of Florida, Florida Fish & Wildlife Conservation Commission (FWC), Zoo Miami, and other members of the Everglades Cooperative Invasive Species Management Area, partnered to conduct an assessment of the South Florida chameleon population in order to determine the likelihood of its eradication and potential impacts on native ecology. Removal surveys have been conducted since July 2011 and data were collected on fecundity and diet.

Removal Efforts

Methods

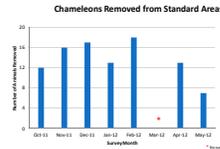
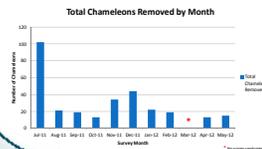
Visual encounter surveys were conducted in the avocado grove at night by walking between rows of trees while shining a light into the canopy to spot resting chameleons. When a chameleon was encountered, it was collected, given a unique identifying number, and a coordinate was recorded with a handheld GPS. From July to September 2011, random areas of the grove were selected and surveyed by teams of at least two people. Beginning in October 2011, four standard routes were established to monitor the response of the population to removal efforts. Each of these four routes was surveyed monthly by a team consisting of at least two people. Additionally, a monthly random survey was continued but excluded any area which was designated as part of a standard route. A total of 15 random and 7 standard surveys have been done.



Monthly standard survey areas

Results

A total of 302 chameleons were removed between July 2011 and May 2012, 96 of which were removed from standard survey areas. July was the most successful month due to the high number of hatchlings encountered.



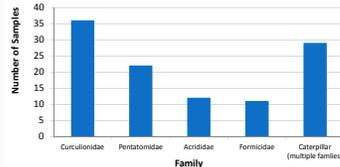
Fecal Diet Analysis

Methods

After capture, food was withheld from the chameleons until a fecal sample was obtained or approximately 5 days elapsed. This ensured that only diet from the capture location was examined. The fecal samples were placed in labeled plastic screw-top jars filled with enough 91% ethyl alcohol to cover the sample. Fifty samples were separated and the contents identified, first under a lighted 3.5 magnification lens and then under a dissecting scope. During initial separation, the samples were placed in a large Petri dish and flushed with 91% ethyl alcohol. Dissecting tools such as tweezers and probes were used to pull apart the fecal sample. Distinctive, unusual, or obvious pieces were set aside for immediate identification or saved to be examined at a later date. All identified or noteworthy objects were placed in a new, labeled jar of alcohol. Everything remaining from the fecal sample was considered waste and was thrown out. Identifications were made using field guides and identification books and with the help of Dr. William Kern, entomologist at Fort Lauderdale REC.

Results

Top Five Families of Insects Found in Chameleon Diet Samples

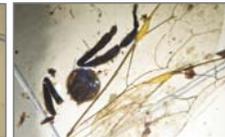


Weevil - Family Curculionidae

- 50 samples have been processed including 6 from juveniles
- The five most commonly identified insect families were Curculionidae (weevils - 36 samples), Pentatomidae (stinkbugs - 22 samples), Acrididae (grasshoppers - 12 samples), Formicidae (ants - 11 samples), and caterpillars from multiple and unknown families (29 samples)
- Several chameleons had eaten eastern lubber grasshoppers, known to be toxic to most predators; one sample contained the remains of 2-3 *Romalea guttata* (lubber grasshopper)
- Six samples contained bones, skins and sometimes whole claws from small lizards, possibly *Anolis* spp.; One of these males was captured near an *Anolis equestris* (knight anole)
- One sample contained a skull fragment from an *Osteopilus septentrionalis* (Cuban tree frog)
- Five samples contained berries or seeds including *Schinus terebinthifolius* (Brazilian pepper)
- Several families of insects that were found are ground-dwelling, indicating that *F. oustaleti* may be moving to the ground to feed



Claw from *Anolis* species



Wasp - Family Ichneumonidae

Fecundity

Between July and August 2011, 8 gravid *F. oustaleti* were collected from the avocado grove and retained in separate enclosures in the lab. A plastic bin filled with garden soil approximately 35 cm deep was placed in their enclosures until eggs were oviposited. All 8 females laid eggs between August to October 2011. The mean clutch size recorded was 39 (N=8; range 32-49). The mean clutch weight recorded was 33.2 g (N=5, range 26-38 g).



A female that recently oviposited and is still showing gravid coloration



Clutch of *F. oustaleti* eggs

Discussion

Preliminary results of this study have allowed us to determine several key factors that will assist in the development of an FWC management plan for eradication of Oustalet's chameleons in Florida. Early results indicate that this species is very fecund and females lay eggs in late summer to early fall with hatchlings emerging the following summer. Further, animals kept in the lab showed high growth rates with females potentially reaching sexual maturity within ten months of age, suggesting this species could have a high intrinsic rate of increase. However, hatchlings are likely quite vulnerable to predation (perhaps even intra-specific predation) which would limit recruitment. A mark-recapture study is needed to learn more on juvenile growth and survival.

More than 300 individuals were removed from 122 acres of avocado grove in 22 surveys without a noticeable decrease in numbers removed over time. Thus, *F. oustaleti* appear capable of reaching high densities within an agricultural grove. However, the extent of their dispersion into adjacent land and survivability in natural areas are important questions that remain unanswered. Numbers found in an adjacent natural area have been very low and accessibility is an impediment in nearby private lands. Focusing more random surveys in areas outside of the avocado grove is a goal over upcoming months.

One of the primary questions this study aimed to address was the potential impacts of chameleons on native fauna. Information in the scientific literature on this species' natural history is largely absent, therefore it was of particular interest to learn if Oustalet's chameleons might prey on native vertebrates.

Based on the fecal analysis, the vertebrate diet of *F. oustaleti* in this grove consists of small lizards and amphibians. Approximately 16% of adult samples contained either *Anolis* spp. or Cuban tree frog fragments. We were unable to positively identify the species of *Anolis* based on remains, but based on size and availability it could be either a native or nonnative species. In addition, the Cuban tree frog skull fragment indicates that small native frogs could also be a potential prey item. However, no mammal or bird remains have been found in samples analyzed thus far, indicating that opportunistic feedings on these taxa are likely rare.

Oustalet's chameleons do not appear to pose a significant threat to Florida's native flora and fauna and eradication does not seem feasible given the amount of effort needed to have an effect on the current, somewhat contained, population. However, there is concern that this and other species of chameleons that are being illegally spread throughout Florida for use in the pet trade has the potential to cause conflicts between landowners and collectors. A management plan that takes into consideration both ecological and social issues is being developed.



Hatchling Oustalet's chameleon collected in July 2011



Same chameleon as photo above in May 2012

Acknowledgments

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Image credits (left to right, top to bottom). *Column 1*: Dustin Smith, Zoo Miami; Joshua Holbrook, Florida Atlantic University; *Map*: Robin Bjlani and Joy Vinci, University of Florida; *Column 2* (Insect microscopy images): Sara Williams (x3), University of Florida; Joshua Holbrook, Florida Atlantic University; Joy Vinci, University of Florida; *Column 3*: Joy Vinci and Sara Williams, University of Florida

