

Rapid Communication

The gold tegu, *Tupinambis teguixin* (Linnaeus, 1758) *sensu lato* (Squamata: Teiidae): evidence for an established population in Florida

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Received: 5 September 2017 / Accepted: 27 October 2017 / Published online: 15 November 2017

Handling editor: John Measey

Abstract

Gold tegus, *Tupinambis teguixin* (Linnaeus, 1758), are generalist predators from South America and are ecologically similar to Argentine black and white tegus (*Salvator merianae*), a successful invader in Florida. We trapped gold tegus in Broward and Miami-Dade counties, Florida, USA. In Miami-Dade County, collection occurred from 2008 through 2016. We combined new trapping records with previous literature records. Ten gold tegus of both sexes and multiple size classes over a nine year period indicate a reproducing population in Miami-Dade County. *Tupinambis teguixin* is the sixth established non-native teiid species in Florida. Additionally, we report *Tupinambis teguixin* from Sarasota and Lee counties, Florida, USA. Determining population status in those counties requires further study. It is critical to differentiate this species from *Salvator merianae* during removal efforts. The possibility of eradicating *Tupinambis teguixin* exists if proper identification enables reliable monitoring of the populations.

Key words: cryptic species, invasive species, trapping, Argentine black and white tegu, biological invasions, pet trade

Introduction

Florida's tropical to subtropical climate, along with major ports of entry and a large number of animal importers have contributed to a high number ($n = 181$) of introduced amphibian and reptile species (Fedler et al. 2016; Krysko et al. 2016). Eight teiid (Squamata, Teiidae) species have been introduced to Florida and five are established (Krysko et al. 2016), including the Argentine black and white tegu: *Salvator merianae* Duméril and Bibron, 1839. During trapping and removal of *S. merianae*, we captured ten animals identified as gold tegus, *Tupinambis teguixin* (Linnaeus, 1758), in a relatively small area in southern

Miami-Dade County, Florida. Herein, we document *T. teguixin* in Miami-Dade County, elucidate previously published vouchers (Krysko et al. 2011), and provide evidence for its establishment.

Material and methods

We compiled all verified records of occurrence of gold tegus from the Florida Museum of Natural History, including those previously published (Krysko et al. 2011), to determine the introduction history and geographic distribution of this species in Florida (see Supplementary material Table S1). Additional records are available on the Early Detection &



Figure 1. Gold tegu (*Tupinambis teguixin*; UF-Herpetology 174329) captured in Miami-Dade County, Florida in February 2014. Photo by Rodney Irwin.

Distribution Mapping System (EDDMapS) but we did not include records unless they were independently verified with photographs or specimens. We also trapped tegus (Figure 1) using box traps baited with raw chicken eggs. Although most of the trapping effort targeted black and white tegus (*Salvator merianae*), we incidentally captured 10 *T. teguixin*. Individuals were euthanized humanely with a captive bolt gun or MS 222 following AVMA guidelines (Leary et al. 2013). Snout-vent length (SVL) and total length (TL) were measured ventrally with a flexible tape. Individuals were examined during necropsy to determine sex and diet. Specimens and photographs were deposited as vouchers in the Division of Herpetology, Florida Museum of Natural History, University of Florida (UF-Herpetology).

Murphy et al. (2016) described four species in the *T. teguixin* complex, rather than the one species historically recognized; this complicates identity of the species in Florida. We identified captured tegus as either *S. merianae* or *T. teguixin* by examining loreal scales. One pair of loreal scales is present in *T. teguixin* while two pair of loreal scales are present in *S. merianae*. Pending research to determine which of the newly-described species is present in Florida, we will identify these animals as *T. teguixin sensu lato* (hereafter referred to as *T. teguixin*).

Results and discussion

The first known *T. teguixin* (UF-Herpetology 153696) in Florida was captured in 1995 inside a pigeon coop at 3820 NW 65 Avenue, Hollywood, Broward County (26°02'34.65"N; 80°13'14.01"W"; Datum WGS84; 1.8 m elev.; see Supplementary material Table S1). This individual had probably escaped from a nearby reptile importer (Krysko et al. 2011; Figure 2). On 21 July 2006, one adult *T. teguixin* (UF-Herpetology 149983) was photographed at Crandon Park on Key Biscayne, Miami-Dade County, Florida (Krysko et al. 2011). This probably represents an isolated introduction given the distance (40 km) between this observation and those elsewhere in Miami-Dade County. Another isolated observation of *T. teguixin* (UF-Herpetology 167193) occurred 17 June 2012 when one was photographed in Plantation, Broward County, Florida.

On 11 June 2008, an adult *Tupinambis teguixin* (UF-Herpetology 152989, EVER 44945; female, 35.5 cm SVL, 61.5 cm TL) was trapped in Everglades National Park (25°23'46.10"N; 80°35'03.58"W") in southwestern Miami-Dade County, after first being detected by a motion sensing camera deployed as part of a mammal inventory project (Krysko et al. 2011). During rapid response activities targeting *S. merianae*,

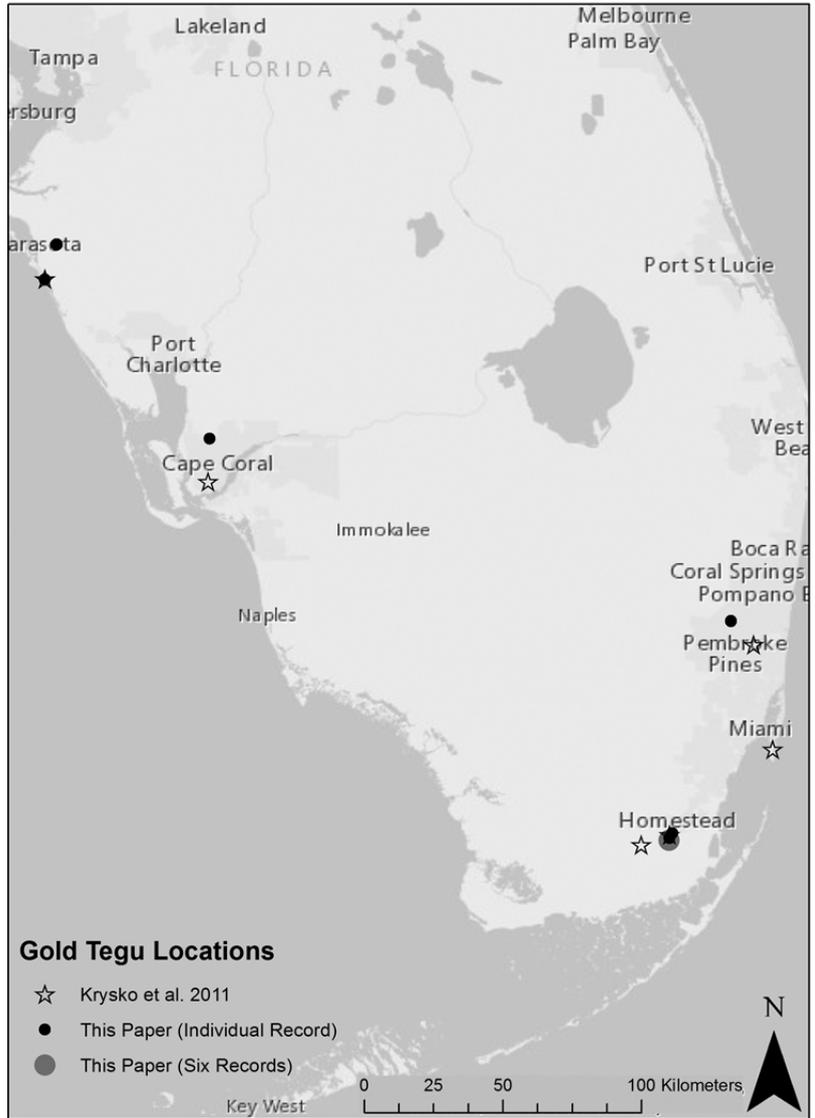


Figure 2. Map of southern Florida showing the locations of gold tegus (*Tupinambis teguixin*).

an adult *T. teguixin* (UF-Herpetology 155723, 30.1 cm SVL, 968 g) was trapped on 20 August 2009 near a rock quarry (25°25'42.70"N; 80°29'36.16"W) in Florida City, Miami-Dade County (Krysko et al. 2011). In 2013, two subadult *T. teguixin* (UF-Herpetology 174003, 174005) were captured in traps targeting *S. merianae* in Florida City. UF-Herpetology 174003 (female, 24.0 cm SVL, 73.5 cm TL) only had remains of trap bait in its digestive system. UF-Herpetology 174005 (male, 22.3 cm SVL, 63.2 cm TL) had remains of one eastern lubber grasshopper, *Romalea guttata* (= *R. microptera*) (Insecta: Orthoptera: Acrididae), in its stomach. This capture site (25°24'40.15"N; 80°29'40.61"W) is near the site of the 2009 specimen. An additional *T. teguixin* (UF-Herpetology 174730)

was captured in May, 2013. In February 2014, four additional adult *T. teguixin* (UF-Herpetology 174328, 174329, 174330, 174331) were collected at the same site as the 2013 specimens. One *T. teguixin* (UF-Herpetology 179332, 30.5 cm SVL, 984 g) was captured on 1 December 2016 near the intersection of SW 187th Avenue and SW 376th Street (25°25'06.33"N; 80°29'35.70"W) in Florida City, Miami-Dade County.

On the west coast of Florida, three adult *T. teguixin* (UF-Herpetology 155487, 165972, 170890) were photographed in Sarasota County between 2007–2013 (also see Krysko et al. 2011), and one adult and one subadult were photographed in Cape Coral, Lee County (UF 152526, 169211) in 2008 (Krysko et al. 2011) and 2012.

Although *T. teguixin* was originally introduced in Florida more than two decades ago, published records (Krysko et al. 2011) and our recent records indicating both mature and immature size classes and both sexes over a period of nine years suggest reproduction and establishment of this species in Miami-Dade County. While introductions of this species have been documented in Broward, Lee and Sarasota counties, there is currently no evidence of reproduction there. With documentation of vouchered specimens, *T. teguixin* appears to be the sixth established non-native species of teiid lizard in Florida. Further investigation is needed to determine which of the four species in the *T. teguixin* complex occurs in our study area. Due to the proximity of *T. teguixin* to the breeding population of *S. merianae* in Miami-Dade County, it is possible that both species were introduced via the same pathway (pet trade) and source (Krysko et al. 2016). Because the diet of *T. teguixin* includes amniote eggs from nests in their native range (Schneider et al. 2011), resource managers in Florida should be aware of potential impacts on nesting indigenous wildlife in areas where *T. teguixin* has been introduced.

Acknowledgements

We thank Michael Harvey for specimen verification; Dustin Smith and Frank Ridgley for assistance with specimen examination; Jennifer Eells, Dallas Hazelton and Tony Pernas for providing specimens; and John Measey and two anonymous reviewers for suggestions that greatly improved this paper. Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Supplementary material

The following supplementary material is available for this article:

Table S1. Georeferenced records of gold tegus (*Tupinambis teguixin*) documented in Florida, USA.

This material is available as part of online article from:

http://www.reabic.net/journals/bir/2017/Supplements/BIR_2017_Edwards_etal_Table_S1.xlsx

References

- Fedler MT, Krysko KL, Avery ML (2016) Molecular analysis confirming the introduction of the Western Fan-footed Gecko, *Ptyodactylus togoensis* (Tornier 1901) (Sauria: Phyllodactylidae), in Florida. *Reptiles & Amphibians* 23: 183–186
- Krysko KL, Burgess JP, Rochford MR, Gillette CR, Cueva D, Enge KM, Somma LA, Stabile JL, Smith DC, Wasilewski JA, Kieckhefer III GN, Granatosky MC, Nielsen SV (2011) Verified non-indigenous amphibians and reptiles in Florida from 1863 through 2010: Outlining the invasion process and identifying invasion pathways and stages. *Zootaxa* 3028: 1–64
- Krysko KL, Somma LA, Smith DC, Gillette CR, Cueva D, Wasilewski JA, Enge KM, Johnson SA, Campbell TS, Edwards JR, Rochford MR, Tompkins R, Fobb JF, Mullin S, Lechowicz CJ, Hazelton D, Warren A (2016) New verified nonindigenous amphibians and reptiles in Florida through 2015, with a summary of over 152 years of introductions. *Reptiles & Amphibians* 23: 110–143
- Leary S, Underwood W, Anthony R, Cartner S, Corey D, Grandin T, Greenacre CB, Gwaltney-Bran S, McCrackin MA, Meyer R, Miller D, Shearer J, Yanong R (2013) AVMA guidelines for the euthanasia of animals: 2013 edition. American Veterinary Medical Association, Schaumburg IL, 102 pp
- Murphy JC, Jowers MJ, Lehtinen RM, Charles SP, Colli GR, Peres Jr. AK, Hendry CR, Pyron RA (2016) Cryptic, sympatric diversity in tegu lizards of the *Tupinambis teguixin* group (Squamata, Sauria, Teiidae) and the description of three new species. *PLoS ONE* 11: e0158542, <https://doi.org/10.1371/journal.pone.0158542>
- Schneider L, Ferrara CR, Vogt RC, Guilhon AV (2011) Nesting ecology and nest predation of *Phrynops geoffroanus* (Testudines, Chelidae) in the Guaporé River of the Brazilian and Bolivian Amazon. *Chelonian Conservation and Biology* 10: 206–212, <https://doi.org/10.2744/1071-8443-10.2.206>