

Distributional Comments on the Teiid Lizards (Squamata: Teiidae) of Florida with a Key to Species

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ABSTRACT.—Florida presently has a large number (44) of established non-native amphibians and reptiles, 36 of which are lizards. There are currently one native and four non-native teiid lizards in Florida, and difficulty arises when trying to distinguish them from other similar species, especially in small individuals and/or deteriorated or faded preserved specimens. Because of the potential for their misidentifications in both the field and laboratory, we present a key to the established teiid species in Florida along with their current geographic distributions.

KEY WORDS.—*Ameiva ameiva*, *Aspidoscelis motaguae*, *Aspidoscelis sexlineatus*, *Cnemidophorus lemniscatus*, Exotic, Introduced, Lizard, Morphology, Non-native, Reptile, *Tupinambis merianae*

INTRODUCTION

Whiptails and tegu lizards (Teiidae) are found throughout much of the New World from central Argentina north into the Caribbean and United States (Reeder et al., 2002; Köhler, 2003; Pough et al., 2004). The state of Florida has five teiids; the native eastern six-lined racerunner, *Aspidoscelis sexlineatus* (Linnaeus 1766); and the non-native giant ameiva, *Ameiva ameiva* (Linnaeus 1758), giant whiptail, *Aspidoscelis motaguae* (Sackett 1941), rainbow whiptail, *Cnemidophorus lemniscatus* (Linnaeus 1758), and Argentine black and white tegu, *Tupinambis merianae* (Duméril and Bibron 1839). Although the golden tegu, *T. teguixin* (Linnaeus 1758), has been found on Key Biscayne, Miami-Dade County, Florida (UF 149983), there is currently no evidence suggesting its establishment in Florida. Like many other non-native lizards that now reside in Florida (see Meshaka et al., 2004; Krysko and Daniels, 2005), misidentification of these teiids arises because of their similarities in color patterns, especially in small individuals and/or deteriorated or

faded preserved specimens. Because of the potential for their misidentifications in both the field and laboratory, we present a key to the established teiid species in Florida and summary of their known geographic distributions.

MATERIALS AND METHODS

The geographic distributions of each teiid species in Florida were obtained from the literature, and by examining and verifying specimens in systematic collections, including the Florida Museum of Natural History (FLMNH), University of Florida (UF collection); and Everglades National Park (EVER), from which the entire collection is now accessioned into UF (Appendix). Additionally, field collections were made throughout Florida from May 1992–October 2006. Specimens were collected by hand, with blowguns projecting tapered corks, funnel traps, and fishing rods with insects or raw bacon for bait (see Krysko, 2000), and deposited in the UF collection. To create a dichotomous key, morphological characters distinguishing each species were obtained from the literature as well as by examining specimens. A total of 438 teiid specimens were examined (Appen-

ms. received Nov. 11, 2006; accepted April. 17, 2007

dix), including 58 *Ameiva ameiva*, 58 *Cnemidophorus lemniscatus*, 16 *Aspidoscelis motaguae*, 300 *Aspidoscelis sexlineatus*, and six *Tupinambis merianae*.

RESULTS

Teiids differ from all other known lizards in Florida by having large, rectangular and plate-like ventral scales. A key to the teiids of Florida is presented in Table 1.

Ameiva ameiva.—Non-native. The native distribution includes the Atlantic versant of South America from southern Brazil, Paraguay, Peru, northern Argentina, north to Colombia, Panama, Costa Rica, Trinidad, Tobago, Isla de Providencia, Grenada, and Grenadines (Barbour and Noble, 1915, 1920; Schwartz and Henderson, 1991; Vitt and Colli, 1994; Savage, 2002; Reeder et al., 2002; Köhler, 2003). It is believed to have been extirpated from St. Vincent (Malhotra and Thorpe, 1999). Duellman and Schwartz (1958) first recorded *A. ameiva* in Florida collected in June 1954 from Miami (UMMZ 111408; also see Neill, 1957:207). In Florida, this species occurs in Deerfield Beach, Broward County (Krysko et al., 2005), Miami, Hialeah, and Key Biscayne, Miami-Dade County. One specimen (LACM 116128) was collected in 1955 on Key West, Monroe County. Another individual was observed at Green Acres, Palm Beach County on 1 March 2003 (M. A. Nickerson, pers. comm.), but not collected. *Ameiva ameiva* is distinguished by having 10-12 longitudinal rows of ventrals at midbody (Table 1; Fig. 1A). Other morphological characters in-

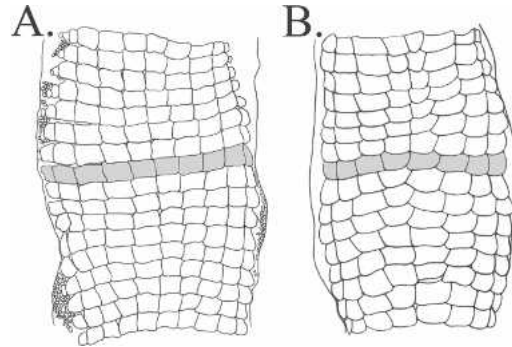


FIG. 1. Ventral views, typical teiid lizards showing large, rectangular, and plate-like ventral scales. Ventral scales in (A) 10-12 or (B) 8 longitudinal rows at midbody (highlighted in gray). Illustrated from: A = *Ameiva ameiva*, UF 142905, Key Biscayne, Miami-Dade County, Florida; B = *Aspidoscelis sexlineatus*, UF 141200, Key West, Monroe County, Florida.

clude one row of greatly enlarged scales on outside of upper arm; presence of a fleshy sheath enclosing base of tongue; posterior portion of tongue not clearly forked; smooth ventrals; absence of cloacal spurs in males; mesoptychial scales not enlarged on gular fold; granular dorsal scales; ontogenetic shift in dorsal color pattern occurs (especially in males); dorsal pattern olive, brown, or tan, sometimes with a green or blue cast with ≤ 5 pale longitudinal stripes and light spots; a greenish to brown head; throat and chest with pale blue and black spots; venter light-colored white to blue; and maximum size of 197 mm snout-vent length (SVL) (Conant and Collins, 1998; Schwartz and Henderson, 1991; Köhler, 2003).

Aspidoscelis motaguae.—Non-native. The

TABLE 1. Key to the teiids of Florida.

1a	Ventral scales large, rectangular, and plate-like (Fig. 1)	2
b	Ventral scales not large, rectangular, and plate-like	other lizard families in Florida
2a	Ventral scales in 8 longitudinal rows at midbody (Fig. 1B)	3
2b	Ventral scales in >8 longitudinal rows at midbody (Fig. 1A)	5
3a	Four parietals (Fig. 2A)	<i>Cnemidophorus lemniscatus</i>
b	Two parietals (Fig. 2B)	4
4a	31-35 enlarged scales from posterior end of gular fold to femoral pores (Fig. 3) ..	<i>Aspidoscelis sexlineatus</i>
b	37-39 enlarged scales from posterior end of gular fold to femoral pores	<i>Aspidoscelis motaguae</i>
5a	Ventral scales in 10-12 longitudinal rows at midbody (Fig. 1A)	<i>Ameiva ameiva</i>
b	Ventral scales in >12 longitudinal rows at midbody	<i>Tupinambis merianae</i>

native distribution includes a discontinuous range in sub-humid environments from central Oaxaca, Mexico through the middle Grijalva Valle in the central depression of Chiapas, the Salamá Basin, and upper Motagua Valley in Guatemala. It is also found in central Honduras, southeastern Guatemala, and adjacent El Salvador (Duellman and Zweifel, 1962). In Florida, it has been introduced in three known localities in Miami-Dade County: Hialeah; just north of Snapper Creek between SW 117 Avenue and the Florida Turnpike; and south of the Taylor Slough entrance to Everglades National Park (formerly Chekika State Park). This species is distinguished by having eight longitudinal rows of ventrals at midbody (Table 1; Fig. 1B), two parietals (Fig. 2B), and 37-39 enlarged scales from the posterior end of the gular fold to femoral pores (Fig. 3). Other morphological characters include ≥ 3 greatly enlarged scales on outside

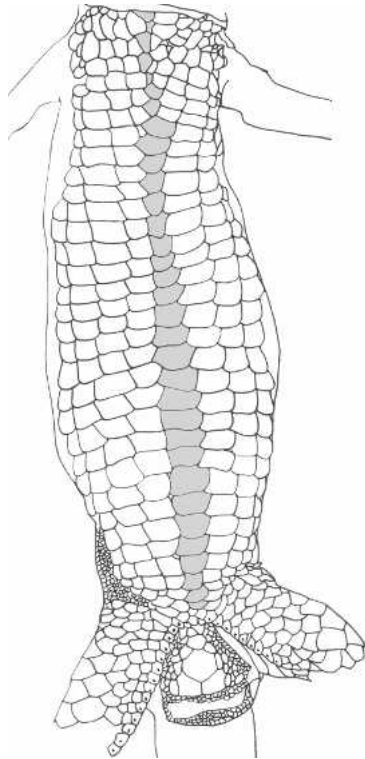


FIG. 2. Ventral view, 31-35 enlarged scales (highlighted in gray) from posterior end of gular fold to femoral pores. Illustrated from *Aspidoscelis sexlineatus*, UF 141200, Key West, Monroe County, Florida.

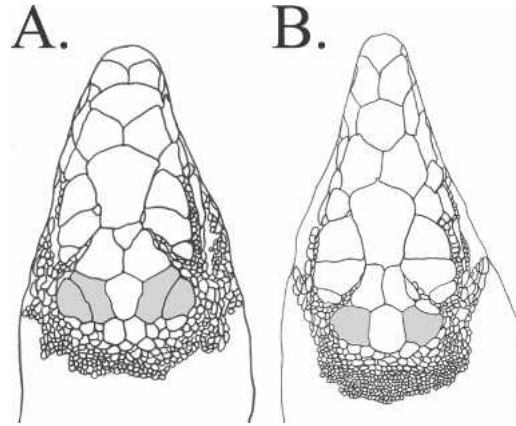


FIG. 3. Dorsal view, four (A) or two (B) parietal scales (highlighted in gray) on top of head. Illustrated from: A = *Cnemidophorus lemniscatus*, UF 131481, Hialeah, Miami-Dade County, Florida; B = *Aspidoscelis motaguanae*, UF 144199, Miami, Miami-Dade County, Florida.

of upper arm; no fleshy sheath enclosing base of tongue; posterior portion of tongue clearly forked; smooth ventrals; absence of cloacal spurs in males; mesoptychial scales abruptly enlarged on gular fold becoming smaller anteriorly; granular dorsal scales; dorsal pattern of juveniles black to brown with six light-colored longitudinal stripes, stripes usually completely replaced by light spots in adults; venter light-colored white to blue; and maximum size of 145 mm SVL (Reeder et al., 2002; Köhler, 2003).

Aspidoscelis sexlineatus.—Native. Occurs from eastern Texas and Missouri east to Maryland and Florida. In Florida, it occurs throughout the panhandle, and most of the peninsula south to Key West (Conant and Collins, 1998). This species is distinguished by having eight longitudinal rows of ventrals at midbody (Table 1; Fig. 1B), two parietals (Fig. 2B), and 31-35 enlarged scales from the posterior end of the gular fold to femoral pores (Fig. 3). Other morphological characters include scales on outside of rear of forearm slightly or not enlarged; no fleshy sheath enclosing base of tongue; posterior portion of tongue clearly forked; smooth ventrals; absence of cloacal spurs in males; mesoptychial scales abruptly enlarged on gular fold becoming smaller anteriorly; granular dorsal scales; dorsal pattern

tern black to brown with six light-colored longitudinal stripes and no spots; venter light-colored white to blue; tail light blue in juveniles; and maximum size of 72 mm SVL (Duellman and Schwartz, 1958; Conant and Collins, 1998; Reeder et al., 2002).

Cnemidophorus lemniscatus.—Non-native. This is part of a species complex that occurs in lower elevations in Amazonian Brazil, French Guiana, Suriname, Guyana, Venezuela, and NW Colombia in South America, and from extreme southeastern Guatemala to northeastern Honduras on the Atlantic versant and on the Pacific slope in Panama in Central America (Avila-Pires, 1995; Savage, 2002). Some populations reproduce parthenogenetically, however the form in southern Florida appears to be bisexual (see Punzo, 2001). King and Krakauer (1966) first reported *C. lemniscatus* (erroneously referred to as *C. picturatus*) from its only known Florida locality, in Hialeah, Miami-Dade County (also see Wilson and Porras, 1983). *Cnemidophorus lemniscatus* is distinguished by having eight longitudinal rows of ventrals at midbody (Table 1; Fig. 1B), and four parietals (Fig. 2A). Other morphological characters include ≥ 3 greatly enlarged scales on outside of upper arm; no fleshy sheath enclosing base of tongue; posterior portion of tongue clearly forked; smooth ventrals; presence of cloacal spurs in males; mesoptychial scales somewhat enlarged on gular fold becoming abruptly enlarged anteriorly; granular dorsal scales; and a maximum size of approximately 104 mm SVL (Avila-Pires, 1995; Conant and Collins, 1998; Reeder et al., 2002; Köhler, 2003). Color patterns are sexually dimorphic; males exhibit a dorsal ground color of brownish black with ≥ 6 yellowish-green longitudinal stripes, golden sides with yellow spots, bluish face, throat, and front of legs, and a bright green tail; females exhibit duller coloration with an orangish head, bright green tail, hind-limbs, and lower sides, and 7-9 yellow stripes on a greenish brown body (Conant and Collins, 1998; Köhler, 2003).

Tupinambis meriana.—Non-native. Occurs primarily south of Amazonia, or southeastern Brazil, Uruguay, eastern Paraguay, and northern Argentina (Luxmoore

et al., 1988; Fitzgerald et al., 1999). It has been introduced to Fernando de Noronha National Park, Brazil (Homewood, 1995), and western central Florida where it occurs in eastern Hillsborough and western Polk counties (Enge et al., 2006). This species has also been found in Miami, Miami-Dade County, and Okeechobee, Okeechobee County (UF 135044), but there is currently no evidence of establishment in these places. *Tupinambis meriana* is distinguished from its closest related congeners (*T. rufescens* and *T. duseni*) by having 20-25 femoral plus precloacal pores (Fitzgerald et al., 1999), although these latter two species do not occur in Florida. *Tupinambis meriana* is distinguished by having 38-42 longitudinal rows of ventrals at midbody (Table 1; Fig. 1), two parietals (Fig. 2B), and 40-45 enlarged scales from the posterior end of the gular fold to femoral pores (Fig. 3). Other morphological characters include non-enlarged scales on outside of upper arm; smooth ventrals; mesoptychial scales abruptly enlarged on gular fold becoming smaller anteriorly; two loreal scales, adult dorsal pattern black and white with dorso-lateral row of light spots or dashes; neonates have bright green heads and anterior portions of their bodies for about the first month after hatching; adult males have massive heads and jowls; and maximum size of 500 mm SVL (Duarte Varela and Cabrera, 2000).

Acknowledgments.—We thank K. M. Enge, J. H. Townsend, A. N. Hooper, A. T. Reppas, J. C. Nifong, A. P. Borgia, E. Lynk, T. S. Campbell, B. Love, E. A. Golden, E. M. Donlan, J. C. Lee, E. M. Langan, K. R. Larson, L. Ketzler, S. A. Johnson, R. Rego, C. M. Sheehy III, B. J. Camposano, C. P. Smith, J. L. Burns, A. M. Morse, S. J. Black, T. Blunden, E. Brown, J. Costine, V. Memmoli, D. Pawlowski, R. Thuemler, B. Kaiser, H. Mushinsky, R. Dickerson, S. Dickman, J. Roberts, K. Bradshaw, B. Carlisle, R. White, and L. Hord for fieldwork and/or laboratory assistance; S. H. and T. B. Townsend, and S. Morey for housing on collecting trips; Nancy Russell (EVER) for providing loans; K. Kirwin and E. Lynk (Crandon Park) and C. Marchand (Fort Zachary Tay-

lor State Historic Site) for access to study sites; D. Watkins and R. Skinner (Department of Environmental Protection) for permits (#5-03-24, #5-04-45, #5-05-05, and #03220410) to collect non-native species in Florida State Parks; and G. A. Rivas Fuenmayor, J. T. Townsend, M. A. Nickerson, and two reviewers for helpful suggestions of this paper.

LITERATURE CITED

- Avila-Pires, T. C. S. 1995. Lizards of Brazilian Amazonia (Reptilia: Squamata). *Zoologische Verhandlungen* 299:1-706.
- Barbour, T., and G. K. Noble. 1915. A revision of the lizards of the genus *Ameiva*. *Bull. Mus. Comp. Zool.* LIX:417-479.
- Barbour, T., and G. K. Noble. 1920. Amphibians and reptiles from southern Peru collected by the Peruvian Expedition of 1914-1915 under the auspices of Yale University and the National Geographic Society. *Proceedings of the United States National Museum* 58:609-620.
- Conant, R., and J. T. Collins. 1998. *A Field Guide to Amphibians and Reptiles of Eastern and Central North America*. Third edition expanded. Boston: Houghton Mifflin Co.
- Duarte Varela, C. F., and M. R. Cabrera. 2000. Testing skeletonchronology in black tegu lizards (*Tupinambis merianae*) of known ages. *Herpetol. Rev.* 31: 224-226.
- Duellman, W. E., and A. Schwartz. 1958. Amphibians and reptiles of southern Florida. *Bull. Fla. Sta. Mus., Biol. Sci.* 3:181-324.
- Duellman, W. E., and R. G. Zweifel. 1962. A synopsis of the lizards of the *sexlineatus* group (genus *Cnemidophorus*). *Bull. Am. Mus. Nat. Hist.* 123:155-210.
- Enge, K. M., B. W. Kaiser, and R. B. Dickerson. 2006. Another large exotic lizard in Florida, the Argentine black and white tegu. Abstract in *Proceedings of the 28th Annual Gopher Tortoise Council Meeting*, 26-29 October 2006, Valdosta, Georgia.
- Fitzgerald, L. A., J. A. Cook, and A. L. Aquino. 1999. Molecular phylogenetics and conservation of *Tupinambis* (Sauria: Teiidae). *Copeia* 1999:894-905.
- Homewood, B. 1995. Tejus upset natural order in Brazilian sanctuary. *New Scientist* (18 March):5.
- King, F. W., and T. Krakauer. 1966. The exotic herpetofauna of southeast Florida. *Quart. J. Fla. Acad. Sci.* 29:144-154.
- Köhler, G. 2003. *Reptiles of Central America*. Offenbach, Herpeton. 368 p.
- Krysko, K. L. 2000. A fishing technique for collecting the introduced knight anole (*Anolis equestris*) in southern peninsular Florida. *Caribb. J. Sci.* 36:162.
- Krysko, K. L., K. M. Enge, J. H. Townsend, E. M. Langan, S. A. Johnson, and T. S. Campbell. 2005. New county records of amphibians and reptiles from Florida. *Herpetol. Rev.* 36:85-87.
- Krysko, K. L., and K. J. Daniels. 2005. A key to the geckos (Sauria: Gekkonidae) of Florida. *Caribb. J. Sci.* 41:28-36.
- Luxmoore, R., B. Groombridge, and S. Broads (eds.). 1988. *Significant Trade in Wildlife: A Review of Selected Species in CITES Appendix II. Volume 2: Reptiles and Invertebrates*. IUCN Conservation Monitoring Centre, Cambridge, UK. 306 p.
- Malhotra, A. and R. S. Thorpe. 1999. *Reptiles and amphibians of the Eastern Caribbean*. London: Macmillan Education LTD. 134 p.
- Meshaka, W. E., Jr., B. P. Butterfield, and J. B. Hauge. 2004. *The Exotic Amphibians and Reptiles of Florida*. Malabar: Krieger Publ. Co. 166 p.
- Neill, W. T. 1957. Historical biogeography of present-day Florida. *Bull. Fla. Sta. Mus., Biol. Sci.* 2:175-220.
- Pough, F. H., R. M. Andrews, J. E. Cadle, M. L. Crump, A. H. Savitzky, and K. D. Wells. 2004. *Herpetology*. 3rd ed. New Jersey, Prentice-Hall.
- Punzo, F. 2001. Diet composition of the rainbow whiptail, *Cnemidophorus lemniscatus* (Sauria: Teiidae), from southern Florida. *Herpetological Review* 32: 85-87.
- Reeder, T. W., C. J. Cole, and H. C. Dessauer. 2002. Phylogenetic relationships of whiptail lizards of the genus *Cnemidophorus* (Squamata: Teiidae): A test of monophyly, reevaluation of karyotypic evolution, and review of hybrid origins. *Am. Mus. Novit.* 3365:1-61.
- Savage, J. M. 2002. *The amphibians and reptiles of Costa Rica: A herpetofauna between two continents, between two seas*. Illinois, Univ. Chicago Press.
- Schwartz, A., and R. W. Henderson. 1991. *Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History*. Gainesville: Univ. Florida Press. 720 p.
- Vitt, L. J., and G. R. Colli. 1994. Geographical ecology of a Neotropical lizard: *Ameiva ameiva* (Teiidae) in Brazil. *Can. J. Zool.* 72:1986-2008.
- Wilson, L. D., and L. Porras. 1983. The ecological impact of man on the south Florida herpetofauna. *Univ. Kansas Mus. Nat. Hist., Spec. Publ.* 9:1-89.

Appendix. Teiid specimens examined.
 UF = University of Florida collection;
 EVER = Everglades National Park
 collection, from which the entire
 collection is currently accessioned
 into UF.

Ameiva ameiva.—Colombia: UF 90281-83, 98756-57, 127227, 127231, 127233, 127234, 127236; Guyana: UF 83652, 87909-17; Panama: UF 127241-42, 127244, 127247, 127249, 127260-62, 127264, 127270; Suriname: UF 87276-78, 89691-94, 89696-98; United States: Florida: Broward County: UF 141584, Miami-Dade County: UF 22040, 83653-56, 83658, 85267, 133182,

133830, 134224, 135905-06, 137074, 137097, 137671, 141579, 142905.

Aspidoscelis motaguae.—Guatemala: UF 51629, 51630; Honduras: UF 87653-54, 87656, 127581-83; United States: Florida: Miami-Dade County: EVER 302534, 304110-11; UF 141587-88, 141595, 144195-96, 144199.

Aspidoscelis sexlineatus.—United States: Florida: Alachua County: UF 459, 464, 1178-2, 1317, 1395, 2707, 42616, 91760-61; Baker County: UF 42623-24; Bradford County: UF 127587-91; Broward County: UF 74899; Calhoun County: UF 9512 (1-3), 16017; Charlotte County: UF 127586; Citrus County: UF 42196-20, 80541, 84612, 127585; Clay County: UF 42621, 43717; Columbia County: UF 42626, 42629; Dixie County: UF 14119; Duval County: UF 127592-94; Franklin County: UF 15974, 42631-32, 42638, 42641, 42643, 55606, 55608, 55609-15, 55618, 55620, 62831-34, 73757-59, 84223, 127597, 127600-03, 127605-07, 143246-48, 143250, 143406; Gulf County: UF 19654; Hardee County: UF 115629; Highlands County: UF 68778-79, 127609-14; Hillsborough County: UF 81688-90; Jackson County: UF 143407; Lafayette County: UF 42646-47; Lake County: UF 4461-62, 61020; Leon County: UF 1939, 68159, 74893-96, 84221; Levy County: UF 9653 (1-2), 36127, 36130-31; Liberty County: UF 127639, 127643-45, 127646-50, 127653, 127655-56, 127658-59, 127667-69, 127670-74, 127676-78, 127680-83, 127685, 127687-89; Madison County: UF 42649; Marion County: UF 36109-10, 40026, 40067, 40124, 40130, 40141-42, 42980, 42988, 44253, 44257, 44816, 44820, 44852, 63409, 63415, 80539-40, 84306, 84308, 91837, 99808, 127943-44, 127869-70, 127880, 127897-98, 127901, 127947, 127951, 127959,

127971, 127975, 127984-85, 127989-90, 127994, 128008, 128017-18, 128049; Martin County: UF 42667-69; Miami-Dade County: UF 90330, 90872-74, 90879, 90891-92, 143245; Monroe County: UF 8635-36, 8638 (5, 7), 8639 (1, 4, 8), 8640 (2), 42670-72, 141200; Nassau County: UF 42674-75, 42677; Okaloosa County: UF 74897, 103299-302, 117701, 117705, 117691, 1177693, 117696-97, 117699; Orange County: UF 128047; Palm Beach County: UF 8754, 8755 (1-2), 8756 (1, 5, 6, 8); Pinellas County: UF 81687; Polk County: UF 2896 (4), 2986 (1, 2), 42679-80, 78768, 68777, 68780-82, 68784; Putnam County: UF 36121, 36123, 42682, 73166, 123981-82, 123984, 123989, 124278, 131730; Santa Rosa County: UF 117694, 117708-16; Sarasota County: UF 42683; St. Johns County: UF 41419, 50614, 115062, 121363; Sumter County: UF 91838-39; Suwannee County: UF 42684, 42688-89; Taylor County: UF 91098; Volusia County: UF 42690; Wakulla County: UF 42696, 42724, 128072, 128092-93, 128096-97, 128100-02, 128105-06; Walton County: UF 2681, 128048; Washington County: UF 64711-12.

Cnemidophorus lemniscatus.—Colombia: UF 90360-61, 90366, 127556-57, 127559, 127561, 127562-64, 127565, 127569, 127572-73, 127575-76; Honduras: UF 28376, 28379, 28430-35, 28444, 28485, 28509-11, 28513, 28534, 28554-56, 90901-03, 90905-06; Panama: UF 127549-50; Suriname: UF 27085, 127578; United States: Florida: Miami-Dade County: UF 131480-82, 131539; Venezuela: UF 34187, 34198, 34199, 34209, 34213, 34215-17, 34229, 34238, 90898.

Tupinambis merianae.—United States: Florida: Hillsborough County: UF 150434-38; Okeechobee County: UF 135044.