

ECOLOGICAL STATUS OF THE INTRODUCED  
YELLOW-HEADED GECKO, *GONATODES ALBOGULARIS*  
(SAURIA: GEKKONIDAE), IN FLORIDA

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**ABSTRACT:** Although the number of non-native herpetofaunal species in Florida has increased rapidly over the last few decades, no exotic amphibian or reptile species has yet been documented to exhibit a range-wide decline since its introduction. In this paper, I document the likely modes of introduction, geographic distribution, and present ecological status of the yellow-headed gecko, *Gonatodes albogularis*, in Florida. *Gonatodes albogularis* was first found in Florida from Opa-Locka, Miami-Dade County, in 1934, but was likely transferred from Key West, Monroe County, where the species was originally introduced and first documented in 1939. This species was also likely transported from Key West to other sites in southern Florida. The last known preserved specimen was collected in 1989 and last field observation occurred in 1995, both on Key West. Additional field surveys from December 1995 through December 2004 throughout the Florida Keys and southern peninsula yielded zero observations of this species, suggesting that it has undergone population declines or local extirpation. This is the first exotic herpetofaunal species in Florida that has been documented exhibiting a range-wide decline since its establishment.

*Key Words:* Ecology, species, lizard, exotic, non-native, Key West

FLORIDA presently has the largest number of established non-native herpetofaunal species and second largest number of non-native fish species in the United States (Butterfield et al., 1997; Fuller et al., 1999; Meshaka et al., 2004). Florida's diverse natural and human-altered habitats, warm climate, and substantial volume of trade involving non-native species have facilitated exotics establishment and range expansion, especially in southern Florida (Krysko et al., 2003; Townsend et al., 2003). Carr (1940) first summarized Florida's herpetofauna, in particular documenting 12 native and six non-native currently recognized lizard species. Many of these early exotic species were introduced as stowaways in shipments of ornamental plants and other commerce. Although Florida Statute 372.265 makes it illegal to release any exotic animal in Florida without first obtaining a permit from the Florida Fish and Wildlife Conservation Commission (FWC), recent introductions are attributed directly to the pet trade as animals have been intentionally released or escaped from reptile dealers or pet owners (for examples see Krysko et al., 2003; Townsend et al., 2003; Enge et al., 2004a, b). Florida currently has 16 native and 34 non-native lizard species (Krysko and Enge, 2005), and the number of introduced

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herpetofaunal species in Florida appears to be growing as quickly as researchers are able to investigate each new rumor (Townsend et al., 2003). It is important to document introduced herpetofaunal species because many are believed to possibly compete or prey on native species, cause habitat destruction, act as disease vectors or seed dispersers of exotic vegetation, and be toxic to other animals. To date, not a single exotic herpetofaunal species has been documented exhibiting a range-wide decline to the point of non-detection since its establishment in Florida.

The yellow-headed gecko, *Gonatodes albogularis* (Duméril and Bibron 1836), is native to the lowlands from Chiapas, Mexico on the Pacific slope and Guatemala on the Atlantic slope, south to northwestern Colombia and western Venezuela (Savage, 2002), and in Aruba, Curaçao, Tortuga, Orchila, Gorgona; Hispaniola, Jamaica, Cayman Islands, and Cuba (Barbour, 1910; Barbour and Ramsden, 1919; Schwartz and Henderson, 1991). This species was introduced on Key West in the lower Florida Keys, United States (Carr, 1939, 1940; King and Krakauer, 1966; Wilson and Porras, 1983; Schwartz and Henderson, 1991; Meshaka et al., 2004), as well as on Grand Cayman, Cayman Islands (Williams, 1964; Schwartz and Thomas, 1975) where it has since disappeared (Seidel and Franz, 1994). On Key West, *G. albogularis* was reported to be very common since its discovery there in 1939 (Carr, 1939, 1940; Duellman and Schwartz, 1958; King and Krakauer, 1966). However, Wilson and Porras (1983) hypothesized that this species had not been found in Florida since 1971 and suggested that its populations had declined or it was possibly extirpated. Afterward, Meshaka and co-workers (2004) speculated that this species had declined on Key West based on only a single field observation, but they did not report effort or hours searched for this species. In this paper, I assess the hypothesis regarding declining populations, as well as document the possible modes of introduction, geographic distribution, and present ecological status of *G. albogularis* in Florida.

**METHODS**—Historical records of *Gonatodes albogularis* in Florida were obtained from the literature, and all known Florida specimens within systematic collections throughout the United States were either borrowed and examined to verify species identification or verified by curatorial staff within their respective institution. Source acronyms follow Leviton and co-workers (1985). To determine the present ecological status of *G. albogularis* in Florida, areas previously known to contain this species, as well as other areas were surveyed, including 40 days in the Florida Keys from December 1995 through December 2004. In addition, press releases asking for assistance from the public to find *G. albogularis* were placed in local and online newspapers throughout the Florida Keys in July–August 2003 and February–March 2004. This method of utilizing the public for information has been successful for locating elusive Nile monitors, *Varanus niloticus* (Linnaeus 1758), in Florida (Enge and co-workers, 2004a). It is also important to know various morphological characters in order to accurately identify species, especially when examining degraded specimens (for key characters of Florida geckos see Krysko and Daniels, 2005).

**RESULTS**—Literature records indicate that *Gonatodes albogularis* had been found only on Key West and Stock Island, Monroe County, and in Coconut Grove, Miami-Dade County. I examined a total of 104 preserved Florida specimens labeled as *G. albogularis*, 99 of which are identified correctly (Table 1). Only one specimen (USF no #; Table 1) could not be verified, which was lost after preservation (Mushinsky, 2004). Three deteriorated specimens (FMNH 251972–74) collected

TABLE 1. Voucher specimens (n = 100) of the yellow-headed gecko (*Gonatodes albogularis*) from Florida. Localities are organized chronologically from Key West east and northeast through the Florida Keys and onto peninsula. An asterisk next to single Key West specimen (USF no #) could not be verified.

County	Locality	Date	Collector	N	Collection
Monroe					
	Key West	24 Apr 1939	R.S. Humbert	1	UF 1897
	Key West	1939	A.F. Carr	2	MCZ 44770-71
	Key West	5 Apr 1940	L.B. & R.H. McCauley, Jr.	6	CU 3305
	Key West	9 Dec 1944	C.H. Lowe	1	LACM 14013
	Key West, near Trumbo	9 Dec 1944	C.H. Lowe	2	LACM 74660-61
	Key West, near Aquarium	9 Dec 1944	D.R. Paulson	2	LACM 116104-05
	Key West	22 Dec 1951	E.L. Bell	1	UIMNH 29023
	Key West	25 Jul 1952	R. Porter	1	UMMZ 106038
	Key West	26 Jun 1953	W.E. Duellman	1	UMMZ 108357
	Key West	8 Aug 1953	D.R. Paulson	2	LACM 61416-17
	Key West	8 Aug 1953	L.N. Bell, D.R. Paulson & A. Schwartz	3	UMMZ 109293
	Key West	Aug 1953	H.W. Peterson	1	UIMNH 35735
	Key West	28 Jun 1954		2	KU 68965-66
	Key West	Sep 1954	R.E. Etheridge	3	UMMZ 115998
	Key West	1954	W.W. Warner	8	UF 7095
	Key West	10 Sep 1956	J.D. Hardy, Jr	2	USNM 138526-27
	Key West	7 Jan 1957	M.B. Mittleman	2	UIMNH 47656-57
	Key West	16 Aug 1958	C.F. Walker & R.E. Etheridge	1	UMMZ 118514
	Key West	Feb 1960	R.H. Mount	1	UF 121293
	Key West	25 Nov 1960	R. Rohe, R.J. & L.D. Ober	3	UF 95980-82
	Key West	9 Jan 1963		3	YPM 06961-63
	Key West	13 Apr 1963	R., J. & L.D. Ober	3	UF 95983-84, 99483
	Key West	21 May 1963	J. Lazlo	1	UF 95985
	Key West	6 Jul 1963	Wharton & E. Fernandez	1	GMNH 3696
	Key West	28 Apr 1964	M. Jones	1	AMNH 139565
	Key West	Apr 1964	F. Tate	1	MCZ 183045
	Key West	8 May 1964	M. Jones	1	AMNH 93789
	Key West, western end	15 Jun 1964	D.R. & M.L. Paulson & D.W. Buden	9	MCZ 183055-63
	Key West, cemetery	18 Aug 1965	R.M. Blaney	1	UF 143361
	Key West	6 Apr 1967	D.R. Paulson	1	LACM 61418
	Key West, 1904 Fogarty Ave	Jul 1967		1	ULM 39215
	*Key West, cemetery	1967-1970		1	USF no #
	Key West, along Salt Run Channel on south side of US 1	28 Apr 1989	R. Lawson & P.G. Frank, Jr.	2	CAS 172089, 174327
	Key West, Rest Beach	21 Jun 1989	A.P. Borgia	1	UF 137765

TABLE 1.—Continued.

County	Locality	Date	Collector	N	Collection
Monroe	Key West			1	UF 11536
	Stock Island, Key West Golf Course	6 Oct 1962	B.W. Mansell	2	UF 121294–95
	Stock Island	15 Jun 1964	D.R. Paulson	1	LACM 61419
	Stock Island, Key West Botanical Garden	15-17 Jul 1970	W.L. Pratt	1	FWM 7545
	Stock Island	20 Mar 1976	W.F. Link & C.R. Smith	2	UF 44398–99
	Stock Island	1977	W.F. Link	1	UF 47212
	Stock Island		W.F. Link	1	UF 43633
	Boca Chica Key, Boca Chica Road ca. 4.0 km SW U.S. 1	21 Aug 1979	W.J. Voss et al.	1	FWM 9837
	Key Largo, northern part of island	14 Jun 1962	C.A. Sutherland	2	ISU 575
	Miami-Dade	Opa-Locka	8 Mar 1934	M.B. Bishop	1
Goulds		29 Dec 1956	F. & C. Phillips	12	FMNH 83215
Miami		10 Sep 1956	J.D. Hardy, Jr	1	USNM 138533
St. Lucie	Fort Pierce			2	FMNH 209439–40

in 1986 on Sugarloaf Key, Monroe County, were misidentified ashy geckos, *Sphaerodactylus elegans* MacLeay 1834. *Sphaerodactylus elegans* is distinguished by having expanded terminal digital lamellae; small, smooth, granular, and juxtaposed dorsal scales; and light dorsal and lateral spots, each comprising only a single scale (Barbour, 1921; Krysko and King, 2002; Krysko and Daniels, 2005). One articulated skeletal specimen (UF 11787) collected prior to April 1961 in Miami, Miami-Dade County, was a misidentified native green anole, *Anolis carolinensis* (Voigt 1832). *Anolis carolinensis* is distinguished by having distinctly tri-cuspid dentition, especially on the posterior end of the jaw, and a relatively narrow head.

Preserved specimens demonstrate the existence of *Gonatodes albogularis* in Florida from 1934–1989 (Table 1), five years before its first documentation (Carr, 1939) and 18 years after Wilson and Porras (1983) suggested possible declines. The first known voucher specimen (YPM 01308) was collected on 8 March 1934 in Opa-Locka, Miami-Dade County, and was previously undocumented. Eighty-one specimens verify *G. albogularis* from previously known localities, including 72 from Key West from 1939–1989, eight from Stock Island from 1962–1977, and one from Miami in 1956. Eighteen specimens were previously undocumented and represent two new island records (one from Boca Chica Key in 1979 and two from Key Largo in 1962, Monroe County), two locality records (one from Opa-Locka, and 12 from Goulds in 1956, Miami-Dade County), and one county record (two from Fort Pierce, St. Lucie County). The press releases yielded 20 responses; Although all responses regarding living lizards led to incorrect identifications (i.e., mostly nocturnal hemidactylid geckos), one resulted in the last known voucher

specimen of *G. albogularis* that was collected and preserved by a Key West resident in June 1989. This preserved specimen (an adult male, 38 mm SVL, 81 mm total length) was photographed in 2003, and photographs were deposited in the Florida Museum of Natural History (FLMNH), University of Florida (UF 137765; Table 1). Field surveys throughout the Florida Keys and southern peninsula yielded zero observations of this species over a 10 yr period.

DISCUSSION—In its native range, *Gonatodes albogularis* prefers dry microhabitats, but is sometimes found in moist areas and often in edificarian situations (Duellman and Schwartz, 1958; Schwartz and Henderson, 1991; Köhler, 2003). *Gonatodes albogularis* is a conspicuous diurnal lizard that is found on trees, in holes and crevices, and under debris (Carr, 1939; Fitch, 1973; Schwartz and Henderson, 1991; Köhler, 2003). This species is often observed on tree trunks, branches, and wooden objects, sometimes hanging upside down (Carr, 1939; Fitch, 1973; Schwartz and Henderson, 1991; Köhler, 2003). Males are especially easily detectable because of their bright yellow heads. Sexual maturity can be reached at six months of age (Fitch, 1973), and intraspecific communal nesting has been reported (Sexton and Turner, 1971; Fitch, 1973). Females oviposit single eggs several times each year (Köhler, 2003) and eggs may take 2–4 months to hatch (Fitch, 1973; Köhler, 1999, 2003). Reproduction may occur year-round (Fitch, 1973), but reduced activity and reproduction occur during the December–May dry season (Sexton and Turner, 1971; Telford, 1971; Fitch, 1973). Adult males are known to defend a specific area and exhibit tail-waving as a territorial signal (Fitch, 1973), but holes and cavities that provide optimal refugia may be communal property and used by numerous individuals (Fitch, 1973). *Gonatodes albogularis* feeds on insects (Fitch, 1973) and spiders (Carr, 1940), and natural predators include larger lizards, snakes, birds, and mammals (Fitch, 1973; Bello, 2000).

Carr (1939:232) first reported *Gonatodes albogularis* collected in April 1939 in the area known as “Trumbo” on the northwestern end of Key West (also see Carr, 1940). This species was very commonly observed there; 18 individuals were collected and numerous other individuals of all age classes were observed, which prompted Carr (1939:232) to state that this species had “become a permanent addition to the Florida fauna.” All *G. albogularis* found there were on platforms and building walls on the dredged-up land occupied by the old railroad and fruit docks (Carr, 1939). Carr (1939) also stated that *G. albogularis* occurred at this site for at least six years prior to 1939 and was introduced here as a result of the frequent trade between Key West and Cuba. In 1940, commercial trade ceased at the Trumbo docks, and the area was taken over by the U.S. Navy and converted into the Trumbo Annex (Hambricht, 2003). Presently, three docks exist at Carr’s (1939) site (pers. obs.), with the center dock being where pineapples were shipped regularly from Cuba (Hambricht, 2003). Thus, *G. albogularis* was likely introduced at this precise site, and subsequently underwent both natural and human-mediated range expansion in southern Florida (see King and Krakauer, 1966). Nearly 20 years later, Duellman and Schwartz (1958) stated that *G. albogularis* still thrived in the old freight yards on Key West, but it was less common in the Navy yards and downtown Key West (Duellman, 2004). Duellman and Schwartz (1958)

also stated that *G. albogularis* was restricted to edificarian habitats, and that it would be unlikely for it to become established in natural habitats if transported to other sites. Crowder (1974) reported that *G. albogularis* was abundant on Key West and the subsequent three to four islands to the east (= Stock Island, Raccoon Key, Boca Chica Key, and Rockland Key, respectively); however, none of his specimens are known to have been deposited in any collection. Florida Keys voucher specimens reveal *G. albogularis* on Key West from 1939–1989, adjacent Stock Island from 1962–1977, Boca Chica Key in 1979, and as far northeast as northern Key Largo in 1962 (Table 1). Wilson and Porras (1983) stated that *G. albogularis* was once abundant on Key West, but none had been observed there since 1971. However, on 19 May 1984, C. D. May (2003) collected two male and five female *G. albogularis* along with several Mediterranean, *Hemidactylus turcicus* (Linnaeus 1758) and ashy (*Sphaerodactylus elegans*) geckos behind exfoliating bark of a single large tamarind tree (*Tamarindus indica*) at 1010 Windsor Lane, St. Mary Star of the Sea Catholic Church, Key West. *Gonatodes albogularis* was also found on this same tree on each of several visits through 1987 and in 1989 (May, 2003), and some of this information was subsequently reported by Meshaka and co-workers (2004) without question. C. D. May and I independently visited this site several times from 2003–2004, which yielded only tropical house geckos, *Hemidactylus mabouia* (Moreau de Jonnès 1818), and brown anoles, *Anolis sagrei* Duméril and Bibron 1837. Additionally, Lawson and co-workers (1991) collected and/or observed *G. albogularis* on Key West along Salt Run Channel on the south side of U.S. 1 on successive trips in 1989 and 1990 (Frank, 2003). Here, *G. albogularis* was easily observed during the daytime in small groups, <1 m high above ground hanging on the underside of low limbs of buttonwood (*Conocarpus erectus*), Brazilian pepper (*Schinus terebinthifolius*), and white mangrove (*Laguncularia racemosa*) trees, and geckos frequently jumped to the ground and hid in leaf litter when approached (Frank, 2003). I visited Salt Run Channel seven times from May 2002–March 2004, and three times I walked nearly the entire channel through Key West without finding any *Gonatodes albogularis*. The last known verified specimen was collected on 21 June 1989 along Atlantic Avenue in Key West, where numerous other individuals were easily observed on a sea wall at the shore of Rest Beach near the White Street Pier (Borgia, 2003). This wall was demolished shortly after its collection, and no *G. albogularis* have been seen there despite subsequent searches of the area from 1990–2004 (pers. obs.; Borgia, 2003). W. E. Meshaka (2003) observed a single *G. albogularis* emerge from a crevice in a ficus tree (*Ficus* sp.) at ca. 1900 h near the Truman Annex in 1995, but it escaped capture (also see Meshaka et al., 2004).

Although the first voucher specimen for *Gonatodes albogularis* in Florida was collected in 1934 in Opa-Locka, Miami-Dade County, this species was likely introduced secondarily from Key West because Opa-Locka is situated inland and not a port of entry from countries where *G. albogularis* occurs. Because only 1–2 voucher specimens demonstrate this species occurring in Opa-Locka, Miami-Dade County, and Fort Pierce, St. Lucie County (Table 1), it is unknown if these specimens ever represented established populations. Twelve specimens were collected in 1956 in Goulds just south of Miami, possibly indicating an established

population, but no known specimens have been collected there since. King and Krakauer (1966) reported that *G. albogularis* was found in 1965 in Coconut Grove, Miami-Dade County, but a reptile hobbyist collected *G. albogularis* on Key West and released them at his residence near Day Avenue and Matilda Street (King and Krakauer, 1966; King, 2003), and this population was later reported to be extirpated (Wilson and Porras, 1983).

*Gonatodes albogularis* occurred in Florida for at least 61 years from ca. 1934–1995. Although recent searches for this species have been unsuccessful, it might still occur in small isolated areas, especially on Key West, as much of the island consists of densely landscaped private residences. Nonetheless, *G. albogularis* is a diurnal and conspicuous species that thrives on buildings and houses in edificarian habitats, and because only one known observation has occurred in the last 15 years in Florida, it appears that this species has indeed undergone severe population declines (see Wilson and Porras, 1983). This is now the first exotic herpetofaunal species in Florida that has been documented exhibiting a range-wide decline since its establishment.

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