

The identity of Spiny-tailed Iguanas, *Ctenosaura*, introduced to Florida, USA (Squamata: Sauria: Iguanidae)

Die Identität von nach Florida (USA) eingeführten Schwarzleguanen
der Gattung *Ctenosaura*
(Squamata: Sauria: Iguanidae)

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KURZFASSUNG

Zwei Arten von Schwarz- oder Stachelschwanzleguanen, *Ctenosaura pectinata* (WIEGMANN, 1834) und *C. similis* (GRAY, 1831), wurden in Florida eingeführt. Die Populationen auf den Inseln Key Biscayne, Miami-Dade-County und Gasparilla, Charlotte- und Lee-County, wurden als *C. pectinata* beschrieben. Über den Status und die Verbreitung von *C. similis* war bisher nur wenig bekannt. Die Ergebnisse herpetologischer Exkursionen (seit 1995), in Gebiete, in denen Schwarzleguane vorkommen und der Untersuchungen an allen bekannten Exemplaren in wissenschaftlichen Sammlungen ließen erkennen, daß es sich bei den meisten beschriebenen Populationen nicht um *C. pectinata*, sondern um *C. similis* handelt. An der südöstlichen Küste Floridas ist *C. similis* auf der Insel Biscayne und in Hialeah, Miami-Dade County, und in Davie, Broward-County nachgewiesen. An der südwestlichen Küste Floridas ist *C. similis* auf der Insel Gasparilla und in den angrenzenden Gebieten, Lee- und Charlotte-County, sowie auf der Insel Keewaydin, Collier-County verbreitet. *Ctenosaura pectinata* kommt nur entlang der Old Cutler Road, westlich der Bucht von Biscayne, Miami-Dade-County vor.

ABSTRACT

Two species of Spiny-tailed Iguanas or ctenosaurs, *Ctenosaura pectinata* (WIEGMANN, 1834) and *C. similis* (GRAY, 1831), have been introduced in Florida. Populations on Key Biscayne, Miami-Dade County, and Gasparilla Island, Charlotte and Lee counties, are reported to be *C. pectinata*. However, the status and distribution of *C. similis* are reported to be poorly known. After conducting herpetofaunal surveys since 1995 in areas known to contain ctenosaurs, as well as examining all known specimens in systematic collections, we found that most populations reported to be *C. pectinata* were *C. similis*. On the south-eastern Florida coast, *C. similis* occurs on Key Biscayne and in Hialeah, Miami-Dade County, and in Davie, Broward County. On the south-western Florida coast, *C. similis* occurs on Gasparilla Island and in adjacent areas, Lee and Charlotte counties, and on Keewaydin Island, Collier County. *Ctenosaura pectinata* occurs only along Old Cutler Road on the western side of Biscayne Bay, Miami-Dade County.

KEY WORDS

Reptilia: Squamata: Sauria: Iguanidae: *Ctenosaura pectinata*, *Ctenosaura similis*, introduced species, misidentification, ctenosaur, Spiny-tailed Iguana, USA, Florida, Davie, Gasparilla Island, Hialeah, Keewaydin Island, Key Biscayne, Old Cutler Road

INTRODUCTION

Spiny-tailed iguanas or ctenosaurs of the genus *Ctenosaura* WIEGMANN, 1828 consist of 17 species native to central and southern Mexico, the Yucatán Peninsula, and Central America (KÖHLER et al. 2000; KÖHLER 2002). Representatives of this genus have been introduced into the United States in southern Texas and southern peninsular Florida. Two species, the Mexican [*C. pecti-*

nata (WIEGMANN, 1834)] and Black [*C. similis* (GRAY, 1831)] Spiny-tailed Iguanas, have been reported to have established populations in southern Florida (EGGERT 1978; BEHLER & KING 1979; WILSON & PORRAS 1983; STILING 1989; CONANT & COLLINS 1991; DALRYMPLE 1994; ANGELL 1996; BUTTERFIELD et al. 1997; BARTLETT & BARTLETT 1999; MCKERCHER 2001; KRYSKO et al. 2003).

Ctenosaura similis was first reported as established along Old Cutler Road on the western side of Key Biscayne, Miami-Dade County (EGGERT 1978). However, WILSON & PORRAS (1983) stated that this population was misidentified and consisted of *C. pectinata*. *Ctenosaura pectinata* was subsequently reported from Key Biscayne and Everglades National Park, Miami-Dade County (BUTTERFIELD et al. 1997), and on Gasparilla Island, Charlotte and Lee counties (ANGELL 1996; BARTLETT & BARTLETT 1999; MC KERCHER 2001; MCCOID 2002). BARTLETT & BARTLETT (1999) stated that

because all *Ctenosaura* populations in southern Florida were purportedly *C. pectinata*, the status of *C. similis* in Florida was poorly known.

During herpetofaunal surveys conducted since 1995, we observed and/or captured more than 300 specimens of *C. similis* in southern Florida. The absence of *C. pectinata* in our surveys suggests that either *C. pectinata* has been extirpated or Florida populations of *Ctenosaura* have been misidentified. Therefore, we attempted to clarify species identification and distribution of *Ctenosaura* in Florida.

MATERIALS AND METHODS

Records were based on captures and observations while surveying Florida's introduced herpetofauna between December 1995 and September 2002. Captures were made during the daytime using nooses, noose carpets, and blowguns with tapered corks. Voucher specimens and photographs were deposited in the Florida Museum of Natural History (FLMNH), University of Florida (UF collection). Historical *Ctenosaura* records from Florida were obtained from the literature. All additional Florida specimens were borrowed from research collections throughout the United States and examined by us to verify species identification, except for three specimens that were examined on our behalf by curatorial staff at the Louisiana State University Museum of Zoology (LSUMZ).

Ctenosaura pectinata and *C. similis* are closely related species but differ in a number of morphological and molecular characters (KÖHLER & STREIT 1996; KÖHLER et al. 2000). In particular, three

morphological characters distinguish these two species in Florida. *Ctenosaura similis* has 0 – 12 (mean = 0.4) scales separating the posterior end of the dorsal and the anterior end of the caudal crests, two complete rows of intercalaries between whorls of enlarged caudal scales near the base of the tail, and dark dorsal crossbands (these may be obscured in some darker adult individuals). *Ctenosaura pectinata* has 0 – 20 (mean = 7.2) scales separating the dorsal and caudal crests, three complete rows of intercalary scales between whorls of enlarged caudal scales near the base of the tail, and lacks dark dorsal crossbands as an adult. Identification of juveniles in the field may be more difficult, as both species tend to be bright green and gray with dark crossbands. However, the number of scales separating the dorsal and caudal crests as well as the number of intercalary scales are diagnosable characters for all age classes, and thus were used for identification of juveniles.

RESULTS AND DISCUSSION

We examined 45 *Ctenosaura* from Florida (Appendix), including 28 collected by the authors. Five individuals from the vicinity of Old Cutler Road were identified as *C. pectinata* (table 1). On the south-eastern coast, 23 individuals from Crandon Park on Key Biscayne, one individual from

Amelia Earhart Park, Hialeah (Miami-Dade County), and one individual from Davie (Broward County) were identified as *C. similis* (table 1, figure 1). On the south-western coast, 14 individuals from Gasparilla Island, and one individual from Keewaydin Island (Collier County) were identified as *C. sim-*

Table 1: Comparison of three key diagnostic morphological characteristics in Florida specimens of *Ctenosaura pectinata* (WIEGMANN, 1834) and *C. similis* (GRAY, 1831) 1 - number of scales between posterior end of dorsal and anterior end of caudal crests, min. - max. values (mean; std. dev.); 2 - number of caudal whirls with three complete rows of intercalaries, min. - max. values (mean; std. dev.); 3 - dark dorsal crossbands present (+) or absent (-). Four specimens from Gasparilla Island (see Appendix) represented by photographs are omitted.

Tab. 1: Vergleich dreier morphologischer Schlüsselmerkmale bei Exemplaren von *Ctenosaura pectinata* (WIEGMANN, 1834) und *C. similis* (GRAY, 1831) aus Florida. 1 - Anzahl der Schuppen zwischen dem Hinterende des Rücken- und dem Vorderende des Schwanzkammes, Minimum - Maximum (Mittelwert; Standardabweichung); 2 - Anzahl der Schwanzschuppenringe mit drei vollständigen Interkalarschuppenreihen, Minimum - Maximum (Mittelwert; Standardabweichung); 3 - dunkle Rückenquerbänderung vorhanden (+) oder fehlend (-). Vier durch Fotos belegte Exemplare von der Insel Gasparilla (siehe Appendix) sind hier nicht berücksichtigt.

Species Art	Locality Fundort	n	1	Character / Merkmal 2	3
KÖHLER & STREIT (1996)					
<i>C. pectinata</i>		66	0 – 20 (7.2; 6.91)	0 – 10 (4.6; 1.97)	–
<i>C. similis</i>		136	0 – 12 (0.4; 1.97)	0 – 6 (0.6; 1.25)	+
This study / diese Untersuchung					
<i>C. pectinata</i>	Old Cutler Road	5	1 – 16 (9.8; 5.89)	3 – 7 (5.2; 1.78)	–
<i>C. similis</i>	Key Biscayne	23	0 – 2 (0.13; 0.45)	0 (0.0; 0.0)	+
	Hialeah	1	0 (0.0; 0.0)	0 (0.0; 0.0)	+
	Gasparilla Island	10	0 (0.0; 0.0)	0 (0.0; 0.0)	+
	Davie	1	0 (0.0; 0.0)	0 (0.0; 0.0)	+
	Keewaydin Island	1	0 (0.0; 0.0)	0 (0.0; 0.0)	+

ilis (table 1, figure 1). We found no evidence supporting the existence of *Ctenosaura* in Everglades National Park (figure 1). Our data suggest that the absence of *C. pectinata* in our surveys is a result of species misidentification and not extirpation.

BARTLETT & BARTLETT (1999) stated that the ecological status of *C. similis* in Florida is poorly known, but our data suggest just the opposite situation exists. *Ctenosaura pectinata* occurs only along Old Cutler Road on the southeastern coast (figure 1). On the southeastern coast, *C. similis* occurs on Key Biscayne and in Hialeah, Miami-Dade County, and in Davie, Broward County (figure 1). On the south-western coast, *C. similis* occurs on Gasparilla Island and in adjacent areas, Lee and Charlotte counties, and on Keewaydin Island, Collier County (figure 1).

Old Cutler Road (Miami-Dade County). EGGERT (1978) originally reported this population as *C. similis*, however WILSON & PORRAS (1983) re-identified this population as *C. pectinata*. Additionally, WILSON & PORRAS (1983) stated that this population has existed since the early 1960s and was restricted to areas between SW 168 and SW 184 streets in South Miami. Photographs provided by EGGERT (1978) indeed

appear to be *C. pectinata*. Voucher specimens for this population identified by us as *C. pectinata* (Appendix) have been collected along the east side of Old Cutler Road in the area between SW 174 and SW 184 streets. Numerous individuals, den sites, and eggs were observed in this area around rock piles near freshwater canals from the 1970s through 1990s (EGGERT 1978; WILSON & PORRAS 1983; DALRYMPLE 1994). We observed two adult *C. pectinata* near the junction of SW 174 Street and Old Cutler Road in September 2002, verifying that this population is still extant.

Key Biscayne (Miami-Dade County). Key Biscayne, an approximately 7-km-long barrier island east of Miami, is separated from the mainland by Virginia Key and Biscayne Bay. This population of ctenosaurs has been known for decades in the area around Crandon Park, formerly known as Crandon Park Zoo. Ctenosaurs have existed here since at least 1979 when the zoo closed, as individuals escaped and were released on the island (K. KIRWIN and E. LYNK, pers. comm.). Presently, a well-established population occurs throughout the island from Crandon Park to Cape Florida. Individuals have been observed utilizing roots of weeping figs (*Ficus benja-*

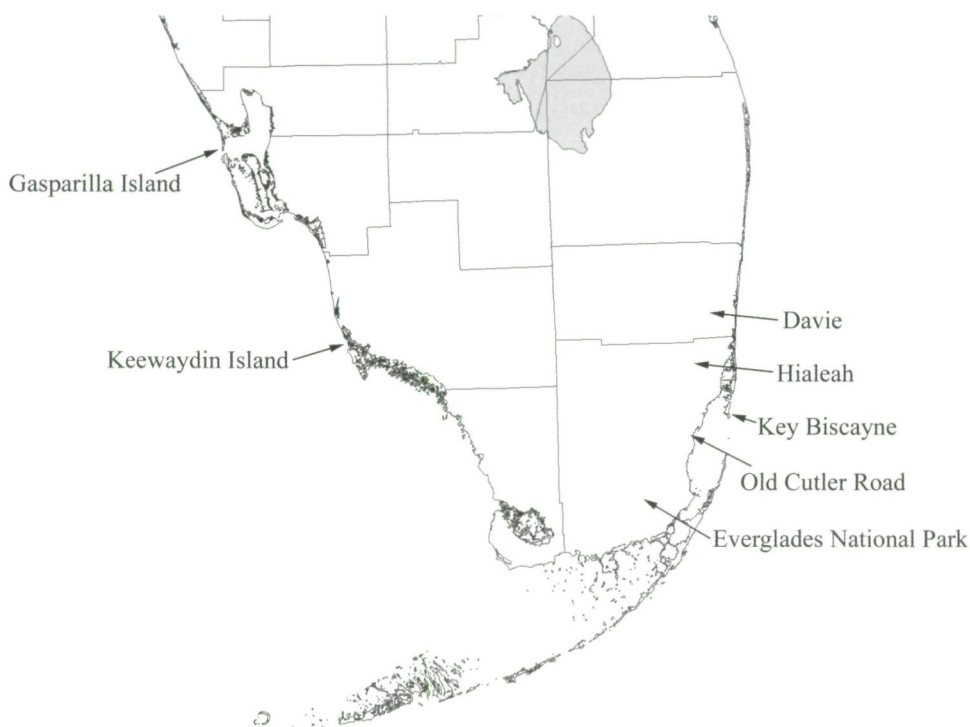


Fig. 1: Map of southern Florida showing reported localities of *Ctenosaura*.

Abb. 1: Karte des südlichen Florida mit den Fundorten von *Ctenosaura*.

mina), oolitic limestone boulders, cement structures in old exhibits, building foundations, and buried PVC and metal pipes as refugia. BUTTERFIELD et al. (1997) reported *C. pectinata* to occur on and along Key Biscayne. However, our records of more than 150 individuals indicate only *C. similis* occurs here, and all voucher specimens examined were *C. similis*.

Hialeah (Miami-Dade County). A single *C. similis* was collected at Amelia Earhart Park in 1996. We do not know whether this specimen is part of a larger population or just an escaped or released animal.

Davie (Broward County). A single *C. similis* was collected dead-on-road (DOR) in a parking lot in Davie. We do not know whether this specimen is part of a larger population or just an escaped or released animal.

Everglades National Park (Miami-Dade County). BUTTERFIELD et al. (1997) reported *C. pectinata* from Everglades National Park based on observation cards filled out by park visitors (W. E. MESHAKA, pers. comm.). However, we found no evidence supporting their report and no *Ctenosaura* specimens from Everglades National Park have been deposited in any known systematic collection.

Gasparilla Island (Lee and Charlotte counties). Gasparilla Island, an approximately 10.5-km-long barrier island southwest of Port Charlotte, is separated from the mainland by Charlotte Harbor and Gasparilla Sound. The approximate northern one-third of Gasparilla Island is situated in Charlotte County, whereas the remainder is in Lee County. ANGELL (1996) first reported *C. pectinata* on Gasparilla Island, and subsequent reports followed

(BARTLETT & BARTLETT 1999; MCKERCHER 2001; MCCOID 2002). Examination of two museum specimens (UF 91662, TCWC 84723) as well as specimens recently collected by the authors confirm this population to be *C. similis* (table 1; KRYSKO et al. 2003). Furthermore, photographs labeled as *C. pectinata* by ANGELL (1996) and BARTLETT & BARTLETT (1999) are misidentified and clearly *C. similis*. Although ctenosaurs on Gasparilla Island have been consistently identified as *C. pectinata* in the literature, there is no evidence to suggest that *C. pectinata* ever occurred in this area.

Ctenosaura similis on Gasparilla Island appears to have originated from a single introduction of three individuals in the late 1970s–early 1980s (KRYSKO et al. 2003). Presently, a large, well-established population of *C. similis* occurs throughout Gasparilla Island, as well as on Cayo Costa Island to the south, and on the mainland at Placida, Cape Haze, and Gulf Cove (KRYSKO et al. 2003).

Keewaydin Island (Collier County). Keewaydin Island, an approxi-

mately 11-km-long barrier island ca. 80 km south of Gasparilla Island, is separated from the mainland primarily by Rookery Bay. *Ctenosaura similis* on Keewaydin Island appears to have originated from a single introduction of 5–30 individuals in 1995 on the southern end of the island within the Rookery Bay Estuarine Research Reserve (KRYSKO et al. 2003). Presently, *C. similis* is now found throughout Keewaydin Island and on adjacent Little Marco Island.

The identity of *Ctenosaura* populations in Florida is an example of the need to deposit voucher specimens in an accessible systematic collection in order to properly document the presence of introduced species. The nature of allopatric populations arising from independent introductions should lead investigators to verify species rather than simply relying on previous reports from unrelated introductions. Reports based on speculation may add to the confusion in the already convoluted world of Florida's non-native herpetofauna.

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APPENDIX

Specimens examined (n = 45)

Source acronyms are Everglades National Park (EVER); University of Kansas (KU); Louisiana State University Museum of Zoology (LSUMZ); Texas Cooperative Wildlife Collection (TCWC); Florida Museum of Natural History, University of Florida (UF). Asterisk indicates specimens collected by the authors.

Ctenosaura pectinata: Miami-Dade Co. — Old Cutler Road: EVER 302959; KU 206675; LSUMZ 36642-43, 36650.

Ctenosaura similis: Broward Co. — Davie: UF 132434. Charlotte Co. — Gasparilla Island: UF 91662, TCWC 84723. Collier Co. — Keewaydin Island: UF 128412. Lee Co. — Gasparilla Island: UF 121140-43 (photos), 133211-17*, 133254*. Miami-Dade Co. — Amelia Earhart Park, Hialeah: EVER 302934; Crandon Park, Key Biscayne: EVER 304105, 306532-33; UF 130697-99*, 130772*, 130783*, 131496-97*, 131536*, 131543*, 133821-28*, 134225-27*.

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