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Neonate Brown Basilisk (*Basiliscus vittatus*) along water's edge at Vanderbilt Beach County Park, Collier County.

The Introduced Brown Basilisk (*Basiliscus vittatus*) in Florida

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Abstract.—The Brown Basilisk (*Basiliscus vittatus* Wiegmann 1828) is the only established representative of the family Corytophanidae in Florida. Until recently, the only reported populations of *B. vittatus* in the United States were in the southeastern Florida peninsula from northern Miami-Dade County and adjacent Broward County to the north. Herein, we document likely modes of introduction of this species in Florida and illustrate range expansion as far south as Homestead in Miami-Dade County, as far north as St. Lucie County, and as far west as Collier County.

Key Words: Corytophanidae, Exotic, Iguania, Lizard, Non-native

The Florida herpetofauna presently contains 50 recognized species of lizards, with an overwhelming 34 (68%) of these being non-native and primarily of tropical origin (Krysko and Enge 2005). Fifteen (44%) of these non-native lizards are in the superfamily Iguania (*sensu* Frost et al. 2001), and eight are anoles in the family Polychrotidae. The Brown Basilisk (*Basiliscus vittatus* Wiegmann 1828) is the only established representative of the family Corytophanidae in Florida, although a few adult Green Basilisks (*Basiliscus plumifrons* Cope 1876), a larger and more arboreal species than *B. vittatus*, have occasionally been observed (Bartlett and Bartlett 1999, Meshaka et al. 2004, R. Goushaw, pers. comm.). Because no voucher specimens or photographs of *B. plumifrons* from Florida are available, we view these sightings as escaped or released pets that do not presently represent established populations. Until recently, *B. vittatus* had only been documented from northern Miami-Dade County and adjacent Broward County in the southeastern peninsula. Herein, we document likely modes of introduction of this species in Florida and illustrate range expansion to the south, north, and west.

Materials and Methods

To determine the present geographic distribution of *Basiliscus vittatus* in Florida, we made field collections of this species from July 2000 through June 2005. Specimens were collected by hand, with nooses (Strong et al. 1993), blowguns shooting tapered corks, and fishing rods using invertebrates for bait (Krysko 2000). *Basiliscus vittatus* can be extremely wary and difficult to approach closely, but we were extremely successful at collecting this species using domestic crickets or crabs on a fishing hook for bait. When a lizard was observed, we used a fishing rod to cast a food item to within about 3 m of the lizard. Lizards would typically jump off their perches or out from dense vegetation and eat the bait, and were then easily reeled in and collected. Specimens were

deposited in the Florida Museum of Natural History (FLMNH), University of Florida (UF collection). We also obtained locality records from the literature and systematic collections throughout the United States. Source acronyms for collections follow Leviton et al. (1985), with the addition of Everglades National Park (EVER), from which the entire collection is currently being accessioned into UF. All records with locality data were plotted using ArcView v3.2 (ESRI).

Results and Discussion

Native Distribution and Natural History.—*Basiliscus vittatus* is found in lowland habitats from coastal regions of central México south through Central America and northern South America to Ecuador (Savage 2002, Köhler 2003). *Basiliscus vittatus* inhabits tropical and subtropical forests in both disturbed and undisturbed habitats, where it can be found on the ground, in bushes, or on the lower branches of trees, particularly near bodies of water (Campbell 1998). Juveniles are more closely associated with the water's edge than adults (Maturana 1962, Hirth 1963, Laerm 1974).

This diurnally active species is most frequently observed in August and September, but is active year-round (Hirth 1963). Peak activity occurs in the early morning and late afternoon during sunny days, but lizards may be active sporadically throughout the day during overcast weather (Hirth 1963). *Basiliscus vittatus* has a small home range of about 7.9–19.8 m² in Costa Rica (Fitch 1973a). At night, *B. vittatus* retreats to elevated (0.3–2.7 m or more) perches (i.e., in palm fronds, on twigs or branches overhanging rivers, under bridges), where it sleeps until daybreak (Conant 1951, Neill and Allen 1959, Alvarez del Toro 1960, Hirth 1963).

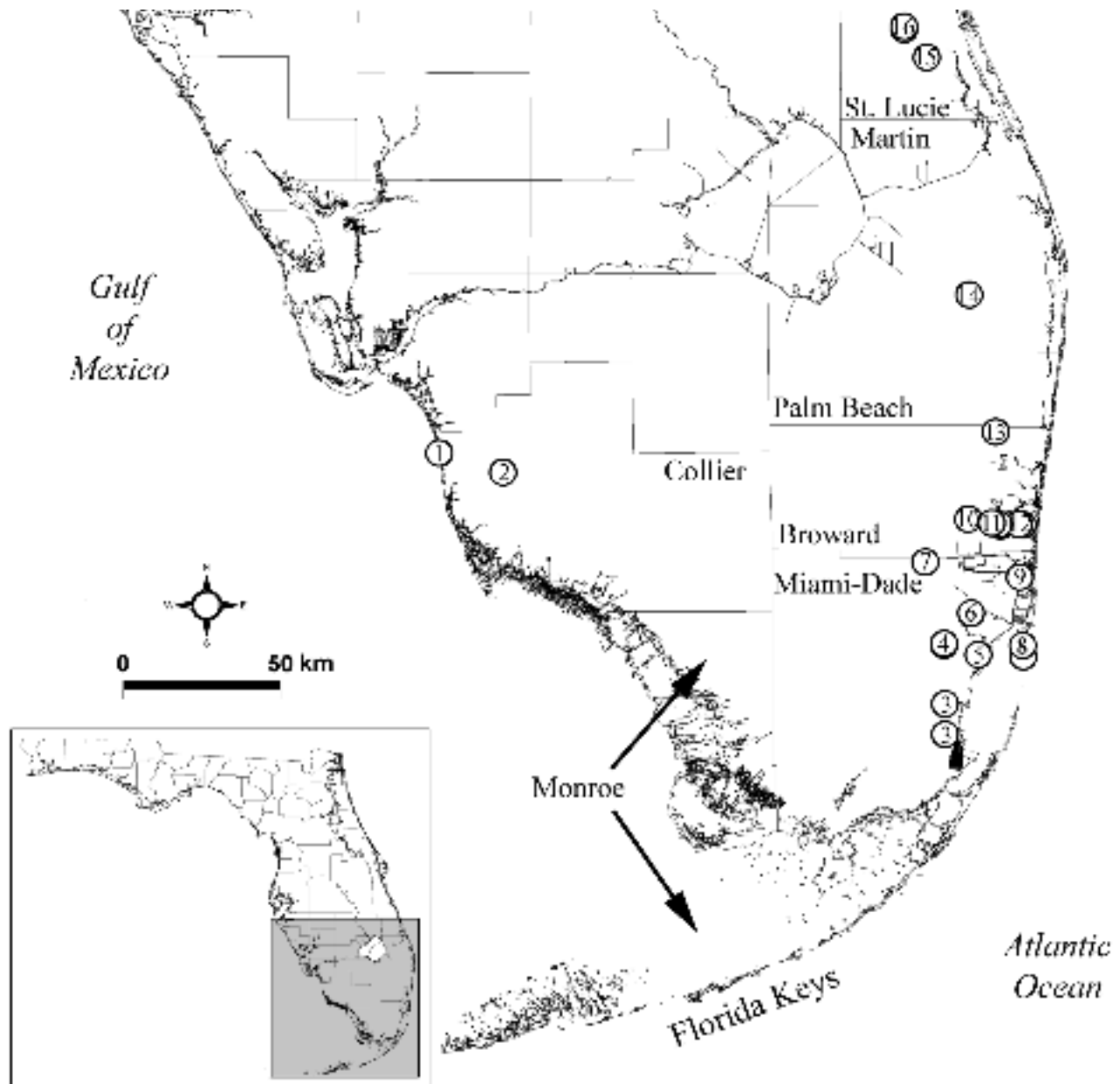
Neonates, which measure 35–40 mm snout-vent length (SVL) and weigh 1.5 g, grow an average of 15 mm during their

first month of life (Hirth 1963). Maturity is reached at about six months of age; adults typically measure around 115 mm (females) to 134 mm SVL (males), but males may grow as large as 170 mm SVL and > 90 g (Fitch 1973a, b, Savage 2000). *Basiliscus vittatus* is reported to live about three years in the wild, but most survive less than one year (Hirth 1963, Fitch 1973a). A female usually deposits between two and four clutches of 2–6 eggs annually (maximum of 12 eggs; Alvarez del Toro 1960), primarily during a nine-month nesting season beginning in mid-February (Fitch 1973a).

Neonates are reported to eat a variety of invertebrates — tenebrionid beetles, ants, grasshoppers, amphipods, lycosid spiders, and lepidopteran larvae — whereas adults feed on both

invertebrates and plant matter such as grasses, seeds, stems, and berries (Hirth 1963, Lee 2000). Predators include snakes, birds, other lizards, and Atlantic Ghost Crabs (*Ocypode quadratus*). Basilisk eggs oviposited on beaches may sometimes be unearthed by nesting sea turtles (Hirth 1963, Campbell 1998). Basilisks may run up to 30 m towards water or vegetation to escape predation (Fitch 1973a), often in a bipedal stance with only their hind feet touching the ground. Basilisks are popularly referred to as “Jesus Christ lizards,” because of their ability to run across the surface of water for short distances.

Distribution in Florida.—We compiled 307 records of *Basiliscus vittatus* from Florida. Sixty-eight of these are preserved speci-



Records ($n = 307$) of the Brown Basilisk (*Basiliscus vittatus*) in Florida. Localities include: (1) Vanderbilt Beach Park, (2) Golden Gate, (3) Homestead, (4) Snapper Creek Canal, (5) Red Road, (6) Miami International Airport, (7) Krome Avenue and US 27, (8) Key Biscayne, (9) Elaine Gordon Park, (10) Cooper City, (11) Davie, (12) Hollywood, (13) Parkland, (14) Loxahatchee, (15) Fort Pierce, and (16) Header Canal and Glades Cutoff Roads.

mens collected between 1979 and 2005 (Appendix), 55 of which were collected during our surveys. The remaining 239 records are our observations of individuals in the wild. *Basiliscus vittatus* was found in five Florida counties, including Broward, Collier, Miami-Dade, Palm Beach, and St. Lucie.

Wilson and Porras (1983) first recorded *Basiliscus vittatus* in Florida from three localities in Miami-Dade and Broward counties, and these had been the only reported populations in the United States until recently (see Conant and Collins 1998, Crother 2000[2001]). In 1976, *B. vittatus* was found in two areas of Miami, Miami-Dade County: near a sparsely vegetated canal near the northwestern corner of Miami International Airport (MIA), and around an animal dealer's compound near NW 70th Street and 70th Avenue (Wilson and Porras 1983). In 1981, the latter site was demolished, but lizards were subsequently seen on a nearby canal bank. Wilson and Porras (1983) predicted that the merging of these two nearby populations was likely because of the species' ability to adapt to modified habitats and that its dispersal was not limited by city growth. Meshaka et al. (2000) speculated that *B. vittatus* would be the next non-native species to enter Everglades National Park.

In Miami-Dade County, we recorded *Basiliscus vittatus* in parking lots and along canals, shores of lakes, and borrow pits from SW 120th Avenue and 72nd Street east to the Snapper Creek Canal and Red Road, near the junction of Krome Avenue and US 27, in Enchanted Forest Elaine Gordon Park, in Bill Baggs Cape Florida State Park and Crandon Park on Key Biscayne, and as far south as SW 117th Avenue and E Palm Drive in Homestead near the Turkey Point Power Plant. For example, at MIA we observed 20 juvenile *B. vittatus* in one hour hiding in grass about 60 cm tall along a single canal. At this site, we also recorded Cane Toads (*Bufo marinus*), Green Anoles (*Anolis carolinensis*), Bark Anoles (*A. distichus*), Brown Anoles (*A. sagrei*), Green Iguanas (*Iguana iguana*), Tropical House Geckos (*Hemidactylus mabouia*), and Brahminy Blind Snakes (*Ramphotyphlops braminus*). We recorded five *B. vittatus* on sidewalks, in parking lots, and in grass on SW 117 Avenue from Snapper Creek to just south of Sunset Drive. At this site, we also recorded Greenhouse Frogs (*Eleutherodactylus planirostris*), Giant Whiptails (*Aspidoscelis motaguae*), and *Anolis sagrei*. On two occasions, while fishing for *Aspidoscelis motaguae*, we blind casted a live cricket on the sidewalk in front of vehicular traffic and had a *B. vittatus* run out from shrubs onto the sidewalk to grab and eat the insect. We recorded more than 50 *B. vittatus* along Snapper Creek on Red Road between SW 88 and 100 streets. There, *B. vittatus* is frequently observed on trees, grass, or cement walls. At this site, we also recorded Red-eared Sliders (*Trachemys scripta elegans*), *Anolis distichus*, *A. carolinensis*, *A. sagrei*, Puerto Rican Crested Anoles (*A. cristatellus*), Knight Anoles (*A. equestris*), and *Iguana iguana*. Around 25 *B. vittatus* were collected using flashlights at night as they slept in vegetation along a canal near the junction of Krome Avenue and US 27 (B. Love, pers. comm.). Along with at least 43 other non-marine amphibian and reptilian species, we recorded more than 125 *B. vittatus* from Crandon Park and Bill Baggs Cape Florida State Park on Key Biscayne (Krysko et al., in prep.). We recorded seven *B. vittatus* in vegetation along canals near the Turkey Point Power Plant. At these sites, we also recorded Two-

toed Amphiuma (*Amphiuma means*), *Bufo marinus*, *Eleutherodactylus planirostris*, Green Treefrogs (*Hyla cinerea*), Cuban Treefrogs (*Osteopilus septentrionalis*), *Anolis carolinensis*, *A. sagrei*, *Hemidactylus mabouia*, Corn (*Elaphe guttata*) and Yellow Rat (*E. obsoleta*) snakes, Southern (*Nerodia fasciata*) and Florida Green (*N. floridana*) watersnakes,



Juvenile Brown Basilisk (*Basiliscus vittatus*) on vegetation along Snapper Creek on Red Road between SW 88 and 100 streets, Miami-Dade County.



Adult female Brown Basilisk (*Basiliscus vittatus*) on a tree along Snapper Creek on Red Road between SW 88 and 100 streets, Miami-Dade County.



Adult male Brown Basilisk (*Basiliscus vittatus*) on a Fig (*Ficus* sp.) along Snapper Creek on Red Road between SW 88 and 100 streets, Miami-Dade County.



KENNETH L. KRYSKO

Juvenile Brown Basilisk (*Basiliscus vittatus*) on a palm at Crandon Park, Key Biscayne, Miami-Dade County.



KENNETH L. KRYSKO

Adult male Brown Basilisk (*Basiliscus vittatus*) along a driveway on curb at Crandon Park, Key Biscayne, Miami-Dade County.

Ramphotyphlops braminus, Ribbon Snakes (*Thamnophis sauritus*), Florida Soft-shelled Turtles (*Apalone ferox*), Common Snappers (*Chelydra serpentina*), Striped Mud Turtles (*Kinosternon baurii*), Peninsula Cooters (*Pseudemys peninsularis*), American Alligators (*Alligator mississippiensis*), and American Crocodiles (*Crocodylus acutus*).

Wilson and Porras (1983) reported a third well-established population of *Basiliscus vittatus*, of unknown origin, along a canal on NW 70th Street between Stirling and Griffin roads in Davie, Broward County. In Broward County, we found *B. vittatus* along many canals and lakes, and in parking lots at localities such as Wolf Lake Park and Stirling Road just west of NW 66th Avenue in Davie, Stirling Road about 0.8 km west of I-95 in Hollywood, Stirling Road about 1.6 km east of I-95 and just east of NW 65th Avenue in Hollywood, C-11 Canal in Cooper

City, and in Parkland. We recorded 16 *B. vittatus* along lake margins at Wolf Lake Park, along with *Anolis distichus*, *A. sagrei*, *Iguana iguana*, Ringneck Snakes (*Diadophis punctatus*), *Elaphe guttata*, *Ramphotyphlops braminus*, and Florida Brown Snakes (*Storeria victa*). We recorded four *B. vittatus* in the parking lot of a reptile dealer on Stirling Road just east of NW 65th Avenue in Hollywood, along with African Rainbow Lizards (*Agama agama*), *Anolis equestris*, *A. sagrei*, Common House Geckos (*Hemidactylus frenatus*), Red-sided Curly-tailed Lizards (*Leiocephalus schreibersii*), a Chinese Water Dragon (*Physignathus cocincinus*), and Smooth-backed Gliding Geckos (*Ptychozoon lionotum*). We recorded five *B. vittatus* in the vicinity of NW 81 Terrace in Parkland, along with Hispaniolan Green Anoles (*Anolis chlorocyanus*), Large-headed Anoles (*A. cybotes*), *A. sagrei*, and *Iguana iguana*.



KENNETH L. KRYSKO

Adult male Brown Basilisk (*Basiliscus vittatus*) on a tree at Wolf Lake Park, Broward County.



ANTHONY T. REPPAS

Senior author holding an adult male Brown Basilisk (*Basiliscus vittatus*) at Wolf Lake Park, Broward County.

Krysko et al. (2005) first reported *Basiliscus vittatus* from Palm Beach County in Loxahatchee, where an adult male and female were observed in a backyard. However, in 1992, a reptile dealer reported buying 100–150 *B. vittatus* per week from children who collected them in the West Palm Beach area, and a commercial collector caught about 300 *B. vittatus* in three nights along canals in West Palm Beach in 2003 (G. Ward, pers. comm.).

Krysko et al. (2005) first reported *Basiliscus vittatus* farther north in St. Lucie County at the northern end of CR 609 (Header Canal Road), as well as east of Carlton Road ca. 1.6 km north of Glades Cutoff Road, where an adult male and female and two juveniles were spotlighted and observed in dense vegetation along canals at night. An adult female was collected while sleeping on a branch at night in an abandoned citrus grove along Eleven Mile Road ca. 1 km north of CR 712 (Midway Road). A disjunct population has been established since about 1990 in White City, south of Fort Pierce (G. Ward, pers. comm.).

Krysko et al. (2005) first reported *Basiliscus vittatus* from southwestern Florida at Vanderbilt Beach County Park in Naples, and near the junction of 17th Street SW and 16th Avenue in Golden Gate, Collier County. *Basiliscus vittatus* was first observed at Vanderbilt Beach County Park in 2000, where a locally abundant population inhabits an urbanized coastal wetland of predominantly Red Mangroves (*Rhizophora mangle*) and Brazilian Pepper (*Schinus terebinthifolius*). This small wetland is positioned around the perimeter of a public parking lot adjacent to a Gulf of Mexico beach. All size classes have been observed at this locality, mostly along the edges of water and the adjacent parking lot, sidewalks, and roads, where lizards are frequently observed basking and foraging. *Basiliscus vittatus* has

also been observed since January 2004 along a canal in adjacent Golden Gate.

Natural History in Florida.—In Florida, *Basiliscus vittatus* is commonly found along the edges of vegetated canals and lakes, especially those bordered by Australian Pine (*Casuarina equisetifolia*), Brazilian Pepper, willow (*Salix* spp.), Buttonwood (*Conocarpus erectus*), and mangrove trees. This species is diurnal and is frequently observed on hot, sunny days; on overcast or cool days, it often basks on vegetation overhanging water or near the water's edge.

In Miami-Dade County, *Basiliscus vittatus* is known to feed on beetles (including the Eyed Elator, *Alaus oculatus*), roaches, ants, hemipterans, and *Ficus* fruits (Meshaka et al. 2004). At Vanderbilt Beach County Park in Naples, Collier County, one of us (JCS) observed *B. vittatus* pursuing and eating large insects and arachnids 2.4–3.0 m away, as well as two *B. vittatus* fighting over a captured *Anolis sagrei*. At this site, we have used domestic crickets, as well as locally collected Wood (*Sesarma cinereum*) or Fiddler (*Uca pugilator*) crabs as bait on fishing rods to collect *B. vittatus*.



KEVIN M. ENGE

Adult male Brown Basilisk (*Basiliscus vittatus*) in vegetation east of Carlton Road, St. Lucie County.



THOMAS M. CRAVENS

Adult male Brown Basilisk (*Basiliscus vittatus*) on a Brazilian Pepper (*Schinus terebinthifolius*) stump within Red Mangroves (*Rhizophora mangle*) at Vanderbilt Beach County Park, Collier County.



Juvenile Brown Basilisk (*Basiliscus vittatus*) on a Brazilian Pepper (*Schinus terebinthifolius*) stump at Vanderbilt Beach County Park, Collier County.

Gravid female *Basiliscus vittatus* have been found from March through July in Florida, and a gravid female collected in June oviposited a second clutch in October (Meshaka et al. 2004). *Elaphe guttata*, Black Racers (*Coluber constrictor*), and Eastern Indigo Snakes (*Drymarchon couperi*) are reported to have been observed eating juvenile *B. vittatus* (see Meshaka et al. 2004).

Since the introduction of *Basiliscus vittatus* in 1976 (Wilson and Porras 1983), this species had slowly spread throughout many parts of Miami-Dade and Broward counties. Its current presence in Palm Beach County is likely due to natural range expansion. However, the occurrence of this species in Collier and St. Lucie counties is likely due to subsequent illegal introductions, because large gaps in distribution occur between these localities. Nonetheless, its preference for riparian habitats and the presence of an extensive and interconnected system of drainage canals will continue to allow *B. vittatus* to expand its range naturally into almost every area in southern Florida.

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Appendix. Specimens examined from Florida counties. Note that Everglades National Park (EVER) specimens are in the process of being accessioned into UF.

Broward: UF 120962, 121430–35, 121798–99, 122501–02, 124584, 142920; *Collier*: UF 137034–36, 141603; *Miami-Dade*: EVER 302935–37, 302960, 304113, 306530, 308399–401; KU 220259, 222395; UF 61444, 121460, 122500, 122581, 130654–56, 130773, 131490–91, 131505, 131519, 133835–37, 134228–30, 134821, 134904–05, 134911–15, 137075, 140835, 142694, 144157–61, 144248; *Palm Beach*: UF 137179–80; *St. Lucie*: UF 137407, 137447.