



From Sea Level to High in the Mountains: Predation on Reptiles by the Opportunistic Cuban Racer, *Cubophis cantherigerus* (Squamata: Dipsadidae)

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The Cuban Racer (*Cubophis cantherigerus*) (Squamata: Dipsadidae; Fig. 1) is an active forager known to feed on a variety of prey, including crabs, frogs, lizards, other snakes, hatchling sea turtles, birds, introduced rodents, and bats (Henderson and Sajdak 1996; Henderson and Powell 2009; Reyes et al. 2013; Rodríguez-Cabrera et al. 2016; Rodríguez-Cabrera 2017). This species is distributed throughout the Cuban Archipelago, where it occupies a wide range of habitats at elevations from sea level to 1,800 m (Henderson and Powell 2009; Rodríguez et al. 2010, 2013; Estrada 2012). Herein we report predation on reptiles by the Cuban Racer in both lowland and highland ecosystems of central and western Cuba (Fig. 2) and present a summary of reptiles predated by this species (Table 1).

At 1558 h on 21 August 2017, we observed a Cuban Racer (ca. 700 mm SVL) swallowing head-first a hatch-

ling Green Sea Turtle (*Chelonia mydas*; ca. 50 mm carapace length; Fig. 3) at the Caleta de los Piojos beach (21°49'34"N, 84°53'55"W; below 1 m asl; WGS 84) on the Guanahacabibes Peninsula, Sandino Municipality, Pinar del Río Province, Cuba (Fig. 2). They were in the shadow of some bushes (*Suriana maritima*, Surianaceae) in a sandy beach vegetation complex about 5 m from the shore (Fig. 4).

Hatchling sea turtles emerge en masse and represent a concentrated food source that is exploited by a variety of predators, including crabs, fishes, lizards, snakes, birds, and mammals (see Ernst and Lovich 2009 for reviews), although relatively few reptiles have been observed exploiting this resource. In the West Indies, only two records document predation by reptiles on sea turtles. Crother (1986) reported a Cuban Racer and Knapp and Prince (2008) documented the Dominica Whiptail (*Pholidoscelis fuscatus*) preying on hatch-



Fig. 1. Adult Cuban Racers (*Cubophis cantherigerus*) from (A) the Guanahacabibes Peninsula, Pinar del Río Province, western Cuba and (B) “Lomas de Banao” Ecological Reserve, eastern Guamuhaaya Massif, Sancti Spíritus Province, central Cuba. Photographs © Raimundo López-Silvero Martínez (A) and Sandy León de Armas (B).

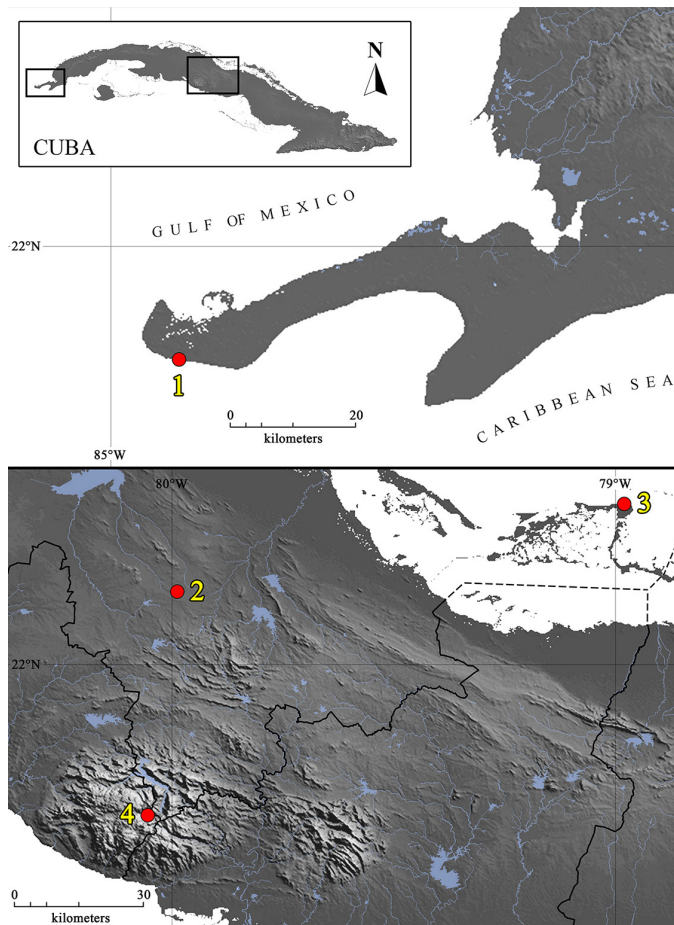


Fig. 2. Map of western (above) and central Cuba (below) depicting the locations (red dots) where we observed predation events by Cuban Racers (*Cubophis cantherigerus*): (1) Caleta de los Piojos beach on the Guanahacabibes Peninsula, (2) the Arroyo Grande River near Santa Clara, (3) Cayo Santa María, and (4) Guanayara Park in the Guamuhaaya Massif.

ling Hawksbill Sea Turtles (*Eretmochelys imbricata*). Although few reports document predation on hatchling sea turtles, the sandy beaches frequently used as nesting sites by turtles in Cuba also are inhabited by the opportunistic Cuban Racer; consequently, the predation rate might be higher than previously thought. Azanza (2008) reported two instances of predation on turtle nests by a snake she referred to as “jubo negro (*Tropidophis melanurus*)” (= “black racer”), but the photograph on p. 44 clearly depicts a Cuban Racer. The predation event reported herein not only represents the second official case of this snake preying on hatchling sea turtles, but also the first instance of reptilian predation on a Green Sea Turtle in the West Indies and the third instance of predation on any hatchling sea turtles by reptiles in the region.

Sea turtles are seriously threatened worldwide, and the Green Sea Turtle (Fig. 5) is listed as Endangered in both the IUCN Red List and the Red Book of Cuban Vertebrates (Lutz and Musick 1997; Seminoff 2004; Moncada and Nodarse 2012). Some sandy beaches are critical for the reproduction of sea turtles and that is the case of those on the Guanahacabibes Peninsula, where more than 400 Green Sea Turtle nests

Table 1. Reptilian prey of the Cuban Racer (*Cubophis cantherigerus*).

Prey	Sources
Squamata: Dactyloidae	
<i>Anolis angusticeps</i>	Henderson and Sajdak (1996)
<i>Anolis equestris buidei</i>	Rodríguez-Cabrera et al. (2016)
<i>Anolis ophiolepis</i>	Henderson and Sajdak (1996)
<i>Anolis porcatus</i>	Henderson and Sajdak (1996)
<i>Anolis quadriocellifer</i>	Henderson and Sajdak (1996)
<i>Anolis sagrei</i>	Henderson and Sajdak (1996)
<i>Anolis</i> sp.	Novo and Arazoza (1986), Henderson and Sajdak (1996)
<i>Pholidoscelis auberi abducta</i>	Buide (1966)
<i>Cyclura nubila nubila</i>	Buide (1966), Schwartz and Henderson (1991), Henderson and Sajdak (1996)
Squamata: Leiocephalidae	
<i>Leiocephalus cubensis</i>	Henderson and Sajdak (1996)
<i>Leiocephalus</i> sp.	Vogel (1965), Novo and Arazoza (1986)
Squamata: Diploglossidae	
<i>Diploglossus delasagra</i>	Henderson and Sajdak (1996)
Squamata: Sphaerodactylidae	
<i>Sphaerodactylus</i> sp.	Henderson and Sajdak (1996)
Lizard (indeterminate)	Henderson and Sajdak (1996)
Squamata: Dipsadidae	
<i>Caraiba andreae</i>	Novo and Arazoza (1986), Henderson and Sajdak (1996)
<i>Cubophis cantherigerus</i>	This paper
Squamata: Tropidophiidae	
<i>Tropidophis m. melanurus</i>	This paper
<i>Tropidophis</i> sp.	Novo and Arazoza (1986)
Testudines: Cheloniidae	
<i>Eretmochelys imbricata</i>	Crother (1986)
<i>Chelonia mydas</i>	This paper
Testudines: Emydidae	
<i>Trachemys d. decussata</i>	This paper

are recorded each year (e.g., Ibarra et al. 2002; Moncada et al. 2006). Fortunately, the entire peninsula is considered a Biosphere Reserve and, to guarantee sea turtle reproduction, its sandy beaches are managed by the administration of the Guanahacabibes National Park with assistance from the Center of Marine Investigations, University of Havana (e.g., Ibarra et al. 2002, 2004; Azanza 2008). However, several



Fig. 3. Sequence of photographs of predation by a Cuban Racer (*Cubophis cantherigerus* ssp.) on a hatchling Green Sea Turtle (*Chelonia mydas*) at the Caleta de los Piojos beach on the Guanahacabibes Peninsula in western Cuba. Photographs © Alejandro Abella Quintana.

threats (beside humans) to the turtle nests have been reported (Azanza 2008; Azanza et al. 2006, 2008). These include ants (several species), dipteran larvae (*Megaselia*), crabs (*Ocyropsis quadrata*), feral dogs (*Canis lupus familiaris*), and feral pigs (*Sus scrofa*), the last of which is considered one of the 100 “World’s Worst Invasive Alien Species” (Lowe et al. 2000) and is particularly harmful in the Guanahacabibes Peninsula, sometimes causing turtle nest losses exceeding 5% (Azanza



Fig. 4. Sandy beach vegetation complex with bushes of *Suriana maritima* (Surianaceae) on the Guanahacabibes Peninsula in western Cuba. Photograph © Aslam I. Castellón Maure.

2008). The presence of the Cuban Racer on sandy beaches used by sea turtles must be considered an additional threat for emerging hatchlings. Because of the critical conservation status of sea turtles, what has been natural predation for millions of years might now have harmful effects as turtle numbers decline. Consequently, even a minimal threat must be considered during nest monitoring in order to guarantee the highest reproductive success possible.

However, turtle predation by Cuban Racers is not limited to hatchlings of marine species. In the summer of 1984 near the Arroyo Grande River, a tributary of the Sagua la Grande River, about 5 km northwest of Santa Clara and 600 m north of “Planta Mecánica,” Santa Clara Municipality, Villa Clara Province, Cuba (22°26’04”N, 80°00’42”W; 80 m asl; WGS 84; Fig. 2), a large adult Cuban Racer (SVL ca. 900 mm) had a hatchling Cuban Slider (*Trachemys decussata decussata*; ca. 30 mm carapace length) in its stomach (obtained by forced regurgitation). The snake was in secondary grassland about 4 m from the Arroyo Grande River bank. The turtle may have



Fig. 5. The Green Sea Turtle (*Chelonia mydas*) is an endangered species that frequently uses the sandy beaches of the Cuban Archipelago for reproduction and shows high fidelity for the same nesting sites each year. Photograph © Tomás M. Rodríguez-Cabrera.

been captured while basking on the banks of the river, which was the closest body of water.

The Cuban Slider (Fig. 6) is the only freshwater turtle in Cuba. Two subspecies (*T. d. decussata* from central and eastern Cuba and northwestern Jamaica, and *T. d. angusta*, from western Cuba, Isla de la Juventud, and the Cayman Islands) are currently recognized (Schwartz and Henderson 1991; Parham et al. 2013), although a recent molecular study (Parham et al. 2013) suggested that they might represent separate species. Adult turtles are threatened only by humans and crocodiles (*Crocodylus acutus* and *C. rhombifer*), but nests and hatchlings have several natural enemies, including ants, the invasive African Catfish (*Clarias gariepinus*), feral dogs, feral pigs, the Small Indian Mongoose (*Urva auropunctata*), and the Cuban Boa (*Chilabothrus angulifer*, Boidae) (Sampedro and Montañez 1989; Ramos et al. 1994; Nieto 1997; Sampedro 1998; see Henderson and Powell 2009 for a review; Alonso et al. 2014; Hurtado et al. 2016). Gundlach (1876) mentioned finding remains of a Cuban Slider in the



Fig. 6. The Cuban Slider (*Trachemys decussata*), the only freshwater turtle in Cuba, is widely distributed in most bodies of water across the Archipelago. Photograph © Tomás M. Rodríguez-Cabrera.

nest of a Crested Caracara (*Caracara cheriway*), but did not indicate whether it was prey or taken as carrion.

Few snakes have been reported in the diet of the Cuban Racer. Novo and Arazoza (1986) found remains of Cuban Lesser Racers (*Caraiba andreae*) and tropes (*Tropidophis*; Tropidophiidae) in stomach contents of wild-caught Cuban Racers, but they specified neither the number of prey items nor the species of trope. Henderson and Sajdak (1996) reported two Cuban Lesser Racers in stomach contents of museum specimens.

In the summer of 1998, EMS captured a very large adult Cuban Racer (SVL ca. 1,000 mm) that contained a smaller conspecific (presumably immature, SVL ca. 400 mm) in its stomach (obtained by forced regurgitation) at Playa Perla Blanca (22°39'55"N, 78°58'24"W; < 3 m asl; WGS 84), Remedios Municipality, Villa Clara Province, Cuba (Fig. 2). The snake was on a dune in a sandy beach vegetation complex. This is the first case of cannibalism reported for the Cuban Racer.

At 1037 h on 5 September 2016, we observed an adult Cuban Racer (SVL ca. 800 mm) preying on a medium-sized Giant Trope (SVL ca. 500 mm; Fig. 7) between the Salto del Rocío waterfall and Poza del Venado (22°57'48"N, 80°03'19"W; 410 m asl; WGS 84) along the Charco Azul River in Guanayara Park, Topes de Collantes Protected Natural Landscape, Cumanayagua Municipality, Cienfuegos Province (Fig. 2). The snakes were in leaf litter adjacent to a path surrounded by gallery forest (Fig. 7). Although we could not confirm complete swallowing, the trope seemed already dead (it was relaxed despite being a constricting snake), probably attributable to envenomation by the Cuban Racer (e.g., Neill 1954; Jaume and Garrido 1980; Rodríguez-Cabrera et al. 2016).

The family Tropidophiidae includes 27 West Indian species (Hedges 2018) and others in South America (e.g., Curcio et al. 2012; Uetz et al. 2018), with Cuba as the center of an adaptive radiation with 16 endemic species (e.g., Hedges 2002; Domínguez et al. 2006). Despite this diversity, few predators have been reported for tropes, probably because of their array



Fig. 7. Sequence of photographs of predation by a Cuban Racer (*Cubophis cantherigerus cantherigerus*) on a Giant Trope (*Tropidophis melanurus*) and the habitat near the place where we observed the predation event, in the Guanayara Park in the Guamuhaia Massif of central Cuba. Photographs © Alexander A. Matienzo Martínez (left and center) and Tomás M. Rodríguez-Cabrera (right).



Fig. 8. The Giant Trope (*Tropidophis melanurus*) is a frequently encountered Cuban endemic distributed throughout the Archipelago. Photograph © Raimundo López-Silvero Martínez.

of apparently effective anti-predator mechanisms (e.g., Greene 1994; Henderson and Powell 2009; Torres et al. 2013; Iturriaga 2014). The only reptilian predators so far reported for any trope are the Cuban Boa (on the Giant Trope; Viña and Armas 1989) and the Cuban Racer (on an indeterminate trope species; Novo and Arazoza 1986). The case reported herein represents the first confirmed species of *Tropidophis* as prey of the Cuban Racer. The other two predators reported for snakes in the family Tropidophiidae are the Great Lizard Cuckoo (*Coccyzus merlini*; Cuculiformes: Cuculidae) and Ridgway's Hawk (*Buteo ridgwayi*; Accipitriformes: Accipitridae) preying on the Spotted Brown Trope (*T. pardalis*) and the Haitian Trope (*T. haetianus*), respectively (Garrido 1976; Wiley and Wiley 1981). The Giant Trope (Fig. 8) is a Cuban endemic and the largest species in the family Tropidophiidae, capable of exceeding one meter in total length (Alayo 1951; Tolson and Henderson 1993; Henderson and Powell 2009; Alayo 1951). It is widespread in the Cuban Archipelago, where it occupies a variety of habitats at elevations from sea level to 1,293 m (Rodríguez et al. 2010; see Henderson and Powell 2009 for a review). Its range fully overlaps that of the Cuban Racer, but the Cuban Racer is an active diurnal forager whereas the Giant Trope is mostly a sit-and-wait nocturnal forager (see Henderson and Powell 2009 for a review), although the latter may occasionally be active by day (Rodríguez-Cabrera et al. 2017).

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