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# The Herpetofauna of Southeast Trinidad, Trinidad and Tobago

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## ABSTRACT

The Rio Claro-Mayaro area of southeast Trinidad contains a variety of lowland habitats. Because access to much of the area is restricted, its herpetofauna has been poorly explored, resulting in few publications on its herpetofauna. Reported here are results of fieldwork conducted in the Rio Claro-Mayaro area between November 2009 and April 2014. Documented here is the presence in southeast Trinidad of 77 of the 106 known (excluding questionable) species that inhabit the island. Included are records from published literature, our own fieldwork, and museum specimens.

## INTRODUCTION

Herpetofauna (particularly anurans) are good indicators of ecosystem health and diversity. They serve as both predators and prey for a large number of other organisms. They can contribute as much as one tenth of the total faunal biomass and have importance in the transference of energy within food webs (Cushman 2006).

Trinidad's herpetofauna is largely derived from South America (Kenny 1969; Williams 1989; Murphy 1997). Murphy (1997) categorised Trinidad's herpetofauna into seven major distribution categories: widespread taxa extending from Trinidad into Middle or North America; Amazonian taxa; Caribbean coastal range taxa (associated with a montane complex that extends from the Santa Marta region of Colombia across northern Venezuela and Trinidad); lowland Guiana endemic species (at elevations below 1000m on the Guiana Shield and on Trinidad); Orinoco Basin taxa; Lesser Antillean taxa; and Cosmopolitan taxa with distributions extending to the other hemisphere. Taxa from each of these categories have been found in the southeast portion of Trinidad.

The Rio Claro-Mayaro area of southeast Trinidad contains a variety of lowland habitats. Because access to much of the area is restricted, its herpetofauna has been poorly explored, resulting in few publications on its herpetofauna. The area is prone to continual colonising events from the Orinoco River delta (Charles 2013).

## MATERIALS AND METHODS

Our most intensive and structured surveys were conducted during 30 days in November 2009 and 30 days in April 2010. Both wet and dry season conditions were

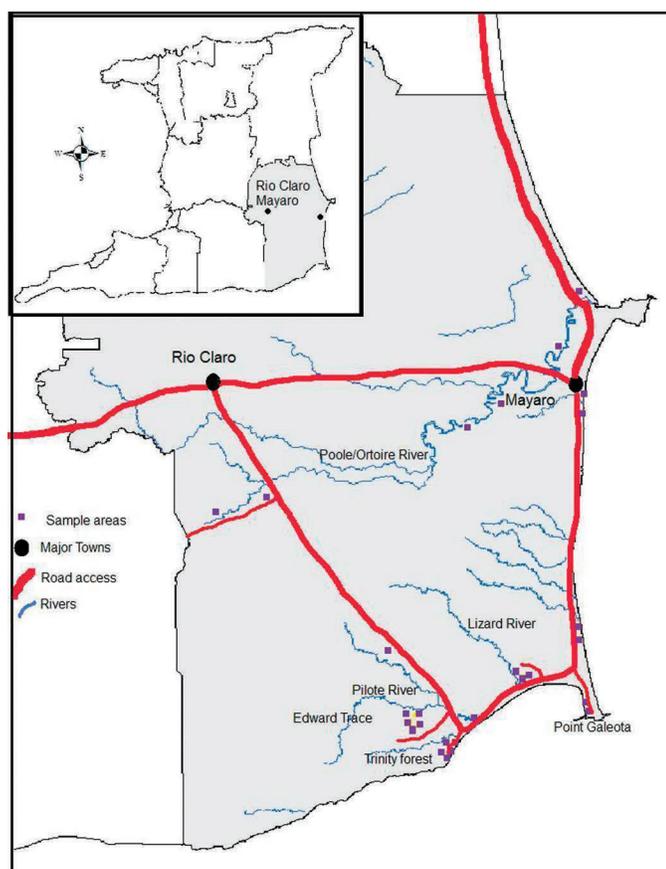
experienced during the sampling periods. We revisited some sites for three days in late September 2013. In April 2014, we made observations along Cedar Grove Road.

Standard visual encounter surveys (Heyer *et al.* 1994) were used for monitoring reptiles. Visual searching was conducted along transects and trails throughout the sample area. Ponds and streams were sampled by use of seines and dip nets. Live specimens were collected, photographed, and released. Hunters' trails were used as sampling transects and to locate sampling points. Sampling was conducted systematically at: morning 0430 to 0900 h, daytime 0900 to 1600 h, sunset 1600 to 1930 h, and nighttime 1900 to 2330 h. Early mornings, sunset, and nighttime searches were most productive for monitoring snakes; daytime, especially sunny days, was most productive for monitoring lizards and turtles. Anurans were monitored by use of audio strip transect and audio point counts (Manickchan 2004; Heyer *et al.* 1994). Occasionally recordings were made on site and later compared to a database of the calls of Trinidad frogs to confirm identifications. Anurans were monitored during sunset and nighttime hours. Audio identifications were made along trails and transect lines. Visual encounters were often for too short a period for photographs to be taken, but GPS locations of sightings were recorded and photographs taken when possible.

The study area included several core areas (Figure 1):

- along Trinity Road,
- Guayaguayare, along the coast, towards the Trinity Hills,
- along the St. Hilaire River,
- at the pond at the end of Trinity Road,

- north of the pond at the north end of Trinity Road,
- along Edward Trace,
- Guayaguayare and northward into the forest towards Pilote River,
- along the Mayaro-Guayaguayare Road towards Manzanilla,
- along the Mayaro-Guayaguayare Road in the vicinity of Baywatch Boulevard,
- Point Galeota mangroves,
- Lizard River wetlands,
- Rio Claro-Guayaguayare Road,
- banks of the Ortoire River along Cedar Grove Road.



**Fig. 1.** Map showing the Rio Claro-Mayaro Municipality (inset) and the sample areas within the region.

Incidental sampling of herpetofauna was conducted at the Lizard River wetlands during daylight hours over a one-year period for two consecutive days at three-month intervals. Incidental sightings were recorded for the Rio Claro Forest (2008 to 2012), Point Galeota (2009 to 2013), and Trinity Hills Wildlife Sanctuary (July 2008). Additionally, a short period of drift fence-pitfall trap sampling was conducted 15-21 August, 2010 near the beach edge of a small coconut (*Cocos nucifera*) plantation near Baywatch Boulevard along the Mayaro-Guayaguayare Road in Mayaro Bay. One straight 10m long, 0.5m high

drift fence equipped with four 5-gallon (18.9-litre) plastic bucket pitfalls was installed in the plantation parallel to and about 7m from the beach. Traps were checked four times per day during daylight hours. Some incidental observations also were made in two nearby areas along the Mayaro-Guayaguayare Road; a very small area of second-growth forest surrounding a small stream near Baywatch Boulevard, and the roadside grass about 600m south of Baywatch Boulevard.

In addition to field survey results, museum records were examined by use of Herpnet (Spencer 2013) and Vertnet (Bloom 2013), by onsite visits to museums, and by examination of specimens borrowed from collections. Some of the specimens were examined by the authors; in other instances we relied on the collector, museum curators, and other authors for identification (i.e. the specimens had been reported in published systematic or taxonomic reviews). Habitats at collection or observation locations were then classified as swamp forest, seasonal evergreen, littoral woodland, forest edge, and palm forest (categories modified from Beard 1946).

## RESULTS AND DISCUSSION

Results from field surveys and museum records are summarised in Table 1. We documented 23 anurans in 17 genera and ten families, one crocodylian species, six species of chelonians in six genera and five families, 19 species of saurians in 15 genera and ten families, and 28 serpents in 20 genera and six families, for a total of 77 species. Murphy (1997) listed 106 species of amphibians and reptiles from Trinidad (excluding questionable records). Our survey documented that 72.6% of the total number of species present on Trinidad were present in the southeast portion of the island.

The species represented on this list are primarily habitat generalists, lowland forest species, or savanna species. The one unexpected species discovered during our survey was the Trinidad stream frog, *Mannophryne trinitatis*. Previously this species was considered to be restricted to the Northern and Central Ranges (Kenny 1969; Murphy 1997; Jowers *et al.* 2011). To our knowledge this is the first record of *Mannophryne* from the Southern Range.

Kenny (1969) considered the highly aquatic frog *Pipa pipa* to be common in Nariva Swamp and also to be present in Rio Claro, Mayaro, and Cedros. One of us (JCM) observed them on the Icos peninsula in the 1980s, but the record presented here is based on a specimen collected in 1947 as well as on the Aitken *et al.* (1973) report from Bush Bush, which was documented with a Trinidad Regional Virus Lab (TRVL) specimen. Two individuals were found in 1990 in the Bush Bush area (G. White, per-

Table.

TAXA/SPECIES	VOUCHER/OBSERVER	LOCATION	HABITAT
<b>AMPHIBIANS</b>			
<b>Family Bufonidae - True Toads</b>			
<i>Rhinella marina</i>	JCM, RSM	Trinity Pond, Bush Bush	Forest edge, littoral woodland
<b>Family Hemiphractidae - Marsupial Frogs</b>			
<i>Flectonotus fitzgeraldi</i>	SAM	Edward Trace	Littoral woodland, swamp forest
<b>Family Hylidae</b>			
<i>Dendropsophus microcephalus misera</i>	CAS 245080-83, SAM	Rio Claro-Mayaro Corp., Trinity Road, Edward Trace	Littoral woodland, swamp forest
<i>Dendropsophus minutus</i>	SAM	Edward Trace	Pond edge
<i>Hypsiboas boans</i>	CAS 245077, RSM	Rio Claro-Mayaro Corp., Trinity Road, Edward Trace	Littoral woodland, swamp forest
<i>Hypsiboas geographicus</i>	Photo	Trinity Pond, Edward Trace	Littoral woodland, swamp forest
<i>Hypsiboas punctatus</i>	CAS 245078	Rio Claro-Mayaro Municipality, Edward Trace	Littoral woodland, swamp forest, seasonal evergreen
<i>Phyllomedusa trinitatis</i>	Kenny 1969, SAM	Mayaro, Edward Trace	Littoral woodland, swamp forest
<i>Pseudis paradoxa caribensis</i>	USNM 306120	Nariva Swamp, on Manzanilla-Mayaro Road near milepost 45.5, 0.15 km S of Bailey bridge over Nariva River, 15.0 km S of junction with Eastern Main Road, Bush Bush	Swamp forest
<i>Scarthyla vigilans</i>	Vic. Trinity Pond (JCM)		Pond edge
<i>Scinax ruber (Laurenti)</i>	USNM 306115, RSM	Nariva Swamp, on Manzanilla-Mayaro Road, near milepost 45.5, 0.15 km S of Bailey bridge over Nariva River, 15.0 km S of junction with Eastern Main Road	Littoral woodland, swamp forest
<i>Sphaenorhynchus lacteus</i>	JCM, SAM	Trinity Pond, Edward Trace, Bush Bush	Pond edge, swamp forest
<i>Trachycephalus typhonius</i>	Photos, JCM	Trinity Pond, Bush Bush	Pond edge
<b>Family Aromobatidae</b>			
<i>Mannophryne trinitatis</i>	SAM	Trinity Pond, Edward Trace	Pond edge
<b>Family Leiuperidae</b>			
<i>Engystomops pustulosus</i>	SAM	Trinity Hills, Edward Trace	Seasonal evergreen
<b>Family Craugastoridae</b>			
<i>Pristimantis urichi</i>	SAM	Edward Trace	Seasonal evergreen
<b>Family Leptodactylidae</b>			
<i>Leptodactylus fuscus</i>	USNM 166621, RSM, SAM	Manzanilla-Mayaro Road, near milepost 44, Trinity Road, Edward Trace	Seasonal evergreen
<i>Leptodactylus insularum</i>			
<i>Leptodactylus validus</i>	MCZ A-11777	Mayaro, Edward Trace	Seasonal evergreen
<b>Family Microhylidae</b>			
<i>Elachistocleis ovalis</i>	TRVL 68	Aitken <i>et al.</i> 1973	
<i>Elachistocleis surinamensis</i>	Mayaro Forest ROM 9746, 9752, SAM	Kenny 1969, Mayaro, Maloney Road, Guayaguayare Road, Edward Trace	Seasonal evergreen
<b>Family Pipidae</b>			
<i>Pipa pipa</i>	FMNH 49601, TRVL 36	Mayaro, Bush Bush	Swamp evergreen
<b>Family Ranidae</b>			
<i>Lithobates palmipes</i>	FMNH 49773, SAM, GW and SA (2009)	Mayaro, Edward Trace	Seasonal evergreen

TAXA/SPECIES	VOUCHER/OBSERVER	LOCATION	HABITAT
<b>TURTLES</b>			
<b>Family Cheloniidae</b>			
<i>Chelonia mydas</i>	RSM	Guayaguayare Bay	Coastal near shore, open water
<i>Eretmochelys imbricata</i>	RSM	Guayaguayare Bay	Coastal near shore, open water
<b>Family Chelidae</b>			
<i>Mesoclemmys gibba</i>	TRVL 301	Bush Bush	Swamp forest
<b>Family Dermochelyidae</b>			
<i>Dermochelys coriacea</i>	Photos, RSM	Mayaro, Trinity Road	Coastal near shore, open water
<b>Family Geoemydidae</b>			
<i>Rhinoclemmys punctularia</i>	USNM 166103, RSM	Rio Claro, Edward Trace, Poole River	Seasonal evergreen, swamp forest, rivers
<b>Family Kinosternidae</b>			
<i>Kinosternon scorpioides</i>	RSM	Rio Claro, St. Hilaire River, Edward Trace, Poole River	Seasonal evergreen, swamp forest, rivers
<b>Family Testudinidae</b>			
<i>Chelonoidis denticulata</i>	RSM, TRVL 301	Rio Claro, Trinity Forest, Edward Trace, Bush Bush, Cedar Grove Road	Littoral woodland, seasonal evergreen, swamp forest
<b>CROCODILIAN</b>			
<b>Family Alligatoridae</b>			
<i>Caiman crocodilus</i>	RSM, TRVL 422	Rio Claro, Mayaro, Trinity Road, Edward Trace, Manzanilla, Bush Bush, Ortoire River, Poole River	Swamp forest, estuary, rivers
<b>LIZARDS</b>			
<b>Family Amphisbaenidae</b>			
<i>Amphisbaena fuliginosa</i>	RSM, TRVL 314	Rio Claro, Trinity Road, Bush Bush	Seasonal evergreen, swamp forest
<i>Amphisbaena alba</i>	GW	Edward Trace	Seasonal forest
<b>Family Gekkonidae</b>			
<i>Hemidactylus mabouia</i>	UWIZM.2012.1.2	Mayaro, Trinity Road, Edward Trace, Cedar Grove Road	Seasonal evergreen
<b>Family Phyllodactylidae</b>			
<i>Thecadactylus rapicauda</i>	SAM, TRVL 438	Trinity Road forest, Bush Bush	Seasonal evergreen
<b>Family Sphaerodactylidae</b>			
<i>Gonatodes ceciliae</i>	SPC	Trinity Hills Wildlife Sanctuary forest	Seasonal evergreen
<i>Gonatodes humeralis</i>	SPC, TRVL 377	Trinity Hills Wildlife Sanctuary forest, Mayaro-Guayaguayare Road, Bush Bush	Seasonal evergreen, second-growth forest edge
<i>Gonatodes vittatus</i>	USNM 166164	Mayaro-Guayaguayare Road, near milepost 5, Edward Trace, Cedar Grove Road	Seasonal evergreen
<i>Sphaerodactylus molei</i>	SAM	Trinity Road, Edwards Trace	Littoral woodland, palm forest
<b>Family Gymnophthalmidae</b>			
<i>Gymnophthalmus underwoodi</i>	RSM, SAM	Trinity Forest, Edward Trace	Littoral woodland
<b>Family Hoplocercidae</b>			
<i>Polychrus marmoratus</i>	TRVL 378	Bush Bush, Cedar Grove Road	Swamp forest
<b>Family Iguanidae</b>			
<i>Iguana iguana</i>	Photo, RSM, TRVL 380	Guayaguayare Forest, Point Galeota, Edward Trace, Trinity Road, Bush Bush, Cedar Grove Road, Ortoire River banks	Littoral woodland, swamp forest

TAXA/SPECIES	VOUCHER/OBSERVER	LOCATION	HABITAT
<b>LIZARDS</b>			
<b>Family Dactyloidae</b>			
<i>Anolis planiceps</i>	Photo, RSM, SAM, TRVL 181	Guayaguayare, Trinity Forest, Edward Trace, Bush Bush, Cedar Grove Road	Littoral woodland, palm forest, swamp forest
<b>Family Scincidae</b>			
<i>Copeoglossum aurae</i>	RSM, SAM	Trinity Forest, Edward Trace	Littoral woodland
<i>Marisora aurulae</i>	SPC	Mayaro Bay (near Baywatch Boulevard)	Coastal coconut plantation
<b>Family Teiidae</b>			
<i>Ameiva atrigularis</i>	JCM, RSM, TRVL 180	Point Galeota, Edward Trace, Bush Bush, Cedar Grove Road	Littoral woodland, swamp forest edge
<i>Cnemidophorus lemniscatus</i>	MCZ R- 39685-88	Guayaguayare Bay and main road, Bush Bush	Forest edge
<i>Kentropyx striata</i>	RSM	Point Galeota, Guayaguayare Road	Forest edge
<i>Tupinambis teguixin</i>	UWI skin, RSM, TRVL 227	Guayaguayare Road, Edward Trace, Bush Bush, Cedar Grove Road, Point Galeota	Forest edge, littoral woodland
<b>Family Tropiduridae</b>			
<i>Plica caribaeana</i>	AMNH 72816-17; TRVL 221	Mayaro, Bush Bush	Forest edge, littoral woodland, swamp forest
<b>SNAKES</b>			
<b>Family Leptotyphlopidae</b>			
<i>Epictia tenella</i>	MCZ R-60801, TRVL 399	Parrylands, Trintoc Well no. 32A, Bush Bush	Forest edge, littoral woodland
<b>Family Boidae</b>			
<i>Boa constrictor</i>	DOR, RSM	Trinity Road, Guayaguayare, Manzanilla, Ortoire River, Cedar Grove Road	Forest edge, littoral woodland
<i>Corallus ruschenbergerii</i>	SAM, JCM, RSM	Trinity Road, Guayaguayare, Manzanilla, Bush Bush, Ortoire River	Forest edge, littoral woodland, swamp forest, palm forest
<i>Epicrates maurus</i>	Photos	Edward Trace, Trinity Road, Mayaro, Rio Claro, Cedar Grove Road	Forest edge, littoral woodland, palm forest
<i>Eunectes murinus</i>	SPC, RSM, Aitken <i>et al.</i> 1973	Guayaguayare, Manzanilla, Bush Bush, Ortoire River	Swamp forest
<b>Family Colubridae</b>			
<i>Chironius carinatus</i>	RSM, Aitken <i>et al.</i> 1973	Guayaguayare, Trinity Road, Edward Trace, Bush Bush	Forest edge, littoral woodland, seasonal evergreen
<i>Leptophis coeruleodorsus</i>	MCZ R-79815	12 km south of Mayaro on Guayaguayare Road	
<i>Mastigodryas boddaerti</i>	USNM 166685	Manzanilla-Mayaro Road, near milepost 41.75, Edward Trace	Forest edge
<i>Oxybelis aeneus</i>	DOR/UWI, RSM, SAM	Guayaguayare Road	Forest edge, littoral woodland, seasonal evergreen
<i>Spilotes pullatus</i>	MSUM SH.470	Mayaro, Edward Trace	Forest edge, littoral woodland, seasonal evergreen
<i>Tantilla melanocephala</i>	SPC	Mayaro Bay (near Baywatch Boulevard)	Coastal coconut plantation
<i>Pseudoboia newwedii</i>	GW	Edward Trace	Forest edge
<b>Family Dipsadidae</b>			
<i>Clelia clelia</i>	FMNH 49968	Mayaro	Forest edge, littoral woodland, seasonal evergreen
<i>Dipsas trinitatis</i>	MVZ 84058	Queen's Beach Hotel, Mayaro Beach	Forest edge, littoral woodland, seasonal evergreen
<i>Erythrolamprus melanotus nesos</i>	MCZ R-60809	Guayaguayare Forest	

TAXA/SPECIES	VOUCHER/OBSERVER	LOCATION	HABITAT
<b>SNAKES</b>			
<i>Erythrolamprus cobella</i>	UWIZM.2010.12.99, TRVL 340	Nariva Swamp, Bush Bush	Swamp forest
<i>Erythrolamprus cf. zweifeli</i>	UWIZM.2010.12.108	Mayaro	
<i>Helicops angulatus</i>	USNM 166686, RSM	Manzanilla-Mayaro Road, Lizard River mangrove swamp, Bush Bush	Swamp forest
<i>Imantodes cenchoa</i>	TRVL 340	Bush Bush	Swamp forest
<i>Leptodeira annulata</i>	SPC	Mayaro-Guayaguayare Road (600m south of Baywatch Boulevard)	Roadside edge of anthropogenic savanna
<i>Mastigodryas boddaerti</i>	TRVL 179	Bush Bush	Swamp forest
<i>Oxybelis aeneus</i>	TRVL 376	Bush Bush	Swamp forest
<i>Oxyrhopus petolaris</i>	FMNH 49986	Mayaro	
<i>Siphlophis compressus</i>	TRVL 434	Bush Bush	Swamp forest
<b>Family Elapidae</b>			
<i>Micrurus circinalis</i>	AMNH 101304	Mayaro	
<i>Micrurus lemniscatus diutius</i>	Photo, SAM	Trinity Forest	Seasonal evergreen
<b>Family Viperidae</b>			
<i>Bothrops</i> sp.	Photo, TRVL 424	Rio Claro, Edward Trace, Trinity Road, Bush Bush, Rio Cla- ro-Guayaguayare Road	Seasonal evergreen
<i>Lachesis muta</i>	RSM	Guayaguayare Forest	Seasonal evergreen

sonal communication). The lack of recent observations of *Pipa pipa* is of potential concern. That having been said, this highly aquatic, bottom-dwelling frog can be highly cryptic in the habitats it uses and thus might have been overlooked.

Two of the ponds we sampled were less than 100m from the beach. Salinity levels measured during the 2009 sampling indicated 0.1 ppt (freshwater) and the other 6.8 ppt (brackish). During the dry season sampling period in 2010, the ponds were dry and were covered with thick, short vegetation. During the wet season of 2013 the freshwater pond contained choruses and newly metamorphosed froglets of *Rhinella marina*, *Dendropsophus microcephalus*, *D. minutus*, *Trachycephalus typhonius*, and *Sphaenorhynchus lacteus*. The brackish water pond had choruses of *Rhinella marina*, *Scinax ruber*, and *Scarthyla vigilans*. All three of these species had been previously reported to use brackish water (Barrios-Amoros *et al.* 2006; Rios-Lopez 2008). The presence of the banded water snake, *Helicops angulatus*, in the Lizard River mangroves further documents the use of brackish water habitats by this species.

In the freshwater pond, tadpoles and new metamorphs of *Trachycephalus typhonius* and other species were exceptionally dense in areas with thick submergent and emergent vegetation. In these areas we observed spiders of the genus *Dolomedes* sitting on the water's surface,

hunting for tadpoles (Figure 2). Menin *et al.* (2005) summarised spider predation on Neotropical frogs and their larvae, but no direct predation on tadpoles by spiders was observed during our survey. Both species discussed are included here.



**Fig. 2.** Metamorphosing *Trachycephalus typhonius* and their predator, a fishing spider, *Dolomedes* sp. Photo: JCM.

Unfortunately, the three species of marine turtles (*Dermodochelys coriacea*, *Eretmodochelys imbricata*, and *Chelonia mydas*) observed were caught in fishermen's nets set in Guayaguayare Bay during the 2009 surveys. A live female *D. coriacea* was seen nesting on the south Mayaro Beach during 2010, and the carcass of another

was seen on the Trinity Road coast in 2009. *Chelonia mydas* was observed, possibly feeding, in the sea grass beds in the shallows of Guayaguayare Bay.



**Fig. 3.** The yellow-footed tortoise, *Chelonoidis denticulata*, feeding on fruits of the *Spondias mombin* tree. Photo: RSM.

The yellow-footed tortoises, *C. denticulata*, observed in the Guayaguayare region were associated with the tree *Spondias mombin* (Anacardiaceae), feeding on fallen fruit (Figure 3). In one case the same individual was observed for five consecutive days feeding at the same tree at the Edward Trace site. Larger specimens were also noted at other fruiting *S. mombin* trees in the Trinity Forest. Two local guides suggested that these tortoises repeatedly visited the trees over the course of the year, possibly implying a restricted range based on food preference. Janzen (1986) found a very high percentage of seed predation (95%) on this tree in Costa Rica. He noted the failure of many seeds to disperse away from the parent tree because of the absence of a herbivorous (frugivorous) megafauna that would have been part of the tree's habitat through most of its evolutionary history. However, Moll and Jansen (1986) and Guzman and Stevenson (2008) reported that this fruit is eaten by *Geochelone denticulata*, *Rhinoclemmys funerea* and *R. annulata*, all of which act as seed dispersal agents for *Spondias mombin*.

Both *Rhinoclemmys punctularia* and *Kinosternon scorpioides* were recorded during river seining at Trinity Forest, Edward Trace Forest, and in smaller tributaries of the Lizard River drainage. During the drought of 2010, *R. punctularia* was observed walking along the forest floor, possibly searching for pools in the Trinity and Edward Trace regions. During heavy rainfall in the 2009 sampling period, both species were observed crossing Edward Trace, moving from flooded swamp forest to higher ground.

*Mesoclemmys gibba* is Trinidad's most aquatic freshwater chelonian. Although rivers and their tributaries were seined extensively at ten sites (both Edward and Trinity during both the 2009 and 2010 surveys), none

was found. Furthermore, none of the accompanying field guide personnel described *Mesoclemmys gibba* when asked about its occurrence in the area. Possibly the species was absent because of the ephemeral nature of the water bodies in the area. Two populations of these turtles are known to occur in the north-central and southwest portions of the island (Mohammed *et al.* 2010) between which there are no connecting drainages. If it is present within the study area, it must be the rarest of the freshwater species of turtles.

The absence of introduced *Anolis* (*A. aeneus*, *A. trinitatis*) species was also somewhat unexpected but may reflect the short time that was spent sampling urban habitats. However, the house gecko, *Hemidactylus mabouia*, and the streak lizard, *Gonatodes vittatus*, both were observed during the survey transects; both thrive in human-modified environments. Most of the other lizards in Trinidad are primarily forest dwellers. During our survey, *Gonatodes ceciliae* was discovered for the first time in the Southern Range (Trinity Hills Wildlife Sanctuary). It was previously reported only from the highlands of Venezuela's Paria Peninsula and from Trinidad, in the Northern Range (including some of the geologically associated satellite islands) and in the Central Range (Murphy 1997). Another discovery was of a single specimen of *Marisora aurulae*, which was caught in a pitfall trap in a coconut plantation at Mayaro Bay. This species has only recently been described and is presumed to be rare, as it seems to have been extirpated from much of its range outside of Trinidad and Tobago; most likely it had not been collected in Trinidad since 1967 (Hedges and Conn 2012). Very little is known about the ecology of *M. aurulae*; our observation demonstrated that it at least sometimes actively forages in the leaf litter of anthropogenically modified coastal habitats. It was not possible for us to determine whether other species of skinks observed in the same plantation were this species or the more expected *Copeoglossum aurulae*.

The snakes found during our survey again were mostly habitat generalists, with a few aquatic and semi-aquatic species (*Eunectes murinus*, *Helicops angulatus*, and *Erythrolamprus cobella*). Anecdotal reports were received of coastal strandings of *Eunectes murinus* along the Trinity Road coast, while documented reports were received of *E. murinus* and *H. angulatus* at Mayaro Beach (Charles 2013). Previously well documented in the Nariva Swamp or Bush Bush area (Boos 2001), a large (~3.0m) *E. murinus* carcass was noted stretched across the Manzanilla Main Road near the Ortoire Estuary in the receding floodwaters of December 2013.

Regarding snakes of the genera *Atractus* and *Ninia*, the lack of published records or museum specimens and our failure to locate specimens of these snakes (which are

fairly common throughout the rest of the island) suggests that much work remains to be done on southeast Trinidad herpetofauna. These species were most likely present in the study area.

The crocodylian *Caiman crocodilus* was observed on several occasions at the Ortoire River, St. Hilaire River, Pilote River, and Lizard River, as well as at Trinity Pond. Charles (2013) noted the stranding of a juvenile near Frontin Road, Mayaro Beach; one of us (RSM) noted a large carcass near the same site in December 2006.

With the influx of large, floating mats of vegetation from the flooding Orinoco River delta, it is plausible to assume that colonizing events such as those documented by Charles (2013) may be adding continually to the herpetofaunal assemblages of southeastern Trinidad and adding new genetic material to established Trinidad populations. For example, several waif specimens of the yellow-spotted river turtle, *Podocnemis unifilis*, were reported to have washed up on the East Coast near Manzanilla in September 2012 (reported in the Trinidad and Tobago *Newsday* newspaper, 10 September, 2012). These specimens have not yet been incorporated into any museum collection.

An important point to note is that at least two species recorded here (*Tantilla melanocephala* and *Mariosora aurulae* – potentially a species of conservation concern) were confirmed only by the brief deployment of drift fence-pitfall trapping, while incidental/opportunistic observations revealed the presence of a number of other species not encountered during standardised visual transect surveys and seining. This underscores the importance of using multiple survey techniques in multiple habitats and locations to assess herpetofaunal biodiversity and the fact that even brief periods of additional and fairly casual observation can increase the yield in species richness counts.

Since publication of Murphy (1997), a considerable number of systematic and nomenclatural changes have been made relating to species of amphibians and reptiles that inhabit Trinidad and Tobago. The most recent changes include descriptions of *Leptophis haileyi* (Murphy *et al.* 2013) and *Plica caribaeana* (Murphy and Jowers 2013), resurrection of the genus *Macrops* for the snakes formerly called *Chironius septentrionalis* and *C. scurrulus* (Pyrone *et al.* 2013), transfer of the snake formerly known as *Pseustes poecilonotus polylepis* to the genus *Phrynonax* and its elevation to species level, transfer of the snake formerly known as *Pseustes sulphureus* to the genus *Spilotes* (Jadin *et al.* 2014), and elevation of the Venezuelan *Erythrolamprus reginae zweifeli* to species level (Rivas *et al.* 2011). These changes all point to the Trinidad and Tobago herpetofauna being much more diverse than previously thought and reinforce the ideas pre-

sented by Murphy and Downie (2012) that the islands' herpetofauna need more careful study and protection from habitat loss.

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## REFERENCES

- Aitken, T.H., Worth, C.B. and Downs, W.G.** 1973. Bush Bush amphibians and reptiles. *Living World, Journal of The Trinidad and Tobago Field Naturalists' Club*, 1973: 19-22.
- Barrio-Amorós, C.L., Díaz de Pascual, A., Mueses-Cisneros, J.J., Infante, E. and Chacón, A.** 2006. *Hyla vigilans* Solano, 1971, a second species for the genus *Scarthyra*, redescription and distribution in Venezuela and Colombia. *Zootaxa*, 1349: 1-18.
- Beard, J.S.** 1946. The Natural Vegetation of Trinidad. Oxford Forest Memorial, Number 20. Clarendon Press, Oxford. 152 p.
- Bloom, D.** 2013. Vertnet [Online]. Available at <http://portal.vernet.org/> ( Accessed multiple times in 2013).
- Boos, H.E.A.** 2001. The Snakes of Trinidad and Tobago. Texas A&M University Press. 328 p.
- Charles, S.P.** 2013. An interesting reptile dispersal event from

- continental South America to Trinidad, Trinidad and Tobago. *Living World, Journal of The Trinidad and Tobago Field Naturalists' Club*, 2013: 63.
- Cushman, S.A.** 2006. Effects of habitat loss on amphibians: a review and prospectus. *Biological Conservation*, 128: 231-240.
- Guzman, A. and Stevenson, P.R.** 2008. Seed dispersal, habitat selection and movement patterns in the Amazonian tortoise, *Geochelone denticulata*. *Amphibia-Reptilia*, 29: 463-472.
- Hedges, S.B. and Conn, C.E.** 2012. A new skink fauna from Caribbean islands (Squamata: Mabuyidae: Mabuyinae). *Zootaxa*, 3288: 1-244.
- Heyer, R., Donnelly, M.A., McDiarmid, R.W., Hayek, L.A.C. and Foster, M.S.** (editors) 1994. Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians. Smithsonian Institution Press. 364 p.
- Jadin, R.C., Burbrink, F.T., Rivas, G.A., Vitt, L.J., Barrio-Amorós, C.L. and Guralnick, R.P.** 2014. Finding arboreal snakes in an evolutionary tree: phylogenetic placement and systematic revision of the Neotropical birdsnakes. *Journal of Zoological Systematics and Evolutionary Research*. doi: 10.1111/jzs.12055.
- Janzen, D.H.** 1985. *Spondias mombin* is culturally deprived in megafauna-free forest. *Journal of Tropical Ecology*, 1: 131-155.
- Jowers, M.J., Martínez-Solano, I., Cohen, B.L., Manzanilla, J. and Downie, R.J.** 2011. Genetic differentiation in the Trinidad endemic *Mannophryne trinitatis* (Anura: Aromobatidae): Miocene vicariance, *in situ* diversification and lack of geographical structuring across the island. *Journal of Zoological Systematics and Evolutionary Research*, 49:133-140.
- Kenny, J.S.** 1969. The Amphibia of Trinidad. *Studies on the Fauna of Curaçao and Other Caribbean Islands*, 29: 1-78.
- Manickchan, S.A.** 2005. M. Phil. Thesis: The Effects of Habitat Degradation and Biological Invasion on Species Richness and Abundance of Anuran Communities in Trinidad, West Indies. Department of Life Sciences, The University of the West Indies, St. Augustine, Trinidad, W.I. 98 p.
- Menin, M., Rodrigues, D.J. and Azevedo, C.S.** 2005. Predation on amphibians by spiders (Arachnida: Araneae) in the Neotropical region. *Phyllomedusa*, 4: 39-47.
- Mohammed, R.S., Mahabir, S.V., Joseph, A.K., Manickchan, S. and Ramjohn, C.** 2010. Update of freshwater turtles' distributions for Trinidad. *Living World, Journal of The Trinidad and Tobago Field Naturalists' Club*, 2010: 54-58.
- Moll, D. and Jansen, K.P.** 1995. Evidence for a role in seed dispersal by two tropical herbivorous turtles. *Biotropica*, 121-127.
- Murphy, J.C.** 1997. Amphibians and Reptiles of Trinidad and Tobago. Malabar, Florida: Krieger Publishing Company. 245 p.
- Murphy, J.C. and Downie, J.R.** 2012. The changing Trinidad and Tobago herpetofauna. *Living World, Journal of The Trinidad and Tobago Field Naturalists' Club*, 2012: 87-95.
- Murphy, J.C. and Jowers, M.J.** 2013. Treerunners, cryptic lizards of the *Plica plica* group (Squamata: Sauria: Tropiduridae) of northern South America. *ZooKeys*, 355: 49-77. doi:10.3897/zookeys.355.5868.
- Murphy, J.C., Charles, S.P., Lehtinen, R.M. and Koeller, K.L.** 2013. A molecular and morphological characterization of Oliver's parrot snake, *Leptophis coeruleodorsus* (Squamata: Serpentes: Colubridae) with the description of a new species from Tobago. *Zootaxa*, 3718: 561-574.
- Pyron, R.A., Burbrink, F.T. and Wiens, J.J.** 2013. A phylogeny and revised classification of Squamata, including 4161 species of lizards and snakes. *BMC Evolutionary Biology*, 13:93 doi:10.1186/1471-2148-13-93.
- Rios-Lopez, N.** 2008. Effects of increased salinity on tadpoles of two anurans from a Caribbean coastal wetland in relation to their natural abundance. *Amphibia-Reptilia*, 29: 7-18.
- Schulze, A. and Jansen, M.** 2010. A tadpole of *Trachycephalus venulosus* (Anura: Hylidae) as prey for a fishing spider (Araneae: Pisauridae) in the Bolivian Chiquitano dry forest. *Herpetology Notes*, 3: 297-298.
- Spencer, C.** 2013. Herpnet [Online]. Available at <http://www.herpnet.org/> (Accessed multiple times during 2013).
- White, G. and Ali, S.** 2009. The status of *Lithobates palmipes* (Spix) in Trinidad and Tobago. *Living World, Journal of The Trinidad and Tobago Field Naturalists' Club*, 2009: 44-45.
- Williams, E.E.** 1989. Old problems and new opportunities in West Indian biogeography. p. 1-46. In **C.A. Wood**, ed. Biogeography of the West Indies: Past, Present, Future. Gainesville, FL USA: Sandhill Crane Press.