

NOTES ON *Micrurus ruatanus* (SERPENTES: ELAPIDAE), THE MOST THREATENED CORAL SNAKE OF AMERICA

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INTRODUCTION

The genus *Micrurus* comprises about 79 species (Uetz P. & Hošek J., 2018) is distributed from the southeastern United States through Mexico, Central America, and most South America, occurring from deserts to cloud forests (Campbell and Lamar 1989). The Roatan Coral Snake, *Micrurus ruatanus* (Günther, 1895), is recognized as the only coral snake endemic to an island, differing from other coral snakes such as *M. lemniscatus* and *M. psyches* that inhabit island systems but South American continental regions as well (Campbell and Lamar 1989).

The Roatan Coral snake is restricted to Isla de Roatan occurring off the north shore of Honduras in the Western Caribbean Sea (Günther 1895, Wilson 1984, Wilson *et al.* 1992, McCranie *et al* 2005; McCranie 2011; McCranie and Valdes-Orellana 2014). This snake is the only venomous snake known to inhabit this island, which is about 48 km long and 5.2 km at its greatest width, and a territorial extension of 147.4 km² (McCranie *et al* 2005).

Unfortunately, the habitat of the Roatan Coral Snake has suffered continuous decline in quality. In this regard, the Secretaria de Recursos Naturales y Ambiente de Honduras (SERNA), added this snake to the list of species of special concern of Honduras (Mejía and House 2008). Later, in 2010 *M. ruatanus* was cataloged as Critically Critically Endangered B1ab(iii) in the IUCN Red List, considering that its habitat is less than 100 km² and using the environmental vulnerability measure, this species is assessed with a high vulnerability score EVS = 18 (Townsend *et al.* 2013; Johnson *et al* 2015).

Since there is a lack of information available and the importance of *M. ruatanus* as the only

RESUMEN

La serpiente de coral de Roatán se encuentra restringida a la Isla de Roatán en el Mar Caribe de Honduras. Esta especie es la única serpiente de coral conocida por ser endémica de una isla. El área potencial de sobrevivencia esta reducido a 86 km². Presentamos un mapa con 37 sitios de registros. En estado natural, encontramos la serpiente *Epictia magnamaculata*, la lagartija *Sphaerodactylus rosaurae* y *Gymnophthalmus speciosus* como presas naturales, basado en su contenido estomacal.

PALABRAS CLAVE: En Peligro Crítico, Honduras, Isla de Roatán, Manejo ex situ, Serpiente coral de Roatán.

ABSTRACT

The Roatan Coral Snake is restricted to Roatan Island in the Caribbean Sea of Honduras. This species is the only coral snake known to be endemic to an island. The potential survival area for this coral snake is reduced to just 86 km². We present a map with 37 record sites. In nature, we found the snake *Epictia magnamaculata* and the lizards *Sphaerodactylus rosaurae* and *Gymnophthalmus speciosus* as natural prey items, based on its stomach contents.

KEYWORDS: *ex-situ* management, Critically Endangered, Honduras, Roatan Coral Snake, Roatan Island.

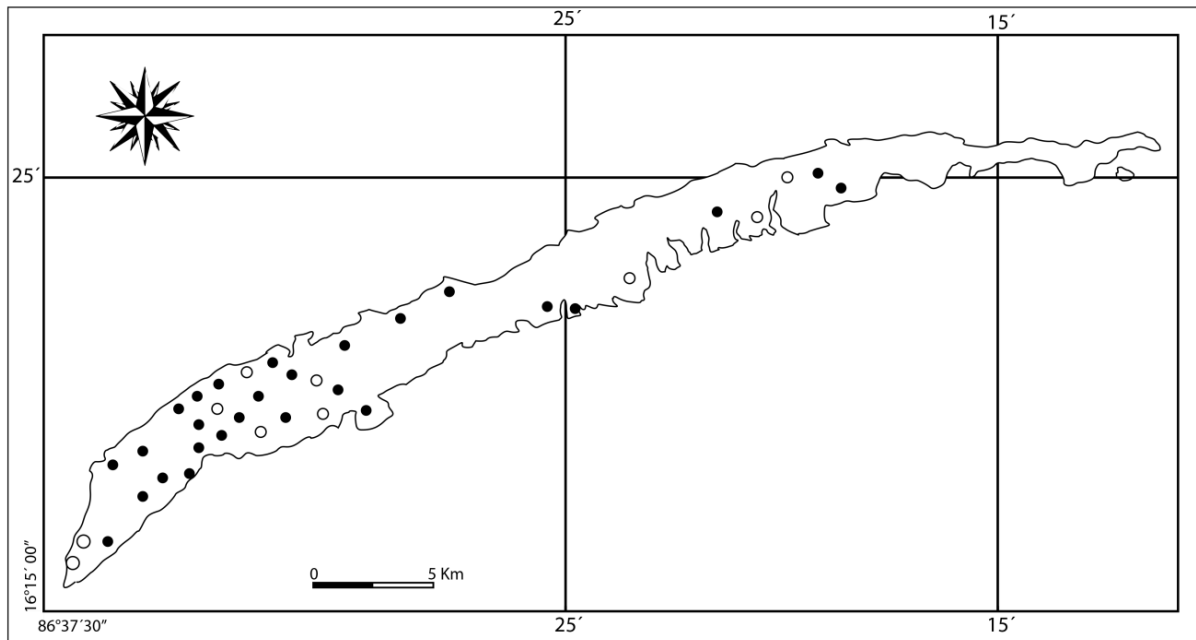


Figure 1. Records of *Micrurus ruatanus* on the Island of Roatan. The white circles refer to museum records and the black points represent field encounters throughout this study.

venomous coral snake inhabiting an island, it has a Critically Endangered status in the IUCN Red List, the aim of this work is to provide new data and photographic records for Roatan Island, and to report for the first time on its adaptability and management in captivity, in order to expand further ex-situ conservation efforts for the species.

METHOD

Materials and methods

In-situ data

Appendix I refers to 37 specimens of *M. ruatanus* used in this study, including nine museum specimens (obtained from McCranie 2011) and 28 specimens seen in the field, most of them documented through photographs or videos (these were not measured, weighed or sexed; Figure 1). The specimens found dead and suspected of stomach contents were collected by the second author to be evaluated *in situ* by opening the stomach and emptying their stomach content, then were documented and identified based on McCranie *et al.* (2005) and McCranie and Valdez-Orellana (2014).

The island presents scattered woodlands with dense forest towards the West end of the island (Municipio José Santos Guardiola). The central area of Roatan is extremely fragmented, reducing the odds of finding this Coral snake. Moreover, there is no information regarding the

presence of *M. ruatanus* in the Santa Elena island, since is separated by 4 Km of marshes and mangroves.

Museum records and personal observations were collected and used to geo-reference and construct a potential distribution map of *M. ruatanus* in the island; using ICF 2015 land use layer, projection NAD27 Datum WGS84 with the software QGIS version 2.12.2 Lyon. Furthermore, mangroves, beaches, urban areas, flooded broad-leave croplands, and water bodies were not considered for the construction of the map.

RESULTS

During the study, a total of 37 records were obtained. Of those, nine sites are based on museum records (specimens and skeletons), and 28 on personal observations (Appendix 1; Figure 1). This snake is known from sea level to 20 m elevation in Lowland Moist Forest formation, under the leaf of coconut trees or crawling on the ground (McCranie 2011).

Specimens were identified as *M. ruatanus* by scale counts and number of black body bands, and a reported total length (TL) ranging from

500 to 600 mm (Campbell and Lamar 2004, Wilson 1984).

In November 2017, two dead specimens were found on the eastern end of the island with a



Figure 2. Stomach content of *M. ruatanus*. A) *M. ruatanus* juvenile with an adult of *Epictia magnamaculata*. B) Remains of *Sphaerodactylus rosaurae* in an adult *M. ruatanus*. C) Remains of *Gymnophthalmus speciosus* in and adult *M. ruatanus*. Scale displayed is in inches.

total length of 170 mm and 590 mm, respectively. The following prey items were present in their stomachs: an *Epictia magnamaculata* (72 mm TL) in the smaller specimen, and a *Sphaerodactylus rosaurae* (52 mm TL) and *Gymnophthalmus speciosus* (28 mm TL) in the larger specimen (Figure 2). The island presents scattered woodlands with dense forest towards the western end (Municipio José Santos Guardiola). The central area of Roatan is extremely fragmented because of anthropic development, reducing the odds of finding this coral snake. Moreover, there is no information regarding the presence of *M. ruatanus* on Santa Elena Island, since it is separated 4 km extent of marshes and mangroves.

DISCUSSION

The previously-known distribution of *M. ruatanus* was restricted to the western sector of the island, but recent encounters (McCranie 2011) and reports presented in this study confirm its presence throughout the island (Figure 1). The actual habitat of the Roatan Coral Snake is fragmented due to anthropogenic soil use and habitat fragmentation (i.e., tourism developments, expansion of urbanization and roads) (Goode *et al.* 2016); which makes the species critically endangered within its potential available habitats of pristine forest, small shrubs and wetlands. Moreover, the potential survival area for this Coral snake is reduced to only 86 Km² because mangrove forests, sandy beaches and urban areas are not included.

The members of the genus *Micrurus* are ophiophagus, preying on smaller snakes (Savage 2002, Campbell and Lamar 2004). In addition, McCranie (2011) and McCranie and Valdez-Orellana (2014), reported nine snake species on the island; three of them are large (*Boa constrictor*, *Drymarchon melanurus*, and

Pseudoelaphe flavirufa), two are arboreal (*Oxybelis aeneus* and *Oxybelis wilsoni*), and one is aquatic (*Tretanorhinus nigroluteus*). The three remaining species, *Coniophanes bipunctatus*, *Epictia magnamaculata* and *Enulius roatanensis* could be part of the Roatan Coral snake diet, in addition to the prey items found in stomachs in this study. Lastly, it is important to mention, that *M. ruatanus* can feed on lizards of the species of *Cnemidophorus roatanus*, according to Roze, (1996).

Other coral snakes, such as *M. averyi*, *M. limbatus*, *M. petersi*, *M. spurrelli*, *M. stewarti* and *M. stuarti*, have restricted distributions, all in continental lands (Campbell and Lamar 1989). *Micrurus ruatanus* is recognized as the only Coral snake endemic to an island (Campbell and Lamar, 1989).

In addition, successful management and maintenance in captivity of the Roatan Coral Snake demonstrates the necessity of incorporating an *ex-situ* breeding program and improving strategies and efforts for its conservation as a major step in ensuring the propagation of the species and its continued occurrence in its natural habitat.

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APPENDIX

Appendix I. Data on the specimens used for this study.

Museum records			
Site	Municipality	Reference	Evidence
Ruatan	n/a	McCranie 2011	Specimen
Coxen Hole	Roatán	McCranie 2011	Specimen
1 km E del aeropuerto cerca de Calabach Bay	Roatán	McCranie 2011	Specimen
Caribbean Point Beach	Santos Guardiola	McCranie 2011	Specimen
entre Coxen Hole y Sandy Bay	Santos Guardiola	McCranie 2011	Skeleton
Cerca de Diamond Rock	Roatán	McCranie 2011	Specimen
Sandy Bay	Santos Guardiola	McCranie 2011	Skeleton
West End	Roatán	McCranie 2011	Specimen
Field records			
Flowers Bay	Roatán	Cesar Gonzales	Picture
West Bay	Roatán	Shawnda Fairburn	Picture
Dimond Rock	Santos Guardiola	Lisa Jeffries	Picture
Flowers Bay	Roatán	Eric George	Picture
Parrot Tree	Roatán	David Mason	Picture
Carambola Gardens	Roatán	Roatan Mateo	Picture
Pristine Bay	Roatán	Mike Carter	Picture
Gravel Bay	Roatán	Lillian Baltodano	Picture
Gibson Bight	Roatán	Rika Royale	Picture
Port Royal	Santos Guardiola	Martina Spilker	n/a
First Bight	Santos Guardiola	Harold J. Green Jr.	n/a
Lawson Rock	Roatán	Harold J. Green Jr.	Picture
Pensacola	Roatán	Elisa Connor	Picture
Jonesville Point	Santos Guardiola	Luis Rodriguez Morales	Picture
Marbella	Roatán	Scott Williams	Picture
Mud Hole	Roatán	Joel Amaya	Picture
Mud Hole	Roatán	Joel Amaya	Picture
Watering Place	Roatán	Joel Amaya	Video
Hottest Sparrow	Roatán	Joel Amaya	Picture
Flowers Bay	Roatán	Waleska Henriquez	Video
Watering Place	Roatán	Joshua Zavala	Picture
Coxen Hole	Roatán	Felipe Aguilar	Picture
Brass Hill	Roatán	Carlos colindres	Picture
White Rock Hills	Roatán	Trish Symons	Picture
White Rock Hills	Roatán	Mary Smoak	Picture
Pristine Bay	Roatán	Ana Loa	Picture
Keyhole	Roatán	Lidia Medina	n/a
Mahogany Bay	Roatán	Leonardo Lanza	Picture