REPTILES & AMPHIBIANS

Interspecific Diurnal Refuge Sharing in Cuban Snakes of the Genus *Tropidophis* (Tropidophiidae)

Tomás M. Rodríguez-Cabrera[1], Ernesto Morell Savall[2], L. Yusnaviel García-Padrón[3], and Javier Torres[4]

[1]Instituto de Ecología y Sistemática, La Habana 11900, Cuba, and Sociedad Cubana de Zoología, Cuba (tomasmichel.rodriguez@gmail.com [corresponding author])
[2]Reparto Virginia, Santa Clara, Villa Clara 50100, Cuba (ernestomorell68@nauta.cu)
[3]Museo de Historia Natural "Tranquilino Sandalio de Noda," Martí 202, Pinar del Río, Cuba (yusnaviel@gmail.com)
[4]Department of Ecology and Evolutionary Biology, University of Kansas, Lawrence, Kansas 66045, USA (javiertorres@ku.edu)

With 17 species, all endemic, the Cuban Archipelago has the richest diversity of snakes in the genus *Tropidophis* (Tropidophiidae) (Hedges 2002; Díaz and Cádiz 2020; Uetz et al. 2021). This diversity is reflected in the co-occurrence of several species, probably the result of the evolution of traits that allowed the ecological segregation of three distinct ecomorphotypes (terrestrial, semi-arboreal, and generalist) (Rodríguez-Cabrera et al. 2016; 2020; 2021a; 2021b; Rodríguez-Cabrera and Blanco Morciego 2021). Jamaica is the only West Indian island other than Cuba with more than one species of *Tropidophis* (three), but they have allopatric distributions and phenotypic divergence is minimal (Schwartz and Henderson 1991; Hedges 2002; Powell and Henderson 2012). However, despite the apparent niche partitioning among sympatric species of *Tropidophis* in Cuba, species belonging to seemingly different ecomorphotypes have

Fig. 1. A Spotted Brown Trope (*Tropidophis pardalis*) (above) and a Giant Trope, *T. melanurus*) (below) found under the same rock at Loma de la Marota, west of Santa Clara City, Santa Clara Municipality, Villa Clara Province, Cuba. Note the presence of the adult male Red Scorpion (*Heteroctenus junceus*) in the same refuge. Photograph © E. Morell Savall.

Fig. 2. A Giant Trope (*Tropidophis melanurus*) (on top) and a Yellow-banded Trope (*T. semicinctus*) (beneath) found under the same rock north of the Palmarito Dam, Ranchuelo Municipality, Villa Clara Province, Cuba. Photograph © E. Morell Savall.

Reptiles & Amphibians ISSN 2332-4961
https://doi.org/10.17161/randa.v29i1.16644

been reported sharing diurnal refuges (Torres and Rodríguez-Cabrera 2020). Herein we report three new instances of diurnal refuge sharing by different species of *Tropidophis* in western and central Cuba.

At 0940 h on 4 February 2016, we found a Spotted Brown Trope, *T. pardalis* (150 mm SVL, 20 mm tail length), and a Spotted Red Trope, *T. maculatus* (250 mm SVL, 30 mm tail length) under the same rock (500 x 300 mm) about 2 km N of El Pitirre Village, San Cristóbal Municipality, Artemisa Province (22.69224, -83.25390; elev. 300 m asl; WGS 84). When first encountered, the snakes were coiled, inactive, and in close proximity to each other. The vegetation in the area is a mostly secondary mosaic of grasslands, shrubs, groves, and patches of subsistence agriculture, mainly coffee plantations.

At 1150 h on 3 February 2022, we found a Spotted Brown Trope (ca. 200 mm SVL) and a Giant Trope, *T. melanurus* (ca. 400 mm SVL), under the same rock at Loma de la Marota, about 8 km W of Santa Clara City, Santa Clara Municipality, Villa Clara Province (22.41340, -80.06866; elev. 100 m asl). When initially encountered, the snakes were coiled, inactive, in close proximity to each other, and sharing the refuge with an adult male Red Scorpion, *Heteroctenus junceus* (Buthidae) (Fig. 1). The predominant vegetation in the area is secondary grassland with isolated invasive thorny shrubs (*Vachellia farnesiana* and *Dichrostachys cinerea*, Mimosaceae) on karstic soil with abundant limestone rock outcrops.

At 1245 h on 12 February 2022, we found a Yellow-banded Trope, *T. semicinctus* (ca. 250 mm SVL), and a Giant Trope (ca. 350 mm SVL) under the same rock about 400 m N of the Palmarito Dam, Ranchuelo Municipality, Villa Clara Province (22.36399, -80.03799; elev. 115 m asl). When first encountered, the snakes were coiled, inactive, in full contact with each other (Fig. 2), and also sharing the refuge with a Red Scorpion that fled as soon as we lifted the rock. The predominant vegetation in the area is secondary grassland on serpentine-derived soil.

The three cases described here bring the total number to six observations of diurnal refuge sharing involving six species of *Tropidophis*: the generalist Giant Trope, the terrestrial Spotted Brown Trope and Escambray White-necked Trope (*T. galacelidus*), and the semi-arboreal Spotted Red Trope, Yellow-banded Trope, and Sancti Spiritus Trope (*T. spiritus*) (see also Torres and Rodríguez-Cabrera 2020) (Fig. 3). Snakes of the genus *Tropidophis* are mostly nocturnal (see Henderson and Powell 2009 for a review). Ecological segregation among sympatric Cuban species, at least within the structural niche, apparently occurs only when snakes are active, suggesting that diurnal refuges are not a limited resource in those ecosystems where cohabitation was observed.

Only generalist or terrestrial ecomorphotypes occur on islands inhabited by *Tropidophis* except Cuba (for reviews

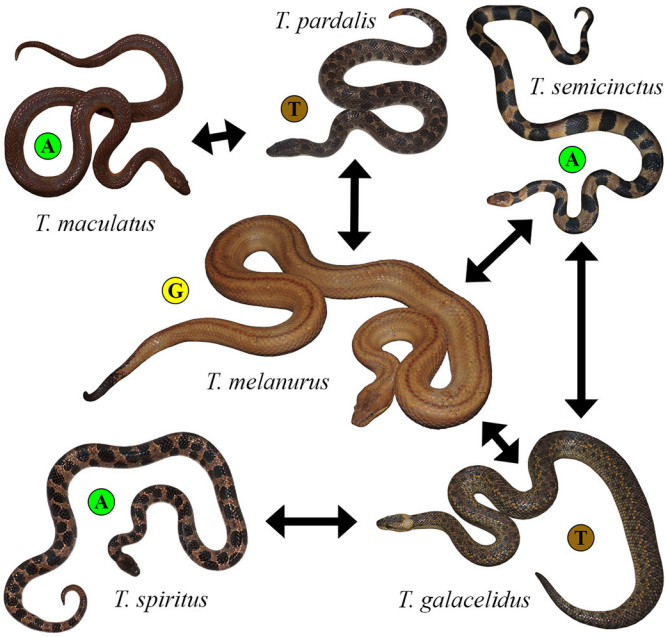

Fig. 3. Species of Cuban tropes (*Tropidophis* spp.) known to share diurnal refuges. Ecomorphotypes: Semi-arboreal (A), terrestrial (T), and generalist (G). Photographs © Raimundo López-Silvero (*T. maculatus*, *T. semicinctus*, and *T. spiritus*) and T.M. Rodríguez-Cabrera (*T. galacelidus*, *T. melanurus*, and *T. pardalis*).

on morphology see Schwartz and Henderson 1991; Hedges 2002). The more specialized semi-arboreal ecomorphotype apparently evolved more than once (Díaz and Cádiz 2020) and is present only where multispecies assemblages occur in Cuba (Rodríguez-Cabrera et al. 2016; 2020; 2021a; 2021b; Rodríguez-Cabrera and Blanco Morciego 2021). These semi-arboreal species do not show the high degree of specialization observed in other strictly arboreal snakes from other families (for reviews see Hedges and Garrido 1992; Lillywhite and Henderson 1993; Hedges 2002; Pizzatto et al. 2007; Rodríguez-Cabrera et al. 2016; Díaz and Cádiz 2020; Landestoy et al. 2021). In addition to lacking the extreme morphological specialization of other arboreal forms, semi-arboreal tropes hide on or near the ground when inactive and their response to being disturbed while foraging in elevated vegetation is to drop to the ground instead of climbing higher (T.M. Rodríguez-Cabrera, pers. obs.). Because these semi-arboreal tropes seem to seek shelter on the ground instead of in the vegetation where they actively forage at night, the coincidence of different species of *Tropidophis* in the same diurnal refuges might be more frequent and widespread in Cuba than previously thought.

Acknowledgements

We thank Yosvani Vicet González and Jose M. de la Cruz Mora for assistance in the field, and Raimundo López-Silvero for his photographs.

Literature Cited

Díaz, L.M. and A. Cádiz. 2020. A new species of *Tropidophis* (Squamata: Tropidophiidae) and molecular phylogeny of the Cuban radiation of the genus. *Novitates Caribaea* 16: 1–9. https://doi.org/10.33800/nc.vi16.222.

Hedges, S.B. 2002. Morphological variation and the definition of species in the snake genus *Tropidophis* (Serpentes, Tropidophiidae). *Bulletin of the Natural History Museum, London (Zoology)* 68: 83–90. https://doi.org/10.1017/S0968047002000092.

Hedges, S.B. and O.H. Garrido. 1992. A new species of *Tropidophis* from Cuba (Serpentes: Tropidophiidae). *Copeia* 1992: 820–825. https://doi.org/10.2307/1446158.

Henderson, R.W. and R. Powell. 2009. *Natural History of West Indian Amphibians and Reptiles*. University Press of Florida, Gainesville, Florida, USA.

Landestoy T., M.A., R.G. Reynolds, and R.W. Henderson. 2021. A small new arboreal species of West Indian boa (Boidae; *Chilabothrus*) from southern Hispaniola. *Breviora* 571: 1–20. https://doi.org/10.3099/MCZ67.1.

Lillywhite, H.B. and R.W. Henderson. 1993. Behavioral and functional ecology of arboreal snakes, pp. 1–48. In: R.A. Seigel and J.T. Collins (eds.), *Snakes: Ecology and Behavior*. McGraw Hill Inc., New York, New York, USA.

Pizzatto, L., S.M. Almeida-Santos, and R. Shine. 2007. Life-history adaptations to arboreality in snakes. *Ecology* 88: 359–366. https://doi.org/10.1890/0012-9658(2007)88[359:LATAIS]2.0.CO;2.

Powell, R. and R.W. Henderson (eds.). 2012. Island lists of West Indian amphibians and reptiles. *Bulletin of the Florida Museum of Natural History* 51: 85–166.

Rodríguez-Cabrera, T.M. and R. Blanco Morciego. 2021. Westernmost record of the Spotted Red Trope, *Tropidophis maculatus* (Squamata: Tropidophiidae), with comments on the *Tropidophis* species assemblage from the Guanahacabibes Peninsula. *Reptiles & Amphibians* 28: 508–511. https://doi.org/10.17161/randa.v28i3.15857.

Rodríguez-Cabrera, T.M., R. Marrero, and J. Torres. 2016. An overview of the past, present and future of the Cuban Boa, *Chilabothrus angulifer* (Squamata: Boidae): A top predator on an oceanic island. *Reptiles & Amphibians* 23: 152–168. https://doi.org/10.17161/randa.v23i3.14123.

Rodríguez-Cabrera, T.M., A. Fong G., and J. Torres. 2020. New dietary records for three Cuban snakes in the genus *Tropidophis* (Tropidophiidae), with comments on possible niche partitioning by Cuban tropes. *Reptiles & Amphibians* 27: 201–208. https://doi.org/10.17161/randa.v27i2.14177.

Rodríguez-Cabrera, T.M., E. Morell Savall, R. Alonso Navarro, J.Q. Pigott, A.M. Rodríguez-González, and J. Torres. 2021a. Giant dwarfs: Very large Giant Tropes, *Tropidophis melanurus* (Squamata: Tropidophiidae), and new maximum size records for the species. *Reptiles & Amphibians* 28: 404–410. https://doi.org/10.17161/randa.v28i3.15965.

Rodríguez-Cabrera, T.M., E. Morell Savall, A. Rodríguez-González, A. Hernández-Gómez, and J. Torres. 2021b. Predation on murid rodents by the Giant Trope, *Tropidophis melanurus* (Squamata: Tropidophiidae), with comments on predation of mammals by snakes of the genus *Tropidophis*. *Reptiles & Amphibians* 28: 516–519. https://doi.org/10.17161/randa.v28i3.15876.

Schwartz, A. and R.W. Henderson. 1991. *Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History*. University of Florida Press, Gainesville, Florida, USA.

Torres, J. and T.M. Rodríguez-Cabrera. 2020. Diurnal refuge sharing between species of Cuban snakes of the genus *Tropidophis* (Squamata: Tropidophiidae). *Caribbean Herpetology* 74: 1–2. https://doi.org/10.31611/ch.74.

Uetz, P., P. Freed, and J. Hošek (eds.). 2021. *The Reptile Database*. <http://www.reptile-database.org>.