REPTILES & AMPHIBIANS

New Reports of Interspecific Refuge Sharing by Cuban Snakes

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Sheltering can increase chances of survival by providing protection from unfavorable environmental conditions and from predators (Milling et al. 2018). However, when refuges are limited, alternatives are to remain exposed or to share a refuge (Vasconcelos et al. 2017), the latter leading to aggregations even in normally solitary or territorial species (Gardner et al. 2016; Marrero et al. 2016). Although such aggregations could be counterproductive because more interacting individuals could increase competition for resources, individual stress, and disease transmission (Leu et al. 2010; Chapman and Valenta 2015), sharing a refuge can be more beneficial than staying exposed (Horváth et al. 2021). We herein present new observations of refuge sharing in Cuban snakes, reporting the first instance of this behavior between the Giant Trope (*Tropidophis melanurus*) and Cuban Racer (*Cubophis cantherigerus*) and the first case of refuge sharing between three species of *Tropidophis.*

At 1224 h on 9 September 2014, we found four Giant Tropes (*T. melanurus*) and a Cuban Racer (*C. cantherigerus*) under one rock at "Casa de María Antonia," "Lomas de Banao" Ecological Reserve, Sancti Spiritus Municipality, Sancti Spiritus Province (21.87547, -79.58453) (Fig. 1). When first encountered, all of the snakes were close together. The predominant vegetation in the area is secondary forest. Notably, we also encountered the entire assemblage of Tropes (*Tropidophis* spp.) known to occur in the region: the generalist Giant Trope (*T. melanurus*), the terrestrial Escambray White-necked Trope (*T. galacelidus*), and the semi-arboreal Sancti Spiritus Trope (*T. spiritus*) (Rodríguez-Schettino et al. 2013).

At 1405 h on 10 January 2021, we found a Giant Trope (*T. melanurus*) and a Cuban Racer (*C. cantherigerus*) under one rock (510 x 360 mm) at Tierra Negra, Batey Heriberto Duquesne, Remedios Municipality, Villa Clara Province (22.39003, -79.48322). When first encountered, the two snakes were inactive and close together, sharing the refuge with a Red Scorpion (*Heteroctenus junceus*) and a Snail-eating Tarantula (*Phormictopus cochleasvorax*). The Cuban Racer fled in response to our presence and hid in a nearby mound of grass, but returned about one minute later to the proximity of the Giant Trope, which had remained in place (Fig. 2). The predominant vegetation in the area is secondary grassland and secondary forest on karstic soil with abundant limestone outcrops.

At 0930 h on 20 February 2024, we found a Giant Trope (*T. melanurus*), a Yellow-banded Trope (*T. semicinctus*), and a Spotted Brown Trope (*T. pardalis*) under one rock at the Palmarito Dam, Ranchuelo Municipality, Villa Clara Province (22.36662, -80.03787). The three snakes were inactive, coiled, and in close proximity, sharing the refuge with a Red Scorpion (*Heteroctenus junceus*) (Fig. 3). The predominant vegetation in the area is secondary grassland on serpentine-derived soil.

In Cuba, refuge sharing seems to occur frequently between different species, often involving snakes of the genus *Tropidophis* (Torres and Rodríguez-Cabrera 2020; Fundora

Figure 1. A Cuban Racer (*Cubophis cantherigerus*) (left) and four Giant Tropes (*Tropidophis melanurus*) (right) found under one rock at "Casa de María Antonia," "Lomas de Banao" Ecological Reserve, Sancti Spiritus Municipality, Sancti Spiritus Province, Cuba. Photograph by Raimundo López Silvero-Martínez (from Torres López et al. 2017).

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Figure 2. A Cuban Racer (*Cubophis cantherigerus*) (above) and a Giant Trope (*Tropidophis melanurus*) (below) found under one rock at Tierra Negra, Batey Heriberto Duquesne, Remedios Municipality, Villa Clara Province, Cuba. Note that the Giant Trope is above the cave of a Snail-eating Tarantula (*Phormictopus cochleasborax*). Photograph by Alejandro M. Rodríguez-González.

Figure 3. A Giant Trope (*Tropidophis melanurus*) (left), a Yellow-banded Trope (*Tropidophis semicinctus*) (center), and a Spotted Brown Trope (*Tropidophis pardalis*) (right) found under one rock at the Palmarito Dam, Ranchuelo Municipality, Villa Clara Province, Cuba. Photograph by Ernesto Morell Savall.

Caballero and Torres López 2022; Rodríguez-Cabrera et al. 2022; Table 1). This phenomenon has been reported six times involving six species — *T. galacelidus, T. maculatus, T. melanurus, T. pardalis, T. semicinctus,* and *T. spiritus* (Table 1). With 17 species, all endemic, Cuba is the center of diversification of this genus (Torres López et al. 2017; Uetz et al. 2024; Zaher et al. 2024), resulting in assemblages of at least three species at any given area (Rodríguez-Cabrera et al. 2020). This co-occurrence is probably due to the evolution of traits leading to niche partitioning resulting in three different ecomorphotypes — terrestrial, semi-arboreal, and generalist (Rodríguez-Cabrera et al. 2016, 2020, 2021a, 2021b; Rodríguez-Cabrera and Blanco Morciego 2021). Despite this ecological segregation, all ecomorphotypes seem to use the same types of diurnal refuges when the animals are inactive (Torres and Rodríguez-Cabrera 2020). The Cuban Racer (*Cubophis cantherigerus*) is a very versatile snake widely distributed across diverse habitats in Cuba (Henderson and Powell 2009; Rodríguez Schettino et al. 2010, 2013). Throughout its range, it always co-occurs with snakes of the genus *Tropidophis* but it has the greatest overlap in distribution with *T. melanurus*, which is also widespread (Rodríguez-Schettino et al. 2010, 2013). Diurnal refuge sharing suggests that in places where it occurs, refuges with the proper conditions are a limited resource, and interspecific competition is apparently lower when snakes are inactive.

These three new reports, combined with the six cases previously documented (Torres and Rodríguez-Cabrera 2020; Rodríguez-Cabrera et al. 2022), bring the total number of reported interspecific refuge sharing events in Cuba to nine (Table 1). Notably, two of these involve the Cuban Racer (*Cubophis cantherigerus*), marking the first records of intergeneric refuge sharing, and an entire *Tropidophis* assemblage. These events suggest that refuge sharing may be a more frequent behavior than previously thought. Further research is needed to determine the ecological significance of these interactions and the factors that influence them.

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Table 1. Summary of interspecific refuge-sharing events reported in Cuban snakes involving two genera, *Tropidophis* and *Cubophis*.

Species	No. Snakes	Source
T. galacelidus + *T. semicinctus*	1 + 1	Torres and Rodríguez-Cabrera 2020
T. galacelidus + *T. spiritus*	1 + 1	Torres and Rodríguez-Cabrera 2020
T. melanurus + *C. cantherigerus*	4 + 1	This study
T. melanurus + *C. cantherigerus*	1 + 1	This study
T. melanurus + *T. pardalis*	1 + 1	Rodríguez-Cabrera et al. 2022
T. melanurus + *T. pardalis* + *T. semicinctus*	1 + 1 + 1	This study
T. melanurus + *T. semicinctus*	1 + 1	Rodríguez-Cabrera et al. 2022

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