



Comments on the Critically Endangered Canasí Trope (*Tropidophis celiae*, Tropidophiidae): Neonates, *ex situ* Maintenance, and Conservation

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The Canasí Trope (*Tropidophis celiae* Hedges, Estrada, and Díaz 1999) is endemic to Cuba. Thirteen years after its description (Hedges et al. 1999), it still was known only from the type locality and only by a single individual. For these reasons and the fact that the type locality was very disturbed by human intrusion, Rodríguez (2012) listed it as Critically Endangered. Despite the description by Torres et al. (2013) of two other adult individuals (and a third lost) from a second locality (37 km east, 8 km south of type locality), *T. celiae* remains the rarest of 16 currently recognized species of Cuban *Tropidophis*. Essentially nothing is known of the species' natural history. Hedges et al. (1999, 2002) reported “enlarged eggs” in the holotype without offering more details. Juveniles are unknown. Herein, twenty years after the collection of the holotype, we report a second specimen from the type locality, describe neonates and *ex situ* maintenance, and comment on the conservation status of the species.

At 1013 h on 13 October 2014, we found an adult female *T. celiae* coiled under a rock (Fig. 1) 1.7 km east of the mouth of the Canasí River, Mayabeque, Cuba, at an elevation of 3 m asl. The distance from the rock to the vegetation line was 1 m and to the shore was 6.5 m (see below for a more detailed description of the habitat).

On 20 October 2014, this individual gave birth to two females (Fig. 2). The second was born at 1225 h. The time of the first birth is unknown but presumably very close to 1225 h because it was still wet at the time the second individual was born. Both neonates were in light phase at birth. The pattern of both was consistent with that of the species but the contrast between light and dark zones was much greater when compared to adults in light phase. The ground color was light beige on the flanks and darker on the dorsum. The head was yellow with a cinnamon-brown spot. The nuchal band was



Fig. 1. An adult female Canasí Trope (*Tropidophis celiae*), the second specimen found at the type locality since 1996. (A) Note the human trash, such as paper, plastic, and small particles of glass. Photograph © Tomás M. Rodríguez-Cabrera. (B) Closer view of the same individual. Photograph © Raimundo López-Silvero Martínez.



Fig. 2. Canasí Tropes (*Tropidophis celiae*) from Canasí, the type locality: Adult female, first neonate (1) and second neonate (2). Photograph © Tomás M. Rodríguez-Cabrera.

immaculate white. Dorsal spots were surrounded by white. As in adults, spotting on the flanks was weak. The tail tip was orange. Measurements at birth were 2.41 g, 147.8 mm SVL, and 17.4 mm tail length for the first-born, and 2.56 g, 144.1 mm SVL, and 17.0 mm tail length for the second. The female weighed 25.34 g before parturition and 19.87 g after parturition. SVL was 298.3 mm and tail length 39.5 mm. Relative clutch mass index was 0.196. The female shed on 3 November 2014, two weeks after parturition.

As in *T. haetianus* (Powell et al. 1992), neonates showed a strong climbing behavior, probably in response to dispersal behavior and/or as a foraging strategy when young. Balling behavior (Fig. 3) was more easily elicited in neonates than in adults. Balling is a defensive behavior that has been reported for several species of *Tropidophis* (Grant 1940; Hecht et al. 1955; Thomas 1963; Petzold 1969; Iverson 1986; Powell et al. 1992; Iturriaga 2014) but this is the first report for *T. celiae*.

The mother was in the dark phase at the time of capture on 13 October, assumed the light phase during the night of 15 October, and reverted to the dark phase the next morning, which she retained until the day after parturition on 20 October. Beginning on the next day, she followed a normal circadian pattern of changing color phases as other *Tropidophis* do (Rehák 1987; Hedges et al. 1989; Torres et al. 2013). We are unaware of any *Tropidophis* holding the same color phase during an entire day. At low temperatures, retaining the dark phase during pregnancy could be a thermo-regulatory strategy in order to maintain a proper temperature for embryonic development (Mattison 1995). The thermal melanism hypothesis (Clusella Trullas et al. 2007 and references therein) suggests that, under conditions of low temperature, dark individuals gain heat faster than light individuals at a given level of solar radiation. Although logical for helio-thermic species, this probably is not relevant for species of *Tropidophis* that appear to be thermal conformers. Activity is largely nocturnal and the change in color phases would appear to contradict the hypothesis. During the day, when temperatures are higher, these snakes remain inactive under cover and in dark phase; whereas during the night, when temperatures are lower, they are active (foraging, reproducing, etc.) and in light phase. The maintenance of the dark phase seems to be related to pregnancy in this particular case but the function of the circadian color change in *Tropidophis* remains unknown.

Tropidophis celiae is known to consume frogs in nature; the only prey reported for the species is *Eleutherodactylus blairhedgesi* (Hedges et al. 1999). However, other potential prey species (*E. atkinsi*, *E. pinarensis*, *E. planirostris*, *E. varleyi*, and *Osteopilus septentrionalis*) have been reported from Canasí (Rivalta et al. 2014). At this locality, *E. blairhedgesi* and *E. atkinsi* (Fig. 4) are abundant, the former on the ground, on rocks, or on low branches (below 30 cm) and the latter on leaves at heights of 50–150 cm when active or on the ground. In captivity, *T. celiae* has accepted *E. atkinsi* and *E. planirostris*

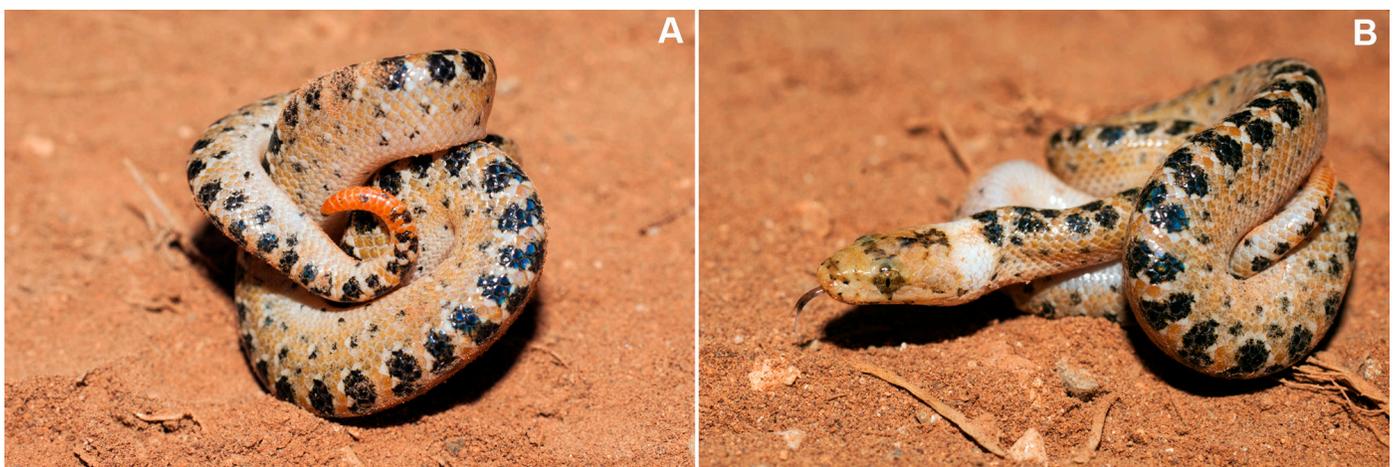


Fig. 3. Balling behavior in a neonatal Canasí Trope (*Tropidophis celiae*). (A) The head is hidden and the tail exposed. (B) After balling, the head is exposed and tongue-flicks explore the surroundings. Photographs © Raimundo López-Silvero Martínez.



Fig. 4. Common *Eleutherodactylus* frogs from Canasí: (A) Canasí Frog (*E. blairhedgesi*) and (B) Cuban Groin-spot Frog (*E. atkinsi*). Photographs © Raimundo López-Silvero Martínez.

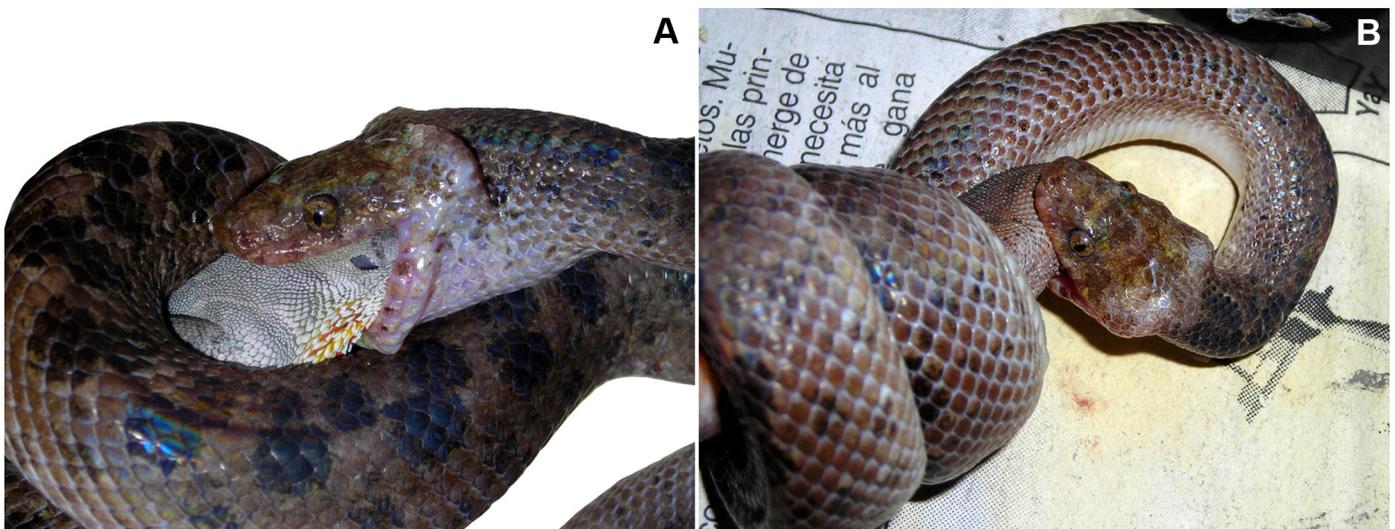


Fig. 5. Captive adult female Canasí Trope (*Tropidophis celiae*) from Carboneras, Matanzas Province, ingesting (A) an adult male Cuban Brown Anole (*Anolis sagrei*) and (B) a young male Cuban Green Anole (*A. porcatius*). Photographs © Javier Torres López.

as well as lizards (*Anolis sagrei* and *A. porcatius*; Fig. 5). No other prey has been offered. Prey is subdued by constriction and swallowed headfirst (Fig. 5). The female reported herein did not accept food during pregnancy but readily did so a day after parturition. Since then, she has been feeding weekly on an adult *A. sagrei* or *A. porcatius*. The neonates accepted adult *E. planirostris* offered a week after birth.

We have maintained five of the seven known *T. celiae* (Torres et al. 2013; this paper). This species can be kept in small containers but rectangular plastic containers with a length equal to the snake's total length and both width and height equal to a half of the snake's total length are preferred. The container must be ventilated but should be situated in an area without strong air currents. Substrate can be paper or dry leaves of a size larger than the snake's gape to avoid inadvertent ingestion. Water should be provided *ad libitum* in a bowl large enough to contain all of the individuals. Especially after feeding, *Tropidophis* will enter the water (Fig. 6) for several



Fig. 6. Adult female Canasí Trope (*Tropidophis celiae*) in the water bowl after a large meal (notice the bulge at midbody). Photograph © Javier Torres López.

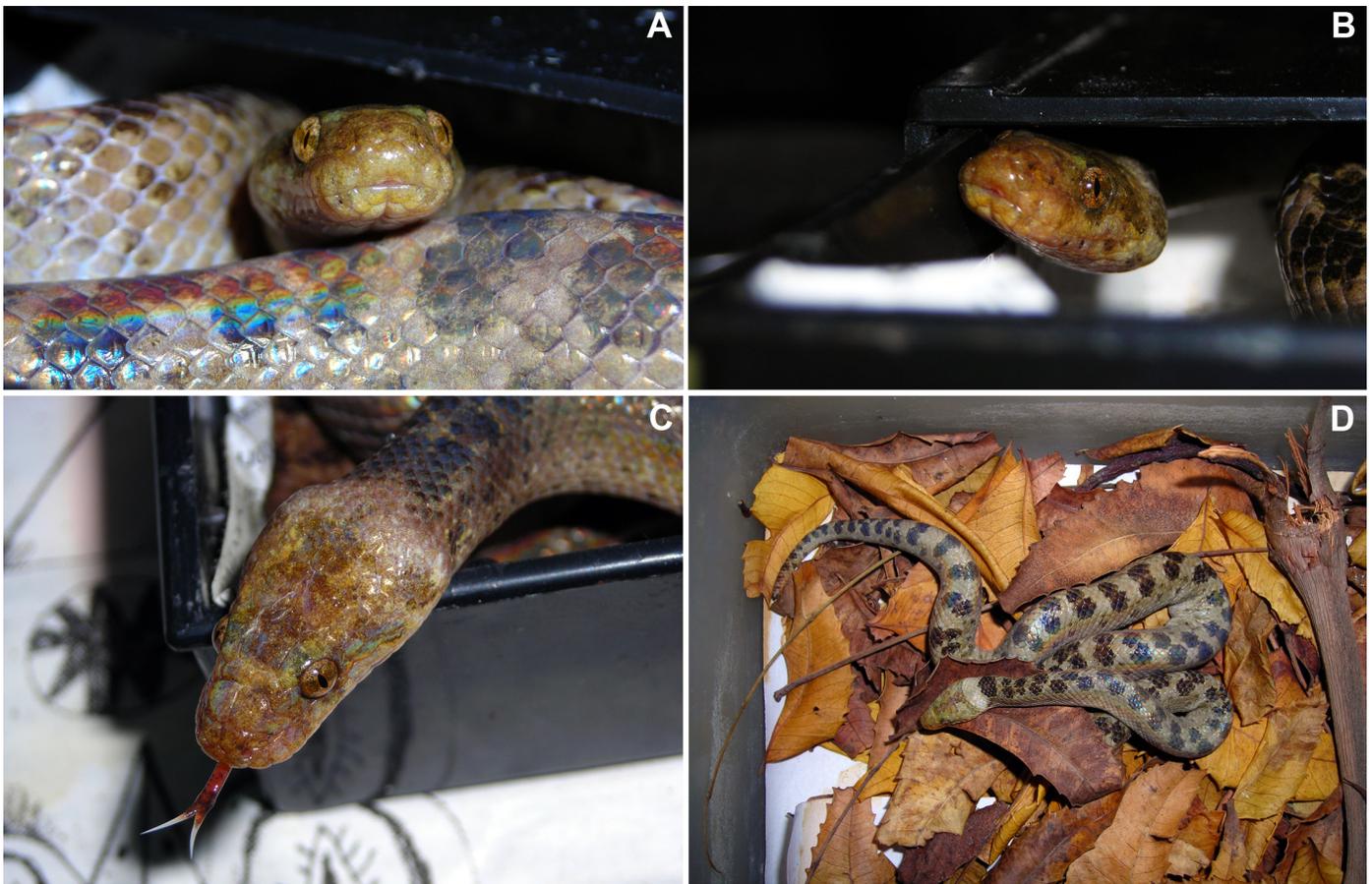


Fig. 7. Behaviors in a captive Canisí Trope (*Tropidophis celiae*): (A) Resting in a refuge, not interested in food, (B) in a sit-and-wait posture inside the refuge, interested in food but without a prey stimulus, (C) in response to a visual prey stimulus, the tongue-flicking frequency increases and the snake commences to abandon the refuge, and (D) completely outside the refuge, foraging around the enclosure without a prey stimulus. Photographs © Javier Torres López.

days. The bowl must be heavy enough to avoid tipping and spillage that could increase the risk of fungal and bacterial proliferation. The bowl must be cleaned and the water renewed at least three times per week — even when apparently clean. Feeding frequency will depend on the behavior of the individual snake (Fig. 7). When hungry, a snake will engage in foraging behavior that might involve moving around the cage while frequently tongue-flicking or assuming a sit-and-wait position, which can be detected even in concealed individuals because they will extend the tip of the snout out of the refuge.

Twenty years after the collection of the holotype in June 1996, only seven individuals of *T. celiae* are known, four from the type locality at Canasí (Hedges et al. 1999, plus the mother and two neonates reported herein) and three from Carboneras, one of them lost (Torres et al. 2013; Fig. 8). Canasí is located on the northern coast of Mayabeque Province. Habitat at this site (Fig. 9A–B) is more varied than that at Carboneras (Fig. 9C). Habitat at Canasí is predominantly succulent scrubland on coastal-rock pavement adjacent to a band of trees consisting mainly of Sea Grape (*Coccoloba uvifera*), in which leaf litter is abundant. Beyond the tree-line, semideciduous forest with small trees and many palms

extends up the slope. Where the species has been found at Carboneras, the habitat is semideciduous forest on karst, with the forest largely restricted to the vicinity of cave entrances.



Fig. 8. Male Canisí Trope (*Tropidophis celiae*) collected by members of the “Heriberto Varcárcel” speleological group in Carboneras, Matanzas in 2004. This specimen remains lost. Photograph © Javier Torres López.



Fig. 9. Habitat at the two localities from which Canasí Tropes (*Tropidophis celiae*) have been reported: (A–B) Canasí, Mayabeque Province (Hedges et al. 1999, this paper) and (C) Carboneras, Matanzas Province (Torres et al. 2013). Photographs © Javier Torres López (A) and Tomás M. Rodríguez-Cabrera (B–C).

Habitat at both localities is heavily disturbed. The female reported herein was found under a rock along with human garbage, such as fragments of a plastic bag, a hard plastic container, and paper (Fig. 1A). This locality, close to Havana, with a small beach and a small patch of forest, and relatively quiet, is frequently used for camping. We have witnessed nearly 20 people at one time (Fig. 10) near the site where we collected the female. Trash, including glass, plastic, and metal, is abundant. The dry litter is flammable and evidence of fires, probably triggered by bonfires or discarded cigarettes, is pres-



Fig. 10. Campers enjoying the beach at Canasí, the type locality of *Tropidophis celiae*. Photograph © Dennis Denis.

ent. Moreover, the northern coast of Mayabeque Province is an oil-extraction site. We cannot link any current effects to the status of the snake population, but previous habitat loss in the area certainly impacted the range of *T. celiae*.

The situation at Carboneras is even worse than at Canasí. Threats in this locality include the presence of extensive pastures and secondary savannas for cattle, tourism, highways, urbanization, habitat degradation and fragmentation, and almost complete deforestation (with remaining fragments limited to cave entrances). The cave where the snakes described by Torres et al. (2013) were collected was surrounded by dense, shrubby, secondary vegetation. A local farmer informed us that in the past that area was set aside for stockbreeding but this activity had been discontinued.

All tropidophiids (one is presumably extinct) are included in Appendix II of CITES (UNEP-WCMC 2015) and all Cuban species are protected by national laws (Ministerio de Justicia 2011). One of the known populations (Canasí) is within a protected area of local significance albeit without current management (CNAP 2013). Cuban authorities strictly limit CITES permits, and these have been issued rarely and only for low numbers of the common and widely distributed *T. melanurus*. Nevertheless, one problem that could affect *T. celiae* in particular is a growing interest in species of *Tropidophis* (and rare animals generally) in the international pet trade. Consequently, we prefer not to reveal the exact location of our discovery. In summary, the limited information on populations of the species and the fact that it is known only from two localities make an appropriate assessment of its conservation status very difficult. However, based on the species' evident rarity despite frequent efforts to find it over a period of nearly 20 years, the anthropomorphic deterioration of its habitat, and a reduced area of occupancy (estimated at 8 km² using the grid size of 2 x 2 km recommended by the IUCN Standard and Petitions Subcommittee 2016), we reaffirm that it must be considered Critically Endangered (see Rodríguez 2012).

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