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Front cover, inside back pages and above

Echis carinatus, known as the saw-scaled viper or the Indian saw-scaled viper. This species is found in parts of the Middle East, Central Asia, and the Indian subcontinent. Despite their relatively small size, the genus *Echis* is responsible for a large number of snakebites and deaths, due to its large distribution across different regions and presence in highly populated areas.

This individual was found during a trip to the Western Ghats in 2022, on a plateau in the state of Goa. In these regions, *Echis carinatus* can be found in laterite plateaus where they rest under rocks during the day, and prey on amphibians and scorpions, especially after rainy nights during the monsoon.

Photographer

Guillem Limia Russell, Master's student at Bangor University, herper and photographer enthusiast.

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Vogel, G. & David, P. & Pauwels, O. (2004) A review of morphological variation in Trimeresurus popeiorum (Serpentes: Viperidae: Crotalinae), with the description of two new species. *Zootaxa* **727**: 1-63.

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News and Other

Husbandry and reproduction of the eastern indigo snake, *Drymarchon couperi* (Holbrook, 1842)

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Introduction

The eastern indigo snake, *Drymarchon couperi* is the largest species of snake in North America reaching a total length of 2.61m (Connant & Collins, 1991). *D.couperi's* current species range is across Southern Georgia and Florida (Deimer & Speake, 1983) but formerly ranged across Alabama, Georgia, Mississippi, South Carolina and throughout Florida (Speake, 1993). *D.couperi* is a uniform bluish black or gunmetal black, both dorsally and ventrally. Red/organge colouration is often present on the chin, sides of the head, and throat (Moler, 1992). A wide variety of habitats is used by this species including; sandhills, oak scrub, sand pine scrub, mangrove swamps, wet prairies and pine flatwoods. Gopher tortoise, Gopherus polyphemus burrows play a central role in the ecology of *D.couperi* as refugia during the winter months (Deimer & Speake, 1983; AZA Snake Tag, 2011). According to the IUCN Red List (2023) the conservation status of *D.couperi* is Least Concern with a decreasing population trend. However, in the United States, *D.couperi* is listed as threatened under the U.S Fish and Wildlife Service (U.S Fish and Wildlife Service, 1998)

Methods

1.1 *D.couperi* were used in the breeding project. The males' age was unknown but possibly an old individual as had begun to develop cataracts in both eyes. Specimen weighed 3431g. The female was seven years old and was obtained by the author a couple of months after hatching. Specimen weighed 2441g. Both specimens were captive bred. These were the final weights taken on 28 November 2019 before the breeding attempt. Specimens were housed individually in 180 x 90 x 50 cm Herptek vivariums (Figure 1). Zoo Med 100w Repti Basking Spot Lamps were used for heating and two bulbs were placed next to each other to allow a larger basking area. This was controlled by a Habistat Dimming Thermostat. UVB was provided by using an Arcadia UV Flood 55w which was placed next to the basking bulbs. Branches the same

Figure 1. Enclosure for female *D.couperi*.

circumference of the snake were used for climbing opportunities. Cork bark tubes were used for hides. Fine-grade orchid bark chipping was used for substrate at a depth of 6-8cm. Dried bamboo leaves were used to provide extra hiding areas and water was provided in a ceramic water bowl.

Ambient daytime temperature ranged from 25-28c. The basking temperature was 30-32c. Night temperatures were between 18-20c. A photoperiod of 14/10 (light/dark) was implemented from April – October and 10/14 from November – March. UVI 2.5-3 was recorded (Solarmeter 6.5) and measured from a position equivalent to the dorsum of a basking *D.couperi*. Humidity was maintained at 55-65 % RH but occasionally reached 90 % RH after spraying the enclosure with warm tap water every two – three days

Feeding was sporadic but usually occurred every two – four weeks. Specimens were fed day-old chicks, adult mice, weaner rats, trout and quail of appropriate size. Adult quail had their wings removed for ease of consumption. Food was readily accepted by both specimens during the cooling period but smaller amounts were given e.g two chicks instead of the usual five-six.

From the beginning of November 2019, the photoperiod was gradually reduced over a 14 day period from a 14/10 (light/dark) cycle to a 10/14 cycle using a standard Materplug mechanical 24hr timer. Ambient temperature was gradually reduced by 1c every two days to coincide with the change in daylight hours. Ambient temperatures were reduced to 23-25c. Basking temperature was reduced to no higher than 30c and night temperatures were reduced to 12-14c. Humidity was still maintained at 55-65 % RH but spraying the enclosure decreased to once per week.

On 19 December 2019, the male *D.couperi* was observed moving around the enclosure and appeared restless. Sperm was observed smeared over the branches and water bowl. The female was also moving around her enclosure and appeared more active than normal. It was decided to introduce the male to the females' adjacent enclosure at 09:30 (table 1). As the male was introduced,

Table 1. Record of events from introduction of adult indigo snakes to oviposition of eggs.

Date	Action
19 – 23 December 2019	Male introduced to female for breeding.
10 January 2020	Female showing signs of being gravid.
26 February	Increased basking behaviour from the female.
14 March	Pre oviposition slough.
4 April	Restless behaviour from female looking for appropriate place to lay eggs.
7 April	Oviposition with a clutch of 11 eggs laid.

he immediately pursued the female around the enclosure. Rapid tongue flicking was observed by the male. The female reduced the speed of her movements which allowed the male to nuzzle the dorsal side of the head. Rhythmic undulating movements were observed ventrally by the male. At 10:10, the female became stationary and this allowed the male to attempt copulation. More of the same reproductive behaviours were observed for another ten minutes until copulation was observed at 10:20am. Copulation lasted for 28 minutes. At 11:00, both specimens were slowly moving around the enclosure. Tongue flicking had also slowed in the male and the general reproductive observations had ceased. It was decided to remove the male at 11:15.

On 23 December 2019, the male was introduced to the females' enclosure due to increased activity. Reproductive behaviour was observed similar to the previous introduction. Specimens were together between 10:15 – 16:00 but were not fully observed during this time. Copulation was not observed.

On 10 January 2020, specimen was believed to be gravid for the first time. Slight swellings noticed in the latter third of the body when the specimen was observed moving around the enclosure. Feeding continued every 7-10 days and consisted of three - four chicks.

On 26 February 2020, specimen was observed basking and moving the latter third of its body under the heat bulbs, which was clearly distended showing the skin between the scales. External body temperature measured 29.6c using a Ketotek laser temperature gun.

On 1 March 2020, temperatures and photoperiod gradually returned to normal over a 10-day period. During this time, the female remained hidden away inside a cork bark tube and was observed to be in slough. Specimen sloughed on 14 March. After sloughing, a thick layer of damp sphagnum moss was added in the middle of the enclosure with a semi-circle piece of cork bark laid on top large enough for the snake to hide under.

8 March - 2 April 2020, female was observed spending the majority of time coiled up in the pile of sphagnum moss and would also be observed basking in the morning for short periods (<60mins) before retreating back to the moss hide. Specimen was never observed basking in the afternoon.

On 4 April 2020, restless behaviour was observed with the specimen continually moving around the enclosure with such force that branches and hides were being displaced and bark mulch ended up in the water bowl. This behaviour continued until the morning of the 7 April where the specimen was discovered coiled around 11 eggs in the sphagnum moss (Figure 2). The eggs were rough in texture (Figure 3) and did not adhere to each other.

All 11 eggs were transferred to two separate plastic air-tight containers measuring 30x20x15cm. Six

Figure 2. Female laying clutch of eggs.

Figure 3. Rough texture of a *D.couperi* egg.

eggs in one and five in the other. 3cm of Hatch Right incubation medium was added to the base of both boxes and egg crate was placed on top of the incubation medium (Figure 4). The eggs were placed on top of the egg crate and damp sphagnum moss was added around the eggs. Eggs were

Figure 4. Egg set up ready for incubation.

incubated in a neonatal incubator (Vickers Medical Model 79 Servo) and set to 26.8c. The container lid was lifted off for a few second every 2-3 days to allow gaseous exchange. Excess water vapour was removed from the lid.

Results

During oviposition, specimen retained an egg that was positioned 3-4cm from the base of the cloaca. 24hrs after oviposition, muscle contractions were observed on two occasions in the morning but the egg didn't appear to move closer towards the cloaca. On 9 April, specimen was restrained and the area palpated. It was determined that the egg had not adhered to the oviduct and the author along with a colleague continued to gently massage the egg toward the cloaca. The egg was slightly moving when gentle force was applied but it wasn't possible to safely extract. Veterinary intervention was necessary and on 14 April, specimen was anaesthetised and a portion of the contents of the egg was removed via aspiration. The egg was then manually extracted with no invasive surgery. The egg was discarded. Specimen weighed 1608g post oviposition.

On 1st July 2020, after 85 days incubation, the first hatchling emerged from the egg (Figure 5). It was

noticed on inspection that one hatchling had two obvious caudal spinal kinks. All 11 eggs hatched and by 4th July 2020 (day 88), the final two hatched out. Hatchlings were weighed as they emerged with weights recorded between 34-49g. Hatchlings were weighed as they emerged with weights recorded between 34-49g.

Rearing of Hatchlings - Hatchlings were housed individually in contico containers measuring 55x40x15cm. Each container was furnished the same with fine orchid bark chippings, ceramic hide containing sphagnum moss in the base, ceramic water bowl and a thick layer of dried bamboo leaves. Temperature was kept at an ambient of 26c in the day with a maximum of 29c at the back of the container closest to the Habistat heat strip.

Figure 5. *Freshly hatched D.couperi*.

Temperature was controlled by a Habistat pulse proportional thermostat. Night temperature was between 20-22c.

Hatchlings sloughed six-eight days after emerging from the egg. First meals were given approx. seven days after sloughing. One defrosted day old (pinkie) mouse was offered to each snake and left at the entrance of the hide. Seven hatchlings fed for the first time and food was consumed after a few minutes being introduced. Uneaten food from the others was removed the next morning. Two hatchlings refused to feed after their first month and several attempts, therefore a day-old mouse was rubbed on some day old chick feathers. This enticed a feeding response with both hatchlings feeding normally after and no other scenting was necessary. After a successful feed on one day old mouse, feeding increased to two day old mice and after four weeks, one small mouse was offered and accepted. Hatchlings were fed every five-seven days. Occasionally chopped trout and salmon was offered but was only accepted by five individuals.

Discussion

During the writing of this paper, 13 eggs were incubated in 2021, 12 hatched and 13 eggs were incubated in 2022, 13 hatched. To the best of the author’s knowledge, all specimens are still alive.

Hatchlings struggled to slough with RH <50%. Skin was often retained around the head, eyes and tail. This was remedied by spraying their habitats with warm water (20-25c) twice daily during the sloughing period.

The cause of the caudal kinks was detected in just one individual. Wines *et al*, (2015) suggested 26c to be optimal for incubating *D.couperi* eggs successfully. While this may be true, the author decided to lower the incubation temperature to 24.8 – 25c to prevent kinked spines in the hatchlings, higher incubation temperatures for prolonged periods often result in spinal kinks (Ross & Marzec, 1990). No spinal kinks were observed in any of the hatchlings following this temperature change. This also increased incubation time by up to 20 days.

No retained eggs or evidence of dystocia were observed during 2021 and 2022 reproductive successes. Invasive surgery to remove retained eggs can cause sterility in snakes resulting from scarring of the oviduct (Ross & Marzec, 1990). Where possible, it's advantageous (through veterinary intervention) to conduct less invasive procedures as discussed in this paper to allow specimens to continue to reproduce successfully.

With a loss of 833g post oviposition, the female was visibly skinny but not emaciated. Specimen was fed weekly on smaller items of food including adult mice, day old chicks and chopped trout. Once specimen's weight exceeded 2000g, it was decided to continue the feeding schedule discussed earlier in this paper. This method continued in 2021 and 2022 with no issues to the female. Clutch size was at its largest in 2022 with 13 eggs.

A varied diet is important when maintaining healthy specimens. Wild *D.couperi* have been known to consume up to 48 different species of prey including snakes, tortoises, fish, birds, rodents and carrion (Stevenson *et al*. 2010). Using wild data is key to replicating a balanced diet and improving the overall nutrition needed to reproduce successfully on an annual basis.

D.couperi is currently maintained by 49 zoological institutions globally (ZIMS, 2023) Few collections outside of the Central Florida Zoological Park is currently breeding this species. Access to more peer reviewed husbandry and breeding notes may better inform other collections on best practice guidelines for reproducing this species successfully.

Acknowledgements

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Status of the green toad (*Bufotes viridis*) and marsh frog (*Pelophylax kurtmuelleri*) on Ios (Cyclades, Greece)

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Initial situation

Graham *et al*. (2021) report a new finding of the green toad (*Bufotes viridis*) on Ios. It was observed in a seasonally flooded area near the coast at Mylopotas (36.7147 N, 25.2955 E). For the marsh frog (*Pelophylax kurtmuellleri*), two sites are reported, a garden pond near Mylopotas Reservoir (36.4252 N, 25.182 E) and a seasonally flooded area in Ios Port (36.7258 N 25.2740 E). In view of this paucity of sites, the authors suggest further clarification, particularly regarding the status of the species and conservation aspects. This is the subject of the following article.

Introduction

The Cycladic island of Ios is located 12 km south of Naxos; it is arid, mountainous and has an area of 108 km2. At 713 m a.s.l., Pyrgos is the highest point on the island. In addition to the amphibian species mentioned above, the documented herpetofauna of the island (cf. Cattaneo 1999) comprises the two gecko species *Cyrtodactylus kotschyi* and *Hemidactylus turcicus*, Erhard's wall lizard (*Podarcis ehrhardii*), the Balkan green lizard (*Lacerta trilineata*) and the three snake species sand boa (*Eryx jaculus*), four-lined snake (*Elaphe quatuorlineata*) and horned-nose viper (*Vipera ammodytes*). With the exception of the Balkan green lizard, these species were observed during our visit to the island from 8-17 April 2022. Our follow-up search focused on potential sites of hydrophilic herpetofauna. The Western Caspian turtle (*Mauremys rivulata*) was also a species of interest. The search concentrated on the water bodies still bearing water and the seasonally flooded mouths of the streams. The site data provided by Graham *et al*. (2021) were checked. The 1:25,000 SKA map of Ios (no. 315) was used for the field work, and GARMIN eTrex 20 was used to determine the coordinates.

Status of the green toad (*Bufotes viridis*)

The mouth of the Stroubouli stream in Mylopotas is enclosed by hotel and other high-rise buildings

(see figure 2) . This is where Graham *et al*. (2021) made their only find of the green toad on the island (36.7147 N, 25.2955 E). The backwater area of the stream is located behind the coastal road and north of the access road to the Deep Blue Restaurant behind the hotel of the same name. The owner reported nightly choruses and the presence of toads in the car park and garden area. The area that was still flooded on 9 April 2022 also included a vehicle track filled with water. There the tadpoles were very numerous and already well developed, although still without their hind legs. At other locations in the area of flooding, dense swarms of even younger tadpoles were found. The water-filled track was kept under observation in the following days. On 9 and 10 April 2022 over a hundred tadpoles were to be seen. However, a little egret (*Egretta garzetta*) and two species of wader, the common sandpiper (*Actitis hypoleucos*) and the wood sandpiper (*Tringa glareola*) were also permanent visitors to the site. On 12 April, no tadpoles were observed in the reduced volume of water in the vehicle track, which was found to be dry on 15 April. The tadpoles in this unprotected habitat obviously served as a concentrated source of food for the waterfowl. This area is listed in the WWF wetland inventory for the Greek islands and is supposed to be protected by a presidential decree. The remaining land, which dries up during the spring, is threatened by a variety of potential measures related to the development of tourism there. After a wet spring, the green toad is able to metamorphose at this site.

On 9 April 2022, tadpoles of the green toad were found in two concrete intakes on the Mylopotas Reservoir (figures 3 & 4). The intake streams themselves had dried up. Residual water remained in the concrete channels, which was impounded by a small cross member. On both spawning sites there is a chance that enough water will remain for metamorphosis to take place. The reservoir itself, which was built in 1995, is fenced off, covered with a sterile synthetic membrane and has steep embankments, so that no vegetation can grow there. This makes it useless as a spawning ground for amphibians.

Apart from the resort of Mylopotas, other sites of relevance in the search for green toads were concentrated in the southeast of the island. In Maganari, in the western sandy bay, five wet bodies were found in backwater areas of the Fylladhakia stream on 9 April 2022 (figures 5 & 6). All these pools were populated with thousands of tadpoles. Two of the five could possibly remain wetted until the tadpoles metamorphose. The wetted areas were found over a distance of 200 metres between the end of the bay in the west, where there is a residential

building and a car park, to Antoni's restaurant in the east.

Spawning sites can also be expected in road construction excavation sites as long as they retain their water. An isolated site of this type was found by the roadside on 10 April 2022 near Kalamos Bay on the eastern side of the island. On 12 April 2022, a wetted depression containing tadpoles was found by the side of the newly upgraded road to Maganari near Vigla Kalamou. There was also water crowfoot growing in the pool, indicating the prolonged presence of water. This was also the case, albeit without tadpoles, with a waterhole excavated out of the rock near the houses of Maganari. Finally, three kilometres north of the bay, two more waterholes with tadpoles were found along the above mentioned new road to Maganari on 16 April 2022 (figures 7 & 8). A total of 12 reproduction sites of the green toad were thus identified on the island of Ios. They are all located in the southwest of the island.

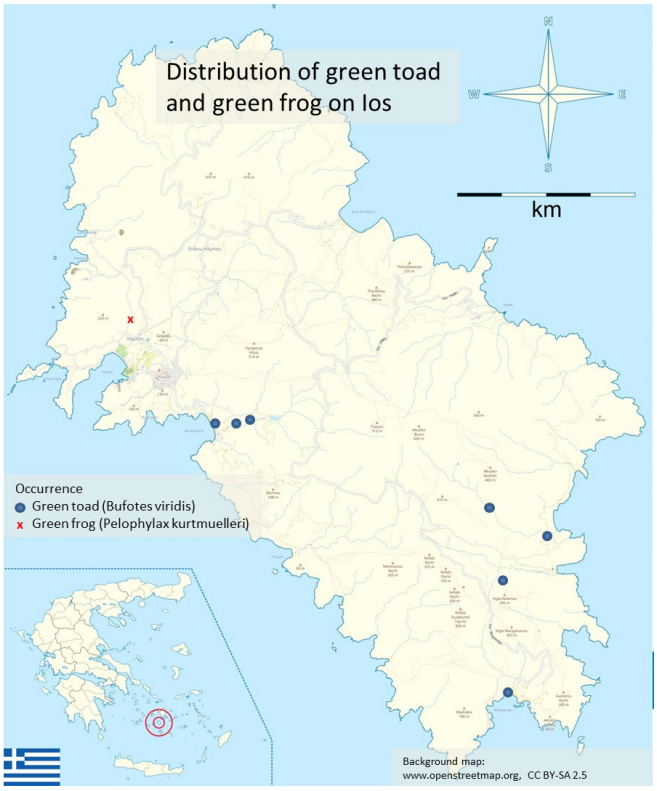

Figure 1. Distribution of green toad and green frog on Ios.

Status of the marsh frog (*Pelophylax kurtmuelleri*)

The two sites with marsh frogs reported in Graham *et al*. (2021) could no longer be confirmed two years after their find. In the private garden pond south of the Mylopotas Reservoir, repeated searches failed to produce evidence of the marsh frog. The seasonal backwater in Ios Port still comprised two water bodies, but there were no signs of the marsh frog. Moreover, it was apparent that the residual puddles were unlikely to remain wetted much longer and the area would soon dry out.

In the grey literature there are two further references to marsh frogs for Ios, but no location details are provided. Whether they correspond to the above sites is uncertain. Carl Corbridge wrote in Yorkshire Field Herping and Wildlife Photography in 2014 about finding "a very nice spring with green frogs", and in his herpetological blog, Matt Wilson mentions a "moderate amount of waterfrogs in ponds" in 2019. During our visit to the island, the mouths of many streams were checked for backwater

areas as well as many upper and middle reaches of mountain streams for flowing or still surface water. Only a few pools were found on bedrock, for example in the Mylopotas stream above the reservoir, but without any evidence of amphibians. It was therefore all the more surprising to come across sections of stream that still held water while hiking on waymarked path no. 1 leading from the Skarkos archaeological site near Ios northwards in the direction of Eparios Kambos. This was the case on 15 April 2022 on the Perivolia stream, where a marsh frog was heard calling near a bridge (figures 9 & 10). Two individuals were eventually seen in a backwater area and one was photographed. Despite the intensive search conducted, this remained the only sighting of the marsh frog on Ios.

Table 1. Amphibian sightings on the island of Ios (see also figure 1 Distribution of green toad and green frog on Ios)

Date	Location	Coordinates	Elevation (m a.s.l)
Marsh frog			
14 April 2022	Bridge on the Perivolia stream	36 44.200 N, 20 20.855 E	30
Green toad			
9 April 2022	Road construction excavation site near Kalamos Bay	36 41.481 N, 25 22 759 E	20
9 April 2022	Backwater area, western bay in Maganari	36 39.645 N, 25 21.970 E	2
10 April 2022	Stream mouth area, eastern coastal road, Mylopotas	36 71.47 N, 25 29.55 E	2
10 April 2022	1st intake, Mylopotas Reservoir	36 42.52 N, 25 18.37 E	60
10 April 2022	2nd intake, Mylopotas Reservoir	36 42.52 N, 25 18.37 E	60
13 April 2022	Road construction excavation site with water crowfoot (Ranunculus peltatus) after Maganari	36 40.659 N, 025 21.848 E	220
16 April 2022	Excavation site with Typha domingensis on a minor loop on the road to Maganari	36 41.943 N, 25 20.884 E	351
16 April 2022	Same excavation site with second water body	36 41.951 N, 25 20.833 E	350

Figure 2. Mouth of Stroubouli stream at Mylopotas enclosed by hotel and other buildings.

Figures 3 & 4. Tadpoles of the green toad remain in the concrete channels of the Myloptamus water reservoir

Conservation aspects

Together with Sikinos and Folegandros, Ios forms part of the Important Bird and Biodiversity Area IBA GR 157. The area around Profitis Ilias on Ios is also a designated Game Refuge with an area of 3,700 ha.

Figures 5 & 6. At Maganari several wet bodies were found in backwater areas of the Fylladhakia stream where populated with thousands of tadpoles of the green toad

Figures 7 & 8. Tadpoles of the green toad found in excavations sites of road construction

Figures 9 & 10. Periviolia stream north of Skarkos archaeological site where a marsh frog was photographed

The Inventory of the Wetlands of the Aegean Islands (Catsadorakis & Paragamian 2007) is a reliable source of information for locating them. It lists seven objects for Ios. All were visited. Apart from the above-mentioned reservoir, they are all stream mouth areas on the coast, where the outflowing water is retained for some time by barrier beach formation. The resulting standing water bodies serve as spawning grounds. On many islands they are also habitats for the Western Caspian turtle (*Mauremys rivulata*). Although protected by presidential decree, the object IOS0003 – arguably the most significant object on the island – no longer exists. It was the largest backwater of a stream in the sandy Pappa Aulaki Bay on the eastern coast. The area of the mouth has been of interest to a 5-star hotel for years and, according to information available at: https://save-ios-gr/en, has now been destroyed despite its protected status. Something similar happened in the Koumpara-Diakofti area north of Ios Port, where a luxury resort was built on a rocky island and a bridge constructed to connect it with the mainland. With a certain lack of sensitivity, old olive and palm trees were planted in the area in the form of an avenue on the access road and then presented as a conservation measure on the Internet. Only the wetland east of Aghia Theodoti covers a large area. The lax-flowered orchid Anacamptis laxiflora was found there. The wet meadows are no longer managed, and the farmhouse located near the slope seems to be abandoned. Domestic pigs have ploughed up much of the soil in the wetland. In these stream mouth areas with their beaches, tourism development is proving to be the biggest threat to the wetland habitats.

They are also threatened by agriculture. The stream mouths listed in the inventory had already dried up by mid-April and, this year at least, were no longer available to hygrophilic herpetofauna for reproduction. Water is also taken from the headwaters of the streams, with kilometre-long hoses used to irrigate fields. Climate change will increase the tendency to dry out early even more. The potential threats to wetlands on the Aegean islands are presented in detail in Broggi (2021).

What are the chances of survival for the two amphibian species on Ios? The green toad seems well adapted to arid conditions. It can survive dry years, taking advantage of favourable events. It can also migrate over long distances and make use of anthropogenic waterholes resulting from road construction or created for watering cattle. In this respect Ios still has some potential, as excavation sites were observed that contained water but did not as yet serve as spawning sites. With the use of such man-made spawning sites, the status of the green

toad for Ios therefore appears to be secure at present. Climate change, with increasingly dry conditions and loss of spawning grounds, is the greatest threat to the species.

The marsh frog needs more stable hydrological conditions than the green toad, as it does not leave its spawning site. Extinction of the marsh frog on Ios must be considered probable. In addition, the island populations of amphibians and hydrophilic reptiles such as the Western Caspian turtle (*Mauremys rivulata*) are often very small and therefore highly vulnerable without the necessary protection measures. Without targeted protection and conservation measures, their survival on the islands is not assured. This must be taken into account in the context of tourism development.

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On the diet of *Pliocercus eurizonus* Cope 1862 (Squamata: Dipsadidae)

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Snakes and anurans are fundamental elements of the food webs in the ecosystem, and are generally involved in predator-prey interactions, usually as predator and prey, respectively (Wells, 2007). Although predatory events are rare to observed in nature, these data are important tools for understand the prey-predator interaction of the species involved.

Savage (2002) assumes that *Pliocercus eurizonus* being closely related to *P. elapoides*, their diet may be similar, appearing to feed mainly on small amphibians (e.g., *Bolitoglossa* spp.). Leenders (2019) mentions its main prey is leaf-litter frogs (genus *Craugastor*) and other amphibians (one individual reportedly ate a salamander). In the literature only three records are known in the diet of *P. eurizonus*: a first individual swallowing a *Craugastor* sp. (Greene, 1997), a second case feeding on the eggs of Red-eyed Treefrogs (*Agalychnis callidryas*) in Panama (Vriesendorp and Robertson, 2007) and a third event with a catfish (*Trichomycterus* sp.) in its stomach contents, in Colombia (Durango *et al*., 2022).

In July 2006 on the town of Alto de Piedra, edge of Santa Fe National Park, province of Veraguas, Panama (8.5139º N, -81.1163º W, WGS 84; 855 m elevation), during the night in a field trip (unrecorded time), one of the authors (ET) observed the snake Cope's False Coral Snake (*P. eurizonus*) preying on the Masked Tree Frog (*S. phaeota*) on the edge of a small lagoon. After approximately one minute the snake then proceeded to swallow the frog from the rear (Fig. 1). The photo and video (https://youtu.be/1ZIjpyVw9E0) clearly show the meal was proportional to the snake. As the frog proved a challenge to the snake, it was allowed to leave after its meal without disturbing the snake.

Figure 1. (A) Predation of *Smilisca phaeota* by *Pliocercus eurizonus*, town of Alto de Piedra, Santa Fe District, province of Veraguas, Panama. (B) Predation of *Craugastor tabasarae* by *Pliocercus eurizonus*, cerro Brewster, Chagres National Park, Panamá. (C) Detail of the head and neck of the snake, the expanded skin is observed while it swallows the prey. Photos credit: (A) Edgar Toribio and (B-C) Ángel Sosa-Bartuano.

At approximately 1900 h on the night of March 16, 2010 in cerro Brewster, Chagres National Park (9.3182º N, -79.2893º W, WGS 84; 833 m elevation), during field work, one of the authors (ASB) observed a *P. eurizonus* preying on a *C. tabasarae*. The moment in which the frog was captured could not be observed, but it was observed in detail how it was swallowing for approximately 5 minutes, including photos (Figure 1 B-C) and video recording (https://youtu.be/oVdcLgNYz9g). The frog inflated its body to increase its volume and make it difficult to be swallowed by the snake. The event occurred on the banks of a stream and could not be observed until the end because the snake hid in the leaf litter to finish its meal.

Zipkin *et al*. (2020) suggest that the decline of amphibians may have negatively affected the survival of some snakes and mention that the occurrence rate of *Pliocercus eurizonus*, in the General de División Omar Torrijos Herrera National Park, decreased after the decline of amphibians in 2004 (Lips *et al*., 2006).

The *Craugastor* sp. showed by Greene (1997), and the anurans reported in this note were swallowed from the hind limbs towards the head. This is the first recorded interspecific predator for *Craugastor tabasarae*. Previously recorded predators for *Smilisca phaeota* include others amphibians as *Leptodactylus savagei* (Savage, 2002) and snakes as *Bothrops asper*, *Chironius flavopictus*, *Leptodeira septentrionalis*, and *Leptodeira annulata* (Arroyo-Trejos and Mora, Farr and Lazcano 2017, Roberto and Souza 2020). This note provides an additional species of snake as a predator of *Smilisca phaeota*.

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New country record of *Erythrolamprus dorsocorallinus* (Reptilia: Dipsadidae) from Guyana

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The genus *Erythrolamprus* Boie, 1826 (synonym of *Liophis*; Grazziotin *et al*., 2012) is one of the most diverse taxa of New World snakes, comprising roughly 50 species widely distributed from Central to South America (Dixon, 1980; Fernandes *et al*., 2002; Esqueda *et al*., 2007; Curcio *et al*., 2009; Vidal *et al*., 2010; Grazziotin *et al*., 2012). Among these, the species *Erythrolamprus dorsocorallinus*, formerly thought to be a variation of *Erythrolamprus reginae* (Dixon, 1983), was originally described from the Venezuelan state of Barinas by Esqueda *et al*., 2007. Since its formal description, *E. dorsocorallinus* has then been reported from a number of localities in Bolivia, Colombia, Peru, Venezuela, and the western Brazilian Amazonia (Franca *et al*., 2010; Bernarde *et al*., 2011; da Silva Araújo *et al*., 2012; Pantoja *et al*., 2012; Miranda *et al*., 2014; Eversole *et al*., 2016; Ascenso *et al*., 2019) (Figure 1).

On 23 July 2022, at about 16:30 h (UTC-4), while walking in proximity of the primary school of the Warapoka village (7.8127, -59.2706; elevation 37 m), Moruca sub-district, Region 1, Guyana, author RB found what he reported to be “an exuberantly coloured snake” (Figure 2A), and called the attention of the other authors to help with identification. The snake was thus carefully inspected in situ, and compared to the information on scale counts, coloration, and markings available from literature (e.g., Esqueda *et al*., 2007; Bernarde *et al*., 2011; da Silva Araújo *et al*., 2012; Ascenso *et al*., 2019).

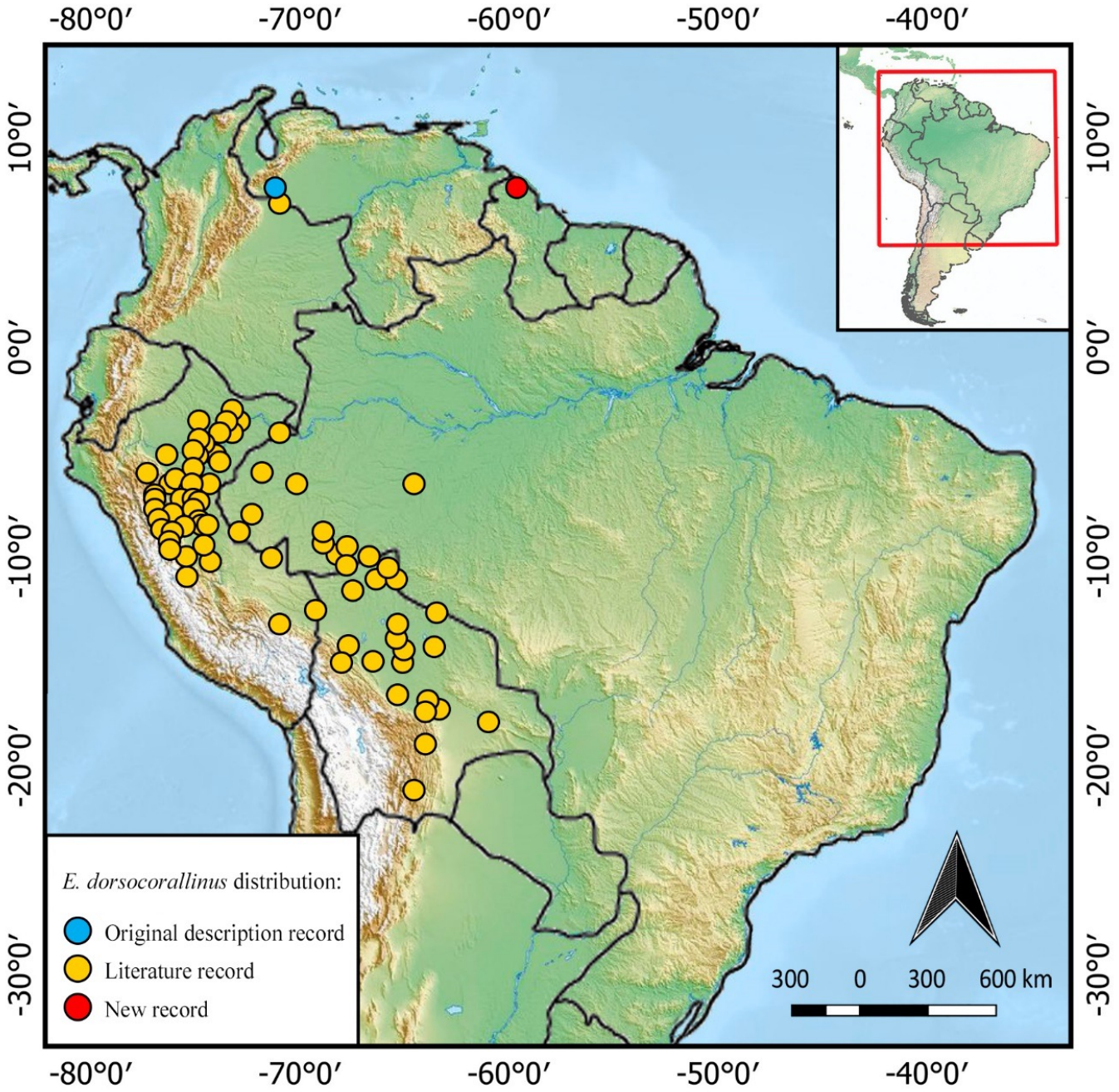

Figure 1. Geographic distribution of *E. dorsocorallinus*, including the new record from Guyana presented in this study (red). Map modified from Ascenso *et al*., 2019.

The specimen presented 17 dorsal scale rows, 147 ventrals, and 68 subcaudals. The dorsum of body and tail was reddish. The distal half of the scales, the upper edges of supralabials, and the post-orbital stripe were black. No lateral black spots and dorsal-lateral stripes were detected. The belly was almost uniformly orange, with very few black spots. The ventral surface of the tail was also orange, but completely lacked black spots. The following head scale features were recognised: prefrontals two contacting supraoculars, preocular, loreal, and postnasal; frontal pentagonal, longer than wide;

parietals two, longer than wide; supralabials eight, second and third contacting loreal, fourth to fifth contacting eye, and sixth and seventh higher than remaining supralabials; supraoculars longer than wide; loreal tetragonal, contacting second and third supralabials, postnasal, prefrontals, and preocular; preocular contacting supraocular, prefrontal, nasal, third and fourth supralabials; postoculars two, upper postocular higher than lower; infralabials nine (see Figure 2B). Based on these characteristics, matching the descriptions by Esqueda *et al*., 2007 and Ascenso *et al*., 2019, the snake was identified as *E. dorsocorallinus*. After further examination, the snake was released exactly where it had been found. No samples were collected from it.

To our knowledge, this is the first report of *E. dorsocorallinus* from Guyana, thus representing an addition to the faunal list of this country. The present record also constitutes the easternmost boundary of the currently known distribution of *E. dorsocorallinus* in South America, and a range extension of about 1,300 km from the location where it was originally described (see Esqueda *et al*., 2007). Due to the novelty of this species, the distribution of *E. dorsocorallinus* is probably underestimated. We hypothesise the presence of significant gaps between known occurrences to be attributable to insufficient sampling, and expect them to be filled by future reporting. Indeed, rigorous sampling is needed to more comprehensively document the actual distribution of *E. dorsocorallinus*, particularly regarding the apparent isolation between northern and southern records (see Figure 1). Reaching a better understanding of the species' distribution might help to promote studies on its ecology and behaviour, as well as to assess the potential need for conservation measures.

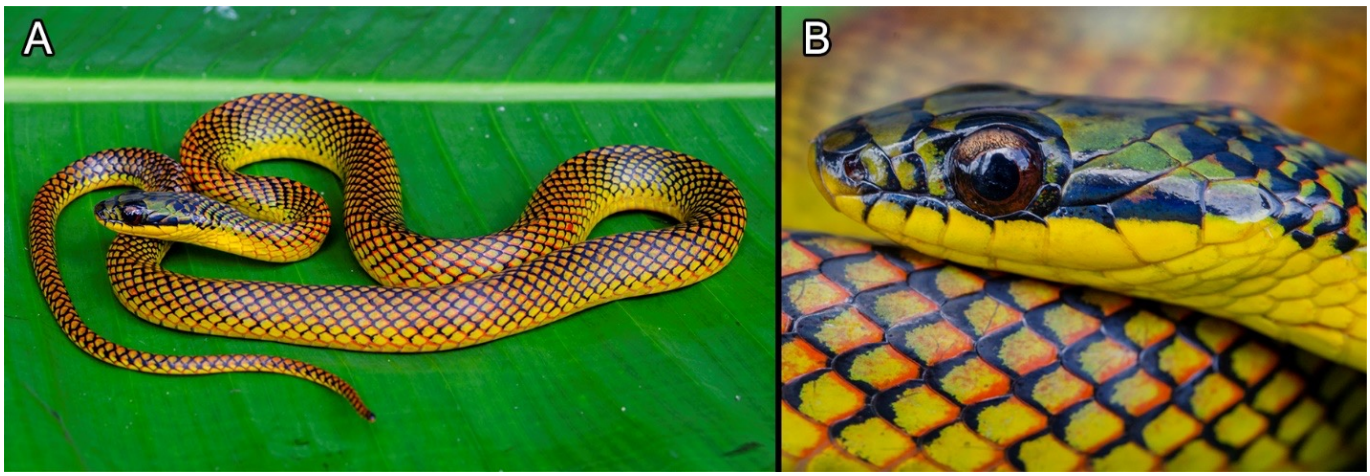

Figure 2. *Erythrolamprus dorsocorallinus* specimen found in Warapoka village, Moruca sub-district, Region 1, Guyana. A: entire view of the specimen; B: detail of the head. Photos by Ignazio Avella.

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Shifting Perceptions of Herpetofauna: A Note on the Implications of Social Media

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Throughout history, snakes have been negatively portrayed and associated with hostility in mainstream media, traditional Judeo-Christian beliefs, and folklore. These representations have played a significant role in shaping unfavorable attitudes towards snakes in Western societies, (Shine, *et al*., 2000), (i.e., Adam and Eve, Snakes on a Plane, Anaconda, ect.).

Thus, a typical response when people find a snake is simply to kill it. People will employ methods of euthanasia such as garden tools, lethal traps, and guns to dispatch snakes, frequently citing concerns for their children and or pets. In fact, people are so perturbed by snakes that this response is not even reserved to when a snake may pose a threat. It has even been shown that while driving, people will swerve their cars to intentionally run over snakes when given the opportunity (Secco, *et al*., 2014). Unfortunately, this indiscriminate killing of snakes harms populations across the board, both venomous and non-venomous (Bansal, 2020).

In stark contrast to seemingly universal disdain for snakes and reptiles, we see a subculture of herpetofauna enthusiasts. These enthusiasts partake in "Herping", the act of searching for reptiles and amphibians either in recreational pursuits or for scientific data collection. Herpers, particularly herping "influencers", are gaining traction on social media. These public figures range from python hunters to hobbyists to researchers. These accounts reach vastly different audiences, and the content posted can have varying implications for public perception of snakes. Social media can play an important role in educating the public by producing content on untrue myths about herpetofauna without the sensationalism seen in mainstream cinemas (Rabbe, *et al*., 2021), and is now considered the best way to spread awareness about herpetofauna (Sajjad, 2021). With the growing popularity of herping influencers, more research is needed to assess changes in public perception of serpents and herpetofauna in relation to media content and conservation efforts.

With this rise in herpetofauna content creators, we see a niche group focusing on anthropomorphic reptile and amphibian content. These anthropomorphic social media accounts, such as Linguini the Snake (Linguini, nd), could further garner public support for conservation and interest in reptiles and amphibians. These accounts make lighthearted content, typically assigning herpetofauna human emotions and words and even going as far as dressing them in personalized clothing. Since these animals typically have a general image problem due to their lack of expressiveness and perceived lack of intelligence (Eddy, *et al*.,1993), assigning them human characteristics or behaviors may be able to influence these animals' desirability as companions (Grasso, *et al*., 2020), in turn helping conservationists develop empathy towards difficult target species (Chan, 2012).

Python hunters on social media may have varying influence on publics support for snake conservation. In South Florida, Burmese pythons are an invasive species, causing economic and environmental harm (Wilson, 2017). It has been shown that how social media portrays human–wildlife conflict, such as the python invasion, plays a substantial role in how certain species are perceived (Nyhus, 2016). Presenting them in certain light on social media may exacerbate negative stereotypes of serpents and make it difficult to alter negative beliefs. Python hunting that is sensationalistic, with monster-like portrayals, may influence public support away from snake conservation in general. However, python hunters on social media are also bringing necessary exposure to the issue of invasive reptiles and their impact on native fauna. These hunters can positively affect the situation through increased awareness resulting in steps toward corrective action (Stone, 2014).

Researchers have the potential to shed a positive light on herpetofauna, due to their informative content (Rabbe, *et al*., 2021), but ethical dilemmas may arise from their pursuits geared at creating content for social media. The posts shared by this group typically provide valuable details about biological characteristics and highlight the impact of human activities on wildlife, thus promoting public awareness about wildlife conservation. Such a framework holds the potential to strengthen wildlife management and conservation initiatives (Wu, 2016). However, as intentional human-herp interactions increase, concerns regarding herping ethics have also emerged within researcher and hobbyist communities. Debates have surfaced on various topics, including the choice between "in-situ" photography and posed/handling shots, staged captures of wildlife, the potential transmission of

diseases between animals, and the disclosure of locations where rare species can be found. In their pursuit of capturing the perfect shot, herpers may unintentionally harm the very species they are working with through improper handling practices.

The impact of hobbyists in the herping community varies significantly, depending on their style of content creation and subgroup within the hobbyist division, such as YouTubers and recreational herpers. Some hobbyists and Youtubers actively promote animal welfare and create educational content, aligning their impact closely with that of researchers. However, the issue lies in certain practices, including staged captures and findings, handling of species without proper permits, irresponsible or incorrect handling of venomous snakes, harassment of animals, and deliberately placing animals in precarious situations for content creation. In 2021, several high profile youtubers in south Florida were exposed by a fellow youtuber for catching and passing around pythons to be used in multiple staged scenes involving inhumane bow hunting videos and putting pythons in storm drains to film python capture scenes (New England Reptile, 00:19–07:51). The pursuit of viral content could drive unethical human-herp interactions and contribute to the amplification of fear and disdain towards herpetofauna for personal gain.

While I do believe the ever-growing presence of herping on social media, in particularly the physical handling and subsequent posting of the handling of reptiles and amphibians, warrants a slew of new ethical and social dilemmas in the context of public perception and animal welfare, it can also be a catalyst for paradigm shifts. Herping influencers are shifting paradigms through their informational posts, their handling of typically feared or disliked animals, and their encouragement for others to safely get hands-on with herpetofauna. This idea can be supported by studies showing that physical contact with snakes is associated with snake likability (Jean-Marie Ballouard, *et al*., 2013), and increased knowledge about snake behavior and biology is positively correlated with positive attitudes toward snakes (Liordos, *et al*., 2018). Therefore, one could surmise that the active presence of herpers on social media, properly handling and spreading information, could shift public perception away from the historically negative media surrounding herpetofauna. Thus, turning the focus from conflict towards a new era of co-existence and tolerance.

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Image: *Echis carinatus*, Western Ghats, India 2022 - Guillem Limia Russell