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Hidden in the lows: a novel record of a Toad-headed Pitviper, genus *Bothrocophias*, in the lowland Chocó of Esmeraldas Province, northwestern Ecuador

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Vipers of the genus *Bothrocophias* inhabit rain- and cloudforests in South America at elevations from 75–2761 m. The genus currently includes nine species: *B. andianus* (Amaral, 1923); *B. campbelli* (Freire-Lascano, 1991); *B. colombianus* (Rendahl & Vestergren, 1940); *B. hyoprora* (Amaral, 1935); *B. lojanus* (Parker, 1930); *B. microphthalmus* (Cope, 1875); *B. myersi* Gutberlet & Campbell, 2001; *B. myrringae* Angarita-Sierra, et al., 2022, and *B. tulitoi* Angarita-Sierra et al., 2022 (Uetz et al., 2025). Before the revision of Gutberlet and Campbell (2001), species had been assigned to the genus *Bothrops*. In the same paper, Gutberlet and Campbell (2001) split *B. campbelli* and described lowland populations from Colombia as a new species, *B. myersi*, based on scalation and coloration. Using both morphological and molecular data, the monophyly of *Bothrocophias* was later confirmed by several studies (e.g., Fenwick et al., 2009; Carrasco et al., 2012; Hamdan et al., 2019).

Bothrocophias campbelli is the only member of the genus known to occur on the western slopes of the Andes, ranging from southern Colombia to southern Ecuador (Gutberlet and Campbell, 2001; Castro et al., 2005). In Ecuador, it has been documented in Chimborazo, Cotopaxi, El Oro, Esmeraldas, Imbabura, and Pichincha provinces at elevation of 725–2265 m (Ortega-Andrade et al., 2010; Valencia et al., 2016; Arteaga, 2024). Known sites of *B. campbelli* in Esmeraldas are restricted to a small area close to the border with Carchi and Imbabura provinces (Valencia et al., 2016; Arteaga, 2020; Rodríguez-Guerra, 2020). In contrast, *B. myersi* is known from the Pacific wet lowland rainforest of the Colombian departments of Cauca and Valle del Cauca at elevations from 75–200 m. Although Gutberlet and Campbell (2001) listed no Ecuadorian record of *B. myersi*, they mentioned the possibility that the species may occur throughout the Chocó region, including Ecuador.

We here report an individual of *Bothrocophias* (Fig. 1) that cannot unambiguously be assigned to either *B. campbelli* or *B. myersi* based on its morphological traits. The snake presented a combination of scalation characters intermediate to those reported for the two species. Furthermore, the locality falls between what is currently documented for these two species, both in horizontal and elevational space.

Locality. Our observation was made at the Tesoro Escondido Reserve (www.tesororeserve.org; coordinates of the lodge are 0.5419°N, 79.1540°W) during a study investigating anuran communities in the wet tropical Ecuadorian Chocó (www.reassembly.de). The reserve is located in the Tumbes-Chocó-Magdalena Biodiversity Hotspot in Esmeraldas Province, northwestern Ecuador. This area is characterized by an annual mean precipitation of up to 6000 mm (Freire and Vázquez, 2005) and was originally covered by lowland evergreen forests and the piedmont forests of the western mountain range (MAE 2013). Due to human forest alteration, the Tesoro Escondido Reserve is composed of a mosaic of primary rainforest, secondary rainforest in different stages of regeneration, and agricultural land.

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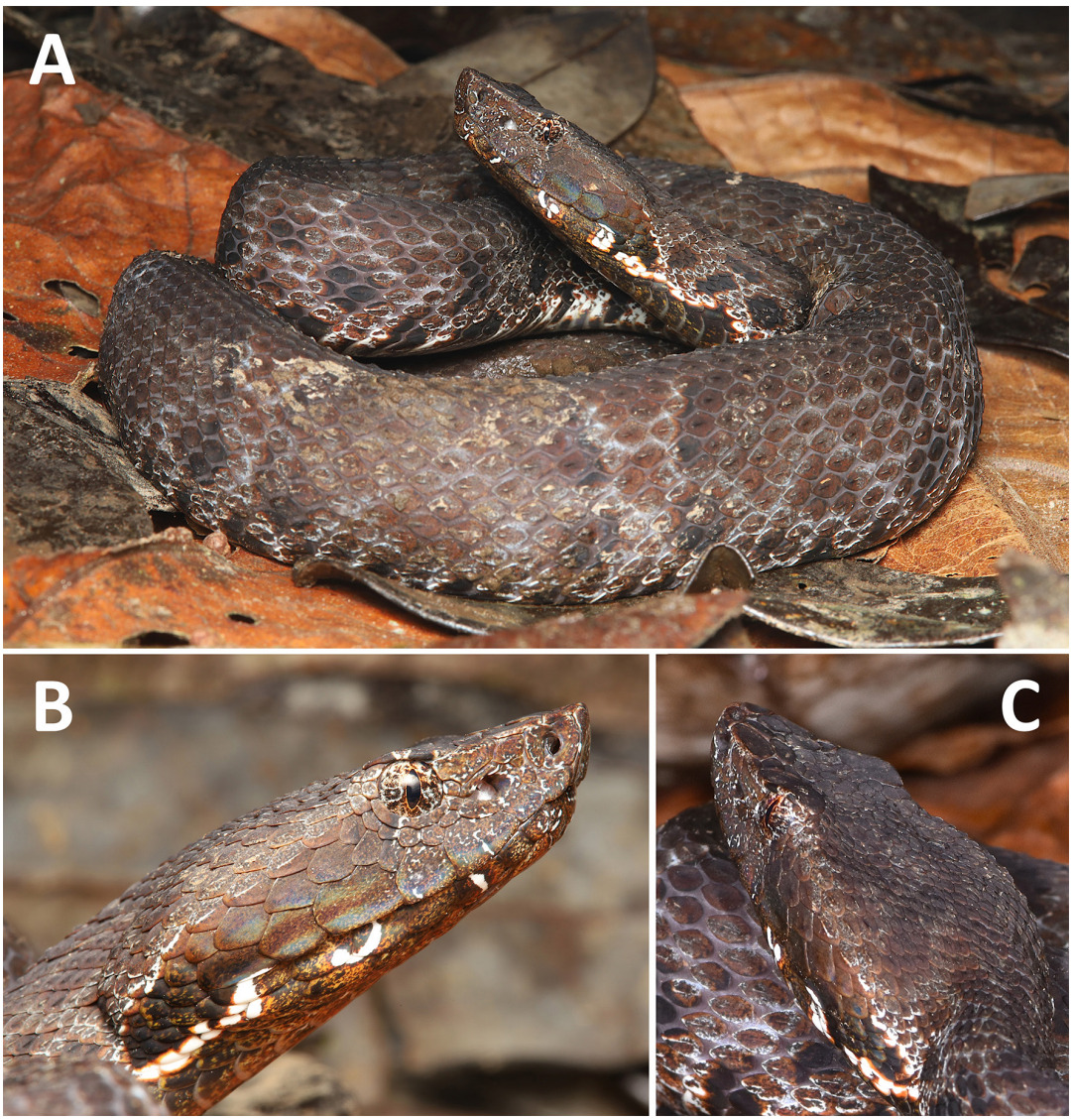

Figure 1. A member of the genus *Bothrocophias*, encountered on 21 March 2023 in the Tesoro Escondido Reserve, Ecuador, illustrating general appearance (A) and some head scalation features (B, C). Photos by Thomas Lindner (A, B) and Mark-Oliver Rödel (C).

Observation. On 21 March 2023 at around 21:00 h, we encountered a *Bothrocophias* with a total length of approximately 70 cm during light rain in a forest plot of the Reassembly project (0.4982°N, 79.1385°W; elevation 529 m). The site is located on a slope of a small ridge. Since the land was used until 1985 for the cultivation of cacao, the vegetation consists of recovering lowland rainforest. The snake was observed moving through leaf litter along small bushes. During capture and handling, we used bite-protective gloves (HexArmor Hercules R8E 3180) but the animal showed no sign of aggression and did not attempt defensive strikes.

Identification. The snake was transported alive to the Tesoro Escondido Reserve lodge for identification. Following Valencia et al. (2016), we identified the snake as *B. campbelli* based on scalation and coloration. Additional photos of the snake were taken (Fig. 1), and it was released at the original site on the following day. Under the assumption that our initial identification was correct, we did not collect additional scale characters, such as dorsal, ventral, and subcaudal scale counts, before releasing the animal.

Mapping reveals a problem. When we later mapped the record (Fig. 2) together with previous Ecuadorian *Bothrocophias* records (taken from Cisneros-Heredia et al., 2006; Valencia et al., 2016; Arteaga, 2020; Rodríguez-Guerra, 2020) we realized, that our record represented the lowest and westernmost occurrence of the genus in Ecuador, far from the known geographical and elevational ranges of *B. campbelli* and *B. myersi*, with no previous *Bothrocophias* records existing in this or other Ecuadorian Pacific lowland areas. To illustrate the significance of the new record, we mapped the new and the available Ecuadorian *Bothrocophias* records using digital elevation model (DEM) data of the Shuttle Radar Topography Mission (SRTM; Fig. 2). The closest Ecuadorian records of *B. campbelli* to the Tesoro Escondido Reserve are from Chontal Alto (Cisneros-Heredia et al., 2006), Milpe Bird Sanctuary (Arteaga, 2020; Rodríguez-Guerra, 2020), Mindo (Cisneros-Heredia et al., 2006; Rodríguez-Guerra, 2020), Río Manduriacu Reserve (Arteaga, 2020), and Gavilán de Orongo (Rodríguez-Guerra, 2020), covering an elevation range of 1130–1650 m. These localities are a minimum linear distance of 40–70 km from the new record and at least 600 m higher in elevation (Fig. 2).

Lower Ecuadorian *B. campbelli* records, as low as 725 m, are known from other regions but not from near Tesoro Escondido Reserve. Previous records of *B. campbelli* from Esmeraldas Province are from a small area close to the borders of the Carchi and Imbabura provinces (El Cristal: Salazar-Valenzuela et al., 2014; Arteaga, 2020. Río Negro Chico: Arteaga, 2020; Rodríguez-Guerra, 2020), about 80 km from Tesoro Escondido Reserve. Rautsaw et al. (2022) mentioned multiple locations of *B. campbelli* from the Ecuadorian lowland rainforest, including Esmeraldas Province. However, none of these locations represent actual records but identify the capital cities of cantons (Ecuador's secondary administrative subdivisions) identified as potentially inhabitable by *B. campbelli* based on ecological niche modelling (Vaca-Guerrero, 2012). These predictions were incorrectly considered actual records by Rautsaw et al. (2022), and none of the records used by Vaca-Guerrero (2012) is from the Ecuadorian lowlands or Esmeraldas Province. If the snake we found was indeed a representative of

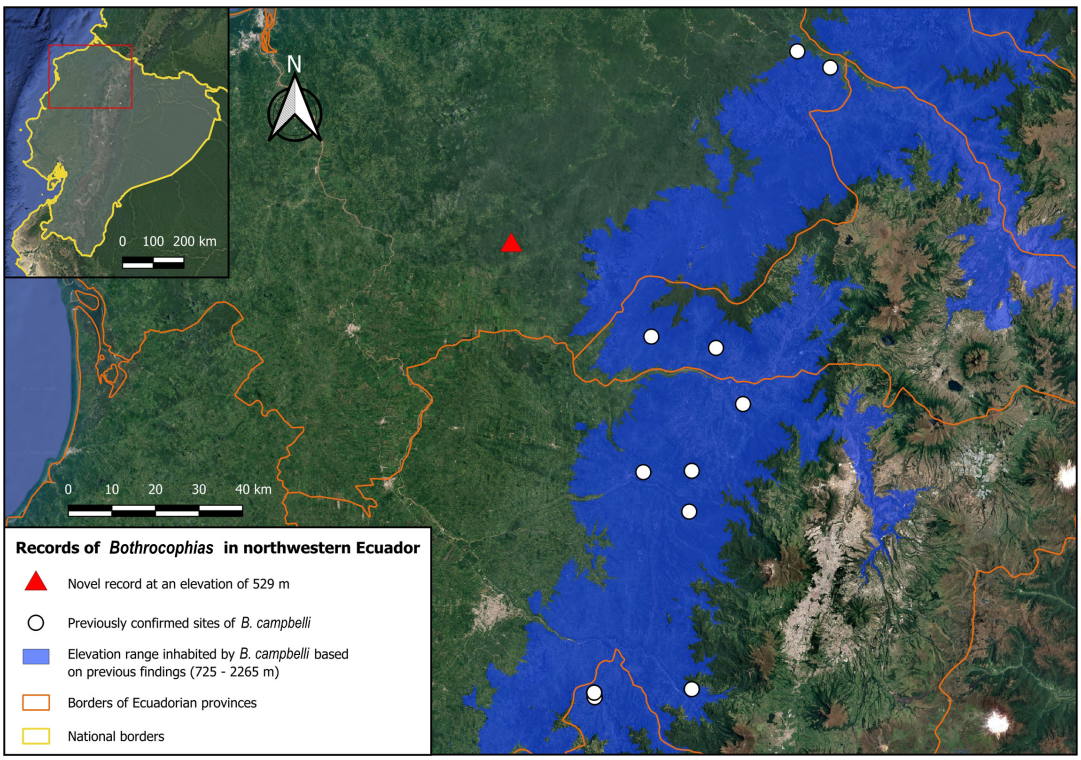

Figure 2. Previously known sites of *Bothrocophias campbelli* (white circles) and the new *Bothrocophias* location (Tesoro Escondido Reserve, red triangle) in northwestern Ecuador. The presumed elevational range of the species, based on published records (725–2265 m), is illustrated in blue. Note that no records of *B. myersi* are so far known from Ecuador.

B. campbelli, our record would reduce the species' elevational range by nearly 200 m and dramatically increase the potential range of this species.

The incongruity in terms of elevation prompted us to reconsider the snake's identity. Based on the limited morphological characters available from our photos, we cannot unambiguously assign our record to either *B. campbelli* or *B. myersi*. Initially, we identified the snake as *B. campbelli*, mainly based on general appearance, colouration, and some morphological characteristics (Valencia et al., 2016). However, our photos reveal two scalation characters in our snake that differ from those of *B. campbelli*, while others fit either *B. campbelli* or *B. myersi* or could not be determined. Valencia et al. (2016) mentioned that the third preocular scale of *B. campbelli* is two to three times smaller than the second one, but both have the same size in our specimen. No reliable and published data exist for assessing the size of the preocular scales in *B. myersi*. In addition, our snake had only three intersupraoculars compared with 5–8 intersupraoculars for *B. campbelli* and 3–6 for *B. myersi*, with the number of intersupraoculars considered one of the main features to distinguish between the two species (Gutberlet and Campbell, 2001). Valencia et al. (2016) described the intersupraoculars as keeled in adult *B. campbelli* and slightly keeled or smooth in juveniles. In contrast, Gutberlet and Campbell (2001) mentioned that all members of the genus *Bothrocophias* had smooth intersupraoculars. Our snake had smooth intersupraoculars. From both publications, it seems that the coloration of live snakes differs between the two species. However, like in many neotropical viperid species complexes, that seems not to be diagnostic for the two species (Campbell and Lamar, 2004). Based on the limited and inconclusive morphological data of our snake, as well as the intermediate geographical location of the new site, in terms of location and elevation, between know records of *B. campbelli* and *B. myersi*, we cannot assign our record to either species with certainty. Nevertheless, in our opinion, more evidence points to the possibility that our record represents *B.* cf. *myersi*.

The potential occurrence of *B. myersi* in the Ecuadorian Chocó was discussed by Gutberlet and Campbell (2001), but the species has not yet been recorded from Ecuador, and the nearest Colombian records are in a linear distance of more than 300 km to the new site and situated below 200 m elevation (Gutberlet and Campbell, 2001).

As our snake was not collected, the taxonomic identity of our new record remains uncertain. Nevertheless, this record shows that the a population of *Bothrocophias* occurs in the lowland rainforest of northwestern Ecuador. Although several taxonomic studies on neotropical pitvipers have been published (e.g., Fenwick et al., 2009; Carrasco et al., 2012; Hamdan et al., 2019), none of these studies included phylogenetic or phylogeographic data of *B. campbelli* and *B. myersi*. This leaves open several possible interpretations of our new record. *Bothrocophias campbelli* and *B. myersi* could actually represent a single species showing a morphological cline along an elevational or longitudinal gradient, while our record represents an intermediate morphology. A similar morphological cline along a longitudinal gradient was shown to exist in *Bothrops jararaca* by Monzel (2009). Given that the Ecuadorian Chocó is a region where new species are still frequently discovered and described (e.g. Dupérré, 2015; Reyes-Puig et al., 2020; Booher and Hoenle, 2021; Tinoco et al., 2023; Bock et al., 2024; Menéndez-Guerrero et al., 2024), it is also possible that our record may represent an undescribed species. Specifically, regarding snakes, Diaz-Ricaurte et al. (2025) recently showed that the species diversity in the Andes is extremely high but equally poorly researched. Finally, the recorded specimen could be the result of a hybridization event between *B. campbelli* and *B. myersi*, resulting in intermediate phenotypic characters like head scalation. Hybrid zones of overlapping species have been supposed for other neotropical pitvipers (Sazima, 1992; Wüster et al., 1996). Further investigation is needed to determine the systematic and taxonomic identity of the *Bothrocophias* species in Tesoro. Lastly, we also recommend exploring similar nearby locations in order to locate additional sites inhabited by *Bothrocophias*.

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