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# THE FIFTH RECORD FOR THE ENDEMIC SNAKE OF GUATEMALA: REDISCOVERY OF *TANTILLA BAIRDI* (SQUAMATA: COLUBRIDAE)

## EL QUINTO REGISTRO PARA LA SERPIENTE ENDÉMICA DE GUATEMALA: REDESCUBRIMIENTO DE *TANTILLA BAIRDI* (SQUAMATA: COLUBRIDAE)

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**Resumen.**– *Tantilla bairdi* es una especie de serpiente de la familia Colubridae que se encuentra únicamente en Guatemala. Hasta el momento solo se contaba con cuatro registros, generando un vacío de información sobre la especie. En este trabajo se presenta el quinto registro para *T. bairdi* y realizamos un modelo de distribución potencial, para predecir el hábitat adecuado para la especie. Aunque los modelos tienden a sobrestimar, se destacan a los bosques nubosos como el hábitat idóneo de la especie . La distribución de esta serpiente está influenciada principalmente por las variables: altitud, rango de temperatura anual, precipitación del mes más húmedo y precipitación del trimestre más seco. Con base en estos resultados, se recomienda realizar esfuerzos de búsqueda de la especie, en el área comprendida entre la Reserva de Biosfera Sierra de las Minas hasta la Sierra de los Cuchumatanes, con el fin de ampliar el conocimiento sobre su ecología y distribución.

**Palabras clave**.– Conservación, distribución, ecología, registros.

**Abstract.**– *Tantilla bairdi* is a snake species from the Colubridae family found exclusively in Guatemala. To date only four records of the species had been documented, creating a significant knowledge gap about it. In the present paper, we present the fifth record of *T. bairdi* and develop a potential distribution model to predict suitable habitats for the species. Although the models tend to overestimate, they identify cloud forests as the ideal habitat for the species. The distribution of this snake is primarily influenced by variables such as elevation, temperature annual range, annual precipitation, precipitation of the wettest month, and precipitation of the driest quarter. Based on these findings, we recommend conducting targeted searches for the species in the area between Sierra de las Minas Biosphere and Sierra de los Cuchumatanes to expand our understanding of its ecology and distribution.

**Keywords**.– Conservation, distribution, ecology, records.

The genus *Tantilla* was described by Baird and Girard (1853) in the description of *Tantilla coronata*. To date, 67 species have been recognized within the genus *Tantilla* (Uetz et al., 2021). All *Tantilla* species are small, secretive, and harmless to humans. They feed on invertebrates and live in habitats such as forests, coffee plantations, and meadows (Köhler, 2008). The genus in Guatemala is well represented by twelve species with vouchered specimens, ranging from lowlands to middle elevations (Köhler, 2008).

*Tantilla bairdi* is known only from Guatemala (Stuart, 1941). The type specimen is a female collected in 1940 two kilometers from Finca Chichén in Alta Verapaz, Guatemala (Stuart, 1940). The distribution of the species was known only from the type locality until Wilson (1985) published the rediscovery of the species from a specimen collected by P. Lucas Pineda for Jonathan Campbell in a locality 5 km from La Union Barrios at Agua Zarca, Baja Verapaz, in 1980. After the rediscovery of the species, there

have been only two more records from individuals collected by Eric Smith from Finca San Jorge, Chilascó, Baja Verapaz, in 1994, and by Selvin Pérez and Mateo X. E. from Reserva Privada K'antí Shul, Finca la Esperanza, Senahú, Alta Verapaz, in 1999. Here we present a new record for the species from the Biotopo Universitario para la Conservación del Quetzal, Mario Dary Rivera (BUCQ) in Baja Verapaz, collected 22 years after the last known record, along with a potential distribution model.

During the rainy season of 2021, we carried out nocturnal sampling for amphibians at the Biotopo Universitario para la Conservación del Quetzal, Mario Dary Rivera (BUCQ). The BUCQ is a protected area near Purulhá, Baja Verapaz in Guatemala; it is inside a well-preserved cloud forest that ranges from 1,500 to 2,348 m a.s.l. (CECON & CONAP, 2000). We conducted visual surveys, using head and hand lights to search directly on the ground for a possible microhabitat inside the searching area. We searched inside 100-meter transects with an effort of two people per hour, from 20:00 to 23:00 hr. For the potential distribution model, we used the ENMTML R package (Andrade et al., 2020). We selected the MaxEnt algorithm and used the WorldClim Bioclimatic layers including elevation (Fick & Hijmans, 2017) and the Guatemalan physiographic zones described by Ministerio de Agricultura, Ganadería y Alimentación (MAGA by its acronym in Spanish) (MAGA, 2001) to create the potential distribution model for the five records available for *T. bairdi*.

On October 11th, 2021, approximately at 22:30 h, we found a *Tantilla bairdi* at the side of one of the visitors' trails (15.2103° N, 90.2163° W, WGS84) of the Biotopo Universitario para la Conservación del Quetzal (BUCQ). We took the specimen to camp for taxonomic identification since we were able to identify the species but not the species in the field. Unfortunately, the specimen died before we were able to identify the species. The specimen was preserved with 5 % formol and then transferred to 70 % alcohol, and a sample of liver tissue was preserved in 95 % ethanol. We used Köhler (2008) for species identification, and M. E. Acevedo and J. A. Campbell confirmed the identification (Fig. 1). Our individual represents the fifth specimen collected since the description of *T. bairdi* in 1941 and adds a new record to the diversity of the BUCQ (Fig. 2). The specimen was deposited at the Herpetology collection of Universidad de San Carlos de Guatemala (USAC 6084) and photographic records were deposited in Photography Collection of Universidad de San Carlos de Guatemala (USACF) at the Portal de Biodiversidad de Guatemala (https://biodiversidad.gt).

The potential distribution model (Fig. 3) shows the suitable habitat for the species. The habitat extends from the Lowlands of northern Guatemala, through the central mountain chain, and across the southern chain of volcanoes. The environmental variables that have the highest explained variance that contribute most to the model are Elevation (27 %), Temperature Annual range (19 %), Annual Precipitation (16%), Precipitation of Wettest Month (14 %), and Precipitation of Driest Quarter (9 %) (Table 1).


**Figura 1.** Individuo de *Tantilla baridi*, colectado por María José Chang Antillón. Los códigos son de la Colección de Registros Fotográficos de Vertebrados de la Universidad de San Carlos de Guatemala. Fotos: Renato Morales.

**Figure 1.** *Tantilla bairdi* specimen, collected by Maria José Chang Antillón. Codes are from the Photography Collection of Universidad de San Carlos de Guatemala. Photos: Renato Morales.

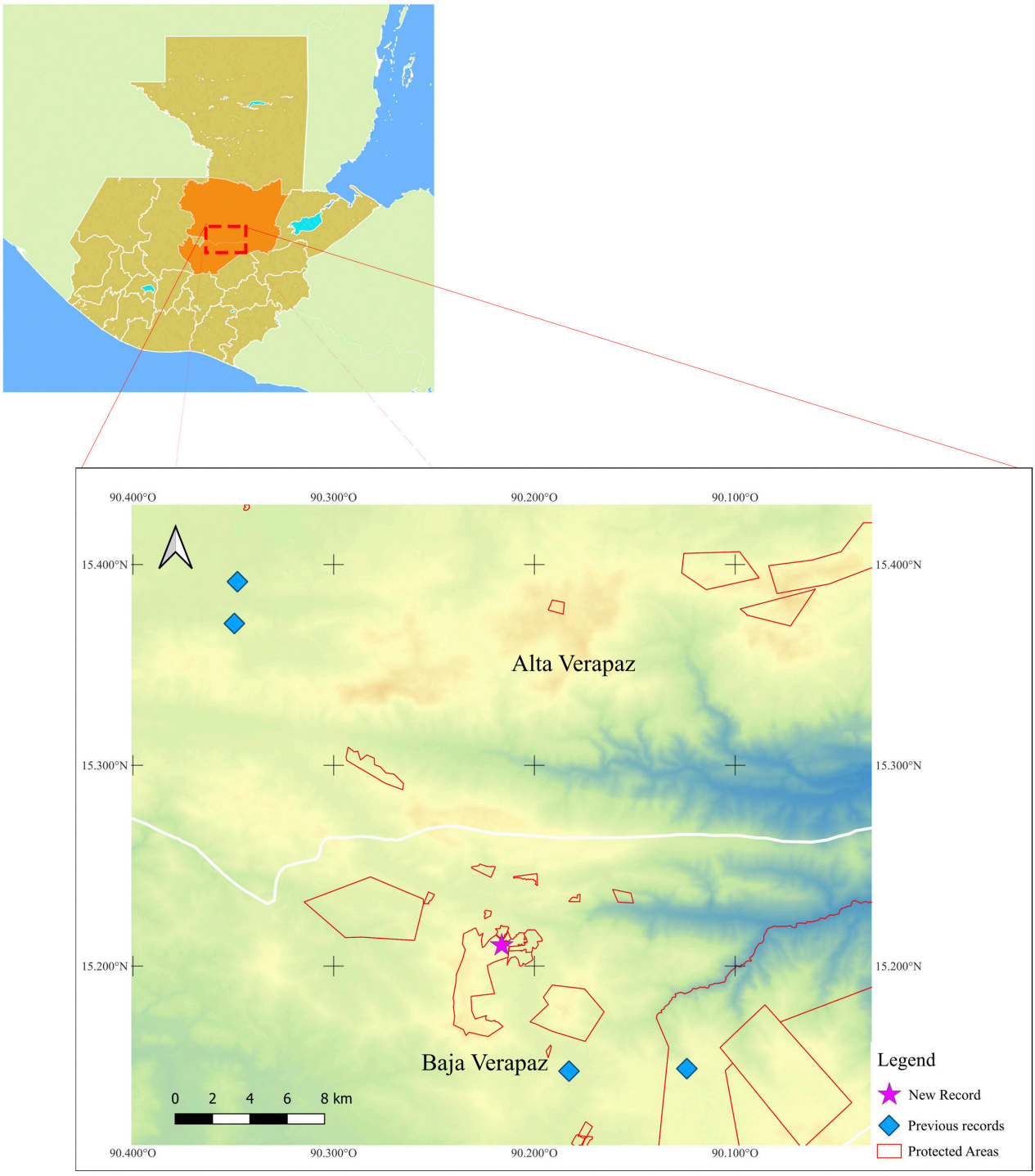


**Figura 2.** Localidades de los registros antiguos y el nuevo registro de *Tantilla bairdi* en Guatemala. El punto de estrella es para el nuevo registro de *T. bairdi*. Los puntos diamante son para los registros antiguos. Los recuadros rojos son para áreas protegidas en el país.

**Figure 2.** Location of previous records and new records of *Tantilla bairdi* in Guatemala. The star point is for the new record of *T. bairdi*. The diamond points are for previous records of the species. The red forms are for protected areas.

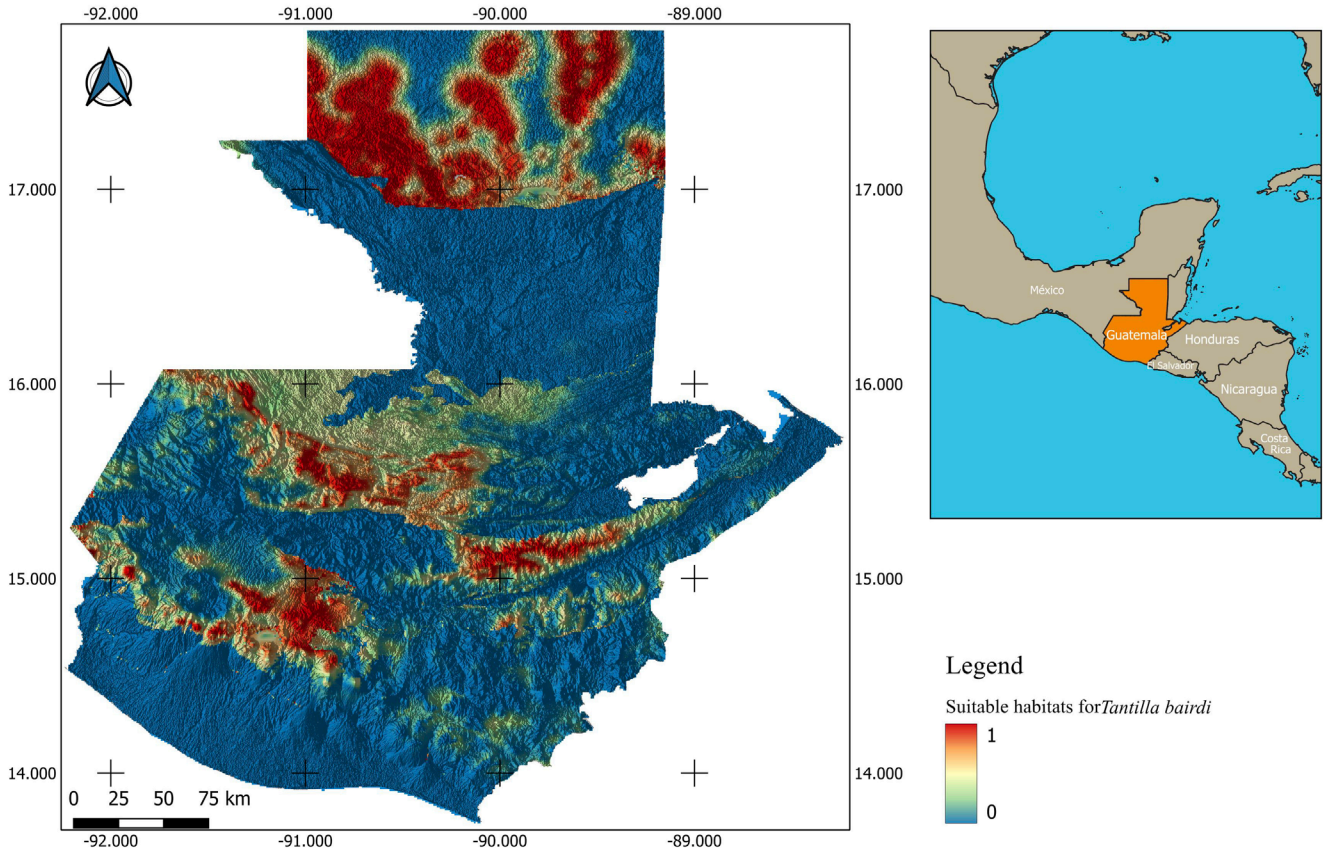


**Figura 3.** Modelo de distribución potencial para *Tantilla bairdi*. El rango de color es desde azul, baja probabilidad de encontrar hábitat adecuado para la especie a rojo alta probabilidad de encontrar hábitat adecuado para la especie.

**Figure 3.** *Tantilla bairdi* potential distribution model. The color range goes from blue, low probability of a suitable habitat for the species to red for high suitable habitat for the species.

The most recent record of *Tantilla bairdi* is from 1999, and previously there are only four records in the history of the species. The species is cataloged as Data Deficient in the IUCN Red List of Endangered Species (Johnson et al., 2013) and it is listed as vulnerable in the Guatemalan Endangered Species List (LEA, 2021). Wilson & Mata-Sila (2015) place the species in the physiographic region of the Western Nuclear Central American Highlands. Currently, we know that the distribution of the species is restricted to the departments of Baja Verapaz to Alta Verapaz at elevations 1,500 m to 1,890 m a.s.l. (Stuart, 1941; Wilson, 1985). The habitat for the species can be very humid tropical low montane forest and agroforest habitat and it may be found in deforested areas. The species has been seen only in two protected areas, Biotopo para la Conservación del Quetzal (BUCQ) Purulhá, and Reserva Privada Reserva Privada K'antí Shul, Finca la Esperanza, Senahú. Other records are outside of Guatemalan's System Protected Areas. The population status is still unknown but now with this record, there are five locations to start a monitoring program, to establish the first approximation of the population status for the species.

For *T. bairdi* potential distribution, the low records and the distance of dates can create an error for the model. Proosdij et al. (2016) a review of the effect of N in the result of the MaxEnt model, shows that MaxEnt can work even with three records depending on the restriction of the species and thirteen records for wide distribution. In the same way, the climatic scale is a problem for small species. Some authors suggest that the scale could be 0.5 km for climatic variables for this type of species, and it's necessary for new methods to create new microhabitat layers, taking the data with data loggers and other instruments (Rholi & Vega, 2017; Paz & Guarnizo, 2019).

**Tabla 1.** Varianza explicativa de los componentes principales 1 y 2 del Análisis de Componentes Principales. Abreviaturas: Bio 1- Bio 19 (variables ambientales WorldClim), CPL= Cinturón Plegado de Lacandon, DI= Depresión de Izabal, Dist_pob = Distancias a Poblados, DM= Depresión del Motagua, LCP=Llanura Costera del Pacífico, MM= Montañas Mayas, PSY= Plataforma Sedimentaria de Yucatán, PVR=Pendiente Volcánica Reciente, TAC= Tierras Altas Cristalinas, TAS=Tierras Altas Sedimentarias, TAV= Tierras Altas Volcánicas, TBIP=Tierras Bajas Interiores de Petén.

**Table 1.** Explanatory variance of principal components 1 and 2 of the Principal Component Analysis. Abbreviations: Bio 1- Bio 19 (WorldClim environmental variables), CPL= Lacandon Fold Belt, DI= Izabal Depression, Dist_pob = Distances to Towns, DM= Motagua Depression, LCP=Pacific Coastal Plain, MM= Maya Mountains, PSY= Yucatan Sedimentary Platform, PVR=Recent Volcanic Slope, TAC= Crystalline Highlands, TAS= Sedimentary Highlands, TAV= Volcanic Highlands, TBIP= Petén Interior Lowlands.

| Variables | Comp.1 | Comp.2 |
|---|---|---|
| Elevation | 0.274634918 | 0.176387019 |
| Bio1 | -0.266398014 | -0.18851063 |
| Bio2 | -0.270840996 | -0.187130977 |
| Bio3 | -0.252974293 | -0.19295048 |
| Bio4 | -0.191644818 | 0.28020103 |
| Bio5 | -0.151811748 | 0.261519893 |
| Bio6 | -0.205511275 | 0.27261695 |
| Bio7 | 0.198758746 | -0.139769848 |
| Bio8 | -0.170527076 | 0.267792232 |
| Bio9 | -0.210565357 | 0.272320198 |
| Bio10 | -0.102948835 | 0.320517021 |
| Bio11 | -0.228839803 | 0.240366089 |
| Bio12 | 0.168213096 | -0.114424575 |
| Bio13 | 0.146653794 | -0.002516903 |
| Bio14 | -0.153084928 | -0.023122582 |
| Bio15 | -0.252895817 | -0.217837214 |
| Bio16 | -0.270266397 | -0.149673456 |
| Bio17 | 0.095194405 | -0.122762621 |
| Bio18 | -0.274255652 | -0.177240103 |
| Bio19 | -0.274183316 | -0.172340336 |
| CPL | -0.081493545 | 0.01021941 |
| DI | -0.047080428 | 0.02421284 |
| dist_pob | -0.059349021 | -0.138336607 |
| DM | -0.032918648 | -0.036066369 |
| LCP | -0.008873842 | -0.164715532 |
| MM | -0.013229678 | 0.032891299 |
| PSY | -0.06070104 | -0.198219421 |
| PVR | -0.008868563 | 0.014947677 |
| TAC | 0.064887995 | 0.007037713 |
| TAS | -0.032164135 | 0.249436191 |
| TAV | 0.195571572 | -0.007533232 |
| TBIP | -0.087705714 | 0.055757689 |

However, we can use the model as a tool to search for new records. Although the lowlands of northern Guatemala suggest a good habitat for the species according to the model, this species is typically found in cloud forests. For this reason, we recommend searching in the Central Mountain Chain. The search could range from the Sierra de las Minas Biosphere Reserve to Alta Verapaz, Baja Verapaz, Quiché, and Huehuetenango Mountains. The volcanic chain also contains cloud forests, but the evolutionary history of the species may be confined to the Mayan Block.

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