



## DESCRIPTION OF COLLARED TROGON (*TROGON COLLARIS PUELLA*) NESTS IN THE SIERRA DE ZONGOLICA, VERACRUZ, MEXICO

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**Abstract** · The Collared Trogon (*Trogon collaris*), distributed from Mexico to Ecuador and Brazil, includes eight subspecies. For the northernmost subspecies *T. collaris puella*, inhabiting from southern Mexico to Panama, no nests had been previously described in Mexico. In May 2019, we found three nests in the Sierra de Zongolica, Veracruz, Mexico. The nests were simple unlined cavities, without a tunnel entrance, carved in rotten stumps between 0.7 and 1.2 m above the ground. The dimensions of the cavities were similar to those reported for the species in Costa Rica, Ecuador, and Brazil. All clutches consisted of two eggs. We suggest that the reproductive activity of the species in Mexico is limited to the spring season, unlike what is reported for Central and South America. The preservation of rotten stumps in the forests would help the conservation of this trogon, which is legally protected in Mexico.

### Resumen · Descripción de nidos del trogón de collar (*Trogon collaris puella*) en la Sierra de Zongolica, Veracruz, México

El trogón de collar (*Trogon collaris*), distribuido desde México hasta Ecuador y Brasil, cuenta con ocho subespecies. Para la más septentrional, *T. collaris puella*, distribuida desde el sur de México hasta Panamá, no se habían descrito nidos para México. En mayo de 2019, encontramos tres nidos de trogón de collar en la Sierra de Zongolica, Veracruz, México. Los nidos eran cavidades simples, sin revestimiento y sin túnel, que fueron excavados en tocones podridos a 0,7-1,2 m de altura. Las dimensiones de las cavidades fueron similares a las reportadas para la especie en Costa Rica, Ecuador y Brasil. Todas las nidadas constaron de dos huevos. Sugerimos que la actividad reproductiva de la especie en México se limita a la temporada de primavera, a diferencia de lo reportado en Centro y Sudamérica. La preservación de tocones podridos en los bosques ayudaría a la conservación de este trogón, que está protegido legalmente en México.

**Key words:** Altas Montañas region · Breeding · Cavity nesting · Eggs · Life history · Nestlings

## INTRODUCTION

The Collared Trogon (*Trogon collaris*) is a member of the Elegant subclade along with *T. mexicanus*, *T. elegans*, *T. rufus*, *T. personatus*, and *T. aurantiiventris*. These trogons predominantly nest in cavities in trees (alive or dead), as opposed to those of the Violaceous subclade, which nest mainly in termitaria (Espinosa de los Monteros 1998, Brightsmith 2005). The nesting cavity is unlined, located 1.2 to 7 m above the ground (González-García 1992, Forshaw 2009). The clutch is made up of two, rarely three, white eggs (Forshaw 2009), and both parents participate in incubation, brooding, and feeding of the chicks (Skutch 1956).

The Collared Trogon inhabits humid to semi-humid evergreen and semi-deciduous forests, tall second growth, and coffee plantations from near sea level to 2800 m a.s.l. (Howell & Webb 1995, Vallely & Dyer 2018). Eight subspecies, distributed from Mexico to Ecuador and Brazil, are recognized (Forshaw 2009). Although the Collared Trogon is common and widespread, it is surprising that there are only three detailed descriptions of its nests: one for *T. collaris puella* in Costa Rica (Skutch 1956) and two for unidentified subspecies in Ecuador and Brazil (Johnsgard 2000, Leite 2017).

The subspecies of concern for this communication is the northernmost subspecies, *T. collaris puella*. It is distributed from Mexico to Panama (Forshaw 2009) and is under special protection in the Mexican legislation (SEMARNAT 2010). Thus, the objective of this study was to contribute to the knowledge of the nesting habits of this trogon by describing three active nests observed in central-western Veracruz, Mexico.

## METHODS

**Study site.** Nests were found in May 2019 in forests within the municipalities of Zongolica and Los Reyes, Veracruz, Mexico.

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**Table 1.** Characteristics of three Collared Trogon (*Trogon collaris puella*) nests found in west-central Veracruz, Mexico.

| Feature              |  | Nest 1   | Nest 2                                    | Nest 3   |
|----------------------|--|--|---|--|
| Site                 | Municipality                               | Zongolica  | Zongolica                                 | Los Reyes  |
|                      | Geographic location                        | 18.°40'31"N, 97.°0'45"W  | 18.°40'25"N, 97°1'7"W                     | 18.°40'47"N, 97°1'39"W   |
|                      | Elevation (m)                              | 1473   | 1602                                      | 1495   |
|                      | Vegetation                                 | Riparian and cloud forest ecotone                                | Cloud forest                              | Riparian and cloud forest ecotone  |
|                      | Microhabitat                               | Forest edge, a few meters from a stream; ground covered by ferns | Ground covered by ferns                   | Forest edge, next to a path and a few meters from a stream; herbaceous cover almost absent |
| Stump                | Height (m)                                 | 2.50   | 1.60                                      | 1.50   |
|                      | Width (cm)                                 | 19   | 25  | 13   |
|                      | Cover                                      | Climbing plants and leafy liverworts                             | Lichens                                   | Leafy liverworts   |
| Nest                 | Type                                       | Cavity without tunnel, simple and unlined                        | Cavity without tunnel, simple and unlined | Cavity without tunnel, simple and unlined  |
|                      | Observation dates                          | 19 and 25 May 2019   | 19 and 25 May 2019                        | 26 May 2019  |
| Cavity               | Observed stages                            | Eggs-nestlings   | Construction-eggs                         | Eggs   |
|                      | Clutch size                                | 2  | 2   | 2  |
|                      | Height above ground (m)                    | 1.2  | 0.7                                       | 1  |
|                      | Entrance height (cm)                       | 10   | 15  | 12   |
|                      | Entrance width (cm)                        | 7  | 7   | 7  |
|                      | Internal diameter (cm)                     | 15   | 10  | 12.8   |
|                      | Height from the floor to the entrance (cm) | 10   | 5   | 8  |
| Entrance orientation | S (196°)                                   | NW (300°)  | N (341°)                                  |  |



**Figure 1.** Nest sites of the Collared Trogon in Sierra de Zongolica, Veracruz. A) Nest 1, stump covered only by scattered small lichens. B) Nest 2, stump covered by climbing plants (*Philodendron* sp. and *Piper* sp.) and leafy liverworts; inside the nest, the brooding male is visible. C) Nest 3, stump with some leafy liverworts on its bark. All the stumps are decaying and cavities had an ovoid entrance.

The observation sites were between 1473 and 1602 m a.s.l. Vegetation was consistent with the cloud forests of the Sierra de Zongolica (Castillo-Hernández & Flores-Olvera 2017): the understory was dominated by *Piper amalago* (Piperaceae) and pteridophytes such as *Selaginella stellata* (Selaginellaceae). *Liquidambar styraciflua* (Altingiaceae), *Quercus* spp. (Fagaceae), *Rhamnus pompana* (Rhamnaceae), and *Trema micrantha* (Cannabaceae) were common trees. Epiphytes of several families, such as Bromeliaceae, Orchidaceae, Araceae and Piperaceae, *Xanthosoma* sp. (Araceae) and tree ferns (Cyatheaceae) were abundant along riparian vegetation.

**Description of the nests and nesting activity.** For each nest, we documented information about the vegetation surrounding the nest, stump characteristics, type of nest (following the proposal of Simón & Pacheco 2005), measurements of the cavities, and activity of the trogons on each day the nests

were observed.

**RESULTS**

In May 2019, we found three Collared Trogon nests (Table 1, Figure 1). Nest 1 was found on May 19 at 09:00 h (Figure 1A). A male and a female were emitting alarm calls near a stump with an ovoid side hole; the inside cavity was empty and recent carving marks were seen. By the next visit, on May 25 at 10:30 h, the nest had a clutch of two eggs. We did not see the parents on that occasion.

After finding nest 1, we explored other stumps in the area and thus found the other two nests. On May 19 at 10:22 h, we found nest 2 when a male Collared Trogon flushed out of a stump on our approach. The stump had an ovoid side hole and inside the cavity there were two eggs (Figure 2). On May 25 at 12:28 h, the male was brooding two nestlings that we estimated were four to six days old (Figure 1B, Figure 3).



**Figure 2.** Collared Trogon eggs inside a nesting cavity in Sierra de Zongolica, Veracruz, Mexico



**Figure 3.** Collared Trogon nestlings in Sierra de Zongolica, Veracruz, Mexico. We estimate that chicks were four to six days old. Most of their body was naked, eyes were closed, noticeable egg tooth and primary and secondary pin feathers emerging.

Their ages were estimated by comparison with descriptions of nestlings by Skutch (1956) for *T. collaris*, and by Greeney et al. (2008) for *T. personatus*. The nestlings had no covert feathers, the pins of their primaries and secondaries were already visible, and they had a noticeable white egg tooth. In the nest there were fragments of eggshells and feces. Nest 3 was found on May 26 at 10:20 h (Figure 1C) when a male flew out of a stump which contained two eggs.

All nests were located in decaying stumps 1.5-2.5 m high and 13-25 cm wide. The cavities showed marks of having been carved by the trogons (Figure 1, Figure 2). The nests were unlined simple cavities without a tunnel entrance. The lower edge of the ovoid shaped entrance holes was located 0.7-1.2 m above the ground. Entrance holes were 10-15 cm in height and 7 cm in width. The distance from the bottom of the cavities to the entrance of the nests was 5-10 cm and the internal diameters of the cavities were between 10-15 cm.

## DISCUSSION

Despite the fact that *T. c. puella* eggs collected in Mexico from Oaxaca and San Luis Potosí (Forshaw 2009, Vertnet 2020), and that there are nest reports from Mexico, Belize and Panama (Russell 1962, Rowley 1966, Wetmore 1968, González-García 1992), there is only one previous detailed description of a nest from Costa Rica (Skutch 1956).

All the nests reported herein were found in May. Nests and eggs from Mexico were reported in late March in Chiapas (González-García 1992), mid-May in San Luis Potosi (Vertnet 2020), and May and early June in Oaxaca (Johnsgard 2000, Vertnet 2020). Additionally, a male in breeding condition was collected in late April from Quintana Roo (Paynter, 1955). These records indicate that the reproductive period of the Collared Trogon in Mexico extends from March to June, coinciding with the spring of the northern hemisphere, while

in Central and South America the breeding season seems to occur throughout the year (Johnsgard 2000, Forshaw 2009, Leite 2017). Breeding during the spring months seems to extend to species in the Elegant subclade that inhabit Mexico, *T. mexicanus* and *T. elegans*, whose nesting records in the country are from March-June and April-June, respectively (Johnsgard 2000).

The elevations in which we found the nests were within the altitudinal range of nests recorded for *T. c. puella*, from 110 to 1875 m a.s.l. (Skutch 1956, Rowley 1966, Rusell 1964, Bindford 1989, González-García, 1992, Vertnet 2020). Two of the nests that we found (nests 2 and 3) were located close to the forest edge, like those observed by Skutch (1956) and González-García (1992).

The time frame of our visits to the nests (from 09:00 h to 12:30 h) probably explains why we only saw the male incubating. According to Skutch (1956), the female remains in the nest during the afternoon and early hours of the morning, and is then relieved by the male. This time partition of incubation duties between members of the pair has also been documented in *T. rufus* and *T. personatus* (Skutch 1959, Greeney et al. 2008).

Nests 2 and 3 are the lowest reported for the Collared Trogon and are among the lowest for all the species of the subclade, along with two nests of *T. mexicanus* reported by Skutch (1942) at 84 cm. Both species are the only known members of the Elegant subclade that nest below 2 m above the ground (Johnsgard 2000). All of our nests were in tree cavities, like the rest of the species in the Elegant subclade (Brightsmith 2005). We observed carving marks in all nests, suggesting that birds excavate or modify their own cavities. This behavior also occurs in *T. collaris*, *T. mexicanus*, and *T. personatus* (Brightsmith 2005, Greeney et al. 2008). The average size of the cavities (12.3 x 7 mm, N = 3) and the ovoid shape of the entrances were similar to those previously described for *T. collaris* and *T. mexicanus* (Skutch 1956, Johnsgard 2000).

The Collared Trogon is under Special Protection in Mexico (SEMARNAT 2010). Knowing about its reproductive biology is important because it helps understand how habitat modifications may affect its populations (Cornelius et al. 2008). Based on our observations, we recommend preserving the stumps in a state of decomposition in forests where this species is present.

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## REFERENCES

Bindford, LC (1989) A distributional survey of the birds of the Mexican State of Oaxaca. *Ornithological Monographs* 43: 1–418.  
 Brightsmith, DJ (2005) Competition, predation and nest niche shifts among tropical cavity nesters: Phylogeny and natural history evolution of parrots (Psittaciformes) and trogons (Trogoniformes). *Journal of Avian Biology* 36: 64–73.  
 Castillo-Hernández, LA, & Flores-Olvera, H. (2017) Floristic composi-

tion of the cloud forest of the Bicentenario Reserve, Zongolica, Veracruz, México. *Botanical Sciences* 95: 539–563.  
 Cornelius, C, K Cockle, N Politi, I Berkunski, L Sandoval, V Ojeda, L Rivera, M Hunter, Jr & K Martin (2008) Cavity-nesting birds in neotropical forests: cavities as a potentially limiting resource. *Ornitología Neotropical* 19: 253–268.  
 Espinosa de los Monteros, A (1998) Phylogenetic relationships among the trogons. *The Auk* 115:937–954.  
 Forshaw, JM (2009) *Trogons: A Natural History of the Trogonidae*. Lynx Edicions, Spain.  
 González-García, F (1992) Avifauna de la Reserva de la Biosfera “Montes Azules”, Selva Lacandona, Chiapas, México. *Acta Zoológica Mexicana* 55: 1–86.  
 Greeney, HF, KS Sheldon & J Simbaña (2008) Observations on the hatchlings, eggs and incubation of the Masked Trogon *Trogon personatus* in eastern Ecuador. *Cotinga* 29: 82–84.  
 Howell, SNG, & S Webb (1995) *A Guide to the Birds of Mexico and Northern Central America*. Oxford University Press, New York, USA.  
 Johnsgard, PA (2000) *Trogons and Quetzals of the World. Vol. 1*. 1st ed. Smithsonian Institution Scholarly Press, Washington DC, USA.  
 Leite, GA (2017) O ninho, ovos e filhotes do surucua-de-coleira *Trogon collaris* no rio Juruá, Amazônia. *Cotinga* 39: 41–42.  
 Paynter, R (1955) The ornithogeography of the Yucatan Peninsula. *Yale University Bulletin* 9: 1–347.  
 Rowley JS (1966) Breeding records of birds from the Sierra Madre del Sur, Oaxaca, Mexico. *Proceedings of the Western Foundation of Vertebrate Zoology* 1: 107–204.  
 Russell SM (1962) A Distributional Study of the Birds of British Honduras. Ph.D. diss, Louisiana State Univ., Baton Rouge, Louisiana, USA.  
 SEMARNAT (2010) Protección ambiental-Especies nativas de México de flora y fauna silvestres-Categorías de riesgo y especificaciones para su inclusión, exclusión o cambio-Lista de especies en riesgo. Secretaría de Medio Ambiente y Recursos Naturales, México.  
 Simón, JE & Pacheco, S (2005) On the standardization of nest descriptions of neotropical birds. *Revista Brasileira de Ornitologia* 13: 143–154.  
 Skutch, AF (1942) Life history of the Mexican Trogon. *The Auk* 59: 340–363.  
 Skutch, AF (1956) A Nesting of the Collared Trogon. *The Auk* 73:354–66.  
 Skutch, AF (1959) Life History of the Black-Throated Trogon. *The Wilson Bulletin* 71:5–18.  
 Valley, AC & D Dyer (2018) *Birds of Central America: Belize, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, and Panama. Vol. 1*. 1st ed. Princeton University Press, New Jersey, USA.  
 Vertnet (2020) *Vertnet: distributed databases with backbone*. National Science Foundation. Available from: <http://vertnet.org/> [Accessed 31 May 2020]  
 Wetmore A (1968) *The Birds of the Republic of Panama. Part 2. –Columbidae (Pigeons) to Picidae (Woodpeckers)*. Smithsonian Institution Press, Washington DC, USA.