

FOUR CASES OF PREY-PREDATOR INTERACTION (ANURAN-SNAKE THROUGH THEIR GEOGRAPHICAL DISTRIBUTION)

CUATRO CASOS DE INTERACCIÓN DE PREDADOR-PRESA (ANURO-SERPIENTE) A TRAVÉS DE SU DISTRIBUCIÓN GEOGRÁFICA

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Abstract.— The biotic interaction prey-predator between one anuran species and one snake species, in some cases have been reported just in one geographical location, and in other cases have been reported several records through the geographical distribution of both interacting species. In this study we report four cases of anurans predation by snakes in different geographical location to the previous records. The previous and new records suggest that the biological interaction prey-predator between species of anurans and snakes is maintained regardless of the geographical location and elevation.

Keywords.— Amphibian, biotic interaction, Mexico, predation, reptile.

Resumen.— La interacción biótica presa-depredador entre una especie de anuro y una especie de serpiente, en algunos casos ha sido reportada solo en una ubicación geográfica, y en otros casos han sido reportados varios registros a través de la distribución geográfica de ambas especies interactuantes. En este estudio reportamos cuatro casos de depredación de anuros por serpientes en diferente ubicación geográfica a los registros previos. Los registros previos y nuevos sugieren que la interacción biológica presa-depredador entre especies de anuros y serpientes se mantiene independientemente de la localización geográfica y elevación.

Palabras clave.— Anfibio, interacción biótica, México, depredación, reptil.

Anurans are important components of the trophic networks in the ecosystems where they inhabit, because of their diversity and abundance (Cortés-Gómez et al., 2015), and the snakes are considered their major predator group (Wells, 2007). The anurans predation by snakes can be carried out in different development stages, eggs (e.g. Warkentin, 1995), larvae (e.g. Azarack & Farias, 2017) or postmetamorphic individuals (juvenile and adults; e.g. Calderón-Patrón et al., 2014). The biotic interaction prey-predator between one anuran species and one snake species, in some cases have been reported just in one geographical location, and in other cases have been reported several records through the geographical distribution of both interacting species. Here

we report four cases of anurans predation by snakes in different geographical location to the previous records.

One individual of *Leptophis mexicanus* (Duméril, Bibron & Duméril 1854) consuming a postmetamorphic individual of *Tlalocohyla loquax* (Gaige & Stuart, 1934), was reported by Stuart (1948). The organisms were observed in a bromeliad located in the Finca Chama, department of Alta Verapaz, Guatemala (approximate location 15.616667°N, 90.566667°W; elevation 566 m a.s.l.). During fieldwork carried out on 14 September 2017 in the Área de Protección y Desarrollo de Ceratözamia (APDC), located in the municipality of Ixhuatlán del Sureste,

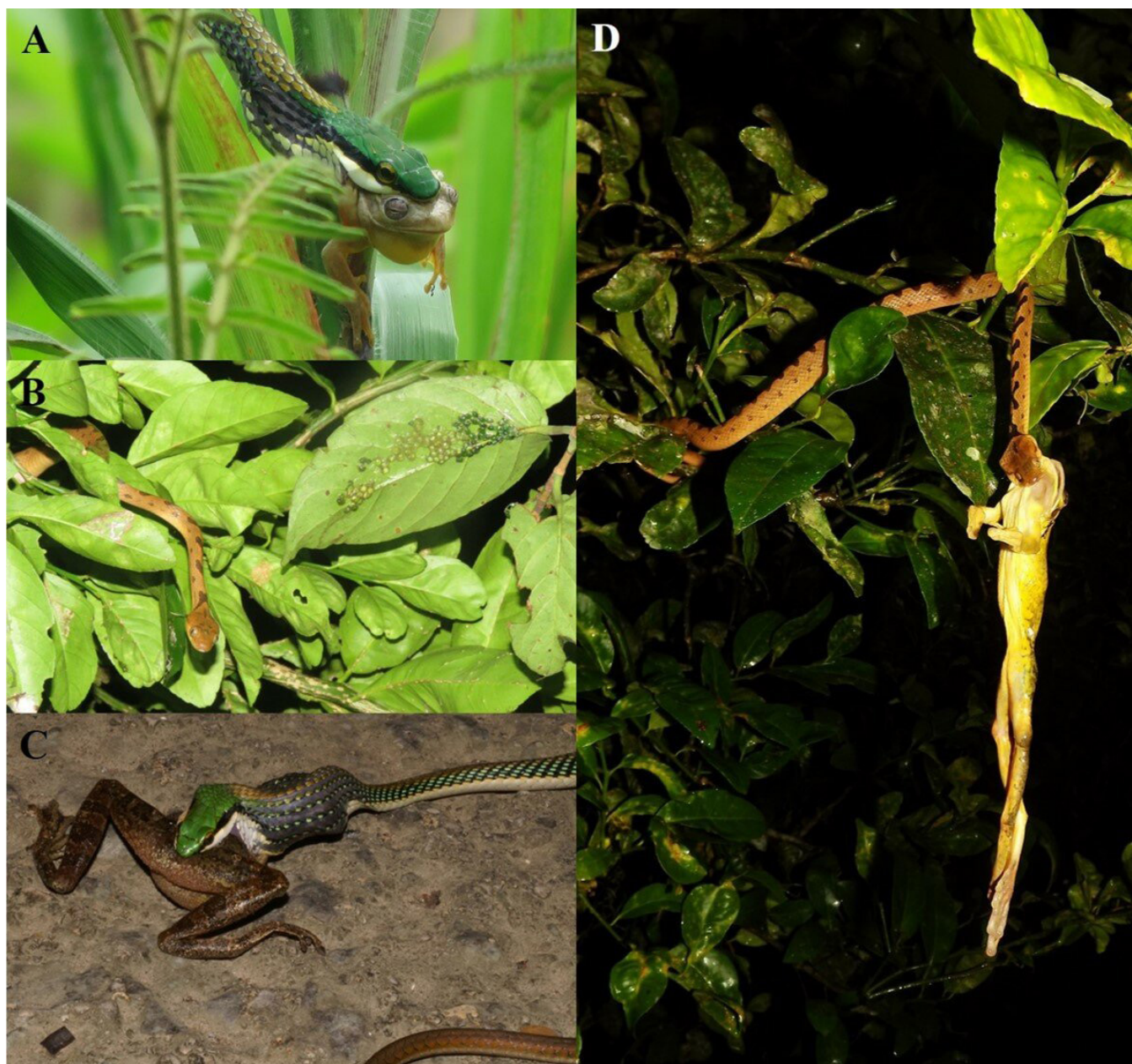


Figure 1. Two species of snakes consuming three species of anurans in different development stages: *Leptophis mexicanus* preying a postmetamorphic individual of *Tlalocohyla loquax* (A), *Leptodeira septentrionalis* consuming eggs of *Agalychnis callidryas* (B), *Leptophis mexicanus* preying a postmetamorphic individual of *Smilisca baudinii* (C), and *Leptodeira septentrionalis* consuming a postmetamorphic individual of *Smilisca baudinii* (D).

Figura 1. Dos especies de serpientes consumiendo tres especies de anuros en diferente estado de desarrollo: *Leptophis mexicanus* depredando un individuo postmetamórfico de *Tlalocohyla loquax* (A), *Leptodeira septentrionalis* consumiendo huevos de *Agalychnis callidryas* (B), *Leptophis mexicanus* consumiendo un individuo postmetamórfico de *Smilisca baudinii* (C), y *Leptodeira septentrionalis* consumiendo un individuo postmetamórfico de *Smilisca baudinii* (D).

Veracruz, Mexico (18.033333°N, 94.350000°W; elevation 30 m a.s.l.), we observed an individual of *L. mexicanus* catching an individual postmetamorphic of *T. loquax*. The biotic interaction was observed in a pond located in a grassland for livestock surrounded by tropical rainforest (Figure 1A). The location of our record extend the distribution of this interaction, approximately 486 km NW of the record of Stuart (1948) and extends the elevational range 530 lower than reported in Guatemala.

One individual of *Leptodeira septentrionalis* (Kennicott, 1859) consuming eggs of *Agalychnis callidryas* (Cope, 1862), was reported by Duellman (1958) in Catemaco, Veracruz, Mexico (approximate location: 18.424157°N, 95.111018°W; elevation 350 m). The consuming of eggs of *A. callidryas* by individuals of *L. septentrionalis* was reported by Warkentin (1995) in Corcovado National Park in Costa Rica (approximate location 8.538680°N, 83.570971°W; elevation 36 m a.s.l.). Savage (2002) reported that the consume of eggs of *A. callidryas* by *L. septentrionalis* in La Selva, Heredia Province, Costa Rica (approximate location 10.429779°N, 84.007347°W; elevation 62 m a.s.l.) is very common. One individual of *L. septentrionalis* consuming a postmetamorphic individual of *A. callidryas* in Green Hill Farm, Cayo District, Belize (17.092000°N, 88.971167°W; elevation 255 m a.s.l.) was reported by Platt et al. (2016). During fieldwork carried out on 15 September 2017 in APDC, we observed an individual of *L. septentrionalis* consuming eggs of *A. callidryas* in a pond located in a grassland for livestock surrounded by tropical rainforest (Figure 1B). The location of our record cover a gap in the geographical distribution of the previous records, this interaction is maintained along the 1640 km from Catemaco, Mexico to the Corcovado, Costa Rica, in an elevational range between sea level and 350 m a.s.l.

One individual of *Leptophis mexicanus* (Duméril, Bibron & Duméril, 1854) consuming a postmetamorphic *Smilisca baudinii* (Duméril & Bibron, 1841) was reported by Henderson et al. (1977) in Tower Hill, Orange Walk District, Belize (approximate location: 18.027669°N, 88.558944°W; elevation 8 m a.s.l.). Henderson (1982) reported the same interaction in Nuevo Xcan, Municipality of Lázaro Cárdenas, Quintana Roo, Mexico (approximate location 20.868376°N, 87.602230°W; elevation 24 m a.s.l.). In a survey conducted on 14 September 2012 in the Federal Natural Protected Area, Parque Nacional Palenque, municipality of Palenque, Chiapas, Mexico (17.488003°N, 92.041147°W; elevation 63 m a.s.l.), we observed one individual of *L. mexicanus* catching a postmetamorphic individual of *S. baudinii* in a parking of archeological site museum surrounded by tropical rainforest (Figure 1C). The location of our record extends the distribution of this interaction, approximately 600

km SW of the record reported in Nuevo Xcan, Quintana Roo and 372 km to the W of Tower Hill's record; the three records were registered below the 70 m of elevation.

Individuals of *Leptodeira septentrionalis* (Kennicott, 1859) consuming *Smilisca baudinii* (Duméril & Bibron, 1841) were reported by Lee (1996) in Campeche, Mexico (without mention of the development stage of individuals of frog or precise location of the record). One individual of *L. septentrionalis* consuming a postmetamorphic *S. baudinii* was reported by Platt et al. (2016) in Green Hill Farm, Cayo District, Belize (17.083333°N, 88.966667°W; elevation 254 m a.s.l.). During a fieldwork carried on 09 July 2013 in the locality of Arroyo Zarco, municipality of Uxpanapa, in southern Veracruz, Mexico (17.184172°N, 94.481047°W; elevation 189 m a.s.l.), we observed an individual of *L. septentrionalis* catching a postmetamorphic individual of *S. baudinii* on an isolated tree in a grassland for livestock surrounded by tropical rainforest (Figure 1D). The location of our record extends the distribution of this interaction, approximately 585 km to the W of the record reported in Belize, and is not possible estimate the distance to the observations reported by Lee (1996) in Campeche, Mexico. The difference between the two located records was of 60 m of elevation.

The previous observations reported of the interaction prey-predator in different locations in conjunction with the observations reported in this study, suggest that the biological interaction prey-predator between two species is maintained regardless of the geographical location and elevation. The observations of a snake species consuming a particular anuran species in different development stages can indicate that a particular anuran species can be an important food resource for a snake (Azarak & Farias 2017), probably due to their availability, independently of the development stage. Predation is one of the most important mechanisms that shapes the biological communities (Vitt & Caldwell, 2009). The consequences of the predation by a specific predator on the populations of the species preyed, and the degree of dependence of the predator species to a specific prey species is a phenomenon that requires further study. The latter can help us to comprehend the relevance of the multi-trophic interactions between anurans and snakes in the entire ecosystem.

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