

# NEW DISTRIBUTIONAL RECORDS FOR AN ENDANGERED TURTLE, *CLAUDIUS ANGUSTATUS* (REPTILIA: TESTUDINES), AND NOTES ON ITS THREATS IN VERACRUZ, MEXICO

NUEVOS REGISTROS DE DISTRIBUCIÓN DE UNA TORTUGA EN PELIGRO DE EXTINCIÓN, *CLAUDIUS ANGUSTATUS* (REPTILIA: TESTUDINES), Y NOTAS SOBRE SUS AMENAZAS EN VERACRUZ, MÉXICO

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**Resumen.** – *Claudius angustatus* es una especie de tortuga de agua dulce en peligro de extinción. En este trabajo aportamos nuevos registros que amplían 25.1 km su distribución geográfica y aumentan en 209 m el rango altitudinal de la especie. Destacamos el hecho de que la mayoría de estos datos provienen de zonas altamente modificadas por acciones humanas, principalmente debido a la industria y cultivo de caña de azúcar.

**Palabras clave.** – Región de las Altas Montañas, tortuga de agua dulce, hábitat perturbado, cultivo de caña de azúcar, urbanización.

**Abstract.** – *Claudius angustatus* is an endangered species of freshwater turtle. In this work, we provide new records that increase its geographical distribution by 25.1 km and increase the altitudinal range by ca. 209 m. We highlight the fact that most of these data come from areas highly modified by human actions, mainly due to the sugar cane industry and cultivation.

**Key words.** – Altas Montañas region, disturbed habitat, freshwater turtle, sugarcane cultivation, urbanization.

*Claudius angustatus* or Chopontil, is classified as Endangered according to the official Mexican legislation NOM-ECOL-059-SEMARNAT-2010 (SEMARNAT, 2019), and is designated as Near Threatened by the Red List of the International Union of Conservation of Nature (IUCN). These assessments were based only on factors relating to habitat decline, which was identified as its primary threat. Although information regarding the trade and exploitation of *C. angustatus* is not considered within the risk assessments generated by the IUCN (IUCN, 1996), it

is known that this species has experienced declines which can be attributed to human consumption, illegal collection for the pet trade, and road mortality, as well as destructive land use practices relating to unregulated agricultural activities (Macip-Ríos et al., 2015; Reynoso et al., 2016). As a result, *C. angustatus* is poorly studied, with few investigations specifically addressing aspects of its natural history and ecology (Reynoso et al., 2016; Legler & Vogt, 2013).

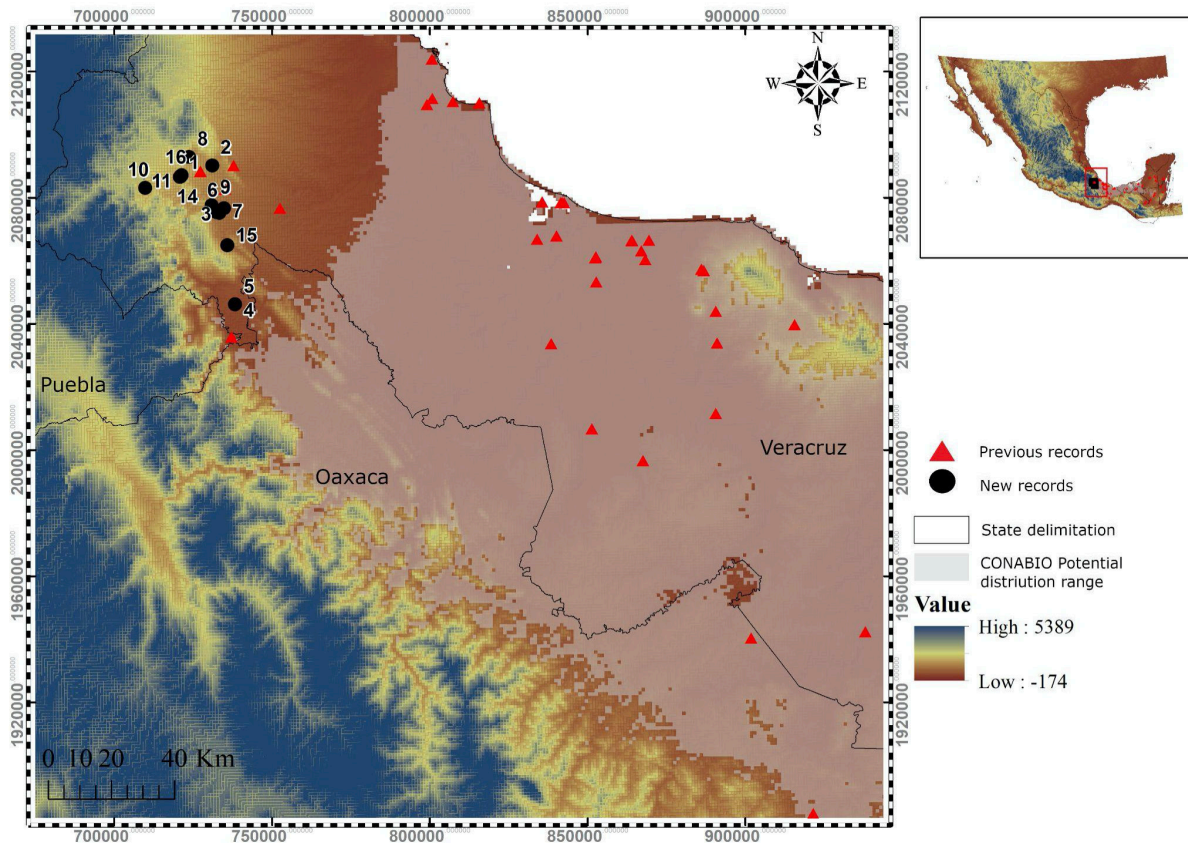


Figura 1. Mapa de la distribución actual de *Claudius angustatus*. / Figure 1. Current distribution map of *Claudius angustatus*.

This species has a known altitudinal range that extends from sea level to ca. 611 m a.s.l. It has a broad geographic distribution encompassing the coastal plain in the Gulf of Mexico, from the Actopan and La Antigua river basins (northern portion of the city of Veracruz), through the main basins of the states of Tabasco, Chiapas, Campeche, Yucatán, and Quintana Roo in México, south through parts of Belize in the Toledo Stann Creek District, large parts of Cayo District south of San Ignacio, and far northern Belize in Corozal District, and in the northeast of Guatemala (Legler & Vogt, 2013; Vertnet, 2016; Vásquez-Cruz & Reynoso-Martínez, 2020; Munscher et al., 2022).

In this study, we present new records of *C. angustatus* in the region of the Altas Montañas, Veracruz, México. This region is recognized by its elevational range of sea level to 5745 m (Continuo de Elevaciones Mexicano 3.0; INEGI, 2013). To determine age and differentiate between sexes, we followed Flores-Villela & Zug (1994). We collected GPS data and documented observations through photographs, which were submitted to the Colección

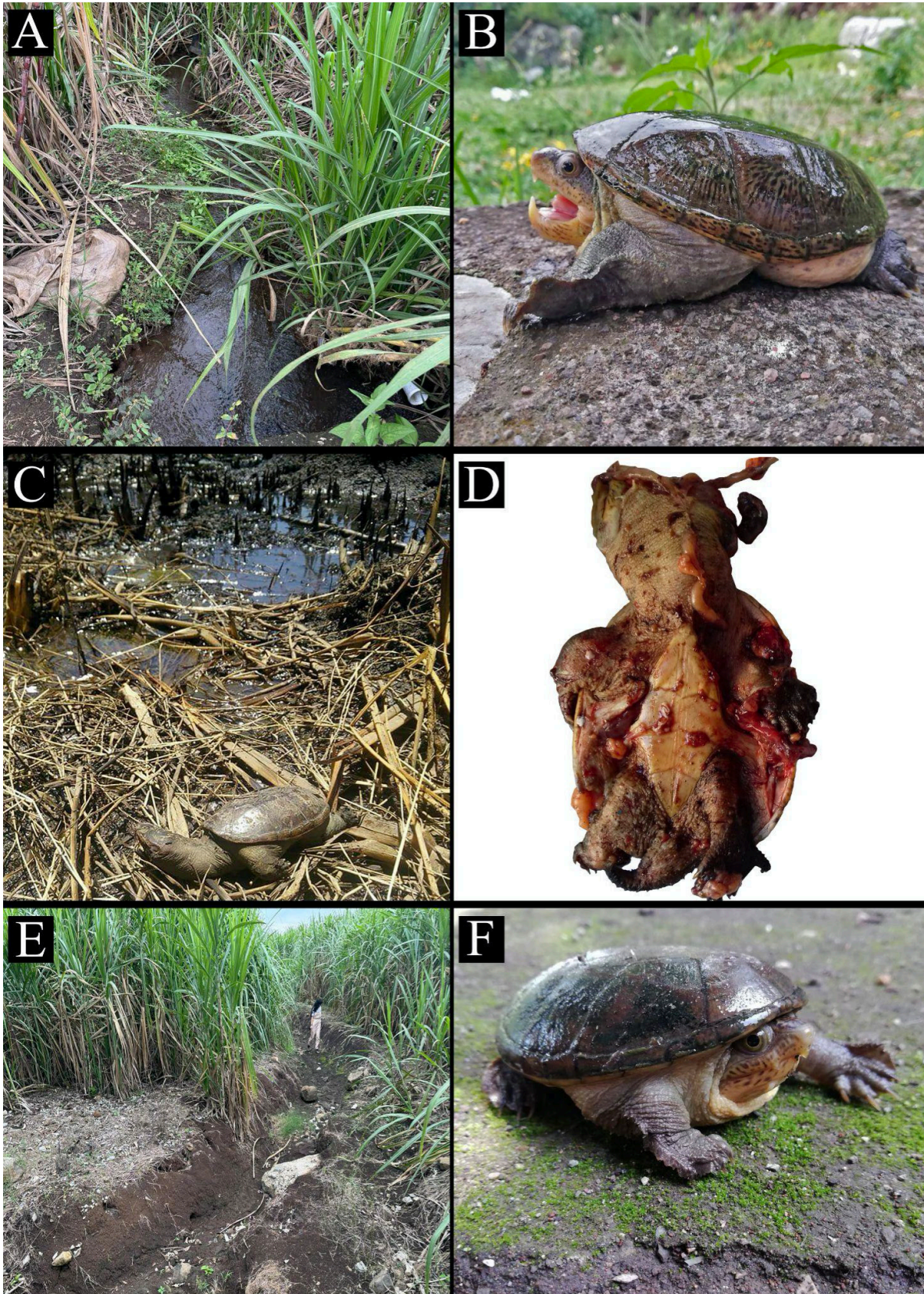
Nacional de Anfibios y Reptiles (CNAR). A map with all the known records was generated using ArcGIS software (ESRI, 2019. ArcGIS Desktop: Version 10.4), incorporating known and curated records (De la Torre-Loranca et al., 2020; Vásquez-Cruz & Reynoso-Martínez, 2020; Kelly-Hernandez & Vasquez-Cruz, 2021; Cervantes-Lopez et al., 2021; GBIF, 2023) with our new distributional records presented herein (Fig. 1).

#### New records:

1. Peñuela, Amatlán de los Reyes (18.8610° N, 96.9025° W, 752 m a.s.l.). 07 November 2006. An adult female (IBH-RF-578) found in an artificial drainage channel at the edge of a sugarcane field at 12:00 h. This site is a suburban area within a broader agricultural matrix.

2. Villa General Miguel Alemán, Atoyac (18.8909° N, 96.8066° W, 537 m a.s.l.). 05 August 2013. 20:00 h. Single unsexed adult crossing a dirt road following heavy rain.





**Figura 2.** A) Canal de riego para caña de azúcar usado como hábitat por *Claudius angustatus*. B) Ejemplar de *Claudius angustatus*. C) *Claudius angustatus*, muerto después de un incendio controlado para el cultivo de caña de azúcar. D) Macho adulto de *Claudius angustatus* atropellado. E) Arroyo temporal usado como hábitat por *Claudius angustatus*. F) Ejemplar juvenil de *Claudius angustatus*.

**Figure 2.** A) irrigation channel for sugarcane used as habitat by *Claudius angustatus*; B) Specimen of *Claudius angustatus*. C) *Claudius angustatus* killed after a controlled fire for sugarcane cultivation. D) Adult male of *Claudius angustatus* roadkill. E) Temporary stream used as habitat by *Claudius angustatus*. F) Juvenile specimen of *Claudius angustatus*.



3. Ejido La Laja, Cuichapa (18.75472° N, 96.7909° W, 423 m a.s.l.) 09 August 2013. 11:00 h. Adult male found in an irrigation canal along the margins of a sugar cane field (Fig. 2A). This site is located within a rural community where sugarcane fields predominate.
4. Almilinga, Tezonapa (18.4925° N, 96.7420° W, 79 m a.s.l.). 15 August 2014. 11:00 h. A single adult individual observed at the edge of a seasonal wetland surrounded by patches of sugarcane and coffee crops.
5. Ixtacapa El Chico, Tezonapa (18.4925° N, 96.7420° W, 133 m a.s.l.). 25 June 2014. 11:00 h. During a study initiated by the Instituto Tecnológico Superior de Zongolica, 12 adults *C. angustatus* (four males and eight females) were observed in a seasonal wetland surrounded by sugarcane and coffee crops.
6. San José de Abajo, Cuitláhuac (18.7680° N, 96.7733° W, 383 m a.s.l.). 02 September 2016. 20:30 h. A single unsexed individual (IBH-RF-580; Fig. 2B) found crossing along a paved road in a rural community dominated by lemon and sugar cane fields.
7. Rancho San Fermín, Atoyac (18.9016° N, 96.8062° W, 555 m a.s.l.). 05 September 2016. 10:00 h. An immobile individual on mud inside the irrigation channel of a sugarcane crop (IBH-RF-581).
8. Ojo de Agua Grande, Amatlán de los Reyes (18.9168° N, 95.8761° W, 557 m a.s.l.). 28 July 2017. Single adult found in an irrigation channel in a sugarcane field in vicinity of the Atoyac River (IBH-RF-583).
9. San Miguel el Grande, Yanga (18.7773° N, 96.8097° W, 491 m a.s.l.). 25 May 2017. 10:30 h. Two individuals found dead after the soil was plowed during agricultural work in a sugarcane field (IBH-RF-582).
10. Campo Grande, Ixtaczoquitlán (18.8297° N, 97.0087° W, 820 m a.s.l.). 08 August 2017. A dead specimen was found after a controlled fire "zafra" intended for the collection of sugar cane; the site is semi-rural (IBH-RF-584; Fig. 2C).
11. Peñuela, Amatlán de los Reyes (18.8594° N, 96.9043° W, 751 m a.s.l.). 11 August 2018. 10:00 h. Single adult male died on the road 50 m. from the intersection of Peñuela road with Federal Highway 150D (Córdoba-Minatitlán), bisecting sugarcane and lemon fields (IBH-RF-585; Fig. 2D).
12. Santa Inés, Cuichapa (18.7570° N, 96.7953° W, 491 m a.s.l.). 27 July 2019. Single adult male found near an ephemeral stream within an agricultural field (IBH-RF-587; Fig. 2E).
13. Santa Inés, Cuichapa (18.7570° N, 96.7953° W, 490 m a.s.l.), 17 July 2019. 11:00 h. A juvenile (76 mm carapace length) was found by a farmer while plowing land in a sugar cane field (IBH-RF-586; Fig. 2F).
14. Peñuela, Amatlán de los Reyes (18.8609° N, 96.90477° W, 752 m a.s.l.). 26 March 2019. 14:00 h. Single adult observed swimming in a temporary lagoon, surrounded by sugar cane and coffee crops. The lagoon is ca. 0.7 km to the southwest from a suburban center.
15. Paraíso La Reforma, Tezonapa (18.6575° N, 96.7641° W, 314 m a.s.l.). 01 September 2020. A juvenile male (85 mm carapace length) found surface active near a rural house following heavy rains was taken into captivity as a pet by local inhabitants. The site is surrounded by agricultural fields.
16. Peñuela, Amatlán de los Reyes (18.8584° N, 96.8993° W, 712 m a.s.l.). 15 September 2022. Adult male, found in a small puddle within an experimental sugarcane field following rain.
17. Peñuela, Amatlán de los Reyes, Veracruz, México (18.8584° N, 96.8994° W, 739 m a.s.l.). 27 September 2023. Adult female crossing on a concrete path (IBH-RF-960) in a suburban area where sugar cane crops dominate.

Our new records of *C. angustatus* extend its known distribution into the central part of México, to the northwest and southwest of Veracruz. The distribution of the species is expanded by 25.1 km in a straight-line distance from the closest known in Palmillas, Yanga Veracruz, (LACM PC 2465) (Vásquez-Cruz & Reynoso-Martínez, 2020), and increases its altitudinal range by 209 m (from sea level to 820 m a.s.l.). Additional field studies are recommended to evaluate the extent of its potential distribution, with careful consideration of the environmental and biogeographical factors that may influence occupancy and detection. Such works can provide a more precise vignette of its natural history and allow for conservation planning and active restoration of increasingly fragmented habitats within its known range (Peterson, 2007).

It is worth noting that most of the observations were made in sugarcane fields, or in close proximity to them. This is possibly because this crop utilizes irrigation channels and drainage systems, which are typically connected to streams or ponds



within the areas inhabited by *C. angustatus*. It has been shown that the impact of sugar cane plantations has negative effects on ecosystems, such as deforestation, erosion, change in land use, high water consumption, and environmental pollution due to the intensive use of fertilizers which results in increased exposure to high UV-B radiation, high temperatures and low air humidity, which could affect local biodiversity (Schiesari & Correa, 2016; Semie et al., 2019; Bancroft et al., 2008; D'Anunção et al., 2013). For example, sites 9, 12, and 13 were historically floodplains, which have since been filled with sand and gravel to facilitate unsustainable agricultural practices (*pers. obs.*). Consequently, this expansion increases the risk of *C. angustatus* suffering from poisoning due to prolonged exposure to pesticides and fertilizers used in these crops (Reynoso-Rosales et al., 2016; Ambrosio et al., 2002).

It has also been observed that during the planting season, individuals in estivation may die due to the machinery (as in site 9) or the fires associated to the sugarcane management, locally known as "zafra" (as in site 10), which are carried out prior to sugarcane harvesting. Another threat is the industrial processing of sugarcane, where wastewater, CO<sub>2</sub> emissions, ethanol, formaldehyde, furfural (Domenech-López et al., 2011), and solid waste are produced, impacting ecosystems, especially aquatic ones (WWF, 2021). It is important to emphasize that all new localities belong to municipalities where there is a high degree of sugarcane processing plants, which could increase the risks to the survival of the species. It has been proven that glyphosate-based herbicides and fipronil, both used in sugarcane plantations (de Almeida-Silva et al., 2022; Triques et al., 2022) generate histopathological damage and mutagenic alterations through the incubation of eggs in contaminated substrates in *Podocnemis expansa* (dos Santos Mendonça et al., 2023).

In the region of the Altas Montañas of Veracruz, the population status of this turtle is unknown, as well as the characteristics of its breeding areas. Six of our records exceed the previously known altitude for the species, thereby expanding our understanding of the altitudinal distribution of *C. angustatus*. These findings suggest the potential for a broader altitudinal distribution for this species in the lower range of the mountainous region of Veracruz. Our results highlight the existence of gaps in our knowledge regarding the ecology of this species and underscore the need for further research to better comprehend its distribution and habitat requirements (Kornilev et al., 2017; Pradhan et al., 2019), and propose conservation measures related to the restoration of their habitats.

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