

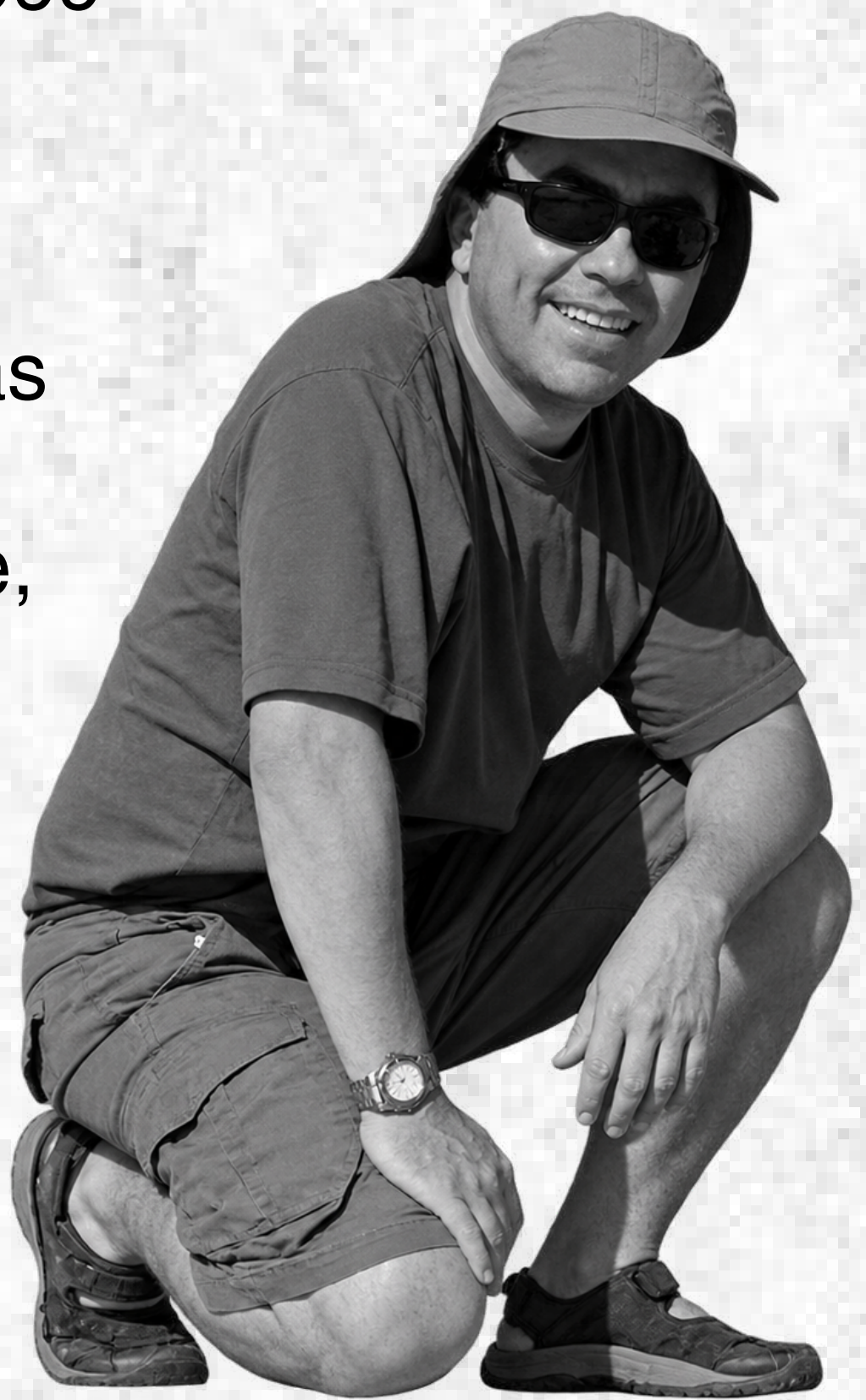
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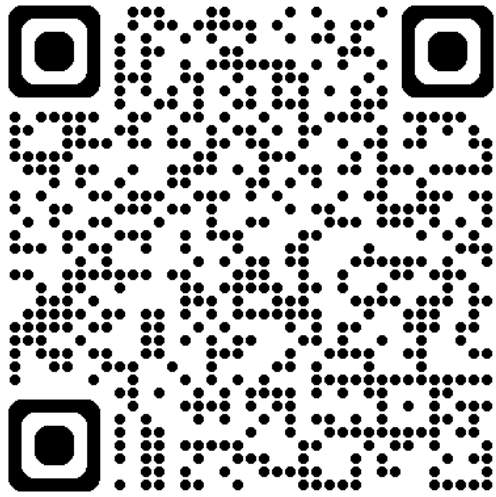
Dr. Manuel Weber

Médico Veterinario Zootecnista por la UNAM (1988), con una Maestría en Ciencias en Salud de Animales Silvestres por la Universidad de Londres (2000) y un Doctorado en Ecología Animal por la Universidad de Durham, Inglaterra (2005).

Inició su trayectoria científica en el INECOL y posteriormente se desempeñó como profesor-investigador en la UAEM y como coordinador de investigación en México del Center for Conservation Biology de la Universidad de Stanford. Entre 1997 y 1999 fue director y cofundador de ECOSUR, Unidad Campeche.

En los últimos años, sus principales líneas de investigación son la ecología de enfermedades y salud de la vida silvestre, los efectos de especies introducidas e invasoras sobre la biodiversidad y la ecología y conservación de cérvidos (venados), área en la que cuenta con más de 20 años de experiencia.





Escanéame

Artículo

Serologic surveillance for orthoflaviviruses and chikungunya virus in bats and Opossums in Chiapas, Mexico



El estudio investigó la presencia de virus transmitidos por artrópodos (arbovirus) en murciélagos y tlacuaches de la Selva Lacandona, Chiapas, durante 2023 y 2024.

Se analizaron muestras de sangre de 94 murciélagos pertenecientes a al menos 15 especies y 43 tlacuaches de tres especies. Los investigadores buscaron anticuerpos contra diferentes virus, entre ellos dengue, Zika, virus del Nilo Occidental, encefalitis de San Luis y chikungunya.

Ciencia en corto:

Un murciélago de la Selva Lacandona presentó anticuerpos contra el virus del Zika, mientras que cerca del 35 % de los tlacuaches estudiados mostraron evidencia de exposición a algún ortoflavivirus.



Article

Serologic Surveillance for Orthoflaviviruses and Chikungunya Virus in Bats and Opossums in Chiapas, Mexico

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Abstract: We performed serologic surveillance for selected arthropod-borne viruses (arboviruses) in bats and opossums in the Lacandona Rainforest, Chiapas, Mexico, in 2023–2024. Sera were collected from 94 bats of at least 15 species and 43 opossums of three species. The sera were assayed by the plaque reduction neutralization test (PRNT) for antibodies to eight orthoflaviviruses (dengue viruses 1–4, St. Louis encephalitis virus, T-Ho virus, West Nile virus, and Zika virus) and one alphavirus (chikungunya virus; CHIKV). Twelve (12.8%) bats and 15 (34.9%) opossums contained orthoflavivirus-specific antibodies. One bat (a Jamaican fruit bat) was seropositive for Zika virus, and 11 bats contained antibodies to an undetermined orthoflavivirus, as did the 15 opossums. All bats and most opossums seropositive for an undetermined orthoflavivirus had low PRNT titers, possibly because they had been infected with another (perhaps unrecognized) orthoflavivirus not included in the PRNTs. Antibodies that neutralized CHIKV were detected in three (7.0%) opossums and none of the bats. The three opossums had low CHIKV PRNT titers, and therefore, another alphavirus may have been responsible for the infections. In summary, we report serologic evidence of arbovirus infections in bats and opossums in Chiapas, Mexico.

Keywords: alphavirus; bats; chikungunya virus; flavivirus; opossums; Zika virus

1. Impacts

- Orthoflavivirus-specific antibodies were detected by the plaque reduction neutralization test in 12 of 94 (12.8%) bats in the Lacandona Rainforest, Chiapas, Mexico. One bat (a Jamaican fruit bat) was seropositive for Zika virus, while the other 11 bats were seropositive for an undetermined orthoflavivirus.
- Orthoflavivirus-specific antibodies were detected by the plaque reduction neutralization test in 15 of 43 (34.9%) opossums in the Lacandona Rainforest. All seropositive opossums had antibodies to an undetermined orthoflavivirus.
- Antibodies that neutralized chikungunya virus were detected in 15 (34.9%) opossums in the Lacandona Rainforest, but the titers were low, and thus, another alphavirus may have caused the infections.



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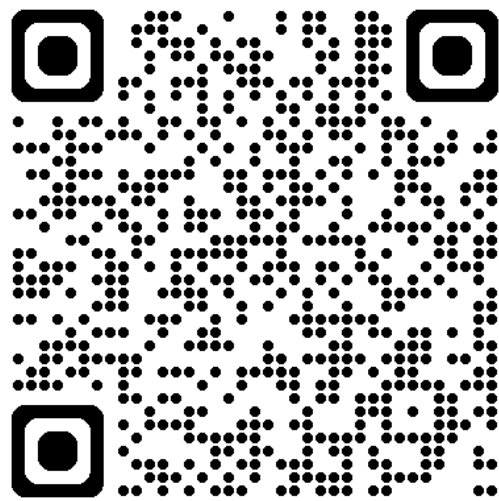
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Escanéame

Artículo

First records of *Phyllostomus hastatus* (Pallas, 1767)(Chiroptera, Phyllostomidae), greater spear-nosed bat, in Mexico

El estudio reporta por primera vez en México la presencia del murciélago de nariz de lanza mayor (*Phyllostomus hastatus*), una especie que hasta entonces no había sido registrada oficialmente en el país.

Este hallazgo amplía aproximadamente 120 km hacia el norte el límite conocido de distribución de la especie, cuyo registro más cercano se encontraba en Lanquín, Alta Verapaz, Guatemala.

Ciencia en corto:

La Selva Lacandona alberga al primer registro de *Phyllostomus hastatus* para México, extendiendo 120 km hacia el norte el límite conocido de distribución de esta especie.



the journal of biodiversity data

NOTES ON GEOGRAPHIC DISTRIBUTION

First records of *Phyllostomus hastatus* (Pallas, 1767) (Chiroptera, Phyllostomidae), Greater Spear-nosed Bat, in Mexico

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Abstract. We report *Phyllostomus hastatus* (Pallas, 1767), Greater Spear-nosed Bat, for the first time in Mexico. We captured two adult males in the Lacandona rainforest, in Chiapas, Mexico. These records extend the known northern distribution limit of the species by 120 km from the nearest occurrence in Lanquín, Alta Verapaz, Guatemala. Given the limited distribution of *P. hastatus* in the country and its potential vulnerability due to habitat loss, we highlight the need for more studies and conservation actions, aiming to its inclusion in the national list of threatened species.

Key words. Bat ecology, Lacandona rainforest, range extension, roosting behavior, species conservation

Aranda-Coello JM, Hernández-Mijangos LA, Weber M (2023) First records of *Phyllostomus hastatus* (Pallas, 1767) (Chiroptera, Phyllostomidae), Greater Spear-nosed Bat, in Mexico. Check List 21 (6): 652–652. <https://doi.org/10.15560/21.6.652>

INTRODUCTION

The genus *Phyllostomus* Lacépède, 1799 was the first recognized group of Neotropical leaf-nosed Bats (family Phyllostomidae) (Rodriguez-Pascua and Sanchez-Palencia 2009). Currently, four species are classified within this genus: *Phyllostomus discolor* (Wagner, 1843), *Phyllostomus f. Geoffroyi* Saint-Hilaire, 1898, *Phyllostomus trullae*, 1957, and *P. latifolius* (Thomas, 1908) (Owenscinski 2006).

Phyllostomus hastatus, whose common name is Greater Spear-nosed Bat, is similar in size to *Chiropterus auritus* (Peters, 1856) and *Phyllostomus stans* (Peters, 1862), making it the second largest Neotropical bat species in the Americas, surpassed only by *Myotis myotis* (Linnaeus, 1758) (Santos et al. 2003). It is the largest species within the genus *Phyllostomus* (forearm length: $x = 83.7$ mm $\pm$ 2.02 SD, $n = 80$; weight: $x = 100.96$ g $\pm$ 9.25 SD, $n = 38$), with a wingspan reaching up to 60 cm (Santos et al. 2003).

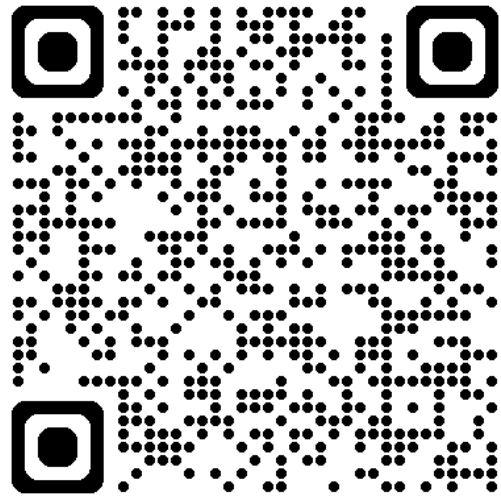
Phyllostomus hastatus is an omnivorous bat species (Gardner 1977; Santos et al. 2003). According to Santos et al. (2003), this species presents triangular, pointed ears; a simple, well-developed nasal leaf; an unused horseshoe structure from the upper lip; and a lower lip with a V-shaped groove bordered by warty protuberances; its wings are relatively large and well developed, adapted for long distance flight. The tail is short, and the calcar is similar in length to the hind limbs. The wing membranes, ears, and face are black, while the dorsal and ventral fur is dark brown to reddish brown, but some individuals exhibit a golden hue.

Phyllostomus hastatus uses various types of diurnal roosts such as caves, hollow trees, termite nests, palm leaves, and man-made structures (Graham 1988; Costa et al. 2001; Cortés-Delgado and Jiménez 2016). Individuals can roost alone, in pairs, in harem, or in male-only groups (Costa et al. 2002). It has been reported to cohabit roosts with species from the genera *Carollia* Gray, 1838, *Chiropterus* Peters, 1865, *Oreopsus* Wied-Neuwied, 1836, *Diagrams* Miller, 1906, *Glossophaga* F. Geoffroy Saint-Hilaire, 1898, *Lophophylla* Thomas, 1903, *Lophosoma* d'Orbigny, 1836, *Myotis* Gray, 1866, *Molossus* F. Geoffroy, 1805, *Myotis* Knapp, 1804, *Platyrrhinus* Saunders, 1864, *Pteronotus* Gray, 1838, *Proserpinx* Peters, 1862, and *Saccolaimus* Illiger, 1811 (Graham 1988; Santos et al. 2003; Costa et al. 2001; Cortés-Delgado and Jiménez 2016).

This species is widely distributed across the Neotropical region, from Peru, Bolivia, and Brazil north to Guatemala and Belize (Bárcenas and Díaz 2016). Its northwestern range was recently extended to Guatemala (Bárcenas-Castañeda et al. 2017). Two allopatric subspecies are currently recognized (Santos et al. 2003). The distribution of *P. h. hastatus* extends from eastern Venezuela to northern Bolivia and southeastern Brazil.

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Escanéame

Artículo

Pulgas parásitas de mamíferos pequeños y medianos de Calakmul, Campeche, México y nuevos registros de localidades



El estudio analiza las pulgas asociadas a mamíferos de la Reserva de la Biosfera de Calakmul, en Campeche, una región con gran diversidad de especies y un alto número de organismos amenazados o en peligro de extinción.

Se revisaron 197 mamíferos, de los cuales 22 (11.16 %) presentaron pulgas. Se identificaron 10 especies de pulgas, incluyendo 5 nuevos registros para Campeche, 2 nuevos registros de huéspedes y 1 nuevo registro para México.

Ciencia en corto:

De 197 mamíferos estudiados en la Reserva de Calakmul, el 11.16 % tenía pulgas, y el estudio permitió registrar cinco especies de pulgas por primera vez en Campeche y una por primera vez en México.



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Nota científica

Pulgas parásitas de mamíferos pequeños y medianos de Calakmul, Campeche, México y nuevos registros de localidades

Fleas of small and medium-sized mammals from Calakmul, Campeche, Mexico and new locality records

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Disponible en Internet el 3 de noviembre de 2016

Resumen

La Reserva de la Biosfera de Calakmul es considerada un área importante ya que contiene ecosistemas con una gran diversidad y fragilidad, además de tener un alto número de especies endémicas, amenazadas y en peligro de extinción; un ejemplo es la diversidad de mamíferos que existe en esta área; sin embargo, a pesar de reconocer la gran diversidad de especies en la región, poco se sabe sobre los ectoparásitos asociados a estos y las enfermedades que pueden llegar a transmitir como vectores en el estado de Campeche. En este trabajo se revisaron 197 individuos de mamíferos, de los cuales 22 (11.16%) ejemplares de 7 especies tuvieron pulgas que pertenecen a las familias Pulicidae y Rhopalopsyllidae (4 géneros y 7 especies), alcanzando así 10 especies de pulgas en el estado. Se registran por primera vez 5 especies para el estado, 2 son nuevos registros de huéspedes y 1 nuevo registro para el país. Confirmada también la presencia de 2 especies de pulgas (*Ctenocephalides felis felis* y *Pulex irritans*) de importancia médica y consideradas como posibles transmisores de patógenos en el estado de Campeche. Estas especies también han sido registradas en Yucatán y Guatemala como vectores de rickettsias y bartonelias.

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Palabras clave: Siphonaptera; Mamíferos medianos; Mamíferos pequeños; Calakmul; Vectores

Abstract

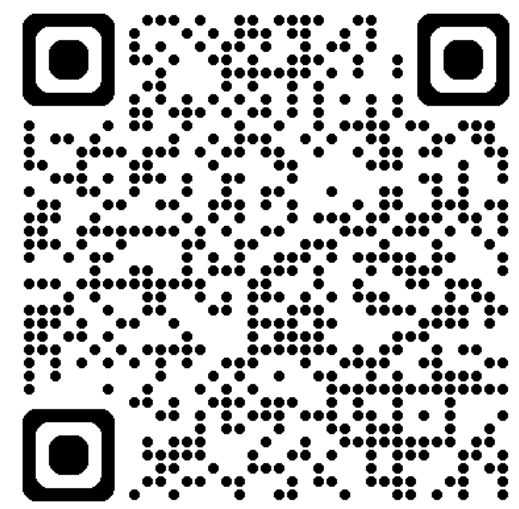
The Calakmul Biosphere Reserve is considered an important area because it contains ecosystems with a great diversity and fragility. Besides having a high number of endemic, threatened and endangered species, the diversity of mammals in Calakmul is also outstanding. However, despite recognizing the great diversity of species in the region, little is known about the ectoparasites associated with them and the diseases that can be transmitted as vectors in the state of Campeche. In this study, 197 mammalian specimens of which 22 (11.16%) specimens of 7 species had fleas were reviewed, which belong to the families Pulicidae and Rhopalopsyllidae (4 genera and 7 species), reaching 10 species of fleas in the state, also 5 new species records for the state, 2 are new host records and 1 new record for the country are recorded. We are also confirming the presence of 2 species of fleas (*Ctenocephalides felis felis* and *Pulex irritans*) of medical importance and considered as potential transmitters of pathogens in the state of Campeche. These species have been reported in Yucatán and Guatemala as vectors of rickettsial and bartonellae.

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Keywords: Siphonaptera; Medium mammals; Small mammals; Calakmul; Vectors

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La revisión por pares es responsabilidad de la Universidad Nacional Autónoma de México.

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Escanéame

Artículo

External injuries of Morelet's crocodile *Crocodylus moreletii* in Campeche, Mexico



El estudio analiza las lesiones externas del cocodrilo de Morelet (*Crocodylus moreletii*) en humedales del norte de Campeche, comparando individuos silvestres y en cautiverio.

Entre marzo y septiembre de 2007 se estudiaron 103 cocodrilos: 52 silvestres y 51 en cautiverio. Los ejemplares en cautiverio presentaron significativamente más lesiones, principalmente incisiones causadas por interacciones agresivas. En los cocodrilos silvestres, las lesiones fueron menos frecuentes y estuvieron dominadas por abrasiones superficiales.

Ciencia en corto:

Los cocodrilos de pantano mantenidos en cautiverio presentaron más lesiones que los individuos silvestres, principalmente cortes provocados por interacciones agresivas, y la cola fue la parte del cuerpo más afectada.

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DISEASES OF AQUATIC ORGANISMS
Dis Aquat Org

Published July 7

External injuries of Morelet's crocodile *Crocodylus moreletii* in Campeche, Mexico

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ABSTRACT. Analysis of external injuries in captive and free-ranging Morelet's crocodiles *Crocodylus moreletii* was performed in the northern wetlands of Campeche, Mexico. From March to September of 2007, a total of 52 free-ranging and 51 captive Morelet's crocodiles were studied. Captive crocodiles presented significantly more injuries. Sixteen free-ranging crocodiles presented some type of lesion, mostly superficial abrasions. Nineteen captive crocodiles presented lesions, mostly incisions from agonistic interactions. Overall, the injuries with highest prevalence were the incisions. The tail was the most frequently injured body region. Injuries were more common in adults than in other size classes. Conversely, the presence of lesions caused by the parasite *Paratrichosoma* spp. was greater in crocodiles captured in the coastal channels (mangrove habitat). The information presented here is important to understand some of the effects of individual interactions and to foresee and manage the consequences of conservation and management activities of crocodile populations.

KEY WORDS: Individual interactions · Free-ranging crocodiles · Lesions · *Paratrichosoma*

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INTRODUCTION

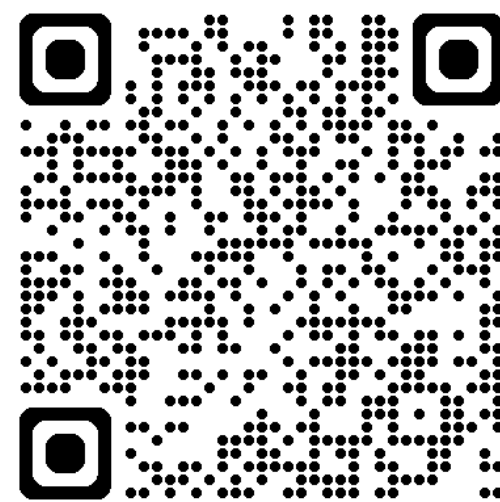
Crocodiles and alligators have a complex social structure (Garrick et al. 1978). A major characteristic of this population is the existence of dominance hierarchies (Lang 1987). Given the social nature of crocodilians, behavioral exhibitions are interactive (Seebacher & Grigg 1997). Crocodiles often engage in agonistic interactions, which regularly result in subordinate individuals with wounds being chased away (Lang 1987). Injuries and infected wounds could have a negative effect on the survival, growth and physical condition (e.g. reproductive capacity) of individuals and therefore on the population dynamics (Seijas 2007). The development and implementation of adequate conservation strategies requires

understanding the dynamics of the competitive interactions between individuals (Macdonald et al. 2000). This is particularly relevant for species with an ecological and economic value such as crocodiles and alligators.

In crocodilians, some external parasites have been reported, such as leeches, ticks and nematodes of the genus *Paratrichosoma* (Webb & Messel 1977, Webb & Manolis 1983, Montague 1984, Buenavieja et al. 1998, Moravec & Vargas-Vázquez 1998, Rainwater et al. 2001, Seijas 2007). The nematode *P. recurvum* was first reported in *Crocodylus moreletii* in Yucatán, Mexico (Moravec & Vargas-Vázquez 1998) and can be found mostly in the ventral region of the animals, causing zigzag tracks on the skin. Montague (1984) suggests that low body weight in *C. novaeguineae* is

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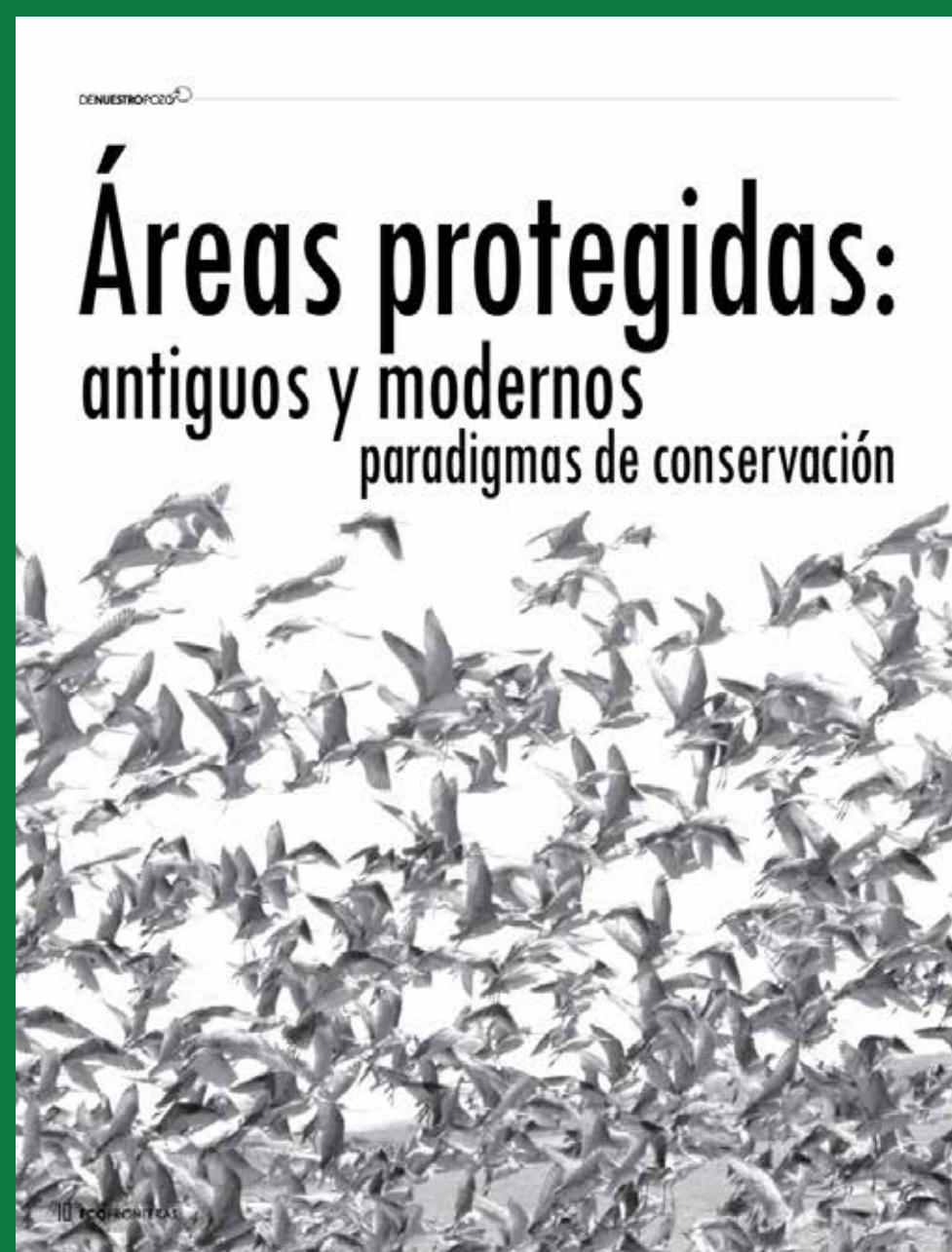
Artículo

Áreas protegidas : antiguos y modernos paradigmas de conservación

Las Áreas Naturales Protegidas (ANPs) son uno de los paradigmas de conservación más antiguos y más vigentes que existen. El artículo hace una síntesis de lo que es y lo que representa una ANP, la importancia del concepto para la sociedad y para la ciencia; abordando temas como la biofília, el refugio, y el manejo comunitario de tierras, entre otros

Ciencia en corto:

Las áreas naturales protegidas posibilitan beneficios económicos mediante actividades como la agricultura, pesca y caza.



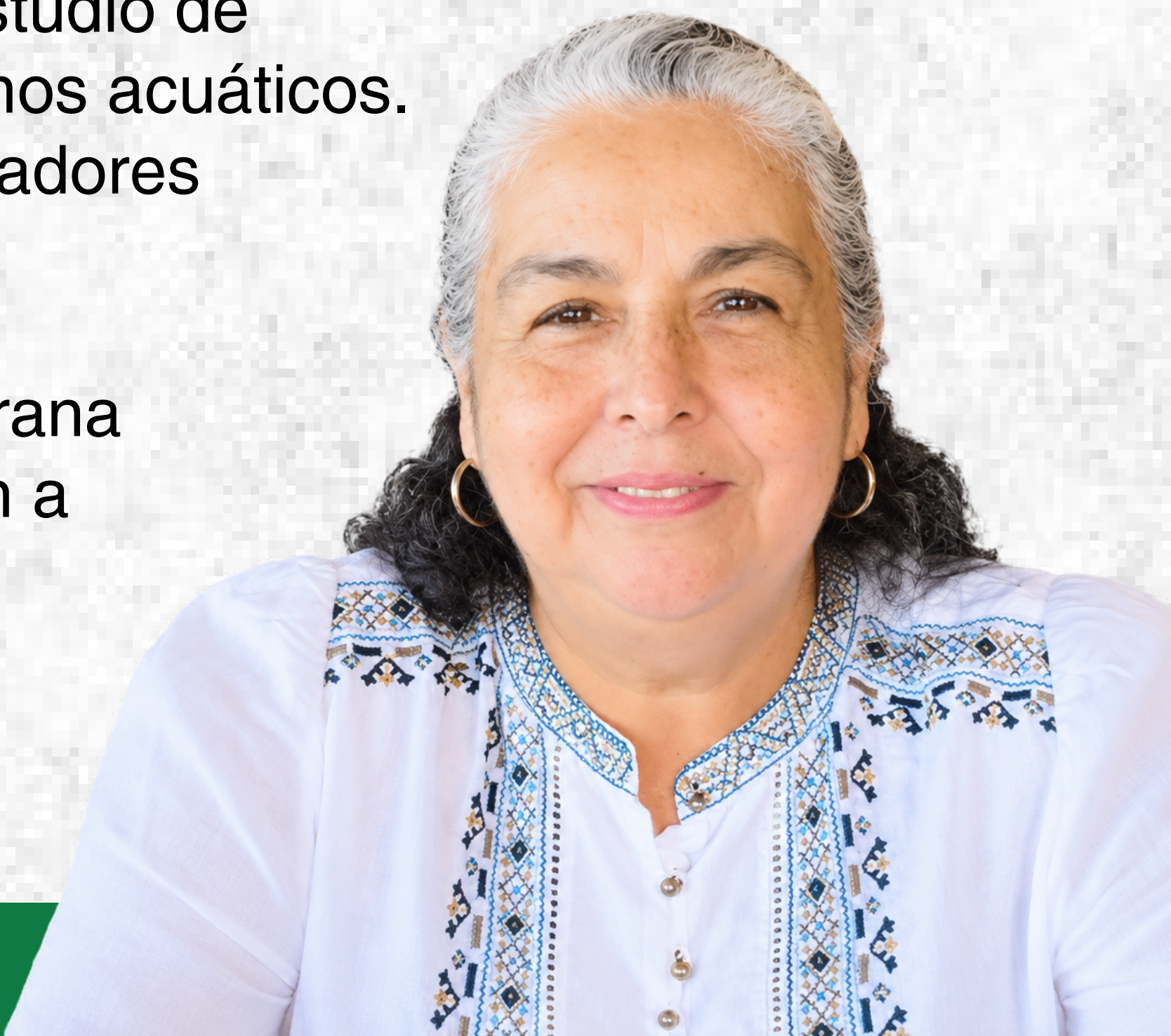
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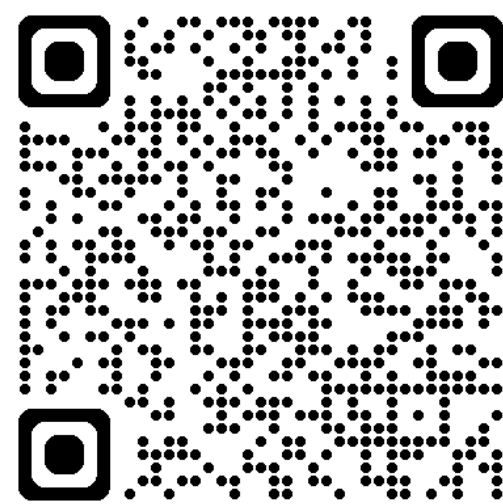
Dra. Teresa Álvarez Legorreta

Bióloga por la Universidad Autónoma Metropolitana, Unidad Xochimilco, y cuenta con una Maestría y un Doctorado en Ciencias Marinas por el Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (Cinvestav-IPN).

Se desempeña como académica en El Colegio de la Frontera Sur (ECOSUR), Unidad Quintana Roo, en el Grupo de Biotecnología Ambiental.

Su trabajo se centró en la evaluación de la calidad del agua y los sedimentos en ecosistemas acuáticos continentales y costeros, así como en el estudio de contaminantes en organismos acuáticos. También investiga biomarcadores bioquímicos, fisiológicos y moleculares que permiten identificar de manera temprana los efectos de la exposición a contaminantes.





Escanéame

Artículo

Tissue-specific metal accumulation in two *Crocodylus moreletii* from southeastern Mexico : a case-based assessment

El estudio analizó la acumulación de metales pesados en tejidos del cocodrilo de pantano (*Crocodylus moreletii*) en el sureste de México, con el objetivo de conocer los niveles de cadmio (Cd), mercurio (Hg), cobre (Cu) y zinc (Zn) presentes en esta especie.

Se examinaron dos cocodrilos muertos: un macho adulto que había sido atropellado y una hembra juvenil que presentaba un estado avanzado de desnutrición. Los investigadores analizaron distintos órganos, plasma sanguíneo y escamas de la cola.

Ciencia en corto:

Un cocodrilo de pantano juvenil del sureste de México presentó en sus riñones 137.55 µg/g de cadmio y 210.27 µg/g de zinc, concentraciones excepcionalmente elevadas que alertan sobre la posible presencia de contaminación ambiental localizada.

Bulletin of Environmental Contamination and Toxicology (2026) 116:19
<https://doi.org/10.1007/s00128-025-04160-4>

Tissue-Specific Metal Accumulation in Two *Crocodylus moreletii* from Southeastern Mexico: A Case-Based Assessment

Asela Marisol Buenfil-Rojas^{1,3,4} · Teresa Alvarez-Legorreta¹ · José Rogelio Cedeño-Vázquez²

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Abstract
This study reports tissue-specific concentrations of cadmium (Cd), mercury (Hg), copper (Cu), and zinc (Zn) in two deceased *Crocodylus moreletii* from Southeastern Mexico. One was an adult male struck by a vehicle; the other, a severely emaciated juvenile female. Organs, plasma, and caudal scutes were analyzed using atomic absorption and voltammetry. The juvenile exhibited extremely high concentrations of Cd (137.55 µg/g) and Zn (210.27 µg/g) in kidney tissue, exceeding values reported in other crocodylian species. Scutes and plasma also reflected internal metal burdens, supporting their use as non-destructive matrices. Comparisons with published data suggest these are among the highest concentrations recorded in crocodylians, raising concern about localized environmental contamination. The findings reinforce known tissue-specific accumulation patterns and highlight the value of opportunistic sampling for internal tissue assessment in protected species. This study contributes rare toxicological data for *C. moreletii* and emphasizes the need for continued biomonitoring in understudied tropical freshwater habitats.

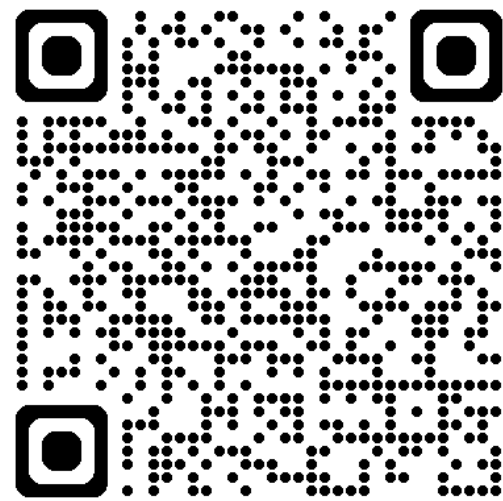
Keywords Cadmium · Zinc · Bioindicators · Scutes · Environmental contamination

Introduction
Crocodylians are considered effective bioindicators of aquatic ecosystems health due to their high trophic position, long lifespan, and propensity to bioaccumulate contaminants over time (Valdez et al. 2006; Thirion et al. 2022). Caudal scutes are increasingly used in non-lethal studies to assess metal exposure in wild populations (Jeffrey et al. 2001; Rainwater et al. 2007; Trillanes-Flores et al. 2014). However, for protected species such as the Morelet's crocodile (*Crocodylus moreletii*), destructive sampling of internal tissues is restricted under conservation regulations (Platt et al. 2023). Although some studies have quantified trace metals in wild *C. moreletii* using blood or caudal scute samples (Cedillo-Leal et al. 2018; Buenfil-Rojas et al. 2022), few have examined internal organs. As a result, our understanding of tissue-specific accumulation patterns and their potential health implications remains limited (Heaton-Jones et al. 1997; Burger et al. 2000; Almli et al. 2005; Xu et al. 2006; Campbell et al. 2010; Buenfil-Rojas et al. 2020). Post-mortem examinations offer a rare but valuable opportunity to investigate internal metal bioaccumulation in protected wildlife without harming individuals.

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Escanéame

Artículo

¿Los peces y los macrocrustáceos indican el deterioro ambiental en un estuario internacional protegido del Caribe occidental?

El estudio analizó la diversidad, abundancia, distribución y tamaño de peces y macrocrustáceos en los manglares de la Bahía de Chetumal-Corozal, una zona protegida compartida por México y Belice. La investigación evaluó cómo varían estas comunidades a lo largo de un gradiente de salinidad, desde las desembocaduras de los ríos Hondo y Nuevo hasta sitios más alejados.

Para obtener información, los investigadores realizaron entrevistas a pescadores de ambos países y utilizaron chinchorros y trampas para capturar organismos.

Ciencia en corto:

En la Bahía de Chetumal-Corozal, algunas especies de peces alcanzan mayores tamaños cerca de las desembocaduras de los ríos, y durante la temporada de lluvias también se registra una mayor riqueza de especies, lo que resalta la importancia ecológica de los manglares para los recursos pesqueros.

Áreas Naturales Protegidas Scripta, 2025, Vol. 11 (2): 01-20. <https://doi.org/10.18242/anpscripta.2025.11.11.02.0001>

Do fish and macrocrustaceans indicate environmental deterioration in a protected international estuary in the western Caribbean?

¿Los peces y los macrocrustáceos indican el deterioro ambiental en un estuario internacional protegido del Caribe occidental?

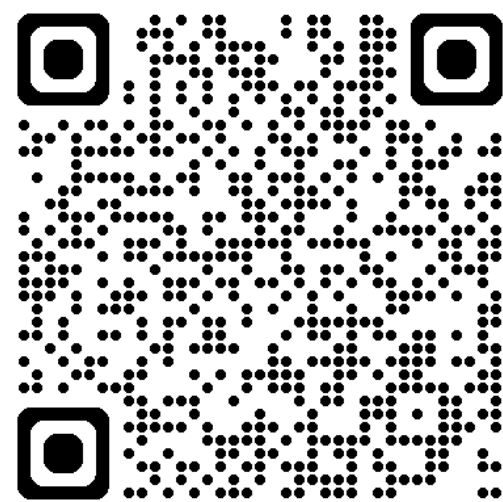
Katerine Palacio-Ayala¹, Juan J. Schmitter-Soto^{1*}, Teresa Álvarez-Legorreta¹, Héctor A. Hernández-Arana¹, Roberto L. Herrera-Pavón¹, Addiel U. Pérez²

Abstract

We analyzed the composition, distribution, abundance, and body length of fish and macrocrustaceans in the mangrove fringe of Chetumal/Corozal Bay, an international protected area in northern Belize and southern Mexico, in a salinity gradient from the mouths of the rivers Hondo and New. Fishers in both countries have reported that resources such as *Lutjanus griseus* and *Scomberomorus maculatus* have declined in recent years, a trend that they attribute to multiple factors, such as global warming, the opening of the Zaragoza canal (a direct connection between Chetumal Bay and the Caribbean), and the use of gillnets on the Mexican side of the system. In addition to interviewing Mexican and Belizean fishers, we sampled using seines and traps. No macrocrustacean species varied significantly, but three species of fishes, *Sphyrna barracuda*, *Eugerres plumieri*, and *Eucinostomus jonesii*, were larger in the river mouth areas compared to locations ca. 10 km away; the two former species were recognized by fishers as relevant commercial fishes. Species richness was higher in the sites closer to the river mouth, but only during the rainy season. We can confirm that mangrove cover is important at least for some commercial species, and that pollution from urban runoff and pesticides carried by the rivers seemingly does not affect much the diversity and abundance of fishes and crustaceans.

Keywords: Anthropogenic impacts. Biotic integrity. Estuarine habitats. Marine protected areas. Pollution.

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Escanéame

Artículo

Influence of temporal growth variation on blood plasma concentrations of metals and metallothioneins in Morelet’s crocodiles (*Crocodylus moreletii*) from Quintana Roo, Mexico

El estudio evaluó los cambios en las concentraciones de metales en el plasma sanguíneo del cocodrilo de pantano (*Crocodylus moreletii*) y su relación con las metalotioneínas (MT), proteínas que participan en la regulación y detoxificación de ciertos metales.

Los investigadores analizaron 34 muestras de plasma de 17 cocodrilos en semicautiverio, recolectadas en dos periodos: 2016 y 2018. Los resultados mostraron que, entre ambos años, las concentraciones de mercurio aumentaron 1.4 veces y las de cadmio 3.5 veces. En contraste, el cobre disminuyó y el zinc se mantuvo estable.

Ciencia en corto:

En cocodrilos de pantano estudiados entre 2016 y 2018, las concentraciones de cadmio en el plasma aumentaron 3.5 veces y las de mercurio 1.4 veces, lo que resalta la importancia de monitorear la exposición de esta especie amenazada a contaminantes ambientales.

Archives of Environmental Contamination and Toxicology (2025) 89:519–527
<https://doi.org/10.1007/s00244-025-01165-2>

Influence of Temporal Growth Variation on Blood Plasma Concentrations of Metals and Metallothioneins in Morelet’s Crocodiles (*Crocodylus moreletii*) from Quintana Roo, Mexico

Asela Marisol Buenfil-Rojas^{1,2,4} · Teresa Alvarez-Legorreta¹ · Mauricio González-Jáuregui^{2,3}

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Abstract
Studies on temporal variation of metal concentrations and their relationship with metal-binding proteins in crocodilians remain scarce. This study aimed to assess interannual changes in physiological (Cu and Zn) and xenobiotic (Hg and Cd) metals, as well as metallothioneins (MTs) levels in blood plasma of 17 semicaptive Morelet’s crocodiles (*Crocodylus moreletii*) sampled twice ($n=34$ samples) in 2016 and 2018. Metal concentrations were quantified in plasma samples, and MTs were measured as biomarkers of metal exposure. Results showed a 1.4-fold increase in Hg and 3.5-fold increase in Cd concentrations over time, possibly reflecting dietary exposure or other unmonitored environmental factors. In contrast, Cu concentrations decreased, while Zn remained stable. MTs levels did not differ significantly between years; however, linear models suggested associations between MTs and both Cu and Cd, highlighting their potential role in homeostasis and detoxification. Although based on a small sample size and limited to plasma, these findings offer insights into metal dynamics under semicaptive conditions and support the value of MTs as candidate biomarkers for future monitoring. Improved temporal frameworks and direct environmental or dietary data are needed to better interpret these trends and support conservation strategies for this endangered species.

In recent years, studies on contaminant exposure, biomagnification, and detoxification mechanisms in wild and captive crocodilians have increased (Grillitsch and Schiesari 2010; Arukwe et al. 2015; Eggins et al. 2015; Lemaire et al. 2021, 2024). However, few have addressed temporal variations. To date, only a handful of studies—such as Gunderson et al. (2002), Arukwe et al. (2015), Nilsen et al. (2017), Lawson et al. (2020), Humphries et al. (2021)—have assessed changes over time in organochlorine pesticides (OCPs), oxidative stress, thyroxine responses, or trace metals in crocodilians, often using blood from recaptured individuals. Whether chronic metal exposure can produce detectable interannual variations in metal-binding proteins remains poorly understood.

Metallothioneins (MTs) are low-molecular-weight (6–7 kDa) cysteine-rich proteins known for their metal-binding properties, primarily due to their abundance of sulfhydryl (-SH) groups (Kowalska et al. 2015). MTs are classically considered intracellular; however, their presence has also been reported in extracellular fluids—including plasma, bile and urine—where they serve as biomarkers of metal exposure (Milnerowicz and Bizoń 2010; Kowalska et al. 2015). MTs play a dual role: maintaining homeostasis of essential metals like Cu and Zn and detoxifying xenobiotic metals such as Hg and Cd. Exposure to excess metals can stimulate MT synthesis in the liver, forming metal–MT complexes that circulate in plasma and are eventually excreted via the kidneys. Prolonged exposure induces sustained MT production, with gradual release of these complexes into circulation (Hidalgo et al. 2009; Nordberg and Nordberg 2009).

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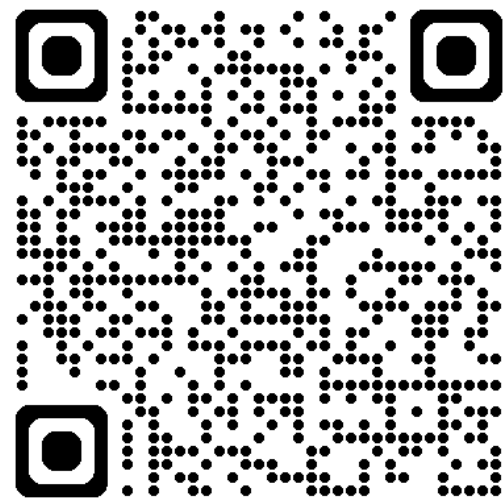
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Artículo

Recent records of thermohaline profiles and water depth in the Taam ja’ Blue Hole (Chetumal Bay, Mexico)

El Taam Ja’, ubicado en la Bahía de Chetumal, en el sureste de México, es un agujero azul submarino formado en estructuras kársticas, es decir, rocas solubles que pueden desarrollar cavidades profundas. Inicialmente, las mediciones con sonar estimaron una profundidad de aproximadamente 274 metros, pero las exploraciones posteriores revelaron que el sitio era mucho más profundo de lo que se pensaba.

Mediante registros de un perfilador oceanográfico que mide propiedades del agua, los investigadores detectaron profundidades superiores a 420 metros sin alcanzar todavía el fondo.

Ciencia en corto:

El agujero azul Taam Ja’, en la Bahía de Chetumal, supera los 420 metros de profundidad y todavía no se ha encontrado su fondo, por lo que es considerado el agujero azul más profundo conocido del mundo.

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Recent records of thermohaline
profiles and water depth in the
Taam ja’ Blue Hole (Chetumal
Bay, Mexico)

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Coastal karst structures have been recently explored and documented in
Chetumal Bay, Mexico, at the southeast of the Yucatan Peninsula. These
structures, recognized as blue holes, stand out for their remarkable dimensions
within a shallow estuarine environment. Particularly the Taam Ja' Blue Hole
(TJBH), revealed a depth of ~274 mbsl based on echo sounder mapping,
momentarily positioning it as the world's second-deepest blue hole. However,
echo-sounding methods face challenges in complex environments like blue
holes or inland sinkholes arising from frequency-dependent detection and range
limitations due to water density vertical gradients, cross-sectional depth
variations, or morphometric deviations in non-strictly vertical caves. Initial
exploration could not reach the bottom and confirm its position, prompting
ongoing investigation into the geomorphological features of TJBH. Recent CTD
profile records in TJBH surpassed 420 mbsl with no bottom yet reached,
establishing the TJBH as the deepest-known blue hole globally. Hydrographic
data delineated multiple water layers within TJBH. Comparison with Caribbean
water conditions at the Mesoamerican Barrier Reef System, reef lagoons, and
estuaries, suggests potential subterranean connections. Further research and
implementation of underwater navigation technologies are essential to decipher
its maximum depth and the possibilities of forming part of an interconnected
system of caves and tunnels.

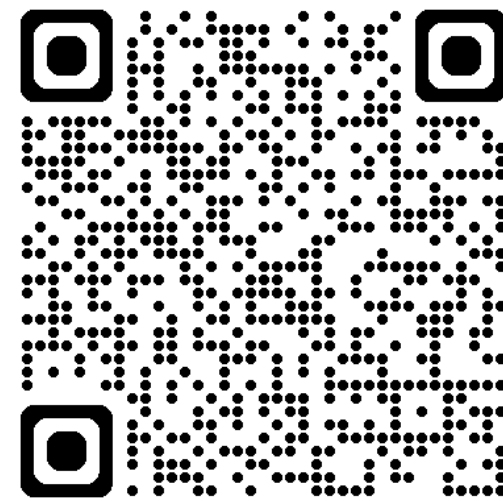
KEYWORDS
coastal karst structures, underwater geomorphology, blue holes, Yucatan Peninsula,
Mexican Caribbean, cave system, anchialine system

Frontiers in Marine Science

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Escanéame

Artículo

First insights into an exceptionally deep blue hole in the Western Caribbean : the Taam ja' Blue Hole 📶

El Taam Ja', ubicado en la Bahía de Chetumal, en el sureste de México, es un agujero azul submarino cuya exploración fue impulsada, en parte, por los conocimientos de pescadores de la región. En septiembre de 2021, un equipo científico estudió su profundidad, forma y características del agua mediante buceo, sonar, instrumentos oceanográficos y muestras de agua.

La investigación reveló una profundidad máxima de 274.4 metros bajo el nivel del mar, lo que en ese momento lo posicionó como el segundo agujero azul más profundo conocido del mundo.

Ciencia en corto:

El Taam Ja' tiene una profundidad documentada de 274.4 metros y una zona sin oxígeno por debajo de los 110 metros, donde las condiciones del agua son muy diferentes de las que existen en la superficie.



Unidad San Cristóbal de Las Casas

Dra. Lorena Soto Pinto

Bióloga y Doctora en Ciencias por la UNAM, con una Maestría en Ciencias Agropecuarias y Recursos Naturales Renovables por el CATIE, Costa Rica, donde obtuvo mención honorífica.

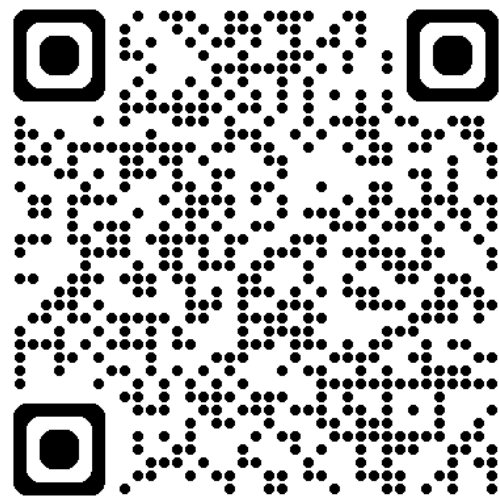
Su trayectoria científica se ha enfocado en la agroforestería comunitaria y los sistemas agroforestales, particularmente en el café con sombra y su biodiversidad asociada, los servicios ecosistémicos y el almacenamiento de carbono.

También ha trabajado en acahuales mejorados, sistemas taungya y alternativas a la agricultura de roza-tumba-quema.

Fue reconocida con el primer lugar a la mejor tesis de Doctorado en Botánica (2001) y el Premio al Desarrollo Institucional de ECOSUR (2003).

Es miembro de la Academia Mexicana de Ciencias y pertenece al Sistema Nacional de Investigadoras e Investigadores, Nivel II.





Escanéame

Artículo

Contradicciones socioambientales en los procesos de mitigación, asociados al ciclo del carbono en sistemas agroforestales



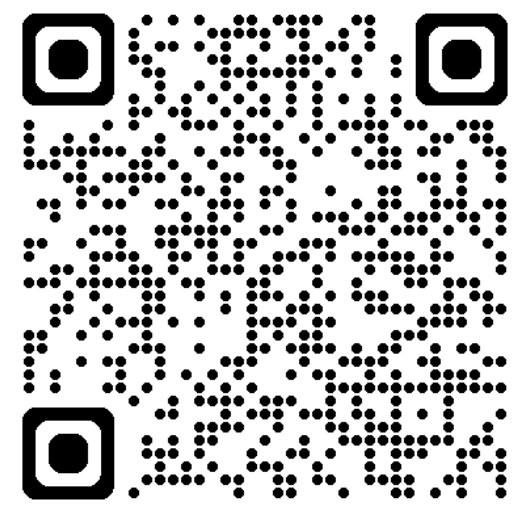
El texto analiza el papel de los sistemas agroforestales en Chiapas como estrategias que pueden combinar la producción de alimentos y madera con la conservación de la biodiversidad y la mitigación del cambio climático.

El estudio señala que sistemas asociados con maíz, café y ganadería bovina pueden almacenar cantidades importantes de carbono en el suelo, la biomasa viva y la biomasa muerta.

Ciencia en corto:

Los sistemas agroforestales de pequeña escala en Chiapas pueden almacenar cantidades importantes de carbono en el suelo y la vegetación, mientras producen alimentos y madera y contribuyen a conservar la biodiversidad.





Escanéame

Artículo

Contributions of agroforestry systems to food provisioning of peasant households : conflicts and synergies in Chiapas, Mexico



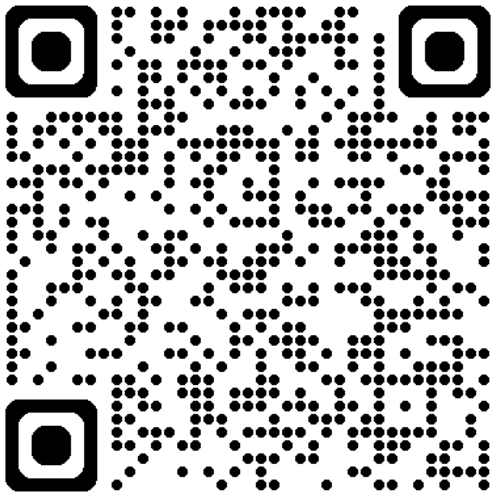
El estudio analiza cómo cuatro sistemas agroforestales tradicionales en Chiapas —cacaotales de sombra, cafetales de sombra, milpas y huertos familiares— contribuyen a la alimentación de las familias campesinas y cómo están cambiando frente al avance de la agricultura industrial y los mercados globales.

La investigación se realizó en 17 comunidades campesinas de Chiapas, donde se registraron 108 especies de plantas pertenecientes a 49 familias botánicas. Estas plantas aportan nutrientes esenciales como carbohidratos, proteínas, vitaminas, minerales y ácidos grasos, demostrando la importancia de la agrobiodiversidad local para la seguridad alimentaria.

Ciencia en corto:

En 17 comunidades campesinas de Chiapas se identificaron 108 especies de plantas utilizadas como alimento, capaces de aportar nutrientes esenciales como proteínas, vitaminas y minerales, demostrando que la agrobiodiversidad de los sistemas agroforestales es también una fuente clave de diversidad alimentaria y conocimiento tradicional.





Escanéame

Artículo

Effects of local energy sources on the in situ digestibility and ruminal kinetic of erythrina poeppigiana foliage in a silvopastoral system



El estudio evaluó cómo diferentes fuentes de energía —grano de sorgo, banano verde, arroz pulido y melaza de caña— afectan la digestibilidad ruminal del follaje de poró (*Erythrina poeppigiana*) utilizado como alimento en sistemas silvopastoriles de Turrialba, Costa Rica.

Se trabajó con cuatro novillos Romosinuano, de aproximadamente 450 kg, que pastorearon en un sistema de rotación y recibieron diariamente follaje fresco de poró. Los resultados mostraron que las diferentes fuentes de energía sí modificaron algunos parámetros de degradación de la materia seca, como la degradabilidad inicial, potencial y velocidad de degradación.

Ciencia en corto:

El follaje de poró (*Erythrina poeppigiana*) puede incorporarse como fuente de alimento en sistemas silvopastoriles tropicales, y aunque diferentes suplementos energéticos modificaron su velocidad de degradación, no cambiaron significativamente la fermentación ruminal total de los bovinos.



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Effects of Local Energy Sources on the "In Situ" Digestibility and Ruminal Kinetic of *Erythrina poeppigiana* Foliage in a Silvopastoral System

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Abstract – This study evaluated the effect of sorghum grain (Sg), green banana (Gb), polished rice (Pr), and sugarcane molasses (Me) on the "in situ" digestibility ruminal kinetic of Poró (*Erythrina poeppigiana*) foliage under silvopastoral conditions in Turrialba, Costa Rica. Four ruminally cannulated Romosinuano steers with a mean live weight of 450 kg (SD 31) were used. The experiment was designed as a 4 x 4 Latin Square with one square and four periods. Steers grazed in twelve paddocks on pasture composed of African star-grass (*Cynodon dactylon*), ruzi grass (*Brachiaria ruziziensis*), and natural grasses (*Axonopus compressus* and *Paspalum conjugatum*), under a rotational grazing system. Energy sources were supplemented at 0.60 Mcal ME /100 kg (BW/day). The steers were supplemented daily with fresh foliage (leaves, petioles, and stems) of Poró at 0.5 kg of DM/100 kg BW. Significant differences (P< 0.05) were found among the DM of energetic supplements for initial degradability, potential degradability and degradation rate. The effects of treatments on the degradability parameters of the DM of *Erythrina* and the grass blend as well as on N-NH₃ and pH content, were not significant (P< 0.05). In addition, there were no significant differences (P< 0.05) among treatments for total concentration of volatile fatty acids (VFA's) (mmole: Pr = 87.0, Gb = 95.0, Sg = 96.0, Me = 87.0); however, the proportion of acetic acid, propionic acid and butyric acid presented significant differences (P< 0.05) due to the effect of the molasses. The fermentation pattern was typical of cattle grazing diets under tropical conditions, with the molar proportion of acetic acid greater than 60%, between 13 and 16% for propionic acid and between 9 and 12% for butyric acid.

Keywords – Central America, Energy, Fodder Tree, Ruminal Fermentation.

I. INTRODUCTION

Tropical cattle's farming is still mainly based on pastures under an extensive grazing system [1]. In Latin America, silvopastoral systems have been widely promoted over recent years [2]; these agroforestry systems incorporate tree foliage and fodder shrubs to improve animal health, milk and meat production [3] [4], in addition to promoting environmental services [5]. In this context, diverse holistic strategies for animal production that include the use of feed supplements to improve the production and consumption of foods of animal origin, have been implemented on a global scale [6].

There is a wide diversity of native fodder trees throughout Latin America [7] and the genus *Erythrina* has a distribution range that extends from Mexico to South America. In southeast Mexico, many species of *Erythrina* are used in agro forestry systems as live fences, windbreaks, shade for coffee and cocoa plants or support

II. MATERIAL AND METHODS

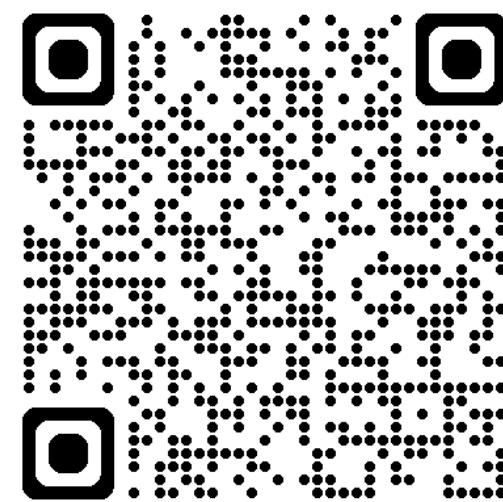
Location

The experiment was carried out at the Tropical Agricultural Research and Higher Education Center (CATIE) in Turrialba, Costa Rica. The silvopastoral area is located at 9° 58' N and 83° 31' W. Mean annual temperature and rainfall is 23 °C and 2600 mm respectively.

Experimental design, treatments and management

Four ruminally cannulated Romosinuano steers, from the CATIE farm herd, weighing an average of 450 kg (SD 31), were used in the experiment. The experiment was designed as a changeover 4 x 4 Latin Square [14], with one square and four periods (14 days adaptation and 7

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Artículo

Ganadería y cambio climático : avances y retos de la mitigación y la adaptación en la frontera sur de México

El texto analiza los avances y alternativas para mitigar y adaptarse al cambio climático en la ganadería del sureste de México, destacando el potencial de los sistemas agroforestales-silvopastoriles (SS) y las buenas prácticas ganaderas (BPG).

En esta región, el principal origen de las emisiones de gases de efecto invernadero (GEI) ha sido el cambio de uso de suelo, especialmente por la deforestación para establecer cultivos y pastizales destinados a la ganadería. El sector agropecuario representa entre 18 y 20 % de las emisiones, y dentro de este sector, la ganadería bovina aporta más del 80 %, principalmente debido a la fermentación entérica, que produce metano.

Ciencia en corto:

En el sureste de México, más del 80 % de las emisiones de GEI del sector agropecuario provienen de la ganadería bovina, principalmente por la fermentación entérica; los sistemas silvopastoriles y el uso de árboles forrajeros locales ofrecen una alternativa de bajo costo para reducir este impacto.

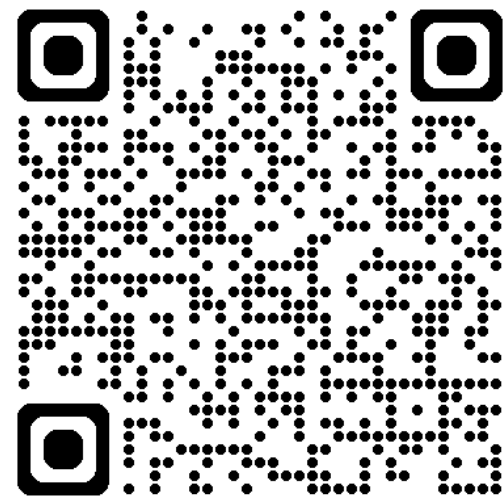
ARTÍCULO CIENTÍFICO

Ganadería y cambio climático: Avances y retos de la mitigación y la adaptación en la frontera sur de México

Guillermo Jiménez Ferrer,¹ Lorena Soto Pinto, Esaú Pérez Luna, Juan Carlos Kú Vera, Armin Ayala Burgos, Gilberto Villanueva López, Armando Alayon Gamboa

Resumen. El sureste de México (SM) no está exento de los efectos del cambio climático (CC), de aquí deriva la importancia de buscar alternativas de mitigación y promover estrategias participativas de adopción y adaptación. El presente trabajo tiene como objetivo revisar los avances en mitigación y adaptación al CC en el sector ganadero en el SM, y resaltar las contribuciones de los sistemas agroforestales-silvopastoriles (SS) y las buenas prácticas ganaderas (BPG). En las últimas décadas, en el SM el principal sector emisor de gases de efecto invernadero (GEI) ha sido el cambio de uso de suelo y la silvicultura (USCUSS), con más de 50% de emisiones ocasionadas por la deforestación y transformación en áreas de agricultura para granos básicos, cultivos comerciales y pastizales para ganadería bovina. El segundo sector, en el rango de emisiones, ha sido el agrícola (incluyendo al ganadero), emitiendo entre 18-20%. De este sector, la ganadería bovina ha contribuido con más de 80% de las emisiones de GEI, las cuales son ocasionadas por la fermentación entérica. En este contexto, los SS y las BPG son una estratégica opción para mitigar y adaptarse al CC. En una revisión de investigaciones previas y proyectos de desarrollo en el sureste de México, se ha encontrado que los sistemas agroforestales, las BPG y el uso de prácticas

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Escanéame

Artículo

Lifeways of families in coffee-growing territories: vulnerability and response capacity

El estudio analiza la capacidad de respuesta de las familias cafetaleras de Chiapas frente a los principales problemas que afectan sus medios de vida. Para ello, propone un enfoque de formas de vida e innovación territorial, que busca comprender no solo los recursos económicos disponibles, sino también las estrategias, valores, conocimientos y características de cada territorio.

Mediante talleres e entrevistas, los investigadores encontraron que las familias cafetaleras enfrentan principalmente cuatro grandes desafíos: el cambio generacional, las plagas y enfermedades del café, los efectos del cambio climático y los precios del café.

Ciencia en corto:

Las familias cafetaleras de Chiapas enfrentan al mismo tiempo cambio climático, plagas, relevo generacional y fluctuaciones en los precios del café, pero su capacidad para adaptarse depende de las características, estrategias y nivel de autonomía de cada territorio.

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Lifeways of families in coffee-growing territories: vulnerability and response capacity

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Abstract Multilateral and research organizations have developed studies in coffee-growing zones that are focused on sustainable livelihoods; however, the origin of this research and its emphasis on capital limits the explanatory capacity of this approach. To overcome this gap in knowledge and analysis, we developed the lifeways and territorial innovation approach that has been used in research in Chiapas, Mexico, through quantitative and qualitative methodology: workshops and interviews, with the aim of analysing complementarity between capital, strategy, expected results and values of the lifeways of coffee-growing families that facilitate or limit their capacity of response to problems. Our study identified that generational change, coffee pests and diseases, the effects of climate change and the volatility of coffee prices and staple crops are the principal problems that, depending on the typology of the coffee-growing territory (the dynamics of the regime, transition to local initiatives, identity appropriation, appropriation and autonomy), affect each family differently.

Introduction The Sustainable Livelihoods Approach (SLA) encompasses the capital and productive activities that families carry out to survive and the capacity of

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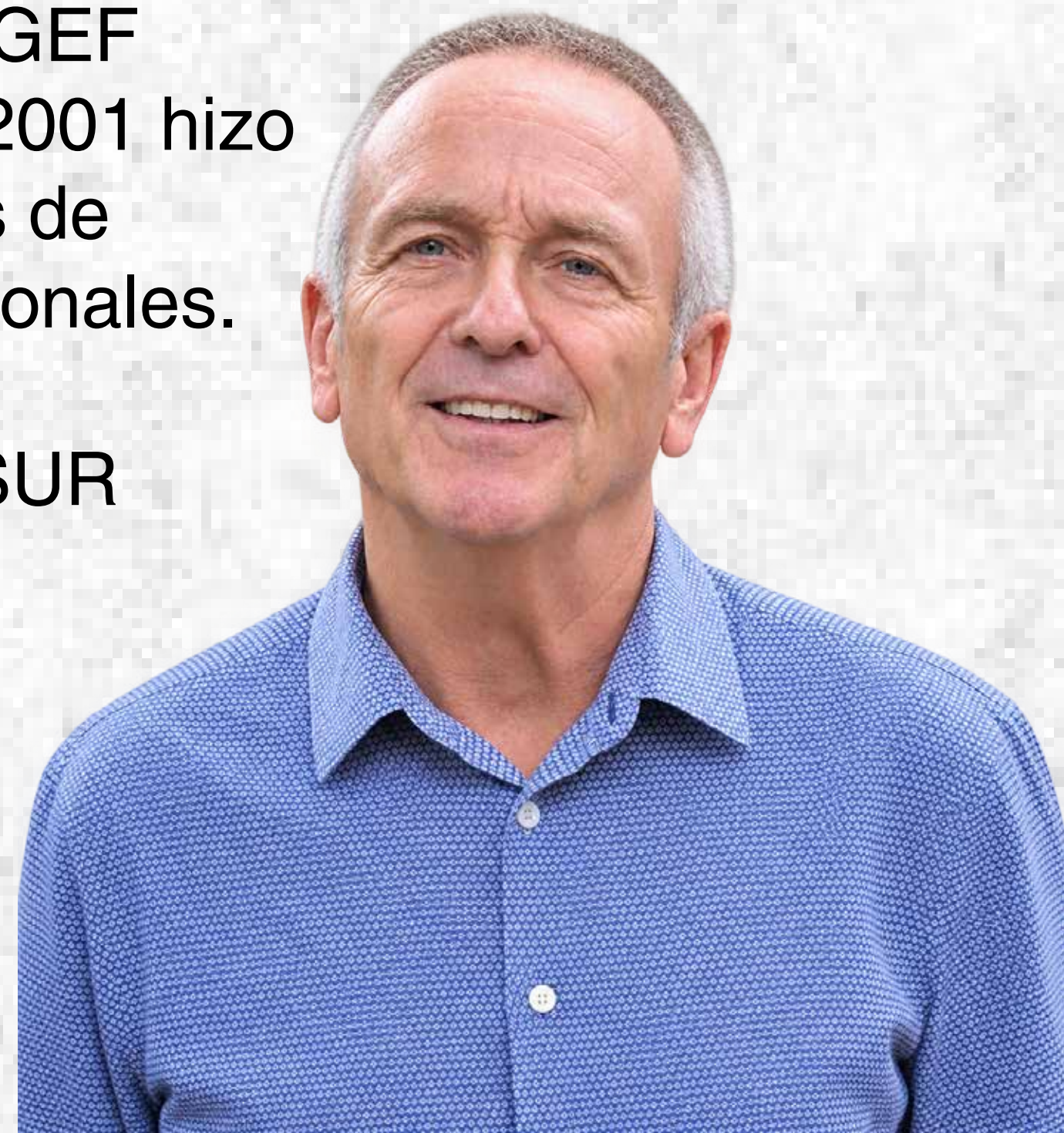
Dr. Hans van der Wal

Después de estudiar la maestría en fitotecnica tropical en la Universidad de Wageningen, trabajó de 1985 a 1996 en Guerrero y en Oaxaca en temas agroecológicos en la agricultura campesina (MIAF, control de plagas, patrones espacio-temporales).

De 1996 a 1999 obtuvo el doctorado en Ecología Agrícola y Conservación de los Recursos Naturales, con mención honorífica, de nuevo en Wageningen.

Participó entre 1999 y 2000 en la preparación de un proyecto GEF sobre corredores biológicos y en 2001 hizo consultorías relacionadas a través de organismos internacionales y nacionales.

Inició como investigador de ECOSUR en 2002, en la unidad de Campeche para posteriormente continuar en la unidad de Villahermosa.





Artículo

Biomass resilience of Neotropical secondary forests



Escanéame

El artículo analiza la recuperación de la biomasa en bosques tropicales secundarios después de que un área ha sido deforestada o utilizada para actividades humanas. El estudio busca entender qué tan rápido estos bosques pueden recuperar su capacidad para almacenar carbono y qué factores ambientales influyen en este proceso.

Los investigadores analizaron 45 sitios forestales y alrededor de 1,500 parcelas distribuidas a lo largo de diferentes condiciones ambientales de la región neotropical.

Ciencia en corto:

Durante sus primeras décadas de crecimiento, los bosques secundarios pueden capturar carbono a una tasa 11 veces mayor que los bosques maduros, demostrando el enorme potencial de la regeneración natural para recuperar biomasa y contribuir a la mitigación del cambio climático.

LETTER

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Biomass resilience of Neotropical secondary forests

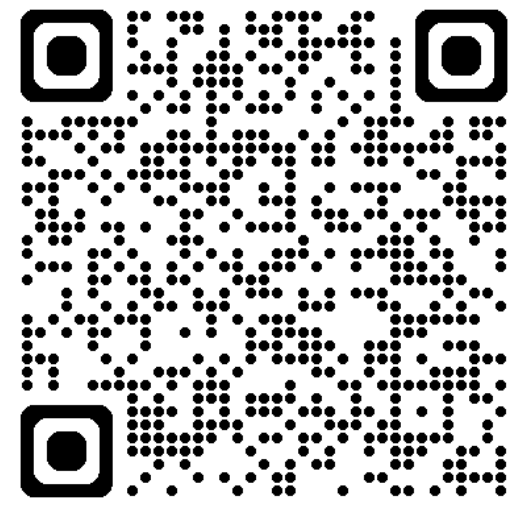
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Land-use change occurs nowhere more rapidly than in the tropics, where the imbalance between deforestation and forest regrowth has large consequences for the global carbon cycle¹. However, considerable uncertainty remains about the rate of biomass recovery in secondary forests, and how these rates are influenced by climate, landscape, and prior land use^{2–4}. Here we analyse aboveground biomass recovery during secondary succession in 45 forest sites and about 1,500 forest plots covering the major environmental gradients in the Neotropics. The studied secondary forests are highly productive and resilient. Aboveground biomass recovery after 20 years was on average 122 megagrams per hectare (Mg ha⁻¹), corresponding to a net carbon uptake of 3.05 Mg C ha⁻¹ yr⁻¹, 11 times the uptake rate of old-growth forests. Aboveground biomass stocks took a median time of 66 years to recover to 90% of old-growth values. Aboveground biomass recovery after 20 years varied 11.3-fold (from 20 to 225 Mg ha⁻¹) across sites, and this recovery increased with water availability (higher local rainfall and lower climatic water deficit). We present a biomass recovery map of Latin America, which illustrates geographical and climatic variation

in carbon sequestration potential during forest regrowth. The map will support policies to minimize forest loss in areas where biomass resilience is naturally low (such as seasonally dry forest regions) and promote forest regeneration and restoration in humid tropical lowland areas with high biomass resilience.

Over half of the world's tropical forests are not old-growth, but naturally regenerating forests⁵. We focus here on secondary forests that regrow after nearly complete removal of forest cover for agricultural use⁶. Despite their crucial role in human-modified tropical landscapes, the rate at which these forests will recover, and the extent to which they can provide equivalent levels of ecosystem services as the forests they replaced, remains uncertain. Several studies suggest that, once a certain threshold of disturbance has been reached, tropical forests may collapse⁶ or switch to an alternative stable state⁷. However, in general, secondary tropical forests have rapid rates of carbon sequestration, with potentially large consequences for the global carbon cycle⁸. The magnitude of the tropical carbon sink is relatively well known for old-growth forest^{9,10}, but current global estimates on carbon uptake and storage of secondary forests are rough

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Escanéame

Artículo

Carbon sequestration potential of second-growth forest regeneration in the Latin American tropics



El estudio estimó que, en 2008, estos bosques cubrían 2.4 millones de km² en los trópicos de América Latina, equivalentes al 28.1 % del área analizada. Si se permitiera su regeneración durante 40 años, podrían almacenar hasta 8.48 Pg de carbono, equivalente a retirar aproximadamente 31.09 Pg de CO₂ de la atmósfera.

Además, permitir la regeneración natural en el 40 % de los pastizales de tierras bajas podría añadir otros 2 Pg de carbono almacenado. Los autores destacan que la regeneración natural es una estrategia relativamente económica que, además de contribuir a la mitigación del cambio climático, puede favorecer la biodiversidad y los servicios ecosistémicos.

Ciencia en corto:

Los bosques tropicales secundarios de América Latina podrían capturar hasta 31.09 gigatoneladas de CO₂ en 40 años mediante su regeneración natural, una cantidad equivalente a las emisiones de combustibles fósiles y procesos industriales de toda América Latina y el Caribe entre 1993 y 2014.

RESEARCH ARTICLE

ECOLOGY

Carbon sequestration potential of second-growth forest regeneration in the Latin American tropics

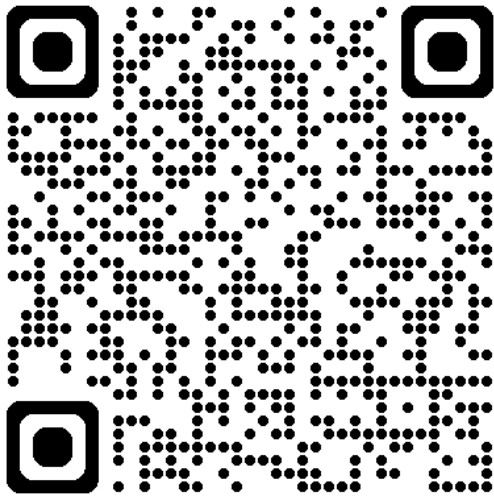
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Regrowth of tropical secondary forests following complete or nearly complete removal of forest vegetation actively stores carbon in aboveground biomass, partially counterbalancing carbon emissions from deforestation, forest degradation, burning of fossil fuels, and other anthropogenic sources. We estimate the age and spatial extent of lowland second-growth forests in the Latin American tropics and model their potential aboveground carbon accumulation over four decades. Our model shows that, in 2008, second-growth forests (1 to 60 years old) covered 2.4 million km² of land (28.1% of the total study area). Over 40 years, these lands can potentially accumulate a total aboveground carbon stock of 8.48 Pg C (petagrams of carbon) in aboveground biomass via low-cost natural regeneration or assisted regeneration, corresponding to a total CO₂ sequestration of 31.09 Pg CO₂. This total is equivalent to carbon emissions from fossil fuel use and industrial processes in all of Latin America and the Caribbean from 1993 to 2014. Ten countries account for 95% of this carbon storage potential, led by Brazil, Colombia, Mexico, and Venezuela. We model future land-use scenarios to guide national carbon mitigation policies. Permitting natural regeneration on 40% of lowland pastures potentially stores an additional 2.0 Pg C over 40 years. Our study provides information and maps to guide national-level forest-based carbon mitigation plans on the basis of estimated rates of natural regeneration and pasture abandonment. Coupled with avoided deforestation and sustainable forest management, natural regeneration of second-growth forests provides a low-cost mechanism that yields a high carbon sequestration potential with multiple benefits for biodiversity and ecosystem services.

INTRODUCTION

Carbon emissions from tropical deforestation and degradation currently contribute an estimated 8 to 15% of annual global anthropogenic carbon emissions, further exacerbating global warming (1). National and global efforts to mitigate carbon emissions due to land-use change, such as the United Nations Reduced Emissions from Deforestation and Degradation program, focus primarily on reducing deforestation and degradation of intact tropical forests and enhancement of carbon stocks within disturbed forests, with less emphasis on reforestation and forest restoration (2, 3). Although deforestation in the world's tropical regions continues to reduce overall forest cover (4), second-growth forests (SIFs) are expanding in many deforested areas of the Neotropics (5, 6). SIFs emerge spontaneously in post-cultivation fallows, on abandoned farms and pastures, in the understory of ecological restoration plantings, and following assisted natural regeneration on private or communal lands (6, 7). Natural regeneration of forests is widely considered to be an effective low-cost mechanism for carbon sequestration, particularly in tropical regions (1, 2, 8, 9). Recent global estimates suggest that if tropical deforestation were halted entirely, if mature forests remain undisturbed, and if new forests were allowed to continue regrowing on deforested land, 24 to 35% of all carbon emissions from fossil fuels

and industrial production from 2000 to 2010 could be mitigated (10). Combined with reforesting unused agricultural land, these actions have been estimated to yield a global net carbon sequestration potential of 3 to 5 Pg C (petagrams of carbon) per year (1, 9). Robust estimates of the carbon sequestration potential of naturally regrowing forests have been hampered by the lack of spatially explicit information on the extent and age distribution of SIFs (including shifting cultivation fallows) and on the effects of climate and other environmental factors on local rates of biomass recovery. Assessments of carbon sequestration potential must account for effects of forest successional status, as well as effects of climate, land use, soils, and landscape context (6). Four key sources of uncertainty have impeded robust projections of the carbon sequestration potential of naturally regenerating tropical forests: (i) the age, longevity, and spatial distribution of regenerating forests and fallows; (ii) the potential for forest regeneration on previously forested land that is currently used for agriculture, pasture, or other nonforest land uses; (iii) the changes over time in aboveground carbon (AGC) storage in SIFs under different environmental conditions (rainfall and soil fertility) and land-use history; and (iv) dynamics of agricultural land use and length of fallow cycles (11–13).



Escanéame

Artículo

Biodiversity recovery of Neotropical secondary forests



El estudio analiza cómo se recupera la biodiversidad de estos bosques y encuentra algo interesante: la cantidad de especies se recupera relativamente rápido, pero la composición de especies tarda mucho más.

Después de 20 años, los bosques secundarios habían recuperado aproximadamente el 80 % de la riqueza de especies que caracteriza a los bosques maduros. Sin embargo, en ese mismo periodo solo habían recuperado el 34 % de la composición de especies. Para recuperar completamente esta composición pueden ser necesarios siglos.

Ciencia en corto:

Un bosque tropical secundario puede recuperar cerca del 80 % de su número de especies en solo 20 años, pero recuperar completamente las especies que caracterizan a un bosque maduro puede tomar siglos.

SCIENCE ADVANCES | RESEARCH ARTICLE

ECOLOGY

Biodiversity recovery of Neotropical secondary forests

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Old-growth tropical forests harbor an immense diversity of tree species but are rapidly being cleared, while secondary forests that regrow on abandoned agricultural lands increase in extent. We assess how tree species richness and composition recover during secondary succession across gradients in environmental conditions and anthropogenic disturbance in an unprecedented multisite analysis for the Neotropics. Secondary forests recover remarkably fast in species richness but slowly in species composition. Secondary forests take a median time of five decades to recover the species richness of old-growth forest (80% recovery after 20 years) based on rarefaction analysis. Full recovery of species composition takes centuries (only 34% recovery after 20 years). A dual strategy that maintains both old-growth forests and species-rich secondary forests is therefore crucial for biodiversity conservation in human-modified tropical landscapes.

INTRODUCTION

Tropical forests store the majority of the world's tree diversity, with an estimated 53,000 tree species (1). Over the past decades, many hyperdiverse old-growth forests and their biodiversity have disappeared because of the conversion of forests into agricultural lands (2). Secondary forests regrowing after abandonment of agricultural lands increase rapidly in extent and may constitute important biodiversity reservoirs (3). It is therefore critical to assess the biodiversity conservation potential of secondary tropical forests (3, 4) by analyzing biodiversity recovery (i.e., the rate of recovery to a pre-disturbance state) of tropical forests during secondary succession. Biodiversity recovery could be fast because species richness (i.e., the number of species) may recover rapidly to old-growth forest levels over succession (5). Recovery of species composition (i.e., species identity and relative abundance), in contrast, could take centuries (6), particularly if old-growth species go locally extinct or fail to be dispersed into regenerating forest areas.

Recovery rates of tree species richness and composition have been evaluated for individual sites (7–9) and summarized in meta-analyses (5, 10), but how recovery rates vary across large-scale gradients in

environmental conditions and anthropogenic disturbance remains unknown. Community assembly during succession depends on the size and the composition of the regional species pool and on local effects of environmental filtering and dispersal limitation that determine which species actually establish. The size and composition of the regional species pool have been shaped by historical effects and vary with water and soil nutrient availability (11). Locally, tree species' establishment during succession depends on (i) water and nutrient availability that constrain or facilitate seedling establishment, (ii) forest cover and quality in the surrounding landscape matrix that indicate the availability and proximity of seed sources and dispersal agents (12, 13), and (iii) the type and intensity of previous land use. Previous land use modifies environmental conditions, such as soil structure and nutrient availability, and determines the presence of forest legacies (e.g., remnant trees, a soil seed bank, and resprouting tree stumps) that accelerate succession (14).

Here, we assess how tree species richness and composition recover during secondary succession across major gradients in environmental conditions and anthropogenic disturbance in the Neotropics using original data from 56 sites, 1630 plots, and >183,000 trees



Escanéame

Libro

Pobreza y democratización energéticas en Tabasco

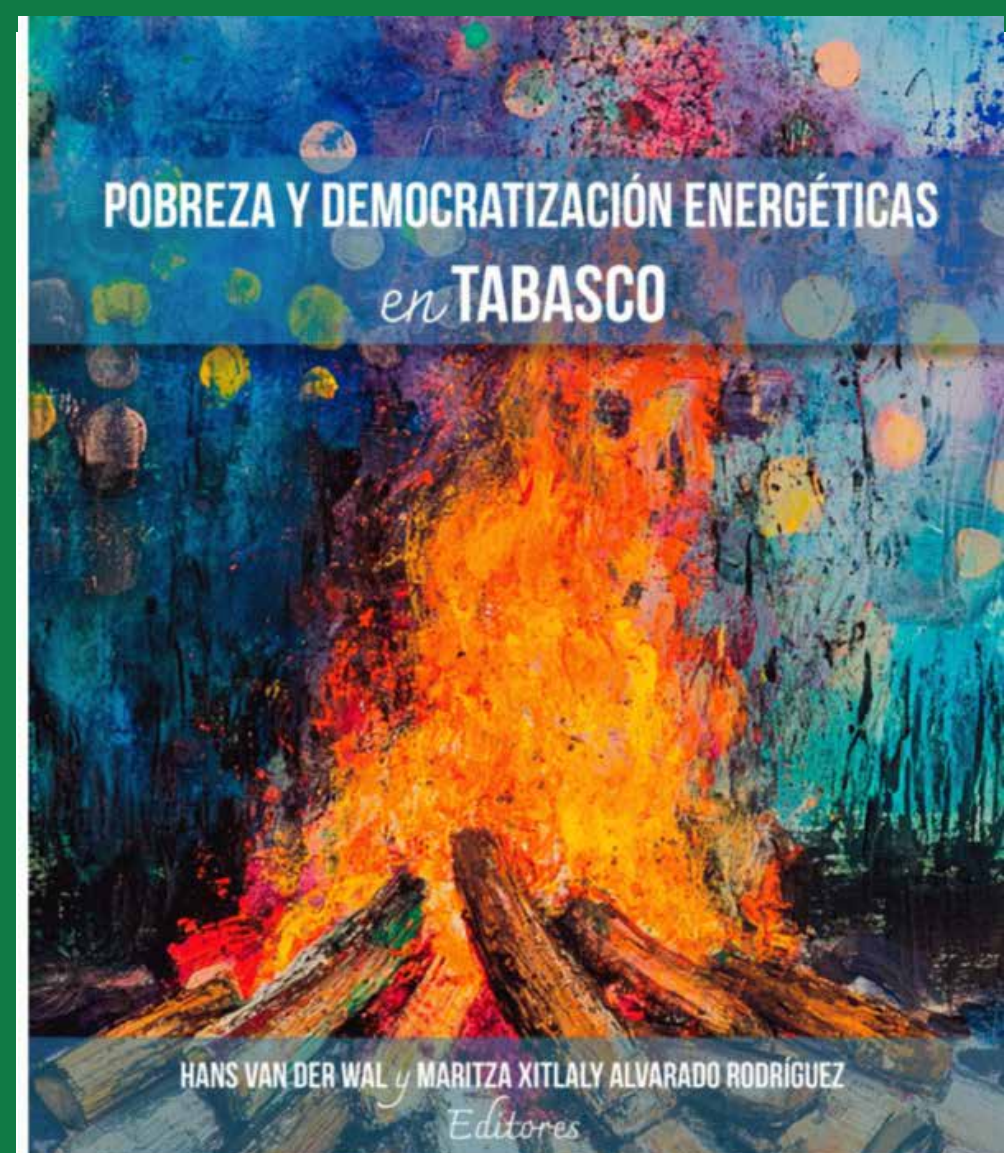


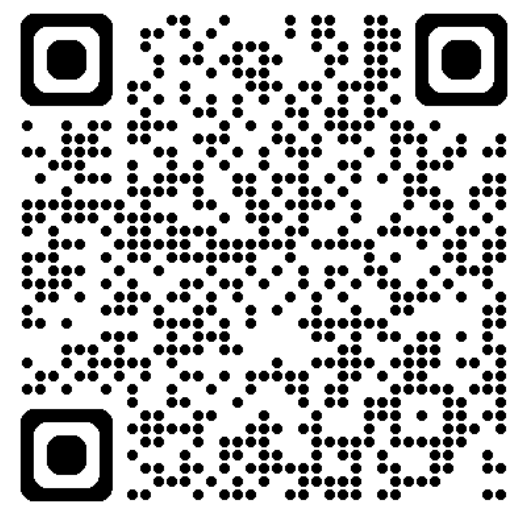
Tabasco cuenta con una gran riqueza de fuentes de energía, la mitad de su población enfrenta pobreza energética, una situación que limita su bienestar y sus oportunidades de desarrollo.

Este libro analiza seis iniciativas comunitarias relacionadas con la artesanía, la carpintería, la producción de mangle, el cacao y la elaboración de chocolate. A través de la colaboración entre comunidades, organizaciones civiles e instituciones académicas y gubernamentales, se exploran alternativas para aprovechar mejor los recursos energéticos disponibles, tomando en cuenta la cultura, la identidad y las necesidades de cada territorio.

Ciencia en corto:

En Tabasco, un estado con abundantes recursos energéticos, aproximadamente la mitad de la población enfrenta pobreza energética. Seis iniciativas comunitarias exploran alternativas para aprovechar la energía de manera más eficiente y fortalecer las economías locales desde las necesidades y los conocimientos de sus habitantes.





Escanéame

Libro

Huertos familiares en Tabasco: elementos para una política integral en materia de ambiente, biodiversidad, alimentación, salud, producción y economía

En un estudio de 54 huertos se identificaron 153 especies de árboles y arbustos, además de una diversidad de organismos que habitan en el suelo. Las especies y su abundancia variaban según la región y las prácticas de manejo de cada huerto.

El estudio propone fortalecer los huertos mediante educación ambiental, elaboración de lombricomposta y construcción de estufas ahorradoras de leña. También presenta diagnósticos y propuestas para mejorar sus funciones, conservar la biodiversidad y promover condiciones de vida más saludables y sostenibles.

Ciencia en corto:

La venta de frutas de los huertos familiares estudiados generaba un ingreso promedio de 2,000 pesos al año por familia. Estos espacios no solo contribuyen a la alimentación, sino que también representan una fuente de ingresos para la economía rural.



Huertos Familiares en Tabasco:
Elementos para una política
integral en materia de ambiente,
biodiversidad, alimentación,
salud, producción y economía

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