

Amphibian Diversity in Laguna Maxbal, Guatemala: An Ecotone to Conserve

Paola Cotí Lux¹, Jean-Luc Betoulle², Daniel Ariano Sánchez³

¹Unidad de Investigación, FUNDAECO (paoniz@gmail.com)

²Director de Unidad de Investigación, FUNDAECO (j.betoulle@fundaeco.org.gt)

³Director de Proyectos, Zootropic (darianosanchez@gmail.com)

Photographs by the senior author except where noted.

The Department of Huehuetenango in Guatemala has been identified as an area with high endemism among its insect and amphibian populations at elevations of 900–2400 m above sea level (Stuart 1943, Schuster et al. 2000, Schuster and Cano 2005, Campbell and Vannini 1998). However, given the levels of biodiversity and endemism (Jolón-Morales 2007), conservation efforts in the department have been limited, especially in the northern region, which has been identified as one of the major gaps in the Guatemalan System of Protected Areas (SIGAP from its Spanish acronym).

In 2008, the NGO FUNDAECO initiated a project to establish a system of protected areas in the northern region of Huehuetenango. To this end, the project is building a social and institutional base to support local conservation by identifying and prioritizing sites with high biodiversity in relation to their social, political, and institutional feasibility.

In August and October 2008, we conducted inventories of biological diversity in Laguna Maxbal, located in northern Huehuetenango in the town of Barillas. This lake is of karst origin, fed by an underground spring,



Laguna Maxbal, Barillas, Huehuetenango.



JEAN-LUC BETOULLE

A Long-limbed Salamander (*Nyctanolis pernix*) captured in the forest near Laguna Maxbal.

Table 1. Amphibian species identified in the forest near San José Maxbal and San Ángel.

Species (N)	Elevation (masl)	Microhabitat
<i>Bolitoglossa occidentalis</i> (1)	1443	10 cm above the ground on a seedling
<i>Bolitoglossa rufescens</i> (29)	1740–1780	0.2–1.0 m above the ground on palm leaves or shrubs
<i>Bolitoglossa cuchumatana</i> (3)	1730	1 m above the ground on palm leaves
<i>Nyctanolis pernix</i> (1)	1443	1.5 m above the ground on a tree covered with moss
<i>Bradytriton silus</i> (2)	1725	1 m above the ground on the leaf of a seedling
<i>Craugastor xucanebi</i> (5)	1230–1515	0.1–2.0 m above the ground on tree trunks covered with moss
<i>Craugastor chac</i> (1)	1276	In leaf litter
<i>Incilius valliceps</i> (7)	1360–1535	Among litter and stones
<i>Incilius macrocristatus</i> (1)	1344	In leaf litter
<i>Plectrohyla matudai</i> (2)	1460	Along stream banks on rotting logs
<i>Lithobates berlandieri</i> (13)	1240–1400	Along banks of the lagoon and pools in the stream
<i>Agalychnis moreletii</i> (1)	1550	0.5 m above the water on a seedling leaf
<i>Ptychohyla</i> sp. (1)	1550	2 m above a pool in a shrub

and lacks any surface inlet or outlet. Local people use the relatively small, exceptionally beautiful lake for recreation, but tourists seldom visit.

Two communities inhabited by people of the Kanjobal ethnic group are situated along the southwestern side of Laguna Maxbal. San José Maxbal (1200–1500 m asl; UTM 0680644 N, 1765346 W) and San Ángel to the east (1500–1800 m asl; UTM 0674986 N, 1766636 W)

are surrounded by well-preserved forest that forms a transition zone (or ecotone) between tropical lowland forest and high-elevation cloud forest. The composition and richness of both amphibian and bird populations are remarkable. For example, we observed species such as the Resplendent Quetzal (*Pharomachrus mocinno*) and Highland Guan (*Penelopina nigra*), both typical of cloud forests, as well as the Black-faced Grosbeak



Critically endangered Morelet's Treefrog (*Agalychnis moreletii*) from the community of San Ángel at 1500 m above sea level.



Stream Frogs (*Ptychohyala* sp.) range from southern Mexico through Central America.



View of the forest in the community of San Ángel.

(*Caryothraustes polioaster*) and the Plain Xenops (*Xenops minutus*), which usually are found in tropical lowland forest.

Amphibian diversity

Thirteen species were identified (Table 1): *Bolitoglossa occidentalis*, the Northern Banana Salamander (*Bolitoglossa rufescens*), *Bolitoglossa cuchumatana*, the Long-limbed Salamander (*Nyctanolis pernix*), the Finca Chiblac Salamander (*Bradytriton silus*), *Craugastor xucanebi*, *Craugastor chac*, the Gulf Coast Toad (*Incilius valliceps*), *Incilius macrocristatus*, *Plectrohyla matudai*, the Rio Grande Leopard Frog (*Lithobates berlandieri*), Morelet's Treefrog (*Agalychnis moreletii*), and Stream Frogs (*Ptychohyala* sp.). Of particular significance is the presence of *Bradytriton silus*, which is endemic to northwestern Guatemala. This species was described in 1983 and the first specimens were collected in already disturbed areas (Elias and Wake 1984). During our sampling, we found two individuals at 1,745 m asl in the primary forest characteristic of this area.

Another interesting find was that of a single *Nyctanolis pernix* in San José Maxbal. This rare species is threatened by habitat destruction, and was previously known from only four localities of pine-oak cloud forest at 1200–1610 m asl (Elias and Wake 1983; Carlos Vásquez, pers. comm. 2009).¹ This individual was found one night during heavy rain 1.5 m high on a tree covered with moss.

The amphibian assemblage from the vicinity of Laguna Maxbal includes endemic species with restricted habitat as well as common species with extended distributions. Of the 13 species identified, six are considered Threatened according to the IUCN Red List (IUCN 2010). *Bradytriton silus* and *Agalychnis moreletii* are listed as Critically Endangered (CR), *Nyctanolis pernix* as Endangered (EN), and *Plectrohyla matudai*, *Craugastor xucanebi*, and *Incilius macrocristatus* as Vulnerable (VU).

Based solely on the amphibian diversity found during sampling at Maxbal, the preservation of the forest is of considerable importance. Although we assigned this region a high conservation priority because it is still well preserved and integrated, the integrity of this forest region nevertheless faces threats that include changing land use patterns, deforestation, and the construction of roads. The first steps necessary for protecting the biodiversity of

Laguna Maxbal will be the continuation of current biological surveys and the promotion of partnerships between local communities and environmental institutions that can lead to the establishment of a protected area system.

Acknowledgements

We thank the communities of San José Maxbal and San Ángel for their help and hospitality. The Tropical Forest Conservation Fund (FCA) and FUNDAECO provided financial and technical support for this study. CONAP issued permits for the research. Obdulio Javier, Antonio López, Miguel Ramírez, Mónica Barrientos, Lili Elias, Jorge Luis Hernández, Juaimar Jiménez, Margarita Palmieri, Enio Cano, Jack Schuster, Elfriede Pöll, Pedro Pardo Villegas, Jorge Jiménez, and Miguel Flores helped in various ways.

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¹ At the northeastern extreme of the Sierra de los Cuchumatanes (Finca Chiblac, Barillas, Guatemala); near Laguna Montebello in northern Chiapas, México; in Alta Verapaz and in the Sierra de las Minas above Purulhá, Guatemala.

