

First record of margay (*Leopardus wiedii*) in cloud forest of Guatemala

Primer registro de margaya (*Leopardus wiedii*) en bosque nuboso de Guatemala

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The margay (*Leopardus wiedii*) is a small to medium-sized Neotropical felid classified as endangered in Guatemala. Non-invasive methods have been recommended to detect elusive species with nocturnal habits in tropical environments. In this work, we present the first photographic record of margay in the Mario Dary Rivera University Biotope for Quetzal Conservation, department of Baja Verapaz using camera traps. This record represents the highest altitude observation for this species in the cloud forests of Guatemala. We used 7 camera traps, 4 LeafRiver™ model C-1BU with Canon © Sure Shot Owl camera, and 3 DeerCam (860 Park Lane, Park Falls WI 54551). The camera traps were installed for 16 consecutive days (February 21 to March 8, 2008), and programmed to take pictures and with the date and hour of each photo recorded automatically. With a total effort of 110 traps/night, we obtained one record of margay in one camera trap in a cloud forest, confirming the presence of this feline at 1,770 m. This photographic record is the first confirmed evidence of the presence of margay in the cloud forest of the Mario Dary Rivera University Biotope for Quetzal Conservation, at 3.3 km southeast of the municipal town of Purulhá. We recommend the implementation of long-term monitoring programs within the area using camera traps, aiming to investigate elusive species with nocturnal-crepuscular habits to promote conservation strategies.

Key words: Altitude; camera trap; carnivore; felidae; record.

El margay (*Leopardus wiedii*) es un felino Neotropical de tamaño pequeño a mediano clasificado como en peligro de extinción en Guatemala. Para detectar especies sigilosas o de hábitos nocturnos en ambientes tropicales se ha recomendado utilizar métodos no invasivos. En este trabajo, presentamos el primer registro fotográfico de margay en el Biotopo Universitario Mario Dary Rivera para la Conservación del Quetzal, departamento de Baja Verapaz, utilizando trampas cámara. Este registro representa la observación a mayor altitud para esta especie en bosques nubosos de Guatemala. Utilizamos 7 trampas cámara, 4 LeafRiver™ modelo C-1BU con cámara Canon© Sure Shot Owl y 3 DeerCam (860 Park Lane, Park Falls WI 54551). Las trampas cámara fueron instaladas durante 16 días consecutivos (21 de febrero al 8 de marzo de 2008) y fueron programadas para obtener fotografías con la hora y fecha impresa. Con un esfuerzo total de 110 trampas/noche, obtuvimos un registro de margay en una trampa cámara en bosque nuboso, confirmando la presencia de este felino a 1,770 m. Este registro fotográfico es la primera evidencia confirmada de la presencia de margay en el bosque nuboso del Biotopo Universitario Mario Dary Rivera para la Conservación del Quetzal, a 3.3 km al sureste del poblado municipal de Purulhá. Recomendamos la implementación de programas de monitoreo a largo plazo utilizando trampas cámara dentro del área, con el objetivo de investigar especies esquivas con hábitos crepusculares, nocturnos, para promover estrategias de conservación.

Palabras clave: Altitud; carnívoro; Felidae; registro; trampa cámara.

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The margay or tigrillo (*Leopardus wiedii*; Schinz, 1821) is one of the five wild cat species inhabiting Guatemala (Reid 2009). The margay ranges from the tropical lowlands of México south through Central America and the Amazon basin to southern Brazil and Paraguay (Nowell and Jackson 1996). The margay is strongly associated with forest habitat/tree cover, from continuous forest to small forest fragments in savanna ecosystems, both evergreen and deciduous, and occasionally recorded outside forested areas (Nowell and Jackson 1996; de Oliveira 1998, 2011). Margays have morphological adaptations that make them excellent climbers, such as long tails that they use for balance and ankles that rotate up to 180° (Hunter 2015).

This felid lives from sea level up to 1,500 m height but rarely has been recorded up to 3,000 m in the Andes

(de Oliveira 1994; Espinosa et al. 2018). Previous photographic record for Guatemala in cloud forest was reported at 1,750 m (Mármol-Kattán et al. 2019). Due to its elusive characteristics, it is one of the most difficult animals to observe. For this reason, it is suggested the use of camera traps to document its presence, abundance, and distribution (Tobler et al. 2008; Vanderhoff et al. 2011). In Guatemala, the margay is classified in Category 2, risk of extinction, of the threatened species list by the Consejo Nacional de Áreas Protegidas (CONAP 2009). The International Union for the Conservation of Nature assess this cat as Near Threatened with a decreasing population trend (de Oliveira et al. 2015). The Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES 2020) lists the margay in Appendix I that includes the most endangered species.

In Guatemala, the margay has been documented by photographic records in private natural reserves of the volcanic mountain range and Zacapa (Escobar-Anleu *et al.* 2017), Izabal (Escobar-Anleu 2019), Petén (Moreira-Ramírez *et al.* 2009, 2011), and Baja Verapaz (Mármol-Kattán *et al.* 2019). In order to advance in margay conservation strategies, we need evidence about its occurrence and thus define research and management policies. Here we present the first photographic record of margay in the Mario Dary Rivera University Biotope for Quetzal Conservation, being the first record higher than 1,750 m in a cloud forest of Guatemala. This reliable record will help to update the distributional range and conservation programs.

The Mario Dary Rivera University Biotope for Quetzal Conservation (BQ) is located in central Guatemala, northeast of Sierra Chuacús between the municipalities of Purlhá and Salamá, in Baja Verapaz department (15° 12' 47.45" N, 90° 13' 2.21" W; Figure 1). Since 1976, BQ has been managed by the Center for Conservation Studies of the University of San Carlos de Guatemala. It includes 1,017 ha of cloud forest with a buffer zone of 5,241 ha and

an altitude range between 1,500 and 2,348 m. The average annual rainfall is 2,092 mm, with January-April with the least precipitation. The annual average temperature is 18 °C, with range between 14 and 20 °C. The average relative humidity ranges between 89.5 and 98.9 %. Average annual humidity is 93.9 %. Vegetation includes ferns, mosses, lichens, orchids that grow abundant on trees up to 30 m height such as *Engelhardia guatemalensis*, *Magnolia guatemalensis*, *Quercus* spp., and *Dendropanax arboreus* (Basterrechea 1999).

To evaluate the presence of mammals, we used 7 camera traps, 4 LeafRiver™ model C-1BU with Canon © Sure Shot Owl camera, and 3 DeerCam (860 Park Lane, Park Falls WI 54551). We placed camera traps for 16 consecutive days (21 February to 8 March 2008). To avoid data loss, on the seventh day of sampling, we checked the camera traps, changing batteries and rolls. The location of camera traps was based on the presence of animal signs (*e.g.*, tracks, scratches, caves) as indicators (Moreira-Ramírez *et al.* 2009). Camera traps were set up along the sides of interpretive trails and spaced 50 to 400 m apart. For the 2 models of

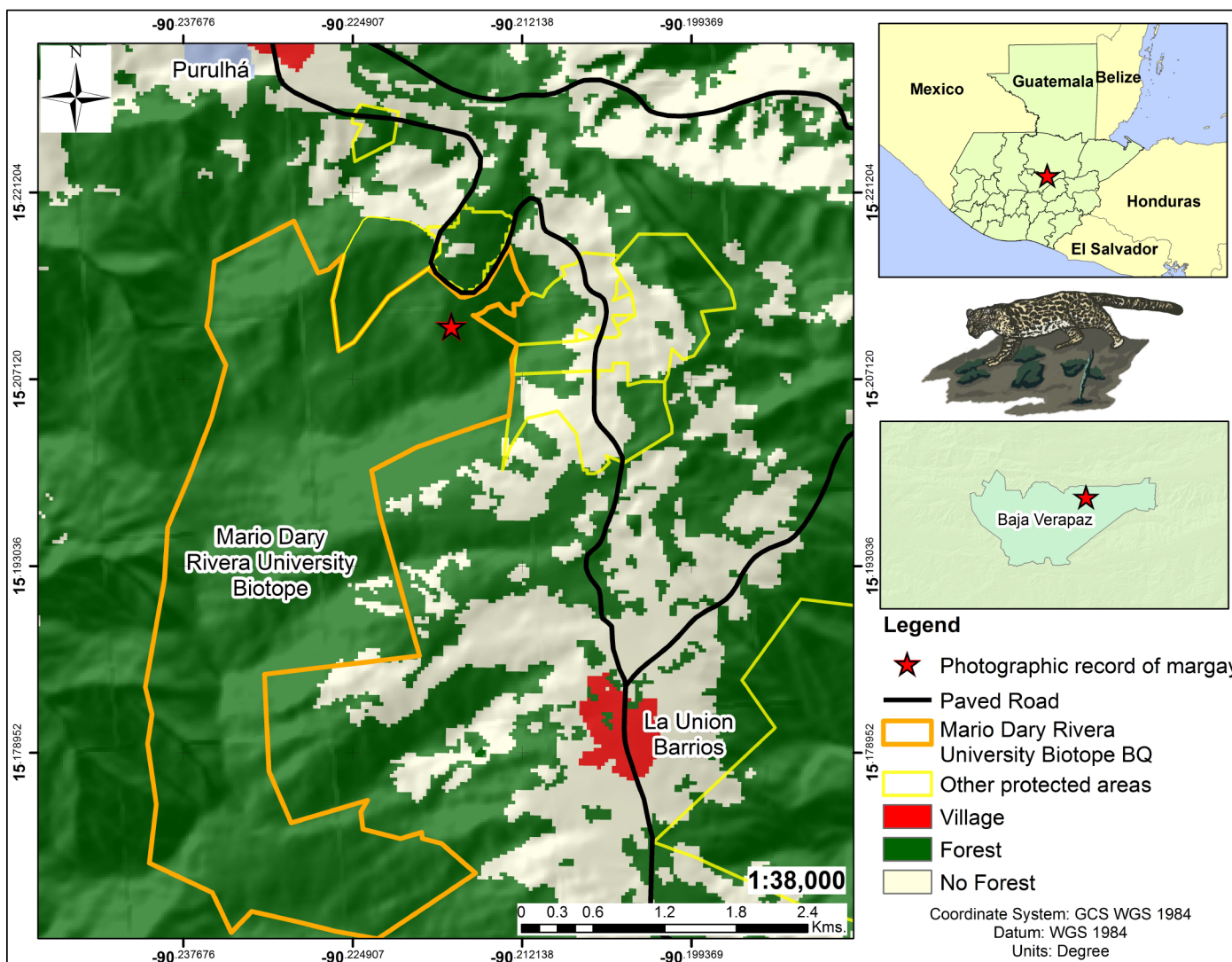


Figure 1. Map of the Mario Dary Rivera University Biotope for Quetzal Conservation, Baja Verapaz, Guatemala, showing the site of the margay photographic record (red star).

camera traps, we used rolls of 24-print, 400 ASA 35-mm film. The camera traps were set for 24-hour operation with a delay of one minute between consecutive photographs at a height of 30 to 40 cm. The photographs were stored in the database of WCS Guatemala Program.

The total trapping effort was 110 trap/nights. During the sampling period, we photographed for the first time a margay in the BQ. The record of margay was obtained in 1 camera trap at an altitude of 1,770 m (15° 12' 40.05" N, 90° 13' 2.85" W) in the cloud forest, 3.3 km southeast of the municipal town of Purulhá, Baja Verapaz. The photographic record was obtained on February 26, 2008, at 23:41 hr (Figure 2). We identified the species based on the distinguishing features of margays: very large and bulging eyes, and very long tail measuring up to 70 % of the head and body length and which is usually thick in appearance (de Oliveira 1998).

The margay is uncommon to rare throughout its range (de Oliveira et al. 2015). Our record of margay is important because it is the first record to confirm its presence in the BQ, a protected area declared in 1976. It is also one of the few records in the cloud forest and the highest in Guatemala. Previously, there was no evidence in scientific litera-

ture documenting the presence of this species in the BQ (Nagy-Reis et al. 2020; SNIBgt 2020), although comments from local rangers indicated a certain probability. This record confirms for the second time the presence of margay in Baja Verapaz department. Additional photographic records were obtained in the Ranchitos del Quetzal Natural Reserve between 2017 to 2019 at 1,680 - 1,750 m (Mármol-Kattán et al. 2019). This nature reserve borders the north of the BQ and embraces a continuous protected cloud forest of approximately 1,300 ha. Our record confirms a new altitude for this species, obtained at 1,770 m in cloud forest, being higher than reported in 2019. In México, there are records of margays in cloud forests for the states of Guerrero, Jalisco, Morelos, Oaxaca, and San Luis Potosí, at elevations between 800 and 2,750 m (Aranda et al. 2012; Carvajal-Villarreal et al. 2012; Cinta-Magallón et al. 2012; Almazán-Catalán et al. 2013; Aranda and Valenzuela-Galván 2015). In Costa Rica and Colombia, this cat was documented at altitudes of 1,529 and 2,313 m, respectively (González-Maya et al. 2018).

The margay is strongly associated with forest habitat/tree cover, from continuous forest to small forest fragments (de Oliveira 2011), under moderate levels of habitat modi-



Figure 2. Photographic record of margay (*Leopardus wiedii*) in the Mario Dary Rivera University Biotope for Quetzal Conservation, Baja Verapaz, Guatemala. The distinguishing features of margays include a very long tail measuring up to 70 % of the head and body length.

fication and human disturbance (Horn et al. 2020). The presence of margay suggests that the BQ still maintains habitat in good conservation status. We recommend the implementation of long-term monitoring programs within the BQ and adjacent protected areas aiming to investigate elusive species with nocturnal-crepuscular habits. This research tool will contribute to generating robust information and conservation strategies. Finally, we suggest evaluating margay as a possible conservation element for the BQ.

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