

New locality records of the Mixteca cloud forest tree frog *Charadrahyla sakbah* from Guerrero, Mexico

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Hylid frogs are among the most studied anurans of Middle America, and yet basic knowledge beyond original descriptions on many species is scarce or non-existent. The Sierra Madre del Sur of Guerrero and Oaxaca is one of the most diverse regions of Mexico, and harbours as many as 99 species of amphibians, of which 36 are hylids and 20 of them are restricted to that region (Mata-Silva et al., 2015; Palacios-Aguilar & Flores-Villela, 2018). Recently, a new species of hylid frog, *Charadrahyla sakbah* Jiménez-Arcos, Calzada-Arciniega, Alfaro-Juantorena, Vázquez-Reyes, Blair & Parra-Olea (2019) was described from the cloud forests of western Oaxaca. Here we present the first records of this species in the state of Guerrero, Mexico.

On 21st April 2018 during an environmental impact survey a subadult female of *C. sakbah* (Museo de Zoología, Facultad de Ciencias, UNAM [MZFC] 35630) was collected inside a bromeliad on a pine tree in a ravine near La Sabana, municipality of Tlacoapa, Guerrero, Mexico (17.29685°N, -98.71607°W; 2121 m). This locality extends the known distribution of the species 101 km west of the nearest record at Río Chite Ku'e (Río de las Mil Cascadas), San Isidro Paz y Progreso, Oaxaca, the type locality of the species (Jiménez-Arcos et al., 2019).

Two inactive subadults of *C. sakbah* (MZFC 35633–634; Fig. 1) were collected on boulders from Arroyo Totoapa, between Chilmixtla and Los Mesones, municipality of Atlixac, Guerrero, Mexico (17.54415° N, -98.89146° W; 1760 m), on 29th December 2019 between 10:00–13:00 h. This locality is 129 km west-north-west from the type locality and 34.5 km north-west from the Tlacoapa record reported herein. Additional specimens (University of Texas at Arlington [UTA-A] 54815, and MZFC 16897) from "120 km by road E Chilpancingo, stream jct W of Mezones (17.54783° N, -98.899° W; 1795 m)" have been reported by Campbell et al. (2009) as *Charadrahyla trux* but not plotted on their map. This locality is approximately 1 km west from our records from Arroyo Totoapa and the specimens are metamorphosing young.



Figure 1. Subadult specimen of *Charadrahyla sakbah* from Arroyo Totoapa, Atlixac, Guerrero, Mexico in life (MZFC 35634)

The specimens reported herein were identified as *C. sakbah* by the presence of axillary membranes, conical tubercles on the sides of the cloaca, white ventral coloration, and banded limbs (see Campbell et al., 2009 and Jiménez-Arcos et al., 2019 for comparative tables for the genus).

With the additional records herein, the distributional range of *C. sakbah* has been increased greatly (Fig. 2). The species is now known from the eastern portion of the Sierra Madre del Sur of Guerrero, westwards to Santiago Yosondúa, Oaxaca (Mata-Silva et al., 2019; MZFC 34760, 34807–34808), in an altitudinal range of 1390–2120 m a.s.l. It is likely that the species' distribution is restricted to the west of Atlixac, Guerrero by several semi-arid valleys covered by tropical deciduous forest and to the east of Yosondúa, Oaxaca by the tributaries of the Río Verde (Fig. 2). The known localities of *C. sakbah* and *C. trux* are separated by ca. 110 km, and although it is likely that the geographic range of both species might be expanded towards the west and east respectively,

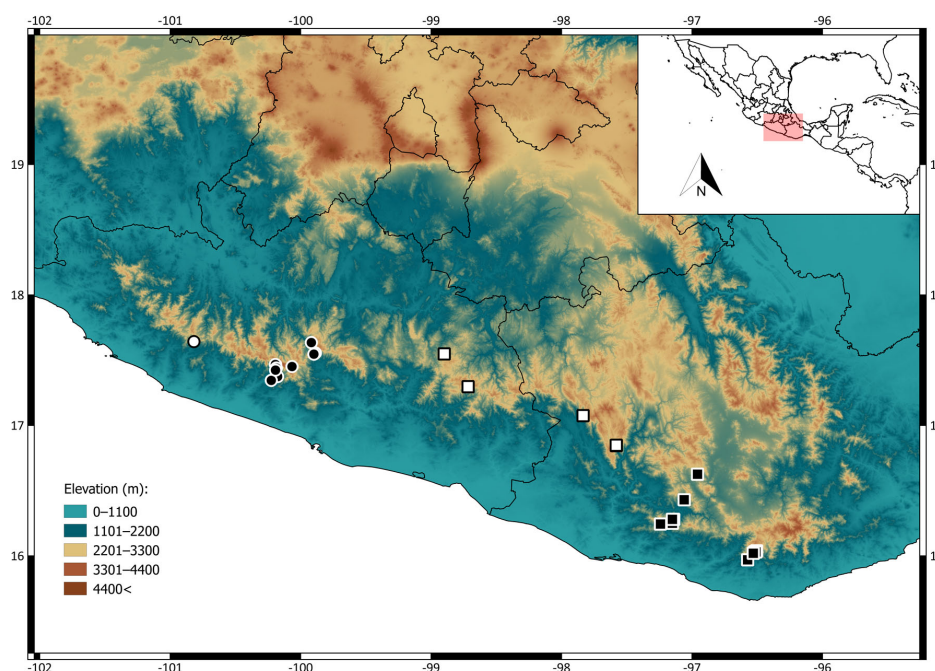


Figure 2. Distribution of the ‘large-bodied’ species of the genus *Charadrahyla* in the Pacific versant of the Sierra Madre del Sur. Open circle- *C. tecuani*; closed circles- *C. trux*; open squares- *C. sakbah*; and closed squares- *C. altipotens*

both species seem to be isolated from each other by a series of intermontane valleys and lower elevations that break the continuity of cloud and oak forests which makes the sympatry of the two unlikely (Campbell et al., 2009; Duellman, 2001). The same might apply to *Charadrahyla altipotens* and *C. sakbah*, separated by about 75 km and the tributaries of the Rio Verde (DeSantis et al., 2016; Mata-Silva et al., 2019).

A new panorama of the biogeography of these frogs is emerging, where apparently the allopatric speciation by vicariance may have played an important role shaping the diversity of the genus, as has been reported similarly in other amphibian groups (Rovito, 2017). The use of molecular techniques would help to elucidate questions regarding the evolutionary history, speciation patterns and the species limits of these and other amphibian groups of southern Mexico.

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