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NOTES ON GEOGRAPHIC DISTRIBUTION

Osteocephalus mimeticus (Melin, 1941) (Amphibia: Anura: Hylidae): New locality, range extension and notes on distribution

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ABSTRACT: We report a new locality for *Osteocephalus mimeticus* from southeast Peru which is the first record for the Madre de Dios region and a first record for Manu Biosphere Reserve. Combined with data from recent literature it also supposes a range extension of ~210 km to the southeast. We provide notes related to the environment in which this species has been found, along with photos of different individuals. We have produced a potential range map for the species, derived from known confirmed localities in which *O. mimeticus* has been previously found, combined with environmental and climatic data.

Osteocephalus mimeticus is a tree frog species that ranges in the Andean eastern foothills of north and central Peru and in the adjacent lowlands. This species is catalogued as Least Concern in the IUCN Red List (Angulo *et al.* 2004). We report a new locality record for this species from southeast Peru that is the first record for the Madre de Dios region and a first record for Manu Biosphere Reserve. Along with information from Jungfer *et al.* (2013) we provide a map which supposes a range extension of ~210 km to the southeast, in southern Peru.

Between 3rd March - 23rd October 2012, ten adult individuals of *O. mimeticus* were found at the side of a fast flowing stream in the Mascoitania land (71°24'15.394"W; 12°48'4.291"S, 518 m asl), on the western side of the Alto Madre de Dios basin, Madre de Dios Region. Two of the individuals were female (SVL = 78-83.1 mm) and eight were male (SVL = 55-57 mm).

The locality Mascoitania holds a research station and lodge; the Manu Learning Centre (71°23'28.06"W; 12°47'21.849"S, 460 m asl) that is situated next to the Alto Madre de Dios River in the buffer area of Manu National Park, on the eastern Andean foothills; between Manu National Park and the Amarakaeri Communal Reserve (Figure 1). It is a 643 ha private reserve owned by the crees foundation, that hosts tourism, research and volunteering activities. It contains areas of primary terra firme, regenerating logged, regenerating clear-felled and bamboo forest with an altitudinal gradient of approximately 460-700 m asl. At the Manu Learning Centre 63 confirmed species of amphibians have been recorded to date, including another three species of the genus *Osteocephalus*: *O. helenae* (also found in the same stream but usually found near small standing pools of water at the sides of the main river or within the forest), *O. taurinus* (breeding associated with seasonal temporary ponds) and *O. castaneicola* (associated with breeding in bamboo and bromeliads; arboreal water sources).

The map shown in Figure 1 was created using confirmed sightings. Environmental factors were obtained from WorldClim (version 1.4; http://www.worldclim.org/; Hijmans *et al.* 2005) and used to predict the potential distribution map of *O. mimeticus* with the

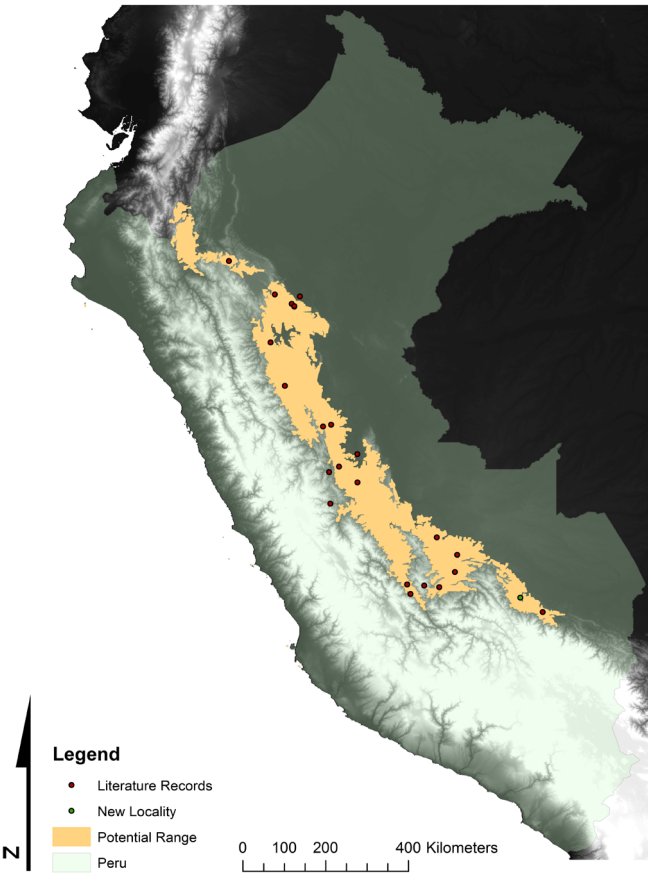

FIGURE 1. Map showing locality records of *Osteocephalus mimeticus* and a potential predicted range using MaxEnt. Based on locality records reported in Chávez and Vásquez (2012), Henle (1981) and Jungfer (2010; 2013). Also showing the situation of the Manu Learning Center and the Mascoitania land (new locality).

modelling program MaxEnt (version 3.3.3e; http://www.cs.princeton.edu/~schapire/maxent/; Phillips *et al.* 2004; 2006). MaxEnt has been shown to perform well at low sample sizes (Hernandez *et al.* 2006; Raxworthy *et al.* 2007), as in the case of *O. mimeticus*.

Five pilot models were constructed using the WorldClim data each focussing on a different environmental variable (e.g. precipitation). Variables with the highest percent contribution to each pilot model were used to construct a further model (Baldwin and Bender 2008). This model was jackknifed to assess variable importance and to point out highly correlated variables (Baldwin 2009). Variables for the final model were chosen (Appendix A) and the model bootstrapped (100 replicates) to create a continuous logistic output of probability distribution. The average training area under curve (AUC) value for the replicate runs in the receiver operator characteristic (ROC) output was 0.984 showing a very good model fit.

To create a binary presence/absence map the output was processed using ArcGIS 10 using the 10 percentile training presence logisitic threshold (Cao *et al.* 2013). Land-cover classification was not used in the model due to the temporal scale of the occurrence records (Anderson and Martínez-Meyer 2004). This may have led to some overprediction and it should be noted the map shows potential distribution and not realized distribution (Phillips *et al.* 2006). Further work is required in both sampling effort and identification of potentially uninhabited areas.

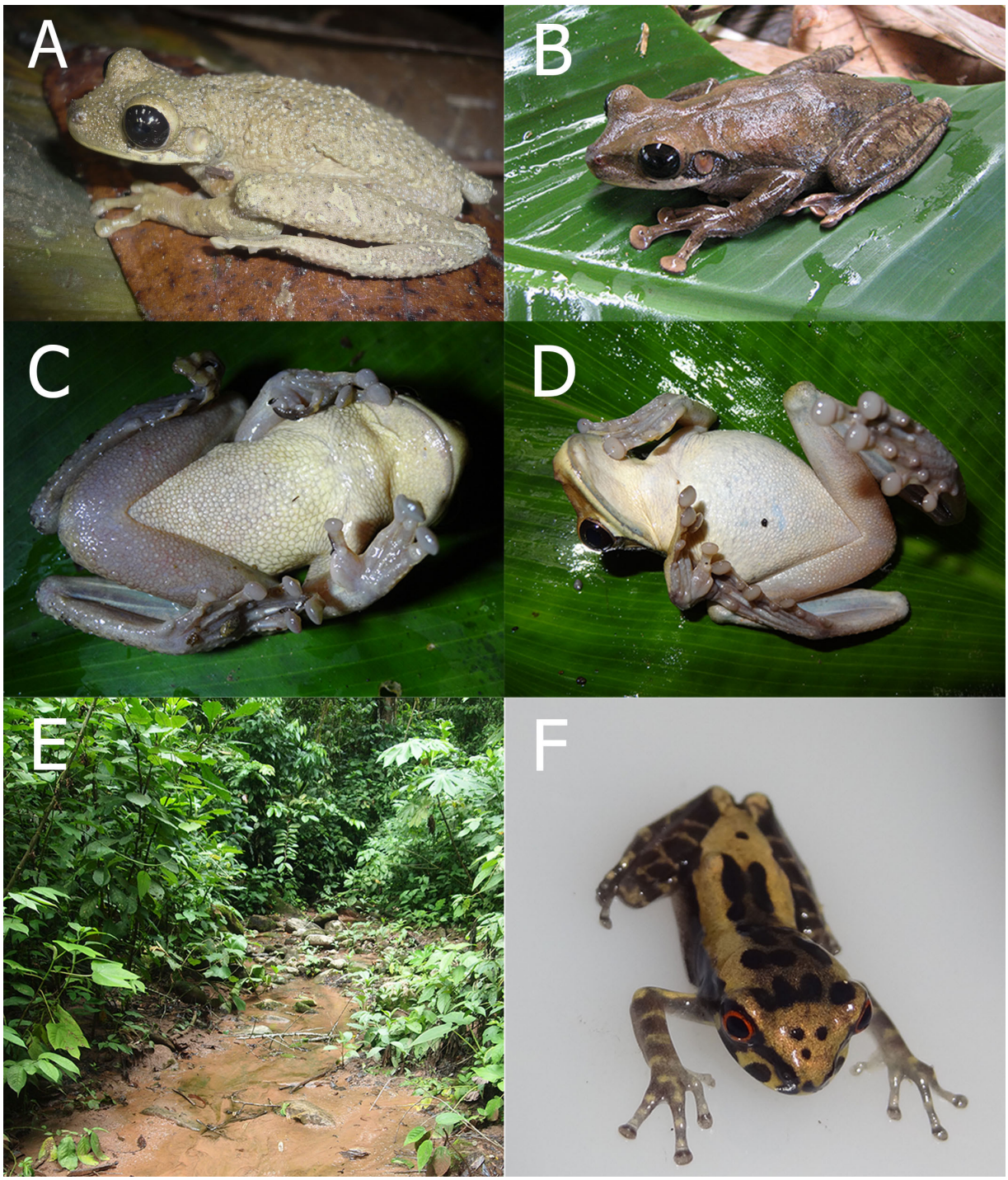

Figure 2. (A) MUSM #31350, male, SVL = 35.3 mm (B) MUSM #31349, female, SVL = 78 mm (C) Ventral surface of male; MUSM #31660, SVL = 55 mm. (D) Ventral surface of female; MUSM #31661, SVL = 83.1 mm. (E) Mascoitania stream, where the adults, meta-morphs and tadpoles were found. (F) Juvenile, not collected.

We suggest that this species only persists where a suitable niche and breeding site is found.

All the individuals of *O. mimeticus* were found at the side of the Mascoitania Stream (Figure 2-E), one of the main streams running through the reserve, into the Alto Madre de Dios River, sourcing from the Piñi-Piñi range to the west. Mascoitania Stream is a rocky fast-moving stream where individuals were found in low branches and leaves, but two males were found on the ground on a sandy stream bank. It appears that *O. mimeticus* chooses an area of these fast flowing rocky streams, that has a slower moving current, and still/slow moving pools at the side to breed in (April-September), following the higher water levels of the wet season (November-February). Shortly after finding many of the adults, various juveniles were encountered sitting on low lying vegetation along the sandy banks.

Individuals fit the description by Henle (1981; 1992). They show strong sexual dimorphism in size and skin texture. Males have a strongly tuberculated dorsum and all of those encountered were found in breeding condition (Figures 2A and 2C). Females had a smooth skin and two specimens that were taken contained eggs, more than 900 in MUSM #31349 (Figures 2B and 2D). Both sexes have a dark brown iris with small golden blotches or lines in the centre area/around the pupil. Juveniles have a golden ground coloured dorsum with black mottling in the centre, the limbs are coloured in a similar way but with bolder mottling and the flanks are completely black. The iris is bright orange/red in colour (Figure 2F).

Four voucher specimens (two males; MUSM #31350 & #31660 and two females; MUSM #31349 & #31661) were deposited at the Universidad Nacional Mayor de San Marcos in Lima**,** Peru (Permit provided by the Ministerio de Agricultura of Peru; Permit Number 'Codigo de Tramite': 25397; Authorisation Number 'Autorización No.' 2904-2012-AG-DGFFS-DGEFFS).

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Appendix. A description of variable layers used to develop the predicted potential range in Figure 1 and the contribution and permutation importance of each layer.

VARIABLE	% CONTRIBUTION	% IMPORTANCE
Average precipitation for August	27.4	20.1
Average minimum temperature for December	17	22.8
Slope	13.6	5.2
Temperature annual range (Max temperature of warmest Month - Min temperature of coldest month)	11.7	2
Northness	8.9	7.7
Altitude	6.4	14.4
Eastness	4.8	3
Precipitation of driest quarter	4.6	9.2
Average maximum temperature for August	2.9	3
Temperature Seasonality (standard deviation *100)	1.4	5.2
Mean Diurnal Range (Mean of monthly (max temp - min temp))	1.4	7.6