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# New geographic and altitudinal range extension of the rare *Pristimantis divnae* Lehr & von May, 2009 (Anura: Craugastoridae) in Peru

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**Abstract:** *Pristimantis divnae* is a nocturnal, semi-arboreal species found in lowland forests of southern Peru in the departments of Cusco, Madre de Dios and Puno. Here, we present a 382 km geographical range extension and the first record at 980 m elevation, increasing the known vertical distribution by 678 m. This is also the first record of this species from premontane forest, suggesting that habitat requirements of *P. divnae* are broader than originally anticipated.

**Key words:** direct-developing frog, Ceuthomantinae, Amarakaeri, Machiguenga, Cusco

The family Craugastoridae Hedges, Duellman, & Heinicke, 2008, contains 747 species (Frost 2015). This family includes *Pristimantis* Jiménez de la Espada, 1870, which is the most diverse genus of terrestrial vertebrates (Glaw and Köhler 1998) with 484 species (Frost 2015). Interestingly, 20% of *Pristimantis* species have been described just over the last 10 years. *Pristimantis* are distributed from Honduras in Central America through the South American Andes, Amazon Basin, Guiana Shield and Atlantic forests to northern Argentina and southern Brazil, and can also be found in Trinidad and Tobago, Grenada and the Lesser Antilles (Frost 2015). Among the 420 *Pristimantis* species assessed by the IUCN Red List (2014), nearly a third is categorized as data deficient, often because distribution records are sparse, resulting in a limited understanding of species-specific ecological requirements.

*Pristimantis divnae* was described recently by Lehr and von May (2009) based on six specimens recorded in 2006 and 2008 within relatively close proximity of one another (25 km) in Los Amigos Conservation Concession (type locality, 12°34′07″ S, 070°05′57″ W; coordinates for two paratypes are unpublished) in the department of Madre de Dios, between 250–300 m above sea level (a.s.l.). Since then, two additional specimens have been documented: one in the Tambopata Nature Reserve (13°7′20″ S, 069°36′55″ W, 238 m a.s.l.) in August 2012 (von May, pers. comm.) and another in July 2013 near the Chocolatillo River within Bahuaja Sonene National Park (13°11′41.5″ S, 070°07′56.7″ W, 302 m a.s.l.) in the department of Puno (Lujan and Venegas 2014). These sites are all typical of Amazonian lowland rainforest, and *P. divnae* was found in bamboo, *terra firme*, and floodplain forest, exhibiting a wide breadth of habitat use at these low elevations.

*Pristimantis divnae* is characterized by having a shagreen dorsum with scattered tubercles with no dorsolateral fold, an areolate venter with dark blotches, tympanic annulus barely visible and lacking tympanic membrane, absence of cranial crests, small tubercles on the upper eyelid, fingers with discs and narrow fringes, metatarsal tubercles and inner tarsal folds, toes with basal webbing and narrow fringes, males with no vocal slits or nuptial pads, and a W-shaped mark in the scapular region (Lehr and von May 2009). Adult males are 21.6–23.4 mm SVL (Lehr and von May 2009; Lujan and Venegas 2014), but females are unknown. The new species was originally placed in the *Pristimantis unistrigatus* group (Lehr and von May 2009), but recent phylogenetic studies on New World direct-developing frogs have called into question the monophyly of the group (Pinto-Sánchez et al. 2012; Padial et al. 2014). *Pristimantis divnae* was removed from the *P. unistrigatus* group and left as unassigned by Padial et al. (2014).

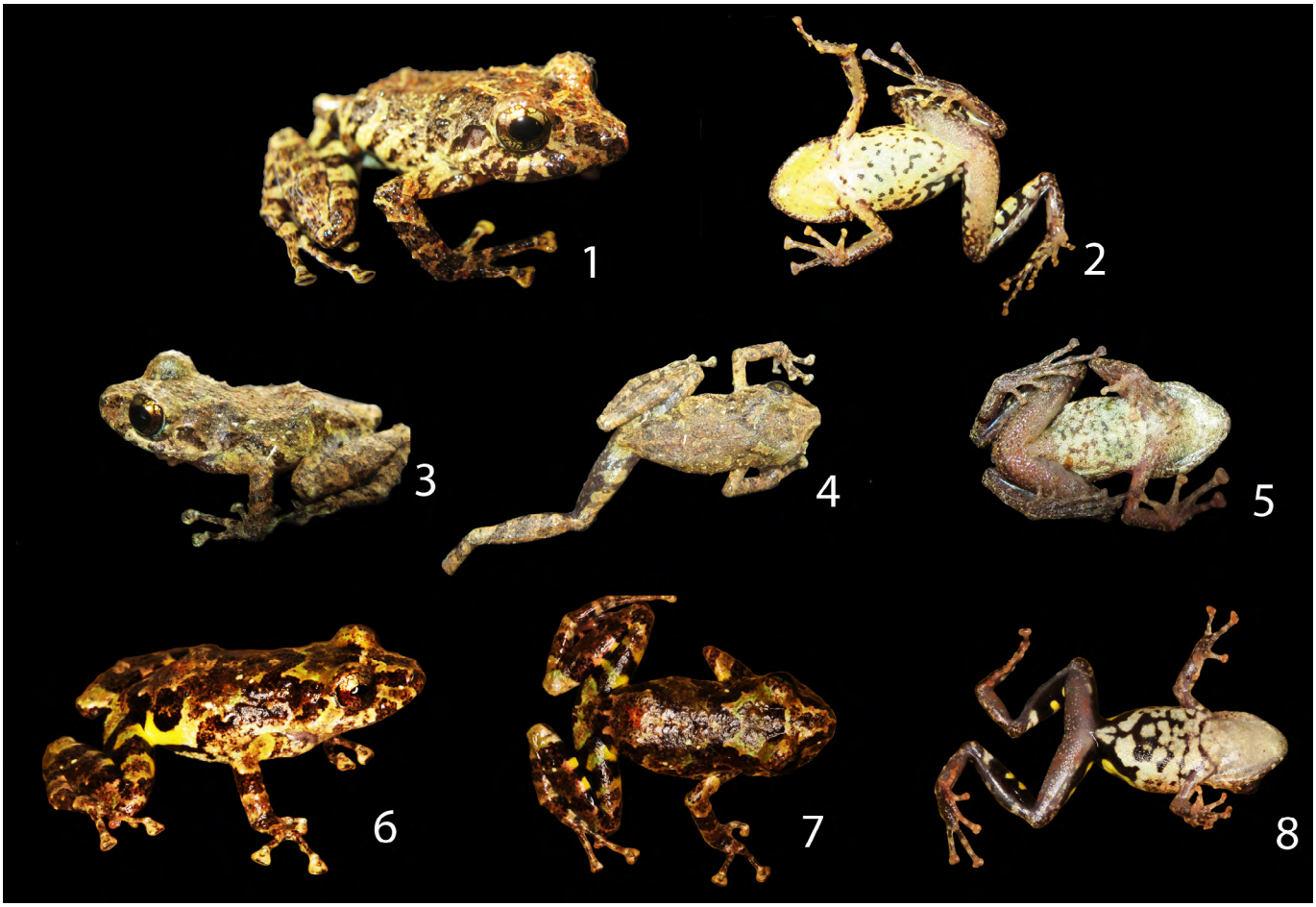
Herein we report additional specimens of *Pristimantis divnae*, extending its distributional and altitudinal

ranges in southern Peru. This work was conducted under research permit No. 004-2013-SERNANP-JRCA. All individuals were encountered active between 18:00–21:00 h. A single person (JCC) took morphometric measurements to the nearest 0.01 mm on all four individuals using a digital caliper (Table 1). Abbreviations are as follows: snout-vent length, SVL; head length (from posterior margin of lower jaw to tip of snout), HL; head width (measured at level of *rictus*), HW; eye length (measured horizontally), EL; eye to nostril distance, EN; internarial distance, IND; eye–eye distance, EE; tympanic membrane height, TYH; tympanic membrane length, TYL; width of disc of Finger III, F3; width of disc of Finger IV, F4; arm length (from posterior margin of thenar tubercle to elbow), FA; tibia length, TL; thigh length, TH (from vent to knee); foot length (from proximal border of inner metatarsal tubercle to tip of fourth toe), FL; width of disc of Toe IV, T4. Terminology for morphological characters follows Duellman and Lehr (2009). All specimens are deposited in the Museo de Historia Natural of the Universidad Nacional de San Antonio Abad del Cusco (MHNC) in Cusco, Peru.

In 2011, during an expedition to the Lower Urubamba River basin, a single female *P. divnae* (MHNC11206;

**Table 1.** Morphometric measurements of the newly recorded specimens of *Pristimantis divnae*.

| Measurement | MHNC 11203 | MHNC 11205 | MHNC 11206 | MHNC 14880 |
|---|---|---|---|---|
| Sex | male | male | female | male |
| SVL | 21.28 | 20.90 | 28.75 | 20.58 |
| HL | 9.23 | 8.65 | 12.64 | 8.64 |
| HW | 8.02 | 7.76 | 10.69 | 7.45 |
| EL | 2.75 | 2.65 | 3.63 | 2.55 |
| EN | 2.51 | 2.30 | 3.38 | 2.43 |
| IND | 1.78 | 1.62 | 2.01 | 1.59 |
| EE | 4.04 | 3.93 | 5.84 | 3.87 |
| TYH | 1.32 | 1.26 | 1.78 | 1.11 |
| TYL | 1.02 | 0.98 | 1.29 | 0.80 |
| F3 | 1.29 | 1.04 | 1.40 | 1.21 |
| F4 | 1.24 | 1.02 | 1.42 | 1.13 |
| FA | 5.06 | 5.02 | 6.57 | 4.64 |
| TL | 11.04 | 11.14 | 14.93 | 10.31 |
| TH | 11.03 | 11.11 | 13.66 | 9.39 |
| FL | 10.30 | 9.34 | 12.51 | 8.53 |
| T4 | 1.11 | 1.11 | 1.17 | 0.92 |
| TL/SVL | 0.52 | 0.53 | 0.52 | 0.50 |
| FL/SVL | 0.48 | 0.45 | 0.44 | 0.41 |
| HW/HL | 0.87 | 0.90 | 0.85 | 0.86 |
| EN/EL | 0.91 | 0.87 | 0.93 | 0.95 |
| EL/HW | 0.34 | 0.34 | 0.34 | 0.34 |
| TYL/TYH | 0.77 | 0.78 | 0.72 | 0.72 |




**Figures 1–8.** Living specimens of *Pristimantis divnae*. **1**: Lateral, and **2**: ventral view of MHNC11206 from the Machiguenga Communal Reserve, Cusco; **3:** lateral, **4:** dorsal, and **5:** ventral view of MHNC11203 from Timpia Native Community, Cusco; and **6:** lateral, **7:** dorsal, and **8:** ventral view of MHNC14480 from the Amarakaeri Communal Reserve, Madre de Dios, Peru. Photos: L. Mamani (1–5), J.C. Chaparro (6–8).



**Figure 9.** *Pristimantis divnae* (MHNC14480) was perched on the bracket fungus pictured when encountered in the Amarakaeri Communal Reserve, Madre de Dios, Peru.

**Table 2.** Matrix showing the distance (km) between recorded localities of *Pristimantis divnae*. CICRA = Los Amigos Biological Station (Type locality), CM1 = Los Amigos Research Station 1, CM2 = Los Amigos Research Station 2, BSNP = Bahuaja Sonene National Park, ACR = Amarakaeri Communal Reserve, TRC = Tambopata Research Center, MCR = Machiguenga Communal Reserve, TNC = Timpia Native Community.

| | CICRA | CM1 | CM2 | TRC | BSNP | ACR | MCR |
|---|---|---|---|---|---|---|---|
| **CM1** | 3 | | | | | | |
| **CM2** | 21 | 24 | | | | | |
| **TRC** | 81 | 80 | 102 | | | | |
| **BSNP** | 69 | 69 | 84 | 57 | | | |
| **ACR** | 111 | 112 | 101 | 152 | 94 | | |
| **MCR** | 318 | 322 | 299 | 382 | 331 | 234 | |
| **TNC** | 298 | 302 | 279 | 364 | 315 | 219 | 25 |

Figures 1 and 2) was collected on 16 August near the Machiguenga Communal Reserve (MCR), department of Cusco, Peru (12°10′41.63″ S, 073°0′9.67″ W, 695 m a.s.l.), and two males (MHNC11203, MHNC11205; Figures 3–5) were collected on 26 August at Timpia Native Community (TNC), department of Cusco, Peru (12°4′52.68″ S, 072°47′58.33″ W, 498 m a.s.l.). All were found perched on branches at 1.5 m above ground. During a more recent expedition to a site in the southern part of the Amarakaeri Communal Reserve (ACR), department of Madre de Dios, Peru (12°59′33.79″ S, 071°0′34.25″ W, 980 m a.s.l.), a single individual *P. divnae* (MHNC14880; Figures 6–8) was found on 3 October 2014 sitting on a large coriaceous bracket fungus (family Ganodermataceae; Figure 9) attached to the bark of a tree at 3.5 m above the ground.

These new records extend the distribution of *P. divnae* by approximately 382 km west of the closest published record, and increase the altitudinal distribution by 678 m (Figure 10; Table 2). Furthermore, these are the

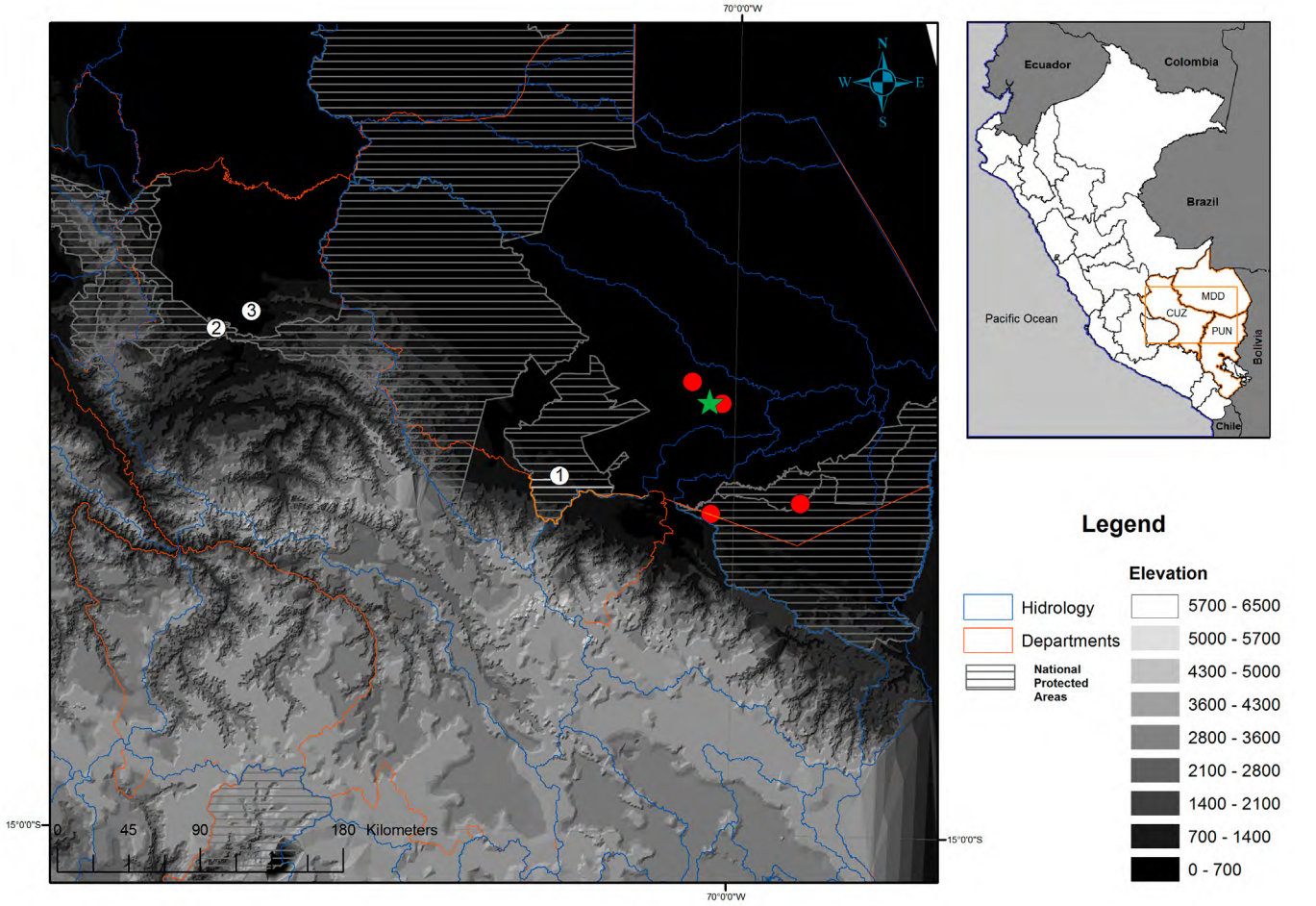



**Figure 10.** Map showing locality records of *Pristimantis divnae*. The green star represents the type locality. Red circles represent previously published records. White circles indicate records reported herein (1= MHNC14480; 2= MHNC11206; 3= MHNC11203 and MHNC11205).

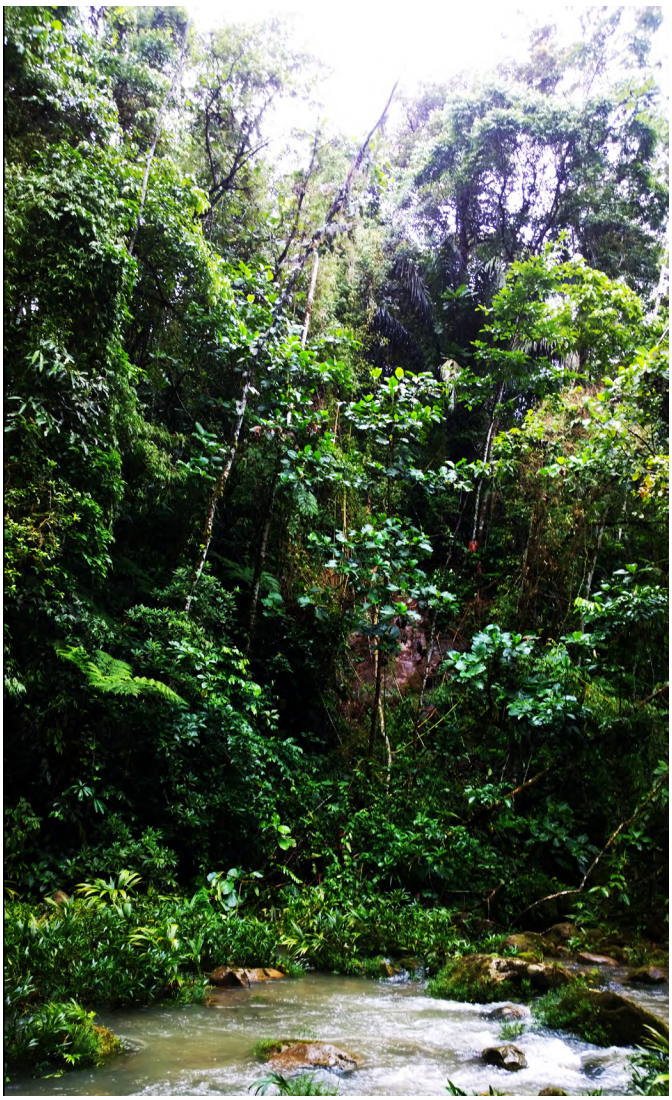


**Figure 11.** Premontane forest habitat of *Pristimantis divnae* (Amarakaeri Communal Reserve, Peru).

second and third records of *P. divnae* within a national protected area. We also report premontane forest as additional suitable habitat for this species in southern Peru (Figure 11; Gentry 1995). These new records lend credence to the species' IUCN listing as Least Concern. Although *P. divnae* is apparently locally rare, its range seems to be more widespread than initially thought (IUCN SSC 2013). The discovery of *P. divnae* within such proximity to the Amarakaeri Communal Reserve and Machiguenga Communal Reserve also suggests that these national protected areas may be particularly important for maintaining connections between populations of the species in neighboring conservation concessions and national parks.

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**Authors' contribution statement:** JCC and JD conceived of the study in the ACR, JCC and FPC collected the data in the ACR, LM collected data in the RCM and TNC, JCC and JD wrote the text.

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