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Individuo macho de Carpintero de Cara Negra (*Melanerpes pucherani*) en el Parque Nacional Cerros de Amotape. Foto: Yufani Olaya Preciado

The expanding known range of Stygian Owl (*Asio stygius*) in the Andes

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ABSTRACT

We provide details on three previously unreported localities for Stygian Owl (*Asio stygius*) in Peru during the past 15 years. One field record and one specimen came from localities ~15 km apart in humid temperate forests in the department of Cajamarca. A second specimen came from humid temperate forest in the department of Cusco, a locality that bisects a ~1700 km gap in this species' distribution in the central Andes. These and other recent records reflect a steady expansion of the known range of *A. stygius*, suggesting that its distribution is less fragmented than previously thought. Although there are very few specimens available for comparison, our evaluation of the plumage and measurements of the Peru specimens supports the taxonomic reassignment of Andean populations from *A. s. robustus* to *A. s. stygius*, and suggests that there may be additional, undescribed geographic variation in the Andes.

Keywords: Stygian Owl, *Asio stygius*, Andes, Peru, department of Cusco, department of Cajamarca, new specimens, range extension.

RESUMEN

Presentamos detalles sobre tres localidades donde no se conocía la presencia del Búho Estigio (*Asio stygius*) en Perú durante los últimos 15 años. Se presenta un registro de campo y un espécimen de los bosques húmedos montanos en el departamento de Cajamarca. Asimismo, se presenta un espécimen del bosque húmedo montano del departamento de Cusco, de una localidad que divide en dos partes un vacío de ~1700 km en la distribución de esta especie. Estos y otros registros recientes reflejan una expansión de la distribución conocida de *A. stygius*, lo cual sugiere que su distribución es menos fraccionada de lo que se pensaba. Aunque se cuenta con pocos especímenes disponibles para comparación, nuestra evaluación del plumaje y las medidas de los especímenes del Perú corroboran la revaluación taxonómica de poblaciones Andinas como *A. s. stygius* en vez de *A. s. robustus* y sugiere que podría haber más variaciones aún no descritas en los Andes.

Palabras clave: Búho Estigio, *Asio stygius*, Andes, Perú, departamento de Cusco, departamento de Cajamarca, nuevos especímenes, extensión de rango.

INTRODUCTION

The Stygian Owl *Asio stygius* is known from a number of widely disparate localities over an enormous area ranging from northwestern Mexico and several Caribbean islands to northern Argentina (Fjeldsa & Krabbe 1990; Hilty 2003; Hilty & Brown 1986; Howell & Webb 1995; Ridgely & Greenfield 2001; König & Weick 2008). Recent records of this secretive species from southern Texas in the United States (Wright and Wright 1997, Cooksey 1998), southern Guyana (Robbins *et al.* 2007), and northern Peru (Vellinga *et al.* 2004, Tello-Alvarado 2011) suggest that it is more widespread and less patchily distributed than the scarcity of records would suggest.

Six subspecies of *A. stygius*, *A. s. lambi*, *A. s. siguapa*, *A. s. noctipetens*, *A. s. robustus*, *A. s. stygius*, and *A. s. barberoi* have been described (Peters 1940). Dickinson (2003) and Dickinson and Remsen (2013) follow the taxonomy of Peters (1940) but König and Weick (2008) consider *A. s. lambi* and *A. s. noctipetens* to be synonymous with *robustus* and *siguapa*, respectively. Due to the paucity of specimens, the subspecies distributions are not known with precision. Dickinson and Remsen (2013) list the distributions of the subspecies as western Mexico (*lambi*), Cuba and the Isle of Pines (*siguapa*), Hispaniola and Gonave islands (*noctipetens*), southern Mexico to Nicaragua and the Andes of western Venezuela to northwestern Peru (*robustus*), southern Venezuela and the Guyanas to northeastern Argentina (*stygius*), and western Paraguay to northern Argentina (*A. s. barberoi*). König and Weick (2008) differ in that they restrict the distribution of *robustus* to northern Central America ("Mexico, locally in Central America to Nicaragua and Belize") and they group Andean populations with *A. s. stygius*, whose distribution they describe as "from Colombia, Venezuela, and Ecuador through Peru; and Bolivia to central Brazil".

In its Andean range *A. stygius* is patchily distributed and has a broad elevational distribution. In Venezuela, *A. stygius* is known from one locality in the Sierra de Perijá and two localities in the main Andean Cordillera (200-2000 m; Hilty 2003); while in Colombia the species is known from scattered localities in all three Andean cordilleras (435-3100 m; Miller 1952; Hilty & Brown 1986; Fjeldsa & Krabbe 1990). In Ecuador, records and specimens from the Andes span the latitudinal extent of the country (1700-3100 m; Williams & Tobias 1994; Best & Kessler, 1995; Ridgely & Greenfield 2001; Table 1). *A. stygius* is known in Bolivia from a sight record at Parque Nacional Tunari in the department of Cochabamba (Fjeldsa & Krabbe 1990; Table 1) and has also been reported from the department of Santa Cruz (Hennessey *et al.* 2003). Hennessey *et al.* (2003) report that the species occurs in montane evergreen forest edge, *Polylepis* forest, and cerrado, across a two-parted elevational range (700-1600 m and 3700-3900 m) in Bolivia.

NEW RECORDS

We report three new localities for *A. stygius* in Peru over the past 15 years. The first specimen was taken on 4 July 1998 in the Cerros del Páramo region of the department of Cajamarca on a Louisiana State University Museum of Natural Science (LSUMNS) expedition led by Dr. John P. O'Neill. The specimen provided the first definitive evidence of *A. stygius* for Peru. Although this record has not previously been described, Schulenberg *et al.* (2010) reference it in the range map of this species, and it is mentioned in Vellinga *et al.* (2004) and Tello-Alvarado (2011).

Country	Department	Specific locality	Documentation	Reference(s)
Ecuador	Pichincha	Volcan Pichincha	S	AMNH 708687
Ecuador	Imbabura	Hacienda Anagumba	S	ANSP 162889
Ecuador	Pichincha	-----	S	ANSP 183867
Ecuador	-----	Klangancti	S	ANSP 101647
Ecuador	-----	Rio Blanco	S	MLZ 4704
Ecuador	Loja	Sozoranga, 04°21'S, 79°47'W, 1400 m	V	Best et al. 1993
Ecuador	Loja	Angashcola, 04°36'S, 79°44'W, ca. 2550 m	V	Williams & Tobias 1994
Peru	San Martín	Moyobamba, 6°02.28'S, 76°58.3'W, elev. 875 m	S, P	CORBIDI uncataloged; Tello-Alvarado 2011
Peru	Cajamarca	Quebrada Grande, ca. 8km ESE Sallique 5°41'S, 79°15'W, elev. ca 2800 m	S	MUSM/LSUMNS 170388
Peru	Cajamarca	2.8 km NW Aqua Azul, 05°34.95'S, 79°09.62'W, ± 100m, 2560 m	V	-----
Peru	Cusco	Abra Bellavista, 7.5 km NE Quebrada, 12°37.26'S, 72°14.55'W, elev. 2850 m	S, R	CORBIDI/MSB 34641
Peru	Piura	Bosque de Cuyas, 04°36'00"S, 79°44'00"W, 2200-2600 m	R	Vellinga et al. 2004
Bolivia	Cochabamba	Parque Nacional Tunari, ca. 3900 m	O	Fjeldsa & Krabbe 1990
Bolivia	Cochabamba	Parque Nacional Carrasco	-----	Hennessey et al. 2003
Bolivia	Santa Cruz	Parque Nacional Noel Kempff Mercado	-----	Hennessey et al. 2003

Table 1. Records of *Asio stygius* from Ecuador and Peru. Documentation codes are specimen (S), photograph (P), vocalization heard (V), vocalization recorded (R), and observational record (O). Collection names are abbreviated as follows: American Museum of Natural History (AMNH), Academy of Natural Sciences of Drexler University (ANSP), Occidental College Moore Laboratory of Zoology (MLZ), Centro de Ornitología y Biodiversidad (CORBIDI), Louisiana State University Museum of Natural Science (LSUMNS), and University of New Mexico Museum of Southwestern Biology (MSB).

The locality of the specimen was montane humid temperate forest just north of the Marañon Gap and east of the Huancabamba Depression, ca. 30 km west of Jaén. The individual was flushed by Abraham Urbay T. from a perch close to the trunk of a tree ca. 5 m off the ground near treeline on a west facing slope at ca. 2800 m.

The bird flew about 30 m before perching again, where it was collected. The locality for the specimen is Quebrada Grande, ca. 8km ESE Sallique, 5°41'S, 79°15'W ±500 m. The bird was a male, with left testis measuring 7 x 5 mm. It weighed 590 g, had

no fat reserves, an empty stomach, no wing or tail molt, light body molt, no bursa, and a 100% ossified skull. The individual was described as having orange-yellow irides, a blackish-horn bill with blacker tomia, ochre-horn tarsi, and yellow soles (partial skeleton, LSUMNS 170388; skin, MUSM uncataloged; tissue, LSUMZ B-32156, DFL 809). Standard measurements of the specimen are presented in Table 2.

The second locality was Abra Bellavista in the department of Cusco (7.5 km NE Quebrada, 12°37.26'S, 72°14.55'W, \pm 50 m, 2850 m). The habitat was \sim 15 m tall montane humid temperate forest on a steep slope that had been selectively logged. CJS heard what he suspected to be Stygian Owl just before sunrise on several mornings during early June, 2010. CJS obtained voice recordings (XC127052, XC127054, XC127056) and, recognizing the potential for discovery of a unique population, collected one specimen. CJS prepared it as a study skin with skeleton and frozen and buffered tissue samples (CORBIDI uncatalogued/ MSB 34641). The specimen was identified as *A. stygius* by the distinctive combination of herringbone pattern on underparts, whitish eyebrows, and closely set ear tufts. Examination of the gonads revealed that it was a female with an enlarged ovary (25 x 13 mm; largest 3 ova- 5 x 5 mm, 4 x 4 mm, 4 x 4 mm). It weighed 696 g and had moderate fat reserves, no wing or tail molt, moderate body molt, no bursa, dark gray bill, gray toes, and yellow irides. The stomach contained bones, skin, and parts of two feet the size and color of a *Pipreola* fruit eater. Standard measurements of the specimen are presented in Table 2.

Finally, we report that a vocalization

identified as *A. stygius* was heard in fragmented humid temperate forest in the department of Cajamarca, approximately 15 km NE of the 1998 specimen and in similar habitat. During an ornithological expedition by CORBIDI and the University of New Mexico, Phred M. Benham and Andrew B. Johnson heard repeated single deep hoots that they identified to be this species during the nights of 2 and 15 July 2012 above the town of Agua Azul (2.8 km NW Agua Azul, 05°34.95'S, 79°09.62'W, \pm 100m, 2560 m). In each case, the vocalizing bird was too far away to obtain recordings.

TAXONOMY AND GEOGRAPHIC VARIATION

The two specimens we report along with a specimen from Moyobamba, Peru (CORBIDI, TA-2798; Tello-Alvarado 2011), are similar in plumage and size. Each has buff posterior underparts and no barring on the undertail coverts. The head, back, and wings of the three specimens are blackish-brown (Figure 2). The Cusco specimen was the only female out of the three Peru specimens and it was heavier than either of the two males, though it had shorter wings (Table 2).

Specimen/subspecies	Sex	Mass (g)	Wing chord (mm)	Tail (mm)	Tarsus (mm)	Exposed culmen chord (mm)
1998 Cajamarca	male	590	340	169	45.4	35.3
2010 Cusco	female	696	316	159	41.6	32.5
2011 Moyobamba	male	483	333	147	41.7	32.3
<i>A. s. stygius</i>	unsexed	632-675	324-348	165-170	-----	-----
<i>A. s. robustus</i>	male	591	292-305	157	-----	-----
<i>A. s. robustus</i>	female	675	340-349	169-171	-----	-----
<i>A. s. barberoi</i>	unsexed	-----	356-380	198	-----	-----
<i>A. s. siguapa</i>	unsexed	-----	291-305	157-171	-----	-----

Table 2. Standard measurements of the three Peru specimens in comparison to Central and South American subspecies of *A. stygius*. Measurements for *A. s. stygius*, *A. s. barberoi*, *A. s. robustus* and *A. s. siguapa* from König and Weick (2008). Note that the 2011 Moyobamba specimen was found injured, so the mass could reflect some degree of emaciation.

The Cajamarca specimen had notably longer tail, tarsi, and culmen than either of the other two specimens. The Moyobamba specimen was ~100 g lighter than the Cajamarca specimen, but it is important to note that it was injured when it was found, so it may have been emaciated. Overall, the measurements for the Peru specimens were similar to those reported by König and Weick (2008) for *A. s. stygius* and *A. s. robustus*. However, the direction of apparent sexual size dimorphism in wing length is reversed based on the measurements for *A. s. robustus*, the only subspecies for which König and Weick (2008) report sex-specific measurements. In the Peru specimens, the two males are lighter but have longer wings than the female (Table 2). In other *Asio* species, males are known to have disproportionately large wings and lower wing-loading (Witt & Dickerman 2012).

An individual of *A. s. robustus* from Belize in the collection of the Louisiana State University Museum of Natural Science (LSUMNS 20994), as well as a description of *robustus* from the type locality in Veracruz, Mexico (Kelso, 1934) do not match the Peru specimens. The Peru males have markedly longer wings but the Peru female has shorter wings than reported for *A. s. robustus* (Table 2). Relative to *A. s. robustus*, the Peru specimens have blacker background color on the head, wings, back, and tail and they lack barring on the undertail coverts, whereas *A. s. robustus* (including *A. s. lambi*) possess three to four bars on each undertrail covert feather (Kelso 1934).

The Peru specimens are similar to *A. s. stygius* in size (Table 2) and the lack of barring on the undertail coverts (Figure 2), but they seem to differ from Kelso's (1934) description *A. s. stygius* in having buff rather than ochreous-buff posterior underparts. Overall, they best match descriptions of *A. s. stygius*, supporting König and Weick's



Figure 2. Ventral, tail, dorsal, and facial photographs of the three Peru specimens. From left to right: (A) 2011 Moyobamba specimen, (B) 1998 Cajamarca specimen, and (C) 2010 Cusco specimen.

(2008) taxonomic reassignment of Andean populations from *A. s. robustus* to *A. s. stygius*.

DISCUSSION

A. stygius is currently known from five localities in Peru, including the new localities reported here. The previously published localities include Bosque de Cuyas, department of Piura (Vellinga *et al.* 2004) and Moyobamba, department of San Martín (Tello-Alvarado 2011; Table 1).

Recent records from Peru have successively narrowed gaps in this species' distribution in the central Andes between Ecuador and Bolivia. Before 1998, there were no records of *A. stygius* between the aforementioned records between Ecuador and Cochabamba, Bolivia (Figure 1). Considering that this species is exceptionally difficult to detect and that substantial tracts of habitat exist along Andean slopes from Ecuador to Bolivia, it would be difficult to rule out the possibility that its distribution is nearly contiguous across this wide range.

Four of the five Peru localities for this species are in humid temperate forest at 2200-2900 m (Vellinga *et al.* 2004; Schulenberg *et al.* 2010; Table 1). The other locality is in the humid upper tropical zone of urban Moyobamba, at 875 m (Tello-Alvarado 2011). This apparent flexibility in elevational range, habitat, and tolerance of human disturbance is consistent with this species' occurrence in Colombia (Miller 1952; Hilty & Brown 1986).

It is clear that the three Peruvian specimens are most similar in plumage to *A. s. stygius*. Measurements of body mass, wing chord, and tail length were fairly similar to published measurements of *A. s. stygius* and *A. s. robustus*, although our finding that males had longer wings and tails was opposite to the direction of sexual size dimorphism reported by König and Weick (2008) for *A. s. robustus*.

In addition to this anomalous pattern of size variation, variable amounts of white streaking on the underparts of the Peru specimens suggest that there may be geographic variation that has not yet been described; however, there are presently too few specimens from the Andean region to distinguish geographic variation from individual variation. A detailed taxonomic and phylogeographic treatment is clearly warranted and future studies should build on the data and specimens reported here.

We suggest searching for *A. stygius* in humid or semi-humid montane forest habitats, including areas near tree line and in patchy or disturbed forests throughout the Andes from foothills to ~3900 m. We suspect that this species is most easily detected in June-August as we noted natural vocalizations during June 2010 in Cusco and it has been heard on multiple occasions during July and August in northwestern Peru and adjacent southwestern Ecuador (Vellinga *et al.* 2004; Williams & Tobias 1994).

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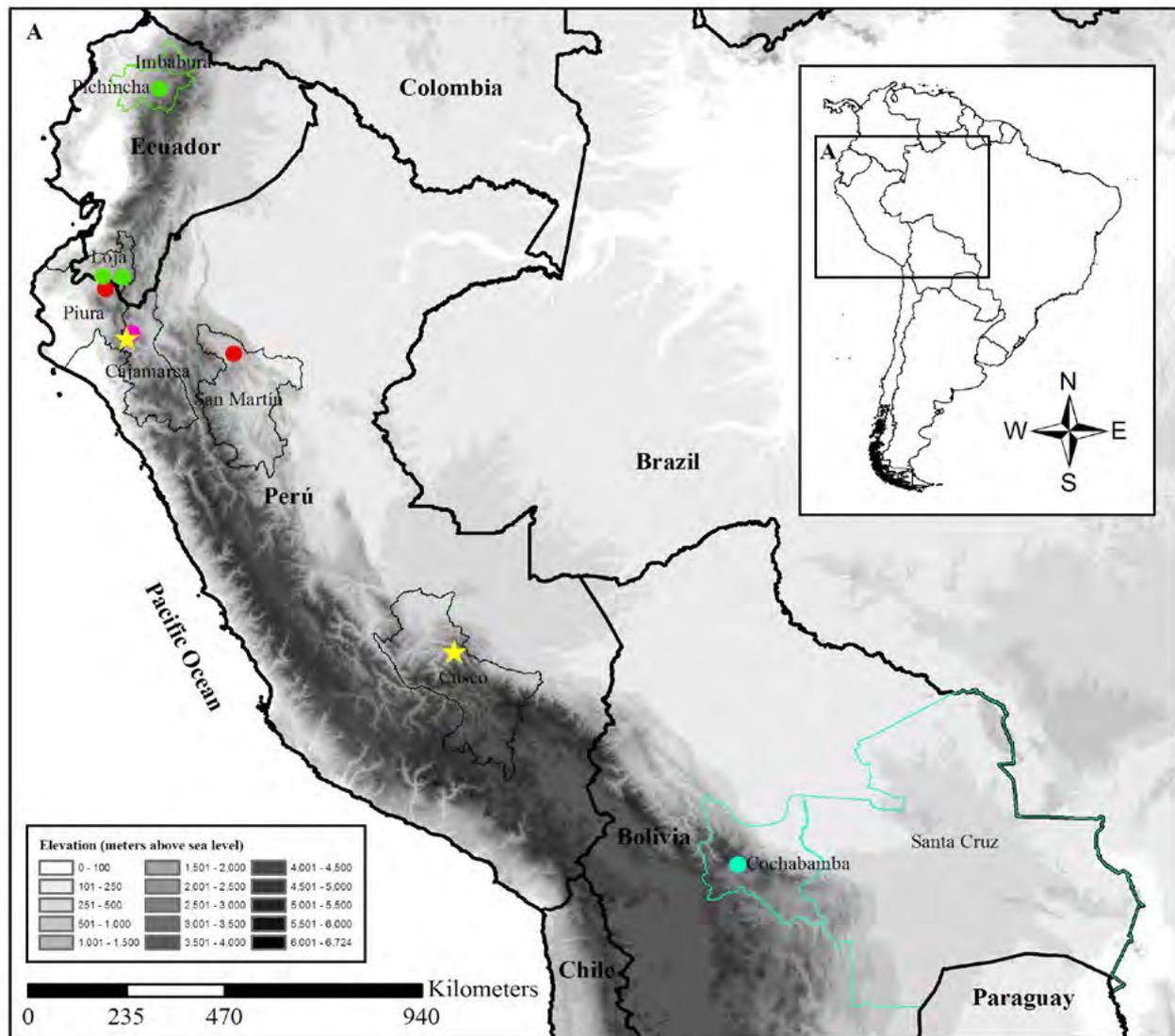


Figure 1. Localities for and specimen records of *Asio stygius* from Ecuador, Peru, and Bolivia. The box, A, in the overview map of South America is the area enlarged in the main part of the map. Yellow stars indicate the new specimen records we present from the departments of Cajamarca and Cusco, Peru. A single pink circle indicates the observational record from Agua Azul. Red circles indicate a locality for *A. stygius* at Bosque de Cuyas, department of Piura, Peru (Vellinga *et al.* 2004), and a specimen plus sight records from Moyobamba, department of San Martín, Peru (Tello-Alvarado 2011). Green circles indicate localities for *A. stygius* at Sozoranga, department of Loja, Ecuador (Ridgley & Greenfield 2001) and Angashcola, department of Loja (Williams & Tobias 1994), as well as a specimen (AMNH 708687) from Volcan Pichincha, department of Pichincha, Ecuador. Departments Imbabura and Pichincha are bounded by green to indicate a specimen of *A. stygius* form each department that could not be georeferenced beyond the departmental level (ANSP 162889 and ANSP 183867 respectively). ANSP 101647 and MLZ 4704 were not included because we were unable to georeference their localities. Finally, the blue circle indicates a sight record from above the city of Cochabamba, department of Cochabamba, Bolivia (Fjeldsa & Krabbe 1990), and the departments of Santa Cruz and Cochabamba are outlined in blue to indicate records that could not be georeferenced beyond department level (Hennessey *et al.* 2003).

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