# Notes on birds of the high Andes of Peru

## Apuntes sobre aves de los altos Andes de Perú

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### Abstract

Well established geographic-range limits and elevational distributions are important to address questions regarding avian systematics, ecology, evolution, and conservation. In spite of recent advances, significant gaps in knowledge remain for bird distributions in South America, especially in high-elevation environments. During fieldwork in 2007-2009 we recorded elevational and geographical data for birds occurring in the extreme high Andes of central and southern Peru. Here we report significant records along with natural history notes for some species. These records illustrate the opportunity for discovery and the importance of continued exploration in remote high-elevation regions of the Andes.

Key words: Andes, birds, elevational distribution, natural history notes, Peru, range extensions.

### Resumen

El conocimiento preciso de las distribuciones geográficas y altitudinales de las aves es fundamental para abordar diferentes aspectos de la sistemática, ecología, evolución y conservación del grupo. A pesar de los avances recientes, el conocimiento de la distribuciones de aves en Suramérica aún presenta vacíos importantes, especialmente en ambientes de alta montaña. Con base en trabajo de campo realizado entre 2007 y 2009, registramos extensiones de distribución y elevación, así como datos de historia natural de varias especies de aves de los altos Andes del centro y sur de Perú. Estos registros ilustran el potencial de hacer descubrimientos y la importancia de continuar explorando regiones remotas de alta montaña en los Andes.

Palabras clave: Andes, aves, distribución de elevación, extensiones de distribución, historia natural, Perú.

## Introduction

Refinement of known distributional and elevational limits for high-Andean bird species has advanced considerably in the last 20 years (e.g., Fjeldså & Krabbe 1990, Stotz *et al.* 1996, Schulenberg *et al.* 2007). Despite these major contributions, considerable gaps in knowledge remain. These gaps can be attributed to the difficulty of accessing patchily distributed habitats at high elevations. However, the need to refine distributional and elevational limits for these alpine species has never been more important given their critical role in the burgeoning field of spatial modeling of global climate change, a phenomenon that is likely to strongly affect high-elevation species (Tingley *et al.* 2009, La Sorte & Jetz 2010). Investigators also rely on accurate distributional data to address questions regarding systematics, ecology, evolution, and conservation. To ensure quality research in these fields, exploration and description of new sites for high Andean species should continue. We here document range or elevational extensions for species of birds occurring in the high Andes of central and southern Peru, based on fieldwork conducted in June-July 2007, January-February 2008, February-April 2009, and June-August 2009. We recognize that elevational limits may not represent actual range limits and that our records could represent dispersing or wandering individuals. To address this possibility, we provide multiple records when available and date ranges for areas surveyed

to give an indication of effort. Further, we supplement several species accounts with natural history observations.

## Materials & Methods

SAMPLING.- We collected specimens and made observations during four expeditions between June 2007 and August 2009 in the Peruvian departments (dptos.) of Ancash, Lima, Junín, Huancavelica, Ayacucho, Apurímac, Cusco, Arequipa, Moquegua, Puno, and Tacna. Our localities ranged from 4300 to 5000 m elevation and were primarily located in the Wet and Moist Puna (Squeo *et al.* 2006). Most of our noteworthy observations were from a few locations above 4,700 m elevation (Fig. 1A). Specimens were deposited in either the Centro de Ornitología y Biodiversidad (CORBIDI) in Lima, Peru, or the Louisiana State University Museum of Natural Science (LSUMZ), Baton Rouge, Louisiana, USA. We follow the taxonomy of the American Ornithologists' Union's South American Checklist Committee (SACC; Remsen *et al.* 2010). We used a Garmin 60Csx global positioning system unit for elevation and geographic coordinates. Coordinates and elevations were verified with 1:100,000 topographic maps from Peru's Instituto Geográfico Nacional. We compared our notes and specimen data with the distributional and elevational information in references on birds of Peru (e.g. Morrison 1939, Koepke 1964, Schulenberg *et al.* 2007), other literature covering birds of the high Andes (Johnson 1965; Fjeldså 1987, 1992; Fjeldså and Krabbe 1990, Stotz *et al.* 1996), and more general references (del Hoyo *et al.* 2003), to determine the significance of our observations.

STUDY AREA.- Andean physiographic regions are generally stratified in elevational bands and shaped by their respective climatic regimes. Vast grasslands are dominant at the highest elevations below snowline and above treeline. These grasslands are comprised of two major types, *paramo* and *puna*. The *puna* is distinguished from the *paramo* primarily by strong effects of seasonality associated with more southerly latitudes. Because of this feature, the *paramo* of the northern Andes grades into *puna* along the seasonality and precipitation gradients through Peru and Bolivia terminating in northwestern Argentina and northern Chile in dry and seasonal *puna*. The *puna* is dominated by grasses (e.g., *Calamagrostis, Festuca,* and *Stipa*) and short shrubs (e.g., *Baccharis* and *Azorella*). Poorly drained valleys often support peatlands with cushion plants of the genera *Oxychloe* and *Distichia* (Weberbauer 1936). Habitats at the study sites include seasonally inundated short grass, called "*césped*" in Peru; permanently saturated peatland, also known as "*turbera*" or "*bofedal*"; bunch-grass, known locally as "*ichu*"; rocky outcrops; bare ground; ephemeral ponds; streams; and lakes.

LOCALITIES.- We collected specimens and made observations in many locations in central and southern Peru. The majority of our significant records were from the following seven sites:

Chaucha - dpto. Junín: 4500- 4600 m; 12.150°S, 75.634°W. This site is on the road from Huancayo to the coastal city of Cañete. It is characterized by two mountain ridges, gently sloping valley walls, and a large lake in the valley basin. Habitats include expansive *césped* and *bofedal*, with some bare ground, rocky outcrops, and streams. The site was first visited 5-6 July 2007 and revisited 23-24 February 2008, 11 April 2009, 25-28 June 2009.

Astobamba - dpto. Huancavelica: 4500-4800 m; 12.959°S, 75.094°W. Approximately 20 km SW of the city of Huancavelica on the road between Santa Ines and Huancavelica, this locality is named for the small town nearby. The area is characterized by two cordilleras and a river. Habitats include *césped*, *bofedal*, streams, ponds, bare

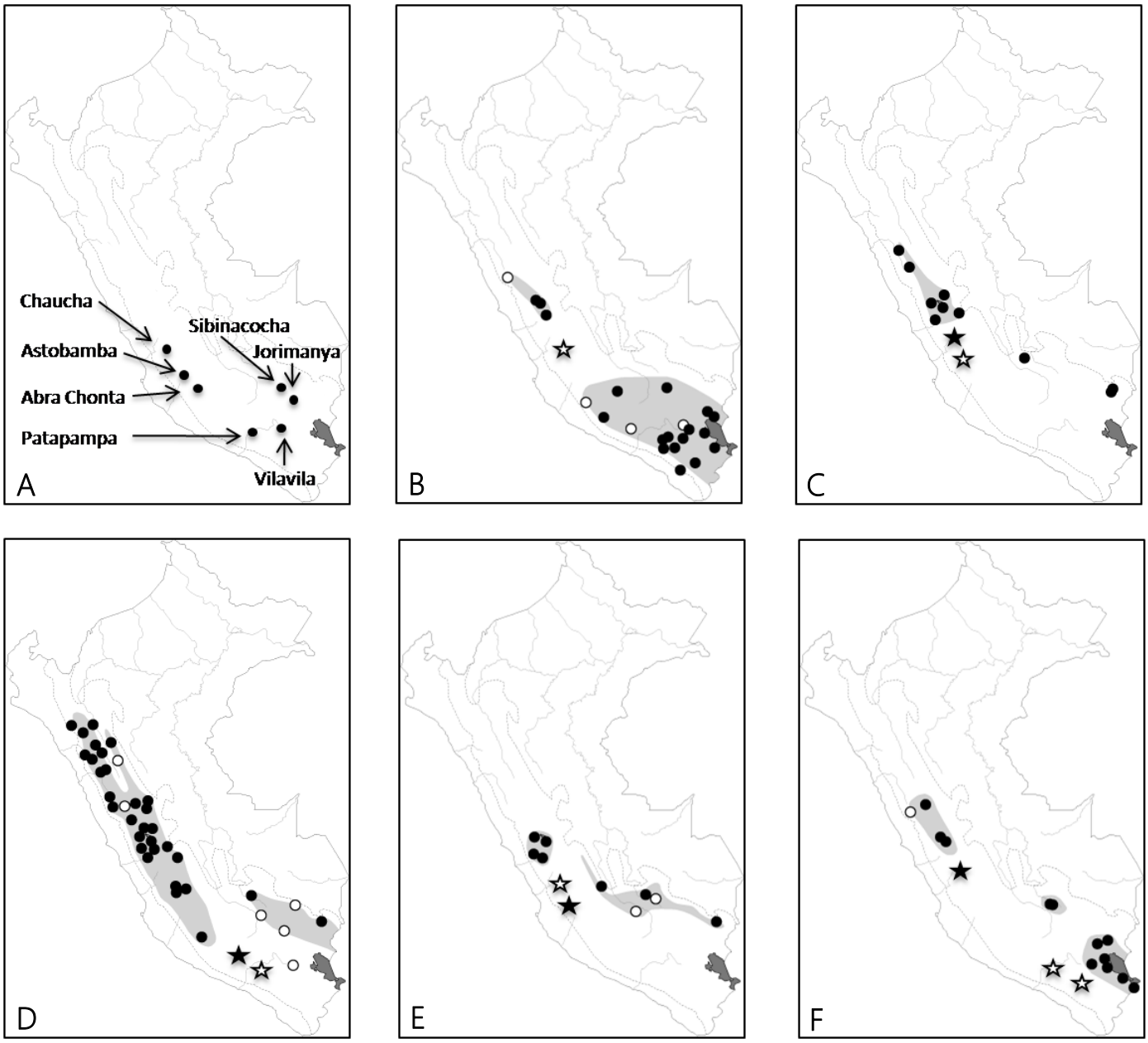


Figure 1. A. The major localities of our records: Chaucha, dpto. Junín; Abra Chonta, dpto. Huancavelica; Astobamba, dpto. Huancavelica; Laguna Sibinacocha, dpto. Cusco; Patapampa, dpto. Arequipa; Laguna Jorimanya, dpto. Puno; and Vilavila, dpto. Puno. B. The current distribution estimate for *Metriopelia aymara* as determined by specimens (black circles) and sight records (white circles). New records are shown with stars, white stars for sight records and black stars for specimens. C. Current distribution estimate with new records for *Chalcostigma olivaceum*. D. Current distribution estimate with new records for *Asthenes humilis*. E. Current distribution estimate with new records for *Asthenes virgata*. F. Current distribution estimate with new records for *Anthus furcatus*. Base maps with specimen and sight records were provided by Schulenberg *et al.* (2007).

ground, and rocky outcroppings. We surveyed areas on both sides of the road including the massive bofedal Huamanrazapamapa to the east and Quebrada Iscomayo to the west. We collected and surveyed this location on 16 July 2007, 1-2 March 2008, 6-7 April 2009, and 21-23 June 2009.

Abra Chonta - dpto. Huancavelica: 4700-4870 m; 13.081°S, 75.049°W. This locality is near the road connecting the cities of Santa Ines and Huancavelica. This high mountain pass has a long southward sloping valley. Habitats include *césped*, *bofedal*, streams, bare ground, stream, rocky out-

croppings, and two small lakes. We collected and surveyed this area on 3 March 2008, 5 April 2009, and 6 June 2009.

**Sibinacocha - dpto. Cusco: 4700-4910 m; 13.931° S, 71.022°W.** A series of large lakes sits below a massive glacial formation at this location, found approximately 40 km northeast of the city of Sicuani. Habitats include *césped*, *bofedal*, ponds, streams, bare ground, and rocky outcroppings. We visited this site briefly on 13 March 2008.

**Patapampa - dpto. Arequipa: 4400-4600 m; 15.761°S, 71.606°W.** This site, 12 km south of Chivay, includes several drainage basins with small streams. Habitats include *bofedal*, *césped*, stream, bunch grass, rocky slopes, and bare ground. This location was visited 31 March 2008, 6-7 March 2009, and 14-18 July 2009.

**Laguna Jorimanya - dpto. Puno: 4300-4610; 14.392°S, 70.864°W.** This locality includes a 10 km winding valley of bunch grass and *césped* grasslands drained by small streams. The highest point of this site is Laguna Jorimanya and a large *bofedal* bordered by a stream. Other habitats include bare ground and rocky outcroppings. We surveyed this location 15 March 2008, 20-21 March 2009, and 29-30 July 2009.

**Vilavila - dpto. Puno: 4600-4800 m; 15.198°S, 70.736°W.** This site is approximately 40 km NNW of Lampa. We surveyed several valleys with *césped, bofedal*, rocky slope, bare ground, and stream habitats. We visited this area 17-18 March 2008, 18 March 2009, and 26-27 July 2009.

## Results

Our fieldwork generated multiple range refinement and extension records for species occurring in the *puna* and natural history observations for several poorly known species. Elevational range extensions are summarized in Table 1.

***Anas puna*** **(Puna Teal)** - In Peru this species has been reported between 3000 and 4600 m and as a vagrant to the coast (Schulenberg *et al.* 2007). This is similar to the range-wide elevational distribution reported by Fjeldså and Krabbe (1990). We observed 5 individuals at 4900 m on 13 March 2008 on Laguna Sibinicocha, a 300 m extension of the published elevational range.

***Oxyura jamaicensis*** **(Ruddy Duck)** - The previously published maximum elevation in Peru (Schulenberg *et al.* 2007) and in the rest of its Andean distribution (Fjeldså and Krabbe 1990) was 4500 m. On 13 March 2008 we observed a single individual on Laguna Sibinacocha at 4850 m, extending the known elevational range of this species by 350 m. Although the records at Sibinacocha might have been exceptional, it seems more likely that the presence of this species at such high elevations had been overlooked owing to reduced accessibility. Sibinacocha is one of the few lakes with road access, providing a rare glimpse of the avifauna of this elevation.

***Rollandia rolland*** **(White-tufted Grebe)** - This species was known to occur above 3200 m to a maximum of 4500 m (Schulenberg *et al.* 2007, Fjeldså and Krabbe 1990). We observed a single bird at 4850 m on Laguna Sibinacocha on 13 March 2008, an upward extension of this species' elevational range by 350 m.

***Phoenicopterus chilensis*** **(Chilean Flamingo)** - On 12 March 2009 we observed a flock of 12 individuals at 4850 m in a *laguna* in dpto. Moquegua, approximately halfway between the cities of Moquegua and Puno. An additional flock of approximately 10 individuals was seen at 4700 m in another *laguna* in the area. Schulenberg *et al.* (2007)

Table 1. Species of interest and the approximate maximum elevation (m) recorded during fieldwork in the highlands of Peru compared to previously published elevations. See annotated species accounts for more detail and locality information. Some species included in the annotated accounts due to departmental or range extensions are not included in this table.

| Species | With new records | Stotz *et al.* (1996) | Schulenberg *et al.* (2007) | Fjeldså and Krabbe (1990) |
|---|---|---|---|---|
| *Anas puna* | 4900 | 4600 | 4600 | 4600 |
| *Anas cyanoptera* | 4900 | 4600 | 4400 | 5000 |
| *Oxyura jamaicensis* | 4900 | 4400 | 4500 | 4500 |
| *Rollandia rolland* | 4900 | 4500 | 3200+ | 4500 |
| *Phoenicopterus chilensis* | 4850 | 4400+ | 4700 | None |
| *Gallinula galeata* | 4500 | 4000 | 4400 | 4200 |
| *Oreopholus ruficollis* | 4400 | 4500 | 4500 | 4600 |
| *Tringa flavipes* | 4800 | 4000 | none | None |
| *Tringa melanoleuca* | 4800 | 4300 | none | 4000 |
| *Calidris melanotos* | 4600 | 4000 | none | 4500 |
| *Phalaropus tricolor* | 4800 | 4100 | none | None |
| *Metriopelia aymara* | 4600 | 4700 | 4500 | 5000 |
| *Bubo virginianus* | 4800 | 4400 | 4400 | 4500 |
| *Chalcostigma olivaceum* | 4700 | 4500 | 4700 | 4600 |
| *Geositta tenuirostris* | 4800 | 4600 | 4600 | 4600 |
| *Asthenes virgata* | 4660 | 4300 | 4600 | 4300 |
| *Muscisaxicola capistratus* | 4630 | 4000 | 4100 | 4000 |
| *Anthus furcatus* | 4500 | 4000 | 4100 | 4250 |
| *Phrygilus alaudinus* | 4565 | 4000 | 4100 | 4100 |

gave 4600 m as the upper limit for this species.

*Gallinula galeata* (Common Gallinule) - The published elevational maximum of this species is 4400 m in the Andes of Peru (Schulenberg *et al.* 2007, Fjeldså and Krabbe 1990). Five individuals were seen near Nuñoa, dpto. Puno, on 15 March 2008 at 4600 m. Additionally, REG observed one bird near Chaucha, dpto. Junín, at 4500 m.

*Oreopholus ruficollis* (Tawny-throated Dotterel) - The distribution for this species in Peru is uncertain north of dptos. Junín and Lima (Fjeldså and Krabbe 1990). REG observed a flock of 17 birds flying north along the ridgeline at 4200 m in the Cordillera Negra, dpto. Ancash, on 22 June 2007, near the road between Huaraz and Chimbote. Although the elevation is within the limits provided by Schulenberg *et al.* (2007) and Fjeldså and Krabbe (1990), published records for this species in Ancash and further north have been near the coast at low elevations and are thought to represent the resident subspecies *pallidus*. This flock could have represented austral migrants of the nominate *ruficollis*. The birds were neither collected nor seen well enough to determine subspecies.

*Tringa flavipes* (Lesser Yellowlegs) - Elevational limits for this Nearctic-Neotropical migrant were not reported in Fjeldså and Krabbe (1990) nor Schulenberg *et al.* (2007). Fjeldså (1987) provided

elevations ranging from 3900 m to 4500 m from four localities. We collected specimens and observed this species in several dptos. from Junín to Moquegua up to 4800 m during the austral summer, representing a 300 m elevational extension. This species was far more common than *T. melanoleuca* (Greater Yellowlegs) during our fieldwork.

*Tringa melanoleuca* (Greater Yellowlegs) - Published elevational limits for this Nearctic-Neotropical migrant are 4350 m (Fjeldså 1987, 1988) and 3900-4500 m (Venero and Brokaw 1980). We observed one *T. melanoleuca* at Sibinacocha 13 March 2008 at 4790 m, one at Jorimanya 15 March 2008 at 4610 m, and one at Chaucha 11 April 2009 at 4600 m. Given the dates, these records may represent individuals that had already initiated migration.

*Calidris melanotos* (Pectoral Sandpiper) - This Nearctic-Neotropic migrant was common in puna peatlands. Fjeldså and Krabbe (1990) gave 4500 m as the upper limit. We observed 16 individuals above 4600 m during the 2009 austral summer in dpto. Puno.

*Phalaropus tricolor* (Wilson's Phalarope) - Morrison (1939) published an elevational record for this species at 4360 m. Neither Fjeldså and Krabbe (1990) nor Schulenberg *et al.* (2007) gave specific elevation distribution ranges. We observed groups of *P. tricolor* from Junín to Moquegua up to 4800 m in the austral summer ranging from one in small puddles near Patapampa to hundreds of individuals such as the observation made on 11 April 2009 at a large laguna near Chaucha. In what appeared to be pre-migratory behavior, tight flocks would lift off from the laguna and fly above the water for several seconds before settling again on the water.

*Metriopelia aymara* (Golden-spotted Ground-Dove) - Fjeldså and Krabbe (1990) and Schulenberg *et al.* (2007) showed a geographic distribution gap between dptos. Junín and Ayacucho. We observed a pair of *M. aymara* near Astobamba (Fig. 1B) on 12 July 2007 at 4550 m. This record could represent a continuous range, dispersing individuals, or migratory movement.

*Bubo virginianus magellanicus* (Great Horned Owl) - The published upper elevational limits of this species are 4400 m (Stotz *et al.* 1996, Schulenberg *et al.* 2007) or 4500 m (Fjeldså and Krabbe 1990); Morrison (1939) detected a pair near Talahuarra (4655 m). We collected a specimen at 4750 m in dpto. Junín, 20 km S of Marcapomacocha, on 6 August 2009. Some authors (e.g., Konig *et al.*1996, Jaramillo 2003) treat *B. v. magellanicus* found in the Andes of central Peru southward through the Andes as a separate species (*Bubo magellanicus*) and cite differences in vocalizations as diagnostic characters, but the elevation of this taxon to species rank has not yet been accepted by the SACC (Remsen *et al.* 2010). Birds heard in the area gave the final tremolo note in the vocalization described by Jaramillo (2003) as the vocalization of *B. v. magellanicus*. Schulenberg *et al.* (2007) noted geographic variation in the vocalization, but cited insufficient evidence to sort out the vocalizations and subspecies.

*Chalcostigma olivaceum* (Olivaceous Thornbill) - This species is patchily distributed in the Peruvian Andes from Ancash south to NW Junín, then locally in W Cusco, E Apurímac, and S Puno (Schulenberg *et al.* 2007). This species was observed and collected in S Junín near Chaucha along the road from Huancayo to Cañete, thereby extending its range within that department (Fig. 1C). Additionally, REG observed this species feeding on flowers of *Gentianella* spp. near Astobamba at 4660 m and Abra Chonta at 4750 m, where it evidently had not previously been recorded. Although we observed approximately 20 individuals throughout its range, we did not see the reported

"walking" or "hopping" behavior (Meyer de Schauensee 1970, Fjeldså and Krabbe 1990, Heindl 1999, Schulenberg *et al.* 2007); short flights of less than 5 cm, however, between *Gentianella* spp. flowers were common.

*Geositta tenuirostris* (Slender-billed Miner) - In Peru, this species occurs between 2650 and 4200 m (Schulenberg *et al.* 2007) and 2500 and 4600 m (Fjeldså and Krabbe 1990). We report both the first coastal record for this species and an extension of its maximum elevational limit. We photographed an individual north of Arequipa along the Pan-American Highway foraging with a group of *Geositta cunicularia* (Common Miner) in an arid rocky area with sparse, scrubby vegetation at ~200 m elevation and within sight of the ocean on 1 April 2008 (Fig. 2). We observed one bird at 4600 m near Astobamba (4780 m) and at Abra Chonta (4800 m) on 12 July 2008. It was also observed near Vilavila at 4700 m on 26 July 2009. Nearly all of our observations throughout the *puna* coincided with the dry season suggesting a near complete retreat from the upper reaches of the *puna* during the wet season. Whether these movements are downslope, south, or both is unknown. REG detected strong seasonality in the distribution of many species from the *puna*.

*Asthenes humilis* (Streak-throated Canastero) - Schulenberg *et al.* (2007) and Fjeldså and Krabbe (1990) both excluded the southern Titicaca basin from its distribution. We collected one individual in dpto. Arequipa, 5 km S Chivay at 4590 m in July 2009. This is the first record of *A. humilis* in dpto. Arequipa. REG observed another individual at 4700 m elevation in W Puno dpto., 110 km NE of the Chivay location. These observations suggest a continuous distribution within the current disjunct range (Fig. 1D).

Figure 2. *Geositta tenuirostris* observed near the coast in dpto. Arequipa. This is the first coastal record to our knowledge. (Photograph by REG).

*Asthenes virgata* (Junin Canastero) - In Peru, the elevational range is given by Fjeldså and Krabbe (1990) as 3350-4300 m and by Schulenberg *et al.* (2007) as 3300-4600 m. The range given by Schulenberg *et al.* (2007) is disjunct, the first polygon running from extreme SW dpto. Pasco to NW Junín and E Lima, the other narrowly from extreme SE dpto. Junín through the N tip of dpto. Huancavelica, and then dptos. Ayacucho, Apurímac, Cusco, and Puno. Fjeldså and Krabbe (1990) show only small patches in their range estimate in dptos. Lima, Junín, Ayacucho, Cusco, and Puno. We collected two specimens of *A. virgata* beyond these range estimates. The first was in S Junín, W of Huancayo near Chaucha on 23 February 2008 at 4585 m on a bunch-grass slope. The second was collected 14 km SSW of the city of Huancavelica, dpto. Huancavelica, at 4375 m. To our knowledge, this is a new record for dpto. Huancavelica. These records fall between the disjunct range estimates and suggest a continuous distribution (Fig. 1E).

*Muscisaxicola capistratus* (Cinnamon-bellied Ground-Tyrant) - Fjeldså and Krabbe (1990) gave a 4000 m limit for S Peru, whereas Schulenberg *et al.* (2007) gave 4100 m as the limit. We collected two individuals in dpto. Puno, one at 4460 m, 24 km S of San Antonio de Esquilache, and the other at 4260 m, 14 km NW of Nuñoa. The highest observed record was in Tacna dpto. at 4585 m, a 500 m increase in the upper elevational limit. Additional individuals (~20) were observed above 4100 m. This species was most often observed in grasslands dominated by short grasses (Fig. 3). REG observed intraspecific aggression among four individuals on a large patch of short grass in dpto. Puno at 4460 m, suggesting winter territoriality. We analyzed stomach contents from the two specimens and found that seeds and pericarp from what appeared to be two different unknown plants comprised the majority of items. This suggests that frugivory -previously unknown for this migratory species- may be a significant dietary component.

*Anthus furcatus* (Short-billed Pipit) - This species is patchily distributed in the Andes of southern Peru; it is known from S dpto. Ancash to NW dptos. Junín, W Cusco and Puno, with elevation limits of 3500-4100 m (Schulenberg *et al.* 2007) or 3500-4250 m (Fjeldså and Krabbe 1990). We found it at 4500 m near Chaucha. Further south in dpto. Huancavelica, we collected a specimen at 4200 m, 7 km N of Astobamba, on 2 March 2008. We later observed one individual in a *bofedal* in dpto. Moquegua on 12 March 2009 at 4435 m. Records from Arequipa and Moquegua are in agreement with observations made in Pampa Galeras by Venero and Brokaw (1980). Finally, REG observed this species in dpto. Arequipa at Patapampa on 30 March 2008, further extending its range within Peru (Fig. 1F).

*Phrygilus alaudinus* (Band-tailed Sierra-Finch) - Upper elevational limits have been given as 4000 m (Stotz *et al.* 1996) or 4100 m (Fjeldså and Krabbe 1990, Schulenberg *et al.* 2007). REG observed and tape-recorded singing individuals in a wet meadow in dpto. Puno at 4565 m.

## Discussion

Our recent fieldwork in the extreme high Andes serves to highlight how limited even basic distributional knowledge remains for this remote and harsh environment. Precise data on geographic and elevational distribution will be essential to further high Andean research and conservation. Distributional data, though basic, are essential for designing sampling regimes in phylogeographic studies, outlining conservation strategies, constructing models of potential distributions, and understanding the limits of physiological adaptations to environmental extremes, (e.g., high altitude hypoxia; Cheviron *et al.* 2008). Our records illustrate the opportunity for discovery in the high Andes

Figure 2. *Muscisaxicola capistratus* is shown in a short grass meadow where multiple individuals were present and observed exhibiting agonistic behavior (chasing). This behavior could represent non-breeding territoriality. (Photograph by REG).

and the importance of continued exploration to the remote and complex regions of the Andes. It is likely that the range of most species mirrors the distribution of suitable habitat. With the exception of some species that may be at their physiological limits, most species characteristic of the *puna* may be limited elevationally only by the snowline.

The discovery of frugivory in *Muscisaxicola capistratus* is intriguing considering recent work exploring the role of diet as an evolutionary precursor of migration (Levey and Stiles 1992, Chesser and Levey 1998, Boyle and Conway 2007). This hypothesis states that migratory bird species involved with the longest migrations and elevational movements are predominantly frugivores or nectarivores of dry and edge habitats. The hypothesis goes on to suggest that these ecological traits predisposed these species for long-distance or elevational migration, the idea being that these resources are seasonal and patchy, and that species exploiting them must travel to find them. Our observations of frugivory in this species, if there is further confirmation that it feeds regularly on fruit, may prove useful in disentangling the relative role of ecological determinants in movement ecology for this speciose genus of high Andean flycatchers with a mixture of resident and migratory species (Chesser 2000). Moreover, our observations further illustrate the limitation of analyses involving species' ecology when basic natural history information is lacking.

The *paramo* and *puna*, with their shared physiographic and biological components, lend themselves well to numerous untold inquiries. We hope this varied collection of notes will encourage study in the upper reaches of the Andes over all of

South America, where so little work has been done.

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