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SHORT NOTE

NOTES ON THE DIET OF THE STRAIGHT-BILLED EARTHCREEPER (*OCHETORHYNCHUS RUFICAUDUS*) AND THE USE OF CITIZEN SCIENCE IMAGE REPOSITORIES

Erik M. Sandvig[1,2*] · Patrich Cerpa[1,3]

[1] Red de Observadores de Aves y Vida Silvestre de Chile (ROC)
[2] Centro Bahía Lomas, Universidad Santo Tomás, Santiago, Chile
[3] Instituto de Entomología, Universidad Metropolitana de Ciencias de la Educación, Chile
E-mail: Erik M. Sandvig · erik.sandvig.c@gmail.com

Abstract · We report on novel information on the diet for the Straight-billed Earthcreeper (*Ochetorynchus ruficaudus*), an uncommon Furnariid of Andean arid environments. We describe an event of food consumption in northern Chile and complement our findings by searching citizen science repositories for photographic evidence of food items. We identified novel food items belonging to Coleoptera and Lepidoptera insect orders. These findings contribute to our understanding of the natural history of an uncommon species, making use of opportunistic photography and freely available, ever-increasing citizen science data.

Resumen · Notas sobre la dieta de *Ochetorhynchus ruficaudus* y el uso de repositorios de imágenes de ciencia ciudadana
Presentamos información novedosa sobre la dieta de la bandurrilla de pico recto (*Ochetorynchus ruficaudus*), un furnárido poco común de ambientes áridos andinos. Describimos un evento de consumo de alimentos en el norte de Chile y complementamos nuestro hallazgo mediante la búsqueda de evidencia fotográfica de alimentación en repositorios digitales de ciencia ciudadana disponibles gratuitamente. Identificamos nuevos alimentos pertenecientes a insectos coleópteros y lepidópteros. Estos hallazgos contribuyen a nuestro conocimiento de la historia natural de una especie poco común, haciendo uso oportunista de la fotografía y datos de repositorios de ciencia ciudadana, que van en constante aumento.

Key words: Citizen science · Diet · eBird · Food item · Furnariidae · iNaturalist

INTRODUCTION

The Straight-billed Earthcreeper (*Ochetorhynchus ruficaudus*) is an uncommon furnariid of the high Andes. It is the most widespread species in its genus, ranging from high-elevation areas (c. 4,300 m a.s.l.) in southern Peru through central Chile, to lower elevations (c. 1,300 m a.s.l.) in southern Argentina (Remsen 2020a). The species is found in rocky arid slopes with sparse vegetation, with a preference for areas with large boulders and scattered bushes (Remsen 2020a, Fjeldså & Krabbe 1990). The members of its genus and close allies are generally acknowledged as insectivorous species (see similar species in Fjeldså & Krabbe 1990, Billerman et al. 2020), but only sparse detailed information has been reported on their diet.

Among the limited number of studies describing aspects of the diet of its closely related species, Schulenberg (1987) analyzed the stomach contents of specimens of the Scale-throated Earthcreeper (*Upucerthia dumetaria*), the White-throated Earthcreeper (*U. albigula*), and the Buff-beasted Earthcreeper (*U. validirostris* and its subspecies *U. v. jelskii*) in southwestern Peru, and he described the contents as containing "insects". In a more detailed analysis of *U. validirostris* in Peru as well, stomach contents included food items from the orders Scorpiones, Coleoptera, Hymenoptera, and Lepidoptera (Soto-Huaira et al. 2019). In northern Chile, McFarlane & Loo (1974) reported that stomach contents of *U. jelskii* contained Coleoptera and Lepidoptera. For other related species' stomachs, such as those of the Chaco Earthcreeper (*Tarphonomus certhioides*) in Bolivia, contained Coleoptera, Orthoptera, and Diptera food items (Kratter et al. 1993), and other studies revealed that the stomach content of the Bolivian Earthcreeper (*Tarphonomus harterti*) was made up of "insects" and a tiny mollusc (Remsen et al. 1988). In addition to published accounts on the diet of related furnariids, there is sparse information on the four species of *Ochetorhynchus.* For the Crag Chilia (*O. melanurus*), Medrano et al. (2020) described its diet as composed of arthropods, seeds and fruits picked among rocks and bushes, whereas the diets of the Straight-billed Earthcreeper (Remsen 2020a), the Rock Earthcreeper (*O. andaecola* (Remsen 2020b), and the Band-tailed Earthcreeper (*O. phoenicurus*) (Remsen 2020c) have been described simply as being composed of arthropods gleaned and extracted from the ground, shrubs, and rock crevices.

The virtues of citizen science have been highlighted extensively for their usefulness in improving our understanding of the

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Figure 1. Straight-billed Earthcreeper (*Ochetorhynchus ruficaudus*) consuming a Tenebrionidae (Coleoptera), in the Antofagasta Region, Chile.

distribution, migration, and abundance of species (Cooper et al. 2014, Sullivan et al. 2014, Tejeda & Medrano 2018), yet little has been mentioned about its potential contribution in filling the gaps in life history components such as diet. Citizen science platforms like eBird and iNaturalist gather copious amounts of photographs, and this photographic evidence —often opportunistic— can be a useful tool in describing a species' diet (Kennedy et al. 2009, Gaglio et al. 2017, Naude et al. 2019, Berryman & Kirwan 2021) and could be used as a non-invasive technique to complement other methods of diet descriptions. This can be leveraged by tapping into the ever-increasing image repositories of citizen science projects and other open datasets which, despite their limitations, have proven to be useful in improving and expanding our knowledge of numerous aspects of the natural history and ecology of species (Theobald et al. 2015).

This study presents novel information on a food item of the Straight-billed Earthcreeper, describing a feeding event. Additionally, we complemented this finding by performing an image search of open-access citizen science and search engine repositories to broaden the description of potential food items in this species' diet.

METHODS

First, we describe an event of food consumption photographed casually by the first author while conducting point counts for a baseline biodiversity study. The site was visited only once, and the species was not encountered in any of the other 10 surveyed sites in the study area. The food item in the photograph was identified by the second author to the closest taxonomic level possible.

This observation was complemented by conducting an image search for further evidence of food items in the widely

Table 1. List of food items in images reported in this study from searching citizen science repositories. Food items were identified to the genus or order level, with their assigned location, found in free citizen science repositories (eBird's Macaulay Library and iNaturalist).

Food Item	Class, Order	Location	Source	URL
Tenebrionidae sp.	Insecta, Coleoptera	24°86'S, 69°61' W Chile	This study	
Larvae Lepidoptera cf. Noctuidae	Insecta, Lepidoptera	18°20'S, 69°56' W Chile	eBird	https://macaulaylibrary.org/asset/100101471
Adult Lepidoptera	Insecta, Lepidoptera	33°65'S, -70°07'W Chile	eBird	https://macaulaylibrary.org/asset/107256161
Larvae Lepidoptera	Insecta, Lepidoptera	20°98'S,- 68°77'W Argentina	iNaturalist	https://www.inaturalist.org/observations/32430703

used citizen science wildlife databases eBird's Macaulay Library, iNaturalist, and Observation.org, as well as in Google's Image Search (the searches were performed on 8 September 2022). For the latter, we used the search terms "Straight-billed Earthcreeper", "*Ochetorhynchus ruficaudus*", "*Upucerthia ruficaudus*" (previous scientific name), as well as local Spanish names "bandurrilla de pico recto", "bandurrita de pico recto", and "bandurrita piquirrecta". All search result images were then inspected for the presence of food items. We only considered an object to be a food item when the bird had it in its beak or the bird had clearly manipulated it (i.e., partial remains of a food item on the ground or rock below the bird). Food items were then visually identified by the second author to the closest taxa possible given the quality and angle of the image.

RESULTS

On 11 June 2020, EMS encountered a pair of Straight-billed Earthcreepers in the Antofagasta region of northern Chile (24°94'S, 69°63"W), one of them consuming a food item (Figure 1). The area was a rocky ravine at 2,900 m a.s.l. with scattered small bushes in an otherwise sheer desert. During the encounter, one individual gleaned a beetle among the rocks, handling it for roughly 5 s and then swallowing it whole. The event was photographed and the food item held in its beak was narrowed down to the family Tenebrionidae by visual inspection, due to the shape of the pronotum and abdomen, the position of the head, the proportion of legs, its medium size, and a dull and dark-brown coloration (Vidal & Guerrero 2007).

From the image searches in open repositories, we found 10 images of birds holding a potential food item or next to it. Three of these were identified as Lepidoptera, one adult and two larvae (Table 1). From Google's Image Search, we found nine additional images of a bird holding an "object" in its beak, but no prey could be identified because of image blurriness or because the image was too distant.

DISCUSSION

Through opportunistic photography and citizen science repositories, we identified four prey types, belonging to two insect orders, for the Straight-billed Earthcreeper, thus contributing to a better understanding of its diet. The food items described here are found among the vegetation (i.e., Lepidoptera larvae), on the ground, and hidden under rocks or in crevices during the day, such as tenebrionid beetles. This is in accordance with the habitat that arthropods use to take shelter from the extreme conditions in the arid alpine environment (i.e., low temperatures, high solar radiation, and strong winds) (Somme 1989).

Our findings showed the same type of food items as similar species in the genera *Upucerthia* and *Tarphonomus*, which consume Coleoptera and Lepidoptera. As the number of images of Earthcreepers increases in citizen science repositories, records of additional insect orders may arise. For example, Hymenoptera or scorpions are consumed by *Upucerthia* species (Soto-Huaira et al. 2019), and Orthoptera and Diptera have been found in the diet of *Tharphonomus* (Kratter et al. 1993). Other possible food items that could supplement their diet in sparsely vegetated rocky slopes are seeds, as described for *O. melanurus* (Medrano et al. 2020), and multiple species of miners (see *Geositta* spp. in Billerman et al. 2020), which share similar habitat preferences to Earthcreepers.

The use of citizen science image repositories as a freely available and ever-increasing data source is promising for studies on natural history. However, we identified two important limitations: 1) opportunistic images do not necessarily paint an accurate or comprehensive picture of a species' diet, because it is uncertain if the food items captured in the photograph were in fact consumed by the individual; 2) in most cases, it only allowed the food item to be identified at supraspecific levels and with a varying degree of certainty due to the quality of the image. However, for low abundance species, those difficult to detect, or with conservation problems, the few records with sufficient quality for identification allowed us to shed light and clarify unknown or little explored aspects of their natural history and their interactions with other organisms in a non-invasive way.

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REFERENCES

Berryman, AJ, & GM Kirwan (2021) Is the Tiny Hawk (*Accipiter superciliosus*) really a specialized predator on hummingbirds? Using citizen science data to elucidate dietary preferences of a little-known Neotropical raptor. *Journal of Raptor Research* 55: 276–280.

Billerman, SM, BK Keeney, PG Rodewald and TS Schulenberg (2020) Birds of the World. Cornell Laboratory of Ornithology, Ithaca, NY, USA. Available at https://birdsoftheworld.org/bow/home [Accessed 8 September 2022].

Cooper, CB, J Shirk, & B Zuckerberg (2014) The invisible prevalence of citizen science in global research: migratory birds and climate

change. *PloS one 9:* e106508.

Fjeldså, J and N Krabbe (1990) Birds of the High Andes. A Manual to the Birds of the Temperate Zone of the Andes and Patagonia, South America. Zoological Museum, University of Copenhagen & Apollo Books, Copenhagen & Svendbor, Denmark.

Gaglio, D, TR Cook,M Connan, PG Ryan & RB Sherley (2017) Dietary studies in birds: testing a non-invasive method using digital photography in seabirds. *Methods in Ecology and Evolution* 8: 214–222.

Kennedy, AC, HB White & DW Tallamy (2019) Predation of dragonfly nymphs by passerines. *Northeastern Naturalist* 26: 21–26.

Kratter, AW, TS Sillett, RT Chesser, JP O'Neill, TA Parker III & A Castillo (1993) Avifauna of a Chaco locality in Bolivia. *The Wilson Bulletin* 105: 114–141.

McFarlane, RW & EP Loo (1974) Food habits of some birds in Tarapacá. *Idesia* 3: 163–166.

Medrano, F, G Contreras, C Piñones, and JV Remsen Jr. (2020) Crag Chilia (*Ochetorhynchus melanurus*), version 2.0 *in* Schulenberg, TS & BK Keeney (eds). Birds of the World Cornell Lab of Ornithology, Ithaca, NY, USA. Available at https://doi.org/10.2173/bow.crachi1.02 [Accessed 8 September 2022]

Naude, VN, LK Smyth, EA Weideman, BA Krochu & A Amar (2019) Using web-sourced photography to explore the diet of a declining African raptor, the Martial Eagle (*Polemaetus bellicosus*). *The Condor: Ornithological Applications* 121: duy015.

Remsen, Jr., JV (2020a) Straight-billed Earthcreeper (*Ochetorhynchus ruficaudus*), version 1.0. *in* del Hoyo, JA, A Elliott, DA Sargatal, DA Christie & E. de Juana (eds). *Birds of the World*. Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.stbear2.01 [Accessed 8 September 2022]

Remsen, Jr., JV (2020b) Rock Earthcreeper (*Ochetorhynchus andaecola*), version 1.0. *in* del Hoyo, JA, A Elliott, DA Sargatal, DA Christie & E. de Juana (eds). *Birds of the World.* Cornell Lab of Ornithology, Ithaca, NY, USA. Available at https://doi.org/10.2173/bow.rocear1.01 [Accessed 8 September 2022].

Remsen, Jr., JV (2020c) Band-tailed Earthcreeper (*Ochetorhynchus phoenicurus*), version 1.0. *in* del Hoyo, JA, A Elliott, DA Sargatal, DA Christie & E. de Juana (eds). *Birds of the World.* Cornell Lab of Ornithology, Ithaca, NY, USA. Available at https://doi.org/10.2173/bow.batear1.01 [Accessed 8 September 2022]

Remsen Jr, JV, CG Schmitt & DC Schmitt (1988) Natural history notes on some poorly known Bolivian birds, part 3. *Le Gerfaut* 78: 363–381.

Schulenberg, TS (1987) Observations on two rare birds, *Upucerthia albigula* and *Conirostrum tamarugense*, from the Andes of southwestern Peru. *The Condor* 89: 654–658.

Somme, L (1989) Adaptations of terrestrial arthropods to the alpine environment. *Biological Reviews* 64: 367–407.

Soto-Huaira, SM, V Gamarra-Toledo, C Medina & E López (2019) Composición de la dieta de las aves de los bosques de Queñua (*Polylepis rugulosa*) en Arequipa, Suroeste del Perú. *Ornitología Neotropical* 30: 217–223.

Sullivan, BL, JL Aycrigg, JH Barry, RE Bonney, N Bruns, CB Cooper, T Damoulas, et al. (2014) The eBird enterprise: An integrated approach to development and application of citizen science. *Biological conservation* 169: 31–40.

Tejeda, I & F Medrano (2018) eBird como una herramienta para mejorar el conocimiento de las aves de Chile. *Revista Chilena de Ornitología* 24: 85–94.

Theobald, EJ, AK Ettinger, HK Burgess, LB DeBey, NR Schmidt, HE Froehlich, C Wagner, et al. (2015) Global Change and Local Solutions: Tapping the Unrealized Potential of Citizen Science for Biodiversity Research. *Biological Conservation* 181: 236–244.

Vidal, P & MG Guerrero (2007) *Los Tenebriónidos de Chile*. Editorial Universidad Católica de Chile, Santiago, Chile.