Conservación Colombiana

Número 19 • octubre 2013

Birds of Colombia 2013

With revisions of Oxypogon and Sirystes and presentation of Colombia's 1900th bird

Aves de Colombia 2013

Con revisiones de Oxypogon y Sirystes y presentación de la especie no. 1900 para Colombia

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Conservación Colombiana

Journal for the diffusion of biodiversity conservation activities in Colombia.
Revista de difusión de acciones de conservación de la biodiversidad en Colombia.

ISSN 1900–1592. Non–profit entity no. S0022872 – Commercial Chamber of Bogotá
ISSN 1900–1592. Entidad sin ánimo de lucro S0022872 – Cámara de Comercio de Bogotá.

Edición Octubre 2013. Publicado 6 de diciembre de 2013.

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Fundación ProAves de Colombia ***www.ProAves.org***
Dirección: Carrera 20 No. 36–61, La Soledad, Bogotá
Teléfonos: +57–1–2455134 / 57–1–3403239; Fax: +57–1–340 3285

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Choco (Western) Sirystes *Sirystes albogriseus*. ©Nick Athanas El Valle, Bahía Solano, Chocó, Colombia. 15 June 2013.

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Contenidos — Contents

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Revision of the status of bird species occurring or reported in Colombia 2013

Revisión del estatus de las especies de aves que han sido reportadas en Colombia 2013

Thomas M. Donegan, W. Miles McMullan, Alonso Quevedo, & Paul Salaman
c/o Fundación ProAves, Cra. 20 #36–61, Bogotá, Colombia. Email: tdonegan@proaves.org

Abstract

The following species are added to Colombia's bird checklist: Red-breasted Merganser *Mergus serrator* (photograph, San Andrés & Providencia), Black Scoter *Melanitta americana* (sight record) and Kelp Gull *Larus dominicanus* (photographic record). A new subspecies of Common Bush-Tanager *Chlorospingus flavopectus olsoni* is recognized. Proposed splits are accepted of *Oxypogon* Helmetcrests into four species (three in Colombia), Lineated Woodcreeper *Lepidocolaptes albolineatus* into five species (one in Colombia), Curve-billed Scythebill *Campylorhamphus procurvoides* into three species (one in Colombia), Stipple-throated Antwren *Epinecrophylla haematonota* into at least three species (one in Colombia) and *Sirystes* into four species (two in Colombia). The Green-crowned Woodnymph *T. fannyi* is lumped back into Purple-crowned Woodnymph *T. colombica*. Dunlin *Calidris alpina* becomes a confirmed species (photograph) and Caribbean Coot *Fulica caribaea* is confirmed from mainland records (photograph). A possible vagrant record of Mallard *Anas platyrhynchos* is presented. Zebra Finch *Taeniopygia guttata* and Fischer's Lovebird *Agapornis fischeri* are new escaped species known only from sight records and Java Sparrow *Lonchura oryzivora* becomes confirmed as an escapee. Several amendments to genus and species names, English names and linear order are made, following recent publications. As a result of these changes, the Colombian checklist again increases in size, for the first time for any country, passing the landmark of 1900 species to 1903 (excluding escapes), of which 1831 are documented by 'confirmed' records on the mainland. The Kelp Gull is Colombia's 1900th bird.

Key words Red-breasted Merganser, Black Scoter, Kelp Gull, Bush-Tanager, Helmetcrests, Lineated Woodcreeper, Curve-billed Scythebill, Stipple-throated Antwren, Mallard, Sirystes, Woodnymph, Dunlin, Caribbean Coot, Colombia, bird, checklist.

Resumen

Las siguientes especies se agregan al listado de aves de Colombia: *Mergus serrator* (basado en fotografía), *Melanitta americana* (observaciones) y *Larus dominicanus* (fotografía). Se reconocen las separaciones propuestas de *Oxypogon* en cuatro especies (tres en Colombia), *Lepidocolaptes albolineatus* en cinco especies (una en Colombia), *Campylorhamphus procurvoides* en tres especies (una en Colombia), *Epinecrophylla haematonota* en por lo menos tres especies (una en Colombia) y *Sirystes* en cuatro especies (dos en Colombia). Se reconoce la nueva subespecie *Chlorospingus flavopectus olsoni*. *Thalurania fannyi* se vuelve otra vez una subespecie de *T. colombica*. *Calidris alpina* se vuelve una especie confirmada (fotografía) y *Fulica caribaea* se confirma en el territorio continental (fotografía). Se presenta un registro de un individuo posiblemente accidental de *Anas platyrhynchos*. *Taeniopygia guttata* y *Agapornis fischeri* son especies exóticas registradas por observaciones y *Lonchura oryzivora* se vuelve especie confirmada como especie escapada. Se realizan varias modificaciones a los nombres de géneros y especies, nombres en inglés y el orden del listado. A raíz de estos cambios, el listado Colombiano aumentó nuevamente, superando 1900 especies por primera vez para cualquier país del mundo, a 1903 especies (excluyendo especies exóticas), de las cuales 1831 han sido confirmadas con registros en el continente. La gaviota *Larus dominicanus* se categoriza como la especie número 1900 para Colombia.

Palabras clave *Mergus serrator, Melanitta americana, Larus dominicanus, Chlorospingus flavopectus olsoni, Lepidocolaptes albolineatus, Oxypogon, Campylorhapmhus procurvoides, Epinecrophylla haematonota, Sirystes, Larus dominicanus,* listado, aves, Colombia.

Introduction

This is the 13th year of the National checklist to the Birds of Colombia, a list which has grown steadily, as set out in three checklist books (Salaman *et al.* 2001, 2008b, 2010), two field guide editions (McMullan *et al.* 2010, 2011) and recent annual updates (Salaman *et al.* 2008a, Donegan *et al.* 2009, 2010a, 2011, 2012). The checklist will be available online in the near future. This paper sets out details of further changes to the Colombian list since our last update was published in October 2012.

New for Science

Common Bush-Tanager *Chlorospingus flavopectus olsoni*

We recognize this new subspecies for science, described from the east slope of the East Andes (Avendaño *et al.* 2013). It is illustrated in Fig. 1.

Figure 1. *C. f. olsoni*. Photograph by Alonso Quevedo, East slope of the Andes in Meta, 14 February 2010.

Species added

Black Scoter *Melanitta americana*
Sight record of seven individuals at sea between Utría and El Valle reported by Barnes (2013) during February 2013. An escaped origin is not a plausible explanation for so many sea-ducks, compared to vagrancy. The locality of the observation is more consistent with vagrancy. Although the report lacks detail, this species would be familiar to the observers. The species is added as known only from sight records (Obs) for Colombia. It is hoped that further information relating to these records will be published in due course.

Red-breasted Merganser *Mergus serrator*
Photographic records off San Andrés and Providencia (Ward-Bolívar & Lasso-Zapata 2012) leave no doubt that this migratory duck species can now be added to Colombia's checklist. It is included as confirmed for the San Andrés region (SA) but not on the mainland. Various other records of this species in Mexico, Belize and elsewhere were overlooked in the summary of Caribbean records accompanying publication of this record (e.g. Howell & Webb 1995, Jones *et al.* 2002). As for Black Scoter, an escaped origin does not seem a plausible explanation compared to vagrancy.

Kelp Gull *Larus dominicanus*
A photographic record by Fagan & McMullan (2013) allows the species to be considered confirmed for Colombia's mainland.

Splits and lumps considered

Crowned Woodnymphs *Thalurania colombica/fannyi*
Green- and Purple-crowned Woodnymphs are lumped following publication of details of intermediate populations in Serranía de San Lucas and the northern Central Cordillera (Donegan 2012a), consistent with Remsen *et al.* (2013a) and Chesser *et al.* (2013)'s approach. Escalante-Pliego & Peterson (1992) had previously split the two species. The new treatment is a reversion to Hilty & Brown (1986)'s taxonomy. This results in a change in English name for *T. colombica* back to Crowned Woodnymph and deletion of Green-crowned Woodnymph *T. fannyi* from the checklist as a species, *fannyi* becoming a subspecies of *colombica*.

Green-bearded Helmetcrest *Oxypogon guerinii*
Blue-bearded Helmetcrest *O. cyanolaemus*
Buffy Helmetcrest *O. stubelii*
We accept the splits set out in Collar & Salaman (2013), resulting in recognition of three species occurring in Colombia, *guerinii* in the Central Andes, *cyanolaemus* in Santa Marta and *stubelii* in the East Andes. All are known from specimen records in Colombia so can be considered confirmed for the country.

Lineated Woodcreeper *Lepidocolaptes albolineatus*
Duida Woodcreeper *L. duidae*
Batista Rodrigues *et al.* (2013) published data on the striking vocal differences and relatively deep (>3.4% mtDNA) molecular structure between five proposed species in this group. Populations in Eastern Colombia, which remain known only from sight records (Willis 1998, Donegan *et al.* 2010) should now be considered part of Duida Woodcreeper *L. duidae*. We accept this split, resulting in a change in name for Colombian populations from *albolineata* to *duidae*.

Curve-billed Scythebill *Campylorhamphus procurvoides*
Populations of this species in Colombia (subspecies *sanus*) are closely related to *C. (p.) gyldenstolpei*, which was described by Aleixo *et al.* (2013). Vocal differences between these two taxa and nominate *procurvoides* are only in the note shape of part of the song; and in note shape of a call comprising a single note similar to the variable note of the song. Typically for antbirds, multiple (>3) diagnostic vocal differences are recommended to treat populations as separate species (Isler *et al.* 1998). In the absence of studies into the extent of vocal variation between sympatric scythebills (e.g. Brown-billed and Red-billed Scythebills in Colombia), we treat *sanus*, *procurvoides* and *gyldenstolpei* as allopatrically distributed subspecies of the same species. Molecular (<1.2% mtDNA), biometric and plumage differences between the three taxa initially appear relatively minor. We instead adopt Aleixo *et al.* (2013)'s alternative three-way split of *procurvoides* (including *sanus* and *gyldenstolpei*) from extralimital species *probatus* (including recently-described *cardosoi* of Portes *et al.* 2013) and *multostriatus*. Such a

treatment separates out vocally highly divergent populations with deep (4.3%-6.7%) molecular differentiation and avoids paraphyly with eastern populations of Red-billed Scythebill *C. trochilirostris*. However, further splitting of *procurvoides* (or other taxa in this complex) lack support of a detailed vocal study. Further consideration needs to be given to vernacular names for this group and to the inclusion of vocally distinctive Colombian populations of *C. trochilirostris* (cf. Donegan 2012a) in molecular studies. No change of names of Colombian populations results from accepting Aleixo *et al.* (2013)'s three-way split.

Amazonian Barred Woodcreeper *Dendrocolaptes certhia*

Batista *et al.* (2013) proposed a multi-pronged split of this species based on molecular and morphological differentiation. However, they also found the loudsong of newly described *D. retentus* not to "differ constantly from those of other taxa in the *D. certhia* complex". Moreover, all proposed split taxa demonstrate less than 2% mtDNA differences. We do not recognize proposed splits in this species in the absence of a detailed vocal study.

Stipple-throated Antwren *Epinecrophylla haematonota*
"Negro Stipple-throated Antwren" *Epinecrophylla pyrrhonota*

Whitney *et al.* (2013) have proposed treating *E. pyrrhonota*, and others as species separate from *E. haemotonota* based on impressive molecular differentiation and some vocal and plumage differences. Differences in loudsoungs appear to fall a little below those generally regarded as necessary for recognition of species in antbirds (Isler *et al.* 1998, Remsen *et al*. 2013). Molecular results included impressive (>5%) differentiation between various groups in a polytomy comprising: *spodionota*, *dentei+amazonica*, *haematonota+fjeldsaai* and *pyrrhonota.* Because *spodionota* and *pyrrhonota* are fully sympatric in the East Andes of Colombia (Salaman *et al.* 2002) and specimens from the zone of sympatry were sampled in the molecular study, lumping the polytomy is not a viable proposition. Proposed new species *E. (amazonica) dentei* is a weaker candidate for species rank but extralimital for Colombia so its status does not require consideration here. Recognition of this split results in a change of the name for populations occurring in Colombia from *haematonota* to *pyrrhonota*.

Choco Sirystes *S. albogriseus*
White-rumped Sirystes *S. albocinereus*

The split of Western from Eastern Sirystes (Ridgely & Greenfield 2001) and of Eastern Sirystes into three species (Donegan 2013b) are adopted here, resulting in recognition of two species occurring in Colombia. Both are known from specimen records in Colombia, so they can both be considered confirmed.

Changes of Category

Pink-footed Shearwater *Puffinus creatopus*

Previously known in Colombia only from sight records in the late 1970s (Hilty & Brown 1986). Mangel *et al.* (2013) placed satellite trackers on a number of individuals, revealing 2% of subsequent transmissions of this Vulnerable species from Colombian waters. A number of records come from maritime regions of the south-west Pacific region of Colombia in particular. Figure 2 shows movements of one individual, which reached the Colombia/Ecuador marine border on or around 7 October 2009, moved northwards up the Pacific coast of Colombia, presumably through seas bordering dptos. Narino, Cauca and Valle to Chocó almost up to the Panamanian border on 20 October 2009 and then returned back into Ecuadorian waters by 27 October 2009.

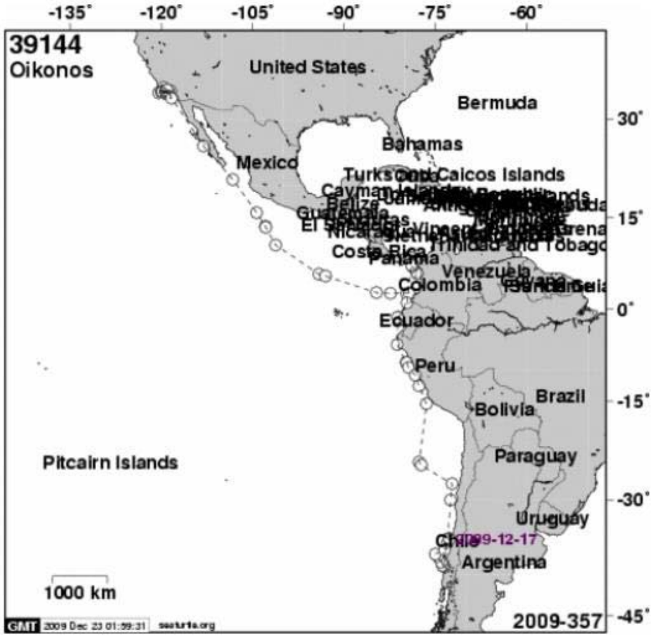

Figure 2 Map showing movements of an individual of *Puffinus creatopus* taken from www.seaturtle.org. Circles show transmissions. Circles show records and dotted line its apparent movements.

The individual in question was registered with satellite no. 39144 and its movements can be viewed online: http://www.seaturtle.org/tracking/index.shtml?tag_id=39144&anime=1&lang, reproduced in Fig. 2. Other individuals appear to have been registered in Colombia by Mangel *et al.* (2013: Fig. 6) using similar methods. Consistent with recent acceptance of other satellite transmitter records (e.g. Fea's Petrel for South America: Ramírez *et al.* 2013, Remsen *et al.* 2013), this species is now considered confirmed for Colombia.

Mallard *Anas platyrhynchos*

Discussed in several previous checklist updates (Salaman *et al.* 2008a, Donegan *et al.* 2010). Another record is of a male showing typical wild plumage and morphology observed at Laguna Santoya, mun. Cabuyaro, dpto. Meta (04º13'57.7"N, 72º49'14.7'W') on 8 January 2011 by A. Quevedo. This is a remote location in the Colombian llanos, far from any major human settlement. The individual was free flying, associating with an Orinoco Goose *Neochen jubata*. This record is considered more likely than not to pertain to a vagrant from northern populations, given its state of plumage and distance from major human habitations. Mallard is also reported as a vagrant or migrant in the Orinoco region of Venezuela by Restall *et al.* (2006).

Mallard is introduced in Bogotá (Salaman *et al.* 2008a, Donegan *et al.* 2010). There are populations of c. 30-40 individuals at Simón Bolivar, c. 20-25 at Parque Timiza, and records of smaller numbers of birds at other localities such as Parque de los Novios, Salitre, Humedal Santa María del Lago and Humedal Jaboque, but many of these individuals are leucistic, melanistic and/or of inelegant morphology, descended from domesticated birds. This possible vagrant record may cast light on the status of the elevated numbers of individuals, including several "wild-type" birds at Parque Timiza in December 2007-January 2008 (Salaman *et al.* 2008a) which were not seen in subsequent visits (Donegan *et al.* 2010).

Mallard changes in status to being *both* an established introduced species (Int) (based on the long-established Bogotá park populations) and a vagrant based only on sight records (Obs), a unique category on the Colombian checklist.

Caribbean Coot *Fulica caribaea*
Previously regarded as known only from sight records on San Andrés island (Donegan *et al.* 2010). The species is here upgraded from "SA Obs" to confirmed on the mainland, on account of Ellery (2013)'s photographic record of an individual which in all likelihood appears to be of this species.

Dunlin *Calidris alpina*
Upgraded from "Obs" to confirmed, on account of Fagan & McMullan (2013)'s impressive and unmistakable photographic records of this species. The species was known in Colombia previously only from sight records (Salaman 1995, Donegan *et al.* 2010).

Java Sparrow *Lonchura oryzivora*
Changed from "escaped" and known only from sight records (Esc and Obs) to being confirmed as an escaped species (Esc only), based on the photographs and sound recordings in Donegan (2013a).

Colombia's 1900th bird

Following the records discussed here, Colombia, the world's most diverse country for birds, becomes the first country in which 1900 bird species have been recorded (Table 1, Fig. 3). This landmark is a testament to the outstanding work of the Colombian ornithological community as well as the collaboration of a growing contingent of birders visiting Colombia.

In date order, Colombia's list can be considered to have changed as follows (in chronological order):

1898	(2012 checklist total) (Donegan *et al.* 2012)
1899	(Earlier, but nominally for present purposes) Red-breasted Merganser *Mergus serrator*, 4 January 2008
1898	Data concerning lump of *Thalurania* published, *T. fannyi* removed: September 2012.
1899	Black Scoter record – February 2013
1900	**Kelp Gull record – 25 March 2013**
1901-3	novel splits recognized in this edition.

The honor of reaching this milestone therefore falls to Jesse Fagan, Miles McMullan and colleagues for their Kelp Gull record. This is one of a string of new records of vagrants uncovered by the increasing number of birding tours taking place in Colombia.

Figure 3 shows how Colombia's bird checklist has increased over time, with large numbers of new records and taxonomic treatments between publication of Meyer de Schauensee (1964) and Hilty & Brown (1986)'s first field guides and Salaman *et al.* (2001)'s first checklist. From 2001 to 2009 the Colombian list remained fairly static, despite many new records being published (e.g. Salaman *et al.* 2008a), as these were offset as a result of species split by Salaman *et al.* (2001) being lumped to follow earlier editions of Remsen *et al.* (2013) (in Salaman *et al.* 2007). Moreover, several species known only from dubious records were removed from the checklist (in Salaman *et al.* 2007, 2008b, Donegan *et al.* 2009, 2010). In the last few years, the Colombian list has grown steadily with new records and in light of the findings of taxonomic research (summarised in Donegan *et al.* 2010, 2011, 2012 and herein), both which have been facilitated by the improving security situation in Colombia.

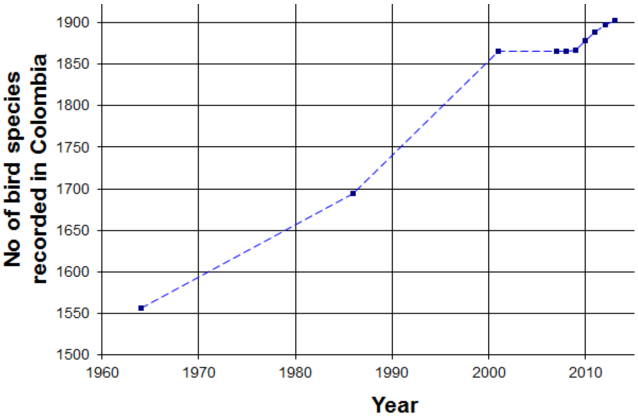

Figure 3 Number of bird species recorded in Colombia over time.

Table 1: Summary of changes resulting in changes of numbers of species in particular categories and new species total.

Change	Species	Conf.	Bog.	Int & Obs	Obs.	Obs.*	SA	SA(Obs)	Int	Int? /Esc	Total
2012 Check–list totals		1,825	4	0	45	4	11	5	4	[14]	1,898 [1,912]
Species added	Red-breasted Merganser *Mergus serrator*						+1				
	Black Scoter *Melanitta americana*				+1						
	Kelp Gull *Larus dominicanus*	+1									
Splits	Blue-bearded Helmetcrest *Oxypogon cyanolaemus*	+1									
	Buffy Helmetcrest *O. stubelii*	+1									
	White-rumped Sirystes *Sirystes albocinereus*	+1									
Lumps	Green-crowned Woodnymph *Thalurania fannyi*	-1									
Changes of category	Pink-footed Shearwater *Puffinus creatopus*	+1			-1						
	Dunlin *Calidris alpina*	+1			-1						
	Caribbean Coot *Fulica caribaea*	+1						-1			
	Mallard *Anas platyrhynchos*			+1					-1		
Escaped species	Zebra Finch *Taeniopygia guttata*									[+1]	
	Fischer's Lovebird *Agapornis fischeri*									[+1]	
Totals per category 2012		**1,831**	**4**	**1**	**44**	**4**	**12**	**4**	**3**	**[16]**	**[1,919]**
Change since 2011 Checklist		+6	-	+1	-1	-	+1	-1	-1	[+2]	
Less escaped species											**-16**
TOTAL BIRD SPECIES FOR COLOMBIA											**1,903**

Genus names, linear order, spellings, English names and pended proposals

The following additional changes to names and orders, which are either under consideration or have been accepted by Remsen *et al.* (2013a), are relevant to Colombia and adopted here. Proposal numbers and, where appropriate, key references supporting these changes are cited below:

522. An alternative classification of nighthawk species in the New World (Han *et al.* 2010) (M. Nores & F.G. Stiles).
543. English names for *Schiffornis* (genus and species) (F.G. Stiles) (except usage of "Western Schiffornis" instead of "Northern Schiffornis" for western *S. veraepacis*).
558. Treat *Thalurania fannyi* and *Thalurania colombica* as conspecific (Donegan 2012a) (see above).
570. Adopt a new English name for *Thamnophilus atrinucha* (2) (M. Isler).
557. Recognize the genus *Euchrepomis* for four "*Terenura*" (Bravo *et al.* 2012) (G. Bravo & J.V. Remsen).
567. Change English name of *Drymophila caudata* (T. Donegan).
568. Change English names of Immaculate Antbirds (T. Donegan).
571. Adopt a new generic classification for the Parulidae (Klein *et al.* 2004, Escalante-Pliego *et al.* 2009, Lovette *et al.* 2010, Gutiérrez-Pinto *et al.* 2012) (R. C. Banks).
578. Divide *Aratinga* into four genera (Remsen *et al.* 2013b) (J.V. Remsen & A. Urantówka).
583. Change English name for *Myrmeciza immaculata* (II) to "Blue-lored Antbird" (T. Donegan).

589A. Split *Epinecrophylla haematonota* (M. Isler) (see above).

591. Revise the classification of the Pipridae (Ohlson *et al.* 2013) (J.V. Remsen).
593. Revise classification of the genus *Saltator* (Chaves *et al.* 2013) (J.V. Remsen).

594B. Revise linear sequences of species in *Cinclodes* (Derryberry *et al.* 2011) (J.V. Remsen).

595. Revise sequence of genera in the New World parrots (Schirtzinger *et al.* 2012) (J.V. Remsen).
597. Modify linear sequence of species in *Dendrocincla* (Derryberry *et al.* 2011, Weir & Price 2011) (J.V. Remsen).
599. Revise classification of the Psittaciformes (Joseph *et al.* 2012) (J.V. Remsen) (noting in addition that escaped species *Melopsittacus undulatus*, *Nymphicus hollandicus* and *Agapornis fischeri* are Psittaculidae and *Cacatua galerita* is a Cacatuidae).

The following AOU-SACC proposal was already dealt with prior to this publication for the Colombian list:

566. Treat *Geotrygon purpurata* as a separate species from *G. saphirina* (Donegan & Salaman 2012).

We pend a decision on the following matters that are subject to ongoing AOU–SACC discussions, until next year:

569. Revise the generic classification of the Mountain-Tanagers (Sedano & Burns 2010) (T. Donegan).
579. Change the English names of *Chlorospingus* species from "Bush-Tanager" to "Chlorospingus" (J.V. Remsen).
584. Recognize Cracidae subfamilies (II) (Donegan 2012b)
587. Split *Gymnopithys leucaspis* into two species (Brumfield *et al.* 2007) (B. Freeman)

We also pend decisions on species limits in Three-striped Warbler *Basileuterus tristriatus* (Gutiérrez-Pinto *et al.* 2012), *Sclerurus* (d'Horta *et al.* 2013) and *Henicorhina leucophrys* (Caro *et al.* 2013) to give time for other apparently forthcoming publications on these groups.

Newly Recorded Escaped species

Fischer's Lovebird *Agapornis fischeri*

Three individuals were observed in the field at vereda el Totumo, mun. Ibagué, dpto. Tolima (00º23'N, 75º11'N, 1,100 m), associating with a flock of Orange-chinned Parakeet *Brotogeris jugularis* by William Figueroa (pers. comm. to A. Quevedo) in June 2010. The species is known to be held in captivity in Colombia (Baptiste *et al.* 2010, Donegan 2013a) but has not previously been recorded free flying. It is added as an escaped species (Esc) owing to lack of evidence of any established or breeding population.

Zebra Finch *Taeniopygia guttata*

Donegan *et al.* (2012) concluded that despite the existence of two Colombian museum specimens, there are no acceptable records of this species in Colombia, even as escapes. Just weeks after this publication, T. Ellery (in litt. 2012) reported an escaped bird in west Bogotá at Barrio Villa Gladys, calle 64c, carrera 112, near Humedal Jaboque in October 2012. The bird was captured and brought to Ellery in an office in central Bogotá. However, no photographic record was made. The individual was kept in captivity by its finder but died some weeks later. Notably, several other escaped bird species have been recorded recently in the Humedal Jaboque area (e.g. Cortés & Donegan 2012). The individual recorded here is clearly an isolated escapee. Zebra Finch can now (finally) be added as an escaped, non-established species but without a confirmed record (Esc and Obs).

Threat Categories

Updates to the threat status of a single species occurring in Colombia follows a further review process by BirdLife International that concluded in September 2013: Black-browed Albatross *Thalassarche melanophrys* changes from EN to NT.

Acknowledgments

Thanks to Jesse Fagan and Trevor Ellery for advance sight of their papers in this issue, to Trevor Ellery and William Figueroa for allowing us to publish details of their sight records of escaped species and to Juan Carlos Verhelst and Alex Monsalve for their comments. We acknowledge the work of Remsen *et al.* (2013a) (American Ornithologists' Union South American Classification Committee), which annually leads to multiple helpful enhancements being made to the Colombian checklist.

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Vocal variation and species limits in the genus *Sirystes* (Tyrannidae)

Variación en vocalizaciones y límites de especies en el género Sirystes *(Tyrannidae)*

Thomas Donegan
c/o Fundación ProAves, Cra. 20 #36–61, Bogotá, Colombia. Email: tdonegan@proaves.org

Abstract

Sirystes was for a long time treated as a monotypic genus with several subspecies, one of which was recently proposed for species rank. Vocal differentiation in the genus was studied using quantitative methods and the determination of primary, secondary and other kinds of vocalizations for different populations. The widely recognized split of Western Sirystes *S. albogriseus* of the Chocó (Panama, Colombia and Ecuador) from the more widespread Eastern Sirystes *S. sibilator* is strongly supported by differences in vocal repertoire and quantitative vocal differentiation. Eastern Sirystes is itself a superspecies comprised of three allopatric species which are vocally differentiated (quantitatively and in repertoire) to such an extent that species rank would be afforded under a modern biological species concept for: (i) White-rumped Sirystes *S. albocinereus* of Western Amazonia (in Venezuela, Colombia, Ecuador, Peru, Bolivia and western Amazonas and Acre states, Brazil); (ii) Todd's Sirystes *S. subcanescens* of North Amazonia (in northern Amazonas, northern Pará and Amapá states in Brazil, French Guiana and Guyana); and (iii) Sibilant Sirystes *S. sibilator* (including subspecies *atimastus*) of the Atlantic and Cerrado regions (in southern Pará state South through most of the rest of Brazil to northern Argentina and eastern Paraguay). Considerable variation in the kind of primary and secondary vocalizations are evident between these four proposed species, with primary vocalizations of particular taxa appearing as rare or secondary vocalizations or not being given at all by others. The four proposed species also show considerable morphological differences in the context of Tyrannidae. Vocal and morphological differences for the four proposed species exceed requirements for proposed "species scoring" tests. "Eastern Sirystes" is not as widespread as was previously thought. Because *Sirystes* populations are primary forest dependent, the threat status of species recognized here should be re-evaluated. *S. albogriseus* in particular may be threatened or near-threatened.

Key words *Sirystes* Tyrannidae, vocalizations, species, subspecies, distribution.

Resumen

Sirystes por mucho tiempo ha sido tratado como un género monotípico con varias subespecies, una de las cuales recientemente fue propuesta para estatus de especie. Se realizó un estudio de diferenciación en las vocalizaciones del género, utilizando métodos cuantitativos y la determinación de las clases de vocalizaciones de las diferentes poblaciones como vocalización principal, secundaria u otra. La separación (ampliamente reconocida) de *S. albogriseus* del Chocó (Panamá, Colombia y Ecuador), de poblaciones orientales (*S. sibilator*), es fuertemente apoyada por las diferencias en clase de vocalizaciones principales y diferencias cuantitativas en vocalizaciones. Las poblaciones orientales representan una super-especie compuesta por tres especies alopátricas que se diferencian vocalmente (cuantativamente y en clases de vocalizaciones) hasta tal punto que el estatus de especie se recomienda, bajo conceptos biológicos: (i) *S. albocinereus* de la Amazonia Occidental (en Venezuela , Colombia , Ecuador , Perú , Bolivia, estados Brasileros de Amazonas (parte occidental) y Acre), (ii) *S. subcanescens* (Todd, 1920), (norte del Amazonas de Brasil (Pará y Amapá), Guayana Francesa y Guyana), y (iii) *S. sibilator* (incluyendo la subespecie *atimastus*) de las regiones Atlántico y Cerrado (en el sur del estado de Pará hacia el sur a través de la mayor parte de Brasil hasta el norte de Argentina y el este de Paraguay). Variaciones notables en las clases de vocalizaciones principales y secundarias, son evidentes entre las cuatro especies propuestas, con vocalizaciones que son primarias en ciertas especies siendo vocalizaciones secundarias, raras o ausentes en otras. Las cuatro especies propuestas también demuestran considerables diferencias morfológicas en el contexto de la familia Tyrannidae. Diferencias vocales y morfológicas de las cuatro especies propuestas, exceden los requisitos propuestos para "puntuación de especies". Poblaciones al oriente de los Andes, no son tan extensas en sus distribuciones como se pensaba antes. Debido a que las poblaciones de *Sirystes*, son dependientes de bosques primarios, el estado de amenaza de las especies reconocidas aquí deben ser re-evaluados. *S. albogriseus* en particular podía ser amenazada o casi-amenazada.

Palabras clave *Sirystes*, Tyrannidae, vocalizaciones, especie, subespecie, distribución.

Introduction

Taxonomic History

The tyrant-flycatchers (Tyrannidae) of the genus *Sirystes* are related to *Myiarchus* and *Casiornis* (Lanyon & Fitzpatrick 1983, Birdsley 20002, Joseph *et al.* 2004, Chaves *et al.* 2008, Tello *et al.* 2009) and found principally in the lowland forests of South America. The genus was described by Cabanis & Heine (1859-1860) based on the type species *Muscicapa sibilator* Vieillot, 1818 (type locality: Paraguay). Vieillot (1818)'s description was itself based on Azara (1802-5)'s "*suiriri pitador*". The name *pitador* was treated by most subsequent authors, including Hartlaub (1847), as a vernacular name (not using Linnean nomenclature) and thus unavailable, with the genus *Suiriri* likewise not generally considered formally described by Azara (1802-5) and attributed to d'Orbigny (1840) (e.g. Dickinson 2003). Five subspecies have been traditionally recognized, in addition to the nominate: *albogriseus* (Lawrence, 1867) (type locality: Lion Hill, Panama), *albocinereus* (Sclater & Salvin, 1880) (type locality: Bogotá, but the BMNH cotype is a specimen of the Western Amazonian population: Fig. 3(iii)), *atimastus* Oberholser, 1902 (type locality: Chapada, Mato Grosso, Brazil) and *subcanescens* Todd, 1920 (type locality: Upper Rocana, northern Pará, Brazil).

Another name, *sibilans*, was described by Lichtenstein (1823), also based on Azara (1802-5) and a specimen from São Paulo. The reason for Lichtenstein (1823)'s second description is not clear, but could have been influenced by the then ongoing nomenclatural controversies between Vieillot and other ornithologists of the era such as Temminck (see e.g. Miracle 2011). Hartlaub (1847) and Burmeister (1856) also used *sibilans* Lichtenstein, 1823, but it is a junior synonym of *sibilator* Vieillot, 1818 (Hellmayr 1927). Because Lichtenstein (1823) is based on a São Paulo syntype as well as birds studied by Azara (1802-5) used in Vieillot (1818)'s description, the two names are subjective and not objective synonyms.

Sirystes was chosen as the subject of this study for two reasons. First, as part of work on updating the Colombian checklist (Salaman *et al.* 2008, 2010, Donegan *et al.* 2009, 2010, 2011, 2012), an initial study of sonagrams in www.xeno-canto.org of species split by Gill & Wright (2006) identified *Sirystes* as a strong candidate for taxonomic revision based on clear vocal differences. Second, although its present taxonomy results in a widespread distribution (Ridgely & Tudor 1994) and an IUCN status of Least Concern, the species is considered primary forest-dependent (Stotz *et al.* 1996). *Sirystes* are canopy-dwelling birds and some populations have been found to require large territories to persist compared to other tyrant-flycatchers (Lopes & Marini 2006), and they are nuclear flock leaders in southern Brazil (A. Lees *in litt.* 2013). Local extinctions of *Sirystes* have been reported in Panama (Karr 1982) and Brazil (Christiansen & Pitter 1997) following forest loss and fragmentation. The species is particularly sensitive to forest fragmentation (Dos Anjos *et al.* 2011) and was reported not to persist following a forest fire in Brazil (Willis 2003). *Sirystes* has been considered "rare", "local" or "uncommon" throughout its range (Ridgely & Gwynne 1989, Ridgely & Greenfield 2001, Schulenberg *et al.* 2007, Honkala & Niiranen 2010, McMullan *et al.* 2011, Lees *et al.* 2013). There are only a few known modern localities for Western Sirystes in Colombia, including in Chocó (N. Athanas: see Appendix 1 and cover) and along the RNA Las Tangaras to Santana road in Valle del Cauca (J. C. Luna pers. comm. 2013). As taxonomic revisions of over-lumped taxa can reveal smaller populations of conservation concern, and given that this species is sensitive to habitat loss and fragmentation, *Sirystes* emerged as a priority for a detailed taxonomic revision.

Morphological variation

S. sibilator is today often considered a widely distributed species (Ridgely & Tudor 1994, 2009, Fitzpatrick 2004, Restall *et al.* 2006), although this study suggests its range has been widely over-reported (Fig. 5). The nominate subspecies occurs in the Atlantic region of Brazil and into Paraguay and Argentina. Subspecies *atimastus* is little studied and often overlooked in modern literature, having been treated as conspecific with *sibilator* since its original description. Hellmayr (1927) restricted *atimastus* to the type locality in Mato Grosso. It differs from geographically proximate *sibilator* in having paler lower underparts and a more extensively white rump (Fig. 3(v)). Hellmayr (1927) also referred to a "clearer" foreneck, whilst Oberholser (1902) and Ridgway (1907) cited its smaller size (Ridgway 1907 noting shorter tail length), lighter and more greyish upperparts; these other differences are slight. Photographs of birds showing paler lower underparts in WikiAves Brazil hail from various localities in the cerrado region. The geographic segregation between this form and *sibilator*, which can be considered otherwise distributed to the south, north and east of the Cerrado, does not appear clear-cut and requires further study of specimens and photographs from Brazil, or using phylogenetic techniques.

There are two named Amazonian populations: *albocinereus* of Western Amazonia (of Bolivia, Peru, Ecuador, Colombia, Venezuela and western Amazonas and Acre, Brazil) and *subcanescens* found north of the Amazon in British Guyana, French Guiana and Brazil from Manaus, Amazonas eastwards to Amapá and Pará states. Rivers seem not to form a barrier for *albocinereus*, whose range straddles the Amazon. Its distribution appears to be restricted by climatic or ecological factors, rather than to interfluves: there were no confirmed records uncovered in this study east of Leticia, Colombia or the border of Acre state. The form *subcanescens* is known only east of the rio Negro and north of the Amazon. Finally, *albogriseus* occurs in the Choco region from eastern Panama through western Colombia to north-western Ecuador.

The Chocó form *albogriseus* and Western Amazonian *albocinereus* were originally described as species and formerly treated specifically with respect to *sibilator* by some authors (e.g. Ridgway 1907). However, Hellmayr (1908) treated *albocinereus* and *atimastus* as "well-marked geographical forms" of *sibilator*. Subsequently, Hellmayr (1927) treated all congeners as conspecific. Most subsequent authors have followed this approach (Meyer de Schauensee 1966, Traylor 1979, Hilty & Brown 1986, Dunning 1987, Ridgely & Gwynne 1989, Ridgely & Tudor 1994, Salaman *et al.* 2001, 2010, Dickinson 2003, Restall *et al.* 2006, Schulenberg *et al.* 2007, McMullan *et al.* 2010, 2011, Remsen *et al.* 2013). However, Ridgely & Greenfield (2001), followed by Jahn *et al.* (2002), Hilty (2003), Gill & Wright (2006), Ridgely & Tudor (2009), McMullan & Navarrete (2013) and others, more recently treated *S. albogriseus* ("Western Sirystes") as a species separate from a broadly defined *S. sibilator* including all remaining taxa

("Eastern Sirystes"), based mainly on differences in vocalizations discussed in Ridgely & Tudor (1994). These differences have previously only been addressed through transcriptions in the field guide literature, in which available accounts have addressed only part of the genus' range.

Plumages have been discussed and illustrated in many publications (Ridgway 1907, Hellmayr 1908, 1927, Ridgely & Gwynne 1989, Sick 1993, Ridgely & Tudor 1994, 2009, Ridgely & Greenfield 2001, Souza 2002, Hilty 2003, Restall *et al.* 2006, Narosky & Yzurieta 2006, Schulenberg *et al.* 2007, Van Perlo 2009, McMullan *et al.* 2010, 2011, McMullan & Navarrete 2013). Most currently recognized taxa are illustrated in Figure 3. The salient plumage differences are summarized in Appendix 5. Western Sirystes *S. albogriseus* has two broad white wing bars and white wing covert edgings forming an extensively white proximal folded wing and a more extensively whitish tip to the tail than other taxa. It has an extensive white rump and grey underparts. In *albocinereus* of Western Amazonia and *subcanescens* of North Amazonia, the underparts are white with broad greyish or beige striations in the throat. Wings lack any extensive white markings except on the edge of flight feathers and in particular the tertials. There is also a broad area of white on the rump. In *atimastus*, the white on the rump is somewhat reduced and in *sibilator* almost absent. Subspecies *sibilator* and *atimastus* show dark streaking on the upperparts and narrow greyish edgings to the wing coverts, a feature which is barely visible in *subcanescens* and *albocinereus*. A supposed westward gradation in increasing whiteness of plumage led Hellmayr (1908, 1927) and Ridgely & Tudor (1994) to treat all *Sirystes* as one species. However, patterns of increasing or decreasing whiteness do not reflect a gradual west-east pattern for all plumage features: Amazonian *albocinereus* and *subcanescens* have almost no white on the wing coverts but the palest underparts of all *Sirystes*, whilst rump coloration is essentially equal for *albocinereus*, *albogriseus* and *subcanescens*.

Previously known vocal variation in Sirystes

The first notes on vocalizations in *Sirystes* were published by Azara (1802-5), as cited by Vieillot (1818) in the original description of *sibilator*, of birds in Paraguay calling "*bi-bi-bi*". Modern studies of voice then began with Lanyon & Fitzpatrick (1983) who, based on fieldwork in the Western Amazonian region of Madre de Dios, Peru, described the "typical daytime vocalization given during active foraging" quite differently, as a "clear, ringing *'wher-péw'*". They stated that during more intense calling, intra-pair displaying, and dawn-singing, this frequently is lengthened into "*wher-pe-pe-pe-pew-pew*". The latter call was reportedly given more incessantly during nest visits.

Ridgely & Gwynne (1989) described the Panamanian population's calls as "*chup-chup-chup* ..." or "*prip-prip-prip* ...". Hilty & Brown (1986) included a note attributed to R. Ridgely about vocal differences between *Sirystes* populations each side of the Andes. Ridgely & Tudor (1994) were then the first to detail these differences, using slightly modified versions of Lanyon & Fitzpatrick (1983)'s transcriptions to describe the calls of Amazonian birds ("*wheer-péw*" or "*wheer-pe-pe-pew-pew-péw*"). These authors noted the "rather different" and "huskier" calls west of the Andes, using Ridgely & Gwynne (1989)'s transcriptions. Ridgely & Greenfield (2001) used similar vocal transcriptions to Ridgely & Tudor (1994) but noted additional alternate calls "*wheer-péwpu*" and "*wheer-péw-péw-péw*" for Eastern Sirystes and "*chup-chip-chip*", "*prup-prip-prip-prip*" and "*che-che-che-che-che-che-chut*" for Western Sirystes. Hilty (2003) described the song of Eastern Sirystes in the south-eastern foothills of the Venezuelan Andes as "*wheer whít-it*", "*wheer whít*" and "*wheer-pi'pi'pi'pi'pi'pi'*", the latter considered an alarm call. Several of the above calls were cited in Restall *et al.* (2006). In Peru, Amazonian birds are described as calling "*p'weer-PEW-pu*", "longer series of '*pew*' notes, the number variable" and "quiet '*kew*' or '*pew*' notes given singly or in isolation" (Schulenberg *et al.* 2007).

Recordings of the kinds of vocalizations discussed in the above paragraphs for Eastern Sirystes have been made throughout Western Amazonia from Bolivia and Acre (Brazil) north through Peru and Ecuador to Venezuela, so are also presumably the vocalizations of birds in the Amazonian region of Colombia, from where there are no available recordings to date. This population corresponds to *albocinereus*.

Vocal differences between the Western Amazonian and other populations east of the Andes have not been highlighted to date in the literature, but are also evident from transcriptions of vocalizations in the field guide literature. Sick (1993) described the song of Brazilian populations as: "*ewe, ewe ewe, wee, wee, wee-WEEeh, tew, tew, ti, ti, ti, ti, ti, ti, ti, tew*". Van Perlo (2009) considered the song of Brazilian birds to be "*weew-weeuw-weeuw*" and its call a "short, rapid series of 4-7, slightly ascending fluted '*wuh-wíwi-wuh*" notes, the last note lowered". Honkala & Niiranen (2010) described south-east Brazilian birds as calling "*pee, pee, pee, pee* ... with persistent tone" (quite similar to Azara 1902-5) or "*peep-pep-pew-pew-pew*, descending at the end". Narosky & Yzurieta (2006) for Paraguay describe the song similarly to Van Perlo (2009) as "*fui-fuí-fuí-fuio*". These songs correspond to the voice of birds occurring in Eastern South America including the Atlantic and Cerrado regions.

Vocalizations are considered innate (non-learned) in the Tyrannidae (Kroodsma 1984, 1989, Kroodsma & Konishi 1991). Although study of vocal differentiation in suboscines begun in this family, revisionary taxonomic studies using voice have focused recently on other groups such as the antbirds (e.g. Isler *et al.* 1999, 2006, 2007, 2009, Isler & Whitney 2011, Donegan 2012, Whitney *et al.* 2013a), tapaculos (e.g. Krabbe & Schulenberg 1997, Coopmans *et al.* 2001, Donegan & Avendaño 2008, Krabbe & Cadena 2010), antpittas (Donegan 2008, Carneiro *et al.* 2012) and furnariids (Krabbe 2008). Although some recent taxonomic revisions of Neotropical Tyrannidae are based on voice (Donegan *et al.* 2009, Garrido *et al.* 2009), vocal characters have latterly been more often used to identify and diagnose cryptic new species (e.g. Coopmans & Krabbe 2000, Alvarez Alonso & Whitney 2001, Johnson & Jones 2001, Zimmer *et al.* 2001, Lane *et al.* 2007, Straneck 2007, Herzog *et al.* 2008, Whitney *et al.* 2013b,c, Zimmer *et al.* 2013). At the same time, various taxonomic revisions for the Tyrannidae based largely on molecular data have been published (e.g. Rheindt *et al.* 2008, 2009, Hosner & Moyle 2012). In this paper, I seek to document and discuss the implications of vocal variation in *Sirystes* and consider the taxonomic implications of vocal variation in the genus.

Methods

I assembled multiple digitized sound recordings (Appendix 1) initially with a view to considering the merits of the split of Western Sirystes. Subsequently, once the more complex variation in this group became evident, the study was expanded to better understand variation and assess species limits in the genus as a whole. Recordings were compiled largely from two major online compendia (www.xeno-canto.org and the Macaulay Library) and commercial CDs and DVDs (Appendix 1). These were supplemented with recordings from WikiAves Brazil from within the range of subspecies *subcanescens* and *albocinereus* only (due to large numbers of *sibilator/atimastus* recordings in other sources). Sonagrams were generated using the default settings of Raven Lite 1.0, sometimes adjusted for brightness and then expanded for time period and frequency to show the detail in Figures 1-2. Sound recordings were attributed to named taxa based on geographical distribution: (i) west of the Andes (*albogriseus*); (ii) Western Amazonia (*albocinereus*); (iii) North Amazonia (*subcanescens*); and (iv) Atlantic-Cerrado (*sibilator/atimastus*).

Sirystes populations were found to deliver various different sorts of vocalizations, with a vocal repertoire that is not particularly consistent in usage or nature between populations, presenting challenges to collating and analyzing data in a quantitative fashion. Four kinds of vocalizations were identified and studied here: short notes, whistles, chattering songs and downstroke songs. Each of these is discussed in turn below.

The first kind of call, apparently the only vocalization given by Western Sirystes, is a repeated single, short note ("short note": Figs. 1A-F). In Western Amazonia, short notes are delivered as part of more complex vocalizations usually commencing with a whistle (i.e. the "*péw*" of Lanyon & Fitzpatrick (1983) "*wher-péw*" or second or third syllable of Ridgely & Greenfield (2001)'s "*wheer-péwpu*" or Schulenberg *et al*. (2007)'s "*p'weer-PEW-pu*": Figs. 1G-L). The subsequent shorter notes only of the "*wheer-péw*" (and similar) vocalizations were measured as short notes, given some similarities in note shape to the short notes of Western Sirystes. In the Atlantic-cerrado population, single notes that might otherwise make up a part of a chattering song are sometimes given as an isolated call (Figs. 2K-L) and are shorter than other calls of this group. Somewhat arbitrarily, these calls of eastern populations were treated as short notes for comparative purposes. It could alternatively be argued that Amazonian and Atlantic-Cerrado populations give no short notes at all, so this is a conservative approach.

The most common vocalization of Western Amazonian birds is a whistle. The whistle is followed immediately by a short note (Lanyon & Fitzpatrick (1983)'s "*wher-péw*": Figs. 1H, K, L), short notes (Ridgely & Greenfield (2001)'s "*wheer-péwpu*" or Schulenberg *et al*. (2007)'s "*p'weer-PEW-pu*"*:* Figs. 1G, I, J), a downstroke song (Ridgely & Greenfield (2001)'s "*wheer-péw-péw-péw*" Figs. 1N-O) or a chattering song (Hilty (2003)'s "*wheer-pi'pi'pi'pi'pi'pi*": Fig. 1Q) in Western Amazonia. Because no other populations combine a whistle with other notes, the combination of notes in such sequences was not measured quantitatively. Instead, only the "*wheer*" part of these vocalizations ("whistle") was measured for Western Amazonian birds. This was compared to the single whistles of other eastern populations. In North Amazonian birds, whistles are given in sequences (Fig. 2A) or alone (Figs. 2B-D). In the Atlantic-cerrado population, whistles similar to those in the Western Amazonian and North Amazonian populations are not found in any recordings, but single long notes that might otherwise make up a part of downstroke songs are sometimes given as an isolated call (Figs. 2M-N). Somewhat arbitrarily, these calls of eastern populations were treated like whistles for comparative purposes. It could alternatively be argued that Atlantic-Cerrado populations give no whistles at all, so this is a conservative approach.

The small sample sizes of whistles and short notes for the Atlantic-Cerrado population (and other kinds of vocalizations which are not primary or secondary vocalizations in a particular population) should not be interpreted overly adversely as such samples generally reflect rare calls which are used for different communication purposes, rather than a lack of sampling. Statistical comparisons of primary vocalizations would render results showing much greater levels of differentiation than under this conservative approach.

For short notes and whistles: (i) individual note length (s), (ii) maximum acoustic frequency of the principal note (kHz), (iii) minimum acoustic frequency of the lower undertone (kHz), (iv) frequency bandwidth (difference between (ii) and (iii)), and (v) structure of vocalization in which the whistle is delivered, were measured or noted. Both short notes and whistles often have harmonic overtones, which in some instances allowed note length to be measured more accurately. However, the strongest and lowest principal note (usually the lowest tone visible on sonagrams) was always measured for frequency.

More complex vocalizations are also given by the Eastern populations of *Sirystes*. The first ("chattering song": Figs. 1P-R, 2G-I, 2O-W) corresponds to Azara (1802-5)'s "*bi-bi-*

bi", Van Perlo (2009)'s "*wuh-wíwi-wuh*", Honkala & Niiranen (2010)'s "*pee, pee, pee, pee ...*", Narosky & Yzurieta (2006)'s "*fui-fuí-fuí-fuio*" and the latter part of Hilty (2003)'s "*wheer-pi'pi'pi'pi'pi'pi*". The chattering song involves a series of few to many notes, often of variable length, in which individual notes are comprised of up-downstrokes with a region of thicker frequency bandwidth in the middle. Notes are often relatively symmetrical in shape and are delivered with short gaps between individual notes. Note length and song speed are highly variable in this sort of song. In Western Amazonian recordings, such vocalizations are rare and except in one recording (Fig. 1M) were delivered immediately following a whistle (Figs. 1P-R). In North Amazonia (Figs. 2G-I) and Atlantic-Cerrado (Figs. 2O-W) populations, these vocalizations did not follow whistles. Whistles of Western Amazonian birds were not included as part of the chattering song as a conservative approach in order to minimize differences between samples.

A second kind of song ("downstroke song": Figs. 1M-O, 2J, 2X-CH) corresponds to Schulenberg *et al.* (2007)'s "longer series of '*pew*' notes", Van Perlo (2009)'s "*weew-weeuw-weeuw*", Honkala & Niiranen (2010)'s "*peep-pep-pew-pew-pew*" and the latter part of Ridgely & Greenfield (2001)'s "*wheer-péw-péw-péw*". This song involves a series of slower notes of essentially equal length in which the notes have a small initial upstroke and long descending part, with a less thick bandwidth at the peak, and a peak in acoustic frequency which occurs near to the start of the note. In the downstroke song, individual notes are more spaced out than in the chattering song.

For both chattering songs and downstroke songs, the following vocal variables were studied: (i) number of notes in song; (ii) total song duration; (iii) song speed (by dividing i by ii); (iv) max. acoustic frequency of highest note (kHz); and (v) peak in acoustic frequency—the relative position of the highest note (as a percentage, calculated as $(p-1)/(n-1)$ where p is the sequential position of the note with the highest frequency and n is the number of notes in the song, and in recordings with no discernible peak or with no ascending or descending pattern, this was instead determined as flat and the recording was ignored); and (vi), note shape (for downstroke songs only, owing to great intra-population note shape variation in chattering songs). Overtones were not often present in recordings of songs, but where present only the lower tones (principal notes) were measured. In some recordings, birds gave a chattering song and downstroke song rolled up one into the other without any break (e.g. Fig. 2X) or immediately following a whistle (e.g. Figs. 1N, O, Q). In such instances, each different sort of vocalization was treated separately.

Nominate or *atimastus* populations have been recorded giving a long, flat whistling alarm call (XC38102) and a fast trill (XC70770), but only a single example of each of these were available for a single population, so they were not studied further.

In *Sirystes*, vocalizations of one particular kind are given repeatedly (almost incessantly) by all taxa, particularly at dawn. Sometimes, other calls are interspersed with such vocalizations, but the predominant vocalization was abundantly apparent from each population sample. The methodology for sound recordings was not standardized, owing to the collaborative effort of many recordists whose recordings were studied used here. However, the large number of such recordists and broad range of localities for all taxa also means that a sampling or identification bias towards different sorts of vocalizations for different populations is unlikely. Primary vocalizations were identified quantitatively by counting the number of recordings inspected which included a vocalization of each kind and identifying which kind of vocalizations were found in at least 80% of the sample. In each case, the kind of recordings so identified were those which were also given in repeated long sequences in many recordings for the population. Secondary vocalizations were identified for most populations as those present in greater than 30% of recordings. Other recordings were classified as "rare". The kind of primary or secondary vocalization was identified and compared for each population.

Up to three different examples of each vocalization type were measured from each single recording analyzed. In total, 447 vocalizations were studied from 134 recordings, comprising 114 short notes, 108 whistles, 60 chattering songs and 165 downstroke songs (App. 2). Appendix 1 contains a list of recordings studied, with details of catalogue number, recordists and localities.

Recordings that were likely to be of the same individual, even if on different archived recordings, were treated as a single recording, with later recordings excluded from analyses. Additional recordings were therefore ignored where involving consecutive or near-consecutive serial numbers or made within two hours by the same recordist at the same locality and where recordings had similar mensural vocal variables. The number of assumed individuals for each vocalization type for each species is stated in Appendix 2. On most recordings, the first three vocalizations (where available) of each kind were studied, but in some recordings where the individual approached closer permitting greater definition on the sonagrams, later recordings were selected. In a handful of recordings with two individuals vocalizing, additional sets of data were taken per vocalization type per individual. Data from recordings that included only fragments of a song or call were ignored, save as stated above for whistles and short notes of *S. sibilator/atimastus*. As many recordings from as many localities as possible were included, where available, to determine the full range of variables. All recordings of individuals under natural conditions and after playback were included for the same reason. After compiling the data, the highest and lowest recorded values for each variable for each vocalization for each taxon were double-checked to verify upper and lower limits.

Statistical tests.—various tests of differentiation were applied for pairs of vocal and biometric variables of these populations in order to assess whether various postulated statistical tests considered relevant to species or subspecies rank had been passed, following Donegan (2008, 2012).

LEVEL 1: statistically significant differences at $p<0.05$. A Bonferroni correction was applied for both vocal data and biometrics with the number of variables treated separately for each different call type (short notes and whistles: 4 variables each, $p<0.0125$); chattering songs and downstroke songs: 5 variables, $p<0.01$). An unequal variance (Welch's) t-test was used to test significance; for song speeds, a two-sample Kolmogorov-Smirnov test was applied as an additional test that must be satisfied for Level 1, to account for the possibility of a non-normal distribution. These calculations assess the statistical significance of differences between the means of populations, but do not address diagnosability, as they tolerate considerable overlap.

Further calculations, described below, were undertaken to measure inter-population differences in the context of various species and subspecies concepts. In the formulae used below, $\bar{x}_1$ and s_1 are the sample mean and sample standard deviation of Population 1; $\bar{x}_2$ and s_2 refer to the same parameters in Population 2; and the t value uses a one-sided confidence interval at the percentage specified for the relevant population and variable, with t_1 referring to Population 1 and t_2 referring to Population 2.

LEVEL 2: a '50% / 97.5%' test, following one of Hubbs & Perlmutter's (1942) subspecies concepts, which is passed if sample means are two average standard deviations or more apart controlling for sample size, i.e. the sample mean of each population falls outside the range of 97.5% of the other population: $|(\bar{x}_1 - \bar{x}_2)| > (s_1(t_{1\ @\ 97.5\%}) + s_2(t_{2\ @\ 97.5\%}))/2$.

LEVEL 3: The traditional '75% / 99%' test for subspecies (Amadon 1949, Patten & Unitt 2002), modified to control for sample size, which requires both the following tests to be passed: $|(\bar{x}_1 - \bar{x}_2)| > s_1(t_{1\ @\ 99\%}) + s_2(t_{2\ @\ 75\%})$ and $|(\bar{x}_2 - \bar{x}_1)| > s_2(t_{2\ @\ 99\%}) + s_1(t_{1\ @\ 75\%})$.

LEVEL 4: diagnosability based on recorded values (first part of Isler *et al.*'s 1998 diagnosability test) or, for plumage and subjective vocal characters (note shape and change of note shape), subjective diagnosability.

LEVEL 5: 'Full' diagnosability (where sample means are four average standard deviations apart at the 97.5% level, controlling for sample size): the second part of Isler *et al.*'s (1998) diagnosability test: $|(\bar{x}_1 - \bar{x}_2)| > s_1(t_{1\ @\ 97.5\%}) + s_2(t_{2\ @\ 97.5\%})$.

A separate proposal for ranking species based on scores using a range of characters was recently developed by Tobias *et al.* (2010). Herein, a taxon pair that reaches Level 1 (but does not meet other tests) is treated as conforming to Tobias *et al.*'s (2010) 'minor magnitude' differences (less than two standard deviations between means). Level 2 is equivalent to their 'medium magnitude' (two standard deviations' difference between means), but the statistical test employed is more rigorous in that it also controls for sample size. Tobias *et al.* (2010) use five standard deviations' difference without controlling for sample size for their 'major magnitude' differences; my Level 5 (four standard deviations apart, i.e.no overlap, but controlling for sample size) is treated as equivalent. Tobias et al. (2010) argued against some of the quantitative methods used above, where "calls of taxon A are comparable to songs of taxon B, or primary song of taxon A to secondary song of taxon B" as "Doing so will result in spurious estimates of phenotypic divergence." As a result, differences in primary vocalization type were also considered scorable as up to 3 each for kinds of primary vocalization which differ temporally or spectorally.

Museum specimens at BMNH and AMNH, including type specimens of *albogriseus* and *albocinereus*, and photographs on WikiAves Brazil were inspected to consider plumage differences, which were compared for all taxa.

Results

The results of vocal analyses are set out in Appendices 2-4. Four populations were found to meet the Tobias *et al.* (2010) test for species rank (App. 5).

"Western Sirystes" *S. albogriseus* has a dramatically different vocal repertoire from all populations East of the Andes. Western Sirystes has a different sort of primary vocalization from all other populations, and no recordings include whistles, chattering songs or downstroke songs. All available recordings involve repeated short notes, which can appear almost vertical on sonagrams. Recordings from across the species' range in Panama, Colombia and Ecuador are similar in this respect (Figs. 1A-E). Notes are quickly delivered downstrokes with a small initial upstroke (Fig. 1A-E). A comparison of the most similar call notes of the proximate (Western Amazonian) population – the second or third notes in the "*wheer-péw*" or "*wheer-péw-péw*" call – reveals statistical diagnosability in note length (Fig. 5B, App. 2-3). The small number of short note recordings in other populations occurring east of the Andes similarly show no overlap for note length. The vocal differences between Western and Eastern birds are substantial, with voices of the two being virtually unrecognizable from one another to the human ear or using sonagrams. These differences give strong support to Ridgely & Greenfield (2001)'s proposed split.

Whilst the vocal differences between populations either side of the Andes are well-known and supported by this study, significant variation in both vocal repertoire and quantitative vocal variables for whistles were found among the three populations occurring east of the Andes. All of them differ diagnosably (or in the case of a variable for one pair, near-diagnosably) in quantitative variables and in their usage of primary and secondary vocalizations:

- The most geographically distant pair: Atlantic-Cerrado versus Western Amazonian populations, differ: (i) in the kind of primary vocalization, which in the Atlantic-Cerrado are chattering songs and in Western Amazonia are whistles (App. 4); (ii) diagnosably in the song structure and.

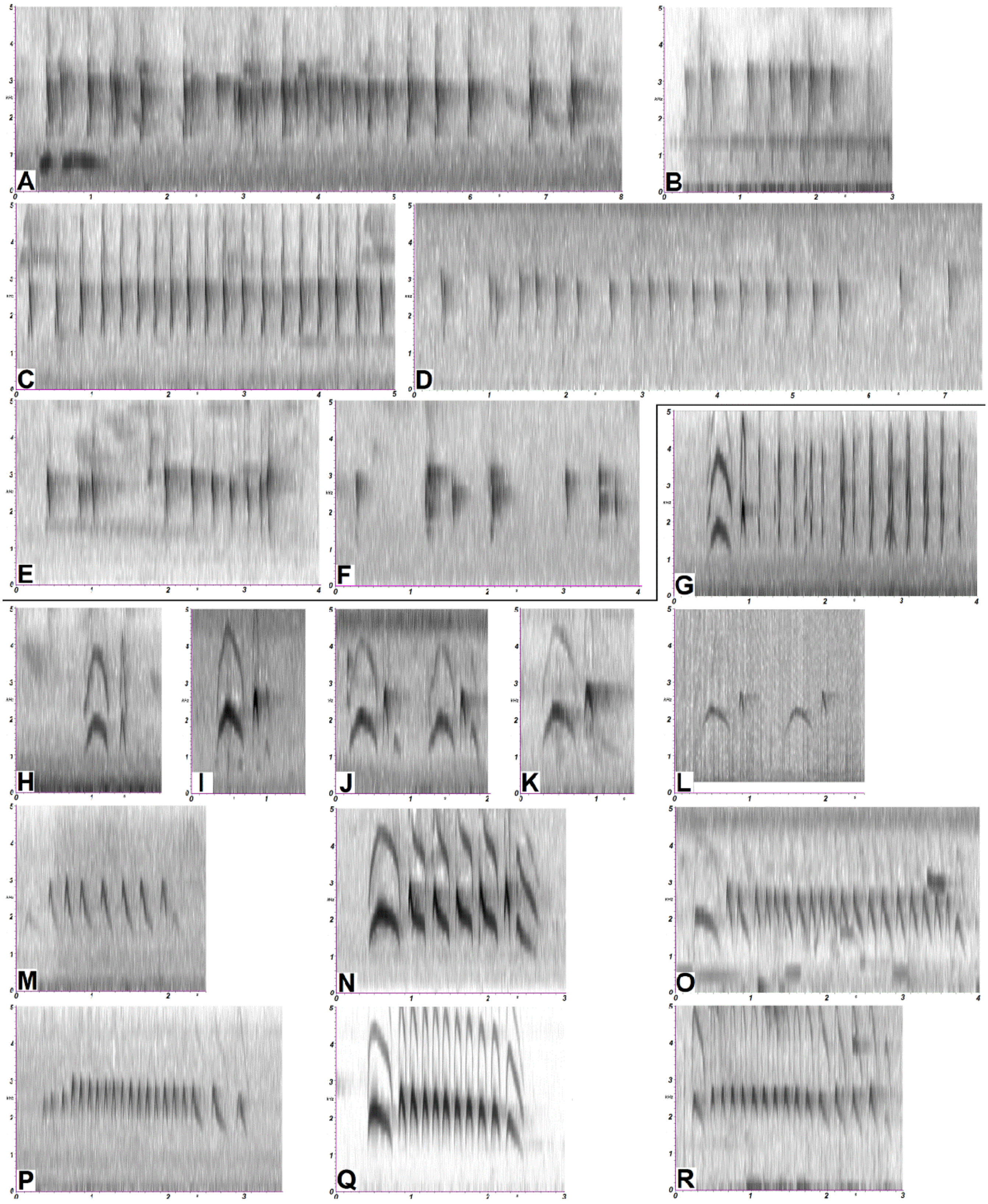

Figure 1: Sonagrams of songs and calls of Western (Choco) Sirystes *S. albogriseus* of the Chocó (A-F) and White-rumped Sirystes *S. albocinereus* of Western Amazonia (G-R). Each sonagram here and in Fig. 2 shows 5 kHz of frequency bandwidth (*y* axis) and is on the same time scale (*x* axis) with number seconds noted; full details of recordings are in Appendix 1. Western (Choco) Sirystes, short notes – A-C: Darién, Panama (ML60335; Boesman 1999; ML31156) (near type locality of *albogriseus*); D: Chocó, Colombia (XC140775); E-F: Esmeraldas, Ecuador (Jahn *et al.* 2002; XC65721). White-rumped Sirystes, whistle and short notes – G. Barinas, Venezuela (ML66396); H: Apure, Venezuela (ML66397); I: Napo, Ecuador

(Krabbe & Nilsson 2003, track 156-1); J: Huánuco, Peru (ML17860); K: La Paz, Bolivia (ML52352); L: Acre, Brazil (WA1028668). White-rumped Sirystes, downstroke song – M: Barinas, Venezuela (ML66395); N. Napo, Ecuador (Boesman 2009), with initial whistle; O: Huánuco, Peru (ML17860), with initial whistle. White-rumped Sirystes, chattering song – P: Barinas, Venezuela (ML66395), with downstrokes at end; Q: Orellana, Ecuador (XC61441), with initial whistle; R: Madre de Dios, Peru (ML29607), with initial whistle and downstrokes at end.

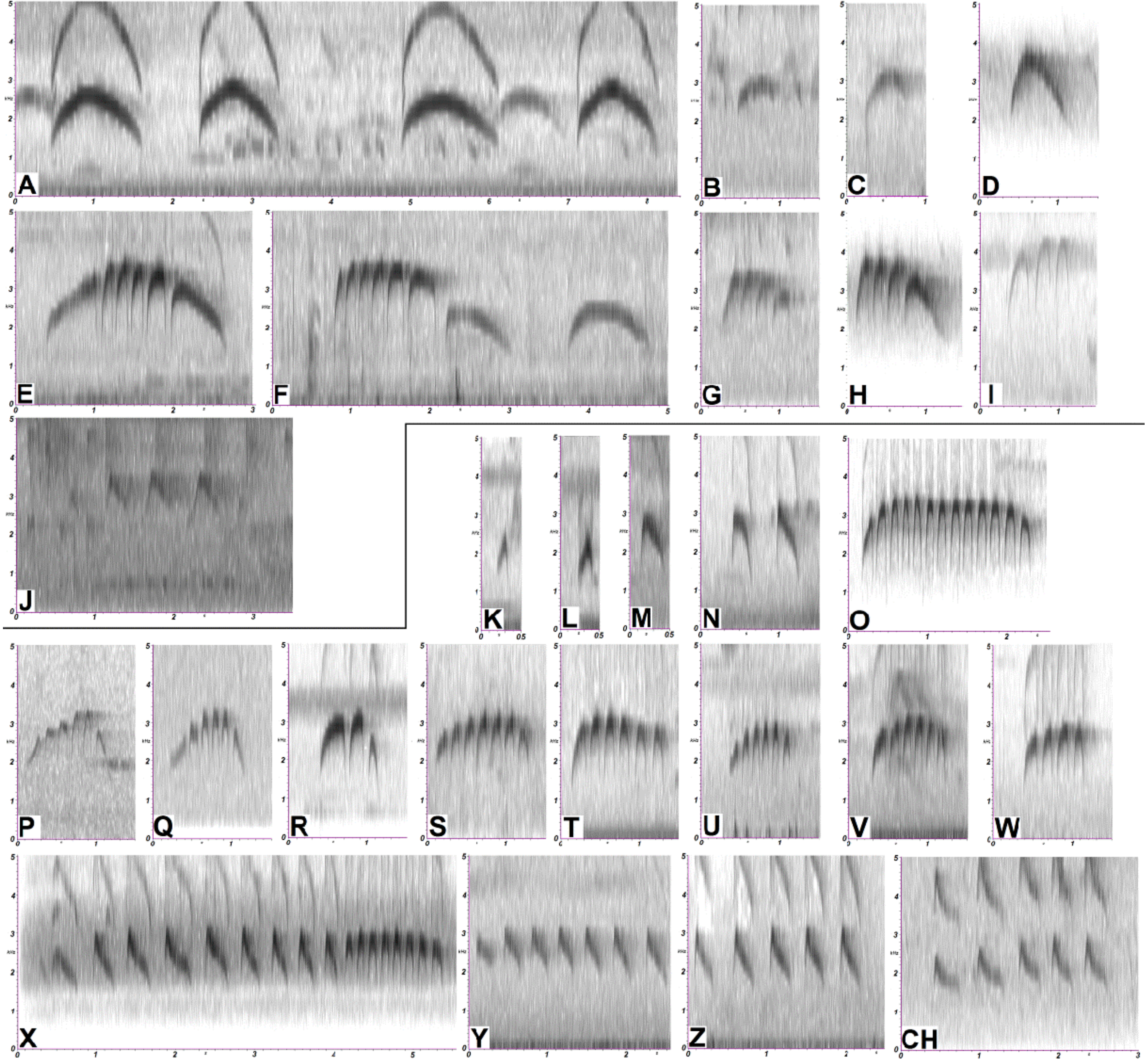

Figure 2: Sonagrams of songs and calls of Todd's Sirystes *S. subcanescens* of North Amazonia (A-J) and Sibilant Sirystes *S. sibilator* of the Atlantic and cerrado regions (K-Z & CH). Todd's Sirystes, whistle – A: Amazonas, Brazil (ML127365); B. Guyana (ML98716); C. French Guiana (XC74402); D. north Brazil (XC49721). Todd's Sirystes, chattering song – E-F: Amazonas, Brazil (ML42831; ML42831), latter with two whistles following; G: Guyana (ML98716); H. north Brazil (XC49721); I: Pará, Brazil (XC126301). Todd's Sirystes, downstroke song – J: French Guiana (XC59331). Sibilant Sirystes *S. sibilator* short note (fragment of chattering song) – K: São Paulo, Brazil (ML66398); L: Rio Grande do Sul, Brazil (ML19527). Sibilant Sirystes *S. sibilator* whistle (fragment of downstroke song) – M: Concepción, Paraguay (ML54296); N: Rio Grande do Sul, Brazil (ML68463). Sibilant Sirystes *S. sibilator* chattering song – O: Paraná, Brazil (XC60864); P: Pará, Brazil (XC13732); Q: Maranhão, Brazil (XC1426); R: Bahia, Brazil (XC82406); S: São Paulo, Brazil (XC7042); T: Rio Grande do Sul, Brazil (ML19369); U: Mato Grosso, Brazil (XC86650); V: Misiones, Argentina (XC8196); W: Caazapá, Paraguay (ML54254). Sibilant Sirystes *S. sibilator* downstroke song (to 4s), then chattering song – X. Caazapá, Paraguay (XC55850). Sibilant Sirystes *S. sibilator* downstroke song – Y: Rio de Janeiro, Brazil (XC58340); Z: Chapada (near type locality of *atimastus*), Mato Grosso, Brazil (XC23724); CH: Misiones, Argentina (XC51980).

note shape of whistles, which in Western Amazonia are always followed by one or more short notes, a chattering song or downstroke song but in the Atlantic-Cerrado population, to the extent fragments of downstroke songs can be considered the equivalent of a whistle, are delivered alone or in sequences of such notes and have a less symmetrical and more sharply peaked note shape (Figs. 1-2); (iii) to the extent fragments of downstroke songs can be considered the equivalent of a whistle, diagnosably and significantly in the maximum acoustic frequency of whistles (App. 3; Fig. 4A); and (iv) significantly but not diagnosably in other vocal variables set out in Appendix 3.

- North Amazonian and Atlantic-Cerrado populations differ: (i) in the kind of primary vocalization, which North Amazonia are whistles and in the Atlantic-Cerrado are chattering songs (App. 4); and (ii) in the kind of secondary vocalization, which in North Amazonia are chattering songs and in the Atlantic-Cerrado are downstroke songs (App. 4); (iii) diagnosably and significantly in the length of whistles (App. 3; Fig. 4A); (iv) provisionally (based on a single recording from North Amazonia), in the note shape of downstroke songs, with the North Amazonia recording having an initial upstroke which is slower in reaching the peak; and (v) significantly but not diagnosably in other variables set out in Appendix 3.
- Western Amazonian and North Amazonian populations differ: (i) diagnosably in the song structure of whistles, which are the primary vocalization for both populations, which in Western Amazonia are always followed by one or more short notes, a chattering song or downstroke song but in North Amazonia are delivered alone or in sequences of whistles; (ii) significantly in maximum acoustic frequency of whistles (App. 3; Fig. 4A), which narrowly missed the statistical test of diagnosability perhaps due to sample sizes from North Amazonia, but showed no overlap; (iii) in secondary vocalization type (which is the chattering song in North Amazonia versus downstroke song in West Amazonia) (App. 4); (iv) provisionally (based on a single recording from North Amazonia), in the note shape of downstroke songs, with the North Amazonia recording having an initial upstroke which is slower in reaching the peak; and (v) significantly but not diagnosably in other variables set out in Appendix 3.

Each of these four populations scores at least Tobias et al. (2010)'s "seven points" required for species rank with respect to each of the others (Appendix 5).

In an initial study, Atlantic (*sibilator*) and cerrado (*atimastus*) populations were treated separately, but only small differences were evident, the most substantial of which was in song speed of chattering songs (mean 5.29 ± 1.07 s.d. (Minimum 3.21- maximum 8.22) (*n*=126) for Atlantic; 6.60 ± 0.98 (5.28-8.62) (*n*=17) for cerrado), but this did not attain 50% diagnosability.

Discussion

The proposed split of Western from Eastern Sirystes, which are trans- and cis-Andean populations of isolated lowland populations, is well documented (Ridgely & Tudor 1994) and here corroborated. However, other distributions of this group do not present simple cases of geographic replacements across known divides (Fig. 5). The Amazon River may be a geographical barrier in the lowermost part of the basin for the *subcanescens* and members of the *sibilator/atimastus* group, with proximate identifiable recordings from both north (Fig. 2I) and south (Fig. 2P) of the Amazon in Pará, Brazil. However, the species is very rare in Pará (A. Lees *in litt*. 2013) and records may therefore relate to austral wanderers whose distribution should not be limited to interfluval regions. Further upstream, neither the Amazon River nor its major tributaries form a barrier between populations of *albocinereus*, which is distributed from Peru, Bolivia and Brazil north through Colombia to Venezuela. The limits between Western Amazonian *albocinereus* and North Amazonian *subcanescens* are not presently known. In Venezuela and northern Colombia, the former is known only in Andean foothills, with no records in the Venezuelan Amazon, although it extends at least east to Iquitos in Peru (BMNH specimen: Fig. 3) and is reported east to Leticia in Colombia (Hilty & Brown 1986).

The form *albocinereus* is known from specimens in Meta, eastern Colombia (App. 6), various localities near the East Andes base in the llanos region and a sight record in Leticia (Hilty & Brown 1986), which is close to a specimen record from Iquitos, Peru (Fig. 3(iv)). However, there were no confirmed records of *Sirystes* uncovered during this study from east of Colombia to Manaus or in Brazilian Amazonia south of the river outside Acre, despite various authorities mapping presence in the region (e.g. Ridgely & Tudor 1994, 2009, Souza 2002, Van Perlo 2009). Historical specimens (e.g. Rio Purus: Carnegie Museum P88176, P93535) and modern collections (Museu Paraense Emílio Goeldi 26485-6, 58026) from south of the Amazon in Brazil are all from Acre state and westernmost Amazonas, not elsewhere, despite quite extensive collections having been made in southern Amazonia. Cohn-Haft *et al*. (2007) do not list this species for either side of the Rio Madeira. There are records from Reserva Natural Palmari on its website (in westernmost Amazonas, so presumably *albocinereus*). Other reported localities in southern Brazilian Amazonia such as Pousada Rio Roosevelt (Whittaker 2009) and rio Urucu (Peres & Whittaker 1991) lack archived sound recordings in the databases studied here and no confirmatory materials or details of the observations are available (A. Whittaker *in litt*. 2013).

The northernmost records of the *sibilator* group come from northern Mato Grosso and south-eastern Pará states. The species is rare in the well-inventoried Alta Floresta region (Lees *et al*. 2013) and may be an austral migrant or vagrant to this area (A. C. Lees *in litt*). Sick (1993) also considered the *sibilator* group to be a partial migrant in southern part of its range. However, Greenberg & Marra (2005) found no

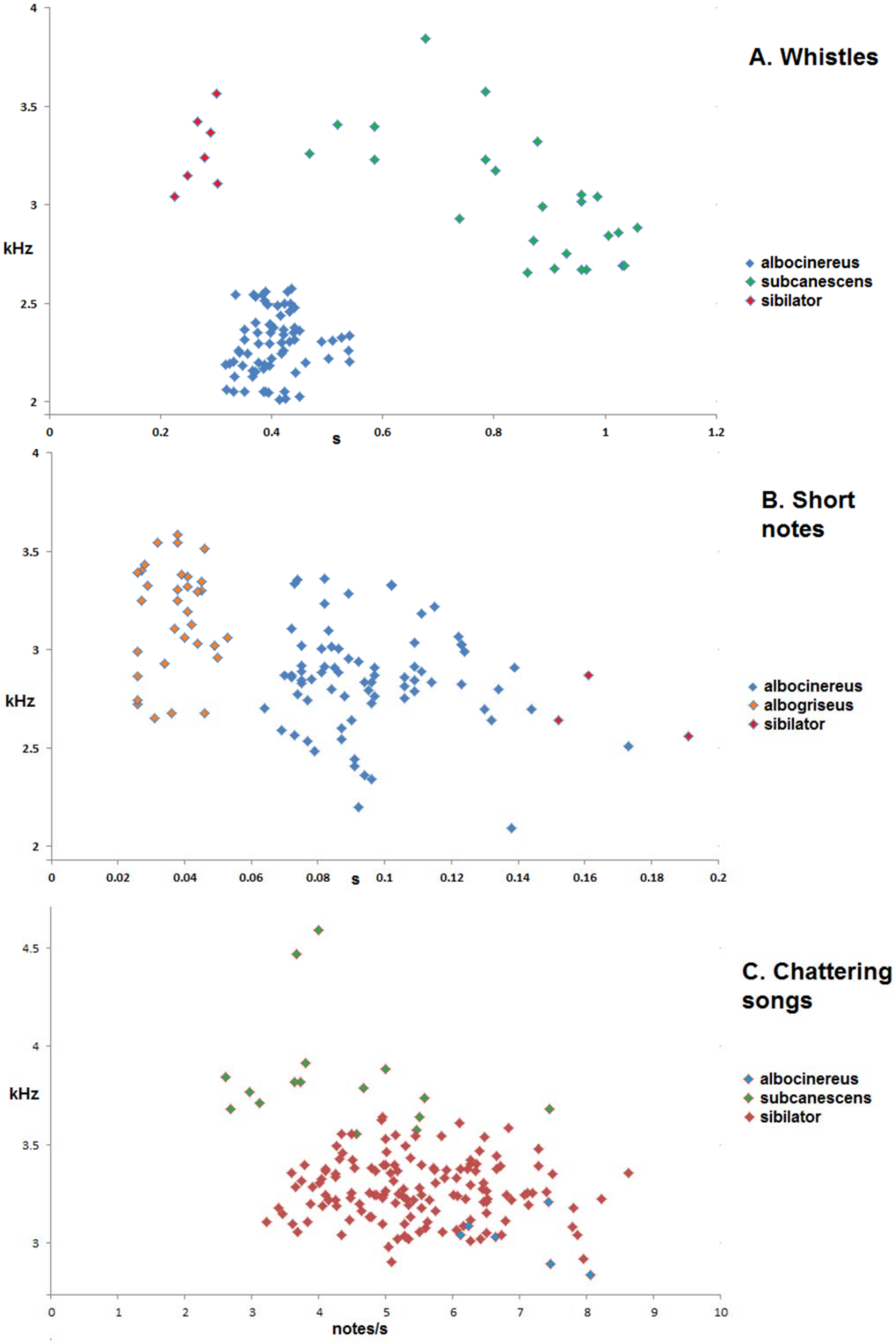

Figure 4: Scatter graphs showing vocal differentiation for selected variables between *Sirystes* taxa. A. song length (s) (x-axis) versus maximum acoustic frequency (kHz) (y-axis) for whistles. B. song length (s) (x-axis) versus maximum acoustic frequency (kHz) (y-axis) for short notes. C. song speed (notes/s) (x-axis) versus maximum acoustic frequency (kHz) (y-axis) for chattering songs.

Figure 3: Examples of the series at BMNH of (left to right): (i)-(ii) Western (Choco) Sirystes *S. albogriseus* Veragua, Panama (both, close to topotyical); (iii) White-rumped Sirystes *S. albocinereus* cotype, "Bogotá"; (iv) *S. albocinereus* Iquitos, Peru (paralectotype); (v) *S. sibilator atimastus* Chapada, Brazil (topotypical); (vi) *S. s. sibilator* Paraguay (topotyical); (vii) *S. s. sibilator* Rio de Janeiro, Brazil. *S. subcanescens* is not illustrated. © Natural History Museum.

evidence for seasonal distributional change and there are sound recordings in the sample from Paraguay, Argentina and southernmost Brazil for all months except December-February and May-July, so it is better considered a wanderer or partial migrant at most. Migration or seasonal movements are not reported in the other taxa

The plumage differences between the various vocally differentiated groups identified in this study are substantial in the context of Tyrannidae. In one of *Sirystes*' hypothesized closest relatives, *Myiarchus*, sympatric species are characterized by strong vocal but minor plumage differentiation.

The split of Western from Eastern Sirystes is strongly supported by differentiation in vocal (Figs. 1-2, 4, App. 2-4) and morphological (Fig. 3) characters. The vocal differences between three of the Eastern populations are less dramatic but still significant within the Tyrannidae. All these populations meet proposed benchmarks or points of reference for species rank in other suboscine groups (Isler *et al*. 1998) and species scoring tests (Tobias *et al*. 2010) vis-a-vis one another. A further pair (*atimastus* and *sibilator*) do not meet the same level of vocal differentiation nor the requirements of species scoring tests and are better treated as subspecies of a single species. The vocal and plumage differences, combined with distribution data, suggest a long-standing lack of gene flow between four populations. Four populations would be afforded species rank under a biological species concept, following modern treatments (Helbig *et al.* 2002, Remsen 2005, Tobias *et al*. 2010).

A. **Western Sirystes *Sirystes albogriseus*** of eastern Panama, western Colombia and north-western Ecuador. Where Eastern Sirystes is split further, this could be renamed as "**Choco Sirystes**".

B. **Eastern Sirystes *S. sibilator***, which in turn can be treated as a superspecies comprising the following three biological species:

1. **White-rumped Sirystes *S. albocinereus*** of the upper Amazon region in Venezuela, Colombia, Ecuador, Peru, Brazil and Bolivia.
2. **Todd's Sirystes *S. subcanescens*** of the Guyana shield and lower Amazon region north of the Amazon river, in Brazil, Guyana and French Guiana.
3. **Sibilant Sirystes *S. sibilator*** (including subspecies *atimastus*) of the Atlantic region and eastern South America in much of Brazil south to eastern Paraguay and north-easternmost Argentina.

The vernacular names set out above are those of Hellmayr (1927) except that for Western Sirystes, which is Ridgely & Greenfield (2001)'s preference over Ridgway (1907) and Hellmayr (1927)'s "Panama Sirystes".

Further molecular analyses for this group could shed light on how the vocal differences between *Sirystes* populations arose, in particular: (i) whether the most vocally divergent and vocally simple population, *albogriseus*, is basal to more vocally variable populations found East of the Andes or recently derived; and (ii) if differences in the kinds of primary and secondary vocalizations between Todd's and Sibilant Sirystes are linked with greater or lower levels of molecular variation than between White-rumped and Todd's Sirystes, which are similar in plumage and differentiate vocally on more quantitative grounds.

A re-assessment of the conservation status of the newly split taxa is called for: whilst the split species are still relatively widely distributed, their populations are doubtless undergoing reductions due to accelerated habitat loss in many parts of their ranges. *S. albogriseus* in particular may be threatened or near-threatened.

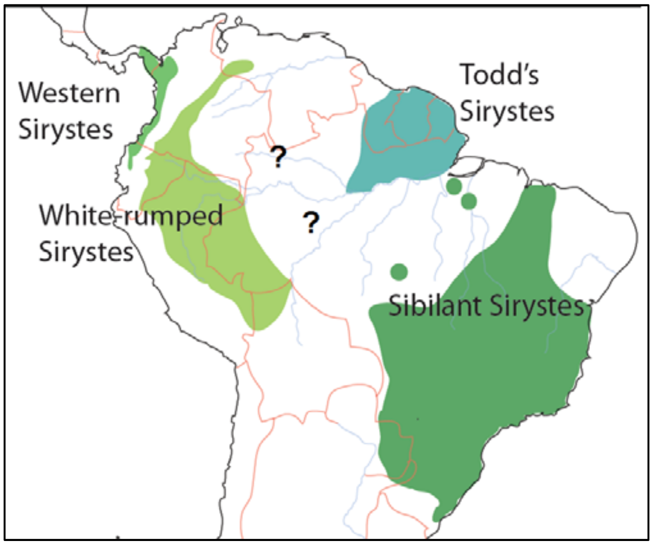

Figure 5: Map of *Sirystes* distributions by M. McMullan.

Acknowledgments

I would like to credit all the sound recordists cited in Appendix 1 for their major contributions. Without their collaborative efforts in fieldwork and making recordings available on xeno-canto and Macaulay library, this paper would not have been conceivable. Thanks to L. Garetano, P. Sweet (AMNH), R. Prŷs-Jones and M. Adams (BMNH) for access to specimens. A. Lees made a number of helpful comments on the manuscript and on the status of Brazilian populations and shared specimen data from the Goeldi museum. Thanks to J. C. Verhelst, N. J. Collar and P. Salaman and A. Monsalve for their helpful comments and to M. McMullan for his efforts on too many iterations of the map. G. Kirwan pointed me to Brazilian literature and A. Whittaker and M. Cohn-Haft shared notes on Brazilian records. R. Ridgely discussed sonagrams and gave some helpful suggestions on how to develop the study. E. Dickinson provided comments on Azara's and Vieillot's publications and '*sibilans*'.

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Appendix 1
Sound recordings inspected.

All sound-recordings used in analyses are cited below. Coordinates are taken from the relevant database or publication and converted where necessary into degrees and minutes. Dashes refer to a series of different cat. nos. starting and ending with the number in question. Taxonomy in all appendices follows the new arrangement presented in the main text. The split of recordings between *sibilator* and *atimastus* is provisional and complicated due to their close similarity and the lack of a detailed morphological study on birds of this region here. Further research is needed to determine the limits between these two forms. Catalogue numbers refer to: ML=Macaulay library; XC=www.xeno-canto.org, WA = WikiAves Brazil.

Choco Sirystes *S. albogriseus*

Panama Darién: Cana (70°51'N, 77°38'W; 500 m) (XC60676: K. Allaire; Boesman 1999). Cerro Jefe (ML31223: T. Davis). Darién (ML31156: T. Davis). Cerro Pirre (ML60293, 60315, 60332, 60335 [latter two treated as same recording]: P. Coopmans).

Colombia Chocó: Utría National Park Trail (06°04'N, 77°23'W) (XC140775: N. Athanas).

Ecuador Esmeraldas: Playa de Oro, Santiago (00°51'N, 78°46'W; 60-300 m) (XC65721-2 [treated as same recording]: A. Spencer; Jahn *et al.* 2002, track 27-3: P. Mena Valenzuela). **Pichincha**: 17km NW Pedro Vicente Maldonado (00°15'N, 79°12'W; 300 m) (XC71119, 71140 [treated as same recording]: D. Lane).

White-rumped Sirystes *S. albocinereus*

Venezuela Apure: El Nula (07º29'N, 71º53'W) (ML66397: P. Schwartz). **Barinas**: Rio Masparro (08º47'N, 70º7'W) (ML66395-6 [treated as same recording]: P. Schwartz).

Ecuador Napo: Sacha Lodge, río Napo (00°32'S, 76°23'W; 250 m) (XC94987, 94990-1 [latter two treated as same recording]: D. Lane; Boesman (2009): J. Moore; Krabbe & Nilsson (2003) track 156.1). La Selva Lodge, (00°24'S, 76°20'W; 300 m) (XC4888: D. Jones; Krabbe & Nilsson (2003) tracks 156.2-3). **Orellana**: Yasuní Research Station, Parque Nacional Yasuní (00°40'S, 76°24'W; 250 m) (XC61440-1, 61434 [all treated as same recording]: A. Spencer).

Peru Huánuco: 35 km NE of Tingo Maria, Santa Elena (09º00'S, 75º00'W) (ML17860, 17863, 2 individuals [latter treated as same recording]: V. Emanuel; ML18330: J. Cartwright). **Ucayali**: Puntijao, 15.4 km. SSE mouth of Rio Cohengua, (10º25'S, 73º57'W) (ML166290: G. Seeholzer). **Madre de Dios:** Cocha Cashu, Manu National Park (11°52'S; 71°22'W) (ML29582, 29607, 29999: T. A. Parker III; XC64190-1; J. Tobias & N. Seddon). ARCC (12°03'S; 69°41'W; 150 m) (XC39828-9: D. Geale). 35.0 km W of Puerto Maldonado, Tambopata (12º30'S, 69º00'W) (ML35176: L. Kibler; ML12835: T. A. Parker III). Explorer's Inn, río Tambopata, Puerto Maldonado, (12°50'S; 69°18'W) (ML28846: A. van den Berg; XC516: J. van der Woude). Sachavacayoc Lodge, Tambopata (12°51'S; 69°22'W; 270 m) (XC55, 737, 25801; B. Planqué).

Bolivia La Paz: Alto Rio Madidi Camp (ML52352, 52357: T. A. Parker III).

Brazil Acre: Senador Guiomard (WA730793: E. Guilherme). Assis (WA1028668: F.I. de Godoy)

Todd's Sirystes *S. subcanescens*

Guyana. Upper Takutu-Upper Essequibo: Right bank of Rewa River at Corona Falls, (03º11'N, 58º41'W) (ML98716: D. Finch).

French Guiana. Sinnamary, route de St Elie (05°20'N, 53°06'W; 15 m) (XC74402: A. Renaudier). Roura, Montagne Maripa (04°27'N, 52°22'W; 20 m) (XC59331: R. Alexandre).

Brazil: "Amapá" (Amazonas?): Torre ZF-2 (XC49721: R. Fraga). **Pará**: Almeirim (01°06'S, 52°39'W) (XC126301: C.B. Andretti). **Amazonas**: ZF-2, INPA research tower (02º35'S, 60º07'W) (ML127365: C Marantz). Manaus (02°35'S, 59°56'W) (XC119125: G. Leite). ZF-2, ca. 30 km. W BR-174, trail to second (LBA) tower (02º36'S, 60º13'W) (ML127479: C. Marantz). 80 km N of Manaus (02º26'S, 60º00'W) (ML42816, 42831: R. Bierregaard). Presidente Figueiredo (WA290276: G. Leite).

Sibilant Sirystes *S. sibilator*

Brazil: **Pará**: Tucuruí dam, right margin of the lake (04°14'S, 49°25'W; 70 m) (XC13732; S. de Melo Dantas). **Bahía**: Road to Remanso, Lençóis, Chapada Diamantina (12°35'S, 41°22'W; 400 m) (XC80120, 81643; J. Minns). Lencois (12°36'S, 41°24'W; 400 m) (XC82406: J. Minns). Boa Nova, Wet Forest (14°23'S, 40°06'W; 825 m) (XC80220, 80268, 81667, 82248, 82317: J. Minns). **Espirito Santo**: Reserva Biológica de Sooretama (19°01'S, 40°01'W; 60 m) (XC65307, 85155, 85159; J. Minns). Reserva Florestal de Linhares (19º05'S, 39º54'W) (ML115333: C. Marantz). Reserva Natural da Vale - Linhares (19°09'S, 40°04'W; 40 m) (XC80096-7: J. Minns). Reserva Biológica A. Ruschi (19°53'S, 40°35'W; 750 m) (XC81687: J. Minns). Duas Bocas, Cariacica, (20°17'S, 40°28'W; 150 m) (XC21070: F. T. & J. Silvério Lemos). Fazenda Caetes, Vargem Alta (20°27'S, 40°60'W) (XC28364, 70768, 70770-1: D. Lane; XC29501: F. Lambert). **Minas Gerais**: Viçosa (20°47'S, 42°53'W) (XC115568: N. Eiterer). **Rio de Janeiro**: Conceicâo do Castelo, Fazenda Pindobas IV (20°18'S, 41°17'W; 1,200 m) (XC85390: J. Minns). Parque Nacional Itatiaia (22°23'S, 44°38'W and environs; 700-1,150 m) (ML32052, 47984: P. Isler; XC46724, 58323-4, 58339-40: B. López-Lanús; XC64841, 64847: R. Gagliardi; XC5971, 17609: N. Athanas; XC62636, 64907: H. van Oosten). **São Paulo**: São Jose dos Campos (23°02'S, 46°02'W; 800 m) (XC7042: C. Candia-Gallardo; XC120008: G. Leite). Intervales State Park, Carmo road (24°17'S, 48°26'W; 800 m) (XC82407: J. Minns; XC91619: J. Honkala). Fazenda Barreiro Rico; Anhembi (ML66398: P. Schwartz). Alto Ribeira State Park (PETAR) (24°32'S, 48°43'S) (XC112627: R. Silva e Silva). **Santa Catarina**: Rio Tigre, Guatambu (27°08'S, 52°47'W; 290 m) (XC23827, 23830: A. Eisen Rupp). Reserva Volta Velha, Itapoá (26°05'S, 48°38'W; 10 m) (XC81682: J. Minns). Ribeirão Quati, Parque Nacional da Serra do Itajaí, Indaial (27°03'S, 49°13'W; 600 m) (XC41912: A. Eisen Rupp). Parque Nacional da Serra do Itajaí, Presidente Nereu (27°10'S, 49°13'W; 500 m) (XC41894: A. Eisen Rupp). Barra do Monte Alegre, Chapecó (27°14'S, 52°35'W; 385 m) (XC23826: A. Eisen Rupp). Campo Belo do Sul (27°54'S, 50°45'W; 1,017 m) (XC85853: C. Espínola). **Paraná**: PN do Iguazu-Pozo Preto (XC60864: M. Castelino). **Rio Grande do Sul**: 40 km NW of Tenente Portela, Turvo Forest Reserve (27º12'S, 54º01'W) (ML19369, 19376: W.

Belton; ML68463: D. Finch). 6 km NW of Garruchos; São Borja (28º10'S, 55º34'W) (ML19391, 19527: W. Belton).

Paraguay Concepción: San Luis National Park (22º40'S, 57º21'W) (ML54296, 54307: M. Robbins). **San Pedro**: Laguna Blanca (XC55849; M. Velázquez). **Caazapá**: 7.5-8 km E of San Carlos, Cordillera de Caaquazu (26º07'S, 55º44'W) (ML54254, 54476: M. Robbins). Reserva Tapyta (XC55850: M. Velazquez).

Argentina Misiones: 20 km S of Foz de Iguaçu; Iguazu National Park (25°40'S, 54°26'W; 190 m) (ML22142, 23720: T.A. Parker III; XC69473: F. Lambert). Yacutinga Lodge, Andresito (25°43'S, 54°25'W) (XC51980: B. López-Lanús). Paraje María Soledad, Dpto Gral Belgrano (25°51S, 53°59'W; 330 m) (XC8196: G. S. Cabanne). PN Iguazu-Macuco (XC49720: R. Fraga). Parque Provincial El Pinalito (26º25'S, 53º50'W) (ML132971: P. Hosner). Parque Provincial Cruce Caballero (26º31'S, 53º59'W) (ML132942: P. Hosner). Reserva Natural Cultural Papel Misionero (27º00'S, 54º06'W) (ML164298: M. Lammertink). PP Mocona (XC53040: C. Ferrari).

***Cerrado recordings subset*:**

Brazil Maranhão: Mancha Verde, São Joao dos Patos (06°36'S, 43°37'W) (XC1426: G. R. R. Brito). **Minas Gerais**: Cavernas do Peruaçu National Park (15°02'S, 44°15'W; 750 m) (XC84486; J. Minns). Itacarambi (15°05'S, 44°07'W; 550 m) (XC82405: J. Minns). **Goiás**: Goiânia, (16°41'S, 49°16'W; 640-690 m) (XC38102 (alarm call): N. D'Acosta). **Mato Grosso**: Cristalino Jungle Lodge, Trilha da Serra Mato Grosso (09º35'S, 55º55'W) (ML126768: C. Marantz). 20 km W of Alta Floresta (09°50'S, 56°19'W) (XC86650: A. Lees). Casa de Pedra area, Chapada dos Guimaraes (XC23724: P. Donahue). **Mato Grosso do Sul**: Estancia Mimosa, Bonito (310 m) (XC8595: D. De Granville). Bonito, Serra da Bodoquena (21°05'S, 56°52'W; 315 m) (XC82176: J. Minns).

Appendix 2

Vocal data

In each table in this appendix, for each taxon / song, data are presented as follows: mean ± standard deviation (lowest value–highest value) (*n* = no. of vocalizations analyzed). $n_{ai}=x$ in respect of each vocalization for each population, refers to the assumed no. of individuals sampled.

A. Short notes

Taxon	Call length (s)	Max. frequency (kHz)	Min. frequency (kHz)	Freq. bandwidth (kHz)
Choco Sirystes *S. albogriseus* Chocó (n_{ai}=11)	0.037 ± 0.008 (0.026–0.053) (*n*=33)	3.16 ± 0.27 (2.65–3.58) (*n*=33)	1.43 ± 0.22 (1.17–1.91) (*n*=33)	1.71 ± 0.27 (1.08–2.21) (*n*=33)
White-rumped Sirystes *S. albocinereus* West Amazonia (second and third notes of "wher-péw" call) (n_{ai}=26)	0.096 ± 0.021 (0.064–0.173) (*n*=74)	2.84 ± 0.27 (2.09–3.36) (*n*=76)	1.10 ± 0.17 (0.72–1.44) (*n*=56)	1.75 ± 0.29 (1.21–2.37) (*n*=56)
Sibilant Sirystes *S. sibilator* Atlantic-Cerrado (chattering song fragments) (n_{ai}=2)	0.168 ± 0.020 (0.152–0.191) (*n*=3)	2.69 ± 0.16 (2.56–2.87) (*n*=3)	1.31 ± 0.35 (1.06–1.71) (*n*=3)	1.38 ± 0.19 (1.15–1.50) (*n*=3)

B. Whistles

Taxon	Call length (s)	Max. frequency (kHz)	Min. frequency (kHz)	Freq. bandwidth (kHz)
White-rumped Sirystes *S. albocinereus* West Amazonia (first note of "wher-péw" and other calls commencing with a similar whistle) (n_{ai}=26)	0.41 ± 0.05 (0.32–0.54) (*n*=70)	2.29 ± 0.16 (2.01–2.57) (*n*=75)	1.06 ± 0.13 (0.81–1.38) (*n*=61)	1.21 ± 0.24 (0.72–1.76) (*n*=61)
Todd's Sirystes *S. subcanescens* N Amazonia (n_{ai}=9)	0.85 ± 0.17 (0.47–1.06) (*n*=25)	3.03 ± 0.32 (2.65–3.46) (*n*=25)	1.59 ± 0.31 (1.05–2.10) (*n*=25)	1.43 ± 0.29 (0.70–1.96) (*n*=25)
Sibilant Sirystes *S. sibilator* Atlantic-Cerrado (downstroke song fragments) (n_{ai}=5)	0.27 ± 0.03 (0.23–0.30) (*n*=7)	3.27 ± 0.19 (3.04–3.57) (*n*=7)	1.36 ± 0.15 (1.09–1.60) (*n*=7)	1.92 ± 0.25 (1.70–2.28) (*n*=7)

C. Downstroke songs

Taxon	No. of notes	Song duration (s)	Song speed (notes/s)	Max. frequency (kHz)	Position of peak (%)
White-rumped Sirystes *S. albocinereus* West Amazonia (n_{ai}=13)	7.06 ± 3.65 (4–20) (*n*=18)	1.46 ± 0.64 (0.77–3.19) (*n*=18)	4.89 ± 0.92 (3.33–6.39) (*n*=18)	3.07 ± 0.18 (2.75–3.36) (*n*=18)	0.25 ± 0.32 (0.00–1.00) (*n*=18)
Todd's Sirystes *S. subcanescens* N Amazonia (n_{ai}=1)	4 (n=1)	1.92 (n=1)	2.08 (n=1)	3.74 (*n*=1)	1.00 (*n*=1)
Sibilant Sirystes *S. sibilator* Atlantic-Cerrado (n_{ai}=26)	7.24 ± 3.06 (3-17) (*n*=41)	2.41 ± 1.14 (0.91–6.50) (*n*=41)	3.08 ± 0.57 (2.06–4.40) (*n*=41)	3.25 ± 0.12 (2.90–3.53) (*n*=41)	0.36 ± 0.22 (0.00–1.00) (*n*=38)

D. Chattering songs

Taxon	No. of notes	Song duration (s)	Song speed (notes/s)	Max. frequency (kHz)	Position of peak (%)
Choco Sirystes *S. albogriseus* Chocó ($n_{ai}=0$)	N/A	N/A	N/A	N/A	N/A
White-rumped Sirystes *S. albocinereus* West Amazonia ($n_{ai}=5$)	11.50 ± 3.23 (9–20) (*n*=6)	1.65 ± 0.56 (1.11–2.70) (*n*=6)	6.98 ± 0.78 (6.05–8.05) (*n*=6)	3.03 ± 0.15 (2.84–3.26) (*n*=6)	0.08 ± 0.13 (0.00–0.33) (*n*=6)
Todd's Sirystes *S. subcanescens* N Amazonia ($n_{ai}=6$)	5.75 ± 4.27 (3–21) (*n*=16)	1.52 ± 1.54 (0.67–7.08) (*n*=16)	4.27 ± 1.29 (2.61–7.44) (*n*=16)	3.84 ± 0.29 (3.56–4.59) (*n*=16)	0.32 ± 0.32 (0.00–0.33) (*n*=16)
Sibilant Sirystes *S. sibilator* Atlantic-Cerrado ($n_{ai}=65$)	6.06 ± 3.24 (3-29) (*n*=145)	1.14 ± 0.58 (0.41–4.46) (*n*=143)	5.45 ± 1.14 (3.21–8.62) (*n*=143)	3.26 ± 0.16 (2.90–3.64) (*n*=146)	0.56 ± 0.18 (0.00–1.00) (*n*=144)

Appendix 3:
Vocal differences between *Sirystes* taxa

The following codes are used in the table below. For vocal variables, the first symbol refers to the type of call: *σ*: short note; λ: whistle; ϕ: chattering song; δ: downstroke song. The immediately following letters refer to vocal variables: NN: number of notes; SL: song length; SS: song speed; MF: maximum acoustic frequency; mF: minimum acoustic frequency; PP: position of peak in acoustic frequency; FV: acoustic frequency bandwidth; PP: position of peak; NS: song structure or note shape; PV: primary vocalization type; SV: secondary vocalization type. Numbers 1,2,3,4 and 5 in brackets refer to the diagnosability levels met by the variable, based on the tests set out under Methods. For PV and SV, vocalization codes refer to the kind of primary or secondary vocalization respectively for each taxon. The code "(pres/abs)" refers to one of the taxa in question not giving the kind of vocalization at all in the sample studied. Degrees of freedom can be calculated by taking the lower value of the two taxa for the relevant variable under '(*n*=x)' in Appendix 2, and subtracting 1. The taxon with the higher or lower of the relevant variable can be seen in Appendix 2. Note that some populations may appear 'less diagnosable' for certain variables than they may actually be due to sample size.

Taxon	White-rumped Sirystes *S. albocinereus* West Amazonia	Todd's Sirystes *S. subcanescens* N Amazonia	Sibilant Sirystes *S. sibilator* (inc. *atimastus*) Atlantic-Cerrado
Choco Sirystes *S. albogriseus* Chocó	**σNS(4)** **σSL(1,2,3,4,5)**[*] σMF(1) σmF(1) **PV(σ/λ)** **λ (pres/abs)** **δ (pres/abs)** **φ (pres/abs)**	**PV(σ/λ)** **σ (pres/abs)** **λ (pres/abs)** **δ (pres/abs)** **φ (pres/abs)**	**σSL(1,2,3,4,5)** σMF(1) **PV(σ/φ)** **λ (pres/abs)** **δ (pres/abs)** **φ (pres/abs)**
White-rumped Sirystes *S. albocinereus* West Amazonia	X	λSL(1,2) λMF(1,2,4) λmF(1) **λNS(4)** λFV(1) δSS(4) δMF(4) **δNS(4)** φSS(1,2) φMF(1,2) **SV(φ/δ)**	σSL(1,2) λSL(1,2,4) **λMF(1,2,3,4,5)** λmF(1) **λNS(4)** λFV(1) δSS(1) δSL(1) δMF(4) **δNS(4)** φSS(1) φPP(1,2) **PV(λ/φ)**
Todd's Sirystes *S. subcanescens* N Amazonia	X	X	**λSL(1,2,3,4,5)** λFV(1) φSS(1) φMF(1,2) φPP(1) **PV(λ/φ)** **SV(φ/δ)**

[*] The level 5 test was missed for this vocalization variable and taxon pair based on the full sample, by a tiny margin of distance between means less than the number of significant figures for which raw data were taken. The test was passed in some instances of random removal of data from the set for each taxon, so was here treated as if passed.

Appendix 4

Use of different vocalization types by *Sirystes* taxa

In the table below, the number of recordings out of the sample for each population containing the kind of vocalization mentioned are noted, then expressed as a percentage of the sample and identified as a primary (>80%), secondary (>30%) or rare (<20%) vocalization. Note that percentages do not add up to 100% by taxon, because many recordings contain examples of more than one vocalization type.

Taxon	**Choco Sirystes** ***S. albogriseus*** **Chocó**	**White-rumped Sirystes** ***S. albocinereus*** **West Amazonia**	**Todd's Sirystes** ***S. subcanescens*** **N Amazonia**	**Sibilant Sirystes** ***S. sibilator*** **Atlantic-Cerrado**
σ (short note)	**Primary voc.** **100%:** 12/12	See under whistle	/	Rare voc. 3.7%: 3/81
λ (whistle)	/	**Primary voc.** **83.3%:** 25/30 (part of wheer-chip")	**Primary voc.** **81.8%:** 9/11	Rare voc. 4.9%: 4/81
δ (downstroke song)	/	*Secondary voc.* *43.3%*: 13/30	Rare voc. 9.1%: 1/11	*Secondary voc.* *32.1%*: 26/81
φ (chattering song)	/	Rare voc. 16.7%: 5/30	*Secondary voc.* *54.5%*: 6/11	**Primary voc.** **80.2%:** 65/81
Other	/	/	/	Alarm: 1.2%: 1/81 Faster song: 1.2%: 1/81

Appendix 5

Species scoring tests

In the table below, scores based on Tobias et al. (2010) are allocated to each taxon studied here. Seven points is the benchmark for species rank. Only up to three plumage characters, one temporal vocal character and one spectoral vocal character are available for consideration for each pair, so this is not an exhaustive list of morphological differences. Neither biometrics nor habitat differences were used here: these could yield increased scoring.

Taxon	**White-rumped Sirystes** ***S. albocinereus*** **West Amazonia**	**Todd's Sirystes** ***S. subcanescens*** **N Amazonia**	**Sibilant Sirystes** ***S. s. atimastus*** **Cerrado**	**Sibilant Sirystes** ***S. s. sibilator*** **Atlantic**
Choco Sirystes ***S. albogriseus*** **Chocó**	Voice (6) Ext. white on wing coverts (3) More ext. white tail tip (1) Pale underparts (3) **Total: 13**	Voice (6) White tail tip (3) Ext. white wing coverts (3) White tail tip (2) **Total: 14**	Voice (6) Striations on back (3) Ext. white on wing coverts (3) Ext. white on rump (3) **Total: 18**	Voice (6) Striations on back (3) Ext. white wing coverts (3) Ext. white on rump (3) **Total: 18**
White-rumped Sirystes ***S. albocinereus*** **West Amazonia**	X	Voice (5) Marginal versus no white tail tip (1) Throat / breast shade (2) **Total: 8**	Voice (6) Ext. striations on back (1) Ext. white rump (3) Ext. white lower wing cov. (2) **Total: 12**	Voice (6) Ext. striations back (1) Ext. white rump (3) Ext. white lower wing cov. (2) **Total: 13**
Todd's Sirystes ***S. subcanescens*** **N Amazonia**	X	X	Voice (6) Ext. of white on lower wing coverts (2) Throat and breast shade (2) Ext. of white on rump (1) **Total: 11**	Voice (6) Ext. white lower wing coverts (2) Ext. white rump (2) Throat and breast shade (2) **Total: 12**
Sibilant Sirystes ***S. s. atimastus*** **Cerrado**	X	X	X	Voice (1) Paler belly (2) Ext. of white rump (1) **Total: 4**

Appendix 6
List of Colombian specimens

Few specimens of *Sirystes* exist from Colombia and several of these have been overlooked by previous authors (e.g. Meyer de Schauensee 1945, who considered ANSP 148061 the only Colombian specimen of *albogriseus*). All specimens found by Biomap Alliance Partners (2012) for Colombia are cited below. Dashes refer to a series of different specimen cat. nos. starting and ending with the number in question. Specimens are listed in order of institution and cat. no. Acronyms: American Museum of Natural History, New York (AMNH); Academy of Natural Sciences, Philadelphia (ANSP); Natural History Museum, Tring (BMNH); Museo de Historia Natural, Universidad de la Salle, Bogotá (MLS); Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt (FNS); Smithsonian Institution, National Museum of Natural History, Washington (USNM); Museo de Historia Natural, Universidad del Valle, Cali (MHNUV). Only AMNH and BMNH specimens were inspected during this study.

Choco Sirystes *S. albogriseus*. ANSP 148061 (Juradó, Chocó). MHNUV 5823 (Bajo Calima, Valle del Cauca). USNM 411925-6 (Montelíbano, Córdoba), 411927 (Nazaret, Valencia, Córdoba), 443382-3 (Nuquí, Chocó).

White-rumped Sirystes *S. albocinereus*. AMNH 130673 (Puerto Barrigón, Puerto López, Meta). BMNH 1888.1.13.765 ("Bogotá") (type of *albocinereus*). FNS 43843 ("Bogotá"). MLS 4420 (rio Ariarí, Meta), 4421 (Hacienda La Realidad, Puerto López, south of Villavicencio, Meta), 4422 (Vista Hermosa, río Guapaya, Macarena, Meta).

The taxonomic and conservation status of the *Oxypogon* helmetcrests

Taxonomia y estado de conservacion de Oxypogon guerinii

Nigel J. Collar[1] & Paul Salaman[2]
[1]BirdLife International, Girton Road, Cambridge CB3 0NA; and Bird Group, Department of Life Sciences, Natural History Museum, Akeman St, Tring, Herts HP23 6AP, UK. Email: nigel.collar@birdlife.org
[2]Rainforest Trust, 25 Horner Street, Warrenton VA 20186, USA. Email: paul@RainforestTrust.org

Abstract

Morphological variation in the genus *Oxypogon* was studied using biometrics and plumage data, and available sound recordings were inspected. Four distinct populations of Bearded Helmetcrest *Oxypogon guerinii* (*cyanolaemus* in the Sierra Nevada de Santa Marta, *lindenii* in the Venezuelan Andes, *guerinii* in the East Andes of Colombia, and *stubelii* in the Central Andes of Colombia) were lumped without justification in the 1940s but are highly distinct in multiple plumage and morphometric characters. Species rank is suggested for all four taxa, following species scoring tests. We draw special attention to *O. cyanolaemus* of the Sierra Nevada de Santa Marta, which has not been reported since 1946. It is recommended for the IUCN criteria of Critically Endangered, although it may possibly already be extinct.

Key words: *Oxypogon*, Bearded helmetcrests, taxonomy, conservation, Sierra Nevada de Santa Marta, paramo

Resumen

Se estudió la variación morfologica en el genero Oxypogon, utilizando datos sobre biometría y plumaje, además fueron estudiadas grabaciones de vocalizaciones. Cuatro poblaciones distintas de Oxypogon guerinii (cyanolaemus en la Sierra Nevada de Santa Marta, lindenii en los Andes venezolanos, guerinii en los Andes del este de Colombia, y stubelii en los Andes Centrales de Colombia), fueron fusionadas sin justificación en la década de 1940, pero son bastante distintas en muchas características de plumaje y morfométria. Se sugiere asignar estatus de especie a cada uno de ellas, utilizando un sistema de puntuación de especies. Llamamos la atención en particular a la especie O. cyanolaemus de la Sierra Nevada de Santa Marta, que no se ha reportado desde 1946. Se recomienda para el estatus de UICN En Peligro Crítico, aunque posiblemente, podía estar extinta.

Palabras clave: Oxypogon*, Chivos de páramo, traxonomía, conservación, Sierra Nevada de Santa Marta, páramo.*

Introduction

Bearded Helmetcrest *Oxypogon guerinii* is a hummingbird comprising four taxonomically distinct populations, named as follows: *cyanolaemus* in the Sierra Nevada de Santa Marta (Colombia), *lindenii* in the Venezuelan Andes, *guerinii* in the East Andes of Colombia south to Cundinamarca, and *stubelii* (spelling here in accordance with Dickinson & Remsen 2013) in the Central Andes of Colombia. These four taxa were originally described as separate species by Boissonneau (1840: *guerinii*), Parzudaki (1845: *lindenii*), Salvin & Godman (1880: *cyanolaemus*) and Meyer (1884: *stubelii*). Species rank for all recognised taxa was afforded by the early pioneers of hummingbird taxonomy, such as Gould (1887), Boucard (1896) and Hartert (1900), followed by Cory (1918). However, these four taxa were then lumped into a single species by Peters (1945), and for almost 70 years Peters's treatment has been universally followed (e.g. Meyer de Schauensee 1948–1952, 1966, Morony *et al.* 1975, Wolters 1975–1982, Hilty & Brown 1986, Fjeldså & Krabbe 1990, Sibley & Monroe 1990, Clements 1991, 2000, 2007, Monroe & Sibley 1993, Stotz *et al.* 1996, Züchner 1999, Dickinson 2003, Hilty 2003, Gill & Wright 2006, Restall *et al.* 2006, McMullan *et al.* 2010, Dickinson & Remsen 2013).

Oxypogon is confined to montane habitats, specifically paramo, subparamo and adjacent elfin forest ecotones, and has a strong association with *Espeletia* (Hilty & Brown 1986, Züchner 1999, Hilty 2003, Restall *et al.* 2006, Salamanca-Reyes 2011), locally known as '*frailejones*', a distinctive genus of plants in the subtribe Espeletiinae endemic to and locally abundant in the high Andean paramos of Venezuela, Colombia and northernmost Ecuador (Rauscher 2002). The literature indicates elevations of 3,200–5,200 m in Colombia (Hilty & Brown 1986) and 3,600–4,500 m (with a sight record from 2,800 m) in Venezuela (Hilty 2003), with 3,200–4,500 m as an overall generalisation (Stotz *et al.* 1996). Inevitably, therefore, each of these taxa, although grouped relatively closely in north-western South America, must have been isolated for considerable lengths of time. Paramo evolved during the Late Pliocene or Early Pleistocene (2–4 million years ago) during the final uplift of the Andes (van der Hammen & Cleef 1986). During the latter part of the Quaternary of the last glacial stadial, there were numerous changes in the elevational limits of paramo and forest, with paramo periodically covering a much greater area and descending to 2,000 m (van der Hammen & Cleef 1986), although the Magdalena valley was a major barrier between the East Andes, Central Andes and Sierra Nevada de Santa Marta. The paramos and avifaunas of the East Andes, Central Andes, Venezuelan Andes and Santa Marta are each separated by at least 150 km (*guerinii* and *stubelii*) and up to 350 km (*cyanolaemus* and *lindenii*) of different (lowerelevation) habitats, resulting in each of them having several unique elements and being treated as separate 'Endemic Bird Areas' (Stattersfield *et al*. 1998).

Only two recent publications illustrate the four taxa in *Oxypogon* together, namely del Hoyo *et al.* (1999) and Restall *et al.* (2006). From these and from the accompanying textual descriptions (credited in the former to Züchner 1999) it is apparent that each form is highly distinctive, and indeed Züchner (1999) remarked: 'Based on morphological differences, the races could be considered four separate species'. This point was picked up in a footnote ('May consist of more than one species') by Dickinson & Remsen (2013), but otherwise there appears to have been no expression of interest in the issue of species limits within the genus. At the same time, it came to our attention that the Santa Marta population is rare and has gone unrecorded for decades. This genus therefore emerged as a priority for taxonomic review. Here we consider the morphological differences afresh, and at the same time assemble what evidence we can find relating to the conservation status of each taxon.

Methods

To investigate the taxonomic status of each taxon of *Oxypogon* we examined specimens in the American Museum of Natural History (AMNH), New York; the Natural History Museum, Tring, UK (NHMUK); and the National Museum of Natural History (USNM, Smithsonian Institution), Washington DC. We measured the degree of phenotypic differentiation between each taxon using a system (elaborated in Tobias *et al*. 2010) in which an exceptional difference (a radically different coloration, pattern or vocalization) scores 4, a major character (pronounced difference in body part colour or pattern, measurement or vocalization) 3, a medium character (clear difference reflected by, e.g., a distinct *hue* rather than different colour) 2, and a minor character (weak difference, e.g. a change in shade) 1; a threshold of 7 is set to allow species status, species status cannot be triggered by minor characters alone, and only up to three plumage characters, two vocal characters (up to one spectral and one temporal), two biometric characters (assessed for effect size using Cohen's *d* where 0.2–2 is minor, 2–5 medium, 5–10 major and >10 exceptional) and one behavioural or ecological character may be counted. Where additional characters are apparent but under these rules cannot be scored, the formula 'ns[1]' is used, signalling 'not scored' but giving in parenthesis the estimated value of the difference in question. For morphometric analysis 10 male *lindeni*, *cyanolaemus* and *guerinii* were measured. *O. g. stubelii* is very rare in collections (we know of only eight specimens worldwide, distributed among five museums) and we could only measure one male (beard not fully developed) in AMNH (illustrated in Plates 1–3).

To investigate the conservation status of the taxa, we drew on appropriate literature sources and information from personal contacts and knowledge to assemble a general profile. Sound recordings were also collated from online and published sources and sonagrams produced using Raven Lite and compared subjectively.

Plate 1. Dorsal view of four taxa of *Oxypogon* (male specimens in AMNH): left to right *O. lindeni*, *O. guerinii*, *O. cyanolaemus* and *O. stubelii*.

Plate 2. Ventral view of same specimens as in Plate 1.

Plate 3. Lower bellies and tails of same specimens as in Plate 1.

Results

Taxonomic status

Each taxon differs from the other three principally in three or more of five plumage characters and one or two morphometric characters of males: the colour and length of the narrow backward-pointing crest, the colour of the narrow mesial 'beard', the colour of the crown-sides, the colour and pattern of the underparts, and the distribution of white (or in *stubelii* buff) in the tail (see Table 1), plus the length of bill, crest, wing and/or tail (see Table 2). From illustrations, texts and the evidence of the single male *stubelii* we examined, we presume this taxon to have the shortest crest of all the taxa. We assess*ed the strength of these characters as follows, with scores only given for differences between the taxon mentioned and all other taxa in the genus:*

a) *The Santa* Marta endemic form *cyanolaemus* uniquely has a (narrowly white-bordered) glittering purplish-blue beard (3); a dull greenish sheen on the crown-sides (2); brown-and-whitish mottled underparts (ns[1]); a white tail except for dark distal edges and central rectrices (3); a relatively short crest (Table 2; effect size *vs guerinii* 1.49, *vs lindeni* 4.23; score 1); and a shorter tail than the others (Table 2; effect size *vs* next shortest *guerinii* –2.32; score 2). Züchner (1999) mentioned buff-white on the outer rectrices but this is not apparent on material we examined; these feathers are white like much of the rest of the tail but with dark tips and an extremely thin dark line down the outside edge. Total 11.

b) The form *lindeni* of the Venezuelan Andes uniquely has (apart from a few tiny green droplet-shaped spots on chin and throat) an all-white beard (3); blackish crown-sides (ns[1]); darkish brown underparts with relatively little pale scaling (1); no white in the tail except for white shaft-streaks on all but the central pair (3); a longer crest than other taxa (Table 2; effect size *vs cyanolaemus* 4.23, *vs guerinii* 3.086; score 2); and longer wings than the other taxa (Table 2; effect size *vs* next longest *cyanolaemus* 1.39; score 1). Its call differs from that of *stubelii* in note shape (score: ns[3]) (Fig. 1). Total 10.

c) The form *guerinii* of the East Andes uniquely has a (narrowly white-bordered) glittering green beard (3); purplish-sheened crown-sides (2); rather evenly scaled buff-and-mid-brown underparts (ns[1]); white centres to tail feathers (2); a relatively short crest (Table 2; effect sizes *vs lindeni* –3.086, *vs cyanolaemus* –1.49; score 1); and (apart from *stubelii*, which Table 2 hints might be very short-winged) shorter wings than the two preceding forms (Table 2; effect size *vs* next shortest *cyanolaemus* –1.06; score 1). Total 9.

d) The form *stubelii* of the Central Andes uniquely has a tan and black crest (where the other three possess white and black feathers) (3); also a much shorter crest than other taxa (Table 1; allow at least 1); a short tan beard with green then purple reflectant spots centrally (3); buffy neck-sides (white in the other three taxa) and a buffier, brownish-tan belly (ns[1]); and a broad buffy-white line on the outer rectrix, with a buffy line around the shaft of the next two outer feathers (3). Fjeldså & Krabbe (1990) described the beard as 'coppery blue', but this is not apparent in any of the material we examined and is contradicted by Chapman (1917), who perceived green on the chin, and orange-purple in the longer plumes; but it can be seen in a photograph at a particular angle (p.51 in Mazariegos 2001). With respect to *lindeni*, this form also differs in the note shape of its call (Fig. 1) (score ns[3] *vs lindeni* but not scorable *vs* others). Total 10.

Females differ from each other mainly in possessing the same tail patterns as the males of their respective taxa but the crest is less prominent and beard less marked. All females of the genus have mixed white with a dull dark greenish-brown on the underparts, but each is slightly different in pattern from the other: *lindeni* is darkest below, with white largely confined to throat, breast and side-collar, with dark green-brown mottling; *cyanolaemus* is mottled green-brown and white throughout; *guerinii* has a slightly buff-shot white breast and its belly is less mottled, more uniform and a paler buff-brown (little if any green feathering); and *stubelii* has less white than the others, being an uneven rufous-buff or brownish-tan mixed with flecks of darker, vaguely greenish shades.

Notable apparent differences in vocalizations are linked to the morphological differences between *stubelii* and *lindeni*, giving further support for species rank. The only available sound recording of a typical call of *guerinii* is of an immature made with a camera (Fig. 1), which appears somewhat distorted so requires confirmation. The recording differs in the note shape (generally flat versus downstrokes or up-downstrokes) and lower acoustic frequency (Fig. 1) but it was not here compared to adult calls of other taxa for purposes of assessing rank. Contact calls of this population are also available (Álvarez *et al.* 2007), as are additional recordings of the main call of *stubelii* (Boesman 2012, Macaulay Library), but the small sample sizes and incomplete taxon sampling do not allow for meaningful statistical comparisons to be made using sound recordings. In any case, the degree and significance of vocal learning in hummingbirds are at an early stage of understanding (see, e.g., Gahr 2000, Araya-Salas & Wright 2013).

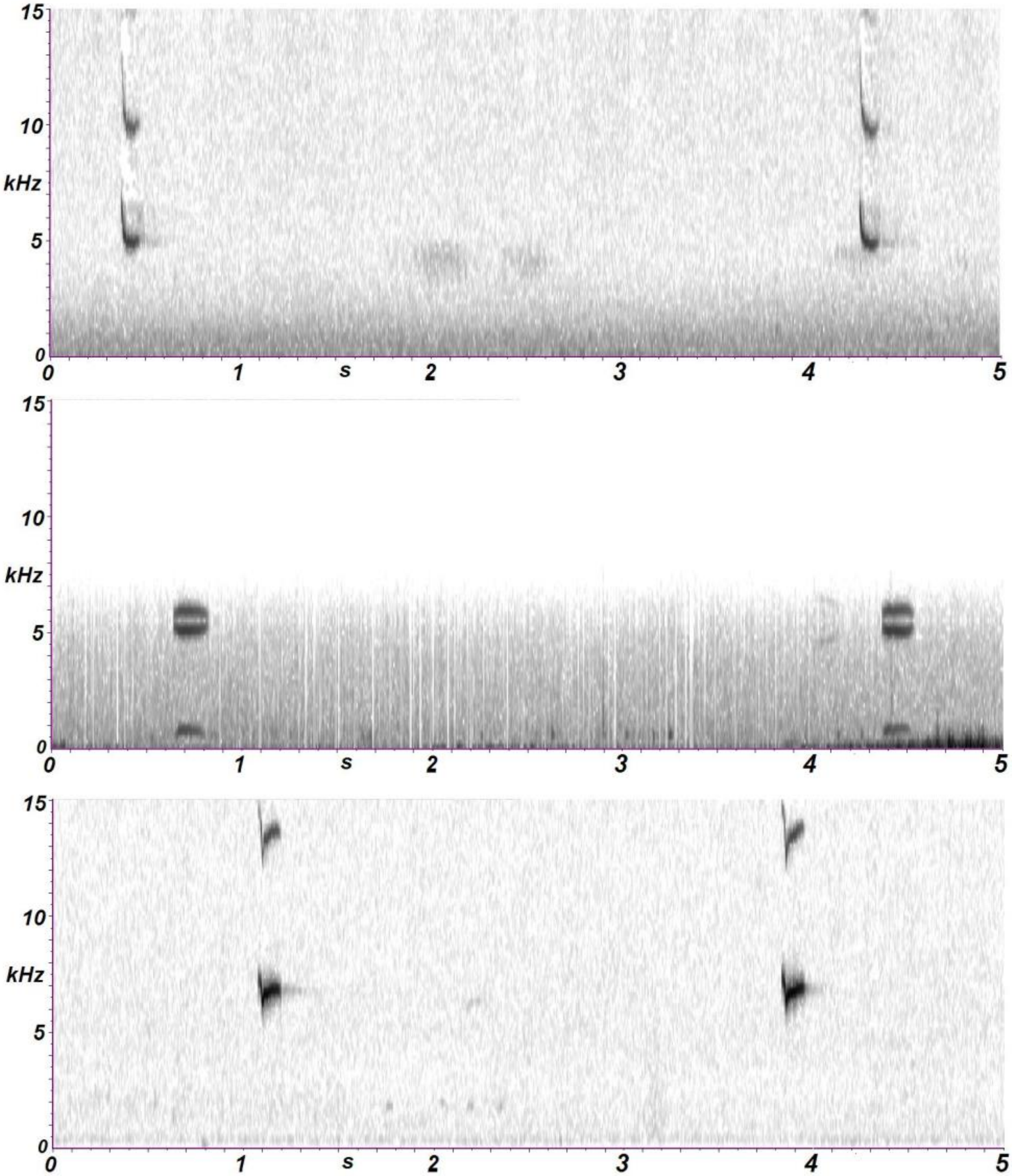

Figure 1. Sonagrams of: **Above**: *Oxypogon lindeni* (ML64920: P. Schwartz, Laguna de Mucubaji, Mérida, Venezuela, c. 08°48'N 70°48'W, 3,450 m). **Middle**: *Oxypogon guerinii* (XC37006: O. Cortes, Paramo de Sumapaz, Cundinamarca, c. 04°13'58"N 74°12'6"W; 3,200 m). **Below**: *Oxypogon stubelii* (XC101708: J. Minns, recorded perched on an *Espeletia* in paramo at entrance to Los Nevados National Park, above Manizales, Caldas, c. 04°56'00"N 75°21'0"W; 4,135 m).

Table 1. Distinctive characters of males of the four taxa in *Oxypogon.*

taxon	crest	beard	headside	underparts	tail
cyanolaemus	short, white	glossy purple-blue	dark green	brown-mottled whitish	white except tips & central pair
lindeni	long, white	white	velvet-black	(whitish-scaled) dark brown	bronzy throughout with white shafts
guerinii	medium, white	glossy green	purplish	(whitish-scaled) mid-brown	bronzy with broad white centres
stubelii	short, tan	tan, green, purple	blackish	brownish-tan	bronzy with buffy shaft-streaks & buff outermost vane

Table 2. Mean lengths (in millimetres) for four parameters in male *Oxypogon* hummingbirds (standard deviation in brackets).

taxon	n	bill	crest	wing	tail
cyanolaemus	10	14.2 (0.398)	22.6 (2.739)	71.2 (1.326)	54.8 (1.02)
lindeni	10	13.6 (0.31)	32.8 (2.031)	73.2 (1.588)	58.3 (1.107)
guerinii	10	13.5 (0.301)	26.3 (2.179)	69.9 (0.966)	57.2 (1.016)
stubelii	1	14.7	16.6	58.8	57.1

Conservation status

Oxypogon cyanolaemus appears to be in serious danger. Of 62 *cyanolaemus* museum specimens logged by Project BioMap (Biomap Alliance 2013) the most recent were collected in 1946 by M. A. Carriker (23 specimens held in USNM). There appear to be no records of it since that time. In February 2007 Niels Krabbe undertook a brief survey of the paramo on the southern slope of the Santa Marta Massif for Fundación ProAves, but no *Oxypogon* was sound-recorded (Krabbe 2008) or reported (N. Krabbe *in litt.* 2007). Todd & Carriker (1922) noted that *cyanolaemus* was 'found very sparingly' and 'very shy', and also noted 'Bushes and shrubbery are scare on this paramo [Paramo de Mamarongo], hence the few birds found there', possibly indicating habitat degradation. Strewe & Navarro (2004) found a pair of the very rare Santa Marta Wren *Troglodytes monticola* at high elevations on Santa Marta but did not record *Oxypogon*. Luna & Quevedo (2012) recently carried out surveys at higher elevations in the Santa Marta mountains, also encountering *T. monticola* and finding important populations of *Ramphomicron dorsale* in remaining patches of subparamo, but similarly did not record *Oxypogon*.

Considering that *cyanolaemus* may depend on *Espeletia* as possibly one of its most important food resources, it is to be noted that while the subtribe Espeletiinae includes about 126 species in 8 genera distributed across the paramos of the northern Andes, there is only one known species from Santa Marta, *Libanothamnus occultus*, recorded from subparamo to open slopes at 3,400–4,040 m across the massif (Cleef & Rangel 1984, Cuatrecasas 2013). Unfortunately, the paramo of the Sierra Nevada is seriously affected by extensive cattle herds belonging to indigenous communities, who repeatedly burn the paramos for pasture (WWF 2013). Cuatrecasas (2013) also noted that indigenous communities collected *L. occultus* for firewood, which has further drastically reduced the population of this *frailejon*.

N. Krabbe (*in litt.* 2007) and Luna & Quevedo (2012) noted that the widespread destruction of the paramo on Santa Marta gives serious cause for concern for species confined to high altitudes. The severe alteration of paramo, subparamo and adjacent elfin forest ecotones in the Sierra Nevada massif must have had a major impact on *Oxypogon cyanolaemus* and other taxa also restricted to this sensitive ecosystem, including *Troglodytes monticola*, *Leptasthenura andicola extima*, *Cistothorus platensis alticola*, *Phrygilus unicolor nivarius* and *Catamenia analis alpaca* (several of which have also not been recorded in decades).

The entire ranges of both *Libanothamnus occultus* and *Oxypogon cyanolaemus* fall within the Sierra Nevada de Santa Marta National Park, but given the intense pressure on the paramo there by indigenous peoples and also their direct use of the slow-growing *fraijelon*, this plant was officially registered in the Colombian Red List as Critically Endangered (B1a+b[iii]) (García *et al.* 2005). Clearly for the same reasons, especially given the likely dependence of the helmetcrest on the *fraijelon*, we judge that *Oxypogon cyanolaemus* also meets the IUCN criteria for Critically Endangered B1a+b(i,iii,v) and D:

B. Geographic range in the form of B1 (extent of occurrence) estimated to be less than 100 km^2, and (a) known to exist at only a single location (Sierra Nevada de Santa Marta National Park) and (b) projected decline in (i) extent of occurrence, (iii) area, extent and/or quality of habitat, and (v) number of mature individuals.

D. Population size estimated to number fewer than 50 mature individuals.

This of course is potentially over-optimistic: we have no firm evidence that the species survives at all.

The other three species are evidently in a better situation, although their ranges are highly constrained. *Oxypogon lindeni* of western Venezuela has been reported to be 'seasonally very common in open paramo' (Hilty 2003) and 'the most abundant species [of bird] within its habitat, which is protected in two national parks (Sierra Nevada and Sierra La Culata), where recorded local densities are of at least 4–5 pairs/km^2' (Züchner 1999).

Oxypogon guerinii of eastern Colombia appears to be common (see, e.g., Salamanca-Reyes 2011) and occurs in various national parks including Chingaza, Sumapaz and El Cocuy in the main East Andes. The genus was not, however, recorded in isolated paramos of Serranía de los Yariguíes (Donegan *et al*. 2010).

Oxypogon stubelii is only known from within the boundaries of the 583 km^2 Los Nevados National Park, around Nevado del Ruiz, but even in its preferred habitat it appears to be patchily distributed, not common and hard to find. Its estimated extent of occurrence is less than 400 km^2, coincident with the superabundant stands of *Espeletia hartwegiana* across the paramos on the mountain range. Fortunately, threats are reasonably limited inside the park, which is well protected and an ecotourism destination. Nevertheless, the paramos continue to be burnt to provide fresh grasslands for cattle, while localised potato cultivation occurs in the subparamo. Based on available information, it is plausible that *O. stubelii* meets the IUCN criteria for Vulnerable D (<1,000 mature individuals). We recommend that researchers study *stubelii* to assess its population and determine potential threats.

We concur with Ridgely & Greenfield (2001) that an *Oxypogon* sight record from the Paramo de Angel in extreme north-west Ecuador (C. Mattheus in Fjeldså & Krabbe 1990) is best regarded as 'uncorroborated'.

Discussion

In due course, vocal and molecular sampling may provide further evidence relevant to relationships between the four taxa of *Oxypogon*. However, it is remarkable that the extraordinary morphological distinctiveness of the four taxa has not been invoked until now to challenge the lumping of the taxa. It is indeed perplexing as to why these species were lumped in the first place, when many less distinctive hummingbirds were not so treated by Peters (1945), and applying standards similar to those invoked for *Oxypogon* to other genera would have resulted in large numbers of other congeners being lumped. The scoring system in Tobias *et al.* (2010) was calibrated according to levels of differentiation between acknowledged sympatric species pairs, and all four *Oxypogon* taxa greatly exceed the threshold of 7 set under this system for species rank, rising 2–4 points higher on the scale, emphasising their considerable divergence. These splits are largely based on comparative morphological considerations, but are also supported in the case of *lindeni* versus *stubelii* at least by vocal differentiation. We therefore propose that the four taxa be returned to species rank, as they were afforded for example in Cory (1918) and earlier authors cited above.

The data on which this paper is based are being used in a forthcoming world list in which the English names proposed for the species are Blue-bearded Helmetcrest *Oxypogon cyanolaemus*, White-bearded Helmetcrest *O. lindeni*, Green-bearded Helmetcrest *O. guerinii* and Buffy Helmetcrest *O. stubelii* (del Hoyo & Collar in press). Cory (1918) and earlier authors used the English names Blue-throated, Linden's, Stübel's and Guerin's respectively for these species; but whilst reversion to earlier vernacular treatments, where possible, is a common approach, it seems unnecessary to resurrect patronyms for species in a group like this where morphological differentiation is so significant.

In many accounts of the species there is a brief reference to its habit of walking and hopping on the ground in search of insects and nectar. It is not clear how frequently this behaviour has been observed, but perhaps the first and seemingly the fullest report—albeit somewhat garbled in both his native Portuguese and his later English translation—is that of Ruschi (1972), who wrote of his encounter with *lindeni* (his English text here slightly cleaned of errors): 'It walks about the whole area, for more than half an hour… continuing to move in small jumps, at the maximum 5 centimeters from one side to another always moving forward and to the sides, capturing micro-insects and also looking for small quantities of nectar that it finds on a drop of dew of the crater of the tiny grass… this jumping walk is the only one known of the hummingbirds… besides this species the only species that perch on the ground are of the genera: *Chalcostigma* and they are only able to take a few paces, while *Oxypogon* makes great distances continually jumping.'

Ruschi (1972) then noted that an accompanying photograph (by C. Greenewalt) shows the bird's long legs and large feet relative to other species. If this habit therefore is common, particularly at times when taller plants are not flowering, it is perhaps possible that the species must sometimes be difficult to locate and evade capture in mist-nets. This possibility, while remote, offers a shred of hope that *O. cyanolaemus* may still survive somewhere in the paramos of the Sierra Nevada de Santa Marta. Although it has gone unrecorded for 67 years, there have been few high-elevation surveys in the Santa Marta mountains during this period and attention may not have been focused on the taxon owing to its subspecific status and reclusive feeding habits. A concerted endeavour is now urgently needed to undertake an exhaustive search for *O. cyanolaemus* and, if found, assess its chances of survival.

More broadly, the conservation of paramo in north-western South America is an increasingly urgent issue, owing to the degradation that follows human use of this habitat for agriculture and livestock production. It is well established that paramo ecosystems provide crucial services of carbon storage and water filtration/provision (e.g. Buytaert *et al*. 2011, Cuatrecasas 2013). To mitigate the impact of livestock while retaining the social benefits of livestock production, it has been argued that grazing should be concentrated in certain areas, leaving others to recover their primary condition (Hofstede 1995). Whether such a model would work at this stage for the paramo vegetation in the Sierra Nevada de Santa Marta is not clear; but 50% of the 125 plants considered endemic to the massif are paramo species (Carbono & Lozano-Contreras 1997), and this in our view now renders an effective and equitable management system for such high levels of biodiversity imperative.

Acknowledgements

We are most grateful to Paul Sweet (AMNH), Robert Prys-Jones (NHMUK) and Chris Milensky (USNM) for access to specimens in their care, and to Thomas Donegan for reviewing and providing various helpful comments on the manuscript as well as the sonagram and its interpretation.

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First confirmed records of Kelp Gull *Larus dominicanus* and Dunlin *Calidris alpina* for Colombia

Primeros registros confirmados de Larus dominicanus *y* Calidris alpina *para Colombia*

Jesse Fagan[1] & Miles McMullan[2]
[1] c/o Field Guides Inc. Email: heliomaster76@yahoo.com
[2] c/o Fundación ProAves, Cra. 20 #36–61, Bogotá, Colombia.

Abstract

We present details and photographs of the first Colombian record of Kelp Gull *Larus dominicanus* and the first confirmed record in Colombia of Dunlin *Calidris alpina*. Both were recorded on 25 January 2013 at Los Camerones, Guajira.

Key words. New record, Kelp Gull, Dunlin, *Larus dominicanus, Calidris alpina*, photograph, Colombia.

Resumen

Se presentan detalles y fotos del primer registro en Colombia de *Larus dominicanus* y el primer registro confirmado en Colombia de *Calidris alpina.* Ambas especies, fueron registradas el 25 de enero del 2013 en Los Camarones, Guajira.

Palabras claves. Nuevo registro, *Larus dominicanus, Calidris alpina*, fotografía, Colombia.

Introduction

Kelp Gull *Larus dominicanus* is a southern hemisphere species recorded to date in various South American countries including Brazil, Argentina, Chile, Ecuador and Uruguay with records north to Panama, El Salvador, Mexico, the USA and Trinidad & Tobago (BirdLife International 2013). With a natural range to the South of Colombia but vagrants recorded north of Colombia, it would be surprising were the species never to have occurred in Colombia and the lack of records to date is an anomaly. For this reason, various authors have referred to the species as a likely vagrant (e.g. Salaman *et al.* 2001, McMullan *et al.* 2010). Nonetheless, there have been no previous published records in the country to our knowledge.

Dunlin *Calidris alpina* is a familiar wader to northern hemisphere birders being abundant in both North America and Europe on tidal mudflats and inshore lagoons that regularly winters (Aug to May) to Costa Rica. In South America, the species is known from a specimen collected in French Guiana in 1926 (Greenwood 1983) and multiple sight records in Ecuador, Peru, Argentina, French Guyana, Venezuela and Paraguay (Lesterhuis & Clay 2003). Among these was a bird observed at Isla Bocagrande, 10 km W of Tumaco, Nariño on 12 September 1994 by Salaman (1995). The species is included on the Colombian list on the basis of this record but considered to be known only from sight records (Donegan *et al.* 2010).

Records

On 25 March 2013, the authors visited Los Camerones as part of a Field Guides Inc bird tour. This locality, in the Guajira peninsula, has recently resulted in multiple new "firsts" for Colombia, such as Lesser Black-backed Gull *L. argentatus* (Salaman *et al.* 2008) and Forster's Tern *Sterna forsteri* (Rowland & Master 2012).

Fig. 1: Kelp Gull (foreground) with outstretched wings, together with a 2nd cycle American Herring Gull *Larus argentatus smithsonianus* (background) (J. Fagan).

Kelp Gull *Larus dominicanus*

A third cycle or adult Kelp Gull in breeding plumage [was observed for 45 minutes and a series of photographs were taken. The bird was suspected to be a Kelp Gull in the field owing to the authors' experience with the species along the Pacific coast of South America. Fagan lives in Lima, Peru, where this species is a common resident along the coast. Identification was later confirmed that evening with available field guides and online references (Figs. 1-3). It associated with two other gull species Herring Gull *Larus argentatus* and Lesser Black-backed Gull *Larus fuscus*, which themselves were only recently confirmed for Colombia (Ruiz-Guerra *et al.* 2007, Salaman *et al.* 2008).

Fig. 2. Kelp Gull (left) together with a Royal Tern *Thalasseus maximus* (centre) and the same American Herring Gull *Larus argentatus smithsonianus* (right) as in Fig. 1 and close-up of the same photograph (J. Fagan).

Identification of this individual as a Kelp Gull was possible on account of its dark back, which excludes all Colombian Gulls except Great Black-backed Gull and Lesser Black-backed Gull; and from the latter species by its rather long and pale yellowish legs (Figs. 1-3), proportionally large bill (Fig. 2), light underwing coverts (Fig. 1) and mantle shade (Fig. 1-3). Direct comparison in the field was possible with a third winter Lesser Black-backed Gull (Fig. 3), which (being in its winter plumage) was a scruffier bird with less intense black on the wings and mantle, greyish head markings, shorter, brighter yellow legs and more extensive white patches on the folded wing.

Dunlin *Calidris alpina*

A winter-plumaged Dunlin was observed for 30 minutes and a series of photographs were taken. The bird was immediately identified in the field as the authors have numerous years of field experience with this species in various parts of the world. It associated with Semipalmated Sandpipers *Calidris pusilla* and Western Sandpipers *C. mauri* in shallow mudflats of the lagoon where it was observed foraging for food and in flight.

Identification of this species was clinched on account of its droopy, relatively long bill, diffuse breast band and larger size. The authors ruled out basic-plumaged Curlew Sandpiper *Calidris ferruginea* primarily by the lack of white rump and uppertail coverts in flight (see Fig. 7). Curlew Sandpiper would also be a very rare vagrant to South America (and first record for Colombia). White-rumped Sandpiper is also a possible confusion species but this individual's distinctly downcurved bill, in-flight views and photography (Fig. 7) showed only the sides of the rump and vent to be marked white, typical of Dunlin.

Fig. 3. Kelp Gull (right, foreground) with a Neotropical Cormorant *Phalacrocorax brasilianus* behind it (right, background), Royal Tern *Thalasseus maximus* (centre) and Lesser Black-backed Gull *Larus fuscus* (left) and a Snowy Egret *Egretta thula* (centre, front) and close-up of the same photograph (J. Fagan).

Fig. 4. Dunlin at Los Camerones (J. Fagan).

Fig. 5. Dunlin (foreground) with Semipalmated Sandpiper *C. pusilla* (J. Fagan).

Fig. 6. Dunlin (furthest right) with three Western Sandpipers *C. mauri* (J. Fagan).

Fig. 7. Dunlin (bottom) in flight with *C. pusilla* (J. Fagan).

Acknowledgements

Thanks to Gustavo Bautista, Diego Calderon, and Álvaro Jaramillo for discussing this record with us. Also, big thanks to Thomas Donegan for additional comments and help on the paper.

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First mainland record of Caribbean Coot *Fulica caribaea* for Colombia

Primer registro continental de Fulica caribaea *para Colombia*

Trevor Ellery
Ecoturs, Cra. 20 #36–61, Bogotá, Colombia. Email: trevor_lotan@hotmail.com

Abstract
Details and photographs are presented of the first Colombian record of an apparent Caribbean Coot *Fulica caribaea* near Barranquilla.

Key words New record, Caribbean Coot, photograph, Colombia.

Resumen
Se presentan detalles y fotos del primer registro en Colombia de un individuo al parecer de *Fulica caribaea* cerca Barranquilla.

Palabras claves. Nuevo registro, fotografía, Colombia.

Caribbean Coot *Fulica caribaea* is a species currently known in Colombia only from sight records on San Andrés island (McNish 2003, Donegan et al. 2009), although there is a nearby population on the north coast of Venezuela (Taylor & Van Perlo 1998). On the 8th September 2013, I was leading a Wings/Sunbird tour with Brian Elce, Carol Goulden, Christopher Newbold, Marc Junio, Gil Ewing and Ann White. We visited private marshes east of Barranquilla at about 9 am this date.

While scanning through the large number of waterbirds present, I noticed a coot. Having never seen a coot in Colombia other than the American Coots *Fulica americana* in and near Bogotá and localized populations of the *colombianus* subspecies of Andean or Slate-colored Coot *Fulica ardesiaca* in the Andes, I realized it might be something interesting and proceeded to take a detailed description and some record photographs. I was aware that the most likely possibilities for a Coot at this location would be (a) a wandering American Coot from the Andean populations, (b) a vagrant American Coot from the nominate subspecies that occurs in North America or (c) a Caribbean Coot.

Figure 1a-c. Caribbean Coot *Fulica caribaea*, Barranquilla marshes, 8 September 2013. Above: original shot showing habitat; below two close-ups showing different aspects of crown detail.

I discussed the bird with Gil Ewing who indicated that Caribbean Coot was best separated from American Coot by the presence of an extensive white forehead shield and the lack of the red-knobs that are found at the top of the shield of American. All of the group studied the bird through the scope and it showed the features associated with Caribbean Coot, as can be seen in Figures 1-2, with overall dark plumage, a large shield with no evident red knob above it and a dusky line on the bill. In the evening, I was able to check a number of reference works which showed that the features noted in the field and in my photographs fitted well with Caribbean Coot. It is not possible to rule out an aberrant nominate American Coot based on any observation or photograph of Caribbean Coot, given that 1% of nominate American Coots show white shields similar to Caribbean (Clark 1985, Sibley 2011). However, a Caribbean Coot would seem the most likely identification given the locality and morphology of the individual we observed.

This represents the first confirmed record of Caribbean Coot for Colombia and the first for mainland Colombia. It is perhaps an unsurprising addition to the Colombian mainland list, considering the presence of resident populations in coastal Venezuela. It remains to be seen if Caribbean Coot is a vagrant to Colombia's coastal marshes or an overlooked resident. It is entirely possible that a small population exists in the vast and under watched marshes of the Cienega Grande or in the Guajira peninsula.

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An escaped, threatened species: Java Sparrow *Padda oryzivora* in Quindío, Colombia

Una especie exótica amenazada en vida silvestre: Padda oryzivora *en Quindío, Colombia*

Thomas Donegan
c/o Fundación ProAves, Cra. 20 #36–61, Bogotá, Colombia. Email: tdonegan@proaves.org

Abstract

A photograph and sound recording of an escaped Java Sparrow are presented from Quindío, Colombia. Although the species is previously reported in the upper Cauca valley, no prior confirmed photographic record exists nor records in this department.

Key words New record, Java Sparrow, photograph, escaped species, Colombia.

Resumen

Se presentan fotos y grabaciones de *Padda oryzivora* especie exótica en vida silvestre en Quindío, Colombia. Aunque la especie se ha reportado antes en el valle del río Cauca, no existen registros confirmados por fotografía ni registros en el departamento.

Palabras claves. Nuevo registro, fotografía, especie escapada, Colombia.

Java Sparrow *Padda oryzivora's* natural range is in Indonesia but it is a common cagebird throughout the world and occurs as an escapee or introduced species in various countries (Lever 2005). In Colombia, there are no published details of records but Java Sparrow was reported in an email exchange on RNOACOL in 2006, with a "couple of pairs" near the airport in Pereira, Risaralda (S. Restrepo Calle) and records in dtpo. Valle del Cauca (F. Estela). The species was therefore listed by Carantón-Alaya *et al.* (2008) for Colombia, by Baptiste *et al.* (2010) as introduced in Risaralda and Valle del Cauca departments and by Salaman *et al.* (2008, 2010) as escaped. However, there are no published records to date of escaped birds or introduced populations. The species has reportedly established populations in Venezuela (Hilty 2003, Restall 2003, Sharpe *et al.* 1997).

It is important to keep track of introduced and escaped species, so as to document historical information as to possible introductions and to monitor species which may raise conservation concerns (Lever 2005). Java Sparrow is also considered a threatened species as a result of local extinctions and severe population declines caused by habitat loss and trapping for the pet trade in its native range (BirdLife International 2013). As a result, introduced and captive populations may have conservation value in addition to raising conservation concerns. This short note includes observations of an escapee in depto. Quindío.

On 17-19 December 2012, I spent three mornings sound recording birds in secondary habitats in the grounds of Hotel Campestre Las Camelias, mun. Armenia, Quindío (c.04°31'N, 75°47'W). On the first of these days at approximately 7 am, I came across a Java Sparrow hopping along a path in the hotel grounds (Fig. 1). The bird was seen at very close quarters (down to 2 m) and identified immediately due to its distinctive plumage. I knew the species previously from zoos and aviaries in Europe and the plate in McMullan et al. (2010). As I approached the bird over a period of 5-10 minutes, it flushed various times, but was only capable of flying short distances (up to 5m) and a few tens of cm height. Several photographs were taken using a Blackberry handset. The bird stayed on the path after each flight, not flushing to the low scrub or grasses either side of the path.

The Java Sparrow vocalized various times with a contact call, of which sound recordings were made (Fig. 2). There are very few comparative sound recordings available for this species. Macaulay Library (ML) recording no. 619 is the only one available of a call of the species in its natural range (Jawa Timur, Indonesia) and is similar to my recording, as is a recording made in captivity in the USA (AVOCET no. 12712). There are only two other recordings of this species on ML, neither of which is from the species' home range, one of which is not digitized (ML72009: Hawaii) and the other of which is not consistent with other recordings (ML14411: Bahamas).

The bird flushed a total of *c.*15 m during the period of observation, until it approached a small bridge with hanging bird cages which had been covered in cotton drapes to sleep the birds overnight. With its continued call, it elicited response of the same call from one of the caged birds, which were not visible (the escaped and captive birds both audible from 1:00 onwards in XC134986). Later in the day, once they had been uncovered by hotel staff, I found these cages to house 6 Java Sparrows. The escaped bird was not seen later in the day or on subsequent days.

Other bird cages near the Java Sparrows housed varieties of Fischer's Lovebird *Agapornis fischeri* and two colour morphs of Gouldian Finch *Erythrura gouldiae*. In the lower part of the hotel, somewhat distant, were larger aviaries housing Common Pheasant *Phasianus colchicus*, Silver Pheasant *Lophthura nycthemera*, Golden Pheasant *Chrysolophus pictus*, ornamental chicken *Gallus gallus* breeds and several tens each of Budgerigars *Melopsittacus undulatus* and Cockatiels *Nymphicus hollandicus* (incorrectly labeled *Agapornis*). The latter two species have been recorded as escapees in Colombia (Cortés & Donegan 2012).

Figures 1 a-d. Java Sparrow *Padda oryzivora* Las Camelias, Quindío, Colombia, 14 December 2012.

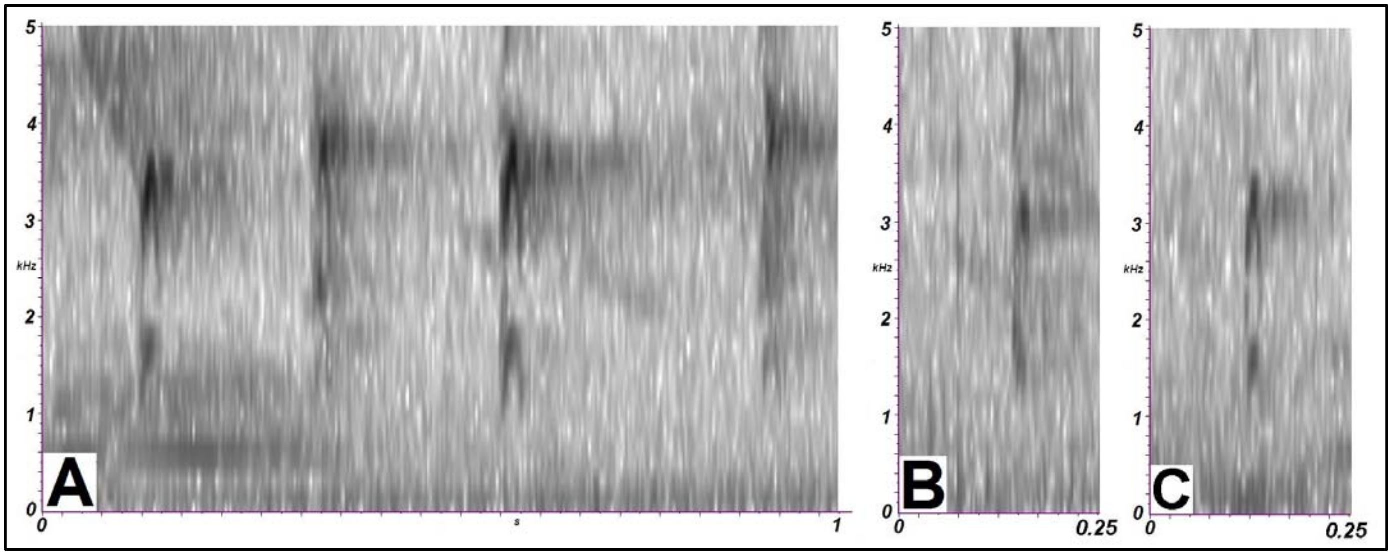

Figure 2: sonagram of calls of the individual illustrated in Figure 1 (XC134986)**.** In Fig. 2A only the first and third notes are of the escaped bird.

This is apparently the first "confirmed" published record of Java Sparrow as an escaped species for Colombia, with photographic and sound recordings supporting the observation. It is also apparently the first record in Quindío. Previous records of escaped Java Sparrow in Colombia are from the same region – the upper río Cauca valley and coffee region from dpto. Valle del Cauca north to Risaralda and now Quindío. This may be the part of Colombia where the species is most common in captivity. It does not seem common in pet shops in Bogotá. Perhaps the species, whose natural range is in tropical lowlands, is more suited to surviving in captivity in warmer parts of Colombia, or this could be due to historical reasons related to the pet trade.

No other Java Sparrows were observed on other days at this locality or elsewhere during four days in dpto. Quindío (nor is the species reported in recent birdwatching trip reports in the department). This lack of reports together with circumstantial information about the observation show this to be an isolated escapee that does not appear representative of an introduced population. The better status for this bird in Colombia, based on records to date and pending further data on its status in Valle del Cauca and Risaralda, is as an escapee (Donegan *et al.* 2010) not an established, introduced species (cf. Anonymous in Remsen *et al.* 2013).

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INSTRUCCIONES PARA AUTORES

Conservación Colombiana es publicada dos veces al año por la Fundación ProAves, una entidad sin ánimo de lucro registrada, que tiene como misión "proteger las aves silvestres y sus hábitat en Colombia a través de la investigación, las acciones de conservación puntuales y el acercamiento con las comunidades locales. El propósito de la revista es divulgar los resultados de las investigaciones y acciones de conservación de las especies colombianas amenazadas de extinción. El formato y tipo de los artículos que se publican es variado incluyendo reportes internos de las actividades en conservación desarrolladas por la Fundación, resultados de las investigaciones y el monitoreo de especies amenazadas, proyectos de grado de estudiantes universitarios, inventarios y conteos poblacionales, planes de acción o estrategias desarrolladas para especies particulares, sitios o regiones y avances en la expansión de la red de áreas protegidas en Colombia.

Conservación Colombiana está dirigida a un público amplio. Principalmente a científicos, conservacionistas y personas interesadas en general en la conservación de las especies amenazadas de Colombia y sus hábitats. Por esta razón es una publicación de carácter científico, aunque laxa en su formato y contenidos.

Las contribuciones deben ser en castellano o inglés y todo manuscrito debe incluir títulos y resúmenes en castellano y en inglés. Los artículos preferiblemente deberán tener una extensión aproximada entre 2,000 y 7,000 palabras, y se dará preferencia a los escritos más cortos. Aunque también se aceptan, a discreción del comité editorial, artículos o compendios largos, los cuales pueden constituir artículos en un mismo tema o monografías que abarquen un número completo de la revista. Las contribuciones serán evaluadas por el comité editorial y en cada caso se ofrecerá a los autores un concepto sobre su publicación tan pronto como sea posible.

Deben entregarse en formato digital, vía correo electrónico en formato RTF. El texto se debe ajustar a dos columnas y se debe usar interlineando sencillo, párrafos justificados, márgenes de 1.78 cm a cada lado, a excepción del inferior que debe ser de 1.52 cm. Titulos y subtitulos de los articulos en letra *Times New Roman* 12, texto en general y para nombrar graficas y Cuadros en *Times New Roman 10.*

Los nombres científicos deben estar escritos en letra cursiva y deben estar mencionados después del nombre en castellano la primera vez en el titulo, resumen y texto. En adelante solo debe usarse el nombre en castellano. Abreviaturas como sp. y spp. no son nombres y no van en cursiva.
Todo artículo científico debe contener las siguientes secciones a excepción de las pequeñas reviciones de especies.

- Titulo en castellano e inglés y autores
- Resumen en castellano e inglés
- Introducción
- Métodos
- Resultados
- Discusión
- Agradecimientos
- Bibliografía

Contribuciones como descripciones de nuevos taxa, revisiones de literatura, discusiones de manuscritos, o artículos en forma de ediciones completas, deben usar secciones apropiadas como es su usanza en la literatura científica. No obstante, su aceptación final queda a criterio del comité editorial.

El titulo debe ser en mayúsculas (sin punto final), Arial 16 y negrilla, el segundo titulo en ingles o español dependiendo del lenguaje del articulo debera ir en *Times New Roman* 12, seguido en reglón aparte por el nombre de los autores en negrilla, sus afiliaciones institucionales y la dirección electrónica del primer autor. Se recomienda a los autores usar solo su primer nombre y apellido. Sin embargo, en caso que quiera usar su segundo apellido deberá ligarlo con un guión corto (–) al primer apellido.

Es recomendable que los resúmenes no excedan las 300 palabras o el 5 % de la longitud total del texto y debe incluirse una lista de palabras clave en el idioma respectivo.

3. CONSERVACIÓN EN COLOMBIA

La conservación en Colombia ha sido históricamente…

7.1. Loros amenazados

Los loros amenazados de Colombia…

7.1.1. Loros en peligro (EN)

Los loros en peligro en Colombia se encuentran principalmente en la zona Andina…
Los Cuadros, figuras y anexos deben estar citados en el texto. Como figuras se entienden todo tipo de gráficos, dibujos, mapas, fotos e ilustraciones. Para las Cuadros, la leyenda debe ir arriba y las explicaciones de abreviaturas o simbología al pie en cursiva. Solamente se deben usar líneas horizontales en las Cuadros. Para las figuras, la leyenda debe ir al pie de la misma. Se recomienda que cada leyenda incluya información suficiente para ser entendida por si misma sin necesidad de volver al texto y que incluya el nombre de la figura, un referente geográfico y temporal, y el nombre abreviado del manuscrito y el periodo del estudio.

Todas las citas en el texto deben estar en la bibliografía y viceversa. Las citas en el texto se deben ordenar cronológicamente. Cuando se cita en el texto no se debe usar coma entre el nombre del autor y la fecha, y se usan comas para separar dos referencias. En citas donde hay dos autores, estos se separan usando "&" no "y". Para citas donde hay más de dos autores se usa "*et al.*", escrito en cursiva. Se deben usar letras minúsculas seguidas al año para diferenciar varios trabajos del mismo autor y año, así: Moreno 1995b, Moreno 1995d. Se pueden citar trabajos publicados o aceptados para publicación, tesis universitarias e informes y reportes internos; que a su vez deberán ir en la Bibliografía. Artículos aceptados para publicación pero aún no publicados se citan como "*en imprenta*", ej: Salaman (*en imprenta*). Manuscritos inéditos o no aceptados y comunicaciones personales se citan únicamente en el texto, como datos no publicados y comunicación personal respectivamente, incluyendo la inicial del nombre del autor, ej: D. Caro (datos no publ.), C. Gómez (com. pers.).

La bibliografía debe estar ordenada alfabéticamente por autor y cronológicamente cuando haya varias citas del mismo autor. Se deben escribir los apellidos de todos los autores y sus iniciales capitalizándolos. Cuando el autor sea una institución, cítela por su nombre completo en el texto la primera vez seguido en mayúscula sostenida por su acrónimo en paréntesis, que deberá ser usado en adelante y en la bibliografía. Cuando un manuscrito ha sido aceptado pero todavía no ha sido publicado y se encuentra en imprenta cítelo como "en imprenta", sin fecha, y cuando hace parte de una publicación seriada reemplace el número de volumen o número y páginas por "0:00". Los nombres de las publicaciones seriadas deben escribirse completos y en cursiva. Recomendamos seguir el siguiente estilo la bibliografía:

- Libros

Autor (Año) Título. Editorial o institución que publica. Ciudad de publicación. Si se cita un libro colegiado, se cita el nombre del editor o editores con (ed.) o (eds.). Ej:

Hilty, S. & Brown W. (1986) A Guide to the Birds of Colombia. Princeton University Press. Princeton.

Chaves, M.E. & Arango, N. (eds.) (1998) Informe nacional sobre el estado de la biodiversidad 1997, Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, PNUMA, Ministerio del Medio Ambiente, Bogotá.

- Artículos

Autor (Año) Título. *Revista* volumen (o número): páginas del artículo. Ej:

Kattan, G., Alvarez, H. & Giraldo, M. 1994. Forest fragmentation and bird extinctions: San Antonio eighty years later. *Conservation Biology* 8: 138–146.

Pacheco, A. (en prensa). Biología reproductiva del Loro Orejiamarillo (*Ognorhynchus icterotis*) en el Municipio de Roncesvalles, Departamento del Tolima. *Conservación Colombiana* 0:00.

- Capítulos o contribuciones dentro de un libro

Autor (Año) Título. Páginas en: Editor (ed.). *Título libro*. Editorial o institución que publica. Ciudad de publicación. Ej:

Rosselli, A. & Estela, F. 2002. *Vireo caribeus*. Págs. 367–370 en Renjifo, L.M., Franco–Maya, A.M., Amaya–Espinel, J.D., Kattan, G.H. & Lopéz–Lanús, B. (eds.) *Libro rojo de aves de Colombia*. Instituto de investigación de Recursos Biológicos Alexander von Humboldt & Ministerio del Medio Ambiente. Bogotá.

- Artículos publicados en el Internet o extractos de páginas electrónicas.

Autor (Año) Titulo. Institución que publica. Disponible en URL [última fecha de acceso]

FAO 2001. *Global forest resources assessment 2000: main report. Food and Agriculture Organization of the United Nations*. Forestry Paper No. 140. Disponible en http://www.fao.org/forestry/index.jsp [descargado en febrero de 2006].

Unidades de medida. Recomendamos usar el Sistema Internacional de Unidades (SI) para todas las unidades de medida. Este puede ser revisado en el URL del "Bureau International des Poids et Measures" http://www.bipm.fr/en/home/. Escriba las unidades usando un espacio intermedio después de los números, así: 33 ºC ó 273 ha.

Numeración en el texto. Cuando un número va acompañado de una unidad siempre se deberá escribir como un número arábigo. Los miles se deberán marcar con una coma (,) y las fracciones decimales con puntos. Cuando los números no van seguidos de unidades, los dígitos de cero a nueve se escriben con palabras y de 10 en adelante con números arábigos. Para separar un intervalo, al igual que en cualquier otra oportunidad que se quiera usar un guión en el texto, se deberá usar el guión corto (–) y no el guión de no separación (-). Es recomendable no usar en cifras decimales más de tres dígitos.

Fechas y horas. Las fechas se deben escribir como día, mes y año, así: 11 de septiembre de 2006 ó 11 septiembre 2006 y use el sistema de 24 horas, así: 21.00 en vez de 9:00 P.M. ó 9:00 p.m., 6.00 en vez de 6:00A.M. ó 6.00 a.m.

La aceptación de los manuscritos dependerá de un proceso riguroso de la revisión de su calidad académica. La coordinación editorial y un miembro del Comité Editorial asociado con el área correspondiente al trabajo remitido, hacen una primera evaluación a fin de verificar el cumplimiento de los requisitos de presentación exigidos por la revista. Los manuscritos que no sean originales, que tengan serias deficiencias en su estructura, que presenten una pobre redacción o no se ajusten a las normas editoriales, serán devueltos para su adecuación antes de ser considerados para revisión por el Comité Editorial.

Los trabajos que pasen la primera etapa serán enviados a por lo menos dos árbitros expertos en el área de conocimiento respectiva, cuyas identidades serán desconocidas para los autores a través de todo el proceso de evaluación. Para notas cortas (menos de dos páginas) el uso de un solo árbitro con comentarios del comité editorial es también posible. Para asegurar la imparcialidad en la evaluación, las identidades de los autores también resultan desconocidas para los árbitros (proceso de evaluación doblemente ciego). Los árbitros disponen de dos semanas para remitir un concepto detallado sobre los siguientes aspectos u otros: el título refleja el tema del escrito, el resumen es claro y permite conocer con claridad el contenido y los elementos básicos del escrito, las palabras clave son pertinentes, la organización y redacción del manuscrito, la originalidad y alcance del trabajo presentado, claridad y delimitación del problema, la justificación es coherente con el problema abordado, la descripción de la metodología utilizada es clara y pertinente, existe formalidad en la escritura, existe relación entre la temática abordada teóricamente y los objetivos y la metodología utilizada, es rigurosa la presentación y discusión de los resultados, la consistencia entre resultados y conclusiones y la pertinencia y precisión de las referencias bibliográficas citadas. Los árbitros pueden enviar sus comentarios o corecciones sobre el manuscrito mismo electrónicamente o en un documento o correo aparte.

Cuando la recomendación de los árbitros coincide, se toma la decisión de aceptar o rechazar el trabajo. Si se rechaza, éste junto con los comentarios de los árbitros, es devuelto a los autores con la recomendación de corregirlo y considerar su publicación en otra revista o en otro número de la revista. La decisión de rechazar un trabajo es definitiva e inapelable. Si se acepta con la recomendación de hacer modificaciones, éste junto con los comentarios de los árbitros, es devuelto a los autores para que preparen una versión revisada y corregida, para lo cual disponen de dos semanas. Los autores deben remitir la versión corregida junto con detalles enviados al editor enumerando los cambios realizados de acuerdo con las recomendaciones hechas por los árbitros.

Anotar las correcciones utilizando subrayado para la pronta identificación. El Editor toma la última decisión acerca de la aceptación de la versión corregida considerando el concepto de los árbitros y las correcciones hechas por los autores. Los árbitros pueden hacer sus aportes en relación con la bibliografía u otro aspecto que no incida en el contenido del manuscrito, de igual manera, pueden hacer recomendaciones al Comité Editorial de la Revista (sólo será conocido por éste) al redactar un concepto de evaluación general del trabajo en el cual incluya las apreciaciones más importantes de su valoración, sugerir las observaciones, modificaciones, controversias y ajustes que estimen convenientes (aunque no se recomiende para publicación).






Fundación ProAves
Carrera 20 No. 36–61
Bogotá, Colombia
Tels: +57-1-245.5134 /340.3239
Fax: +57-1-340.3285
fundacion@proaves.org

www.proaves.org

ISSN 1900-1592