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## Birds of Colombia 2012

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**Conservación Colombiana** es una revista científica publicada por la Fundación ProAves, institución que tiene como misión “proteger las aves silvestres y sus hábitat en Colombia a través de la investigación, acciones de conservación puntuales y el acercamiento a la comunidad”. El propósito de la revista es divulgar las acciones de conservación que se llevan a cabo en Colombia, para avanzar en su conocimiento y en las técnicas correspondientes. El formato y tipo de los manuscritos que se publican es variado, incluyendo reportes de las actividades de conservación desarrolladas, 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, incluyendo científicos, conservacionistas y personas en general interesadas en la conservación de las especies amenazadas de Colombia y sus hábitats.

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### **Fotografía portada / Cover photograph**

The first ever published photograph in life of Santa Marta Wren *Troglodytes monticola*, an Endangered and Colombian endemic species restricted to a highly degraded timberline ecotone in the Sierra Nevada de Santa Marta. By Juan Carlos Luna. All rights reserved © Fundación ProAves.

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# Vocal differentiation and conservation of Indigo-crowned Quail-Dove *Geotrygon purpurata*

*Diferenciación en la vocalización de Geotrygon purpurata y evaluación de su estado de conservación*

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## Abstract

*Geotrygon purpurata* of the West Andes foothills differs from *G. saphirina* of Amazonia in its shorter main note to the song, which is less variable in acoustic frequency. Its conservation status is discussed and Endangered (EN) status is recommended.

## Resumen

*Geotrygon purpurata* del piedemonte de la Cordillera Occidental difiere en su vocalización de *G. saphirina* en tener la nota principal más corta que demuestra menos variación en la frecuencia acústica. Su estado de conservación es discutido y se recomienda considerarla como En Peligro (EN).

## Introduction

Indigo-crowned Quail-Dove *G. saphirina* has a west Amazonian distribution whilst *G. (s.) purpurata* is found in the Chocó of Ecuador and Colombia. Although *purpurata* Salvin, 1878 was originally described as a separate species, these allopatric taxa were lumped for many years (e.g., Hellmayr & Conover 1942, Meyer de Schauensee 1964, 1966, 1970, Goodwin 1970, Hilty & Brown 1986, Sibley & Monroe 1990, Brumfield & Capparella 1996, Baptista *et al.* 1997, Erize *et al.* 2006, Salaman *et al.* 2008, 2010, McMullan *et al.* 2010, 2011). More recently, several authors split them on account of their differing voice and morphology, e.g. Gibbs *et al.* (2001), Salaman *et al.* (2001), Ridgely & Greenfield (2001), Jahn *et al.* (2002), Granizo *et al.* (2002), Restall *et al.* (2006), Gill & Donker (2010), Solano-Ugalde (2011) and Johnson & Weckstein (2011). The Colombian checklist moved to Remsen *et al.* (2012)'s treatment in Salaman *et al.* (2008) and subsequent editions.

The morphological differences between these two groups are well-known, with *purpurata* (Fig. 1) having a dark purple crown and nape contrasting with its white forehead (whilst in *saphirina* this is bluish and less contrasting), different shade of mauve coloration on the upper mantle, darker grey chest, lacking of white wing patches found in *saphirina* and different iris coloration (Hellmayr & Conover 1942, Ridgely & Greenfield 2001, Restall *et al.* 2006 and McMullan *et al.* 2010, 2011, Remsen *et al.* 2012).

Two molecular studies have addressed this group. First, Brumfield & Capparella (1996), using three samples of each group, found unusually high divergence between *purpurata*

and *saphirina* for lowland conspecifics with a Chocó / Amazonian distribution. More recently, Johnson & Weckstein (2011) studied a single Ecuadorian *purpurata* and single Peruvian *saphirina*, finding strong support for a sister relationship and moderate (modelled >1.2 million years) differentiation, consistent with that observed between samples of Russet-crowned Quail-Dove *Geotrygon goldmani* & Chiriquí or Rufous-breasted Ground-Dove *G. chiriquensis* and those between nominate Grey-fronted Dove *Leptotila rufaxilla* & Yungas Dove *L. megalura*. However, observed differentiation does not attain that found within the widespread White-tipped Dove *L. vereauxii*.

We are not aware of any published paper concerning vocal variation in this species. Remsen *et al.* (2012) considered this split but decided against adopting it on account of the lack of published analysis of vocal variation. Only Ridgely & Greenfield (2001)'s transcriptions were available in addition to some published and archived recordings at that time. Given that other authorities continue to split these birds, that several sound recordings are now available of both populations and the results of recent molecular studies, a re-evaluation of the available vocal data is called for.



**Figure 1.** *G. purpurata* (RNA Pangan, Nariño, Colombia; J. C. Luna/ProAves).

## Methods

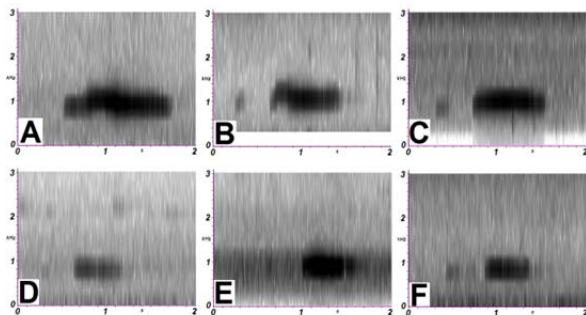
We collated available sonograms from published and online sources. Note length, maximum acoustic frequency and subjective descriptions of note shape were studied, based on

the first three recordings of each recording. Statistical tests set out in Donegan (2012) were applied to consider vocal differentiation.

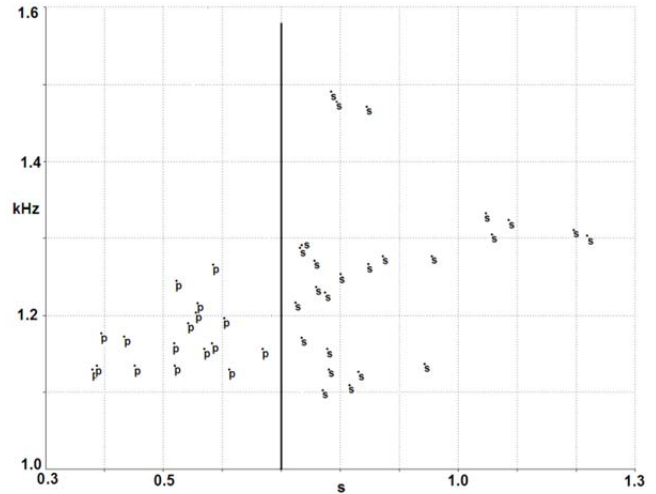
### Vocal differences

Both the *saphirina* and *purpurata* groups appear to give two different vocalizations, one constituted solely by a single drawn out note and the other being similar, but preceded by a very short single note (Fig. 2). Calls of both sorts are often repeated several times for periods of several minutes. Recordist notes on xeno-canto show instances of *purpurata* songs changing from a single to double note after playback (R. Ahlman: XC 20968). Recordings of *saphirina* which include double notes both state that the bird called in response to whistled imitations. The main, longer note is essentially similar in both sorts of song and was analyzed here using Raven Lite for all recordings.

There are noteworthy differences in the sole or main note in songs. The main note of the *G. saphirina* song is longer than that of *G. purpurata* (Fig. 2). There is no recorded overlap for song length in the sample studied (Fig. 3, Appendix). The differences are statistically significant (unequal variance *t*-test,  $p < 3 \times 10^{-12}$ ) and meet Donegan (2012)'s levels 1, 2 and 4 tests of differentiation. However, they marginally miss the test of 97.5%/97.5% statistical diagnosability using *t*-distributions (Level 5), perhaps influenced by the moderate vocal sample size for these rare species. *G. saphirina* is also more variable in maximum acoustic frequency than *G. purpurata*, although there is broad overlap in this feature of songs between the two populations (Figs. 2-3). Differences in maximum acoustic frequency are statistically significant (unequal variance *t*-test,  $p < 0.0004$ ) but meet only the "Level 1" test of differentiation and not others, i.e. weak mean differences only for this variable. Notably though, *G. saphirina* is more variable in note shape of the main note, across the sample, with a peak or variation in frequency shown in some recordings (Fig. 2), whereas such variations in frequency are absent from all available *G. purpurata* recordings.



**Figure 2.** Sonograms of songs of (top) *G. saphirina* & (bottom) *G. purpurata*. A. XC89253; B. XC22977; C. XC94977; D. XC85492; E. Jahn *et al.* (2002); F. Krabbe & Nilsson (2003). Details of each sound recording in the appendix.



**Figure 3.** X-Y scatter graph generated using Past software of acoustic frequency (y axis) and length of the main note (x axis) of the principal note of *Geotrygon* songs. The vertical line shows song length = 0.7 s. All data points to the left of the line ("p") relate to *G. purpurata*. All data points to the right relate of the line ("s") relate to *G. saphirina*.

These vocal differences are likely to be significant in the context of a family in which songs generally appear to be stereotypical. A video showing an individual of Amazonian *saphirina* singing (Internet Bird Collection: see list of recordings below) shows an individual first puffing out its chest, presumably as it inhales. The song then coincides with the individual exhaling, without opening its bill, piping air through its nostrils to create sound. The ability of the Amazonian population to make longer, acoustically variable and higher pitched calls in this way is likely linked to physiological factors such as lung capacity, chest muscle strength or the shape or size of the bill, nostrils or trachea.

### Distribution

*G. purpurata* is considered restricted to the humid Chocó. There are no records in the Magdalena valley or near low Andean passes in the elevational range of these species (McMullan *et al.* 2010). Its distribution and elevational range are similar to another terrestrial Chocó endemic, the Banded Ground-cuckoo *Neomorphus radiolus*, restricted to extremely wet / pluvial foothill tropical forest in the Chocó in northwestern Ecuador and western Colombia. However, *G. purpurata* has a narrower elevational range of between 200 to 1100 m (Hilty & Brown 1986). Although the latter authors considered it may range lower, surveys of forested localities on the Chocó floor did not result in any records (Salaman 1994). Latitudinally, it is found across 750 km of foothills from central Chocó, Colombia to Pichincha, Ecuador with an estimated Extent of Occurrence of <15,000 km<sup>2</sup>.

*G. purpurata* is considered rare to uncommon locally in humid and wet forest and advanced second growth at the following locations from Colombia (26 specimen records in Biomap Alliance Participants 2012); Chocó: Nóvita with 1 specimen in 1911 and La Vieja (most northerly record at 05°24'N) with three specimens from 1912; Valle de Cauca: río Verde / Alto Anchicaya with two specimens (1943 by F.C. Lehmann; 1972 by S.L. Hilty), and a specimen at Cajambre, Río Aguasucia in 1983 (C.J. Cabrera); Cauca: Río Huisitó / below El Tambo in Cauca Dept with 13 specimens from 1936-39, 1950 and 1958 (K. Von Sneider) plus a specimen in 1991 (Á. Negret); and Nariño Dept: la Guayacana with 4 specimens (1958 by M.A. Carriker), Buenavista with a specimen from 1912 (W.B. Richardson).

The species is reported from just three locations in recent decades in Colombia: Alto Anchicaya in the early 1970s by S.L. Hilty (Hilty & Brown 1986), Pangan Nature Reserve (Salaman 1994, J. C. Luna *in litt.* 2012; Fig. 1) and below Tambito nature reserve (Á. Negret records). In Ecuador, Ridgely and Greenfield (2001) reported the species to be rare to uncommon inside very humid forest from various sites in Esmeraldas, Imbabura and nw. Pichincha Provinces, but reliably from only El Placer and Bilsa. Various other sound recording localities are mentioned in the Appendix.

*G. saphirina* in contrast is found more broadly in lowlands and in the East slope foothills where it generally occurs below 1,300 m (McMullan *et al.* 2010) with recent sound recordings at 1,450 m (XC 98120, 98253). The high Andes probably constitute a formidable barrier for a largely terrestrial to understory lowland group such as these *Geotrygon*.

### Available names

The name *saphirina* (Bonaparte 1855) has its type locality in Napo, Ecuador, so refers to the Amazonian population. This name is senior to *rothschildi* Sztolcman, 1926 which has its type locality along the río Cadena, Marcapata valley, Peru (also in the Amazonian region). Hellmayr & Conover (1942) considered the taxonomic validity of *rothschildi* in need of confirmation, an issue outside the scope of this paper. The sole Peruvian recording attains the highest frequency among the sample, but falls within the range of other recordings for note length. A greater vocal sample, particularly from Peru, would be needed to assess whether any geographic variation in voice exists in Amazonia which should be recognized through the use of subspecies.

The name *purpurata* Salvin, 1878 has a vague type locality of "Ecuador", with the type in the BMNH. In the original description, the type was compared directly to various *saphirina* collected in Ecuadorian Amazonia and *purpurata* distinguished in "*having the crown of the head of a rich blackish purple, from which the white forehead is clearly defined*". The *purpurata* type should therefore be assumed to have been collected west of the Andes or on the western

slope of Ecuador. The name is correctly available for the split Chocó population.

### Taxonomic considerations and vernacular names

Because they are apparently sister taxa, the molecular data on a conservative view could be considered neither to support nor contradict splitting or lumping. Separation would nonetheless be consistent with the treatment of several other recognized pigeon species and Chocó versus Amazonia splits (Brumfield & Capparella 1996, Johnson & Weckstein 2011).

Considering proposed species scoring methodologies (Tobias *et al.* 2010), *purpuata* attains 2 points for song, 3 for crown and nape coloration, 1 for mantle coloration, 1 for breast coloration and 1 for iris coloration, at least 8 points (without considering biometrics) and over the 7 recommended for species rank of allopatric populations. Considering Helbig *et al.* (2002)'s guidelines, diagnosability by voice would have to be made out to a similar level to that shown between other Neotropical pigeon species in order to be indicative of species rank. Although our vocal data fall short of diagnosability, it is noteworthy that Lined Quail-Dove *G. linearis* and White-throated Quail-Dove *G. frenata* show similar vocal differences, principally in note length and in variability of note shape as those shown here. Other sympatric Neotropical pigeon species such as Plumbeous Pigeon *Patagioenas plumbea* / Ruddy Pigeon *subvinacea* and some *Leptotila* also differ primarily in the frequency and length of the notes in their songs rather than the number of notes in them, showing comparable levels of differences to those between these *Geotrygon*.

Hellmayr & Conover (1942) used the name Purple Quail-Dove, which is appropriate given that this is the most purple *Geotrygon*. However, this name seems to have been overlooked in the recent literature in favour of Indigo-crowned (e.g. Ridgely & Greenfield 2001, Restall *et al.* 2006).

### Conservation of *G. purpurata*

The broader *Geotrygon saphirina* was recently upgraded to IUCN Vulnerable status following an assessment of deforestation rates in its Amazonian range (Bird *et al.* 2011, BirdLife International 2012). A split *G. purpurata* is forest-dependent (Solano-Ugalde 2011) and has a small geographical range within a narrow elevational range in the most humid part of the Chocó. It is evidently a low-density species and locally uncommon to rare in Ecuador (Ridgely & Greenfield 2001, Granizo *et al.* 2002, Solano-Ugalde 2011). Although due to its secretive nature it may be overlooked (McMullan *et al.* 2010), there are few specimens, sound recordings or modern localities. The population of *purpuata* is roughly estimated to number 1,000-2,499 individuals (600-1,700 mature individuals),

based on an assessment of known records, descriptions of abundance and estimated Extent of Occurrence.

A rapid population decline is suspected owing to accelerating rates of habitat loss and presumed hunting pressure in its range over the period of three generations. Habitat destruction is taking place due to coca production and alluvial gold prospecting, mining and related colonization of the Colombian Chocó. African oil palm cultivations, cattle grazing, infrastructural developments and advancing agricultural colonization are all accelerating at an unprecedented rate in both western Ecuador and Colombia. During the 2000s, deforestation reduced primary forest cover in Esmeraldas, Ecuador by over 38% (Cárdenas 2007) whilst illicit and licit cultivations in Colombia have reduced the cover of primary forest in Nariño, Colombia by over 30%. Alarming, several localities where *G. purpurata* has been confirmed in the past century have now been deforested.

In recent decades, *Geotrogon purpurata* has been confirmed in just a few protected areas: Bilsa Biological Reserve (3000 ha) in Esmeraldas (Ridgely & Greenfield 2001), Mangaloma (Athanas recordings) and Reserva Mariposas y Guañas, río Pachijal (Solano-Ulgade 2011) in Ecuador and Pangan Nature Reserve (8,361 has) in Nariño, Colombia (Salaman *et al.* 2010). Whilst it is likely to occur in the lowest elevations of Cotacachi Cayapas Ecological Reserve as well as the Awá Indigenous community lands in Ecuador and Colombia, all of these areas are being rapidly deforested and colonized, so provide no safe haven for *G. purpurata*. A population may persist at Alto Anchicaya, on the northern boundary of the Farallones de Cali National Park and below Munchique National Park, from where there are historical records (Hilty & Brown 1986).

*G. purpurata* has a very limited range with an Extent of Occurrence of less than 15,000 km<sup>2</sup> (within the threshold for Vulnerable) that is severely fragmented (B1a) combined with a continuing decline (B1b) in (i) extent of occurrence, (ii) area of occupancy, (iii) area, extent and quality of habitat, (iv) number of locations and (v) given that it is a forest-dependent species, presumably number of mature individuals (B1ab(i,ii,iii,v)). Granizo *et al.* (2002) considered it Vulnerable for Ecuador. The population size is however estimated to number fewer than 2,500 mature individuals and is continuing an inferred decline in the numbers of mature individuals. No subpopulation is estimated to comprise more than 50 mature individuals, perhaps qualifying it for Endangered status (C2a(i)).

## Acknowledgements

Thanks to the recordists whose names feature in the appendix below, to J. C. Luna for providing various data and the photographs.

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## Appendix

### Vocal data:

Data are presented as follows: mean  $\pm$  standard deviation (lowest value–highest recorded value) (n = no. of vocalizations; no. of recordings). *Acoustic frequency*: *purpurata* 1.173 kHz  $\pm$  0.039 (1.129-1.265) (n=18; 6). *saphirina* 1.263 kHz  $\pm$  0.106 (1.102-1.490) (n=26; 9). *Song length*: *purpurata* 0.522s  $\pm$  0.083 (0.379-0.668) (n=18; 6). *saphirina* 0.861 s  $\pm$  0.145 (0.724-1.219) (n=26; 9).

### Sound recordings inspected:

*Geotrygon purpurata* Ecuador: XC 20968 (R. Ahlman: 23 km west of Lita, Esmeraldas). XC 76410 (R. Ahlman: Bilsa, Mache-Chindul Hills). XC 85492 (A. Spencer: trail to the río Mira, 4 km. west of Alto Tambo, Esmeraldas). XC 9172 (= IBC recording = Boesman 2009 track) (N. Athanas: Reserva Mangaloma, Pichincha). Jahn *et al.* (2002) track 1-22 (M. Lysinger: west of Pedro Vicente Maldonado, Pichincha, 400-500 m). Krabbe & Nilsson (2003) (J. Tobias: Jatun Sacha biological station, Mache-Chindu hills, Esmeraldas, 400 m).

*Geotrygon saphirina* Ecuador: XC 4943 (D. Jones: La Selva Lodge, Sucumbios/Napo). XC 98120, 98253 (T. Brooks: Wildsumaco, 5km NW Guagua, Sumaco, Napo). XC 94977 (D. Lane: Yasuni NP, Parakeet Lick, Napo). ML53349 (L. F. Kibler: 235 km E of Quito; La Selva lodge area on Garza Cocha). IBC video: (J. del Hoyo: Sani Lodge, Orellana Province). Moore (1996, track 15) (unspecified locality, lowland rainforest of eastern Ecuador). Peru: XC 22977 (= Boesman 2009 track) (D. Geale: Chikais, Amazonas).





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