An Approach to Identifying Bird Songs: A Key to more than 300 Songs in the Pipeline Road Area, Soberanía National Park, Panama

Kent Livezey*

East Coast Tower, Costa del Este, Panama City, Panama

Received: June 21, 2016 Revised: August 03, 2016 Accepted: September 07, 2016

Abstract:

Background:

Identifying bird songs is an integral part of censusing, watching, and enjoying birds. However, doing so can be difficult due to the large variety of songs and, often, subtle differences among them. One way to facilitate this is to place songs into a descriptive key, thereby analyzing each song as well as identifying similarities and differences among songs.

Objective:

Here I present a key to bird songs in a bird-rich location in and adjacent to the Pipeline Road area, Soberanía National Park, Panama, to help researchers and birders in Panama identify and learn these songs, and, more importantly, to provide a model for a key to aid in the analysis and characterization of bird songs in other areas.

Methods:

After an unfruitful attempt to find a key I could use as a template, I developed an order of choices that groups similar songs, eliminates duplication, and optimizes the probability of correctly identifying them. The order is: trill or churr, slur (for songs that do not trill or churr), tempo, pitch, and other pertinent attributes. I followed a published system of descriptive units of bird songs (i.e., element, phrase, section) and gleaned from many sources how to describe various aspects of bird songs (e.g., pitch, quality, tempo). Definitions of terms and final choices are linked to recordings of songs available in www.xeno-canto.org.

Results:

This key includes 321 songs of 216 species in the intact rainforest along southern Pipeline Road and the fragmented forests and wetlands adjacent to the southern entrance to Pipeline Road. These songs include all but the most rarely heard songs of the area.

Conclusion:

This key is the first example of a descriptive key to bird songs in Central or South America, and is unique in at least the western hemisphere in its large scope, ordering of choices, and use of links to xeno-canto. It also provides a model for the construction of keys for bird songs in other areas. In addition, this work describes and utilizes many aspects of bird songs that, if employed, can improve your abilities to listen to, remember, and differentiate among songs.

Keywords: Bird song key, Panama, Pipeline Road, Soberanía National Park, xeno-canto.

*Address correspondence to this author at the East Coast Tower, Costa del Este, Panama City, Panama; Tel: 507-831-1141; E-mail: kentbl@gmail.com
# TABLE OF CONTENTS

**INTRODUCTION** .................................................................................................................. 73
**METHODS** ............................................................................................................................ 73
**STUDY AREA** .......................................................................................................................... 73
**DEVELOPMENT OF THE KEY** ............................................................................................. 73
**SONGS AND SPECIES COVERED** ......................................................................................... 74
**HOW TO USE** ......................................................................................................................... 74

**DEFINITIONS OF TERMS** ..................................................................................................... 75
- **DESCRIPTIVE UNITS** ........................................................................................................... 75
- **PITCH** .................................................................................................................................. 75
  - Pitch categories .................................................................................................................... 75
  - Pitch changes with two or more elements .......................................................................... 76
  - Pitch changes within an element ....................................................................................... 77
- **QUALITY** ............................................................................................................................. 77
- **TEMPO** ............................................................................................................................... 78
- **VARIATION** .......................................................................................................................... 79
- **EMPHASIS** .......................................................................................................................... 79

**PART I: KEY TO SONGS OF DIURNAL BIRDS IN THE FORESTS ALONG PIPELINE ROAD** .... 79

- **SONG IS A TRILL OR CHURR** .......................................................................................... 79
- **SONG INCLUDES TRILLS OR CHURRS** ........................................................................... 83
  - **SONG INCLUDES TRILLS** ............................................................................................... 83
    - Song is composed of two or three sections ...................................................................... 83
    - Song is composed of one section .................................................................................. 83
  - **SONG INCLUDES CHURRS** ........................................................................................... 83
    - Tempo accelerates .......................................................................................................... 83
    - Tempo is steady .............................................................................................................. 83
  - **SONG IS NOT A TRILL OR CHURR AND DOES NOT INCLUDE TRILLS OR CHURRS** .... 84

- **ELEMENTS UPSLUR AND DOWNSLUR** .......................................................................... 84
  - Tempo accelerates and decelerates .................................................................................. 84
  - Tempo accelerates ............................................................................................................ 84
    - Pitch rises and falls ........................................................................................................... 84
    - Pitch rises ......................................................................................................................... 84
    - Pitch falls .......................................................................................................................... 85
    - Pitch is steady .................................................................................................................. 85
  - Tempo decelerates ............................................................................................................ 85
  - Tempo is erratic ................................................................................................................. 85
  - Tempo is steady .................................................................................................................. 85
    - Pitch rises then falls ........................................................................................................ 85
    - Pitch rises ......................................................................................................................... 85
    - Pitch falls .......................................................................................................................... 85
    - Pitch alternates higher and lower .................................................................................. 86
    - Pitch is steady .................................................................................................................. 86

- **ELEMENTS UPSLUR** .......................................................................................................... 90
  - Tempo accelerates and decelerates .................................................................................. 90
  - Tempo is steady .................................................................................................................. 90
    - Pitch rises ......................................................................................................................... 90
    - Pitch falls .......................................................................................................................... 90
    - Pitch is steady .................................................................................................................. 91

- **ELEMENTS DOWNSLUR** .................................................................................................... 92
Tempo is erratic → ......................................................... 92
Tempo is steady .......................................................... 92
Pitch is low or very low → ............................................. 92
Pitch is medium, high, or very high ................................ 92

Elements do not slur ................................................... 92
Tempo accelerates → ..................................................... 92
Pitch rises → .................................................................. 92
Pitch falls → .................................................................. 93
Pitch is steady ............................................................... 93
Tempo decelerates → ..................................................... 93
Tempo is erratic → ........................................................ 93
Tempo is steady ............................................................. 93
Pitch rises and falls → ................................................... 93
Pitch falls → .................................................................. 93
Pitch is steady ............................................................... 93

Part II: Key to Songs of Diurnal Birds in the Fragmented Forests, Forest Edges, and Grassy Areas Adjacent to the Entrance to Pipeline Road → ............................................. 96
Song IS a Trill or Churr → .............................................. 96
Tempo Accelerates → .................................................... 96
Tempo is steady ............................................................. 96
Pitch rises → .................................................................. 96
Pitch falls → .................................................................. 96
Pitch is steady ............................................................... 96

Song includes Trills or Churrs → ..................................... 96
Song IS NOT a Trill or Churr and Does NOT Include Trills or Churrs .......................................................... 97
Elements Upslur and Downsbr → .................................... 97
Tempo accelerates → ..................................................... 97
Tempo is steady ............................................................. 97
Pitch is very high → ....................................................... 97
Pitch is medium or high .................................................. 97

Elements Upslur → ......................................................... 99
Elements Downsbr → ..................................................... 100
Tempo accelerates → ..................................................... 100
Tempo decelerates → ..................................................... 100
Tempo is steady ............................................................. 100

Elements Do Not Slur ..................................................... 100
Tempo accelerates → ..................................................... 100
Tempo is steady ............................................................. 100

Part III: Key to Songs of Diurnal Birds in the Wetlands Adjacent to the Entrance to Pipeline Road → .................................................................................. 101
Song IS a Trill or Churr → .............................................. 101
Tempo Decelerates → ..................................................... 101
Tempo is erratic → ........................................................ 101
Tempo is steady ............................................................. 101
Pitch rises and falls → ................................................... 101
Pitch falls → .................................................................. 101
Pitch is steady ............................................................... 101

Song includes Trills or Churrs → ..................................... 101
Song IS NOT a Trill or Churr and Does NOT Include Trills or Churrs .......................................................... 102
Elements Upslur and Downsbr → .................................... 102
Elements Upslur → ......................................................... 102
Elements Downsbr → ..................................................... 102
Elements Do Not Slur ..................................................... 102

Part IV: Key to Songs of Nocturnal Birds in the Forests Along Pipeline Road, and the Fragmented Forests, Forest Edges, Grassy Areas, and Wetlands Adjacent to the Entrance to Pipeline Road ............................................. 102
Song IS a Trill or Churr or Includes Trills or Churrs → ........................................................................ 102
Song IS NOT a Trill or Churr and Does NOT Include Trills or Churrs .......................................................... 103
INTRODUCTION

Identifying bird songs is an integral part of censusing, watching, and enjoying birds. However, doing so can be difficult due to the large variety of songs and, often, subtle differences among them. One way to facilitate this is to place songs into a descriptive key, thereby analyzing each song as well as identifying similarities and differences among songs. Here I present a key to bird songs in a species-rich location in Soberanía National Park, Panama, to help researchers and birders in Panama identify and learn these songs, and, more importantly, to provide a model for a descriptive key to aid in the analysis and characterization of bird songs in other areas and regions. This work describes and uses many aspects of bird songs that, if employed, can improve your abilities to listen to, remember, and differentiate among songs. If you are learning the bird songs in your area, I encourage you to make a key for all of them, or at least for the ones you find to be troublesome. Doing so will identify the similarities and differences among the songs. I suggest you follow a consistent pattern of choices that works for you and the bird songs in your area. My key shows one way to approach doing this. This key is the first example of a descriptive key to bird songs in Central or South America, and is unique in at least the western hemisphere in each of three ways: its large scope, ordering of choices, and use of links to xeno-canto.

METHODS

STUDY AREA

Pipeline Road (approximately 9°8’00”N, 79°43’12”W) is a 17.5-km, single-lane, dirt road through the center of 22,100-hectare Soberanía National Park. The road is accessed from the south from the town of Gamboa, which is about 25 km northwest of Panama City, Panama. The study area includes intact rainforest along the southernmost 10 km of Pipeline Road and fragmented forests and wetlands adjacent to the southern entrance to Pipeline Road. This species-rich area contains approximately 40% of the bird species found in Panama [1, 2]. The eBird hotspot “Pipeline Road (Camino del Oleoducto)” reports a total of 450 species, more than anywhere else in Panama [3].

DEVELOPMENT OF THE KEY

In May 2013, I decided to make a key to the bird songs of the Pipeline Road area. My goals were to make a key that (1) grouped similarly sounding songs as much as possible, (2) included all of the regularly heard songs of the area, (3) differentiated among all of the presented songs, (4) used a system that others could adapt for their areas, and (5) was based on recordings in www.xeno-canto.org. To that end, I looked for other bird song keys in the western hemisphere to use as templates. I found no key for anywhere in Central America or South America, but I found two keys for North America. The first key appears to include one song from all bird species in North America north of Mexico, although no species total is presented [4]. This key did not meet my goals in two ways. Its first choice is whether the song in question has one, two, or three or more notes; choosing three or more notes, for my study area, initially would group disparate songs like the repetitive, sharp chips of Long-billed Hermit (www.xeno-canto.org/107762 by Klemens Steiof) with the complex, melodious, many-sectioned repertoires of Bay Wren (www.xeno-canto.org/92124 by William Adsett) (scientific names are provided in the Appendix), so it did not fulfill my first goal. Also, when using that key, you are left, after all choices have been made, with as many as 25 species’ songs with no explanation as to how to identify them; therefore, it did not meet my third goal. The second analysis of bird songs in North America differentiates among the songs of all 56 species of warblers using complex, descriptive charts including spectrograms [5]. I believe that making such charts would be beyond the abilities of most users, so that approach did not comply with my fourth goal.

Without any established method for a bird song key to use, I adopted the traditional dichotomous key method but, like the charts in the key to warblers [5], I allowed more than two choices to be made at any one time. After many versions and reorganizations, I developed a consistent order of choices that groups similar songs, eliminates duplication, and optimizes the probability that you will correctly identify the songs. After you decide whether the song in question: (1) trills or churrs, or (2) includes trills or churrs, choices flow from most to least complex, including whether the song (3) slurs (upslurs and downsllurs, upslurs only, downsllurs only, does not slur), (4) has changes in tempo (accelerates and decelerates, accelerates only, decelerates only, is steady), (5) has changes in pitch (rises and falls, rises only, falls only, is steady) (see Definitions of Terms below), and (6) has other attributes, depending on the remaining songs to be compared. Often, choices terminate with two or more songs when there is no objective way to describe how they differ.
(without using absolute pitch; see below); when that happens, I provide relative comparisons via text or tables to enable you to make decisions (except for a few seemingly identical, high- or very high-pitched, single-element calls in Part II). These groups of similar songs are arranged taxonomically [5]. In addition to these relative comparisons, I often parenthetically include comparisons between similarly sounding songs found in different parts of the key.

To simplify use of the key based on time of day and location, I parsed the key to address four areas. Part I concerns the diurnal birds along the southernmost 10 km or so of Pipeline Road. In Part II are the diurnal birds found in the fragmented forests, forest edges, and grassy areas adjacent to the entrance to Pipeline Road without redundantly including the species covered in Part I. Part III includes the diurnal birds associated with the wetlands and ponds adjacent to the entrance to Pipeline Road (locally called Ammo Dump Ponds) and other nearby wetlands (e.g., the lake at Panama Rainforest Discovery Center), without redundancy with Parts I or II. For species found in more than one area, I placed them in their most-frequented areas. When species were found in two areas approximately equally, I placed them in the area in which most of the species in their taxonomic Order frequents in order to aid in comparisons; consequently, all doves/pigeons, parrots/parakeets, and toucans/aracaris are in Part I and all kingfishers are in Part III. Locations of songs heard in more than one area are identified in the Appendix. If you are unsuccessful in identifying a song, you might check the Appendix for another area where the song is heard and try keying it out there. Part IV covers the nocturnal birds of all three areas.

A vital part of this key is being able to hear the bird songs. This is made possible through use of a freely available, geographically based database of bird songs worldwide: www.xeno-canto.org. Definitions of terms and final choices in the key are linked to representative recordings and spectrograms from this website (spectrograms are called “sonograms” therein). Use of recordings from xeno-canto is subject to three Creative Commons licenses. Here I used the most-restrictive level (Attribution-NonCommercial-NoDerivs) in which users are free to download and distribute recordings as long as they attribute the recordist, but they are not free to use them commercially or alter them in any way; the two less-restrictive levels allow commercial use and alterations of the recordings.

SONGS AND SPECIES COVERED

This key covers 321 songs and calls of 216 species in the Pipeline Road area. One could survey this area for months without hearing any other bird songs or calls. Many species have two or more vocalizations (see Appendix). Five common, vocal migrants are included (Eastern Wood-Pewee, Great Crested Flycatcher, Northern Waterthrush, Swainson’s Thrush, Yellow-throated Vireo). The key also notes wing snaps of two species of manakins and distinctive drumming patterns of woodpeckers. In addition, the key parenthetically includes the birdlike song of the most-frequently heard frog along Pipeline Road: the Striped Rocket Frog (Allobates talamancae).

When choosing which recordings from www.xeno-canto.org to include in the key, I gave first priority to those taken in the study area. If none were available, I moved progressively farther away until I found sounds that sounded, as far as I could tell, exactly like those in the study area. Thirty-nine percent of the 354 recordings included here were from Pipeline Road or within 8 km of Pipeline Road, 36.3% were from other parts of Panama, 7.3% were from other countries of Central America (6.2% from neighboring Costa Rica), 15.8% were from South America (9.3% from neighboring Colombia), and less than 1% each were from Mexico (0.8%) and the United States (0.6%). Five described songs did not have a representative recording.

Taxonomic changes resulting in new species recognized after the printing of Angehr and Dean (2010 [1]) included are: Crowned Woodnymph (from Violet-crowned Woodnymph), Gartered Trogon (split from Violaceous Trogon), Whooping Motmot (from Blue-crowned Motmot), Black-mandibled Toucan (from Chestnut-mandibled Toucan), Black-crowned Antshrike (from Western-Slaty Antshrike), Russet-winged Schiffornis (from Thrush-like Schiffornis), and Scaly-breasted Wren (from Southern Nightingale-Wren). In addition, Mistletoe Tyrannulet soon may be split from Paltry Tyrannulet (and is so called in www.xeno-canto.org), so that possibility is noted parenthetically.

HOW TO USE

I suggest the following methods to use and learn from this key. First, read and understand the Definitions of Terms, and listen to each of the examples provided. Then, examine the choices presented in the Table of Contents, which shows the order in which choices are made. Finally, go through the key and listen to many or all of the songs and calls. More than one song can be played at the same time, thereby allowing simultaneous comparisons between or among songs. Look carefully at the spectrograms provided with each song to see how, for example, elements downsllur or upslur (see Definitions of Terms). In spectrograms, frequency (in kHz) is presented on the Y axis, time (in sec) on the X axis, and relative volume by the lightness/darkness of the image and by the lower graph; see Stephenson & Whittle (2015 [5]), McCallum (2010a, b [6, 7]), and Pieplow (undated [8]) to fully understand spectrograms.

When one tries to describe a bird song, many adjectives may come to mind in no particular order. However, within this key, one must follow its ordering of choices. Applying this approach as a model for learning the bird songs in different areas or regions could aid in identifying the similarities and differences among songs; however, a different ordering of choices may be more appropriate in other areas. A way to streamline keying-out a song is to make the first few choices via the Table of Contents, jump to the appropriate part of the key, and go from there. You can move within
the key by links to the next choice (→) for all choices listed in the Table of Contents and for all choices when the next choice is not close by. You can keep track of where you are because equal-level choices have the same indentation level and the same font, boldness, italics, and underlining; as follows:

LEVEL 1

LEVEL 2

LEVEL 3

Level 4

Level 5

Level 6

Level 7

Level 8

Level 9

Level 10

Level 11

DEFINITIONS OF TERMS

**DESCRIPTIVE UNITS** →

I searched the scientific literature for terms used for descriptive units of bird songs to see whether any would be suitable for my key. During that search, I found that many researchers [e.g., 9-11] use three levels of units within a song. For them, the lowest level is the *note*, which is represented by a continuous trace on a spectrograph. The next level is the *syllable*, which is a sequence of one or more notes. Groupings of syllables and notes are called *phrases*. However, I found their term “note” to be counter-intuitive because it communicates a note on the musical scale, but their notes often include many notes on the musical scale (e.g., slurs; see below). Also, I found their use of “syllable” to be confusing because it is not like a syllable we use when speaking or writing; it can contain several of which otherwise would be considered as syllables. Fortunately, the structural organization of bird songs presented in Stephenson and Whittle (2015 [5]) avoids these problems and is intuitively easy to use; therefore, I employ it here. Their three terms are *element*, *phrase*, and *section*. “Every separate sound you hear when listening to a song is an element. An element can be a single long note, a short note, or even a long buzz. Elements are the building blocks of songs. If it sounds like one smoothly continuous sound to our ears, it’s an element” (Stephenson and Whittle 2015:70 [5]). A phrase is “a single element or a group of two, three, or more…elements that are repeated 2 or more times without change” (Stephenson and Whittle 2015:71 [5]). Sections are groups of similar phrases. In addition, sections are grouped together into *songs*, which are “identified by the pauses between them, which are of the order of several seconds” (Thompson et al. 1994:273 [10]).

Vocalizations of birds often are placed into arbitrary categories such as *song*, *call*, and *scold*, which can be based on how pleasing they are to the human ear. We usually think of the prettiest vocalizations as songs, less pretty ones as calls, and burry ones as scolds or alarm calls. In addition, we generally think of a bird singing as part of a territorial display by males, calling as part of more mundane activities (e.g., contact calls), scolding when disturbed, and alarm-calling when drawing attention to the presence of a predator such as a raptor or a snake. (See Baker 2001 [11] and Slater 2003 [12] for reviews of studies that examine the development and functions of songs, and Suzuki 2016 [13] for a review of studies concerning functions of alarm calls.) Many authors “point out the arbitrary distinction between calls and songs but acknowledge that the terms are probably not going to go away” Baker (2001:8 [11]). Such labels, while often accurately describing the bird’s actions, can presume we understand the bird’s motives which, in many cases, we cannot. For example, Yellow-billed Orioles vocalize a series of melodious *weo-wee* whistles as well as harsh *chink, chink, chink* sounds. One might call the former a song and the latter a call; however, sometimes these birds mix both types in an uninterrupted series (e.g., *weo-weo-wee, chink-chink-chink, weo-wee-wee, chink-chink*). So in most cases (as in the title), I simply refer to them all as songs; in some cases, I label vocalizations as songs, calls, or scolds to communicate general musicality without ascribing motive or function.

**PITCH** →

**Pitch categories** →

To minimize confusion, I use only three *pitch categories*, and I do so only a few times. Several species here utter notes of (1) *low* or *very low* pitch (e.g., Short-billed Pigeon www.xeno-canto.org/112914 by Sander Bot, Rufous-vented Ground-Cuckoo www.xeno-canto.org/83102 by Brian Cox, Spectacled Owl www.xeno-canto.org/92131 by William Adsett); I do not attempt to distinguish between pitches that are low or very low. Most birds sing notes of (2) *medium or high* pitch; again, I do not differentiate between these two. A few species sing notes of (3) *very high* pitch (e.g., Pied Puffbird www.xeno-canto.org/113047 by Sander Bot, Olive-striped Flycatcher www.xeno-canto.org/2970 by David Bradley); to help you calibrate this pitch, a very small percentage of people can whistle very high. I use relative pitch (e.g., one trill is higher than another) throughout this key rather than absolute pitch (e.g., elements that are middle C vs. middle G on a piano) because it is difficult or impossible for humans, even those with “perfect pitch,” to find absolute pitch of many bird songs; this is because many birds vocalize at pitches well above the range of the human ear.
and “many bird sounds are harmonically complex, comprising not a single tone but an admixture of several” (Pieplow 2007:50 [14]). **Harmonics** are pitches in addition to the fundamental pitch that are multiples of the fundamental; such harmonics create rich-sounding songs to us [5, 6, 14] (e.g., songs in Figs. 1-4), whereas we hear songs with simultaneous, non-harmonic pitches as harsh or discordant [5] (e.g., churrs of Bicolored Antbird www.xeno-canto.org/133165 by Jerome Fischer and Black-bellied Wren www.xeno-canto.org/24181 by Ken Allaire).

**Fig. (1).** Spectrogram of song of Ocellated Antbird (www.xeno-canto.org/71900 by Andrew Spencer) showing rising and falling pitches, harmonics, up/downslurring elements, and accelerating and decelerating tempos.

**Fig. (2).** Spectrogram of song of White-winged Becard (www.xeno-canto.org/107784 by Klemens Steiof) showing harmonics, up/downslurring second element, downslurring third-to-eighth elements, and a pause between the first and second elements. The horizontal line indicates background noise.

**Fig. (3).** Spectrogram of song of White-tailed Trogon (www.xeno-canto.org/113450 Jerome Fischer) showing harmonics, up/downslurring elements, and accelerating tempo.
Fig. (4). Spectrogram of song of Russet-winged Schiffornis (www.xeno-canto.org/60785 by Ken Allaire) showing harmonics, a down/upslurring first element, and upslurring second and third elements. The horizontal lines indicate sounds made by insects.

**Pitch changes with two or more elements**

Many songs include changes in pitch. Pitch rises when at least two successive elements, phrases, or sections ascend in pitch (e.g., Tropical Kingbird www.xeno-canto.org/1123 by Robin Carter), pitch falls when they descend in pitch (e.g., Brown-capped Tyrannulet www.xeno-canto.org/18618 by Ken Allaire) (Fig. 1), and pitch is steady when they do not change. Complex songs of variable pitch (e.g., Gray-headed Chachalaca www.xeno-canto.org/17192 by Allen T. Chartier, Yellow-rumped Cacique www.xeno-canto.org/32050 by Andrew Spencer) are considered to be of steady pitch. To conserve space and not inflate the total number of songs presented, when a species has songs of more than one pitch-change type, the songs key-out in the more or most complex type. For example, songs of Golden-crowned Spadebill and Long-billed Gnatwren can rise then fall, fall then rise, rise, fall, or be steady, so these songs key-out as “Pitch rises and falls.” In such cases, song descriptions list all pertinent pitch-change types. This space-saving feature can be a source of error when trying to identify songs, so if you are unsuccessful at keying-out a song, you might try a more complex pitch change.

**Pitch changes within an element**

Elements upslur when they rise in pitch (e.g., Squirrel Cuckoo www.xeno-canto.org/60783 by Ken Allaire; Paltry (or Mistletoe) Tyrannulet www.xeno-canto.org/46978 by Mike Nelson) and downslur when they fall in pitch (e.g., White-winged Becard www.xeno-canto.org/107784 by Clemens Steiof) [5, 8, 14, 15] (Fig. 2). Some elements “up/down slur” [5] or “overslur” [8] when they upslur and then immediately downslur (e.g., Bright-rumped Attila www.xeno-canto.org/31820 by Andrew Spencer, Red-capped Manakin www.xeno-canto.org/10085 by Ken Allaire, Slate-colored Grosbeak www.xeno-canto.org/271577 by Peter Boesman) (Figs. 1, 3). Similarly, some elements “down/upslur” [5] or “underslur” [8] when they downslur and then immediately upslur (e.g., Eastern Wood-Pewee www.xeno-canto.org/94732 by William Adsett; Russet-winged Schiffornis www.xeno-canto.org/60785 by Ken Allaire) (Fig. 4). I often find it to be difficult or impossible to differentiate between elements that up/downslur vs. those that down/upslur, especially when the elements almost run together. So, to lessen user error, I do not use these complicated terms for choices in the key; I simply place such songs under “Elements upslur and downslur.” I do, however, use those terms in song descriptions. Such elements or phrases also could be classified as warbling, which are “vocalizations that change pitch rapidly in no simple pattern” (Pieplow 2007:51 [14]). Most songs in this key include elements that upslur and downslur. “Birding by ear, visually” [6, 7] first requires dedicating the time to listen to songs while examining their spectrograms. The biggest “ear-opening” experience for me while preparing this key was how many songs upslur and downslur when I thought they were not slurring (e.g., Great Kiskadee www.xeno-canto.org/32045 by Andrew Spencer, Brownish Twistwing www.xeno-canto.org/2960 by David Bradley), were only upslurring (e.g., Black-tailed Trogon www.xeno-canto.org/2947 by David Bradley, Scrub Greenlet www.xeno-canto.org/60714 by Ken Allaire), or were only downslurring (e.g., Collared Forest-Falcon www.xeno-canto.org/15730 by Ken Allaire, Rufous Mourner www.xeno-canto.org/113553 by Jerome Fischer). It takes careful listening and practice to differentiate between, for example, elements that upslur (e.g., Lineated Woodpecker www.xeno-canto.org/54677 by Bernabe Lopez-Lanus) and those that quickly upslur and downslur (Gray-headed Kite www.xeno-canto.org/31899 by Andrew Spencer). To learn how simple non-slurring songs sound, you might listen to each of the songs in the “Elements do not slur” sections in the four parts of the key.

**Quality**

Quality of notes concerns how clear or nasal they are. Clear notes are familiar to us by many musical instruments including the flute and clarinet. Many songs in this key are clear, including those of Fasciated Antshrike (www.xeno-
canto.org/24194 by Ken Allaire) and Russet-winged Schiffrornis (www.xeno-canto.org/60785 by Ken Allaire). A trill is a “rapid repetition of elements at a speed too fast for us to count” (Stephenson & Whittle 2015:64 [5]). In this key, trills are clear notes sung at a tempo of at least 6 per sec, like the song of Long-billed Gnatwren (www.xeno-canto.org/133152 by Jerome Fischer). (Stephenson & Whittle 2015 [5] consider notes as fast as 9 per sec to be countable, but I think that is too fast for most people.) Trills can change in tempo or pitch. Elements within trills can slur, but because it would be very difficult or impossible to discern whether such quickly voiced elements slur, trilling songs key-out first. Here, “Song trills” means the whole song is a trill, whereas “Song includes trills” means the song includes at least one phrase that trill and at least one phrase that does not. Here I call a run a series of the same clear notes or very similar clear notes sung quickly but at countable tempo—at about 4 notes per sec.

Clear notes can quaver or tremble. Quavering songs include only four species here: Little Tinamou (www.xeno-canto.org/47059 by Mike Nelson, www.xeno-canto.org/56908 by Mike Nelson), Great Tinamou (www.xeno-canto.org/131552 by Thore Noernberg), Pheasant Cuckoo (www.xeno-canto.org/83089 by Brian Fox), and Rosy Thrush-Tanager (www.xeno-canto.org/15702 by Don Jones). Some clear songs include clucks, as do those of Song Wren (www.xeno-canto.org/107771 by Klemsen Steiof) and Black-faced Antthrush (www.xeno-canto.org/10535 by Allen T. Chartier). Some clear songs are airy, like those of Great Jacamar (www.xeno-canto.org/110631 by Ken Allaire) and Tropical Gnatchatcher (www.xeno-canto.org/96416 by Yair G. Molina-Martínez). The clear song of Bay Wren repeat-bounces as it quickly repeats the lowest notes or highest notes of phrases (www.xeno-canto.org/92124 by William Adsett). Several finches such as Thick-billed Seed-Finch (www.xeno-canto.org/72316 by Andrew Spencer) have clear songs with short, little twirling notes. Elements are subjectively sweet when they are clear, short, relatively quiet and, often, sound like swe (e.g., Ruddy-tailed Flycatcher www.xeno-canto.org/6516 by Ken Allaire, Lesser Greenlet www.xeno-canto.org/78668 by William Adsett, Cinnamon Becard www.xeno-canto.org/2944 by David Bradley). Whistles typically are clear; the energy in whistles is concentrated on single frequencies, such that their spectrograms are represented by single lines [14]. Some songs gurgle or bubble, as if emanating from underwater; gurgles are lower-pitched (e.g., Yellow-rumped Cacique (www.xeno-canto.org/10491 by Allen Chartier; Chestnut-headed Oropendula (www.xeno-canto.org/18434 by Hernan van Oosten) than are bubbles (e.g., Blue-crowned Manakin www.xeno-canto.org/112920 by Sander Bot).

Nasal sounds by humans are lowered by the soft palate so that air resonates in the nasal cavities and passes out the nose, like when we say the letter “n”. Birds create vocalizations that sound similarly nasal to us. However, nasal sounds by birds are “combinations of multiple simultaneous whistles on different pitches” (Pieplow undated [8]) (Figs. 1, 3) which our brains often interpret as whistles, especially if they are high-pitched [14]. Consequently, in this key, some clear and some nasal elements are referred to as whistles. Many songs in this key are obviously nasal, three of which are Black-throated Trogon (www.xeno-canto.org/1085 by Robin Carter), Plain-brown Woodcreeper (www.xeno-canto.org/1113 by Robin Carter), and Spotted Ambird (www.xeno-canto.org/108217 by Jerome Fischer). Here I refer to clear songs and nasal songs only when they obviously fit into one category or the other because there is a large “gray area” between these two categories. Songs churr when a bird sings a series of harsh, non-musical, usually nasal notes at a tempo of at least 6 per sec which, as described above, is about the fastest most people can count. Churrs often are described as being buzzy, burry, grating, croaking, or growling, and can sound like rent, dzerrr, or aarrr, but also can be less grating (e.g., wups of Slaty-tailed Trogon www.xeno-canto.org/31915 by Andrew Spencer) if they are sung at a tempo of at least 6 per sec. Churrs can change in tempo or pitch. Examples include scolds of Black-crowned Antshrike (www.xeno-canto.org/107779 by Klemsen Steiof) and Plain Wren (www.xeno-canto.org/32047 by Andrew Spencer). In the key, “Song churrs” means the whole song is a churr, whereas “Song includes churrs” means the song includes at least one phrase that churr and at least one phrase that does not. Here I call a run a series of the same nasal notes or very similar nasal notes sung quickly but at countable tempo—at about 4 notes per sec. Some nasal songs are airy, like those of Cinnamon Woodpecker (www.xeno-canto.org/116313 by Diego Calderon F.), Broad-billed Motmot (www.xeno-canto.org/1088 by Robin Carter), and Boat-billed Flycatcher (www.xeno-canto.org/46785 by Mike Nelson). A few nasal songs possess clucks, including those of Gray-necked Wood-Rail (www.xeno-canto.org/106510 by Mike Nelson), Greater Ani (www.xeno-canto.org/9314 by Allen T. Chartier), and Gray-headed Chachalaca (www.xeno-canto.org/17192 by Allen T. Chartier). “Song includes clucks” means the song includes phrases that are clucks and other phrases that are not. Some nasal songs sound spoken, as if a person were talking; an example is a call of Black-crowned Antshrike (www.xeno-canto.org/90394 by Leslie Lieurance). Finally, a few species have songs that screech: Yellow-headed Caracara (www.xeno-canto.org/199019 by Guillermo Funes), Semiplumbeous Hawk (www.xeno-canto.org/274200 by Peter Boesman), Orange-chinned Parakeet (www.xeno-canto.org/1104 by Robin Carter), and all three parrots (e.g., Red-lored Amazon www.xeno-canto.org/127524 by Thore Noernberg).

TEMPO →

Many songs of at least three elements or phrases have notes that change in tempo, or in number of beats per unit of time; tempo is also called “rhythm” [5] or “rate” [14]. Tempo accelerates when elements increase in tempo (Figs. 1, 3), decelerates when elements decrease in tempo (Fig. 1) (e.g., White-bellied Antbird www.xeno-canto.org/182262 by Jerome Fischer), is erratic when elements are sung in an irregular tempo (e.g. Fasciated Antshrike www.xeno-canto.org/133153 Jerome Fischer), and is steady when tempo does not change. Several songs have an introductory
element, a pause, then a series of elements of steady tempo (e.g., Black-faced Ant thrush [www.xeno-canto.org/2959 by David Bradley], Yellow-margined Flycatcher [www.xeno-canto.org/18232 by Herman van Oosten]) (Fig. 2); here such songs are considered to have steady tempo.

**VARIATION**

I developed a system of four song-variation categories so you will know how much variation to expect when learning the songs. **Invariable** songs are sung every time without any change in arrangement. They may have changes in pitch or tempo, but all of the elements, phrases, and/or sections are sung, and all are sung in the same order (e.g., Blue-crowned Manakin [www.xeno-canto.org/112920 by Sander Bot], Crimson-crested-crowned Woodpecker [www.xeno-canto.org/31897 by Andrew Spencer]). More than three-quarters of the songs in the key are invariable. **Variable** songs are those that sometimes delete or rearrange sections of the typical song, but do not rearrange elements or phrases within the sections that are sung (e.g., Cinnamon Becard [www.xeno-canto.org/2944 by David Bradley]). Almost one-fifth of the songs in the key are variable. **Variable/repertoire** songs are sung so quickly, and have so many complexities, that it is difficult or impossible for most people to determine whether they merely delete or rearrange sections or whether they rearrange elements or phrases within sections (e.g., Variable Seed eater [www.xeno-canto.org/271589 by Peter Boesman]). Here Yellow-bellied Seed eater, Ruddy-breasted Seed eater, Variable Seed eater, Thick-billed Seed-Finch, and Lesser Gold finch have variable/repertoire songs. Finally, **repertoire** songs are non-rapid songs that obviously rearrange elements or phrases within sections; these are sung slowly enough that it is easy to discern and describe the rearrangements. Here Clay-colored Thrush, Rosy Thrush-Tanager, Tropical Mockingbird, Yellow-tailed Oriole, and most of the wrens sing repertoires. I include song variation in song descriptions, but do not use song variation in choices in the key because some birds sing only one arrangement at a time and I made this key to identify each song as it is heard.

**EMPHASIS**

Some elements are sung more strongly or with more emphasis than others. Such elements are termed **emphatic** [1] (e.g., Rufous Nightjar [www.xeno-canto.org/2954 by David Bradley], Bright-rumped Atilla [www.xeno-canto.org/31820 by Andrew Spencer], Rufous Piha [www.xeno-canto.org/60760 by Ken Allaire]).

**PART I: KEY TO SONGS OF DIURNAL BIRDS IN THE FORESTS ALONG PIPELINE ROAD**

**SONG IS A TRILL OR CHURR**

**TEMPO ACCELERATES AND DECELERATES**

Plain-brown Woodcreeper. A rapid, long series of nasal, “loud churring” [1:196] that accelerates then decelerates. Can repeat the series uninterrupted once or many times; song can include hundreds of elements and last more than 1 min. Invariable. [www.xeno-canto.org/1113 by Robin Carter]

**TEMPO ACCELERATES**

Plain Xenops. A “rapid series of 8 to 12 high chik notes, accelerating slightly” [1:192] and stopping abruptly. Invariable. [www.xeno-canto.org/46983 by Mike Nelson]

**TEMPO DECELERATES**

Notes are bubbly

Blue-crowned Manakin. A series of about 6–12 bubbly notes in about 1 sec, last few notes decelerate. Invariable. [www.xeno-canto.org/112920 by Sander Bot]

Notes are sharp

**Song lasts less than 15 sec**

Squirrel Cuckoo. A series of nasal, chattering elements lasting about 6–12 sec; decelerates from about 10 to about 3 elements per sec. Invariable. Sharper than song of Plain-brown Woodcreeper. [www.xeno-canto.org/37847 by Oswaldo Cortes]

Plain-brown Woodcreeper. A shortened, decelerating version of this species’ song that accelerates and decelerates; includes about 20–30 elements. Invariable. [www.xeno-canto.org/271222 by Peter Boesman]

Olivaceous Woodcreeper. “Song a high, fast musical trill” [1:194]; the last few notes decelerate. Invariable. Higher than songs of Squirrel Cuckoo and Plain-brown Woodcreeper. [www.xeno-canto.org/271585 by Peter Boesman]

**Song lasts at least 30 sec**

Ruddy Woodcreeper. A fast churring of sharp, nasal notes lasting 30 sec or more, abruptly decelerating at the end. Invariable. [www.xeno-canto.org/137727 by Paul Driver]
**TEMPO IS STEADY**

Pitch rises and falls →

Pitch is very high →

*White-whiskered Puffbird.* A trilling, very “high, thin, hissing” song [1:170]: *ee-euuuu!* or *ee-euu-eeeu!* Can be sung individually or in a series of several phrases at about 1 per sec. Pitch can fall, fall and rise, be steady, *etc.* Variable. www.xeno-canto.org/2818 by David Bradley, www.xeno-canto.org/107783 by Klemens Steiof

*Golden-crowned Spadebill.* A quiet, very high, clear, insect-like trill lasting about 2 sec. Pitch can rise then fall, fall then rise, rise, fall, or be steady. Sweeter and clearer than song of White-whiskered Puffbird. Invariable. www.xeno-canto.org/93679 by Tom Stevens, www.xeno-canto.org/16166 by Ken Allaire

**Pitch is medium or high**

Song trills

*Long-billed Gnatwren.* A clear, sweet trill lasting about 2 sec. Pitch can rise then fall, fall then rise, rise, fall, or be steady. Invariable. www.xeno-canto.org/133152 by Jerome Fischer

Song churrs

Elements alternate between two pitches

*Bay Wren.* A rapid churring of about 5–8 sharp notes mixed with higher, single sharp notes; each churr is sung within about one-half sec. Variable. www.xeno-canto.org/31892 by Andrew Spencer

Elements do not alternate between two pitches


*Black-throated Trogon.* A churr of nasal, falling, almost bubbly notes lasting about 1 sec, often sung in a series with pauses of about 1 sec between churrs. Can start with a burst of sharp, nasal, rising notes *Brrrr-deet-deet-deet!*, especially when the birds flush from a perch. Falling or rising songs can be sung together or separately. Variable. www.xeno-canto.org/6005 by Ricardo Gagliardi

Pitch rises →

*Blue-headed Parrot.* A fast, two-phrased churr of strong, rising elements; a “shrink... *zher-renk*” [1:116]. Invariable. Higher and more shrill than songs of Keel-billed Toucan and Blue-crowned Manakin. (Highest-pitched song of the parrots, and the only one with only a rising pitch. Similar in pitch to song of Orange-chinned Parakeet.) xeno-canto.org/57152 by Bernabe Lopez-Lanus

*Keel-billed Toucan.* A loud, rising, “frog-like, croaking” “Kreek!” “often repeated for long intervals” [1:176] of 1–2 mins. Each “croak” is composed of about 6 rough elements; about 1–2 croaks per sec. Invariable. www.xeno-canto.org/15689 by Don Jones

*Blue-crowned Manakin.* A “doubled, croaking, frog-like *ku-wheek!*” [1:270] or *ku-WEEK?!,* with the accent on the second, higher phrase, which is composed of about 6 elements; about one “croak” every 2 sec. Usually preceded by a few bubbly elements. Invariable. Each croak is composed of two phrases, unlike song of Keel-billed Toucan. www.xeno-canto.org/18617 by Ken Allaire

**Pitch falls** →

Song is composed of one trill or churr →

*Southern Benthill.* A nasal, falling, “rolling, burry... *bwrrrrrrrr*” [1:256] (1) and a clear, falling, rolling, trilly *eeerr* (2) (Table 1). Invariable (both). (1) www.xeno-canto.org/1031 by Robin Carter, (2) www.xeno-canto.org/24329 by Thomas Donegan

*Bicoloried Antbird.* A falling, “harsh, grating gwarr!” and a thin, falling *zhrooo”* [1:214] (Table 1). Invariable. www.xeno-canto.org/133165 by Jerome Fischer

*Ocellated Antbird.* A falling, “sharp *dzerrr*” [1:214] (Table 1). Invariable. www.xeno-canto.org/31922 by Andrew Spencer

*Black-bellied Wren.* A falling, harsh *aaarrrr!* (Table 1). Invariable. www.xeno-canto.org/24181 by Ken Allaire
Table 1. Comparison of the songs in Part I that are a trill or churr, tempo is steady, and: (1) pitch falls, song is composed of one trill or churr; (2) pitch is steady, song trills, song is composed of one trill, each trill lasts 1 sec or less; or (3) pitch is steady, song churrs, song is composed of one churr.

<table>
<thead>
<tr>
<th>Species</th>
<th>Pitch rises and falls (RF), falls (F), or is steady (S)</th>
<th>Trill (T) or churr (C)</th>
<th>Relative pitch (1–5; 1 = lowest)</th>
<th>Relative sharpness (1–5; 1 = least)</th>
<th>Relative “spoken-ness” (1–5; 1 = least)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spotted Antbird</td>
<td>S</td>
<td>T</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Dusky Antbird</td>
<td>RF</td>
<td>C</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Chestnut-backed Antbird</td>
<td>RF</td>
<td>C</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Bicolorored Antbird</td>
<td>F</td>
<td>C</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Ocellated Antbird</td>
<td>F</td>
<td>T</td>
<td>5</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Southern Bentbill (burry)</td>
<td>F</td>
<td>C</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Southern Bentbill (trilly)</td>
<td>F</td>
<td>T</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Black-capped Pygmy-Tyrant</td>
<td>S</td>
<td>T</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Olivaceous Flatbill</td>
<td>S</td>
<td>T</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Red-capped Manakin</td>
<td>S</td>
<td>C</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Black-bellied Wren</td>
<td>F</td>
<td>C</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>White-breasted Wood-Wren (more spoken)</td>
<td>S</td>
<td>C</td>
<td>5</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>White-breasted Wood-Wren (less spoken)</td>
<td>S</td>
<td>C</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

Song is composed of three or more churrs

**Cinnamon Woodpecker.** An airy, nasal, sharp, fast series of about 7–10 elements, falling slightly in the last few elements: *kik ik ik ik ik keu*. Invariable. Sharper than songs of Golden-collared Manakin. [www.xeno-canto.org/116313](http://www.xeno-canto.org/116313) by Diego Calderon F.

**Golden-collared Manakin.** A churring, falling, “shriII whee-you!” [1:268], strung together into a song with other similar, churring phrases such as *keruu kyoonk-kyonk* (1). Variable. “Displaying males make rapid, loud snapping noises with their wings, like a string of firecrackers going off” [1:268] (2). The wing snaps differ from those of Red-capped Manakins in that they are about twice as loud, and they are done in single burst only, not as a series of bursts. (1) [www.xeno-canto.org/31898](http://www.xeno-canto.org/31898) by Andrew Spencer (not the loud White-breasted Wood-Wren song in sec 23–27), (2) [www.xeno-canto.org/10078](http://www.xeno-canto.org/10078) by Ken Allaire

**Pitch is steady**

**Song trills** →

**Each trill lasts 1 sec or less** →

- **Spotted Antbird.** A rapid, sharp trill, often sung when at army-ant swarms (Table 1). Invariable. [www.xeno-canto.org/113042](http://www.xeno-canto.org/113042) by Sander Bot

- **Black-capped Pygmy-Tyrant.** A trilling, “sharp, high-pitched cheet! [or cheleet!] given singly or repeated at intervals of 1 or 2 sec (easily mistaken for call of an insect)” [1:230]. Invariable. Faster and shorter than calls of Spotted Antbird and Olivaceous Flatbill (Table 1). [www.xeno-canto.org/107745](http://www.xeno-canto.org/107745) by Klemens Steiof, [www.xeno-canto.org/17186](http://www.xeno-canto.org/17186) by Allen Chartier

- **Olivaceous Flatbill.** A trilling “short, harsh…khrrrt!” [1:234] (Table 1). Invariable. [www.xeno-canto.org/17201](http://www.xeno-canto.org/17201) by Allen Chartier

**Each trill lasts 2–3 sec** →

- **Whooping Motmot.** A series of about 8–16 whoops within about 2 sec, sometimes starting with a sharper *whop!* Invariable. Song whoops, unlike that of Streak-chested Antpitta. [www.xeno-canto.org/10069](http://www.xeno-canto.org/10069) by Ken Allaire

- **Streak-chested Antpitta.** A series of about 8–20 sweet, downsllurring notes sung at about 6–8 per sec, accented on the top of each downsllur. Sometimes the song decelerates a little. Invariable. [www.xeno-canto.org/3309](http://www.xeno-canto.org/3309) by David Bradley
Each trill lasts at least 4 sec


Song is composed of two or three trills

Fulvous-vented Euphonia. “Call a short rolling churrit that is often doubled or tripled” [1:386]. Invariable. www.xeno-canto.org/18649 by Ken Allaire

Song churrs

Song is composed of one churr

Dusky Antbird. A harsh aarr (Table 1). Invariable. www.xeno-canto.org/2805 by David Bradley

Chestnut-backed Antbird. A cat-like aaahr (Table 1). Invariable. www.xeno-canto.org/329125 by Kent Livezey

Red-capped Manakin. A rough churr that can be sung alone or as the last section of its upslurring and downsllurring song; the churr can be heard at much farther distances than the rest of its song. Sometimes the churr is doubled, with the first one higher in pitch than the second. Some churrs are harsher, louder, and longer than others (Table 1). Variable. www.xeno-canto.org/271229 by Peter Boesman at sec 27, 30

White-breasted Wood-Wren. Two harsh calls, one of which is more spoken (1) than the other (2) (Table 1). Invariable (both). (1) www.xeno-canto.org/107782 by Klemens Steiof, (2) www.xeno-canto.org/94744 by William Adsett

Song is composed of two churrs


White-breasted Wood-Wren. A rough, burry bur DEEP accented on the second, burry phrase (1). Also a KE haw with the first phrase clear and the second one hoarse and rough, accented on the first phrase (2). Invariable (both). (1) Not in xeno-canto. (2) Not in xeno-canto.

Song is composed of three or more churrs

Slaty-tailed Trogan. A rapid series of nasal waps, about 7–8 per sec (Table 2). Invariable. Fewer elements per sec than all other songs in Table 2. www.xeno-canto.org/31915 by Andrew Spencer

Broad-billed Motmot. Call is a series of 5 or more low, grating churrs, about 1 churr per sec (Table 2). Invariable. www.xeno-canto.org/76409 by Roger Ahlman

Black-cheeked Woodpecker. Two loud, churring, rattling songs, each of about 4–8 elements. One song is lower and rougher (1) than the other (2) (Table 2). Invariable (both). (1) www.xeno-canto.org/78587 by William Adsett, (2) www.xeno-canto.org/106090 by Mike Nelson

Bright-rumped Attila. About 5–7 very rapid, rattling, nasal elements (Table 2). Invariable. www.xeno-canto.org/32043 by Andrew Spencer

Masked Tityra. A series of “dry, raspy, croaking kwirrk [calls] (often doubled or repeated in a longer series)” [1:262]. Males with lower-pitched croaks than females (Table 2). Invariable. www.xeno-canto.org/274185 by Peter Boesman

Black-crowned Tityra. Song is “similar to that of Masked Tityra, but thinner and not as rasping” [1:262]: kih-rr-rr-rit (Table 2). Invariable. www.xeno-canto.org/71403 by Andrew Spencer

White-breasted Wood-Wren. A very rapid series of about 8–12 sharp notes sung within one-half sec (Table 2). Invariable. www.xeno-canto.org/111802 by Thore Noernberg

Red-throated Ant-Tanager. A series of “raspy notes that sound like tearing paper” [1:366] (Table 2). Invariable. www.xeno-canto.org/32041 by Andrew Spencer

Red-crowned Ant-Tanager. A series of raspy calls “much less harsh and grating than those of Red-throated [Ant-Tanager]” [1:366] (Table 2). Invariable. www.xeno-canto.org/126065 by Mike Nelson

Yellow-backed Oriole. Mechanical, grating oink! oink! oink! oink! Higher than call of Yellow-rumped Cacique. (Table 2). Invariable. (About the same pitch as the kink! of Yellow-tailed Oriole in Part III.) www.xeno-canto.org/113043 by Sander Bot

Yellow-rumped Cacique. A grating rent! rent! rent! Lower than call of Yellow-backed Oriole (Table 2). Invariable. (About the same pitch as the onk of Yellow-tailed Oriole in Part III.) www.xeno-canto.org/78378 by William Adsett
Table 2. Comparison of the songs in Part I that are trills or churrs, tempo is steady, pitch is steady, song churrs, and song is composed of three or more churrs.

<table>
<thead>
<tr>
<th>Species</th>
<th>Relative pitch (1–5; 1 = lowest)</th>
<th>Relative sharpness (1–5; 1 = least)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slaty-tailed Trogon</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Broad-billed Motmot</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Black-cheeked Woodpecker (low)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Black-cheeked Woodpecker (high)</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Bright-rumped Atila</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Masked Tityra</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Black-crowned Tityra</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>White-breasted Wood-Wren</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Red-throated Ant-Tanager</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Red-crowned Ant-Tanager</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Yellow-backed Oriole</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Yellow-rumped Cacique</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

**SONG INCLUDES TRILLS OR CHURRS →**

**SONG INCLUDES TRILLS →**

*Song is composed of two or three sections →*

**Brown-capped Tyrannulet.** A series of about 10–14 clear, high-pitched whistles; the first one or two upslurred notes are followed by a distinct pause, a falling trill, then an upslurred *weet!* Variations include skipping the first note, the pause, or the last note, and singing only the first note. Variable. Elements fall much more than those in song of Cinnamon Becard. Song terminates in an upslurring element, unlike song of Cinnamon Becard. www.xeno-canto.org/92095 by Mike Nelson, www.xeno-canto.org/18618 by Ken Allaire

**Cinnamon Becard.** A series of about 10–16 clear, sweet whistles, typically in two sections, one of which is a high trill, and the other is a series of lower, downsllurring elements: *deedeedeedeedeedeede* *dew dew dew dew dew dew.* Variations include singing fewer elements per section (*e.g.*, *deedeedeedeedeede*) and singing the sections in reverse order (*e.g.*, *dew dew, deedeedeedeedeedeede*). Variable. www.xeno-canto.org/2944 by David Bradley

*Song is composed of one section*

**Spot-crowned Antvireo.** About 20–25 whistles that rise slightly, then accelerate into a trill while falling. Invariable. www.xeno-canto.org/98347 by Jerome Fischer

**Moustached Antwren.** A series of about 12–20 “high-pitched chirps, accelerating at the end” [1:206] into a trill while falling. Invariable. Elements downslur, unlike the nonslurring elements in song of Spot-crowned Antvireo. www.xeno-canto.org/2714398 by Peter Boesman

**SONG INCLUDES CHURRS**

**Tempo accelerates →**


**Black-crowned Antshrike.** A nasal, “rapid, accelerating series of [about 12–16] nasal *henh* notes, ending on a longer harsh *hu-henk!*” [1:204] or ending on a one-noted *henk!* Invariable. (Compared to similar, accelerating song of Barred Antshrike in Part II: less nasal, slightly higher in pitch, slightly more rushed, elements do not fall before last one, and last element is squeaky.) www.xeno-canto.org/49856 by J. Patrick Kelley

**Tempo is steady**

*Song includes gurgling →*

**Yellow-rumped Cacique.** A “variety of liquid whistling and bubbling calls, as well as grating churrs, squeaks, and sharp notes” [1:380]. Variable. Smoother and less crackly than songs of Chestnut-headed Oropendula. www.xeno-canto.org/32050 by Andrew Spencer

**Chestnut-headed Oropendula.** A “variety of calls including a gurgling rattle followed by a churr, and explosive resonant *whhhuurk!* and other chortling and bubbling notes” [1:382]. Variable. www.xeno-
Song does not include gurgling

All sections of the song are similar

Violet-bellied Hummingbird. Each of the 3–10 sections of this song starts with an up/downslurring element (zee) immediately followed by a falling churr (uuurr), at about 1 per sec: zeeuuurr zeeuuurr zeeuuurr. Invariable. www.xeno-canto.org/271220 by Peter Boesman

All sections of the song are not similar

Black-crowned Antshrike. A nasal, “abrupt ak! followed by a rolling kur-r-r-r-r” [1:204]. Variable. (Somewhat like the reverse of the other accelerating song of this species, but the elements in the churr in this song are sung much faster.) www.xeno-canto.org/107779 by Klemens Steiof

SONG IS NOT A TRILL OR CHURR AND DOES NOT INCLUDE TRILLS OR CHURRS

Elements ups slur and downs lur →

Tempo accelerates and decelerates →

Sections are without pauses between them →

Song is spoken

Collared Forest-Falcon. A series of about 12 nasal, spoken, up/downslurring aoww calls that accelerate from about 1 to 2 per sec, then, for the last few notes, decelerate and fall. Invariable. www.xeno-canto.org/15730 by Ken Allaire

Song is not spoken

White-tailed Trogon. A series of about 20–30 nasal “resonant aowp” [1:160] elements that accelerate from about 3 to 6 per sec, then, for the last few elements, decelerate and fall. Each aowp ups slur and downs lur. Invariable. www.xeno-canto.org/113450 by Jerome Fischer

Cocoa Woodcreeper. About 6–16 sharp, nasal whistles that rise while accelerating then fall while decelerating. Birds usually sing individual songs (1) but also string many songs together (2). Invariable (both). Elements down/upslur, rather than up/downslur, unlike those of the other songs in this section. (1) www.xeno-canto.org/182101 by Jerome Fischer (2) www.xeno-canto.org/46446 by Karl Kaufmann

Bicolored Antbird. A series of about 8–12 harsh, airy whistles, “the first three of four rising sharply in pitch and intensity, then rapidly decelerating and falling off” while becoming more nasal [1:214]. Many whistles are unslurred only, but some are up/downslurred. Airier than the other sections in this song. Invariable. www.xeno-canto.org/31819 by Andrew Spencer

Ocellated Antbird. Series of about 6–16 sharp, up/downslurring, “piping notes, rising sharply in pitch and intensity” [1:214] while accelerating, then dropping in pitch while decelerating, sometimes ending in several clear notes of the same pitch. Invariable. Less airy and more musical than song of Bicolored Antbird; sharper than songs of White-tailed Trogon and Bright-rumped Attila. www.xeno-canto.org/71900 by Andrew Spencer

Bright-rumped Attila. A fast series of about a dozen nasal, “emphatic two-note whistles” [1:246]: wedo-wedo-wedo-wedo-wedo-wedo-wedo-wedo-wedo. The whe ups slur and the do downs lur. Phrases accelerate while the pitch rises, then decelerate as the pitch falls. Invariable. Phrases are more two-noted than those in song of White-tailed Trogon. www.xeno-canto.org/31820 by Andrew Spencer

Sections are with 1–3 sec pauses between them

Piratic Flycatcher. “A sibilant whistled fee-eee usually followed after a pause by a staccato dididididi” [1:254]; the pause lasts 1–3 sec. The fee ups slur and the eee downs lur. Birds vary this by singing either part without the other. Variable. www.xeno-canto.org/1107 by Robin Carter

Tempo accelerates →

Pitch rises and falls →


Pitch rises →

Pheasant Cuckoo. Five or six sharp, clear whistles with the first note lower than the rest. The first two whistles are sung at about 1 per sec; the remaining whistles at about 3 or 4 per sec in a hurried, accelerating manner, huhu huhu hee-ee-it-it! Invariable. (The pitches of the first and second whistles
sound the same as the first and second whistles of this species’ three-whistled, quavering song.)

www.xeno-canto.org/60746 by Ken Allaire

**Pitch falls** →

**Gray Elaenia.** A series of high, thin notes. The first section is composed of downsllurring elements at about 2 per sec; this abruptly accelerates in the second section into about 12 upsllurring elements sung at about 5 per second, while falling. Invariable. www.xeno-canto.org/22502 by Scott Olmstead

**Pitch is steady**

**Little Tinamou.** A “series of high quavering whistles, similar to that of Great Tinamou but thinner and higher pitched” [1:2] that increases in tempo and then ends abruptly. Invariable. www.xeno-canto.org/18652 by Ken Allaire

**Tempo decelerates** →

**Pied Puffbird.** A “series of high, thin, reedy two-syllable whistles, often slowing down at the end” [1:170]. The decelerating, two-noted whistles are somewhat reminiscent of the sound of a cantering horse as it slows down. Invariable. Much airier and thinner than song of White-winged Becard. www.xeno-canto.org/113047 by Sander Bot

**White-winged Becard.** A series of “musical notes, the first note followed by a pause, the subsequent series beginning rapidly and then decelerating: chew, chichichichichuchuchewchew” [1:269]. Sometimes, however, there is no pause after the first chew. The first chi can up/downslur. Variable. www.xeno-canto.org/107784 by Klemens Steiof

**Tempo is erratic** →

**Fasciated Antshrike.** A series of about 5–40 erratic, sharp, single notes and runs mixed with 1–3 clear, upsllurring or downsllurring whistles; about 2–5 elements per sec. Variable. Notes are much more staccato than other songs in this section. www.xeno-canto.org/133153 Jerome Fischer

**Dusky-capped Flycatcher.** A nasal, erratic chattering, including some elements that upslur and downslur. Variable. More nasal and less sharp than song of Ochre-bellied Flycatcher. www.xeno-canto.org/11573 by Todd Mark

**Ochre-bellied Flycatcher.** A many-phrased song consisting of “interminable series of sharp tsik! notes in an irregular tempo (occasionally interspersed with two-syllable chwik notes)” [1:226]; about 1–2 notes per sec. Many elements up/downslur. Song lasts about 20 sec to 1 min. Variable. www.xeno-canto.org/113453 by Jerome Fischer

**Tempo is steady**

**Pitch rises and falls** →

**Dusky Antbird.** The male’s song is “series of about 10 piping notes [elements], the first several notes ascending in pitch and the final notes descending” [1:210]. Each upsllurring element of the male’s song is two-parted. The female’s song is one-parted; rises then falls, or simply rises; and is clearer than the male’s song. His song sounds somewhat like ku-WERR, whereas hers sounds more like WERR. Songs of the lower-pitched male and the higher-pitched female of pairs often overlap as they sing together; either sex can initiate the duet. Invariable. www.xeno-canto.org/6957 by Ken Allaire, www.xeno-canto.org/164776 by James Bradley: female at 12-14, 33-34 sec

**Pitch rises** →

**Black Hawk-Eagle.** “During middle of day, often soars high and calls frequently, giving a loud whistled what-what-what-WHEER!” [1:54], what-WHEER! or simply WHEER!, downsllurring on the WHEER! Variable. More emphatic than song of Rufous Mourner. www.xeno-canto.org/51334 by Bernabe Lopez-Lanus

**Rufous Mourner.** If Chestnut-backed Antbird whistles a clear “Come HERE!” [1:212], then Rufous Mourner whistles a clear, rising Coooooome HEEEERE! with both elements upsllurring and downsllurring. Invariable. (Song of Chestnut-backed Antbird, however, is steady-pitched, and just downsllurs on the second element.) www.xeno-canto.org/113553 by Jerome Fischer

**Pitch falls** →

**Black-throated Trogon.** A “descending series of two to five [or six] caow notes, with noticeable spacing between each note” [1:160] (Table 3). Invariable. www.xeno-canto.org/199029 by Guillermo Funes

**Cocoa Woodcreeper.** A nasal, falling keuw, keuw, kuew, keuw (Table 3). Invariable. www.xeno-canto.org/91403 by Mike Nelson

**Black-striped Woodcreeper.** A series of “three or four loud, sharp, evenly spaced, falling whistles: WHEU, hew, hew, hu” [1:198] (Table 3). Invariable. www.xeno-canto.org/106123 by Mike Nelson

**Spotted Antbird.** A series of about 8–10 emphatic, wheezy elements, each of which with the first part
higher and longer than the second: WHEEEEza WHEEza WHEEza WHEEza WHEEZa...; the WHEEs upslur and zas downsllur. The first half-dozen elements remain at a steady pitch, then the last several fall in pitch (Table 3). Invariable. www.xeno-canto.org/108217 by Jerome Fischer

**White-flanked Antwren.** A high, squeaky eeee, eeee with the first note slightly higher than the second. Each eeee downsllurs or up/downslurs (Table 3). Invariable. Much squakier than the other songs in this section. www.xeno-canto.org/131555 by Thore Noernberg

**White-flanked Antwren.** A series of about 6–16 slightly nasal wheep whistles that fall in pitch; about 3 elements per sec. Each wheep up/downslurs. Songs can be repeated without pause (Table 3). Invariable. www.xeno-canto.org/112874 by Sander Bot

**Brownish Twistwing.** A series of about 6–8 elements that up/downslur, falling in pitch (Table 3). Invariable. www.xeno-canto.org/328067 by Kent Livezey

**Bright-rumped Attila.** A series of about 5–8 nasal, “emphatic two-note whistles which rise and become louder, then conclude with a single descending note: whee-dup, whee-dup, Whee-dup, WHEE-DUP, WHEE-DUP, WHEE-DUP, WHEE-DUP, WHEE-DUP, WHEE-DUP, WHEE-DUP, WHEE-DUP, WHEE-DUP” [1:246]. The whe upsllurs and the dup and eerrr downsllurs; the whe parts are accented (Table 3). Invariable. The upsllurs and downsllurs are more extreme (more frequency change) than are those in the other songs in this section. www.xeno-canto.org/7354 by Ken Allaire

**Golden-collared Manakin.** A nasal KEE-how! with the KEE higher in pitch than the how! Invariable. Much less spacing between elements than the only other song in this section that can have only two elements (Black-throated Trogon). www.xeno-canto.org/31898 by Andrew Spencer: sec 9, 13, 15, 15, 18, etc.

Table 3. Comparison of the songs in Part I that are not a trill or churr, elements upsllurs and downsllurs, tempo is steady, and pitch falls.

<table>
<thead>
<tr>
<th>Species</th>
<th>Relative emphasis (how emphatic) (1–5; 1 = lowest)</th>
<th>Relative airiness (1–4; 1 = least)</th>
<th>Easilyaudible&gt;200 m away?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black-throated Trogon</td>
<td>1</td>
<td>3</td>
<td>No</td>
</tr>
<tr>
<td>Cocoa Woodcreeper</td>
<td>3</td>
<td>2</td>
<td>Yes</td>
</tr>
<tr>
<td>Black-striped Woodcreeper</td>
<td>5</td>
<td>1</td>
<td>Yes</td>
</tr>
<tr>
<td>Spotted Antbird</td>
<td>3</td>
<td>4</td>
<td>No</td>
</tr>
<tr>
<td>White-flanked Antwren (two notes)</td>
<td>1</td>
<td>3</td>
<td>No</td>
</tr>
<tr>
<td>White-flanked Antwren (series)</td>
<td>4</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td>Brownish Twistwing</td>
<td>2</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td>Bright-rumped Attila</td>
<td>5</td>
<td>1</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Pitch alternates higher and lower →**

**Olive-striped Flycatcher.** A series of about 20–35 very high, thin, barely audible pairs of “tsi notes” that alternatively “rise and fall” [1:226]: tsii-tsi-tsi-tsi-tsi-tsi... Invariable. www.xeno-canto.org/2970 by David Bradley

**Pitch is steady**

**Song quavers or includes quavers; is spoken; includes clucks and/or metallic clanks; includes screeches; or is very squeaky →**

**Song quavers or includes quavers →**

**Great Tinamou.** A “series of quavering whistles, deeper and more resonant than that of Little Tinamou” [1:2]. Invariable. www.xeno-canto.org/131552 by Thore Noernberg

**Little Tinamou.** A ghostly eeee-uuuuur, downsllurring between the first and second elements; the second element quavers. Can be sung singly or once every few sec as a series. Variable. www.xeno-canto.org/47059 by Mike Nelson

**Pheasant Cuckoo.** Three sharp, clear whistles with the second one higher in pitch than the first and third, huu hee huuuu; the third element quavers. Invariable. (The first and second whistles are the same pitches as those of this species’ five-whistled, non-quavering song.) www.xeno-canto.org/83089 by Brian Fox

**Song is spoken →**

**Squirrel Cuckoo.** A nasal, sharp KIK! aaaww “with the cadence of a wolf-whistle” [1:121], up/downslurring on the spoken aaaww. Invariable. www.xeno-canto.org/129893 by Oscar
Humberto Marin-Gomez

**Slaty-backed Forest-Falcon.** A series of about a dozen, loud, long, nasal *aaamnhs*; about 1.5 per sec. Invariable. www.xeno-canto.org/92172 by Dusan Brinkhuizen

**Song includes clucks and/or metallic clanks →**

**Gray-headed Chachalaca.** A variety of sharp, clucking and clanking notes, including “a high-pitched *wheee!* repeated frequently, especially when alarmed” [1:10]. Variable. www.xeno-canto.org/17192 by Allen T. Chartier

**Clay-colored Thrush.** A “melodious series of varied notes, including slurred whistles…and clucks” [1:304] as well as runs. Song includes clear and nasal phrases and sections. Songs can last more than 1 min. Repertoire. The song includes clucks, but is much more melodious than the clanking song of Gray-headed Chachalaca. (Similar to song of Crimson-backed Tanager in Part II, but that species’ song is less variable—not a repertoire—and is less rich.) www.xeno-canto.org/6953 by Ken Allaire

**Song includes screeches →**

**Orange-chinned Parakeet.** The “calls include loud harsh chattering and sharp *zhreee!* notes” [1:114] and runs. Often sing *CHEEchuhCHEE* with the *CHEEs* higher than the *chuh*. Variable. Higher-pitched and more shrill than songs of the parrots in this section. (Similar in pitch to song of Blue-headed Parrot.) www.xeno-canto.org/1104 by Robin Carter


**Red-lored Amazon.** Loud, sharp screeches and chortles. “Calls include a distinctive *krack-co-rak*… other calls are similar to those of Mealy, but higher pitched” [1:116]. *KRACK-co-RAK* is accented on first and third elements. Variable. *krack-co-rak*: www.xeno-canto.org/10481 by Allen Chartier; other calls: www.xeno-canto.org/127524 by Thore Noernberg

**Mealy Amazon.** Loud, sharp screeches and chortles. “Loud calls are mostly similar to those of Red-lored Amazon (although deeper), but also include a distinctive *chop-chop* or *cheeeeyup-teeeyup*” [1:116]. Often, lower-pitched *chop-chops* alternate with higher-pitched *chop-chops*. Variable. Sings a three-element song similar to that of Red-lored Amazon, but it tends to be accented only on the first element (*KRACK-co-rak*) or is not accented on any element and rises at the third element like a question (*krack-co-rak*?). www.xeno-canto.org/110633 by Ken Allaire; *chop-chop*: www.xeno-canto.org/31927 by Andrew Spencer

**Song is very squeaky**

**Snowy-bellied Hummingbird.** A high, very squeaky *eee-ah, eee*. Sounds like the bird is exhaling on the *eee* and inhaling on the *ah*. Invariable. www.xeno-canto.org/6410 by Ken Allaire

**Song does not include quavers; is not spoken; does not include clucks and metallic clanks; does not include screeches; is not very squeaky**

**Song is composed of one element →**

**Song is very clear →**

**Ruddy-tailed Flycatcher.** A sweet, quiet, “high, thin *psee-ee-it*!” [1:236] that up/downslurs; the second element can have a hint of a trill in it. Invariable. Much quieter than the other songs in this section. www.xeno-canto.org/65163 by Ken Allaire

**Rufous Piha.** A “loud, emphatic whistle” [1:258] of two or three elements: and upslurring *chuur-EEP!* or a down/upslurring *chu-ar-EEP!* Invariable. Much louder than the other songs in this section. www.xeno-canto.org/60760 by Ken Allaire

**Lesser Greenlet.** A sweet, “musical *chee-wit*! or *shr-eee-it!* (repeated almost incessantly)” [1:376]. In a typical shorter version, the *chee* downs Blrs and the *wit*! ups: in a typical longer version, the *shre* downs Blrs, the *eee* up/downslurs, and the *it*! ups: Variable. More complex than the other songs in this section. (Song is virtually identical to the three-element song of Golden-fronted Greenlet in Part II, but that species is “found in second growth and scrub” [1:276].) www.xeno-canto.org/78668 by William Adsett

**Song is nasal or not very clear**

**Song ends in an upslur**

**Eastern Wood-Pewee.** A nasal, emphatic, down/upslurring *uu-wee!* Migrants are present in Panama from September to November and from March to mid-May [1:240].
A very nasal, up/downslurring "fweer" that up/downslurs. A series of about 12 "fweer" [1:234], sung singly (1) or in pairs (2). Invariable. The downslur is shorter than that in the song of Cocoa Woodcreeper. (1) www.xeno-canto.org/2960 by David Bradley, (2) www.xeno-canto.org/131584 by Thore Noernberg

Royal Flycatcher. A nasal, "squealing, emphatic… keheee-up!" [1:234] that up/downslurs, singly or repeated every few sec. Invariable. Sharper and more emphatic than the other songs in this section. www.xeno-canto.org/5931 by Richard Hoyt

Brownish Twistwing. A nasal, quick, up/downslurring "fweer" [1:234], sung singly (1) or in pairs (2). Invariable. The downslur is shorter than that in the song of Cocoa Woodcreeper. (1) www.xeno-canto.org/2960 by David Bradley, (2) www.xeno-canto.org/131584 by Thore Noernberg

Tropical Gnatcatcher. An airy, nasal, up/downslurring, almost catlike "eeeuu". Invariable. Airier than the other songs in this section. www.xeno-canto.org/47463 by Niels Krabbe


Song is composed of three or more elements

Song is composed of a series of simple, repeated elements →

Cocoa Woodcreeper. A very nasal, up/downslurring "fweer." Invariable. www.xeno-canto.org/11213 by Allen Chartier

Dusky-capped Flycatcher. A weak, thin "fweer" that up/downslurs. A series of about 12 "fweer" [1:234]; the downslurring "fweer" elements; about 2 per sec. Sometimes the last couple of elements fall slightly in pitch and volume. Invariable. Each element rises in frequency more than those in similar song of Slaty-tailed Trogon, so they can sound as if they end in an upslur. www.xeno-canto.org/10563 by Allen T. Chartier

Royal Flycatcher. A nasal, "squealing, emphatic… keheee-up!" [1:234] that up/downslurs, singly or repeated every few sec. Invariable. Sharper and more emphatic than the other songs in this section. www.xeno-canto.org/5931 by Richard Hoyt

Brownish Twistwing. A nasal, quick, up/downslurring "fweer" [1:234], sung singly (1) or in pairs (2). Invariable. The downslur is shorter than that in the song of Cocoa Woodcreeper. (1) www.xeno-canto.org/2960 by David Bradley, (2) www.xeno-canto.org/131584 by Thore Noernberg

Tropical Gnatcatcher. An airy, nasal, up/downslurring, almost catlike "eeeuu." Invariable. Airier than the other songs in this section. www.xeno-canto.org/47463 by Niels Krabbe


Song is composed of three or more elements

Song is composed of a series of simple, repeated elements →

Cocoa Woodcreeper. A very nasal, up/downslurring "fweer." Invariable. www.xeno-canto.org/11213 by Allen Chartier

Dusky-capped Flycatcher. A weak, thin "fweer" that up/downslurs. A series of about 12 "fweer" [1:234]; the downslurring "fweer" elements; about 2 per sec. Sometimes the last couple of elements fall slightly in pitch and volume. Invariable. Each element rises in frequency more than those in similar song of Slaty-tailed Trogon, so they can sound as if they end in an upslur. www.xeno-canto.org/10563 by Allen T. Chartier

Royal Flycatcher. A nasal, "squealing, emphatic… keheee-up!" [1:234] that up/downslurs, singly or repeated every few sec. Invariable. Sharper and more emphatic than the other songs in this section. www.xeno-canto.org/5931 by Richard Hoyt

Brownish Twistwing. A nasal, quick, up/downslurring "fweer" [1:234], sung singly (1) or in pairs (2). Invariable. The downslur is shorter than that in the song of Cocoa Woodcreeper. (1) www.xeno-canto.org/2960 by David Bradley, (2) www.xeno-canto.org/131584 by Thore Noernberg

Tropical Gnatcatcher. An airy, nasal, up/downslurring, almost catlike "eeeuu." Invariable. Airier than the other songs in this section. www.xeno-canto.org/47463 by Niels Krabbe


Song is composed of three or more elements

Song is composed of a series of simple, repeated elements →
about 1–2 per sec (1). Song can speed-up into a jumbled chatter (2). Variable. More nasal than the other songs in this section. (1) www.xeno-canto.org/78670 by William Adsett, (2) www.xeno-canto.org/131614 by Jerome Fischer

Yellow-margined Flycatcher. A “series of 3 to 5 sharp, high-pitched notes, usually with a slight pause after the first note: shrik, shrik-shrik-shrik” [1:236], as if the second note is missing. Occasionally sings the first note a few times before voicing the complete song. Variable. Thinner and airier than the other songs in this section. www.xeno-canto.org/18232 by Herman van Oosten

Song is more complex than a series of simple, repeated elements

Song is composed of clear and nasal phrases

Scarlet-rumped Cacique. Melodious, variable songs, typically of about a dozen, two-element phrases: ca-lee ca-lee ca-loo ca-loo... Songs often include a low, grating, upslurring ooo-rah! Variable. www.xeno-canto.org/31933 by Andrew Spencer, www.xeno-canto.org/131362 by Jerome Fischer

Song is composed of clear phrases only

Song is sharp

Double-toothed Kite. A few high, thin, sharp whistles “whit-whee-up!”; can be mixed with a simpler, rising “wheet!” [1:40]. Variable. Songs of this species and Semiplumbeous Hawk are airier and thinner than those of the other species in this section. www.xeno-canto.org/112868 by Sander Bot

Semiplumbeous Hawk. An airy, shrill, “whistled wheee-EEP!” [1:46]. The wheee strongly up/downslurs; the EEP upslurs. If repeated two or several times, the elements become more emphatic (and may rise slightly). Invariable. Squeakier than song of Double-toothed Kite. www.xeno-canto.org/274200 by Peter Boesman

Black-mandibled Toucan. A “loud, yelping keeyO0O, kedek, kedek (sounds almost gull-like)” [1:176]. Song has a diagnostic tempo and emphasis with the upslurring and downslurring keeyO0O accented on the YOO and the kedeks sounding somewhat like a cantering horse. Typically repeats the same song many times for many mins. Invariable. www.xeno-canto.org/112916 by Sander Bot

Gray-headed Tanager. A jumble of high-pitched, sharp, thin notes mixed with runs and sweet notes. Variable. The only song in this section that contains runs and sweet notes. (The high, thin notes are more melodic than those of White-whiskered Puffbird.) www.xeno-canto.org/1015 by Robin Carter, www.xeno-canto.org/31900 by Andrew Spencer

Song is not sharp

Red-capped Manakin. Song is “several short chit notes, then a long...whistle, followed by a final chit: chit-chit, suwhheeeeee, chit!” [1:270] (1). The suwhhe part down/upslurs; the long eeee whistle downslurs. (The first few chit notes, if sung apart from the rest of the song (2), differ from the chip-chip or chip...chip-chip notes of Spotted Antbird in that they are sweeter (not as sharp) and do not have a pause between the first and second notes.) The final chit ranges from a sweet little note audible to only a few m to a loud, raspy, short churr audible to more than 50 m (the churr keys-out separately in this key). Variable. They also “make loud explosive wing-snaps” [1:270]. The wing snaps differ from those of Golden-collared Manakins in that they are about one-half as loud, and they can be done either singly or in about 3–10 rapid bursts at about 3 bursts per sec. The only song in this section of the key with a long downslurring element. (1) www.xeno-canto.org/10085 by Ken Allaire, (2) www.xeno-canto.org/271228 by Peter Boesman

Yellow-backed Oriole. A “lackadaisical series of clear mellow whistles that vary disjointedly both in pitch and in the intervals between notes” [1:378]; each whistled phrase is composed of one, two, or three elements. Variable. www.xeno-canto.org/107785 by Klemens Steiof

Bay Wren. A “rapid series of loud, ringing...whistled phrases, each variant repeated several times before changing to another” [1:290]; song repeat-bounces. Repertoire. Song is more rapid and complicated than those of Blue-black Grosbeak, Slate-colored Grosbeak, orioles, and other wrens. www.xeno-canto.org/92124 by William Adsett

Black-bellied Wren. A series of short phrases composed of deep, rich, “loud, resonant, whistled notes, often inflected upward at the end: hooo-eer, hoo-it! Each variant is
repeated many times before being switched to another” [1:290]. Repertoire. Deeper and richer than all other songs in this section. www.xeno-canto.org/83255 by Wouter Halfwerk

**White-breasted Wood-Wren.** A series of about 6–10 clear whistles in about 1–4 phrases. “Typical phrases include...chee, churry churry; and chee-chee-cheery” [1:294]; often sings WEduWEdu in which the WE notes are higher than the du notes. Repertoire. Unlike all other species in this key, often sing several elements or phrases at about 1 per sec, pauses for a few sec, then sings one, two, or three “encore” elements or phrases with many sec between them. Songs of this species and of Blue-black Grosbeak are sharper than those of Slate-colored Grosbeak. www.xeno-canto.org/135369 by William Adsett


**Slate-colored Grosbeak.** “Variable, deliberate phrases made up of loud rich whistles (rather wrenlike in quality)” [1:352]; often a sweet WEET diu-diu-diu that upslurs on the WEET and downsurs on each diu, or a sweet WEET diu, WEET diu. Variable. Unlike the other species in this section, each song includes (and often ends) with a diagnostic, downsurring diu. www.xeno-canto.org/271577 by Peter Boesman

*Song is composed of nasal phrases only*


**Elements upslur →**

**Tempo accelerates and decelerates →**

**Scly-throated Leaftossier.** A “long series (sometimes continuing for several minutes) of sharp whistles” [1:194], starting with several upslurring whistles followed by about 3–12 non-upslurring, accelerating whistles that fall then rise: Weeep! Weeep! Weeep! Weeep! We-we-we-we. Each section lasts about 4 sec and can blend almost seamlessly into the next as if riding a roller coaster up and down, up and down, etc. Variable. www.xeno-canto.org/16068 by Ken Allaire

**Tempo is steady**

**Pitch rises →**

**Wedge-billed Woodcreeper.** About 6–8, upslurring, sharp elements that rise in pitch and then end abruptly: Clee clee clee clee clee clee clee clee clee. Invariable. Sharper than song of Olivaceous Flatbill. www.xeno-canto.org/92916 by Tom Stevens

**Olivaceous Flatbill.** About 4–6 upslurring, rising, wheezy elements: wee wee wee wee wee wee. Invariable. Airier than song of Wedge-billed Woodcreeper. www.xeno-canto.org/158862 by Rodrigo Dela Rosa

**Pitch falls →**

**Song ends in falling couplets**


**Song does not end in falling couplets**

**Scly-throated Leaftossier.** A strong, sharp, fast series of about 8–12 upslurring whistles, the last 2 or 3 of which fall. About 5 elements per sec. Invariable. Faster and stronger than song of Fasciated Antshrike. www.xeno-canto.org/112873 by Sander Bot

**Fasciated Antshrike.** A series of about 4–8 clear, upslurring whistles, with the first two or three elements slightly higher than the rest. About 2 elements per sec. Invariable. Easily imitated by whistling, unlike songs of the other species in this section. www.xeno-canto.org/24194 by Ken Allaire
Tropical Gnatcatcher. A series of about 8–14 high, airy, thin, upslurring falling elements. Invariable. Airy, unlike songs of the other species in this section. www.xeno-canto.org/59517 by Mike Nelson

**Pitch is steady**

**Elements are spoken →**

**Song sounds like whoop →**

**Rufous Motmot.** A deep Whoop!, very similar to that of Whooping Motmot (1). Also a “deep, resonant, rapid booo-bupa-bupa (usually three notes, sometimes two or just one)” [1:166] (2), and a series of about 5–20 whoops, with pairs or triplets alternating between higher and lower pitches (3). Invariable. (1) www.xeno-canto.org/153250 by Wouter Halfwerk, (2) www.xeno-canto.org/93638 by Tom Stevens, (3) www.xeno-canto.org/16063 by Ken Allaire

**Whooping Motmot.** A deep, resonant Whoop!, very similar to that of Rufous Motmot (1). Also a “deep, resonant rapid booooo-buuup-buuup (usually three notes, sometimes two or just one)” [1:166] (2), and a series of about 5–20 whoops, with pairs or triplets alternating between higher and lower pitches (3). Invariable. (1) www.xeno-canto.org/46779 by Mike Nelson, (2) www.xeno-canto.org/10069 by Ken Allaire

**Purple-throated Fruitcrow.** “Loud, far-carrying, melodious whoops… [usually] rising at the end” [1:264]: whoop, whoop, whooOOP! Invariable. Elements are longer (whooop vs. whoop) than songs of the motmots. www.xeno-canto.org/24217 by Ken Allaire

**Song does not sound like whoop**


**Elements are not spoken**

**Song is composed of one whistle →**

**Black-striped Woodcreeper.** A nasal, whistled, sharp, upslurring zuuuuu-reep! (Table 4). Invariable. www.xeno-canto.org/11930 by Nick Athanas

**Great Crested Flycatcher.** A nasal, “sharp, rising fweeUP!” [1:248]. Migrants are present in Panama from October to April [1:248] (Table 4). Invariable. www.xeno-canto.org/31903 by Andrew Spencer

**Brownish Twitling.** A nasal, airy, upslurring uuu-reek! (Table 4). Invariable. www.xeno-canto.org/107753 by Klemens Steiof


**Paltry (or Mistletoe) Tyrannulet.** An upslurring, “clearly whistled peee-yup! [or che-weep!)] (accented on the second syllable)” [1:230] (Table 4). Invariable. www.xeno-canto.org/46978 by Mike Nelson

**Swainson’s Thrush.** A “sharp, uprising wheeik!” [1:302]. Migrants are common in Panama in October, November, March, and April; winter residents are uncommon [1:302] (Table 4). Invariable. www.xeno-canto.org/65181 by Ken Allaire

---

**Table 4.** Comparison of the songs in Part I that are not a trill or churr, elements upslur, tempo is steady, pitch is steady, elements are not spoken, and song is composed of one whistle.

<table>
<thead>
<tr>
<th>Species</th>
<th>Relative sharpness (1–4; 1 = least)</th>
<th>Relative clarity (1–3; 1 = nasal, 3 = clear)</th>
<th>Relative length of first element (1–4; 1 = shortest)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black-striped Woodcreeper*</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Great Crested Flycatcher*</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Brownish Twitling*</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Forest Elaenia*</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Paltry (or Mistletoe) Tyrannulet</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Swainson’s Thrush</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

* Elements upslur only, unlike somewhat similar-sounding song of Eastern Wood-Pewee, which down/upslur
**Song is composed of at least 10 whistles**

**Squirrel Cuckoo.** About 10–35 loud, slightly nasal whistles *whip, whip, whip...* with a short pause between whistles; a little faster than 1 whistle per sec. Invariable. www.xeno-canto.org/60783 by Ken Allaire

**Black-breasted Puffbird.** About 10–50 strong, nasal, fast, upslurring whistles *Weep! Weep! Weep!* at about 2–2.5 per sec (when song stops before the series of descending couplets). Invariable. Unlike song of Squirrel Cuckoo, there are no pauses between whistles. www.xeno-canto.org/108270 by Jerome Fischer; sec 0–21


**ELEMENTS DOWNSLR →**

**Tempo is erratic →**

**Black-chested Jay.** “Calls include a loud, ringing *cheoup, cheoup* and a staccato *chh-chh-chh-chowp!*” [1:280], sounding like shots from a ray-gun. Invariable. www.xeno-canto.org/113451 by Jerome Fischer

**Tempo is steady**

**Pitch is low or very low →**

**Short-billed Pigeon.** A deep, whistled, easily imitated *cooo, coo-coo, coooo* with the last element downsllurring. Invariable. www.xeno-canto.org/112914 by Sander Bot

**Scaled Pigeon.** A “very low-pitched *whooo! whut-wooo! whut-woooo!*” [1:102]; the *whooo* elements downslur. Invariable. Unlike song of Short-billed Pigeon, the first, third, and fifth elements downslur. www.xeno-canto.org/142686 by William Adsett

**Pitch is medium, high, or very high**

**Song is spoken →**

**Collared Forest-Falcon.** Sings “a mournful, slowly repeated *aoww... aoww... aoww... aoww* (often given at dawn or dusk)” [1:56] with about 2–3 sec between songs. Invariable. Song of Black-crowned Antshrike is audible to about 75 m, whereas song of Collared Forest-Falcon is audible to more than 300 m. www.xeno-canto.org/271370 by Peter Boesman

**Black-crowned Antshrike.** A nasal *kaow, kaow-kaow* or a set of three elements, each about one-half sec apart: *kaow-kaow-kaow*. Invariable. www.xeno-canto.org/90394 by Leslie Lieurance

**Song is not spoken**

**Each element lasts 1 sec or less →**

**Song is composed of two or three clear whistles**

**Chestnut-backed Antbird.** A clear, steady-pitched, two-element “*Come HERE!*” or three-element “*Come right HERE!*” [1:212], accented on the last element. Invariable. (Each element takes about one-half as long to sing as each element in the similar song of Rufous Mourner, but that song upslurs and downslurs.) www.xeno-canto.org/328700 by Kent Livezey

**Song is composed of at least six sharp chips**

**White-necked Jacobin.** A series of sharp, high chips, very quickly downslurring, sung at about 1–2 per sec. Invariable. www.xeno-canto.org/128070 by Thore Noernberg

**Each element lasts 2 sec or more**


**ELEMENTS DO NOT SLUR**

**Tempo accelerates →**

**Pitch rises →**

**Paltry (or Mistletoe) Tyrannulet.** A series of about 9 or 10 clear, sweet notes, accelerating and rising after the first two or three notes: *du, du, di-di-di-di-di-di-di*. Song lasts about 2 sec. Invariable. (Notes sound identical in pitch and quality to those in this species’ two-noted song.) Not in xeno-canto.
**Pitch falls** →

**Cinnamon Woodpecker.** A nasal, airy, falling series of whistles “whee, wheee, whee-wit” [1:182], with third and fourth elements accelerated compared to the first and second. Invariable. www.xeno-canto.org/92126 by William Adsett

**Pitch is steady**

(Striped Rocket Frog. An emphatic, accelerating series of about 6-10, two-element phrases: chu-deep!... chu-deep!... chu-deep! chu-deep! chu-deep! chu-deep! chu-deep! chu-deep! chu-deep! Invariable. biogeodb.stri.si.edu/bioinformatics/dfm/metas/view/30483 by Ibáñez *et al.* undated [16])

**Tempo decelerates** →

**Song lasts a few sec**

**Streak-chested Antpitta.** An easily imitated, “slow, mournful series of about 10 clear whistles, the first few notes rising, then leveling off for several notes, finally slowing down and descending slightly” [1:218]. Invariable. www.xeno-canto.org/128621 by Wouter Halfwerk

**Song lasts at least 30 sec**

**Scaly-breasted Wren.** A series of high, sweet whistles, starting with about 6–8 short whistles going up the scale at about 3 notes per sec, then a pause of about 1 sec, then about 8–12 longer, descending whistles with gaps between them increasing from 1 sec to 2 sec to 3 sec, etc. down to about 15 sec. Songs can last up to about 2 mins. Song can consist only of individual whistles about 10 sec apart. Variable. www.xeno-canto.org/70709 by William Adsett

**Tempo is erratic** →

**Song is composed of sharp chips or airy grunts** →

**Song is composed of sharp chips** →

**Black-throated Mango.** A series of erratic, sharp chips, usually about 1 per sec. Invariable. Not nasal, unlike songs of Rufous-tailed Hummingbird and White-vented Plumeleteer. www.xeno-canto.org/14587 by Oswaldo Cortes

**Rufous-tailed Hummingbird.** A long series of nasal, erratic, sharp chips, ranging from about 1–4 per sec; feeding birds can sing for more than 1 min. Invariable. More chips per second than songs of Black-throated Mango and White-vented Plumeleteer. www.xeno-canto.org/78672 by William Adsett

**White-vented Plumeleteer.** A series of nasal, erratic, sharp chips, usually less than 1 per sec. Invariable. A little airier and less sharp than song of Rufous-tailed Hummingbird. www.xeno-canto.org/17180 by Allen T. Chartier

**Song is composed of airy grunts**

**Whooping Motmot.** A series of erratic, airy grunts sounding like a scolding squirrel. Invariable. www.xeno-canto.org/29240 by Karl Kaufmann

**Song is composed of whistles and clucks**

**Song Wren.** Variable compositions of “sweet clear whistles of various pitches, interspersed with guttural clucks...; sounds like a haywire cuckoo clock” [1:296]. Two-noted whistles are unique in the area (first note low and second note high, or vice versa; both are included in the first recording below). Family groups often sing only the clucks, possibly as contact calls, when foraging on the forest floor (as in second recording below). Variable. www.xeno-canto.org/107771 by Klemens Steiof, www.xeno-canto.org/271210 by Peter Boesman

**Tempo is steady**

**Pitch rises and falls** →

**Green Shrike-Vireo.** A series of about 8–15 sweet notes, each at a slightly different pitch, that slowly fall, rise, fall, etc., in about 2–4 sec. Invariable. (Like a slow song of Long-billed Gnatwren.) Not in xeno-canto.

**Pitch falls** →

**Notes are very clear, easily imitated by whistling**

**Black-faced Anthrush.** A clear, “slow, hesitant series of plaintive whistles (usually 3 or 4, sometimes as many as 15)” [1:216], with a slight pause after the first note, which is slightly accented more than and higher in pitch than the rest of the notes. Invariable. www.xeno-canto.org/2959 by David Bradley
Notes are airy or nasal, not easily imitated by whistling

**Squirrel Cuckoo.** A nasal, hurried, three-element CHICKaroo usually sung singly but occasionally sung once every few sec in a series. Invariable. www.xeno-canto.org/87520 by Paul Rene

**Pitch is steady**

Pitch is low or very low →

**Song is composed of one element →**


**Ruddy Quail-Dove.** A “low soft whoooah, given at 3- to 5-sec intervals (shorter and lower pitched than that of Gray-chested Dove)” [1:108]. Invariable. Similar in pitch to Rufous-vented Ground-Cuckoo, but shorter and less moaning. www.xeno-canto.org/81327 by Leonardo Ordóñez-Delgado


**Song is composed of two elements**


**Pitch is medium or high →**

**Song is sharp and/or airy, squeaky, or clucky →**

**Song is sharp and/or airy →**

**Plain-brown Woodcreeper.** A nasal, airy, sharp eyeenk! Invariable. Airier than songs of the other species in this section. www.xeno-canto.org/78671 by William Adsett

**Northern Waterthrush.** A “sharp … whink!” [1:322] repeated once every few sec or so. Migrants are present in Panama from September to late April, sometimes mid-September to May [1:322]. Invariable. Flatter and more bubbly than the other calls in this section. www.xeno-canto.org/78859 by Oswaldo Cortes

**Slate-colored Grosbeak.** A sharp speek! Invariable. A bit sharper than call of Northern Waterthrush. www.xeno-canto.org/86513 by Andrew Spencer

**Blue-black Grosbeak.** A “sharp metallic chirrt!” [1:370] typically sung singly or in pairs. Invariable. More ringing than the other calls in this section. www.xeno-canto.org/80947 by Scott Olmstead

**Song is composed of a series of similar elements**

Song is loud, is audible to more than about 125 m →

**Squirrel Cuckoo.** A series of 3–5 loud, sharp, clattering notes: chink! chink! chink! sung within 1–2 sec. Invariable. Sharper than songs of the other species in this section. www.xeno-canto.org/11652 by Nathan Pieplow

**Broad-billed Motmot.** Airy “awwnnk! suggesting a whistle on a toy train” [1:166]. Usually sung at about 1 per 4–30 sec, but sometimes sung at a faster tempo at about 1 per sec. Invariable. Airier than songs of the other species in this section. www.xeno-canto.org/1088 by Robin Carter

**Collared Aracari.** A sharp, “high-pitched wheezy khwhilk!” [1:176] sung in a series of about 3–20 elements at about 1 per sec. Invariable. Wheezier than songs of the other species in this section. www.xeno-canto.org/28313 by Daniel Lane

Song is not loud, is audible to less than about 75 m →

**Long-billed Hermit.** A long series of sharp chips sung at about 1–2 per sec; perched birds can sing for many mins. This species also chips at about 1 chip per 3 sec while flying through the woods. Invariable. Elements sound richer, more complex, with more ringing tonal quality, than those of Blue-chested Hummingbird and Crowned Woodnymph. www.xeno-canto.org/107762 by Klemens Steiof
Blue-chested Hummingbird. A long series of sharp chips sung at about 1–2 per sec; perched birds can sing for several mins, with short pauses between series of chips. Invariable. Notes sound flatter, with less tonal quality, than notes of Long-billed Hermit. www.xeno-canto.org/10068 by Ken Allaire

Crowned Woodnymph. A long series of sharp chips sung at about 1–2 per sec (1); perched birds can sing for several mins. Invariable. Chips are sharper and thinner than those of Blue-chested Hummingbird. Unlike the other songs in this section, sometimes sings a double-noted version (2). (1) www.xeno-canto.org/271614 by Peter Boesman, (2) www.xeno-canto.org/60789 by Ken Allaire

Spotted Antbird. A series of a few sharp, two- or three-noted chip...chip, chip, chip or chip...chip-chip, chip-chip calls. Unlike songs of the other species in this section, the series usually has a short pause (like a skipped note) after the first note. Invariable. (The first few chit notes of Red-capped Manakin, if sung apart from the rest of the song, differ from these notes of Spotted Antbird in that they are less sharp and do not have a pause between the first and second notes.) www.xeno-canto.org/72009 by Andrew Spencer

Checker-throated Antwren. A “series of evenly spaced, high, thin seek [or cleek] notes, all on the same pitch” [1:206]. Series can consist of a few notes and last only a few sec to more than 100 notes lasting more than 1 min. Sung at about 1–4 notes per sec. When sung quickly, notes take on an emphatic, scolding quality. Competing males sometimes sing within 20 cm of one another. Invariable. Elements are more two-noted than in songs of Long-billed Hermit, Blue-chested Hummingbird, single-noted Crowned Woodnymph, and Green Shrike-Vireo. www.xeno-canto.org/10559 by Allen T. Chartier

**Song is squeaky →**


**Song is clucky**


**Song is not airy and/or sharp, squeaky, or clucky**

Elements are sung at about 1–3 per sec →

Gartered Trogan. A series of slightly nasal, one-noted chup calls, a bit faster than 1 per sec. Invariable. A bit sharper than faster song of Gartered Trogan, and a little flatter than similar call of White-tailed Trogan. www.xeno-canto.org/120656 by Lars Lachmann

White-tailed Trogan. A series of slightly nasal, one- or two-noted chup or chup-chup calls, about 1–2 per sec. Invariable. All notes are of the same pitch, unlike the two-noted call of Dusky Antbird. A little sweeter and higher than the chup song of Gartered Trogan. www.xeno-canto.org/175166 by Juan Antonio Alonso de Juan

Dusky Antbird. Piping, two-noted di-di...di-di... calls, with the first note higher than the second. Invariable. www.xeno-canto.org/46879 by Mike Nelson, especially sec 13–18

Elements are sung at about 5 per sec

White-flanked Antwren. A scold consisting of a rapid series of about 5–10 rough, staccato notes; can be repeated with a pause of about 1–5 sec between series. Invariable. (There is no exact recording of this song in xeno-canto, but a recording with slightly longer scolds is www.xeno-canto.org/88372 by Alexandre Renaudier.)

**Pitch is very high**

White-whiskered Puffbird. A quiet, insect-like series of about 2–5 elements, audible to only about 10–15 m. Invariable. www.xeno-canto.org/329127 by Kent Livezey
PART II: KEY TO SONGS OF DIURNAL BIRDS IN THE FRAGMENTED FORESTS, FOREST EDGES, AND GRASSY AREAS ADJACENT TO THE ENTRANCE TO PIPELINE ROAD

SONG IS A TRILL OR CHURR →

TEMPO ACCELERATES →

Song is composed of one churr

Plain Wren. A rough scold starting with a few elements that rapidly accelerates. Invariable. www.xenocanto.org/32047 by Andrew Spencer

Song is composed of several churrs


TEMPO IS STEADY

Pitch rises →


Pitch falls →

Pitch is very high →

Blue-black Grassquit. Males sing a series of a very high, falling, very fast trill zeeeereee! “from an exposed perch…often jumping up a few feet during the song before returning to the same perch or one nearby” [1:352]. Invariable. www.xenocanto.org/16029 by Ken Allaire

Pitch is medium or high

Song is a trill →

Common Tody-Flycatcher. “A rapid descending trill” [1:232], given individually or in a series of about 1 per sec; also sing trills with steady pitch. Invariable. www.xenocanto.org/24190 by Ken Allaire


Song is a churr

Boat-billed Flycatcher. A nasal, sharp, falling churr, lasting about 1 sec. Invariable. Much sharper than call of Yellow-throated Vireo. www.xenocanto.org/32033 by Andrew Spencer

Yellow-throated Vireo. Call is a falling series of about eight raspy notes reur-reur-reur-reur-reur-reur-reur-reur. Invariable. www.xenocanto.org/130041 by Oscar Humberto Marin-Gomez

Pitch is steady

Song is a trill →

Pitch is very high

Plain-colored Tanager. A very high, twittering trill. Invariable. www.xenocanto.org/271605 by Peter Boesman

Pitch is medium or high

White-bellied Antbird. Scold is a sharp but somewhat bubbly trill of about 4–8 notes in less than 1 sec, often repeated several or many times in rapid succession. Invariable. www.xenocanto.org/112886 by Sander Bot

Song is a churr

Barred Antshrike. “Call a growling arrrh!” [1:202]. Invariable. Call sounds growling, unlike the other songs in this section. www.xenocanto.org/2602 by David Bradley

House Wren. A rough burst of identical notes, lasting about one-half sec. Invariable. Much thinner, more insect-like, and shorter than scold of Buff-breasted Wren. www.xenocanto.org/106554 by Mike Nelson

Buff-breasted Wren. A rapid series of rough, raspy notes, typically lasting several sec. Invariable. www.xenocanto.org/92398 by Oswaldo Cortes

SONG INCLUDES TRILLS OR CHURRS →

Song is composed of a series of simple elements

Tropical Kingbird. The rising “dawn song consists of a few short notes followed by an undulating trill: pip-pip-
pip-deetdididideet” [1:254]. Invariable. Song always follows this simple pattern, unlike the song of Thick-billed Euphonia. www.xeno-canto.org/1123 by Robin Carter

**Thick-billed Euphonia.** A mix of trills, buzzes, single clear notes, and upslurring two-noted clear phrases, each separated by 1–3 sec, including “a sweet clear fweet, a burry breet, and a clear dee-di,” the latter softer and faster than common [beem-beem] call of Yellow-crowned Euphonia” [1:384]. Variable. www.xeno-canto.org/78748 by William Adsett

**SONG IS COMPOSED OF A COMPLICATED SERIES OF VARIABLE PHRASES**

**Yellow-bellied Elaenia.** “Very active and noisy; one common call is a descending series of hoarse notes: FWEER-fweer-fwir, also gives a harsh descending fwirrr!” [1:226]. The FWEER is an up/downslurring churr, the fweer upslurs, and fwir is a trill. Also sings any of these sections individually. Variable. Complete song is nasal, unlike the other songs in this section. www.xeno-canto.org/16088 by Ken Allaire


**Tropical Mockingbird.** A “long, melodious series of varied, whistling trills and warbles, some repeated several times” [1:306]. Typically includes some nasal phrases. Repertoire. Songs often last for many mins without pause, unlike the others in this section. www.xeno-canto.org/199020 by Guillermo Funes

**Yellow-bellied Seedeater.** “A rapid musical warbling, often ending with a buzzy” churr [1:354]. Variable/repertoire. This version of this species’ song ends in a buzzy churr, unlike the others in this section. www.xeno-canto.org/24248 by Ken Allaire


**SONG IS NOT A TRILL OR CHURR AND DOES NOT INCLUDE TRILLS OR CHURRS**

**ELEMENTS UPSLUR AND DOWNSLUR →**

**Tempo accelerates →**

**Black-striped Sparrow.** “Distinctive song is a series of mellow [downslurring] cho notes that last 15 to 20 sec; initially slow and then gradually accelerating (like sound of a ball bouncing to a halt)” [1:362] (1). Also sings the downslurring, harsher “cho! and [upslurring, sweeter] wheet! calls, singly or in short series” without accelerating [1:362] (2). Invariable. (1) www.xeno-canto.org/31942 by Andrew Spencer, (2) www.xeno-canto.org/128619 by Wouter Halfwerk

**Tempo is steady**

**Pitch is very high →**

**Song is composed of paired elements alternating up and down**

**Blue-gray Tanager.** Very high, paired “squeaky notes rising and falling in pitch” [1:342] seet-suu, seet-suu, as if the bird is breathing in-out, in-out as it sings. Paired elements often are mixed with high notes in a squeaky chatter. Variable. www.xeno-canto.org/2813 by David Bradley

**Song is not composed of paired elements alternating up and down**

**Palm Tanager.** “Song like that of Blue-gray Tanager, but faster and with sharper and less squeaky notes” [1:342]. Variable. www.xeno-canto.org/15700 by Don Jones, www.xeno-canto.org/271627 by Peter Boesman

**Plain Wren.** A very high, shrill song which upslurs and/or downslurs. Sounds somewhat like a violin. Invariable. Simpler than songs of Palm Tanager and Yellow-crowned Euphonia. www.xeno-canto.org/83092 by Brian Cox, www.xeno-canto.org/18658 by Ken Allaire


**Pitch is medium or high**

**Song is composed of one element →**


**Gray-lined Hawk.** A nasal, shrill, up/downslurring whistle “KEEEEeeer” [1:50]. Invariable. Song slightly less nasal than song of Roadside Hawk; in addition, pitch often remains steady longer between the KEEE and the eer of Grey-lined Hawk than between the kee and YOOuuu of Roadside Hawk. www.xeno-canto.org/6419 by Ken Allaire, www.xeno-canto.org/117314 by

Rusty-margined Flycatcher. A nasal, up/downslurring, “sharp, plaintive, prolonged feeeeeeerrrr (lasting a second or more)” [1:250]. Invariable. Not as whistled as song of Gray-phased Flycatcher. (Song is longer and more emphatic than similar song of Dusky-capped Flycatcher in Part I). www.xeno-canto.org/15714 by Don Jones

Great Kiskadee. A loud, nasal Yeang! that up/downslurs. Invariable. Not shrill, like the hawks in this section; more nasal than songs of Social and Rusty-margined flycatchers. www.xeno-canto.org/32045 by Andrew Spencer


Crimson-backed Tanager. Call is a rough, barking aaaw! that quickly (and somewhat imperceptibly) up/downslurs. Invariable. Sounds barking, unlike the other songs in this section. www.xeno-canto.org/164783 by James Bradley

Song is composed of a series of identical or nearly identical elements →

Song screeches


Song does not screech

Roadside Hawk. A nasal series (run) of up/downslurring elements, elements; about 4 per sec. Invariable. Squeakier than song of Panama Flycatcher. www.xeno-canto.org/110758 by Thore Noernberg


Panama Flycatcher. A nasal run of up/downslurring elements, the most-distinctive of which is a Wee-du-du-du-du-du-du; about 5–6 per sec. Variable. www.xeno-canto.org/45131 by Scott Olmstead


Song is composed of a simple, two- or three-element phrase →

Great Kiskadee. A loud, nasal, two-element KE-haaw!; the haaw! up/downslurs. Invariable. www.xeno-canto.org/32046 by Andrew Spencer: sec 4-6, 12-13, 15-16

Great Kiskadee. A loud, nasal, three-element KISK-a-DEE; the DEE up/downslurs. Invariable. www.xeno-canto.org/32046 by Andrew Spencer: sec 0-1, 7-8

Song is composed of a complex series of elements and phrases

Song includes quavers

Rosy Thrush-Tanager. Variable songs with a distinctive trembling or quavering quality. “One of Panama’s best songsters; the rich, resonant, wrenlike song...is sung antiphonally, with each member of a pair giving part of the song; gives a rhythmic che-ow-wheldup, chiwwee-duup and variants. Has a variety of other calls, including a sharp wheet, chu-wu and a falling whiwhiwhiwiwiwi that alternates with single or double melodious whistles” [1:334]. Repertoire (1). Also sing a long series of two-element, quavering phrases, each about 1 or 2 sec apart, which is invariable (2), (1) www.xeno-canto.org/15702 by Don Jones and www.xeno-canto.org/31939 by Andrew Spencer, (2) www.xeno-canto.org/2616 by David Bradley

Song does not include quavers

Phrases are sung with a 1–3-sec pause between them →

Streaked Flycatcher. At dawn and dusk, sings a nasal, “musical wheet!-fididi-wheet!” [1:252], with about 2–3 sec between phrases. Invariable. More emphatic than songs of
Panama Bird Song Key

Crimson-backed Tanager and Golden-fronted Greenlet. www.xeno-canto.org/121509 by Leslie Lieurance

Crimson-backed Tanager. “Song, given at dawn, a musical whistled *chit-dee-chew* or *chit, dew, dew*” [1:340] with about 1 sec between phrases; phrases can alternate upslurring and downslurring. Invariable. Richer than song of Golden-fronted Greenlet. (Similar to song of Clay-colored Thrush in Part I, but that species’ song is more variable—a repertoire—and is richer.) www.xeno-canto.org/31823 by Andrew Spencer

Golden-fronted Greenlet. A “rapid, musical series of four (sometimes three or five) whistled notes: *chit-ee-chee-ew* or *che-eet-er-chew*” [1:276] with about 2 sec between phrases. Invariable. Not nasal, unlike song of Streaked Flycatcher. Sharper than song of Crimson-backed Tanager. (The three-element version is virtually identical to the three-element song of Lesser Greenlet in Part I, but that species is “found in middle and upper levels of forest” [1:276].) www.xeno-canto.org/182280 by Jerome Fischer

Phrases are sung without pauses between them

*Song is composed of repeated, single, slurred elements* →

Buff-breasted Wren. “A rapid, rollicking series of musical whistled notes [elements], each...repeated several times before changing to another; *chiri-chi, chi-chi, chi-chi, chi-chi and chi-dit, chi-dit, chi-dit*, *churwee, chit-dit, chi-dit, churwee* [1:292]. Repertoire. More musical, less sharp, and usually faster than song of Plain Wren; unlike song of Plain Wren, can include a diagnostic, downsllurring element (which, when sung alone, also keys-out separately in this key). www.xeno-canto.org/46865 by Mike Nelson (two-element phrase is near the end of this recording)


*Song is not composed of repeated, single, slurred elements* →

Song is clear and sweet

Song lasts about 1–2 sec

Yellow-bellied Seedeater. “A rapid musical warbling” [1:354]. Variable/reertoire. Song can include churrs and trills, unlike song of Ruddy-breasted Seedeater. www.xeno-canto.org/16079 by Ken Allaire,

Ruddy-breasted Seedeater. “Song consists of deliberate series of sweet whistles, often with some notes doubled” [1:354]. Most or all elements upslur or downslur. Variable/reertoire. Song is slower than song of Yellow-bellied Seedeater. www.xeno-canto.org/16057 by Ken Allaire

Song lasts about 10–30 sec

Variable Seedeater. “Song consists of sweet twittering and warbling notes that rise and fall in no particular sequence” [1:354]. Variable/reertoire. Compared to song of Thick-billed Seed-Finch, a little less melodic and each song fades away more at the end. www.xeno-canto.org/24238 by Ken Allaire, www.xeno-canto.org/271589 by Peter Boesman


Song is nasal and sharp

Rusty-margined Flycatcher. A bouncing chatter of many nasal, sharp notes mixed with clear, sweet notes. Variable. www.xeno-canto.org/92252 by Oswaldo Cortes

Social Flycatcher. A bouncing chatter of many nasal, sharp notes mixed with clear, sweet notes (1). Variable. Unlike song of Rusty-margined Flycatcher, often includes a diagnostic, downsllurring *chi-iww!* call (2). (1) www.xeno-canto.org/73196 by Ezekiel S. Jakub, (2) www.xeno-canto.org/10094 by Ken Allaire

Elements upslur →

Great-tailed Grackle. “Has a wide variety of calls, including a strident *wheek-wheek-wheek*, and rising *whuREEEK*, and various other shining and chattering vocalizations” [1:376], many of which upslur. Variable. www.xeno-canto.org/56187 by Mike Nelson
ELEMENTS DOWNSLUR →

**Tempo accelerates →**

**Barred Antshrike.** “Song a rapid, accelerating series of soft heh notes, ending in a longer nasal hu-hek!” [1:202]. Invariable. (Compared to similar, accelerating song of Black-crowned Antshrike in Part I: more nasal, slightly lower in pitch, slightly less rushed, notes fall before last element, and last element is not squeaky.) www.xeno-canto.org/24174 by Ken Allaire

**Tempo decelerates →**

**White-bellied Antbird.** “Song a series of loud chirps, beginning very rapidly, then gradually slowing down and finally trailing off (often likened to sound made by mechanical wind-up bird)” [1:212]. Invariable. www.xeno-canto.org/182262 by Jerome Fischer

**Tempo is steady**

**Song is composed of simple, non-warbled phrases →**

**Song is composed of phrases with two elements**

**Yellow-crowned Tyrannulet.** A clearly whistled heeEER! Invariable. Easily imitated by whistling, unlike song of Buff-breasted Wren. www.xeno-canto.org/47090 by Mike Nelson

**Buff-breasted Wren.** A sweet, downslurring, two-noted song. Invariable. www.xeno-canto.org/46862 by Mike Nelson

**Song is composed of phrases with three to five elements**

**Streaked Saltator.** “Song consists of three to five sweet whistled notes, the last one (sometimes two) slurred [downward] and longer [than the first notes]: tew-tew-tew-teeuuuwo!” [1:350]. Invariable. www.xeno-canto.org/93039 by Oswaldo Cortes

**Song is composed of complex, warbled phrases**

**Streaked Saltator.** Longer version of this species’ three- to five-element song, with short, sweet runs and strong, clear, downslurring elements. Variable. Richer and less sharp than song of Buff-throated Saltator. www.xeno-canto.org/16069 by Ken Allaire

**Buff-throated Saltator.** “Song consists of variable warbled phrases of mellow whistles, such as chuweet, cheet, choo-a-wheet” [1:350], typically downslurring at the end. Variable. www.xeno-canto.org/110593 by Ken Allaire

**ELEMENTS DO NOT SLUR**

**Tempo accelerates →**

**Golden-hooded Tanager.** “Call a thin…chit…[typically] accelerated into a rapid chatter [1:346]. Invariable. www.xeno-canto.org/31943 by Andrew Spencer

**Tempo is steady**

**Pitch is very high →**

**Streaked Saltator.** Call is a very high-pitched, sharp tsit. Invariable. www.xeno-canto.org/57295 by Bernabe Lopez-Lanus

**Buff-throated Saltator.** Call is a very high-pitched, sharp tsit. Invariable. www.xeno-canto.org/10073 by Ken Allaire

**Plain-colored Tanager.** “Call a [very] high-pitched…dziit” [1:342]. Invariable. www.xeno-canto.org/83082 by Brian Cox

**Blue Dacnis.** “Calls include a very high-pitched sharp tsit” [1:346]. Invariable. www.xeno-canto.org/168605 by Martin St. Michel

**Red-legged Honeycreeper.** “Calls include a thin dzt and a piercing chuweet!” [1:348]. Invariable. www.xeno-canto.org/11157 by Doug Knapp

**Pitch is medium or high**

**Song is composed of one element**


**Blue Dacnis.** Calls include a thin, sharp “chut” [1:346] sung about 1 per sec. Invariable. www.xeno-canto.org/37432 by Charlie Vogt

**Green Honeycreeper.** “Call a chirping cheet!” sung about 1 per sec. [1:348]. Invariable. www.xeno-canto.org/65156 by Ken Allaire
Song is composed of two or three elements

**Yellow-crowned Euphonia.** “Constantly gives a sharp, high-pitched beem-beem or beem-beem-beem” [1:384]. Invariable. www.xeno-canto.org/31839 by Andrew Spencer

Song is composed of many elements


**Tropical Kingbird.** A “high-pitched...chittering” [1:254] of identical or almost identical notes. Invariable. www.xeno-canto.org/135489 by William Adsett

**PART III: KEY TO SONGS OF DIURNAL BIRDS IN THE WETLANDS ADJACENT TO THE ENTRANCE TO PIPELINE ROAD**

**SONG IS A TRILL OR CHURR**

**TEMPO DECELERATES**

**Amazon Kingfisher.** A burst or series of bursts of high, sharp notes, decelerating from about 12 to about 4 notes per sec. Invariable. www.xeno-canto.org/31704 by Mike Nelson

**TEMPO IS ERRATIC**

**Barn Swallow.** Rough, quickly upslurring calls sung at about 1 per sec; sung while in flight. Invariable. Dr. Livezev_TOEENIJ.docxwww.xeno-canto.org/327328 by Antonio Xeira

**TEMPO IS STEADY**

**Pitch rises and falls**

**Lesser Kiskadee.** Call is a nasal, “hoarse, buzzy wheeeerrrr-bik!” [1:248] in which the pitch rises in the wheeeerrr and falls to a lower note for the bik. Invariable. www.xeno-canto.org/10082 by Ken Allaire

**Yellow-tailed Oriole.** A burry kink! onk kink! onk kink! with kink!‘s higher and more emphatic than the onks. Invariable. www.xeno-canto.org/148337 by Gary Stiles

**Pitch falls**

**White-throated Crake.** A mechanical, churring, “abrupt descending chuuuuurr,,rrrrrr, given at frequent intervals” [1:62]; song lasts several sec. Invariable. www.xeno-canto.org/59285 by Frank Lambert, starting at sec 9

**Pitch is steady**

**Snail Kite.** “Call a harsh creaky” [1:42] krhrhrhrhr. Invariable. About same pitch as song of Ringed Kingfisher, but notes in the trill are sung about twice as fast. www.xeno-canto.org/127155 by Thore Noernberg

**Mangrove Swallow.** A sharp, rapid trill in one-half sec, usually with about 1–3 sec between them. Invariable. Higher in pitch than the other songs in this section except American Pygmy Kingfisher; about same pitch as song of American Pygmy Kingfisher, but is weaker and less sharp. www.xeno-canto.org/274356 by Peter Boesman

**Green-and-rufous Kingfisher.** A sharp, rapid churr in one-half sec, with several or many sec between them. Invariable. Songs of Green-and-rufous and American Pygmy kingfishers are shorter than those of Red-crowned Woodpecker and Ringed Kingfisher. www.xeno-canto.org/154634 by Oswaldo Cortes at sec 10, 14, 18, etc.

**American Pygmy Kingfisher.** A sharp, rapid churr in one-half sec, with several or many sec between them. Invariable. Higher in pitch than the other songs in this section except Mangrove Swallow; about same pitch as song of that species, but is stronger and sharper. www.xeno-canto.org/133539 by John van Dort

**Red-crowned Woodpecker.** A churr of harsh, burry notes in less than 1 sec; a “loud harsh churr-r-r-r” [1:178]. Invariable. Higher, more rolling, and less sharp than song of Ringed Kingfisher. www.xeno-canto.org/31835 by Andrew Spencer: first three songs

**Ringed Kingfisher.** A strong churr of harsh, burry notes. Churrs are of two types: one lasts about 1 sec (1) and the other lasts about 1/4 sec and is typically sung in a series of about 1 churr per sec for up to about 15 sec (2). Invariable. (1) and (2) www.xeno-canto.org/43234 by Joe Klaiber

**SONG INCLUDES TRILLS OR CHURRS**

**SONG INCLUDES TRILLS**

**Barn Swallow.** A busy chattering mixed with upslurring elements and trills of about 12–15 elements per sec; sung while perched. Variable. www.xeno-canto.org/317544 by Manuel Grosselet
SONG INCLUDES CHURRS


SONG IS NOT A TRILL OR CHURR AND DOES NOT INCLUDE TRILLS OR CHURRS

ELEMENTS UPSLUR AND DOWNSLUR →

Song includes clucks


Song does not include clucks


Southern Lapwing. “Frequently gives loud raucous alarm calls…: KEER KEER KEER KEER” [1:68]. Invariable. Sharper and more emphatic than the other songs in this section. www.xeno-canto.org/57435 by Bernabe Lopez-Lanus

Wattled Jacana. Calls are nasal, harsh, and somewhat squeaky: hee, hee, hee that sound like a person laughing. Invariable. More muffled and nasal than the other songs in this section. www.xeno-canto.org/65177 by Ken Allaire


ELEMENTS UPSLUR →


ELEMENTS DOWNSLUR →

Western Osprey. A downsllurring, sharp seeuup! Invariable. www.xeno-canto.org/109038 by Andrew Spencer

ELEMENTS DO NOT SLUR

Notes are very flat, are not nasal

Green Kingfisher. A series of sharp notes, about 1–3 per sec, somewhat like the sound made by tapping two rocks together. Invariable. www.xeno-canto.org/108678 by Taylor Brooks

Notes are not flat, are nasal

Purple Gallinule. A nasal, “sharp kik!” [1:66] and a quick series of similar notes that sound like a person laughing. Invariable. (Lower pitched than laughing calls of Wattled Jacana.) www.xeno-canto.org/166168 by Mike Nelson


PART IV. KEY TO SONGS OF NOCTURNAL BIRDS IN THE FORESTS ALONG PIPELINE ROAD, AND THE FRAGMENTED FORESTS, FOREST EDGES, GRASSY AREAS, AND WETLANDS ADJACENT TO THE ENTRANCE TO PIPELINE ROAD

SONG IS A TRILL OR CHURR OR INCLUDES TRILLS OR CHURRS →

TRILL OR CHURR TERMINATES WITH A LOUD FINAL ELEMENT

TRILL OR CHURR DOES NOT TERMINATE WITH A LOUD FINAL ELEMENT

Churr lasts about 1 sec


Common Nighthawk. “Flight call (frequently given) is a nasal buzzy \textit{peent!} or \textit{beezhnt!}; during courtship, males in dive display produce a whooshing or booming sound with wings” [1:128]. Invariable. www.xeno-canto.org/75590 by William Adsett

Trill lasts 5–7 sec


Trill lasts more than 30 sec

Lesser Nighthawk. An even or “evenly pitched froglike trill” [1:128] that can last 1 min or more. Invariable. www.xeno-canto.org/42861 by Andrew Spencer

SONG IS NOT A TRILL OR CHURR AND DOES NOT INCLUDE TRILLS OR CHURRS

Elements upslur and downsler →

Tempo accelerates →


Tempo is steady

Song is a run of similar, simple elements

Spectacled Owl. “Call is a….series of short notes that become softer toward the end (sounds like muffled knocking on woody: \textit{bubububububububuhbuh}” [1:124]. Invariable. www.xeno-canto.org/92131 by William Adsett

Song is not a run of similar, simple elements

Song is composed of a high, thin whistle; or is spoken →

Song is composed of a high, thin whistle


White-tailed Nightjar. “Call consists of a short introductory note followed by a thin high-pitched whistle that rises and then falls, \textit{chik-wHEeee}” [1:130]. Invariable. Higher and clearer than song of Striped Owl. www.xeno-canto.org/118595 by David Bradley and Sandra Valderrama

Song is spoken

Mottled Owl. “Gives a variety of calls, including a muffled \textit{hWHOo}, often repeated two or more times” [1:124]. Invariable. (Lower in pitch and less nasal than song of Pauraque.) www.xeno-canto.org/78669 by William Adsett, at sec 2, 4, 11, 12, etc.

Song is not composed of a high, thin whistle; is not spoken

Song is a simple, catlike meow, weakly up/downslurring


Song is a complex arrangement of notes, strongly up/downslurring

Rufous Nightjar. A nasal, “rapid…\textit{chuck, wik-wik-WHEeoh!”} [1:130], repeated many times. Invariable. More hurried than song of Pauraque with only about 1 sec between sections and with the \textit{WHEeohs} lasting about one-half as long as the \textit{HEERRrs} of Pauraque. Also, more emphatic than song of Pauraque with stronger emphasis of \textit{chuck, wik-wik} than on the \textit{wik-wik} of Pauraque. www.xeno-canto.org/2954 by David Bradley

ELEMENTS DO NOT SLUR

Pitch falls →

Pitch is steady

Song is composed of one element →

Song is a low roar

Song is a short, sharp whistle

Short-tailed Nighthawk. “Flight call is a sharp chwit!” [1:128]. Invariable. www.xeno-canto.org/93187 by Tom Stevens

Song is composed of a series of similar elements

Lesser Nighthawk. A series of calls, each of which is a “bleating whinny” [1:128]. Invariable. www.xeno-canto.org/66590 by Jeremy Minns: starting at sec14


CONFLICT OF INTEREST

The author confirms that this article content has no conflict of interest.

ACKNOWLEDGMENTS

I am very grateful to the many people who recorded and uploaded songs to www.xeno-canto.org, and to those who maintain that valuable website: without them, this key would not be possible. I thank George Angehr (of Angehr and Dean 2010 [1]) for the almost 200 song descriptions quoted here. Domiciano Alveo and Natalia Sarco helped me learn these songs in the rainforest (not on the computer). Arch McCallum, David Lemmon, Karl Kaufmann, Chip Scialfa, Bob Pearson, and Rolando Jordán provided review and many helpful comments. Leslie and Cindy Lieurance, Beny Wilson, Gonzalo Horna, and Ariel Aguirre commented on early drafts, and Roberto Ibáñez identified and provided the recording of Striped Rocket Frog.

APPENDIX

Appendix. Counts of species and songs, and scientific names of birds in the key. x = a song often heard while the bird is in or flying over this area in addition to its primary area.

<table>
<thead>
<tr>
<th>Group</th>
<th>Scientific name</th>
<th>Common name</th>
<th>Part I (Pipeline)</th>
<th>Part II (fragmented forests)</th>
<th>Part III (wetlands)</th>
<th>Part IV (nocturnal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tinamous</td>
<td>Tinamus major</td>
<td>Great Tinamou</td>
<td>1</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Crypturellus soui</td>
<td>Little Tinamou</td>
<td>2</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ducks</td>
<td>Dendrocygna autumnalis</td>
<td>Black-bellied Whistling-Duck</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curassows, Guans, and Chachalacas</td>
<td>Ortalis cinereiceps</td>
<td>Gray-headed Chachalaca</td>
<td>1</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hawks, Eagles, and Kites</td>
<td>Pandion haliaetus</td>
<td>Osprey</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Leptodon cayanensis</td>
<td>Gray-headed Kite</td>
<td>1</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chondrohierax uncinatus</td>
<td>Hook-billed Kite</td>
<td>1</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bird Name</td>
<td>Common Name</td>
<td>Country</td>
<td>Example</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------------------</td>
<td>---------</td>
<td>---------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harpagus bidentatus</td>
<td>Double-toothed Kite</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rostrhamus sociabilis</td>
<td>Snail Kite</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leucopternis semiplumbeus</td>
<td>Semiplumbeous Hawk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buteo magnirostris</td>
<td>Roadside Hawk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buteo nitidus</td>
<td>Gray-lined Hawk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spizaetus tyrannus</td>
<td>Black Hawk-Eagle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micrastur mirandollei</td>
<td>Slaty-backed Forest-Falcon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micrastur semitorquatus</td>
<td>Collared Forest-Falcon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milvago chimachima</td>
<td>Yellow-headed Caracara</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laterallus albigularis</td>
<td>White-throated Crake</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aramides cajanea</td>
<td>Gray-necked Wood-Rail</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Porphyrio martinicus</td>
<td>Purple Gallinule</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gallinula chloropus</td>
<td>Common Gallinule</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vanellus chilensis</td>
<td>Southern Lapwing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jacana jacana</td>
<td>Wattled Jacana</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patagioenas nigrirostris</td>
<td>Short-billed Pigeon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patagioenas cayennensis</td>
<td>Pale-vented Pigeon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patagioenas speciosa</td>
<td>Scaled Pigeon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leptotila verreauxi</td>
<td>White-tipped Dove</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leptotila cassini</td>
<td>Gray-chested Dove</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geotrygon montana</td>
<td>Ruddy Quail-Dove</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brotogeris jugularis</td>
<td>Orange-chinned Parakeet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pionopsitta haematotis</td>
<td>Brown-hooded Parrot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pionus menstruus</td>
<td>Blue-headed Parrot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amazona autumnalis</td>
<td>Red-lored Parrot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amazona farinosa</td>
<td>Mealy Parrot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piaya cayana</td>
<td>Squirrel Cuckoo</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dromococcyx phasianellus</td>
<td>Pheasant Cuckoo</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neomorphus geoffroyi</td>
<td>Rufous-vented Ground-Cuckoo</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crotophaga major</td>
<td>Greater Ani</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crotophaga ani</td>
<td>Smooth-billed Ani</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Panama Bird Song Key</strong></td>
<td><strong>The Open Ornithology Journal, 2016, Volume 9</strong></td>
<td><strong>105</strong></td>
<td><strong>x</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family</td>
<td>Species</td>
<td>Common Name</td>
<td>Qty</td>
<td>Notes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------</td>
<td>------------------------------</td>
<td>-----</td>
<td>-------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owls</td>
<td>Lophostrix cristata</td>
<td>Crested Owl</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pulsatrix perspicillata</td>
<td>Spectacled Owl</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ciccaba virgata</td>
<td>Mottled Owl</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ciccaba nigrolineata</td>
<td>Black-and-white Owl</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pseudoscopyx clamator</td>
<td>Striped Owl</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Megascoops choliba</td>
<td>Tropical Screech-Owl</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Megascoops guatemalae</td>
<td>Vermiculated Screech-Owl</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Glaucidium griseiceps</td>
<td>Central American Pygmy-Owl</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nightjars</td>
<td>Lurocalis semitorquatus</td>
<td>Short-tailed Nighthawk</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chordeiles acutipennis</td>
<td>Lesser Nighthawk</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chordeiles minor</td>
<td>Common Nighthawk</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nyctidromus albicollis</td>
<td>Pauraque</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Caprimulgus rufus</td>
<td>Rufous Nightjar</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Caprimulgus cayennensis</td>
<td>White-tailed Nightjar</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potoos</td>
<td>Nyctibius grandis</td>
<td>Great Potoo</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nyctibius griseus</td>
<td>Common Potoo</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hummingbirds</td>
<td>Phaethornis longirostris</td>
<td>Long-billed Hermit</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Florisuga mellivora</td>
<td>White-necked Jacobin</td>
<td>1</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Anthracothorax nigricollis</td>
<td>Black-throated Mango</td>
<td>1</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thalurania colombica</td>
<td>Crowned Woodnymph</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Damophila julie</td>
<td>Violet-bellied Hummingbird</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Amazilia edward</td>
<td>Snowy-bellied Hummingbird</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Amazilia tzacatl</td>
<td>Rufous-tailed Hummingbird</td>
<td>1</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Amazilia amabilis</td>
<td>Blue-chested Hummingbird</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chalybura buffonii</td>
<td>White-vented Plumeleteer</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trogs</td>
<td>Trogon viridis</td>
<td>White-tailed Trogon</td>
<td>2</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trogon caligatus</td>
<td>Gartered Trogon</td>
<td>2</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trogon rufus</td>
<td>Black-throated Trogon</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trogon melanurus</td>
<td>Black-tailed Trogon</td>
<td>1</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trogon massena</td>
<td>Slaty-tailed Trogon</td>
<td>2</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motmots</td>
<td>Baryphthengus martii</td>
<td>Rufous Motmot</td>
<td>3</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electron platyrhynchum</td>
<td>Broad-billed Motmot</td>
<td>2</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Name</td>
<td>Scientific Name</td>
<td>Behavior</td>
<td>Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------</td>
<td>---------</td>
<td>-------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whooping Motmot</td>
<td>Momotus subrufescens</td>
<td>4</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Kingfishers**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Behavior</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ringed Kingfisher</td>
<td>Megaceryle torquatus</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Green Kingfisher</td>
<td>Chloroceryle amazona</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Green- and -rufous Kingfisher</td>
<td>Chloroceryle americana</td>
<td>x</td>
<td>1</td>
</tr>
<tr>
<td>American Pygmy Kingfisher</td>
<td>Chloroceryle aenea</td>
<td>x</td>
<td>1</td>
</tr>
</tbody>
</table>

**Puffbirds**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Behavior</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>White-necked Puffbird</td>
<td>Notharchus hyperrhynchus</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td>Black-breasted Puffbird</td>
<td>Notharchus pectoralis</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td>Pied Puffbird</td>
<td>Notharchus tectus</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>White-whiskered Puffbird</td>
<td>Malacoptila panamensis</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

**Jacamars**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Behavior</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great Jacamar</td>
<td>Jacamerops aureus</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Barbets and Toucans**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Behavior</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collared Aracari</td>
<td>Pteroglossus torquatus</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td>Keel-billed Toucan</td>
<td>Ramphastos sulfuratus</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td>Black-mandibled Toucan</td>
<td>Ramphastos ambiguus</td>
<td>1</td>
<td>x</td>
</tr>
</tbody>
</table>

**Woodpeckers**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Behavior</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black-cheeked Woodpecker</td>
<td>Melanerpes pucherani</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td>Red-crowned Woodpecker</td>
<td>Melanerpes rubricapillus</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Cinnamon Woodpecker</td>
<td>Celeus laricatus</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td>Lineated Woodpecker</td>
<td>Dryocopus lineatus</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td>Crimson-crested Woodpecker</td>
<td>Campephilus melanoleucos</td>
<td>1</td>
<td>x</td>
</tr>
</tbody>
</table>

**Ovenbirds and Woodcreepers**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Behavior</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buff-throated Foliage-gleaner</td>
<td>Automolus ochrolaemus</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Plain Xenops</td>
<td>Xenops minutus</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td>Scaly-throated Leaf-tosser</td>
<td>Sclerurus guatemalensis</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Olivaceous Woodcreeper</td>
<td>Sittasomus griseicapillus</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Plain-brown Woodcreeper</td>
<td>Dendrocincla fuliginosa</td>
<td>3</td>
<td>x</td>
</tr>
<tr>
<td>Ruddy Woodcreeper</td>
<td>Dendrocincla homochroa</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Northern Barred Woodcreeper</td>
<td>Dendrocolaptes sanctithomae</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Cocoa Woodcreeper</td>
<td>Xiphorhynchus susurrans</td>
<td>4</td>
<td>x</td>
</tr>
<tr>
<td>Black-striped Woodcreeper</td>
<td>Xiphorhynchus lachrymosus</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Wedge-billed Woodcreeper</td>
<td>Glyphorynchus spirurus</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Typical Antbirds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>---------------------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><em>Cymbilaimus lineatus</em></td>
<td>Fasciated Antshrike</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td><em>Thamnophilus dolius</em></td>
<td>Barred Antshrike</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><em>Thamnophilus atrinucha</em></td>
<td>Black-crowned Antshrike</td>
<td>3</td>
<td>x</td>
</tr>
<tr>
<td><em>Dysithamnus puncticeps</em></td>
<td>Spot-crowned Antvireo</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Epinecrophilla fulvicervens</em></td>
<td>Checker-throated Antwren</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Myrmotherula ignota</em></td>
<td>Moustached Antwren</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Myrmotherula asilarius</em></td>
<td>White-flanked Antwren</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><em>Microrhopias quitensis</em></td>
<td>Dot-winged Antwren</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Cercomacra tyrannina</em></td>
<td>Dusky Antbird</td>
<td>3</td>
<td>x</td>
</tr>
<tr>
<td><em>Myrmeciza exsul</em></td>
<td>Chestnut-backed Antbird</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td><em>Myrmeciza longipes</em></td>
<td>White-bellied Antbird</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><em>Hylophylax naeviosides</em></td>
<td>Spotted Antbird</td>
<td>3</td>
<td>x</td>
</tr>
<tr>
<td><em>Gymnopithys leucaspis</em></td>
<td>Bicolored Antbird</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td><em>Phaenostictus meleannani</em></td>
<td>Ocellated Antbird</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Anthruses</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Formicarius analis</em></td>
<td>Black-faced Anthrash</td>
<td>2</td>
<td>x</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Antpittas</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Hylopezus perspicillatus</em></td>
<td>Streak-chested Antpitta</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tyrant Flycatchers</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Ornithion brunnecapillus</em></td>
<td>Brown-capped Tyrannulet</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td><em>Camptostoma obsoletum</em></td>
<td>Southern Beardless-Tyrannulet</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Tyrannulus elatus</em></td>
<td>Yellow-crowned Tyrannulet</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Myiopagis gaimardii</em></td>
<td>Forest Elaenia</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td><em>Myiopagis caniceps</em></td>
<td>Gray Elaenia</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Elaenia flavogaster</em></td>
<td>Yellow-bellied Elaenia</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Mionectes oleagineus</em></td>
<td>Ochre-bellied Flycatcher</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Mionectes olivaceus</em></td>
<td>Olive-striped Flycatcher</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Zimmerius vilisimus</em></td>
<td>Paltry Tyrannulet</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><em>Myornis atricapillus</em></td>
<td>Black-capped Pygmy-Tyrant</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Todirostrum cinereum</em></td>
<td>Common Tody-Flycatcher</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td><em>Oncostoma olivaceum</em></td>
<td>Southern Bentbill</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td><em>Cnipodectes subbrunneus</em></td>
<td>Brownish Twistwing</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><em>Rynchocyclus olivaceus</em></td>
<td>Olivaceous Flatbill</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><em>Onychorhynchus coronatus</em></td>
<td>Royal Flycatcher</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Tolmomyias assimilis</em></td>
<td>Yellow-margined Flycatcher</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td><em>Platyrinchus coronatus</em></td>
<td>Golden-crowned Spadebill</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Terenotriccus erythrurus</em></td>
<td>Ruddy-tailed Flycatcher</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Common Name</td>
<td>Scientific Name</td>
<td>Song Code</td>
<td>Notes</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------</td>
<td>-----------</td>
<td>-------</td>
</tr>
<tr>
<td>Black-tailed Flycatcher</td>
<td>Myiobius atricaudus</td>
<td>x</td>
<td>1</td>
</tr>
<tr>
<td>Eastern Wood-Pewee</td>
<td>Contopus virens</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Bright-rumped Attila</td>
<td>Attila spadiceus</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Rufous Mourner</td>
<td>Rhytipterna holerythra</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Dusky-capped Flycatcher</td>
<td>Myiarchus tuberculifer</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Panama Flycatcher</td>
<td>Myiarchus panamensis</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Great Crested Flycatcher</td>
<td>Myiarchus crinitus</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Lesser Kiskadee</td>
<td>Pitangus lictor</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Great Kiskadee</td>
<td>Pitangus sulphuratus</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Boat-billed Flycatcher</td>
<td>Megarynchus pitangus</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Rusty-margined Flycatcher</td>
<td>Myiozetetes cayanensis</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Social Flycatcher</td>
<td>Myiozetetes similis</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Streaked Flycatcher</td>
<td>Myiodynastes maculatus</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Piratic Flycatcher</td>
<td>Legatus Leucophaius</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Tropical Kingbird</td>
<td>Tyrannus melancholicus</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Russet-winged Schiffornis</td>
<td>Schiffornis stenorhyncha</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Rufous Pха</td>
<td>Lipaugus unirufus</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Speckled Mourner</td>
<td>Laniocera rufescens</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Cinnamon Beward</td>
<td>Pachyramphus cinnamo- meus</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>White-winged Beward</td>
<td>Pachyramphus polychopterus</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Masked Tityra</td>
<td>Tityra semifasciata</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Black-crowned Tityra</td>
<td>Tityra inquisitor</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Golden-throated Fructcrown</td>
<td>Querula purpurata</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Golden-collared Manakin</td>
<td>Manacus vitellinus</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Blue-crowned Manakin</td>
<td>Pipra coronata</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Red-capped Manakin</td>
<td>Pipra mentalis</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Scrub Greenlet</td>
<td>Hylophilus flavipes</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Golden-fronted Greenlet</td>
<td>Hylophilus aurantifrons</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Lesser Greenlet</td>
<td>Hylophilus decurtatus</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Green Shrike-Vireo</td>
<td>Vireolanius pulchelias</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Yellow-throated Vireo</td>
<td>Vireo flavifrons</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Black-chested Jay</td>
<td>Cyanocorax affinis</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Mangrove Swallow</td>
<td>Tachycineta albitinea</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Order</td>
<td>Species</td>
<td>Common Name</td>
<td>Count</td>
</tr>
<tr>
<td>------------------------------</td>
<td>----------------------------------------------</td>
<td>----------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Hirundo rustica</td>
<td>Barn Swallow</td>
<td>x</td>
<td>2</td>
</tr>
<tr>
<td>Progne chalybea</td>
<td>Gray-breasted Martin</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td><strong>Wrens</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thryothorus fasciatoventris</td>
<td>Black-bellied Wren</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td>Thryothorus nigricapillus</td>
<td>Bay Wren</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Thryothorus leucotis</td>
<td>Buff-breasted Wren</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td>Thryothorus modestus</td>
<td>Plain Wren</td>
<td>3</td>
<td>x</td>
</tr>
<tr>
<td>Troglodytes aedon</td>
<td>House Wren</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Henicorhina leucosticta</td>
<td>White-breasted Wood-Wren</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Microcerculus marginatus</td>
<td>Scaly-breasted Wren</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Cyphorhinus phaeoccephalus</td>
<td>Song Wren</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td><strong>Gnatwrens and Gnatcatchers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ramphocelus melanurus</td>
<td>Long-billed Gnatwren</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td>Polioptila plumbea</td>
<td>Tropical Gnatcatcher</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td><strong>Thrushes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catharus satulatus</td>
<td>Swainson’s Thrush</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Turdus grayi</td>
<td>Clay-colored Thrush</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td><strong>Mockingbirds and Allies</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mimus gilvus</td>
<td>Tropical Mockingbird</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Wood-warblers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seiurus noveboracensis</td>
<td>Northern Waterthrush</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td><strong>Tanagers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rhodinocichla rosea</td>
<td>Rosy Thrush-Tanager</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td>Eucometis penicillata</td>
<td>Gray-headed Tanager</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tachyphonus luctuosus</td>
<td>White-shouldered Tanager</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td>Ramphocelus dimidiatus</td>
<td>Crimson-backed Tanager</td>
<td>x</td>
<td>2</td>
</tr>
<tr>
<td>Thraupis episcopus</td>
<td>Blue-gray Tanager</td>
<td>x</td>
<td>1</td>
</tr>
<tr>
<td>Thraupis palmarum</td>
<td>Palm Tanager</td>
<td>x</td>
<td>1</td>
</tr>
<tr>
<td>Tangara inornata</td>
<td>Plain-colored Tanager</td>
<td>x</td>
<td>2</td>
</tr>
<tr>
<td>Tangara larvata</td>
<td>Golden-hooded Tanager</td>
<td>x</td>
<td>1</td>
</tr>
<tr>
<td>Dacnis cayana</td>
<td>Blue Dacnis</td>
<td>x</td>
<td>1</td>
</tr>
<tr>
<td>Chlorophasis spiza</td>
<td>Green Honeycreeper</td>
<td>x</td>
<td>1</td>
</tr>
<tr>
<td>Cyanerpes cyaneus</td>
<td>Red-legged Honeycreeper</td>
<td>x</td>
<td>1</td>
</tr>
<tr>
<td><strong>Seedeaters, Finches, and Sparrows</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volatinia jacarina</td>
<td>Blue-black Grassquit</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sporophila americana</td>
<td>Variable Seedeater</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sporophila nigriceps</td>
<td>Yellow-bellied Seedeater</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sporophila minuta</td>
<td>Ruddy-breasted Seedeater</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Oryzoborus funereus</td>
<td>Thick-billed Seed-Finch</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Species</td>
<td>Description</td>
<td>Count</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>Arremonops conirostris</td>
<td>Black-striped Sparrow</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Saltator striaticeps</td>
<td>Streaked Saltator</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Saltator maximus</td>
<td>Buff-throated Saltator</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Saltator grossus</td>
<td>Slate-colored Grosbeak</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Habia rubica</td>
<td>Red-crowned Ant-Tanager</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Habia fuscicauda</td>
<td>Red-throated Ant-Tanager</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Cyanocompsa cyanoides</td>
<td>Blue-black Grosbeak</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Quiscalus mexicanus</td>
<td>Great-tailed Grackle</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Icterus chrysater</td>
<td>Yellow-backed Oriole</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Icterus mesomelas</td>
<td>Yellow-tailed Oriole</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Amblycercus holosericeus</td>
<td>Yellow-billed Cacique</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Cacicus uropygialis</td>
<td>Scarlet-rumped Cacique</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Cacicus cela</td>
<td>Yellow-rumped Cacique</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Psarocolius wagleri</td>
<td>Chestnut-headed Oropendola</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Euphonia luteicapilla</td>
<td>Yellow-crowned Euphonia</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Euphonia lantirostris</td>
<td>Thick-billed Euphonia</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Euphonia fulvicrissa</td>
<td>Fulvous-vented Euphonia</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Carduelis psaltria</td>
<td>Lesser Goldfinch</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**TOTALS** | 208 | 70 | 24 | 19 |

**Total species count** | **Total song count** | 216 | 321 |

**REFERENCES**