

## WINTER SONGS REVEAL GEOGRAPHIC ORIGIN OF THREE MIGRATORY SEEDEATERS (*SPOROPHILA* SPP.) IN SOUTHERN NEOTROPICAL GRASSLANDS

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**ABSTRACT.**—The winter distribution of neotropical seedeaters (*Sporophila* spp.) known as capuchinos is poorly known. There are difficulties to understanding their migration patterns: fieldwork is lacking in their wintering areas, their ‘eclipse’ plumages often make it difficult to identify species, different species share habitats during winter, and there is little or no genetic differentiation of several forms. Vocalizations display a geographic signature (i.e., diagnostic acoustic features that are found in a limited area during the breeding period) and can be useful as indicators of a specific geographic origin of a wintering bird. I present data that: (1) demonstrates that non-breeding male Dark-throated Seedeater (*S. ruficollis*), Rufous-rumped Seedeater (*S. hypochroma*), and Tawny-bellied Seedeater (*S. hypoxantha*) in wintering areas can be assigned to a particular distant breeding population based on vocalizations; (2) evaluate the potential contribution of vocal variation in other capuchinos to understand their migratory movements; and (3) use vocalizations to unravel migration patterns of capuchinos. Non-breeding males of *S. ruficollis* from the Entre Ríos regiolect were recorded in Cerrado habitat close to Vila Bela da Santíssima Trindade, Brazil and in the Beni savannas close to Trinidad, Bolivia. *S. hypochroma* from the Corrientes regiolect was recorded close to Vila Bela da Santíssima Trindade, and *S. hypoxantha* from the Entre Ríos regiolect was recorded close to Trinidad. Linking breeding and non-breeding areas through song-types is important to understand the evolutionary ecology and to promote conservation of these tiny long-distance flyers. Received 28 January 2012. Accepted 2 July 2012.

Stem-gleaner specialists are birds that feed upon seeds still borne on the stalks of natural grasses. Many of these species engage in short to long-distance seasonal migrations in response to temporal fluctuations in their food supply (Remsen and Hunn 1979, Silva 1999). One group of stem-gleaner specialists is the capuchinos, a distinctive subgroup of the genus *Sporophila*. This group is presently composed of 11 species: Dark-throated Seedeater (*S. ruficollis*), Rufous-rumped Seedeater (*S. hypochroma*), Chestnut Seedeater (*S. cinnamomea*), Marsh Seedeater (*S. palustris*), Tawny-bellied Seedeater (*S. hypoxantha*), Black-and-tawny Seedeater (*S. nigrorufa*), Copper Seedeater (*S. bouvreuil*), Pearly-bellied Seedeater (*S. pileata*), Ruddy-breasted Seedeater (*S. minuta*), Chestnut-bellied Seedeater (*S. castaneiventris*), and Black-bellied Seedeater (*S. melanogaster*) (Sick 1997; Lijtmaer et al. 2004; Areta 2008, 2010; Machado and Silveira 2011).

Capuchinos are conspicuous members of diverse neotropical grassland communities during the breeding season. Some species are known to migrate from their breeding areas in winter, but remarkably little is known about their distribution, migration ecology, and wintering areas (Ridgely and Tudor 1989, Chesser 1994).

Many species of capuchinos gather in mixed-species flocks during migration to and from breeding areas. These seasonal movements were outlined by Silva (1999), who proposed that after breeding in the grasslands of central Bolivia, northern Argentina, Uruguay, eastern Paraguay, and southeast Brazil they migrate to their main wintering area: the Cerrado region. *S. ruficollis*, *S. hypochroma*, and *S. hypoxantha* at the local scale were found mostly in spring in Concepción, Bolivia, and were considered transient long-distance migrants (Davis 1993). Similarly, *S. ruficollis* was found to be a complete migrant, *S. hypochroma* suggested to be a medium-distance migrant, and *S. hypoxantha* to be a short-distance migrant during the winter in the San Joaquín area, Bolivia (Mitchell 1997). Wintering records of *S. cinnamomea* and *S. palustris* suggest they do not venture into central Bolivia and western Mato Grosso (Ridgely and Tudor 1989), but gather in large flocks with other species including *S. hypoxantha*, *S. melanogaster*, *S. ruficollis*, *S. bouvreuil*, *S. castaneiventris*, *S. caerulescens*, *S. nigricollis*, and *S. albogularis* during mid September in Minas Gerais, Brazil (Sick 1997). *S. ruficollis*, *S. hypochroma*, *S. cinnamomea*, and *S. palustris* are encountered only in migratory passage in eastern Formosa, Argentina to and from more southern breeding areas in eastern Argentina, Uruguay, and southeastern Brazil (Ridgely and Tudor 1989, Di Giacomo 2005).

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At least two species have migratory and resident populations: the population of *S. hypoxantha* of eastern Formosa is resident with birds gathering in wintering flocks and wandering over local grasslands (Di Giacomo 2005), and a presumably resident population of *S. ruficollis* inhabits the Alto Madidi Savannas (Areta et al. 2011). These data show the existence of complex spatial and temporal associations of several species. For example, some species migrate together in mixed-species flocks, but later breed in close proximity but in different habitats, and finally take divergent migration routes to their non-breeding areas. The mechanisms and patterns behind this bewildering complexity have yet to be unraveled.

Three main reasons account for the scant knowledge of migration of capuchinos. First, sampling effort has been low in the relevant areas (Silva 1999). Second, it can be difficult to reliably identify capuchinos to species based on plumages during winter (Pearce-Higgins 1996, Sick 1997, Areta 2009, Kirwan and Areta 2009). Third, the birds are too small to follow with tracking devices.

Movements between breeding and non-breeding areas are unknown for any individual of the migrant populations of capuchinos. Use of vocalizations seems a potentially powerful way to uncover the details of their migration patterns given the lack of genetic differentiation reported to date (Lijtmaer et al. 2004, Campagna et al. 2011), and the diagnostic differences in their voices (Areta 2008, Areta and Repenning 2011, Areta et al. 2011).

Vocalizations have been used successfully to reconstruct the migratory trajectory of some birds, but this approach has seldom been used in the Neotropics (Dowsett-Lemaire 1979; see Chu 2001, Marler and Slabbekoorn 2004: 129). Schwartz (1975), in a unique study of the *Sporophila*, demonstrated the existence of two divergent migratory routes and breeding areas of Lined Seedeaters (*S. lineola*) based on their vocalizations. This method allowed for a more precise delineation of the migration routes of *S. lineola* (Silva 1994, Neto and Vasconcelos 2007); it was later proposed that further work with vocalizations of *S. lineola* might show the existence of other geographical variants (Areta and Almirón 2009).

My objectives are to: (1) present data that demonstrates that non-breeding male *S. ruficollis*, *S. hypochroma*, and *S. hypoxantha* in wintering

areas can be assigned to a particular distant breeding population based on their vocalizations, (2) evaluate the potential contribution of vocal variation in other capuchinos to understand their migratory movements, and (3) use vocalizations to unravel migration patterns in capuchinos.

## METHODS

I recorded vocalizations of all species using different microphones (audioTechnica 815b, Sennheiser ME-67 protected with a Rycote 6 Kit [shock-mount, windshield, and windjammer], Sennheiser ME-62 mounted on a Telinga Universal Parabola or on a 60-cm parabola), and tape recorders (Marantz PMD-222, PMD-661, and Sony TC-D5M). Spectrograms were prepared using Syrinx 2.1 (John Burt, www.syrinxpc.com). Additional recordings were provided by other investigators (Appendices 1, 2). All recordings by JIA are archived at the Macaulay Library of Natural Sounds (MLNS, Cornell Laboratory of Ornithology, Ithaca, NY, USA). The comparative data set for this study consists of recordings of the vocalizations of 348 individuals of all species of capuchinos from 49 localities (Fig. 1; Appendices 1, 2; Areta 2008, 2010; Areta and Repenning 2011; Areta et al. 2011).

Songs of capuchinos include many different, non-repetitive, and morphologically complex notes. I characterized notes which, based on shape (including duration and frequency distribution) and relative position in the songs, could be identified unambiguously despite variation among individuals. The frequency of occurrence of these notes in individuals was compared within and among populations. The analysis was limited to sexually mature males, identified based on the possession of fully adult plumages. Only male capuchinos are known to sing regularly, while the repertoire of females usually consists of high-pitched notes (Areta 2008; JIA, unpubl. data). Males of three species of capuchinos, *S. ruficollis*, *S. hypochroma*, and *S. hypoxantha* sing different songs depending on where they breed, and different macrogeographic song variants or regiolects (“song variants encompassing extensive subpopulations of a species and all individuals within this large range” Martens [1996:221]) have been defined based on the presence of diagnostic notes in their vocalizations. The known song types of *S. ruficollis* have been separated into: (1) Mesopotamia (Argentina), and (2) Apolo Madidi Savannas (Bolivia) regiolects (Fig. 1A;

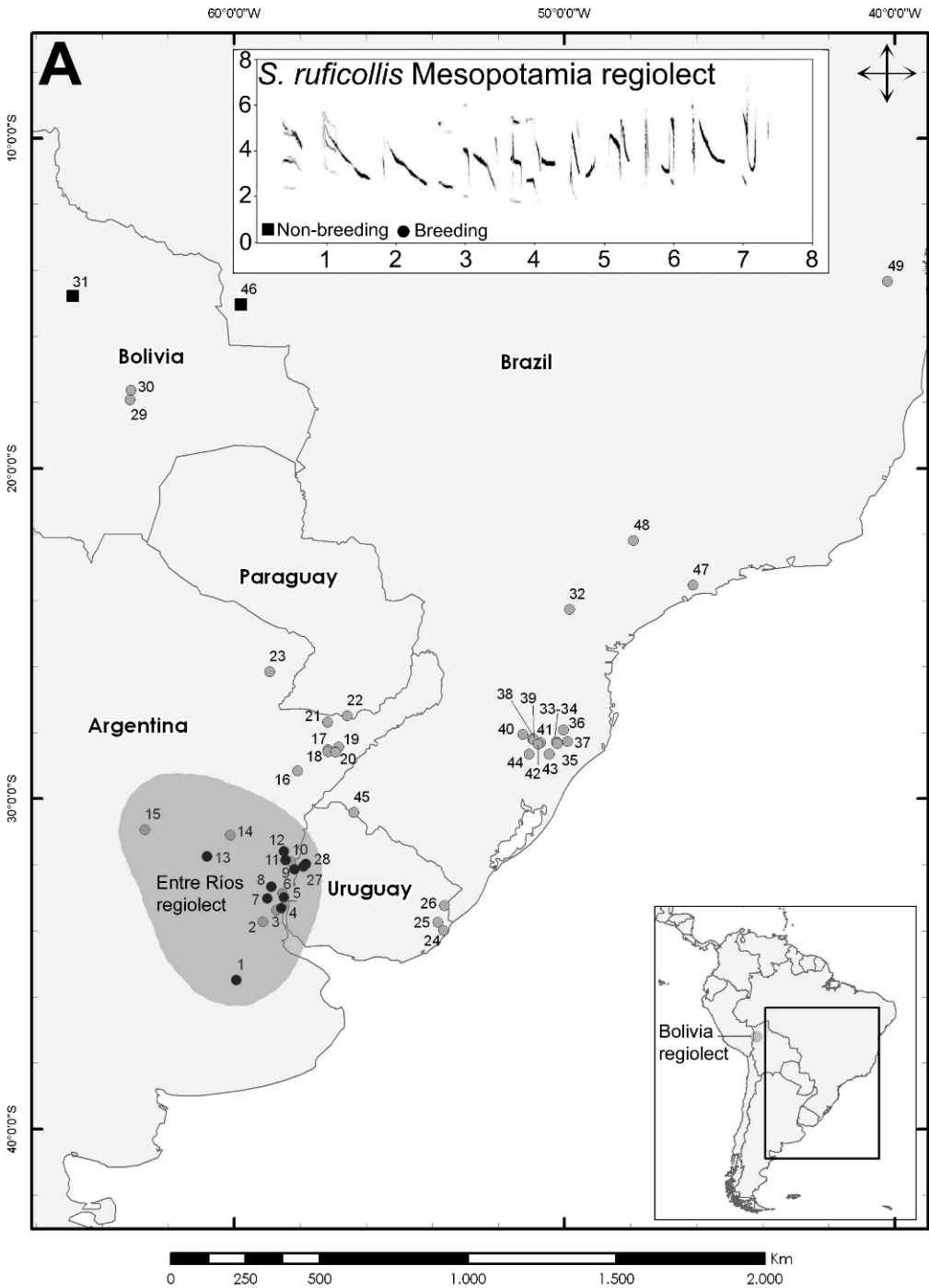
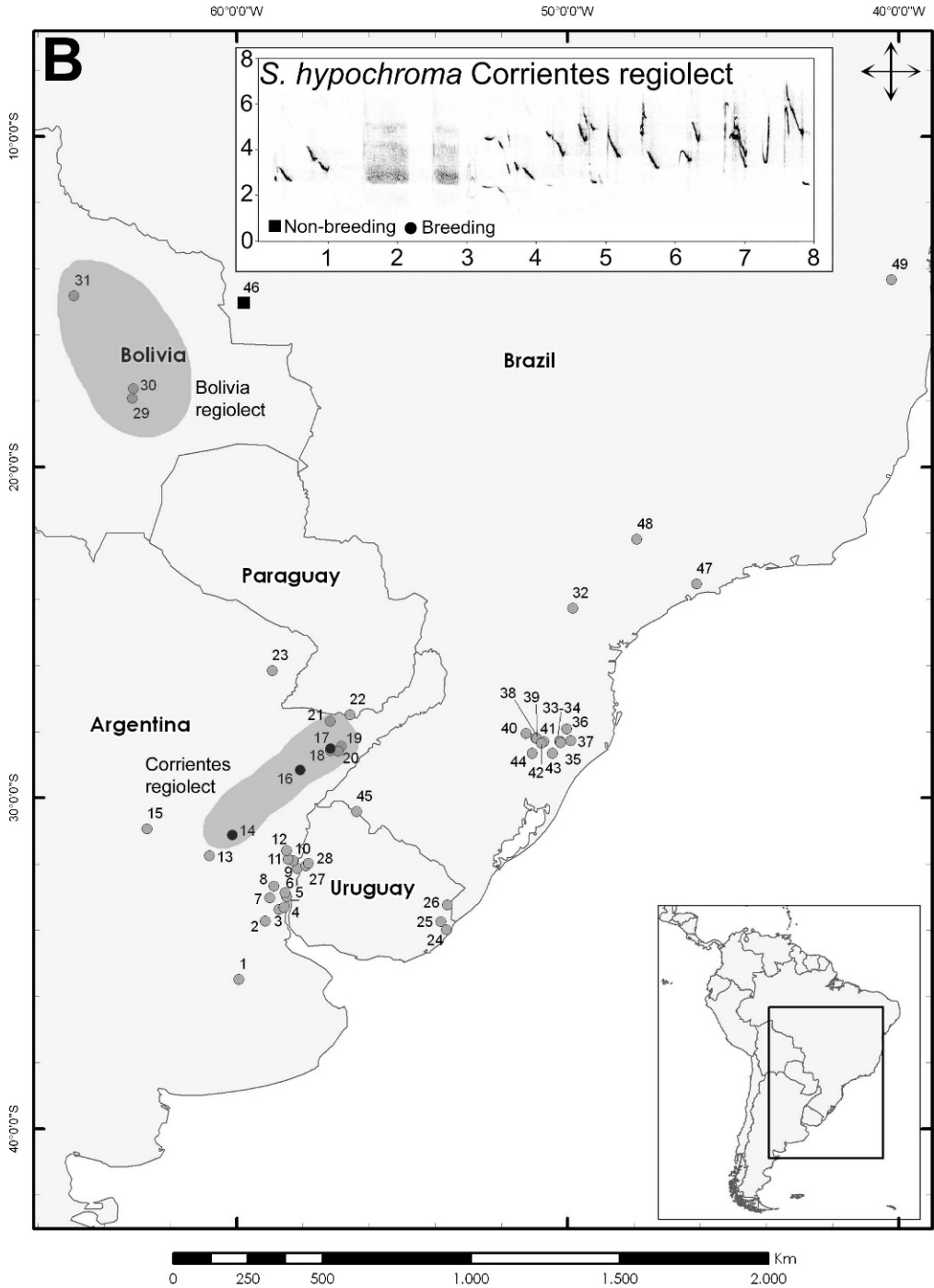
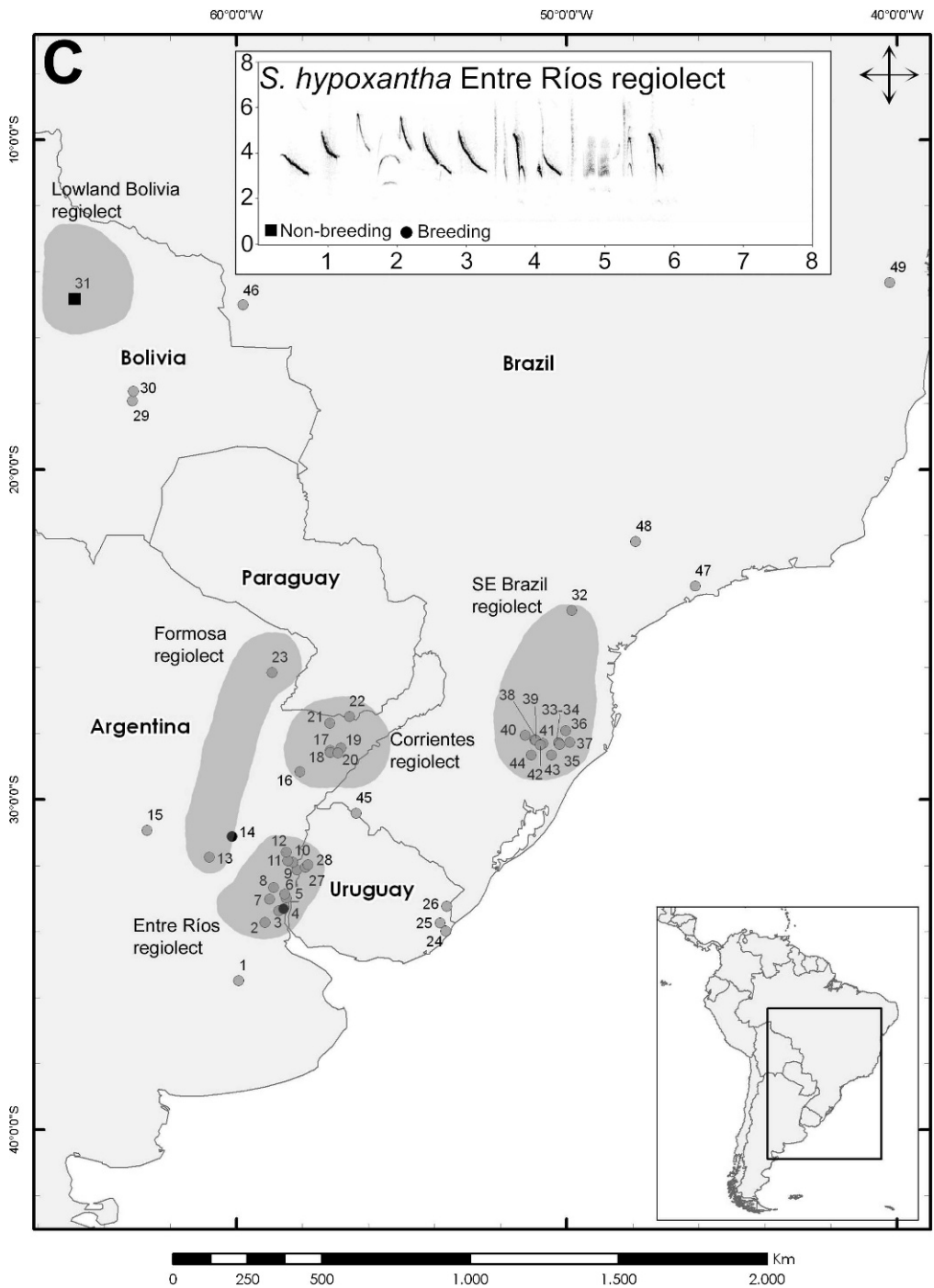


FIG. 1. Geographic distribution of sampling points where capuchinos were recorded and spectrograms showing song-types recorded in breeding areas that match those recorded in non-breeding areas of three species. (A) Dark-throated Seedeater (*S. ruficollis* Entre Ríos regiolect; wintering: 31 and 46, breeding: 1, 4, 5, 7, 8, 9, 11, **12**, 13, 27 and 28), (B) Rufous-rumped Seedeater (*S. hypochroma* Corrientes regiolect; wintering: 46, breeding: **14**, 16, 17), and (C) Tawny-bellied Seedeater (*S. hypoxantha* Entre Ríos regiolect; wintering: 31, breeding: **4** and 14). Numbers in the map and between



←  
brackets indicate recording localities. Bold numbers indicate recording locality of shown spectrogram. Shaded areas indicate approximate limits of regiolects (precise localities in Appendices 1, 2). Gray circles indicate sampling localities of vocalizations for all species of capuchins in southern South America. Black circles indicate localities where song-types recorded during the breeding season match those recorded during the non-breeding season. Dark squares indicate localities where song-types recorded during the non-breeding season match those recorded during the breeding season.



Areta et al. 2011). Songs of *S. hypochroma* have been separated into: (1) Corrientes (eastern populations, Argentina), and (2) Bolivia (western populations, Bolivia) regiolects (Fig. 1B; Areta 2010). Songs of *S. hypoxantha* have been separated into: (1) Entre Ríos (Argentina), (2) Corrientes (Argentina), (3) Formosa (Argentina), (4) south-east Brazil (Brazil), and (5) Bolivia (Bolivia) regiolects (Fig. 1C; Areta and Repenning 2011).

Vocalizations display a geographic signature (i.e., diagnostic acoustic features that are found in a limited area during the breeding period) and could be useful as indicators of a specific geographic origin. I investigated the correspondence between songs recorded during the breeding season in known breeding areas and songs recorded outside the breeding season in presumed wintering areas of *S. ruficollis*, *S. hypochroma*, and *S. hypoxantha*.

## RESULTS

**Dark-throated Seedeater (*S. ruficollis*).**—I tape recorded a mixed-species flock in the Beni savannas on 26 October 2006, close to the city of Trinidad (64° 54' W, 14° 50' S), Beni, Bolivia. I visually identified adult males of *S. ruficollis*, *S. hypoxantha*, and *S. hypochroma* as part of the flock which had ~200 *Sporophila* individuals. I found songs identical to that of *S. ruficollis*, belonging to an undetermined number of birds. I tape recorded a male on 16 June 2008 in the seasonally inundated cerrado of the Campos do Encanto (59° 48' W, 15° 03' S), close to Vila Bela da Santíssima Trindade, Mato Grosso, Brazil. The bird was heard singing and was immediately identified as *S. ruficollis*. I observed the singing male after the tape-recording. It had a yellow base to the lower mandible, light brownish-gray back, gray cap, light creamy-rufous belly, and had a few dark-brown feathers in the throat, making it identifiable to species based on plumage. The voice-type of both recordings is known to exist in males breeding in Entre Ríos, Santa Fé, Buenos Aires (Argentina), Paysandú (Uruguay), and Rio Grande do Sul (Brazil). The minimum distances between wintering localities and the breeding area is ~1,800 km (Vila Bela-Paysandú) or 2,300 km (Vila Bela-Saladillo) (Fig. 1A).

**Rufous-rumped Seedeater (*S. hypochroma*).**—I tape recorded a male on 16 June 2008 in the seasonally inundated cerrado of the Campos do Encanto, close to Vila Bela da Santíssima Trindade, Mato Grosso, Brazil. The bird was

heard singing and was immediately identified as *S. hypochroma*. I observed the singing male after tape-recording and it only displayed a few somewhat light-orangish feathers on the otherwise creamy throat. The belly had a few light-orangish feathers, and the back and cap were light-brown. This male was not possible to identify to species based on plumage features. This voice-type is known from males breeding in Corrientes and Santa Fé (Argentina). The minimum distances between the wintering locality and the breeding area is ~1,500 km (Vila Bela-Esteros del Iberá) or 1,700 km (Vila Bela-Campo del Medio) (Fig. 1B).

**Tawny-bellied Seedeater (*S. hypoxantha*).**—I tape recorded a male in the Beni savannas on 26 October 2007, close to the city of Trinidad (64° 54' W, 14° 50' S), Beni, Bolivia. The bird was heard singing and was immediately identified as *S. hypoxantha*. The bird could not be seen while singing as it was hidden amid vegetation. Three birds were flushed from the precise spot where the bird appeared to be singing. At least one was *S. hypoxantha*, but it did not show any diagnostic plumage feature. This voice-type is known exclusively from Entre Ríos (Argentina), although presumably transient individuals were also recorded at a locality in Santa Fe (Argentina). The minimum distance between the wintering locality and the breeding area is ~2,150 km (Trinidad-Guaqueyachú) (Fig. 1C).

## DISCUSSION

The large geographic area over which capuchinos are distributed during the non-breeding season, acquisition of confusing 'eclipse' plumages, sharing of habitats among species during winter, and lack of, or scant genetic differentiation of several forms pose difficulties to understanding their migration patterns within South America. Vocalizations can partly overcome these difficulties, and reveal important biogeographic and ecological relationships between distant breeding and non-breeding areas for *S. ruficollis*, *S. hypochroma*, and *S. hypoxantha* (Fig. 1). Sample sizes of recordings of wintering birds are small, but geographic coverage and sample sizes of breeding birds are satisfactory; thus, the migration patterns uncovered are unequivocally supported by my data.

The Cerrado region and the upland Amazonian savannas of Humaitá (Brazil) were recognized as two important wintering areas for *S. ruficollis*



(Silva 1999). *S. ruficollis* overwintering in the Cerrado region are, at least in part, from the southern and easternmost breeding areas in Entre Ríos, Santa Fé, Buenos Aires, Paysandú, and/or Rio Grande do Sul. However, there is no evidence suggesting where birds wintering in Humaitá breed. The wintering populations of *S. ruficollis* in the cerrado of central Bolivia are completely migratory (Davis 1993, Mitchell 1997), and the source of these populations remains unknown.

The main wintering areas identified for *S. hypochroma* are the Cerrado region and central Brazil (Silva 1999). Populations from Corrientes (to which I add Santa Fé) that Short (1969) attributed to *S. hypochroma* seem to overwinter in the Cerrado of eastern Brazil, but precise evidence of the source populations of birds in central Brazil is lacking. The western populations of *S. hypochroma* have been considered mid-distance northward austral migrants during winter (Mitchell 1997). At least two populations with distinct vocal types are involved within *S. hypochroma* as currently delineated (JIA, unpubl. data). Further recordings of *S. hypochroma* should prove rewarding to elucidate both the systematics and the migration of this poorly known species.

The Cerrado region is also considered an important wintering area for *S. hypoxantha* (Silva 1999). Possible short- and long-distance migrant populations of *S. hypoxantha* might coexist in the Cerrado during winter. This seems to be the case in the Trinidad grasslands where presumably resident or short-distance migrants from the lowland Bolivia regiolect co-occur together with long-distance migrants from the Entre Ríos regiolect. The overall seasonal patterns of *S. ruficollis*, *S. hypochroma*, and *S. hypoxantha* in Concepción (Bolivia; Davis 1993) were interpreted as consistent with different migratory movements: “long-distance temperate-tropical migration, intraregional migration, local wandering or several of these categories applied to the same individuals or populations over several years” (Joseph 1996:190). My vocal data support the long-distance migration hypothesis for *S. hypoxantha* in Trinidad, and for *S. hypochroma* and *S. ruficollis* in Vila Bela. Neither my data, nor previously published studies (Ridgely and Tudor 1989, Davis 1993, Pearce-Higgins 1996, Mitchell 1997, Silva 1999) support Short’s (1975) claim that *S. hypoxantha* (including *S. ruficollis* and *S. palustris*) and *S. hypochroma* are non-migratory at a wide scale. The general pattern suggests at least

some populations of these species migrate long distances, but some resident local populations may remain at or close to their breeding areas in wintering flocks.

The lack of geographic variation in vocalizations of *S. cinnamomea* and *S. palustris* (Areta 2008) suggest that, whereas voices can aid in identification of wintering males, they cannot be used to identify the origin of individuals of these species. The locally-breeding *S. nigrorufa* and *S. melano-gaster* have little or no geographic variation in song-types (Areta 2010; Repenning et al. 2010; JIA, unpubl. data). Geographic variation in vocalizations of populations of *S. bouvreuil* and *S. pileata* could provide useful guidance to allocate wintering birds to a specific breeding area (Areta 2010; Machado and Silveira 2010; JIA, unpubl. data).

Vocalizations have three advantages that make them promising tools to unravel the migration patterns of capuchinos. First, they can be detected, recorded, and identified from a fairly long distance, partially overcoming the problems associated with surveying a large wintering area. Second, they do not vary seasonally for sexually mature males. Third, they are geographically structured for some species (Areta and Repenning 2011, Areta et al. 2011). In contrast, plumage traits vary seasonally and seem fairly uniform over the geographic range of the species. Vocalizations may prove to be a useful tool to uncover migration patterns of capuchinos. Future migration, biogeographic, ecological, evolutionary, and conservation studies of seedeaters will benefit enormously from this source of information.

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APPENDIX 1. Recording localities that correspond to numbers in Table 1.

**ARGENTINA. Buenos Aires.** 1-Saladillo (59° 56' W, 35° 30' S). **Entre Ríos.** 2-Ibicuy (59° 09' W, 33° 44' S), 3-Arroyo Ñancay (58° 44' W, 33° 23' S), 4-Estancia La Marita (58° 35' W, 33° 20' S), 5-Guaaleguaychú (58° 30' W, 33° 00' S), 6-Las Piedras (58° 33' W, 32° 53' S), 7-Larroque (59° 00' W, 33° 02' S), 8-Urdinarrain (58° 53' W, 32° 41' S), 9-Puerto Liebig and Arroyo Caraballo (58° 11' W, 32° 09' S), 10-PN El Palmar (58° 18' W, 31° 55' S), 11-Arroyo Baru (58° 27' W, 31° 52' S), 12-San Salvador (58° 30' W, 31° 37' S). **Santa Fé.** 13-Sauce Viejo (60° 50' W, 31° 46' S), 14-Campo del Medio (60° 08' W, 31° 08' S). **Córdoba.** 15-Laguna Mar Chiquita (62° 43' W, 30° 57' S). **Corrientes.** 16-Mercedes (58° 05' W, 29° 10' S), 17-Estancia Rincón del Socorro (57° 10' W, 28° 32' S), 18-Colonia Pellegrini (57° 10' W, 28° 35' S), 19-Cambá Trapo (56° 51' W, 28° 27' S), 20-Cuenca del Río Aguapey (56° 56' W, 28° 36' S), 21-Estancia San Juan Poriahú (57° 11' W, 27° 42' S)/PN Mburucuyá (58° 05' W, 28° 00' S), 22-Rincón Santa María (56° 35' W, 27° 30' S). **Formosa.** 23-Estancia El Bagual (58° 56' W, 26° 10' S). **URUGUAY. Rocha.** 24-Laguna Negra (53° 40' W, 34° 00' S), 25-Bañados de la India Muerta (53° 50' W, 33° 45' S), 26-Cebollatí (53° 38' W, 33° 15' S). **Paysandú.** 27-Lorenzo Geyres-Quebracho (57° 55' W, 32° 04' S), 28-Queguayar (57° 50' W, 32° 00' S). **BOLIVIA. Santa Cruz.** 29-Lomas de Arena (63° 10' W, 17° 56' S), 30-Pampas de Viru-Viru (63° 08' W, 17° 39' S). **Beni.** 31-Trinidad-Mamoré (64° 54' W, 14° 50' S). **BRAZIL. Paraná.** 32-Faz Chapadão-Rio das Perdizes (49° 51' W, 24° 17' S). **Santa Catarina.** 33-Coxilha Rica (50° 15' W, 28° 18' S), 34-Estancia do Meio (50° 15' W, 28° 18' S), 35-Rio São Mateus (50° 13' W, 28° 21' S), 36-Pedra Branca (50° 02' W, 27° 55' S), 37-São Joaquim/Lages (49° 55' W, 28° 17' S). **Rio Grande do Sul.** 38-Capão Alto (50° 58' W, 28° 12' S), 39-São Pedro (50° 56' W, 28° 13' S), 40-Capão Bonito (51° 16' W, 28° 04' S), 41-Antiga Estação Férrea-Bom Jesus (50° 44' W, 28° 19' S), 42-Fazenda Socorro/Rio Santana (50° 48' W, 28° 22' S), 43-Cachoeira dos Baggio (50° 28' W, 28° 40' S), 44-Guacho (51° 05' W, 28° 40' S), 45-Distrito Areal-Quaraí (56° 23' W, 30° 26' S). **Mato Grosso.** 46-Campos do Encanto-Vila Bela da Santíssima Trindade (59° 48' W, 15° 03' S). **São Paulo.** 47-Mogi das Cruzes (46° 07' W, 23° 33' S),

48-Estação Ecológica Itirapina (47° 55' W, 22° 12' S). **Bahia.** 49-Boa Nova (40° 13' W, 14° 21' S).

APPENDIX 2. Recordings analyzed in this study. Number in square brackets denotes number of individuals and number in parentheses indicates reference number in the data base. All recordings by JIA except those indicated by **AJ** = Alvaro Jaramillo, **BH** = Bennet Hennesey, **BO** = Brian O'Shea, **CD** = Charles Duncan, **CM** = Curtis Marantz, **DM** = Diego Monteleone, **EM** = Eugene Morton, **FJ** = Fernando Jacobs, **FS** = Fabio Silva, **HR** = Heimz Remold, **LD** = L. Davis, **MR** = Marcio Repenning, **MP** = Mark Pearman, **PAS** = Paul Schwartz, **RF** = Rosendo Fraga, **SD** = Susan Davis, **SM** = Sjoerd Maijer, **TP** = Ted Parker III, and **QV** = QuillénVidóz.

**S. castaneiventris** [2]. **BRAZIL.** Bajo Río Uaipas, Amazonas [1] (CM1: MLNS-113196-113197), Careiro do Castanho, Amazonas [1] (CM2: MLNS-127641).

**S. melanogaster** [12]. **BRAZIL. 2007–2009:** Pedras Brancas [1] (1), São Joaquim/Lages [1] (2), Coxilha Rica [6] (4–9), Bom Jesus [1] (3), Fazenda Socorro [1] (10). **1979–1982:** São Francisco de Paula [2] (FS11: MLNS-25401, TP12: MLNS-32160-32161).

**S. 'xumanxu'** [4]. **BRAZIL.** Coxilha Rica [1] (MR1), Estância do Meio [1] (MR2), Bom Jesus [1] (MR3), Rio Santana [1] (MR4).

**S. minuta** [23]. **VENEZUELA.** Caracas [19] (PAS1-19: MLNS-15470-15484, 15486–15489), Santa Elena de Guairén [1] (CD1: MLNS-110188). **GUYANA.** Rio Corantyne [1] (BO1: MLNS-134808). **MEXICO.** Chuhuites [1] (LD1: MLNS-15485). **PANAMA.** Tocumún [1] (EM1: MLNS-15490).

**S. hypoxantha** [103+]. **ENTRE RÍOS REGIOLECT** [14]. **ARGENTINA.** Estancia La Marita [13] (1–5, 7, 32–37), Campo del Medio [1] (38). **BOLIVIA.** Trinidad (1) [63]. **FORMOSA REGIOLECT** [19]. **ARGENTINA.** Estancia El Bagual [16] (43–58), Estancia La Marita [1] (6), Campo del Medio [2] (39, 40). **CORRIENTES REGIOLECT** [24]. **ARGENTINA.** Colonia Pellegrini (8, 9, 12–13, 17), Cambá Trapo [2] (10, 11), Mercedes (14–16, 28), Estancia Rincón del Socorro [14] (18–27, 29–31, 42). **LOWLAND BOLIVIA REGIOLECT.** Trinidad [2+] (SM68-69, + several in non-breeding mixed species flocks). **SOUTH-EAST BRASIL REGIOLECT** [43]. **BRAZIL.**

- 1971:** Guacho/Vacaria [3]. (PAS123-125: MLNS 67596-67598). **2004–2009:** Coxilha Rica [23] (MR89-90, 93–95, 97, 99–105, 108–113, 118, 120–122), Estância do Meio (4) [MR86, 91, 96, 98], Fazenda Socorro/Rio Santana [3] (80, 82, MR88, 114), Lages [1] (MR64), Capão Alto [3] (MR85, 115–117), Capão Bonito [1], São Pedro [2] (MR84-85), Cachoeira dos Baggio [1] (107), Rio São Mateus [1] (MR119), Guacho [2] (MR87, 92), Fazenda Chapadão-Rio das Perdizes [1] (MR106).
- S. ‘uruguaya’ [2]. CORRIENTES REGIOLECT.** Estancia Rincón del Socorro [1] (2). **SOUTHEAST BRAZIL REGIOLECT.** Coxilha Rica [1] (MR1).
- S. hypochroma [28]. CORRIENTES REGIOLECT [20]. ARGENTINA. 1993:** Esteros del Iberá [AJ18-19]. **2004–2008:** Colonia Pellegrini [6] (2–5, 7–8), Estancia Rincón del Socorro [7] (9–15), Campo del Medio [2] (16–17), Esteros del Iberá [2] (20–21). **BRAZIL. 2004–2008.** Vila Bela da Santíssima Trindade [1] (25). **BOLIVIA REGIOLECT [6]. BOLIVIA.** Pampas de Viru-Viru [2] (SD22, 29), Trinidad [1] (30), Lomas de Arena [3] (QV26-28).
- S. cinnamomea [24]. ARGENTINA. 1992–1993:** Mercedes [2] (AJ21, AJ22), PN El Palmar [1] (MP23), Caza Pava-Corrientes [1] (MP24). **2003–2007:** Estancia Rincón del Socorro [9] (1–5, 7–10), Mercedes [1] (1), Colonia Pellegrini [2] (11,12), Gualeduaychú [1] (13). **URUGUAY. 2003–2007:** Lorenzo Geyres [5] (14–18), San Javier-Rio Negro [1] (RF19), Villa Soriano-Rio Negro [1] (RF20).
- S. ruficollis [83]. ENTRE RÍOS REGIOLECT [79]. ARGENTINA.** Arroyo Baru [8] (4–11), Larroque-Urdinarraín [11] (20–27,38–40), San Salvador [6] (12–17), Gualeduaychú [5] (33–37), Estancia La Marita [4] (1,2,18,19), Puerto Liebig and Arroyo Caraballo [1] (3), Sauce Viejo [5] (28–32), Saladillo [10] (41–50). **BOLIVIA.** Trinidad [1] (94). **BRAZIL.** Vila Bela da Santíssima Trindade [1] (92). **URUGUAY.** Lorenzo Geyres-Quebracho [26] (51–76), Queguayar [2] (77,78). **BOLIVIA REGIOLECT [4]. BOLIVIA.** Apolo-Madidi [4] (BH88-91).
- S. ‘caraguata’ [3]. ARGENTINA.** Las Piedras [1] (1), Ibicuy [1] (2), Gualeduaychú [1] (3).
- S. palustris [34]. ARGENTINA. 1991–1993:** Mercedes [1] (AJ30), Gualeduaychú [2] (MP32, MP34), Banco Caraballo–Entre Ríos [1] (MP33). **2003–2007:** Estancia La Marita [2] (1,2), Colonia Pellegrini [2] (3,4), Estancia Rincón del Socorro [11] (5–14, DM31), Estancia Santa Isabel-Corrientes [1] (RF28), Bañado Santa Rosa – Corrientes [1] (RF29). **URUGUAY. 2003–2007:** Bañados de la India Muerta [6] (15–20), Cebollati [7] (21–27).
- S. ‘zelichi’ [3]. ARGENTINA. 1992:** Gualeduaychú [1] (MP3). **2003–2007:** Gualeduaychú [1] (1), Estancia Rincón del Socorro [1] (2).
- S. nigrorufa [9]. BOLIVIA.** Flor d’Oro, PN Noel Kempff Mercado [2] (SM1-2). **BRAZIL.** Vila Bela da Santíssima Trindade [7] [3–9].
- S. bouvreuil [6]. SÃO PAULO REGIOLECT. BRAZIL [4].** Mogi das cruces [1] (1), Taiaçupeba [3] (2–4). **BAHIA REGIOLECT. BRAZIL [2].** Boa Nova [2] (5–6).
- S. pileata [13]. GUARANÍ REGIOLECT [2]. ARGENTINA. 2005–2007:** Campo San Juan [1] (6). **PARAGUAY. 2002:** Estancia La Yegreña (Itapuá) [1] (RF11). **CORRIENTES REGIOLECT [6]. ARGENTINA. 1997:** Estancia San Juan Poriahú [1] (RF12). **2005–2007:** Rincón Santa María [5] (1–5). **SÃO PAULO REGIOLECT. BRAZIL [5]. 1999:** Serra da Canastra [3] (CM14: MLNS 113420–113422, TP13: MLNS-39143, HR16: MLNS-114653). **2007:** Estação Ecológica Itirapina [4] (7–10).