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ARTICLE

Breeding behavior, distribution, and conservation of the Sharp-tailed Tyrant *Culicivora caudacuta* (Vieillot, 1818) (Aves: Tyrannidae), a South American grassland specialist

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Abstract. *Culicivora caudacuta* occurs in the Cerrado, Pampa and Chaco grasslands of Bolivia, Brazil, Paraguay, Argentina and Uruguay. Its breeding biology is poorly known. Here, I present a summary of the published information and new data gathered between 2003 and 2009 in southeast Brazil at Tapira, Minas Gerais. Breeding occurred during the rainy season (October to March), clutch size being three eggs. Juveniles and immatures show a different plumage from the adults, mostly brownish orange. All nests studied at Tapira showed evidence of cooperative breeding, with one helper engaged in incubation and provisioning the young. This is the first observations of this behavior for the species. The species has a wider range than currently understood and its presence in protected areas is similarly more common.

Keywords. Nest description; Cooperative breeding; Eggs; Young plumage; Records.

INTRODUCTION

The Sharp-tailed Tyrant *Culicivora caudacuta* (Fig. 1) is a small tyrant flycatcher (Tyrannidae: Elaeniinae) described in 1818 by Louis Jean Pierre Vieillot (1748-1830) as *Muscicapa caudacuta* (Le Moucherolle a queue en aiguille), based on the original description of the "Cola de agujas" (№ 277) from Paraguay by Félix de Azara (1746-1821) (Vieillot, 1818). Later, in 1822, Coenraad Jacob Temminck (1778-1858) described the same bird under the name *Muscicapa stenura* (Gobe-Mouche a queue grêle), with an illustration (Fig. 2) based on specimens (Fig. 3) collected in Brazil (São Paulo state) during the expedition of the Austrian naturalist Johann Natterer (1787-1843) (Temminck, 1822; Cory & Hellmayr, 1927).

Culicivora caudacuta occurs in central South America in habitats dominated by tall grasses and bushes in the Cerrado, Chaco and Pampa of Bolivia, Brazil, Paraguay, Argentina and Uruguay (Azpiroz, 1998; Fitzpatrick, 2004; Lopes *et al.,* 2009).

Brazil accounts for most of the species' range, with records in the states of Amazonas, Maranhão, Tocantins, Bahia, Mato Grosso, Mato Grosso do Sul, Goiás, Distrito Federal, Minas Gerais, São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul (Lopes *et al.,* 2009; WikiAves, 2020).

There are few studies of its biology and breeding behavior, the first data being gathered in Argentina in the early 20th century (Hartert & Venturi, 1909), with little published since then. Most of the available information refers to breeding records and the presence of nests, young or immatures in the Brazilian states of Tocantins (Dornas & Pascoal, 2019), Distrito Federal (Marini *et al.,* 2012), Goiás (Hass & Silva e Silva, 2008), Minas Gerais (Ribon *et al.,* 1995; Silveira, 1998; Lombardi *et al.,* 2010; Peixoto, 2014), Santa Catarina and Rio Grande do Sul (Fontana *et al.,* 2003; Rovedder *et al.,* 2007; Fontana *et al.,* 2008; Repenning *et al.,* 2010), and in Paraguay in Itapúa Department (Smith, 2017).

More detailed data on the breeding biology of *C. caudacuta* were gathered at the Distrito Federal (Braz, 2008; Sousa & Marini, 2007), Goiás (Braz, 2008) and Minas Gerais (Silva e Silva, 2006) in Brazil, and Formosa (Di Giacomo, 1996, 2005; Di Giacomo *et al.,* 2011) in Argentina.

Here I summarize all the available information on the distribution and breeding biology of *C. caudacuta,* and add new data mostly based on observations carried out at Tapira, Minas Gerais state, southeast Brazil, with the first observations of cooperative breeding by this species.

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MATERIAL AND METHODS

Study area

The main study area is in the municipality of Tapira, southeast Minas Gerais, on the property of Fosfertil (now Mosaic Fertilizantes) known as Tapira Mining Complex (Complexo de Mineração de Tapira – CMT). This covers an area of 7,150.86 ha, including the largest phosphate mining operation in Latin America, with elevations from 950 to 1,300 m a.s.l. The area has several tailing dams (BDs) built to receive the discards from the mining process and protect the watershed downstream from the CMT (Santos *et al.,* 2002). One of these dams, BD-5 (Fig. 4) (19°49′36″S, 46°50′14″W, elevation 1,160 m), covers an area of 46 ha, and was formed by the damming of the Potreiro and Boa Vista creeks, showing varied aquatic habitats with cattails *Typha domingensis* (Typhaceae), muddy shores and open-water areas with different depths.

This dam is surrounded by open Cerrado, with *campos limpos* (open grasslands) and *campos sujos* (grasslands with scattered bushes) showing a mix of invasive exotic grasses such as *Melinis minutiflora* (Poaceae) and *Brachiaria decumbens* (Poaceae), and native ones as *Echinolaena inflexa* (Poaceae), with scattered bushes, such as *Baccharis dracunculifolia* (Asteraceae) and *Solanum lycocarpum* (Solanaceae), among others.

Around the BD-5, as in the vicinity of Tapira and Araxá, there are also a few remnants of Atlantic Forest fragments, especially along watercourses, and a few plantations of *Eucalyptus* sp. (Myrtaceae).

The grasslands around BD-5 shelter several bird species typical of the Cerrado including Red-winged Tinamou (*Rhynchotus rufescens*), Spotted Nothura (*Nothura maculosa*), Dwarf Tinamou (*Taoniscus nanus*), Ocellated Crake (*Micropygia schomburgkii*), Red-legged Seriema (*Cariama cristata*), Collared Crescentchest (*Melanopareia torquata*), Crested Black-Tyrant (*Knipolegus lophotes*), Sedge Wren (*Cistothorus platensis*), Grassland Sparrow (*Ammodramus humeralis*), Blue Finch (*Porphyrospiza caerulescens*), Stripe-tailed Yellow-Finch (*Sicalis citrina*), Wedge-tailed Grass-Finch (*Emberizoides herbicola*), Plumbeous Seedeater (*Sporophila plumbea*), and Black-masked Finch (*Coryphaspiza melanotis*). This assemblage, as well as general habitat and setting, are very similar to those at Serra da Canastra National Park (Silveira, 1998), only 25 km away.

Besides the BD-5, *Culicivora caudacuta* was also found and studied in another two areas in the CMT, one in the 1,430.20 ha legal reserve upstream from the dam (19°51′44″S, 46°47′52″W, elevation 1,250 m), an area with very similar habitat, and near Ribeirão do Inferno, another similar area covering 510 ha partially included in the municipality of Araxá (19°46′22″S, 46°52′48″W, elevation 1,240 m).

Figure 1. Adult Sharp-tailed Tyrant *Culicivora caudacuta,* (11 October 2011), Patrocínio, Minas Gerais, Brazil. Photo: RSS.

Figure 2. Illustration of *Muscicapa stenura* (*Culicivora caudacuta*), by Jean-Gabriel Prêtre, in Temminck's work, with a wrongly drawn tail.

Figure 3. Specimen (RMNH 88812) of *Culicivora caudacuta* used in Temminck's description. Photo: RSS.

Figure 4. Partial view of BD-5 showing the study site at CMT, Tapira, Minas Gerais (18 June 2009). The arrow shows where nests were found. Photo: RSS.

Dairy ranching is the main economic activity in the region where CMT is located but grazing animals are excluded from the dam area and the legal reserve. Grazing has transformed the native grasslands in open landscapes dominated by African grasses with some remnant native plants. Fires for "pasture renovation" are frequent and have a direct impact on the avifauna, especially grassland-dependent species.

Supplementary observations on the breeding biology of *C. caudacuta* were made in two additional areas. The first was in the municipality of Patrocínio, in the Triângulo Mineiro and Alto Paranaíba region of Minas Gerais, about 100 km from CMT. There the species was recorded more frequently in the headwaters of the Córrego Bebedouro (19°00′06″S, 46°46′07″W, elevation 1,012 m), an area belonging to Mosaic Fertilizantes, and in the headwaters of the Córrego do Mato (19°09′37″S, 46°55′28″W, elevation 1,005 m), Córrego do Fundão (19°06′49″S, 46°54′07″W, elevation 1,184 m), and Córrego Capoeira Grande (19°11′42″S, 46°55′56″W, elevation 1,049 m).

The second area, also in Minas Gerais, in the municipality of Paracatu, includes the headwaters of the Ribeirão Batalha (17°29′48″S, 47°15′48″W, elevation 880 m) at the border with Goiás state and the municipality of Catalão, about 260 km from CMT. The area has remnant *veredas* dominated by *Mauritia* palm swamps bordered by hydromorphic grasslands on undulated terrain and grasslands with mounds built by termites *campos de murunduns* in a landscape where most native vegetation has been replaced by soybean monoculture.

Sampling

The research done at CMT was part of a broader project to survey the avifauna in areas belonging to Fosfertil in Minas Gerais and Goiás. I made two-day visits every month totalling 158 days between June 2002 and October 2011. Observations were made *ad libitum* (Altmann, 1974) from sunrise to sunset over the entirety of the areas.

At Patrocínio I made monthly two-day visits between 2007 and 2012, 15 days in August 2020, and 16 days in May-June 2021 totalling 114 days, while at Ribeirão Batalha I made occasional visits between 2004 and 2009 with a total of 28 days.

Territorial groups at CMT were mist-netted in 2005, and as *C. caudacuta* would easily pass through the mesh I used a speaker to attract the birds while an assistant held the pole supporting one extremity of the net, closing it once a bird hit the net.

Netted birds received both metal rings from CEMAVE (Brazil's official ringing scheme) and colour rings to allow individual identification. Bill, tail, tarsus, wing chord, nests and eggs were measured with a digital Mitutoyo® caliper; birds and eggs were weighted with Pesola® spring scales. All measurements are in mm, and when necessary other units are used.

Birds and their nests were found by active search with playback in suitable habitat inside CMT, especially near BD-5, where the birds were more habituated to human presence and, when nests were located, monitoring caused little interference in their behavior. Nests were not tagged with tape or other markers to avoid attracting predators.

Additional data on the breeding biology and localities were gathered from records at Wikiaves (http://www.wikiaves.com.br), xeno-canto (http://www.xeno-canto.org), Macaulay Library (http://www.macaulaylibrary.org), eBird (http://www.ebird.org), and from personal communications by fellow researchers.

RESULTS AND DISCUSSION

Breeding behavior

Breeding season

Culicivora caudacuta was first recorded at CMT on 26 November 2002 at BD-5, the same spot where nests were found, and in another two areas along the reservoir.

At CMT, the breeding season occurs from October to March (Silva e Silva, 2006), considering the time the first nests were found to the latest date fledglings were fed by their parents. The actual start of the nesting period is probably September since nest building take 10 to 15 days (Di Giacomo, 2005).

At Águas Emendadas Ecological Station, Central Brazil, the breeding season was bracketed between October and April, based on the presence of brooding patches, active nests and records of young being fed by adult birds (Sousa & Marini, 2007; Marini *et al.,* 2012). Not far away, at Chapada dos Veadeiros National Park, also in Central Brazil, breeding runs from mid-October to late March (Braz, 2008).

In Formosa, northwestern Argentina, nests were active between October and March, with no information on the time when fledglings were attended by adults (Di Giacomo, 1996, 2005; Di Giacomo *et al.,* 2011).

Culicivora caudacuta, as most species breeding at this time of the year, starts nesting at the end of the dry season when the first rains begin in September (Marini *et al.,* 2012), as the rainy season is associated with greater abundance of food, especially insects, to feed the young.

The nest

The first nest (Nest 1) was found on 8 December 2003 at CMT, on the left bank of BD-5 (19°49′34″S, 46°50′28″W) when the fledglings were being attended by the parents (see below). It was a small and delicate, deep cup made of coarser plant fibres, flowers and cotton-like material bound with spider webs and lined with soft material. It was *ca.* 0.7 m above ground on the branches of a *Baccharis dracunculifolia* (Asteraceae) bush *ca.* 1.40 m high. The nest was 48.79 high, 40.55 deep, had an external diameter of 51.34. The empty nest was collected and is in the ornithological collection of the Museu de Zoologia da Universidade de São Paulo (MZUSP), São Paulo, Brazil.

Nest 2 (Fig. 5) was found on 8 November 2004, only 88 m from Nest 1, in the same area of BD-5 (Fig. 6). It had two very young nestlings and was also built on a *B. dracunculifolia,* at 1.30 m above ground.

Nest 3 was found on 25 October 2005 in the same area, 48 m from Nest 1 and 40 m from Nest 2. It contained three eggs and was built 0.45 m above ground on a *Campomanesia* sp. (Myrtaceae) shrub about 0.90 m tall. Measurements were height 48.63, internal depth 40.93, external diameter at the rim 50.55, internal diameter 49.04.

Nest 4 was found still empty on 10 October 2008 (Fig. 7). It was built on a *Vernonanthura* cf. *polyanthes* (Asteraceae), also at BD-5 but was not monitored for long as on 27 October it looked unkempt and abandoned, apparently due to predation.

At Ribeirão Batalha, on 28 November 2007, one adult was seen collecting the soft fibres (Fig. 8), likely for a nest that was not located. This strongly suggests the bird was breeding, as Di Giacomo (2005) points the adults continue to bring nest material throughout laying and incubation.

At Chapada dos Veadeiros, another nest was found while still being built on 3 September 2007, at Fazenda Chapada das Almas (13°58′28″S, 47°27′03″W, 1,380 m), near the Rio das Almas, Alto Paraíso de Goiás, Goiás. This was in a wet grassland dominated by grasses some 40 cm tall with scattered bushes *ca.* 1 m tall by a riverine forest. Built *ca.* 85 cm above ground on a bush, the nest had grass seeds lining its structure, which was held together and attached to the branches with spider webs. (Dante Buzzetti *pers. comm.* May 2020).

Nests found at our study areas agree with descriptions from the Argentine Chaco (Hartert & Venturi, 1909), Formosa Province (Di Giacomo *et al.,* 2005), Central Brazil (Braz, 2008; Marini *et al.,* 2012), Minas Gerais (Lombardi *et al.,* 2010), and Rio Grande do Sul (Rovedder *et al.,* 2007). In all areas, nests were half-spherical, deep, solid cups made of fine plant material bound with spider silk and lined with soft material, especially fine fibres from Asteraceae seeds. They were built among the vertical branches of low bushes, mostly less than 1 m above ground.

The exception to the use of bushes seems to be the nest built close to the ground in a grass tussock found by Hass & Silva e Silva (2008) at Emas National Park, Central Brazil, suggesting some degree of plasticity. The same behavior was recorded by Lombardi *et al.* (2012) at Carrancas, Minas Gerais, in October 2009.

Peixoto (2014) also recorded an adult carrying cotton-like soft fibres to its nest on 12 October 2013 at Andrelândia, Minas Gerais, in grassland with shrubs.

The first published description of a *C. caudacuta* nest, from the Chaco of Santa Fe province, Argentina, was made in the early 20th century (Hartert & Venturi, 1909). The nest, with three eggs, was built on a low spiny bush of a kind growing sparsely in the grasslands; it was solidly built with grass flowers and soft fibres neatly organised and lined with softer material. Its measurements were:

Figure 5. Nest 2, 9 November 2004. Photo: RSS.

Figure 6. Nest site of Nest 1, 8 December 2003. Photo: RSS.

Figure 7. Nest site of Nest 4 in the same area, 11 October 2008. Photo: RSS.

Figure 8. Adult *Culicivora caudacuta* collecting material for the nest. Photo: RSS.

height 70, diameter 50, internal depth 40, inner diameter 25-30 (Hartert & Venturi, 1909).

A more detailed study was carried much later at El Bagual Ecological Reserve (26°10′S, 58°56′W), Formosa province, Argentina, from 1995 to 2010, with more than 500 nests (Di Giacomo, 1996, 2005; Di Giacomo *et al.,* 2011). These were built on annual herbs, the most important ones being *Vernonia chamaedrys* (Asteraceae) (more than 30% of the nests), *Desmodium cuneatum* (Fabaceae) (13%), *Solidago chilensis* (Asteraceae) (10%), and *Eupatorium ivaefolium* (Asteraceae) (8%), with additional 10 species accounting for the remainder.

As in our study area, nests were supported by several vertical or nearly vertical branches or, in some cases, inflorescences as in *V. cognata, E. eburneum* and *E. elegans.* Average nest height above ground was 1 m, ranging from 0.45 m to 1.8 m. Most nests were quite visible and similar to each other, built in the shape of compact, well-built half-spheres, straw or yellowish coloured with white inner lining. Nests are built with fine plant matter such as dry fibres, petioles, Poaceae and Asteraceae flowers bound with silk from spider webs or egg sacs. The same material is used to anchor the nest to supporting branches, which varied from three to eight. The nest chamber is lined with very soft material, mostly fine fibres from Asteraceae inflorescences (Di Giacomo, 2005).

Additional nests were found at Brasília National Park (15°47′S, 47°56′W), central Brazil, on 12 November 2004, and two nests were found at Chapada dos Veadeiros National Park (14°05′S, 47°40′W), Goiás state, in November 2005 and November 2006 (Braz, 2008). The nests were attached to vertical branches and shaped as deep cups. These were built with fine plant material including dried fibres, petioles, grass flowers and leaves woven with spider webs. Height above ground ranged from 64 cm to 1 m. Measurements of the nest found in November 2006 were inner diameter 20.9, outer diameter 44.4 and depth 54.8 (Braz, 2008).

Another study at Águas Emendadas Ecological Station (15°32′S, 47°36′W, 1,040 m), Distrito Federal, between 2004 and 2007, provided information on three nests. One, with three eggs, was found on 10 November 2005 at 0.34 m above ground on an *Esenbeckia pumila* (Rutaceae) bush 0.50 m tall. The other nests, one found on 22 and the other on 24 November 2007, were about 150 m apart in an open grassland. Both were on *Eremanthus glomerulatus* (Asteraceae) bushes about 0.55 m high, built 0.34 m and 0.53 m above ground (Sousa & Marini, 2007). In the same area another nest was found on 4 October 2009 in a *campo sujo* area built 38 cm above ground and having three eggs (Marini *et al.,* 2012).

The following additional accounts of nests of *C. caudacuta* found in Brazil provide more limited but important information as to localities and breeding dates for the species.

A nest found in late October and another in early November 2000 were cup-shaped and built near the ground inside grass clumps at Emas National Park (18°08′S, 52°56′W), Mineiros municipality, Goiás state (Hass & Silva e Silva, 2008).

Also at Emas National Park, but at Chapadão do Céu (18°17′48″S, 52°46′53″W, 850 m) a nest with three eggs attended by one incubating adult was found on 7 November 2004. The nest had been built 84 cm above ground on a *Vernonia* sp. (Asteraceae), in a *campo sujo* dominated by *Tristachya leiostachya* (Poaceae), and measured: total height 55, inner depth 30, external diameter 56, inner diameter at the rim 43 (Dante Buzzetti *pers. comm.* May 2020).

Southeast of Serra de Carrancas (21°27′S, 44°37′W, *ca.* 1,250 m), Carrancas, Minas Gerais state, a nest with three eggs was found on 21 October 2008. This was on a *Diospyros hispida* (Ebenaceae) bush in a small patch of *campo sujo* by a forest. The nest had been built with grass inflorescences and fine plant fibre (silk cotton), the latter mostly lining the incubation chamber. As other nests, the material was bound by spider webs, resulting in a soft and light, but resistant, construction. Measurements were: depth of the incubation chamber 30, external height 45, inner diameter 30 and external diameter 55 (Lombardi *et al.,* 2010).

On 9 November 2006 a nest with two eggs was found at the headwaters of the Arroio Macena (28°30′55″S, 50°47′56″W, 940 m), Vacaria, Rio Grande do Sul. This was described as a delicate cup-shaped structure covered by silk cotton, built on a bush in a small wetland near a fallow dominated by *Senecio* sp. (Asteraceae) (Rovedder *et al.,* 2007).

One adult was photographed bringing nest material (silk cotton) to its nest at Itirapina Ecological Station (22°13′S, 47°54′W, 740 m), Itirapina, São Paulo state, on 27 November 2009. The nest had been built in an isolated bush in open grassland (Motta-Jr. *et al.,* 2020).

Further nests found in different Brazilian localities have been documented with photographs. On 12 November 2019 a nest was found at Barbacena, Minas Gerais state, and on 10 January 2008 a nest with eggs was located at Indianópolis, Minas Gerais. Another was photographed at Piraí do Sul, Paraná state, on 18 January 2014 (WikiAves, 2020).

Eggs, clutch size, incubation

On 25 October 2005, Nest 3 had three light cream eggs (Fig. 9), measuring 13.31 × 12.26, 13.56 × 11.75 and 13.51 × 11.58, respectively. The adults were seen taking turns at incubation (Fig. 10), but its length could not be determined.

A nest found at Emas National Park, Goiás, on 7 November 2004 had three light cream eggs measuring 14.3 × 11.5, 14.2 × 11.3 e 14.0 × 11.4. When revisited on 13 November 2004 it was abandoned (Dante Buzzetti *pers. comm.* May 2020).

Our small sample precludes generalisations but a clutch size of three and egg colour agree with previous information from Argentina (Hartert & Venturi, 1909; Di Giacomo, 2005; Di Giacomo *et al.,* 2011), Central Brazil (Sousa & Marini, 2007; Braz, 2008) and Minas Gerais (Lombardi *et al.,* 2010).

All published information puts egg size range at 14-18.7 × 10.3-12.4 mm, the eggs found at CMT being

Figure 9. Nest 3 of *Culicivora caudacuta* with eggs. Photo: RSS.

Figure 10. Nest 3 of *Culicivora caudacuta,* with adult incubating, 25 October 2005. Photo: RSS.

Figure 11. Fledglings of *Culicivora caudacuta* near Nest 1. Photo: RSS.

Figure 12. Two adults feeding a nestling with dragonflies, 8 December 2003. Photo: RSS.

unusually short. The significance of this, if any, remains to be assessed.

Di Giacomo (2005) and Di Giacomo *et al.* (2011) state that incubation begins after the penultimate egg is laid and lasts 15 to 16 days. The pairs may have a second clutch during the same nesting season but this is raised in a newly built nest in a different part of the territory.

Nestlings, juveniles and parental care

Nest 1 was found on 8 December 2003 when the young had already left and were being attended by the parents. The short-tailed fledglings were orange-brown colour (Fig. 11). They remained in the nearby shrubs and were seen to be fed by three different adults (sometimes at the same time) with dragonflies, horseflies and other flying insects (Figs. 12 and 13) until the 11 December. This family group provided the first published photographs of young *C. caudacuta* (Silva e Silva, 2004).

Later, on 16-17 January 2004, the young already showed longer tails and foraged by themselves, but always associated with the three adult birds.

On 8 November 2004 Nest 2 had two downy nestlings only a few days old attended by three adults that fed them beetles, dragonflies and flies and removed faecal sacs (Fig. 14), which were dropped 10 m away from the nest.

On 15 December 2004 the young had already fledged and were foraging by themselves but were still followed by the three adults. A few times two adults were seen to harass the young to direct them back near to the nest.

On 7 and 8 November 2005 Nest 3 had one egg and one nestling (Fig. 15) already covered in orange-cream feathers, lighter on the underparts, and scattered down. It was also attended by three adults that fed it with horseflies, small grasshoppers, flies and dragonflies (Fig. 16) mostly caught 5-10 m from the nest. The nestling would produce a faecal sac soon after being fed and one of the adults would at once take it and drop five meters or so from the nest, closer than seen in the previous nest. The nestling was able to raise itself from the nest but kept still most of the time, calling when it heard the voice or wing sounds of adults nearby.

Nests were not found the following nesting season at CMT but breeding was confirmed on 29 November 2006 when two adults, one previously banded at the site on 2 December 2005, and one short-tailed fledgling were seen. The young bird already showed a long tail and was following the adults when found again on 28 December 2006 and 24 January 2007.

The following day one adult pair followed by two young was found in the same area, with two adults and three young on 7 March 2007. One of these showed a whiter supercilium, a characteristic of an older bird than

Figure 13. Adult feeding a nestling with a fly, 8 December 2003. Photo: RSS.

Figure 14. Adult removing a faecal sac from Nest 2 after feeding the nestlings. Photo: RSS.

Figure 15. *Culicivora caudacuta* nestling. Photo: RSS.

Figure 16. Adult feeding the nestling. Photo: RSS.

Figure 17. Juvenile *Culicivora caudacuta,* with adult in the background. Photo: RSS.

Figure 18. Juvenile of *Culicivora caudacuta,* Ribeirão Batalha. Photo: RSS.

its siblings suggesting that the young from two consecutive clutches were following their parents.

Additional information on youngsters was gathered at other sites. At Patrocínio, around the headwaters of Córrego Bebedouro, two adults and one young were found on 6 February 2009, with one adult being captured and banded. Two adults and one young were also seen on 14 and 16 January 2012.

Also at Patrocínio, at the headwaters of Córrego Capoeira Grande, three adults and one young were seen on 1, 6 and 13 March 2011 (Fig. 17). The following season, two adults followed by two young were found on 12 January 2012.

At Paracatu, around Ribeirão Batalha, three adults and one young (Fig. 18) were found near a *Mauritia* palm swamp on 27 January 2009.

The available literature provides further data on the presence of young *C. caudacuta* in other localities, mostly in Brazil. Although most mentions are just brief it is worth listing them in order to add more information.

In Brazil, the first data on young Sharp-tailed Tyrants are from 12 October 1988 at Fazenda Perdões (18°11′41″S,

45°25′17″W, 810-730 m), Três Marias, Minas Gerais. Two adults were seen feeding two juveniles showing a paler colour compared to the adults, lacking the black on the cap (Ribon *et al.,* 1995).

On 17 February 1991 two fledglings were recorded calling at Itirapina Ecological Station (Parker III & Willis, 1997).

In December 1996, a family group with two dependent young was found at Serra da Canastra National Park (20°15′S, 46°37′W), São Roque de Minas, Minas Gerais (Silveira, 1998). Adults and three young were seen on 12 February 2002 (Dante Buzetti *pers. comm.* May 2020), and on 8 February 2006 three adults and one young were seen in the same park (RSS).

At Brasília National Park, a nest was found on 12 November 2004 with three nestlings being fed by two adults. The young had emerging wing, tail and body feathers and an average weight of 4.33 g, but were predated five days later (Braz, 2008).

At Chapada dos Veadeiros National Park a nest was found in November 2006 with two nestlings still showing a mostly naked body, with just some down on the cap, back and wings. These had an average weight of 1.5 g and were taken by a predator four days later (Braz, 2008).

During a study at Águas Emendadas Ecological Station, two young in different family groups were found in November 2004 and April 2005. They showed completely cinnamon-coloured faces, short tail feathers and limited flight but, two months later, one of them had a full black mask and made several vocalizations (Sousa & Marini, 2007). In the same area, a nest was found on 4 October 2009. It had three eggs that hatched around 17 October, but the nestlings were preyed on about eight days later (Marini *et al.,* 2012).

At Jalapão, Mateiros, Tocantins state, in a patch of cerrado and *campo sujo,* bordering a soy plantation (10°27′56″S, 46°08′34″W, 770 m), five birds, including a recently fledged young bird, were seen on 24 March 2018 (Dornas & Pascoal, 2019).

At Carrancas, Minas Gerais, young were found in May 2009 and January 2010, and in the same region, at Serra da Chapada das Perdizes (1,500 m), on the border of Minduri municipality, further young were recorded in January 2010 (Lombardi *et al.,* 2012).

On 7 October 2005, at Fazenda Indiana (20°25′S, 56°39′W, 120 m), Rio Salobra, Bodoquena, Mato Grosso do Sul, two adults with two young were observed in a recently burnt fallow near a rice plantation (Pivatto *et al.,* 2006).

At Fazenda Pai João (28°10′58″S, 50°38′28″W, 1,005 m), Capão Alto, Santa Catarina, one pair of adults followed by a juvenile was found on 13 January 2013 in a grassy area with sparse flowering bushes (RSS). At the same locality, on 22 January 2012, one young and one adult were photographed together, while on 30 January 2012, one young was photographed (Wikiaves, 2020).

The nest found with two eggs at Vacaria, Rio Grande do Sul, on 9 November 2006 (Rovedder *et al.,* 2007) was photographed on 20 November 2006 with one nestling (Repenning *et al.,* 2010).

Near Ibirapuitã Biological Reserve, at Fazenda do Beto, Alegrete, Rio Grande do Sul, four individuals, including young, were found in early February 2001 (Fontana *et al.,* 2003).

In Paraguay, on 13 February 1995, at Aguara Ñu, Bosque Mbaracayú Natural Reserve (24°09′S, 55°17′W), Canindeyu departament, one adult and one immature were seen (Madroño Nieto & Esquivel, 1997).

Also in Paraguay, at Estancia Kanguery (26°30′S, 55°47′W), Itapúa department, San Rafael National Park, three recently fledged juveniles were seen, and photographed together with two adults on 5 April 2016 (Smith, 2017).

In Argentina, at Estancia Virocay (28°15′S, 55°57′W), Corrientes, two young following a pair of adults were found on 16 December 2010 (Marino *et al.,* 2013).

The young acquire full adult plumage five to six months after fledging and juvenile-plumaged birds were not recorded during the cold and dry winter months.

The juvenile plumage of *C. caudacuta* remained undescribed for a long time despite at least two juveniles having been collected by Johann Natterer in the early 19th century. Among the eleven *C. caudacuta* collected by Natterer in Brazil, including nine from São Paulo and two from Paraná (Pelzeln, 1868-1870), two specimens, NMW 17822 and NHMUK 1888.1.13.331 (Fig. 19), both collected on 11 February 1821 at Itararé, São Paulo state, are juvenile. The specimens are held at the collections of the Naturhistorisches Museum Wien (NMW), at Vienna, Austria (Hans Berg-Martin *in litt.,* 2020), and Natural History Museum, Tring, UK (Hein van Grow *in litt.,* 2021).

Another specimen (ZSM 32700), which had probably just fledged judging from its short tail and colour, was collected in Paraguay on 4 December 1931 and is housed in the ornithological collections of the Zoologische Staatssammlung München (ZSM), Munich, Germany (Fig. 20), remained unknown until now (Markus Unsöld *in litt.,* 2020). This is one of four specimens of *C. caudacuta* collected in Paraguay during the 1931 expedition (Laubmann, 1940).

Despite this, the juvenile plumage of *C. caudacuta* was first shown in a field guide by Sigrist (2004, 2007), based on photographs taken at CMT by RSS.

As described in this guide, the juvenile plumage of *C. caudacuta,* from the time they fledge until acquiring adult plumage, is quite distinctive and unlikely to be confused with the non-breeding plumage or female of the Bearded Tachuri *Polystictus pectoralis,* as shown by Smith (2017).

The female and young male of *P. pectoralis* show most of the head blackish, contrary to *C. caudacuta* which, after fledging and while still showing a short tail, has practically no black on the head.

As the tail grows and becomes as long as the head and body, the young start showing the first black streaks on the cap and show a very different jizz from the short, broad-tailed *P. pectoralis.*

Of 1,698 photos of *C. caudacuta* available at Wikiaves (2020), up to 16 May 2020, only 47 show juvenile birds. These were taken at Tocantins, Goiás, Distrito Federal, Bahia, Minas Gerais, Paraná, Santa Catarina and Rio Grande do Sul, showing the confirmed breeding range

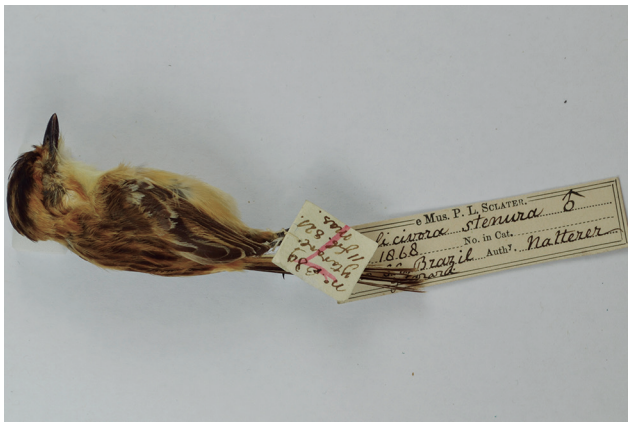

Figure 19. Immature specimen of *Culicivora caudacuta* at Natural History Museum, Tring. Photo: Hein van Grow.

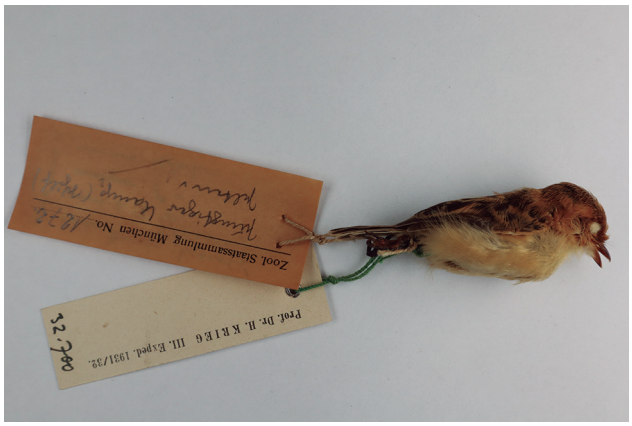

Figure 20. Specimen of young *Culicivora caudacuta* at Zoologische Staatssammlung München. Photo: Markus Unsöld.

includes most of the species' range in Brazil. The presence of young in the months of October, November, December, January, February, March, April, and May agrees with the observations in the literature and the ones presented above, and suggest more than one brood can be raised per season.

Cooperative breeding and helpers

A common feature of family groups of *C. caudacuta* was the presence of three adult birds sharing the duties of incubation and provisioning of the young (Silva e Silva, 2006).

When Nest 1 and its fledglings were found in December 2003, three adults were found caring for the two young that remained next to the nest. Even when the young were already foraging by themselves, on 16 January 2004 and 2 February 2004, the three adults stayed near them, forming a family group, but only two of the adults would react aggressively to playback.

At Nest 2, found with two nestlings, three adults took turns feeding them and removing faecal sacs. The young continued to be attended by the three adults after they left the nest but, again, only two of the adult birds would approach in response to playback, the third remaining some distance away uttering softer and lower calls. Nest 3 also had three adults attending its single young from incubation until well after it had fledged.

The same behavior was also recorded in other sites we visited in Minas Gerais. At Ribeirão Batalha, Paracatu, one young bird attended by three adults was recorded on 9 November 2005 and 27 January 2009. The same grouping was seen on 1, 6 and 13 March 2011 at Patrocínio, near Córrego Capoeira Grande, when three adults and one young bird were attracted with playback.

The same grouping was found during a study on *C. caudacuta* at Águas Emendadas Ecological Station, where one young bird was attended by three adults, one of these providing food with higher frequency (Sousa & Marini, 2007).

Cockburn (2006) states that among the 1,097 New World suboscines, cooperative breeding is consistently rare, found in just 1% of the species. By contrast, a significantly larger proportion of all oscines are cooperative breeders (13%).

Although Fitzpatrick (2004) states no tyrant flycatcher is known to exhibit cooperative breeding on a regular basis, Griesser & Suzuki (2016) show that among the Tyrannidae, six species show cooperative breeding.

According to Griesser & Suzuki, (2016), most (93%) helpers are offspring that remain associated with their parents until the next breeding season and provide alloparental care at the nest of their parents or close relatives.

Following this pattern, it is likely the helpers among *C. caudacuta* are young from the previous nesting season that remained in the natal territory through the following season.

During the fieldwork recently carried out in Patrocínio, Minas Gerais, in August 2020, three groups of three individuals each of *C. caudacuta* were found, where it was noted that only two of these individuals responded promptly to playback, while the third individual was more distant and responded with a much softer and weaker vocalization, being possibly a young bird accompanying its parents.

Detailed studies, including genetic profiling, are necessary to further knowlege on this behavior in *C. caudacuta* and the few tyrant flycatchers also showing helper behavior like Streamer-tailed Tyrant *Gubernetes yetapa* (Wagener *et al.,* 2019).

Birds' measurements

Eleven birds were captured for ringing in the study sites: nine, including one young, at Tapira between 1 and 2 December 2005, one at Paracatu on 28 December 2005, and another at Patrocínio on 6 February 2009. The measurements are in Table 1. These fall in the range of the 13 birds captured at Águas Emendadas Ecological Station (Sousa & Marini, 2007).

Distribution

The first information on the distribution of *C. caudacuta* was supplied in the 18th century by Félix de

Table 1. Measurements (mm) and body mass (g) of *Culicivora caudacuta* from Tapira (n = 9), Paracatu (n = 1) and Patrocínio (n = 1).

Age	Bill			Tail			Wing			Tarsus			Mass		
	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.
Adult	7.05	7.61	8.17	42.94	47.77	52.54	36.63	38.65	39.63	12.56	14.15	15.82	6	6.2	7.5
Juvenile		5.77			40.15			37.15			12.81			6	

Azara and mentioned in the species' description, where Paraguay was assumed as the type locality (Vieillot, 1818). Nevertheless, Azara's observations also covered nearby parts of Argentina and Brazil (Beddall, 1975) where *C. caudacuta* is known to occur, the presence of the species in Brazil having already been noted in the early 19th century (Temminck, 1822). The assignment of Paraguay as type locality is accordingly best seen as tentative.

It took much longer for the actual distribution of *C. caudacuta* to be better understood as including parts of Brazil, Bolivia, Paraguay, and Argentina (Lopes *et al.,* 2009). However, coverage was limited and the gaps that were shown may not be real.

Technological progress, especially the greater availability of digital cameras and sound recorders, with the rise of birdwatching and on-line platforms for ornithological data, such as Wikiaves, xeno-canto and eBird has increased coverage in a dramatic way and resulted in a jump in the known localities for the species.

On the other hand, greater coverage and the resulting increase in the number of localities mean that caution is required in considering claims that *C. caudacuta* may be expanding its range.

The recent data show that the area of occupancy of *C. caudacuta* has been underestimated. Using Minas Gerais state (58,652,800 ha), in Brazil, as an example, the species was previously known from just three localities (Lins, 1998), later jumping to 20 (Lopes *et al.,* 2009), and with the compilation presented here this jumps to 134 localities (Appendix 1; Fig. 21).

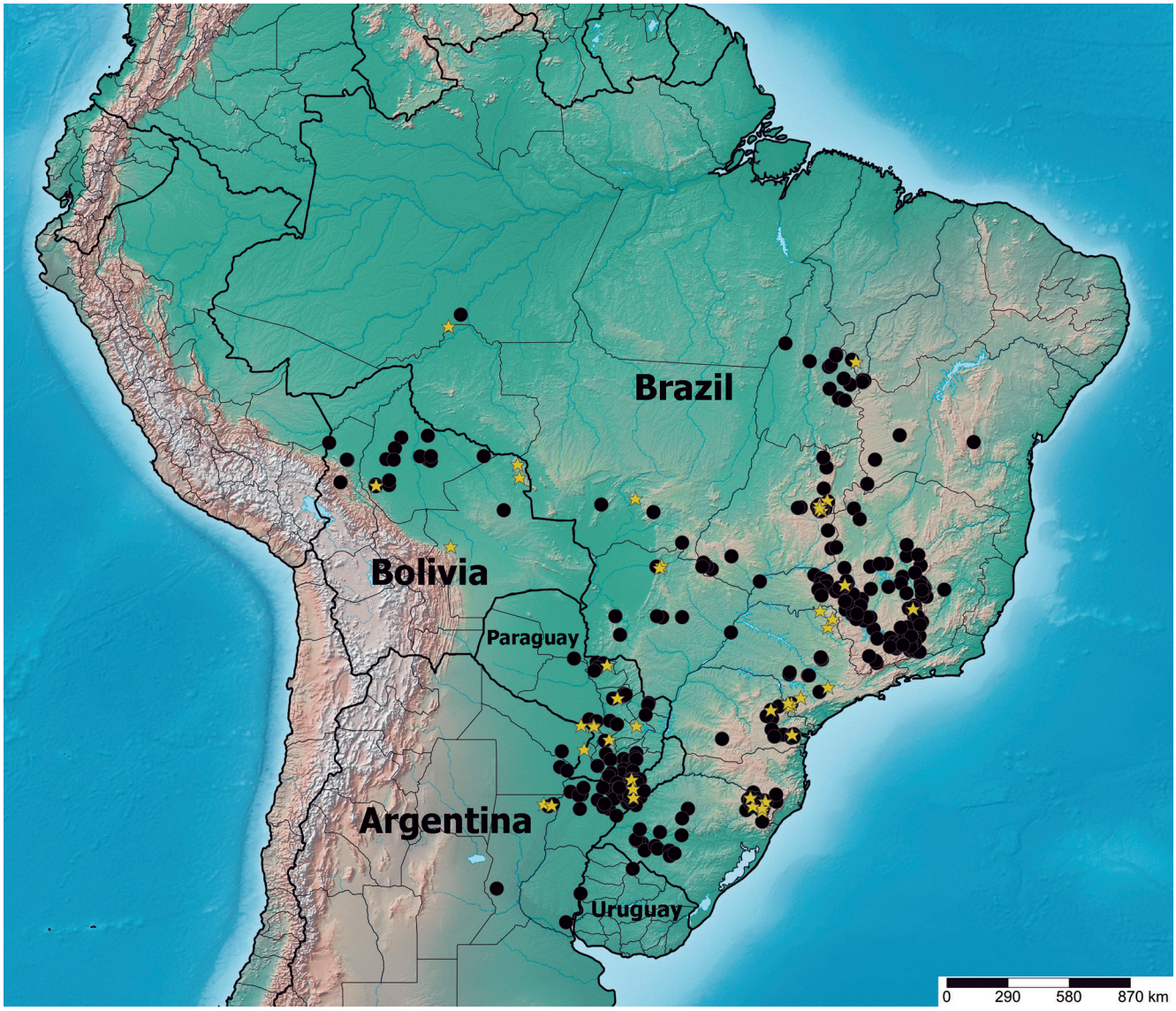

Figure 21. Records of *Culicivora caudacuta*. Yellow stars indicate museum specimens, dots indicate other categories of records. See Appendix 1 for details.

Culicivora caudacuta is mostly associated with open grassland and savanna of the Pampa and Cerrado biomes characterized by a dense ground cover of grasses and scattered, well-spaced low bushes, occasionally near watercourses, but it also occurs in areas where the original vegetation has already been contaminated by exotic grasses.

Records show it occurs from elevations of 60 m in the Chaco of Argentina and Paraguay to 1,550 m at Serra da Chapada das Perdizes, in Brazil (Lombardi *et al.,* 2012).

The species has most of its range in Brazil, occurring in all major regions. Its presence in the states of Amazonas, Tocantins, Bahia, Santa Catarina and Rio Grande do Sul was confirmed only in the past two decades, showing the imperfect knowledge on its distribution. Regarding the last two states, Fontana *et al.* (2008) point out that the lack of previous records is best considered a result of a lack of studies rather than a colonization event.

Among the new localities where the species has been found are savanna enclaves in the region of Humaitá and Canutama (MZUSP; Wikiaves, 2020), in southern Amazonia (now being converted for soybean crops), and similar habitats at Campos Amazônicos National Park (961,317.77 ha) further east, where other grassland specialists have also been found (Cândido-Jr. & Dal'Maso, 2016). The Amazonian savannas are of great ecological interest and, in the case of the national park, may protect significant populations of the species.

The species has also been cited as occurring in Amapá state (BirdLife International, 2020b), another Amazonian region with extensive savannas, but the source of this record could not be traced and this locality was excluded here.

The current information shows that *C. caudacuta* has a much broader range than first thought, and besides at least 13 Brazilian states where it has been found, in Bolivia, in the departments of El Beni, La Paz and Santa Cruz; in Paraguay in the departments San Pedro, Presidente Hayes, Cordillera, Paraguarí, Concepción, Canindeyú, Caaguazú, Caazapá, Itapúa and Misiones; in Argentina in the provinces of Misiones, Chaco, Corrientes, Entre Ríos, Formosa and Santa Fe; and In Uruguay it is known from a single record from the department of Rivera.

Its presence is probable but still undocumented in southeast Peru, at Madre de Dios in the Pampas de Heath (12°53'S, 68°54'W), a seasonally flooded grassland on the Peru-Bolivia border making a northwestern extension of the Gran Chaco Boliviano-Paraguayo, where several grassland specialists such as *Rhynchotus rufescens, Micropygia schomburgkii, Ammodramus humeralis, Sporophila plumbea* and *Coryphaspiza melanotis* have been found (Graham *et al.,* 1980). A record of *C. caudacuta* from Pampa Moscoso was made just 13 km from Pampas de Heath, adding to the likelihood of the species occurring there.

Conservation

Culicivora caudacuta has long figured in threatened species lists: at global level it was considered as

Figure 22. *Culicivora caudacuta* habitat occupation by *Eucalyptus* sp. monoculture, Araxá, Ribeirão do Inferno (07 May 2014). Photo: RSS.

Threatened in 1988, Lower Risk/Near Threatened in 1994 and 2000, and Vulnerable from 2004 to the present (BirdLife International, 2020b).

Most countries in its range consider it to be threatened, as Argentina, where it was considered as Vulnerable (Fraga, 1996), and now as Threatened (Ministerio de Ambiente y Desarrollo Sustentable & Aves Argentina, 2017).

In Brazil, *C. caudacuta* is included in several state lists of threatened species, as in Minas Gerais (Lins, 1998; COPAM, 2010), São Paulo (Bressan *et al.,* 2009), Paraná (Mikich & Bérnils, 2004), Santa Catarina (Occhialini, 2010) and Rio Grande do Sul (Fontana *et al.,* 2003).

On the other hand it has been dropped from the national list since 2014 (ICMBio, 2018), where it was previously listed as Vulnerable (Hass & Silva e Silva, 2008).

In Uruguay, where it is known from a single locality, it is considered as Vulnerable (Azpiroz *et al.,* 2012), while in Bolivia it is not included in red lists (Balderrama, 2009).

The main reason for *C. caudacuta* to be considered threatened is the widespread conversion of native grasslands all over South America into cultivation, mostly for soybeans, and pastures dominated by exotic grasses where the birds cannot persist (Codesido & Fraga, 2009; BirdLife International, 2020b).

In the study area the expansion of *Eucalyptus* monocultures for pulp and charcoal over the natural grasslands continues unchecked and is the main driver of habitat loss (Fig. 22), a trend also in southern Brazil, Uruguay and Argentina also (Modernel *et al.,* 2016).

There are little data on population densities, and all come from Brazil. At Chapada dos Veadeiros National Park the estimated population is 1,475-4,022 individuals, with an average of 2,433 individuals, while at Brasília National Park there are estimated to be 440 to 2,374 individuals, with an average of 1,021 (Braz, 2008). Kanegae (2011) found densities of 9.6 individuals/km^2 at Itirapina Ecological Station, with a total estimated population of 112 individuals.

Another population has recently been found in Tocantins state, in the Jalapão region including the Serra Geral do Tocantins Ecological Station and Jalapão State Park where a significant population seems to occur (Dornas & Crozariol, 2012; Dornas & Pascoal, 2019), especially along the wet grasslands bordering the *Mauritia* palm swamps *veredas*.

Culicivora caudacuta has been confirmed to occur at the following state-run protected areas in Brazil: Serra Geral do Tocantins Ecological Station, Jalapão State Park, Chapada Diamantina National Park, RESEX Recanto das Araras de Terra Ronca, Chapada dos Veadeiros National Park, Serra dos Pirineus State Park, Emas National Park, Águas Emendadas Ecological Station, APA Cafuringa, ARIE Cruls, Brasília National Park, Brasília National Forest, Brasília Botanical Garden, Guará Ecological Park, IBGE Ecological Reserve, Serra das Araras Ecological Station, Serra da Boa Esperança State Park, Serra do Cabral State Park, Tabuleiro Municipal Natural Park, Quedas do Rio Bonito Ecological Park, Serra do Intendente State Park, Sempre Vivas National Park, Mata do Limoeiro State Park, APA Morro da Pedreira, Serra do Rola Moça State Park, Serra do Cipó National Park, Serra da Canastra National Park, São Miguel Wildlife Sanctuary, Santa Bárbara do Rio Pardo Experimental Farm, Santa Bárbara Ecological Station, Itirapina Ecological Station, Botucatu State Forest, Itararé Unit of Research and Development, Vila Velha State Park, Guartelá State Park, APA Rio Iraí, APA Ibirapuitã, Ibirapuitã Biological Reserve, and the following private reserves (as recognised by Brazil's environmental agencies): RPPN Fazenda Minnehaha, RPPN Lagoa do Formoso, RPPN Reserva Natural Serra do Tombador, RPPN SESC Pantanal e Entorno, RPPN Cisalpina, RPPN Fazenda da Barra, RPPN Aves Gerais, RPPN Mata do Jambreiro, RPPN Unidade de Conservação de Galheiros, RPPN Vale Encantado, and RPPN Foz do Rio Aguapeí.

In Bolivia it occurs at Madidi National Park, Barba Azul Nature Reserve, Beni Biological Station, and Noel Kempff Mercado National Park.

Protected areas in Paraguay where *C. caudacuta* has been recorded are Serranía San Luis National Park, Bosque Mbaracayú Natural Reserve, Kanguery Biological Station, and San Rafael National Park.

In Argentina it occurs in the following protected areas, many private: Puerto San Juan Private Reserve, Campo San Juan Reserve, Urutaú Reserve, Don Lorenzo Refuge, Santa Rosa Private Reserve, Iberá Provincial Reserve, Iberá National Park, Isla Apipé Grande Provincial Natural Reserve, Rincón de Santa María Natural Reserve, Mburucuyá National Park, El Bagual Reserve, Río Pilcomayo National Park, and Federico Wildermuth Provincial Reserve for Multiple Uses.

In Brazil it is likely that *C. caudacuta* will be found in additional protected areas since about half of the existing ones do not have a management plan with information on their avifauna while others have only preliminary data.

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APPENDIX 1

Records of Sharp-tailed Tyrant *Culicivora caudacuta*. Record: O = observation, P = photography, S = specimen, V = vocalization recorded. Source: AMNH = American Museum of Natural History, New York, USA; ANSP = Academy of Natural Sciences, Philadelphia, USA; CM = Carnegie Museum of Natural History, Pittsburgh, USA; DZUFMG = Departamento de Zoologia da Universidade Federal de Minas Gerais, Belo Horizonte, Brazil; FMNH = Field Museum of Natural History, Chicago, USA; IBGE = Coleção Ornitológica da Reserva Ecológica do IBGE, Brasília, Brazil; LSUMZ = Louisiana State University, Museum of Natural Science, Baton Rouge, USA; MACN = Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires, Argentina; MCNA = Museu de Ciências Naturais da Pontifícia Universidade Católica de Minas Gerais, Belo Horizonte, Brazil; MCP = Museu de Ciências da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, Brazil; MCZ = Museum of Comparative Zoology, Cambridge, USA; MHNCI = Museu de História Natural Capão da Imbuia, Curitiba, Brazil; MHNSCP = Museo de Historia Natural de la Sociedad Científica del Paraguay, Asunción, Paraguay; MNK = Museo de Historia Natural Noel Kempff Mercado, Santa Cruz de la Sierra, Bolivia; MNRJ = Museu Nacional, Rio de Janeiro, Brazil; MPEG = Museu Paraense Emílio Goeldi, Belém, Brazil; MZUSP = Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil; NHMUK = Natural History Museum, Tring, UK; NMW = Naturhistorisches Museum Wien, Wien, Austria; RMNH = Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands; SMF = Senckenberg Naturmuseum Frankfurt, Germany; USNM = United States National Museum, Washington, USA; ZSM = Zoologische Staatssammlung München, Germany; EB = eBird database; ML = Macaulay Library database; WA = WikiAves database; XC = XenoCanto database. Personal observations: DB = Dante Buzzetti; FO = Fabio Olmos; JFP = José Fernando Pacheco; JNC = Juvêncio Nunes da Costa; RSS = Robson Silva e Silva.

Country, State/Province/Departament, Municipality, Locality	Latitude	Longitude	Record	Source
BRAZIL				
Amazonas				
Canutama, Igarapé Assuã, BR 319	08°05'S	63°45'W	S, P	MZUSP, WA
Humaitá	07°35'S	63°14'W	O	EB
Maranhão				
Alto Parnaíba, Estiva	09°35'S	46°25'W	S	MPEG
Tocantins				
Almas, RPPN Fazenda Minnehaha	11°08'S	47°08'W	O	(Dornas & Crozariol, 2012)
Araguacema, Rio Piranha	08°48'S	49°25'W	O	JFP & FO
Lizarda, 15 km East	09°27'S	46°35'W	O	(Pacheco & Olmos, 2010)
Mateiros	10°22'S	46°08'W	O	(Dornas & Pascoal, 2019)
Mateiros	10°23'S	46°03'W	P	WA, (Dornas & Pascoal, 2019)
Mateiros	10°27'S	46°08'W	O	(Dornas & Pascoal, 2019)
Mateiros, Jalapão State Park, lake near the dunes	10°34'S	46°40'W	O	RSS, (Pacheco & Olmos, 2010)
Mateiros, Jalapão State Park, near Pousada do Jalapão	10°18'S	46°56'W	O	RSS & JFP
Miracema do Tocantins	09°34'S	48°23'W	P	WA
Ponte Alta do Tocantins	10°44'S	47°32'W	P	WA
Rio da Conceição, Serra Geral do Tocantins Ecological Station	11°14'S	46°53'W	P	WA, (Dornas & Crozariol, 2012)
Rio Sono	09°25'S	47°15'W	P	WA, (Dornas & Pascoal, 2019)
Rio Sono, headwaters of Ribeirão Areias	09°48'S	47°34'W	O	(Dornas & Pascoal, 2019)
Rio Sono, headwaters of Ribeirão Monte Santo	09°44'S	47°29'W	P, V	WA, XC, (Dornas & Pascoal, 2019)
Rio Sono, Mansinha	09°20'S	47°16'W	O	(Dornas & Pascoal, 2019)
Bahia				
Cocos	12°43'S	44°33'W	P	WA
Correntina, Fazenda Jatobá	13°45'S	45°36'W	O	(Antas *et al.,* 1993)
Jaborandi, Pousada Trijunção, RPPN Lagoa do Formoso	14°47'S	45°56'W	P	WA
Mucugê, Gerais of Chapada Diamantina	13°00'S	41°24'W	P, V	EB, WA, XC
Goiás				
Água Fria de Goiás, Fazenda Nossa Senhora Aparecida	14°47'S	47°45'W	P	WA, EB
Águas Lindas de Goiás, Lago do Descoberto	15°44'S	48°13'W	O	JNC
Alto Paraíso de Goiás, Chapada dos Veadeiros National Park	14°05'S	47°40'W	P, V	(Reinert *et al.,* 1998), (Braz, 2008), WA
Alto Paraíso de Goiás, Fazenda dos Anões	14°19'S	47°30'W	P	EB
Alto Paraíso de Goiás, Fazenda Chapadão das Almas, Rio das Almas	13°58'S	47°27'W	P	DB
Alto Paraíso de Goiás, Fazenda Firmeza	14°17'S	47°29'W	O	EB
Alto Paraíso de Goiás, Fazenda São Bento	14°06'S	47°28'W	O	EB
Alto Paraíso de Goiás, Fazenda Volta da Serra	14°10'S	47°46'W	O	EB
Alto Paraíso de Goiás, near Ribeirão São Miguel	14°09'S	47°47'W	O	EB
Alto Paraíso de Goiás, Pontezinha	14°08'S	47°31'W	P	EB
Alto Paraíso de Goiás, Road to Osho Lua	14°18'S	47°39'W	O	EB
Alto Paraíso de Goiás, Road to Rio dos Couros	14°08'S	47°40'W	O	EB

Country, State/Province/Departament, Municipality, Locality	Latitude	Longitude	Record	Source
Alto Paraíso de Goiás, Templo Centelha Divina	14°08'S	47°34'W	O	EB
Anápolis, Boa Vista, Chácara das Rosas	16°18'S	48°54'W	O	(Pereira & Silva, 2009)
Anápolis, Trilha Ecológica do Tucano	16°17'S	48°56'W	O	(Pereira & Silva, 2009)
Aparecida de Goiânia, Serra das Areias, Rio Dourados	16°51'S	49°18'W	O	JNC
Campo Alegre de Goiás, Serra do Facão	17°39'S	47°43'W	O	JNC
Catalão, headwaters of Ribeirão Batalha	17°32'S	47°27'W	P	RSS
Cavalcante, Fazenda Piqui	13°29'S	47°33'W	O	EB
Cavalcante, Road BR-10	13°56'S	47°27'W	O	EB
Cavalcante, RPPN Reserva Natural Serra do Tombador	13°40'S	47°48'W	P	WA, (Antonelli-Filho, 2011)
Chapadão do Céu	18°25'S	52°33'W	P, V	WA
Chapadão do Céu, Emas National Park	18°17'S	52°46'W	P	(Rodrigues *et al.,* 1999), DB, RSS
Cocalzinho de Goiás	15°47'S	48°46'W	P	WA, JNC
Cocalzinho de Goiás, headwaters of Rio Corumbá	15°51'S	48°45'W	O	JNC
Cristalina	16°46'S	47°36'W	P, V	WA, XC
Cristalina, Córrego Cristal	16°51'S	47°22'W	O	JNC
Jataí	17°52'S	51°43'W	P	WA
Mineiros, Emas National Park	18°08'S	52°54'W	P	(Rodrigues *et al.,* 1999), RSS, WA, XC
Ouro Verde	16°11'S	49°11'W	O	JNC
Pirenópolis. Serra dos Pirineus State Park	15°48'S	48°53'W	P	WA, EB
Planaltina	15°29'S	47°38'W	S	MNRJ
Rio Quente	17°45'S	48°44'W	O	JNC
São Domingos, RESEX Recanto das Araras	13°36'S	46°17'W	O	EB
Taquaral de Goiás, Serra do Brandão	16°03'S	49°33'W	O	JNC
Distrito Federal				
Brasília, Planaltina, Águas Emendadas Ecological Station	15°32'S	47°36'W	O	(Sousa & Marini, 2007)
Brasília, Altiplano Leste	15°50'S	47°43'W	P, V	EB, XC, WA, RSS
Brasília, ARIE Cruls	15°44'S	47°55'W	O	(Felizola & Azevedo, 2013)
Brasília, Brazlândia and Sobradinho, APA de Cafuringa	15°32'S	48°04'W	O	(Bagno *et al.,* 2006)
Brasília, Cristo Redentor, RECOR	15°55'S	47°53'W	S	IBGE
Brasília, Taguatinga, Brasília National Forest	15°45'S	48°04'W	P, O	EB, RSS
Brasília, Lago Sul, Brasília Botanical Gardens	15°52'S	47°49'W	O	EB
Brasília, Núcleo Bandeirante, Fazenda Água Limpa	15°57'S	47°56'W	P, V	EB, XC
Brasília, Núcleo Bandeirante, Granja Modelo do Ipê	15°55'S	47°59'W	O	EB
Brasília, Santa Maria	16°00'S	47°56'W	O	JNC
Brasília, Brasília National Park	15°40'S	47°58'W	S, O	MNRJ, (Antas, 1995), EB
Brasília, Guará, Guará Ecological Park	15°49'S	47°58'W	S	MNRJ
Brasília, IBGE Ecological Reserve	15°55'S	47°52'W	V	(Braz & Cavalcanti, 2001), ML
Mato Grosso				
Barão de Melgaço, RPPN SESC Pantanal e Entorno	16°35'S	56°15'W	O	(BirdLife International, 2020a)
Chapada dos Guimarães, Chapada	15°25'S	55°48'W	S	AMNH, NHMUK
Itiquira	17°17'S	53°49'W	P, V	WA
Jaciara, Fazenda Santa Fé	15°59'S	55°02'W	O	(Petermann *et al.,* 2001)
Porto Estrela, Serra das Araras Ecological Station, Rio Salobo valley	15°39'S	57°13'W	O	(Silva & Oniki, 1988)
Mato Grosso do Sul				
Bodoquena, Fazenda Indiana, Rio Salobra	20°25'S	56°39'W	O	(Pivatto *et al.,* 2006)
Bonito, RPPN Fazenda da Barra	21°06'S	56°13'W	P	WA, (Pellin *et al.,* 2008)
Brazilândia, RPPN Cisalpina	21°16'S	51°55'W	O	(Godoi *et al.,* 2013), (Morante-Filho *et al.,* 2014)
Campo Grande, airport	20°28'S	54°40'W	P	EB, WA
Costa Rica	18°18'S	54°54'W	P	WA
Costa Rica, Emas National Park	18°18'S	52°57'W	P, O	WA, RSS
Coxim, Fazenda Monte Verde	18°15'S	54°41'W	S	MZUSP, MCZ, (Pinto, 1944)
Coxim, Fazenda Recreio	18°22'S	54°46'W	S	FMNH, (Pinto, 1944)
Ribas do Rio Pardo	20°27'S	53°49'W	P	WA
Terenos	20°25'S	54°53'W	P, V	EB, WA
Minas Gerais				
Aiuruoca	21°47'S	44°42'W	P	EB, WA, (Peixoto, 2014)
Andrelândia	21°44'S	44°11'W	P	XC, WA, (Peixoto, 2014)
Antônio Carlos	21°18'S	43°45'W	P	WA
Antônio Carlos, São Sebastião de Campolide	21°17'S	43°50'W	P	WA
Araguari	18°39'S	48°11'W	P	WA
Araxá, Horizonte Perdido	19°42'S	46°51'W	O	RSS
Araxá, Ribeirão do Inferno	19°46'S	46°52'W	O	RSS

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Araxá, Serra da Bocaína	19°43'S	46°48'W	P	WA
Barbacena, Galego	21°15'S	43°43'W	P, V	WA
Belo Vale, Serra de Belo Vale	20°25'S	43°56'W	V	WA, EB
Bias Fortes, Várzea de Santo Antônio	21°36'S	43°43'W	P	WA
Boa Esperança, Serra da Boa Esperança State Park	20°58'S	45°40'W	P	EB, WA
Bom Jardim de Minas, Fazenda Areão	21°52'S	44°07'W	O	(Pacheco *et al.,* 2008), (Lopes *et al.,* 2009)
Brumadinho, Serra da Moeda	20°05'S	44°10'W	P	WA
Buenópolis, Serra do Cabral State Park	17°51'S	44°15'W	P	WA, RSS
Campos Altos	19°41'S	46°10'W	P	WA
Capitólio	20°36'S	46°04'W	V	WA
Carmo da Cachoeira	21°22'S	45°30'W	P	WA
Carrancas	21°28'S	44°36'W	P, V	WA, (Peixoto, 2014)
Carrancas	21°29'S	44°38'W	O	(Lombardi *et al.,* 2012)
Carrancas, Fazenda do Oswaldo	21°30'S	44°52'W	P	(Moura & Corrêa, 2012)
Carrancas, Serra das Broas	21°36'S	44°36'W	P	(Moura & Corrêa, 2012), WA, RSS
Carrancas, Serra de Carrancas	21°26'S	44°42'W	P	EB, XC, WA, RSS
Conceição do Mato Dentro, Parque Natural Municipal do Tabuleiro	19°05'S	43°34'W	O	(IEF, 2016)
Conceição do Mato Dentro, Parque Natural Municipal do Tabuleiro, headwaters of Ribeirão do Campo	19°04'S	43°37'W	O	(IEF, 2016)
Conceição do Mato Dentro, Serra do Intendente State Park, hedwaters of Rio Cubas	19°07'S	43°33'W	O	(IEF, 2016)
Conceição do Mato Dentro, Serra do Intendente State Park	18°58'S	43°39'W	O	(IEF, 2016)
Congonhas	20°29'S	43°50'W	O	(Mazzoni *et al.,* 2012)
Coronel Xavier Chaves	21°03'S	44°09'W	O	EB
Cruzeiro da Fortaleza	18°58'S	46°40'W	P	WA
Cruzília	21°43'S	44°43'W	V	XC, (Peixoto, 2014)
Curvelo	18°44'S	44°26'W	P	WA
Curvelo, Fazenda Olhos D'Água	19°00'S	44°30'W	O	(Melo, 1997)
Delfinópolis, Serra da Babilônia	20°21'S	46°34'W	P	WA, RSS
Diamantina, Guinda	18°15'S	43°40'W	P	WA
Diamantina, Sempre-Vivas National Park	17°48'S	43°46'W	P	WA
Estrela do Sul, Fazenda Monte Carmelo, Ribeirão Piçarrão	18°48'S	47°53'W	O	(Lopes *et al.,* 2009)
Felixlândia	18°45'S	44°52'W	P	WA
Francisco Dumont, Serra do Cabral, Vereda Córrego do Cachorro	17°23'S	44°15'W	P	WA
Gouveia	18°34'S	43°54'W	P, V	WA
Guapé, Serra da Rapadura/Serra dos Macacos	20°50'S	45°55'W	P	WA
Ibertioga	21°24'S	43°56'W	P	WA, (Peixoto, 2014)
Ibiá	19°29'S	46°32'W	P	WA
Indianópolis	19°02'S	47°55'W	P	WA
Indianópolis, Fazenda Monte Carmelo, Ribeirão Mandaguari	19°02'S	47°42'W	O	EB, (Lopes *et al.,* 2009)
Indianópolis, Fazenda Nova Monte Carmelo	18°55'S	47°40'W	O	(Ferreira *et al.,* 2015)
Itabira, Serra dos Alves	19°30'S	43°27'W	P, V	WA, EB
Itabira, Mata do Limoeiro State Park	19°35'S	43°25'W	P	WA
Itabirito	20°15'S	43°53'W	P	WA, EB
Itajubá, near Frigorífico Frivasa	22°26'S	45°27'W	P	WA
Itaverava	20°39'S	43°36'W	P, V	WA
Itutinga	21°23'S	44°40'W	O	EB
Jaboticatubas, Serra do Cipó National Park	19°30'S	43°36'W	P	WA
Juiz de Fora, Paredão de Pedra, Condomínio do Sol	21°45'S	43°21'W	P	WA
Juiz de Fora, Road of Torreões	21°49'S	43°28'W	P	WA
Lavras, Quedas do Rio Bonito Ecological Park	21°19'S	44°58'W	O	EB
Lavras, Serra do Carrapato	21°20'S	44°57'W	P, V	EB, WA
Lima Duarte, Fazenda do Sr. G.C. Fonseca	21°43'S	44°00'W	O	(Lopes *et al.,* 2009)
Lima Duarte, São Sebastião do Monte Verde	21°55'S	43°50'W	P	WA
Lima Duarte, Souza	21°48'S	44°03'W	O	(Lopes *et al.,* 2009)
Luminárias, Serra Grande	21°32'S	44°49'W	P	EB, XC, WA, (Peixoto, 2014)
Madre de Deus de Minas	21°32'S	44°21'W	P	WA, (Peixoto, 2014)
Medeiros	19°58'S	46°13'W	P	WA
Minduri	21°40'S	44°36'W	O	(Lombardi *et al.,* 2012)
Minduri, Serra da Chapada das Perdizes	21°35'S	44°35'W	O	WA, (Lombardi *et al.,* 2012)
Morro do Pilar, APA Morro da Pedreira	19°17'S	42°39'W	P	WA
Morro do Pilar, RPPN Aves Gerais, headwaters of Rio Picão	19°13'S	43°29'W	P, V	(Carrara & Faria, 2012)
Morro do Pilar, Serra do Cipó National Park	19°15'S	43°31'W	P, V	WA, XC, (Rodrigues *et al.,* 2011)
Nepomuceno	21°22'S	45°14'W	O	EB

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Nova Lima, Estrada de Rio de Peixe	20°04'S	43°54'W	P	WA
Nova Lima, Retiro das Pedras	20°06'S	43°59'W	S, P, V	DZUFMG, MCNA, WA
Nova Lima, São Sebastião das Águas Claras	20°02'S	43°57'W	P	WA
Nova Lima, Serra do Curral, RPPN Mata do Jambreiro	19°58'S	43°54'W	P	WA
Nova Lima, Serra do Rola Moça State Park	20°03'S	44°00'W	O	(Hoffmann *et al.,* 2007)
Nova Ponte	19°09'S	47°41'W	O	EB
Nova Ponte, Fazenda São Pedro	18°55'S	47°42'W	O	(SUPRAM, 2019)
Olaria	21°52'S	43°55'W	P	WA
Ouro Preto, Miguel Burnier	20°26'S	43°47'W	P, V	(Mazzoni *et al.,* 2012)
Paracatu, headwaters of Ribeirão Batalha	17°29'S	47°15'W	P	RSS
Patos de Minas, Mosaic Fertilizantes	18°22'S	46°54'W	P	RSS
Patrocínio, headwaters of Córrego Bebedouro, Mosaic Fertilizantes	19°00'S	46°46'W	S, P	RSS, MZUSP
Patrocínio, headwaters of Córrego Capoeira Grande	19°11'S	46°55'W	S, P, V	RSS, XC, MZUSP
Patrocínio, headwaters of Córrego do Fundão	19°05'S	46°53'W	S, P	MZUSP, RSS
Patrocínio, headwaters of Córrego do Jacu	19°03'S	46°52'W	P	RSS
Patrocínio, headwaters of Córrego do Mato	19°09'S	46°55'W	P	RSS
Patrocínio, headwaters of Córrego Duas Pontes	19°09'S	46°56'W	P	RSS
Patrocínio, near power line 1	19°04'S	46°52'W	P	RSS
Patrocínio, Serra Chapadão de Ferro	18°55'S	46°49'W	O	(Mattos *et al.,* 1991), RSS
Perdizes	19°21'S	47°16'W	P, V	WA
Perdizes, RPPN Unidade de Conservação de Galheiros	19°12'S	47°08'W	O, V	(Malacco *et al.,* 2003), (Lopes *et al.,* 2009)
Piedade do Rio Grande	21°27'S	44°11'W	P, V	WA, XC
Pimenta	20°28'S	45°48'W	P	WA
Piranguinho	22°24'S	45°32'W	P	WA
Piranguinho, Olegário Maciel	22°19'S	45°35'W	O	(Mattos *et al.,* 1991)
Piumhi, Serra de Piumhi	20°28'S	45°55'W	P	WA
Pompéu	19°10'S	45°02'W	P, V	WA, (Souza *et al.,* 2018)
Pouso Alegre	22°07'S	45°51'W	P, V	WA, EB
Prados, Pitangueiras	21°12'S	44°04'W	P	WA
Prados, Ribeirão do Elvas	21°08'S	44°06'W	P	WA
Quartel Geral, Quartel São João	19°15'S	45°47'W	P, V	(Moura *et al.,* 2011)
Resende Costa, Córrego da Cruz	20°54'S	44°15'W	P, V	WA, EB
Sacramento, Serra da Canastra National Park	20°08'S	46°51'W	P	RSS, WA
Santa Bárbara do Monte Verde	21°56'S	43°42'W	P	WA
Santa Rita de Ibitipoca	21°33'S	43°55'W	V	XC
Santa Rita do Sapucaí	21°12'S	45°42'W	O	EB
Santa Vitória, São Simão Channel, Serra Negra	18°56'S	50°30'W	O	(Mattos *et al.,* 1991)
Santana do Garambéu	21°34'S	44°04'W	P, V	WA, XC
Santana do Garambéu, Fazenda do Sr. Pp.S. Almeida	21°43'S	44°05'W	O	(Lopes *et al.,* 2009)
Santana do Riacho, Lapinha da Serra, Serra do Cipó	19°07'S	43°40'W	P	WA, EB
Santana do Riacho, Cardeal Mota, Serra do Cipó	19°19'S	43°37'W	P	WA
Santana dos Montes	20°47'S	43°41'W	P	WA, EB
Santo Hilário	20°39'S	45°50'W	O	EB
São Gonçalo do Abaeté, Fazenda São Francisco 4 and 10	18°18'S	45°48'W	P, V	WA
São João Batista do Glória, Serra da Canastra National Park	20°32'S	46°24'W	P	WA, EB
São João del Rei	21°15'S	44°20'W	P, V	WA, (Peixoto, 2014)
São João del Rei	21°16'S	44°08'W	O	(Peixoto, 2014), RSS
São João del Rei	21°16'S	44°04'W	O	(Peixoto, 2014)
São João del Rei, Serra do Carvoeiro	21°09'S	44°11'W	P	EB
São Roque de Minas, Serra da Canastra National Park	20°14'S	46°32'W	P, V	(Silveira, 1998), EB, ML, WA, XC, RSS
São Thomé das Letras	21°43'S	44°58'W	P	WA
São Tiago	20°54'S	44°30'W	P	WA
São Vicente de Minas, Fazenda Bom Jardim	21°38'S	44°25'W	P	EB, WA
Sete Lagoas, Serra de Santa Helena	19°26'S	44°16'W	P	WA
Tapira, Mosaic Fertilizantes (BD-5)	19°49'S	46°50'W	P, V	RSS, XC
Tapira, Mosaic Fertilizantes (Natural Reserve)	19°51'S	46°47'W	P	RSS
Tapira, Ribeirão do Inferno	19°47'S	46°53'W	P	RSS
Três Marias, Fazenda Araras 8	18°11'S	45°06'W	P	WA
Três Marias, Fazenda Perdões	18°11'S	45°25'W	O	(Ribon *et al.,* 1995)
Uberaba, headwaters of Rio Uberabinha	19°21'S	47°54'W	P	WA, EB
Uberaba, Fazenda Água Emendada	19°17'S	48°01'W	O	(Lopes *et al.,* 2009)
Uberaba, RPPN Vale Encantado	19°32'S	47°53'W	P	WA

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Unaí, Santuário da Vida Silvestre São Miguel, Fazenda São Miguel	15°50′S	46°30′W	O	(FUNATURA, 1994), (Lopes *et al.,* 2008)
Uruana de Minas, Cercado	16°17′S	46°15′W	P	WA
Vargem Bonita	20°19′S	46°22′W	P	WA
São Paulo				
Águas de Santa Bárbara, Fazenda Experimental Santa Bárbara do Rio Pardo	22°53′S	49°15′W	O	(Willis & Oniki, 2003)
Águas de Santa Bárbara, Santa Bárbara Ecological Station	22°48′S	49°14′W	O	(Willis & Oniki, 2003)
Batatais	20°53′S	47°37′W	S	MZUSP, (Pinto, 1944)
Bofete	23°05′S	48°16′W	P	WA, EB
Botucatu, Botucatu State Forest	22°56′S	48°27′W	P, V	WA, EB, XC
Botucatu, Sítio São José	22°56′S	48°25′W	P	WA
Broa, Rio Itaqueri	22°15′S	47°52′W	O	(Willis & Oniki, 2003)
Castilho, RPPN Foz do Rio Aguapeí	21°06′S	51°44′W	O	(Miyaji, 2013)
Franca	20°32′S	47°24′W	S	MZUSP, (Pinto, 1944)
Iperó, Ipanema	23°26′S	47°36′W	S	SMF, NMW
Itapetininga, Fazenda Campo Grande	23°38′S	47°58′W	O	(Willis & Oniki, 2003)
Itararé	24°06′S	49°18′W	S	NMW, NHMUK, RMNH
Itararé, Fazenda Santa Andrea	24°08′S	49°10′W	O	(Willis & Oniki, 2003)
Itararé, Unidade de Pesquisa e Desenvolvimento de Itararé	24°16′S	49°13′W	S	MCP
Itirapina, Itirapina Ecological Station	22°13′S	47°54′W	P, V	(Willis & Oniki, 2003), WA
Ituverava, Rio das Pedras	20°11′S	47°56′W	S	NMW
Santa Lúcia	21°41′S	48°04′W	S	ZMB
São Carlos, Fazenda Santa Maria da Fábrica	22°10′S	47°55′W	O	(Willis & Oniki, 2003)
Taquarivaí, Córrego Escaramuça (Scaramuza)	23°53′S	48°46′W	S	NMW
Paraná				
Balsa Nova, São Luiz do Purunã	25°28′S	49°42′W	P, V	WA, EB, XC
Campo Largo	25°27′S	49°29′W	P	WA
Candói, Fazenda Rodeio Velho	25°38′S	52°07′W	P, V	WA, EB
Castro	24°46′S	49°59′W	P	WA
Curitiba	25°27′S	49°08′W	S, V	NMW, NHMUK, XC
Jaguariaíva	24°15′S	49°42′W	O, P, V	(Santos, 2007), WA, EB
Maringá, Campus do Centro Universitário de Maringá (CESUMAR)	23°26′S	51°55′W	O	(Esclarski *et al.,* 2011)
Palmeira, Fazenda Santa Rita	28°18′S	49°48′W	O	(Anjos & Graf, 1993)
Piraí do Sul, Fazenda Cuiabá	24°24′S	50°02′W	S, P	MCP, WA
Piraquara	25°26′S	49°04′W	P, V	WA
Ponta Grossa, Vila Velha State Park	25°14′S	50°00′W	O	(Mikich & Bérnils, 2004)
Porto Amazonas	25°32′S	49°53′W	P	WA
Quatro Barras, APA Estadual do Rio Iraí	25°23′S	49°04′W	S	MHNCI, (Mikich & Bérnils, 2004)
São José dos Pinhais, Banhados do Rio Miringuava	25°35′S	49°10′W	P	WA
São José dos Pinhais, Várzea na estrada do Curralinho	25°33′S	49°03′W	P	EB
Telêmaco Borba, Fazenda Monte Alegre	24°12′S	50°33′W	O	(Rocha *et al.,* 2003)
Tibagi, Guartelá State Park	24°40′S	50°13′W	P, V	EB, WA
Santa Catarina				
Campo Belo do Sul	27°55′S	50°47′W	P, V	EB, WA
Capão Alto, Fazenda Pai João	28°10′S	50°38′W	P, V	WA, RSS
Lages, Coxilha Rica	28°17′S	50°17′W	S, P, V	MCP, (Repenning *et al.,* 2010)
Lages, Coxilha Rica	28°18′S	50°16′W	S, P, V	MCP, (Repenning *et al.,* 2010)
Lages, Fazenda Santa Maria, Coxilha Rica	28°15′S	50°18′W	P, V	(Repenning *et al.,* 2010)
Lages, Morrinhos, Coxilha Rica	28°16′S	50°17′W	P	WA
Lages, Rio Lava-Tudo Valley, Coxilha Rica	28°18′S	50°14′W	P	WA
Urupema, Morro do Combate	28°00′S	49°49′W	O	RSS
Rio Grande do Sul				
Alegrete, Fazenda Cerro dos Porongos	30°04′S	55°31′W	O	EB
Alegrete, Fazenda do Beto	29°54′S	55°49′W	O	(Fontana *et al.,* 2003)
Alegrete, Fazenda Sá Brito	29°58′S	55°45′W	O	EB
Alegrete. Ibirapuitã APA	29°59′S	55°40′W	O	EB
Alegrete, Ibirapuitã Biological Reserve	29°55′S	55°47′W	V	(Bencke, 2001)
Alegrete, Serra do Caverá	30°23′S	55°24′W	P	WA
Bom Jesus	28°42′S	50°24′W	S, P, V	MCP, XC, WA
Bom Jesus, Arroio Água Branca	28°35′S	50°24′W	S, P, V	MCP, (Repenning *et al.,* 2010)
Bom Jesus, Banhado do Arroio Água Branca	28°36′S	50°23′W	S, V	MCP, EB
Bom Jesus, Cachoeira dos Baggio	28°40′S	50°28′W	P, V	(Repenning *et al.,* 2010)
Bom Jesus, Fazenda da Ronda	28°28′S	50°42′W	P, V	(Repenning *et al.,* 2010)

Country, State/Province/Departament, Municipality, Locality	Latitude	Longitude	Record	Source
Bom Jesus, northeast of Rio Santana	28°26'S	50°41'W	P, V	(Repenning *et al.,* 2010)
Bom Jesus, Road RS-110	28°35'S	50°22'W	P, V	(Repenning *et al.,* 2010)
Bom Jesus, Sanga José Luis	28°28'S	50°42'W	P, V	(Repenning *et al.,* 2010)
Bom Jesus, Várzea do Rio Santana	28°29'S	50°43'W	P, V	(Repenning *et al.,* 2010)
Campestre da Serra, Guacho	28°40'S	51°05'W	P	(Repenning *et al.,* 2010), WA
Cruz Alta	28°36'S	53°34'W	P, V	WA
Manoel Viana, Assentamento Santa Maria do Ibicuí	29°29'S	55°37'W	O	EB
Rosário do Sul	30°11'S	54°57'W	P	WA
Rosário do Sul, Fazenda Schütz	30°18'S	54°51'W	O	EB
Rosário do Sul, São Bento	30°17'S	54°46'W	O	EB
Rosário do Sul, Vila Temp	30°14'S	54°51'W	O	EB
Santa Margarida do Sul	30°21'S	54°04'W	P	WA
Santa Maria	29°44'S	53°50'W	P	WA
São Francisco de Assis	29°36'S	54°45'W	O	(Gressler & Krüger, 2005)
São Francisco de Paula	29°09'S	50°24'W	O	EB
São Gabriel	30°23'S	54°21'W	P	EB, WA
São Gabriel, Suspiro	30°37'S	54°20'W	P	EB, WA
São Gabriel, Horto Florestal Formosa (CMPC)	30°17'S	54°47'W	P	WA
Tupanciretã, Porteira Encantada – Fazenda Moresco	28°57'S	53°46'W	P	WA
Tupanciretã, old Road Tupã-Cruz Alta	28°56'S	53°45'W	P, V	EB, WA
Vacaria, Arroio Pessegueiro	28°22'S	50°45'W	P, V	(Repenning *et al.,* 2010)
Vacaria, Banhado Rio Santana	28°28'S	50°42'W	O	EB
Vacaria, Capão Alto	28°12'S	51°00'W	P, V	(Repenning *et al.,* 2010)
Vacaria, East of Rio Socorro	28°21'S	50°53'W	P, V	(Repenning *et al.,* 2010)
Vacaria, Estrada de Ferro	28°21'S	50°46'W	P, V	(Repenning *et al.,* 2010)
Vacaria, Estrada de Ferro, Fazenda Socorro	28°21'S	50°47'W	P, V	(Repenning *et al.,* 2010)
Vacaria, headwaters of Arroio Macena	28°30'S	50°47'W	P, V	(Repenning *et al.,* 2010), WA
Vacaria, Itacolomi	28°13'S	50°52'W	P, V	(Repenning *et al.,* 2010)
Vacaria, São Pedro, Capela do Caravaggio	28°08'S	50°54'W	S, P, V	MCP, (Repenning *et al.,* 2010)
Vacaria, Túneis da Estrada de Ferro	28°19'S	50°43'W	P, V	(Repenning *et al.,* 2010)
Vacaria, West of Rio Socorro	28°20'S	50°55'W	P, V	(Repenning *et al.,* 2010)
Vacaria, Várzea do Arroio Moema	28°30'S	50°48'W	S	MCP
BOLIVIA				
La Paz				
7 km East of Ixiamas	13°46'S	68°03'W	O	(Parker III *et al.,* 1991)
Franz Tamayo, Apolo, Madidi Savanna, Madidi National Park	14°43'S	68°21'W	V	(Soria-Auza & Hennessey, 2005), ML
Ixiamas	13°45'S	68°05'W	O	EB
Pampa Moscoso	13°02'S	68°50'W	O	EB
El Beni				
10 km Southwest of San Borja	14°53'S	66°51'W	O	(Parker III *et al.,* 1991)
26 and 30 km East of San Borja	14°49'S	66°51'W	V	(Parker III *et al.,* 1991), ML
Barba Azul Nature Reserve	13°45'S	66°05'W	P	EB
Beni Biosphere Station	14°38'S	66°17'W	O	EB
Cerro San Simón	13°36'S	62°15'W	O	(Parker III & Rocha, 1991)
Estancia El Porvenir, Beni Biological Station	14°50'S	66°17'W	O	(Brace *et al.,* 1997)
Estancia Motacuzal	13°45'S	64°37'W	O	EB
Estancia Peñas Verdes	13°36'S	64°30'W	O	EB
General Jose Ballivan, 3 km Southwest of San Borja	14°51'S	66°50'W	S	LSUMZ, (Schmitt & Schmitt, 1987)
Las Palmiras	13°44'S	66°24'W	O	EB
Llanos de Mojos, 7 Islas Camp	13°48'S	64°30'W	O	EB
North of Trinidad	13°37'S	64°58'W	O	(Soria-Auza & Hennessey, 2005)
Puerto Ustarez	12°44'S	64°38'W	P	EB
Selva Blue, Laguna Larga	12°49'S	65°46'W	O	EB
Upper Yata/Tapado	13°16'S	66°02'W	O	EB
Santa Cruz				
Buena Vista	17°27'S	63°40'W	S	ANSP, CM
Santa Rosa de la Roca	15°54'S	61°24'W	P	EB
Serranía de Huanchaca I, Noel Kempff Mercado National Park	13°57'S	60°49'W	S	LSUMZ, (Bates & Parker III, 1998)
Serranía de Huanchaca II, Noel Kempff Mercado National Park	14°31'S	60°44'W	S	LSUMZ, MNK, (Bates & Parker III, 1998), EB
PARAGUAY				
San Pedro				
Establecimiento Laguna Blanca, Retiro Malvina	23°49'S	56°18'W	O	(Barnett *et al.,* 2004)

Country, State/Province/Departament, Municipality, Locality	Latitude	Longitude	Record	Source
Estancia Villa Josefina	23°55′S	56°45′W	O	EB
Forestadora Río Verde	23°46′S	56°20′W	P	EB
Laguna Blanca	23°46′S	56°17′W	P	(Centrón, 2009a), EB
North Yboty	23°43′S	56°18′W	O	EB
Nueva Germania	23°54′S	56°34′W	S	ZSM, (Laubmann, 1940)
Señorita	23°45′S	56°13′W	O	EB
Presidente Hayes				
Benjamín Aceval, Villa Hayes	25°06′S	57°34′W	S	MHNSCP, (Bertoni, 1930)
Estancia La Rafaela	24°53′S	57°27′W	O	EB
Monte Sociedad	25°03′S	57°35′W	S	(Laubmann, 1940)
Pirizal area, Catholic Mission	22°13′S	58°25′W	O	EB
Ruta Transchaco, km 20 to 79	24°48′S	57°46′W	O	EB
Ruta Transchaco, km 60	24°55′S	57°38′W	O	(Hayes, 1995)
Cordillera				
Arroyos y Esteros, km 100	24°52′S	56°53′W	O	EB
Estancia Sombrero	25°01′S	56°35′W	O	EB
Paraguarí				
Agromonte	25°43′S	57°06′W	O	EB
Estancia Barrerito	26°16′S	57°03′W	O	(Centrón, 2009c), EB
Sapucái	25°40′S	56°55′W	S	NHMUK, (Chubb, 1910)
Concepción				
Arroyo Tagatiya, Campos Cerrados	22°44′S	57°33′W	O	EB
Cerrados de Concepción	22°25′S	57°10′W	O	EB
Estancia San Luis de La Sierra, Arroyo La Paz	22°23′S	57°27′W	O	EB
Serranía San Luis National Park	22°36′S	57°25′W	O	EB
Zanja Moroti, Río Apa	22°30′S	57°00′W	S	ZSM, (Laubmann, 1940)
Canindeyú				
Aguara Ñú	24°11′S	55°16′W	P	EB, XC
Reserva Natural del Bosque Mbaracayú	24°06′S	55°14′W	O	(Madroño Nieto & Esquivel, 1997), EB
Caaguazú				
Morombi	24°37′S	55°22′W	O	EB
Upper Iguazú River	25°05′S	55°45′W	S	AMNH
Caazapá				
Arrozal Codas	26°29′S	56°18′W	O	EB
Estancia Roa Coé	26°33′S	56°06′W	O	(Codesido & Fraga, 2009)
Estancia Tapyta	26°14′S	55°46′W	O	EB, XC
San Juan Nepomuceno	26°08′S	55°56′W	O	EB
Itapúa				
Carmen del Paraná	27°15′S	56°08′W	O	(Codesido & Fraga, 2009)
Coronel Bogado, Fundación San Rafael	27°07′S	56°22′W	O	EB
Dr. Blas Garay	26°46′S	56°16′W	O	EB
Estero San José	26°55′S	56°04′W	O	(Bonzi *et al.,* 2020)
General Artigas, Estero Ñu Guasu	26°56′S	56°18′W	O	(Bonzi *et al.,* 2020), EB
Isla Yacyretá Natural Reserve	27°25′S	56°43′W	O	(Codesido & Fraga, 2009), (Bonzi *et al.,* 2020), EB
La Paz Fish Farm	27°00′S	55°54′W	P	EB
Leandro Oviedo	26°43′S	56°16′W	O	EB
San Miguel Potrero	27°03′S	56°08′W	O	(Bonzi *et al.,* 2020)
San Rafael, Guyra Reta Reserve, Kanguery Biological Station	26°30′S	55°46′W	O	(del Castillo & Centrón, 2010), EB
San Rafael National Park, Estancia Kanguery	26°25′S	55°48′W	O	(Esquivel-M. *et al.,* 2007), (Smith, 2017), EB
Misiones				
Campo Llano	26°47′S	57°25′W	O	(Centrón & del Castillo, 2011), EB
Estancia La Graciela	26°31′S	56°52′W	O	(Centrón, 2009b), (Ferreira, 2009), EB
Santiago	27°05′S	56°50′W	O	EB
Yabebyry	27°13′S	56°56′W	O	EB
ARGENTINA				
Misiones				
Campo Prates, Barra Concepción	28°07′S	55°35′W	O	(Krauczuk, 2005)
Candelaria, Estancia Santa Cecília	27°27′S	55°42′W	P	EB
Candelaria, Puerto San Juan Private Reserve	27°21′S	55°37′W	O	(Krauczuk, 2005)
Candelaria, Santa Ana, Campo San Juan Reserve	27°24′S	55°37′W	P	(Krauczuk, 1997), (Di Giacomo *et al.,* 2007), EB
Candelaria, Urutaú Reserve	27°29′S	55°46′W	P	EB
Capital, Garupá, near Barrio Santa Helena	27°28′S	55°53′W	O	(Krauczuk, 2005, 2006)

Country, State/Province/Departament, Municipality, Locality	Latitude	Longitude	Record	Source
Capital, Posadas, airport	27°23'S	55°57'W	0	EB
Capital, Posadas, Campus of Universidad Nacional de Misiones	27°26'S	55°53'W	0	(Krauczuk, 2005)
Capital, Posadas, Don Lorenzo Refuge	27°25'S	55°52'W	0	(Krauczuk, 2005, 2006)
Capital, Posadas, international bridge Posadas-Encarnación, El Zaimám creek confluence	27°22'S	55°53'W	0	(Krauczuk, 2006)
Capital, Posadas, Itaembé Guazú	27°25'S	55°58'W	P	EB
Capital, Posadas, mouth of Mártires river	27°23'S	55°57'W	P	EB
Capital, Posadas, near the Ruínas de Mártires	27°25'S	55°56'W	0	(Krauczuk, 2005)
Capital, Posadas, Nemesio Parma, Paraíso Costero	27°20'S	56°01'W	P	EB
Capital, Posadas, Santa Rosa Private Reserve	27°24'S	55°53'W	0	(Krauczuk, 2005)
Capital, Posadas, west access to Posadas	27°22'S	55°57'W	0	(Krauczuk, 2006)
Concepción, Cerro Mártires y Barra Santa María	27°51'S	55°26'W	0	(Di Giacomo *et al.,* 2007)
Concepción de la Sierra, Barra Concepción	28°08'S	55°53'W	S	MACN, (Di Giacomo *et al.,* 2007)
Garupá creek basin	27°29'S	55°44'W	0	(Di Giacomo *et al.,* 2007)
Near Río Saimá, Itapua	27°22'S	55°58'W	S	(White, 1882)
Chaco				
Bermejo, El Cachapé	26°50'S	59°00'W	0	(Di Giacomo *et al.,* 2007)
Bermejo, Sol de Mayo	26°59'S	58°42'W	P	EB
Corrientes				
Capital, Estero Valenzuela	27°53'S	58°34'W	0	(Di Giacomo *et al.,* 2007)
Concepción and San Roque, Concepcíon – Chavarría	28°37'S	58°10'W	0	(Di Giacomo *et al.,* 2007)
Estancia Puerto Valle	27°43'S	56°29'W	0	(Parera, 2004)
General Alvear, Bañado San Isidoro	28°54'S	56°36'W	0	EB
General Paz, Lomas de Vallejos, Ruta Provincial 5	27°43'S	58°01'W	0	EB
Gobernador General Virasoro, Estancia La Higuera	27°59'S	56°18'W	0	(Marino *et al.,* 2013)
Gobernador General Virasoro, Estancia Virocay	28°15'S	55°57'W	0	(Marino *et al.,* 2013), EB
Gobernador General Virasoro, Las Marías	28°06'S	56°03'W	0	(Krauczuk, 2005), EB
Gobernador General Virasoro, Sosa Cué	28°00'S	56°02'W	0	EB
Iberá Provincial Reserve	28°24'S	57°07'W	0	(Chebez *et al.,* 1999)
Ituzaingó, Estancia La Guayna	27°45'S	56°04'W	0	(Codesido & Fraga, 2009)
Ituzaingó, Iberá National Park, Cambyretá	27°49'S	56°50'W	0	EB
Ituzaingó, Isla Apipé Grande Natural Reserve	27°30'S	56°52'W	0	(Esteban, 1953)
Ituzaingó, Lomada de San Alonso, Esteros del Iberá	28°14'S	57°24'W	0	EB
Ituzaingó, Puerto Valle	27°43'S	56°30'W	0	EB
Ituzaingó, Rincón de Santa María Natural Reserve	27°30'S	56°35'W	P	(Krauczuk, 2005), (Di Giacomo *et al.,* 2007), XC, EB
Ituzaingó, San Carlos, Rio Aguapey, Estancia San Joaquín	27°45'S	55°54'W	S	MACN, (Darrieu & Camperi, 1992)
Isla Apipé Grande	27°30'S	56°52'W	0	(Esteban, 1953)
Mburucuyá, Mburucuyá National Park	28°00'S	58°05'W	0	(Chebez *et al.,* 1999), (Di Giacomo *et al.,* 2007), EB
Mburucuyá, Mburucuyá village and surroundings	28°02'S	58°13'W	0	EB
Mercedes and San Martín, Rincón del Socorro and Iberá	28°32'S	57°10'W	0	(Di Giacomo *et al.,* 2007), EB
San Martín, Colonia Carlos Pellegrini	28°32'S	57°10'W	0	EB
San Miguel, Estancia San Juan Poriahú	27°42'S	57°11'W	0	EB
Santo Tomé, Estancia Mora Cué and around	28°18'S	56°10'W	0	(Di Giacomo *et al.,* 2007)
Santo Tomé, far northeast Corrientes	28°27'S	55°47'W	0	(Di Giacomo *et al.,* 2007)
Santo Tomé, Río Aguapey basin	28°36'S	56°56'W	0	(Di Giacomo *et al.,* 2007)
Santo Tomé, Ruta Provincial 40	28°22'S	56°07'W	0	EB
Santo Tomé, Ruta Provincial 41	28°11'S	56°43'W	0	EB
Entre Ríos				
Colón, Arroyo Caraballo	32°13'S	58°08'W	0	(Milat *et al.,* 1985)
Ibicuy, Ceibas	33°26'S	58°45'W	0	(Di Giacomo *et al.,* 2007)
Formosa				
Laishi, El Bagual Reserve	26°10'S	58°56'W	P	(Di Giacomo, 1996, 2005), EB
Riacho Pilaga	26°05'S	57°59'W	S	USNM, (Wetmore, 1926)
Río Pilcomayo National Park	25°04'S	58°07'W	S	(Chebez *et al.,* 1999)
Santa Fe				
Gral. Obligado y Vera, wooded wedge of Santa Fe	28°30'S	59°30'W	0	(Di Giacomo *et al.,* 2007)
Mocovi	28°24'S	59°42'W	S	AMNH, (Hartert & Venturi, 1909)
San Martín, Provincial Reserve for Multiple Uses Federico Wildermuth	32°00'S	61°42'W	0	(Di Giacomo *et al.,* 2007)
Tacuarendi	28°25'S	59°18'W	0	(Lillo, 1909)
Villa Ocampo	28°28'S	59°22'W	S	AMNH, (Hartert & Venturi, 1909)
URUGUAY				
Rivera				
Near La Palma, Valle del Lunarejo	31°10'S	55°55'W	P	(Azpiroz, 1998)

APPENDIX 2

Specimens of *Culicivora caudacuta*.

BRAZIL

Amazonas:
MZUSP 92411, ♂, Igarapé Assuã, BR 319, Canutama, 07.xii.2011, Fábio Schunck & Bret Whitney.
MZUSP 92412, ♂, Igarapé Assuã, BR 319, Canutama, 07.xii.2011, Fábio Schunck & Bret Whitney.
MZUSP 92413, ?, Igarapé Assuã, BR 319, Canutama, 07.xii.2011, Fábio Schunck & Bret Whitney.

Maranhão:
MPEG 43519, ♂, Estiva, Alto Parnaíba, 03.iv.1989, Brígida, Rosemiro, J.M. Rosa, Raimundo & Dionísio.

Distrito Federal:
MNRJ 28988, ♀, Parque Guará, Brasília, 11.x.1963, Luiz Moojen.
MNRJ 28989, ♂, Parque Guará, Brasília, 11.x.1963, Luiz Moojen.
MNRJ 28990, ♂, Parque Guará, Brasília, 11.x.1963, Luiz Moojen.
MNRJ 28991, ♂, Parque Guará, Brasília, 11.x.1963, Luiz Moojen.
MNRJ 32662, ♂, Parque Nacional de Brasília, Brasília, 02.xii.1978, Helmut Sick.
MNRJ 32663, ♀, Parque Nacional de Brasília, Brasília, 02.xii.1978, Helmut Sick.
IBGE 719, ♂, Cristo Redentor, RECOR, Brasília, 04.vii.1984.
IBGE 720, ♀, Cristo Redentor, RECOR, Brasília, 04.vii.1984.

Goiás:
MNRJ 13218, ♂, Planaltina, 15.vi.1927, Emilie Snethlage.
MNRJ 13219, ♀, Planaltina, 15.vi.1927, Emilie Snethlage.

Mato Grosso:
AMNH 33317, ♀, Chapada, 13.iv.1883, Herbert Smith.
NHMUK 1889.1.10.299, ♀, Chapada, 17.x.1883, Herbert Smith.

Mato Grosso do Sul:
MZUSP 13211, ♀, Fazenda Monte Verde, Coxim, 29.vi.1930, João Leonardo Lima.
MZUSP 17391, ♀, Fazenda Monte Verde, Coxim, 08.viii.1937, José Leonardo de Lima.
MCZ 154615, ♀, Coxim, 29.vi.1930, João Leonardo Lima.
MCZ 154616, ♂, Coxim, 10.vii.1930, João Leonardo Lima.
MCZ 154617, ♀, Fazenda Monte Verde, Coxim, 10.vii.1930, João Leonardo Lima.
FMNH 17390, ♂, Fazenda Recreio, Coxim, 09.viii.1937, José Leonardo de Lima.

Minas Gerais:
DZUFMG 4511, ♂, Retiro das Pedras, Nova Lima, 02.vi.2005, Marcelo Ferreira de Vasconcelos, Diego Hoffmann, Leonardo Esteves Lopes & Éverton Vieira Ouriques.
DZUFMG 4512, ♀, Retiro das Pedras, Nova Lima, 02.vi.2005, Marcelo Ferreira de Vasconcelos, Diego Hoffmann, Leonardo Esteves Lopes & Éverton Vieira Ouriques.
MCNA 2211, ♂, Retiro das Pedras, Nova Lima, 02.vi.2005, Marcelo Ferreira de Vasconcelos, Diego Hoffmann, Leonardo Esteves Lopes & Éverton Vieira Ouriques.
MCNA 2277, ♀, Retiro das Pedras, Nova Lima, 02.vi.2005, Marcelo Ferreira de Vasconcelos, Diego Hoffmann, Leonardo Esteves Lopes & Éverton Vieira Ouriques.
MZUSP 115128, headwaters of Córrego do Fundão, Patrocínio, 22.x.2015, Luís Fábio Silveira & Robson Silva e Silva.
MZUSP 115129, Fazenda Todos os Santos, headwaters of Córrego Capoeira Grande, Patrocínio, 19.viii.2020, Robson Silva e Silva & Lucio dos Reis Oliveira.
MZUSP 115130, headwaters of Córrego Bebedouro, Patrocínio, 30.v.2021, Robson Silva e Silva, Paulo César Araújo dos Santos-Jr. & Lucio dos Reis Oliveira.
MZUSP 115131, headwaters of Córrego Bebedouro, Patrocínio, 30.v.2021, Robson Silva e Silva, Paulo César Araújo dos Santos-Jr. & Lucio dos Reis Oliveira.
MZUSP 115132, headwaters of Córrego Bebedouro, Patrocínio, 30.v.2021, Robson Silva e Silva, Paulo César Araújo dos Santos-Jr. & Lucio dos Reis Oliveira.
MZUSP 115133, headwaters of Córrego Bebedouro, Patrocínio, 30.v.2021, Robson Silva e Silva, Paulo César Araújo dos Santos-Jr. & Lucio dos Reis Oliveira.

São Paulo:
NMW 17817, ♂, Scaramuza, Itararé, 20.viii.1820, Johann Natterer.
NMW 17818, ♂, Scaramuza, Itararé, 20.viii.1820, Johann Natterer.
NMW 17820, ♀, Ipanema, 29.v.1819, Johann Natterer.
NMW 17821, ♂, Ipanema, 29.v.1819, Johann Natterer.
SMF 43938, ?, Ipanema, 29.v.1819, Johann Natterer.
NMW 17822, ♂, Itararé, 11.ii.1821, Johann Natterer.
NHMUK 1888.1.13.331, ♂, Itararé, 11.ii.1821, Johann Natterer.

RMNH 88812, ♂, Itararé, Johann Natterer.
NMW 17823, ♂, Rio das Pedras, 16.iv.1823, Johann Natterer.
MZUSP 1434, ♀, Batatais, 12.xii.1900, João Leonardo Lima.
MZUSP 7995, ♂, Franca, ix.1910, Ernest Garbe.
MCP 3269, Unidade de Pesquisa e Desenvolvimento de Itararé, Itararé, 26.i.2010, Márcio Repenning.
ZMB 2559, ♂, Santa Lúcia, between 1814 and 1831, Friedrich Sellow.

Paraná:
NMW 17819, ♂, Curitiba, 29.x.1820, Johann Natterer.
NHMUK 1888.1.13.330, ♂, 20.xi.1820, Curitiba, Johann Natterer.
MHNCI 5023, ♂, Quatro Barras, 07.iv.1999, Eduardo Carrano & Luiz Fernando Franco de Macedo.
MHNCI 5140, ?, Rio Iraí, Quatro Barras, 13.iv.1999, Eduardo Carrano & Luiz Fernando Franco de Macedo.
MCP 3583, Piraí do Sul, 29.i.2013, Tony Andrey Bichinski Teixeira.
MCP 3584, Piraí do Sul, 29.i.2013, Tony Andrey Bichinski Teixeira.

Santa Catarina:
MCP 2773, Coxilha Rica, Lages, 03.xii.2009, Márcio Repenning.
MCP 2793, Coxilha Rica, Lages, 12.i.2010, Mariana Lopes Gonçalves.
MCP 3294, Coxilha Rica, Lages, 01.ii.2009, Ismael Franz.
MCP 3689, Coxilha Rica, Lages, 10.ii.2010, Ismael Franz.

Rio Grande do Sul:
MCP 1845, Várzea do Arroio Moema, Vacaria, 22.xii.2006, Márcio Repenning.
MCP 2110, Banhado do Arroio Água Branca, Bom Jesus, 12.xii.2007, Cristiano Eidt Rovedder.
MCP 2111, Banhado do Arroio Água Branca, Bom Jesus, 24.xii.2007, Cristiano Eidt Rovedder.
MCP 2112, Banhado do Arroio Água Branca, Bom Jesus, 09.i.2008, Cristiano Eidt Rovedder.
MCP 2246, Banhado do Arroio Água Branca, Bom Jesus, 04.iv.2008, Márcio Repenning.
MCP 2265, Banhado do Arroio Água Branca, Bom Jesus, 03.xii.2007, Márcio Repenning.
MCP 2266, Banhado do Arroio Água Branca, Bom Jesus, 07.i.2008, Cristiano Eidt Rovedder.
MCP 3274, Bom Jesus, 08.i.2010, Cristiano Eidt Rovedder.
MCP 3275, Bom Jesus, 08.i.2010, Cristiano Eidt Rovedder.
MCP 3657, Coxilha Grande São Pedro, Vacaria, 16.i.2009, Márcio Repenning.
MCP 3683, Banhado do Arroio Água Branca, Bom Jesus, 14.xii.2009, Cristiano Eidt Rovedder.
MCP 3684, Banhado do Arroio Água Branca, Bom Jesus, 17.xi.2009, Cristiano Eidt Rovedder.

Unknown State
NHMUK 1888.1.1.433, ?, S.E. Brazil, P.L. Sclater.
ZMB 2560, ♂, between 1814 and 1831, Friedrich Sellow.
ZMB 2561, ♂, between 1814 and 1831, Friedrich Sellow.
ZSM, S. Brazil, ex. Mus. H. von Leuchtenberg.

BOLIVIA

El Beni:
LSUMZ 124493, ♂, General Jose Ballivan, 3 km SW San Borja, 06.x.1984, C. Gregory Schmitt.

Santa Cruz:
ANSP 143068, ♂, Buena Vista, 26.vii.1912, Joseph Steinbach.
CM P43912, ♀, Buena Vista, 25.vii.1911, Joseph Steinbach.
CM P43925, ♂, Buena Vista, 26.i.1912, Joseph Steinbach.
CM P51046, ♂, Buena Vista, 20.xi.1914, Joseph Steinbach.
CM P79126, ♂, Buena Vista, 16.iii.1917, Joseph Steinbach.
LSUMZ 150981, ♀, Velasco, Serranía de Huanchaca, 45 km E. Florida, 02.x.1989, Tristan J. Davis.
LSUMZ 150982, ♀, Velasco, Serranía de Huanchaca, 45 km E. Florida, 03.x.1989, John M. Bates.
LSUMZ 150983, ♀, Velasco, Serranía de Huanchaca, 45 km E. Florida, 03.x.1989, Gary H. Rosenberg.
LSUMZ 150984, ♀, Velasco, Serranía de Huanchaca, 45 km E. Florida, 04.x.1989, Abel Castillo.
LSUMZ 150985, ♂, Velasco, Serranía de Huanchaca, 45 km E. Florida, 06.x.1989, Tristan J. Davis.
LSUMZ 150986, ♂, Velasco, Serranía de Huanchaca, 45 km E. Florida, 12.x.1989, Tristan J. Davis.
LSUMZ 150987, ♂, Velasco, Serranía de Huanchaca, 45 km E. Florida, 12.x.1989, Gary H. Rosenberg.
LSUMZ 151790, ♀, Velasco, Serranía de Huanchaca, 45 km E. Florida, 03.x.1989, Abel Castillo (skeleton specimen).

LSUMZ 151884, ?, Velasco, Serranía de Huanchaca, 45 km E. Florida, 03.x.1989, Tristan J. Davis (alcoholic specimen).
MNK 701, ♀, Velasco, Serranía Huanchaca, 45 km E. Florida, 30.ix.1989, Abel Castillo.

PARAGUAY

Caaguazú:
AMNH 320548, ♂, Upper Iguazú River, 07.i.1931, Emil Kaempfer.
AMNH 320549, ♀, Upper Iguazú River, 07.i.1931, Emil Kaempfer.

San Pedro:
ZSM 32699, ♂, Col. Nueva Germânia, 01.ii.1932, E. Schunmacher.

Presidente Hayes:
MHNSCP, Benjamin Aceval, Villa Hayes.
? Monte Sociedad.

Paraguarí:
NHMUK 1905.10.12.364, ♂, Sapucái, 24.iii.1903, William Foster.
NHMUK 1905.10.12.365, ♂, Sapucái, 24.vii.1904, William Foster.
NHMUK 1905.10.12.366, ♂, Sapucái, 27.vii.1904, William Foster.
NHMUK 1905.10.12.367, ♂, Sapucái, 16.viii.1904, William Foster.
NHMUK 1905.10.12.368, ♀, Sapucái, 16.viii.1904, William Foster.

Concepción:
ZSM, Zanja Moroti, Río Apa.

ARGENTINA

Misiones:
MACN 44769, ♂, Concepción de la Sierra, Barra Concepción.
MACN 44771, ♂, Concepción de la Sierra, Barra Concepción.

Corrientes:
MACN 44770, ♀, Ituzaingó, San Carlos, Río Aguapey, Estancia San Joaquín.
MACN 44772, ♀, Ituzaingó, San Carlos, Río Aguapey, Estancia San Joaquín.
MACN 44773, ♂, Ituzaingó, San Carlos, Río Aguapey, Estancia San Joaquín.

Formosa:
USNM 227339, ♀, Kilometro 182, Riacho Pilaga, 10 mi NW, 14.viii.1920, Alexander Wetmore.
USNM 284426, ♀, Kilometro 182, Riacho Pilaga, 10 mi NW, 14.viii.1920, Alexander Wetmore.
? Río Pilcomayo National Park.

Santa Fe:
AMNH 498990, ♂, Mocovi, 02.xii.1903, Santiago Venturi.
AMNH 498991, ♀, Mocovi, 02.xii.1903, Santiago Venturi.
AMNH 435689, ♂, Villa Ocampo, 07.i.1904, Santiago Venturi.
AMNH 498989, ♂, Villa Ocampo, 01.xi.1905, Santiago Venturi.

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