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.
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 (*Tooniscus nanus*), Ocellated Crane (*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 3. Specimen (RMNH 88812) of *Culicivora caudacuta* used in Temminck’s description. Photo: RSS.

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

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 weighed 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 Zoológia 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:
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 Brasilia 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 glomeratus* (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 25 October 2005 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 hibispa* (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 Pirai 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 and 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
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
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, 77°27'36"W)
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′, 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, ordering 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 (28°10′58″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 (Repennig 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), Canindéy department, 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 Unßöld 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 Polyistictus 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
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 Patrocinio, 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 Patrocinio, 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 knowledge 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 Patrocinio 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
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).

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

| Age    | Bill Min. | Bill Mean | Bill Max. | Tail Min. | Tail Mean | Tail Max. | Wing Min. | Wing Mean | Wing Max. | Tarsus Min. | Tarsus Mean | Tarsus Max. | Mass Min. | Mass Mean | Mass Max. |
|--------|------------|-----------|------------|-----------|-----------|-----------|-----------|-----------|-----------|-------------|------------|-------------|-----------|-----------|-----------|
| Adult  | 7.05       | 7.61      | 8.17       | 42.94     | 47.77     | 52.34     | 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     | 12.81     |            |           |           |           |             |             |             |           |           |           |

**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, Paraguari, 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
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 (Miklich & 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 (Balderama, 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 (Moder nel 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 Brasilia 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/km² at Itirapina Ecological Station, with a total estimated population of 112 individuals.

Another population has recently been found in Tocantins state, in the Japaló region including the Serra Geral do Tocantins Ecological Station and Japaló 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 do Rola Moça State Park, Serra do Cipó National Park, Serra de Canastra National Park, São Miguel Wildlife Sanctuary, Santa Bárbara do Rio Pardo Experimental Farm, Santa Bárbara Ecological Station, Itirapina Ecological Station, Botucatu State Forest, Itará unit of Research and Development, Vila Velha State Park, Guartelá State Park, APA Rio Iraí, APA Ibirapuê, Ibirapuê Biological Reserve, and the following private reserves (as recognised by Brazil’s environmental agencies): RPPN Fazenda Minheilha, 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 Jambereiro, RPPN Unidade de Conservação de Galheiros, RPPN Vale Encantado, and RPPN Foz do Rio Aguaípei.

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 National 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, Uruñuela Reserve, Don Lorenzo Refuge, Santa Rosa Private Reserve, Iberá Provincial Reserve, Iberá National Park, Isla Aipí 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 = Museu 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 Imbuía, 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/Department, Municipality, Locality | Latitude | Longitude | Record | Source |
|-----------------------------------------------------------|----------|-----------|--------|--------|
| **BRAZIL**                                                |          |           |        |        |
| Amazonas                                                  |          |           |        |        |
| Canutama, Igarapé Assuá, BR 319                          | 08°05'S  | 63°45'W   | S, P   | MZUSP, WA |
| Humaitá                                                   | 07°35'S  | 63°14'W   | 0      | EB     |
| Maramáhno                                                 |          |           |        |        |
| Alto Parnaiba, 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'P   | P      | (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      | (Dornas & Crozariol, 2012) |
| Rio Sono                                                  | 09°25'S  | 47°15'W   | P      | (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, Mansinhan                                        | 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 de 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 Paraiso de Goiás, Chapada dos Vadeiros National Park | 14°05'S  | 47°40'W   | 0      | (Reinert et al., 1998), (Braz, 2008), WA |
| Alto Paraiso de Goiás, Fazenda dos Anões                  | 14°19'S  | 47°30'W   | P      | EB     |
| Alto Paraiso de Goiás, Fazenda Chapadão das Almas, Rio das Almas | 13°50'S  | 47°27'W   | P      | DB     |
| Alto Paraiso de Goiás, Fazenda Firmeza                    | 14°17'S  | 47°29'W   | 0      | EB     |
| Alto Paraiso de Goiás, Fazenda São Bento                  | 14°06'S  | 47°28'W   | 0      | EB     |
| Alto Paraiso de Goiás, Fazenda Volta da Serra             | 14°10'S  | 47°46'W   | 0      | EB     |
| Alto Paraiso de Goiás, near Ribeirão São Miguel            | 14°09'S  | 47°47'W   | 0      | EB     |
| Alto Paraiso de Goiás, Ponteiminha                        | 14°08'S  | 47°31'W   | P      | EB     |
| Alto Paraiso de Goiás, Road to Osho Lua                    | 14°18'S  | 47°39'W   | 0      | EB     |
| Alto Paraiso de Goiás, Road to Rio dos Coroues             | 14°08'S  | 47°40'W   | 0      | 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, Chacara das Rosas                       | 16°18'S    | 48°54'W    | O      | (Pereira & Silva, 2009) |
| Anápolis, Trilha Ecológica do Turano                        | 16°17'S    | 48°56'W    | O      | (Pereira & Silva, 2009) |
| Aparecida de Goiânia, Serra das Aréas, Rio Dourados         | 16°51'S    | 49°18'W    | O      | JNC    |
| Campo Alegre de Goiás, Serra do Faco                          | 17°39'S    | 47°43'W    | O      | JNC    |
| Catalão, headwaters of Ribeirão Batalha                      | 17°32'S    | 47°27'P    | P      | RSS    |
| Cavaçante, Fazenda Piqui                                     | 13°29'S    | 47°33'W    | O      | EB     |
| Cavaçante, Road BR-10                                        | 13°56'S    | 47°27'W    | O      | EB     |
| Cavaçante, RPPN Reserva Natural Serra do Tombador            | 13°40'S    | 47°48'W    | P      | WA, (Antonelli-Filho, 2011) |
| Chapadão do Céu                                              | 18°23'S    | 52°33'P,V  | WA     |        |
| Chapadão do Céu, Emas National Park                          | 18°17'S    | 52°46'P     | 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'P,V  | WA, XC  |        |
| Cristalina, Corrego 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'P     | P      | (Rodrigues et al., 1999), RSS, WA, XC |
| Ouro Verde                                                  | 16°11'S    | 49°11'W    | O      | JNC    |
| Pirenópolis, Serra dos Pinheiros 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**

| Brasilia, Planaltina, Águas Emedadas Ecological Station     | 15°32'S    | 47°36'W    | O      | (Sousa & Marini, 2007) |
| Brasilia, Altiplano Leste                                   | 15°50'S    | 47°43'W    | P,V    | EB, XC, WA, RSS |
| Brasilia, ARIE Cruds                                        | 15°44'S    | 47°55'W    | O      | (Félixola & Azvedo, 2013) |
| Brasilia, Bразília and Sobradinho, APA de Cafiúranga        | 15°32'S    | 48°04'W    | O      | (Bagno et al., 2006) |
| Brasilia, Cristo Redentor, RECOR                             | 15°53'S    | 47°53'S    | S      | IBGE    |
| Brasilia, Taguatinga, Brasilia National Forest              | 15°45'S    | 48°04'W    | P,D    | EB, RSS  |
| Brasilia, Lago Sul, Brasilia Botanical Gardens              | 15°52'S    | 47°49'W    | O      | EB     |
| Brasilia, Núcleo Bandeirante, Fazenda Água Limpa             | 15°57'S    | 47°56'W    | P,V    | EB, XC  |
| Brasilia, Núcleo Bandeirante, Grana Modelo do Ipê             | 15°55'S    | 47°59'W    | O      | EB     |
| Brasilia, Santa Maria                                       | 16°00'S    | 47°56'W    | O      | JNC    |
| Brasilia, Brasilia National Park                            | 15°40'S    | 47°58'W    | S,O    | MNRJ, (Antas, 1995), EB |
| Brasilia, Guará, Guará Ecological Park                      | 15°49'S    | 47°58'W    | S      | MNRJ   |
| Brasilia, IBGE Ecological Reserve                           | 15°55'S    | 47°52'W    | V      | (Braz & Cavaçanti, 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, NNMUK |
| Itiquira                                                    | 17°17'S    | 53°49'W    | P,V    | WA     |
| Jacara, Fazenda Santa Fé                                    | 15°59'S    | 55°02'W    | O      | (Petermann et al., 2001) |
| Porto Espera, Serra das Araras Ecological Station, Rio Salobo valley | 15°39'S    | 57°13'W    | O      | (Silva & Onki, 1988) |

**Mato Grosso do Sul**

| Bodoquena, Fazenda Indaina, Rio Salobra                       | 20°25'S    | 56°39'W    | O      | (Privato et al., 2006) |
| Bonito, RPPN Fazenda da Barra                                | 21°06'S    | 56°13'W    | P      | WA, (Pellin et al., 2008) |
| Brazilândia, RPPN Cicalinpa                                   | 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'P    | O,D    | 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    |
| Country, State/Province/Department, Municipality, Locality | Latitude | Longitude | Record | Source |
|-----------------------------------------------------------|----------|-----------|--------|--------|
| Araxá, Serra da Bocaina | 19°43'S | 46°48'W | P | WA |
| Barbacena, Galo | 21°15'S | 43°43'W | P | V | WA |
| Belo Vale, Serra de Belo Vale | 20°25'S | 43°56'W | V | WA, EB |
| Biaç Fortes, Várzea de Santo Antônio | 21°36'S | 43°43'W | P | WA |
| Boa Esperança, Serra do 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 Mota | 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 | O | (Moura & Corrêa, 2012) |
| Carrancas, Serra das Brios | 21°36'S | 44°36'W | P | (Moura & Corrêa, 2012), WA, RSS |
| Carrancas, Serra de Carrancas | 21°26'S | 44°42'W | O | 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, headwaters 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) |
| Gongonhas | 20°29'S | 43°50'W | O | (Mazzoni et al., 2012) |
| Gonvel Xavier Chaves | 21°03'S | 44°09'W | O | EB |
| Cruzeiro da Fortaleza | 18°58'S | 46°40'W | P | WA |
| Cuzuíla | 21°43'S | 44°43'W | V | XC, (Peixoto, 2014) |
| Curvele | 18°44'S | 44°26'W | P | WA |
| Curvele, Fazenda Olhos D’Água | 19°00'S | 43°30'W | O | (Meio, 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) |
| Felitânia | 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 |
| Goiânia | 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) |
| Ibiti | 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 Frisava | 22°26'S | 45°27'W | P | WA |
| Itaverava | 20°39'S | 43°36'W | P | V | WA |
| Itatinga | 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, Paciência 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, Quebras do Rio Bonito Ecological Park | 21°19'S | 44°58'W | O | EB |
| Lavras, Serra do Cerrado | 21°20'S | 44°57'W | P | V | EB, WA |
| Lima Duarte, Fazenda do Sr. G.C. Ferreira | 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 | V | EB, XC, WA, (Peixoto, 2014) |
| Madre de Deus de Minas | 21°32'S | 44°21'W | P | WA, (Peixoto, 2014) |
| Medeiras | 19°58'S | 46°13'W | P | WA |
| Minervino | 21°40'S | 44°36'W | P | O | (Lombardi et al., 2012) |
| Minervino, 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) |
| Neomucoeno | 21°22'S | 45°14'W | O | EB |
| Country, State/Province/Department, Municipality, Locality | Latitude | Longitude | Record | Source |
|----------------------------------------------------------|----------|-----------|--------|--------|
| Unai, 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) |
| Batatas | 20°53′S | 47°37′W | S | MZUSP, (Pinto, 1944) |
| Botucatu, Botucatu State Forest | 23°05′S | 48°16′W | P | WA, EB |
| Botucatu, Sítio São José | 22°56′S | 48°27′W | PV | WA, EB, XC |
| Broa, Rio Itaqueri | 22°15′S | 47°52′W | O | (Willis & Oniki, 2003) |
| Castilho, RPPN Faz do Rio Aguapei | 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 |
| Itatininga, Fazenda Campo Grande | 23°38′S | 47°58′W | O | (Willis & Oniki, 2003) |
| Itararé | 24°06′S | 49°18′W | S | NMW, HNHUK, RMNH |
| Itararé, Fazenda Santa Andresa | 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 |
| Itrapina, Itrapina Ecological Station | 22°13′S | 47°54′W | PV | (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) |
| Taquaralí, Córrego Escaramuça (Scaramuza) | 23°53′S | 48°46′W | S | NMW |
| **Paraná** | | | | |
| Balneário, São Luiz do Purunã | 25°28′S | 49°42′W | PV | WA, EB, XC |
| Campo Largo | 25°27′S | 49°29′W | P | WA |
| Cambé, Fazenda Rodoeno Velho | 25°38′S | 52°07′W | PV | WA, EB |
| Castro | 24°46′S | 49°59′W | P | WA |
| Curitiba | 25°27′S | 49°08′W | SV | NMW, HNHUK, XC |
| Jaguariaíva | 24°15′S | 49°42′W | O, PV | (Santos, 2007), WA, EB |
| Maringá, Campus do Centro Universitário de Maringá (CESUMAR) | 23°26′S | 51°55′W | O | (Escaladei et al., 2011) |
| Palmeira, Fazenda Santa Rita | 28°18′S | 49°48′W | O | (Anjos & Greg, 1993) |
| Pirai do Sul, Fazenda Cuiabá | 24°24′S | 50°02′W | SP | MCP, WA |
| Piraquara | 25°26′S | 49°04′W | PV | WA |
| Ponta Grossa, Vila Velha State Park | 25°14′S | 50°00′W | O | (Mikich & Bérmis, 2004) |
| Porto Abram | 25°32′S | 49°53′W | P | WA |
| Quatro Barras, APA Estadual do Rio Irai | 25°23′S | 49°04′W | S | MHNCL, (Mikhich & Bérmis, 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 Giralhino | 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 | PV | EB, WA |
| **Santa Catarina** | | | | |
| Campo Belo do Sul | 27°55′S | 50°47′W | PV | EB, WA |
| Capão Alto, Fazenda Paí João | 28°10′S | 50°38′W | PV | WA, RS |
| Lages, Coxilha Rica | 28°17′S | 50°17′W | SPV | MCP, (Repenning et al., 2010) |
| Lages, Coxilha Rica | 28°18′S | 50°16′W | SPV | MCP, (Repenning et al., 2010) |
| Lages, Fazenda Santa Maria, Coxilha Rica | 28°15′S | 50°18′W | PV | (Repenning et al., 2010) |
| Lages, Morroinhos, 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 | RS |
| **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, Ibarapuã APA | 29°59′S | 55°40′W | O | EB |
| Alegrete, Ibarapuã Biological Reserve | 29°55′S | 55°47′W | V | (Bencze, 2001) |
| Alegrete, Serra do Caneiro | 30°23′S | 55°24′W | P | WA |
| Bom Jesus | 28°42′S | 50°24′W | SPV | MCP, XC, WA |
| Bom Jesus, Arroio do Corvo | 28°35′S | 50°24′W | SPV | MCP, (Repenning et al., 2010) |
| Bom Jesus, Banhado do Arroio do Corvo | 28°36′S | 50°23′W | SPV | MCP, EB |
| Bom Jesus, Cachoeira dos Baggio | 28°40′S | 50°28′W | PV | (Repenning et al., 2010) |
| Bom Jesus, Fazenda da Ronda | 28°28′S | 50°42′W | PV | (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°08'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 Ibicui          | 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, Suspuro                                      | 30°37'S | 54°20'W  | P      | EB, WA |
| São Gabriel, Horto Florestal Formosa (CMPC)               | 30°17'S | 54°47'W  | P      | WA     |
| Tupancorretã, Porteira Encantada — Fazenda Moreno        | 28°57'S | 53°46'W  | P      | WA     |
| Tupancorretã, old Road Tupã-Cruz Alta                    | 28°56'S | 53°45'W  | P, V   | EB, WA |
| Vacaria, Arroio Pessequeiro                              | 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 Socoro                              | 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    |
| Vacaria, Túneis da Estrada de Ferro                      | 28°19'S | 50°43'W  | P, V   | (Repenning et al., 2010) |
| Vacaria, West of Rio Socoro                              | 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 Isiamas: 13°46'S, 68°03'W, O (Parker III et al., 1991)
- Franz Tamayo, Apolo, Madidi Savannah, Madidi National Park: 14°43'S, 68°21'W, V (Soria-Auza & Hennessey, 2005), ML
- Isiamas: 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 Povemre, Beni Biological Station: 14°50'S, 66°17'W, O (Verse et al., 1997)
- Estancia Matucual: 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**
- Buenavista: 17°27'S, 63°40'W, S ANSP, CM
- Santa Rosa de la Roca: 15°54'S, 61°24'W, P EB
- Serrania de Huanchaca I, Noel Kempff Mercado National Park: 13°57'S, 60°49'W, S LSUMZ, (Bates & Parker III, 1998)
- Serrania 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/Department, Municipality, Locality | Latitude | Longitude | Record | Source |
|----------------------------------------------------------|----------|-----------|--------|--------|
| Estancia Villa Josefina                                  | 23°55'S  | 56°45'W   | O      | EB     |
| Forestadora Rio Verde                                    | 23°46'S  | 56°20'W   | P      | EB     |
| Laguna Blanca                                            | 23°46'S  | 56°17'W   | P      | (Centrón, 2009a), EB |
| North Ybyty                                             | 23°43'S  | 56°18'W   | O      | EB     |
| Nueva Germania                                           | 23°54'S  | 56°34'S    | S      | ZSM, (Laubmann, 1940) |
| Setiornita                                               | 23°45'S  | 56°13'W   | O      | EB     |
| Presidente Hayes                                         |          |           |        |        |
| Benjamin Aceval, Villa Hayes                             | 25°06'S  | 57°34'S    | S      | MNHNCB, (Bertoni, 1930) |
| Estancia La Rafaela                                       | 24°53'S  | 57°27'W    | O      | EB     |
| Monte Sociedad                                           | 25°03'S  | 57°35'W    | S      | (Laubmann, 1940) |
| Pirial 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                                               |          |           |        |        |
| Amoyos y Esteros, km 100                                 | 24°52'S  | 56°53'W    | O      | EB     |
| Estancia Sombrero                                        | 25°01'S  | 56°35'W    | O      | EB     |
| Paraguay                                                 |          |           |        |        |
| Agromonte                                                | 25°43'S  | 57°06'W    | O      | EB     |
| Estancia Barrento                                        | 26°16'S  | 57°03'W    | O      | (Centrón, 2009c), EB |
| Sapucái                                                  | 25°40'S  | 56°55'S    | S      | NHHNJK, (Chubb, 1910) |
| Concepción                                               |          |           |        |        |
| Amoyo 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 Siena, Amoyo 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 Mbaracayù                      | 24°06'S  | 55°14'W    | O      | (Madrroño Nieto & Esquivel, 1997), EB |
| Caaguazú                                                 |          |           |        |        |
| Morombí                                                  | 24°37'S  | 55°22'W    | O      | EB     |
| Upper Iguazú River                                       | 25°05'S  | 55°45'W    | S      | ANNH   |
| 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 Tapitya                                         | 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      | (Bonzì et al., 2020) |
| General Artigas, Estero Nu Guasu                         | 26°56'S  | 56°18'W    | O      | (Bonzì et al., 2020), EB |
| Isla Yacyretá Natural Reserve                           | 27°25'S  | 56°43'W    | O      | (Codesido & Fraga, 2009), (Bonzì et al., 2020), EB |
| La Paz Fish Farm                                         | 27°00'S  | 55°54'W    | P      | EB     |
| Leandro Ovedo                                            | 26°43'S  | 56°16'W    | O      | EB     |
| San Miguel Potroro                                      | 27°03'S  | 56°08'W    | O      | (Bonzì et al., 2020) |
| San Rafael, Guya Retta 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     |
| Yapebyry                                                | 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 Cecilia                       | 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, Uruatui Reserve                              | 27°29'S  | 55°46'W    | P      | EB     |
| Capital, Garupá, near Bairro 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   | O      | EB     |
| Capital, Posadas, Campus of Universidad Nacional de Misiones | 27°26'S  | 55°53'W   | O      | (Krauczuk, 2005) |
| Capital, Posadas, Don Lorenzo Refuge                       | 27°25'S  | 55°52'W   | O      | (Krauczuk, 2005, 2006) |
| Capital, Posadas, international bridge Posadas-Encarnación, El Zaimán creek confluence | 27°22'S  | 55°53'W   | O      | (Krauczuk, 2006) |
| Capital, Posadas, Raembé Guazú                            | 27°25'S  | 55°58'W   | P      | EB     |
| Capital, Posadas, mouth of Mártes river                    | 27°23'S  | 55°57'W   | P      | EB     |
| Capital, Posadas, near the Ruinas de Mártes                | 27°25'S  | 55°56'W   | O      | (Krauczuk, 2005) |
| Capital, Posadas, Nemesis Parma, Paraíso Costero           | 27°20'S  | 56°01'W   | P      | EB     |
| Capital, Posadas, Santa Rosa Private Reserve               | 27°24'S  | 55°53'W   | O      | (Krauczuk, 2005) |
| Capital, Posadas, west access to Posadas                    | 27°22'S  | 55°57'W   | O      | (Krauczuk, 2006) |
| Concepción, Cerro Mártes and Barra Santa María             | 27°51'S  | 55°26'W   | O      | (Di Giacomo et al., 2007) |
| Concepción de la Sierra, Barra Concepción                  | 28°08'S  | 55°53'W   | S      | MACH, (Di Giacomo et al., 2007) |
| Garupa creek basin                                         | 27°29'S  | 55°44'W   | O      | (Di Giacomo et al., 2007) |
| Near Rio Salma, Itapua                                     | 27°22'S  | 55°58'W   | S      | (White, 1882) |
| **Chaco**                                                  |          |           |        |        |
| Bermejo, El Cachapé                                        | 26°50'S  | 59°00'W   | O      | (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   | O      | (Di Giacomo et al., 2007) |
| Concepción and San Roque, Concepcion – Chavarría           | 28°37'S  | 58°10'W   | O      | (Di Giacomo et al., 2007) |
| Estancia Puerto Valle                                      | 27°43'S  | 56°29'W   | O      | (Pareja, 2004) |
| General Alvear, Bahiado San Isidro                         | 28°54'S  | 56°36'W   | O      | EB     |
| General Paz, Lomas de Vallesllos, Ruta Provincial S         | 27°43'S  | 58°01'W   | O      | EB     |
| Gobernador General Vazason, Estancia La Higuera            | 27°59'S  | 56°18'W   | O      | Marino et al., 2013 |
| Gobernador General Vazason, Estancia Virocay               | 28°15'S  | 55°57'W   | O      | Marino et al., 2013, EB |
| Gobernador General Vazason, Las Marias                      | 28°06'S  | 56°03'W   | O      | Krauczuk, 2005, EB |
| Gobernador General Vazason, Sesú Gué                       | 28°00'S  | 56°02'W   | O      | EB     |
| Ibera Provincial Reserve                                    | 28°24'S  | 57°07'W   | O      | Chebez et al., 1999 |
| Ituzaingó, Estancia La Guaya                               | 27°45'S  | 56°04'W   | O      | (Codersdo & Fraga, 2009) |
| Ituzaingó, Ibera National Park, Cambyretá                  | 27°49'S  | 56°50'W   | O      | EB     |
| Ituzaingó, Islas Apege Grande Natural Reserve              | 27°30'S  | 56°52'W   | O      | (Esteban, 1953) |
| Ituzaingó, Locamada de San Alonso, Esteros del Iberá        | 28°14'S  | 57°24'W   | O      | EB     |
| Ituzaingó, Puerto Vello                                     | 27°43'S  | 56°30'W   | O      | 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, Río Aguapey, Estancia San Joaquín   | 27°45'S  | 55°54'W   | S      | MACH, (Darrieu & Camperi, 1992) |
| Isla Aripé Grande                                          | 27°30'S  | 56°52'W   | O      | (Esteban, 1953) |
| Mburucuyá, Mburucuyánal National Park                      | 28°00'S  | 58°05'W   | O      | (Chebez et al., 1999), (Di Giacomo et al., 2007), EB |
| Mburucuyá, Mburucuyánal village and surroundings           | 28°02'S  | 58°13'W   | O      | EB     |
| Mercedes and San Martin, Rincón del Socorro and Iberá      | 28°12'S  | 57°10'W   | O      | (Di Giacomo et al., 2007), EB |
| San Martin, Colonos Carlos Pellegrini                      | 28°12'S  | 57°10'W   | O      | EB     |
| San Miguel, Estancia San Juan Porisá                      | 27°42'S  | 57°11'W   | O      | EB     |
| Santo Tomé, Estancia Mora Cuy and around                   | 28°18'S  | 56°10'W   | O      | (Di Giacomo et al., 2007) |
| Santo Tomé, far northeast Corrientes                       | 28°27'S  | 55°47'W   | O      | (Di Giacomo et al., 2007) |
| Santo Tomé, Río Aguapey basin                              | 28°36'S  | 56°56'W   | O      | (Di Giacomo et al., 2007) |
| Santo Tomé, Ruta Provincial 40                             | 28°22'S  | 56°07'W   | O      | EB     |
| Santo Tomé, Ruta Provincial 41                             | 28°11'S  | 56°43'W   | O      | EB     |
| **Entre Ríos**                                             |          |           |        |        |
| Colón, Arroyo Caraballo                                    | 32°13'S  | 58°08'W   | O      | (Miát et al, 1985) |
| Ibiyuy, Ceibas                                            | 33°26'S  | 58°45'W   | O      | (Di Giacomo et al., 2007) |
| **Formosa**                                                |          |           |        |        |
| Lach, El Bagual Reserve                                    | 26°10'S  | 58°56'W   | P      | (Di Giacomo, 1996, 2005), EB |
| Racho Pílaga                                              | 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   | O      | (Di Giacomo et al., 2007) |
| Mocoyi                                                    | 28°24'S  | 59°42'W   | S      | AMNH, (Hartert & Ventur, 1909) |
| San Martin, Provincial Reserve for Multiple Uses Frederico Wildermuth | 32°00'S  | 61°42'W   | O      | (Di Giacomo et al., 2007) |
| Tacuarendi                                                | 28°25'S  | 59°18'W   | O      | (Lillo, 1909) |
| Villa Ocampo                                              | 28°28'S  | 59°22'W   | S      | AMNH, (Hartert & Ventur, 1909) |
| **URUGUAY**                                               |          |           |        |        |
| Rivera                                                    |          |           |        |        |
| Near La Palma, Valle del Lunearejo                        | 31°10'S  | 55°55'W   | P      | (Azcrrnez, 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.i.1821, Johann Natterer.
NHMUK 1888.1.13.331,♂, Itararé, 11.i.1821, Johann Natterer.
RMNH 88812, ♂, Itararé, Johann Natterer.
RMNH 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 3383, Pirai do Sul, 29.i.2013, Tony Andrey Bichinski Teixeira.
MCP 3384, Pirai 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, ♂, Buenavista, 26.vii.1912, Joseph Steinbach.
CM P43912, ♀, Buenavista, 25.vii.1911, Joseph Steinbach.
CM P43923, ♀, Buenavista, 26.i.1912, Joseph Steinbach.
CM P51046, ♀, Buenavista, 20.xi.1914, Joseph Steinbach.
CM P79126, ♀, Buenavista, 16.iii.1917, Joseph Steinbach.
LSUMZ 150981, ♂, Velasco, Serrania de Huanchaca, 45 km E. Florida, 02.x.1989, Tristan J. Davis.
LSUMZ 150982, ♀, Velasco, Serrania de Huanchaca, 45 km E. Florida, 03.x.1989, John M. Bates.
LSUMZ 150983, ♀, Velasco, Serrania de Huanchaca, 45 km E. Florida, 03.x.1989, Gary H. Rosenberg.
LSUMZ 150984, ♂, Velasco, Serrania de Huanchaca, 45 km E. Florida, 04.x.1989, Abel Castillo.
LSUMZ 150985, ♂, Velasco, Serrania de Huanchaca, 45 km E. Florida, 06.x.1989, Tristan J. Davis.
LSUMZ 150986, ♂, Velasco, Serrania de Huanchaca, 45 km E. Florida, 12.x.1989, Tristan J. Davis.
LSUMZ 150987, ♂, Velasco, Serrania de Huanchaca, 45 km E. Florida, 12.x.1989, Gary H. Rosenberg.
LSUMZ 151790, ♀, Velasco, Serrania 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:
MNHSCP, Benjamin Aceval, Villa Hayes.

Monte Sociedad:

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

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.