

Short Note

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Bats found entangled in natural and artificial traps

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Abstract: Here, we report cases of bats entangled in natural and artificial traps in Brazil. We found 10 bats entangled in barbed wire, including one *Artibeus fimbriatus* (dead), one each of *Artibeus lituratus*, *Lasiurus blossevillii* and *Lasiurus cinereus* (alive), one *L. blossevillii* and five *Myotis levis* (mummified) and one *Eptesicus diminutus* entangled on adhesive spines in a branch. All were adult bats. Although we cannot control the occurrence of natural traps, we can suggest actions to mitigate negative effects of man-made structures. The most economic and effective way to mitigate these negative effects is to use plain wire to construct fences.

Keywords: barbed wire; mortality; plain wire; thorns.

The major causes of decline in biodiversity are anthropogenic disturbances (Dirzo et al. 2014). Understanding the causes and implications of disturbance is crucial for mitigating negative effects (Stone et al. 2009).

Natural (e.g. adhesive spines, thorns, other plant structures, spider webs) and artificial (e.g. barbed wire) structures can pose a threat to small flying vertebrates (Allen and Ramirez 1990, Van Der Ree 1999, Norquay et al. 2010, Pigage et al. 2011, Nyffeler and Knörnschild 2013, Jacomassa et al. 2015). Cases have been reported from around the world of bats becoming entangled in these structures, regardless of species size, flight characteristics

or taxonomic family (Wisely 1978, Maclean 2006, Norquay et al. 2010, Pigage et al. 2011, Breviglieri 2014).

One hypothesis for these incidents suggests miscalculations by the bats while foraging or passing by these structures (Manville 1963, Norquay et al. 2010), or that bats are pushed into these structures by wind or rain (Manville 1963, Jacomassa et al. 2015). Once the bats come into contact with the structures, they become entangled or are impaled while struggling to free themselves. In many cases, the result is death. Some biologists have suggested actions to mitigate the effects of barbed wire (Brooth 2006, Maclean 2006); however, there are still gaps as a study gathering information like this, especially for neotropical bats, in knowledge of this subject.

Here, we report several cases of bats entangled in natural and artificial traps in Brazil. These were fortuitous records made during fieldwork and/or on ways that we spent walking. For each record, we identify species, location, status when found (dead, alive, mummified) and deposition of specimen. We include comments about these records and suggestions to minimize the negative effects of barbed wire on bats due to injury and death.

Artibeus fimbriatus (Gray 1838). An adult male was found entangled in barbed wire on October 26, 1997, in Centro de Conservação da Natureza Pró-Mata (CPCN Pró-Mata), in a rural area of São Francisco de Paula, RS (Figure 1A). The bat was found dead and the wings were torn, indicating attempts to escape. It was deposited in the Museum of Science and Technology of the Pontifícia Universidade Católica, Porto Alegre, RS (PUCRS number MCP 0715).

Artibeus lituratus (Olfers 1818). An adult male was found entangled in barbed wire in the morning of August 2009 in an urban area of Porto Alegre, RS. The bat was alive, with no signs of injury or dehydration. It was freed from of the barbed wire and released.

Eptesicus diminutus (Osgood 1915). An adult male was found entangled in adhesive spines of *Desmodium* sp. (Fabaceae) on the morning on February 25, 2014, at the State University of São Paulo in Rio Claro, SP (Figure 1B). The bat was alive, with no signs of injury or dehydration. It was deposited in the Zoology Museum of the State University of Campinas (Unicamp), SP (number ZUEC-MAM 2710).

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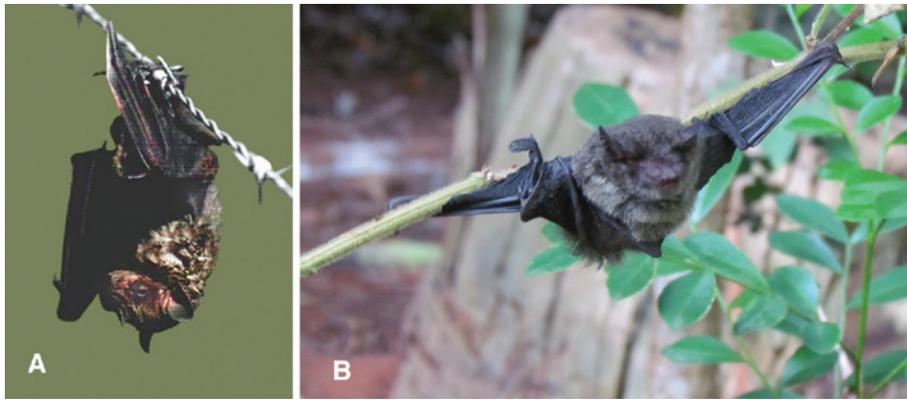


Figure 1: *Artibeus fimbriatus* entangled on barbed wire in Centro de Conservação da Natureza Pró-Mata, São Francisco de Paula, RS (A), and *Eptesicus diminutus* entangled on adhesive spines in a branch of *Desmodium* sp. in Rio Claro, SP (B).

Lasiurus blossevillii (Lesson et Garnot 1826). An adult male was found entangled in barbed wire in an open area on May 19, 1996, also in CPCN Pró-Mata. The bat was alive, with torn wings and a broken right forearm. It was deposited in PUCRS in Porto Alegre, RS (number MCP 0579). A mummified individual was also found entangled in barbed wire on January 19, 2007, in Palmeira, PR; this was discarded.

Lasiurus cinereus (Palisot de Beauvois 1796). An adult female was found entangled in barbed wire in the afternoon of December 12, 2005 in an urban area of Frederico Westphalen, RS. The bat was alive, with injuries to the right forearm. It was deposited in Universidade Federal do Paraná, PR (number DZUP/CCMZ 659).

Myotis levis (Geoffroy 1824). Five mummified individuals were found entangled by the uropatagium on barbed wire, three on August 11, 2004, and two on January 24, 2005, at the Fazenda São João da Chapada in Palmas, PR. These were discarded. There was a roost of this species near the location where these bats were found (Miranda et al. 2010).

Body mass, aspect ratio and wing loading (Table 1) indicate that bats with various flight characteristics and sizes can become entangled in these structures.

Bats entangled or seriously injured after collisions with natural and artificial structures may die of exposure, starvation, drowning or predation.

Manville (1963) comments that the death rates are considerably higher for juveniles than for adults because the inexperience and reduced vigor make juveniles more accident-prone and vulnerable to predation. However, we did not find any juvenile entangled in these structures.

Probably thousands or more animals face a cruel death from entanglement each year, as described (Maclean 2006). We cannot control natural traps; however, actions can be taken to minimize the negative effects of artificial traps. Maclean (2006) suggested use of barbed wire with the top strand wound with electric fence tape or bird-scare tape, or the use of borderline and nightline. The latter two are highly visible solid high-tension nylon wires. She also suggested replacing the top strand of barbed

Table 1: General data for the bat species found entangled in Brazil.

Species	N	Condition	Sex	Age	Trap	Mass (g) ^a	AR ^a	WL ^a
<i>Artibeus fimbriatus</i>	1	D, I	M	Ad	A	64.5 ¹	0.14 ¹	1.64 ¹
<i>Artibeus lituratus</i>	1	A	M	Ad	A	74.5 ¹	0.12 ¹	2.03 ¹
<i>Eptesicus diminutus</i>	1	A	M	Ad	N	4	0.27 ²	0.93 ²
<i>Lasiurus blossevillii</i>	1	A, I	M	Ad	A	9 ¹	0.23 ¹	2.35 ¹
<i>Lasiurus blossevillii</i>	1	D, M ³	–	Ad	A	9 ¹	0.23 ¹	2.35 ¹
<i>Lasiurus cinereus</i>	1	A, I	F	Ad	A	21 ¹	0.2 ¹	1.06 ¹
<i>Myotis levis</i>	5	D, M ³	–	Ad	A	8 ¹	0.25 ⁴	0.74 ⁴

N, Number of specimens; Condition: A, alive; D, dead; M, mummified; I, signs of injury; Sex: M, male; F, female. Age: Ad, Adult; Trap: N, natural; A, artificial; AR, aspect ratio; WL, wing loading. ¹=our data medium. ²=approximate data related to *Eptesicus furinalis*. ³=we cannot assign sex to mummified individuals due the decomposition stage. ⁴=approximate data related to *Myotis ruber*.

wire, especially on ridgelines, with plain wire or electric fencing. Another suggested method includes placement of deterrents directly on the fence or, when possible, removing barbed wire altogether.

This is the first report of frugivorous phyllostomid bats entangled in barbed wire. These bats (*Artibeus fimbriatus* and *Artibeus lituratus*) are common in south and southeastern Brazil and in urban areas (Passos et al. 2003, Pacheco et al. 2010, Bernardi and Passos 2012, Esb erard et al. 2014). Louise Saunders and Michael Beatty of the organization Bat Conservation & Rescue (<http://www.bats.org.au/>) recommend the removal of trees and shrubs near fences that bear fruit or flowers that are eaten by bats. They also suggest the investigation of alternative security options and the replacement of barbed wire with wildlife-friendly fencing.

We also recommend that barbed wire fences be removed from areas near plants that are attractive to bats, from areas near light sources that attract insect prey and from areas near bat roosts, flyways and water sources. Environmental education, while it may not help bats avoid traps, is also important for raising awareness of the ecological and economic importance of bats.

Finally, manufacturers of barbed wire may consider developing new forms of wire that are both functional and safe for wildlife, perhaps by virtue of a special top strand with bright anodized aluminium tags attached, as suggested by Brooth (2006).

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