



NECTAR ROBBING BY THE RED-TAILED COMET *SAPPHO SPARGANURUS*: THE VALUE OF CITIZEN SCIENCE TO DOCUMENT INFREQUENT BEHAVIOR IN BIRDS

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Abstract · Nectar robbing by hummingbirds (i.e., the extraction of nectar through perforations in the base of the corolla tube instead of through the natural corolla opening) is seldom documented in the literature. Here, we present the first photographic record of nectar robbing by the Red-tailed Comet *Sappho sparganurus* in Bolivia and examine published and photographic evidence of this behavior. We found no published evidence of nectar robbing by Red-tailed Comets in peer-reviewed literature. However, we found that about 4% of the photographs of hummingbird-flower interactions involving this species on citizen science platforms showed clear nectar robbing behavior. Our results suggest that nectar robbing is not an uncommon behavior for the Red-tailed Comet and highlight the hidden, yet immense, value of citizen science photographic databases to document avian natural history and behavior.

Resumen · Robo de néctar por el picaflor cometa *Sappho sparganurus*: el valor de la ciencia ciudadana para documentar comportamientos infrecuentes en aves

El robo de néctar por picaflores (i.e., la extracción de néctar utilizando perforaciones en la base de la corola en lugar de la apertura de la corola) es raramente documentado en la literatura. Aquí presentamos el primer registro fotográfico de robo de néctar de *Sappho sparganurus* para Bolivia, y examinamos evidencia publicada y fotografiada de este comportamiento. No encontramos ninguna publicación revisada por pares que mencione robo de néctar por parte de la especie, sin embargo, encontramos que más del 4% de las fotografías de interacciones planta-picaflor que involucran al colibrí cometa evidencian eventos de robo de néctar. Nuestros resultados sugieren que el comportamiento de robo de néctar es común para esta especie, y resaltan el increíble valor de las plataformas fotográficas de ciencia ciudadana para documentar la historia natural y el comportamiento de las aves.

Key words: Bolivia · floral larceny · nectar robbing · *Tecoma fulva*

INTRODUCTION

Nectar robbing is a foraging behavior in which animals feed on floral nectar using holes in the corolla and not the flower's opening. Robbers gain the nutritious reward of nectar, but do not contribute to its pollination (Irwin et al. 2010). Nectar robbing can affect the foraging behavior and dynamics of the community of floral visitors by, for example, reducing the available food for legitimate pollinators and, in consequence, pollination services (Lara & Ornelas 2001, Rojas-Nossa et al. 2016, Irwin et al. 2010, Irwin 2000). By affecting pollination, nectar robbing might also play a selective role in floral traits such as corolla length (Maruyama et al. 2015, Lara & Ornelas 2001). Nectar robbers could either be primary when they pierce the holes in the corolla by which they access the nectar or secondary when they use pre-existing holes drilled by other nectar robbers (Inouye 1980, Irwin et al. 2010), most commonly flowerpiercers and bumblebees (Rojas-Nossa et al. 2016). In fact, this behavior (both primary and secondary nectar robbery) seems to be more frequently reported in species feeding on tubular flowers, where access to nectar is limited for short-billed species (Lara & Ornelas 2001, Rojas-Nossa et al. 2016, Marks et al. 2023). Although it has been proposed to be relatively common in hummingbirds (Ornelas 1994) and commonly observed by ornithologists during surveys and pollination studies, nectar robbery by hummingbirds is, unfortunately, not often documented in the literature (G. Stiles pers. com). Here, we present the first photographic evidence of nectar robbing by the Red-tailed Comet *Sappho sparganurus*, and exemplify how citizen science platforms can be used to further study the occurrence and frequency of this behavior (Igić et al. 2020).

METHODS AND RESULTS

The Red-tailed Comet is the only species in the genus *Sappho* and is characterized by a long, forked, iridescent-red tail that is no-

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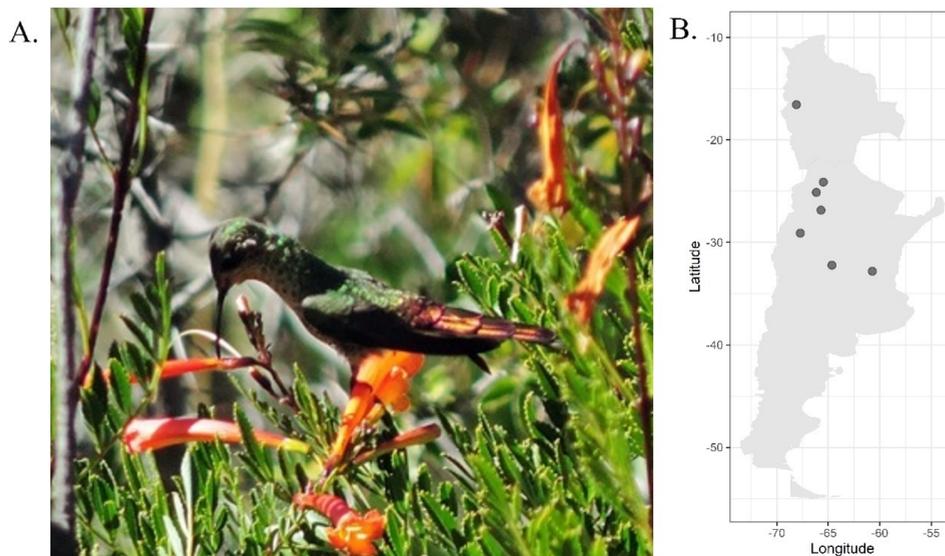


Figure 1. Nectar robbing by the Red-tailed Comet. A. Nectar robbing in flowers of *Tecoma fulva*, photographed in La Paz, Bolivia (16°33'29"S; 68°05'47"W; ca. 3250 m a.s.l.). B. Localities where nectar robbing events were recorded throughout the species distribution documented by photographs on citizen science platforms.

tably longer in males than in females (Schulenberg & Jaramillo 2020). The Red-tailed Comet inhabits dry valleys in the Andes of Bolivia and Argentina between 200 and 4200 m a.s.l. (Fjeldså & Krabbe 1990). In Bolivia, it forages on flowers of native species with tubular corollas (e.g., *Dunalia brachyacantha*, *Salvia haenkei*, *Agalinis lanceolata*, *Hippeastrum cybister*, *Mutisia orbignyana* and *Tecoma fulva*; Morales 2015). Red-tailed Comets have relatively small bills (culmen 20.1 mm) when compared with other species on its range (e.g., *Amazilia chionogaster* 25.6 mm; *Colibri coruscans* 29.1 mm; *Patagona gigas* 45.2 mm; Tobias et al. 2022), which could favor nectar robbing behavior (Ornelas 1994).

After three casual observations of nectar robbing by the Red-tailed Comet in La Paz Valley, one reported in an undergraduate thesis (Olivera 1999), one in a book of regional distribution (Pacheco et al. 2015), and one in this study (by L. Telleria & R. Calbimonte), we were interested in (1) photographing this behavior and (2) estimating how common this behavior is for the species. As part of a larger study focused on plant pollination by hummingbirds (L. Telleria unpublished data), we monitored flowering plants in a native vegetation remnant in the city of La Paz (Sendero del Aguila; 16°33'29"S, 68°05'47"W, ca. 3250 m a.s.l.). Observations were conducted unsystematically for ca. 120 hours between February and August 2014. In this study, we observed nectar robbing by *S. sparganurus* on *Tecoma fulva* (Bignoneaceae). On 10 August 2013, we obtained the first photographic record of nectar robbing by the Red-tailed Comet for Bolivia (Figure 1).

Distinguishing between primary and secondary robbing can be difficult in hummingbirds (Igić et al. 2020), and is yet to be determined in our system. Three species of flowerpiercers (*Diglossa carbonaria*, *D. sittoides*, and *D. brunneiventris*) and two species of bumblebees of the genus *Xylocopa* inhabit our study site, frequently pierce the corollas of *Tecoma arequipensis*, and thus, could act as primary robbers, creating holes that *S. sparganurus* might use. However, if bill serrations and hooked maxilla are in fact good indicators of nectar robbery, *Sappho* would also be an effective primary robber (Ornelas 1994).

To examine how frequently the Red-tail Comet engages in

nectar robbing, we initially searched for published reports on this behavior. On 21 December 2021 we conducted a search in all databases of Web of Science (WoS Core Collection, BIOSIS, CABI, KCI, MEDLINE, ScieLO, Zoological Record) using “*Sappho spargan**” AND “robo de nectar” OR “nectar robbery” OR “floral larceny”. No published records were found during the initial search. Then, we conducted a broader search using only the species name (“*Sappho spargan**”). This second search resulted in 23 published journal articles that mentioned this species. All articles were read and carefully examined by FMC. We found no evidence of nectar robbing by *Sappho sparganurus* in these articles.

We then focused our attention on citizen science databases. On 23 December 2021, we conducted a Google Images search using the terms “*Sappho spargan**” OR “colibri cometa” OR “Red-tailed comet”. In addition, we examined all images of the genus in three photographic databases: iNaturalist, eBird, and Flickr. We carefully selected all images that included plant-hummingbird interactions. Images that did not contain flowers were dismissed, as were images in which the bird was perched. For each preselected image, we extracted information on the location of the photographic record, date, and all metadata related to the image. When possible, we noted the sex of the individual in the photographs. We categorized photographs into two groups: (1) pollinating behavior, if the bill/head of the bird was within the natural opening of the flower, and (2) nectar robbing behavior, if the bird’s bill was instead in a hole in the corolla.

We extracted and evaluated 1993 photographs of *S. sparganurus*: 1238 from eBird, 376 from iNaturalist, 179 from Flickr, and 200 from Google Images. Only 188 images showed any interaction between the hummingbird and flowers. Three photographs were discarded because their low resolution impeded a proper classification. Of the photos showing plant-bird interactions, 94.4% were potential pollination events ($N = 177$), while only 4.25% ($N = 8$) of the photographs showed clear nectar-robbing events. All eight photographs were taken in Argentina and involved six different plant species (Table 1). Only one of the eight robbing individuals was female.

Our study presents not only the first photographic evi-

Table 1. Photographic records of nectar robbing by the Red-tailed Comet. Location and date information were extracted from the photographs deposited in the source database.

Location	Date	Plant species	Source	Record author
La Paz, Bolivia	10 August 2013	<i>Tecoma fulva</i>	This study	L. Telleria & R. Calbimonte
Salta, Argentina	24 October 2008	<i>Nicotiana glauca</i>	Flickr	R. Knight
Jujuy, Argentina	23 November 2021	<i>Digitalis purpurea</i>	eBird	H. Cabassi
Cordoba, Argentina	5 September 2020	<i>Dolichandra cynanchoides</i>	eBird	G. Ortiz Best
Santa Fe, Argentina	9 May 2009	<i>Malvaviscus arboreus</i>	eBird	J. Teloni
La Rioja, Argentina	7 October 2019	<i>Nicotiana glauca</i>	iNaturalist	M. B. Dri
Tucuman, Argentina	5 April 2015	<i>Mirabilis jalapa</i>	iNaturalist	G. Diaz & L. Roget
Argentina	1 July 2020	<i>Abutilon pictum</i>	Flickr	J. Paverini
Argentina	12 July 2021	<i>Digitalis purpurea</i>	Flickr	J. Paverini

dence of nectar robbing by the Red-tailed Comet, but, to our knowledge, the first documented report of nectar robbing by any hummingbird in Bolivia. Nevertheless, our results suggest that nectar robbing by this species might be relatively frequent, having been casually photographed in both native and introduced plant species across its distribution (Figure 1B, Table 1). Although we found no documentation of this behavior in *S. sparganurus* in peer-reviewed literature, it is possible it has been reported in local and regional field guides. Nevertheless, it is not mentioned in main cited sources such as Birds of the World (Schulenberg & Jaramillo 2020), Birds of Bolivia (Herzog et al. 2016), or field guides of Birds of Argentina (Narosky & Yzurieta 2003, Pearman & Areta 2020). Our study exemplifies the value of citizen science platforms to document infrequent behaviors (Igić et al. 2020) and the great potential of photographic databases to provide valuable information on avian natural history. Finally, we would like to encourage researchers to document these behavioral observations, which can be pivotal for a complete understanding of pollination dynamics in ecosystems (Lara & Ornelas 2001, Rojas-Nossa et al. 2016, Irwin et al. 2010, Irwin 2000), and the evolution of plant floral traits (Maruyama et al. 2015, Lara & Ornelas 2001). Future empirical studies should address the relevance of nectar robbery by *S. sparganurus* and other hummingbirds on the vegetation of Andean dry valleys, including threatened patches of native vegetation in urban areas.

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