

Southeastern Brazilian tyrannulets as flower watchers

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ABSTRACT: Several species of insect-eating birds occasionally visit flowering trees or shrubs to feed on arthropods at flowers instead of nectar or petals. In southeastern Brazil, the Planalto Tyrannulet *Phyllomyias fasciatus* (10.3 g) and the Gray-headed Tody-Flycatcher *Todirostrum poliocephalum* (7 g) often watch flowers to get insects and can visit flowering trees for hours or for several days. We describe the foraging behavior of these two tyrannulets at flowering trees and also report observations on several other species, mostly tyrant-flycatchers and tanagers. As an opportunistic foraging strategy, flower watching can be expected to be more common among small, canopy or edge birds that sally or hover-glean to catch small insects on or near foliage.

KEY-WORDS: foraging behavior, insects, *Phyllomyias fasciatus*, tanagers, *Todirostrum poliocephalum*, tyrant-flycatchers.

INTRODUCTION

Birds often visit flowers for nectar or to eat petals (Willis 2002). Insects attracted to flowers provide another type of food, and certain birds watch flowers to catch them. Pereyra (1941) noted many birds eating insects in flowering corn fields, and suggested that such birds as the Spectacled Tyrant *Hymenops perspicillatus* could help pollinate the crop. Beehler (1980) reported several species catching insects in flowering trees in New Guinea, and the Green Honeycreeper *Chlorophanes spiza* in Panama (as described earlier by Snow & Snow 1971). Stiles *et al.* (1989) reported the Tropical Kingbird *Tyrannus melancholicus* getting butterflies near flowers, and stated that the Black-headed Tody-Flycatcher *Todirostrum nigriceps* often forages in flowering trees. Tampion (1990) noted the Cattle Tyrant *Machetornis rixosa* catching insects in palm flowers. Dobbs & Greeney (2006) observed that nearly 1% of insects captured by the Rufous-breasted Flycatcher *Leptopogon rufpectus* are taken on flowers.

Here, we discuss flower watching in southeastern Brazil by the Gray-headed Tody-Flycatcher *Todirostrum poliocephalum*, a close relative of *T. nigriceps*, and the Planalto Tyrannulet *Phyllomyias fasciatus*. These two tyrannulets occasionally visit flowers for hours, or for several days. We also report some observations for the Bran-colored Flycatcher *Myiophobus fasciatus* and others.

METHODS

Most observations were at the Santa Lúcia Biological Station (19°58'S; 40°32'W, 650 m a.s.l.) in the Santa Teresa mountain range of central Espírito Santo state, Brazil. Flowering trees were mainly cultivated avocados *Persea americana* (Lauraceae) and Japanese Plums *Eriobotrya japonica* (Rosaceae) by the laboratory and several native yellow-flowered *Senna multijuga* var. *lindleyana* (Fabaceae) along the entry road, 500 m upriver. Observations were made with 8 × 30 and 10 × 42 binoculars from an appropriate distance so as not to disturb the birds.

G.A.B. studied insectivorous and omnivorous birds foraging at flowers of three neighboring avocados on 04, 05 and 09 September 1994, for a total of 1405 min. For each bird visitation, data recorded included species, number of individuals, arrival and departure time, foraging maneuvers and substrate of captures. Whenever it was not possible to record an individual's arrival or departure time, we used the average visit length calculated for the species. Foraging maneuvers were classified according to Remsen & Robinson (1990) into eight categories. These categories were then combined with substrates of capture to generate composite codes representing foraging tactics (*e.g.*, SH/F indicates a sally-hover to capture an insect on a flower). E.O.W. studied *P. fasciatus*, *M. fasciatus* and other species at flowers mainly April–May 1996. We also report observations on tyrant-flycatchers and other passerines

made elsewhere in southeastern Brazil. Scientific names of birds follow Piacentini *et al.* (2015). Bird body masses are from Wilman *et al.* (2014).

RESULTS

In September 1994, twelve species foraged on insects attracted to avocado flowers at Santa Lúcia (Table 1). Ten others visited flowers exclusively for nectar (*Thalurania glaucopis*, *Coereba flaveola* and *Dacnis cayana*) or perched/foraged away from flowers (*Craniolaema pallida*, *Xenops rutilans*, *Piprites chloris*, *Camptostoma obsoletum*, *Lathrotriccus eulerei*, *Euphonia violacea* and *Tangara cayana*). *Todirostrum poliocephalum*, *P. fasciatus* and three tanagers visited the trees in more than one day and made considerably more visits or spent considerably more time foraging at flowers than other species (Table 1). *Todirostrum poliocephalum* spent the largest amount of time on trees and made long visits concentrated in the second half of the morning, when it was a regular and constant visitor. Typically, one bird of a pair that held a territory in the area would forage for long periods in the avocados, sometimes accompanied by its mate. Aerial maneuvers (short sally-strikes and, to a lesser extent, sally-pounces and leaps) were used to capture prey mainly on substrates other than air, and about 65% of captures were on or very close to flowers (Table 2).

Phyllomyias fasciatus was the most frequent species in the avocados. It made medium-length regular visits

throughout the morning and early afternoon (Table 1). Usually only one or two birds foraged in the trees at the same time, but up to four were present on some occasions. Prey were mostly captured in the air or at flowers with sally-strikes and, less frequently, sally-hover and sally-pounce maneuvers. Nearly 62% of insect-catching attempts were at or near flowers (Table 2). This species showed the greatest range of foraging maneuvers among all visitors.

The avocado flowers were visited earlier by a *T. poliocephalum* on 03 September 1994, with short strikes under leaves near the flowers. We have often seen it sallying under leaves away from flowers, at dense vine tangles in woods or at edges. E.O.W. also noted visits by two *P. fasciatus*, which sallied to the air or leaves near flowers at 10–12 h. Later, two birds were sallying in a small flowering tree (not identified) in the woods downriver. We have seen it sallying away from flowers, or getting *Myrsine* fruit or *Alchornea* arils, on other occasions.

On 24 April 1996, 16:22–16:28 h, one *P. fasciatus* sallied for insects in the *Senna*. On the 25 April, between 9–10 h, two were now and then near Japanese Plum flowers by the lab, between visits by tanagers and relatives that poked their bills deep into the flowers (*D. cayana*, *Tangara seledon* and *Schistochlamys ruficapillus*). A *T. poliocephalum* worked briefly near one of the *P. fasciatus*, but soon left. On the 26 April, E.O.W. watched at the *Senna* from 15:24 h to dark at 17:30 h. The main visitor was a *M. fasciatus*, but two *P. fasciatus* worked 16:00 h in the crowns, sallying to catch insects on flowers several times.

Table 1. Number of visits on each day of observation, total number of visits, mean length of visits (min), total time spent on trees (min) and average number of individuals per visit for birds recorded foraging on insects attracted to avocado flowers at Santa Lúcia, Espírito Santo state, Brazil, in September 1994.

Species	No. of visits/day			Total No. of visits	Mean length of visits	Total time spent on trees	Average No. of individuals per visit
	04 Sept	05 Sept	09 Sept				
<i>Todirostrum poliocephalum</i>	-	3	8	11	26.3	289	1.1
<i>Phyllomyias fasciatus</i>	-	8	19	27	9.2	249	1.2
<i>Saltator maximus</i>	-	1	7	8	8.9	71	1.0
<i>Tangara ornata</i>	-	3	17	20	2.8	56	1.3
<i>Tangara sayaca</i>	-	1	4	5	5.0	25	1.6
<i>Tolmomyias sulphureus</i>	-	-	6	6	3.2*	19.5*	+1.0
<i>Hemitriccus nidipendulus</i>	2	-	1	3	3.0	9	1.0
<i>Pachyramphus castaneus</i>	-	1	2	3	1.7	5	1.0
<i>Pachyramphus viridis</i>	-	-	2	2	1.2	2.5	1.0
<i>Contopus cinereus</i>	-	-	2	2	0.7	1.5	1.0
<i>Piaya cayana</i>	-	-	1	1	1.0	1	1.0
<i>Hylophilus poicilotis</i>	-	1	-	1	1.0	1	1.0
Total	2	18	69	89	-	-	-

*possibly overestimated because the length of some visits could not be determined.

Table 2. Frequency of use of foraging tactics by five species with the longest time of association with flowering avocados at Santa Lúcia, Espírito Santo state, Brazil, in September 1994. Attack maneuvers: SS – sally-strike; SP – sally-pounce; SH – sally-hover; FCh – flutter-chase; Le – leap; Lu – lunge; RO – reach-out; RU – reach-up (from Remsen & Robinson 1990). Substrates: A – air; F – flower; UL – upper surface of leaves; LL – lower surface of leaves; B – branch; Fo – foliage (used when a substrate other than air could not be determined). An asterisk after the substrate code indicates captures near flowers.

Maneuver/ substrate	<i>Phyllomyias fasciatus</i>	<i>Todirostrum poliocephalum</i>	<i>Tangara ornata</i>	<i>Tangara sayaca</i>	<i>Saltator maximus</i>
SS/A (SS/A*)	49 (26)	7 (5)	-	3 (2)	2
SS/F	26	18	2	-	2
SS/LL	2	3	-	-	-
SS/UL	3	-	-	-	-
SS/Fo	5	-	-	-	1
SS/B	2	4	-	-	-
SP	-	-	1	-	1
SP/F	6	5	-	-	-
SP/Fo	1	-	-	-	-
SH	1	-	-	-	-
SH/F	6	-	-	-	-
FCh	-	-	1	1	-
Le	-	-	3	-	-
Le/A	2	-	-	-	-
Le/B (Le/B*)	1 (1)	2	-	-	-
Le/F	2	2	-	1	-
Le/LL	-	2	-	-	-
Le/Fo	-	2	-	-	-
Lu	2	-	1	1	-
Lu/F	-	-	-	1	-
RO	-	1	-	-	-
RO/F	1	1	-	-	-
RO/A*	1	-	1	-	-
RO/UP	-	1	-	-	-
RU/F	1	-	-	-	-
RU/A*	-	-	1	-	-
<i>n</i>	111	48	10	7	6

On 14 May, 15:54 h, two *P. fasciatus* were back to the *Senna* and worked near flowers, at times pecking deep inside, 16:00–16:10 h. After 5 min in the low bushes below, one returned for 3 min to sally to air or leaves near flowers, and again at 16:21 h for several sallies to the air, then dropping to a *Cecropia* below. A third bird and the two moved into the *Senna* 16:24 h to 16:32 h, then wandered off. At 16:42 h, a *P. fasciatus* returned for six more short sallies to the air, moving off by 16:50 h.

On 19 May, there were several visits by *P. fasciatus*. Between 14:38–14:51 h one did ten air sallies and three pecks into flowers before preening, then five other sallies

(all next to flowers or leaves). At 15:44 h, two were in the *Senna* trees, sallying four times before moving to a *Myrsine* bush with tiny flowers. Between 16:01–16:04 h, two *P. fasciatus* returned, sallying eight times or more to the air by flowers. Between 16:10–16:34 h one worked the flowers, preening and regurgitating two seeds on a twig and defecating another, before 32 short sallies to near flowers 16:19–16:32 h. Between 16:36–16:38 h, one returned for five short sallies, then to a *Cecropia* off east. Two and then three birds continued to sally in the area 16:40 h on, using other trees and a telephone wire, but between 17:00–17:10 h some sallies were again near

flowers, after which birds wandered off for the night.

On most days, the *M. fasciatus* worked low bushes under or near the *Senna*. On 26 April, however, one sallied in the midlevels of the *Senna* at 15:46 h, returning 15:52 h after some long calls and sallying to near flowers. It fled if people or bicycles passed, but returned to catch insects with sallies to flowers, the air, or foliage; at 16:23 h it dropped to bushes, sallied to the ground in the road a few times, and did not return to the flowers. The next morning, 08:05–08:15 h, the *M. fasciatus* was less timid and sallied to or near flowers up one tree several times.

Elsewhere, E.O.W. noted *P. fasciatus*, *M. fasciatus* and six other small flycatchers sallying or hovering for insects near flowers of trees or bushes in southeastern Brazil (Table 3). Late on 15 August 2002, fallen flowers of *Tabebuia chrysostricha* (Bignoniaceae) on the lawn of the UNESP Campus (22°23'S; 47°33'W, 620 m a.s.l.), Rio Claro, São Paulo state, attracted insect-eating birds such as the Great Kiskadee *Pitangus sulphuratus*, *M. rixosa*, woodpeckers, wrens and others, while flowers in the trees nearby attracted the Yellow-bellied Elaenia *Elaenia*

flavogaster and the White-crested Tyrannulet *Serpophaga subcristata*.

In southern Brazil, G.A.B. noticed two other tyrant-flycatchers watching flowers of bushes to catch insects (Table 3). In addition, in the Pampas grasslands around Lavras do Sul (30°48'S; 53°54'W, 315 m a.s.l.), 05–08 January 2018, at least three species of tyrant-flycatchers were plucking soldier beetles *Chauliognathus flavipes* (Cantharidae) from the umbellate flower stalks of *Eryngium chamissonis* (Urb., 1879) (Apiaceae) in densely vegetated upland swales dominated by this spiny sedge. These polymorphic, soft-elytra beetles are distinctly colored with yellow and black and gather by the thousands on the upright inflorescences of *E. chamissonis*, which rise up to 1.5 m above the vegetative stratum in mid-summer to form a temporary emergent layer of flowering shoots. Birds seen capturing the beetles in a more or less systematic way included a family group of Yellow-browed Tyrants *Satrapa icterophrys* on the 04 January, plus a solitary individual on the 06 January, and two *M. fasciatus* on the 05 and 08 January, at four different locations. One

Table 3. Observations of tyrant-flycatchers (Rhynchocyclidae and Tyrannidae) foraging on insects attracted by flowers in southeastern Brazil.

Species	Plant (family)	Locality (coordinates, altitude, a.s.l.)*	Date (observer)**
<i>Phylloscartes ventralis</i> Mottle-cheeked Tyrannulet	<i>Rubus rosifolius</i> (Rosaceae)	Mariana Pimentel, RS (30°19'S; 51°36'W, 230 m)	18 July 1997 (1)
<i>Tolmomyias sulphureus</i> Yellow-olive Flycatcher	<i>Ceiba speciosa</i> (Malvaceae)	near Broa Reservoir, SP (22°08'S; 47°52'W, 740 m)	25 March 1984 (2)
<i>Todirostrum cinereum</i> Common Tody- Flycatcher	<i>Inga</i> sp. (Fabaceae)	Sooretama, ES (19°03'S; 40°09'W, 85 m)	27 December 1992 (2)
<i>Phyllomyias fasciatus</i> Planalto Tyrannulet	<i>Vochysia</i> sp. (Vochysiaceae)	Rio do Cipó, MG (18°40'; 43°59', 570 m)	20 December 1997 (2)
	unidentified bush	Campos do Jordão, SP (22°38'S; 45°26'W, 1600 m)	11 August 2001 (2)
<i>Phyllomyias griseocapilla</i> Gray-capped Tyrannulet	unidentified flowers	Augusto Ruschi Biological Reserve, ES (19°54'S; 40°33'W, 850 m)	September 2002 (2)
<i>Culicivora caudacuta</i> Sharp-tailed Tyrant	tiny flowers of bushes	Broa prairie, SP (22°14'S; 47°52'W, 715 m)	14 June 2002 (2)
<i>Myiarchus swainsoni</i> Swainson's Flycatcher	unidentified yellow flowers	Intervales, SP (24°16'S; 48°25'W, 830 m)	04 March 1988 (2)
<i>Myiarchus ferox</i> Short-crested Flycatcher	<i>Croton floribundus</i> (Euphorbiaceae)	Fazenda São José, SP (22°21'S; 47°29'W, 650 m)	12 January 1992 (2)
<i>Myiophobus fasciatus</i> Bran-colored Flycatcher	<i>Inga</i> sp. (Fabaceae)	Fazenda São José, SP	09 September 2001 (2)
<i>Muscipipra vetula</i> Shear- tailed Gray Tyrant	<i>Tecoma stans</i> (Bignoniaceae)	Monte Alverne, RS (29°34'S; 52°22'W, 350 m)	23 September 1995 (1)

*Acronyms of states: ES – Espírito Santo, MG – Minas Gerais, SP – São Paulo, RS – Rio Grande do Sul.

**Observers: 1: G.A. Bencke, 2: E.O. Willis.

Highland Elaenia *Elaenia obscura* also briefly fed on the insects on the first day. Beetles were picked or snapped off flower heads and outermost peduncles mostly with glean, reach and leap maneuvers, and the birds seemed to make little effort to catch them, since prey was everywhere and almost stationary.

Other species

On 27 April 1996, a tanager flock visited *Senna* trees by the lab of the Museu de Biologia Mello Leitão (19°58'S; 40°36'W, 680 m a.s.l.), Santa Teresa, sallying to air or leaves for insects near or far from flowers (*Tangara palmarum*, *T. ornata*, *T. sayaca*, and *T. cayana*). A female Barred Antshrike *Thamnophilus doliatus* pecked an insect from a *Bauhinia* flower (Fabaceae) at Barão Geraldo District (22°50'S; 47°05'W, 620 m a.s.l.), Campinas, São Paulo state, on 06 June 1998 (E.O.W.). On 15 October 1995, a male Hepatic Tanager *Piranga flava* worked the crown of a flowering *Phytolacca dioica* tree (Phytolaccaceae) for about 25 min at Itati (29°23'S; 50°11'W, 230 m a.s.l.), Rio Grande do Sul state, hopping and jumping along branches to catch insects on or near flowers with short sallies, flutter-chases and one reach-out; the bird often watched closely the movements of flying insects around flowers before attempting to capture its prey (G.A.B.).

DISCUSSION

The temporary association of insect-eating birds with flowering trees or shrubs is scarcely documented in the literature. We expect this opportunistic behavior to be more common among small-bodied, edge or canopy-dwelling birds that sally or hover-glean to catch small insects on or near foliage, because *i*) insects attracted to flowers are usually small (mostly hymenopterans, flies and beetles, but also butterflies and moths; Willmer 2011), making them non-rewarding prey for larger birds; *ii*) plant species showing massive flowering (*i.e.*, producing large numbers of exposed flowers to attract relatively non-specialized pollinators) predominate in the upper strata of tropical forests and along borders (Janzen 1975, Baker *et al.* 1983); and *iii*) flowers are rarely accessible directly to perching birds in the New World (Cronk & Ojeda 2008).

In southeastern Brazil, *P. fasciatus* (10.3 g) often watches flowers and sallies for or pecks insects, *T. poliocephalum* (7 g) and *M. fasciatus* (9.9 g) less. As illustrated here, many other birds (mass range 6.3–102 g) visit flowering trees to get insects, but they move through the trees and do not obviously watch flowers as do the tyrannulets above, or perhaps do it for shorter periods (*e.g.*, *Piranga flava*). Wholly insectivorous birds such as *T. poliocephalum* may forage in flowering trees for longer

periods as compared to similarly sized species that also feed on fruits, presumably because they are able to find most of their food items in the flowers and/or foliage, and also because arthropods at flowers are a rapidly renewing resource (Beehler 1980). In contrast, *P. fasciatus* and several tanagers make more frequent but shorter visits to flowering trees, possibly because insects are only part of their diet. Individuals of *P. fasciatus* observed at Santa Lúcia often regurgitated mistletoe seeds upon arriving at the flowering trees, indicating they had been feeding on fruit shortly before.

Several other Tyrannoidea visit eucalyptus or other flowers, but more study is needed to establish whether arthropods, nectar, or pollen are used. We did not confirm any activity that could have pollinated flowers, except when one bird put its head in a flower. Flight near flowers could have picked up some pollen, but tanagers and others that visit flowers directly are more likely to pollinate.

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