

*Supplementary Materials*

# Fruit Size and Structure of Zoochorous Trees: Identifying Drivers for the Foraging Preferences of Fruit-Eating Birds in a Mexican Successional Dry Forest

R. Carlos Almazán-Núñez <sup>1,\*</sup>, Edson A. Alvarez-Alvarez <sup>1,2</sup>, Pablo Sierra-Morales <sup>1,2</sup> and Rosalba Rodríguez-Godínez <sup>1,2</sup>

<sup>1</sup> Laboratorio Integral de Fauna Silvestre (Área de Ornitología), Facultad de Ciencias Químico Biológicas, Universidad Autónoma de Guerrero, Chilpancingo 39090, Guerrero, Mexico; bio\_ed19@hotmail.com (E.A.A.-A.); sierra02pix@hotmail.com (P.S.-M.); goretti.merced3@gmail.com (R.R.-G.)

<sup>2</sup> Posgrado en Recursos Naturales y Ecología, Facultad de Ecología Marina, Universidad Autónoma de Guerrero, Acapulco 39390, Guerrero, Mexico

\* Correspondence: rcarlos.almazan@gmail.com; Tel.: +52-747-105-6697

**Citation:** Almazán-Núñez, R.C.; Alvarez-Alvarez, E.A.; Sierra-Morales, P.; Rodríguez-Godínez, R. Fruit Size and Structure of Zoochorous Trees: Identifying Drivers for the Foraging Preferences of Fruit-Eating Birds in a Mexican Successional Dry Forest. *Animals* **2021**, *11*, 3343. <https://doi.org/10.3390/ani11123343>

Academic Editors: Jesús Domínguez and Sandra Goded

Received: 18 September 2021

Accepted: 15 November 2021

Published: 23 November 2021

**Publisher's Note:** MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



**Copyright:** © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

**Table S1.** Monthly fruiting phenology of zoochorous tree species in a TDF of southern Mexico. The space between the dotted lines corresponds to the rainy season of the year, while the rest of the space corresponds to the dry season. Months: January (Ja), February (Fe), March (Ma), April (Ap), May (My), June (Jn), July (Ju), August (Au), September (Se), October (Oc), November (No), December (De).

[illegible]

**Table S2.** Composition of fruit-eating birds along the successional gradient of TDF in southern Mexico. Type of frugivore: pulp consumer (PulC), seed predator (SeedP), legitimate disperser (LegD). Successional stage: early stage (ES), intermediate stage (IS), mature stage (MS). The nomenclature and systematic arrangement of bird species follow the guidelines of the American Ornithological Society [91].

Family	Bird species	English name	Species code	Type of frugivore	Successional stages		
					ES	IS	MS
Cracidae	<i>Ortalis poliocephala</i>	West Mexican Chachalaca	Ortpol	LegD		x	x
Momotidae	<i>Momotus mexicanus</i>	Russet-crowned Motmot	Mommex	LegD		x	
Picidae	<i>Melanerpes chrysogenys</i>	Golden-cheeked Woodpecker	Melchr	LegD	x	x	
	<i>Melanerpes hypopolius</i>	Gray-breasted Woodpecker	Melhyp	LegD			x
Psittacidae	<i>Eupsittula canicularis</i>	Orange-fronted Parakeet	Eupcan	SeedP		x	x
	<i>Myiarchus tuberculifer</i>	Dusky-capped Flycatcher	Myitub	LegD		x	x
	<i>Myiarchus cinerascens</i>	Ash-throated Flycatcher	Myicin	LegD	x	x	x
	<i>Myiarchus nuttingi</i>	Nutting's Flycatcher	Myinut	LegD		x	
Tyrannidae	<i>Myiarchus tyrannulus</i>	Brown-crested Flycatcher	Myityr	LegD	x	x	x
	<i>Myiodynastes luteiventris</i>	Sulphur-bellied Flycatcher	Myilut	LegD	x		x
	<i>Tyrannus vociferans</i>	Cassin's Kingbird	Tyrvor	LegD		x	x
	<i>Tyrannus verticalis</i>	Western Kingbird	Tyrver	LegD	x	x	x
	<i>Tyrannus forficatus</i>	Scissor-tailed Flycatcher	Tyrfor	LegD			x
Corvidae	<i>Calocitta formosa</i>	White-throated Magpie-Jay	Calfor	LegD	x	x	
Fringillidae	<i>Haemorhous mexicanus</i>	House Finch	Haemex	PulC		x	
	<i>Spinus psaltria</i>	Lesser Goldfinch	Spipsa	PulC	x	x	x
Icteridae	<i>Icterus wagleri</i>	Black-vented Oriole	Ictwag	LegD		x	x
	<i>Icterus pustulatus</i>	Streak-backed Oriole	Ictpus	LegD	x	x	
	<i>Piranga ludoviciana</i>	Western Tanager	Pirlud	LegD		x	x
	<i>Pheucticus melanocephalus</i>	Black-headed Grosbeak	Phemel	SeedP			x
Cardinalidae	<i>Passerina caerulea</i>	Blue Grosbeak	Paecae	SeedP		x	x
	<i>Passerina leclancherii</i>	Orange-breasted Bunting	Paslec	PulC			x
	<i>Passerina versicolor</i>	Varied Bunting	Pasver	PulC	x	x	x

**Table S3.** Foraging preferences based on the coverage of zoochorous trees by group of frugivore and by species of bird for each of the successional stages. Significant preferences (+) or avoidances (-) are shown with:  $\pm p < 0.05$ ,  $\pm \pm p < 0.01$ ,  $\pm \pm \pm p < 0.001$ . Type of frugivore: pulp consumer (PulC), seed predator (SeedP), legitimate disperser (LegD). The complete names of the zoochorous tree species and fruit-eating bird species are shown in Table S1 and S2, respectively.

Bird species	Early					Intermediate										Mature									
	Bap	Bfa	Bmo	Bsc	Sca	Bap	Bch	Bfa	Blo	Bmo	Bsc	Bsu	Bsn	Bve	Csp	Bap	Bch	Bfa	Blo	Bmo	Bsc	Bsu	Bsn	Bve	Bxo
<i>Pasver</i>			+++								+++							++			+++				
<i>Paslec</i>																			+		+++				
<i>Haemex</i>						++			++																
<i>Spipsa</i>									+	++									+++						
<i>PulC</i>									+++		++	-		--		-		+++	-	++					-
<i>Eupcan</i>									++					++				+++							+
<i>Pascae</i>									+++											+++	++				
<i>Phemel</i>																									
<i>SeedP</i>									+++	-				+		-		+++				+			
<i>Ortpol</i>											+														
<i>Melchr</i>					+++					++		++			+++										
<i>Melhyp</i>																				+++					
<i>Myicin</i>	+	+				+++		++						-				+++	-						--
<i>Myitub</i>								+++										++							
<i>Myityr</i>																++									
<i>Myinut</i>									+	+															
<i>Myilut</i>				+++																+++					
<i>Tyrver</i>												+++		---				-	+++	++	-				---
<i>Tyrvoc</i>								++		+++								+++				-			--
<i>Tyrfor</i>																						+++			
<i>Calfor</i>				+++				+++																	
<i>Pirlud</i>														+++						+++					
<i>Ictwag</i>										+++									+++						
<i>Ictpus</i>				++							+++			-											
<i>Mommex</i>																									
<i>LegD</i>				+	--		-	+++	+				---	---			-	---	+++				-	---	--

**Table S4.** Foraging preferences based on the foliage height diversity of zoochorous trees by group of frugivore and by species of bird for each of the successional stages. Significant preferences (+) or avoidances (-) are shown with:  $\pm p < 0.05$ ,  $\pm \pm p < 0.01$ ,  $\pm \pm \pm p < 0.001$ . Type of frugivore: pulp consumer (PulC), seed predator (SeedP), legitimate disperser (LegD). The complete names of the zoochorous tree species and fruit-eating bird species are shown in Table S1 and S2, respectively.

Bird species	Early			Intermediate											Mature										
	Blo	Bmo	Sca	Bap	Bch	Bfa	Bgr	Blo	Bmo	Bsc	Bsu	Bsn	Bxo	Bve	Csp	Bap	Bch	Bfa	Blo	Bmo	Bsc	Bsn	Bsu	Bve	Bxo
<i>Pasver</i>		+++						++		+++								+			+++				
<i>Paslec</i>																			+++						
<i>Haemex</i>	+++			++				+																	
<i>Spipsa</i>	+++							+	+++										+++						
<i>PulC</i>	+++							+++						-					+++						
<i>Eupcan</i>								+++						+++					+++						
<i>Pascae</i>																				+++					
<i>Phemel</i>																			++					++	
<i>SeedP</i>								+++						+++		-			+++						
<i>Ortpol</i>								+++																	
<i>Melchr</i>			+++						+++		++				+++	++			++						
<i>Melhyp</i>																			+++						
<i>Myicin</i>			+					+++						-		+		+++	-					-	
<i>Myitub</i>								+++											+++						
<i>Myityr</i>	+++							+++	++							+++	-		+++			-			
<i>Myinut</i>								+++	++																
<i>Myilut</i>	++	-																	+++						
<i>Tyrover</i>	+++					-	-	+++		-		-		--			-	-	+++	+++	--	-	+	--	--
<i>Tyrvoc</i>				-				+++		+++							-		+++			-	-	-	-
<i>Tyrfor</i>																						+++			
<i>Calfor</i>			+++					+++																	
<i>Pirlud</i>								+++												+++					
<i>Ictwag</i>	+++								+++										+++						
<i>Ictpus</i>	++							+++								++			+++	+	-				
<i>Mommex</i>								++																	
<i>LegD</i>	+++	+		-	++	--	--	+++	+++			--	-	--		+++	--	--	+++	+++	--	--		--	--