

Supplementary material

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Is there more than one way to cross the Caribbean Sea? Migratory strategies of Nearctic-Neotropical birds

Table A1. Measurements used for flight range calculations in *Flight 1.25* (Pennycuick, 2008). Sample sizes correspond to wingspan and wing area measurements. Aspect ratio is equivalent to the wingspan squared divided by the wing area. *Species for which flight muscle fraction was estimated, as empirical muscle mass measurements were not available.

Species	<i>n</i>	Span (m)	Wing area (m ²)	Aspect Ratio	Muscle Fraction	LBM (g)
Yellow-billed Cuckoo*	5	0.459	0.0253	8.36	0.168	45.8
Willow Flycatcher*	5	0.212	0.0081	5.35	0.154	11.2
Alder Flycatcher*	1	0.221	0.0079	5.85	0.154	11.9
Eastern Wood-Pewee*	7	0.249	0.0099	6.33	0.152	12.0
Red-eyed Vireo	7	0.236	0.0105	5.30	0.159	15.0
Gray-cheeked Thrush	5	0.307	0.0168	5.63	0.169	26.8
Swainson's Thrush	6	0.272	0.0138	5.35	0.168	25.4
Summer Tanager*	4	0.275	0.0141	5.35	0.164	26.5
Scarlet Tanager	6	0.273	0.0137	5.39	0.169	27.9
Rose-breasted Grosbeak	3	0.311	0.0177	5.46	0.173	41.6
Northern Waterthrush*	7	0.223	0.0093	5.38	0.156	14.1
Tennessee Warbler	5	0.184	0.0067	5.03	0.154	8.1
Mourning Warbler*	4	0.183	0.0066	5.14	0.156	10.8
American Redstart	5	0.187	0.0068	5.09	0.147	6.9
Blackburnian Warbler	5	0.195	0.0072	5.26	0.147	8.6
Yellow Warbler*	5	0.183	0.0061	5.57	0.151	8.2

Table A2. Body mass and the equivalent departure fuel load required to fly to potential stopovers in Central America/Cuba (1070 km), Yucatan/Florida peninsulas (1800 km) or the Gulf coast of Louisiana/Texas in 16 migratory landbirds captured in northern Colombia on spring migration. Fuel load = (Body mass - lean body mass) / lean body mass)*100.

Species	1070 km		1800 km		2800 km	
	Body	Fuel Load	Body	Fuel Load	Body	Fuel Load
	mass (g)	(% LBM)	mass (g)	(%LBM)	mass (g)	(%LBM)
Yellow-billed Cuckoo	52.0	13.5	56.3	22.9	62.4	36.2
Willow Flycatcher	13.7	22.3	15.5	38.4	18.2	62.5
Alder Flycatcher	14.5	21.8	16.5	38.7	19.4	63.0
Eastern Wood-Pewee	14.4	20.0	16.0	33.3	19.5	62.5
Red-eyed Vireo	18.2	21.3	20.5	36.7	23.9	59.3
Gray-cheeked Thrush	31.8	18.7	35.3	31.7	40.6	51.5
Swainson's Thrush	30.5	20.1	34.1	34.3	39.8	56.7
Summer Tanager	31.8	20.0	35.6	34.3	41.5	56.6
Scarlet Tanager	32.4	20.0	36.3	34.4	42.2	51.6
Rose-breasted Grosbeak	48.7	17.1	53.9	29.6	61.9	48.8
Northern Waterthrush	17.1	21.3	19.3	36.9	22.7	61.0
Tennessee Warbler	10.1	24.7	11.6	43.2	13.8	70.4
Mourning Warbler	13.4	24.1	15.3	41.7	18.3	69.4
American Redstart	8.54	23.8	9.73	41.0	11.6	68.1
Blackburnian Warbler	10.7	24.4	12.1	40.7	14.3	66.3
Yellow Warbler	10.2	24.4	11.6	41.5	13.7	67.1

Table A3. Estimated Lean Body Mass \pm (SD) for eight species of migratory landbirds captured in northern Colombia and a comparison with previously reported fat-free weights taken from Yong & Finch (1997)^a; Connell, Odum, & Kale (1960)^b; Bayly, Gómez, & Hobson (2013)^c and Rogers, David, & Odum (1966)^d.

Species	Estimated in this study		Previously reported	
	<i>n</i>	Lean Body Mass	<i>n</i>	Fat- Free weight
Willow Flycatcher	183	11.2 \pm 0.33	41	12.3 \pm 0.9 ^a
Red-eyed Vireo	68	15.0 \pm 0.16	87	15.05 \pm 0.11 ^b
Gray-cheeked Thrush	99	26.8 \pm 0.91	43	26.8 ^c
Swainson's Thrush	143	25.4 \pm 0.59	73	25.4 \pm 1.96 ^d
Summer Tanager	23	26.5 \pm 0.54	22	25.07 \pm 1.6 ^d
Scarlet Tanager	43	27.9 \pm 0.61	28	23.52 \pm 0.24 ^b
Northern Waterthrush	126	14.1 \pm 0.49	88	13.95 \pm 1.13 ^d
Tennessee Warbler	29	8.1 \pm 0.20	11	7.94 \pm 0.13 ^b

Table A4. Average speed and wind direction during April for nine weather stations located along the over-water migratory route between northern Colombia and the United States based on data reported by Widmann et al. (1999).

Weather stations			Wind direction (degrees)	Wind speed (m/s)
Locations	Lat	Lon		
San Andres Island, Colombia	12.5336	-81.7112	67	6.23
Riohacha Airport, Colombia	11.5283	-72.9177	90	5.81
Roatan Island, Honduras	16.3168	-86.5227	90	6.26
Mujeres Island, Mexico	21.2450	-86.7400	157	4.47
Yucatan Basin Buoy, Mexico	19.8741	-85.0590	90	7.15
Gran Caiman, Guyana	19.2928	-81.3537	67	5.81
Saint James, Jamaica	18.5001	-77.9100	67	4.47
Sand key, Florida	24.4601	-81.8800	90	7.15
Vermillon 331A, Louisiana	28.2700	-92.2640	157	6.26

Figure A1. Density plots of fuel loads in 15 species of Nearctic-Neotropical migratory landbirds captured at two sites in northern Colombia during spring migration. Vertical lines represent the fuel load required in each species to cover three pre-established distances based on likely stopover regions in Central America (1070 km), Yucatan/Florida Peninsula (1800 km) and the Gulf coast of the United States (2800 km).

Fig. A2. Comparison of fuel loads in Tennessee Warbler and Mourning Warbler on spring migration at two study sites in northern Colombia: Finca las Palmeras, Cordoba (Palmeras) and Hacienda La Victoria in the Sierra Nevada de Santa Marta (SNSM). Vertical lines represent the previously established flight ranges required to reach potential stopovers in Central America (1070 km) and the Yucatan/Florida peninsulas (1800 km). For a further comparison, see Red-eyed Vireo in Figure 5 in the main text of the article.

