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REPEATS, RETURNS, AND ESTIMATED FLIGHT RANGES OF SOME NORTH AMERICAN MIGRANTS IN GUATEMALA

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The activities of North American migratory birds in Latin America are important because many of those species spend approximately 50% of their time there. Many early studies were attempts to understand the distribution and flight routes of the migrants with notable works by Cooke (1904, 1915), Wetmore (1926), and Grinnell (1931). Lowery (1945) and Stevenson (1957) were convinced that the bulk of spring migration from Central America launched on a trans-Gulf journey from the peninsula of Yucatán. Recently, Rappole et al. (1980) presented data indicating a large migration through the state of Veracruz, Mexico. The latter study may indicate a larger circum-Gulf migration or a group flying a short trans-Gulf flight.

A different approach to possible routes was presented by Rogers and Odum (1966) who gave evidence that many birds were leaving Belice without having the weight necessary to make a trans-Gulf flight. Since that time, more refined data concerning the metabolic requirements of flight have become available (Tucker 1971) and should make estimates of flight-range capability more accurate.

Another type of basic data necessary to understand migrants in their tropical environment is the degree of fidelity of various species to specific localities. The extent to which individuals return to the same winter quarters in Central America has been summarized by Loftin (1977), with additional data provided by Ely et al. (1977). The data indicate a variety of responses by species and locality. Sufficient data for many generalizations are still lacking.

The purpose of this paper is to present data on repeats (retrapped within less than 90 days), returns (retrapped after more than 90 days), weights, and theoretical maximum flight ranges of North American migratory birds caught in the province of Izabal, Guatemala, during the periods 9 March through 17 April 1979 and 10 through 14 March 1980.

STUDY SITE AND METHODS

The study site is located approximately 5 km SW of Entre Rios, Izabal, Guatemala, adjacent to highway C-A9 (15°30′N, 88°30′W) in the foothills of the Micos Mountains. Seventeen nets were set up in a 4 ha orange grove and operated from dawn until approximately 0900 and from 1600 to approximately 1900 during March and April 1979. During March 1980 the nets were open from dawn until approximately 1900 each day. Nets were placed at the edges and in the interior of the orchard. The orchard has pasture along approximately 50% of the perimeter, and low second growth vegetation along approximately 40%. The other 10% is bordered by highway (C-A9) and the yard of a house.

Birds were banded and then weighed to the nearest 0.1 g on a triple beam balance within 20 min after capture.

RESULTS AND DISCUSSION

The first consideration was the question of which species might be winter residents and which were transients. Criteria for this judgment are frequency of repeats, time intervals between repeats, and return to the same area in a subsequent year. The problems, of course, are how many repeats and what time intervals are necessary in order to classify a species as a winter resident. Data in Table 1 indicate some species which seem to be long term residents and others which are not. For example, Swainson's Thrush showed no repeats, no returns, and appeared late in the season (13–15 April), making this species an obvious transient. At the other extreme, the Northern Waterthrush appeared throughout the study period, had 64.3% repeats in 1979 and 35.7% returns during the following year, making it an obvious winter resident. Other species with high percentage repeats were the Magnolia Warbler (51.7%), Ovenbird (56.3%), American Redstart (46.1%), Black and White Warbler (55.5%), and Yellow Warbler (36.8%).

Another approach to identifying winter residents is the time lapse between repeats. Table 1 gives the greatest time lapse between repeats for individuals of the various species. Using 3 weeks as an adequate time lapse to designate a bird a winter resident, the Indigo Bunting, Least Flycatcher, Louisiana Waterthrush, Hooded Warbler, Worm-eating Warbler, Chestnut-sided Warbler, Summer Tanager, Yellow-throated Vireo, Tennessee Warbler, and Wood Thrush can be added to the list of winter residents.

A lesser form of evidence for designating a species as a winter resident is to recapture an individual during a subsequent year. Certainly, an individual is more likely to be a return if it is a winter resident than if it is a transient. On this basis there is additional support given for classifying 9 species as winter residents (Table 1). The return of the Louisiana Waterthrush was only the second such record for the species in Middle America, the other being from Panama (Loftin 1977). Perhaps the most impressive return data are of the Northern Waterthrush with 5 of 14 birds returning. Previous data indicate much lower returns with 1 of 403 in Panama (Loftin 1977) and 1.4% in Jamaica (Diamond and Smith 1973).

The other phase of this study was concerned with the weights of migrants and its relation to flight-range capability. Of particular interest was the question of whether the study area might be a launch point for trans-Gulf flights. Data in Table 2 suggest that, on the average, birds leaving the study site were not capable of flying to North America. The assumptions underlying the maximum flight-range capabilities were: (1) The difference between average fat-free weight (Rogers and Odum 1966) and average live weight represented fat weight, (2) the birds would be flying in still air, and (3) flight-range capability could be cal-

TABLE 1. Migrant birds banded, repeats, and returns at Puerto Barrios, Guatemala.

Species	March–April 1979		Time lapse[1] (days)	March 1980		
	Banded	Repeats		Banded[2]	Repeats	Returns
Yellow-bellied Sapsucker *Sphyrapicus varius*	1	0				
Wied's Crested Flycatcher *Myriarchus tyrannulus*				2	0	
Great Crested Flycatcher *Myriarchus crinitus*				1	0	
Acadian Flycatcher *Empidonax virescens*	2	1	4			
Least Flycatcher *Empidonax minimus*	1	1	34			
Gray Catbird *Dumetella carolinensis*	12	1	4	2	0	
Swainson's Thrush *Catharus ustulata*	6	0				
Wood Thrush *Hylocichla mustelina*	17	5	25	9	5	1
White-eyed Vireo *Vireo griseus*	1	1	2	1	0	
Red-eyed Vireo *Vireo olivaceus*	1	0				
Yellow-throated Vireo *Vireo flavifrons*	2	0	23			1
Warbling Vireo *Vireo gilvus*	1	0				
Louisiana Waterthrush *Seiurus moticilla*	2	1	30	2	0	1
Northern Waterthrush *Seiurus noveboracensis*	14	9	33	10	4	5
Ovenbird *Seiurus aurocapillus*	16	9	37	15	5	3
Kentucky Warbler *Oporornis formosus*				1	0	
Blue-winged Warbler *Vermivora pinus*				2	0	
American Redstart *Setophaga ruticilla*	13	6	12	3	2	2
Hooded Warbler *Wilsonia citrina*	5	2	29	3	0	1
Wilson's Warbler *Wilsonia pusilla*				2	1	
Common Yellowthroat *Geothlypis trichas*	9	1	11	1	0	
Worm-eating Warbler *Helmitheros vermivorus*	2	1	29	1	0	
Yellow-breasted Chat *Icteria virens*	1	0				

TABLE 1. Continued.

Species	March–April 1979 Banded	March–April 1979 Repeats	Time lapse[1] (days)	March 1980 Banded[2]	March 1980 Repeats	March 1980 Returns
Tennessee Warbler *Vermivora peregrina*	71	17	38	20	6	2
Magnolia Warbler *Dendroica magnolia*	29	15	38	7	1	
Yellow Warbler *Dendroica petechia*	19	7	35	6	1	
Chestnut-sided Warbler *Dendroica pensylvanica*	2	2	26	4	0	
Black and White Warbler *Mniotilta varia*	9	5	35	6	2	1
Yellow-throated Warbler *Dendroica dominica*	1	0		2	0	
Blackburnian Warbler *Dendroica fusca*	1	0				
Northern Oriole *Icterus galbula*	8	1	3			
Orchard Oriole *Icterus spurius*	7	1	3	5	0	
Summer Tanager *Piranga rubra*	10	2	24	2	0	
Painted Bunting *Passerina ciris*	5	1	1	1	0	
Indigo Bunting *Passerina cyanea*	38	5	30	15	0	
Rose-breasted Grosbeak *Pheucticus ludovicianus*	5	0				
Black-headed Grosbeak *Pheucticus melanocephalus*				1	0	
Blue Grosbeak *Guiraca caerulea*	4	0				

[1] Longest time lapse for a repeat.
[2] Includes returns from 1979.

culated using the formula: distance in km = (fat weight/live weight) (7.16×10^3) (live weight in $kg^{0.227}$) as modified from equation 25 of Tucker (1971). The equation is based on oxygen consumption of birds trained to fly in a wind tunnel.

In 1979 the study was terminated after the daily catch dwindled to 1 bird. In no species was there a trend toward increasing weight at the end of the period. Thus the mean live weights over the entire period are reported in Table 2. There is a remarkable uniformity in flight-range estimates with the exception of Swainson's Thrush which was discussed previously as an obvious transient. Obviously the migrants

TABLE 2. Mean weights, estimated percent fat, and flight ranges from spring migrants in Guatemala.

Species	n	Mean live wt (g)	[1]Fat free wt (g)	% fat	[2]Estimated flight range km
Swainson's Thrush	6	26.17	25.46	2.7	88
Wood Thrush	17	48.68	41.64	14.5	544
Gray Catbird	12	37.37	31.80	14.8	528
Summer Tanager	10	29.53	25.07	15.1	506
Tennessee Warbler	68	8.53	7.46	12.5	317
Northern Waterthrush	13	16.53	13.95	15.6	458
Ovenbird	8	19.38	15.98	17.5	543
Indigo Bunting	11	14.70	12.12	17.5	502

[1] From Rogers and Odum (1966).
[2] Distance = (fat wt/live wt) (7.16×10^3) (live wt in $kg^{0.227}$) modified from Tucker (1971).

were leaving the study area but not on a trans-Gulf flight. A flight-range capability of 500 km would place the possible destination of a bird on an arc extending from Felipe Carrillo Puerto, Quintana Roo, through Tekax, Yucatan, to the City of Campeche, Campeche. Thus it might be profitable to look somewhere along this arc for an important final fattening area for trans-Gulf migrants. Complicating factors such as suitable habitat and wind patterns would be expected to have a great effect. This arc falls within 1000–1500 mm rainfall area and has been called Semi-Evergreen Seasonal Forest (Wilson 1980:24–29). Since rainfall, and perhaps insect abundance, increases in April in this area (Wilson 1980:24) it should be more suitable as a source of energy than more southern areas of the peninsula where April is drier.

SUMMARY

On the criteria of repeat frequency, length of time between repeats and return to winter quarters, 16 species of North American migratory birds were suggested as likely winter residents near Puerto Barrios, Guatemala. In 1980, approximately 5.5% of the birds banded in 1979 were recaptured. A consideration of probable fat reserves indicated that the birds leaving the study area were not capable of trans-Gulf flight. Based on an equation of energy requirements for flight, a probable maximum destination for the birds was postulated as being at a mid-point on the Yucatan Peninsula.

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