——— AND K. C. PARKES. 1982. The status of the avifauna of the Revillagigedo Islands, Mexico. Wilson Bull. 94:1--19.

KAEDING, H. B. 1905. Birds from the west coast of Lower California and adjacent islands. Condor 7:105–111, 134–138. 138.

MCLELLAN, M. E. 1926. Expedition to the Revillagigedo Islands, Mexico, in 1925, VI. The birds and mammals. Proc. Calif. Acad. Sci. 4th ser. 15:279–322.

NELSON, J. B. 1978. The Sulidae. Oxford Univ. Press. Oxford, England.

PITMAN, R. L. 1985. The marine birds of Alijos Rocks, Mexico. Western Birds 16:81–92.

———. 1986. Atlas of seabird distribution and relative abundance in the Eastern Tropical Pacific. Southwest Fisheries Center. La Jolla, California.

———. 1988. Laysan Albatross breeding in the Eastern Pacific—and a comment. Pacific Seabird Group Bulletin 15:52.

TOWNSEND, C. H. 1890. Scientific results of explorations by the U.S. Fish Commission steamer Albatross. XIV. Birds from the coasts of western North America and adjacent islands, collected in 1888–'89, with descriptions of new species. Proc. U.S. Natl. Mus. 13:131–142.

STEVE N. G. HOWELL, *40 Cae Glas Road, Rumney, Cardiff, U.K.* AND SOPHIE WEBB, *Box 664, Wellfleet, Massachusetts 02667.* *Received 11 Oct. 1988, accepted 21 April 1989.*

Wilson Bull., 102(1), 1990, pp. 146–150

Nearctic passerine fall migration in central Belize.—Although migration across the Gulf of Mexico is now an accepted phenomenon for many birds that breed in the Nearctic (Lowery 1951, Stevenson 1957, Buskirk 1980), little is known about specific routes, landing areas in fall (Paynter 1955, Rogers et al. 1986, Bossong 1988), staging areas in spring (Rogers et al. 1982), wintering areas, or habitat corridors for transients. Paynter (1951) estimated the minimum number of birds that arrived on the Yucatan peninsula during fall migration at over one million. Many of the species that cross the Gulf of Mexico pass through or winter on the Yucatan peninsula (Paynter 1951, 1953, 1955, Rogers et al. 1986, Bossong 1988). The landing areas for many species on the Yucatan peninsula have not been identified (Paynter 1955, Rogers et al. 1986, Bossong 1988). Therefore, we present data concerning migrant arrival times and weights during fall migration in central Belize.

We captured migrants on a citrus plantation (BGMC Limited) at mile 36 on the Western Highway, Cayo District, in central Belize, Central America (17°10'N, 88°40'W). We operated 15 mist nets (12 m × 2.6 m, 36 mm mesh) from 0600 to 1200 h during fall migration (25 August–18 November 1986). We weighed migrants with Pesola spring scales (to the nearest gram), banded each with a Fish and Wildlife Service band, and measured unflattened wing chord. Capture rates are reported as birds/net-h. The amount of fat remaining in migrants arriving in Belize was estimated by subtracting live weight from the mean fat-free weights given by Connell et al. (1960), Rogers and Odum (1964), Rogers (1965), and Hicks (1967). This region of Belize receives approximately 3500 mm of annual rainfall (129 mm during the fall study period) and is a transition zone from pine savannah to hardwood forest. The plantation is bordered by the Sibun River, and the surrounding vegetation has been described as semi-rainforest (Lundell 1945). Many areas within the plantation support successional growth, and other agricultural products are grown adjacent to the orange orchards.

We captured 1170 migrants of 47 species (0.33 birds/net-h) during fall migration, and 23 warbler species (Parulinae) accounted for 79% of the total number of individuals. Three

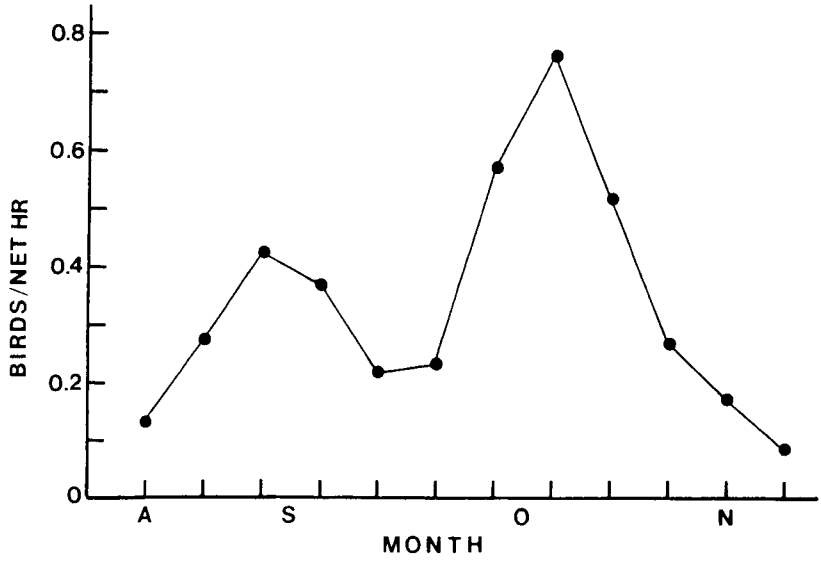

FIG. 1. Capture rates of migrants during fall migration (25 Aug–18 Nov 1986) on a citrus plantation in central Belize.

species (Magnolia [*Dendroica magnolia*], Prothonotary [*Protonotaria citrea*], and Yellow [*D. petechia*], warblers) accounted for 36% of the total number of migrants. Migrants did not arrive in a continuous stream but exhibited two peaks (Fig. 1). The first peak (8–14 Sept.) was due mainly to flocks of the transient Yellow and Prothonotary warblers. The second peak (13–19 Oct.) consisted of many species and coincides with the usual departure time of large numbers of birds from North America (Lowery and Newman 1966, Buskirk 1980). There was a dramatic increase in the number of birds arriving in Belize during the first week of October. On 7 Oct. we captured seven birds representing five migrant species, and 8 Oct. we caught 54 birds of 12 migrant species. Two cold fronts moved along the northern Gulf coast during this same week, but the weights of individuals of several species that arrived before and after these cold fronts were not significantly different (Table 1). Ovenbirds (*Seiurus aurocapillus*) had the least estimated fat, while Common Yellowthroats (*Geothlypis trichas*) were very fat (Table 2).

Lowery (1945) described the phenomenon of a coastal hiatus for spring migratory birds on the northern Gulf coast during periods of fair weather. The northern part of the Yucatan peninsula may also be an overflight zone for migrants in the fall, and mist net studies in Yucatan have shown that very few migrant species and individuals are found within 50 km of the coast (Rogers et al. 1986, Bossong 1988). There are three other lines of evidence indicating that northern Yucatan is an overflight zone : (1) Buskirk (1968) reported few fall migrants arriving in coastal Yucatan during fair weather but noted large fallouts of migrants with unfavorable southerly winds over the Gulf of Mexico. He believed they were tired from flying into a headwind. (2) We caught 10 nearctic migrant species in central Belize (450 km south of the coast of Yucatan) on dates earlier than previously recorded on the Yucatan Peninsula. Paynter (1955) and Rogers et al. (1986) reported data from a combined 120 sites in Yucatan, Campeche, and Quintana Roo. Many of our captures in this study

TABLE 1

MIGRANT WEIGHTS (MEAN GRAMS ± SD) IN CENTRAL BELIZE BEFORE AND AFTER OCTOBER COLD FRONTS, FALL 1986

Species	Before	After	*F* value[a]
Black-and-white Warbler (*Mniotilta varia*) N = 26, 74[b]	9.6 ± 1.1	9.2 ± 0.9	2.08 ($P = 0.11$)
Hooded Warbler (*Wilsonia citrina*) N = 14, 28	9.9 ± 1.2	9.7 ± 0.7	2.25 ($P = 0.10$)
Tennessee Warbler (*Vermivora peregrina*) N = 12, 55	8.9 ± 1.5	8.3 ± 1.2	2.96 ($P = 0.09$)
Northern Waterthrush (*Seiurus noveboracensis*) N = 43, 41	14.9 ± 1.5	14.6 ± 1.8	2.14 ($P = 0.15$)

[a] One-way ANOVA for unequal sample sizes.
[b] N = sample size before and after cold front.

were only one or two days earlier and might represent normal variation in the timing of fall migration. However, 2 Blue Grosbeak (*Guiraca caerulea*) was one month early, Blue-winged Warbler (*Vermivora pinus*) was over two weeks early, and Yellow-bellied Flycatcher (*Empidonax flaviventris*) was 10 days early. (3) We caught 14 migrant species that were not recorded inland by Rogers et al. (1986), Bossong (1988), or Paynter (1955) during fall migration. Some of these were noted by Paynter along the coast or on adjacent islands. These coastal reports could be the result of unfavorable weather conditions that forced migrants to land, or the differences in species composition might be due to slightly different migration patterns through the Yucatan peninsula.

From the third week in August until the first week in October 1986, there were no cold fronts along the northern Gulf coast or extending out into the Gulf of Mexico. Some studies have suggested that many migrants may wait for northerly winds or cold fronts before crossing the Gulf (Lowery and Newman 1966, Buskirk 1968, Able 1972). A cold front would provide a tailwind, allow birds to conserve energy, and reduce the chances of flying into a headwind above the Gulf of Mexico. The 1000 km flight from the coast of the United States to the Yucatan peninsula takes from 20–30 h for most passerines, depending on the weather conditions over the Gulf (Buskirk 1980). During the first week of October, two cold fronts pushed across the southern United States and extended out into the Gulf. Migrants arrived in flocks during this period, gave frequent vocalizations (calls), and made many short, rapid flights from tree to tree. This hyperactive behavior after the two cold fronts in October suggests the migrants may have landed closer to central Belize than the coast of Yucatan. The migrants that arrived before the cold fronts may have landed farther from our study site and then fed as they moved south across the peninsula. This might account for the similar weights of migrants at our study site before and after cold fronts.

Transient species arrived earlier than winter resident species, as might be expected. Migrants that typically winter south of Belize such as Prothonotary, Canada (*Wilsonia canadensis*), and Yellow warblers (*Dendroica petechia*), and Eastern Kingbirds (*Tyrannus tyrannus*) arrived in September and disappeared by October. The bulk of the wintering migrants arrived with the cold fronts in October, and remained until late April–early May 1987.

TABLE 2
ESTIMATED FAT REMAINING FOR SELECTED MIGRANT SPECIES IN BELIZE, FALL 1986

Species	Weight ± SD	Fat (g)
Swainson's Thrush (*Hylocichla ustulata*) (N = 11)	28.4 ± 2.3	2.9
Gray Catbird (*Dumetella carolinensis*) (N = 9)	34.4 ± 2.3	2.6
Tennessee Warbler (*Vermivora peregrina*) (N = 67)	8.4 ± 0.9	0.9
Prothonotary Warbler (*Protonoteria citrea*) (N = 128)	12.6 ± 1.3	1.6
Magnolia Warbler (*Dendroica magnolia*) (N = 161)	7.1 ± 0.8	0.4
Ovenbird (*Seiurus aurocapillus*) (N = 29)	16.4 ± 1.2	0.4
Northern Waterthrush (*Seiurus noveborarensis*) (N = 84)	14.8 ± 1.6	0.8
Common Yellowthroat (*Geothlypis trichas*) (N = 32)	9.7 ± 0.8	1.3
Summer Tanager (*Piranga rubra*) (N = 8)	28.2 ± 2.1	3.1
Indigo Bunting (*Passerina cyanea*) (N = 31)	13.1 ± 1.3	1.0
Orchard Oriole (*Icterus spurius*) (N = 6)	19.8 ± 1.5	1.7

Acknowledgments.—We thank B. Sokolsky, V. Sokolsky, Y. Plasmann, B. Hasse, J. Van Der Vinne, D. Van Der Vinne, and Belize Groves Management Company Limited for aid in Belize. We thank O. Rosado and the Ministry of Agriculture for permission to work in Belize. We are grateful to C. R. Blem for helpful comments on this manuscript. Our work during 1986–87 in Belize was funded by the J. Nicholene Bishop Memorial Fund, the Latin American Studies Program, and a Student Government Association research grant, all from the Univ. of Alabama.

LITERATURE CITED

ABLE, K. P. 1972. Fall migration in coastal Louisiana and the evolution of migration patterns in the Gulf region. Wilson Bull. 84:231–242.

BOSSONG, J. L. 1988. A mist net sampling of fall migrants in Ticul, Yucatan. M.S. thesis, Univ. of Alabama, Tuscaloosa.

BUSKIRK, W. H. 1968. The arrival of trans-Gulf migrants on the northern coast of Yucatan in fall. M.S. thesis, Louisiana State Univ., Baton Rouge, Louisiana.

———. 1980. Influence of meteorological patterns and trans-Gulf migration on the calendars of latitudinal migrants. Pp. 485–491 *in* Migrant birds in the neotropics: ecology, behavior, distribution, and conservation (A. Keast and E. S. Morton, eds.). Washington, D.C., Smithsonian Inst. Press.

CONNELL, C. E., E. P. ODUM, AND H. KALE. 1960. Fat-free weights of birds. Auk 77:1–9.

HICKS, D. L. 1967. A study of adipose tissue during fat depletion in spring migrant birds. Ph.D. diss., Univ. of Georgia, Athens, Georgia.

LOWERY, G. H., JR. 1945. Trans-Gulf spring migration of birds and the coastal hiatus. Wilson Bull. 57:92–121.

———. 1951. A qualitative study of the nocturnal migration of birds. Univ. Kans. Publ. Mus. Nat. Hist. 3:361–472.

——— AND R. J. NEWMAN. 1966. A continentwide view of bird migration on four nights in October. Auk 83:547–586.

LUNDELL, C. L. 1945. The vegetation and natural resources of British Honduras. Pp. 270–273 *in* Plants and plant science in Latin America (F. Verdoorn, ed.). Chronica Botanica, Waltham, Massachusetts.

PAYNTER, R. A., JR. 1951. Autumnal trans-Gulf migrants and a new record for the Yucatan peninsula. Auk 68:113–114.

———. 1953. Autumnal migrants on the Campeche bank. Auk 70:338–349.

———. 1955. Ornithogeography of the Yucatan Peninsula. Bull. Peabody Mus. Nat. Hist. 9.

ROGERS, D. T., JR. 1965. Fat levels and estimated flight-ranges of some autumn migratory birds killed in Panama during a nocturnal rainstorm. Bird-Banding 36:115–116.

———, J. B. GARCIA, AND A. B. ROGEL. 1986. Additions to records of North American avifauna in Yucatan, Mexico. Wilson Bull. 98:163–167.

———, D. L. HICKS, E. W. WISCHUSEN, AND J. R. PARRISH. 1982. Repeats, returns, and estimated flight ranges of some North American migrants in Guatemala. J. Field Ornith. 53:133–138.

——— AND E. P. ODUM. 1964. Effect of age, sex, and level of fat deposition on major body components in some wood warblers. Auk 81:505–513.

STEVENSON, H. M. 1957. The relative magnitude of the trans-Gulf and circum-Gulf spring migrations. Wilson Bull. 69:39--77.

EDWARD D. MILLS AND DAVID T. ROGERS, JR., *Univ. of Alabama, Dept. of Biology, Box 870344, Tuscaloosa, Alabama 35487-0344.* (Present address EDM: *Dept. of Biology, Wingate College, Wingate, North Carolina 28174.*) *Received 9 Jan. 1989, accepted 15 May 1989.*

Wilson Bull., 102(1), 1990, pp. 150–154

The location of the Mexican locality, Valle Real.—From 1824 to 1829, Ferdinand Deppe and his companions were the first naturalists to collect birds in Mexico for scientific purposes (Stresemann 1954). During this period, Deppe visited a locality, then known as Valle Real, where he collected a number of bird specimens, some of which were used by various authors as types of new species or subspecies. This locality has been referred almost universally to as the state of Veracruz (e.g., Ridgway 1914:356–357, 486; Stresemann 1954; Miller et al. 1957:14, 23). Some years ago, F. W. Loetscher, Jr. (in litt.) suggested to me that Valle Real might be synonymous with Valle Nacional, Oaxaca, a supposition with which I concurred but could not confirm (Binford 1989:389). Recently, however, I discovered an old map that, together with other data, proves this to be the case.

The map (Fig. 1), entitled "Mapa de Departamento Oaxaqueño," was prepared by Juan B. Carriedo and dated 1840. It shows a nearly direct trail from "Oajaca" [=Oaxaca City] through "Capulalpa" [Capulalpan], "Yxtlan" [Ixtlán de Juárez], Jaltianguis, Analco, Comaltepec [Santiago Comaltepec], "Yolos" [San Pedro Yolox], Guajimulco [probably Santiago Cuanimulco], "S. Juan" [probably San Juan Quiotepec], "Etla" [probably San Mateo Yetla], "Valle real" [Valle Nacional], "Tustepec" [San Juan Bautista Tuxtepec], and "Otatitlan" [Otatitlán, Veracruz] to "Chalcatiangis" [Chalcatianguis, Veracruz]. The last town is on the Río Papaloapan, which flows past "Cosamaluapa" [Cosamaloapan; Fig. 1D] to the Gulf of Mexico at Alvarado, Veracruz. Although these 16 towns are not in the exact positions shown on modern maps, they are located properly in relation to one another. Most importantly, "Valle real" (Fig. 1A) is between "Yolos" (B) and "Tustepec" (C), approximately where