Diversity and abundance of landbirds in spring reorientation flights in the Pelee region, Canada

Kenneth G.D. Burrell, Stephen D. Murphy and Bradley C. Fedy

Introduction

The reorientation flight of landbirds during migration (often termed "reverse migration") is a phenomenon that involves birds flying, diurnally, in the opposite direction of normal migration in North America (Lewis 1939, Gunn 1951). Noted primarily in spring, reorientation flights also occur in varying intensity in the fall in the Atlantic maritime provinces of Canada (Richardson 1982, McLaren *et al.* 2000), at Cape May, New Jersey (Weidner *et al.* 1992, Van Doren *et al.* 2015), and in Fennoscandia (Alerstam 1978, Åkesson 1999). Reorientation flights have seldom been studied in the Great Lakes region and have only been documented there in the spring (Lewis 1939, Gunn 1951). Lewis (1939) made perhaps the earliest observations about reorientation flights. He made the observation that species which were common during spring reorientation flights in the Pelee region seem to become increasingly uncommon or absent in days following intense reorientation flights. Gunn (1951) conducted an observational study and reported that reorientation flights occurred between one and four hours after sunrise, were most intense in May and were mainly comprised of blackbirds (Icteridae), wood warblers (Parulidae) and pipits (Motacillidae).

This paper describes the species composition and abundances associated with reorientation flights in the Pelee region of southwestern Ontario. We conducted daily visual observations to identify and count landbird species engaged in spring reorientation flights and estimate their abundance at Point Pelee National Park and Fish Point Provincial Nature Reserve on Pelee Island (Figure 1). Our study had three main objectives. First, we wanted to document the composition and abundance of species that participated in spring reorientation flights and determine their relative abundances. Second, because of population declines

Figure 1. The Pelee region, showing the locations of both study sites (Fish Point Provincial Nature Reserve and Point Pelee National Park).

noted among Neotropical species (Sauer *et al.* 2014), we wanted to know if there were significant differences in composition and abundance of Neotropical-wintering versus temperate-wintering migrant species. Finally, we wanted to compare differences in composition and abundance of species between the mainland and island study sites.

Methods

Data Collection

We developed a standardized fixed point survey, similar to that employed by the Cape May Bird Observatory's 'Morning Flight' program (New Jersey Audubon 2014), and to the Thunder Cape Bird Observatory's migration monitoring protocol (Wojnowski *et al.* 2010). Daily

observations were conducted by two trained observers between 26 April and 20 May, 2010-2012 at the southern tip of Fish Point Provincial Nature Reserve (41.4° N, 82.4° W) on Pelee Island and in 2012 at the southern tip of Point Pelee National Park (41.5° N, 82.3° W). The timing of observations (late April to May) corresponded with peak spring abundances of migrating landbirds.

Surveys were conducted during the first three hours following local sunrise at both locations. Birds flying in a persistent southerly direction out of sight over Lake Erie were recorded as participating in reorientation flights. Identification and counting occurred while birds were in flight. Using binoculars, we identified birds to species whenever possible; otherwise birds were assigned an identification as close to species level as possible (e.g., blackbird species). Where necessary and possible, some birds were photographed to aid in identification; however, identification was greatly aided by call notes, as well as by birds landing before continuing south. Only landbirds were counted, as these species have been shown to commonly participate in reorientation flights (Lewis 1939, Gunn 1951). One family (swallows) was excluded, as foraging extends over large areas (Kerlinger 1995, Faaborg 2002), making it difficult to differentiate between foraging birds and those engaging in reorientation flights and to accurately record numbers.

Data Analysis

Species were identified as Neotropical-wintering or temperate-wintering migrants based on Sibley (2000) and Dunn and Alderfer (2011). We compared abundance and species composition between the two study sites and among years at Fish Point. Differences in daily counts were tested for significance using a Wilcoxon rank sum test (Crawley 2013).

Figure 2. A male Baltimore Oriole engaged in a reorientation flight; this species is one of the most conspicuous participants to spring reorientation flights (n = 2783). *Photo: Brandon R. Holden. May 2011, Fish Point Provincial Nature Reserve.*

Figure 3. Red-headed Woodpeckers were observed infrequently during spring reorientation flights (n = 44). *Photo: Brandon R. Holden. May 2011, Fish Point Provincial Nature Reserve.*

Results

The number of days of observation in 2010, 2011 and 2012 at Fish Point was 24, 24, 25 respectively, and 24 in 2012 at Point Pelee. Eighty species, totalling 61,677 individuals, were recorded participating in spring reorientation flights. Of these individuals, 38,337 were identified to species and 23,340 were identified to family level only. During our three hour early morning observation periods, very few birds were observed flying to the north, presumably because most northbound spring migrants engage in nocturnal migration, whereas reorienting birds fly south diurnally.

Blackbirds (9 species) and wood warblers (27 species) were the most common participants (n = 42,686 and 10,842, respectively) (Table 1; Figure 2), accounting for 87% of all reorienting migrants. Woodpeckers (Figure 3) and pipits were comparatively scarce, with just 58 and 136 individuals noted (0.09 and 0.22% of all observed migrants, respectively). The remaining species and numbers are listed in Table 1. Thrushes (*Catharus* spp.) were absent in all surveys, while tyrant flycatchers (Figure 4), vireos and sparrows were observed in relatively low numbers. These results were surprising based on the number of observations of the species at these locations (K. Burrell pers. obs.).

Neotropical wintering migrants species (n = 42) represented just over half of all species (n = 80) participating. However, individuals of temperate-wintering migrant species outnumbered individuals of Neotropical species almost 4:1, largely as a result of the high number of blackbirds. There was a difference in individuals of the two groups between study sites; at Fish Point, Neotropical wintering migrant species comprised approximately 12.6% (2011 and 2012) and 9% (2010) of the tally of birds observed reorienting per year, compared to only 7.2% of the total at Point Pelee in 2012. Certain Neotropical wintering species also engaged in high abundance during reorientation flights, including Nashville (n = 831) and Yellow warblers (n = 581), as well as Indigo Bunting (n = 788), all of which are common breeding species in Ontario (Table 1; Cadman *et al.* 2007).

The number of reorienting birds varied across study sites and years (Table 1). The highest annual total was recorded at Fish Point in 2011 (n = 20,828) and the lowest annual total count was in 2012 at Fish Point (n = 10,768). The mean daily count did not vary significantly between the two study sites in 2012; at Fish Point it was 675 and at Point Pelee it was 517 (Wilcoxon rank sum test, P= 0.790). While there was not a substantial amount of variation between study sites, there was considerable variation among the mean daily count among the three study years at Fish Point, where the mean daily count was 736 in 2010, 906 in 2011, and 431 in 2012. There was a significant difference in pairs of study years at Fish Point, with 2010 and 2012, and 2011 and 2012 being significantly different (Wilcoxon rank sum test, P= 0.001); 2010 and 2011 were not significantly different, P= 0.776).

Figure 4. Eastern Kingbirds were noted to participate in spring reorientation flights (n = 282).
Photo: Brandon R. Holden, May 2011, Fish Point Provincial Nature Reserve.

Figure 5. Scarlet Tanagers were observed to participate in spring reorientation flights less commonly than previously thought (n = 111). *Photo: Brandon R. Holden. May 2012. Point Pelee National Park.*

Table 1. Total number of observed reorientation migrants throughout the study (2010-2012). Species are in taxonomic order following American Ornithologist Union (1998). Totals are delineated by species, study site (Fish Point, Pelee Island, ON; and Point Pelee National Park, ON) and year; [1] denotes a species at risk; [2] denotes a vagrant bird species; and * denotes a Neotropical migrant.

Bird families with more than one representative have been identified by their family name and subtotals provided, e.g. Columbidae. Bird families with only a single representative are separated with a blank space below their names, e.g. Ruby-throated Hummingbird.

Common name	Latin name	2010 Fish Point Total	2011 Fish Point Total	2012 Fish Point Total	2012 Point Pelee Total	Total Individuals
Rock Pigeon	*Columba livia*	0	0	0	1	1
Mourning Dove	*Zenaida macroura*	7	9	4	26	46
Columbidae						47
Ruby-throated Hummingbird*	*Archilochus colubris*	61	35	20	16	132
Red-headed Woodpecker[1]	*Melanerpes erythrocephalus*	17	11	7	9	44
Red-bellied Woodpecker	*Melanerpes carolinus*	3	0	6	0	9
Northern Flicker	*Colaptes auratus*	2	1	0	2	5
Picidae						58
Eastern Wood-Pewee*	*Contopus virens*	1	1	2	0	4
Least Flycatcher*	*Empidonax minimus*	0	1	0	0	1
Eastern Phoebe	*Sayornis phoebe*	2	0	0	1	3
Great Crested Flycatcher*	*Myiarchus crinitus*	0	4	4	0	8
Eastern Kingbird*	*Tyrannus tyrannus*	107	156	13	6	282
Flycatcher spp.	*Tyrannidae* spp.	2	0	0	0	2

Common name	Latin name	2010 Fish Point Total	2011 Fish Point Total	2012 Fish Point Total	2012 Point Pelee Total	Total Individuals
Tyrannidae						300
Yellow-throated Vireo*	*Vireo flavifrons*	1	5	1	0	7
Blue-headed Vireo	*Vireo solitarius*	0	8	0	0	8
Warbling Vireo*	*Vireo gilvus*	20	21	24	3	68
Philadelphia Vireo*	*Vireo philadelphicus*	0	9	2	0	11
Red-eyed Vireo*	*Vireo olivaceus*	2	16	0	0	18
Vireo spp.	*Vireo* spp.	22	28	0	4	54
Vireonidae						166
Blue Jay	*Cyanocitta cristata*	349	220	101	439	1109
American Crow	*Corvus brachyrhynchos*	2	0	0	0	2
Crow spp.	*Corvus* spp.	0	0	0	2	2
Corvidae						1113
Horned Lark	*Eremophila alpestris*	0	4	1	0	5
Blue-gray Gnatcatcher	*Polioptila caerulea*	31	8	10	36	85
Ruby-crowned Kinglet	*Regulus calendula*	0	5	0	0	5
Eastern Bluebird	*Sialis sialis*	0	3	2	0	5
American Robin	*Turdus migratorius*	147	151	52	215	565
Turdidae						570
Gray Catbird	*Dumetella carolinensis*	0	0	1	0	1
European Starling	*Sturnus vulgaris*	502	362	238	581	1683
American Pipit	*Anthus rubescens*	83	11	16	26	136
Cedar Waxwing	*Bombycilla cedrorum*	33	116	128	482	759
Ovenbird*	*Seiurus aurocapillus*	0	2	0	0	2
Northern Waterthrush*	*Parkesia noveboracensis*	0	0	1	0	1
Golden-winged Warbler[1]*	*Vermivora chrysoptera*	0	0	1	0	1
Blue-winged Warbler*	*Vermivora cyanoptera*	0	1	4	1	6
Black-and-white Warbler*	*Mniotilta varia*	0	25	0	0	25
Prothonotary Warbler[1]*	*Protonotaria citrea*	1	1	1	1	4

Common name	Latin name	2010 Fish Point Total	2011 Fish Point Total	2012 Fish Point Total	2012 Point Pelee Total	Total Individuals
Tennessee Warbler*	*Oreothlypis peregrina*	1	11	6	0	18
Orange-crowned Warbler*	*Oreothlypis celata*	0	2	1	0	3
Nashville Warbler*	*Oreothlypis ruficapilla*	58	626	119	28	831
Hooded Warbler[1]*	*Setophaga citrina*	0	1	0	0	1
American Redstart*	*Setophaga ruticilla*	0	53	3	0	56
Kirtland's Warbler[1 2]*	*Setophaga kirtlandii*	0	1	0	0	1
Cape May Warbler*	*Setophaga tigrina*	3	11	6	0	20
Northern Parula*	*Setophaga americana*	0	28	0	0	28
Magnolia Warbler*	*Setophaga magnolia*	0	286	1	2	289
Bay-breasted Warbler*	*Setophaga castanea*	0	32	0	0	32
Blackburnian Warbler*	*Setophaga fusca*	3	68	3	2	76
Yellow Warbler*	*Setophaga petechia*	153	129	166	133	581
Chestnut-sided Warbler*	*Setophaga pensylvanica*	2	136	1	0	139
Blackpoll Warbler*	*Setophaga striata*	0	8	0	0	8
Black-throated Blue Warbler*	*Setophaga caerulescens*	0	33	0	0	33
Palm Warbler	*Setophaga palmarum*	11	268	56	16	351
Pine Warbler	*Setophaga pinus*	0	1	3	1	5
Yellow-rumped Warbler	*Setophaga coronata*	236	404	1618	19	2277
Black-throated Green Warbler*	*Setophaga virens*	11	44	11	0	66
Canada Warbler[1]*	*Cardellina canadensis*	0	6	0	0	6
Wilson's Warbler*	*Cardellina pusilla*	0	7	0	0	7
Warbler spp.	*Parulidae* spp.	148	4277	1378	172	5975
Parulidae						10842
Chipping Sparrow	*Spizella passerina*	40	3	19	1	63
Clay-colored Sparrow	*Spizella pallida*	0	1	0	0	1
Field Sparrow	*Spizella pusilla*	1	2	1	0	4
Lark Sparrow[2]	*Chondestes grammacus*	1	0	0	0	1
Savannah Sparrow	*Passerculus sandwichensis*	0	5	0	0	5
Sparrow spp.	*Emberizidae* spp.	47	12	91	2	152
Emberizidae						226
Summer Tanager[2]*	*Piranga rubra*	1	2	0	0	3
Scarlet Tanager*	*Piranga olivacea*	10	101	0	0	111
Northern Cardinal	*Cardinalis cardinalis*	0	0	1	8	9

Common name	Latin name	2010 Fish Point Total	2011 Fish Point Total	2012 Fish Point Total	2012 Point Pelee Total	Total Individuals
Rose-breasted Grosbeak*	*Pheuticus ludovicianus*	1	24	13	5	43
Blue Grosbeak[2]*	*Passerina caerulea*	0	0	0	1	1
Indigo Bunting*	*Passerina cyanea*	255	188	228	117	788
Dickcissel[2]*	*Spiza americana*	1	4	1	0	6
Cardinalidae						961
Bobolink[1]*	*Dolichonyx oryzivorus*	42	126	33	40	241
Red-winged Blackbird	*Agelaius phoeniceus*	2553	2498	3584	6398	15033
Eastern Meadowlark[1]	*Sturnella magna*	1	1	0	0	2
Yellow-headed Blackbird[2]	*Xanthocephalus xanthocephalus*	0	0	0	1	1
Rusty Blackbird[1]	*Euphagus carolinus*	2	3	0	8	13
Common Grackle	*Quiscalus quiscula*	949	1400	1574	2288	6211
Brown-headed Cowbird	*Molothrus ater*	388	831	287	143	1649
Orchard Oriole*	*Icterus spurious*	58	24	116	68	266
Baltimore Oriole*	*Icterus galbula*	1014	634	644	491	2783
Meadowlark spp.	*Sturnella* spp.	0	0	0	1	1
Blackbird spp.	*Icteridae* spp.	9718	6553	0	215	16486
Icteridae						42686
House Finch	*Haemorhous mexicanus*	0	12	5	0	17
Purple Finch	*Haemorhous purpureus*	0	1	0	0	1
Pine Siskin	*Spinus pinus*	0	21	0	0	21
American Goldfinch	*Spinus tristis*	442	188	160	401	1191
Fringillidae						1230
House Sparrow	*Passer domesticus*	2	2	0	0	4
Small Bird spp.	*Passeriformes* spp.	122	546	0	0	668
Neotropical (N=42 species)		1614	2614	1359	888	6475
Temperate (N=38 species)		16055	18214	9409	11524	55202
Total		**17669**	**20828**	**10768**	**12412**	**61677**

Discussion

While species richness was high, several species and families were conspicuously absent from reorientation flights. *Catharus* thrushes were completely absent, despite being relatively abundant migrants at Fish Point and Point Pelee during all study years (K. Burrell, pers. obs.). Weidner *et al.* (1992) also found that *Catharus* thrushes rarely participated in diurnal reorientation flights, accounting for 0.01% of all identified Neotropical migrants (among a sample size of 24,378). *Catharus* thrushes are largely nocturnal migrants (Mack and Yong 2000, Lowther *et al.* 2001, Rimmer *et al.* 2001), and our results confirm they essentially do not participate in diurnal reorientation flights.

Several other species were also observed in lower numbers than expected based on the senior author's previous experience with spring migration and reorientation flights in the Pelee region (K. Burrell, pers. obs.). Fewer than expected Rose-breasted Grosbeaks (*Pheucticus ludovicianus*; n = 43), Scarlet Tanagers (*Piranga olivacea*; n = 111) (Figure 5), vireos (n = 166), sparrows (n = 226), and tyrant flycatchers (n = 300) were noted. Similar to *Catharus* thrushes, these species and families are all noted to be primarily nocturnal migrants (Lanyon 1997, Middleton 1998, Mowbray 1999, Cimprich *et al.* 2000, Wyatt and Francis 2002) and common in Ontario (Cadman *et al.* 2007). It is possible that larger landbird species which flock, such as blackbirds, may be better adapted for diurnal migration and in particular diurnal spring reorientation flights than other birds. Birds that flock are generally better adapted for identifying predators and alerting other birds to their presence (Thompson *et al.* 1974, Lazarus 1979, Cresswell 1994).

Involvement in spring reorientation flights through the Pelee region of families and species from different wintering areas varied. Although we observed more individuals of temperate-wintering species than Neotropical-wintering species, number of species was similar between the two groups (Table 1). Wood warblers and cardinals and allies were the most abundant Neotropical-wintering migrants during spring reorientation flights, while blackbirds were the most abundant temperate-wintering migrants. Based on their flight ecology, nocturnal migrants, such as wood warblers, are expected to be less prone to engage in diurnal flight events in comparison to diurnal migrants, such as blackbirds (Van Doren *et al.* 2015). Our results confirmed this, as we found that the highest number of reorienting birds was blackbirds. However, wood warblers still accounted for 17.5% of all observed migrants (n = 10,842); supporting the results of Wiedner *et al.* (1992) that wood warblers engage frequently in this migration phenomenon, despite the general tendency of nocturnal migrants to be less prone to engaging in reorientation.

Distinct differences were noted between Fish Point and Point Pelee during surveys in 2012. Temperate-wintering migrants outnumbered Neotropical-wintering migrants by a substantial margin at Point Pelee, while the opposite was true at Fish Point. Additionally, as Point Pelee has a larger amount of immediately available vegetative cover in comparison to Fish Point and Pelee Island, our results suggest

that increased vegetative land cover may result in increased number of birds in the study site, thus increasing density among migrants and increasing the likelihood for increases in the number of migrants to be counted. In particular, the larger amount of wetlands at Point Pelee may help account for the relatively high abundance of blackbirds. Water crossing is also a difference that is likely to affect responses between study sites. Point Pelee is on the Ontario mainland 45km from the US mainland while Fish Point is on Pelee Island, 21km and 24km from the US and Canadian mainland shorelines, respectively.

While spring reorientation flights are a regularly observed phenomenon, the implications and repercussions of these flights are not clearly understood. It is possible that birds engaging in this form of flight do so to take advantage of propitious weather to the south because of inclement weather. Impacts associated with migration delays may have negative impacts on the life-cycles of birds most readily seen through delays reaching suitable territories and/or engaging in breeding opportunities. Monitoring programs (e.g., the Canadian Migration Monitoring Network) and short-term studies such as ours allow researchers and conservationists the ability to monitor migratory bird populations unobtrusively. The study of spring reorientation flights warrants more research to determine their relationship with weather events, potential differences in life-cycle impacts of migration delays among long- and short-distance migrant groups and to determine how far reorienting birds travel in the opposing direction before resuming normal migration orientation.

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Kenneth G.D. Burrell
Natural Resource Solutions Inc.
225 Labrador Drive,
Waterloo, Ontario N2K 4M8
E-mail: kenneth.gd.burrell@gmail.com

Stephen D. Murphy and Bradley C. Fedy
Dept. of Env. and Resource Studies,
University of Waterloo,
200 University Avenue West
Waterloo, Ontario N2L 3G1