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Fall Movement of Black-capped Chickadees Analyzed Through Banding Re-encounters

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INTRODUCTION

Studies of the Black-capped Chickadee (*Parus atricapillus*) have been conflicting in their acknowledgment of and explanation for movement during fall. Banding re-encounters provide fragmented but useful data to analyze the timing, duration, direction and extent of fall movement of this species.

By late July or early August, young chickadees have finished post-breeding dispersal which consists of an abrupt initiation of movement in all compass directions after the fledglings have spent about three weeks with their parents. Studies by Weise and Meyer (1979) led them to believe that the young were developing site tenacity to the places where they would subsequently breed. Their studies indicated that perhaps five to nine percent of all juveniles undergo permanent winter or spring dispersal movements but that between 1 November and 1 March chickadees are site-tenacious. Studies by Brittingham and Temple (1988) in Wisconsin indicated that permanent winter or spring dispersal movements rarely occur. Their studies and that by Desrochers et al. (1988) classified birds as dead if they were not present during winter on territories occupied before 1 November.

Black-capped Chickadees are considered by most ornithologists to be an irruptive species, i.e., a species which may show mass movement without periodicity (Pettingill 1970). Studies by Wallace (1941) in Massachusetts, Butts (1931) in New York, Elder and Zimmerman (1983) in Missouri, Weise and Meyer (1979) in Wisconsin, Lawrence (1958) in central Ontario and Yunick (1982) in New York reported fall and winter influxes of chickadees in their study areas, but the extent and timing showed wide geographic variation.

Whether movement is brought on by over-population, a reduction in food supply, or the pressure of dominant birds over subordinates, there is clear evidence of irruptions of Black-capped Chickadees during autumn. Bagg (1969)

summarized the chickadee irruptive years in the United States and Canada from 1951 to 1968 and subsequent irruptive years were identified in *American Birds* (DeBenedictis 1976, 1978, 1982, 1984, 1986 and Hall 1981). Irruptive years vary in intensity--from 1985 where the phenomenon was noted only in western Ontario and western Pennsylvania (DeBenedictis 1986) to the massive movement which occurred in 1961 (Bull 1974 and Beardslee and Mitchell 1965).

In speculating about the specifics of fall chickadee movement, Ralph (1981) indicated that, contrary to Blue Jays (*Cyanocitta cristata*) where the same percent of hatching year (HY) birds migrate as after hatching year (AHY) (Wenger 1975), chickadee populations frequently irrupt and it is the HY birds that move. Barry (1970) and Leberman and Clench (1975) have suggested that the age classes of most species follow different routes--adults inland, HY birds along the coast. Ralph (1981) believed that chickadees probably follow a coastal route through the northeast.

METHODS

I analyzed nearly 15,000 Black-capped Chickadee banding re-encounters recorded at the Bird Banding Laboratory in Laurel, Maryland, between 1922 and 1988. The only records used in this paper involved birds moving out of the 10-minute banding block and re-encountered during the same fall season. Although there were additional records involving re-encounters during subsequent seasons and/or years, I felt that same season-same year re-encounters provided the most accurate picture of chickadee movement. I defined fall as any time between 1 August, when post-breeding dispersal should have been completed, and 12 January. I extended the time definition of fall to 12 January because analysis of banding re-encounters has shown that no significant movement of chickadees takes place in December and early January and

spring movement is initiated after 12 January, more often after 1 March (Brooks 1987, 1989). Only one record exists of chickadees both banded and re-encountered out of the banding block during the period between 1 December and 12 January.

There were 83 chickadees which met the criteria for analysis. These 83 re-encounters were analyzed for direction, duration, distance, geographic location and age of individuals. Movement was analyzed by irruptive or non-irruptive year, by short and long-distance flight, and by coastal and inland/northeastern routes. It would have been interesting to analyze movement according to sex but none of the birds in this study had been sexed as per the instructions of the Bird Banding Lab (U.S. Fish and Wildlife Service 1980 and Wood and Beimbom 1981).

RESULTS

Of the 83 re-encounters analyzed in this paper, none had been banded as Locals (nestlings or very recent fledglings).

Short-distance (under 20 km but beyond the limits of the 10-minute banding block) fall movement of Black-capped Chickadees involved 27 individuals (10 HY, 3 AHY, 14 unknown age) with the time between banding (or last repeat at the banding site) and re-encounters averaging 47 days. Figure 1 shows the compass directions taken by these individuals. Ten of these birds moved in non-irruptive years (average time elapsed: 37 days) and 17 moved in irruptive years (average time elapsed: 57 days).

There were 56 long-distance (over 20 km) fall re-encounters of banded chickadees (24 HY, 8 AHY, 24 U). The raw data on these 56 birds are shown in Table 1. Distances range from 23 km to 1051 km and averaged 188 km. Time elapsed ranged from six days (43 km) to 114 days (702 km) and averaged 40 days. Fastest movement was 1051 km in 42 days while slowest rate was 23 km in 23 days. Average rate of movement was 4 km/day. Figure 2 shows the compass directions taken by these 56 birds.

Of these 56 long distance re-encounters, 18 occurred in non-irruptive years. The age breakdown of this group was 13 HY, 1 AHY, 4 U. Distances ranged from 23 km to 283 km and averaged 96 km. Time elapsed ranged from eight days (47 km) to 82 days (216 km) and averaged 38 days. Fastest rate of movement was 47 km in eight days; slowest rate was 23 km in 23 days. Average distance per day for birds moving in non-irruptive years was 2.6 km/day.

There were 38 long distance fall re-encounters of banded chickadees (11 HY, 7 AHY, 20 U) in years identified as irruptive years. Distances ranged from 27 to 1051 km and averaged 234 km. Time elapsed ranged from six days (43 km) to 114 days (702 km) and averaged 40 days. Fastest rate of movement was 1051 km in 42 days; slowest rate was 27 km in 30 days. Average rate of movement was 5.9 km/day by this group.

Routes taken by chickadees banded and re-encountered in Minnesota, Wisconsin, and Michigan are shown in Figure 3. Routes taken by HY chickadees in the northeast are shown in Figure 4 and routes taken by AHY chickadees in the same region are shown in Figure 5. Of 22 HY chickadees banded in the northeast, 16 took coastal routes and six took inland routes. Of seven AHY chickadees banded in the same region, four took coastal routes and three took inland routes.

DISCUSSION

Analysis of the 83 banding re-encounters provides evidence that some chickadees migrate during fall and that some move even in non-irruptive years (thus suggesting that immediate population pressure may not trigger movement in some cases).

There were twice as many fall re-encounters of chickadees in irruptive years as in non-irruptive years, both in long-distance and short-distance movement. Of those birds moving greater than 20 km, the average distance moved was nearly 2½ times as far in irruptive years as in non-irruptive years and the average distance moved per day was 2½ times greater.

The most common compass direction of chickadees moving short distances was westerly in both irruptive and non-irruptive years while the most common direction was southwesterly in both irruptive and non-irruptive year long distance re-encounters. However, direction of movement generalizations about birds banded in Maine and Massachusetts are somewhat misleading since these birds cannot possibly disperse long distances east.

Because of the large number of chickadees aged "unknown," the age significance in long distance re-encounters is less clear, but there were significantly more AHY birds moving in irruptive years. Overall, three times as many HY birds as AHY were represented in the re-encounter records. Still, since 11 of 44 aged re-encountered chickadees were AHY birds, the assumption can no longer be made that only HY chickadees migrate.

These re-encounter records show movement between 1 November and 7 January in five of the long distance migrants and four of the short distance birds, causing skepticism of studies which based survival rates of chickadees on site tenacity between 1 November and 1 March.

The comparison of the routes taken in the northeast by HY and AHY birds shows that over 2½ times as many HY birds took a coastal rather than inland route, while the numbers were about the same in AHY birds' routes. Still, since six HY birds took inland routes and four AHY birds took coastal routes, generalizations about age classes of chickadees taking inland or coastal routes are not supported by banding re-encounter data.

ACKNOWLEDGMENTS

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Figure 1. Direction of movement of 27 Black-capped Chickadees Involved in short distance (under 20 km) Re-encounters during fall.

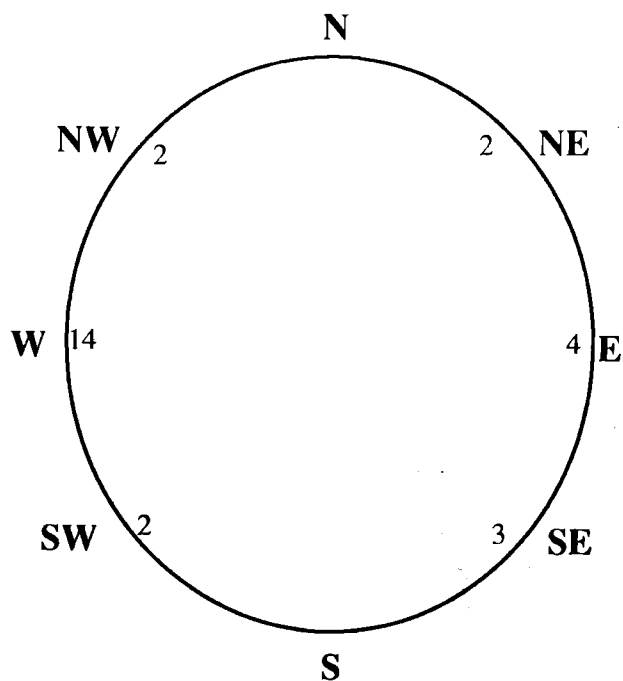
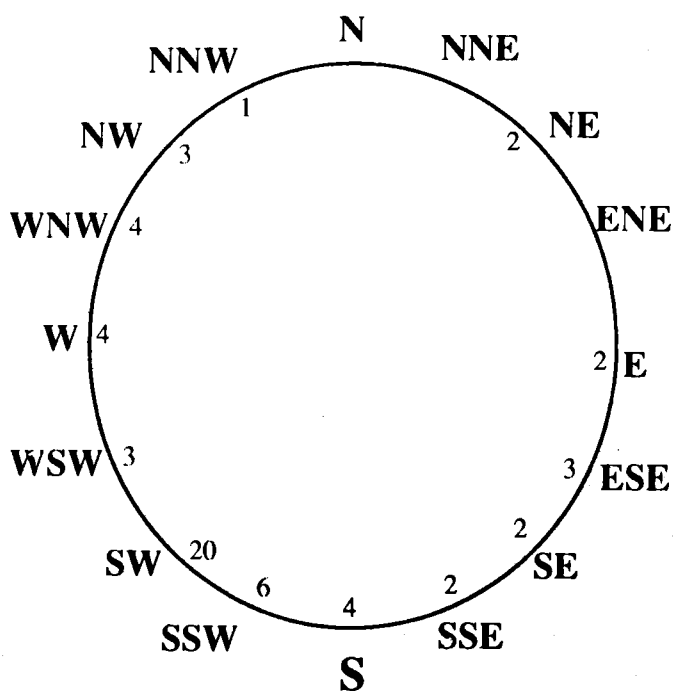


Figure 2. Direction of movement of 56 Black-capped Chickadees Involved in long distance Re-encounters during fall.



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Table 1. Raw data on 56 long distance Black-capped Chickadee banding re-encounters.							
Band No. Age	Banding Location	Banding Date	Re-enc. Location	Re-enc. Date	Distance & Direction	Number of Days	
1010-98008	Maine	09-15 <u>-61*</u>	Pennsylvania	11-05-61	603 kn SW	51 days	
U	435-0692		401-0744				
1010-99245	Maine	10-02 <u>-61</u>	Maryland	11-26-61	702 km SW	55 days	
U	435-0700		393-0760				
1050-38030	Maine	09-20 <u>-63</u>	Delaware	01-12-64	702 km SW	114 days	
U	435-0692		394-0753				
1050-73678	Maine	09-23 <u>-65</u>	Vermont	11-25-65	356 km W	63 days	
U	442-0675		441-0722				
1260-07107	Maine	10-29 <u>-74</u>	Maine	11-20-74	80 km SW	22 days	
U	441-0695		434-0701				
1460-99048	Maine	09-24 <u>-77</u>	Connecticut	11-28-77	319 km SW	65 days	
H Y	435-0695		413-0721				
1440-68918	Maine	09-30 <u>-80</u>	Pennsylvania	11-11-80	1051 km SW	42 days	
H Y	443-0681		400-0791				
1550-93214	Maine	09-30 -82	Maine	11-25-82	87 km WNW	36 days	
H Y	435-0692		440-0702				
0050-81651	Massachusetts	10-07 -32	New Jersey	11-24-32	283 km SW	48 days	
U	422-0723		404-0750				
0410-23551	Massachusetts	08-10 -41	Connecticut	10-07-41	130 km SW	58 days	
U	423-0714		414-0723				
0270-26113	Massachusetts	12-03 <u>-57</u>	Massachusetts	01-07-58	92 km SE	35 days	
U	423-0714		415-0705				
1160-82759	Massachusetts	09-24 <u>-68</u>	Massachusetts	12-24-68	134 km WSW	91 days	
H Y	423-0714		422-0731				
1170-54385	Massachusetts	09-28 <u>-68</u>	Massachusetts	10-28-68	27 km W	30 days	
H Y	415-0703		415-0705				
1180-99426	Massachusetts	10-14 <u>-68</u>	Massachusetts	11-13-68	106 km WNW	30 days	
H Y	415-0703		421-0705				
1210-42911	Massachusetts	09-24 <u>-69</u>	New York	12-7-69	323 km SW	82 days**	
H Y	415-0703		404-0734				
1210-43041	Massachusetts	09-27 <u>-69</u>	Connecticut	11-7-69	161 km SW	49 days**	
H Y	415-0703		411-0721				
1240-69627	Massachusetts	09-30 -70	Massachusetts	10-20-70	87 km NW	21 days	
H Y	415-0703		422-0712				
1270-26440	Massachusetts	09-30 -71	Massachusetts	10-29-71	47 km NW	29 days	
H Y	415-0703		421-0705				
1270-42234	Massachusetts	11-03 -71	Massachusetts	11-14-71	37 km SE	11 days	
H Y	415-0703		414-0702				
1270-41284	Massachusetts	10-29 -71	Massachusetts	11-12-71	27 km W	14 days	
A H Y	415-0703		415-0705				
1270-39419	Massachusetts	10-20 -71	Massachusetts	12-11-71	51 km SW	52 days	
H Y	415-0703		413-0705				
1270-40306	Massachusetts	10-21 -71	Massachusetts	10-29-71	47 km S	8 days	
H Y	415-0703		413-0704				

Table 1. Continued							
Band No. Age	Banding Location	Banding Date	Re-enc. Location	Re-enc. Date	Distance & Direction	Number of Days	
1330-23098	Massachusetts	09-30 -73	Massachusetts	11-24-73	58 km NW	55 days	
HY	415-0703		421-0705				
1350-79776	Massachusetts	09-28 -75	Massachusetts	10-14-75	51 km ESE	16 days	
AHY	415-0703		414-0695				
1330-80515	Massachusetts	09-17 -75	Massachusetts	10-05-75	47 km W	18 days	
U	414-0695		415-0703				
1350-79752	Massachusetts	09-28 -75	Massachusetts	10-06-75	50 km SSE	8 days	
HY	415-0703		413-0702				
1420-38231	Massachusetts	10-15 -76	Massachusetts	11-03-76	43 km NE	19 days	
HY	413-0705		415-0703				
1550-65878	Massachusetts	10-19 -80	Rhode Island	10-29-80	77 km SW	10 days	
HY	415-0703		412-0711				
1550-66378	Massachusetts	10-27 -80	Massachusetts	12-18-80	55 km ESE	52 days	
AHY	415-0703		414-0700				
1630-43660	Massachusetts	10-21 -83	Massachusetts	10-27-83	60 km WNW	6 days	
AHY	415-0703		421-0711				
1250-81548	Rhode Island	10-03 -71**	Massachusetts	10-30-71	93 km NE	27 days	
HY	412-0713		415-0703				
0270-39608	Connecticut	10-11 -57	Pennsylvania	11-10-57	280 km SW	30 days	
AHY	414-0721		401-0744				
0330-97618	New York	09-12 -61	New York	11-19-61	418 km WNW	68 days	
AHY	415-0740		425-0785				
0330-17318	New York	10-06 -61	Massachusetts	12-02-61	354 km ESE	57 days	
AHY	430-0762		421-0723				
1050-51788	New York	09-25 -65	New York	10-09-65	80 km E	14 days	
U	404-0735		404-0725				
1150-72335	New York	09-23 -68	Pennsylvania	11-04-68	512 km WSW	42 days	
HY	414-0742		404-0801				
1180-44828	New York	10-26 -69	Pennsylvania	11-13-69	335 km SW	18 days	
U	424-0770		402-0794				
1360-77891	New York	09-27 -75	New York	10-26-75	76 km E	29 days	
U	424-0770		423-0761				
1800-69519	New York	11-01 -87	New York	11-22-87	23 km SW	21 days	
HY	431-0774		431-0775				
1800-68919	New York	11-02 -87	New York	11-25-87	23 km SW	23 days	
HY	431-0774		431-0775				
1060-28917	Pennsylvania	10-26 -63	West Virginia	12-20-63	89 km SSW	55 days	
U	400-0791		393-0795				
0700-46159	Michigan	10-16 -63	Michigan	11-??-63	312 km SW	50 days ***	
U	441-0832		420-0855				
1090-95528	Michigan	10-10 -65	Wisconsin	12-30-65	296 km SSW	81 days	
U	454-0870		431-0882				
0107-49751	Michigan	10-16 -65	Michigan	11-??-65	134 km SSW	30 days ***	
U	441-0832		430-0834				

Table 1. Continued

Band No. Age	Banding Location	Banding Date	Re-enc. Location	Re-enc. Date	Distance & Direction	Number of Days
1210-12264	Michigan	10-07 -70	Michigan	12-10-70	251 km SSW	64 days
U	441-0832		420-0841			
1210-12913	Michigan	10-18 -70	Michigan	01-08-71	216 km SW	82 days
U	441-0832		432-0854			
1250-42435	Michigan	10-14 -71	Michigan	11-20-71	132 km NNW	37 days
U	441-0832		452-0834			
1320-42119	Michigan	09-22 -75	Michigan	10-01-75	154 km SSW	9 days
U	441-0832		435-0835			
1030-66459	Wisconsin	10-06 -63	Wisconsin	11-27-63	72 km SSW	52 days
U	433-0875		430-0882			
1060-86727	Wisconsin	10-28 -63	Wisconsin	11-11-63	61 km S	14 days
U	435-0875		430-0880			
1480-27997	Wisconsin	09-27 -77	Wisconsin	10-22-77	56 km S	25 days
AHY	435-0875		432-0880			
1480-28089	Wisconsin	10-10 -77	Wisconsin	10-30-77	80 km S	20 days
U	435-0875		431-0875			
1290-12351	Minnesota	09-27 -72	Minnesota	10-26-72	169 km WSW	29 days
U	460-0942		453-0963			
1710-86138	Minnesota	09-21 -85	Minnesota	10-25-85	322 km SW	34 days
HY	465-0920		452-0960			
1630-78334	Minnesota	11-07 -85	Minnesota	11-14-85	95 km SW	7 days
U	450-0925		441-0931			
1730-36553	Minnesota	09-07 -86	Minnesota	11-19-86	95 km SSE	73 days
HY	445-0924		440-0922			
* Underlined dates denote years identified as irruptive years.						
** Time estimated.						
*** Banded on 08-15-71 but last repeat on 10-03-71.						

Figure 3. Directions taken by Black-Capped Chickadees banded and re-encountered in Minnesota, Wisconsin and Michigan.

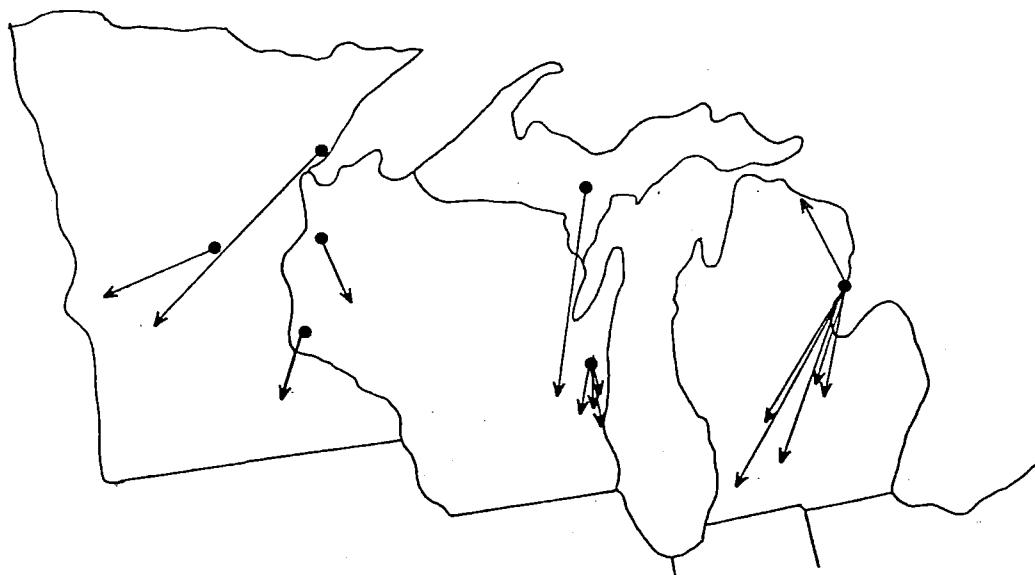


Figure 4. Directions taken by 22 HY Black-capped Chickadees banded and re-encountered during fall in the Northeast.



Figure 5. Directions taken by seven AHY Black-capped Chickadees banded and re-encountered during fall in the Northeast.

