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THE INFLUX OF BLACK-CAPPED CHICKADEES AT LONG POINT, ONTARIO IN THE SPRING OF 1962: A 35-YEAR PERSPECTIVE ON AN UNUSUAL EVENT

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Abstract.—A large influx of Black-capped Chickadees (*Parus atricapillus*) occurred at Long Point, Ontario in the spring of 1962 (Hussell and Stamp 1965). Observations from 1960–1994 indicate that large spring migrations are infrequent at this site, and the 1962 influx was the largest in the 35-yr period. Spring influxes of chickadees were related to irruptions occurring the preceding fall, but not all irruptions were followed by spring migrations. Although the large spring migration in 1962 occurred in an exceptionally warm spring, there is no evidence that the size of spring migrations was consistently related to spring temperature. The 1962 influx is regarded as an unusual event, perhaps triggered by a combination of unusual (but largely unknown) circumstances. A large irruption of Boreal Chickadees (*Parus hudsonicus*) in the autumn of 1972 can also be classified as an unusual event because it was unique in the 35-yr record.

EL INFLUJO DE *PARUS ATRICAPILLUS* EN LONG POINT, ONTARIO, EN LA PRIMAVERA DEL 1962: UNA PERSPECTIVA DE 35 AÑOS EN UN SUCESO INUSUAL

Sinopsis.—Un gran influjo de *Parus atricapillus* ocurrió en Long Point. Ontario, en la primavera del 1962 (Hussell and Stamp 1965). Observaciones entre 1960 y 1964 indican que grandes migraciones primaverales son infrecuentes en esta localidad y que el influjo del 1962 fué el mayor de estos 35 años. Influjos de *Parus* se relacionaron a irrupciones ocurridas el otoño anterior, pero no todas las irrupciones fueron seguidas por migraciones primaverales. Aunque la gran migración primaveral del 1962 ocurrió en una primavera excepcionalmente calurosa falta evidencia de que el tamaño de las migraciones primaverales esté consistentemente afectado por la temperatura primaveral. El influjo del 1962 se concibe como un evento inusual, tal vez producido por una combinación de circunstancias inusuales (pero mayormente desconocidas). Una gran irrupción de *Parus hudsonicus* en el otoño del 1972 puede clasificarse también como un evento inusual porque también fué único en el registro de 35 años.

Although Black-capped Chickadees (*Parus atricapillus*) are normally permanent residents throughout their range, they undergo irregular irruptions, particularly in eastern North America (Smith 1991:308–309). These generally southward movements usually occur in October and November. They vary greatly from year to year both in their geographic extent and in the numbers involved. As is true for many other seed-eating birds, the occurrence of irruptions is correlated with failure of seed crops (Bock and Lepthein 1976) and large irruptions may also be more likely following summers of high reproductive success (Smith 1991:310–312).

Relatively little is known about whether chickadees involved in irruptions return to their area of origin, but there is at least some more or less northward movement in the spring following an irruption (Brooks 1987, Hussell 1991, Stewart 1988).

Following a southward invasion of Black-capped Chickadees extending into and beyond southern Ontario in October 1961, a substantial return migration was observed in the spring of 1962. At Long Point on the north shore of Lake Erie, large numbers of chickadees occurred particularly in the period 10–20 May and 505 were captured and banded by the Long Point Bird Observatory (Hussell and Stamp 1965). Ninety-one recaptures of 81 banded chickadees indicated that many lingered at Long Point for a week or more during their spring migration. We noted that there had been a large invasion of Black-capped Chickadees into southern Ontario in the previous October, and that there was no comparable invasion in the autumn of 1962 or any significant spring movement at Long Point in 1963. We also commented that the start of the heaviest migration in the spring of 1962 coincided with a period of increasingly warm temperatures that developed into an unseasonably warm spell from 13–20 May, registering temperatures as high as 26 C on Long Point and 32 C on the adjacent mainland.

Here I report an additional 32 years of observations that show that spring invasions of chickadees are infrequent events at Long Point. Data on the fall migrations of chickadees at Long Point are included to provide additional perspective on the precursors of spring migrations. Because the 1962 influx occurred with unusually warm weather, it seemed possible that high temperatures either stimulated migratory activity or arrested migration so that large numbers occurred at Long Point. Therefore, I examined the hypothesis that exceptionally large influxes tend to occur in spring seasons that are warmer than normal.

Weatherhead (1986) asked the question "how unusual are unusual events?" He surveyed 380 papers reporting behavioral, evolutionary, and ecological field studies and found that 9.5% recorded at least one event that was perceived as unusual by the authors. Among 73 papers on birds, the proportion reporting unusual events (9.6%) was similar to the average for all taxonomic groups. At the time of the 1962 chickadee invasion, Long Point Bird Observatory was in its third season of observing and recording birds at Long Point. We thought that the spring influx of chickadees that year was remarkable but we had no way of assessing how unusual it was.

Given that autumn irruptions of Black-capped Chickadees are irregular but not infrequent events in Ontario, readers of our account of the 1962 spring influx at Long Point (Hussell and Stamp 1965) might conclude that spring migrations similar to that of 1962 are to be expected at Long Point following autumn irruptions. A primary objective of this paper is to show that such a conclusion is incorrect and that the invasion of chickadees at Long Point in the spring of 1962 was an unusual event.

METHODS

Long Point Bird Observatory maintained observations at the eastern tip of Long Point (42°33′N, 80°03′W) on most days during the spring and fall migration periods from 1960–1994. Starting in 1961, estimates were recorded of the number of individual birds of each species present or passing through a defined area each day, based on numbers counted along a survey route, numbers trapped, and other observations. The estimation procedure and the study site are described in more detail elsewhere (Hussell 1981, Hussell et al. 1992, Hussell and Stamp 1965).

I chose 16 April–4 June (50 d) and 11 October–4 November (30 d) as the spring and fall migration periods of Black-capped Chickadees, based on inspection of the counts in years when large numbers of chickadees occurred at Long Point. I report the mean number of birds recorded per day in each annual spring and fall migration period.

Coverage of the selected migration periods was often incomplete, but most years had records for well over 50% of the days. Daily estimates of numbers of chickadees (and other birds) were missing or sparse in some years and seasons (particularly spring 1965 and 1973 and autumn 1961, 1964, and 1974), but an assessment of the migration in those years can usually be made from numbers captured for banding or other observations. Chickadees were captured mainly in mist nets and Heligoland traps.

Years in which fall irruptions of Black-capped Chickadees occurred in the Great Lakes region were identified by consulting seasonal reports for the years 1960–1993 in *American Birds* (*AB*) and its predecessor *Audubon Field Notes* (*AFN*). I examined reports from the Appalachian region and from all regions adjacent to Lake Erie and Lake Ontario.

Air temperatures were obtained from the National Oceanic and Atmospheric Administration for the weather station at Erie, Pennsylvania (42°05′N, 80°11′W), about 50 km south of Long Point near the south shore of Lake Erie. "Daily temperature" was the difference from normal temperature of the mean of dry bulb temperatures (C) measured at 0700, 1000, and 1300, Eastern Standard Time. Normal temperature was calculated from a sixth power polynomial regression of mean temperature on day for all dates from 1 Jan.–31 Dec. 1961–1994. "Spring temperature" was the mean of "daily temperatures" for 16 April–4 June.

Spearman rank correlations were used to determine whether there were significant relationships between the sizes of spring and fall flights and between the size of spring flights and spring temperature. For these purposes, annual estimates of mean numbers observed per day were considered acceptable if they were based on observations on more than 40% of the days in the selected spring and fall migration periods.

RESULTS

Spring.—Average daily totals of Black-capped Chickadees recorded in spring at Long Point from 1961–1992 ranged from zero in 1975 and 1986 to 59.9 in 1962 (Table 1). In most years, fewer than one chickadee was

TABLE 1. Numbers of Black-capped Chickadees observed and banded at the eastern tip of Long Point, 16 Apr.–4 Jun. 1960–1994.

	Estimated numbers observed[a]		Number banded[a]	
Year	Mean no./d	*n*(d)	Mean no./d	*n*(d)
1960	—	0	1.4	31
1961	0.7	26	0.0+	32
1962	59.9	43	10.1	45
1963	2.7	41	0.0+	43
1964	42.3	22	5.3	23
1965	—	0	0.2	50
1966	6.7	45	0.5	23
1967	0.6	50	0.0	48
1968	0.1	49	0.0	48
1969	1.7	48	0.2	49
1970	10.4	50	1.1	50
1971	0.4	50	0.0+	46
1972	0.0+	49	0.0	33
1973	0.2	5	0.1	19
1974	0.2	31	0.0	2
1975	0.0	44	0.0	44
1976	1.9	48	0.7	45
1977	0.0+	48	0.0	48
1978	0.8	50	0.1	48
1979	0.0+	49	0.0	43
1980	0.1	50	0.0	48
1981	1.2	45	0.1	45
1982	2.2	50	0.4	50
1983	0.6	50	0.1	50
1984	2.3	50	0.4	50
1985	0.0+	50	0.0	50
1986	0.0	19	0.0	9
1987	0.6	44	0.0+	23
1988	0.2	40	0.0	34
1989	0.4	50	0.0+	45
1990	0.1	41	0.0	31
1991	1.0	48	0.2	44
1992	1.3	50	0.1	47
1993	0.1	50	0.0+	48
1994	11.4	50	1.4	48

[a] *n*(d) is number of days on which observations were recorded or banding was attempted. Means are total number observed or banded divided by the appropriate *n*.

recorded per day. An average of 1–3 chickadees/d was seen in 1963, 1969, 1976, 1981, 1982, 1984 and 1992. Moderate influxes (6.7–11.4/d) occurred in 1966, 1970, and 1994. Only in 1964, with 42.3 birds/d, did numbers approach those in 1962. Daily totals were not recorded in 1960, those from 1965 are missing, and many of those recorded in 1973 were lost in a fire. Nevertheless, we know from banding totals that no large migrations of chickadees occurred in 1965 or 1973. In the spring of 1960 however, 44 chickadees were captured in 31 d, a capture rate (1.4/d) that was similar to that of 1994 and exceeded only by those in 1962 and 1964

(Table 1). This indicates that the 1960 flight was probably larger than that of 1970 but smaller than the one in 1964.

Daily totals of 50 or more Black-capped Chickadees were recorded only in the springs of 1962 (13 d), 1964 (9 d), 1970 (4 d), and 1994 (2 d). Maximum daily totals recorded in those years were 400 on 11 May 1962, 150 on 23 May 1964, 200 on 26 Apr. 1970, and 80 on 14 May 1994. In 1962, 1964, and 1994, peak numbers occurred after 10 May. The 1970 flight was earlier, with 2 peak periods: 26–27 April and 9–10 May. The moderate influx of 1966 peaked in late May, with maxima of 30 birds recorded on 26 and 28 May.

Fall.—Coverage of the fall migration period was often less complete than that of spring. From the data in Table 2, we know that large fall flights of Black-capped Chickadees occurred at Long Point in 1965, 1972, 1973, 1980, 1983, and 1993. In other years, irruptions of Chickadees were much smaller; nevertheless noticeable influxes occurred in 1963, 1969, 1981, and 1990. Irruptions in these four years were confirmed by reports in *AFN* or *AB* and in 1990 by data from another site on Long Point ("site 3" in Hussell et al. 1992, located near the base of the point about 28 km west of the eastern tip of the point). However, the 1969 flight was described as being light in southern Ontario, although there was a major irruption in the Appalachian region, south of Lake Erie.

Data from Long Point were inadequate for assessing the size of the fall flights in 1960, 1961, 1964, and 1974. Reports in *AFN* and *AB* indicate that in those years there was a chickadee irruption in southern Ontario only in 1961.

In 1968, 1973, 1975, and 1986 there were discrepancies between the Long Point data and the regional reports in *AFN* and *AB*. In 1968, flights of chickadees were reported in southern Ontario and adjacent states, but it was noted that they appeared to bypass Long Point and the Niagara peninsula. Thus, I classify 1968 as an irruption year regionally, despite the lack of birds at Long Point. On the other hand, in 1973 there was no mention in *AB* of irruptive movements in the immediate vicinity of the lower Great Lakes, although a moderate southward irruption was reported in the Appalachian region. At the eastern tip of the Long Point peninsula, there was a marked influx 12–31 October. On 18 observation days in that period there was an average of 43.3 chickadees/d, with as many as 150, 120, and 100 recorded as the estimated daily totals on 15, 21, and 22 October, respectively. Therefore, I retain 1973 as an irruption year at Long Point. In 1975, the *AB* reports for southern Ontario and adjacent states all speak of a big flight year and large scale movements, but the evidence in Table 2 indicates that this flight also bypassed Long Point. In 1986 a moderate irruption was mentioned in the Ontario report, and there was an increase in numbers at "site 3" near the base of the Long Point peninsula after 28 October, but there was no influx at the eastern tip of the peninsula. This flight was also not reported from adjacent states.

Years that I classified as irruption years in the southern Great Lakes region are indicated by an asterisk in Table 2. This classification differs

TABLE 2. Numbers of Black-capped Chickadees observed and banded at the eastern tip of Long Point, 11 Oct.–9 Nov. 1960–1994.

	Estimated numbers observed[a]		Number banded[a]	
Year[b]	Mean no./d	*n*(d)	Mean no./d	*n*(d)
1960	—	0	0.0	4
1961*	0.0	4	0.0	4
1962	1.9	12	0.3	12
1963*	5.9	17	0.3	27
1964	0.0	1	0.0	10
1965*	71.4	21	6.0	21
1966	0.0	20	0.0	18
1967	0.1	19	0.0	17
1968*	0.8	19	0.1	19
1969*	2.4	18	0.2	19
1970	0.1	21	0.0	8
1971	0.1	21	0.0	16
1972*	52.9	28	12.8	26
1973*	33.9	23	1.6	13
1974	—	0	—	0
1975*	0.5	21	0.1	10
1976	0.1	29	0.0+	26
1977	0.0	19	0.0	15
1978	0.0	20	0.0	16
1979	0.0	25	0.0	24
1980*	50.2	30	20.9	30
1981*	1.7	21	1.6	16
1982	0.1	28	0.0	26
1983*	21.3	28	10.3	25
1984	0.2	30	0.0	29
1985	0.0	30	0.0	28
1986*	0.4	30	0.0	14
1987	0.2	30	0.0	24
1988	0.5	15	0.0	17
1989	0.7	30	0.1	23
1990*	2.0	24	0.3	23
1991	0.5	19	0.0	11
1992	0.0	24	0.0	23
1993*	76.1	28	15.1	24
1994	0.0+	21	0.0	18

[a] See footnote a, Table 1.
[b] An asterisk indicates an irruption year in southern Ontario (see text).

from that of Brooks (1991) because she based her classification on data from the entire range as reported in *AFN* and *AB*, while I based mine on reports from Long Point and the lower Great Lakes regions.

The fall 1972 migration of Black-capped Chickadees was particularly notable because it was accompanied by a large invasion of Boreal Chickadees (*Parus hudsonicus*). Numbers observed averaged 9.6/d (versus 52.9 for Black-capped Chickadees) and 109 were banded (versus 333 Black-capped Chickadees) indicating that the Boreal influx was 18–33% of the size of the Black-capped Chickadee migration. There is only one other

record of a Boreal Chickadee at the eastern tip of Long Point in any season: one found dead on 28 Oct. 1963.

Relationship between spring and fall flights.—The average number of Black-capped Chickadees recorded per day in spring was positively correlated with the average number recorded in the previous fall (Spearman rank correlation $r_s = 0.665$, $n = 27$, $P = 0.0002$). However, when separate correlations were calculated for spring seasons following a fall irruption in the lower Great Lakes region (asterisks in Table 2) and for those not preceded by an irruption, neither correlation was significant (after an irruption $r_s = 0.371$, $n = 12$, $P = 0.236$; after no irruption $r_s = 0.005$, $n = 15$, $P = 0.987$). This indicates that the overall positive correlation depended primarily on the occurrence of larger numbers (median 2.1, range 0.2–42.3 birds/d) in springs following a fall irruption than in other years (median 0.1, range 0.0–1.3 birds/d).

Relationship between size of spring flight and mean spring temperature.—The 1962 influx occurred in an exceptionally warm spring (3.01 C above normal): the average temperature during the migration period was higher only in 1991 (3.97 C above normal). The four largest spring migrations occurred in 1962, 1964, 1970, and 1994. The first three of these years had above average spring temperatures, but in 1994 the mean temperature was 0.54 C below the long-term average. Prior to 1982 there was a tendency for flight size and spring temperature to be correlated when only years following a fall irruption were considered ($r_s = 0.619$, $n = 8$, $P = 0.102$). This relationship completely broke down when data from 1982–1994 were included ($r_s = 0.071$, $n = 13$, $P = 0.817$, for years following an irruption only), mainly because relatively small spring flights occurred in the warm springs of 1982, 1987, and 1991. Moreover for all years with adequate spring migration coverage (>20 days, Table 1) regardless of whether or not there was a preceding irruption, the size of the migration was not correlated with spring temperature ($r_s = 0.114$, $n = 31$, $P = 0.542$).

DISCUSSION

The influx of Black-capped Chickadees at the eastern tip of Long Point in the spring of 1962 was the largest in the 35-yr period 1960–1994. The only other flight of comparable size occurred in 1964, but there were moderate spring influxes in 1966, 1970, and 1994. The sizes of spring flights were related to the occurrence of an irruption in the lower Great Lakes region during the previous fall: large and moderate spring influxes occurred only following irruptions. Although the heavy 1962 migration occurred in an exceptionally warm spring, flights in subsequent years provided no evidence that the numbers of chickadees migrating were related to mean spring temperature, either in springs following a fall irruption or in other years.

The 1962 influx of Black-capped Chickadees was clearly an unusual event, presumably triggered by an unusual combination of factors. The only clear precursor that I have identified is the occurrence of an irrup-

tion of chickadees during the previous fall, although such irruptions have also preceded much smaller spring influxes. The large invasion of Boreal Chickadees recorded in October and November 1972 was also an exceptional event: only one other Boreal Chickadee has been recorded at the tip of Long Point in the 35-yr period.

A curious aspect of the spring influxes of Black-capped Chickadees at Long Point is their uneven distribution in relation to fall irruptions, which apparently continued at about the same frequency throughout the 35-yr period (Tables 1 and 2). Moderate or large spring irruptions followed four of the five fall irruptions in the first decade of the study (1961–1970), but only one of nine in the next 24 years. The spring influx in 1994 followed 23 years (1971–1993) and eight fall irruptions that did not generate a spring flight of comparable size. That some fall irruptions in the Great Lakes region were clearly evident at the tip of Long Point while others went undetected (Table 2) indicates that various unknown factors may influence local fall numbers. Such factors may also influence occurrence of spring influxes at Long Point and contribute to their unpredictability.

Describing the 1962 flight, we commented on the "rather slow" and "somewhat aimless" nature of the chickadee's spring migratory behavior (Hussell and Stamp 1965). Because of the late date of the migration (mainly after 10 May) we suggested that many of the birds involved must have been non-breeders in the 1962 season. Similar conclusions apply to other late spring migrations, particularly the flights of 1964 and 1994. Banding recoveries show relatively short-distance movements in spring (up to 246 km) with most of the longest movements towards the northeastern quadrant and migration occurring in late March and April as well as later (Brooks 1987, Hussell 1989, Stewart 1988). Presence of individuals at Point Pelee and Long Point in successive years both before and after a spring migration (Hussell and Stamp 1965) also raises questions about the nature and function of spring return movements following fall irruptions. Perhaps some birds return or move towards their area of origin, but others either delay their return or do not return at all. Spring return migrations of titmice (mainly Blue Tits, *Parus caeruleus,* and Great Tits, *Parus major*) occur in Britain and western Europe following irruptions (Cramp 1963, Cramp et al. 1960, Perrins 1979). These spring movements, which are in approximately the opposite direction to the autumn flight, tend to be somewhat erratic and occur over extended periods. They involve many fewer birds than the autumn irruptions and there is other evidence that some individuals do not make the return journey but remain to breed in a place remote from their natal area or previous breeding site. Although we lack conclusive evidence, it seems likely that some of the chickadees involved in irruptions may also breed opportunistically in places far from their natal or previous breeding area, but others that do not acquire a suitable territory may wander or attempt a return migration.

In Weatherhead's (1986) investigation of unusual events, the frequency

of events reported as unusual by authors of 380 field studies increased with the length of the study up to six years but not to the level expected from their occurrence in 1- and 2-yr studies. In longer studies (up to 15 yr) unusual events were even less common and were reported no more frequently than in 2-yr studies. Weatherhead's explanation of this seeming paradox was that extreme events are encountered at the same rate in long and short studies, but researchers in long investigations may less often consider them important enough to designate them as unusual. The opposite is true in this study: the degree to which the 1962 spring influx of chickadees at Long Point was unusual has become increasingly apparent as the length of the study increased.

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