

**A REVIEW OF RECENT IRRUPTIONS OF THE  
BLACK-BACKED WOODPECKER AND  
THREE-TOED WOODPECKER IN  
EASTERN NORTH AMERICA**

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The Black-backed (*Picoides arcticus*) and Three-toed (*P. tridactylus*) woodpeckers are sedentary species that irrupt from their usual habitat in boreal coniferous forests (American Ornithologists' Union 1983). Van Tyne (1926) described a 1923-1924 irruption of 56 Black-backed Woodpeckers in the Northeast. West and Spiers (1958) recorded 294 Black-backed and 59 Three-toed woodpeckers in an irruption in 1956-1957 covering the northcentral and northeastern states.

I have used data from the northeastern United States and southeastern Canada to examine arrival and departure dates and the frequency, magnitude, and coincidence of recent irruptive activity. I placed emphasis on developing the New York irruptive history and compared it to that of the surrounding states and provinces. Some of these results were compared with data from earlier irruptions. Using New York data I examined length of stay, sex ratio, and food tree preferences of these irrupting individuals.

METHODS

Seasonal field note reports for the state of New York published in *The Kingbird* from 1950 to 1982 were used as one of the data bases for comparing occurrences and annual fluctuations in abundance of the 2 species. Both species are locally resident in the Adirondack Mountains of northern New York (Bull 1974) and only records occurring outside this resident range were used. I accounted for the number of sightings made annually for the period August through June, and made note of the sex of the reported individual, dates of observation, and any information about food tree identity. Sighting reports from Audubon Field Notes/American Birds from Ontario, Quebec, the Maritime provinces, Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New Jersey, and Pennsylvania were tabulated for the same time period to provide a regional comparison.

Due to the characterizations used by some field note editors ("few," "several," etc.) to describe the abundance of reports, it was difficult to develop accurate counts for every year or area. Certain of the characterizations ("most birds," etc.) could not be quantified and some of the listed counts are believed to be low as a result. Therefore, some totals are estimates. The reporting format of both data sources did not allow opportunity to judge validity or accuracy of a sighting report. Presumably field-note editors who accepted these reports scrutinized infor-

mation on the reported field marks and observer reliability. Lacking that information, I relied on the published reports.

#### RESULTS

In New York the Black-backed Woodpecker was reported out of its resident range in 25 of the 32 years, during which time 172 individuals were reported. A peak of 39 observations occurred in 1956–1957, followed by the next 4 highest counts of 24 in 1965–1966, 16 each in 1960–1961 and 1963–1964, and 14 in 1962–1963. The Three-toed Woodpecker was observed in 13 years with a total count of 30. The top 3 counts were 8 in 1965–1966, and 4 each in 1963–1964 and 1974–1975. The results for both species are represented in Fig. 1.

In the surrounding states and provinces an estimated 1346 reports of Black-backed Woodpeckers were tallied in 30 of the 32 years. The greatest recorded irruption occurred in 1974–1975 with an estimated 462 black-backed reported, followed by peaks of 91 in 1960–1961, 79 in 1956–1957, 75 in 1958–1959, 70 in 1965–1966 and 1978–1979, 58 in 1963–1964, and 46 in 1972–1973. No black-backed were reported in 1959–1960 and 1973–1974.

Outside of New York the Three-toed Woodpecker was recorded in 28 of the 32 years with the largest irruption of 189 occurring also in 1974–1975. Prior to a recent apparent increase in reports of 22–44 individuals per year in 1972–1973, and 1975–1976 through 1979–1980, the only earlier peak year was 1963–1964 when 31 were noted. There were no reports in 1952–1953, 1954–1955, 1958–1959, and 1959–1960. In viewing the changes in abundance for both species, one must be mindful of the marked increase in popularity of field birding, and in the increase in numbers of people in the field since 1950. For this reason, among others, the data in Fig. 1 can only be regarded as indicative of trends and not as an exact measure of the events discussed.

The average arrival date for the black-backed in New York was 22 October based on arrival dates for 18 years ranging from 28 August to 21 December. Included were 3 unusually early dates of 28 August 1959 (Bemont 1959), 23 September 1962 (Treacy 1963), and 26 September 1981 (Spahn 1982). Otherwise, dates in 11 years ranged 3 October–7 November. In Ontario arrival dates were noted in 14 years and averaged 29 September, range 20 July–20 December. Included were 2 unusually early dates of 20 July 1974 (Goodwin 1975a) and 1 August 1975 (Goodwin 1976). The next earliest date was 6 September. Quebec averaged 27 September based on 5 years that ranged 21 August–9 November with 21 August 1975 being quite early (David and Gosselin 1976). The next earliest date was 16 September.

In the Maritime provinces only 2 dates of 11 September and 4 October were given. A 4-year average in Maine was 11 October, range 26 September–5 November, while a similar average in New Hampshire was 15 October, range 14 September–7 November. A 3-year average date

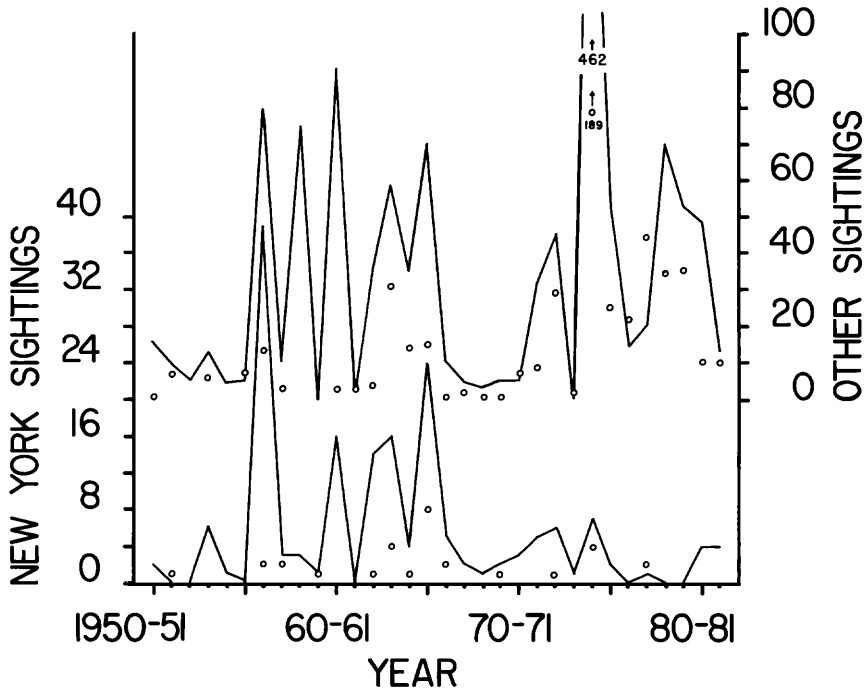


FIGURE 1. Annual fluctuations in reported observations of Black-backed and Three-toed woodpeckers for the period 1950–1982. Connected lines represent sightings of Black-backed Woodpecker and open circles represent Three-toed Woodpecker. The lower data group and the left ordinate scale represent New York sightings. The upper data group and the right ordinate scale represent sightings from the surrounding north-eastern states and Canadian provinces.

in Vermont was 9 October, range 1 August–5 December. A 10-year average in Massachusetts was 22 October, range 15 September–20 December. Dates in 6 of those years were in late September and the first half of October. A 3-year average in Connecticut was 31 October, range 29 September–23 November; and a 4-year average in New Jersey was 30 November, range 22 October–29 December. Pennsylvania averaged 6 December based on 3 years ranging 24 November–21 December. A lone Ohio record was on 14 December.

In some years the dates of last reported Black-backed Woodpeckers in New York were scattered through the winter months, and in other years into spring. There were 3 in December, 1 in January, 4 in February, 3 in March, 3 in April, and 8 in May. The 11-year average for April–May dates was 8 May, range 8 April–31 May. Departure dates in the surrounding states and provinces were sparse. In some cases birds were reported to simply have lingered into winter or spring without an exact date given. In Ontario a 7-year average was 12 May, range 8

April–31 May. Six of those dates were in May. Montreal and Hull, both in Quebec, had birds linger until an unstated day in June following the record 1974–1975 irruption (Kane and Buckley 1975). An 8-year average in Massachusetts was 6 May, range 4 April–17 May. Other dates were 29 April and 28 May in New Hampshire, 30 May in Vermont, and 21 April in Connecticut. The last sighting dates in Pennsylvania were 3 fall–winter dates averaging 28 December, only 22 days after the average arrival date, range 4 December–14 January. However, West and Spiers (1958) reported a 23 March bird in western Pennsylvania in the 1956–1957 irruption.

The earliest reported Three-toed Woodpecker arrival in New York was in August 1964 (Spofford 1965). Seven arrival dates in other years ranged from 27 October to 27 December with 5 of them in December. The average of all 8 was 26 November, and excluding the unusual August date it was 8 December. Ontario had an unusually early 25 August 1971 report (Goodwin 1972a) which, when included in an 11-year average, gave a date of 16 October. Excluding that date gave an average of 22 October, range 22 September–19 November. Three-year averages in Quebec and the Maritime provinces were 20 October, range 6 October–3 November, and 18 November, range 29 September–24 December, respectively. Maine had only 1 date and an unusually early bird on 31 August 1977 (Vickery 1978). New Hampshire had 2 dates on 3 October and 28 December. Vermont had 3 on 3 August 1978 (Kibbe 1979) and 9 and 28 October. A 6-year average in Massachusetts was 14 November, range 10 October–15 December. The first and only Pennsylvania record was 15 December 1974 (Kibbe 1975).

Three-toed Woodpecker departures dates were sparse. A 9-year average in Ontario was 22 May, range 25 April–30 May, excluding a 24 January date. Excluding a 10 February date in Quebec, the only other reported dates were 12 and 13 May. Except for 2 March dates, the only last date in the Maritime provinces was 17 May. Maine had a date of 15 May, excluding 3 March dates. New Hampshire's only date was 31 May. A 3-year average in Vermont was 28 April, range 7 April–11 May. 7 and 13 May were the only Massachusetts dates reported. New York had 1 last date in February, 2 in March, and 5 in the 16 April–22 May period, the last averaging 7 May. The monthly occurrences of both species in New York are represented in Fig. 2.

There were 159 Black-backed Woodpecker sighting reports in New York for which a length of stay in a general area was indicated. Single-day sightings were 61.6% ( $n = 98$ ) of the total, while multiple-day sightings were 38.4% ( $n = 61$ ). Of the multiple-day sightings, 18 were for unspecified periods of more than 1 day, while 43 were specified and ranged from 2 to 192 days, averaging 44.7 days. For the Three-toed Woodpecker, 63.0% ( $n = 17$ ) were single-day sightings and 37.0% ( $n = 10$ ) were multiple-day sightings. Only 1 of the latter was for an unspecified period of time, while those that were specified ranged from 3 to more than 132 days and averaged 45.6 days in 1 location.

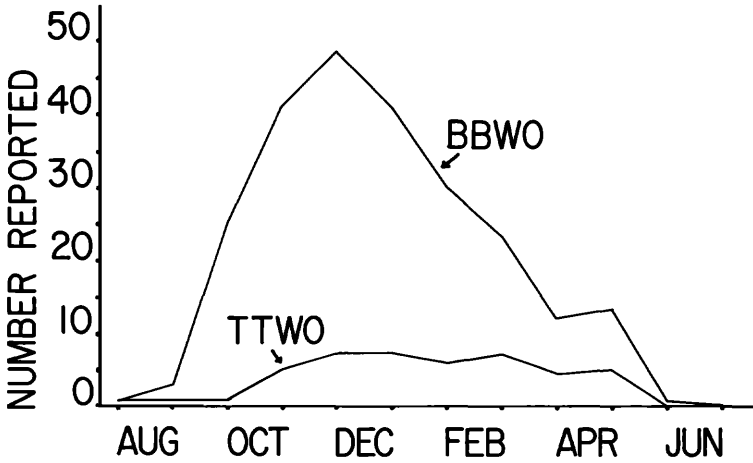


FIGURE 2. Monthly reported occurrences in New York of Black-backed and Three-toed woodpeckers outside their resident range for the years 1950–1982. Each individual was counted only once per month for as many months as it was reported at a location.

To the extent that Black-backed Woodpecker sexual identity was reported for New York sightings (89 or 51.5% of the 172 were identified), females outnumbered males by 1.17:1. A similar percentage of Three-toed Woodpeckers was identified (56.7% of the 30 reports). Females outnumbered males by 1.43:1. Due to the brevity of the reporting format in Audubon Field Notes and American Birds, there were not adequate data on sex ratio, length of stay, and food-tree preference to make a meaningful analysis and comparison. West and Spiers (1958) reported the sexual identity of 38.4% of the Black-backed Woodpecker sightings and 39.0% of the Three-toed Woodpecker sightings in the 1923–1924 irruption. Female black-backed outnumbered males by 1.40:1, and male three-toeds outnumbered females by 1.30:1.

Prior to the invasion of 1956–1957, there was no mention of food trees for the birds reported in New York. However, with the frequent association of the Black-backed Woodpecker with dead elm trees (*Ulmus americana*) in the 1956–1957 invasion, subsequent reports included mention of the kinds of trees on which some of these birds were seen stripping bark, or were otherwise found. From the 61 records for the black-backed, 27 referred to elm; 7 to tamarack (*Larix laricina*); 5 each to hemlock (*Tsuga canadensis*) and pine (*Pinus* spp.); 3 to red pine (*Pinus resinosa*); 2 each to Scotch pine (*Pinus sylvestris*), cedar (*Thuja* spp.), and orchard or apple (*Malus* spp.); and 1 each to Japanese black pine (*Pinus* sp.), spruce (*Picea* spp.), feeder, suet, white oak (*Quercus alba*), mixed hardwood/conifer, evergreen, and oak. Only 7 cases were reported for the three-toed. They included 3 on elm, 2 on hemlock, 1 on tamarack, and 1 at a feeder.

## DISCUSSION

The 1956–1957 irruption of Black-backed Woodpeckers was the greatest on record in New York. Mitchell (1957) and West and Spiers (1958) accounted for 37 non-Adirondack reports. By combining their and my totals I accounted for 39. The subsequent irruptive activity depicted in Fig. 1 that led to reports of 14 to 24 birds per year in 1960–1961, 1962–1963, 1963–1964, and 1965–1966 ranks next most abundant. The oft referred to northeastern invasion of 1923–1924 (Van Tyne 1926) tallied only 3 New York records, while Cruickshank (1942) and Bartlett (1937) list 7 records for 1925–1926. Further examination of records from the 1920's shows a clustering of reports similar to that of the 1956–1966 period. In the 1922–1927 period the combined tallies of Bartlett (1937), Cruickshank (1942), and Van Tyne (1926) show 16 records, approximately matching the prior recorded history of this species from 1844 to 1918. Forbush (1927) noted similar activity in the 1920's in adjacent New England when he commented on the 1923–1924 invasion, and on a "lesser movement" in autumn of 1925 and "another considerable southward migration" in autumn 1926.

Records of Eaton (1910, 1914) and Beardslee and Mitchell (1965) were combined with those referred to above for the 1883–1950 period in an attempt to look at a more complete state history. There appear to be periods of irruptive activity spanning varying periods of time, alternating with long lapses of a lack of records. Beginning in 1883, there were reports in 4 of the next 6 years at intervals of 1 year (next) and 2 years (twice). A 10-year lapse of no reports followed. In the next 3 years (1899–1901) there were reports in 3 years at intervals of 1 year. A 17-year lapse of no reports followed. Then in 1918 there began a 19-year period with reports in 9 of those years at intervals of 4 years (3 times), 2 years (once), and 1 year (5 times), including the well-noted irruptions of the 1920's. Then from 1937 to 1950 there was a 13-year lapse of no reports.

Comments made by reporters of the irruptive activity of the 1950's corroborate the suggestion of long lapses between appearances of this species. The 3 October 1953 sighting in western New York caused Beardslee (1953) to note that it was the first in the area in 20 years. On the same invasion, Ulrich (1954) observed: "From past experience it would seem that we must wait ten or twenty years before seeing this bird again in the Niagara Frontier Region." In referring to the 7 April 1955 record in northern Westchester County, Deed (1955) noted a comment of Cruickshank that it was the first area record since 1925.

Forbush (1927) ruled out seed availability and weather as factors affecting Black-backed Woodpecker irruption. Van Tyne (1926) attributed the 1923–1924 irruption to an abundance of birds created by an abundance of wood-boring beetle larvae. A massive die-off of trees in eastern Canada and parts of Maine caused by spruce budworm in 1909–1914 produced an abundance of wood boring larvae. This outbreak lasted in some regions to 1924. Axtell (1957) suggested that the record

New York 1956–1957 invasion may have resulted from successful woodpecker breeding facilitated by an abundance of borers following extensive fires in Ontario in 1955. Short (1982) attributed irruptions of these woodpeckers to a lack of wood-boring insect prey on their normal range, or to over-population following an insect outbreak. These suggestions and observations imply that this species is sedentary except when impacted by some large-scale forest disaster. These consequences appear to manifest themselves at irregular intervals involving a several-year period and then subside.

In examining and comparing recent Northeastern and Canadian irruptive history, I divided it into 2 periods: 1950–1970 and 1971–1982. A comparison of records of Black-backed Woodpeckers in the 1950–1970 period in surrounding states and provinces shows a similarity to records from New York. Irruption patterns noted in Fig. 1 are similar, with differences in relative magnitude. A major exception occurred in 1958–1959 when New York had no invasion (3 reports), while Ontario (13 fall reports, 12 in winter), Quebec (8 winter reports), and Massachusetts (18 fall, 8 winter, and 2 spring reports) were the major contributors to the 75 reports noted. Even New Jersey had a record 3 reports that winter.

The 1956–1957 irruption, which established an all-time New York record, was a widespread event. In fall, Black-backed Woodpeckers irrupted in a belt from Massachusetts to Wisconsin, producing the greatest invasion in Massachusetts since 1923, and included a report from the island of Nantucket (Newman 1957). Birds continued to appear in winter from New England and New Jersey west to Michigan and Illinois (Pettingill 1957). In West and Spiers' (1958) accounting of this irruption, highest counts were in Ontario (about 120) and Massachusetts (56) followed by New York (38).

By winter 1965–1966, repetitious irruption of the previous 9 years brought interesting comment from field note editors. Near Montreal where both species had been rare previously, Carleton (1966) quoting I. A. McLaren, indicated that they “. . . have been curiously regular the last few falls.” In Ontario and western New York, Rosche (1966) wrote that flights of both species were “. . . becoming regular fall events.”

During 1950–1970, Ontario and Massachusetts were the major sources of surrounding reports, with lesser numbers from Quebec and New Hampshire. Ontario had 251 records in 15 of the 21 years, Massachusetts had 147 reports in 14 years, Quebec had 65 in 10 years, and New Hampshire had 31 in 11 years. Among remaining areas, the Maritimes had 3 in 3 years, Maine had 16 in 7 years, Vermont had 5 in 5 years, Connecticut had 9 in 7 years, Rhode Island had 1 in 1958–1959, and New Jersey had 9 in 6 years.

Through this period, Ontario was a consistently high source of records, peaking in the 1965–1966 when 60 of 74 reports originated there. The 1965–1966 irruption was centered primarily in Ontario and New York, with Quebec and Massachusetts the only other lesser contributors.

Most Massachusetts reports came in irruptions of 1956–1957 (20), 1958–1959 (34), 1960–1961 (51), and 1963–1964 (15). Prior to 1956–1957, going back to 1950 it had had only 3 reports in 3 years. Following the 1963–1964 invasion, there was a marked decline in reports from Massachusetts. All of the New Hampshire reports came from 11 years of a 12-year period between 1953 and 1965.

Following the irruption of 1965–1966, data in Fig. 1 show a brief period of relative quiescence until 1970–1971, followed by a low level of reporting activity in New York and an increased level in surrounding states and provinces in the 1971–1982 period. Only 33 Black-backed Woodpeckers were reported in New York in the 1971–1982 period as opposed to 139 in the prior 1950–1970 period. However, New York was not alone in experiencing this decline in reports. There appeared to be a distinct geographical relocation of reports on irrupting black-backed following 1966. Along with it came the greatest invasion ever recorded in eastern North America in 1974–1975 when an estimated 462 reports were tallied.

Through the 1971–1982 period, Ontario maintained a high reporting profile with 346 reports in 10 of the 11 years, followed by 304 from Quebec in 3 of the 11 years. The 1974–1975 invasion total of 462 and dominance of Quebec in that irruption deserve further comment. Quebec had more than 50 reports in the fall. In winter Kane and Buckley (1975) quoted Poulin's report from the Ottawa area: "Hundreds, found in every suitable woodlot and small patch of trees—19 and 25 respectively (i.e., of Black-backed and Northern—Eds.) on CBC in only a seven and a half mile radius circle! Greatest invasion ever recorded in this area; peaked in late December, gradually decreasing through winter, but still to be found in choice sites at the end of the period." Not far away in Montreal only 7 black-backed were reported in the same period, thus illustrating very localized and intense concentration of these birds in the Ottawa area. In arriving at the total of 462 reports for this 1974–1975 irruption, I estimated Poulin's "hundreds" conservatively at 200. In the same irruption black-backed occurred "in numbers" in the Maritimes, Maine, and eastern Massachusetts. New Hampshire, Connecticut, and Rhode Island had none; however, lone individuals penetrated south into New Jersey, Pennsylvania, and Ohio. New York had 7 reports.

Returning to the 1971–1982 period, Quebec had the second highest total (304) having moved up from third in the 1950–1970 period (65). Maine with 42 reports in 4 of the 11 years was third, having been fifth in the earlier period with 16 prior reports concentrated in the 1956–1967 period. Fourth was the Maritime provinces with 37 reports (26 of them in the 1978–1979 winter) compared to only 3 records previously in the 1956–1963 period. Also moving up in rank, to fifth, was Vermont with at least 28 records in at least 7 of the 11 years, compared to only 5 reports in the previous period (4 were in 1951–1957, and 1 in 1967–1968).

Joining New York in the decline of reports in the 1971–1982 period



was Massachusetts which went from second with 147 reports in the earlier period to sixth with 24 reports in 7 of the 11 latter years. The last sizable report in Massachusetts was 15 sightings in 1963–1964, and since then 36 reports of Black-backed Woodpeckers were noted in 11 of the 18 intervening years. New Hampshire, which ranked fourth in the earlier period with 31 reports, last in 1964–1965, reported only 1 bird in 1978–1979 for all of the 17 intervening years. Connecticut which had participated nominally in the irruptions of the 1950's and 1960's with 8 reports in the 1956–1964 period and a single report in 1968–1969 had no reports in the 1971–1982 period. There were no reports from Rhode Island since the 1 in 1958–1959. New Jersey which had 9 reports from 1950 to 1964 had only 1 report in the latter period, it being in the record 1974–1975 irruption. Pennsylvania which had had no earlier reports had 1 in the record 1974–1975 flight, 2 in 1980–1981, and 1 in 1981–1982. The only Ohio record was 1 during the record 1974–1975 flight.

In summary, the decline noted in Fig. 1 for records in New York following the last major invasion of Black-backed Woodpeckers in 1965–1966 was similarly experienced in New Hampshire, Massachusetts, Connecticut, Rhode Island, and New Jersey, suggesting a general decline, relative to the events of 1956–1966, in the southern sector of this species' irruptive range. Simultaneously, reporting activity increased in Ontario, Quebec, the Maritimes, Vermont, and Maine indicating an apparent northward movement of the locus of active reporting areas.

While birders may welcome the sight of these unique, rare woodpeckers outside of their resident range during times of irruption, these birds are not harbingers of ecological tranquility. On the contrary, their presence can be attributed usually to some forest malady (insect outbreak, fire, disease, etc.), and indications of their increase in an area may not necessarily be good news.

The Three-toed Woodpecker appears to be considerably rarer and/or perhaps less influenced by the factors causing the Black-backed Woodpecker irruptions. The 2 species are sympatric on their resident range in New York (Bull 1974) but apparently, and intriguingly, are not completely synchronous in irrupting as shown in Fig. 1. The largest three-toed invasion in New York occurred in 1965–1966 coinciding with the last recent black-backed irruption of significance. The 1960–1961 black-backed irruption in New York occurred with no concurrent three-toed irruption. The other 3 large black-backed invasions of the 1956–1966 period had only nominal showings of 2–4 three-toeds per invasion. Only twice in the 32-year history, 1951–1952 and 1977–1978, did the Three-toed Woodpecker count exceed the Black-backed Woodpecker count in New York (by 1 bird each time).

As a further indication of the three-toed's rarity in New York, the 16 December 1962 sighting reported by Rosche (1963) was the first for the Buffalo region—an area of extensively documented field ornithol-

ogy. The 29 April 1966 sighting in the Syracuse area was similarly labelled by Scheider (1966) as "... the first modern record."

While it is not clear why there was a lack of synchrony in the irruptions of the 1950–1970 period, there are differences in foraging behavior of the 2 species on their resident range that may influence irruption, since irruption appears related to food availability. The Black-backed Woodpecker has been observed to favor more open forest situations, such as flooded or burned areas, where it feeds more on dead trees including fallen trees. The Three-toed Woodpecker prefers denser stands of spruce-larch where it forages not only on dead trees, but to a greater extent than the black-backed on live trees (Short 1974, 1982). If the three-toed can sustain itself on a food source dependent on live trees, it may be relatively immune to responding to the forest disasters that appear to effect Black-backed Woodpecker irruptions, because the factors affecting the insects on live and dead trees may not cause synchronous changes in abundance of these insects.

In the surrounding states and provinces, Three-toed Woodpeckers were reported in 17 of the 21 years up to 1970–1971. The first major irruption of 1963–1964 was centered in Ontario where 30 of the 31 reports occurred. Quebec had the only other report. Ontario also had the highest count in the 1950–1970 period of 64 in 9 of the 21 years, Quebec had 21 in 9 years, Massachusetts had 14 in 8 years, Maine had 8 in 4 years, New Hampshire had 7 in 5 years, followed by 3 in the Maritimes in 3 years, and 2 in Vermont in 2 years. Connecticut, Rhode Island, New Jersey, and Pennsylvania had no reports. New York had 23 in 10 years during this period.

Following 1970–1971 the Three-toed Woodpecker remained very scarce in New York, but based on data in Fig. 1 it appeared to have increased in the surrounding states and provinces. In the 1972–1973 irruption, 28 of the 29 reports outside New York were from Ontario (16), Quebec (7), and the Maritimes (5). The unprecedented 189 recorded outside New York in 1974–1975 were centered in Ontario (110) and Quebec (72) with lesser reports of 5 in Vermont, 1 in Massachusetts, and the first record for Pennsylvania. New York had 4 sightings.

The reports outside New York in the 1975–1976 to 1979–1980 period were primarily of Canadian and northern New England origin. Ontario had 113, Quebec 26, the Maritimes 6, Maine 5, Vermont 4, and New Hampshire 3. To the south only New York (2) and Massachusetts (3) had reports in this period. In New York and New England the Three-toed Woodpecker remained a rare species even during years of irruption. There appears to have been no significant change in numbers of sighting reports in New York and New England in the 1950–1970 period vs. 1971–1982 period. The events that produced Black-backed Woodpecker reports in New York and New England in the 1956–1966 period, and then caused the relocation of black-backed irruptions to the north in the 1970's, appear not to have influenced the Three-toed

Woodpecker's occurrence in New York and New England. The same does not seem to be the case in Canada. In Fig. 1 there is some suggestion of a slight degree of synchrony of the black-backed and three-toed irruptions of the 1970's. These were primarily Canadian irruptions, not far removed from the Three-toed Woodpecker's resident range.

Overall, Black-backed outnumbered Three-toed woodpeckers by 5.7:1 in New York and 2.6:1 in the surrounding states and provinces. The highest ratio occurred in Massachusetts (10.1:1), and the lowest in Ontario (1.8:1). There is some suggestion of a geographical gradient from north to south which may imply that the three-toed is either less irruptive or travels shorter distances during irruptions than the black-backed. The Canadian average was 2.2:1 and in New England it was 5.3:1. In the 5 black-backed invasions of the 1950's and 1960's the ratio increased to 7.5:1 in New York. West and Spiers (1958) found that in the 16 states and provinces where the 1956–1957 invasion was recorded, the ratio was 5.1:1. Among their data there is also an indication of a north–south gradient in relative abundance. Their BBWO:TTWO ratios varied from 1.9:1 in Maine, to 3.4:1 in Quebec, 4.3:1 in Ontario, 7.6:1 in New York, and 18.7:1 in Massachusetts. Van Tyne (1926) made no comparison in the 1923–1924 irruption. Bull (1974) noted that in known breeding areas of the Adirondack Mountains the Black-backed Woodpecker outnumbered the Three-toed Woodpecker by 2:1.

A review of Black-backed Woodpecker average arrival dates showed a gradual movement of birds from north to south over a period of about 70 days from Ontario-Quebec to Pennsylvania covering a distance of about 570 km (Ottawa to Reading). Except for a few unusually early July–September dates noted earlier for certain regions, black-backed began to appear out of resident range in Ontario and Quebec in early and mid-September with overall averages of 29 and 27 September, respectively. They arrived in northern New England on average about 2 weeks later in early and mid-October. Average arrival dates in Massachusetts and New York were 1–2 weeks later still. In some years Massachusetts had birds arrive in late September and early October, while in New York the earliest arrivals were typically in early October.

By the end of October birds reached southern New England and a month later New Jersey. On average they made their farthest penetration south into Pennsylvania in early December. In December the number of New York reports peaked (Fig. 2) and then declined until April, followed by a slight return flight in May. The 3 major reporting areas of Ontario, Massachusetts, and New York had average last sighting dates in early and mid-May, though both Ontario and New York had late dates going to the end of the month in more than 1 year. Once, in 1974–1975, birds lingered in Quebec into June. While I lacked sufficient records to do the same analysis of Canadian and New England records as I did for New York in Fig. 2, a perusal of the available records from these areas suggested a similar pattern. Poulin's comment, referred to earlier (Kane and Buckley 1975), concerning the record 1974–1975

irruption, corroborated a peaking of reports in December and a gradual decrease thereafter through the winter.

Three-toed Woodpeckers were later in irrupting. In Ontario they appeared about 3 weeks later than Black-backed Woodpeckers in late October. On average they arrived in Massachusetts in mid-November also about 3 weeks later than did the black-backed. In New York the three-toed arrived on average in late November and early December almost 5–6 weeks following the average black-backed arrival. They appeared to stay about as late as black-backed in May. Last sightings dates in New England and New York were scattered in early and mid-May; and in Ontario to the end of May.

Both species showed a high incidence of single-day sightings in New York (61–63%) suggesting considerable wandering by some of these individuals. Some of those which located abundant food sources apparently remained attached to such areas for lengthy periods of time (up to a maximum of 192 days for the Black-backed Woodpecker with 18 records of over 30 days). The average lengths of stay of both species were quite similar (BBWO = 44.7 days, TTWO = 45.6 days). In some cases where the attachment was to dead or dying elm trees in city parks, cemeteries, and urban neighborhoods, it illustrated a sharp contrast in choice of habitat compared to their native haunts in the vast spruce and balsam forests and bogs of the north.

The elm die-off due to Dutch elm disease in western New York in the 1950's may have contributed to increased reporting of the invasion of 1956–1957. The urban setting for many of the dead and dying elms increased the likelihood of the birds being reported. In the 1956–1957 invasion, 12 black-backed were reported on elms in the Rochester area (Miller 1957), and 6 in the Syracuse area (Scheider 1957). During the next invasion in 1960–1961, 5 black-backed were seen on elms in and near Syracuse (Scheider 1960). When these 23 urban elm observations are subtracted from the 27 reports for elm, the elm then assumes a much lower rank than the 25 combined conifer reports. However, even though dead elms abounded into the 1958–1959 season in the Rochester area, neither of these woodpeckers was reported in that area (Miller 1958). Thus, during the 1956–1957 and 1960–1961 invasions, the Black-backed Woodpecker appeared to have made opportunistic use of the blighted elm trees. Otherwise, the black-backed reverted thereafter principally to conifer species similar to ones found on its resident range.

Similar observations on this relationship with Dutch elm disease occurred in Canada. Black-backed Woodpeckers that irrupted in January–February 1954 near Ulverton, Quebec, fed on heavily infested elms (Nichols 1954). For the Ontario and western New York region, Goodwin (1972b) commented: “The period of regular incursions (1956–1966) coincided with the main passage of the Dutch elm disease along the Lower Lakes. The disease has now pressed northwards and the woodpeckers no longer appear.” Then he posed the question: “But if the influxes were a response to an available food supply the puzzle is, how

were the three-toeds, which are generally viewed as sedentary, able to respond to a food supply 100 or more miles south of its usual range?" In response to the record 1974–1975 invasion in eastern Ontario, he (Goodwin 1975b) indicated that the scarcity of birds near Toronto to the west of the main area of irruption at Ottawa had prompted speculation that the northward movement of Dutch elm disease was a factor, however, "... the correlation with the spread of the disease is not very good." Information on the foraging habits, tree preferences, and diet for both species on their resident range are given by Short (1974, 1982).

#### SUMMARY

An examination of the 1950–1982 field note records for Black-backed and Three-toed woodpeckers in northeastern United States and southeastern Canada indicates a pattern of irregular irruption from their resident range. Periods of irruptive activity lasting several years appear interspersed between long lapses of little or no reporting. A period of almost regular and heightened irruptive activity by the Black-backed Woodpecker occurred in 1956–1966. Following it there was a marked decline in New York and southern New England, while in Canada there was another period of irruptive activity through the 1970's. During this time the greatest reported irruption occurred in 1974–1975.

The Three-toed Woodpecker is not only rarer than the Black-backed Woodpecker, but appears to be less irruptive, judging from its increased scarcity relative to the Black-backed Woodpecker at greater distances from its resident range. While these species are sympatric on their resident range, they do not appear to be completely synchronous in irrupting.

During irruption, both species have occurred in urban habitats totally unlike the boreal forests of their resident range. In the irruptions of the 1950's and 1960's in New York, they frequented urban areas blighted by the Dutch elm disease. Irrupting individuals appeared out of their resident range in the north typically in September and spread gradually southward reaching the southern limit of irruption in New Jersey-Pennsylvania by December. Numbers declined thereafter throughout the occupied winter range until May, at which time the last birds gradually disappeared northward.

Most sightings for both species (61–63%) were single-day sightings, although some individuals remained in an area for prolonged periods of 132 days or more for the Three-toed Woodpecker and 192 days for the Black-backed Woodpecker. Females of both species were recorded more frequently than males by 1.43:1 and 1.17:1, respectively.

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#### NOTES AND NEWS

**HAWK MOUNTAIN SANCTUARY RESEARCH AWARD.**—The Hawk Mountain Sanctuary Association is accepting applications for its ninth annual award for raptor research. To apply for the \$750 award, students should submit a brief description of their research program (maximum of 5 pp), a curriculum vitae, and two letters of recommendation by 30 September 1985, to Stanley E. Senner, Executive Director, Hawk Mountain Sanctuary Association, Rt. 2, Kempton, PA 19529. The Association's board of directors will make a final decision late in 1985. Only students enrolled in a degree-granting institution are eligible; both undergraduate and graduate students may apply. The award will be granted on the basis of a project's potential to improve understanding of raptor biology and its ultimate relevance to conservation of North American raptor populations.