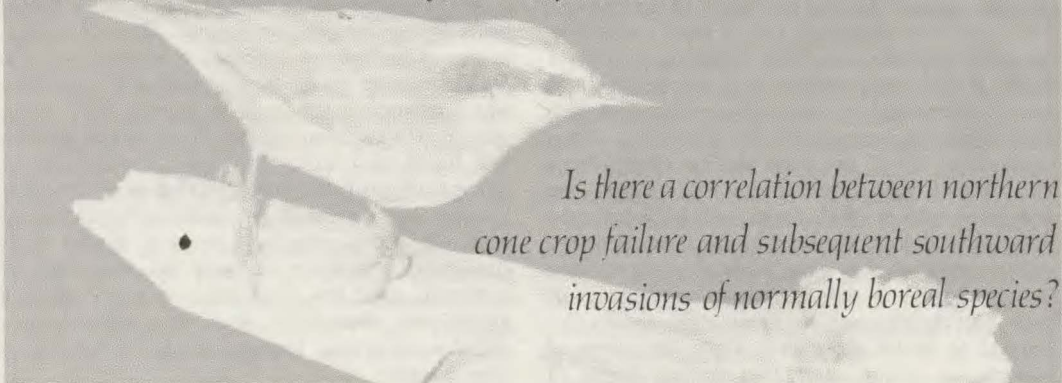


Winter Eruptions of Red-breasted Nuthatches in North America, 1950-1970

by Carl E. Bock* and Larry W. Lephien*



Is there a correlation between northern cone crop failure and subsequent southward invasions of normally boreal species?

Photo Allan D. Cruickshank from N.A.S.

INTRODUCTION

The Red-breasted Nuthatch (*Sitta canadensis*) is the only member of its family regularly associated with the boreal forests of North America; its breeding range is restricted to Canada and the coniferous forests of western and northeastern United States (*A.O.U. "Check-list,"* 1957). However, it is known to migrate in the fall as far south as Florida, Texas, southern California, and northern Mexico. Many ornithologists have observed that these fall migrations vary greatly in magnitude from one year to the next, at least on a local scale (e.g., Bent, 1948; many reports in *Audubon Field Notes* and *American Birds*).

We have analyzed the winter abundance of Red-breasted Nuthatches throughout North America from 1950 to 1970, using Audubon Christmas Bird Count data to investigate the magnitude, geography, and possible causes of southward nuthatch "invasions."

This paper represents a continuation of our efforts to use Christmas Bird Count data for studying winter population dynamics of North American birds (see Bock and Smith, 1971).

METHODS OF STUDY

Data for Red-breasted Nuthatches were extracted from the 1950 to 1970 Christmas Bird Count volumes, and grouped such that we were able to generate plots of birds per party-hour

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per year for each state and province (see Bock and Smith, op. cit.). These plots almost always revealed marked differences between the number of birds counted in what might be called "flight years" compared to years when few individuals appeared, especially for regions outside the breeding range of the species. Maps were constructed, one for each year, showing the annual distribution of relative high and low counts, based on these plots. Figure 1 shows the results of the mapping for 1960 to 1970. The patterning was similar for 1950-59.

RESULTS

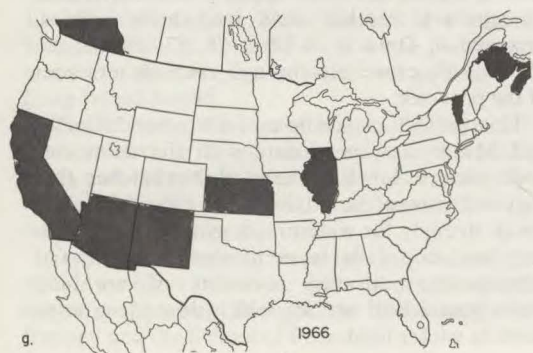
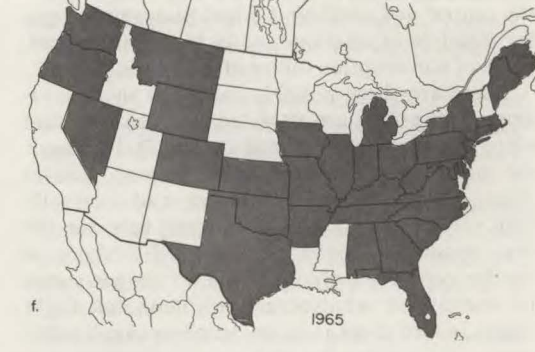
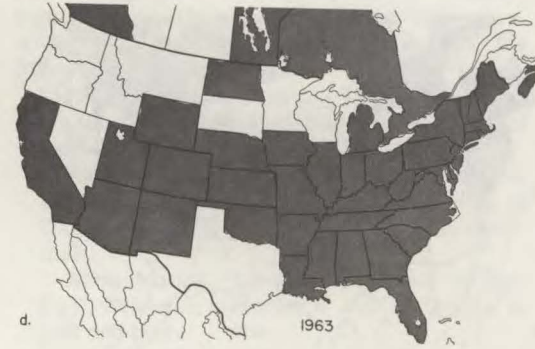
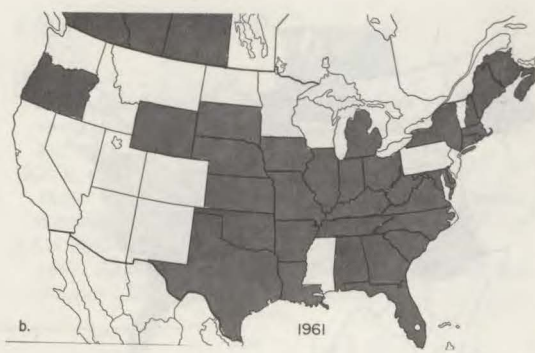
The annual maps (Figure 1) and the summary graph for all North America (Figure 2) show clearly that there were massive and widespread southward invasions of Red-breasted Nuthatches in 1951, 54, 55, 57, 59, 61, 63, 65, 68, and 1969. Little movement occurred in 1950, 52, 53, 56, 58, 60, 62, 64, 66, 67, and 1970.

DISCUSSION

Lansdowne and Livingston (1966) wrote of the Red-breasted Nuthatch in Canada:

"In winter this common species concentrates for a good part of its food supply on the seeds of various conifers. In years when the cone crop is poor . . . great flights come south in winter, as with the Boreal Chickadee. These irruptions are sporadic and unpredictable; they are not on any definable schedule."

Inssofar as the past 21 years are concerned, Red-breasted Nuthatches have been coming south into



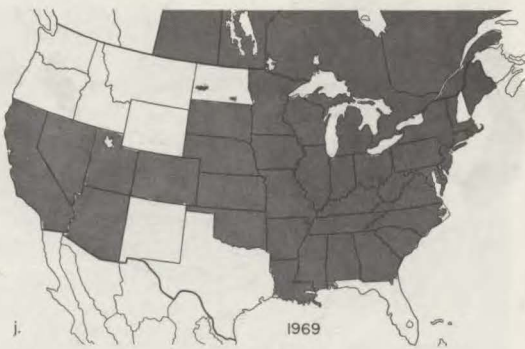
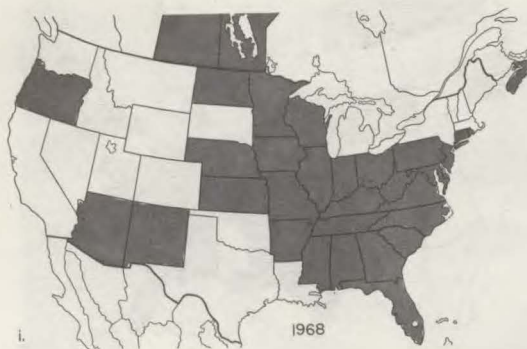


Figure 1, a-k. Christmas Bird Count documentation of Red-breasted Nuthatch invasions, 1960-1970. Shaded states and provinces are those which showed relative high counts in the years indicated on the maps.

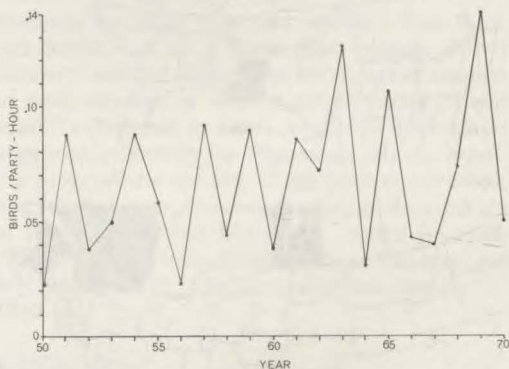


Figure 2. Summary of Red-breasted Nuthatches counted per party-hour on all Christmas Bird Counts, 1950 to 1970.

the central and southern United States on a regular schedule of alternate, or in two cases paired, years of non-eruption followed by invasion.

There are three possible causes of these invasions: 1) the birds are attracted south to abundant winter food supplies (= seed crops), 2) they leave the northern regions because of cone failures there, or 3) invasions follow years of unusually high reproductive success. We can rule out the first possibility, since an extensive analysis of conifer cone productivity in winter ranges shows no correlation whatsoever with nuthatch flight years. Indeed there is no evidence to suggest that cone productivity is synchronous between species or over broad geographic areas in central and southern conifer forests. We have no data for or against the third possible cause—eruptions following high reproduction.

The second possibility—that Red-breasted Nuthatches come south in years when northern cone crops fail—seems the most likely. Supporting data are scarce but most intriguing. What follows we owe to the late Aaron Bagg and his introduction to the fall migration issue of *Audubon Field Notes* in 1968. First, Alma Chapman reported that conifer cone productivity in Penobscot County, Maine, was *high* in 1956, 58, 60, 62, 64, 66, and 67; cone crops *failed* in 1957, 59, 61, 63,

65, and 68. Also, M. Clive Goodwin reported that fall flights of the Black-capped Chickadee (*Parus atricapillus*), another cone seed-eating species, occurred in Ontario in 1951, 54, 57, 59, 61, 63, 65, and 68, especially through the southern part of the province.

This perfect correlation of Ontario chickadee and Maine cone crop data with the continent-wide picture for Red-breasted Nuthatches (see Figure 2) cannot be attributed to chance. It does speak strongly for widespread, synchronous, conifer cone crop failures in northern forests, and subsequent southward invasions of normally more boreal bird species which depend on cone seeds as winter food.

ACKNOWLEDGMENTS

We would like to thank the students in the fall, 1971, class in Advanced Vertebrate Ecology for their many man-hours of labor in extracting nuthatch data from the Christmas Bird Count volumes. In addition Mrs. Jackie Forsythe provided valuable cone crop data for the United States. This work was made possible in part through the support of the University of Colorado Computing Center, E. Rex Krueger, Director.

The Centers of Learning

Yale University

by Charles G. Sibley

Ornithology at Yale can trace its origins back to 1834 when the first specimens of birds were added to the "Natural History Cabinet." With the founding of the Peabody Museum of Natural History in 1866 the Yale collections, especially in paleontology and invertebrate zoology, began to increase rapidly. Ornithology was part of the zoological department of the Museum but it did not really begin to flourish until 1946 when Dr. S. Dillon Ripley joined the staff of the Peabody Museum. With characteristic vigor, Ripley established ornithology as part of the academic curriculum and in the short span of 18 years added some 80,000 specimens to the scientific collections.

Today the facilities for ornithology at Yale include a collection of 90,000 study skins, 8,700 specimens preserved in alcohol and 1,100 skeletons. The ornithological library contains over 4,000 volumes, sets of more than 100 periodicals and a large reprint collection. Laboratories for research in biochemical systematics and equipment for field and museum studies are available. Within a few miles of New Haven are several university-owned natural areas for field studies. The Yale Biological Field Station in Guilford includes areas of uplands, fresh water ponds and marshes, salt marshes, estuaries and an island in Long Island Sound.

The Peabody Museum of Natural History contains collections in all zoological and botanical fields and the twenty curators are also professors in one of the four academic departments that are involved in the Museum.

Courses in general ornithology, the birds of the world, ecology, behavior, evolution, and related subjects are given through the Department of Biology and the School of Forestry.

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1971. An analysis of Colorado Christmas Counts. *American Birds*, 25: 945-947.
- LANSDOWNE, J.F. and J.A. LIVINGSTON
1967. *Birds of the northern forest*. McClelland and Stewart Ltd., Montreal and Toronto.

The faculty in the biological sciences (including paleontology and several aspects of forestry) numbers approximately fifty. Those with an interest in ornithological research include the following.

Peter A. Jordan, Assistant Professor of Wildlife Ecology, School of Forestry. Ecology of game birds.

Richard S. Miller, Professor of Wildlife Ecology, School of Forestry and Professor of Biology. General ecology of birds and mammals.

Alvin Novick, Associate Professor of Biology. Behavior; orientation and navigation in bats and birds.

John H. Ostrom, Professor of Geology and Geophysics and Curator of Vertebrate Paleontology, Peabody Museum of Natural History. Fossil birds; *Archeopteryx* and the problem of the origin of bird flight.

Charles L. Remington, Associate Professor of Biology and Associate Curator of Entomology, Peabody Museum of Natural History. Evolutionary principles.

Charles G. Sibley, Professor of Ornithology, Curator of Birds and Director, Peabody Museum of Natural History. Avian systematics and distribution; protein structure as a source of data for classification.

The thesis topics of present and recent graduate students include studies of the passerines of the Aegean islands (George E. Watson), ontogeny and evolution in the megapodes (George A. Clark, Jr.), passerine pterylography (Mary Heimerdinger Clench), passerine syringeal structure (Peter Ames), shorebird feeding ecology (M. C. Baker), cowbird-host relationships (Stephen I. Rothstein), ecological aspects of bird song (Eugene S. Morton), population ecology of *Zonotrichia capensis* (Dennis Kalma), relationships of and within the shorebirds (Jon E. Ahlquist), relationships within the Anseriformes (Peter D. Bottjer), a study of the Galliformes (Jeffrey A. Spindelaw), and the development of feeding behavior in gulls (Karl Tolonen).