

## BIENNIAL RHYTHM IN PURPLE FINCH MIGRATION

BY JOHN H. KENNARD

Bock and Lepthien (1976) have published a study demonstrating a biennial rhythm in the southward migration of certain seed-eating birds. This study was based on a statistical analysis of the Audubon Christmas counts of eight species. At the same time I (Kennard, 1976) published a study based on banding data, showing a similar pattern in the southward migration of the Common Redpoll (*Carduelis flammea*). Both studies showed a greater southward migration each winter in which Christmas was in an odd-numbered year (e.g. 1955-56). 1967-68 was an exception, correlated with a year of exceptionally heavy seed production in the summer and fall of 1967. Bock and Lepthien state (1976: 570) "Literature analysis revealed a circumboreally synchronized pattern of seed crop fluctuations in certain high latitude tree species and an apparently resulting pattern of southward eruptions of birds dependent upon these foods."

This paper is intended to support this theory further by analysis of banding data on the Purple Finch (*Carpodacus purpureus*). Data by state or province and calendar year were kindly supplied by the Bird Banding Laboratory of the U.S. Fish and Wildlife Service. In most of the northern United States summer and winter ranges overlap, and Purple Finches may be banded all year round. I therefore selected two areas for study: (1) the Canadian Provinces of Manitoba, Saskatchewan, and Ontario, where most birds may be presumed to have been banded in the summer, and (2) the states of South Carolina, Georgia, Tennessee, Alabama, Mississippi, and Arkansas, where most birds were presumed to have been banded in January through April. These data are summarized in Table 1.

Banding data on Purple Finches from the southern states show a remarkable similarity to the data on redpolls and to the data from Bock and Lepthien. Even-numbered years show a greater number of birds banded than the preceding odd-numbered years except in 1968.

Bock and Lepthien showed a regular biennial rhythm in the production of tree seeds in the boreal forest, with heavy seeding each even-numbered year, and a relatively poor seed crop each odd-numbered year except 1967, when there was an out-of-phase very heavy seed production. Gross and Harden (1968) documented a very heavy seed crop in the Laurentian Forest in 1967. The data from the southern states reflect this, because in each winter following a year of poor seeding, Purple Finches were more numerous. Following the years of good seeding (even-numbered plus 1967) banding data indicate fewer birds wintering in the south.

The data from central Canada show the opposite, with greater numbers in the breeding area in the odd-numbered years, including the 1967-69 period when the biennial rhythm of southward migration was broken.

TABLE 1.  
Purple Finch bandings by year.

	Southern United States	Central Canada
1955	201	54
1956	872	89
1957	61	272
1958	674	231
1959	163	125
1960	1,433	47
1961	125	220
1962	792	80
1963	216	538
1964	881	499
1965	433	1,199
1966	4,689	654
1967	2,693	1,059
1968	1,710	339
1969	5,870	1,162
1970	6,368	252
1971	1,781	768
1972	4,394	1,022
Nine Even Years	21,813	3,213
Nine Odd Years	11,543	5,397

These data suggest that following a year of high production of tree seeds, and therefore a more abundant food supply, Purple Finches remain farther north through the winter and probably survive in greater numbers. The following summer there are increased numbers on the breeding ground, and some may occur farther north. In the odd-numbered years the increased number breeding produces more fledglings in a year of less abundant food, and this drives some of the birds farther south the following winter.

In conclusion, the data from the Bird Banding Laboratory on the Purple Finch support the conclusions of Bock and Lepthien (1976) that there exists a biennial rhythm in the production of boreal tree seeds, and this is reflected in a similar rhythm in the southward migration of seed-eating birds.

#### LITERATURE CITED

- BOCK, C. E., AND L. W. LEPTHIEN. 1976. Synchronous eruption of boreal seed-eating birds. *Amer. Nat.*, **110**: 559-571.

GROSS, H. L., AND A. A. HARDEN. 1968. Dieback and abnormal growth of yellow birch induced by heavy fruiting. Information report O-x-79, Forest Research Laboratory, Sault Ste. Marie, Ontario.

KENNARD, J. H. 1976. A biennial rhythm in the winter distribution of the Common Redpoll. *Bird-Banding*, 47: 231-237.

#### ADDENDUM

In the northeastern United States the fall of 1976 produced an unusually heavy crop of tree and shrub seeds and fruit. December 1976 and January 1977 were marked by record-breaking cold weather. In New Hampshire, January produced very heavy snow. In spite of these adverse weather conditions Purple Finches have remained in New Hampshire in unusually large numbers.

*R.F.D. 5, Box 150, Bedford, N.H. 03102.* Received 24 October 1976, accepted 14 February 1977.