

VARIATION IN THE BREEDING SEASON AND CLUTCH-SIZE OF THE ROBIN IN THE NORTHEASTERN UNITED STATES AND THE MARITIME PROVINCES OF CANADA¹

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THIS paper summarizes an analysis of nest record cards of the Robin (*Turdus migratorius*) for variations in breeding season and clutch-size. Although these variations have been studied in detail for several species of European birds, very little similar work has been done in North America, partly because the available data were widely scattered and difficult to obtain. The North American Nest Record Card Program at Cornell University, organized to make a centralized source of records available to workers throughout the continent, should provide the stimulus for additional work here.

Many important variations are apparent only when the number of records is very large. There are, however, numerous sources of error in data collected by many observers. These are lucidly discussed by Myres (1955) and Snow (1955 *a, b*) in their papers on breeding season, clutch-size, and nesting success in three species of thrushes (Blackbird (*Turdus merula*), Song Thrush (*T. ericetorum*), and Mistle Thrush (*T. viscivorus*)). Burton and Mayer-Gross (1965) have recently compiled a list of papers based on records from the British Nest Records Scheme. These have been most helpful and merit careful study by anyone analyzing nest cards. Unless otherwise stated, it should be understood that Robin refers to the American Robin, and not the European Robin (*Erithacus rubecula*).

METHODS

A total of 1,605 records, collected in Massachusetts and New York states and the Maritime Provinces of Canada (New Brunswick, Nova Scotia, and Prince Edward Island) in 1963, 1964, and 1965, were used. The records from New York were loaned by the North American Nest Record Card Program at Cornell and those from the Maritime Provinces by the Maritimes Nest Record Scheme at Sackville, New Brunswick. All the records for Massachusetts (with the exception of 7 from Cornell) were collected by the Massachusetts Audubon Society as part of their Robin Nest Survey.

Figure 1 shows the distribution of records by counties. The most heavily represented areas are those nearest the record collection centers: western and southern New York around Ithaca, eastern Massachusetts around Lincoln, and

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TABLE 1
SEASONAL VARIATION IN CLUTCH-SIZE

Mean clutch-size by months for Massachusetts and New York states and each of the Maritime Provinces.

	April			May			June			July		
	Mean	S.D.	No.	Mean	S.D.	No.	Mean	S.D.	No.	Mean	S.D.	No.
Massachusetts (408 clutches)	3.5 ± 0.07	0.60	83	3.5 ± 0.04	0.68	258	3.1 ± 0.13	0.89	50	3.1 ± 0.09	0.35	17
New York (351 clutches)	3.5 ± 0.07	0.61	85	3.6 ± 0.05	0.69	190	3.4 ± 0.08	0.58	60	3.2 ± 0.18	0.73	16
New Brunswick (169 clutches)	3.3		3	3.5 ± 0.06	0.65	116	3.0 ± 0.10	0.68	46	2.5		4
Nova Scotia (162 clutches)	2.9		7	3.3 ± 0.07	0.65	97	3.2 ± 0.10	0.71	53	3.0		5
Prince Edward Island (73 clutches)				3.1 ± 0.07	0.53	52	3.0 ± 0.15	0.71	21			

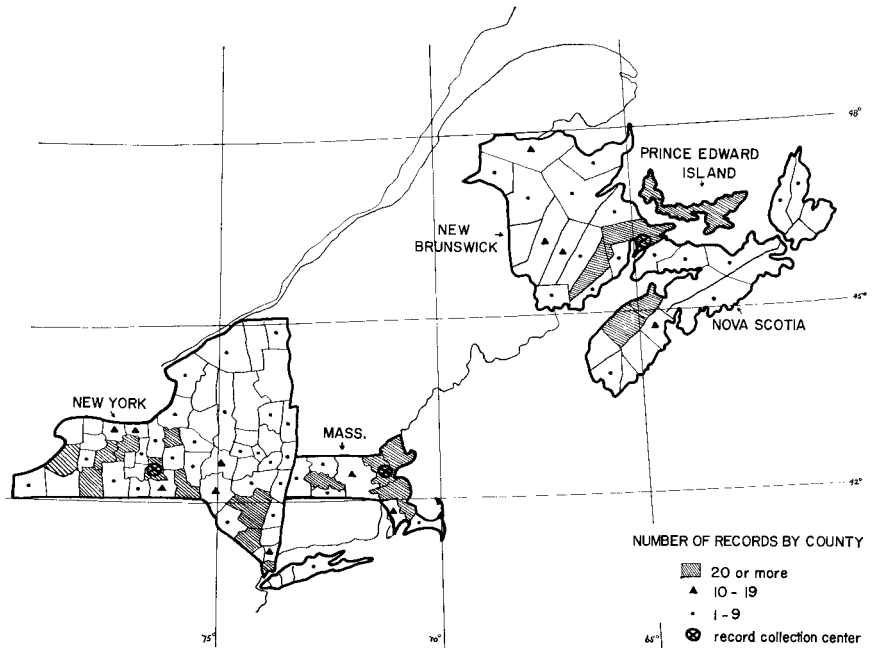


FIG. 1. Geographical distribution of nest records from Massachusetts, New York, and the Maritime Provinces.

the central Maritime region around Sackville. The less populated areas are poorly represented.

The criteria used for inclusion and dating of records were a modification of those of Myres and Snow. A total of 1,167 nests were available for analysis of clutch-size. All nests containing eggs were used except that obviously incomplete clutches and all clutches of one were excluded, as were nests containing hatched young together with infertile eggs. Those nests found during laying and closely watched until the clutch is complete give the most nearly accurate figures. These comprised one quarter of the cards. The remaining three quarters were nests found during the incubation period. About one fifth of these were visited only once. Because some incomplete clutches and some clutches which had lost eggs were doubtless included, all the figures given for clutch-size are probably low. They are therefore suited for comparative purposes, but caution should be used in drawing conclusions from the absolute values.

Nests were dated from the day the first egg was laid. For those found during laying, the initial date could be figured most accurately. If the hatching or fledging date or the age of the young was given, the initial date could

be calculated less accurately using an average incubation period of 13 days and an average nestling period of 13 days (Young, 1955; pers. obs.). Nests visited more than once during the incubation or nestling period with none of the above dates given were dated using the bracketing method of Myres: the earliest and latest dates on which the hatching or fledging could have occurred were calculated from the observations. The date when the clutch was started was then estimated from the median date between them. The largest possible bracket was 12 days, with an error of plus or minus six days from the middle date. Nests visited only once, with no additional information given, were assumed to be in the middle of the incubation or nestling period (D. Lack, 1946; E. Lack, 1950). Nests could also be dated if the banding date was given, as the young birds are usually banded when they are 7 or 8 days old. Once dated, the nests were grouped into 5-day periods for description of the breeding season. Although 40 per cent of the cards were dated using brackets, most of these were smaller than the maximum of 12 days. There is nevertheless the possibility that some were placed in the wrong 5-day period.

CLUTCH-SIZE

Robins usually lay a clutch of three or four eggs. Casual description of the clutch-size as three to five is misleading, as only 2 per cent of the clutches in Massachusetts and New York and less than one per cent in the Maritimes consist of five eggs. Most clutches of one and two are probably the result of disturbance or actual predation during laying, although it is probable that clutches of two are more common in the Maritimes (see below). Nests containing more than five eggs have been reported, but are apparently the result of multiple nesting or erratic behavior on the part of a single female (Young, op. cit.; Howell, 1942). The Brown-headed Cowbird (*Molothrus ater*) lays in Robin's nests occasionally, but the Robins customarily remove the egg (Friedmann, 1929; pers. obs.). This results in a lower clutch-size, for the cowbird removes a robin's egg before it lays its own, and this egg is not replaced.

Seasonal variation.—Table 1 shows the mean clutch-size in Massachusetts, New York, and each of the Maritime Provinces by months throughout the nesting season. In all but Massachusetts, the clutch-size is higher in May than in April or June, suggesting a peak during that month. Further, the majority of clutches of five reported were begun in May. The rise between April and May is not statistically significant (using a two-sided T test, with a confidence limit of 95 per cent), nor is the drop from May to June except for Massachusetts and New Brunswick. The difference between May and July, however, is significant for all areas but Nova Scotia. The difference in all cases is small, being on the order of half an egg.

TABLE 2
PERCENTAGE DISTRIBUTION OF CLUTCH-SIZES IN MASSACHUSETTS-NEW YORK AND THE
MARITIME PROVINCES

Clutch-size	Mass.-New York per cent	Maritimes per cent
5	2	1
4	50	38
3	41	45
2	7	15
Total number of clutches	762	405

Lack (1946), Monk (1954), Peakall (1960), and Snow (1955a) using British nest records, have found that clutch-size for the European Robin, the Yellowhammer (*Emberiza citrinella*), the Greenfinch (*Chloris chloris*), and the Blackbird and the Song Thrush rises to a peak in May or June and then declines. That of the Robin apparently also follows this pattern, although the initial rise is much less pronounced than the later decline. The Robin does not begin to lay until late April. In contrast, the Blackbird, which lays its first eggs in March in Great Britain, shows a gradual rise in clutch-size from March until mid-May, after which it declines. Lack (1954) has pointed out that the clutch-size of many double-brooded passerines reaches a peak in May or June. He suggests that this seasonal variation in clutch-size has come about through natural selection and results in the production of the most young possible. The proximate factors influencing the variation are changes in day-length and the availability of food for the young throughout the breeding season.

Geographical variation.—The percentage distribution of clutch-size in Massachusetts–New York and the Maritime Provinces is shown in Table 2. The most common clutch-size in the Maritimes is 3, while that in Massachusetts–New York is 4. Clutches of five are less than half as frequent in the Maritimes and there are twice as many clutches of two. Clutches of two are more or less evenly distributed through the season in Massachusetts–New York, supporting the theory that many of them are due to predation (Snow, 1955a), but there is a sharp rise in the number of clutches of two in the Maritimes late in the season. The overall mean clutch-size for the Maritime Provinces is 3.2 ± 0.04 . This differs significantly at 99 per cent confidence limits from the overall mean for Massachusetts–New York, which is 3.5 ± 0.02 . Moreover, the mean clutch-size declines steadily from New Brunswick (3.3 ± 0.05) to Nova Scotia (3.2 ± 0.06) to Prince Edward Island (3.0 ± 0.10). This tendency persists on the island of Newfoundland, where, out of more than 70 Robin nest records, only 4 were found to contain 4 eggs or

TABLE 3
ANNUAL VARIATION

	Variation in mean monthly clutch-size in Massachusetts-New York each year from the overall monthly mean.			
	1963	1964	1965	All years
April	3.6	3.5	3.6	3.5
May	3.6	3.6	3.4	3.5
June	3.0	3.3	3.3	3.3
July	3.0	3.1	3.2	3.2

young (Tuck, pers. comm.) while in Labrador, clutches of 4 are more common (Todd, 1963).

Howell (op. cit.) and Young (op. cit.) each calculated an overall mean clutch-size for the Robin which agrees closely with the overall mean for Massachusetts-New York: Howell at Ithaca, New York (42°N lat)—3.4, 127 nests; Young at Madison, Wisconsin (43°N lat)—3.4, 146 nests.

It has been shown for a number of species in northern Europe that clutch-size increases with increasing latitude. In the case of the Robin in New York-Massachusetts and the Maritime Provinces, any influence of the increase in latitude is apparently overridden by the more maritime climate in the Provinces. Lack (1947, 1948a) and others have commented on the fact that clutch-size tends to be lower in maritime or island situations than in a continental environment. Detailed records for the European Robin and Common Swift (*Apus apus*) in Europe show that this is true for these species (Lack, 1954; Lack and Lack, 1951) and Tompa (1964) has shown that this variation holds for the Song Sparrow (*Melospiza melodia*) in British Columbia. Generally accepted theory suggests that this is an adaptation to a poorer food supply in maritime as compared with continental environments.

Annual variation.—Annual variation in clutch-size has been described for several species of European birds (Lack, 1948b; Kluijver, 1951; Snow, 1955a). Table 3 shows the monthly means for Massachusetts-New York for each year and the overall monthly means for all years combined. Although there is a slight amount of variation from the overall mean on each month, in no case is the difference statistically significant.

BREEDING SEASON

Robins raise more than one brood during a season in northeastern United States and the Maritime Provinces. Howell (op. cit.) estimated that a maximum of one out of seven pairs raised a third brood at Ithaca, New York but I suspect that third broods are rare in the Maritimes, as there were only nine

TABLE 4
BREEDING SEASON

Number of clutches begun in each 5-day period in Massachusetts-New York and the Maritime Provinces in the years 1963, 1964, and 1965.							
	1963		1964		1965		
	Mass.-New York	M.P.	Mass.-New York	M.P.	Mass.-New York	M.P.	
12-16 April	2		3		1		
17-21	4		11		14		
22-26	14	1	41	2	40	1	
27-1	24	6	59	4	74	8	
2-6 May	37	8	50	14	75	19	
7-11	17	19	34	27	49	15	
12-16	19	18	27	30	51	36	
17-21	9	23	39	22	31	36	
22-26	9	16	31	15	34	23	
27-31	9	15	14	12	17	30	
1-5 June	4	7	12	6	27	12	
6-10	4	17	17	14	15	22	
11-15		5	5	13	15	20	
16-20	7	3	13	5	14	10	
21-25		6	7	6	2	5	
26-30		4	8	8	6	4	
July	2	8	21	12	23	6	
Mean date of completion of first clutches*	3 May	16 May	2 May	15 May	3 May	17 May	

* Calculated for Massachusetts-New York using all clutches begun through 16 May; for the Maritimes, all those begun through 31 May.

nests out of 405 reported from the three Provinces which were begun late enough to fall in this category.

While nests with eggs are commonly found in New York and Massachusetts in late April, they are rather rare this early in the Maritimes. The great majority (80 per cent) of nests reported from all areas were begun in May and June, with a few in July and one from New York in August (omitted from Table 4). Part of the seasonal decline is an artifact, however, because nests are harder to find and less sought after later in the season. Indeed, Peakall (op. cit.) was able to show that, for the Yellowhammer, this bias shifted the nesting season peak forward by about five days. It probably applies equally to all nest records examined in this study, and they can therefore be compared. The breeding season is approximately 14 days earlier in the Massachusetts-New York area than it is in the Maritimes. Although the weather was compatible with a truly earlier season in 1964, there is not enough information to show whether there is an annual variation.

SUMMARY

A total of 1,605 nest record cards from New York and Massachusetts and the Maritime Provinces of Canada were examined for variations in the breeding season and clutch-size of the Robin. In all areas but Massachusetts, clutch-size is higher in May than in April or June, suggesting a peak during that month. Clutch-size is significantly lower in the Maritimes than in New York-Massachusetts and declines steadily from New Brunswick to Nova Scotia to Prince Edward Island. The breeding season is approximately two weeks earlier in New York-Massachusetts than in the Maritime Provinces.

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A recent addition to the roll of Life Members of the Wilson Ornithological Society is Dr. Robert C. Stein, Professor of Biology at the State University College, Buffalo, New York. Dr. Stein has a bachelor's degree from St. Olaf College, and a doctorate from Cornell University. He has specialized in bioacoustics and the use of sound as a species isolating mechanism. He has published numerous papers in these fields and is perhaps best known for his work in studying the two different songs of the Trail's Flycatcher. Dr. Stein is a member of the AOU, the BOU, the Cooper Society, American Society of Zoologists, as well as several other ornithological and zoological organizations. He is married and has one child.