SIZE OF BIRD FLOCKS IN WINTER

BY LEONARD WING

IN the forty years during which the 'Bird-lore' Christmas censuses (1900–1939) have been taken, many observers have reported the number of individuals observed in flocks of various species. No concerted effort has been made to gather these data, but the reporting of flocks has been only additional data as far as the census-takers were concerned. Naturally, the number of flocks reported has varied from year to year. Over the entire forty-year period 2,514 flocks have been reported for 104 species of birds. The individuals contained in these flocks number 113,116, an average of 44.99 per flock. The number of flocks reported for each species varies from one to 1,101, the latter figure being the total for the Bob-white. The flocks have been reported both singly and in groups. Thus one observer might report two coveys containing thirty Bob-white while another might report two coveys containing sixteen and fourteen birds, respectively. Reported singly, there were 803 flocks containing a total of 34,964 individuals. The number of species with singly-reported flocks totalled 101.

There are two possible reasons for winter aggregations of birds: the birds may *associate* together because of a gregarious urge, or they may *congregate* for reasons of habitat. The association of individuals probably constitutes a true flock since the birds join together voluntarily. The congregation probably should not be considered a true flock since the birds are thrown together only because the environment which they individually seek is limited.

A number of apparently very large flocks have been reported. They range in size from 500 to 25,000 individuals, the latter at a Starling roost. In the case of a few of these, the reports indicate that they are not true flocks but rather *aggregations* of smaller flocks. Where it has been possible to determine that such numbers were aggregations of smaller flocks, the data have been omitted from the tabulations used in this paper. In cases where the status could not be determined, they have been assumed to be true flocks.

Another matter of some significance is the minimum number of individuals that make up a flock. Should a pair of nuthatches be considered a flock? It is probable that two nuthatches associated together in winter constitute a true flock. They are not *mated* but are *associated* because of gregariousness, rather than because of environmental compulsion. Nuthatches and other associated birds call

back and forth, indicating that they are aware of and interested in others of their kind. The same may be said of true flocks of other species such as the Bob-white. On the other hand, the Ring-necked Pheasant may be cited as an example of birds that are chiefly solitary, and which rarely congregate except when thrown together by scarcity of wintering habitats. We can probably interpret a true flock as two or more birds associated together because of an internal gregarious urge rather than congregated together because of external environmental pressure.

The flocks of each species reported have been separated into three groups: migratory species, semi-migratory species, and resident species. Designation of species as 'migratory', 'semi-migratory', or 'resident' presents somewhat of a problem. The classifications of migratory and resident are quite clear-cut, but what constitutes semi-migratory species is not so clear. Semi-migratory species are here considered to be those that exhibit a tendency to migrate in parts of the range and to be resident in other parts of the range in considerable numbers. Naturally, decisions have had to be somewhat arbitrary in a number of cases. It is believed, however, that these designations are substantially sound.

In a summation of the data for those species for which more than ten flocks have been reported, the Grackle (Purple, Florida, and Bronzed) with 433.87 individuals has the largest average flock size of all the species for which data for ten or more flocks are available. Next is the Snow Bunting with an average of 310.55. At the other end of the scale is the White-breasted Nuthatch with an average of 2.29 individuals.

The weight of the average flock[1] puts the Canada Goose at the head of the list with 180,000 grams. The Golden-crowned Kinglet with an average of 35 grams per flock is at the bottom of the list. The flocks of the migratory birds are heavier than those of the non-migratory birds. Heavier flocks are found in the relatively omnivorous species than in the insect-eating or granivorous species. The weight of the flock also varies with the cruising radius of the species. With the exception of the pheasant (which probably does not have true flocks), the Hungarian Partridge, and the Bob-white, no species of low daily cruising radius averages more than 1,000 grams per flock. Birds having flocks averaging in excess of 2,500 grams (excepting pheasant and Hungarian Partridge) have daily cruising radii of five miles or more. The relationship between the

[1] The weight of the average flock has been estimated by multiplying the average weight of the individual by the number of birds in the average flock.

weight of the flocks and the cruising radii reflects the greater mobility needed for flocks requiring larger quantities of food. It seem probable that the greater mobility makes possible the larger flocks.

In order to test the probability that mobility and habit differences are general, the data have been recombined into natural groupings in Table 1. While the data for several groups are not so plentiful

TABLE 1

AVERAGE SIZE OF FLOCKS BY GROUPS

	Number of flocks	*Number of individuals*	*Average size of flock*
Dabbling Ducks	22	870	29.55
Diving Ducks	33	13,724	415.88
Fish Ducks	9	242	26.88
All ducks (including 'Unidentified')	68	19,598	288.21
Galliformes	1,197	14,174	11.84
Galliformes other than Bob-white	96	928	9.67
Shorebirds	19	635	33.42
Passeriformes	1,145	75,635	66.05
Migratory Passeriformes	643	68,482	106.50
Semi-migratory Passeriformes	238	4,832	20.30
Resident Passeriformes	264	2,321	9.79
Fringillidae	464	18,602	40.09
Migratory Fringillidae	326	16,062	49.27
Semi-migratory Fringillidae	99	2,133	21.55
Resident Fringillidae	39	407	10.44
Migratory birds	795	91,374	114.94
Migratory flocks (averaging under 100 birds each)	548	19,771	36.08
Migratory flocks (averaging more than 100 birds each)	247	71,603	289.89
Semi-migratory birds	252	5,140	20.40
Resident birds	1,467	16,602	11.32
Resident birds other than Galliformes	270	2,428	8.99
All flocks (104 species)	2,514	113,116	44.99

as one would wish, certain relationships are indicated. The diving ducks have the largest average flock size of all, a corollary of their cruising radius and available food. It is probable that a better knowledge of flock composition making up aggregations will materially reduce the apparent average size of the flock.

The tendency of the more sedentary birds to associate in flocks smaller than those of migratory birds is shown by the summations

for migratory, semi-migratory, and resident species. The 795 flocks of migratory species average 114.94 birds while the 1,467 flocks of resident species average but 11.32. Removal of the 1,197 flocks of gallinaceous birds leaves 270 flocks of resident birds averaging 8.99 individuals. It is obvious that the difference is a consistent one, not traceable to the preponderance of gallinaceous flocks. The semi-migratory flocks average 20.40 individuals which is less than a sixth of the size of the migratory flocks. On the other hand, the resident flocks average less than half the size of semi-migratory flocks and but a tenth of the size of the migratory flocks.

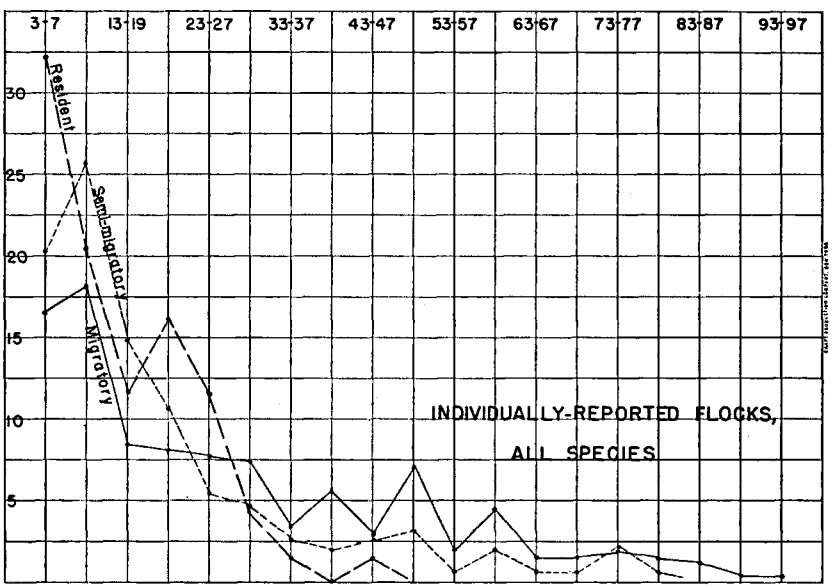
A separate summation for those having more than, and for those having less than 100 birds each was made in order to eliminate the influence of the huge flocks or any aggregations. The 247 flocks of more than 100 birds each, averaged 289.89 whereas the 548 flocks of less than 100 birds each averaged 36.08. The latter average is still twice the average for all semi-migratory birds and nearly four times the average of all resident birds. We are justified in concluding that the difference in size between the migratory, semi-migratory, and resident flocks is a true characteristic.

The data for the Passeriformes and the Fringillidae are sufficient to warrant analyzing them to determine whether or not the differences between the size of migratory, semi-migratory, and resident flocks is distinguishable in species of as close affinities as found in orders and families. The migratory, semi-migratory, and resident flocks of Passeriformes average 106.50, 20.30 and 9.79, respectively. The semi-migratory are but a fifth of the size of the migratory flocks while the residents are but a tenth of the size of the migratory flocks. This approximates the ratios for all species of migratory, semi-migratory, and resident birds. It is possible that the large numbers of Passeriformes flocks are responsible for the ratios for all species. However, a check of the non-Passeriformes flocks indicates that this is not the case.

The migratory Fringillidae average 49.27 birds, while the semi-migratory and resident species average 21.55 and 10.44, respectively. The difference between the semi-migratory and the resident is substantially the same as before, but the size of the migratory flocks has been reduced by a half, likewise reducing the ratios proportionately. It is clear from these breakdowns that the relationship between the size of migratory, semi-migratory, and resident flocks is true.

Flocks reported singly total 803 for 101 species. In order to determine the range between the respective maximum and minimum average flocks for the three groups, the largest and the smallest flock

for each species have been combined separately. The average of the respective largest flocks is 346.18 for the 101 species while the average of the smallest is 15.62. The occurrence of a larger average flock in the migratory than in either the semi-migratory or the resident species is found in both the average maximum and the average minimum flocks. The difference between the average minimum flock and the average maximum flock is approximately thirty times in the migratory group but only three times in the semi-migratory and resident groups. It is clear that a greater range in the size of flocks occurs in migratory species than in either semi-migratory or



TEXT-FIG. 1.—Frequency grouping of individually reported flocks.

resident species, a fact to be noted in the data of Table 1. The flock is a more consistent unit in the more sedentary birds than in the more migratory.

A frequency grouping of the flocks reported individually shows some interesting concentrations. The flocks have been grouped by fives between three and ninety-seven birds per flock. Only one flock smaller than three has been reported so that three is taken as the starting point. There are a number of scattered reports of flocks larger than ninety-seven, but these reports are not necessary to a frequency distribution grouped by fives. The data have been graphed in Text-figure 1. From the graph and the tabulation it

appears that the flocks of resident birds concentrate in the low range while the semi-migratory and migratory species have flocks somewhat larger in size. Fifty per cent of the resident flocks number 8–12 individuals or less while fifty per cent of the semi-migratory flocks are under 13–17 individuals. The flocks of the migratory birds do not total fifty per cent until the 18–22 grouping is reached. Similarly, we find that the flocks reach seventy-five per cent at the 18–22, 23–27, and 38–42 groupings, respectively. The flocks of resident birds drop off at the fifty mark while the semi-migratory groups end at eighty-five with but few scattered flocks beyond.

The average flock-size for the Bob-white, based upon 1,101 flocks is 12.03 birds. There are data for 96 gallinaceous flocks other than Bob-white and these average 9.67 birds per flock. Inasmuch as the Bob-white has the lowest cruising radius of the gregarious gallinaceous birds reported, it seems likely that the size of the flocks is related inversely to the cruising distance as well as to the size of the individual birds.

There were 188 Bob-white flocks reported singly. A frequency distribution shows that the majority of Bob-white coveys range between 7 and 19 individuals. The few which are larger are probably combined coveys which have not yet re-formed as a result of the 'fall shuffle.' The size of the coveys varies from region to region. In a summary of the regional distribution of the flocks, the largest coveys are found in the North-central region, averaging 12.54. The smallest are found in the Gulf States, averaging 10.54. They differ in size by two birds. The second largest flocks are found in the Northeastern region where they average about one bird smaller than the coveys of the North-central region. Likewise the coveys of the Central region average slightly less than coveys of the Northeastern region. These size differences parallel the differences in weather and seem to reflect the greater need for protection from cold which is provided by the larger roosting coveys inhabiting the coldest regions.

The temperature difference for the respective sections becomes important for Bob-white as winter progresses. Due to the continental influence on temperature distribution, during the early fall temperatures approach uniformity for a brief period in the four regions. The differences between the interior of the continent and the coast, and between the North and the South become pronounced as winter advances. By Christmas time the differences are decidedly pronounced, even more pronounced (especially between the North-central and the Northeastern regions) than the average monthly temperature indicates.

SUMMARY

During the interval 1900–1939 inclusive, 2,514 flocks containing 113,116 individuals have been reported for 104 species of birds. The number of singly-reported flocks is 803 containing 34,964 individuals.

The species have been grouped as migratory, semi-migratory, and resident. Migratory species have larger flocks than semi-migratory or resident species. Semi-migratory species have larger flocks than resident species.

Grackles have the largest flocks (averaging 433.87) while the White-breasted Nuthatch has the smallest (averaging 2.29).

The Canada Goose has the highest average weight per flock (180,000 grams), while the Golden-crowned Kinglet has the lowest (35 grams). Migratory species have flocks of greater average weight than non-migratory species.

Heavier flocks are found in relatively omnivorous species than in insect-eating or granivorous species.

With the exception of the Bob-white, no species of low daily cruising radius has true flocks averaging more than 1,000 grams in weight.

With the exception of the Hungarian Partridge, true flocks averaging more than 2,500 grams in weight are found only in species having daily cruising radii in excess of five miles.

The data for the Bob-white indicate that the size of its covey is correlated with temperature, the covey averaging the largest in the North-central States and smallest in the Gulf States.

The State College of Washington
Pullman, Washington