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Wintering Distribution Changes in Mallards and Black Ducks

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ABSTRACT: Through the use of data compiled by the Audubon Society's annual Christmas Counts, an attempt has been made to trace the distributional changes of wintering Mallards and Black Ducks in the eastern states from 1900 to the present. During this period the Black Duck has increased relative to the Mallard in few if any states (the Great Lakes region), whereas the Mallard has increased nearly everywhere else (except in the extreme northeast), particularly in the southern coastal states. Deforestation and changes in land use are suggested as probable reasons for this trend, which is not likely to be reversed.

Although several rather spectacular shifts in the distributions of various American species of birds have become evident in recent years, the "colonization" of the eastern states by the Mallard (*Anas platyrhynchos*) has not been so generally recognized. The magnitude of this range extension has been great nevertheless, and the probable reasons for it have been discussed elsewhere (Johnsgard, 1959, 1961). Concomitant with the increase of the Mallard in the eastern states, the native Black Duck (*Anas rubripes*) has suffered a decline in numbers, and apparently for some of the same reasons as the Mallard has increased. Since this trend is not likely to be reversed in the future, it will be of interest to follow it carefully and thus possibly to predict the fate of the Black Duck.

Wing (1943) became interested in the ratios of Mallards to Black Ducks throughout the eastern states before the range shift was at all apparent, and calculated state ratios for the two forms on the basis of the data provided by the annual Audubon Society Christmas counts for the forty years 1900 to 1939. He found that the average ratios for that period (which, because of the continuously increasing number of counts, is probably typical of the situation somewhat after the midpoint of 1920) indicated that the zone of equal ratios fell in a north-south line between Michigan and western Florida. East of this line the Black Duck was markedly dominant over the Mallard and west of it the Mallard was equally dominant. Wing's data are presented in Table I, but they are converted from simple Mallard: Black Duck ratios to the alternative method of calculating the relative percentages of each form in the combined sample. This latter means of presenting ratio data has certain statistical advantages (Hickey, 1957). Arguments supporting the use of these data as unbiased estimates of wintering Mallard and Black Duck populations have been presented elsewhere (Johnsgard, 1959), and so will not be repeated here.

To test the possibility that these counts might indicate the degree to which the Mallard has moved eastward in recent years, it was de-

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cided to bring these calculations up to date, by collating the Christmas Count records for the twenty years 1940 to 1959. Since the numbers of counts and counters has increased enormously since 1940, the data were divided into earlier (1940-1949) and later (1950-1959) periods. Again, although the averages for these total periods are presented (Table I), they probably reflect the existing conditions somewhat after the mid-points of the periods. It must be remembered too that changes in the ratios can be attributed both to Mallard increases in the East and to Black Duck decreases, rather than only to Mallard increases alone.

The data for the years 1940 to 1949 show some interesting differences from Wing's data for the preceding forty years. Of the states east of the Michigan to western Florida zone, one state (Florida) exhibits a majority of Mallards in the wintering population. Fourteen states exhibit what are probably significant reductions in the percentages of Black Ducks, with the most marked changes occurring in Florida, North Carolina, and Michigan. Only four states (Wisconsin, Kentucky, West Virginia and Virginia) exhibit noticeable increases in Black Duck ratios; of these West Virginia's data are probably not based on a sufficient sample. Since Wing's (1943) data did not include information on sample size it is impossible to evaluate these differences statistically.

The data for the years 1950 to 1959 bring to light some even more striking changes. Five states (Florida, Georgia, South Carolina, North Carolina and Ohio) east of the Michigan-western Florida zone exhibit majorities of Mallards in the samples. Eighteen states exhibit marked declines in Black Duck ratios from those presented by Wing. Only two states (Minnesota and Wisconsin) exhibit significant increases in Black Duck ratios over those of preceding years.

To provide a relatively up-to-date picture of the situation, data for the years 1958 to 1960 are also presented in Table I. Although in some cases the sample sizes are too small to be useful, in most a still greater decrease in Black Duck ratios is evident. It is astonishing to contemplate that in twenty years Delaware, for example, has undergone a shift in ratios from an almost pure Black Duck population to one in which Mallards are more abundant than Black Ducks. Other only slightly less remarkable examples are provided by the coastal states from North Carolina to Florida. On the other hand, the northern interior states have undergone less pronounced decreases, such as, for example, Michigan, Illinois, Indiana and Ohio. If a line delineating the zone of equality between Mallard and Black ratios were to be drawn today, it would still have to pass through Michigan at the north, but be deflected eastward to the south so as to pass through Virginia and North Carolina. Only in Maine and the Canadian maritime provinces may the wintering population still be considered "pure" Black Duck. It appears, therefore, that the Mallard has been invading the East by a "flanking" movement along the Gulf Coast states. It is hard to determine how rapidly the Mallard has colonized

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TABLE I.—Relative numbers of wintering Mallards and Black Ducks, based on Audubon Christmas Counts from 1900-1960

State or Province	Total Black Ducks	Total Mallards	Per cent Black Duck
Nova Scotia			
1950-1959	5,962	2	99.97
1958-1960	1,865	1	99.95
Quebec			
1940-1949	2,092	81	96.27
1950-1959	6,314	155	97.60
1958-1960	1,821	50	97.33
Ontario			
1900-1939	.....	.....	97.51
1940-1949	9,370	1,450	86.59
1950-1959	15,163	7,936	65.36
1958-1960	7,261	3,793	65.69
Maine			
1940-1949	1,773	2	99.89
1950-1959	6,543	43	99.35
1958-1960	5,102	29	99.43
New Hampshire			
1950-1959	5,791	171	97.13
1958-1960	1,736	234	88.12
Vermont			
1940-1949	272	11	96.11
1950-1959	538	12	97.82
1958-1960	170	5	97.14
Massachusetts			
1900-1939	.....	.....	99.28
1940-1949	78,570	472	98.52
1950-1959	117,499	7,002	94.37
1958-1960	53,679	4,606	90.38
Rhode Island			
1900-1939	.....	.....	99.35
1940-1949	18,468	101	99.45
1950-1959	18,759	410	97.86
1958-1960	6,800	221	96.85
Connecticut			
1900-1939	.....	.....	94.31
1940-1949	19,398	577	97.11
1950-1959	39,802	13,646	74.47
1958-1960	15,269	8,838	63.34
New York (entire state)			
1900-1939	.....	.....	96.12
1940-1949	135,376	13,426	90.97
1950-1959	202,713	30,563	86.90
1958-1960	65,891	14,417	82.05

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TABLE I.—(continued)

State or Province	Total Black Ducks	Total Mallards	Per cent Black Duck
New York (Long Island)			
1940-1949	78,172	4,990	94.00
1950-1959	125,489	13,711	90.15
1958-1960	43,530	7,276	85.68
New York (rest of state)			
1940-1949	57,204	8,436	87.15
1950-1959	77,224	16,852	82.09
1958-1960	22,361	7,141	75.79
New Jersey			
1900-1939	.....	.....	99.17
1940-1949	50,305	3,922	92.76
1950-1959	226,744	28,631	88.79
1958-1960	104,640	10,542	90.85
Pennsylvania			
1900-1939	.....	.....	95.39
1940-1949	63,933	9,953	86.52
1950-1959	90,307	55,738	61.83
1958-1960	20,456	21,043	49.29
Delaware			
1900-1939	.....	.....	99.08
1940-1949	21,777	634	97.17
1950-1959	118,489	85,175	58.18
1958-1960	31,288	42,432	42.44
Maryland			
1900-1939	.....	.....	94.08
1940-1949	23,309	3,108	88.23
1950-1959	102,184	60,343	62.87
1958-1960	43,482	30,719	58.60
Washington, D.C.			
1940-1949	1,854	376	83.14
1950-1959	7,619	2,170	77.83
1958-1960	1,717	449	79.27
Virginia			
1900-1939	.....	.....	67.53
1940-1949	15,557	2,599	85.67
1950-1959	68,736	31,259	68.74
1958-1960	26,531	13,706	65.94
North Carolina			
1900-1939	.....	.....	90.13
1940-1949	3,133	1,831	63.10
1950-1959	28,830	29,522	49.41
1958-1960	16,849	16,593	50.38

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TABLE I.—(continued)

State or Province	Total Black Ducks	Total Mallards	Per cent Black Duck
South Carolina			
1900-1939	.....	.....	71.35
1940-1949	3,232	1,534	67.84
1950-1959	3,169	49,281	6.04
1958-1960	1,483	32,341	4.59
Georgia			
1900-1939	.....	.....	70.58
1940-1949	21,266	10,882	66.10
1950-1959	169	2,258	6.96
1958-1960	210	984	17.59
Florida			
1900-1939	.....	.....	65.98
1940-1949	1,188	1,854	29.09
1950-1959	1,142	4,164	21.52
1958-1960	304	1,296	19.00
Ohio			
1900-1939	.....	.....	66.89
1940-1949	33,983	22,266	60.32
1950-1959	105,670	150,582	41.23
1958-1960	65,153	78,541	45.34
West Virginia			
1900-1939	.....	.....	88.01
1940-1949	622	35	94.67
1950-1959	1,321	674	66.21
1958-1960	642	427	60.06
Kentucky			
1900-1939	.....	.....	15.31
1940-1949	8,216	11,083	42.74
1950-1959	39,902	375,891	9.60
1958-1960	6,912	23,875	22.45
Tennessee			
1900-1939	.....	.....	19.54
1940-1949	4,477	33,844	11.68
1950-1959	6,044	354,969	1.67
1958-1960	8,288	176,772	4.48
Alabama			
1940-1949	4,257	19,380	18.02
1950-1959	5,024	59,720	7.70
1958-1960	89	380	18.98
Mississippi			
1900-1939	.....	.....	14.56
1940-1949	96	1,119	7.90
1950-1959	2	11,621	0.02
1958-1960	0	178	0.00

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TABLE I.—(continued)

State or Province	Total Black Ducks	Total Mallards	Per cent Black Duck
Michigan			
1900-1939	.....	.....	71.75
1940-1949	7,800	6,656	53.91
1950-1959	15,275	11,990	56.02
1958-1960	2,146	1,868	53.46
Indiana			
1900-1939	.....	.....	21.37
1940-1949	26,425	93,660	22.03
1950-1959	68,372	1,442,230	4.53
1958-1960	4,935	69,187	6.65
Illinois			
1900-1939	.....	.....	8.52
1940-1949	51,625	2,311,226	2.19
1950-1959	74,486	1,410,753	5.01
1958-1960	11,112	290,805	3.68
Wisconsin			
1900-1939	.....	.....	10.10
1940-1949	7,175	14,794	32.38
1950-1959	12,543	41,853	23.06
1958-1960	3,452	22,118	13.50
Minnesota			
1900-1939	.....	.....	0.07
1940-1949	36	3,337	1.07
1950-1959	682	8,705	7.26
1958-1960	31	4,463	0.69
Iowa			
1900-1939	.....	.....	0.22
1940-1949	65	29,745	0.22
1950-1959	210	45,724	0.46
1958-1960	207	13,949	1.46
Missouri			
1900-1939	.....	.....	0.70
1940-1949	460	94,516	0.48
1950-1959	163	275,485	0.06
1958-1960	93	168,045	0.06
Arkansas			
1900-1939	.....	.....	0.33
1940-1949	1	871	0.12
1950-1959	136	479,094	0.03
1958-1960	32	156,625	0.02
Louisiana			
1900-1939	.....	.....	7.57
1940-1949	490	20,626	2.33
1950-1959	194	28,228	0.68
1958-1960	54	4,581	1.16

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TABLE I.—(continued)

State or Province	Total Black Ducks	Total Mallards	Per cent Black Duck
North Dakota			
1940-1949	1	1,977	0.05
1950-1959	0	1,661	0.00
1958-1960	0	99	0.00
South Dakota			
1900-1939	.....	.....	0.21
1940-1949	10	340,265	0.003
1950-1959	35	484,132	0.01
1958-1960	10	300,664	0.003
Nebraska			
1940-1949	0	475	0.00
1950-1959	0	119,635	0.00
1958-1960	0	226,468	0.00
Kansas			
1940-1949	13	18,457	0.07
1950-1959	23	278,104	0.01
1958-1960	4	58,712	0.007
Oklahoma			
1940-1949	65	271,791	0.02
1950-1959	42	219,765	0.02
1958-1960	5	34,058	0.01
Texas			
1900-1939	.....	.....	0.85
1940-1949	29	371,396	0.01
1950-1959	122	780,629	0.01
1958-1960	17	134,715	0.01

the eastern states as a breeding bird, but counts made by federal and state biologists during the breeding season indicate that Mallard-Black Duck ratios in the northern states and provinces during the period 1948-1956 closely parallel the wintering ratios of those areas for the same period (Johnsgard, 1959).

It would appear that the Mallard has in the past few decades made enormous inroads into what formerly was predominantly Black Duck territory, whereas the reverse is true only to a very limited extent in the Great Lakes region. Probably this can be attributed to the great changes in land use, and the deforestation, which have occurred in the East during the present century, and which have had the effect of decreasing Black Duck breeding habitat while at the same time increasing Mallard habitat. Whether sufficient preservation and regeneration of the northeastern forests will occur to permit the Black Duck to retain a stronghold is impossible to predict, but it appears likely that the Black Duck, through hybridization with the much larger

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Mallard gene pool and through the constant reduction of its breeding habitat, may eventually disappear as a distinct entity from our fauna.

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