

## DUCK WEIGHTS IN ILLINOIS

BY FRANK C. BELLROSE AND ARTHUR S. HAWKINS

A STUDY of the weights of ducks migrating through Illinois was undertaken (1) to discover whether there was basis for the contention of some Illinois hunters in 1938 that many ducks were in poor flesh or were "starving"; (2) to determine the weights of various species; (3) to ascertain the validity of reports concerning Mallards and Black Ducks weighing four or five pounds each. As part of the study, 4,979 ducks were weighed in 1938 to 1940. Acknowledgement is made to Drs. Herman and Elizabeth Brown Chase for statistical analysis.

## MEASURING WEIGHTS OF DUCKS

Within each duck species, weights varied according to the age class (juveniles or adults), sex, wetness of feathers, amount of food in the crop, and the amount of blood lost. We recorded the approximate crop content and wetness of feathers but found it impractical to correct weight data for these variables or for the loss of blood. Wet and dirt-matted feathers added about two per cent to the over-all weights.

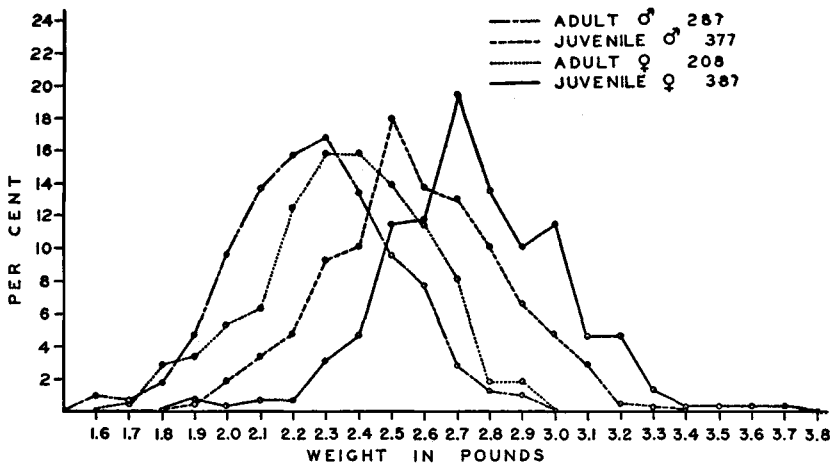
In 1938, the first year of the study, the cloacal method of aging ducks was unknown (Hochbaum, 1942). However, we classified many ducks as juveniles or adults by the presence or absence of notched tail feathers (Kortright, 1942); Gadwalls, Baldpates, Shovellers, and Lesser Scaups were species in which most juveniles retained their juvenal tail feathers. In 1939 and 1940, all ducks were aged by the cloacal method.

## WEIGHTS

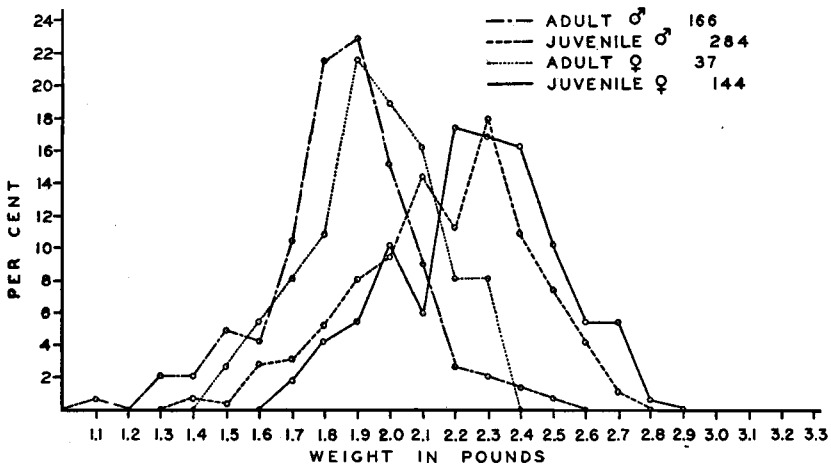
Apparently hunters, like fishermen, are prone to exaggerate the weight of their take, for we have heard reports of four- and five-pound Mallards and in a leading book on duck shooting, the author reports shooting eight Black Ducks "that must have weighed nearly five pounds apiece." Among the 3,261 Mallards that we weighed, the heaviest was 3.7 pounds. The distribution of Mallard and Pintail weights in 1940 are shown in text-figs. 1 and 2. Adult drake Black Ducks in Illinois averaged 2.65 pounds; the top weight among 69 individuals was 3.1 pounds.

We have noted that Mallards weighing over three pounds show characteristics similar to barnyard Mallards. It is our opinion, therefore, that most Mallards weighing more than three pounds are from, or related to, barnyard birds.

A comparison of the weights of different species of ducks is given in Table 1. The Canvas-back was apparently the heaviest of the spe-



Text-fig. 1. The weight distribution, by age and sex classes, of 1,259 Mallards shot in the Illinois River Valley, 1940.



Text-fig. 2. The weight distribution, by age and sex classes, of 631 Pintails shot in the Illinois River Valley, 1940.

cies weighed. Mallards and Black Ducks weighed about the same; both were significantly heavier than the Pintail in all sex and age classes. Gadwall weights were similar to those of Pintails except in the juvenile male class where Pintails were heavier. Baldpates averaged about one-fourth pound less than Gadwalls. Lesser Scaups weighed slightly more than Baldpates and slightly less than Gadwalls. The Green-winged Teal was the lightest of the species weighed.

TABLE 1  
AVERAGE WEIGHTS OF DUCKS IN THE ILLINOIS RIVER VALLEY, 1938-1940

Species	Adult male			Juvenile male			Adult female			Juvenile female		
	Number	Average weight in pounds	Standard error	Number	Average weight in pounds	Standard error	Number	Average weight in pounds	Standard error	Number	Average weight in pounds	Standard error
Mallard	631	2.78	±.01	730	2.59	±.01	402	2.39	±.02	671	2.28	±.01
Pintail	237	2.28	±.02	403	2.15	±.01	60	1.96	±.03	219	1.84	±.02
Gadwall <sup>1</sup>	16	2.18	±.06	68	2.00	±.03	14	1.87	±.04	66	1.78	±.03
Baldpate <sup>1</sup>	19	1.78	±.05	82	1.72	±.03	16	1.66	±.05	92	1.58	±.02
Black Duck	12	2.65	±.10	18	2.59	±.07	10	2.40	±.09	29	2.35	±.05
G.-w. Teal	21	0.86	±.01	38	0.82	±.01	10	0.78	±.02	31	0.74	±.02
Shoveller <sup>1</sup>	16	1.52	—	45	1.48	—	6	1.37	—	35	1.30	—
Lesser Scaup <sup>1</sup>	9	1.85	—	26	1.78	—	6	1.72	—	27	1.73	—
B.-w. Teal	0	—	—	4	1.13	—	5	0.95	—	13	0.95	—
Ring-neck	9	1.90	—	9	1.62	—	5	1.53	—	6	1.45	—
Redhead	1	2.62	—	3	2.33	—	3	2.37	—	1	2.10	—
Wood Duck <sup>2</sup>	4	1.53	—	5	1.57	—	0	—	—	4	1.22	—
Canvas-back	4	2.98	—	1	2.20	—	2	2.58	—	5	2.35	—
Ruddy Duck	3	1.35	—	0	—	—	2	1.21	—	0	—	—
	982			1432			541			1199		

<sup>1</sup> Includes 1938 data. All others only 1939, 1940.

<sup>2</sup> Live trapped Wood Ducks in September, 1943, weighed: 13 adult ♂, average 1.54 lbs.; 46 juvenile ♂, 14.6; 32 ♀, 1.42.

#### WEIGHT DIFFERENCES ASSOCIATED WITH SEX

Adult drakes of the Mallard, Pintail, Gadwall, and Green-winged Teal were (Table 1) significantly heavier than adult hens of the same species. In the juvenile class, drakes also were considerably heavier than hens for these species as well as for the Black Duck and the Baldpate. The degree that drakes were heavier than hens varied from 7 to 18 per cent for those species in which the sample was statistically significant (Table 1).

Among 24 species of birds, Baldwin and Kendeigh (1938) found that in 11 species the males were heavier than the females, while in nine species no difference in weight occurred between the sexes; in four species females were heavier than males.

#### WEIGHT DIFFERENCES ASSOCIATED WITH AGE

Adult ducks in most species weigh significantly more than juveniles in both drake and hen groups (Table 1). For species with a statistically significant sample, the degree that adults were heavier than juveniles ranged from 4 to 9 per cent, about half as much as differences in weight associated with sex.

Weight differences between juveniles and adults seem more pronounced in passerine and other small birds than in ducks. In 15

out of 19 species of birds, Baldwin and Kendeigh (1938) found that immatures were lighter than adults. Differences ranged from 3.5 per cent in sparrows to about 44 per cent in the Flicker.

#### WEIGHT VARIATIONS WITH LOCALITY

We investigated the possibility that weights varied by localities. Weights of Mallards were taken by Frederic Leopold in the Mississippi River Valley near Burlington, Iowa, in 1938 and 1939, as well as by us in the Illinois River Valley in 1938-1940. Ages of the ducks weighed near Burlington were not recorded, so we have compared weights only by sex classes (Table 2). Drake Mallards in the Illinois

TABLE 2  
DIFFERENCES IN WEIGHT OF MALLARDS IN THE ILLINOIS AND THE MISSISSIPPI RIVERS VALLEYS

Year	Sex	Illinois River			Mississippi River			Standard error of difference Probability	
		Number	Weight	Standard error	Number	Weight	Standard error		
1938	♂	334	2.70	±.02	109	2.59	±.03	.04	.006
	♀	266	2.32	±.02	118	2.33	±.03	.04	.80
1939	♂	766	2.69	±.01	97	2.52	±.03	.03	<.0001
	♀	478	2.34	±.01	96	2.24	±.03	.03	.0009

River Valley were significantly heavier than those weighed in the Mississippi River Valley during both years of the study. Illinois River hen Mallards outweighed Mississippi River hens in 1939, but in 1938, hen weights were similar in the two areas.

#### SEASONAL WEIGHTS

Weights of Mallards and Pintails were tabulated by two-week periods for the 1939 and 1940 seasons. Tables 3-6 show a drop in weight the last period of the season in six of the eight Pintail age and sex classes and six of the eight Mallard age and sex classes. However, differences are so slight as to have little statistical significance. While there is no well-defined seasonal trend, there are seasonal differences which are statistically significant. These probably resulted from variations in feeding conditions and from differences in reaction of the sex and age groups to temperature and snow.

Elder (1946) reported that Canada Geese were also lighter in winter than during the fall months. Waterfowl appear to differ in this respect from small birds. Baldwin and Kendeigh (1938) found that weights of small birds were higher during the winter than during the fall or summer; their weight curves for both adult and juvenile passerine birds show a rapid rise from October through December.

TABLE 3  
CHANGES IN WEIGHTS OF PINTAILS FROM OCTOBER 15 TO DECEMBER 15, 1939

<i>Date</i>	<i>Age</i>	<i>Sex</i>	<i>Number</i>	<i>Average weight</i>	<i>Standard error</i>	<i>Standard error of difference</i>	<i>Probability</i>
Oct. 15-Oct. 31	Adult	♂	32	2.35	± .07	.09	.89
Nov. 1-Nov. 15	Adult	♂	18	2.36	± .06		
Nov. 15-Nov. 30	Adult	♂	8	2.41	—		
Nov. 30-Dec. 15	Adult	♂	13	2.14	± .07		
Oct. 15-Oct. 31	Juvenile	♂	52	2.08	± .04	.07	.58
Nov. 1-Nov. 15	Juvenile	♂	24	2.12	± .06		
Nov. 16-Nov. 30	Juvenile	♂	23	2.21	± .05		
Dec. 1-Dec. 15	Juvenile	♂	20	1.99	± .04		
Oct. 15-Oct. 31	Adult	♀	7	2.04	—	.08	.61
Nov. 1-Nov. 15	Adult	♀	12	1.96	± .04		
Nov. 16-Nov. 30	Adult	♀	3	1.97	—		
Dec. 1-Dec. 15	Adult	♀	1	1.80	—		
Oct. 15-Oct. 31	Juvenile	♀	40	1.81	± .04	.10	.23
Nov. 1-Nov. 15	Juvenile	♀	17	1.85	± .07		
Nov. 16-Nov. 30	Juvenile	♀	12	1.73	± .07		
Dec. 1-Dec. 15	Juvenile	♀	6	1.90	—		

TABLE 4  
CHANGES IN WEIGHTS OF PINTAILS FROM OCTOBER 15 TO DECEMBER 15, 1940

<i>Date</i>	<i>Age</i>	<i>Sex</i>	<i>Number</i>	<i>Average weight</i>	<i>Standard error</i>	<i>Standard error of difference</i>	<i>Probability</i>
Oct. 15-Oct. 31	Adult	♂	90	2.23	± .03	.04	.001
Nov. 1-Nov. 15	Adult	♂	48	2.36	± .03		
Nov. 16-Nov. 30	Adult	♂	25	2.19	± .04		
Dec. 1-Dec. 15	Adult	♂	3	2.47	—		
Oct. 15-Oct. 31	Juvenile	♂	132	2.14	± .02	.03	< .0001
Nov. 1-Nov. 15	Juvenile	♂	112	2.27	± .02		
Nov. 16-Nov. 30	Juvenile	♂	32	2.04	± .04		
Dec. 1-Dec. 15	Juvenile	♂	8	1.86	—		
Oct. 15-Oct. 31	Adult	♀	16	1.89	± .04	.06	.0001
Nov. 1-Nov. 15	Adult	♀	11	2.14	± .05		
Nov. 16-Nov. 30	Adult	♀	9	1.87	± .06		
Dec. 1-Dec. 15	Adult	♀	1	1.70	—		
Oct. 15-Oct. 31	Juvenile	♀	65	1.85	± .03	.08	.48
Nov. 1-Nov. 15	Juvenile	♀	68	1.88	± .03		
Nov. 16-Nov. 30	Juvenile	♀	9	1.80	± .07		
Dec. 1-Dec. 15	Juvenile	♀	2	1.70	—		

TABLE 5  
CHANGES IN WEIGHTS OF MALLARDS FROM OCTOBER 15 TO DECEMBER 15, 1939

Date	Age	Sex	Number	Average weight	Standard error	Standard error of difference	Probability
Oct. 15-Oct. 31	Adult	♂	92	2.80	± .03	.04	.07
Nov. 1-Nov. 15	Adult	♂	100	2.87	± .02		
Nov. 16-Nov. 30	Adult	♂	80	2.76	± .03		
Dec. 1-Dec. 15	Adult	♂	72	2.77	± .03		
Oct. 15-Oct. 31	Juvenile	♂	52	2.55	± .03	.04	.19
Nov. 1-Nov. 15	Juvenile	♂	87	2.60	± .03		
Nov. 16-Nov. 30	Juvenile	♂	130	2.61	± .02		
Dec. 1-Dec. 15	Juvenile	♂	84	2.59	± .03		
Oct. 15-Oct. 31	Adult	♀	64	2.50	± .03	.05	.16
Nov. 1-Nov. 15	Adult	♀	41	2.43	± .04		
Nov. 16-Nov. 30	Adult	♀	44	2.34	± .04		
Dec. 1-Dec. 15	Adult	♀	45	2.38	± .05		
Oct. 15-Oct. 31	Juvenile	♀	63	2.28	± .03	.04	.62
Nov. 1-Nov. 15	Juvenile	♀	63	2.30	± .03		
Nov. 16-Nov. 30	Juvenile	♀	99	2.34	± .03		
Dec. 1-Dec. 15	Juvenile	♀	59	2.24	± .03		

TABLE 6  
CHANGES IN WEIGHTS OF MALLARDS FROM OCTOBER 15 TO DECEMBER 15, 1940

Date	Age	Sex	Number	Average weight	Standard error	Standard error of difference	Probability
Oct. 15-Oct. 31	Adult	♂	66	2.82	± .03	.04	.006
Nov. 1-Nov. 15	Adult	♂	104	2.71	± .03		
Nov. 16-Nov. 30	Adult	♂	75	2.76	± .03		
Dec. 1-Dec. 15	Adult	♂	42	2.73	± .05		
Oct. 15-Oct. 31	Juvenile	♂	149	2.60	± .02	.04	.80
Nov. 1-Nov. 15	Juvenile	♂	114	2.59	± .03		
Nov. 16-Nov. 30	Juvenile	♂	66	2.47	± .03		
Dec. 1-Dec. 15	Juvenile	♂	48	2.62	± .03		
Oct. 15-Oct. 31	Adult	♀	74	2.41	± .03	.05	.16
Nov. 1-Nov. 15	Adult	♀	52	2.34	± .04		
Nov. 16-Nov. 30	Adult	♀	51	2.34	± .03		
Dec. 1-Dec. 15	Adult	♀	31	2.31	± .05		
					first period	.06	.09
Oct. 15-Oct. 31	Juvenile	♀	167	2.28	± .02	.03	.04
Nov. 1-Nov. 15	Juvenile	♀	106	2.34	± .02		
Nov. 16-Nov. 30	Juvenile	♀	64	2.14	± .02		
Dec. 1-Dec. 15	Juvenile	♀	50	2.26	± .04		

A number of other investigators have recorded similar seasonal trends in the weights of small birds.

#### ANNUAL WEIGHTS

Mallards in all age and sex groups, and Pintails in three such groups, averaged (Tables 7 and 8), slightly more in 1939 than in 1940. However, differences were so slight as to have no statistical significance. Again, drake and hen Pintails were heavier in 1939 than in 1938, but differences were not statistically significant (Table 9).

#### EFFECT OF FOOD AND WEATHER ON WEIGHTS

As indicated by data, food and weather have only a slight effect on the weights of the ducks taken in Illinois. To illustrate, compare the abundance of the principal plants Pintails use for food with the weights of that species.

These plants—millets, smartweeds, pigweeds, nutgrasses—were almost absent from the Illinois River Valley in 1938; in 1939 there were about 595 acres of the plants in five lake basins, and in 1940 there were about 1,780 acres in the same lake basins. Yet the increased food supply did not result in any significant overall increases in either Pintail or Mallard weights. However, Pintail numbers increased—comprising 1.44 per cent of the duck population in the Illinois River Valley in 1938, 2.19 per cent in 1939, and 3.35 per cent in 1940, as the food supply increased. Mallards obtain the bulk of their food from waste corn left in fields by the mechanical pickers; this supply varies little from year to year.

Available food supply is apparently a factor in Mallard weight differences in the Illinois and Mississippi River valleys, for waste corn, although occurring in almost unlimited quantities in both areas, is largely unavailable in the Mississippi River Valley because of the lack of a suitable series of rest areas there. The lack of rest areas apparently results in a more rapid migration through the Mississippi region than through the Illinois River Valley.

When cold weather and snow have greatly reduced the food supply, this has seldom reduced the weight of ducks, although severe weather probably was responsible for a statistically significant loss in weight among adult and juvenile drake Pintails and juvenile hen Mallards from December 1 to 15, 1939 (Tables 3 and 5). Mild weather and a bountiful food supply, which prevailed from November 1 to 11, 1940, probably accounted for the increased weight of Pintails during that period (Table 4).

TABLE 7  
YEARLY AVERAGE WEIGHTS OF MALLARDS, BY AGE AND SEX CLASSES, IN THE  
ILLINOIS RIVER VALLEY, 1939-1940

Year	Age	Sex	Number	Average weight	Standard error	Standard error of difference	Probability
1939	Adult	♂	344	2.80	± .01	.024	.04
1940	Adult	♂	287	2.75	± .02		
1939	Adult	♀	194	2.42	± .02	.028	.04
1940	Adult	♀	208	2.36	± .02		
1939	Juvenile	♂	353	2.60	± .01	.014	.16
1940	Juvenile	♂	377	2.58	± .01		
1939	Juvenile	♀	284	2.30	± .01	.014	.04
1940	Juvenile	♀	387	2.27	± .01		

TABLE 8  
YEARLY AVERAGE WEIGHTS OF PINTAILS, BY AGE AND SEX CLASSES, IN THE  
ILLINOIS RIVER VALLEY, 1939-1940

Year	Age	Sex	Number	Average weight	Standard error	Standard error of difference	Probability
1939	Adult	♂	71	2.32	± .03	.04	.13
1940	Adult	♂	166	2.26	± .02		
1939	Adult	♀	23	1.98	± .04	.05	.55
1940	Adult	♀	37	1.95	± .03		
1939	Juvenile	♂	119	2.20	± .03	.04	.45
1940	Juvenile	♂	284	2.17	± .02		
1939	Juvenile	♀	75	1.81	± .03	.04	.19
1940	Juvenile	♀	144	1.86	± .02		

TABLE 9  
YEARLY AVERAGE WEIGHTS OF PINTAILS, BY SEX CLASSES, IN THE  
ILLINOIS RIVER VALLEY, 1938-1939

Year	Sex	Number	Average weight	Standard error	Standard error of difference	Probability
1938	♂	112	2.15	± .02	.04	.32
1939	♂	202	2.19	± .03		
1938	♀	93	1.79	± .02	.04	.13
1939	♀	125	1.85	± .03		

We deduce, therefore, that, except in rare instances, the number of ducks present in an area is well within the carrying capacity of that area; a reduction in the available food supply, brought about by adverse weather or other conditions, results in a reduction in numbers roughly comparable to the reduction in food supply. Consequently, the ducks remaining have sufficient food to maintain their body weight.



We conclude that: (1) Illinois hunters in 1938 were mistaken in their belief that ducks were in poor flesh because of a scarcity of food. (Perhaps these hunters were killing unusually large numbers of juveniles which average from 4 to 9 per cent lighter than adults.) Because of mobility, ducks undergo little change in weight with adverse food and weather conditions in a limited area. (2) Canvas-backs are the heaviest of the ducks that migrate through Illinois, followed by Mallards and Black Ducks, Pintails, and Gadwalls; Green-winged Teals are the lightest. (3) Very few Mallards or Black Ducks weigh over three pounds; no ducks of these species were found to weigh four or five pounds.

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*Illinois Natural History Survey*  
*Urbana, Illinois*

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ALLAN BROOKS, 1869-1946

BY HAMILTON M. LAING

*Plate 15*

A REVIEW of the life of the late Allan Brooks reminds us anew that naturalists, like poets, are born—or made very young. Scion of a naturalist father, William Edwin Brooks, of Newcastle-on-Tyne stock, engineer by profession but ornithologist in heart, young Allan had the blood. Named after one of his father's greatest friends—Allan O. Hume—he seems to have climbed out of the cradle into an environment which in tenderest years shaped a course that through life never wavered. Destiny marked him for ornithology. In a biography covering the greater part of his life (*Condor*, Jan.-Feb., 1938) Marjorie Brooks has given us almost all the salient points about Allan's early days that probably we shall ever know, and everything points to the fact that he was born with a genius for biological study, a vast