A STUDY OF SEX RATIOS OF MALLARDS IN THE STATE OF WASHINGTON

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Many data have been recorded on the sex of waterfowl; these have been obtained from duck-banding stations, from hunters' kills by means of questionnaires and personal examinations of the bags of hunters, and by direct counts of migrating and wintering populations. But the questions raised by the several types of available data are such that the subject of sex ratios in waterfowl warrants continued study by all methods available.

The writer became interested in the sex ratio of Mallards (*Anas platyrhynchos*) in Washington when the first returns from questionnaires sent to duck hunters were examined at the end of the 1943 duck-hunting season. The collecting of data on sex ratios was incidental to other work and restricted to the Mallard because sexes in it are easily recognized and it is the most important game duck in the state as a whole. From 1943

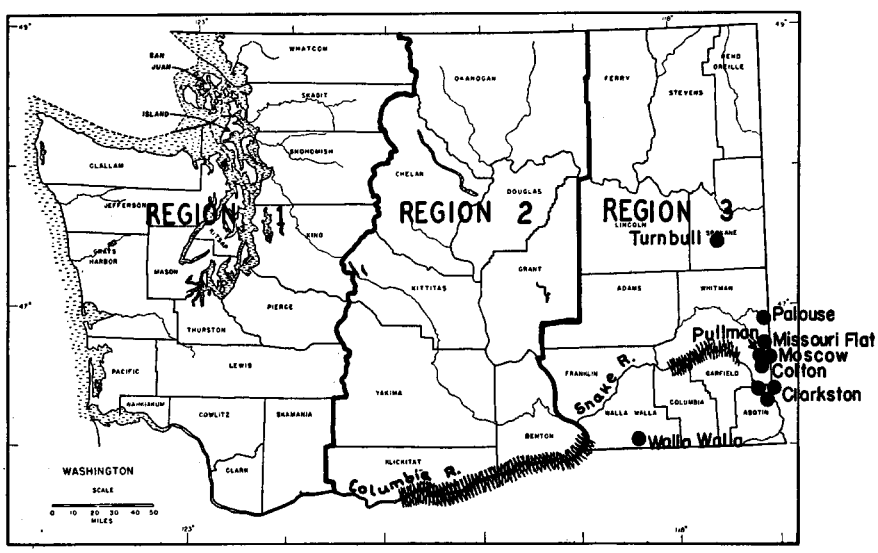

Fig. 41. Map of state of Washington showing localities mentioned in text and the three regions established arbitrarily for the study of sex ratios in Mallards.

until 1948 records of sex were reported for 4,564 Mallards shot in Washington. In the fall and winter of 1947-48, the writer additionally investigated by direct count the sex ratio of migrating and wintering waterfowl in eastern Washington. Data on the sex ratio among 8805 Mallards were thus obtained. One purpose of this study is to see if data on sex ratios collected from duck-hunter questionnaires are in accord with data collected by direct count in the field. The investigation was supported in part by the State College of Washington Research Fund.

RESULTS FROM DUCK HUNTERS' REPORTS

The state of Washington was divided into three main regions for purposes of this investigation (fig. 41). Region one includes all the counties on the west side of the crest of the Cascade Mountains. Region two is more or less an arbitrary area including

all the counties in the central part of the state, and region three includes counties on the east side.

Table 1 shows the data on sex ratios in Mallards in the three respective regions. Ratios vary considerably from year to year and from region to region, and the males are for the most part shot more often than females. This is especially true for the eastern counties where the bulk of the data was obtained and where Mallards are the principal waterfowl hunted. Data on sex ratio were obtained both from daily hunting returns and seasonal hunting returns, and both are included in table 1. Frequently, hunters would not turn in daily hunting returns, but would send in a record for the season. On the other hand, some parties would send in the daily return and not a seasonal return, so that there is some, but not necessarily complete, duplication of data collected from the two sources. The ratios collected in this manner vary considerably, but that is undoubtedly due to the small size of the samples in some instances.

WATERFOWL WINTERING IN EASTERN WASHINGTON

In eastern Washington, where the winters are normally mild, the Mallard is by far the most common wintering duck. Large numbers of them feed on waste grain in the fields of the Palouse and Big Bend areas. Large bodies of water, such as Sprague Lake, Rock Lake, the Columbia, Snake and Spokane rivers, as well as small tributaries of these rivers, normally do not freeze over. Such bodies of water are utilized as loitering, resting and roosting areas. From these open waters ducks fly to adjacent feeding grounds. In addition to wheat fields, pea fields are important feeding areas in the Palouse region, where the commercial production of dry peas has become important.

Baldpates also winter in some sections of eastern Washington. A few remain along the Clearwater and Snake rivers in the vicinity of Clarkston, Washington, and feed principally on green grass along the Snake River. Occasionally a few individuals are noted with flocks of Mallards throughout other sections of eastern Washington.

A few American Golden-eyes winter along the Snake River and on Turnbull National Wildlife Refuge. Buffle-heads, Pintails, Scaups, Hooded Mergansers, and American Mergansers also winter regularly in eastern Washington, but their numbers are too limited to yield adequate data on sex ratio. Occasionally Red-heads, Ring-necked Ducks and Canvasbacks are also seen here during the winter months.

RESULTS BASED UPON DIRECT COUNTS

Method of making counts.—In 1947, counts were started on November 20 and continued throughout the winter and spring until March 14. The waterfowl hunting season for the state of Washington was split into two parts, one from October 21 to November 3 and the other from December 16 to December 29. The break in the hunting season made it possible for the writer to obtain data on sex ratio of waterfowl (especially Mallards) during the period between the two seasons when the waterfowl were undisturbed and congregated in large groups. Locally, many waterfowl remained in creeks and fed in adjacent wheat fields in the time intervening between the two seasons. Many were also concentrated along the Snake and Clearwater rivers during the hunting season. The Snake River is a refuge from the east boundary of the state to its confluence with the Columbia River.

Most of the data (table 2) were obtained by walking along the streams where large concentrations of waterfowl occurred, and in some instances large numbers of ducks could be sexed from an automobile driven near concentrations. Along the Snake River, data were obtained by drifting down current in a rubber life raft. In this manner the

segment of the Snake River between Wawawai and Central Ferry, Washington, was surveyed several times.

The most successful method for making counts was to use a pair of 7×50 binoculars and to count segments of flying flocks or of flocks on the ground by groups of three to five. The data were recorded in two columns by an assistant. In this manner it is possible to sex as many as 1000 ducks from large concentrations in a half hour. Mrs. Iris Yocom or a student from the State College of Washington usually accompanied the writer to record the data as they were gathered.

Table 1

Sex Ratios of Mallards Obtained from Duck-hunters' Reports

	Males	Females	Ratio
Region one			
1943 Total	145	133	109:100
1944 Daily reports	13	7	186:100
Seasonal reports	68	50	136:100
Total	81	57	142:100
1946 Daily reports	60	42	143:100
Seasonal reports	184	105	175:100
Total	244	147	166:100
1947 Daily reports	67	49	137:100
Seasonal reports	8	8	100:100
Total	75	57	132:100
Total, region one	545	394	138:100
Region two			
1943 Total	149	84	177:100
1944 Daily reports	105	89	118:100
Seasonal reports	9	6	150:100
Total	114	95	120:100
1946 Daily reports	8	11	73:100
Seasonal reports	22	34	65:100
Total	30	45	67:100
1947 Daily reports	10	3	333:100
Seasonal reports	9	6	150:100
Total	19	9	211:100
Total, region two	312	233	134:100
Region three			
1943 Total	786	549	143:100
1944 Daily reports	143	142	101:100
Seasonal reports	80	83	96:100
Total	223	225	99:100
1946 Daily reports	384	221	174:100
Seasonal reports	189	116	163:100
Total	573	337	170:100
1947 Daily reports	229	127	180:100
Seasonal reports	18	13	138:100
Total	247	140	176:100
Total, region three	1828	1251	146:100

Areas studied.—Figure 41 shows the areas where data on sex ratios were collected throughout the study. The Turnbull National Wildlife Refuge at Cheney, Washington, was visited on several occasions as also were areas in the vicinity of Walla Walla. For the most part, however, the data were collected in areas not far from Pullman, Whitman County. Two trips were made along the Columbia River, and that information is included also in table 2 although that region is somewhat peripheral to the major areas studied.

The winter of 1947-48 was not severe and many ducks remained along the creeks in Whitman County. A flock of approximately 10,000 Mallards remained throughout most of the winter in the vicinity of Colton, Washington. These ducks fed in grain fields in that area. Many Mallards as well as a few Baldpates and a scattering of other species wintered along the Snake River, particularly in the vicinity of Clarkston, Davis Bar three miles below Wawawai, and along the river between Almota and Central Ferry.

DISCUSSION

The writer obtained data on the sex of 4,563 Mallards from questionnaires sent to hunters. Many more males were shot than females. The ratios, however, do not agree with the ratio obtained by Munro (Canadian Jour. Res., 21, 1943:223-260) from data collected at banding stations in British Columbia. His ratio was 84 males to 100 females. Munro also indicates that more females were shot than males.

In this study there were only two questionnaires which reported more hunter-shot females than males. In both instances the samples were small. In 1946, both daily and seasonal records showed more females shot in region two. The seasonal records of 1944 for eastern Washington also showed more females shot than males although the difference is small and possibly insignificant (see table 1).

Sex ratios of hunter-shot Mallards over a period of four hunting seasons, summarized in table 1, show a considerable variation. Some of this variation is undoubtedly due to insufficiency of the data. The summarized data for the four hunting seasons are as follows:

Year	Males	Females	Sex Ratio
1943	1080	760	141:100
1944	418	377	111:100
1946	847	529	160:100
1947	341	206	165:100
Total	2686	1878	143:100

For the most part, the sex ratio of 8,805 Mallards observed during this study in eastern Washington was quite even (109:100); there appears to be, however, considerable variation in sex ratios between duck populations or between flocks in different localities. For example, the Mallards that were observed at the Turnbull National Wildlife Refuge consistently had a high percentage of males, whereas a large flock that wintered near Colton, Washington, had a ratio closely approaching 100:100. All but one of the counts made along the Snake River in the vicinity of Clarkston showed considerably more males than females, whereas counts made on the river between Wawawai and Central Ferry on January 28 showed a nearly balanced sex ratio. On December 7, 1947, the author sexed 251 Mallards out of a large flock that was staying along Missouri Flat Creek which is located only a few miles northeast of Pullman, Washington. This particular flock consisted of many more females than males as shown in table 2. During the same month, however, most of the flocks contained many more males than females.

Table 2 suggests an increase in males in the months of November and December

Table 2

Sex Ratio of Mallards Obtained by Direct Count

	Males	Females	Ratio
Nov. 20, Turnbull Wildlife Refuge	158	136	116:100
Nov. 21, Wawawai to Almota	6	5	120:100
Nov. 28, Turnbull Wildlife Refuge	137	114	118:100
Nov. 29, Missouri Flat Cr. n. of Pullman	76	59	129:100
Nov. 30, Colton	342	338	101:100
Totals for November	719	652	110:100
Dec. 6, Colton	72	67	107:100
Dec. 6, Snake River at Clarkston	212	156	136:100
Dec. 7, Missouri Flat	108	143	76:100
Dec. 8, Turnbull	212	169	125:100
Dec. 16, Columbia River	29	19	153:100
Dec. 19-29, Pullman	14	8	175:100
Dec. 23, Turnbull	176	89	198:100
Totals for December	823	651	126:100
Jan. 11, Clarkston	76	55	138:100
Jan. 15, Colton	712	698	102:100
Jan. 23, Moscow area	192	147	131:100
Jan. 23, Colton	250	248	101:100
Jan. 24, Palouse area	48	48	100:100
Jan. 28, Wawawai to Central Ferry	727	673	108:100
Jan. 30, Walla Walla	235	207	114:100
Totals for January	2240	2076	108:100
Feb. 16, Walla Walla	376	404	93:100
Feb. 16, Columbia River	15	10	150:100
Feb. 18, Walla Walla	56	53	106:100
Feb. 23, Clarkston	100	114	88:100
Totals for February	547	581	94:100
March 13, Snake River	228	235	97:100
March 14, Pullman	30	23	130:100
Totals for March	258	258	100:100
Grand totals	4587	4218	109:100

and then a drop in males until the sex ratio is slightly in favor of the females or is balanced. It is difficult to account for the changes in sex ratios from month to month and from area to area. Hunters definitely shot more males than females in this region, and this may account in part for the decrease in the number of males in February and March. Possibly groups of ducks raised in the same locality migrate and move from one locality to another as a unit, and variation in sex ratio may thus show in part the local influences on the breeding population. Another point of view that should be investigated is the possibility of differential migration or differential ranges of the sexes. Many of the ducks sexed in February and March were undoubtedly birds that had wintered farther south.

Petrides (Auk, 61, 1944:564-571) suggests that male ducks appear to enter banding traps more frequently than females. According to the same author, records of banded ducks before and after hunting, when compared, revealed similar sex ratios, indicating negligible sex selection by sportsmen. In Illinois, Hawkins, *et al.* (Illinois Nat. Hist.

Surv., Biol. Notes, 12, 1939:1-16) found that the take of female Mallards increased through the season from 48 per cent in the first half-month to 62 per cent in the last.

Sex-ratio data obtained in the fall of 1947 from hunters' reports from eastern Washington do not coincide with data obtained by counting sexes in the field. According to hunters' records, the ratio was 176 males to 100 females, whereas according to figures from direct counts, the ratio was 110:100 for November and 126:100 for December, or 118:100 for the two months. It appears to me that the sex ratios obtained from hunters' kills are not representative for the populations of waterfowl hunted and that selective shooting among duck hunters accounts for the larger number of males recorded in returns from hunters.

Considerable study through the entire wintering area is needed to obtain a true picture of the actual sex ratios of waterfowl. There is little or no agreement among data obtained by records of banded birds, checks on kills of duck-hunters, returns of questionnaires, and direct counts. The most reliable data are obtained apparently by counts of birds in the field. The author's results seem to indicate that such counts should be made at several locations within a region to secure a better indication of the sex ratios of waterfowl in that area.

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