EFFORTS TO DEVELOP AN EXTERNAL AGING AND SEXING TECHNIQUE FOR COMMON SNIPE IN LOUISIANA

By H. RANDOLPH PERRY, JR.
Louisiana Cooperative Wildlife Research Unit, Louisiana State University, Baton Rouge

and

JOHN D. NEWSOM
Louisiana Cooperative Wildlife Research Unit, Louisiana State University, Baton Rouge

and

PRENTISS E. SCHILLING
Department of Experimental Statistics, Louisiana State University, Baton Rouge

ABSTRACT

Three hundred and two snipe were collected in an effort to evaluate proposed aging and sexing techniques and to determine a practical method of aging and sexing the common snipe by external characters. Thirty-one external variables were selected for measurement based on their potential to discriminate between ages or sexes of various birds as shown by past studies. The minimum percent misclassification of sexes (28.38%) and ages (22.64%) was obtained when the top 25 sexing and top 22 aging variables were formulated into a discriminant function (Z), constructed so as to minimize the frequency of misclassification when used as a means of discriminating sex and age of snipe. These possible misclassifications were considered too great to accurately sex or age snipe. None of the variations noted in morphological characteristics or in feather color patterns, shades, tints, and shapes could be consistently and accurately related to differences in sex or age of snipe. Snipe in this study could not be accurately sexed or aged externally using techniques suggested in past studies.

INTRODUCTION

One practical method of relieving some of the existing and future hunting pressures from present popular game animals is to direct this pressure to other underexploited wildlife species. The common snipe, *Capella gallinago delicata* (Ord), offers excellent potential for this purpose.

If the snipe is to withstand future sport hunting pressures, the dynamics of wintering snipe populations must be expanded to provide more specific management information. A study of the structure of any game population should include estimates of the age and sex composition (Eberhardt 1969; 457). From estimates of the age and sex composition of the population and kill, production, mortality, survival and population levels may be estimated thus aiding in the assessment of an animal as a game species. Thus, one objective in a recent study of the common snipe in Louisiana (Perry 1971), supported by the Bureau of Sport Fisheries and Wildlife through the cooperation of the Louisiana Wild Life and Fisheries Commission and the Louisiana Wildlife Research Unit, was to evaluate proposed snipe aging and sexing techniques and to determine a practical method of aging and sexing snipe by external characters.

External aging and sexing techniques for the common snipe employing various plumage characteristics have been proposed in past studies (Grinnell, Bryant, and Storer 1918; Bent 1927; Whitehead 1965; Oswald 1969; Tuck 1969a, 1969b). Hoffpauir (1969) used 20 snipe to formulate linear equations employing various external measurements to sex and age snipe. However, when these techniques are applied to snipe wintering in Louisiana, they are either inaccurate or impractical for field use.

STUDY AREA

This study was conducted in southern Louisiana from September, 1969 to May, 1971. Even though the most extensive collections were made in Cameron and Vermilion Parishes, snipe were collected from 21 locations in four parishes in an effort to obtain a representative sample. Collections were made in various sections of the marsh (burned and unburned), pastures, and rice fields.

METHODS

Collection of Snipe

Snipe were collected for sex and age study using shot guns and number 7½ shot. Any snipe mortalities resulting from trapping and banding operations were also retained for sex and age study. After making the desired field measurements and observations, collected snipe were tagged, wrapped in a paper towel, placed in a plastic bag, and quickly frozen. If the birds were excessively wet, a portable electric fan was used to aid drying. Location, type of area, weather, and personnel assisting with collection were recorded for each collecting trip.

Two hundred snipe were collected during the 1969-70 season, mostly in the month of January, 1970. One hundred and two additional snipe were collected in the 1970-71 season. Sixty-five of these birds were collected in October and 37 during the first three days of November. Birds were purposefully collected early in the 1970-71 season in order to simplify aging by the use of the bursa of Fabricius.

The order in which 50 snipe were collected during the 1970-71 season was noted by recording the exact time each bird was shot. Fifteen snipe were taken on one occasion and 35 during a second collection trip. Assistants placed collected snipe in individual paper sacks with the exact time of collection recorded on each sack. Watches were synchronized before collection started and on any one trip all collections were made from the same group of snipe.

Laboratory Examination

Measurements. All collected snipe were dissected, aged, sexed, and various measurements were taken. Variables measured on each bird (when possible) were (1) width of the oviduct flattened over a probe or length of the largest testis, (2) length of bill from nostril, (3) length from nostril to base of exposed culmen, (4) bill height at base, (5) tarsus length, (6) tarsus diameter at middle, (7) middle toe length, (8) width between tips of pubic bones, (9, 10) first primary feather width at the widest point and width 0.5 cm from the tip, (11-16) second, eighth, and ninth primary feather widths 0.5 cm from the tip and widths 1 cm from the tip, (17-22) first and fifth secondary feather widths at the widest point, widths 0.5 cm from the tip, and widths 1 cm from the tip, (23, 24) third secondary feather width at the widest point and width 0.5 cm from the tip, (25-38) sixth and seventh secondary feather widths 0.5 cm from the tip and widths 1 cm from the tip, and (29) breadth of wing at third primary. On birds collected during the 1970-71 season, the number of bars on the outer rectvice and a field measurement (immediately after collection) of the width between tips of the pubic bones were also taken. All of the external variables were measured as would have been done on a live bird, *i.e.*, all feathers were left intact. Variables were selected for measurement on the basis of their potential to discriminate between ages or sexes of various birds as shown in past studies (White 1963, Whitehead 1965, Hoffpauir 1969, Oswald 1969). Variables were measured in accordance with guidelines established by Baldwin, Oberholser, and Worley (1931).

Sex and Age Determination. Internal sex and age determination was aided by the use of a 10X light magnifier. Sex was determined by examination of the gonads. Males and females collected in October and

November were aged by the bursa of Fabricius (Gower 1939, Davis 1947). If a bursa was present, it was teased away from the cloaca and rectum. A bursa 3 mm or more was considered to be that of an immature (White 1963). A bursa less than 3 mm or no bursa was considered evidence of an adult (White 1963). Because of bursa absorption, the presence or absence of the bursa of Fabricuius was not considered reliable for snipe collected in January.

Females collected in January were aged by measuring the width of the oviduct flattened over a probe. As used in past studies (Whitehead 1965, Hoffpauir 1969), an oviduct width greater than 2.5 mm was considered to be that of an adult snipe. Testes color and length were recorded for all male snipe.

Plumage and Morphological Evaluation. In addition to the external measurements, various feather color patterns and shapes were extensively studied. Snipe skins and mounts owned by the Louisiana Cooperative Wildlife Research Unit, as well as freshly collected specimens, were used in this segment of the study. Feathers were studied both intact and plucked. Certain feathers were selected for special study on the basis of their potential to discriminate between ages or sexes of various birds as shown by past studies (White 1963, Whitehead 1965, Hoffpauir 1969, Oswald 1969). Other external features of the bird that might be related to sex or age, such as the bill, legs, eyes, cloaca, tongue, and feet were also studied.

Statistical Analyses

Age data from the 1969-70 season were analyzed separately from 1970-71 data. This was done as the aging of the January collected 1969-70 birds was not considered completely reliable. However, sex data from the two seasons were analyzed together and separately.

Runs Test on Collection Data. The order of collection of 50 snipe was used to determine if a random sample over time of the age and sex classes was obtained. After determining the age and sex of each collected bird, a one-sample Runs test (Siegel 1956; 52-58) was performed to determine if the order of males and females, and immatures and adults collected was random over time.

Least Squares Analysis of Variance. An analysis of variance for evaluating differences among sexes and ages was performed for all the external variables. To remove the effects of unequal numbers for sex by age classes (males and females, adults and immatures), a least squares analysis for unequal subclass numbers was utilized.

Stepwise Discriminant and Discriminant Function Analyses. Discriminant function analyses were conducted using variables that showed a significant difference between sexes and/or ages. From a stepwise analysis, an ordered list of the most important discriminating variables was obtained. Each variable was ordered on the basis of mean differences, as well as correlation with other variables under consideration. The discriminant function analysis resulted in specific linear combinations of the variables ranked high in the stepwise analysis. The linear compound (Z), as given by Mather (1951), minimizes the possibility of misclassification by sex and age and takes the form of $Z = \lambda_i X_i + \ldots + \lambda_n X_n$ where λ_i is the constant weight computed for the ith variable and n is the number of variables included in the equation.

RESULTS AND DISCUSSION

Dissection and Measurement

As most snipe used in this segment of the study were collected by shooting, all measurements could not be taken on every bird. For example, some of the birds had broken bills which could not be accurately measured. Only 180 birds had complete measurements and were used in statistical analyses.

Although testis color and length were recorded for all male snipe, after the bursa ceased to be reliable the accurate aging of males required for statistical analyses could not be performed.

Statistical Analyses of Measurements

Least Squares Analyses of Variance. Width between tips of pubic bones, measured after the bird had been frozen and thawed, yielded the lowest percent overlap between sexes of snipe collected during the 1969-70 season (Table 1). Bill length, wing breadth at third primary, and fifth secondary width completed the list of highly significant variables for external sex determination. All of these variables showed an expected overlap of less than 38 percent between male and female populations.

TABLE 1. The most important sexing variables and expected percent overlap of the two populations from the analysis of variance of data from snipe collected in Louisiana during the 1969-70 season.

Variable	Mean Squares Sex	Mean Squares Error	Means (mm) Males	Means (mm) Females	F[a]	Percent Overlap
Width between tips pubic bones	77.354	5.034	10.00	12.00	15.366**	32.91
Bill length	90.331	9.244	58.81	60.87	9.772**	36.86
Wing breadth at 3rd primary	65.800	7.316	85.75	88.56	8.944**	37.01
5th secondary W	8.207	0.918	13.34	13.97	8.940**	37.23
9th primary W′	3.288	0.489	5.71	6.12	6.724*	38.56
6th secondary W″	8.806	1.365	11.19	11.85	6.452*	38.97
5th secondary W″	6.070	1.028	11.97	12.51	5.905*	39.56
2nd primary W″	3.501	0.724	11.38	11.79	4.836*	40.51
9th primary W″	2.884	0.541	7.13	7.98	5.331*	40.63
1st secondary W	4.159	0.903	13.09	13.53	4.605*	40.90
Middle toe length	9.478	2.195	30.53	31.20	4.318*	41.09
1st primary W	3.982	0.954	11.59	12.02	4.174*	41.33

[a] width 1 and 97 degrees of freedom.
W = feather width at widest point.
W′ = feather width 0.5 cm from tip.
W″ = feather width 1 cm from tip.
* $p < 0.05$.
** $p < 0.01$.

The breadth of the wing at the third primary showed a highly significant difference ($p < 0.001$) between sexes of snipe collected during the 1970-71 season (Table 2). Width of the first secondary 1 cm from the tip provided the greatest difference between immature and adult snipe collected during the same period (Table 3).

The breadth of the wing at the third primary showed special promise as a sexing character in this study. This variable demonstrated the least amount of overlap (32.05%) in the 1970-71 data. One problem encountered in measuring wing breadth involved variability resulting from the degree of wing spreading. The length of the third primary (plucked) yielded a highly significant ($p < 0.01$) difference between sexes in a study by Hoffpauir (1969). Whitehead (1965) used the width of the first secondary 1 cm from the tip to sex snipe, but this measurement showed no significant difference between sexes with the present data. However, both the width of the first and seventh secondaries 1 cm from the tip were highly significant external aging characters.

Initially, width between tips of the pubic bones was considered a promising external sexing variable (Table 1). This highly significant variable yielded the least amount of overlap of all the sexing variables studied in the 1969-70 analysis. Generally, on thawed specimens, width between tips of the pubic bones was greater in females than in males. It was hypothesized that this variable would provide even greater sex discrimination if measured on live or freshly killed specimens. Therefore, width between tips of the pubic bones was measured immediately after shooting on all snipe collected during the 1970-71 season. Results

TABLE 2. The most important sexing variables and expected percent overlap of the two populations from the analysis of variance of data from snipe collected in Louisiana during the 1970-71 season.

Variable	Mean Squares Sex	Mean Squares Error	Means (mm) Males	Means (mm) Females	F[a]	Percent Overlap
Wing breadth at 3rd primary	127.883	9.143	84.45	87.30	13.988**	32.05
Bill Length	49.434	8.003	58.38	60.15	6.177*	37.84
6th secondary W'	6.321	1.085	8.80	9.43	5.826*	38.24
3rd secondary W	4.105	0.781	12.95	13.46	5.259*	38.72
Number of bars on outer rectrice	3.392	0.780	7.23	6.76	4.351*	39.56
2nd primary W'	3.292	0.826	9.10	9.56	3,986*	40.04
2nd primary W"	4.081	1.036	11.05	11.56	5.399*	40.12

[a] with 1 and 76 degrees of freedom.
W = feather width at widest point.
W' = feather width 0.5 cm from tip.
W" = feather width 1 cm from tip.
* $p < 0.05$.
** $p < 0.01$.

TABLE 3. The most important aging variables and expected percent overlap of the two populations from the analysis of variance of data from snipe collected in Louisiana during the 1970-71 season.

Variable	Mean Squares Age	Mean Squares Error	Means (mm) Males	Means (mm) Females	F[a]	Percent Overlap
1st secondary W"	8.175	0.805	12.02	12.74	10.159**	34.62
7th secondary W"	6.562	0.920	10.97	11.61	7.133**	37.07
Wing breadth at 3rd primary	52.536	9.143	84.96	86.79	5.756*	38.21
1st secondary W'	9.809	1.704	10.56	11.35	5.765*	38.24
1st primary W'	3.449	0.788	9.76	10.14	4.377*	39.63
Bill height at base	1.694	0.394	9.24	9.57	4.297*	39.67
2nd primary W'	3.517	0.826	9.09	9.56	4.258*	39.82
7th secondary W'	4.706	1.450	8.65	9.20	5.464*	41.17
2nd primary W"	3.099	0.744	11.08	11.52	4.164*	41.48
1st secondary W	4.547	1.540	12.88	13.41	4.686*	41.60

[a] with 1 and 76 degrees of freedom.
W = feather width at widest point.
W' = feather width 0.5 cm from tip.
W" = feather width 1 cm from tip.
* $p < 0.05$.
** $p < 0.01$.

of the analysis of variance of the sex data for 1970-71 showed, however, that sexes did not differ for this variable when measured on freshly killed specimens. A paired t-test demonstrated a highly significant difference ($p < 0.01$ between the field and lab (after thawing) measurements of width between tips of the pubic bones ($t = 2.78$ with 60 degrees of freedom).

Neither the number of bars on the outer rectrice nor the length of the third toe could be used to accurately sex snipe in this study. These variables were given special attention as Oswald (1969) reported highly significant ($p < 0.005$) results when using these variables to sex snipe.

It should be noted that a variable demonstrating a statistically significant difference between ages or sexes does not necessarily mean that individual snipe can be accurately sexed or aged using this particular variable alone. The statistical analysis indicates a difference between the means of the two populations (males and females, immatures and adults). However, considerble overlap may exist between the two populations composed of individual bird measurements.

As the chance of misclassification (percent overlap) was considerable, none of the variables in the present study could be used alone to sex or age snipe. Therefore, a discriminant analysis was performed to determine if several variables could be used jointly to accurately sex or age snipe.

Stepwise Discriminant Analysis. A stepwise discriminant analysis was performed on the combined sex data from both seasons. A stepwise discriminant analysis was conducted on the age data from the 1970-71 season. Wing breadth at the third primary was the best sexing and aging variable in the ordered lists (Tables 4 and 5). Any differences between the ranking of variables in the stepwise analysis and in the analysis of variance should be due to the correlation among variables which is taken into account in the stepwise discriminant analysis.

TABLE 4. The most important external variables of snipe collected in Louisiana during the 1969-70 and 1970-71 seasons ranked according to sex discriminating ability.

Order	Variable
1	wing breadth 3rd primary
2	bill length
3	2nd primary W″
4	3rd secondary W
5	bill height at base
6	6th secondary W′
7	1st primary W′
8	1st primary W
9	2nd primary W′
10	8th primary W′
11	3rd secondary W′
12	8th primary W″

W = feather width at widest point.
W′ = feather width 0.5 cm from tip.
W″ = feather width 1 cm from tip.

TABLE 5. The most important external variable of snipe collected in Louisiana during the 1970-71 season ranked according to age discriminating ability.

Order	Variable
1	wing breadth at 3rd primary
2	6th secondary W′
3	no. of bars on outer rectrice
4	bill length
5	3rd secondary W
6	7th secondary W″
7	1st secondary W″
8	2nd primary W′
9	tarsus length
10	middle toe length
11	1st secondary W
12	8th primary W′

W = feather width at widest point.
W′ = feather width 0.5 cm from tip.
W″ = feather width 1 cm from tip.

Discriminant Function Analysis. The minimum percent misclassification (28.38%) for sexes was obtained when the top 25 variables of the ordered list were formulated into a linear combination (Z). However, by using only the top eight variables in a linear combination (given below), misclassification of 28.81 percent could be obtained.

$$Z = -0.00109X_1 - 0.00111X_2 - 0.00232X_3 - 0.00127X_4 + 0.00367X_5 - 0.00116X_6 + 0.00170X_7 - 0.00144X_8, \text{ where;}$$

X_1 = wing breadth at 3rd primary
X_2 = bill length
X_3 = 2nd primary width 1 cm from feather tip
X_4 = 3rd secondary width at widest point
X_5 = bill height at base
X_6 = 6th secondary width 0.5 cm from feather tip
X_7 = 1st primary width 0.5 cm from feather tip
X_8 = 1st primary width at widest point.

Any snipe in this study with a computed Z value greater than -0.200625 was considered a female. However, if the resulting Z value was less than -0.200625, the snipe was considered a male.

External aging of snipe proved almost as difficult as sexing. The minimum percent misclassification (22.64%) occurred when the top 22 ordered variables were formulated into a linear compound (Z). The percent misclassification was increased to only 26.24 percent when using the 13 best age discriminating variables in a linear function (presented below).

$$Z = -0.00369X_1 - 0.00013X_2 + 0.00599X_3 + 0.00052X_4 + 0.00336X_5 - 0.00973X_6 - 0.01476X_7 - 0.00844X_8 + 0.00097X_9 + 0.00490X_{10} + 0.00615X_{11} + 0.00404X_{12} + 0.00366X_{13}, \text{ where;}$$

X_1 = wing breadth at 3rd primary
X_2 = 6th secondary width at widest point
X_3 = number of bars on outer rectrice
X_4 = bill length
X_5 = 3rd secondary width at widest point
X_6 = 7th secondary width 1 cm from feather tip
X_7 = 1st secondary width 1 cm from feather tip
X_8 = 2nd primary width 0.5 cm from feather tip
X_9 = tarsus length
X_{10} = middle toe length
X_{11} = 1st secondary width at widest point
X_{12} = 8th primary width 0.5 cm from feather tip
X_{13} = 8th primary width 1 cm from feather tip

A snipe with a computed Z value greater than -0.25326 was considered an adult. However, if the resulting Z value was less than -0.25326, the snipe was considered an immature.

The possible misclassification for sex (28.81%) and age (26.24%) associated with the above linear functions was considered too excessive to accurately sex or age snipe on the basis of these equations. As these linear functions were formulated from variables with the best sex and age discriminating ability of the variables studied, it was concluded that bill length; distance from nostril to base of exposed culmen; bill height at base; tarsus length; tarsus diameter; middle toe length; width between tips of the pubic bones; width of the first primary at widest point, 0.5 cm and 1 cm from feather tip; width of second, eighth, and ninth primaries 0.5 cm and 1 cm from feather tip; width of first and fifth secondaries at widest point, 0.5 cm and 1 cm from feather tip; width of third secondary at widest point, and 0.5 cm from feather tip; width of sixth and seventh secondaries 0.5 cm and 1 cm from feather tip; wing breadth at third primary; and number of bars on the outer rectrice could not be used alone or in a linear combination to accurately sex or age snipe in this study.

Hoffpauir (1969) reported linear equations for sexing and aging snipe with an associated 2.78 and 12 percent overlap, respectively. It should be noted, however, that his results were based on a sample size of only 20 snipe.

A sample size of 20 snipe proved very misleading in this study on three different occasions. One random sample of 20 snipe could be sexed with no error using width between tips of the pubic bones. In a second random sample, 18 of 20 birds could be sexed by using the number of bars on the outer rectrice. In a third random collection, 15 of 20 snipe could be sexed using wing breadth at the third primary. However, when the analysis was expanded to include 180 snipe, none of the above variables could be used to accurately sex snipe, as the percent misclassification was excessive.

Plumage and Morphological Evaluation

Sex and age differences were sought in various feather color patterns, shades, tints, and shapes. None of the variations noted could be consistently related to differences in sex or age. Aging and sexing techniques suggested in past studies that employ plumage characteristics (Grinnell, *et al.* 1918, Bent 1927, Whitehead 1965, Tuck 1969a, 1969b) were found to be too subjective to accurately sex or age snipe in this study. Studies of the bill, tongue, legs, feet, eyes, toes, and cloaca also showed no differences that could be accurately and consistently correlated to sex and/or age of snipe.

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REPORT OF THE FARM GAME COMMITTEE

The S. E. Section of the Wildlife Society
and
The S. E. Association of Game and Fish Commissioners
Charleston, South Carolina
October 17-20, 1971

The Farm Game Committee was called to order Monday afternoon in Room D of the Municipal Auditorium, Charleston, South Carolina, with twenty-four persons in attendance. Call to order was followed by an introduction of state representatives and others present at the meeting.

After a review of the memorandum sent to all member states by the Chairman, each representative present was asked to suggest any proposed programs, describe existing programs, or make suggestions pertinent to the theme of the meeting, "Government Subsidies for Farm Game Habitat on Private Lands."

Much discussion by the Committee revealed the important fact that there is significant under utilization of existing programs designed by the USDA to benefit farm game species. Many landowners are simply not aware of these programs and some programs are not available in many areas. It was pointed out that irregardless of how beneficial a program is, when adopted at the federal level, the state and county ASCS Committees do not have to participate in the programs if they do not desire to do so.

Two resolutions were presented by the Chairman and adopted by the Farm Game Committee for implementation. The resolutions were as follows:

Resolution Number 1: Develop a farm game subsidy program plan derived from suggestions presented at the Farm Game Committee meeting. A plan is to be drawn up by the Chairman, and pending approval or amending by the Director of member states or their representatives, is to be presented to the USDA for their review and possible adoption. It was stated that if the plan is accepted by the USDA then participation by state and county ASCS offices be mandatory. This resolution was unanimously approved by members of the committee present.

Resolution Number 2: Development of a regional brochure to provide landowners with guidelines as how to best utilize existing USDA programs in order to provide the most benefits for farm game species. This resolution was approved by members present.

Respectfully submitted,

Chester McConnell,
Chairman.

Edward P. Hill	Robert Murry	William Mahan
Lew Johnson	Earl Hodil	Dennis Russell
A. Gordon Spratt	Edsel Cliburn	Dan Canter
Ronald Simpson	Horace Gore	C. H. Shaffer
Dan Russel	George Dellinger	Ralph Dimmick
	Ted R. Mitchell	