Age and Sex Related Characteristics of the Loggerhead Shrike *(Lanius l. ludovicianus)* in Coastal Mississippi

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INTRODUCTION

Miller (1928, 1931) described the plumage and presented measurements for 11 subspecies of the Loggerhead Shrike *(Lanius ludovicianus)*. Haas (1987) addressed the need for obtaining measurements of live birds as an aid for separating subspecies versus clinal variation in the Loggerhead Shrike. This paper presents variations in characters between age and sex classes for the resident population of Loggerhead Shrike *(Lanius l. ludovicianus)* in coastal Mississippi. A key to the age and sex of the Loggerhead Shrike is suggested.

METHODS

Loggerhead Shrikes were live trapped in coastal Mississippi from September 1986 through October 1992. The juvenile plumage described by Miller (1928, 1931) and the color of juvenile soft parts described by Lohrer (1974) were used to age birds as hatching year (HY) before completion of the first prebasic molt. HY and second-year (SY) birds in first basic plumage and after-hatching-year (AHY) and after-second-year (ASY) birds in definitive plumage were aged based on the incomplete first prebasic molt and complete prebasic molt described by Miller (1928, 1931). Notes were made on gape color; age class of primaries, secondaries, and wing coverts; and color and extent of barring of the underparts. In addition, feathers representative of the pattern of the underparts of 52 shrikes (6 juvenile plumage, sex unknown; 13 SY-F; 9 ASY-F; 11 SY-M; and 13 ASY-M) were examined microscopically and grouped based on (1) color of the rachis and barbs and (2) presence or absence of gray to black pigmentation on the barbules.

Sex was determined by the presence of a brood patch or cloacal protuberance. Measurements (mm) were made of wing chord, tail length, and bill length (from the proximal margin to the tip of the maxilla [culmen], and from the distal margin of the nostril to the tip of the maxilla). Wing chord to tail length ratio was calculated for each bird. Measurements of known age and sex shrikes were analyzed by one- and two-way analysis of variance and evaluated by the Student-Newman-Keuls multiple range test (Sokal and Rohlf 1981).

RESULTS

Gape Color - Lohrer (1974) recorded the perimeter of the mouth in juveniles in south Florida as usually remaining pale yellow until 46 to 50 days of age, with one individual having a pale yellow mouth on day 67. HY shrikes with a pale yellow gape were found as late as October in coastal Mississippi during this study.

During this study, gape color in SY and ASY birds was white or gray to black. Of 59 females, 88.1%(SY-F, n = 24; ASY-F, n = 28) had a white or light gray to dark gray gape and 11.9% (SY-F, n = 5; ASY-F, n = 2) had a black gape. Of 64 males, 81.2% (SY-M, n = 23; ASY-, n = 29) had a black gape and 18.8% (SY-M, n = 4; ASY-M, n = 8) had a white or light gray to dark gray gape.

Wing Feathers - Juvenile primaries, secondaries, and their respective coverts were described as deep blackish brown or dull black by Miller (1928, 1931). A variable number of remiges and their coverts are replaced by the first prebasic molt (Miller

1928, 1931). Most birds in the first basic plumage in coastal Mississippi had replaced all secondary coverts and an inner block of secondaries (often S5, S6, or S7 through S9). The primaries and their respective coverts were usually retained. One HY, sex unknown, when captured on 5 December, and three SY-F had retained all juvenile wing feathers. By spring, juvenile remiges fade to dull brown and contrast markedly to new adult feathers (Slack, pers. obs.). The buff tips of juvenile remiges and coverts, depending on wear, may be present in some SY birds into summer (Haas, pers. comm.; Slack, pers. obs.). Subsequent molts are complete; and in the definitive plumage, the wing feathers are black to glossy black without contrast and buff tips (Miller 1928, 1931.)

Underparts - The underparts of shrikes in juvenile plumage in coastal Mississippi have an overall distinctly barred appearance. Microscopic examination of selected barred feathers showed many with two distinct bars across the distal two-thirds of the rachis. Some of these feathers had a wide, indistinct to distinct bar at the junction of the calamus and rachis. The rachis and barbs were brown. This feather pattern was found only in the juvenile plumage. All juvenile body feathers are replaced by the first prebasic molt (Miller 1928, 1931; Slack, pers. obs.). The remaining juvenile feather patterns are similar to the variations found in the definitive plumage and are described below.

Feathers were initially separated based on the color of the rachis and barbs. Individual feathers may have the rachis and barbs entirely brown or white or a mixture of brown and white. The appearance of these groups are further affected by the presence or absence of gray to black pigmentation on the barbules. When present, the gray to black pigmentation may be (1) located on the barbules across the entire vane forming a bar, (2) irregularly located on the barbules, or (3) present on all barbules the entire length of the vane. Combinations of these basic patterns are also found in individual feathers. A distinctly barred feather with the barbules edged irregularly in another area of the vane was grouped with barred feathers. A feather with the barbules edged irregularly on one side of the vane and edged their entire length on the other side of the vane was grouped with feathers having the barbules edged irregularly or the entire length of the vane.

Of 179 feathers examined from females (Table 1), 58.1% had the rachis and barbs brown, 38.0% had the rachis and barbs white, and 3.9% had the rachis and barbs with a mixture of brown and white. Of those feathers with a brown rachis and barbs, 48.1% had one or two distinct bars, 25.0% had the barbules edged irregularly or their entire length with gray to black pigmentation, and 26.9% had no gray to black pigmentation on the barbules. Of those feathers with a white rachis and barbs, 1.5% had one distinct bar, 76.5% had the barbules edged irregularly or their entire length with gray to black pigmentation, and 22.0% had no gray to black pigmentation on the barbules. Of those feathers with a mixture of brown and white in the rachis and barbs, 85.7% had the barbules edged irregularly or their entire length with gray to black pigmentation, and 14.3% had no gray to black pigmentation on the barbules.

Of 197 feathers examined from males (Table 1), 11.7% had the rachis and barbs brown, 82.7% had the rachis and barbs white, and 5.6% had the rachis and barbs with a mixture of brown and white. Of those feathers with a brown rachis and barbs, 13.0% had one distinct bar, 26.1% had the barbules edged irregularly or their entire length with gray to black pigmentation, and 60.9% had no gray to black pigmentation on the barbules. Of those feathers with a white rachis and barbs, 3.7% had one distinct bar, 33.1% had the barbules edged irregularly or their entire length with gray to black pigmentation, and 63.2% had no gray to black pigmentation on the barbules. Of those feathers with a mixture of brown and white in the rachis and barbs, 100% had no gray to black pigmentation on the barbules.

External Measurements - Basic data for variables are given in Table 2 and the Student-Newman-Keuls comparisons are given in Table 3. Wing chord was significantly different between age and sex classes ($F = 15.64$, $df = 3, 130$, $P < 0.001$). Males had a significantly longer wing chord than females. ASY males had a significantly longer wing chord than SY males but age classes of females

were not significantly different. Tail length was significantly different between age and sex classes ($F = 16.33$, $df = 3, 124$, $P < 0.001$). ASY females and SY males were not significantly different but tail length was significantly shorter in SY females and longer in ASY males. Age and sex classes were not significantly different in wing chord to tail length ratios ($F = 2.68$, $df = 3, 122$, $P > 0.05$). There were no significant differences in culmen length in ASY females, SY females, and SY males. Age classes of males were not significantly different; however, ASY males had a significantly longer culmen than did females ($F = 4.97$, $df = 3, 131$, $P < 0.01$).. Bill length from the nostril to the tip of the culmen was significantly shorter in females than in males ($F = 9.65$, $df = 3, 131$, $P < 0.001$). This measurement was not significantly different in age classes within the sexes.

DISCUSSION

The yellow gape, buff-tipped remiges, and extensive, distinct barring of the underparts are characteristic of Loggerhead Shrikes in juvenile plumage. In the first basic plumage, shrikes may be aged as HY or SY by (1) the contrast in retained juvenile remiges and new adult feathers, or (2) by the retention of all juvenile remiges. Shrikes in definitive plumage show no contrast in the remiges and can be aged AHY or ASY depending on time of year.

The underparts of females, after the first prebasic molt, tend to have feathers with the rachis and barbs brown compared to males which have the rachis and barbs white. It may be possible to sex individuals as females by the presence of distinctly barred feathers with the rachis and barbs brown. Examination of individual feathers with a hand lens is recommended, as the presence of feathers with barbules edged irregularly or their entire length with gray to black pigmentation may give the underparts an indistinct barred appearance.

Wing chord and tail length of the Loggerhead Shrike in coastal Mississippi show significant differences between age and sex classes. Culmen length was significantly different in ASY males, and bill length from the nostril to the tip of the culmen was significantly different between sexes. However, measurements overlap and cannot be used to age or sex Loggerhead Shrikes in coastal Mississippi. Haas (1987) suggested that combinations of characters used with wing chord to tail length ratios might be helpful in separating the subspecies of Loggerhead Shrike. Detailed studies will be needed throughout the Loggerhead Shrike range to determine if variations between populations are distinguishable from the variations found in the coastal Mississippi population.

SUGGESTED KEY TO AGE AND SEX: Sex only by brood patch or cloacal protuberance.

1A. Underparts with extensive distinct barring, remiges and coverts buff tipped, and/or gape yellow . . . . . L/HY

1B. Underparts without extensive barring, remiges and coverts without buff tips*, and gape white or gray to black . . . . . (see 2)

2A. Variable number of wing feathers blackish-brown or brown contrasting with black to glossy black wing feathers . . . . . HY/SY

2B. No contrast in color of wing feathers. . . . (see 3)

3A. Wing feathers blackish-brown or brown . . . HY/SY

3B. Wing feathers black or glossy black . . . . . AHY/ASY

*Note: Some HY and SY birds in the first basic plumage, depending on feather wear, may have remiges or coverts with buff tips.

Notes for further study: Can females be identified by the presence of distinctly barred feathers with a brown rachis and barbs? Does this key work with all subspecies?

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Table 1. Number of feathers representative of the pattern of underparts from Loggerhead Shrikes in coastal Mississippi.

Feather Patterns	Females		Males	
	SY	ASY	SY	ASY
Rachis and Barbs Brown	60	44	12	11
One or two distinct bars	38	12	0	3
Barbules edged irregularly or entire length with gray to black	4	22	6	0
No gray or black pigment on barbules	18	10	6	8
Rachis and Barbs White	30	38	70	93
One distinct bar	1	0	2	4
Barbules edged irregularly or entire length with gray to black	17	35	21	33
No gray or black pigment on barbules	12	3	47	56
Rachis or Barbs Mixed Brown and White	6	1	8	3
Barbules edged irregularly or entire length with gray to black	6	0	0	0
No gray or black pigment on barbules	0	1	8	3

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Table 2. Measurements (mm) of Loggerhead Shrikes in coastal Mississippi.					
	Mean	**SD**	**Minimum**	**Maximum**	**N**
Wing Chord					
SY-F	93.7	1.90	89.0	97.5	39
ASY-F	94.3	2.06	91.5	100.0	24
SY-M	95.4	1.38	93.0	99.0	39
ASY-M	96.3	1.34	93.5	100.0	32
Tail Length					
SY-F	98.1	2.07	92.0	103.0	40
ASY-F	100.0	2.34	94.5	105.0	22
SY-M	100.3	2.53	96.0	108.5	35
ASY-M	101.7	1.99	98.5	107.5	31
Culmen					
SY-F	16.4	0.57	14.9	17.3	40
ASY-F	16.4	0.67	14.7	17.3	24
SY-M	16.7	0.75	15.1	18.3	39
ASY-M	16.8	0.53	15.9	17.9	32
Nostril to Culmen Tip					
SY-F	11.8	0.48	10.7	12.7	40
ASY-F	11.8	0.53	10.7	12.7	24
SY-M	12.2	0.67	10.7	13.7	39
ASY-M	12.4	0.46	11.5	13.3	32
Wing Chord to Tail Ratio					
SY-F	0.956	0.015	0.927	0.985	39
ASY-F	0.943	0.021	0.914	0.995	22
SY-M	0.950	0.016	0.910	0.975	32
ASY-M	0.947	0.014	0.902	0.970	31

Table 3. Student-Newman-Keuls comparisons for variables, 95% confidence level.				
Wing Chord	**SY-F**	**ASY-F**	**SY-M**	**ASY-M**
Mean	93.73	94.31	95.40	96.27

Tail Length	**SY-F**	**ASY-F**	**SY-M**	**ASY-M**
Mean	98.07	100.02	100.34	101.73

Culmen	**ASY-F**	**SY-F**	**SY-M**	**ASY-M**
Mean	16.35	16.36	16.72	16.84

Nostril to Culmen	**ASY-F**	**SY-F**	**SY-M**	**ASY-M**
Tip Mean	11.82	11.84	12.24	12.43