18 - 20 July 94

Grouse Data Totals (Insect)

Total Bugs → Brood sites = 69

→ Random sites = 129

Total Bug wt. → BS = 0.31 g

→ RS = 0.43 g

Although some difference was apparent, it is hard to say anything concrete about the different sites - in relation to grouse location.

It's possible that the broods were in areas where the bugs were bigger, but I feel a larger sample size is necessary to truely say that.

[Brood 4] Goose Data Sheet

Date	19 July 94
Time	0900
Location	airstrip middle
Habitat	mowed grass, & not mowed edge between strip & river

Brood size	(2 broods) 2/4 ~ 8	Already banded: 1/2
# caught & marked	0/0	

Insect Sweeps	Brood location	Random location (165°)
habitat	same as above	
Total bugs	15	10
wt.	~~0.5g~~ 0.07g	.02g
Grasshoppers	1	Ø
wt.	0.03g	Ø

[Brood 3] Grouse Data Sheet

Date	19 July 94
Time	0840
Location	airstrip
Habitat	tall grass, unmowed

Brood size	1/1	Already banded: 0/0
# caught & marked	0/0	

	Brood location	Random location (195°)
Insect sweep		
habitat	same as above	Hillside, S of airstrip, above fence grass, mesangrape (dry)
Total bugs	5	2
wt.	0.01g	0.02g
Grasshoppers	Ø	Ø
wt.	Ø	Ø

[Brood 2] Groose Data Sheet

Date	19 July 94
Time	0805
Location	Airstrip, where strip bends
Habitat	mowed edge (N side) ~~water~~

Brood size	1/4	Already banded: 0/1
# caught & marked	0/1	

Insect sweeps	Brood location	(167°) Zonolon location
Habitat	mowed grass edge	pastured, non-mowed grass
Total bugs	10	25
wt.	0.04g	0.06g
Grasshoppers	ø	ø
wt.	ø	ø

[Brood 1] Grouse Data Sheet

Date	19 July 94	
Time	0745	
Location	Main pasture (NE corner by [redacted] fence corner	
Habitat	Tallgrass, hawthorne	
Brood size	0/1	Already marked 0/1
# caught & marked	0/0	
Insect sweeps	Brood Location	Random location (255°)
habitat	Same as above	Pasture grass
Total bugs	2	5
weight	< 0.01g	0.02g
Grasshoppers	Ø	1
wt.	Ø	0.01g

[Brood 5] Grouse Data Sheet

Date	18 July 94
Time	0915
Location	airstrip, South side below 6 bluffs (across creek is big snag)
Habitat	Grass, forbes, rose

Broodsize	1/2	Already banded: 0/0
# caught & marked	0/0	

Insect sweeps	Brood location	Random location (73°)
Habitat	same as above	grass, willows, goldenrod equicedum
Total bugs	ø	15
wt.	ø	0.08 g
Grasshoppers	ø	ø
wt.	ø	ø

[Brood 4]

Grouse Data Sheet

Date	18 July 94
Time	0900
Location	West end of airstrip (50 m from windsock)
Habitat	small brush, dogwood, ninebark, hawthorn

Brood size	4/4	Already banded: Ø/0
# caught / ~~unmarked~~ marked	Ø/Ø	

	Brood location	Random location (40°)
Insect sweeps		
Habitat	same as above	grass next to river bank
Total bugs	3	22
weight	0.03 g	0.10 g
Grasshoppers	Ø	1
wt.	Ø	0.04 g

Grouse Data Sheet

[Brood 3]

Date	18 July 94
Time	0830
Location	River gravel bar
Habitat	rocky, willows, small cottonwoods

Broodsize	1/7	Already Banded:	1/2
# caught & marked	ø/ø		

	Brood location	(190°) Random location
Insect sweeps		
habitat	same as above	tallgrass, dry
Total bugs	+3 14	3
weight	0.07g	< 0.01g
Grasshoppers	ø	ø
wt.	ø	ø

Grouse Data Sheet

[Brood 2]

Date	18 July 94
Time	0805
Location	airstrip
Habitat	Grass, mowed edge

Broodsize	1/4	Already banded: Ø/Ø
# caught & marked	Ø/Ø	

Insect sweeps	Brood location	(155°) Random location
habitat	same as above	tall grass (green)
Total bugs	11	33
weight	Ø.Ø1g	0.02g
Grasshoppers	Ø	Ø
wt.	Ø	Ø

Grouse Data Sheet - Broods seen

[Brood 1]

Date	18 July 94 (monday)
Time	0745
Location	Between footbridges below airstrip fuel shed
Habitat	Cottonwoods, tall grass (green)

Brood size	1 Hen / 1 chick	Already banded 0/0
# caught & marked	0/0	

Insects	Brood sighting location	Random location (101°)
habitat	same as above	tall grass (dry)
Total Bugs #	3	10
weight	0.03 g	0.1 g
Grasshopper #	0	2
wt.	0	0.09 g

Lincoln - Peterson Population Estimates

$$\hat{N} = \frac{(n_1+1)(n_2+1)}{(m_2+1)}$$

n_1 = total marked
n_2 = total seen
m_2 = # seen w/ marks

popn count Monday, Tues, Wed (mornings)

insect sampling @ brood locations - ~~morning~~ afternoon ? - 10 sweeps of 5 broods
- concentrate only on catching and banding birds

pace - random distance + direction
~~30~~ - 30 paces

18 July 94 $\hat{N}$ = m-morn 7-18 $\frac{(15+1)(27+1)}{(4+1)} = \frac{16 \times 28}{5} = \frac{448}{5} = 88$

4 28 / 16 / 168 / 28 / 448 / 88 / 5 | 440 / 40 / 40

4 16 / 17 / 112 / 16 / 5 | 272 | 54 / 25 / 22

21 / 17 / 147 / 21 / 5 | 357 | 71 / 35

Assumptions
1. popn is closed (restricted to both sides of Big Creek w/out birds east of ~~Cliff~~ Creek)
2. bands don't impact second sample
3. capture prob doesn't change
4. for captured animals, bands are not lost and all bands are seen. ← ~~over~~ estimate of the true popn
5. ~~pop. includes both sides of Big Creek, but nothing E of Cliff Creek.~~

7-19 $\hat{N}_{min} = \frac{(16+1)(15+1)}{(4+1)} = \frac{17 \times 16}{5} = \frac{272}{5} = 54$ * minimum

$\frac{(16+1)(20+1)}{(4+1)} = \frac{17 \times 21}{5} = 71$ * maximum

* - n_2 (total birds seen) was between 15-20, so the pop. estimate was figured to be between 54-71.

7-20 only 4 birds total were seen, so this estimate ~~would~~ would not be valid.

STATE OF IDAHO
DEPARTMENT OF FISH AND GAME
SCIENTIFIC CAPTURE/BANDING PERMIT

Name:	Kerry Paul Reese	Permit No.:	SCP930616
Address:	2168 Henry Court	Issued:	6/17/93
	Moscow, ID 83843	Renewed:	6/23/95
Date of Birth:	2/11/51	Revised:	6/23/95
Phone No.:	(208) 885-6435	Expires:	6/30/96
		Permit Status:	Renewal/Revision

Kerry Paul Reese, affiliated with College of Forestry, Wildlife & Range Sciences, University of Idaho, is hereby granted permission to capture/band wildlife in Idaho under the following terms and conditions:

Purpose of collecting or banding: To initiate a long-term study of ruffed grouse and blue grouse and their broods in a wilderness environment. Approximately 200 individuals of each species will be banded.

Species: Ruffed Grouse and Blue Grouse.

Methods and equipment to be used (METHODS NOT LISTED ARE ABSOLUTELY PROHIBITED) Funnel traps with 50 foot leads and noose poles. Captured birds will be banded using numbered and colored leg bands and released at the site of capture.

Geographic area(s) or waters: Regions 3 and 7.

Depository or disposition of specimens: Carcasses of accidental mortality will be frozen and given to IDFG.

Federal permit number, if any: 21684 (inactive)

Permit provisions:

1. This permit is not transferable, nor may its authority be delegated.
2. A report specifying the number and species of wildlife collected or banded shall be submitted within 30 days following expiration of this permit to the Idaho Department of Fish and Game, Bureau of Wildlife, P.O. Box 25, Boise, Idaho 83707. No renewal will be considered until such collecting/banding report is received.
3. This permit shall be produced for inspection upon request of any conservation officer or other authorized representative of the Idaho Department of Fish and Game.
4. Any abuse or misuse of privileges granted by this permit shall be grounds for revocation.
5. All stationary equipment used to collect fish and wildlife (nets, traps, etc.) will have an attached metal tag bearing, in legible English, the name and current address of the permit holder.
6. No collections shall be made under this permit until the local conservation officer or the Region 3 and 7 office is notified where and when the collection is to be made. A record of dates, times and persons notified shall be kept and submitted at the end of the year as part of the collecting report.

Additional information and/or stipulations: Sub-permittee: Aaron Foster.

cc: Regs. - 3 & 7
USFWS

Reg. 1, 765-3111; Reg. 2, 743-6502;
Reg. 3, 327-7025; Reg. 4, 324-4350;
Reg. 5, 232-4703; Reg. 6, 525-7290
Reg. 7, 756-2271; McCall 634-8139

IDAHO DEPARTMENT OF FISH AND GAME
Jerry M. Conley, Director

By Tom Rinck

Date 6-26-95

Color Combinations for 1995 Grouse - Taylor Ranch

GBPF
GWYF
WYBF
GRBF
BWPF
PBWF
BGBF
YBBF
RWRF
PGRF
WWRF
GPGF
YRGF
BGGF
PWPF
WGPF
YPYF
BWYF
BYYF
BGYF
PGYF
YGBF
PRWF
YPBF
GGBF
YWPF
PPGF

PGBF
RWYF
YPBF
PWWF
GGRF
GPWF
GGWF
PBBF
YWYF
RRWF
RGBF
WYRF
YBRF
WBGF
RGGF
PWRF
GRYF
PRPF
WGYF
WRGF
YRPF
GYGF
YBWF
YPRF
WYPF
WWBF
BBWF

PGGF
YGYF
YPPF
YYWF
WBBF
WPBF

RFGG
[redacted]
PFGP
GFGR

Example
GBPF

Left leg G above B
Right leg P above FtG

Previously captured birds in 1993 + 1994

1993

C-2001	YFYR
C-2002	WFWG
C-2003	GFGY
C-2004	RFRO
C-2005	OFOB
06	BFBW
07	WFGY
08	GFYR
09	YFRO
10	RFOB
11	RYWF
12	OFBW
13	~~WFGB~~ BFWG
14	WFYO
15	~~GF~~ GFOB
16	YFOW
17	RFBW
18	OFWG
19	GFOW
20	OFGY
21	WFWY
22	WFYB
23	OFYW
24	WFWG
25	GFYW
26	GFYG
27	GFGB

1994
Pinks instead of orange

C-2028	YFYG
29	YFYY
30	GFRR
31	PFWP
32	BFPP
33	WFYW
34	GFWY
35	BFWB
36	WFPY
37	YFWY
38	BFWR
39	WFYR
40	BFBG
41	YFGP
42	PFYY
43	BFWP
44	PFRR
45	GFRP
46	PFRW
47	RFYP
48	YFWB
49	WFYG
50	RFYP
51	GFYB
52	YFYP
53	PFRB
54	PFPG

C-2055	GFWW
56	PFBB
57	RFWW
58	PFBG
59	RFGW
60	PFGB
61	BFPR
62	PFYP

Color Combinations - Group I or II

check off combination after use (circle I or II)

Ruffed - right

~~RYWF~~ C-2011	YRBF
GBOF	OWWF
GWYF	GGRF
WYBF	GOWF
GRBF	GGWF
BWOF	OBBF
OBWF	YWYF
BGBF	RRWF
YBBF	RGBF
RWRF	WYRF
OGRF	YBRF
WWRF	WBGF
GOGF	RGGF
YRGF	OWRF
BGGF	GRYF
OWOF	ORDF
WGOF	WGYF
YOYF	WRGF
BWYF	YROF
GYYF	GYGF
BYYF	YBWF
BGYF	YORF
OGYF	WYOF
YGBF	WWBF
ORWF	BBWF
YOBF	OGGF
GGBF	YGYF
YWOF	YOOF
OOGF	YYWF
OGBF	WBBF
RWYF	WOBF

Blue - left

~~YFYG~~ C-2028	~~YFYY~~ C-2029
~~WFWG~~ C-2002	WFYW
~~GFGY~~ C-2003	YFWY
~~YFYR~~ C-2001	WFYR
~~RFRO~~ C-2004	BFWR
~~OFOB~~ C-2005	BFWO
~~BFBW~~ C-2006	BFWB
~~WFGY~~ C-2007	YFGO
~~GFYR~~ C-2008	~~GFGB~~ C-2027
~~YFRO~~ C-2009	OFRW
~~RFOB~~ C-2010	RFYO
~~OFBW~~ C-2012	YFRG
~~BFWG~~ C-2013	WFYG
~~WFYO~~ C-2014	OFGB
~~GFRR~~ C-2030	BFOR
~~YFOW~~ C-2016	GFWY
~~RFBW~~ C-2017	OFYO
~~OFWG~~ C-2018	RFGG
~~GFOW~~ C-2019	BFBG
~~OFGY~~ C-2020	WFOY
~~WFWY~~ C-2021	OFRR
~~WFYB~~ C-2022	OFBG
~~OFYW~~ C-2023	RFGW
~~YFWG~~ C-2024	OFGO
~~GFOB~~ C-2015	GFYB
~~GFYW~~ C-2025	OFYY
OFWO	YFWB
~~GFYG~~ C-2026	RFWW
BFOO	GFGR
GFRO	OFBB
YFYO	GFWW
OFRB	OFOG

Taylor Ranch Ruffed and Blue Grouse Capture Data

Time/ DATE	Location of trap	Species[1]	Band #	Colors[2]	Sex[3]	Age[4]	Weight (gm)	Band # of siblings

#1 R = ruffed, B = blue

2 Color code: X X X X ← lower right
upper left ——— ↑ lower left ↑ upper right

EXAmple: Blue grouse RFBY
(red above FTG on left, Blue above Y on right)

Blue Grouse: FTG on left, Ruffed grouse, FTG on right

3 Sex: M = male, F = female, U = unknown

4 Age: A = adult, J = juvenile, Y = yearling
↑ young of year

Taylor Ranch Ruffed and Blue Grouse Capture Data

Time/ DATE	Location of trap	Species[1]	Band #	Colors[2]	Sex[3]	Age[4]	Weight (gm)	Band # of siblings

#1 R = ruffed, B = blue

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upper left ——→ lower left ↑ upper right

EXAMPLE: Blue grouse RFBY
(red above FtG on left, Blue above Y on right)

Blue Grouse: FtG on left, Ruffed grouse, FtG on right

3 Sex: M = male, F = female, U = unknown

4 Age: A = adult, J = juvenile, Y = yearling
↑ young of year

Color Combinations - Group I or II

check off combination after use (circle I or II)

Ruffed

RYWF	YRBF
GBOF	OWWF
GWYF	GGRF
WYBF	GOWF
GRBF	GGWF
BWOF	OBBF
OBWF	YWYF
BGBF	RRWF
YBBF	RGBF
RWRF	WYRF
OGRF	YBRF
WWRF	WBGF
GOGF	RGGF
YRGF	OWRF
BGGF	GRYF
OWOF	ORDF
WGOF	WGYF
YOYF	WRGF
BWYF	YROF
GYYF	GYGF
BYYF	YBWF
BGYF	YORF
OGYF	WYOF
YGBF	WWBF
ORWF	BBWF
YOBF	OGGF
GGBF	YGYF
YWOF	YOOF
OOGF	YYWF
OGBF	WBBF
RWYF	WOBF

↑ start here

Blue

~~WFWG~~ ©2002	WFYW
~~GFGY~~ ©2003	YFWY
~~YFYR~~ ©2001	WFYR
~~RFRO~~ ©2004	BFWR
~~OFOB~~ ©2005	BFWO
~~BFBW~~ ©2006	BFWB
~~WFGY~~ ©2007	YFGO
~~GFYR~~ ©2008	GFGB
YFRO	OFRW
RFOB	RFYO
OFBW	YFRG
BFWG	WFYG
WFYO	OFGB
GFRR	BFOR
YFOW	GFWY
RFBW	OFYO
OFWG	RFGG
GFOW	BFBG
OFGY	WFOY
WFWY	OFRR
WFYB	OFBG
OFYW	RFGW
YFWG	OFGO
GFOB	GFYB
GFYW	OFYY
OFWO	YFWB
GFYG	RFWW
BFOO	GFGR
GFRO	OFBB
YFYO	GFWW
OFRB	OFOG

↑ start here

Ruffed Grouse Sex

1. Color of bare spot over upper eyelid (8-14 weeks)
   Male: subdued orange to red-orange
   Female: little or no color

2. Number of spots on rump feathers
   Male: 2 or 3 spots
   Female: 1 spot

3. Band completeness
   Male: complete
   Female: incomplete

Ruffed Grouse Age

1. Shape of 9th and 10th primaries
   Adult: round
   Yearling: pointed
   Juvenile: growing (bird may also be downy)

2. Sheathing on primaries
   Adult: sheathing at base
   Yearling: sheathing on P8, not on P9 or P10

Blue Grouse Sex

1. Cervical air sacs (from 8 weks of age)
   Male: surrounded by white feathers, tipped black
   Female: surrounded by grayish brown feathers

2. Head and nape
   Male: no barred feathers
   Female: some barred feathers

3. Wings - color of secondary and tertiary coverts
   Male: fine vermiculations on blue-gray or blue-black
   Female: more mottled brown and buffy

Blue Grouse Age

1. Shape of 9th and 10th primaries
   Adult: round,
   Yearling: pointed
   Juvenile: growing

2. Contour feathers
   Adult: shaft streaks dark
   Yearling: shaft streaks dull white

3. Tail
   Adult: gray bar at end
   Yearling: no gray bar at end

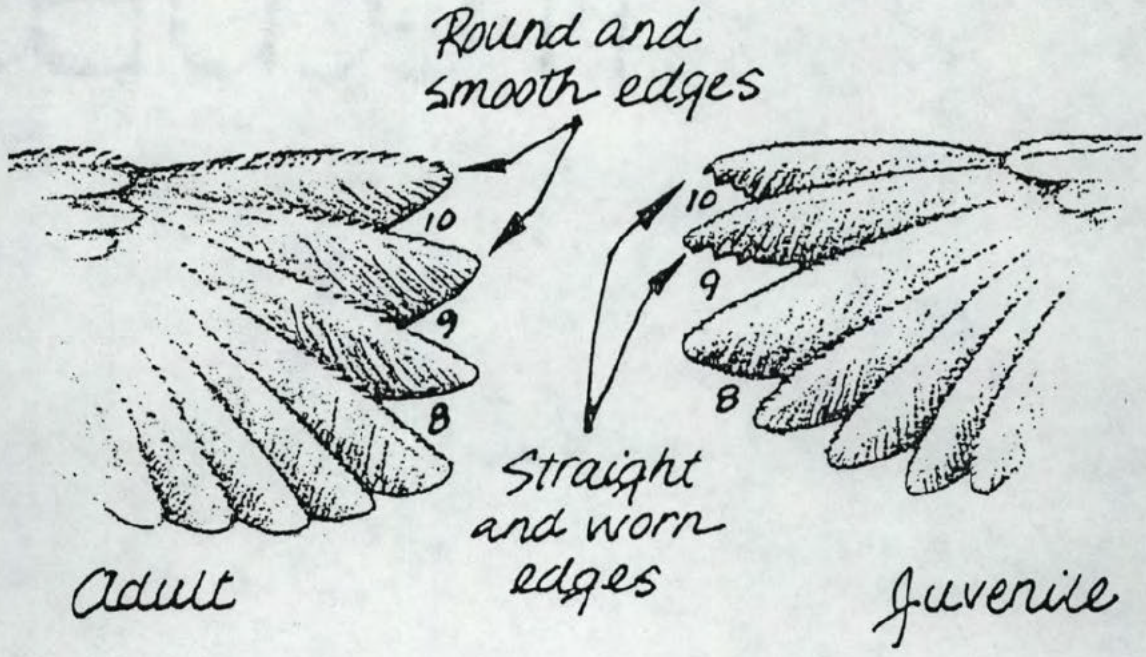

Figure 6. Contrasting appearance of the trailing edge proximal to the tip of the ninth and tenth primaries of ruffed grouse. Primaries 8-10 are indicated. Note the rounded tips of adults and the pointed tips of juveniles (from DeStafano et al. 1983).

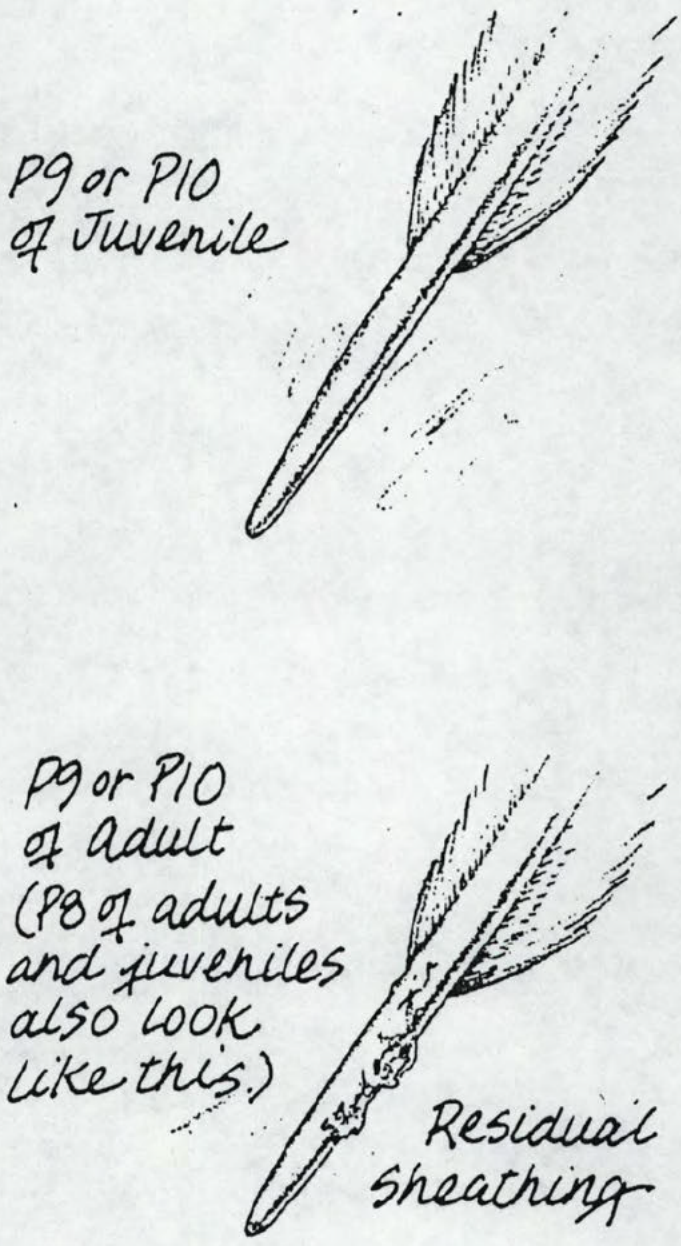

Figure 7. Basal sheathing on the eighth to tenth primaries of ruffed grouse (from DeStafano et al. 1983).

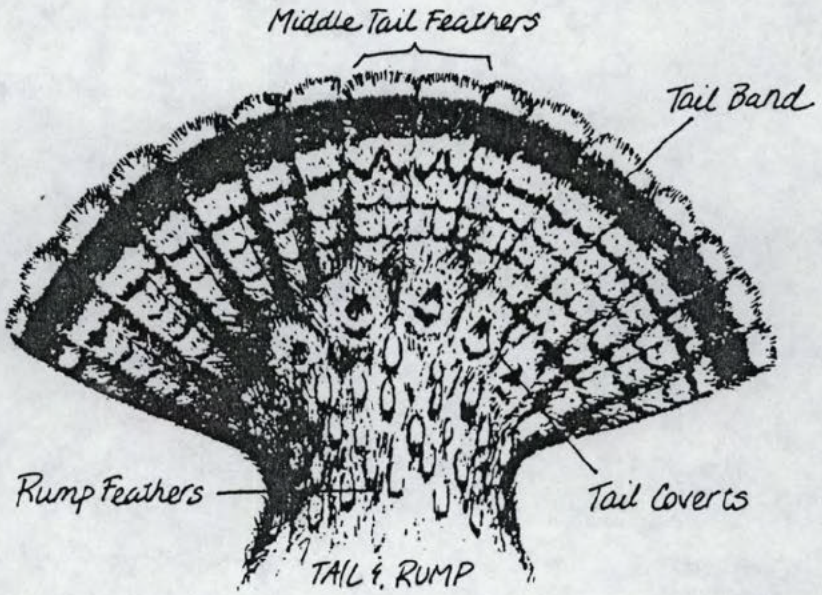

Figure 3. Feathers on the rump and tail region of ruffed grouse (from DeStafano et al. 1983).

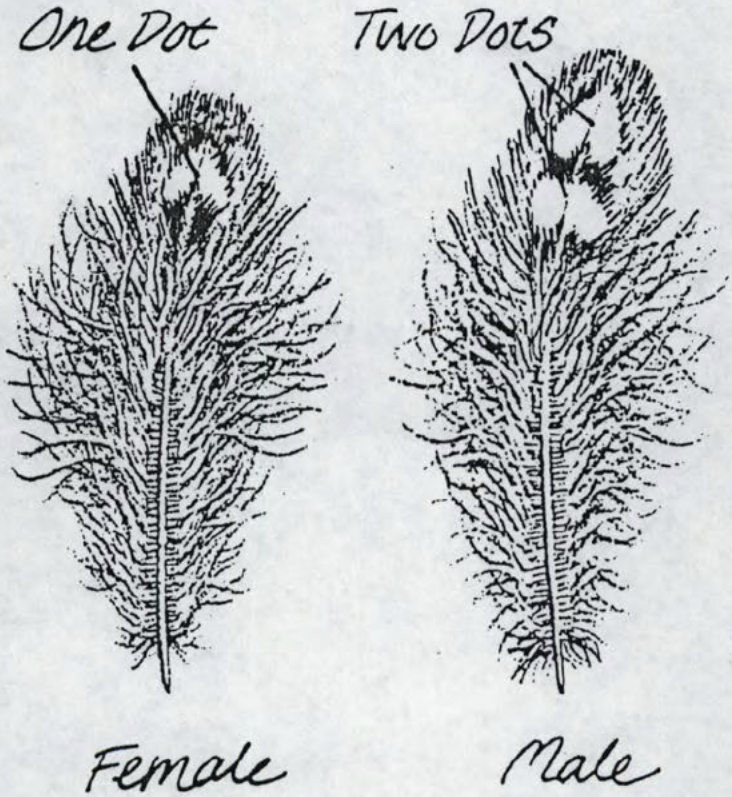

Figure 8. Rump feathers of ruffed grouse. Some males have three dots (from DeStafano et al. 1983).

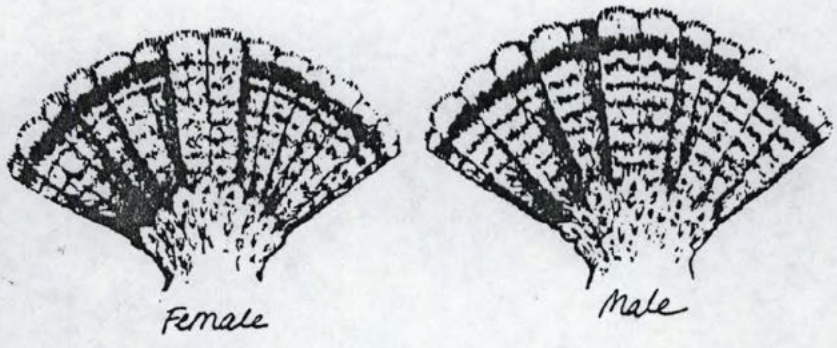

Figure 9. Incomplete (left) and complete (right) tail bands of ruffed grouse (from DeStafano et al. 1983).

highly visible, readily accessible, and placed near stop signs or road intersections where traffic must stop or proceed slowly and where there is ample space for vehicles to pull off the road.

4. Stations should remain in operation from opening weekend through the last weekend in September. Reasons for selecting this time period are: (1) it avoids conflicts with other work assignments during big game seasons, (2) hunter pressure and harvest are greatest in September, and (3) many birds have completed their primary molt by early October and wings from these birds are not useful for identifying the yearling component in the harvest or for calculating nesting success and hatching dates.

5. Stations should be checked twice each week, preferably on Friday afternoons and Monday mornings. Wings collected on Fridays are assumed to be from birds harvested during the week, while those collected on Mondays are assumed to be from birds harvested over the weekend. Knowledge concerning the approximate date of harvest is imperative for calculation of hatching dates and nesting success, and for assessment of the distribution of harvest over time.

6. Date, station location, and number of wings collected by species should be recorded on a standardized form (Appendix B) each time a station is checked. Wings collected from each station should be placed in a plastic bag, labeled as to date and location of collection, and stored in a freezer until processed.

Separation of Age Classes

Age of fall-harvested blue grouse can be identified from wing characteristics alone (Van Rossem 1925, Braun 1971, Bunnell et al. 1977). To accurately do so requires an understanding of the nomenclature, position, and molt pattern of the major wing feathers (Fig. 2) (reviewed by Johnsgard 1973, Larson and Taber 1980). All native galliforms have 10 primaries. For descriptive purposes, primaries are numbered from proximal (I) to distal (X). Upon hatching, there are only 8 juvenal primaries per wing. Juvenal primaries IX and X do not emerge until chicks are 3-4 weeks of age. Grouse molt their primaries in sequence, starting with PI and progressing outwardly to PX. Adults and yearlings replace all 10 primaries each year, but juveniles only replace I through VIII. Juvenal primaries IX and X are not replaced until the birds are 14-16 months of age. Thus, wings of adult (> 26 months) and juvenile (< 4 months) blue grouse, and in some cases yearlings (14-15 months), can be distinguished in September by the shape, color, and wear of P IX and X (Braun 1971) (Fig. 3).

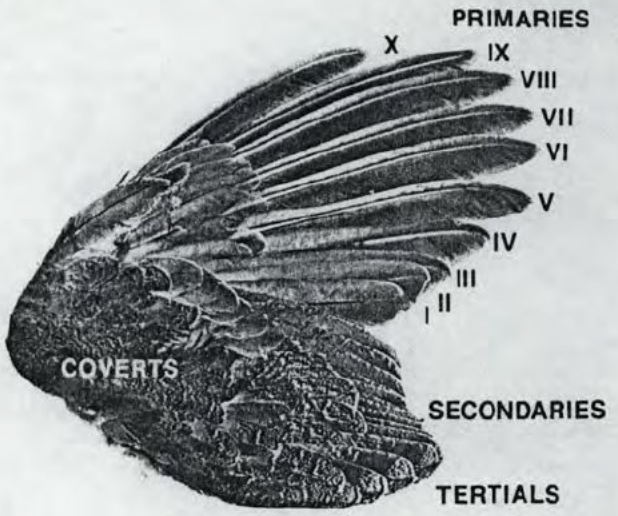

Fig. 2. Wing from fall-harvested blue grouse with a full molt showing the position and nomenclature of the major wing feathers.

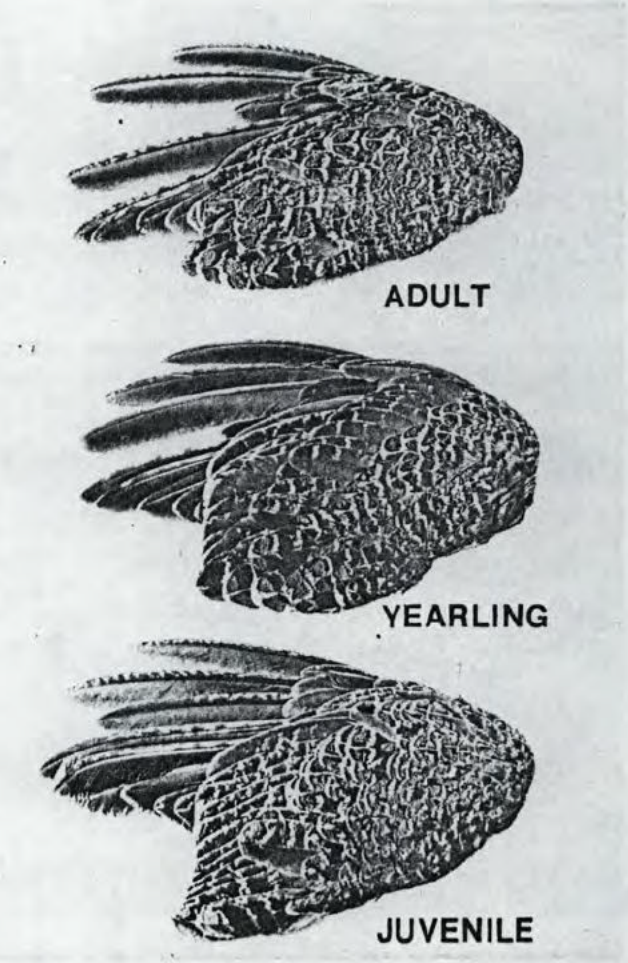

Fig. 3. Wings from adult, yearling, and juvenile blue grouse harvested in September.

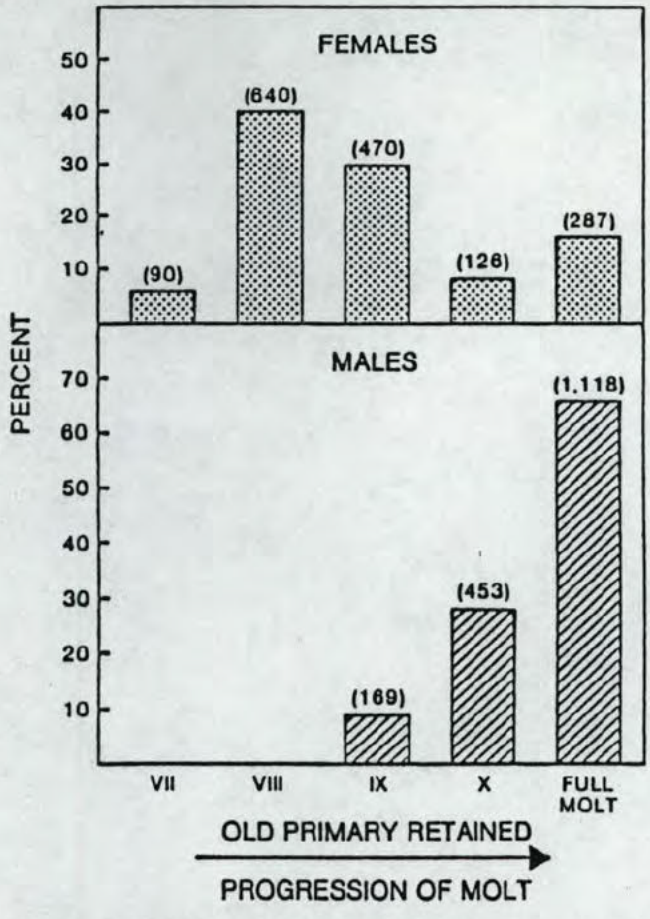

Fig. 6. Molt stage of September-harvested blue grouse classified as adults, Colorado, 1975-82. Sample sizes are in parentheses.

(Fig. 8). Although Braun (1971) reported that juveniles > 6 weeks of age possess the same wing color patterns as adults and yearlings, other data indicate that 10 weeks is the minimum age at which sex of juveniles can be reliably ascertained from wing color (Hoffman 1983). Of 339 known-sex juveniles > 70 days of age examined, sex of 332 (98%) was correctly classified by wing color (Hoffman 1983). Wings of juveniles < 10 weeks of age have a mottled brown pattern resembling that of females (Fig. 8). In September, about 8% of the harvested juveniles will be < 10 weeks of age and might be incorrectly classified by wing color (Table 2).

Wing length measured from the carpal joint to the tip of the longest primary (VII), has been used to ascertain sex of juvenile blue grouse in Utah (Bunnell et al. 1977) and Colorado (Hoffman 1983) as follows:

Total length ≥ 228 mm = male,
< 228 mm = female.

To use this technique, P VII must be fully grown (calamus tip hardened and no blood inside the quill) (Fig. 9). However, only 7% of the juvenal wings collected in Colorado in September met this criterion, of which 96% were correctly classified to sex (Hoffman 1983).

Because of the subjective interpretation involved in discerning wing color and the limited application of wing length measurements, Hoffman (1983) tested and recommended the use of a discriminant function developed from measurements of P IX and X for identifying sex of juvenal wings. The discriminant function is:

$$0.424\,(\text{P IX}) + 0.362\,(\text{P X}) \quad \begin{cases} > 110.712 = \text{male}, \\ < 110.712 = \text{female}; \end{cases}$$

where P IX = length of primary IX in mm and
P X = length of primary X in mm.

To use this technique, P IX and X must be fully grown. This was not a problem as P IX and/or X were growing in only 5% (156/3,090) of the sample examined by Hoffman (1983). The discriminating power is 92%, which is less accurate than the other techniques.

Using data in this report, a key for ascertaining age and sex of blue grouse in Colorado was developed based on shape, molt pattern and length of primary feathers, and wing color (Table 3).

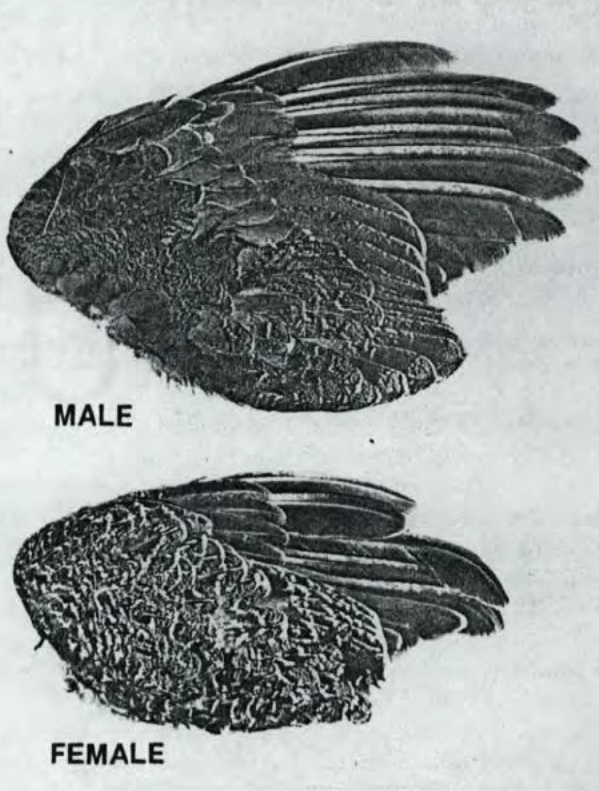

Fig. 7. Wings from adult male and female blue grouse.

STATE OF IDAHO
DEPARTMENT OF FISH AND GAME

SCIENTIFIC COLLECTING/BANDING PERMIT

Name: Kerry Paul Reese
Address: 2168 Henry Court
Moscow, ID 83843

Date of Birth: 2/11/51
Phone No. (208) 885-6435

Permit No.: SCP930616
Issued: 06/17/93
Revised:
Expires: 06/30/94
Permit Status: New

Kerry Paul Reese, affiliated with College of Forestry, Wildlife & Range Sciences, University of Idaho, is hereby granted permission to capture/band wildlife in Idaho under the following terms and conditions:

Purpose of collecting or banding: To initiate a long-term study of ruffed grouse and blue grouse in wilderness.

Species: Ruffed Grouse and Blue Grouse.

Methods and equipment to be used (METHODS NOT LISTED ARE ABSOLUTELY PROHIBITED) Funnel traps with 50 foot leads.

Geographic area(s) or waters: Regions 7 and 3.

Depository or disposition of specimens: All birds will be released at the site of capture. Carcasses of accidental mortality will be frozen and given to IDFG.

Federal permit number, if any: 21684 (inactive)

Permit provisions:

1. This permit is not transferable, nor may its authority be delegated.
2. A report specifying the number and species of wildlife collected or banded shall be submitted within 30 days following expiration of this permit to the Idaho Department of Fish and Game, Bureau of Wildlife, P.O. Box 25, Boise, Idaho 83707. No renewal will be considered until such collecting/banding report is received.
3. This permit shall be produced for inspection upon request of any conservation officer or other authorized representative of the Idaho Department of Fish and Game.
4. Any abuse or misuse of privileges granted by this permit shall be grounds for revocation.
5. All stationary equipment used to collect fish and wildlife (nets, traps, etc.) will have an attached metal tag bearing, in legible English, the name and current address of the permit holder.
6. No collections shall be made under this permit until the local conservation officer or the Region 3 and 7 office is notified where and when the collection is to be made. A record of dates, times and persons notified shall be kept and submitted at the end of the year as part of the collecting report.

Additional information and/or stipulations: Sub-permittee: Sushan Han.

cc: Regs. - 3 & 7
USFWS

Reg. 1, 765-3111; Reg. 2, 743-6502;
Reg. 3, 327-7025; Reg. 4, 324-4350;
Reg. 5, 232-4703; Reg. 6, 525-7290
Reg. 7, 756-2271; McCall 634-8139

IDAHO DEPARTMENT OF FISH AND GAME
Jerry M. Conley, Director

By Tom Rich

Date 7-2-94

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 1

To Kerry Reese	From Barbara Lewis
Co. U of I - Moscow	Co. BOW
Dept. Will send hard copy w/ bands	Phone #
Fax # 885-6226	Fax #

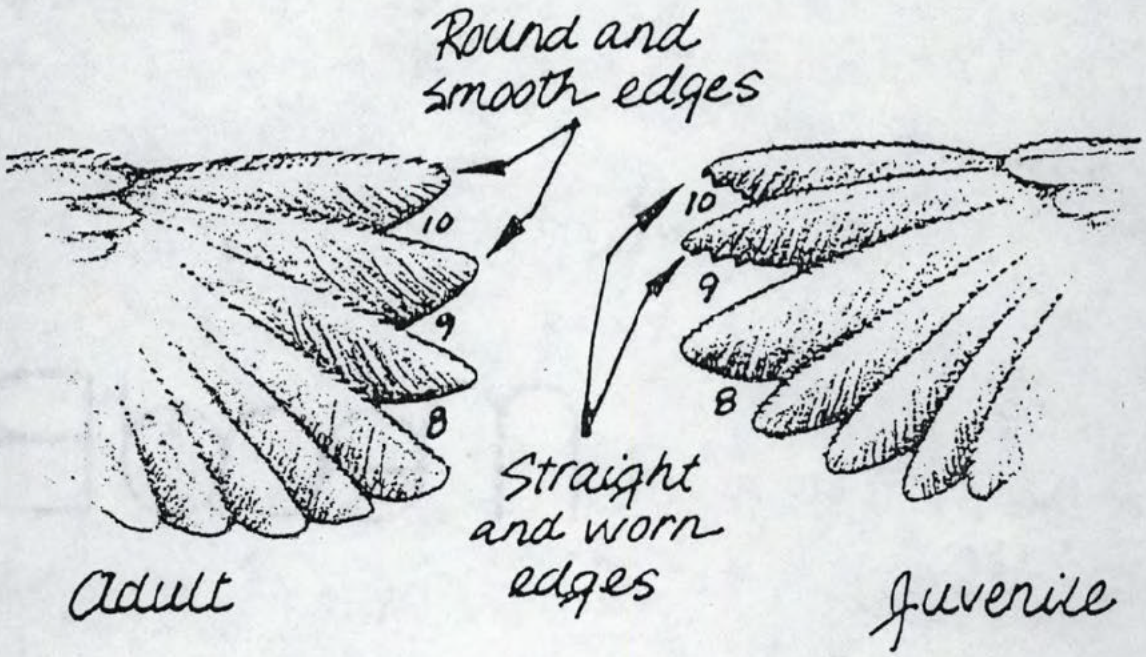

Figure 6. Contrasting appearance of the trailing edge proximal to the tip of the ninth and tenth primaries of ruffed grouse. Primaries 8-10 are indicated. Note the rounded tips of adults and the pointed tips of juveniles (from DeStafano et al. 1983).

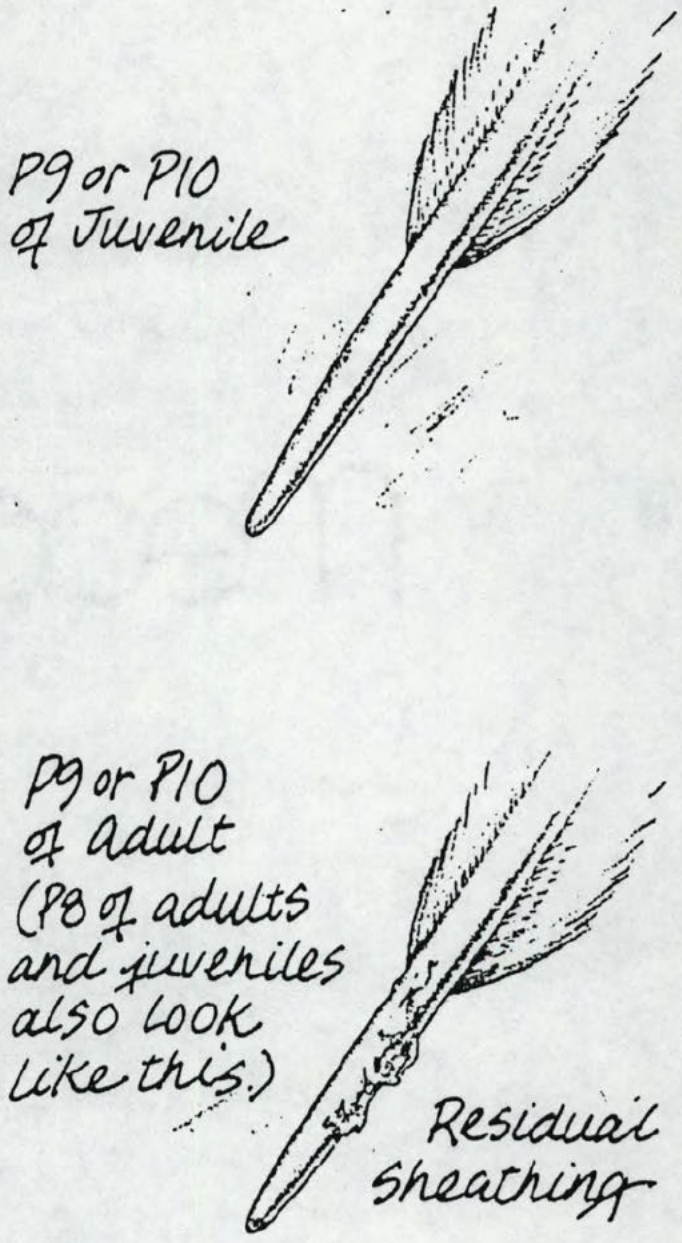

Figure 7. Basal sheathing on the eighth to tenth primaries of ruffed grouse (from DeStafano et al. 1983).

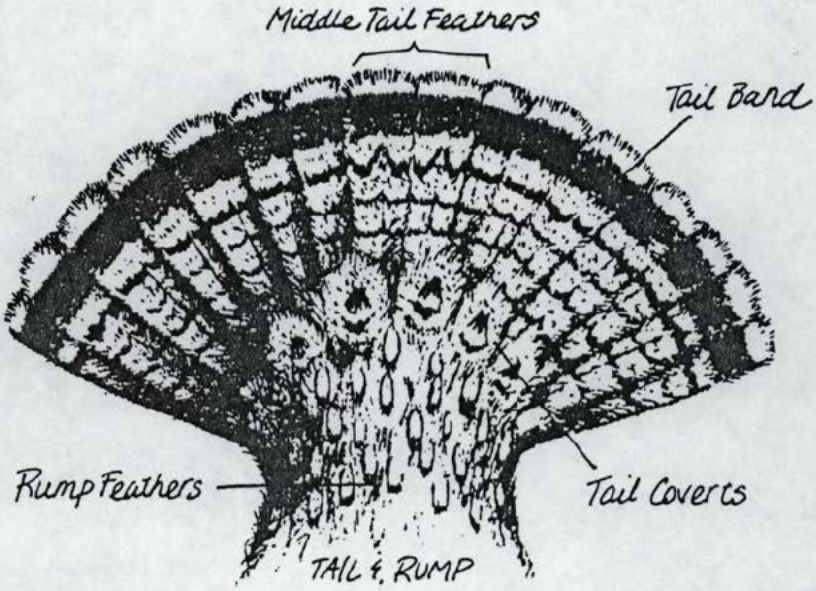

Figure 3. Feathers on the rump and tail region of ruffed grouse (from DeStafano et al. 1983).

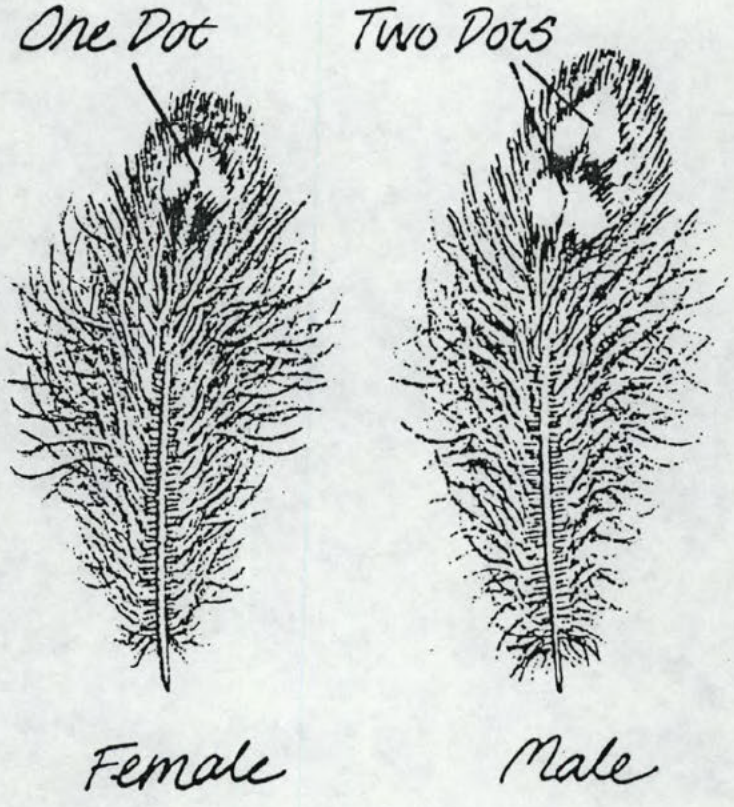

Figure 8. Rump feathers of ruffed grouse. Some males have three dots (from DeStafano et al. 1983).

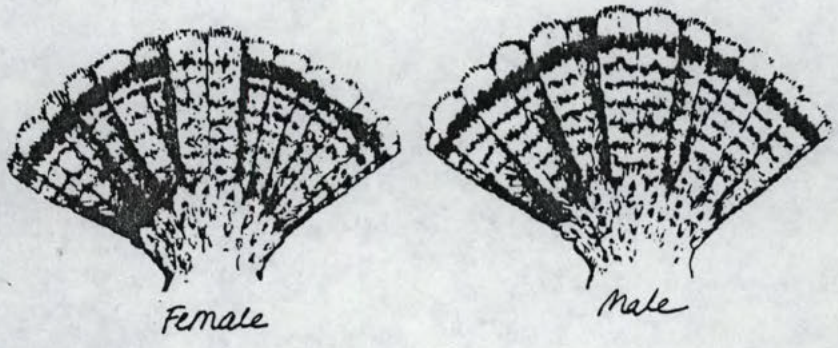

Figure 9. Incomplete (left) and complete (right) tail bands of ruffed grouse (from DeStafano et al. 1983).

highly visible, readily accessible, and placed near stop signs or road intersections where traffic must stop or proceed slowly and where there is ample space for vehicles to pull off the road.

4. Stations should remain in operation from opening weekend through the last weekend in September. Reasons for selecting this time period are: (1) it avoids conflicts with other work assignments during big game seasons, (2) hunter pressure and harvest are greatest in September, and (3) many birds have completed their primary molt by early October and wings from these birds are not useful for identifying the yearling component in the harvest or for calculating nesting success and hatching dates.

5. Stations should be checked twice each week, preferably on Friday afternoons and Monday mornings. Wings collected on Fridays are assumed to be from birds harvested during the week, while those collected on Mondays are assumed to be from birds harvested over the weekend. Knowledge concerning the approximate date of harvest is imperative for calculation of hatching dates and nesting success, and for assessment of the distribution of harvest over time.

6. Date, station location, and number of wings collected by species should be recorded on a standardized form (Appendix B) each time a station is checked. Wings collected from each station should be placed in a plastic bag, labeled as to date and location of collection, and stored in a freezer until processed.

Separation of Age Classes

Age of fall-harvested blue grouse can be identified from wing characteristics alone (Van Rossem 1925, Braun 1971, Bunnell et al. 1977). To accurately do so requires an understanding of the nomenclature, position, and molt pattern of the major wing feathers (Fig. 2) (reviewed by Johnsgard 1973, Larson and Taber 1980). All native galliforms have 10 primaries. For descriptive purposes, primaries are numbered from proximal (I) to distal (X). Upon hatching, there are only 8 juvenal primaries per wing. Juvenal primaries IX and X do not emerge until chicks are 3-4 weeks of age. Grouse molt their primaries in sequence, starting with PI and progressing outwardly to PX. Adults and yearlings replace all 10 primaries each year, but juveniles only replace I through VIII. Juvenal primaries IX and X are not replaced until the birds are 14-16 months of age. Thus, wings of adult (> 26 months) and juvenile (< 4 months) blue grouse, and in some cases yearlings (14-15 months), can be distinguished in September by the shape, color, and wear of P IX and X (Braun 1971) (Fig. 3).

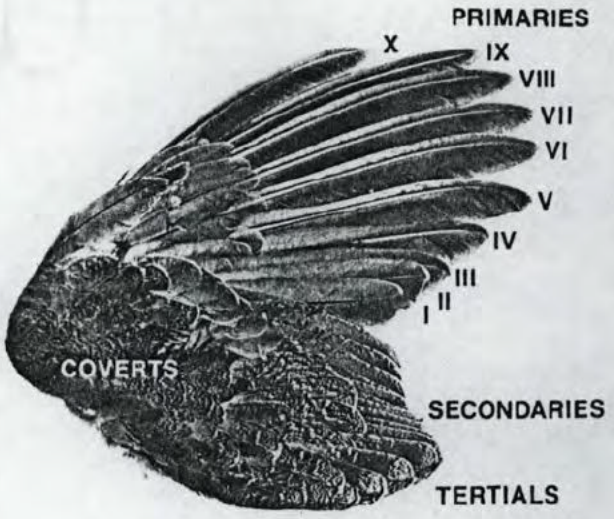

Fig. 2. Wing from fall-harvested blue grouse with a full molt showing the position and nomenclature of the major wing feathers.

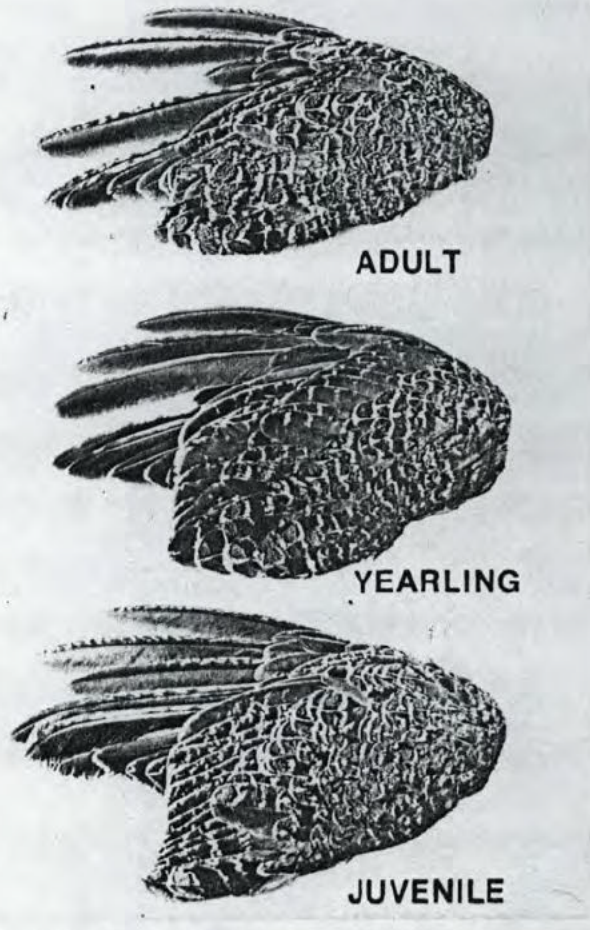

Fig. 3. Wings from adult, yearling, and juvenile blue grouse harvested in September.

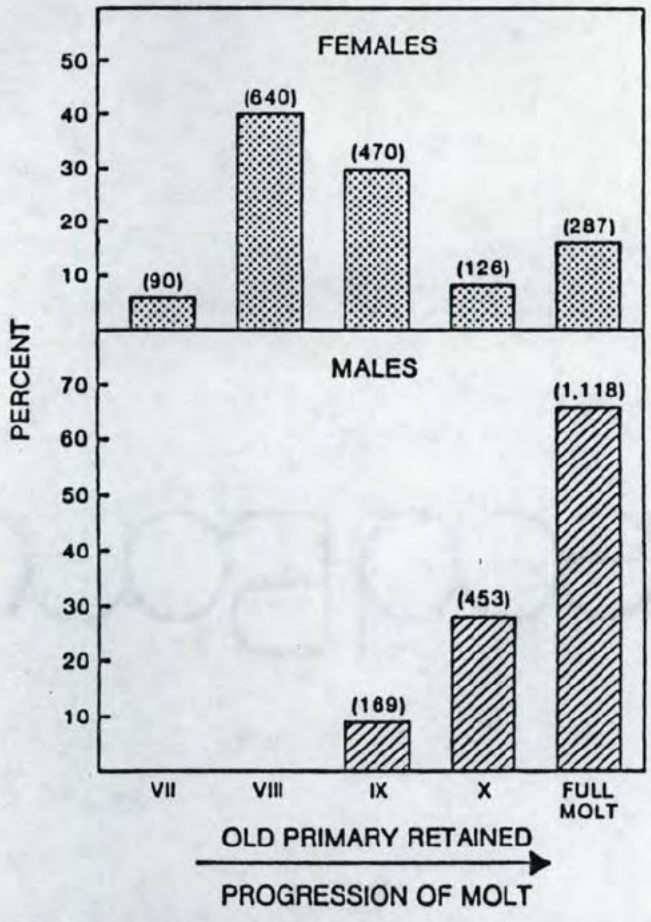

Fig. 6. Molt stage of September-harvested blue grouse classified as adults, Colorado, 1975-82. Sample sizes are in parentheses.

(Fig. 8). Although Braun (1971) reported that juveniles > 6 weeks of age possess the same wing color patterns as adults and yearlings, other data indicate that 10 weeks is the minimum age at which sex of juveniles can be reliably ascertained from wing color (Hoffman 1983). Of 339 known-sex juveniles > 70 days of age examined, sex of 332 (98%) was correctly classified by wing color (Hoffman 1983). Wings of juveniles < 10 weeks of age have a mottled brown pattern resembling that of females (Fig. 8). In September, about 8% of the harvested juveniles will be < 10 weeks of age and might be incorrectly classified by wing color (Table 2).

Wing length measured from the carpal joint to the tip of the longest primary (VII), has been used to ascertain sex of juvenile blue grouse in Utah (Bunnell et al. 1977) and Colorado (Hoffman 1983) as follows:

Total length ≥ 228 mm = male,
< 228 mm = female.

To use this technique, P VII must be fully grown (calamus tip hardened and no blood inside the quill) (Fig. 9). However, only 7% of the juvenal wings collected in Colorado in September met this criterion, of which 96% were correctly classified to sex (Hoffman 1983).

Because of the subjective interpretation involved in discerning wing color and the limited application of wing length measurements, Hoffman (1983) tested and recommended the use of a discriminant function developed from measurements of P IX and X for identifying sex of juvenal wings. The discriminant function is:

$0.424\ (\text{P IX}) + 0.362\ (\text{P X}) \quad > 110.712 = \text{male},$
$< 110.712 = \text{female};$

where P IX = length of primary IX in mm and
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To use this technique, P IX and X must be fully grown. This was not a problem as P IX and/or X were growing in only 5% (156/3,090) of the sample examined by Hoffman (1983). The discriminating power is 92%, which is less accurate than the other techniques.

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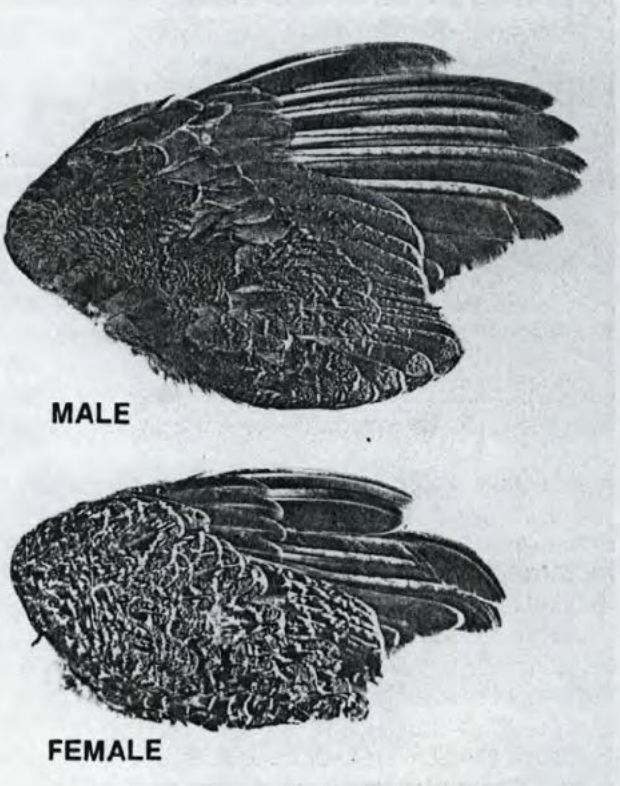

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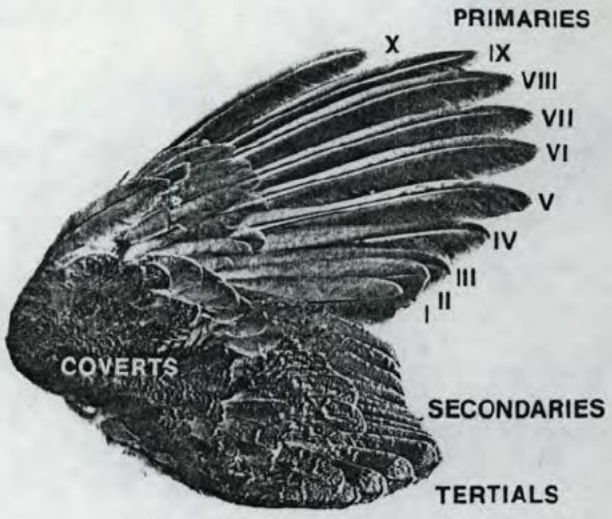

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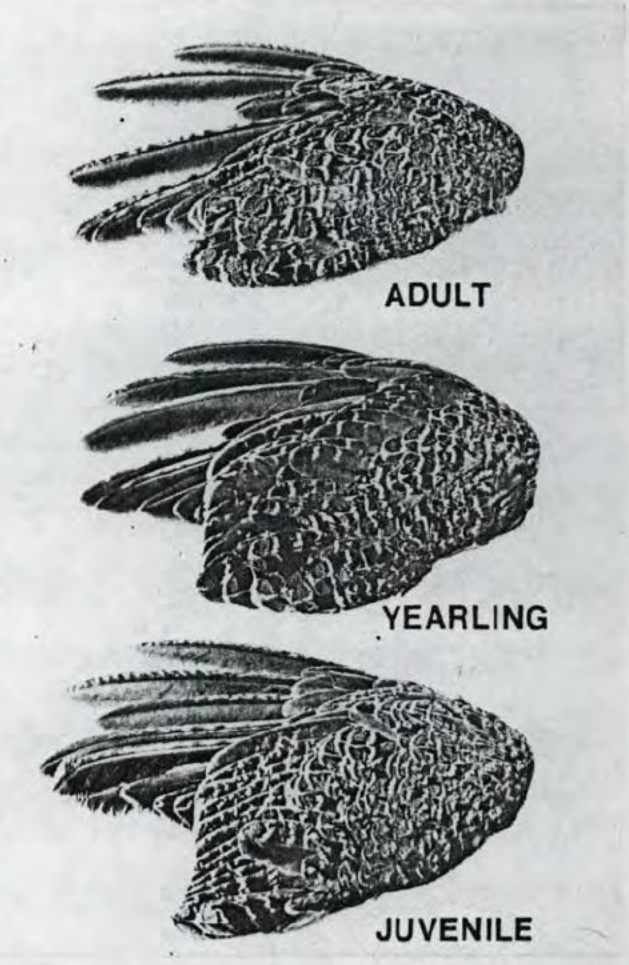

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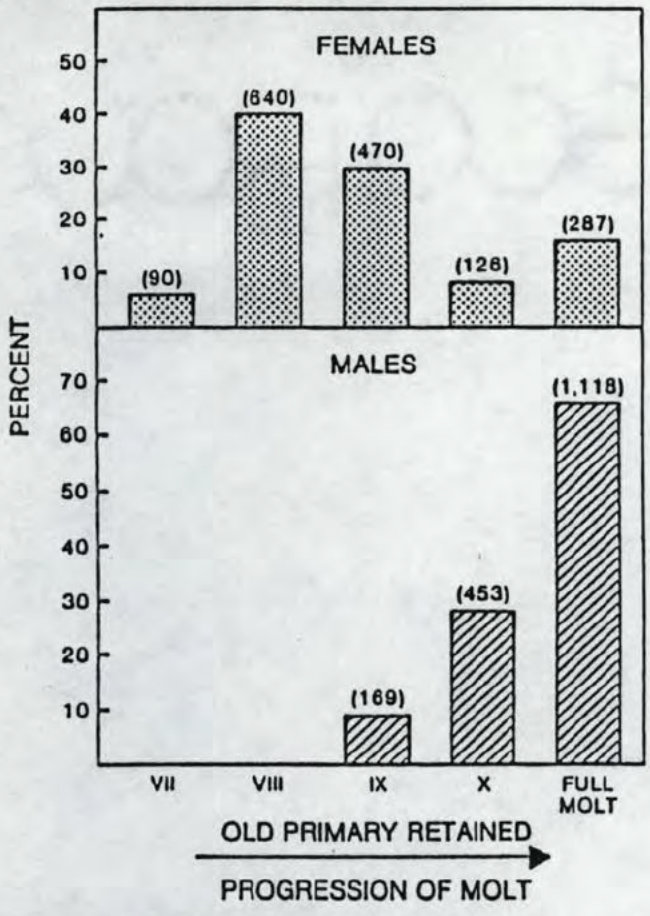

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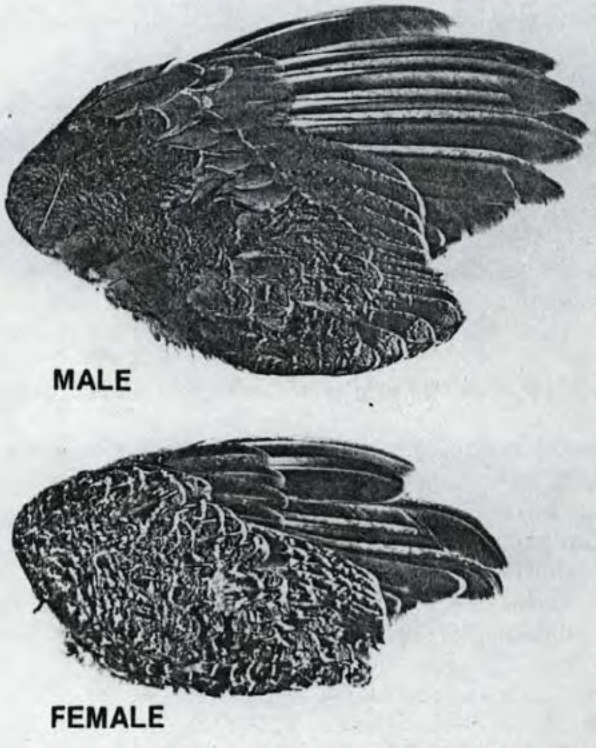


Fig. 7. Wings from adult male and female blue grouse.

STATUS OF BROWN-HEADED COWBIRDS IN THE WILDERNESS OF CENTRAL IDAHO

PRELIMINARY REPORT

ANTHONY L. WRIGHT, Hornocker Wildlife Institute,
HC-83 Running Creek Ranch, Cascade, ID 83611

Brown-headed cowbirds (*Molothrus ater*) are obligate nest parasites that may cause reductions in populations of vulnerable host species, primarily neotropical migrants. Originally associated with plains bison, they probably were absent from the Idaho backcountry before homesteading in the early 20th century. Now they occur on and around horses, hayfields, and irrigated lawns on wilderness ranches and USFS guard stations. Typically these developed areas are located in the best riparian songbird habitat in the wilderness.

Several justifications exist for studying cowbirds in this area and eventually evaluating control strategies: 1) The value of wilderness as an ecological control area where natural processes can be observed is diminished by the presence of exotic species. 2) There is some evidence that populations of neotropical migrants in developed landscapes are not self-sustaining and only the production of surplus individuals in wild areas keeps these populations from collapsing. 3) There may be logical extensions of this study to grazing schedules on cattle allotments throughout the northern Rockies.

Lazuli Bunting 80% parasitized by cowbirds @ Missoula

STUDY AREA

Our study area was 1.5 million ha of contiguous, federally designated wilderness that comprise the Selway-Bitterroot and Frank Church-River of No Return Wildernesses. The vegetation is a mosaic of conifer stands of various types and open areas including brushlands, steep slopes of grasses and forbs, and wet meadows. Elevations range from 670 to 3000 m. Developed areas, both private and public, are generally under 60 ha and are located along rivers or large creeks.

The focal point of our study was Running Creek Ranch on the Selway River, a 12 ha research station where 6 or fewer horses and mules are kept year-round. These animals concentrate their activities near the ranch, wandering up to 1 km away into the grazing allotment 1 Jun-15 Aug and returning to the corral daily. Two similar ranches are located 2.5 and 13 km downriver. A trailhead, USFS guard station, and outfitting camp, all located 13 km upriver, receive very heavy stock use.

METHODS

When I observed cowbirds during the course of daily activities at Running Creek Ranch, I classified them as adult male, adult female, or juvenile and counted the numbers in each category. I considered the highest count achieved each day the minimum number present in that age/sex category.

When I visited other wilderness ranches in central Idaho, I counted cowbirds in the same manner. I also watched for cowbirds during 190 5-minute point counts made within 20 km of Running Creek Ranch.

RESULTS

The minimum number of adult cowbirds present at Running Creek Ranch followed a bimodal pattern for both sexes in all years. A first peak occurred 18-26 May, followed by a period of very low numbers from about 7 Jun-7 Jul, a second peak 10-20 Jul, and very low numbers again by the final days of July (Tables 1 and 2).

Juveniles first appeared 23-26 Jul, peaked 18-24 Aug, and disappeared by 6 Sep. (Table 3).

No cowbirds were seen or heard during point counts in the surrounding wilderness. Cowbirds were seen at 6 of 7 other backcountry developed sites where we looked for them, including Root Ranch at 1900 m. Cowbirds associated with moose at Stonebreaker Ranch, where salt block often attracts the latter.

DISCUSSION

Adult cowbirds leave Running Creek Ranch about the time common host species have completed their first clutch and are at least at the incubation stage of the breeding cycle. This rapid departure suggests the Ranch may be excellent cowbird breeding habitat but offer little in terms of food. The reasons for and nature of this movement, whether it is local or long distance, and whether the adults seen during the July peak are the same individuals as seen earlier can only be determined by marking studies.

Juveniles seen at Running Creek Ranch may well be produced locally. Because they seem to be present at only 1 of the 3 local ranches on a given day, it seems likely the juveniles move freely among them, often as a single flock. Again, only marking studies can confirm this.

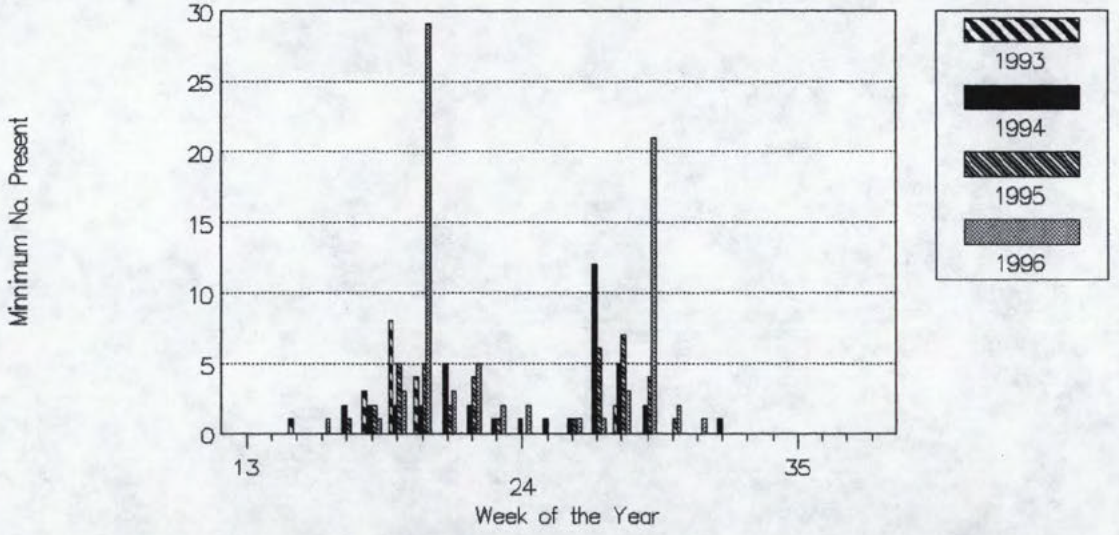
Because cowbirds appear to be present only near backcountry developments, control efforts are worth considering. If cowbirds exhibit strong breeding site and natal site fidelity, removal may be inexpensive and effective. If removed individuals are quickly replaced by floaters, however, the expense could probably not be justified. The question could be approached either by trying removal to see if it is effective or by looking at the site fidelity of marked individuals.

ACKNOWLEDGEMENTS

I thank Terry Holubetz and Brian Leth of the Idaho Department of Fish and Game for looking for cowbirds during their travels through the backcountry.

Minnimum Number Adult Male Cowbirds

Running Creek Ranch



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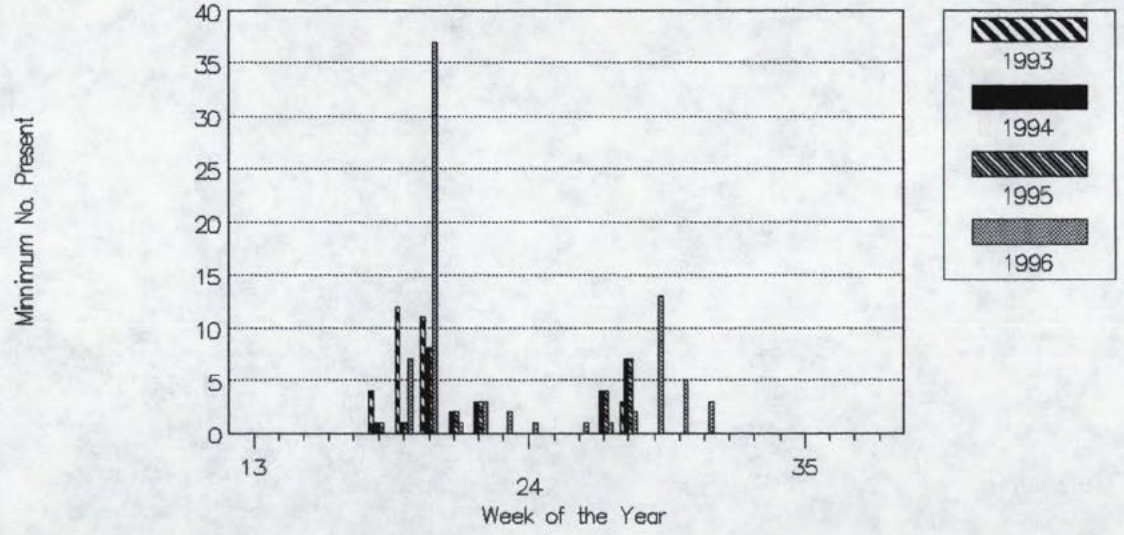
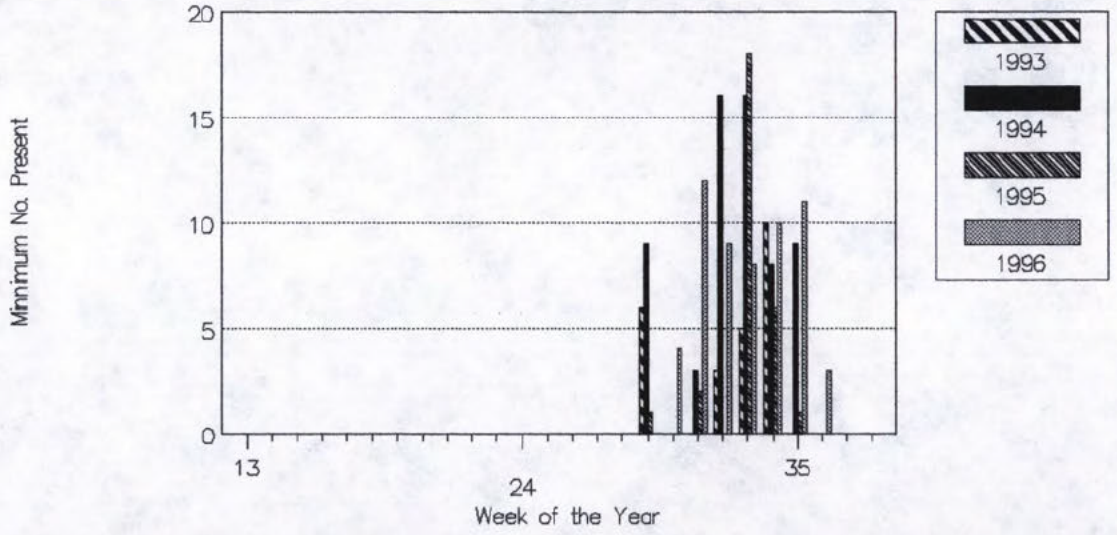


Minnimum Number Juvenile Cowbirds

Running Creek Ranch



COWBIRD DATA FORM

Date	Location	Minimum # Present #Male	#Female	#Juvenile	Habitat	Comments

Please note the highest # of cowbirds of each class you see each day. For example if you see 6 female cowbirds at 0900, 4 at 1200, and 2 in one spot and 5 different female cowbirds 100 yard away in another spot both at 1600, write down 7 under females. You know there were at least 7 around on that day because you saw 7 at once.

For habitat please note corral, pasture, lawn, etc. Under comments, please note if following large mammal, what species.

Return to Tony Wright, HC-83 Running Creek Ranch, Cascade, ID 83611

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Color Combinations - Group I or II

check off combination after use (circle I or II)

2015
2016

Ruffed

RYWF C-2011	YRBF
GBOF	OWWF
GWYF	GGRF
WYBF	GOWF
GRBF	GGWF
BWOF	OBBF
OBWF	YWYF
BGBF	RRWF
YBBF	RGBF
RWRF	WYRF
OGRF	YBRF
WWRF	WBGF
GOGF	RGGF
YRGF	OWRF
BGGF	GRYF C-2038
OWOF	OROF
WGOF	WGYF
YOYF	WRGF
BWYF	YROF
GYYF	GYGF
BYYF	YBWF
BGYF	YORF
OGYF	WYOF
YGBF	WWBF
ORWF	BBWF
YOBF	OGGF
GGBF	YGYF
YWOF	YOOF
OOGF	YYWF
OGBF	WBBF
RWYF	WOBF

Blue

~~YFYO~~ C-2028	~~YFYY~~ C-2024
~~WFWG~~ C-2002	WFYW C-2033
~~GFGY~~ C-2003	YFWY C-2037
~~YFYR~~ C-2001	WFYR C-2039
~~RFRO~~ C-2004	BFWR C-2038
~~OFOB~~ C-2005	BFWP C-2043
~~BFBW~~ C-2006	~~BFWB~~ C-2035
~~WFGY~~ C-2007	~~YFGP~~ C-2041
~~GFYR~~ C-2008	~~GFGB~~ C-2021
~~YFRO~~ C-2009	PFRW C-2046
~~RFOB~~ C-2010	RFYP C-2050
~~OFBW~~ C-2012	YFRG C-2039
~~BFWG~~ C-2013	WFYG C-2049
~~WFYO~~ C-2014	PFGB ~~Pink~~ C-2060
~~GFRR~~ C-2004	BFPR C-2061 for orange
~~YFOW~~ C-2016	~~GFWY~~
RFBW C-2017	PFYP C-2062
~~OFWG~~ C-2018	RFGG 94
~~GFOW~~ C-2019	BFBG C-2046
~~OFGY~~ C-2020	WFPY C-2036
~~WFWY~~ C-2021	PFRR C-2044
~~WFYB~~ C-2022	PFBG C-2058
~~OFYW~~ C-2023	RFGW C-2059
~~YFWG~~ C-2024	PFGP ~~C-2009~~
GFOB C-2015	GFYB C-2051
~~GFYW~~ C-2025	PFYY C-2042
~~PFWP~~ C-2031	~~YFWB~~ C-2048
~~GFYG~~ C-2026	RFWW C-2057
BFPP C-2032	GFGR
GFRP C-2045	PFBB C-2056
YFYP C-2052	GFWW C-2055
PFRB C-2053	~~GFGG~~ C-2054
	PFPG

Color Combinations - Group I or II

check off combination after use

(circle I or II)

2015
2016

Ruffed

~~RYWF~~ C-2011	YRBF
GBOF	OWWF
GWYF	GGRF
WYBF	GOWF
GRBF	GGWF
BWOF	OBBF
OBWF	YWYF
BGBF	RRWF
YBBF	RGBF
RWRF	WYRF
OGRF	YBRF
WWRF	WBGF
GOGF	RGGF
YRGF	OWRF
BGGF	GRYF C-2030
OWOF	OROF
WGOF	WGYF
YOYF	WRGF
BWYF	YROF
GYYF	GYGF
BYYF	YBWF
BGYF	YORF
OGYF	WYOF
YGBF	WWBF
ORWF	BBWF
YOBF	OGGF
GGBF	YGYF
YWOF	YOOF
OOGF	YYWF
OGBF	WBBF
RWYF	WOBF

Blue

~~YFYO~~ C-2028	~~YFYY~~ C-2029
~~WFWG~~ C-2002	WFYW
~~GFGY~~ C-2003	YFWY
~~YFYR~~ C-2001	WFYR
~~RFRO~~ C-2004	~~BFWR~~ C2101
~~OFOB~~ C-2005	~~BFWO~~ C2103
~~BFBW~~ C-2006	BFWB
~~WFGY~~ C-2007	YFGO
~~GFYR~~ C-2008	~~GFGB~~ C-2027
~~YFRO~~ C-2009	OFRW
~~RFOB~~ C-2010	RFYO
OFBW C-2012	YFRG
~~BFWG~~ C-2013	WFYG
~~WFYO~~ C-2014	OFGB
~~GFRR~~ [illegible]	BFOR
~~YFOW~~ C-2016	GFWY
RFBW C-2017	OFYO
~~OFWG~~ C-2018	RFGG
~~GFOW~~ C-2019	BFBG
~~OFGY~~ C-2020	WFOY
~~WFWY~~ C-2021	OFRR
~~WFYB~~ C-2022	OFBG
~~OFYW~~ C-2023	RFGW
~~YFWG~~ C-2024	OFGO
~~GFOB~~ C-2015	GFYB
~~GFYW~~ C-2025	OFYY
OFWO	YFWB
~~GFYG~~ C-2026	RFWW
BFOO	GFGR
GFRO	OFBB
YFYO	GFWW
OFRB	OFOG

Pink for orange in 94

Color Combinations - Group I or II

check off combination after use (circle I or II)

Ruffed

RYWF
GBOF
GWYF
WYBF
GRBF
BWOF
OBWF
BGBF
YBBF
RWRF
OGRF
WWRF
GOGF
YRGF
BGGF
OWOF
WGOF
YOYF
BWYF
GYYF
BYYF
BGYF
OGYF
YGBF
ORWF
YOBF
GGBF
YWOF
OOGF
OGBF
RWYF

YRBF
OWWF
GGRF
GOWF
GGWF
OBBF
YWYF
RRWF
RGBF
WYRF
YBRF
WBGF
RGGF
OWRF
GRYF
OROF
WGYF
WRGF
YROF
GYGF
YBWF
YORF
WYOF
WWBF
BBWF
OGGF
YGYF
YOOF
YYWF
WBBF
WOBF

Blue

WFWG
GFGY
YFYR
RFRO
OFOB
BFBW
WFGY
GFYR
YFRO
RFOB
OFBW
BFWG
WFYO
GFRR
YFOW
RFBW
OFWG
GFOW
OFGY
WFWY
WFYB
OFYW
YFWG
GFOB
GFYW
OFYO
WFOO
GFRO
YFYO
OFRB

WFYW
YFWY
WFYR
BFWR
BFWO
BFWB
YFGO
GFGB
OFRW
RFYO
YFRG
WFYG
OFGB
BFOR
GFWY
OFYO
RFGG
BFBG
WFOY
OFRR
OFBG
RFGW
OFGO
GFYB
OFYY
YFWB
RFWW
GFGR
OFBB
GFWW
OFOG

Taylor Ranch Ruffed and Blue Grouse Capture Data

Time/ DATE	Location & trap	Species[1]	Band #	Colors[2]	Sex[3]	Age[4]	Weight (gm)	Band # of siblings

1 R = ruffed, B = blue

2 Color code: X X X * ← lower right
upper left ——→ ↑ lower left ↑ upper right

Example: Blue grouse RFBY
(red above FTG on left, Blue above Y on right)

Blue Grouse: FTG on left, Ruffed grouse, FTG on right

3 Sex: M = male, F = female, U = unknown

4 Age: A = adult, J = juvenile, Y = yearling
↑ young of year

Taylor Ranch Ruffed and Blue Grouse Capture Data

Time/ DATE	Location & Trap	Species[1]	Band #	Colors[2]	Sex[3]	Age[4]	Weight (gm)	Band # of siblings

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4 Age: A = adult, J = juvenile, Y = yearling
↑ young of year

STATE OF IDAHO
DEPARTMENT OF FISH AND GAME

SCIENTIFIC COLLECTING/BANDING PERMIT

Name: Kerry Paul Reese
Address: [redacted]

Date of Birth: [redacted]
Phone No. [redacted]

Permit No.: [redacted]
Issued: 06/17/93
Revised: 06/01/94
Expires: 06/30/95
Permit Status: Renewal

Kerry Paul Reese, affiliated with College of Forestry, Wildlife & Range Sciences, University of Idaho, is hereby granted permission to capture/band wildlife in Idaho under the following terms and conditions:

Purpose of collecting or banding: To initiate a long-term study of ruffed grouse and blue grouse and their broods in a wilderness environment. Approximately 200 individuals of each species will be banded.

Species: Ruffed Grouse and Blue Grouse.

Methods and equipment to be used (METHODS NOT LISTED ARE ABSOLUTELY PROHIBITED) Funnel traps with 50 foot leads and noose poles. Captured birds will be banded using numbered and colored leg bands and released at the site of capture.

Geographic area(s) or waters: Regions 3 and 7.

Depository or disposition of specimens: Carcasses of accidental mortality will be frozen and given to IDFG.

Federal permit number, if any: [redacted]

Permit provisions:

1. This permit is not transferable, nor may its authority be delegated.
2. A report specifying the number and species of wildlife collected or banded shall be submitted within 30 days following expiration of this permit to the Idaho Department of Fish and Game, Bureau of Wildlife, P.O. Box 25, Boise, Idaho 83707. No renewal will be considered until such collecting/banding report is received.
3. This permit shall be produced for inspection upon request of any conservation officer or other authorized representative of the Idaho Department of Fish and Game.
4. Any abuse or misuse of privileges granted by this permit shall be grounds for revocation.
5. All stationary equipment used to collect fish and wildlife (nets, traps, etc.) will have an attached metal tag bearing, in legible English, the name and current address of the permit holder.
6. No collections shall be made under this permit until the local conservation officer or the Region 3 and 7 office is notified where and when the collection is to be made. A record of dates, times and persons notified shall be kept and submitted at the end of the year as part of the collecting report.

Additional information and/or stipulations: Sub-permittee: David Duncan.

cc: Regs. - 3 & 7
USFWS

Reg. 1, 765-3111; Reg. 2, 743-6502;
Reg. 3, 327-7025; Reg. 4, 324-4350;
Reg. 5, 232-4703; Reg. 6, 525-7290
Reg. 7, 756-2271; McCall 634-8139

IDAHO DEPARTMENT OF FISH AND GAME
Jerry M. Conley, Director

By Tom Rinck

Date 6-16-94

Application for a Capturing and Banding Permit

by Kerry P. Reese

Department of Fish and Wildlife Resources

University of Idaho, Moscow, ID 83843

Submitted to Tom Hemker

Idaho Department of Fish and Game

600 S. Walnut St., Boise, ID 83707

Forest Grouse Research Plans for Taylor Ranch 1993-95

A. Project proposal.

Many studies have been conducted on ruffed and blue grouse reproductive success, survival and habitat use, especially in populations exploited by sportsmen. Relatively little research has occurred on these species in wilderness areas where human-induced losses are few. The University of Idaho's Taylor Ranch, in the Frank Church River of No Return Wilderness, offers an opportunity to band numerous ruffed and blue grouse to examine the basic ecologies of the species over time.

The Taylor Ranch represents a unique chance to band large numbers of hen grouse with their broods in a relatively small area. This may allow research that concentrates on aspects of grouse ecology influenced by hen-offspring lineages along with traditional studies of grouse survival, population size and habitat use and movement patterns.

Many ecological theories are based on concepts of relative fitness, ie., differential reproductive success of individuals and their offspring over time. Following lineages of animals in the wild is nearly impossible due to logistic constraints. However, a knowledge of the relative reproductive success of female grouse, their survival rates, and the survival and productivity of their young, would begin to permit examination of numerous ecological questions. Do certain hens produce offspring that consistently out-live or out-produce other hens? If so, is this related to differential use of habitats over the year or during a portion of the year? Does differential habitat use really influence survival or is differential survival mediated through genetic features passed through hen lineages? Are reproductive parameters such as nest initiation date, clutch size, egg weight, incubation period, etc, related more to genetics than to variables such as weather, hen age, hen condition or habitat quality? Can such questions be answered by only knowing hen lineages or will knowledge of male parental lines also be required?

The first 3 years of this study will consist of trapping and banding hen grouse with their broods on the Taylor Ranch. Each bird will be individually banded with an Idaho Department of Fish and Game band and a unique combination of color bands for later recognition. In each successive year survival of birds will be determined as will relative survival of individual hen lineages. If this is successful after 3 years, additional outside funding will be sought (National Science Foundation, National Institute of Health, private foundations) to further expand the study with graduate students into such topics as habitat selection via radio-telemetry, habitat quality studies, and blood-sampling for genetic fingerprinting in attempts to identify male and female parents.

Goals in 1993

** Build walk-in funnel traps at the Taylor Ranch, a UI-owned site in the Frank Church River of No Return Wilderness Area.

** Select hen and brood trapping sites at the ranch in early July.

** Train technician Sushan Han in trapping, handling and banding birds (she is a junior wildlife student at the UI).

** Trap and band birds beginning 8 July through early August until broods disperse from the ranch or hens and their broods breakup.

** Record normal banding data: trap days per capture, number captured in each brood, hen and chick weights, chick ages, capture habitat, capture weather conditions, recaptures, etc.

** Map locations of where banded birds are subsequently sighted for later habitat evaluation.

Goals in 1994 and 1995

** Repeat capture efforts to band new birds and recapture previously banded birds for survival and population estimates.

** Determine recapture rate, survival, reproductive success, etc. by hens banded as broods in previous years to evaluate differential productivity of hen lineages.

** Begin developing proposals to build on 1993-95 data.

Requested of Idaho Department of Fish and Game

1. Permission to trap, band and color-band ruffed and blue grouse hens and their broods (and incidentally captured males), yearly from 1993 through 1995 on the Taylor Ranch. Banding reports will be submitted each year in the fall.

2. Provide individually-numbered ruffed and blue grouse leg bands - estimated need of 200 of each per year.

3. No funds or supplies are requested. All expenses will be provided by the Wilderness Research Center at the University of Idaho.

B. Collection of specimens.

No collection of birds will occur.

C. Method of capture.

Walk-in funnel traps placed to intercept birds as they move from forest to open meadow habitat.

D. Number and disposition of specimens killed.

If any accidental mortality occurs, the carcasses will be frozen and given to Idaho Fish and Game.

E. Minimum study area.

Frank Church River of No Return Wilderness, specifically the UI-owned Taylor Ranch and immediate vicinity in Valley County.

F. Minimum time.

Trapping is planned for July and August of 1993, 1994 and 1995 to accumulate sufficient data to discover if long-term hen and brood studies are feasible at the Taylor Ranch and to serve as the basis for proposals to other agencies such as National Science Foundation, National Institute of Health, etc.

G. Personal qualifications.

I have been a wildlife faculty member at the UI for 10 years and as part of my duties teach methods of capturing, handling and marking birds. I am involved in numerous studies cooperatively with IDFG biologists Jack Connelly, Pete Zager and Walt Bodie on game birds. In all these studies we trap and band sage grouse, sharp-tailed grouse, mountain quail and wild turkeys. In addition to work in Idaho, I have trapped and banded wood ducks, magpies and spotted owls in other states and hold Federal Master-Personal Bird Marking and Salvage Permit No. 21684 (now inactive the last 2 years).

highly visible, readily accessible, and placed near stop signs or road intersections where traffic must stop or proceed slowly and where there is ample space for vehicles to pull off the road.

4. Stations should remain in operation from opening weekend through the last weekend in September. Reasons for selecting this time period are: (1) it avoids conflicts with other work assignments during big game seasons, (2) hunter pressure and harvest are greatest in September, and (3) many birds have completed their primary molt by early October and wings from these birds are not useful for identifying the yearling component in the harvest or for calculating nesting success and hatching dates.

5. Stations should be checked twice each week, preferably on Friday afternoons and Monday mornings. Wings collected on Fridays are assumed to be from birds harvested during the week, while those collected on Mondays are assumed to be from birds harvested over the weekend. Knowledge concerning the approximate date of harvest is imperative for calculation of hatching dates and nesting success, and for assessment of the distribution of harvest over time.

6. Date, station location, and number of wings collected by species should be recorded on a standardized form (Appendix B) each time a station is checked. Wings collected from each station should be placed in a plastic bag, labeled as to date and location of collection, and stored in a freezer until processed.

Separation of Age Classes

Age of fall-harvested blue grouse can be identified from wing characteristics alone (Van Rossem 1925, Braun 1971, Bunnell et al. 1977). To accurately do so requires an understanding of the nomenclature, position, and molt pattern of the major wing feathers (Fig. 2) (reviewed by Johnsgard 1973, Larson and Taber 1980). All native galliforms have 10 primaries. For descriptive purposes, primaries are numbered from proximal (I) to distal (X). Upon hatching, there are only 8 juvenal primaries per wing. Juvenal primaries IX and X do not emerge until chicks are 3-4 weeks of age. Grouse molt their primaries in sequence, starting with PI and progressing outwardly to PX. Adults and yearlings replace all 10 primaries each year, but juveniles only replace I through VIII. Juvenal primaries IX and X are not replaced until the birds are 14-16 months of age. Thus, wings of adult (> 26 months) and juvenile (< 4 months) blue grouse, and in some cases yearlings (14-15 months), can be distinguished in September by the shape, color, and wear of P IX and X (Braun 1971) (Fig. 3).

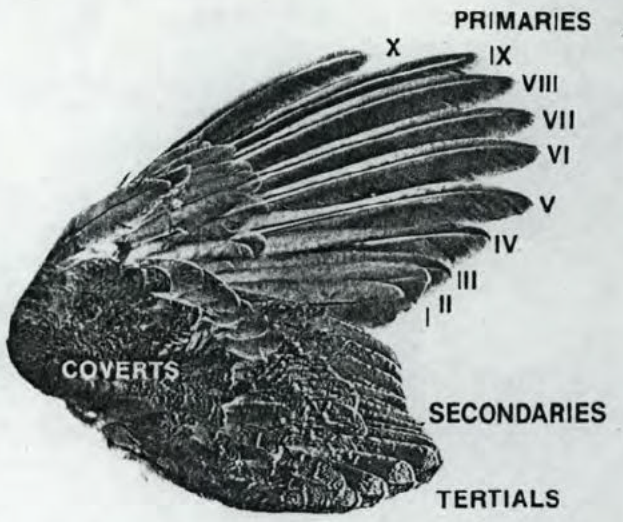


Fig. 2. Wing from fall-harvested blue grouse with a full molt showing the position and nomenclature of the major wing feathers.

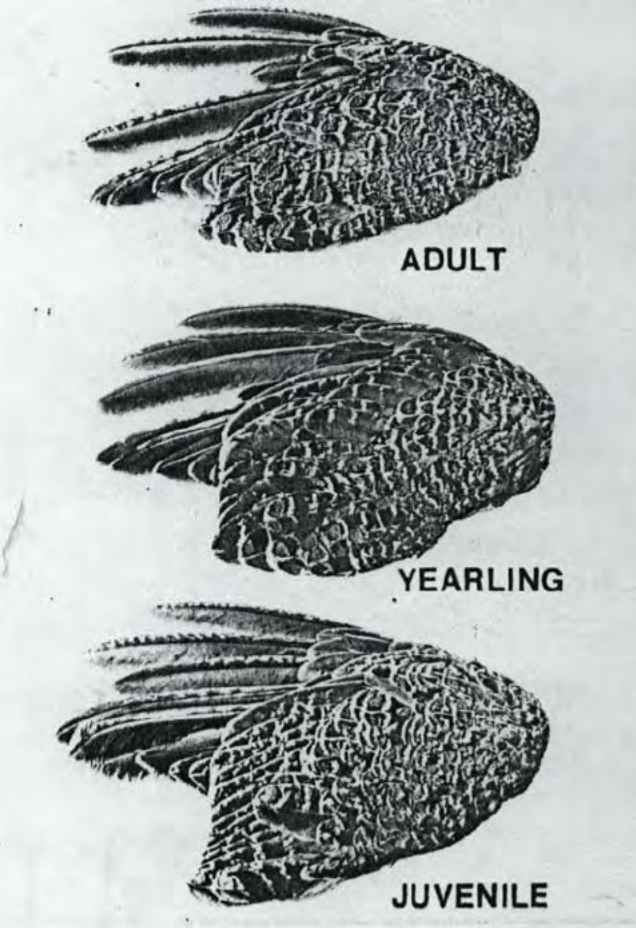


Fig. 3. Wings from adult, yearling, and juvenile blue grouse harvested in September.

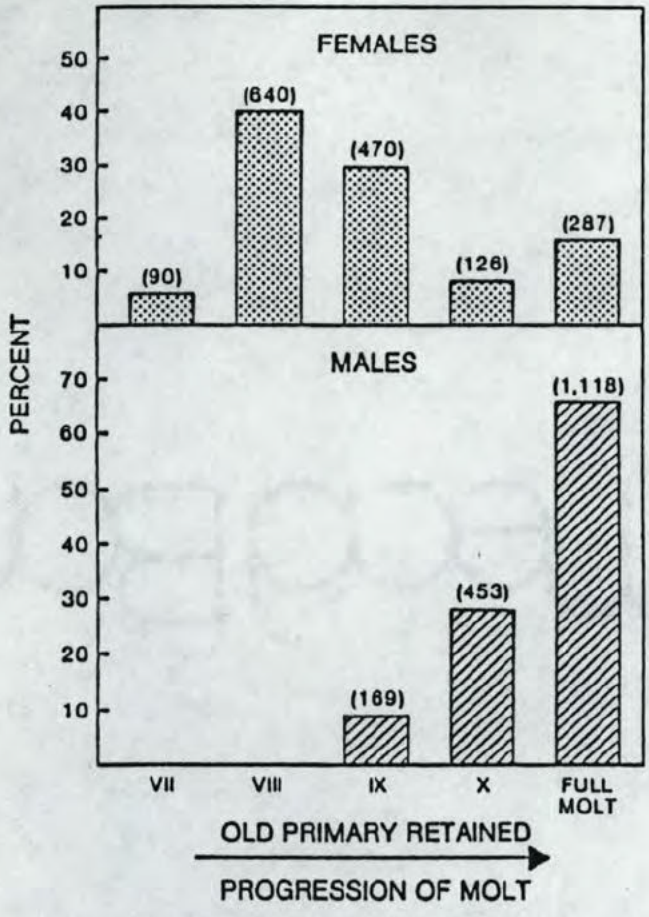


Fig. 6. Molt stage of September-harvested blue grouse classified as adults, Colorado, 1975-82. Sample sizes are in parentheses.

(Fig. 8). Although Braun (1971) reported that juveniles > 6 weeks of age possess the same wing color patterns as adults and yearlings, other data indicate that 10 weeks is the minimum age at which sex of juveniles can be reliably ascertained from wing color (Hoffman 1983). Of 339 known-sex juveniles > 70 days of age examined, sex of 332 (98%) was correctly classified by wing color (Hoffman 1983). Wings of juveniles < 10 weeks of age have a mottled brown pattern resembling that of females (Fig. 8). In September, about 8% of the harvested juveniles will be < 10 weeks of age and might be incorrectly classified by wing color (Table 2).

Wing length measured from the carpal joint to the tip of the longest primary (VII), has been used to ascertain sex of juvenile blue grouse in Utah (Bunnell et al. 1977) and Colorado (Hoffman 1983) as follows:

Total length ≥ 228 mm = male,
< 228 mm = female.

To use this technique, P VII must be fully grown (calamus tip hardened and no blood inside the quill) (Fig. 9). However, only 7% of the juvenal wings collected in Colorado in September met this criterion, of which 96% were correctly classified to sex (Hoffman 1983).

Because of the subjective interpretation involved in discerning wing color and the limited application of wing length measurements, Hoffman (1983) tested and recommended the use of a discriminant function developed from measurements of P IX and X for identifying sex of juvenal wings. The discriminant function is:

$0.424\,(\text{P IX}) + 0.362\,(\text{P X}) \quad > 110.712 = \text{male},$
$< 110.712 = \text{female};$

where P IX = length of primary IX in mm and
P X = length of primary X in mm.

To use this technique, P IX and X must be fully grown. This was not a problem as P IX and/or X were growing in only 5% (156/3,090) of the sample examined by Hoffman (1983). The discriminating power is 92%, which is less accurate than the other techniques.

Using data in this report, a key for ascertaining age and sex of blue grouse in Colorado was developed based on shape, molt pattern and length of primary feathers, and wing color (Table 3).

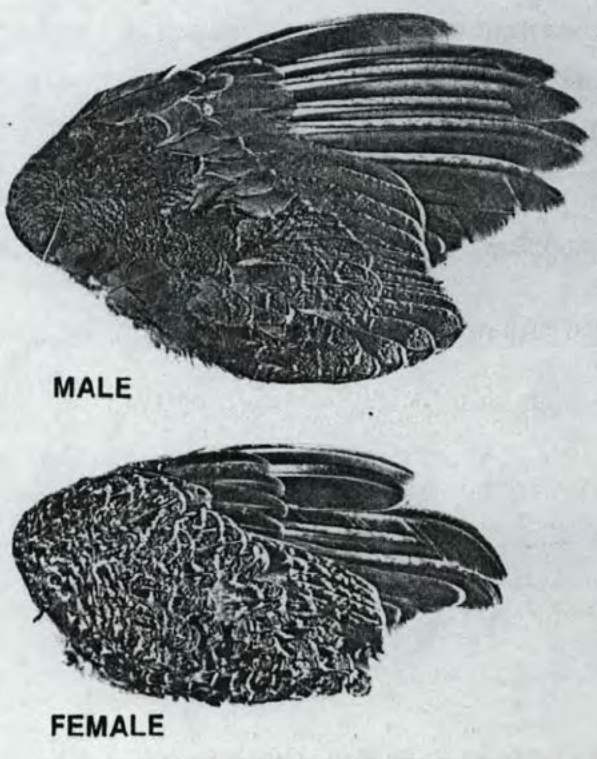


Fig. 7. Wings from adult male and female blue grouse.

KEY TO AGE AND SEX: *Caution* locals can be sexed only by cloacal examination unless tertials are present.

1A Stripe on most distal tertial black and sharply delineated from basic feather colour; penis present ..... Male (see2)

1B Stripe on most distal tertial blackish to brownish, grading into basic feather colour, penis absent ..... Female (see 3)

2A(1) Greater tertial coverts long and narrow with fine light edging, dull and faded ..... HY/SY

2B Greater tertial converts tapering to blunt point, sometimes with a narrow buffy edging, uniform gray ..... AHY/ASY

3A(1) Tertials with frayed tips; tertial coverts narrow; primary coverts heavily light-edged ..... HY/SY

3B Tertials with unfrayed tips; tertial coverts broadly rounded; primary coverts unedged to faintly light-edged ..... AHY/ASY

SIMILAR SPECIES: *Blue-winged Teal* have bright blue wing patches; *Cinnamon* are reddish in colour.

MOLTS: Post-juvenal partial (except some wing feathers), Sep.-Dec.; pre-nuptial complete, Sep.-Mar.; post-nuptial partial (body, scapulars only), Jun.-Aug.

INCUBATION: 21-23 days. FLYING YOUNG: 35-44 days. BANDING: ? days.

REFERENCES: Carney 1964. FWS. SSR. No. 82.

USUALLY ACCEPTABLE AGE-SEX CODES BY MONTH

Age-Sex	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
L-U/M/F												
HYU/M/F												
SY-M/F												
AHY-M/F												
ASY-M/F												

American Green-winged Teal codes.

1/ Species treated in this report: mallard, black duck, American wigeon, green-winged teal, blue-winged teal, cinnamon teal, northern shoveller, pintail, woodduck, redhead, canvasback, greater scaup, common goldeneye, Barrow's goldeneye, and bufflehead.

2/ Varying amounts of information on plumage characters for aging of other species is provided in narrative by Bellrose (1980).

Fig. 5. Example of a key to sex and age criteria for a species of duck (green-winged teal) (U.S. Fish and Wildlife Service and Canadian Wildlife Service 1977).

SURF SCOTER

All surf scoter wings are dark and unpatterned on both upper and under surfaces. Only adult males are black. Wings of all other sex-age categories are dark brown. Among these, adult females can be identified by their broadly rounded tertials and greater coverts over both secondaries and tertials. On immature birds, tertials are pointed and usually frayed and faded at their tips, and greater coverts over both secondaries and tertials are quite narrow and have frayed and faded tips.

Wing	Male		Female	
Character	Adult	Immature	Immature	Adult
Primaries	Outermost primary similar to and as long as or longer than the adjacent primary			
	Outer webs black	Outer webs dark blackish brown		
Tertials	Shiny black and bluntly pointed; approximately 20 mm. longer than most secondaries	Dark brown and pointed; may be faded at their tips	Very dark blackish brown; tips bluntly pointed; usually less than 20 mm. longer than most secondaries	
Tertial	shiny black	Dark brown; noticeably narrower than those of adults; often faded at their tips	Very dark blackish brown; smoothly rounded tips	
Greater, middle, and lesser coverts	Entirely black; appear smooth	Dark brown; most greater coverts are faded at their tips; they often appear rough	Very dark blackish brown; some are slightly faded at their tips; all appear smooth	

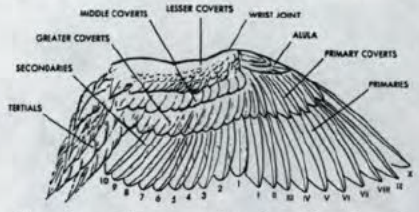


Fig. 6. Key for aging surf scoter wings (text based on Carney 1992).

Gallinaceous Birds

GENERAL CHARACTERISTICS

Sixteen native game birds and three introduced exotics comprise the gallinaceous bird fauna of North America. Native species include the wild turkey, six species of quail, six of grouse, and three of ptarmigan. Ring-necked pheasants, gray partridge, and chukar are well-established exotic species.

Definitive plumages range from strongly sexually dimorphic (e.g., ring-necked pheasant) to monomorphic (e.g., mountain quail, chukar). Secondary sexual characteristics, including plumage and soft parts, may become pronounced during the breeding season for some species (sage grouse) or not change for others (all species of quail).

Most gallinaceous birds can be identified as juveniles or adults by plumage characteristics. Primary flight feathers are molted sequentially, beginning with the proximal feather, P1, and progressing distally in a fairly regular time pattern. Typically, primaries 9 and 10 will be retained until after the first breeding season. Consequently, these two feathers might be worn, duller in color, and more pointed in juveniles than in adults. Among juveniles of many species, the pattern of replacement of primary feathers is sufficiently consistent to permit aging individuals in days or weeks up to the time primary 8 is completely grown. Primary coverts of most quail are retained through the first breeding season; shape and color of these feathers are excellent diagnostic characters of age (Petrides 1942). Typically, coverts of juveniles are slightly more pointed, often with lighter colored tips, and duller in overall color than coverts of adults (Fig. 7). The bursa of Fabricius is also a useful guide to age, but complete closure of the bursa might not occur in some species at the time sexual maturity is reached.

WILD TURKEY

Four races of wild turkeys occupy North America north of Mexico (Williams and Austin 1988). General characters of sex and age apply among these races, though the timing of specific molts and the rate of development of plumage and other characters might differ among populations (Healy and Nenno 1980, Williams and Austin 1988).

Differentiation between the sexes is apparent 10–14 weeks post-hatching (Williams and Austin 1988:79). In males caruncles of the neck begin to enlarge, and the head

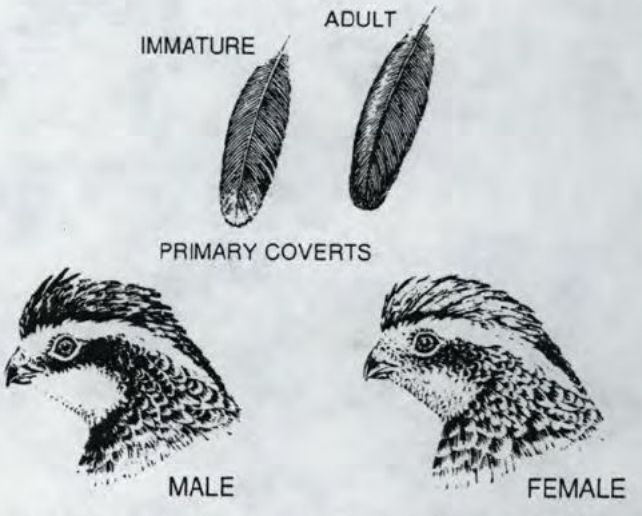


Fig. 7. Sex and age characters of northern bobwhites (Dimmick 1992).

and neck show fewer feathers than in females. The skin on the sides of the head is pink in males at 11–13 weeks; females of all ages lack pink skin on the sides of the head. The beard of the young male emerges from the skin as a cornified epidermal protuberance at 16–20 weeks. Among mature birds, the head, throat, and neck of males are bare to nearly bare, and the skin is predominantly reddish. The head, throat, and neck of females are moderately feathered, and the skin is gray to grayish-blue. The beard of males in their second autumn may reach >12 cm in length; the beard displayed by an occasional female seldom exceeds 7.6 cm (Edminster 1954:61–62). Wallin (1982) sexed juvenile, autumn-harvested wild turkeys in Vermont using the length of primary 10 measured from the rotator muscle to the tip. All birds with 10th primaries ≤22.9 cm were identified as females, and all birds with primaries >22.9 cm were classified males. Error rate was 1.8%, and about equal numbers of each sex were misclassified. Breast feathers of males are black-tipped; those of females are buff-tipped.

Three plumage characteristics are useful for distinguishing between juvenile and older wild turkeys during autumn and winter. The most pronounced character is the extended central three pairs of tail feathers of first-year birds versus the uniform length of all tail feathers of adults (Fig. 8). Both sexes display this trait, though it is more obvious in males. The greater upper secondary covert patch is narrower in first-year birds and is also duller in color (Fig. 8). This character is detectable in live turkeys at a distance (Williams and Austin 1988). Juvenal primary feathers 9 and 10 are typically retained into the first winter, though in the Florida race P9 may be molted early, and more than 5% will molt all 10 primaries (Williams and Austin 1970). Juvenal primaries are pointed, lack barring in the distal portion, and may be ragged and dull (Fig. 8). Spur length of gobblers can be a reliable indicator for distinguishing among year classes. Kelly (1975) reported that spur length was more highly correlated with age than any other single variable. Body weight was lighter and beard length was significantly shorter among first-year birds than older birds, but neither of these criteria permitted aging birds to year class after the first year.

NORTHERN BOBWHITE

Females have buffy chins, upper throats, and eyestripes (Fig. 7). These markings are white on males. Feathers of the middle wing coverts of females have wide, dull-gray bands, lacking distinct contrast (Thomas 1969). Middle wing coverts of males display fine, black, sharply pointed undulations, sharply contrasting with adjacent colors on the feathers. The base of the lower mandible of females is yellow, whereas in males it is uniformly black (distinguishable at 6–8 weeks) (Loveless 1958).

The upper greater primary coverts of immature bobwhites have buffy tips and are dull brown and tapered (Fig. 7). Corresponding feathers of adults are uniformly gray or gray-brown, shiny, and broadly rounded. The outer two primaries (P9 and P10) are pointed and dull brown in immatures, rounded and grayish in adults.

An estimate of age in days can be obtained for birds in the process of replacing juvenal primaries. This method relies upon the replacement and growth of primaries 1 through 8. It is valid to about 150 days post-hatching, when P8 has been replaced and is fully grown (Petrides and Nestler 1952).

SCALED QUAIL

Sex of scaled quail is difficult to distinguish for birds in hand and virtually impossible for birds observed in the field. The most striking and consistent differences occur in plumage on the head and throat (Wallmo 1956). The plumage of the side of the face of females is streaked and dirty gray in color due to longitudinal black streaks on background color of gray or grayish-white. The side of the face of males is uniformly pearl gray except for a brownish ear patch. The throat of females is streaked; in males it is clear white behind the mandible, blending into a yellowish or buffy wash. These characters become evident in juveniles at about 17 weeks.

Immatures are characterized by primary coverts that are tipped, edged, or mottled with white. In adults, these are all uniformly gray. This character separates first-year birds up to about 1 year of life (Wallmo 1956).

GAMBEL'S QUAIL, CALIFORNIA QUAIL

Females have dark brown crests and lack black throats. Males have black crests and black throats.

Immatures of both species have mostly buff-tipped and pointed greater upper primary coverts, adults have uniformly gray, rounded coverts. The outer two primaries (P9 and P10) are more pointed and frayed in immatures, rounded in adults.

MOUNTAIN QUAIL

Females have shorter and browner plumes than males (Johnsgard 1975). Except for a population in Monterrey County, California, however, separation of sexes by plume length is sufficient for this character to be diagnostic of sex (Brennan and Block 1985). Brown color of the back extends to the top of the head of females; the hind neck of males is grayish-blue.

Immatures have buff-tipped primary coverts and pointed, frayed, outer primaries (P9 and P10). Adult primary coverts are uniformly gray; P9 and P10 are more rounded, not noticeably different from P1–P8.

HARLEQUIN QUAIL

Sexes are markedly different in plumage but similar in size. The head and neck of females are mottled brown and buff with whitish chin (Leopold 1959). The face and throat of males are boldly marked with a black and white pattern. Male head feathers are elongated, forming a broad, tan hood streaked with dark hues.

Greater upper primary coverts of immatures are edged with buff or barred near the base with buff. These feathers on adults are spotted with white (males) or barred with wide white markings (females) (Johnsgard 1973).

RING-NECKED PHEASANT

Adult and older juvenile pheasants are strongly sexually dimorphic. Distinguishing sex is relatively simple at 8 weeks or older; males exhibit brightly colored plumage and females present mottled shades of brown and buff coloration. However, the widespread popularity of this game bird, its extensive production in private and public game farms, and a pattern of hunting regulations prohib-

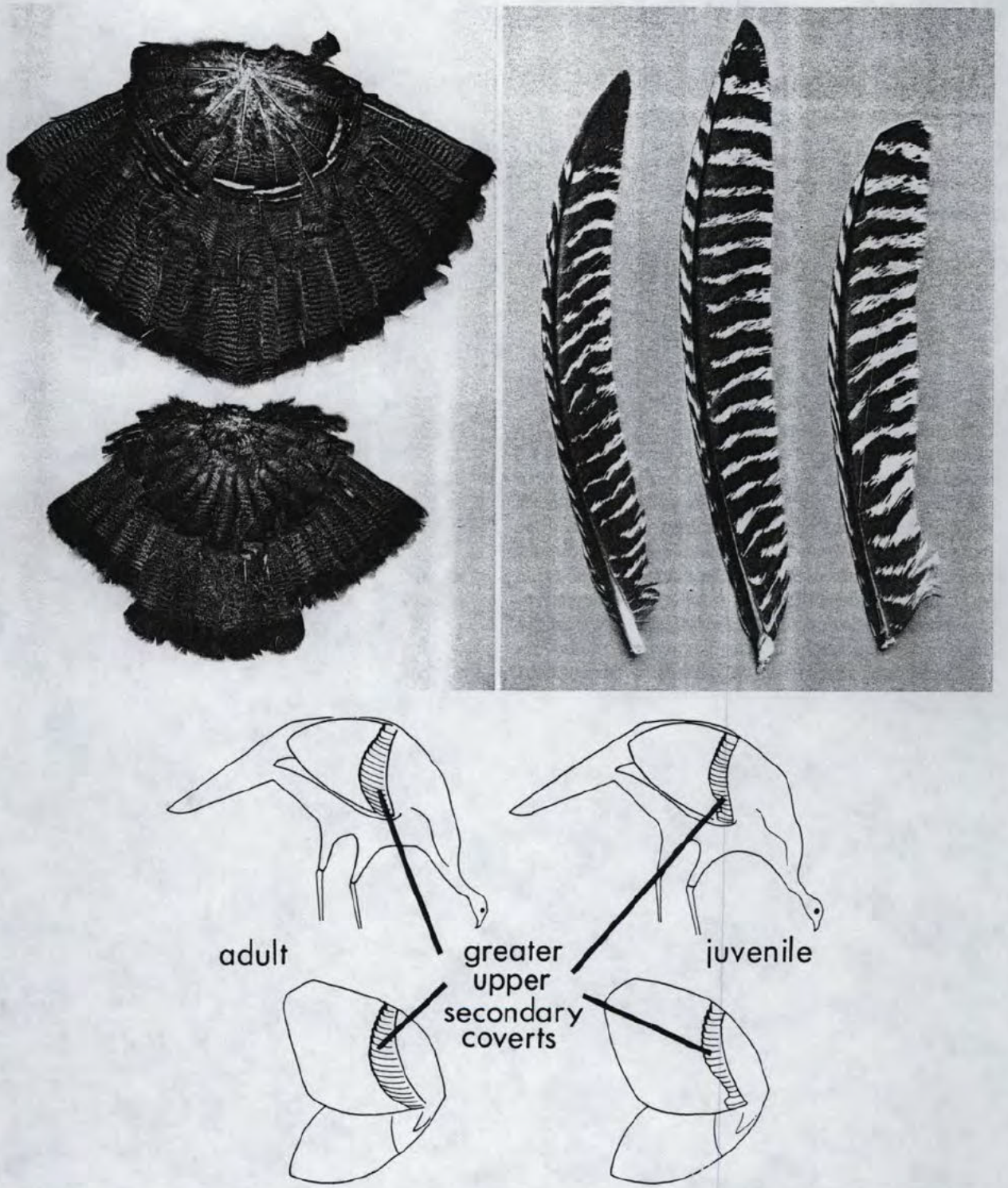


Fig. 8. Diagnostic plumage characteristics of adult and juvenile wild turkeys (based on Williams 1961, original report by Petrides 1942). Upper left: tail fans of adult (top) and juvenile. Upper right: outer primaries of juvenile (left) and adult (center and right). Blunt tip of right feather caused by dragging on ground during strut. Bottom: shape of secondary covert patch on folded wing.

iting or restricting the take of females have combined to generate research on a variety of criteria for determining age and sex of this species. Sex of day-old chicks can be determined quickly and accurately by the presence in males of an infantile wattle—a small flap of unfeathered papillary tissue just below the eye, partially hidden by natal down (Fig. 9, Woehler and Gates 1970). This technique produced 90% accuracy among males and 98% among females at 24–36 hours post-hatching.

Primary feathers are useful for sexing birds when only wings are available (Linder et al. 1971). Primaries from females typically show light-colored bars that meet the rachis at right angles along its entire length. Males typically exhibit no barring at the tips of primaries. Bars on

Fig. 9. Heads of day-old pheasant chicks showing regions of maximum wattle development. Male chick on left, female on right (from Woehler and Gates 1970).

male primaries meet the rachis at a sharp angle, and the pattern is often diffuse. Accuracy of this technique was greater than 90% for all sex-age classes except wild males that had not completed the post-juvenal molt (63%). Dressed carcasses can be sexed by the presence of a spur on the leg of males and by plumage color on the head, providing these body parts are retained. When they are removed, the larger body size of males enables sexing the carcass with measurements of the breast. Oates et al. (1985) and Rodgers (1985) provided breast dimensions and methods for determining sex of dressed pheasants.

Depth of the bursa of Fabricius is a reliable method for separating juvenile from adult pheasants (Wishart 1969). Larson and Taber (1980) indicated that bursal depths of males ≤8 mm denote adults. Johnsgard (1975:106) also used 8 mm as a separation point for males, but noted that depths of adult female bursa were ≤6 mm. In contrast to most North American gallinaceous birds, pheasant wing feathers do not provide readily observed qualitative clues to age. Wishart (1969) separated adults from juveniles using combined measurements of shaft diameter and length of primary 1. His technique was useful in autumn and spring for pen-reared and wild Alberta pheasants. Greenberg et al. (1972) reported that P1 shaft diameter alone yielded a reliable and relatively simple separation point for Illinois pheasants. When adjusted for sex and season, P1 shaft diameter provided 90–98% reliability. Etter et al. (1970) provided criteria based on length of P10 for estimating the age in weeks of juvenile pheasants. Spur length (Stokes 1957), qualitative spur characters (Gates 1966), and eye-lens weight (Dahlgren et al. 1965) are not reliable techniques for separating juveniles from adult pheasants.

CHUKAR

Male and female chukars cannot be differentiated by qualitative plumage and structural characteristics. Combinations of various wing-feather measurements are necessary for identifying the sex of chukars (Table 2) (Weaver and Haskell 1968). Christensen (1970), however, noted significant bias favoring females when results obtained by using Weaver and Haskell's wing key were compared with results from internal sexing.

Juveniles less than about 14 weeks old possess mottled secondaries, whereas secondaries of older juveniles and adults lack mottling. Primary covert 9 measures <29 mm among juveniles throughout the first winter. This characteristic and pointed primaries 9 and 10 are reliable indicators of juveniles beyond the post-juvenal molt.

Table 2. A key for determining age and sex of chukar partridge from wings, from mid-September through December (from Weaver and Haskell 1968).

1a.	Mottled secondaries absent	2
1b.	Mottled secondaries present	juvenile
2a.	Neither primary 9 nor 10 in stage of molt	3
2b.	Either 9 or 10 or both in stage of molt	adult
3a.	Upper primary covert 9 is <29 mm	4
3b.	Upper primary covert 9 is ≥29 mm	adult
4a.	Outer two primaries pointed at tips, only slightly faded, showing little wear	juvenile
4b.	Outer two primaries faded, showing wear	adult
5a.	Primary 3 is fully grown, is at least 4 mm longer than primary 2	6
5b.	Primary 3 is in stage of molt, not fully grown	7
6a.	Primary 3 is <135 mm	juvenile female
6b.	Primary 3 is ≥135 mm	juvenile male
7a.	Primary 1 is ≤119 mm	juvenile female
7b.	Primary 1 is >119 mm	juvenile male
8a.	Primary 3 is ≤136 mm	adult female
8b.	Primary 3 is >136 mm	adult male

GRAY PARTRIDGE

Scapulars and median wing coverts of females typically present a wide, buff-colored stripe along the shaft and two to four buffy crossbars (Fig. 10) (McCabe and Hawkins 1946). Outer edges of the scapulars show vermiculations. Comparable male feathers lack crossbars, have a narrow, median, longitudinal stripe, and have vermiculations across the entire width of the scapulars.

The outer two primaries are pointed on immatures but rounded on adults. Also, the covert of P9 is pointed on immatures, rounded on adults (Petrides 1942).

RUFFED GROUSE

The sexes of adult and somatically mature juvenile ruffed grouse are similar but not identical in appearance. Females are smaller, have shorter ruffs and tails than males, and exhibit qualitative differences in markings on certain portions of their plumage. The species is widely distributed in North America and has many subspecies; it varies clinally in some of the qualitative measurements diagnostic of sex, and the reliability of qualitative plumage characteristics appears to differ among populations.

The number of whitish dots on the terminal ends of rump feathers is a reliable sex criterion for birds 13 weeks old or older; females possess only one dot, males two or three (Fig. 11) (Roussel and Ouellet 1975). In Quebec, only one female of 366 grouse sexed by this method was misclassified. Servello and Kirkpatrick (1986) correctly classified each of 62 southeastern ruffed grouse, and Kalla (1991) reported a 2.6% error rate for 235 Tennessee birds. Length of the plucked central tail feather is a widely used indicator of sex. Central rectrices <~15 cm characterize females, longer feathers denote males (Fig. 12) (Hale et al. 1954). More recent studies indicated that the separation point varies with geographic region and with age of the individual, more southerly populations tending toward

Fig. 10. Scapular feathers and wings from gray partridge. Note central stripe in feather from male on right and barring on feather from female (after McCabe and Hawkins 1946).

greater lengths (Uhlig 1953, Davis 1969, Servello and Kirkpatrick 1986). Using different separation points for juveniles and adults increases reliability. In Tennessee a separation point of 16.5 cm for adults and 15.5 cm for juveniles yielded 2.4% error for each group; a combined separation point of 16.0 cm yielded an error rate of 6.0% (n = 235) (Kalla 1991). Coloration of the eye patch and completeness of the tail band are somewhat ambiguous characters. Their use for adults typically results in an unacceptable number of unclassifiable birds and a high rate of misclassifications (Kalla 1991). Coloration of the eye patch permits distinction of the sexes from about 8 to 9 weeks until the spotted rump feathers appear. Females lack color in the eye patch, males display vivid or moderate reddish-orange color. Palmer (1959) reported 95% accuracy on live immature birds with this method.

Criteria for aging ruffed grouse are less reliable than sexing criteria, particularly beyond midwinter. Presence of a bursa is the most dependable indicator for immatures but is useful only until about January (Kalla 1991). Sharply pointed tips of primaries 9 and 10 are indicative of immatures (Fig. 13) (Hale et al. 1954), but the character declines in reliability as the season progresses (Kalla 1991). The usefulness of sheathing on the base of P8 and its absence on P9 and P10 for identifying immatures likewise decreases in reliability in late winter (Kalla 1991). The diameter of the calamus of P9 is smaller in immatures of both sexes and is a useful criterion of age among sexed birds beyond midwinter (Davis 1969). The ratio of P9:P8 calamus diameters provides some increase in reliability, immatures having a lower ratio than adults (Rodgers 1979).

BLUE GROUSE

Sexes are differentiated by white feathers tipped with bluish-black around the cervical sacs of males; among females, feathers of the cervical region are barred grayish-brown (Caswell 1954). This character is diagnostic as early as 6 weeks and often can be observed in the field as well as on birds in hand. Wings of female blue grouse present a more mottled brown appearance than do male wings (Fig. 14) (Mussehl and Leik 1963). Female marginal coverts at the base of the alula have numerous blotches of brown mottling; male marginal coverts are gray and less mottled. This character is evident on adults and on juveniles 10 weeks or older (Hoffman 1985). Coloration and pattern of barring of upper tail coverts permit sexing birds as young as 6 weeks (Nietfeld and Zwickel 1983). Females show black to blackish-brown coverts with bold cinnamon or buffy brown crossbars; male coverts are black with gray flecking and have whitish-gray, narrow bars. Fewer than 2% of juveniles of the sooty race of blue grouse were misclassified or not classifiable by tail covert markings.

Primaries 9 and 10 are pointed on juveniles and rounded on adults. Hoffman (1985) provided tables for estimating age of juvenile blue grouse in weeks based on stage of development of post-juvenal primary feathers.

SPRUCE GROUSE

Spruce grouse exhibit marked plumage differences among races, but all races are strongly sexually dimorphic. Markings on breast feathers are diagnostic from about 5 to 6 weeks post-hatching. Breast feathers of females are tipped with white or buffy brown and have one to three buffy brown bars on a black background (Ellison 1968). Male breast feathers are black, tipped with 1–4 mm of white. Chin and cheek feathers of females are barred with brown, those of males are black. A white eye stripe and white cheek stripe are more pronounced on males. The rectrices of females are black with vermiculated brown barring often extending from base to tip; male rectrices are black, and brown flecking is limited mostly to the basal two-thirds of the feather (Zwickel and Martinsen 1967).

Juvenile spruce grouse retain a bursa until at least December but have lost it by April (Ellison 1968). The pointed tips of P9 and P10 also characterize juveniles; how-

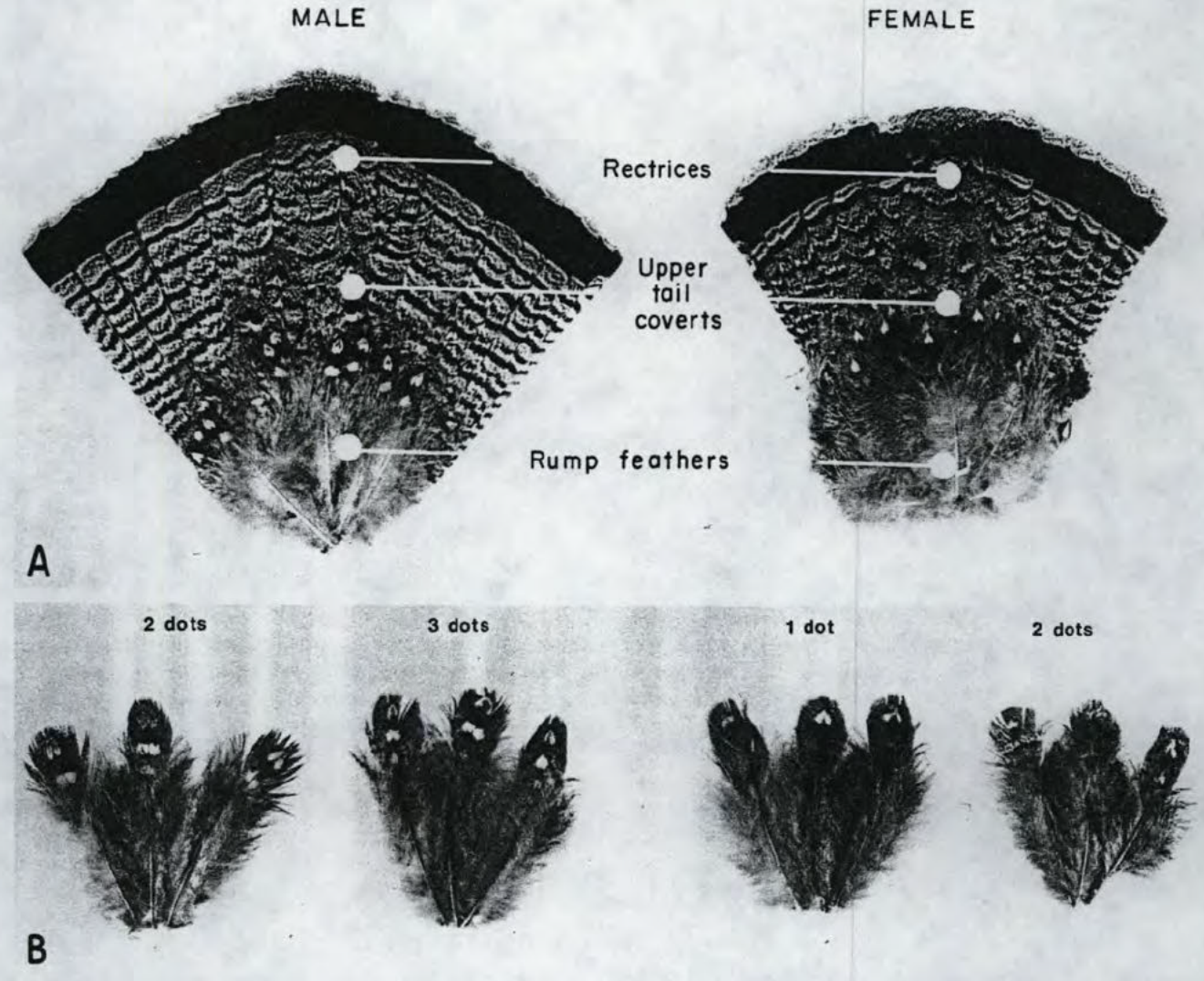


Fig. 11. Markings on tail feathers of male and female ruffed grouse. A. Location of rump feathers. B. Dot configuration on individual rump feathers (Roussel and Ouellet 1975).

ever, this character is subjective and regarded as unreliable by some researchers. Zwickel and Martinsen (1967) separated juvenile from adult Franklin's spruce grouse by the narrower, light-colored tip stripe of the upper tail coverts of both sexes of juveniles. Ellison (1968), however, could not separate age classes of Alaskan spruce grouse by this criterion. Using shaft diameters or length of various primaries might permit separation of age classes, including distinguishing between older yearlings and adults. McKinnon (1983) separated adult from yearling Franklin's spruce grouse in southwestern Alberta using the calamus diameter of P9. This was a highly reliable criterion, but specific separation points may vary with geographic region. Szuba et al. (1987) reported that shaft diameter of P1 reliably separated age classes of Hudsonian spruce grouse in Ontario in all seasons except summer. McCourt and Keppie (1975) and Towers (1988) developed growth curves for specific primary feathers to age juvenile spruce grouse from Alberta, and New Brunswick and Ontario, respectively.

SAGE GROUSE

Adult male sage grouse are nearly twice as large as adult females. In nuptial plumage the sexes are markedly different. The breeding cock presents a black chin, narrow-white throat band, and white breast (Dalke et al. 1963). The female shows no black and white patterns but has gray feathering on the throat, neck, and breast and a light gray chin. During summer, chin, neck, and throat feathering of both sexes is similar. By September-October, some of the black chin and throat feathers are showing on adult and juvenile cocks. Sexes are also differentiated by the typical black and white pattern on the longest undertail coverts. The tips of male coverts are white and have no other white except the rachis; female coverts have white markings in other vaned areas (Dalke et al. 1963). Coverts exhibit diagnostic markings at about 12 weeks. Minor wing coverts of males are dark, occasionally with some white in the rachis. Female coverts show more white, often causing the feathers to appear barred.

The two outer primaries of immature sage grouse are

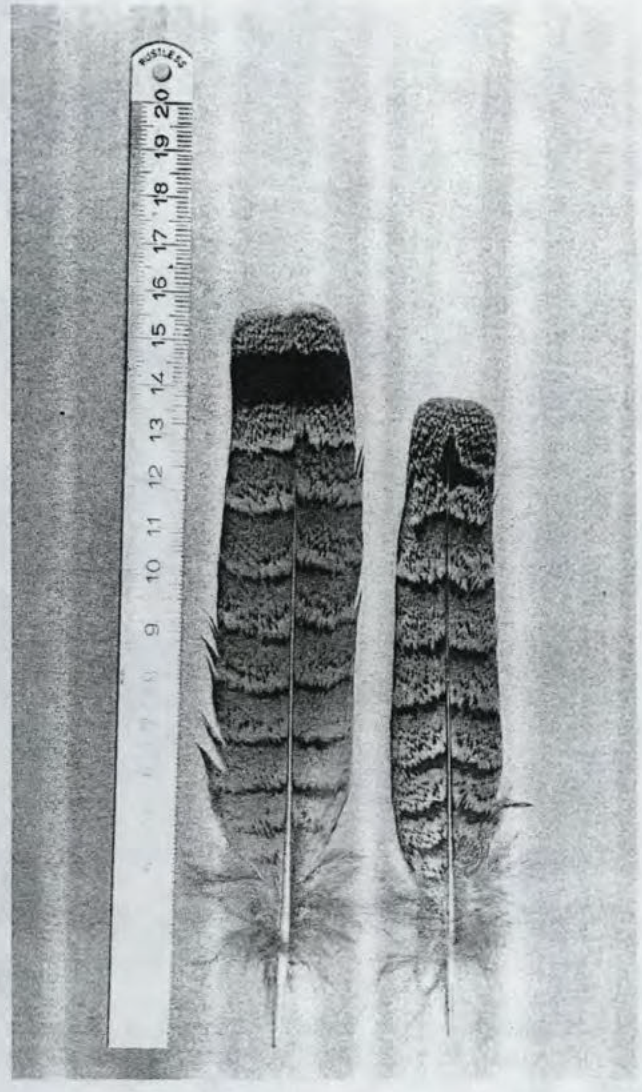


Fig. 12. Central tail feathers of ruffed grouse, showing sex characters of length and subterminal tail band pattern (based on Hale et al. 1954). Male on left.

pointed and frayed, contrasted with the rounded tips of the same adult feathers (Eng 1955). Lengths of wing and specific primaries are shorter in females than in males. Crunden (1963) provided division points for separating juveniles from adults that gave a high degree of reliability. However, primary numbers assigned by Crunden (1963) (and several others reporting on sage grouse) were the reverse of numbers typically assigned, i.e., Crunden's P1 is usually designated P10.

PINNATED GROUSE

The sexes of all races of pinnated grouse are generally similar in external appearance, but tail and crown plumage provide reliable characters for distinguishing between sexes. Tail feathers of hens (adults and juveniles) are entirely or partially barred; tails of males are black or lightly barred (Fig. 15) (Copelin 1963). This technique is highly reliable for adults and juveniles with fully developed remiges (tail feathers). The undertail coverts of hens are barred, those of males are black with a round white spot on the end (Copelin 1963). This character enables sexing birds as young as 12 weeks. Crown feathers of females are cross-barred with alternating light and dark bands; male feathers are dark with a buff-colored edge (Henderson et al. 1967). Crown feathers are less useful than tail characters for sexing pinnated grouse.

Immature birds have conspicuous spotting on the anterior portions of P9 and P10 all the way to the tips; in adults spotting does not extend to the tips (Campbell 1972). P9 and P10 of immatures are worn, faded, and pointed, contrasted with feathers of adults. Copelin (1963) observed white coloration in the distal portion of the shaft of the outer primary wing coverts of immatures, but not adults. Baker (1953) presented a sequence of photos and descriptions of juvenile greater prairie chickens by 1-week intervals.

SHARP-TAILED GROUSE

The sexes are similar in size and general appearance but can be distinguished in hand by tail feather and crown feather markings. Crown feather markings (7.0% error) are more reliable than tail feather markings (13.0%) (Henderson et al. 1967). Crown feathers of females show alternating dark and buff-colored crossbars; male feathers are dark with buff edges. Central tail feathers of females are cross-barred, whereas male feathers are longitudinally striped along most of their length.

Immatures are distinguished by having P9 and P10 more pointed than those of adults. P9 and P10 will also have frayed, worn tips contrasted with even-edged, less-worn tips of adult outer primaries (Hillman and Jackson 1973).

PTARMIGAN

North American ptarmigan exhibit distinctly different plumages in summer and winter. The sexes are similar in body size but show plumage differences that are more noticeable in summer than in winter. Adult females of willow and rock ptarmigan lack the conspicuous red "eyebrows" of adult males, but both sexes of white-tailed ptarmigan exhibit eyecombs (Johnsgard 1973). Females of all three species in summer plumage are more heavily barred on the breast and flanks than are males. Female willow ptarmigan have shorter wings and tails than males, and they have brown pigment rather than black on the rectrices and central pair of upper tail coverts (Bergerud et al. 1963). These characters are diagnostic in all seasons.

Immature willow ptarmigan show more dark pigmentation on P9 than on P8. Adults have similar amounts on P8 and P9 or more on P8 (Bergerud et al. 1963). Immatures also have a greater amount of gloss on P8 than on P9 or P10, whereas adults show similar amounts on all three feathers. This characteristic was about 98% accurate for all sex and age groups of Alaskan and Scottish rock ptarmigan (Weeden and Watson 1967). Shape of the outer primaries is not a good indicator of age. Among white-tailed ptarmigan, immatures display black pigmentation on P9 and/or P10 and on the outer primary covert. Adults lack pigmentation in these areas (Braun and Rogers 1967 *in* Johnsgard 1973:242). Criteria for aging juveniles in days post-hatching were described for willow ptarmigan in Newfoundland (Bergerud et al. 1963), white-tailed ptarmigan in Colorado (Giesen and Braun 1979), and red grouse in Scotland (Parr 1975).

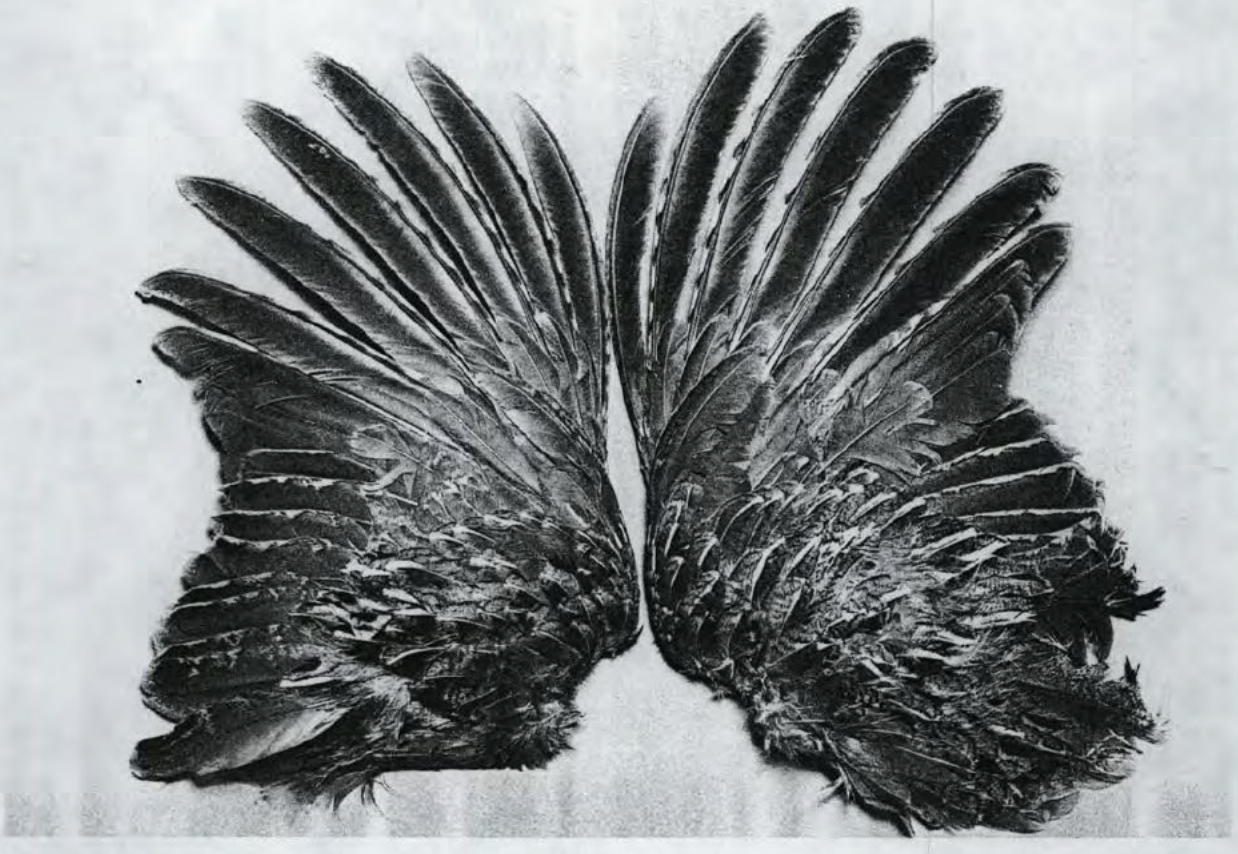


Fig. 13. Typical completely molted adult (right) and juvenile ruffed grouse wings, showing age difference in contours of outer two primaries (based on Hale et al. 1954).

Shorebirds

GENERAL CHARACTERISTICS

Two native game birds, American woodcock and common snipe, represent this large group of birds in North America. Neither species exhibits pronounced sexual dimorphism in plumage, though woodcock females are noticeably larger than males. Juveniles attain adult size and general plumage characteristics within about 4 weeks after hatching (Fogarty et al. 1977, Owen et al. 1977).

AMERICAN WOODCOCK

Female woodcock are heavier than males, weight ranging from 160 g to 240 g for females and from 125 g to 190 g for males (Owen and Krohn 1973). Significant overlap in body weights, however, limits their utility for distinguishing between sexes. Beak length, combined width of the outer three primary feathers, and wing length are reliable indicators of sex used independently or in combination. Beak lengths >72 mm characterize females, and lengths <64 mm indicate males (Fig. 16). However, 17% of woodcock could not be sexed by this criterion (Mendall and Aldous 1943). Combined width of the outer three primaries of females (measured 2 cm from the tip) is ≥12.6 mm; for males it is ≤12.4 mm (Blankenship 1957:89). This technique is highly reliable when all three outer primaries are present. With some practice, a technician can sex woodcock correctly by inspection without measurement, because male primaries are noticeably narrower than those of females. Artmann and Shroeder (1976) refined the use of total wing length by measuring from the tip of primary 6 or 7 to the notch at the bend of the wing. Wings measuring ≥134 mm were from females, ≤133 mm were from males in 99.7% of 700 wings.

Depending on the time of year, two or three age classes can be recognized: immatures (flying young); subadults (birds hatched in the preceding calendar year that have retained juvenal secondaries); and adults (birds hatched earlier than the preceding year) (Martin 1964). Proximal secondary feathers of immatures have light tips and well-defined, dark, subterminal bars (Fig. 16). Subadults retain these secondaries but can be distinguished from immatures during April-September by the greater amount of wear on their primaries and by the occurrence of primary and secondary feather molt that begins about July. Adults exhibit secondaries lacking the contrasting, light-colored band around the tip and the well-defined, dark, subterminal bar.

COMMON SNIPE

Sexes cannot be distinguished by plumage or cloacal characteristics (U.S. Fish and Wildlife Service and Canadian Wildlife Service 1977). Immatures can be separated from adults by lesser and median secondary coverts, at least in September and early October (Dwyer and Dobell 1979). Immatures show a faint, black tip on some of these coverts; adults show a wide, dark, terminal shaft line on these feathers.

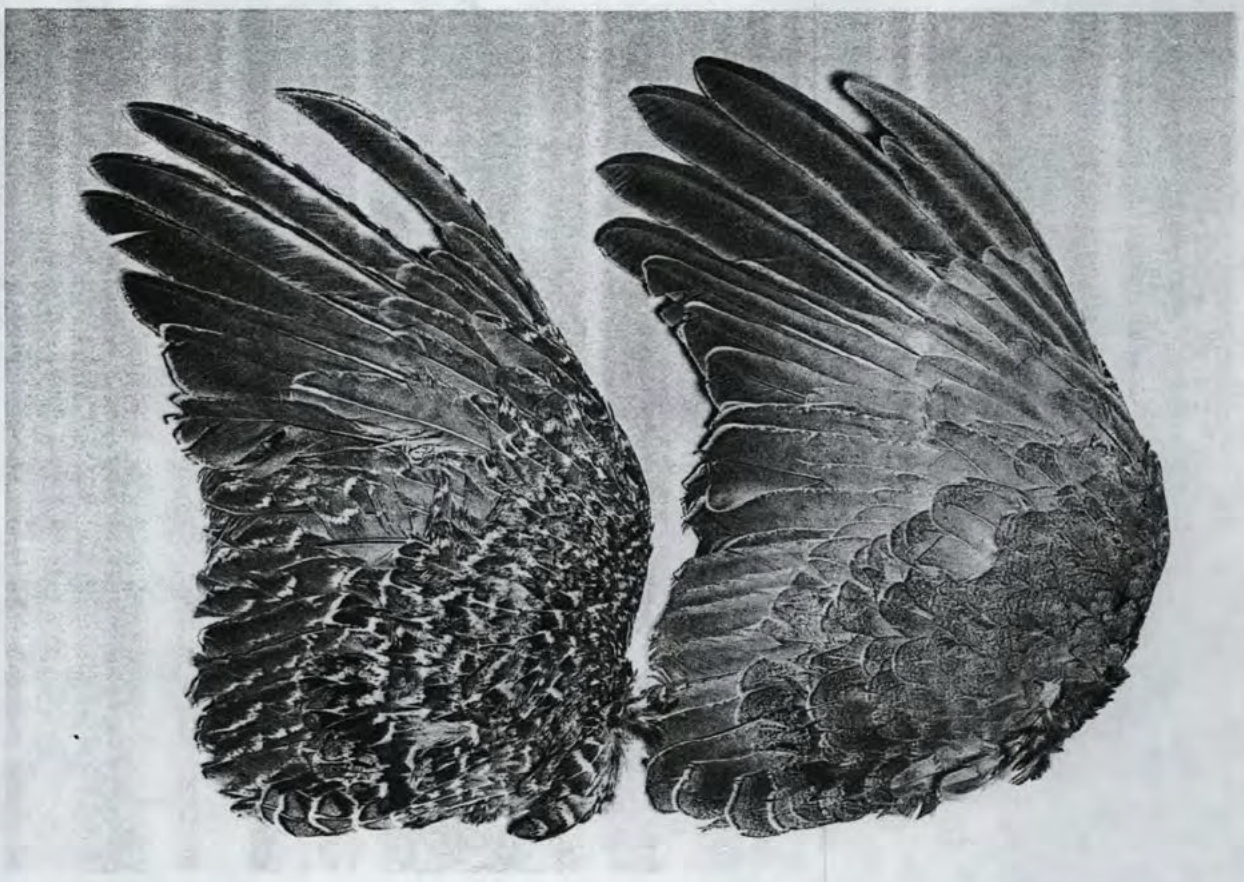


Fig. 14. Adult blue grouse wings, showing the difference in the amount of mottling on the female (left) and male (right) (based on Mussehl and Leik 1963).

Doves and Pigeons

GENERAL CHARACTERISTICS

Definitive plumages of doves and pigeons are monomorphic. Distinguishing sex and age is not practical except for birds in hand, although courting behavior during breeding season (e.g., cooing and puffing of throat by males) can permit a careful observer to identify the sex of some birds. Slight but recognizable differences in color of body plumage denote sex of somatically mature birds. Wing plumage characters separate juveniles from adults until the post-juvenal wing molt is completed.

MOURNING DOVE

The crown and nape of the head region of females are brown or brownish-gray; on males this region is blue or blue-gray (Reeves et al. 1968). The breast and throat area of females is tan; it is washed with a pink or rosy hue on males. Cloacal examination will expose the oviduct opening of females or the genital papillae of males. This technique is highly accurate, but time consuming.

Correctly delineating the age structure of a mourning dove population is made difficult because the nesting season is long, and full adult plumage is reached in only 4.5–5 months (Reeves et al. 1968). Immatures are identified by the presence of at least one white or buffy-tipped primary covert. If all coverts are uniformly gray, but the 9th or 10th primary has a smooth, whitish edge, the bird is immature. If primary coverts are all gray and primary 9 or 10 has frayed, worn edges, the bird is an adult. If the bird has completely replaced all primaries, it usually cannot be aged.

BAND-TAILED PIGEON

Color of the breast and crown of band-tailed pigeons is an indicator of sex (White and Braun 1978). Feathers of these regions are dull brown to gray on females, purplish to vinaceous on males. Post-juvenal molt replaces at least some of the breast feathers indicative of sex as early as 45 days. Consequently, band-tailed pigeons can be sexed at an early age; 96% of immatures examined at $\leq$80 days were classified correctly by plumage characters (White and Braun 1978).

Immature band-tailed pigeons can be distinguished from adults to about 340 days on the basis of plumage characters, particularly the presence of juvenal primaries, secondaries, and secondary coverts (White and Braun 1978). Primary wing feathers of immatures exhibit white or buffy edging (Silovsky et al. 1968); adult primaries lack this edging, and the outer two primaries show wear at the tips. Primary characters are dependable through about October. Secondaries 6 and 7 are particularly important for separating older juveniles from adults, for they are the last juvenal feathers molted (340 days) (White and Braun 1978). Adults show wear on the tips and leading edges of unmolted secondaries, immature pigeons do not (Silovsky et al. 1968).

the kidneys—will be seen lying on either side of the backbone. The gonads are at the anterior, or forward, end of the kidneys, in a position that in the living bird would have been immediately dorsal to, or above, the gizzard.

A male has two small black or dark gray testes about the size and color of a piece of lead pencil. They are spaced about half an inch apart on each side of the backbone. In a young male the testes can be inconspicuous, no more than one-quarter inch long, and you may have to look closely to see them. After the breeding season, the testes of an adult male will be somewhat larger, nearly one-half inch, and a lighter gray.

A hen has a single more-or-less heart-shaped ovary about the size of your little fingernail, lying at the head of the left kidney. In an adult female the ovary resembles a clump of tiny white grapes. This granular appearance is less pronounced in young females.

A note of caution: as the bird lies on its back, the gonads usually rest on top of some yellow material, the adrenal glands. Since the testes are inconspicuous, you might mistake a male's adrenal gland for an ovary and incorrectly sex your bird. In a hen the two organs—ovary and adrenal gland—are about the same size.

Feather length. In the absence of internal examination, the lengths of tail and wing feathers, alone or in combination, provide the most reliable criteria for sexing ruffed grouse.

The tail feathers are called rectrices (singular *rectrix,* a feminine form of the Latin *rector,* meaning "director") because they control the direction of flight. A ruffed grouse may have sixteen to eighteen rectrices, but the two central rectrices—and these are the significant ones—usually look slightly different. First, they are inserted in the bird's body a little above and forward of the plane of insertion of the remaining rectrices. Second, they exhibit some difference in pattern, even if it's nothing more than a fuzzier transition from the subterminal band into the bordering colors.

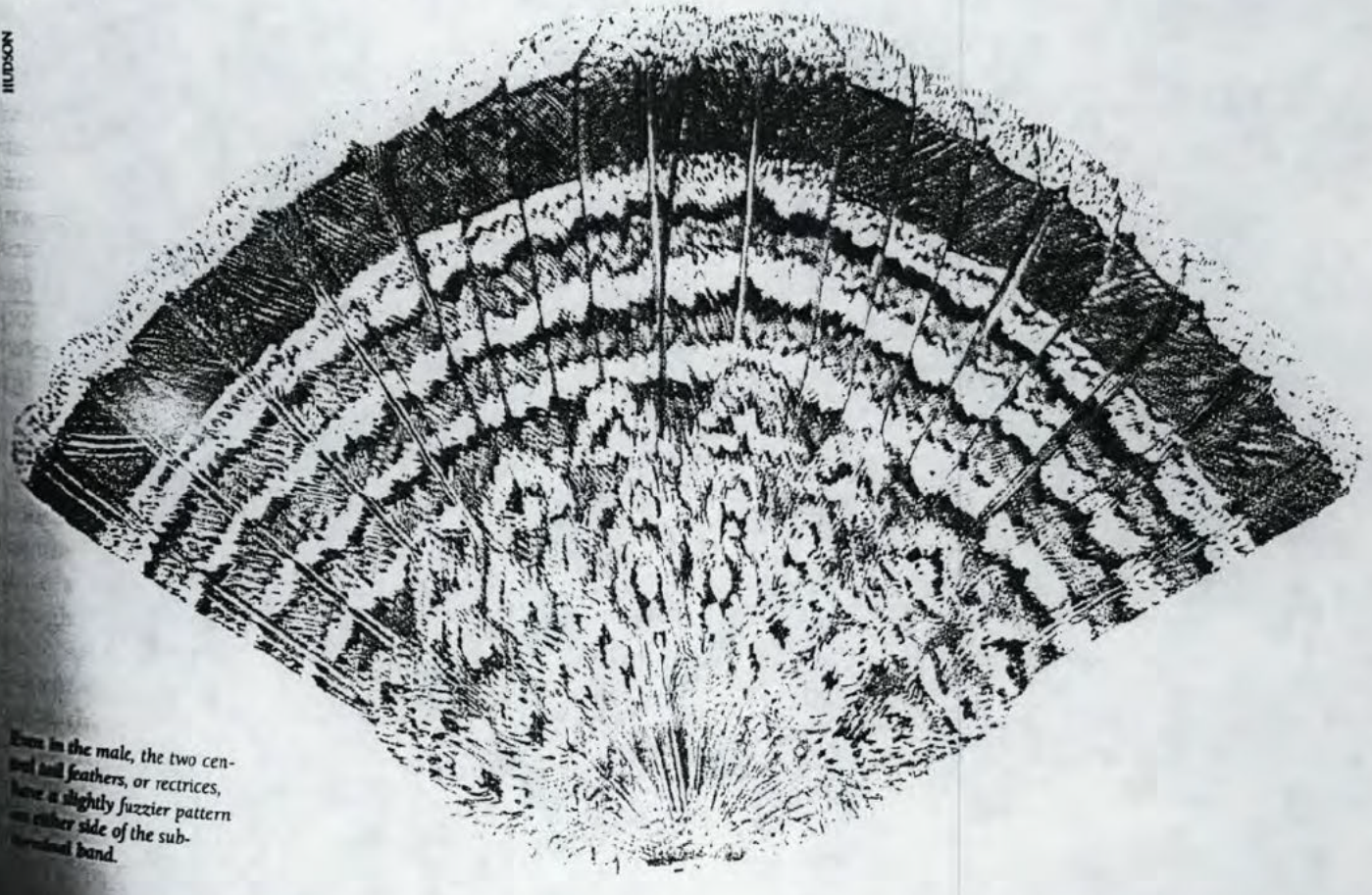
The wing has several sets of feathers: a series of coverts, the alula (Latin for "little

GULLION

GULLION

Top: *The testes of the male ruffed grouse are small and dark gray. The yellowish adrenal glands, immediately beneath the testes, are sometimes mistaken for ovaries.* Bottom: *The ovaries are whiter and may have a granular appearance.*

HUDSON



Even in the male, the two central tail feathers, or rectrices, have a slightly fuzzier pattern on either side of the subterminal band.

wing") at the wingtip, and the primary, secondary, and tertiary flight feathers. The primaries, also called remiges (singular *remex,* Latin for "oarsman"), are numbered from the inside out, 1 to 10. It is the outermost remiges, numbers 8, 9, and 10, that yield information on age.

For determining sex and age, the appropriate feathers are normally plucked before being measured. To be comparable to the Minnesota data presented in this chapter, your measurement should follow the natural curve of the feather, and the outer edge should not extend more than 15 millimeters from the cord.

Among a Minnesota sample of 299 grouse whose age and sex were known, there was a highly significant, close correlation between tail length and the bird's sex and age. In statisticians' terms, 81 percent of the variation in tail-feather length was due to age and sex. In laymen's terms, the longer the length of the central rectrices, the more likely the bird is an adult male.

The length of the flight feathers, however, tends to be related to the bird's overall size and age, rather than its sex. But if the rectrices fail to make a definitive sexing, the length of the remiges becomes important because there are fairly constant relationships between remex-rectrix pairs of feathers. That is, a small male may have shorter tail feathers than a large hen, but the length of his tail feathers in relation to the length of his flight feathers will remain constant, and that ratio will identify him as a male. To see how this works, first consider the way tail feathers are used to sex grouse.

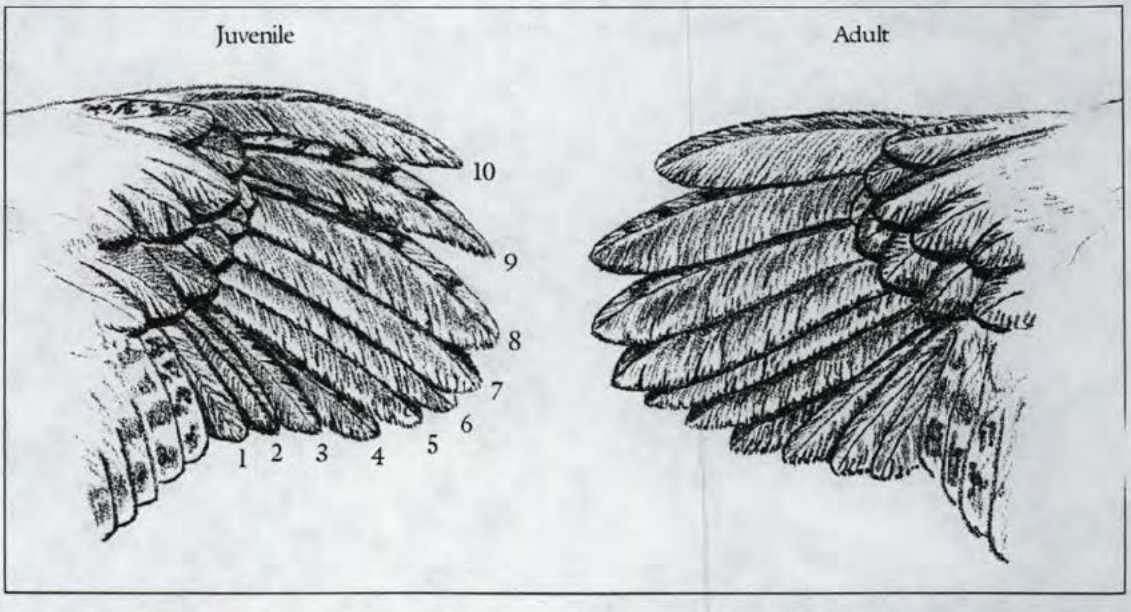
In a sample of 2,030 grouse from Minnesota, 98.5 percent of the males had rectrices longer than 150 millimeters. On the other hand, 88.2 percent of the females had tails shorter than 144 millimeters. No males had rectrices shorter than 144 millimeters, and no females had rectrices longer than 150 millimeters. There is, then, a gray area—from 144 to 150 millimeters—where male and female tail lengths overlap and consequently cannot be definite indicators of sex.

Now let's throw in another factor: age. Among the females in the area of overlap, 70.5 percent were adult hens, but all the males in this category were young. If you had a bird whose rectrices fell into the gray area, and you knew it was a young bird, you might be willing to bet it was a male; if you knew it to be old, you might put your money on a hen.

But what if you didn't know its age. Here is where the remex-rectrix ratio comes into play.

In the overlap group the central rectrices of the young males were always 5 millimeters or more *longer* than the ninth primaries. In females the central rectrices were always the same as or *shorter* than the ninth primaries.

The rule holds for the eighth primaries—at least for females. Their central rectrices are nearly always shorter than the eighth primaries—99.7 percent of the time, in fact.



HUDSON

The primary flight feathers of the wing, called remiges, are numbered from innermost to outermost. These feathers reveal the bird's age but can also be used in conjunction with tail feathers to determine sex.

But only a very few males (2.7 percent in this study) had an eighth primary *longer* than the central rectrix. In each case, however, the male's rectrix was at least 6 millimeters long[illegible] than the ninth primary and the tail exceeded 149 millimeters in length. Thus the bird would already have been sexed male on the basis of these two criteria.

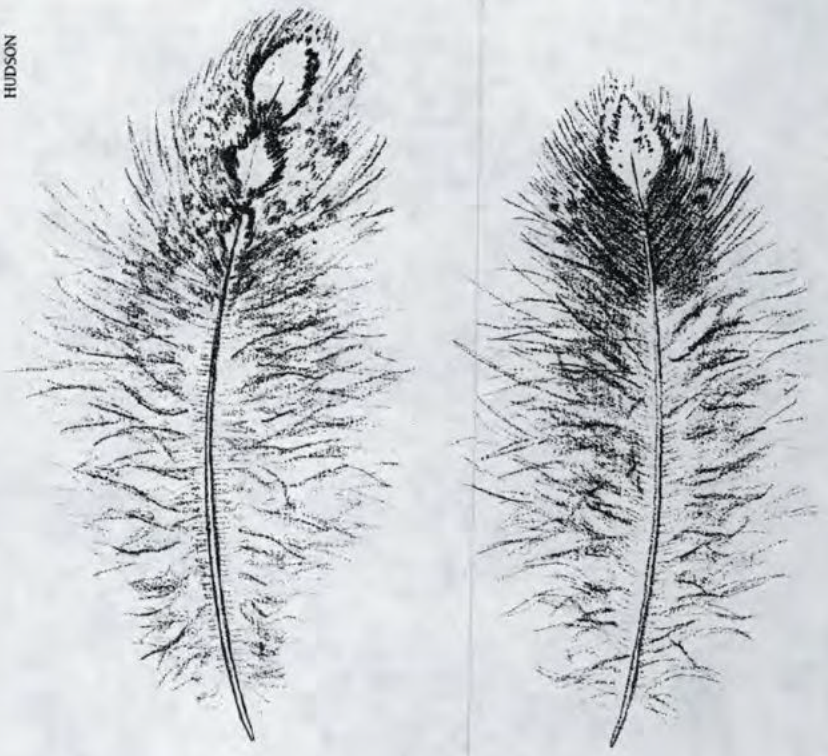
Comparisons of remex-rectrix length to determine sex have a confidence rating of 94 percent. Of 681 males, only 5 (a mere 0.7 percent) had rectrices that were 5 to 10 millimeters shorter than the ninth primaries; and of [illegible] females, only 12 (11.5 percent) had rectrices 5 to 10 millimeters longer than their ninth primaries.

But when all is said and done, these remex-rectrix intricacies may not even be necessary. As long ago as 1948 Ammann concluded that although a few birds might be misclassified on the basis of rectrix measurement alone, in a large sample the erroneous males and the erroneous females would cancel each other out. And in 1954 Hale found that for Wisconsin grouse, the 150-millimeter yardstick for tail feathers would place 99.2 percent of the males and 98.8 percent of the females in their proper categories.

Rump spots. Although Bump and his colleagues noted sexual differences in rump feather coloration, it was not until 1975 that rump spots were recognized as useful for identifying sex. In a sample of 366 Quebec grouse, whose sex was determined internally, Roussel and Ouellet found that only one hen of 164 had more than a single white spot on its rump feathers, and all of 202 males had two or three white spots. Servello and Kirkpatrick have also found this procedure reliable among a sample of 62 birds sexed internally in Virginia.

In Minnesota we recently reexamined 397 grouse taken in the Grand Rapids National Grouse Hunt from 1982 to 1986 and found quite a bit of overlap in rump spots. Although 16 percent of the females had no white spots on the rump feathers, and 51 percent of the males had two or more white spots, the rest of the birds could not be distinguished on this basis. Indeed, 49 percent of the males had one white spot or one white and one brown spot. In other words, the technique fails to sex half the males and one-sixth of the females. Furthermore, feathers collected from the center of the rump are most likely to have the "correct" number of spots. Toward the sides the number of spots is often fewer, or none at all. In Minnesota, then, this technique should be used only when more reliable criteria are not available.

HUDSON



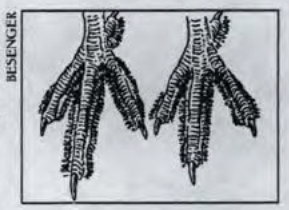
A central rump feather with two spots is most likely to be from a male (left). *The feather of a female* (right) *can have just one spot. The accuracy of this method has been high in some studies, mixed in others.*

Midtoe. A measurement that has some validity for sex determination is the length of the midtoe, from the joint to the end of the skin at the base of the claw (the length of the claw itself is not included, since it can vary from season to season, depending on wear).

There is a significant correlation between midtoe length and the bird's sex: males have longer toes. The longest midtoe of any of 44 females was 41 millimeters; 26 percent of the 576 males had toes longer than that. The shortest midtoe on any male was 37 millimeters; 18 percent of females had shorter toes. When we used 40 millimeters as a cutoff, we found that only 10 percent of females didn't fit the short-is-female guideline.

Admittedly, there is a great deal of overlap in midtoe length, but it can provide a basis for sexing a bird when other evidence is lacking. And occasionally, all that remains of a grouse at the site of a goshawk kill is the pelvic girdle with the legs.

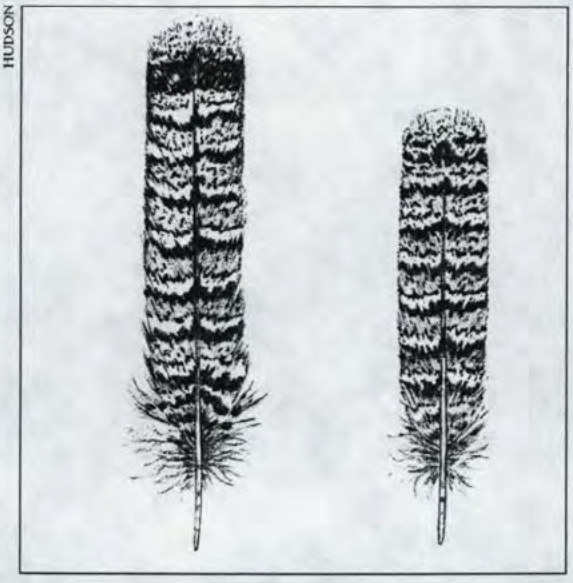
BESENGER



Field conditions often make sex identification difficult. Measuring the length of the midtoe is sometimes a practical method.

In both pattern and length, the central rectrix indicates the sex of the bird. Left: The male's subterminal band is clear, and the feather is longer. Right: This hen's subterminal band is blotched. Also compare the number of tail bars; hens tend to have fewer.

HUDSON



The Minnesota study

The analysis presented in this section and in "Determining Age" is more detailed than anything published to date. It is based on material from 2,433 samples of grouse whose sex was determined by internal examination or by observation of nesting or drumming, plus 1,121 samples of grouse whose age was known as a result of being trapped and leg-banded, then recaptured at a later date. For 945 samples, both age and sex were certain.

The grouse came from three Minnesota research projects and the National Ruffed Grouse Hunt near Grand Rapids, Minnesota. Criteria developed and refined in the study were used to determine the sex and age of another 27,700 grouse from various Minnesota sources.

Research procedures allowed nearly total accuracy. If all the necessary feathers were available and normal, according to Gordon Gullion, the error was probably less than one bird in a thousand.

Tail band. The traditional basis for sexing grouse–clear tail band for males, mottled tail band for females– is not even as reliable as the midtoe measurement. To complicate matters, among Minnesota ruffed grouse, five tail-band patterns are recognized.

Among 1,441 males, 79 percent had the clear or nearly clear band that indicates maleness. Various degrees of tail-band obscurity marked 18 percent of the males, and 9, or 0.6 percent, lacked evidence of any subterminal tail band. An occasional female (4.2 percent among 188 females) may have a clear band, but most have varying degrees of obscurity.

Then there is the "blotched" or "pooled" band pattern. This distinctive pattern evidently reflects a melding of the band with the most distal tail bar–that is, the bar farthest from the body of the bird. Among females, 68.6 percent exhibited this pattern, but it also occurred on 2.4 percent of the males. Some 13 percent of the females had no distinct band across the central rectrix.

Regional differences should be noted. In Michigan, Ammann found that only 44 of 91 males had complete bands. And although 86 of 87 females had interrupted bands, so did 47 of the males. In Wisconsin, Hale found that 73 percent of 365 males had complete bands; the rest shared the interrupted pattern with 97 percent of 403 females. A few females had the clear bands typical of males.

Tail bars. If a fox has sheared the tail near its base, or if rectrices have been carelessly snipped, a count of the transverse bars on the central rectrix can be useful. These bars are the dark stripes across the tail. They may be dark in red-phased grouse but alternate dark and lighter hues in the gray and brown phases. Start at the proximal or insertion end of the feather and begin counting with the first complete bar. If the bar pattern is asymmetrical–and it often is–base the count on the vane with the most bars.

In our study of 1,552 Minnesota males, 51.2 percent had nine or more bars, and none had fewer than six. Among 217 hens, 82 percent had seven or fewer bars, and only 4.6 percent had nine or more. To make the roughest sort of generalization: more bars means male.

Part of this sexual dimorphism results from the melding of the most distal bar into the tail band on many hens, producing the pattern called blotched or pooled. In the Cloquet population, 27 percent of the grouse had eight bars, whatever their sex.

Tail barb. The length of the central tail feather barbs provides a way to sex grouse whose tails are not fully grown. Dorney took his measurements on the central rectrix, at a point 50 millimeters from the tip.

Males tend to have longer tail barbs. Among 1,207 males in Minnesota, barbs ranged from 31 to 45 millimeters long for young birds, and 35 to 49 for yearlings and adults. Among 61 females, barbs measured 31 to 37 millimeters in young birds and 33 to 39 in adults.

A separation point of 38 millimeters would misclassify 7 percent of the males and 2[illegible] percent of the females. But all birds with barbs 40 millimeters or longer were males.

Tail color. It is not always necessary to pluck feathers and make painstaking measurements. When more than one color phase exists—and this means most of the range for the species—differences in tail colors may reliably classify females. At least in Minnesota, among the hens that are not red phased, the two central tail feathers are often markedly redder than the bordering rectrices. This characteristic, termed the split phase, was recorded for 88.5 percent of 261 nonred females. None of the 2,179 males in the sample showed this female characteristic.

Although this difference has been noted in tails from grouse in other regions, there are no data concerning its frequency outside Minnesota. But this pattern of tail coloration is characteristic of the closely related Eurasian hazel grouse, *Bonasa bonasia*.

HUDSON

The barb of the central rectrix is measured as shown, 50 millimeters from the tip. Males usually have longer tail barbs.

HUDSON

The eye patch is simply the unfeathered rim above the eye. The male's may range from bright red during mating to orange in the off-season. The female's eye patch is more subdued.

Eyebrow color. If the bird's eye patch is glowing like a fiery coal, with surrounding feathers drawn back to reveal its brilliance, odds are it's a male. This characteristic, part of the cock's displaying behavior, is most reliable if the bird knows a hen is nearby, and if it's April. At other times of the year, the color of the eye patch is more subdued—but still useful for sexing a grouse in hand.

Palmer found this method helpful for sexing Michigan juveniles too young to be sexed by plumage. Checking it against internal examination, he reported a 95 percent accuracy among juvenile grouse, compared with 85 percent among adults.

In a Minnesota sample, we found that among 901 males 32.5 percent had light to bright red eye patches, 62 percent had orange, and 2.5 percent were without coloration. Among 56 females, 9 percent were red, 14 percent orange, and the rest showed no coloration.

Using the rump spot count with the eye patch color test should permit nearly complete confidence in determining the sex of young grouse older than about ten weeks.

—Gordon W. Gullion

Ruffed Grouse Sex

1. Color of bare spot over upper eyelid (8-14 weeks)
   Male: subdued orange to red-orange
   Female: little or no color

2. Number of spots on rump feathers
   Male: 2 or 3 spots
   Female: 1 spot

3. Band completeness
   Male: complete
   Female: incomplete

Ruffed Grouse Age

1. Shape of 9th and 10th primaries
   Adult: round
   Yearling: pointed
   Juvenile: growing (bird may also be downy)

2. Sheathing on primaries
   Adult: sheathing at base
   Yearling: sheathing on P8, not on P9 or P10

Blue Grouse Sex

1. Cervical air sacs (from 8 weks of age)
   Male: surrounded by white feathers, tipped black
   Female: surrounded by grayish brown feathers

2. Head and nape
   Male: no barred feathers
   Female: some barred feathers

3. Wings - color of secondary and tertiary coverts
   Male: fine vermiculations on blue-gray or blue-black
   Female: more mottled brown and buffy

Blue Grouse Age

1. Shape of 9th and 10th primaries
   Adult: round,
   Yearling: pointed
   Juvenile: growing

2. Contour feathers
   Adult: shaft streaks dark
   Yearling: shaft streaks dull white

3. Tail
   Adult: gray bar at end
   Yearling: no gray bar at end

Ruffed Grouse Research Plans for Taylor Ranch 1991-1995

by Kerry P. Reese

Many studies have been conducted on ruffed grouse reproductive success, survival and habitat use, especially in populations exploited by sportsman. Relatively little research has occurred on the species in wilderness areas where human-induced losses are few. The Taylor Ranch offers such an opportunity to band many ruffed grouse and examine basic ecology of the species over time.

The Taylor Ranch represents a unique opportunity to band large numbers of hen ruffed grouse with their broods in a relatively small area. This may allow research that concentrates on aspects of grouse ecology influenced by hen-offspring lineages.

Many ecological theories are based on concepts of relative fitness, ie., differential reproductive success of individuals and their offspring over time. Following lineages of animals in the wild is nearly impossible due to logistic constraints. However, a knowledge of the relative reproductive success of female grouse, their survival rates, and the survival and reproduction of their young, would begin to permit examination of numerous ecological questions. Do certain hens produce offspring that consistently out-live or out-produce other hens? If so, is this related to differential use of habitats over the year or during a particular time of year? Does differential habitat use really influence survival or is differential survival mediated through genetic features passed through hen lineages? Are reproductive parameters such as nest initiation date, clutch size, egg weight, incubation period, etc, related more to genetics than to variables such as weather, hen age, hen condition or habitat quality? Can such questions be answered by only knowing hen lineages while possessing no knowledge of male parental lines?

The first 3 years of this study will consist of trapping and banding hen grouse with their broods on the Taylor Ranch. Each bird will be individually banded for later recognition. In each successive year survival of birds will be determined as will relative survival of individual hen lineages. If this is successful after 3 years, additional funding will be sought to further expand the study into such topics as habitat selection via radio-telemetry, habitat quality studies, and blood sampling for genetic fingerprinting (an attempt to identify male parents).