

Alberta Sage-Grouse Molted Feather Findings

Krissy Bush

Department of Biological Sciences, University of Alberta
kbush@aviangenetics.com (<http://www.aviangenetics.com>)

- **PURPOSE** = demonstrate that collecting molted feathers from leks is an inexpensive and easy method of obtaining genetic data and secondary lek counts.
- **WHY DID I USE MOLTED FEATHERS IN ALBERTA?** Not enough birds were captured & sampled – I needed MORE samples to determine why Alberta birds are endangered. Later, I also used molted feathers to sample most of the Northern Montana Sage-Grouse population (Alberta, Saskatchewan, and everything north of the Missouri River in Montana) and 2 populations of Sharp-tailed Grouse in Canada
- **WHY DO I RECOMMEND MOLTED FEATHER COLLECTION?**
 - It is a cheap and easy method for getting a lot of samples - you are out at the lek counting the birds anyways
 - My new DNA extraction techniques have resulted in a 99.8% success rate for molted feathers
 - You can perform any kind of genetic analysis on the samples (you get a small amount of good quality DNA)
 - You can get an estimate of population size and male longevity

Sample Collection

- Molted feather collection started in 2003 as a way to obtain samples from leks with few or no birds captured on them.
- After preliminary analyses revealed the samples contained good quality DNA, sampling was expanded to all leks in 2005.
- Sample collection acknowledgements - most molted feathers were collected by K. Bush and volunteers with the annual Fish & Wildlife lek counts (I would like to thank Joel Nicholson & Dale Eslinger with AB F&W specifically). Blood and plucked feathers from captured individuals and some molted feather samples were collected by Cam Aldridge, Jen Carpenter, & their assistants.

Part I. Do Molted Feathers Work?

- 1422 samples were collected from 1998-2007 (327 tissue/blood & 1095 molted feather)
- Of the 1422 samples, 604 unique individuals were identified
- Of the 1095 non-invasive samples, 1093 contained enough DNA to be analyzed at >6 microsatellite loci (99.8% success) – most were also DNA sexed
- Many birds were sampled multiple times via molted feathers (each individual was represented by 1 - 43 feathers, but most birds were sampled between 2-10 times)

Part II: Genetic Lek Counts

- Sampling effort ranged from 1-7 feather collections per lek per year
- High intensity feather collections revealed that more males visit the lek than are counted on any given morning
- Single collections appear very useful - generally capture at least half of the male lek count along with some females.

Table 1: Alberta Sage-Grouse molted feather collections conducted from 2003-2007. Lek counts are from the yearly official Alberta Fish & Wildlife counts and # of males & females detected are from DNA extracted from molted feathers

Lek	Year	Lek Count (Males Only)	# of Males Detected	# of Females Detected	Effort (# of times feathers were collected)
1/9	2004	3	5	0	1
2/24	2005	3	4	1	1
10/11	2005	7	13	1	4
10/11	2006	12	26	0	6
16	2005	31	37	6	3
16	2006	25	37	1	6
16	2007*	24	8	0	1
22	2003	14	9	0	1
22	2004	13	6	0	1
22	2005	9	4	0	1
22	2006	7	15	8	3
22	2007*	5	3	0	1
30	2003	19	7	0	1
30	2005	18	20	7	1
30	2006	18	23	8	2
30	2007*	16	9	1	1
31	2004	12	3	0	1
31	2005	10	8	0	1
31	2006	9	9	0	1
31	2007*	7	6	0	1
34	2005	8	15	7	4
34	2006	11	19	1	7
34	2007*	13	9	0	1
35	2003	5	3	1	1
35	2004	8	11	0	1
35	2005	8	7	4	1
35	2006**	6	2	0	2
35	2007*	4	7	5	1

* 2007 was a very wet year, which made feather collection difficult

** A raptor kill on the lek made it difficult to collect feathers since most were likely from the killed male

- Multiple off-lek samples were collected – represented unique individuals that were not assigned to a lek (indicates possibility of unknown leks)
- Females are more difficult to sample because they are on the lek for a much shorter period of time and generally do not fight (fighting is the primary cause of feather loss)

- Lek 1/9 is genetically unique lek that was identified thanks to feather collection – the sole male trapped on lek 9 in 1998 appears to have moved from lek 9 after the 1999 lekking season to the old lek 1 site and founded the current lek 1/9 (he appears to be the grandfather of all sampled males).

Part III: Survivorship determined by molted feather “mark-recapture”

- DNA allows you to determine how long a particular bird lives based on how many years their DNA is sampled on a lek
- Can be done either with just molted feathers or in conjunction with field studies that involve capturing birds

• HOW DID I DETERMINE HOW LONG MALES LIVE?

- Birds were either physically captured and sampled or “captured” via molted feathers on the lek.
- Birds were “recaptured” when molted feathers matching their genetic profiles were found in subsequent years.
- In a few cases, birds were sampled via molted feathers the year prior to their physical capture.

Table 2: Survivorship of males based on molted feather collection

# of Years Males were Sampled on the Lek*	Physically Captured Males**	Molted Feather “Captured” Males***
1	6 adults, 1 yearling	156
2	15 adults, 1 yearling	28
3	12 adults, 2 yearlings	2
4	4 adults, 4 yearlings	1
5	1 adult	0
6	2 adults, 1 yearling	0

*Each category is independent of one another. E.g. If a male was sampled in two years, he is not included in the 1 year category.

**Physically captured individuals were aged as adults or yearlings. The year of capture is assumed to be the first lekking season for yearling males and the second lekking season for adult males (the exact age was not determined at capture so this is a conservative estimate).

***Males sampled via molted feathers ONLY are assumed to be alive only in the years sampled

• WHAT DOES TABLE 2 MEAN?

- Most males are sampled only for 1-2 years, but some males are surviving 7 + years
- For the physically captured males:
 - Age of yearlings = # of years sampled
 - Age of adults = # of years sampled + 1 (conservatively).

- Females are difficult to sample via molted feathers, but there were two females sampled over 3 years and five females sampled over 2 years.

WHY SHOULD YOU COLLECT MOLTED FEATHERS?

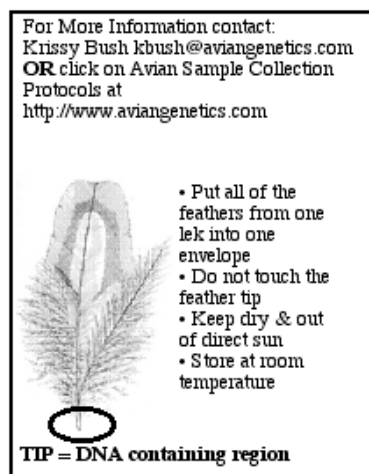
- (1) If you ever want to look at the genetics of your population, you already have samples collected
- (2) Sample collection is essentially free since you are out counting the birds on the lek anyways
- (3) Molted feathers will keep indefinitely in paper envelopes at room temperature

HOW OFTEN DO I NEED TO COLLECT FEATHERS FROM A SINGLE LEK IN A SINGLE YEAR?

- Intensively sampling a lek once a year is sufficient to obtain baseline genetic data for the population and a fair idea of the number of males attending the lek
- Sampling twice is recommended (1 early in the season & 1 late in the season) to get the most data possible
- If you just want a snap shot in time, single season sampling is fine, but if you want to monitor trends and determine things such as survivability, feathers need to be collected yearly
- **Intensive sampling** = picking up every feather present on the lek, lek periphery, and downwind of the lek – a.k.a. vacuuming the lek
- Non-intensive sampling will not get you much data
- As a general rule of thumb, try find at least 20 feathers because 10 unique birds are required for most lek based analyses. If there are more feathers, collect them! It only takes a few minutes.

HOW DO I GO ABOUT COLLECTING FEATHERS?

- Supplies = paper envelopes of any size
- I print the following on the envelopes (white regular letter sized) that I give out:



SPECIES:

YEAR:

LEK NAME:

PROVINCE/STATE and COUNTY:

GPS COORDINATES:

NAME OF COLLECTOR(S):

OF MALES + # OF FEMALES:

NOTES:

- All information listed above (species, year, lek name, location [province/state and country], GPS coordinates, name of collectors, # of males & # of females) is required so that the genetic analysis is as informative as it can be
- Feathers can be collected in the morning, afternoon, and evening when birds are not present on the lek (just put N/A for lek count), NOTES = unusual observations