

Bartonella prevalence in fleas isolated from populations of Uinta Ground Squirrels in Logan Canyon Utah

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Introduction

- During the 1960s and 1970s, social dynamics in population regulation was studied using Uinta ground squirrels (UGS). (Figure 1)
- Uinta Ground Squirrels are used as a model organism to understand effects of climate change, parasite loads, and infectious diseases.
- As average temperatures increase it is predicted that parasites and infectious diseases will increase in prevalence in response to the warming.
- Infectious diseases can be transmitted by ectoparasites such as fleas and ticks.
- UGS are primarily burdened with ectoparasites in which are well-known vectors of parasites and will be used to test for *Bartonella* (a gram negative bacteria).
- Our objective is to conduct population genetics analysis of *Bartonella spp.* recovered from numerous field flea specimens from UGS in Logan, UT. Data will be used to find relationships with climate change and the disease prevalence.



Figure 1. Uinta Ground Squirrel

Methods

- Uinta Ground Squirrels were trapped in Logan Canyon, Utah in May and August 2014. (Figure 2, 3, and 4)
- Fleas were collected from each squirrel and placed in 70% ethanol.
- Using conventional PCR, each flea specimen was analyzed for presence of ground squirrel DNA and presence of *Bartonella spp.*
Forward Bart. primer-GCTATCTCTGCATTCTATCA
Reverse Bart. primer-GATCYTCAATCATTCTTTCCA
- Each flea was cleared and mounted for Identification, Fleas will be identified using Furham and Katts flea identification keys.



Figure 2 (above). Map of Logan Canyon, UT where squirrels were trapped and fleas collected.



Figure 3 (left) and Figure 4 (right). Squirrels live trapped and ready for processing.

Preliminary Results

- 47 squirrels were live trapped. (Figure 5)
- Fleas were collected and pooled based on squirrel. (Figure 7)
- Flea DNA was extracted using Quigen DNeasy Blood & Tissue Kit.
- None of the fleas that have been tested to date are positive for *Bartonella*. (Figure 8)
- Uinta Ground squirrel specific primers (SARM) were used to confirm quality of DNA. (Figure 9)
- Furham and Katts flea identification keys will be used to distinguish flea species.
- Images of cleared and mounted fleas ready for identification are seen in Figures 10, 11, 12, and 13.

Figure 5. Captured and Tagged Uinta ground squirrel.



Figure 7. Data for each flea containing squirrel

Date of Collection	Sample Name	nfleas	Extr DNA	Bartonella	Mounted
5/14/2013	6L7R	12	Y	N	Y
5/14/2013	8L9R	12	Y	N	Y
5/14/2013	10L11R	7	Y	N	N
5/14/2013	12L13R	8	Y	N	N
5/14/2013	15L14R	4	Y	N	N
5/14/2013	16L17R	7	Y	N	N
5/14/2013	18L19R	11	Y	N	N
5/14/2013	20L21R	4	Y	N	N
5/14/2013	22L24R	1	Y	N	N
5/14/2013	23L26R	8	Y	N	N
5/15/2013	29L30R	2	Y	N	N
5/15/2013	31L32R	6	Y	N	N
5/15/2013	33L34R	1	Y	N	N
5/15/2013	35L36R	15	Y	N	N
5/15/2013	37L38R	2	Y	N	N
5/15/2013	39L40R	6	Y	N	N
5/15/2013	41L42R	7	Y	-	N
5/15/2013	43L44R	11	Y	-	N
5/15/2013	45L46R	4	Y	-	N
5/15/2013	47L48R	-	N	-	N
5/15/2013	49L50R	8	Y	-	N
5/15/2013	51L52R	2	Y	-	N
5/15/2013	53L54R	8	Y	-	N
5/15/2013	55L56R	7	Y	-	N
5/15/2013	57L58R	-	N	-	N
5/15/2013	61L62R	5	Y	-	N
5/21/2013	64L65R	5	Y	-	N
5/21/2013	66L67R	-	N	-	N
5/21/2013	68L69R	-	N	-	N
5/21/2013	71L72R	-	N	-	N
5/21/2013	76L77R	-	N	-	N
5/21/2013	80L81R	-	N	-	N
5/21/2013	82L83R	5	Y	-	N
5/21/2013	84L85R	-	N	-	N
5/21/2013	86L87R	-	N	-	N
5/21/2013	88L89R	-	N	-	N
5/21/2013	90L91R	3	Y	-	N
5/21/2013	97L98R	-	N	-	N
5/21/2013	99L100R	6	Y	-	N
5/29/2013	94L95R	-	N	-	N
5/29/2013	92L93R	-	N	-	N
5/29/2013	71L72R	-	N	-	N
5/29/2013	55L56R	-	N	-	N
5/29/2013	102L103R	-	N	-	N
8/9/2013	104L105R	-	N	-	N
8/9/2013	106L107R	-	N	-	N

Squirrel and Flea Descriptive Data

Total Squirrels	47
Average Flea per Squirrel	8
Total Fleas Collected	~380
Flea DNA Extracted	204
Fleas Tested for <i>Bartonella</i>	106
Total Mounts	24

Figure 10. Male Flea

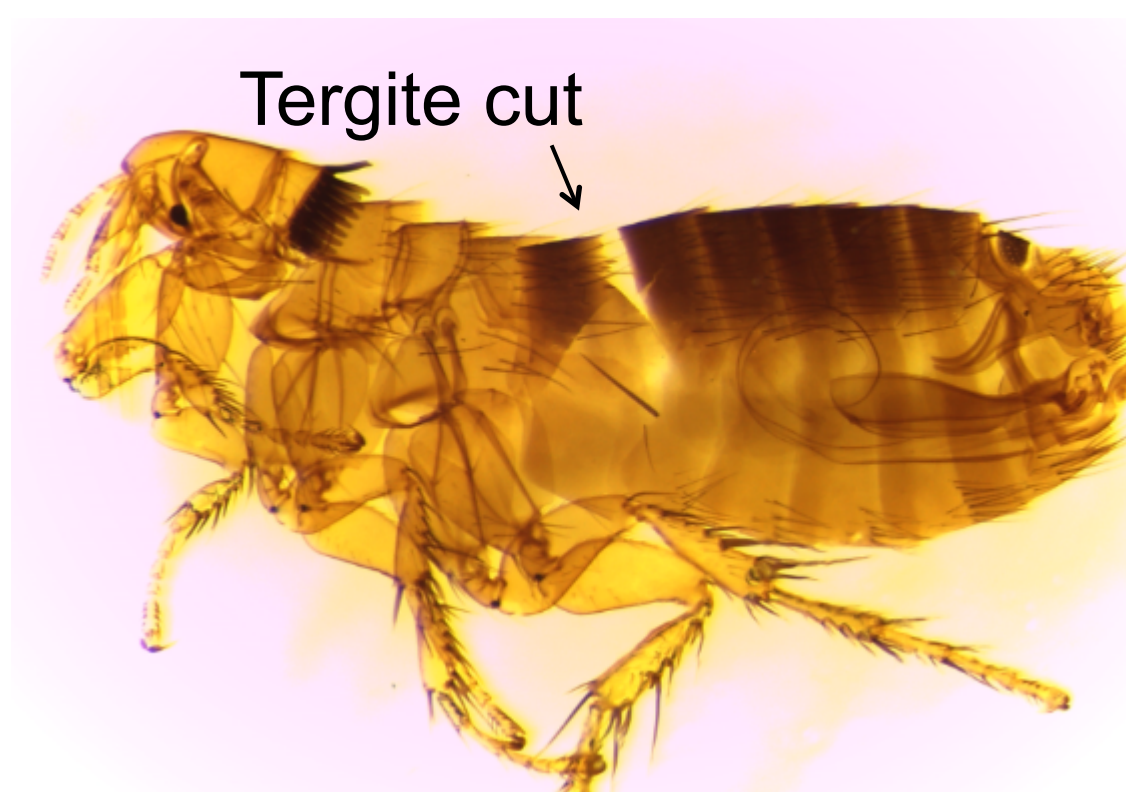


Figure 12. Female Flea



Figure 11. Enlargement of male genitalia

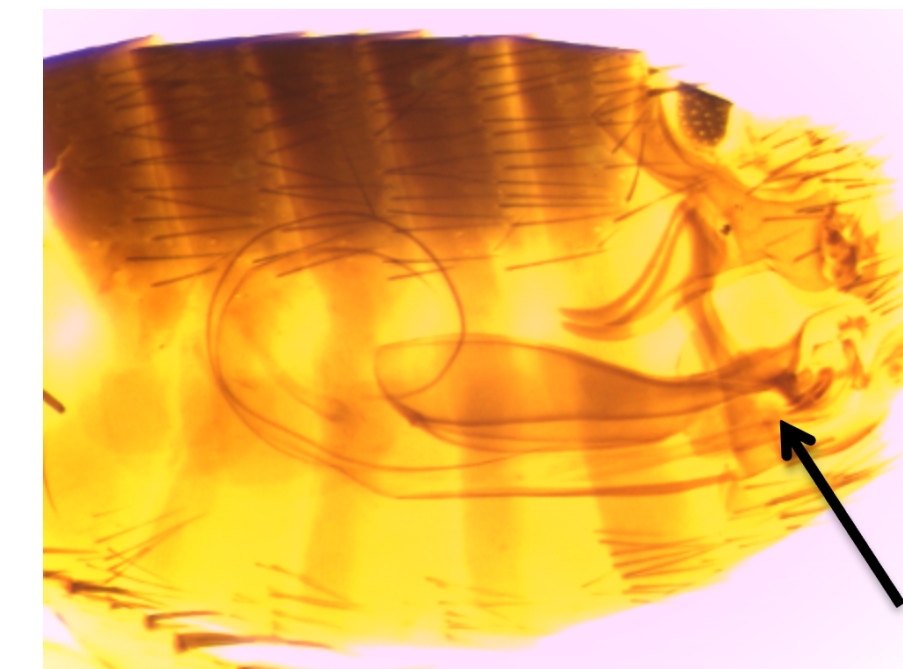


Figure 13. Enlargement of female genitalia

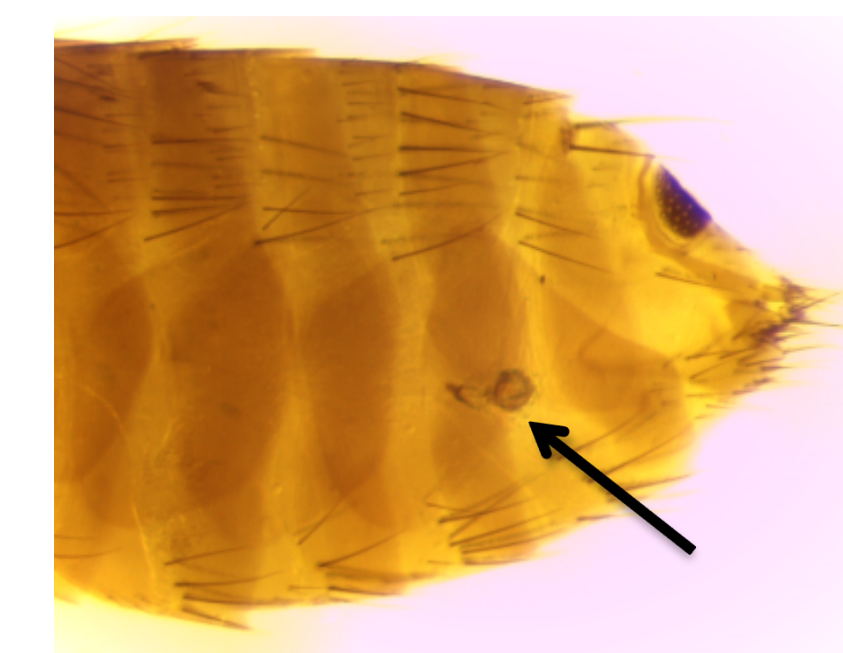


Figure 8. Gel-electrophoresis using *Bartonella* (GLTA) primers. All fleas are negative for *Bartonella*.

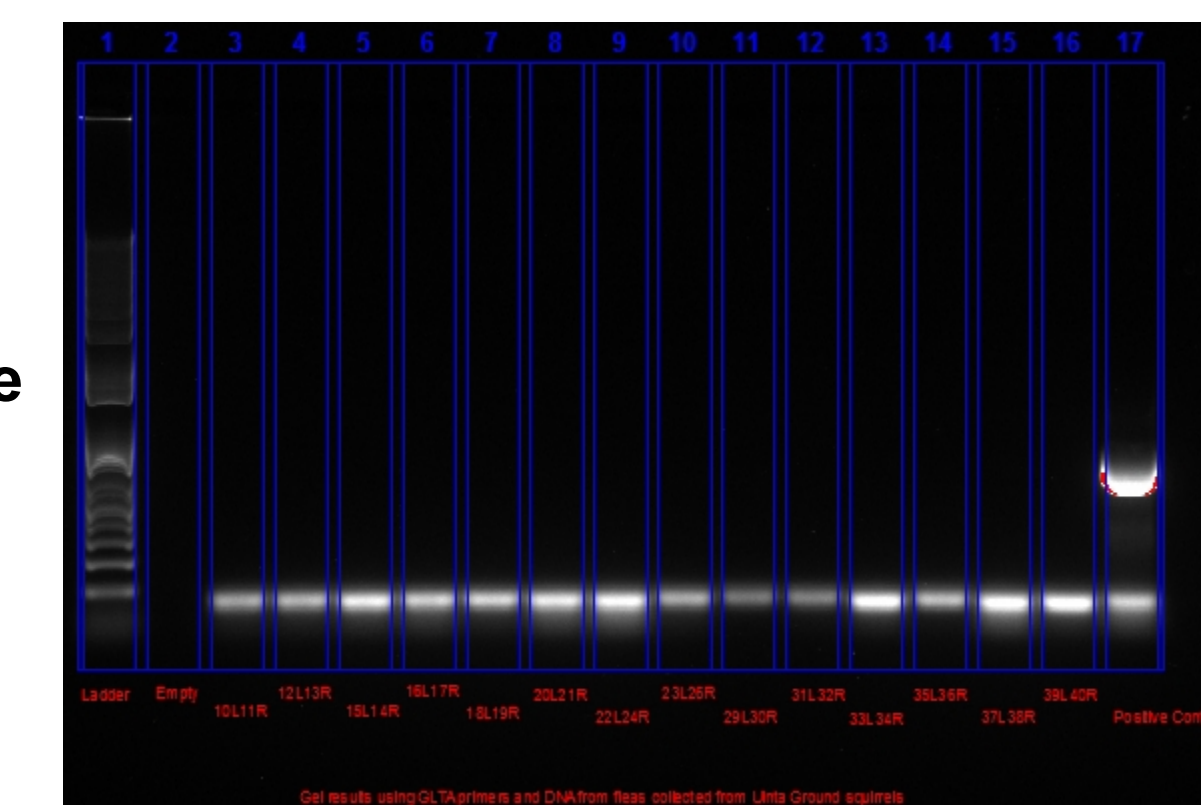
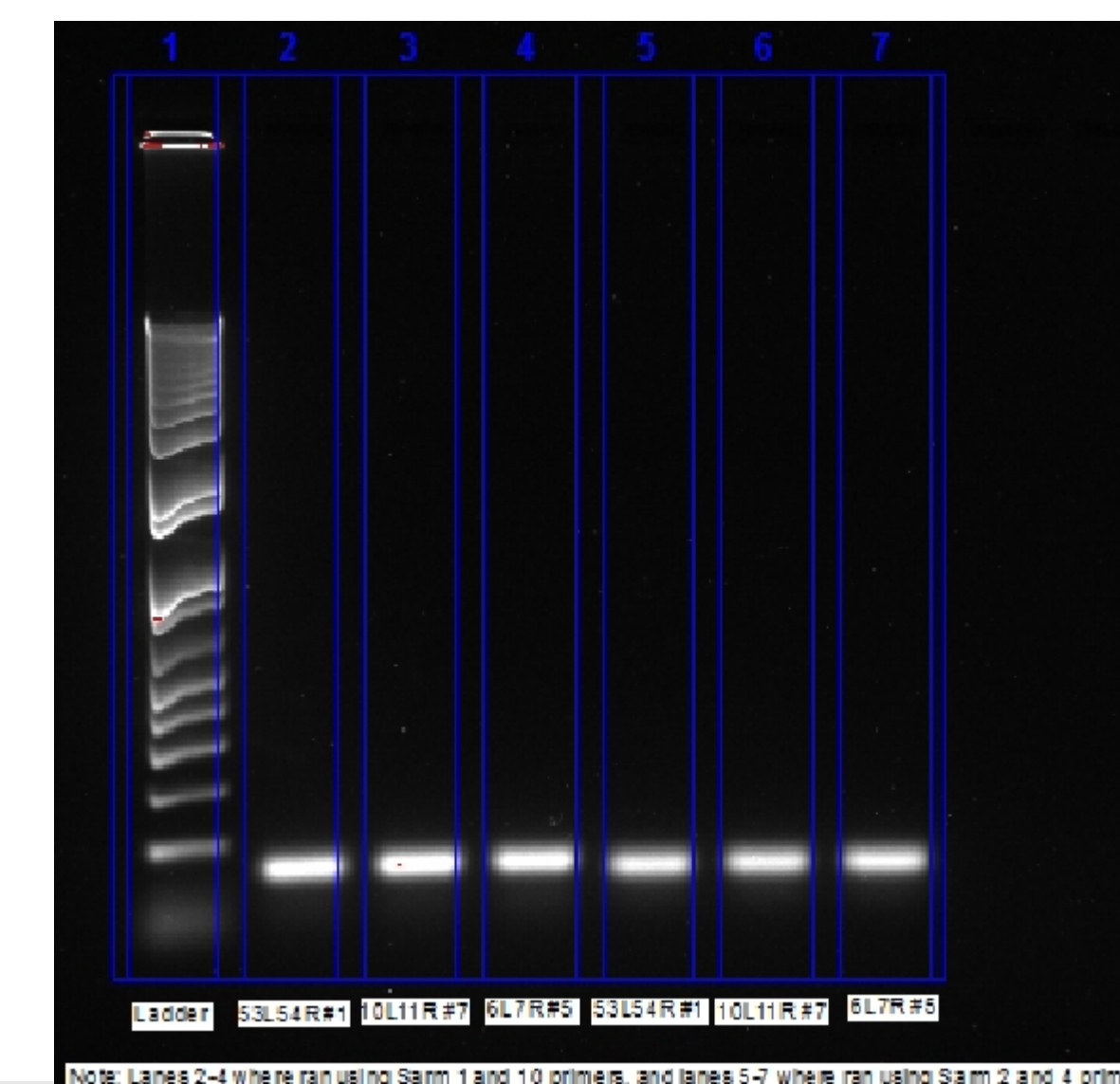


Figure 9. Gel-electrophoresis results confirming presence of Uinta Ground Squirrel DNA. PCR fragment size is ~100bp



Future Research

- DNA extractions for remaining fleas needs to be completed for *Bartonella* confirmation.
- Remaining fleas need to be mounted and identified to species.
- DNA Sequence analysis needs to be completed for both Uinta Ground Squirrel and any positive *Bartonella* specimens.



Figure 14. Road side of collection site.

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