REPORT

Project: BLM--Klamath Fisher (*Pekania pennanti*) 2016 Samples DNA Results

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REPORT

On July 27, 2016 we received 8 hair samples (#193-200) collected in 2016 as part of non-invasive surveys for fisher on BLM lands (Klamath district) southern Oregon. We also received two hair samples from live-caught fishers from the study area (F01 and F03). Subsequently, on September 9, 2016 we received blood samples stored on FTA blood cards from seven live-caught fisher (including F01 and F03). DNA analysis was requested on these samples.

We tested the eight non-invasive samples for species (Table 1). We obtained DNA for analysis from seven of the samples, and all are from fisher.

Table 1. Species identification results of hair samples collected on BLM lands in the Klamath District; samples #193-200

Sample #	Station #	Sample Collection Date	Location (TRS)	UTM (NAD 83 10N)	Notes	DNA Species ID
193	JS 06	4/20/2016	T39S R6E Sec 06	568894 4672410	Fisher Photos	Fisher
194	23	6/9/2016	T38S, R05E, Sec. 23	566746; 4678045	Fisher Photos	Fisher
195	3-2	6/9/2016	T39S, R05E, Sec. 03	564403, 4673638	Fisher Photos	Fisher
196	23	6/14/2016	T38S, R05E, Sec. 23	566746; 4678045	Fisher Photos	poor DNA
197	3-2	6/14/2016	T39S, R05E, Sec. 03	564403, 4673638	Fisher Photos	Fisher
198	3-2	6/22/2016	T39S, R05E, Sec. 03	564403, 4673638	Fisher Photos	Fisher
199	23	6/24/2016	T38S, R05E, Sec. 23	566746; 4678045	Fisher Photos	Fisher
200	3-2	6/24/2016	T39S, R05E, Sec. 03	564403, 4673638	Fisher Photos	Fisher

We tested the seven fisher hair samples collected non-invasively, for individual and sex. We also tested the seven live-caught fisher for individual. From the non-invasive hair samples, we identified three individuals (two females and one male). The females are recaptures of previously identified individuals, and the male is a new individual (Table 2).

Table 2. Individual and sex results for fisher identified from non-invasively collected hair samples from 2016.

Sample #	Station #	Sample Collection Date	Location (TRS)	UTM (NAD 83 10N)	DNA Species ID	Sex	Individual	Recapture
193	JS 06	4/20/2016	T39S R6E Sec 06	568894 4672410	Fisher	F	BLM-KL16-F10	yes
194	23	6/9/2016	T38S, R05E, Sec. 23	566746; 4678045	Fisher	M	BLM-KL16-M12	no
195	3-2	6/9/2016	T39S, R05E, Sec. 03	564403, 4673638	Fisher	F	BLM-KL13-F1	Yes
196	23	6/14/2016	T38S, R05E, Sec. 23	566746; 4678045	poor DNA			
197	3-2	6/14/2016	T39S, R05E, Sec. 03	564403, 4673638	Fisher	F	BLM-KL13-F1	Yes
198	3-2	6/22/2016	T39S, R05E, Sec. 03	564403, 4673638	Fisher	F	BLM-KL13-F1	Yes
199	23	6/24/2016	T38S, R05E, Sec. 23	566746; 4678045	Fisher	M	BLM-KL16-M12	no
200	3-2	6/24/2016	T39S, R05E, Sec. 03	564403, 4673638	Fisher	F	BLM-KL13-F1	Yes

We tested the seven samples from live-caught fisher (3 females and 4 males). Five of the samples are recaptures of individuals previously identified from hair samples (Table 3).

Table 3. Individual results for seven live-caught fishers from the Klamath district 2016

Individual	Sex	Individual	Recapture
F01T	F	BLM-KL13-F1	yes
F02T	F	BLM-KL15-F6	yes
F03T	F	BLM-KL14-F4	yes
M01T	M	BLM_Winema_12M	yes
M02T	M	BLM-KL-M02T	no
M03T	M	BLM-KL-M03T	no
M04T	M	BLM-KL13-M3	yes

We evaluated the mitochondrial DNA from individual BLM-KL-M12, BLM-KL-M02T and BLM-KL-M03T with the goal of assessing the source population. These samples were analyzed using a 300bp region of the mitochondrial DNA control region (Drew *et al.* 2003, Vinkey *et al.* 2006, Schwartz 2007).

Individual BLM-KL-M12 has a mitochondrial DNA (mtDNA) haplotype Drew-hap9, while individuals BLM-KL-M02T and BLM-KL-M03T have haplotype Drew-hap2 (Table 4). Drew-hap2 is one of two native haplotypes observed previously in fishers from Northern California, the Mt. Ashland area, and from BLM surveys west of I-5 in the Medford district (Drew *et al.* 2003; Timber Products Company Annual Reports 2007-2015; BLM results 5/20/2013). Drew-hap9 has been detected in fisher populations in southwestern Oregon (a population that received translocations from western Canada and the mid-west United States). Drew-hap9 is common in British Columbia (Drew *et al.* 2003).

Table 4. Mitochondrial DNA haplotypes from fisher samples collected from the 2016 BLM-Klammath surveys. Samples in blue are live-caught fisher. The highlighted haplotypes are consistent with native populations.

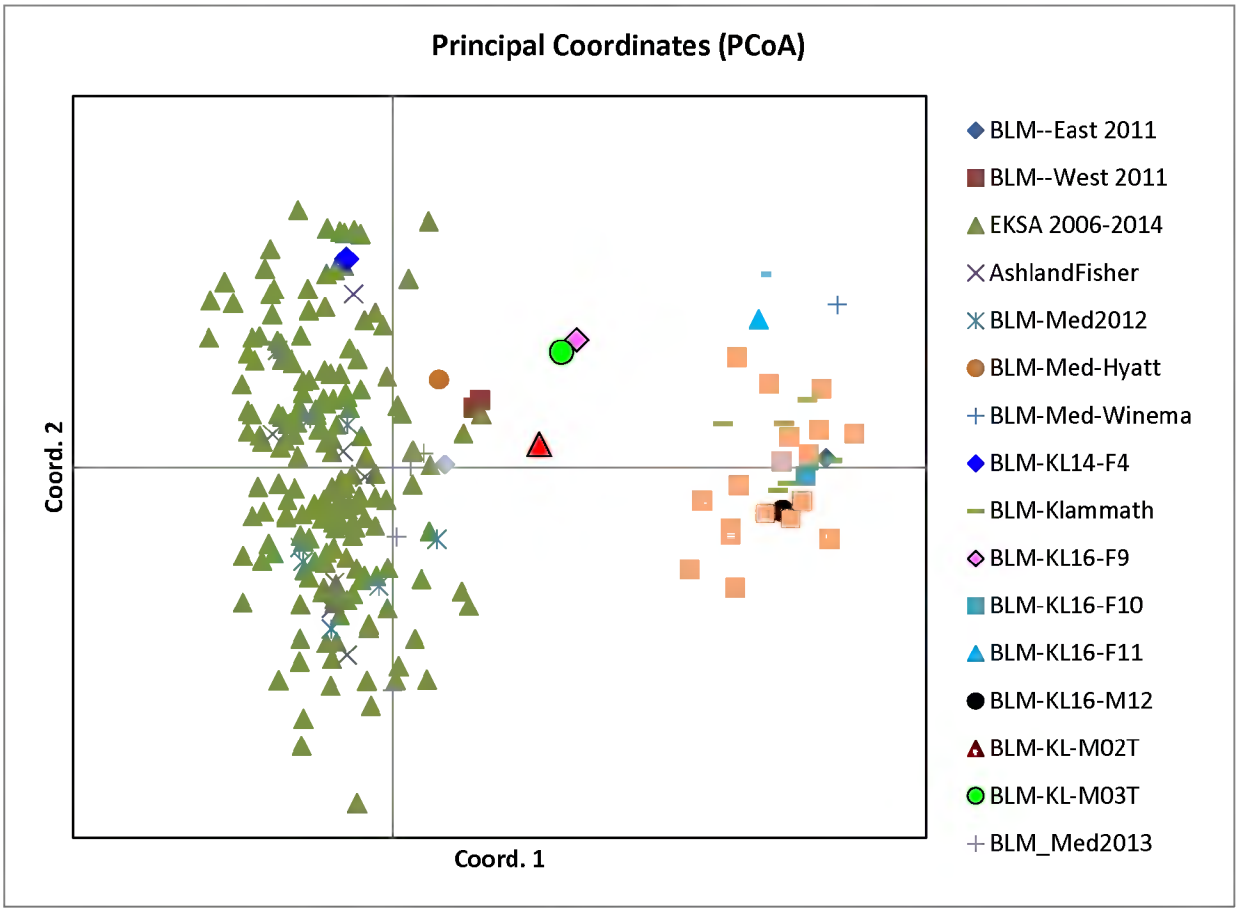
Sex	Individual	mtDNA Haplotype	BLM Samples	1st Year Detection
F	BLM-KL13-F1	Drew-hap9	1, 2, 4, 10, 11, 13, 22, 23, 51, 86, 87, 89, 94, 97, 101, 142, 144, 148, 149, 153, 171, 173, 195, 197, 198, 200, 202, F01T	2013
F	BLM-KL13-F2	Drew-hap9	8	2013
M	BLM-KL13-M3	Drew-hap9	9, 88, 93, 96, 136, 137, 143, 164, M04T	2013
F	BLM-KL14-F4	Drew-hap2	76, F03T	2014
M	BLM-KL15-M5	Drew-hap9	90, 91, 98, 99, 100, 112, 123	2015
F	BLM-KL15-F6	Drew-hap9	92, 110, 120, 122, 140, 146, 147, 152, 157, 172, F02T	2015
M	BLM_Winema_12M	Drew-hap9	BLM-MED-41, 29, 102, 106, 107, 108, M01T	2011
M	BLM-KL15-M7	Drew-hap9	105	2015
M	BLM-KL15-M8	Drew-hap9	111	2015
F	BLM-KL16-F9	Drew-hap2	178, 180	2016
F	BLM-KL16-F10	Drew-hap9	181, 183, 184, 185, 186, 189, 190, 193	2016
F	BLM-KL16-F11	Drew-hap9	182	2016
M	BLM-MED13M-Hyatt	Drew-hap1	BLM-MED-44	2012
F	BLM-MED-01F	Drew-hap9	BLM-MED-006	2008

M	BLM-KL16-M12	Drew-hap9	194, 199	2016
M	BLM-KL-M02T	Drew-hap2	M02T	2016
M	BLM-KL-M03T	Drew-hap2	M03T	2016

Males BLM-KL-M02T and BLM-KL-M03T are the fourth and fifth individuals to be detected east of I-5 with a native haplotype (Drew-hap2). The other individuals sampled east of I-5 from BLM surveys all have haplotype Drew-hap9.

Eleven variable microsatellite markers used previously to determine the number of unique genotypes (individuals) were used to assess population substructure. Genotypes from individuals collected by the BLM were compared to our fisher microsatellite database for fisher in Oregon and California. Individual BLM-KL-M12 has nuclear DNA consistent with being related to/descended from native populations (Figure 1). Individuals BLM-KL-M02T and BLM-KL-M03T have a genetic signature showing nuclear DNA from both the Northern California (native) and Southern Oregon (reintroduced origin) populations. These individuals are the second and third introgressed individuals (along with BLM-KL-F9) observed from this area.

Figure 1. Principal coordinates graph of microsatellites from modern fisher collected in N. CA and S. OR by collection location (East and West of I-5). The translocated OR fishers from 1998-2001 are represented by squares. The three individuals detected east of I-5 with native haplotypes are shown separately. BLM-Med-13M_Hyatt (yellow triangle) and BLM-KL16-F4 (green circle) were sampled East of I-5 but have nuclear DNA genotypes and mtDNA haplotypes consistent with originating from West of I-5. BLM-KL16-F9, BLM-KL-M02T and BLM-KL-M03T were also sampled East of I-5 and have a mtDNA haplotype consistent with being from West of I-5 (native haplotype), but a genotype that appears to be introgressed from individuals both East and West of I-5 (see text for further discussion).



Interpretations

We identified five individuals sampled east of I-5 with native haplotypes that were previously only found West of I-5. BLM-Med-13M_Hyatt (tan circle; Figure 1) and BLM-KL16-F4 (blue diamond; Figure 1) were sampled East of I-5 but have nuclear DNA genotypes and mtDNA haplotypes consistent with originating from West of I-5. BLM-KL16-F9 (pink triangle), BLM-KL-M02T (red triangle) and BLM-KL-M03T (green circle) were also sampled East of I-5, have mtDNA haplotypes consistent with being from West of I-5 (native haplotype), but a genotype that appears to be introgressed from individuals both East and West of I-5. This suggests that the individual's mother was originally from the population in Northern California/Southwestern Oregon with the native haplotype as mtDNA is maternally inherited, and its father was from the Southern Oregon introduced population. While there may be other individuals in the study area that are un-sampled that may also be possible parents, female BLM-KL16-F9, and males BLM-KL-M02T and BLM-KL-M03T are genetically consistent with being offspring of BLM-KL14-F4 and BLM-KL15-M5.