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Supplementary material

Appendix 1

Table A1

Birds sampled for the contemporary cline and their capture location, morphometrics and genotype for the *COI* and *CHD1Z* genetic markers. RbSa – *Sphyrapicus ruber*, YbSa – *S. varius*; Culm, culmen length (see Methods); Bill-H, bill height; Bill-W, bill width; Head-L, head length; Head-W, head width; Flat-W, flattened wing; Tail-L, tail length; Tarsu-L, tarsus length; Mous-L, length of the white moustache; Mous-W, moustache width; Wing bar, the length of the wing bar; Mantle and Rectrix, amount of white and black plumes on the mantle and on dorsal mid-rectrix. All measurements were measured using a dial caliper (±0.01 mm; see Methods). Geographic coordinates were given as Degrees.Minutes.Decimal Minutes.

Record No.	Sp.	Long (N)	Lat (W)	Sex	COI (2-E, 0-W)	CHD1Z (2-E, 0-W)	Culm	Bill -H	Bill -W	Head -L	Head -W	Flat -W	Tail -L	Tarsu -L	Mous -L	Mous -W	Mantle (%w)	Wing bar
IE08S01	YbSa	55.41.208	121.34.967	Male	2	2	24.8	6.2	7.4	21.3	19.2	124	68	20.0	>30	4.9	80	53.9
IE08S02	YbSa	55.41.208	121.34.967	Male	2	2	24.0	6.4	7.8	22.3	18.7	128	75	20.8	>30	4.0	60	53.9
IE09S01	YbSa	55.40.792	121.33.391	Male	2	2	23.4	6.3	8.8	20.7	17.8	121	74	20.7	>30	4.3	70	n
IE09S02	YbSa	55.40.547	121.33.499	Male	2	2	23.5	6.7	8.4	22.4	19.7	129	73	20.9	>30	3.7	70	53.4
IE10S01	YbSa	55.40.854	121.32.413	Male	2	2	25.8	6.7	8.3	21.7	18.2	131	80	20.4	>30	4.6	60	57.5
IE10S02	YbSa	55.40.766	121.32.301	Male	2	2	23.5	6.6	8.6	22.1	19.0	126	78	19.7	>30	5.1	70	54.5
IE10S03	YbSa	55.41.141	121.33.048	Male	2	2	24.2	6.7	8.1	22.0	18.4	123	75	19.4	>30	5.2	60	53.9
IE10S04	YbSa	55.40.109	121.33.648	Female	2	2	26.4	6.5	8.9	21.7	19.0	129	82	20.2	>30	5.0	60	55.2
IE11S01	YbSa	55.38.266	121.45.303	Female	2	2	24.2	6.4	7.9	21.5	18.0	127	78	20.0	>30	4.3	70	49.4
IE11S02	YbSa	55.38.174	121.45.211	Male	2	2	24.0	6.8	8.2	22.4	19.8	128	76	21.3	>30	4.5	70	54.6
IE11S03	YbSa	55.36.771	121.54.296	Male	2	2	23.5	6.6	8.7	22.0	18.7	127	75	19.6	>30	4.1	60	52.8
IE11S04	YbSa	55.40.138	121.33.672	Male	2	2	24.0	6.3	8.4	21.9	19.1	125	76	19.8	>30	5.4	70	54.7
IE13S01	YbSa	55.36.796	121.56.990	Male	2	2	21.5	6.4	7.7	21.7	19.1	125	79	20.5	>30	5.0	60	57.6
IE14S01	YbSa	55.38.847	122.12.314	Male	2	2	24.0	6.5	7.9	21.6	18.2	126	72	20.9	>30	5.0	60	53.3
IE14S02	YbSa	55.38.318	122.13.755	Male	2	2	23.9	6.7	7.5	21.5	18.6	124	76	20.3	>30	4.3	60	47.1
IE14S03	YbSa	55.37.652	122.15.543	Male	2	2	22.9	6.9	8.8	22.8	18.3	132	82	20.8	>30	5.1	50	53.7
IE15S01	YbSa	55.36.183	122.19.213	Male	2	2	24.0	7.0	8.2	22.4	18.5	126	78	20.7	>30	5.9	60	50.3
IE15S02	YbSa	55.36.183	122.19.213	Female	2	X	24.4	6.4	8.7	21.8	17.5	130	77	19.9	>30	3.8	70	58.2
IE15S03	YbSa	55.34.661	122.23.343	Male	2	2	24.4	6.7	8.7	22.5	19.3	128	77	22.0	>30	4.6	70	51.0
IE15S04	YbSa	55.33.599	122.24.457	Male	2	2	24.5	6.6	7.9	22.7	18.0	124	77	19.9	>30	4.5	60	53.5

Record No.	Sp.	Long (N)	Lat (W)	Sex	COI (2-E, 0-W)	CHD1 Z	Culmen	Bill-H	Bill-W	Head-L	Head-W	Flat-W	Tail-L	Tars-L	Mous-L	Mous-W	Mantle (%w)	Wing bar
IE16S01	RbSa	55.31.493	122.30.163	Male	0	0	26.0	7.4	9.1	22.5	18.8	129	80	20.7	15.1	0.0	10	51.3
IE18S01	YbSa	55.38.696	122.09.456	Male	2	2	23.9	7.1	8.8	22.6	19.0	124	73	21.3	>30	4.4	70	52.3
IE18S02	YbSa	55.38.696	122.09.456	Female	2	2	25.3	6.5	7.9	21.8	17.6	126	75	20.4	>30	5.9	70	53.0
IE18S03	YbSa	55.39.071	122.11.886	Male	2	2	21.8	6.5	7.6	20.8	17.5	119	74	19.0	>30	4.1	60	48.4
IE18S04	YbSa	55.37.930	122.14.785	Male	2	2	23.2	6.6	8.7	21.8	19.1	125	75	20.9	>30	4.6	80	53.8
IE20S01	YbSa	55.38.479	122.13.417	Male	2	2	22.8	6.5	7.8	21.8	18.4	125	71	20.7	>30	5.2	60	53.6
IE20S02	YbSa	55.37.326	122.15.951	Male	2	2	23.1	6.8	7.8	21.0	18.4	123	78	19.9	>30	4.7	50	50.9
IE20S03	YbSa	55.36.071	122.19.720	Male	2	2	23.3	7.1	8.0	21.5	18.1	125	77	20.1	>30	4.7	60	50.2
IE20S04	YbSa	55.33.504	122.25.290	Female	2	2	24.4	6.3	8.9	22.0	18.0	123	78	19.9	>30	2.8	70	53.9
IE20S05	YbSa	55.33.504	122.25.290	Female	2	2	24.1	6.5	8.0	21.5	17.6	130	84	19.9	>30	3.7	70	53.2
IE21S01	YbSa	55.33.582	122.25.327	Male	2	2	23.9	6.5	8.8	22.0	18.2	132	80	20.1	>30	4.0	60	55.5
IE21S02	YbSa	55.33.582	122.25.327	Female	2	X	23.7	6.4	8.1	21.6	8.9	127	72	20.2	>30	4.4	70	48.0
IE23S01	YbSa	53.53.456	122.49.389	Male	2	2	n	n	n	n	n	n	n	n	>30	n	n	n
IE24S01	HYB	55.21.523	123.06.286	Male	2	2	23.9	6.5	8.3	21.9	18.3	127	79	19.8	>30	4.7	40	51.8
IE24S02	YbSa	55.21.860	123.06.072	Male	2	2	24.5	6.5	8.0	21.6	18.2	129	76	19.7	>30	4.5	60	53.0
IE24S03	YbSa	55.24.140	123.11.144	Male	2	2	22.6	6.6	8.5	22.1	18.6	127	76	20.7	>30	5.0	60	51.1
IE25S01	YbSa	55.22.917	123.08.270	Male	2	2	25.0	6.4	8.5	21.8	17.5	126	77	19.8	>30	5.1	70	46.9
IE25S02	RbSa	55.22.917	123.08.270	Female	0	0	26.3	7.1	8.8	22.0	18.6	129	81	20.6	14.7	1.2	20	33.0
IE25S03	RbSa	55.22.917	123.08.270	Male	0	H	25.5	7.0	8.4	22.5	19.0	130	82	21.1	12.2	0.0	5	50.5
1E27S01	YbSa	55.22.088	123.07.223	Male	2	2	21.7	6.3	7.3	21.4	19.0	127	76	18.8	>30	5.3	60	50.0
1E27S02	YbSa	55.22.088	123.07.223	Female	2	X	22.8	6.2	8.7	21.7	19.2	128	83	19.5	>30	6.0	70	53.7
1E27S03	YbSa	55.22.088	123.07.223	Male	2	2	24.8	6.9	9.0	n	n	127	76	20.7	>30	4.8	70	54.0
1E27S04	YbSa	55.22.088	123.07.223	Male	2	2	21.1	6.3	8.5	21.2	18.4	123	75	19.6	>30	3.4	60	46.7
1E27S05	YbSa	55.22.088	123.07.223	Female	2	2	25.1	6.1	8.9	21.6	19.0	126	80	20.3	>30	4.4	70	49.3
1E27S06	YbSa	55.25.183	123.10.269	Male	2	2	22.8	6.9	8.6	22.0	19.0	127	73	20.6	>30	5.0	70	50.6
IE28S01	RbSa	55.08.715	123.13.687	Female	0	X	26.4	7.0	7.9	22.0	18.7	133	85	21.6	25.5	2.6	5	54.3
IE28S02	YbSa	55.06.345	123.15.435	Male	2	2	24.7	6.4	8.1	21.6	19.1	115	n	19.1	>30	4.6	80	48.5
IE28S03	YbSa	55.06.345	123.15.435	Male	2	2	25.4	6.7	8.9	21.9	19.1	127	n	21.3	>30	4.1	70	54.1
IE30S01	RbSa	55.00.917	123.01.890	Female	0	X	24.8	6.6	8.1	21.0	18.3	131	79	21.9	24.8	2.0	10	52.2
IF01S02	RbSa	55.06.081	123.15.080	Male	0	H	25.9	7.4	8.9	22.8	20.1	130	82	21.3	13.5	0.0	10	54.2
IF02S01	HYB	55.28.843	123.13.564	Male	2	2	25.6	7.1	8.5	22.3	18.5	129	77	20.7	>30	6.0	70	55.0
IF02S02	RbSa	55.31.459	123.16.411	Male	0	0	26.4	7.2	8.9	22.8	19.5	133	83	21.0	14.4	0.0	<5	28.3
IF03S01	YbSa	55.14.127	123.12.710	Female	2	2	25.1	6.5	8.5	21.6	19.1	130	74	20.5	>30	4.2	80	54.3

Record No.	Sp.	Long (N)	Lat (W)	Sex	COI (2-E, 0-W)	CHD1 Z	Culmen	Bill-H	Bill-W	Head-L	Head-W	Flat-W	Tail-L	Tars-L	Mous-L	Mous-W	Mantle (%w)	Wing bar
IF03S02	HYB	55.14.127	123.12.710	Male	2	H	23.9	7.0	8.7	22.6	19.4	131	75	20.6	>30	3.3	10	51.0
IF03S03	RbSa	55.17.640	123.14.456	Male	0	0	23.2	7.3	9.4	23.1	20.4	130	81	21.4	13.3	0.0	5	52.7
IF03S04	RbSa	55.17.640	123.14.456	Female	0	0	25.8	7.3	8.4	22.0	18.6	133	80	20.9	24.0	2.1	10	50.6
IF05S01	RbSa	54.38.778	124.23.612	Female	0	0	27.4	7.0	8.2	22.3	20.1	133	88	21.0	31.8	2.6	20	52.1
IF05S02	RbSa	54.38.778	124.23.612	Male	0	2	25.7	7.5	9.8	22.7	19.9	131	79	21.5	12.8	0.0	20	53.3
IF05S03	RbSa	54.38.890	124.26.616	Male	0	H	28.2	7.5	8.2	23.7	20.7	132	83	22.5	17.4	0.6	10	55.1
IF05S04	RbSa	54.39.222	124.21.401	Male	0	0	25.5	8.2	8.5	23.0	20.0	131	82	21.0	32.8	2.3	10	48.0
IF06S01	RbSa	54.38.186	124.23.825	Male	0	0	26.4	7.7	8.2	22.9	19.4	129	82	20.4	13.2	0.0	10	53.1
IF06S02	RbSa	54.37.780	124.23.839	Male	0	H	28.1	7.2	9.0	23.1	20.2	131	77	21.6	13.3	0.0	5	51.6
IF06S03	RbSa	54.39.365	124.22.390	Male	0	0	25.2	7.2	9.2	23.2	20.0	128	84	22.1	11.6	0.0	5	55.7
IF08S01	RbSa	54.34.947	124.07.697	Male	0	0	29.2	7.8	9.1	23.6	20.9	139	85	21.4	13.6	1.0	20	54.6
IF08S02	YbSa	54.34.947	124.07.697	Male	2	2	24.6	6.5	7.6	21.2	19.0	121	74	20.5	>30	4.0	60	50.5
IF08S03	RbSa	54.31.294	124.06.195	Male	2	H	25.4	7.3	9.4	23.0	20.0	131	80	22.0	12.3	0.0	5	52.2
IF08S04	RbSa	54.29.683	124.08.201	Female	0	0	27.1	7.0	8.6	22.7	19.0	131	77	20.9	13.9	0.0	10	52.7
IF08S05	RbSa	54.29.683	124.08.201	Male	2	0	28.8	8.2	8.8	22.6	20.1	133	84	22.5	15.2	1.3	10	47.5
IF09S01	RbSa	54.21.131	124.17.762	Male	0	H	27.5	7.5	8.6	22.7	20.5	135	85	20.5	14.3	0.0	5	55.5
IF09S02	RbSa	54.21.810	124.20.572	Female	0	X	26.8	7.3	9.0	22.0	19.9	132	84	21.5	33.4	1.5	30	52.2
IF10S01	RbSa	54.21.250	124.18.212	Female	0	X	25.9	7.0	9.2	22.1	19.8	133	85	20.6	36.5	1.8	5	54.1
IF10S02	RbSa	54.16.310	124.16.154	Male	0	0	25.9	7.2	8.6	22.2	19.6	131	80	21.8	32.0	1.8	10	52.7
IF11S01	YbSa	54.36.320	124.04.650	Male	2	2	22.1	6.6	8.2	22.7	19.6	126	76	20.7	>30	4.5	70	51.5
IF11S02	RbSa	54.39.248	124.08.844	Male	0	0	29.2	7.8	9.9	23.7	21.1	131	83	21.8	13.0	1.3	10	55.5
IF11S03	RbSa	54.39.330	124.08.497	Female	0	X	26.5	7.4	8.6	22.3	19.9	133	87	20.0	34.8	1.3	10	53.8
IF12S01	RbSa	54.38.801	124.09.146	Male	X	0	27.3	7.6	9.1	23.1	20.5	129	83	21.0	32.8	2.1	10	49.5
IF12S02	RbSa	54.38.801	124.09.146	Female	0	0	28.0	7.2	9.0	22.8	19.7	135	86	21.3	>30	2.2	10	56.8
IF12S03	RbSa	54.42.731	124.08.711	Male	0	0	27.0	7.8	9.3	23.0	20.2	129	77	21.3	11.1	0.0	10	56.7
IF12S04	YbSa	54.42.731	124.08.711	Male	2	2	23.6	6.7	8.3	22.5	19.7	127	79	21.3	>30	4.5	60	53.8
IF12S05	RbSa	54.48.785	124.09.046	Female	0	0	26.2	7.0	7.9	22.2	19.4	133	83	21.5	29.3	2.2	10	53.7
IF12S06	RbSa	54.48.785	124.09.046	Male	0	0	26.5	7.9	9.2	22.2	19.5	131	87	20.2	27.1	2.0	10	48.0
IF13S01	RbSa	54.48.742	124.08.201	Male	0	0	24.5	7.3	8.5	22.7	20.2	135	85	21.3	30.6	2.0	5	52.0
IF13S02	YbSa	54.48.742	124.08.201	Female	2	2	24.9	6.4	8.3	21.7	18.8	131	82	20.7	>30	4.6	70	44.4
IF13S03	RbSa	54.48.414	124.03.522	Male	0	H	26.7	7.8	8.8	22.1	19.8	126	78	21.0	15.9	2.7	10	51.0
IF16S01	RbSa	53.59.601	126.31.356	Female	2	0	27.2	7.5	8.8	22.2	20.1	127	81	20.1	18.3	1.3	20	47.4
IF16S02	RbSa	53.59.601	126.31.356	Male	0	0	26.4	8.4	9.8	23.5	20.8	128	82	21.9	12.2	0.0	5	54.0

Record No.	Sp.	Long (N)	Lat (W)	Sex	COI (2-E, 0-W)	CHD1 Z	Culmen	Bill-H	Bill-W	Head-L	Head-W	Flat-W	Tail-L	Tars-L	Mous-L	Mous-W	Mantle (%w)	Wing bar
IF16S03	RbSa	54.02.339	126.29.851	Male	2	H	26.9	7.4	8.8	22.4	20.0	126	78	21.9	32.7	3.4	20	54.0
IF16S04	RbSa	54.02.053	126.30.541	Male	0	0	25.4	7.4	9.7	23.2	20.0	129	81	21.0	13.5	0.0	10	53.9
IF16S05	RbSa	54.02.053	126.30.541	Male	0	H	26.4	7.6	8.5	23.1	20.3	131	88	22.1	11.4	0.0	10	56.5
IF16S06	RbSa	54.02.053	126.30.541	Female	0	X	26.4	7.2	9.5	22.1	19.5	129	85	20.8	22.7	2.6	20	49.5
IF17S01	RbSa	54.01.143	126.32.454	Female	0	2	27.4	7.5	9.2	21.4	19.3	132	82	20.3	33.8	2.9	20	50.5
IF17S02	RbSa	54.01.143	126.32.454	Male	0	2	29.1	7.7	9.4	23.5	20.1	132	84	21.5	11.1	0.0	10	53.9
IF17S03	RbSa	54.01.614	126.33.573	Female	0	2	27.5	7.4	8.4	21.6	19.4	128	84	21.1	14.6	1.0	10	52.1
IF17S04	RbSa	54.04.091	126.39.828	Female	0	0	27.7	8.0	9.3	21.7	20.0	131	85	21.7	31.1	2.2	10	55.4
IF17S05	RbSa	54.04.091	126.39.828	Male	0	0	27.6	8.2	9.6	22.3	20.0	130	81	21.8	10.7	0.0	5	55.0
RbSa01	RbSa	Vanc. Is.	BC	Female	0	0												
RbSa02	RbSa	N. Vanc.	BC	Male	0	0												
RbSa03	RbSa	N. Vanc.	BC	Female	0	0												
RbSa04	RbSa	N. Vanc.	BC	Female	0	0												
RbSa05	RbSa	W. Vanc	BC	Male	0	0												
RbSa06	RbSa	Vanc.	BC	Male	0	H												
RbSa07	RbSa	Vanc.	BC	Male	0	0												
RbSa08	RbSa	Vanc.	BC	Male	0	0												
RbSa09	RbSa	Vanc.	BC	Female	X	X												
RbSa10	RbSa	Gulf Is.	BC	Female	0	0												
z89.56.6	YbSa	55.27	110.30	Female	2	X												
z96.121	YbSa	53.32.59	113.07.59	Female	2	X												
z98.6.57	YbSa	55.19.59	113.20.59	Female	2	X												
z99.14.21	YbSa	54.08.58	115.01.58	Male	2	2												
z00.11.2	YbSa	53.25.59	112.43.01	Male	2	X												
z00.31.1	YbSa	53.32.59	113.04.01	Male	2	2												
z09.11.1	YbSa	53.31.59	113..01.01	Male	2	X												
z09.11.2	YbSa	53.21.00	113.05.59	Female	2	2												
freez 3	YbSa	53.31.59	113.01.01	Female	2	2												
freez 4	YbSa	Morinville	Alberta	Female	2	2												
freez 5	YbSa	Edmonton	Alberta	Male	2	2												
freez 6	YbSa	Edmonton	Alberta	Male	2	X												
freez 7	YbSa	Hastin. L.	Alberta	Female	2	2												

Table A2

We used CFit-7 (Gay et al. 2008, Lenormand and Gay 2008) to compare genetic clines with phenotypic clines and to compare phenotypic clines between contemporary and historic datasets. Cline centers and slopes estimates of CFit-7 are not reported here due to the poor fit of the models and our data. PC1 scores of morphometric and plumage characters were treated as quantitative traits for this analysis. We used the unimodal model (Lenormand and Gay 2008) for phenotypic traits with 11 parameters to be fitted (cline centre, slope, position of the right and left tails, minimum trait value, overall trait difference and variance of three modes: Lenormand and Gay 2008). The genetic characters *COI* and *CHD1Z* were treated as simple two-allele systems. We determined whether the cline centers and slopes differ between the four contemporary clines and between contemporary and historic clines. Following Irwin et al. (2009) we obtained a single best-fitting curve for all contemporary traits together and used a likelihood ratio test to compare the likelihood of the model in which all contemporary clines vary independently with the model.

A - B.) Comparison of clines based on maximum log-likelihood estimates obtained from CFit-7 for genetic and phenotypic clines. (* Values are given for the comparison of unconstrained models with centers and slopes constrained models. Log Likelihood and AIC values are for the latter model).

		Comparison	Log-likelihood	AIC	X^2 (df)	*P*
A.	*Contemporary clines by category*					
5.	Phenotypic and genetic clines	*	-456.71	979.42	5.43 (2)	0.07
6.	Phenotypic clines	*	-263.05	566.10	1.45 (2)	0.48
7.	Genetic clines	*	-114.42	244.84	2.27 (2)	0.32
B.	*Contemporary vs. historic clines*					
8.	Morphometrics	*	-230.25	504.50	0.49 (2)	0.78
9.	Plumage	*	-152.30	340.60	1.92 (2)	0.38

Figure A1
Deviations from Hardy-Weinberg Equilibrium (X^2) for two loci plotted along the transect (A). Standardized pair-wise cytonuclear disequilibrium (R_{ij}) estimates for two loci plotted along the transect (B), and the R_{ij} values plotted against geometric mean of allele frequencies $(pq)^{1/2}$ (C). Only five sampling sites were available for the calculations of R_{ij} in B and C.

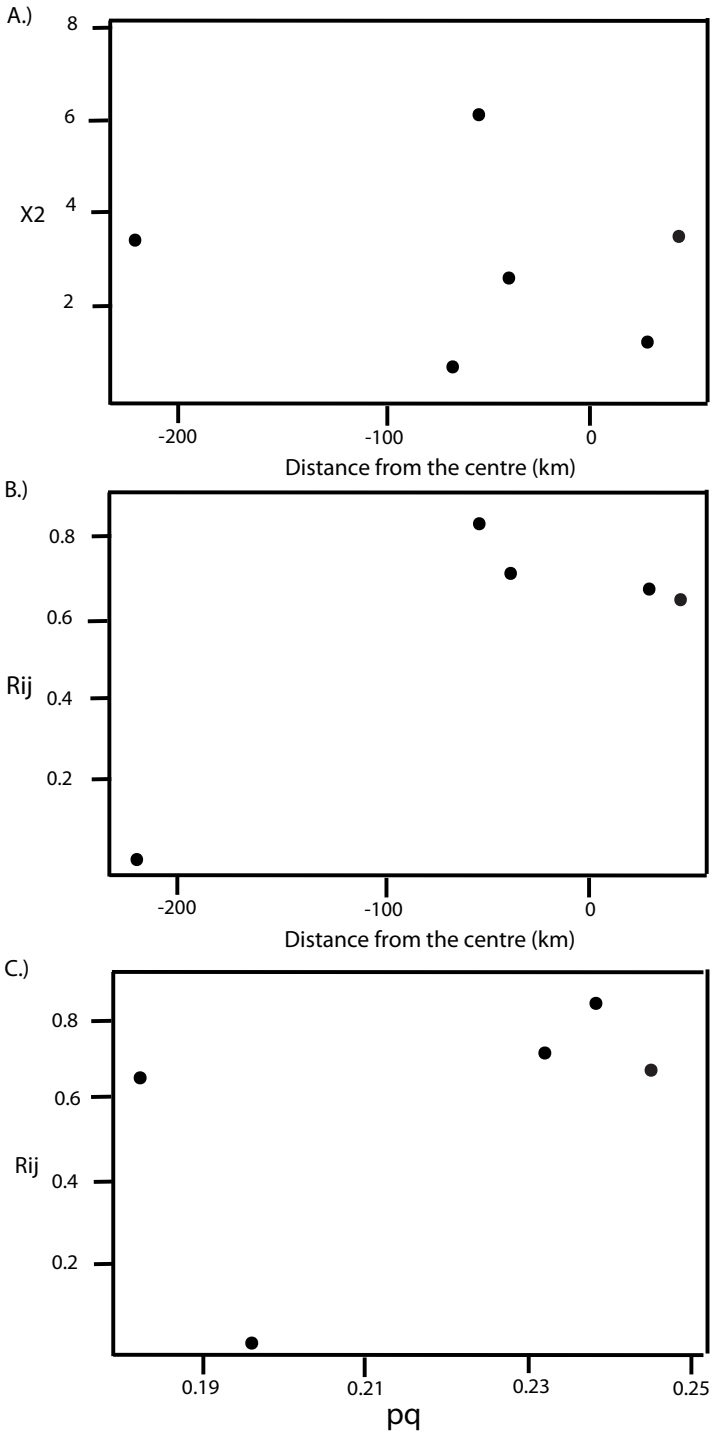

Figure A2

Percentage of sapsuckers banded (**a**) and observed in point count surveys (**b**) at the Mugaha Mash banding station in Mackenzie, BC (see Fig. 1), from 1994-2009. The dark grey indicates *S. ruber*, light grey *S. varius*, and the hatched bars indicate phenotypic hybrids. The numbers above each of the column indicate sample size (data from Mackenzie Nature Observatory, Mackenzie, BC, Canada).