Supplementary Information for

Intercontinental genomic parallelism in multiple three-spined stickleback adaptive radiations

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This PDF file includes:

Other supplementary materials for this manuscript include the following:

Supplementary Datasets 1 to 3

Supplementary Information 1 - Windows based on genetic distance (0.1 cM) and recombination estimates

Variable linkage across the genome moderates our ability to detect genomic associations with environmental/phenotypic variation by influencing linkage between sequenced and causative variants. Thus, our ability to detect associations is lower in a low-linkage window than a high-linkage window despite equal physical size of the windows. To assess whether this may influence our results, we estimated windows based on genetic distance, using a previously published genetic map (1). This approach is less-desirable than our physical distance windows because the genetic map itself has limited coverage within chromosomes and does not extent to unplaced scaffolds. However, it does allow us to assess how patterns of genomic parallelism may be driven by variable linkage in a subset of our original data. We chose to use windows of 0.1 cM as this gave us a broadly similar number of windows to our 50kb dataset.

Signals of parallelism for 0.1 cM windows were strongest for variables for which we similarly detected genomic parallelism with 50kb windows: calcium, pH, pelvic spine length, pelvis length, plate N and gill raker N all exhibited parallelism FDR < 0.001. Further, weakly significant genomic parallelism (FDR < 0.05) was recovered for *Gyrodactylus* prevalence, salinity, zinc, dorsal spine 1 & 2 length and pelvis height. This suggests that our physical distance windows may be conservative estimates of parallelism.

0.1 cM windows also recovered several instances of higher order parallelism (parallelism in > 2 radiations) than observed for 50kb windows. Two windows on chromosome 4 (46.3-46.4 cM; 42.6-42.7 cM) were found associated with zinc variation and plate N respectively in Alaska, BC and Iceland. A further window on chromosome 4 (44.2-44.3 cM) was associated with pelvis length in BC, Iceland and Scotland. This latter window likely corresponds to our three-way pelvis length window detected at 50kb resolution.

To estimate recombination for our 50kb windows, we overlapped recombination rate estimates between genetic markers in the map with our 50kb windows and took the weighted mean of overlapping recombination regions. Recombination was weighted according to the proportional coverage of each recombination interval within the 50kb window.

Supplementary Information 2 - Marine x Freshwater (MxF) comparisons

We wanted to compare our freshwater results to well-studied genomic parallelism in marine x freshwater comparisons. This analysis had two aims: 1) to act as a positive control to assess our methods ability to detect regions of known genomic parallelism; 2) to compare the extent of freshwater parallelism to MxF parallelism. To this end, we compiled four additional SNP datasets. Each dataset included the freshwater populations for a specific radiation and additional genomic data from four marine populations sampled from each country (OBSM - Scotland; NYPS - Iceland; LICA - BC, MUD - Alaska). Thus, each dataset contained 23 (Alaska) or 22 (BC, Iceland, Scotland) populations. SNPs were called using stacks Populations program, with a map assigned to each dataset that denoted "marine" and "freshwater" populations. SNPs that were not present in both "marine" and "freshwater" populations were removed; SNPs present in <50% of individuals within either "marine" or "freshwater" were removed; SNPs with a minor allele frequency below 0.05 were removed; all SNPs per locus were retained; and data from the sex chromosome (XIX) were also removed. SNPs were output to VCF format with 24,416, 26,658, 21,089 and 20,605 SNPs retained in Alaska, BC, Iceland, and Scotland respectively.

To make the MxF analyses as comparable as possible to our intra-radiation analyses, we used Bayenv2 in the same way. To generate Bayesfactors and Spearman's ρ, we calculated allele frequencies within each of the 23 or 22 populations and assigned marine populations "1" and freshwater populations "-1" in the environment input file. Covariance matrices were calculated using a subset of each SNP dataset pruned for linkage and averaged over 10 independent runs. Bayenv2 was run over each SNP for 100,000 MCMC iterations with results averaged over 10 independent runs. Outliers were determined using the methods used for intra-radiation analyses, and all downstream analyses were run in the same way. To recap, outlier SNPs were determined as having $\log_{10}$(Bayesfactors) > 1.5 and Spearman's ρ values above the 0.95 quantile. Outlier windows were determined as those that contained more outlier SNPs than a 99% binomial expectation given the number of SNPs in that window. Outlier windows were overlapped, and significance was determined by comparing observed overlap to a null distribution of random overlap over 10,000 permutations. In total, we detected 91 (Alaska), 34 (BC), 30 (Iceland) and 29 (Scotland) 50kb outlier windows, which represented 1.07%, 0.40%, 0.35% and 0.34% of windows that contained SNPs.

For 50kb windows, one window (groupXX:8950000-9000000; FDR = 0.0003) was found to overlap in all four MxF datasets, and three overlapped in Alaska, Iceland and Scotland (groupI:21600000-21650000; groupI:21750000-21800000; groupIV:12800000-12850000; FDR < 0.0001). In pairwise comparisons, overlap was greatest for Alaska and BC ($N_{windows}$ = 8; FDR < 0.0001), followed by Iceland and Scotland ($N_{windows}$ = 5; FDR < 0.0001), Alaska and Iceland ($N_{windows}$ = 2; FDR = 0.08), Alaska and Scotland ($N_{windows}$ = 1; FDR = 0.409), BC and Iceland ($N_{windows}$ = 1; FDR = 0.204), and no windows overlapped in BC and Scotland.

Supplementary methods:

Sampling and environmental data collection.

Fish were collected by setting between 10 and 30 unbaited minnow traps (Gee traps, Dynamic Aqua, Vancouver, Canada) in water approximately 0.3–3m deep, within 5 m of shore along a 100–400m stretch of shoreline. The fish were haphazardly selected with individuals of all sizes, sex and breeding condition collected (see Supplementary Table S17 for details of sex of each fish collected).

We chose environmental variables that were likely to cause natural selection on the fish and could be precisely measured . For abiotic environmental variables we chose pH, calcium (Ca), sodium (Na) zinc (Zn) and lake area, which have been associated previously with the evolution of body shape, size and armour in stickleback (2, 3, 4). We measured the pH of each lake using a calibrated pH meter (Multi 340i, WTW, Weilheim, Germany). The concentrations of metallic cation concentrations sodium (“Na”), calcium (“Ca”) and zinc (“Zn”) were obtained by collecting a filtered water sample acidified with 2% nitric acid in the field from each lake. These samples were then analysed at the Division of Agriculture & Environmental Science at the University of Nottingham for metallic cation concentrations by inductively coupled plasma mass spectrometry (ICP-MS) and anions using a Dionex DX500 ion chromatograph with an IonPac AS14A (4 x 250 mm). Lake area was estimated using the polygon function in Google Earth.

Many biotic variables are difficult to quantify precisely so we used the prevalence of two parasites *Gyrodactylus* sp. (ectoparasitic trematodes) and *Schistocephalus solidus* (endoparasitic cestode) that are likely to have a significant impact on the reproduction and life cycle of stickleback (5, 6, 7). The prevalence of *Gyrodactylus spp.* and *Schistochephalus solidus* per fish were counted during dissections and parasite numbers were averaged by lake. Concentrations of cations, pH and parasite prevalence per lake are shown in Supplementary Table S2.

Phenotypic data collection.

The 12 phenotypic traits are all known to have undergone major changes as result of the migration of sticklebacks from marine to freshwater habitats (8) and are known to be highly variable between freshwater populations (4).

All morphological measurements and analyses were done using the left side of the fish. To quantify body shape variation across individuals and lakes we digitized 13 homologous landmarks (n=16) using the TPS software package (8, 9, 10). Landmark coordinates for 1298 individuals were exported, and analyzed using MORPHOJ 1.03 (12). Briefly, we first performed a Procrustes superimposition to extract shape coordinates for further analyses (13, 14). For each radiation separately, we then performed a size correction to account for any allometric effects (15, 16) using multivariate regressions of Procrustes coordinates against the logarithm of centroid size and tested its significance using a permutation test against the null hypothesis of independence (10 000 iterations).

Using photographs of the left side of alizarin-stained individual fish we measured the following body armour and spines traits: number of armour plates (“Plate_N”), length of 1st dorsal spine (“DS1”) and 2nd dorsal spine (“DS2”), length of biggest armour plate

("BAP"), pelvic spine length ("PS"), length of the horizontal process of the pelvis ("LP") and height of the ascending process of the pelvis ("HP") (30). The first gill arch from at least three fish per population (mean = 13.8) was removed and photographed at 10x magnification under a graticule. The total number of gill rakers ("Gill_Raker_N") was then counted from the photograph, and the three longest rakers measured to give an average 'gill raker length' ("Gill_Raker_L"). As all traits, apart from number of plates, were significantly correlated with SL (results not shown), we size corrected the data by regressing each trait against SL (all individuals from all lakes pooled) and used the residuals in further analyses.

DNA extractions, RAD library preparation and sequencing.

In 2014 we conducted RAD sequencing on samples from Scotland and from Iceland. Sequencing libraries were prepared and processed into RAD following the modified libraries according to (17), using the restriction enzyme SbfI-HF (NEB), which digests DNA at an 8bp recognition sequence and is expected to cut roughly 22,000 locations across the stickleback genome. Each sample was individually ligated to adaptors with 6bp in-line barcodes and multiplexed in libraries of 192. We sequenced these RAD libraries in four lanes on an Illumina HiSeq sequencer at the University of Oregon, producing 100-bp single-end reads.

In 2016 we conducted RAD sequencing on samples from British Columbia and from Alaska. Sequencing libraries were prepared following the modified single-digest RAD protocol of (16), using the restriction enzyme SbfI. Each sample was individually labelled using one of 96 unique 8bp barcodes, and each pool of 96 samples received a different 8bp inline index using the NEBNext Ultra DNA Library Prep Kit for Illumina (18). We sequenced these RAD libraries in two lanes of Illumina NextSeq high-output sequencing at the University of Oregon, using paired-end 75bp reads. After filtering for the presence of a correct index, barcode, and SbfI cut site, these two lanes of sequencing produced a total of 256 million and 267 million read pairs, respectively.

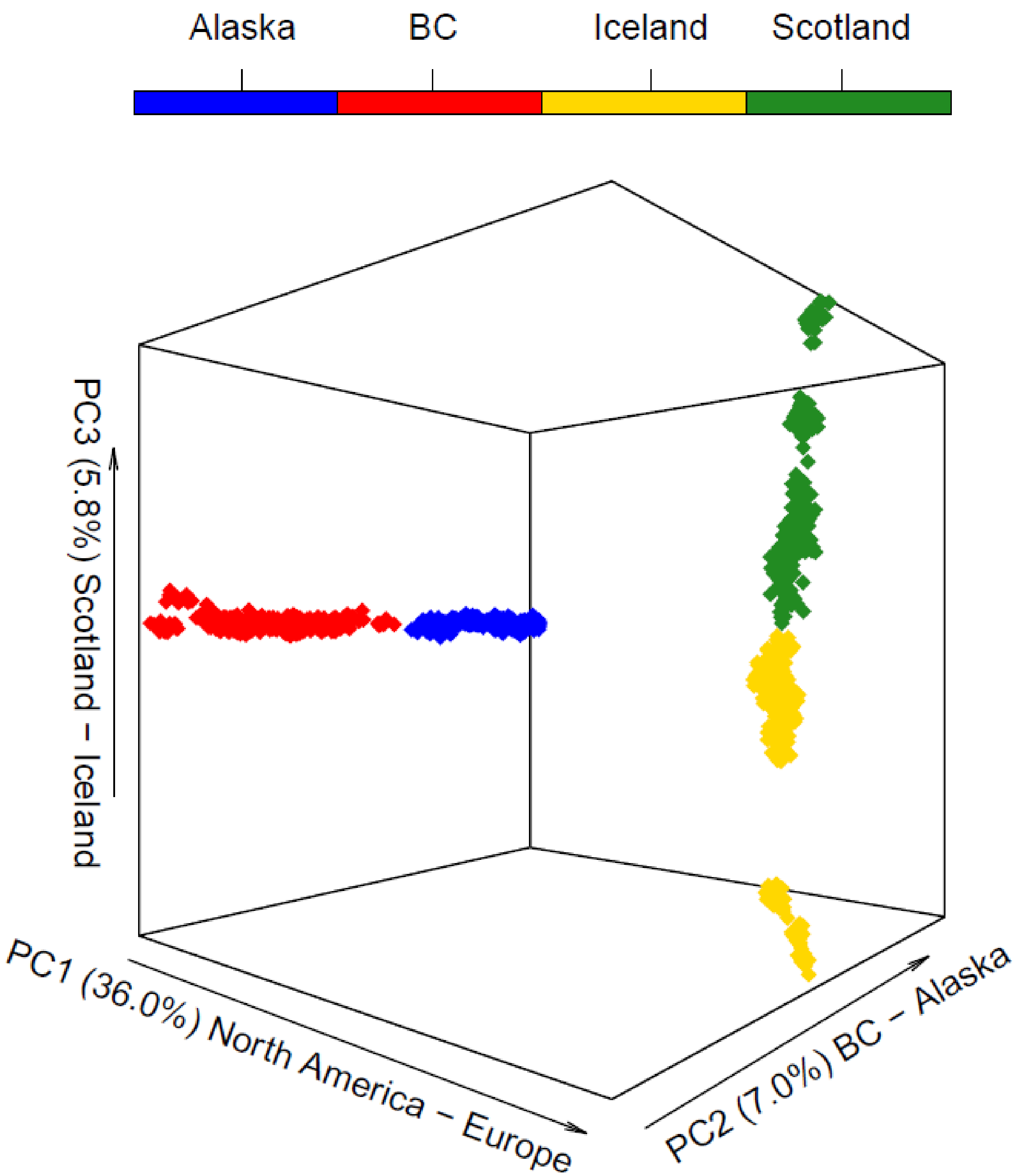
Population genetics statistics.

The retained reads were aligned to the three-spined stickleback reference genome (version BROADs1, Ensembl release 82) using GSnap (19). Reference mapping with GSnap took sequence quality information into account, allowed for up to five mismatches and up to 2 indels between each read and the reference sequence and ignored reads that mapped against more than a single position in the genome. The STACKS pipeline was used to analyse mapping files and population genetics statistics were calculated using the POPULATIONS program in Stacks. POPULATIONS was run independently for each radiation with the following filters applied: SNPs that were present in less than 8 populations were removed; SNPs present in <50% of individuals within a population were removed; SNPs with a minor allele frequency below 0.05 were removed; all SNPs within a locus were retained; and data from the sex chromosome (XIX) were also removed. These filters were chosen to maximise SNP count whilst still providing enough information for allele frequencies and environmental and phenotypic variables to be correlated. After filtering we retained 26,990, 26,937, 29,111, 26,169 SNPs within a GENEPOP formatted output for Scotland, Iceland, British Columbia and Alaska, respectively. GENEPOP files were converted to BAYENV2 format using PGDSpider2 (20).

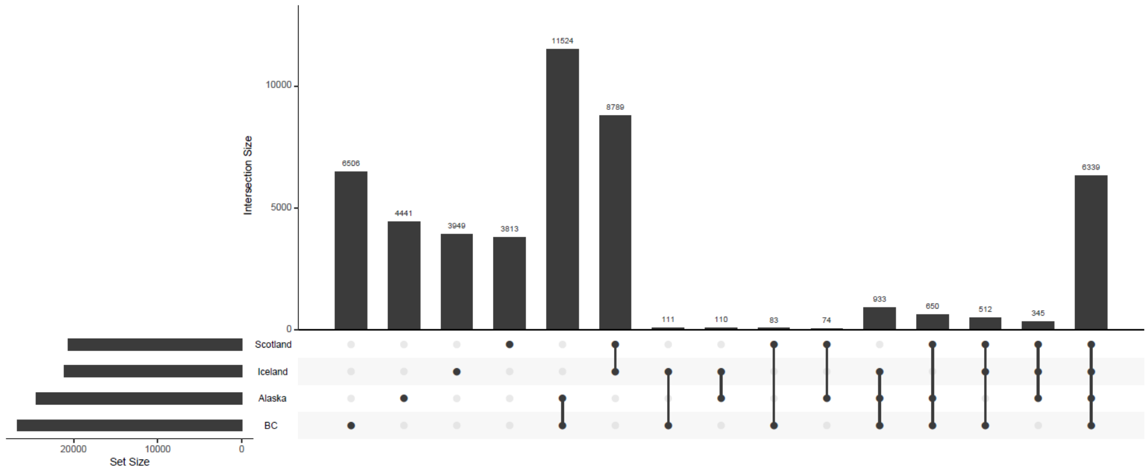
Permutations for genomic parallelism

We quantified genomic parallelism associated with individual variables by carrying out randomised permutations (akin to χ^2, but avoiding Poisson assumptions) with the expectation that all of the windows to which our (environmentally and phenotypically associated) SNPs mapped had an equal probability of being associated with environmental or phenotypic variables, assuming independence between windows. Whilst the latter is technically untrue, non-independence should be minimal at window sizes of 50Kb or greater given linkage disequilibrium in the stickleback genome. Results were also consistent at larger window sizes (up to 100 kb) where non-independence is further minimised but traded-off against signal.

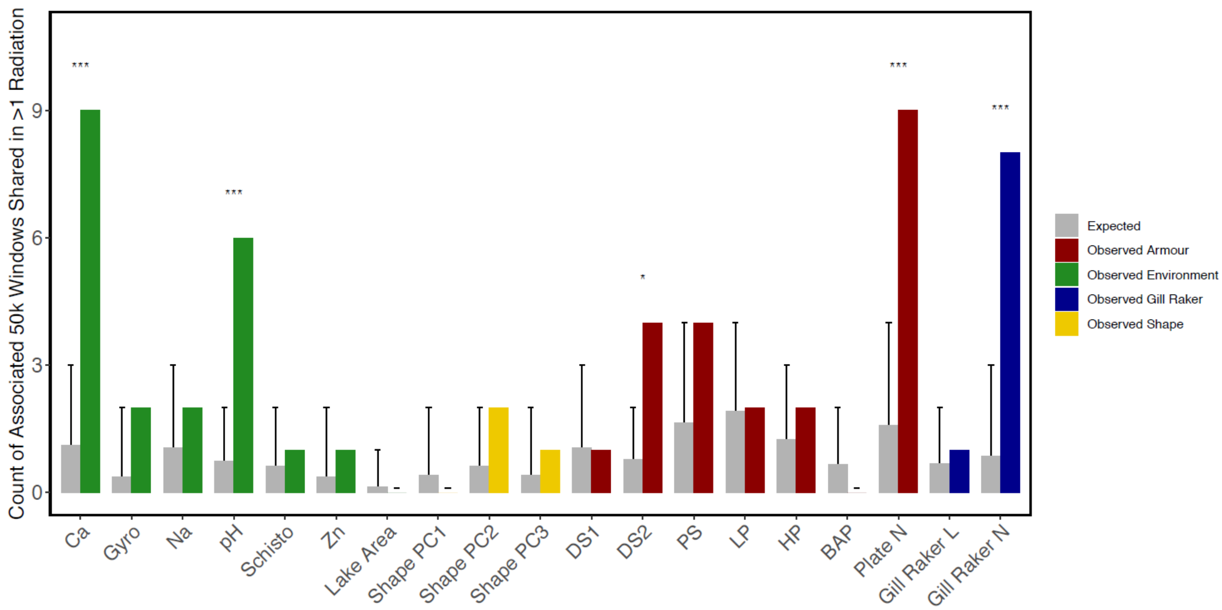
Supplementary Fig. 1. Three-dimensional plot of the PCA on 8,395 SNPs for 1,304 individuals.



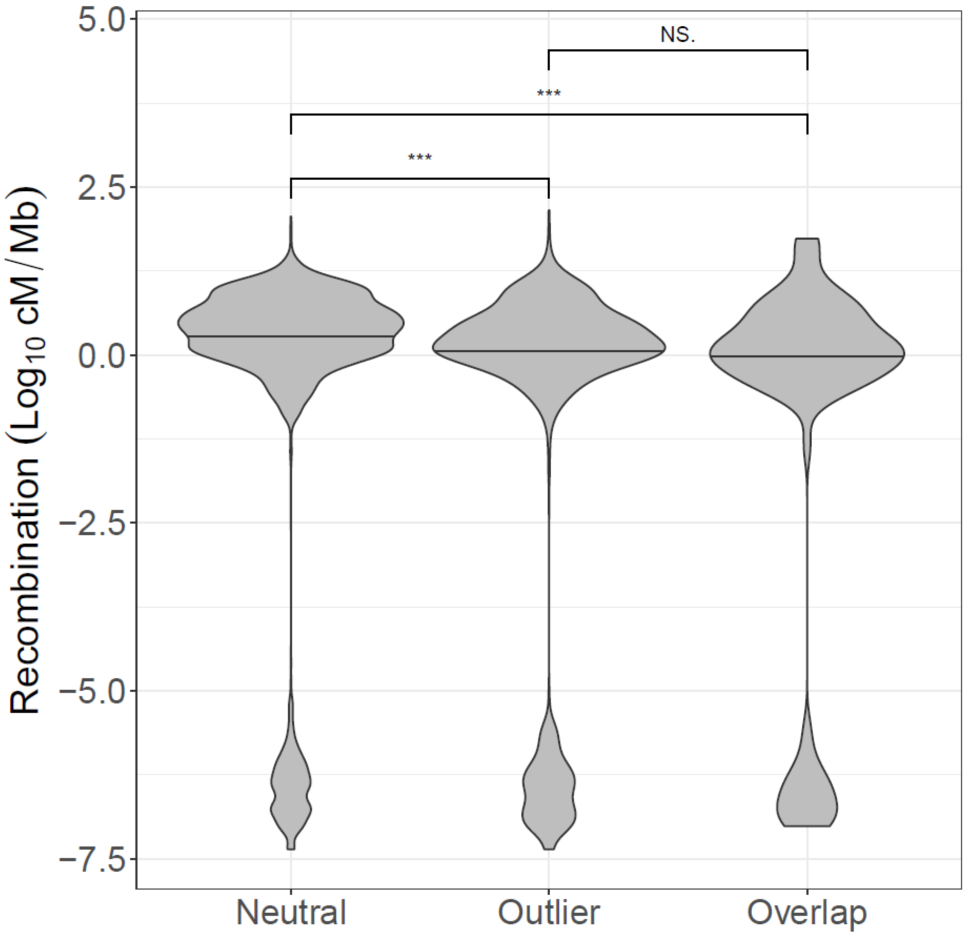
Supplementary Fig. 2. Distribution of shared polymorphic sites among the four adaptive radiations. Bars along the top denote the number of shared polymorphic sites within each intersection of the four groups. Below the bars, the intersection is defined as filled points. Bars are ordered according to: singular polymorphic sites (not shared), sites shared in two radiations, sites shared in three radiations, and sites shared in all four radiations.



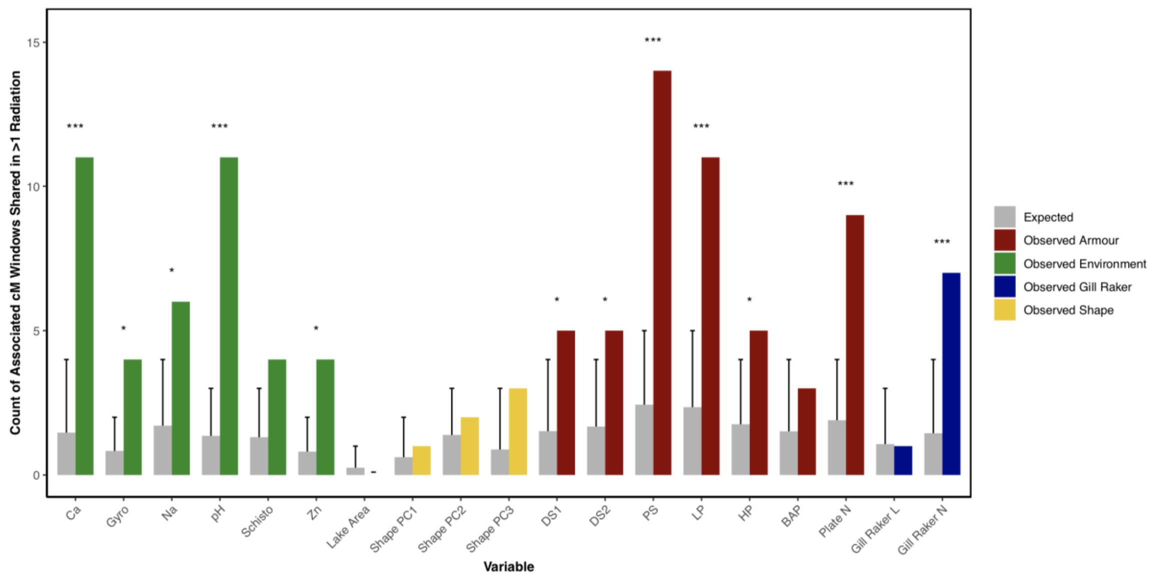
Supplementary Fig. 3. Expected and observed counts of 50kb windows containing an above 99% binomial expectation number of SNPs associated environmental variables and phenotypic traits in at least 2 radiations with permutation tests restricted exclusively to Alaska/BC and Iceland/Scotland pairings. Expected bars (grey) represent mean counts across 10,000 simulated outcomes with 95% confidence intervals per a one-tailed hypothesis. Asterisks denote significance of FDR-corrected one-tailed tests between the observed counts and the 100,000 simulated counts at the <0.05 (*), <0.01 (**) and <0.001 (***) levels.



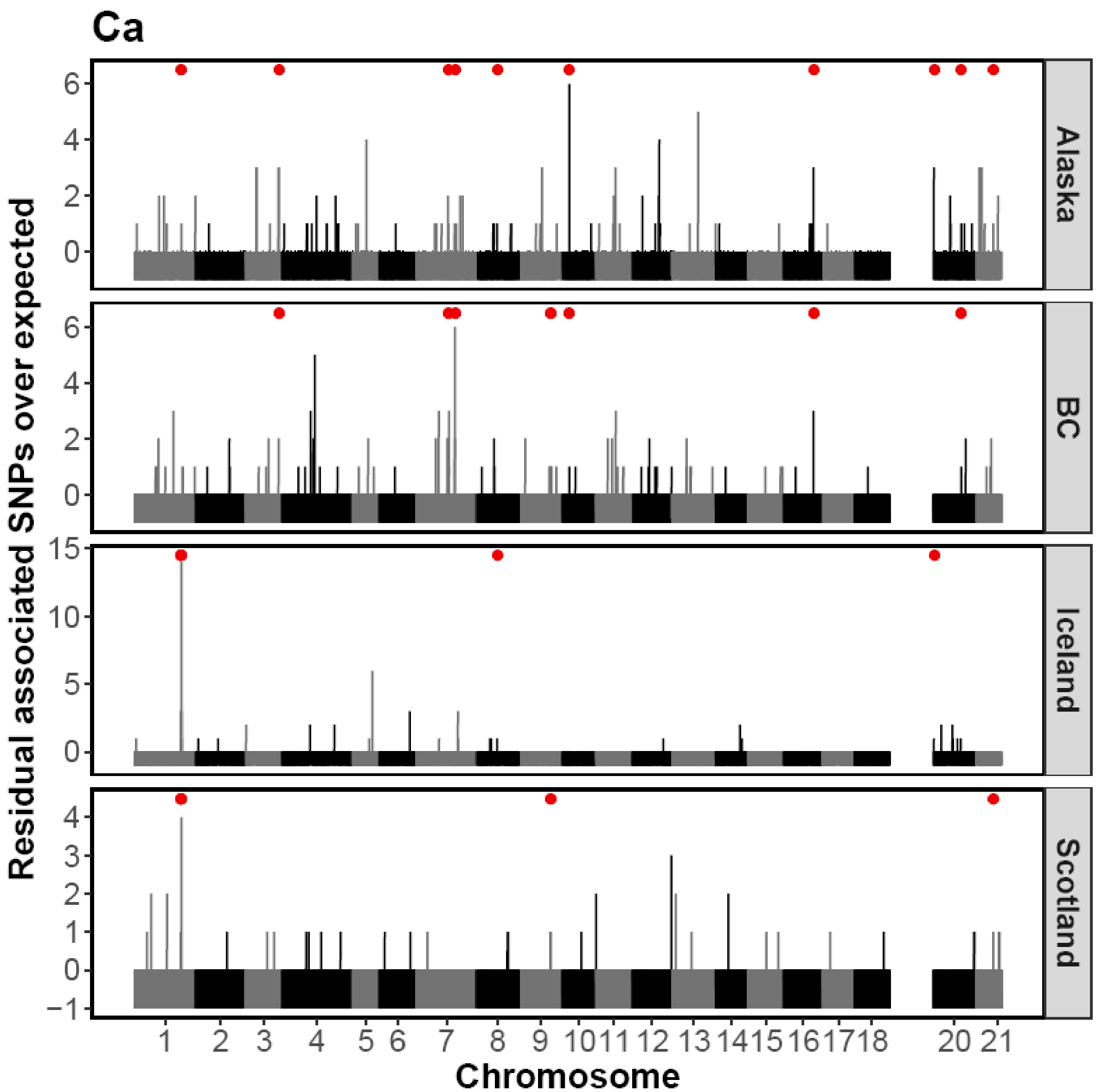
Supplementary Fig. 4. Recombination for all windows, classified as non-associated ('Neutral'), environmentally or phenotypically associated ('Outlier'), or parallel across radiations ('Overlap'). Pairwise wilcoxon tests are shown between all violins ($p > 0.05$ = NS; $p < 0.001$ = ***).

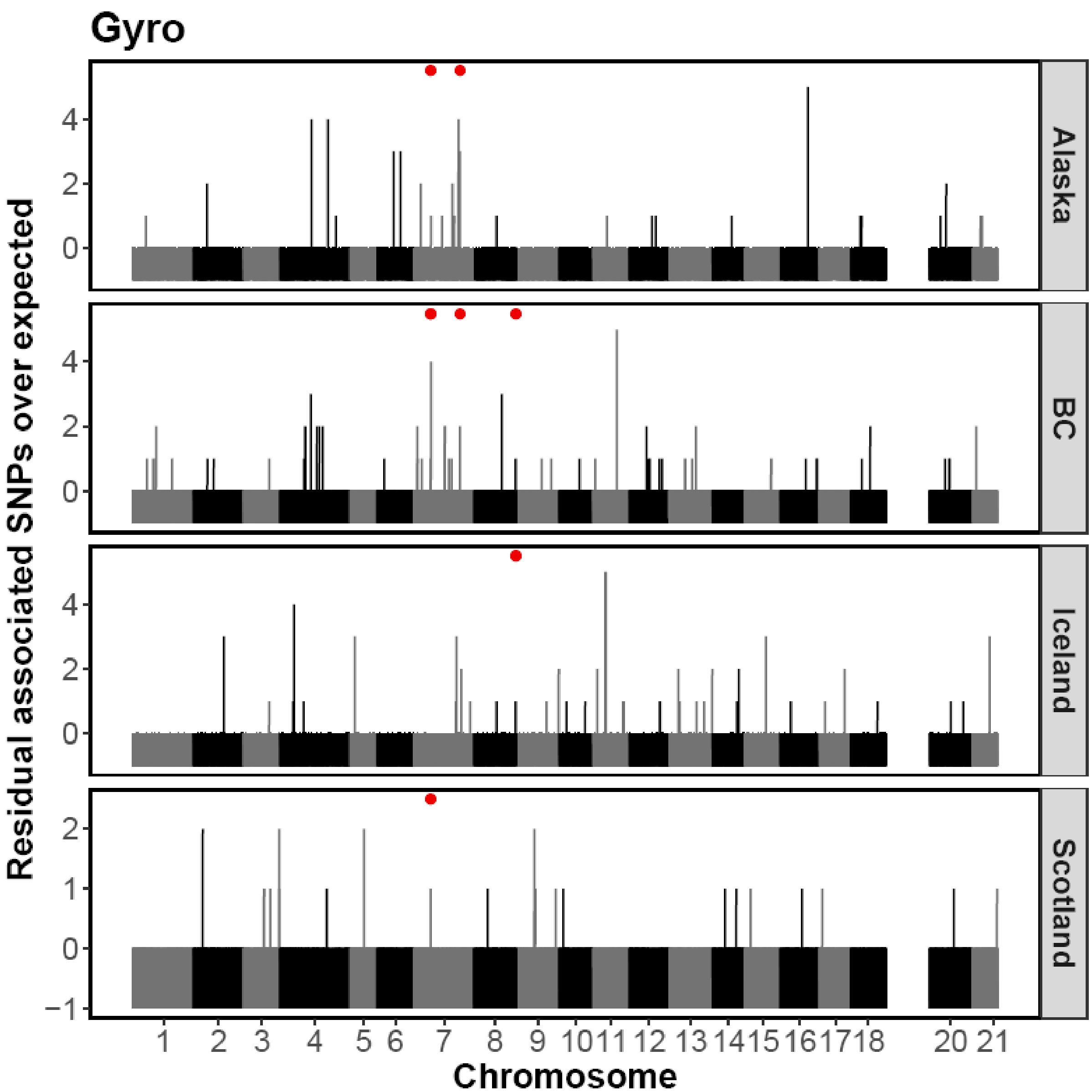


Supplementary Fig. 5. Expected and observed counts of 0.1cM windows containing an above 99% binomial expectation number of SNPs associated with environmental variables and phenotypic traits in at least 2 radiations. Expected bars represent mean counts across 10,000 simulated outcomes with 95% confidence intervals per a one-tailed hypothesis. Asterisks denote significance of FDR-corrected one-tailed tests between the observed counts and the 100,000 simulated counts at the <0.05 (*), <0.01 (**) and <0.001 (***) levels.

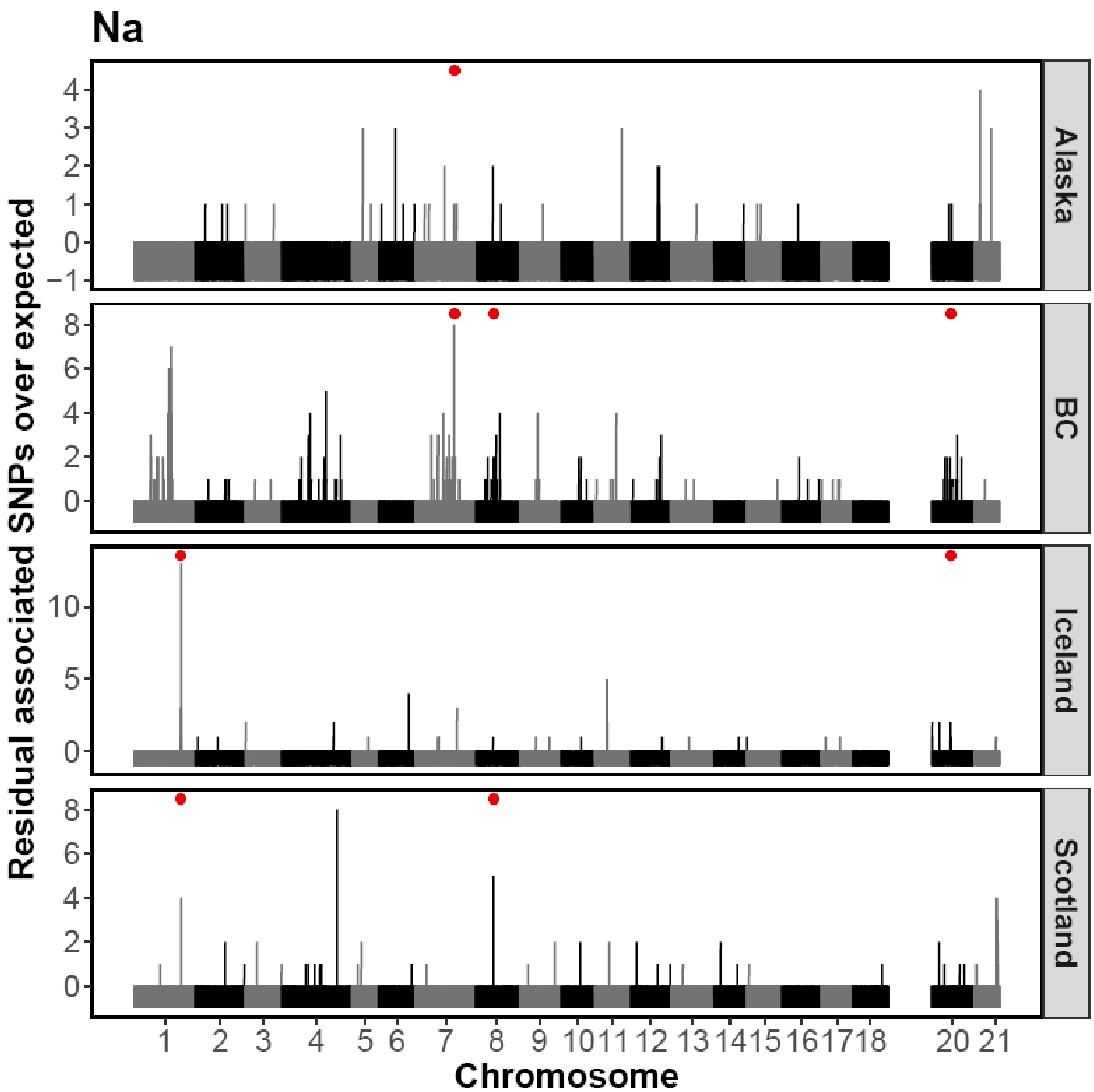


Supplementary Fig. 6. Manhattan plots summarizing correlations of allele frequency with all environmental variables and phenotypic traits. Bars show residual associated SNPs above the 99% binomial expectation. Parallel windows are highlighted as circles (associated in 2 radiations) or triangles (associated in 3 radiations).

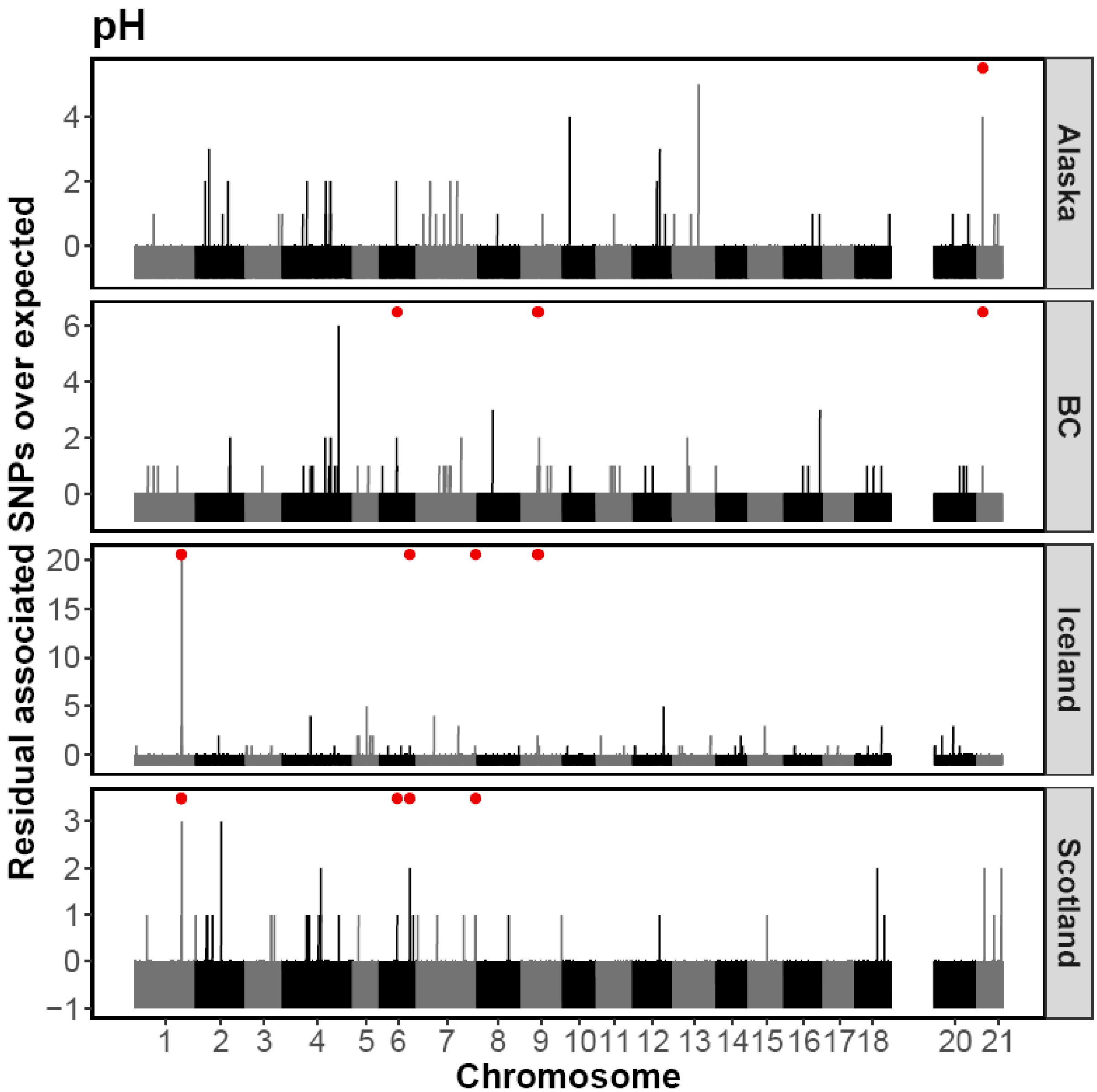




Gyro
Residual associated SNPs over expected
Alaska
BC
Iceland
Scotland
Chromosome
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21



Na
Residual associated SNPs over expected
Alaska
BC
Iceland
Scotland
Chromosome
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21


pH
Residual associated SNPs over expected
Alaska
BC
Iceland
Scotland
Chromosome
1
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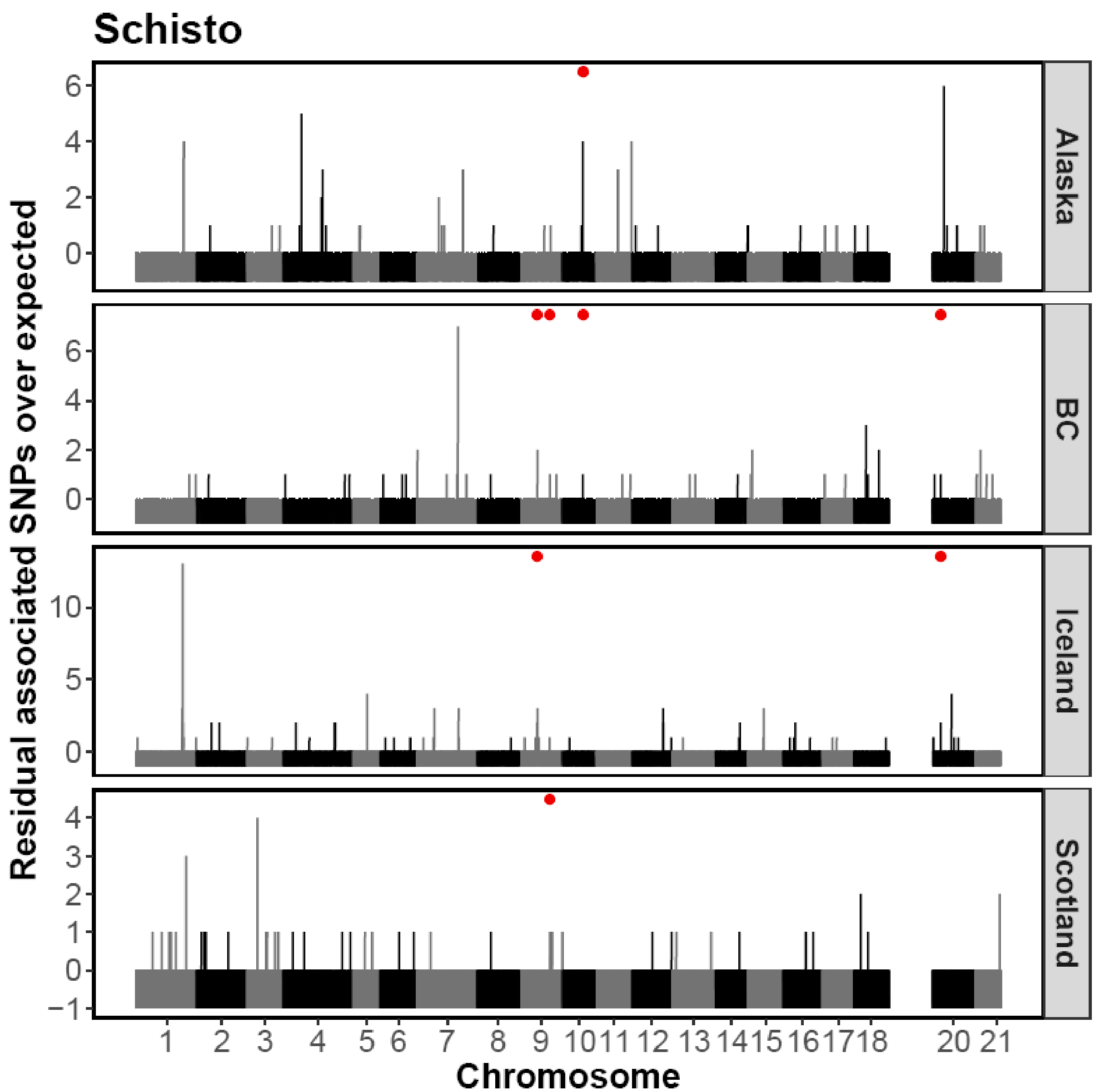
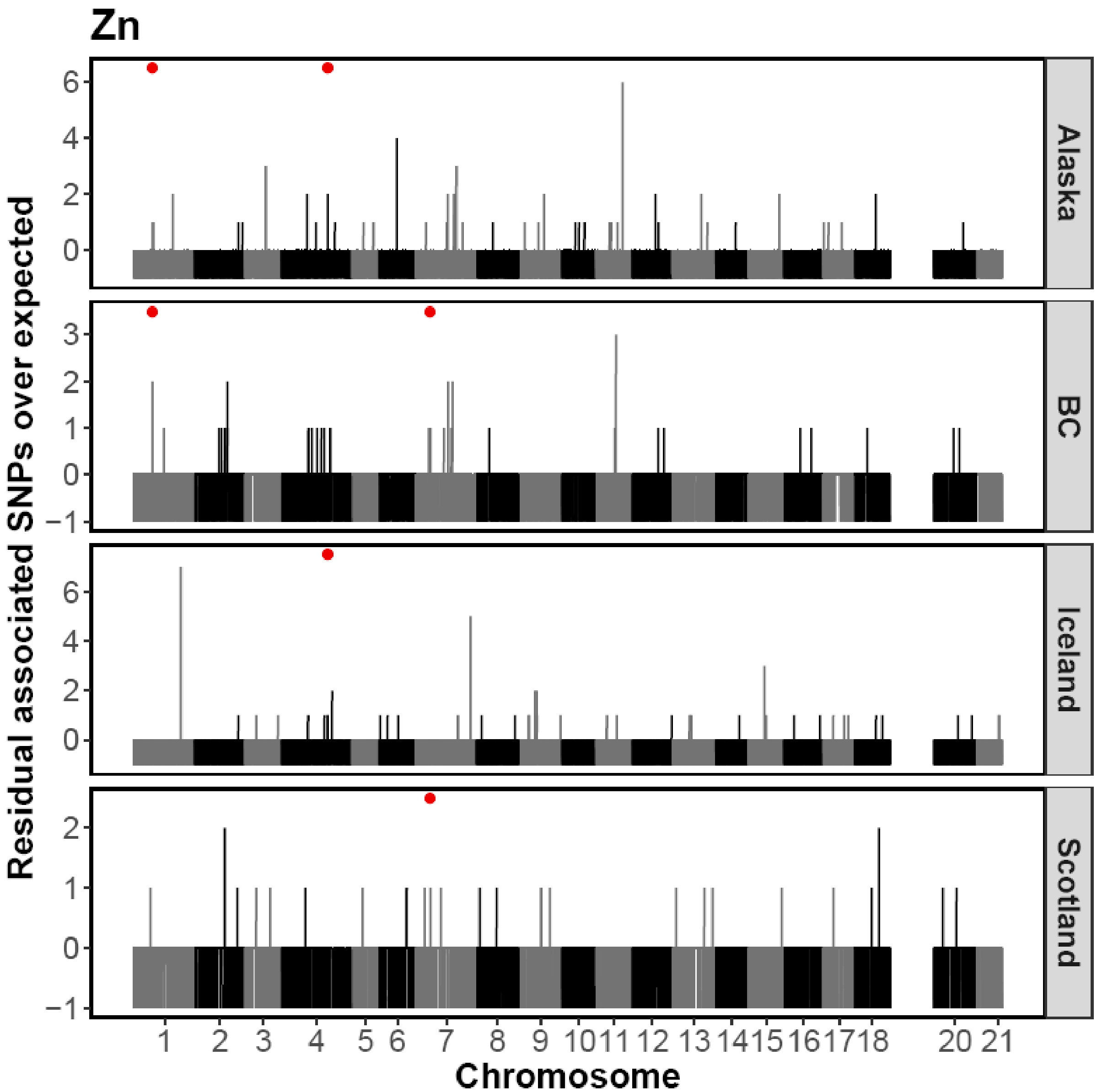


Schisto
Residual associated SNPs over expected
Alaska
BC
Iceland
Scotland
Chromosome
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21


Zn
Residual associated SNPs over expected
Alaska
BC
Iceland
Scotland
Chromosome
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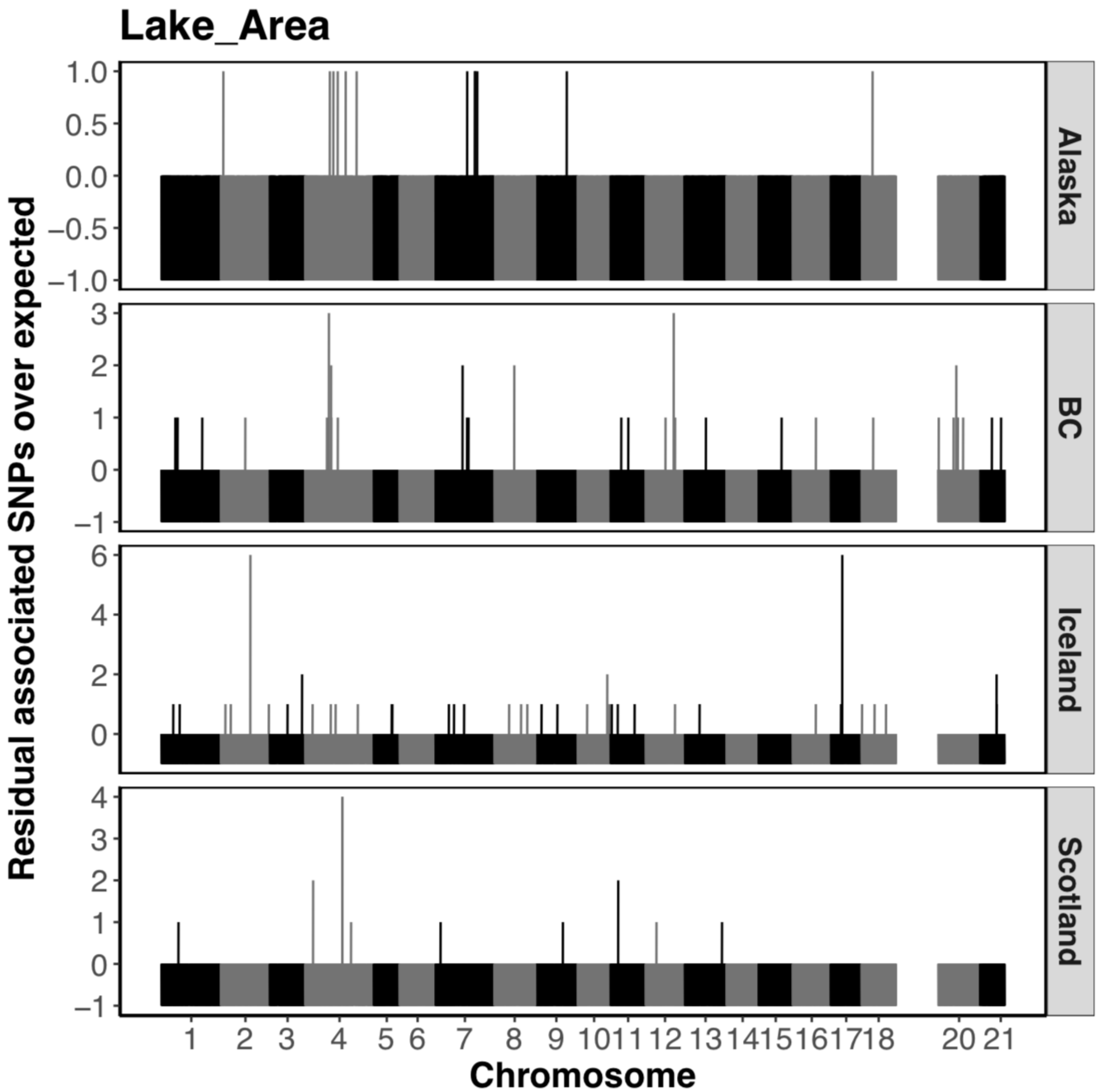
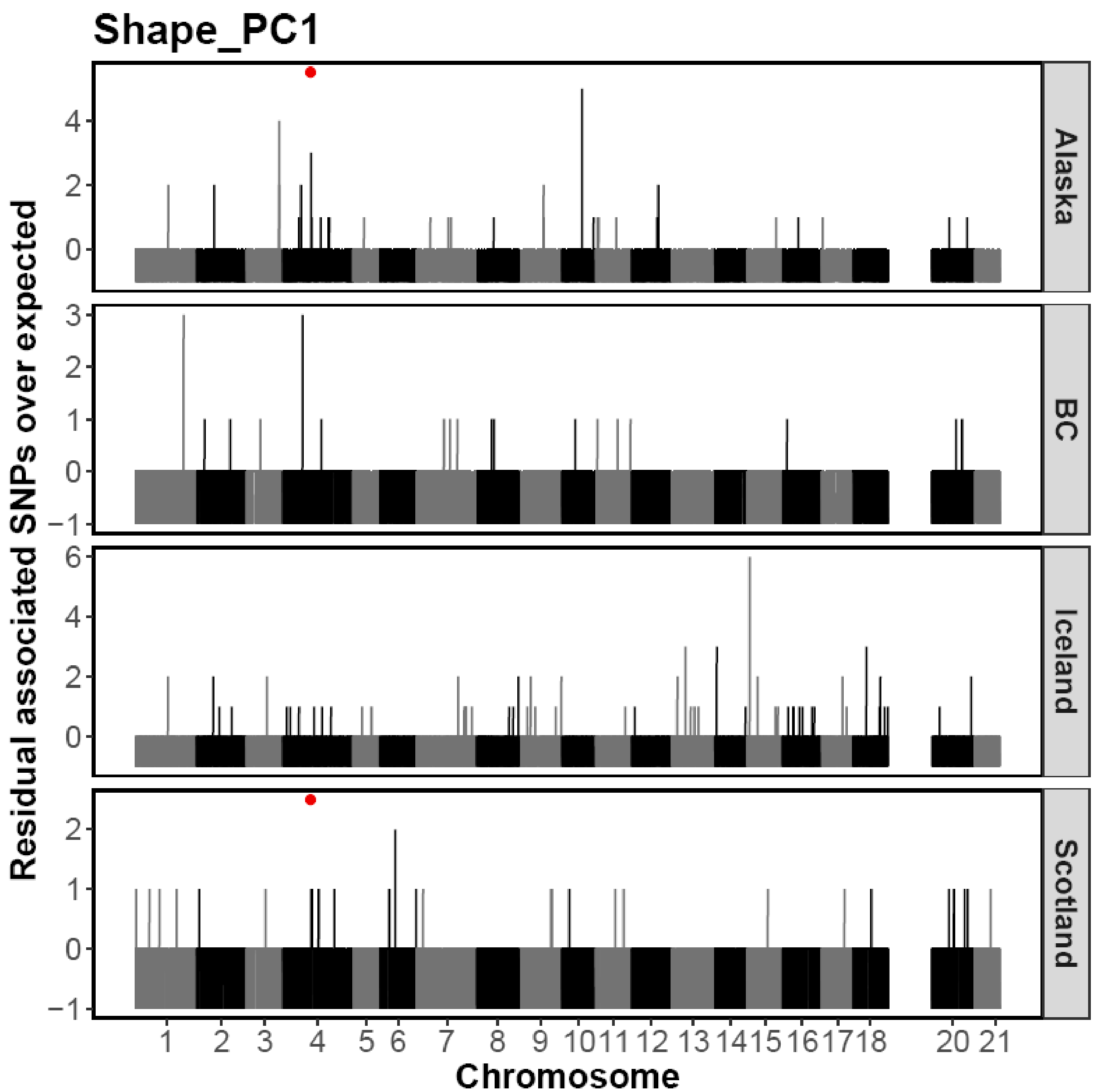


Lake_Area
Residual associated SNPs over expected
Alaska
BC
Iceland
Scotland
1.0
0.5
0.0
−0.5
−1.0
3
2
1
0
−1
6
4
2
0
4
3
2
1
0
−1
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21
Chromosome



Shape_PC1
Residual associated SNPs over expected
Alaska
BC
Iceland
Scotland
Chromosome
1
2
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4
5
6
7
8
9
10
11
12
13
14
15
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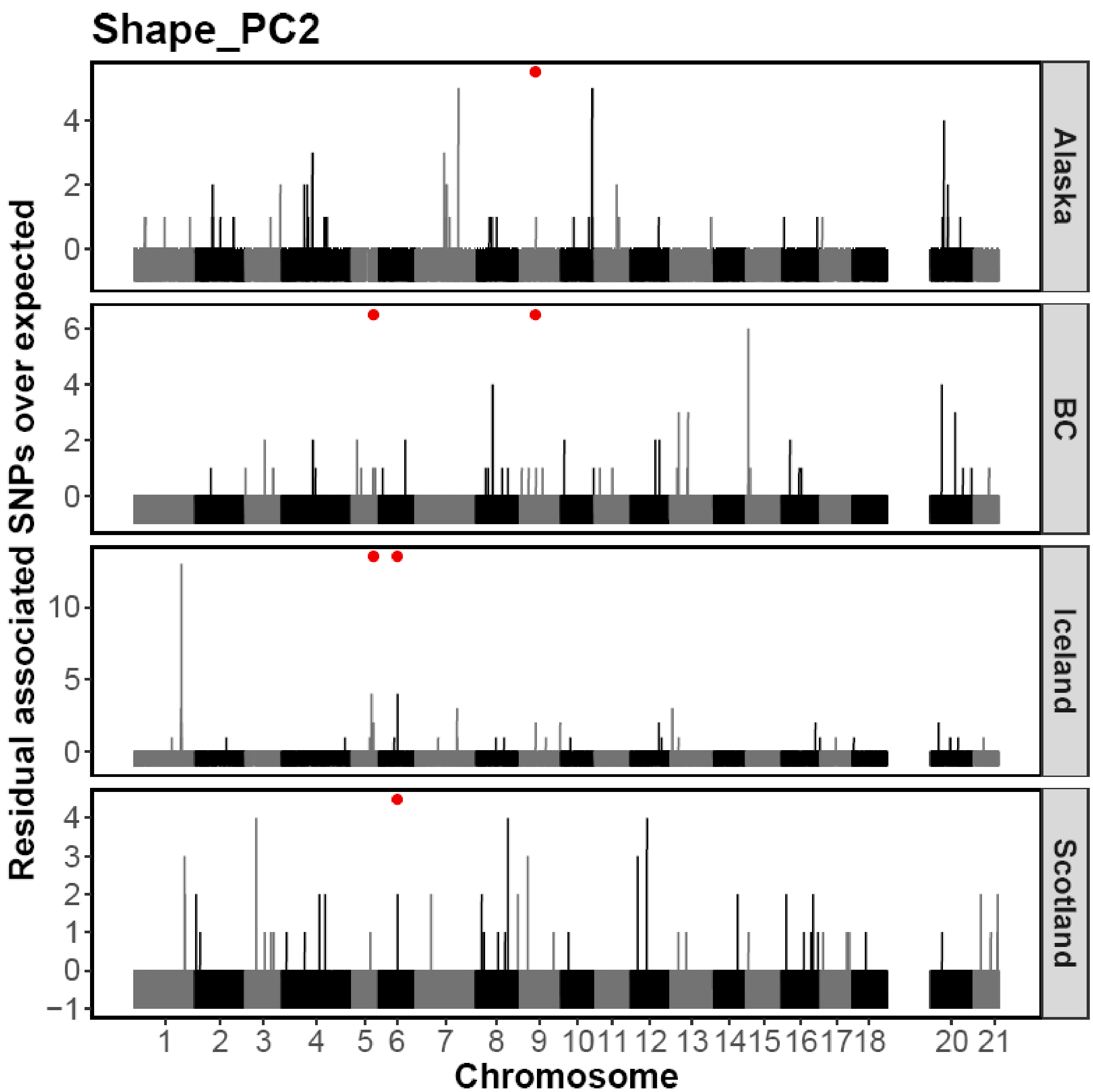
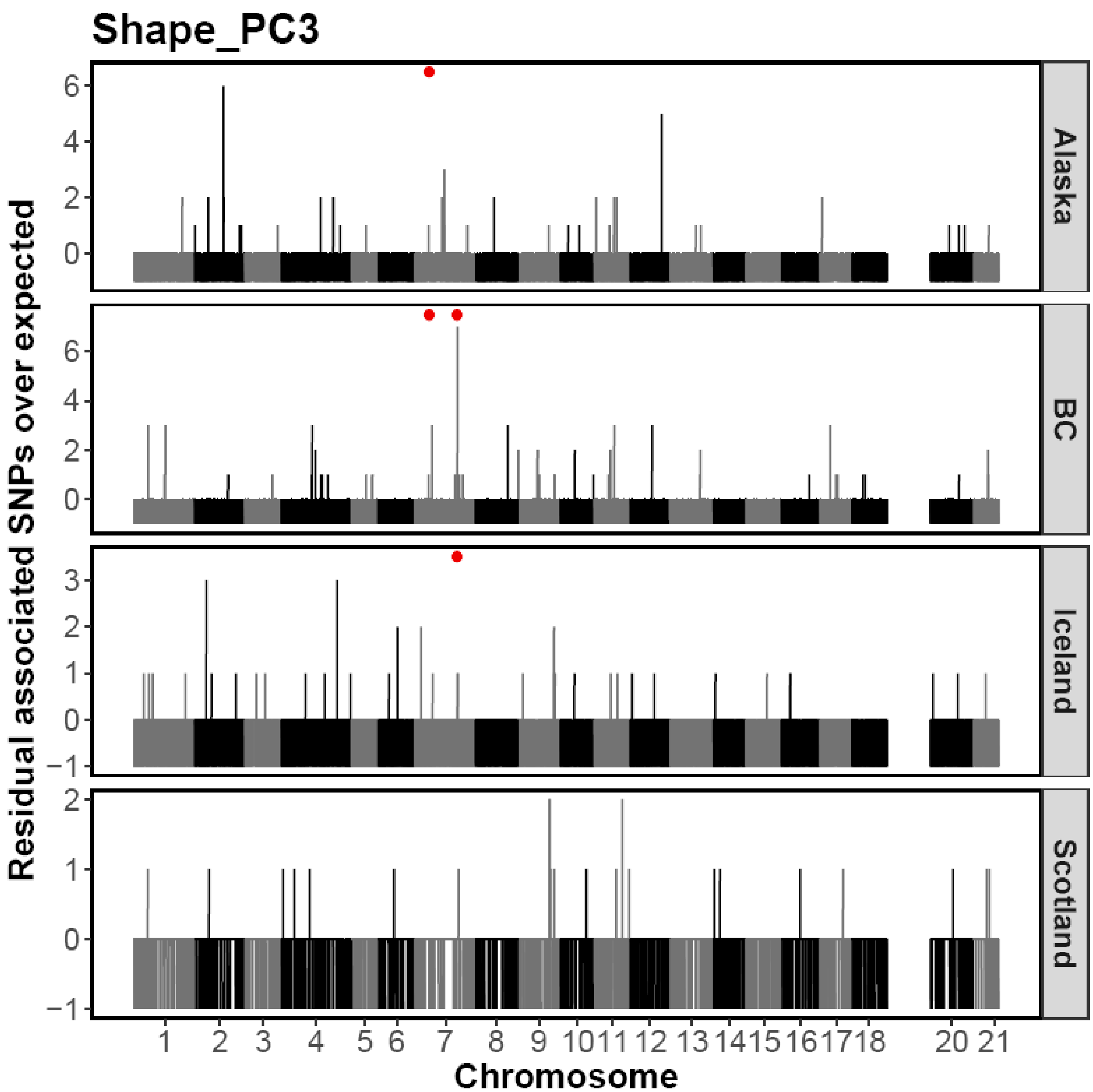
21


Shape_PC2
Residual associated SNPs over expected
Alaska
BC
Iceland
Scotland
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21
Chromosome


Shape_PC3
Residual associated SNPs over expected
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BC
Iceland
Scotland
Chromosome
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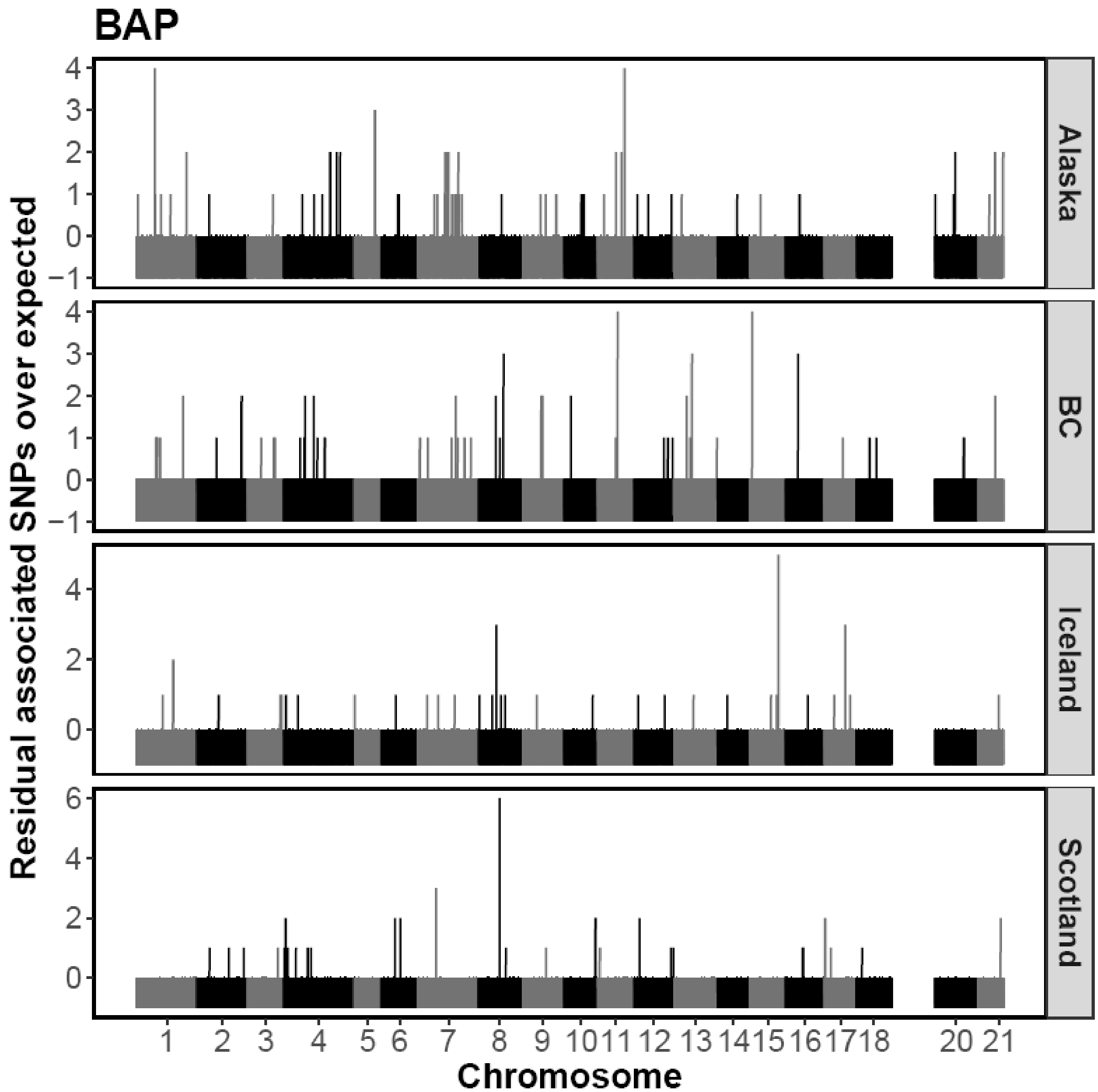
BAP
Residual associated SNPs over expected
Alaska
BC
Iceland
Scotland
Chromosome
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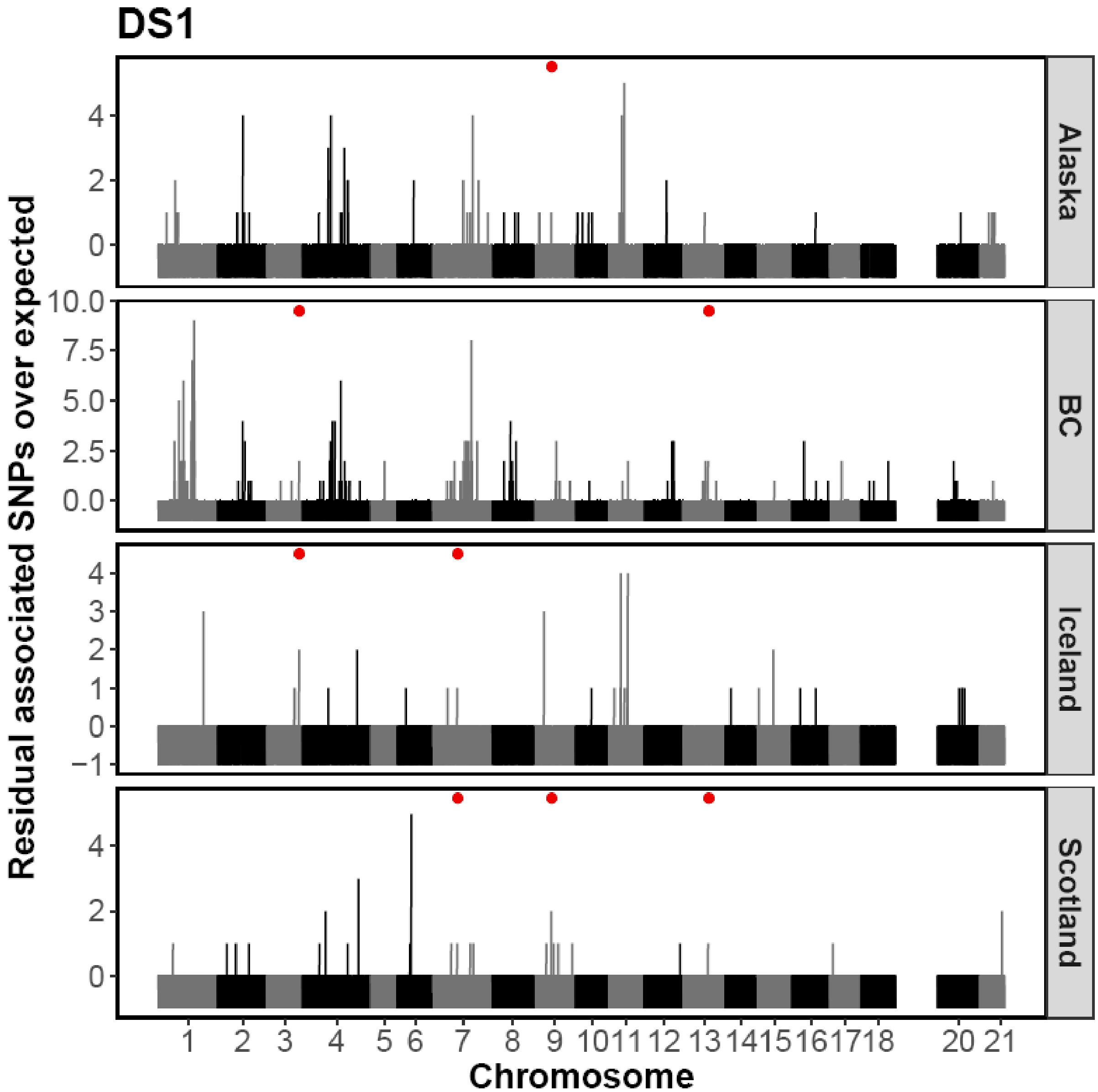
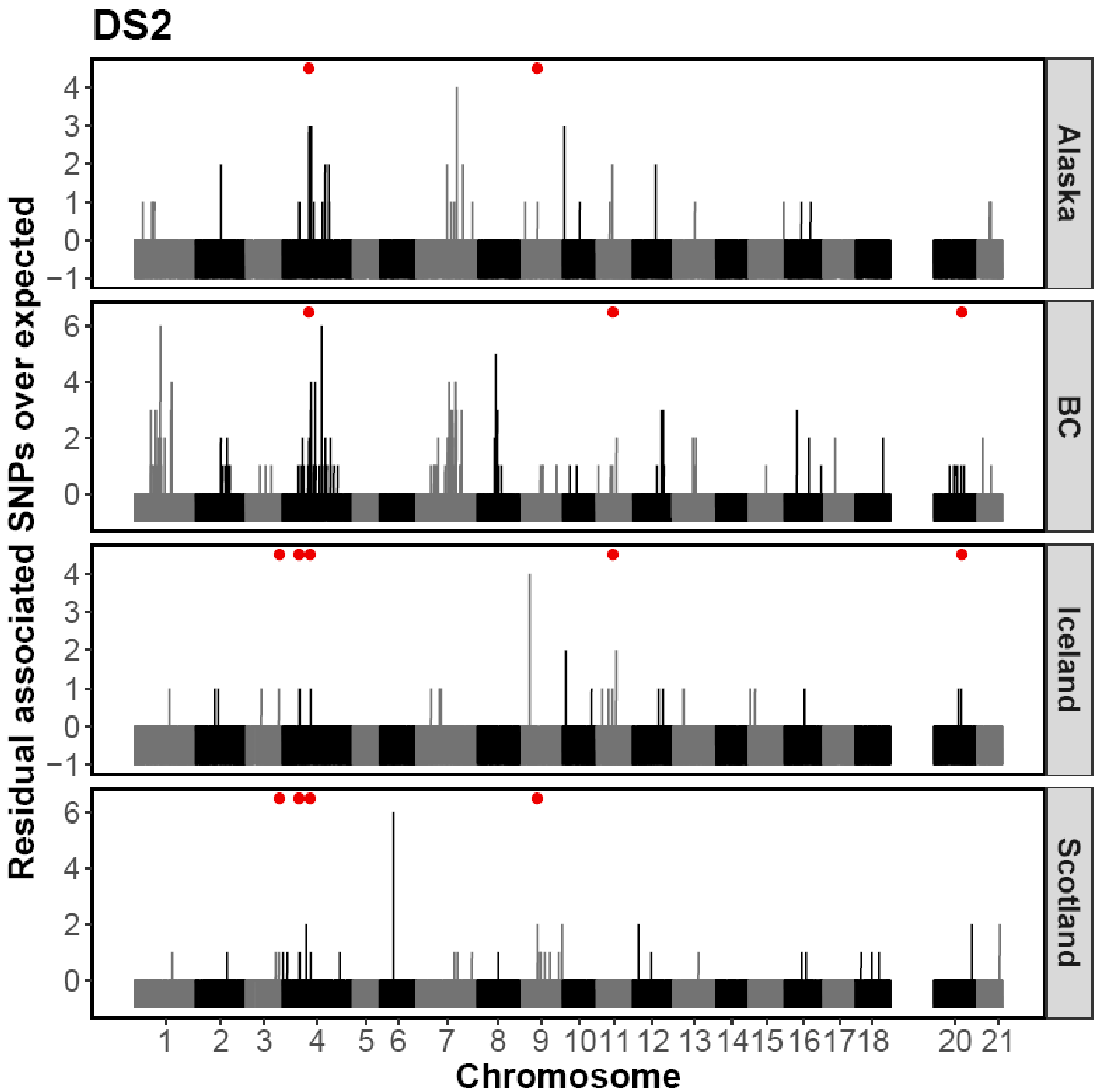
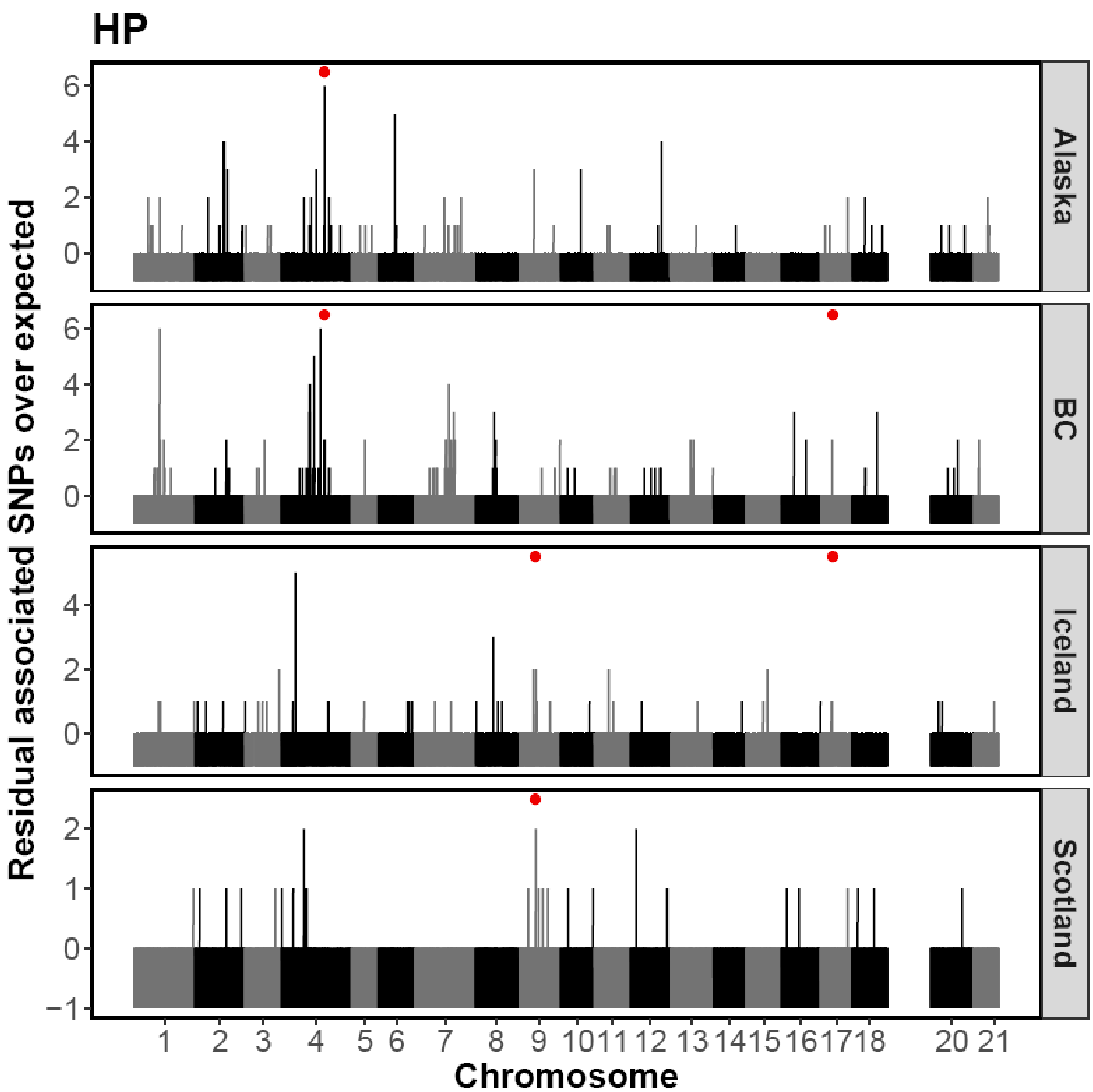
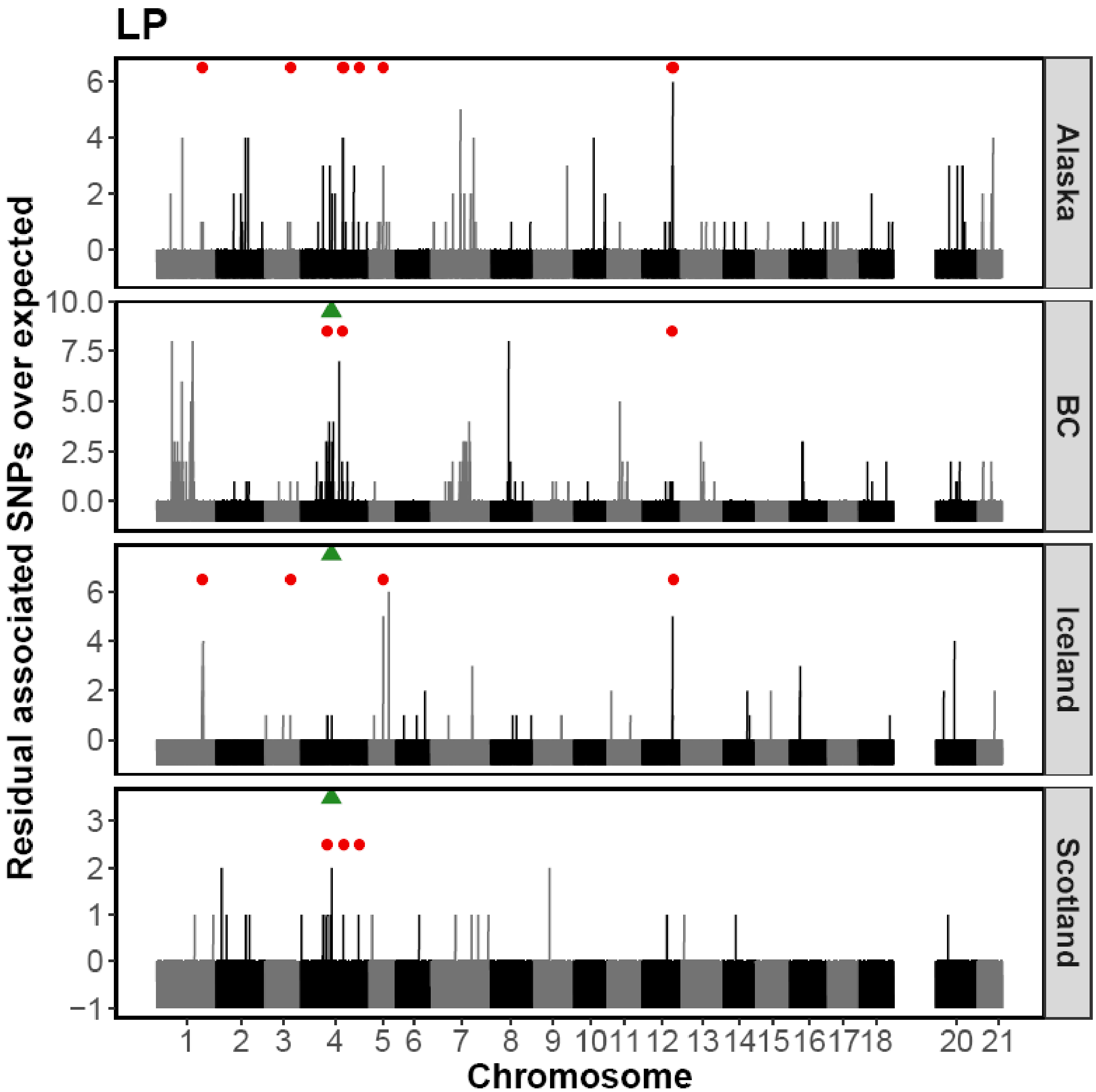
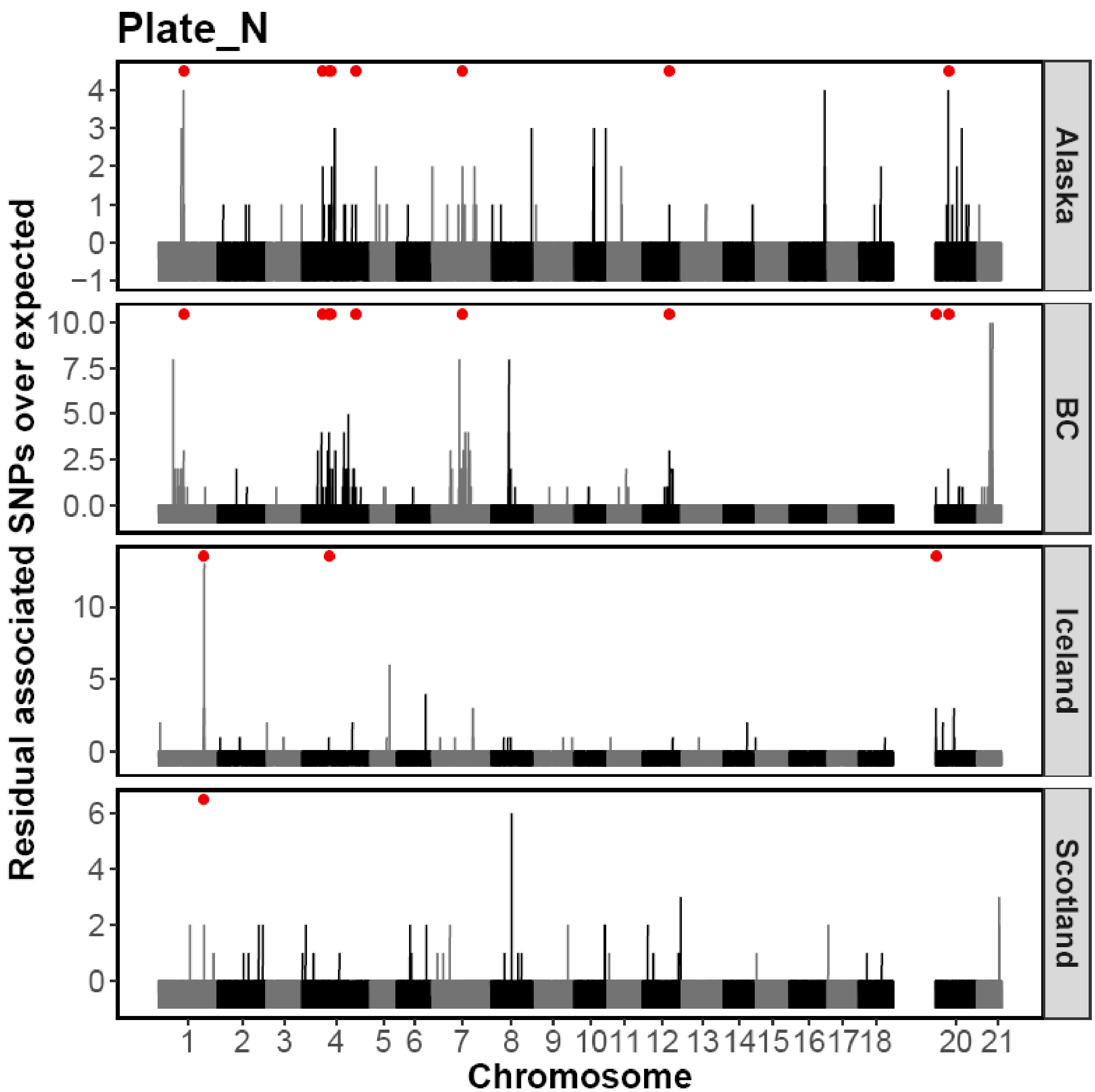

DS1
Residual associated SNPs over expected
Alaska
BC
Iceland
Scotland
Chromosome
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21
4
2
0
10.0
7.5
5.0
2.5
0.0
3
1
−1

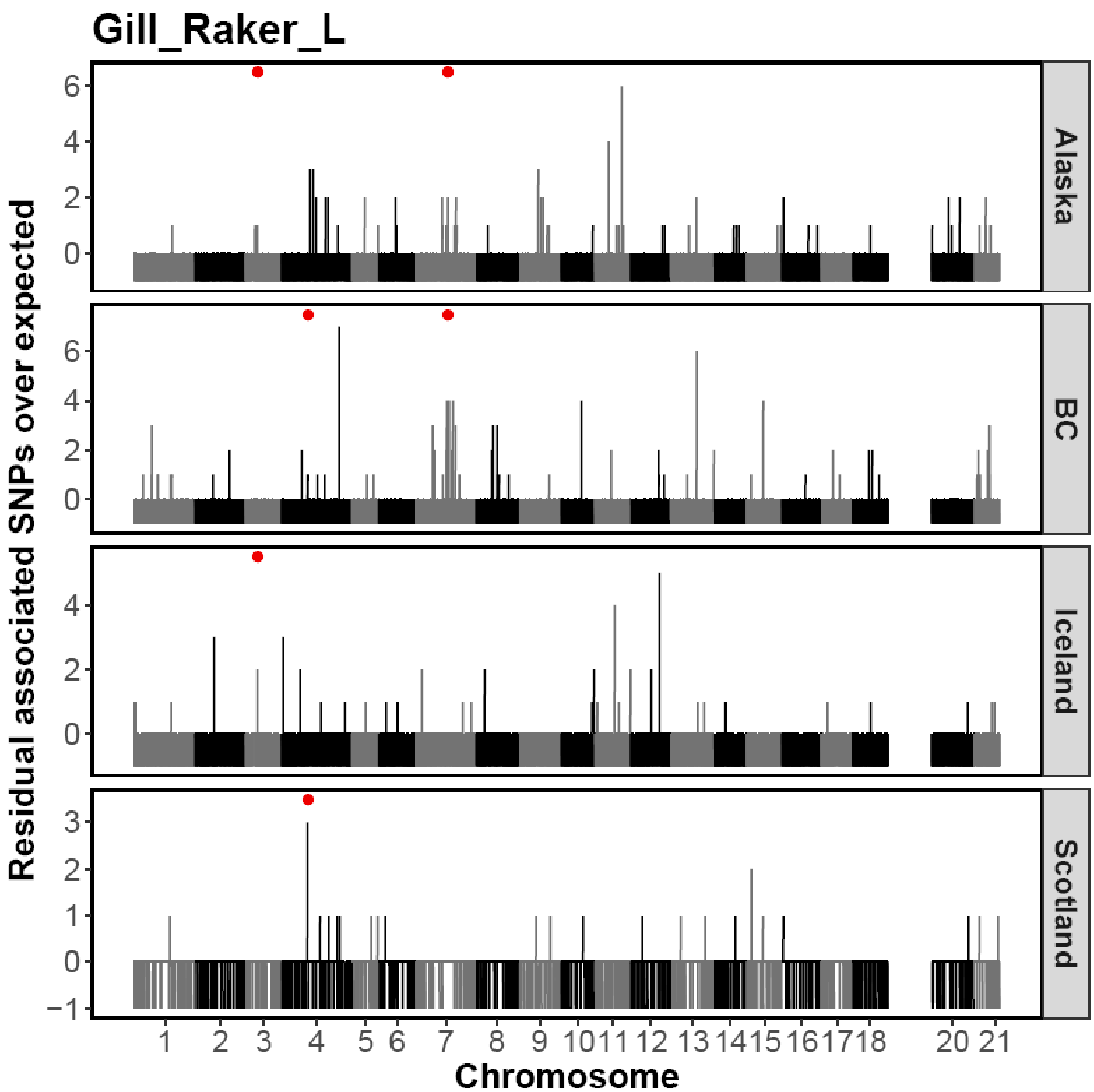

DS2
Residual associated SNPs over expected
Alaska
BC
Iceland
Scotland
Chromosome
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21


HP
Residual associated SNPs over expected
Alaska
BC
Iceland
Scotland
Chromosome
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21

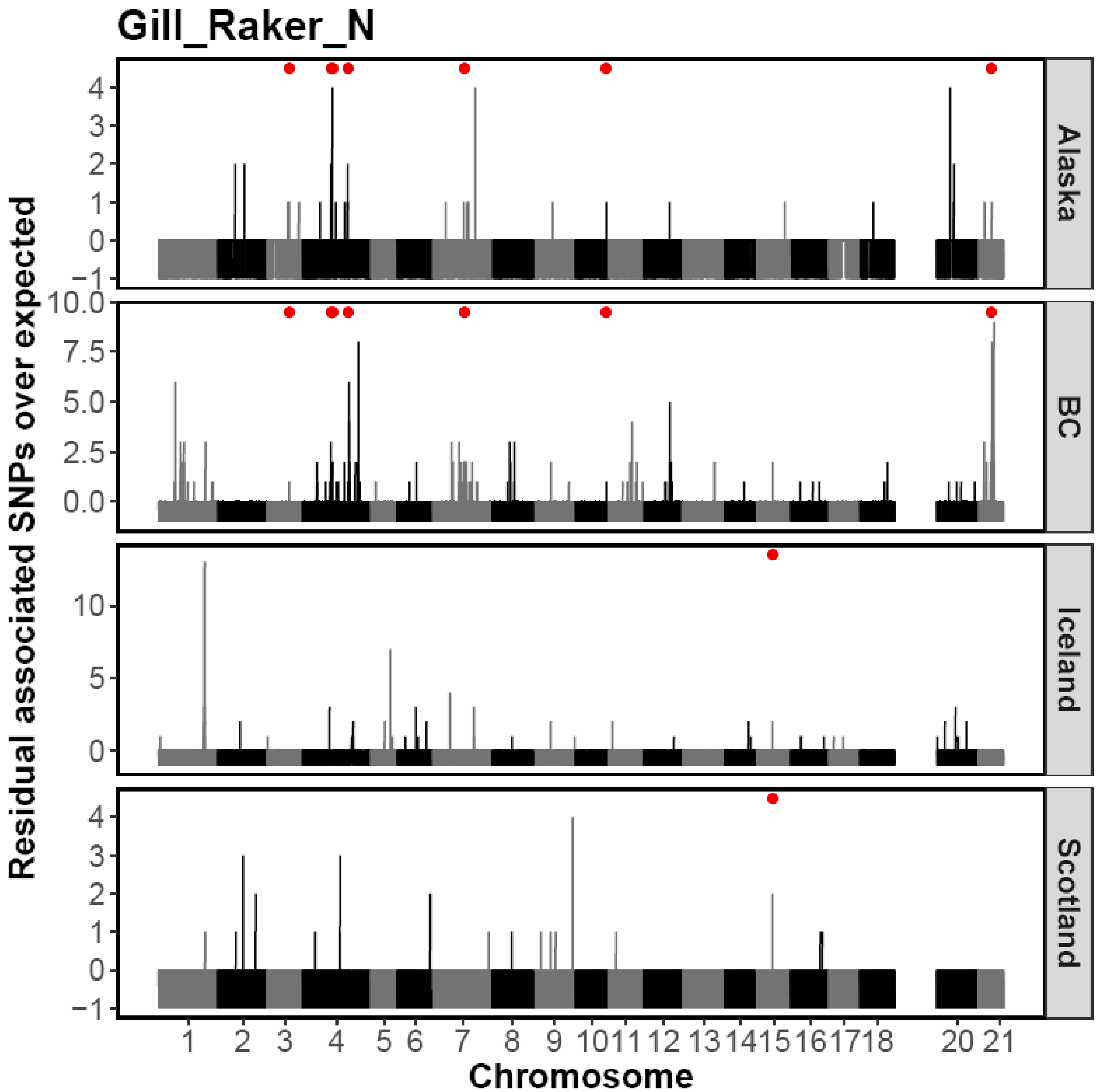

LP
Residual associated SNPs over expected
Alaska
BC
Iceland
Scotland
Chromosome
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21



Plate_N
Residual associated SNPs over expected
Alaska
BC
Iceland
Scotland
Chromosome
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21



Gill_Raker_L
Residual associated SNPs over expected
Alaska
BC
Iceland
Scotland
Chromosome
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21



Gill_Raker_N
Residual associated SNPs over expected
Alaska
BC
Iceland
Scotland
Chromosome
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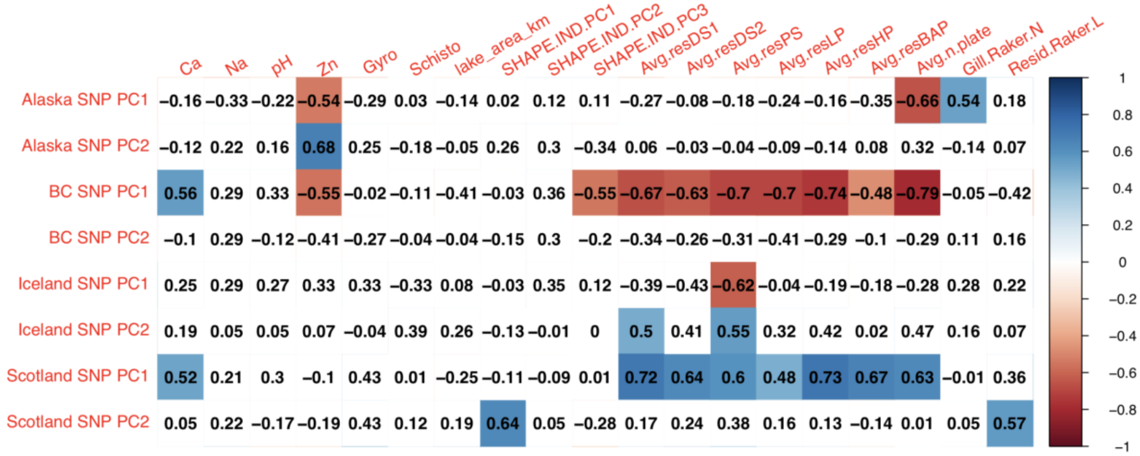
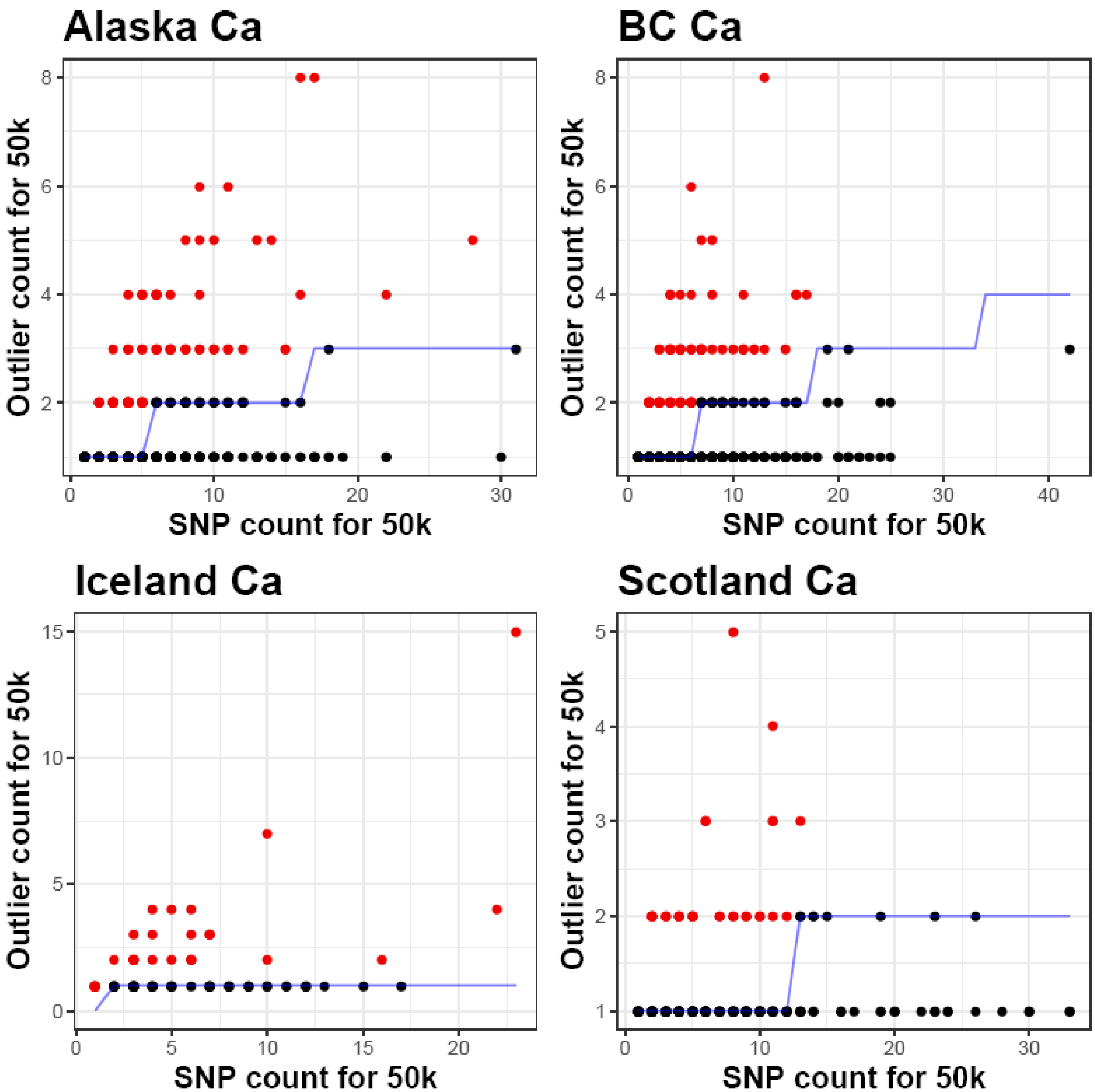
Supplementary Fig. 7. Correlations (Spearman's ρ) between our 19 environmental / phenotypic variables and the first two major PC axes of genetic variation (population structure) within each adaptive radiation.



Supplementary Fig. 8. Example illustration for Calcium of outlier windows on the basis of SNPs above a 99% binomial expectation (blue line). Red points denote 50kb outlier windows, whilst black points denote 50kb windows with associated SNPs in line with or less than the binomial expectation, given the number of SNPs within each window (SNP count).



Supplementary Table 1. Names of lakes sampled, abbreviations of their names, geographic region and area within the geographic region where samples came from, date of sampling, geographic coordinates of each lake and numbers of three-spined sticklebacks analysed from each lake.

Population name	Code	Geographic region	Area	Date	Latitude	Longitude	N
Freshwater							
Aonghais	AONG	Scotland	W	16.05.2013	57°38'39.89"N	7°16'27.49"W	18
Mhic a'Roin	AROI	Scotland	S	09.05.2013	57°35'40.8"N	7°25'52.5"W	19
a'Bharpa	BHAR	Scotland	S	14.05.2013	57°34'15.1"N	7°18'07.1"W	18
na Buaile	BUAI	Scotland	NE	13.05.2013	57°38'48.94"N	7°11'52.85"W	17
Chadha Ruaidh	CHRU	Scotland	SE	29.04.2013	57°35'38.63"N	7°11'51.84"W	17
an Daimh	DAIM	Scotland	S	30.04.2013	57°35'35.40"N	7°12'33.27"W	20
Eisiadar	EISI	Scotland	N	17.05.2013	57°37'54.97"N	7°21'14.53"W	17
Fada	FADA	Scotland	E	17.05.2013	57°37'3.69"N	7°12'33.92"W	15
nan Geireann	GEIR	Scotland	N	16.05.2013	57°38'24.56"N	7°17'24.93"W	17
Mhic Gille-bhride	GILL	Scotland	W	09.05.2013	57°36'7.11"N	7°24'35.29"W	17
Hosta	HOST	Scotland	NW	15.05.2013	57°37'37.65"N	7°29'27.28"W	19
Iala	IALA	Scotland	E	16.05.2013	57°37'11.28"N	7°12'20.41"W	18
na Moracha	MORA	Scotland	S	07.05.2013	57°34'24.75"N	7°16'33.73"W	21
na Reival	REIV	Scotland	W	04.05.2013	57°36'40.78"N	7°30'52.84"W	19
Scadavay	SCAD	Scotland	S	06.05.2013	57°35'4.09"N	7°14'9.56"W	17
nan Strùban	STRU	Scotland	SW	17.05.2013	57°33'29.8"N	7°21'09.1"W	16
Tormasad	TORM	Scotland	SW	01.05.2013	57°33'43.7"N	7°19'00.6"W	19
Trosavat	TROS	Scotland	SW	19.05.2013	57°35'3.85"N	7°24'48.40"W	20
Bakkatjorn	BAKK	Iceland	SW	02.06.2014	64° 9'19.29"N	22° 1'6.99"W	19
Eidarvatn	EIDA	Iceland	E	17.06.2014	65°23'17.26"N	14°21'35.94"W	19
Flodid	FLOD	Iceland	N	09.06.2014	65°29'27.95"N	20°21'33.59"W	20
Galtabol	GALT	Iceland	N	09.06.2014	65°15'40.89"N	19°44'24.30"W	19
Grettislaug	GRET	Iceland	N	13.06.2014	65°52'57.3"N	19°44'13.1"W	19
Grjotarvatn	GRJO	Iceland	W	08.07.2014	64°46'36.39"N	22° 0'6.89"W	18
Holsvatn	HOLS	Iceland	W	26.05.2014	64°30'48.00"N	22° 8'43.28"W	18
Hredavatn	HRED	Iceland	W	26.05.2014	64°45'56.66"N	21°34'21.72"W	18
Kleifarvatn	KLEI	Iceland	SW	22.05.2014	63°55'27.55"N	21°59'56.42"W	16
Mjoavatn	MJOA	Iceland	N	09.06.2014	65°15'41.45"N	19°48'4.60"W	20
Myvatn-lava	MYVL	Iceland	NE	14.06.2014	65°37'41.49"N	16°55'31.57"W	19
Myvatn-mud	MYVM	Iceland	NE	14.06.2014	65°39'7.67"N	16°58'8.95"W	20
Sauravatn	SAUR	Iceland	W	26.05.2014	64°39'47.23"N	22° 7'32.61"W	16
Skorradalsvatn	SKOR	Iceland	W	30.06.2014	64°28'57.48"N	21°19'2.22"W	19
Thingvallavatn	THIN	Iceland	SW	23.05.2014	64°11'11.6"N	21°05'18.1"W	20
Urridavatn	URR2	Iceland	SE	17.06.2014	65°17'59.45"N	14°27'21.82"W	19
Urridakotsvatn	URRI	Iceland	E	19.05.2014	64° 4'5.41"N	21°54'34.08"W	19
Vífilsstaðavatn	VIFI	Iceland	SW	18.05.2014	64° 4'45.72"N	21°52'38.86"W	20
Ambrose	AMBR	B.C.	Sechelt P.	20.05.2015	49°44'4.70"N	124° 1'32.52"W	17

Beaver	BEAV	B.C.	Vancouver I.	12.05.2015	48°48'41.96"N	124° 4'51.38"W	18
Brannen	BRAN	B.C.	Vancouver I.	13.05.2015	49°12'51.16"N	124° 2'59.50"W	18
Bullocks	BULL	B.C.	Saltspring I.	10.05.2015	48°52'24.4"N	123°30'22.0"W	15
Cranby	CRAN	B.C.	Texada I.	29.04.2015	49°41'31.85"N	124°30'27.00"W	20
Dougan	DOUG	B.C.	Vancouver I.	12.05.2015	48°42'51.73"N	123°36'38.44"W	16
Errock	ERRO	B.C.	Fraser Valley	22.05.2015	49°13'28.73"N	122° 0'41.42"W	18
Garden Bay	GARD	B.C.	Sechelt P.	26.04.2015	49°39'3.62"N	124° 0'59.67"W	10
Hoggan	HOGG	B.C.	Gabriola I.	14.05.2015	49° 9'12.09"N	123°49'41.94"W	18
Hotel	HOTE	B.C.	Sechelt P.	25.04.2015	49°38'19.46"N	124° 3'9.01"W	18
Kennedy	KENN	B.C.	Vancouver I.	15.05.2015	49° 7'35.72"N	125°25'35.84"W	18
Kirk	KIRK	B.C.	Texada I.	01.05.2015	49°44'24.21"N	124°34'59.82"W	19
Klein	KLEN	B.C.	Sechelt P.	26.04.2015	49°44'20.34"N	123°58'0.93"W	18
Lily	LILY	B.C.	Sechelt P.	25.04.2015	49°36'44.02"N	124° 1'16.73"W	19
North	NORT	B.C.	Sechelt P.	26.04.2015	49°44'52.60"N	123°58'31.91"W	14
Sproat	SPRO	B.C.	Vancouver I.	15.05.2015	49°17'04.3"N	124°58'25.5"W	18
Stowell	STOW	B.C.	Saltspring I.	10.05.2015	48°46'55.12"N	123°26'41.46"W	17
Trout	TROUT	B.C.	Sechelt P.	25.04.2015	49°30'25.02"N	123°52'27.28"W	18
Arness	ARNE	Alaska	Kenai	15.06.2015	60°38'45.73"N	151°18'7.36"W	17
Arrow	ARRO	Alaska	Kenai	24.06.2015	60°45'1.29"N	150°29'21.07"W	15
Barley	BARL	Alaska	Mat-Su	08.06.2015	61°21'40.09"N	150° 5'1.20"W	18
Bear Paw	BEPA	Alaska	Mat-Su	03.06.2015	61°36'50.38"N	149°45'11.91"W	17
Big	BIGL	Alaska	Mat-Su	08.06.2015	61°31'58.86"N	149°50'3.79"W	15
Bruce	BRUC	Alaska	Mat-Su	12.06.2015	61°36'31.97"N	149°33'4.77"W	16
Community	COMM	Alaska	Kenai	15.06.2015	60°42'8.72"N	151°23'1.32"W	17
Corcoran	CORC	Alaska	Mat-Su	05.06.2015	61°34'23.07"N	149°41'30.40"W	16
Daniel	DANI	Alaska	Kenai	15.06.2015	60°43'28.79"N	151°10'49.99"W	18
Duck	DUCK	Alaska	Kenai	15.06.2015	60°41'7.33"N	151°13'25.41"W	16
Jade	JADE	Alaska	Mat-Su	08.06.2015	61°31'29.25"N	149°52'1.50"W	18
Long	LONG	Alaska	Mat-Su	11.06.2015	61°34'33.76"N	149°46'29.47"W	18
Luci	LUCI	Alaska	Mat-Su	03.06.2015	61°34'11.93"N	149°28'53.26"W	18
Lynda	LYND	Alaska	Mat-Su	08.06.2015	61°34'13.44"N	149°50'24.75"W	17
Seymour	SEYM	Alaska	Mat-Su	03.06.2015	61°36'52.7"N	149°39'51.3"W	17
Tern	TERN	Alaska	Kenai	24.06.2015	60°32'2.70"N	149°32'49.59"W	18
Toad	TOAD	Alaska	Mat-Su	03.06.2015	61°37'12.12"N	149°41'56.11"W	19
Walby	WALB	Alaska	Mat-Su	22.06.2015	61°37'13.2"N	149°12'48.5"W	18
Y	YLAK	Alaska	Mat-Su	22.06.2015	62°18'21.42"N	150° 3'52.34"W	19
Marine							
Ob nan Stearnain	OBSM	Scotland	S	17.05.2013	57°36'4.82"N	7°10'24.50"W	19
Nypslon	NYPS	Iceland	NE	17.06.2014	65°46'18.85"N	14°50'6.10"W	19
Little Campbell River	LICA	B.C.	Surrey	27.04.2015	49° 0'50.89"N	122°45'38.50"W	20
Mud	MUD	Alaska	Mat-Su	01.06.2015	61°35'50.39"N	149°20'36.69"W	18

Supplementary Table 2. Measured abiotic and biotic characteristics of 73 freshwater lakes and average phenotypic traits for populations from those lakes. From left to right: Calcium (Ca), sodium (Na) and zinc (Zn) concentrations, pH, lake area, prevalence of *Gyrodactylus* spp. (Gyro) and *Schistochephalus solidus* (Schisto), Pricipal Components 1, 2 and 3 of body shape (Shape PC1,2 ,3), length of dorsal spines 1 and 2 (DS1, DS2), length of pelvic spine (PS), lenght of pelvis (LP), height of pelvis (HP), length of biggest armour plate (BAP), number of armour plates (plate.N), standard length (SL), gill raker number (Gill_Raker_N) and length (Gill_Raker_L).

Radiation	Pop	Ca (mg/L)	Na (mg/L)	Zn (µg/L)	pH	Lake Area (km^2)	Gyro	Schisto	Shape PC1	Shape PC2	Shape PC3	DS1	DS2	PS	LP	HP	BAP	Plate N	SL	GRN	GRL
Alaska	ARNE	8.106	4.192	48.26	7.41	0.911	0.926	0.000	-0.012	0.002	-0.015	-0.065	-0.066	-0.060	0.016	0.043	0.049	6.059	58.53	18.06	-0.015
Alaska	ARRO	0.736	1.8	31.582	6.92	0.137	0.900	0.000	-0.011	0.016	-0.003	0.012	0.026	-0.492	-0.133	-0.502	0.004	4.800	57.33	20.20	-0.068
Alaska	BARL	42.206	2.75	8.339	8.37	0.163	0.967	0.100	-0.014	0.006	-0.011	-0.013	-0.032	-0.073	0.001	0.011	-0.024	4.833	60.11	21.44	-0.005
Alaska	BEPA	0.21	0.585	9.244	5.7	0.174	0.167	0.167	-0.010	0.004	0.003	-0.019	-0.018	-0.433	-0.084	-0.424	-0.038	3.824	42.00	20.12	-0.005
Alaska	BIGL	21.962	3.552	5.083	8.07	12.310	0.900	0.067	0.007	-0.002	-0.009	0.073	0.070	0.098	0.019	-0.010	-0.016	6.333	47.00	20.07	0.129
Alaska	BRUC	1.111	0.661	6.779	6.61	0.100	0.862	0.000	-0.011	-0.002	-0.012	-0.021	-0.046	-0.428	-0.012	-0.125	0.018	4.563	47.56	20.00	0.048
Alaska	COMM	0.325	1.836	26.339	6.8	0.052	0.769	0.067	-0.006	0.012	-0.015	-0.043	-0.032	-0.279	-0.023	-0.191	0.011	6.389	44.56	19.83	-0.019
Alaska	CORC	29.2	4.643	5.147	8.18	0.041	0.700	0.233	-0.018	0.007	-0.018	0.020	0.036	0.019	0.020	0.036	0.012	5.824	44.00	20.82	-0.191
Alaska	DANI	13.515	4.53	14.593	7.51	2.713	0.533	0.333	0.009	-0.004	-0.016	0.042	0.045	0.041	0.038	0.010	0.045	6.667	48.89	20.28	0.135
Alaska	DUCK	12.677	4.842	13.619	9.68	0.343	1.000	0.000	0.001	0.001	-0.019	-0.015	-0.020	-0.046	-0.004	0.054	-0.016	7.000	50.44	18.56	-0.060
Alaska	JADE	0.826	0.649	15.431	6.57	0.100	0.423	0.167	-0.009	0.004	-0.006	-0.023	-0.012	-0.019	-0.004	0.022	-0.094	5.333	58.83	21.06	0.001
Alaska	LONG	12.837	2.426	4.968	7.8	0.178	0.833	0.033	-0.002	-0.002	-0.013	0.074	0.076	0.079	0.020	0.044	-0.027	6.278	52.61	21.44	0.112
Alaska	LUCI	29.942	11.982	7.562	8.17	1.517	0.885	0.167	-0.021	0.005	-0.009	0.033	0.031	0.026	0.023	0.073	0.054	6.000	47.22	20.72	-0.044
Alaska	LYND	11.641	2.007	7.692	7.42	0.057	0.467	0.000	-0.003	-0.005	-0.019	-0.018	-0.037	0.003	0.022	-0.003	-0.020	6.056	50.22	21.50	0.137

Alaska	SEYM	25.906	3.526	11.674	8.28	0.947	0.857	0.067	-0.010	0.011	-0.014	-0.054	-0.014	-0.068	-0.002	0.038	0.009	5.706	50.77	22.12	0.002
Alaska	TERN	32.131	3.036	7.936	7.6	0.512	0.767	0.300	-0.024	-0.009	0.004	0.035	0.033	0.030	0.033	0.070	0.024	6.895	43.37	18.63	-0.129
Alaska	TOAD	0.604	0.688	6.639	5.99	0.188	0.567	0.267	-0.011	0.007	-0.008	-0.069	-0.045	-0.496	-0.093	-0.483	-0.011	4.350	58.50	20.85	-0.051
Alaska	WALB	25.468	7.307	10.209	8.53	0.201	0.462	0.367	-0.019	0.005	-0.012	0.049	0.054	0.038	0.027	0.046	0.016	6.684	40.90	20.11	-0.080
Alaska	YLAK	2.822	1.295	16.374	6.98	0.185	0.833	0.133	-0.014	0.012	-0.001	0.004	-0.022	-0.482	-0.189	-0.453	0.028	5.789	54.84	20.84	0.106
BC	AMBR	2.231	1.906	10.188	6.88	0.298	0.448	0.000	-0.007	0.030	0.011	0.025	-0.001	-0.012	-0.026	-0.025	-0.010	6.294	50.24	24.94	0.288
BC	BEAV	3.87	1.211	31.199	6.82	0.193	1.000	0.040	-0.001	0.005	0.001	0.098	0.096	0.164	0.030	0.073	0.007	6.950	51.60	19.28	-0.142
BC	BRAN	7.434	3.162	8.894	7.82	1.087	0.960	0.000	0.006	0.006	-0.003	0.187	0.182	0.220	0.028	0.159	0.035	5.737	53.74	17.79	-0.096
BC	BULL	10.456	8.551	7.802	7.58	0.094	0.739	0.059	-0.007	0.015	-0.021	-0.200	-0.133	-0.217	-0.065	-0.093	-0.066	3.867	48.20	19.67	0.093
BC	CRAN	15.627	3.86	13.049	7.23	0.446	1.000	0.000	-0.004	0.010	0.000	-0.104	-0.108	-0.096	-0.029	-0.057	-0.023	5.450	45.10	19.85	-0.009
BC	DOUG	20.007	6.98	15.88	7.52	0.100	0.917	0.000	-0.021	-0.006	-0.006	-0.146	-0.148	-0.165	-0.018	-0.079	0.031	5.063	51.75	20.19	0.033
BC	ERRO	3.03	1.997	45.606	7	0.259	0.833	0.000	-0.008	-0.005	0.009	0.127	0.106	0.183	0.016	0.132	0.057	32.500	55.44	19.89	0.198
BC	GARD	4.699	4.768	12.68	6.91	0.624	0.000	0.000	0.017	0.012	0.011	0.056	0.002	0.035	0.003	0.048	0.009	7.222	49.78	22.67	0.060
BC	HOGG	6.771	6.542	10.6	6.09	0.197	0.880	0.000	-0.014	0.011	-0.003	-0.085	-0.079	-0.138	-0.009	-0.083	-0.008	4.800	45.20	19.50	0.005
BC	HOTE	2.861	4.992	9.132	7.36	0.252	0.000	0.000	-0.016	0.005	0.013	0.142	0.106	0.197	0.046	0.108	0.003	7.000	46.65	21.88	0.124
BC	KENN	5.891	1.079	11.865	7	60.400	1.000	0.000	-0.010	0.008	-0.003	0.156	0.131	0.239	0.036	0.105	-0.025	30.895	54.26	22.32	0.165
BC	KIRK	19.732	2.959	8.884	7.6	0.083	0.778	0.000	0.002	0.019	0.000	-0.112	-0.102	-0.195	-0.004	-0.168	-0.041	4.000	54.33	20.67	-0.271
BC	KLEN	5.101	1.491	7.852	6.65	0.135	0.000	0.000	0.001	0.016	-0.012	-0.287	-0.100	-0.305	-0.027	-0.150	0.012	5.529	46.00	21.13	-0.175
BC	LILY	5.665	6.498	11.854	6.97	0.121	0.029	0.000	0.000	0.010	0.003	0.055	0.038	0.087	0.022	0.047	0.037	6.053	42.53	20.84	0.010
BC	NORT	4.362	2.191	3.418	7.11	0.128	0.000	0.000	0.005	0.020	0.005	0.104	0.077	0.090	0.021	0.005	0.017	33.643	47.36	22.29	0.014
BC	SPRO	8.646	1.149	15.463	7.04	37.750	0.880	0.000	0.006	0.012	-0.004	0.071	0.080	0.126	0.009	0.098	-0.019	7.947	61.32	20.11	-0.059
BC	STOW	8.987	5.941	8.91	7.61	0.056	0.478	0.000	-0.017	-0.003	-0.002	-0.144	-0.158	-0.242	-0.032	-0.063	0.005	4.765	46.18	21.88	-0.001
BC	TROUT	6.263	3.675	8.692	7.12	0.076	0.640	0.000	0.011	0.020	-0.007	0.032	0.004	-0.008	-0.039	-0.036	-0.015	4.389	46.06	20.88	-0.220

Iceland	BAKK	34.329	58.667	204.131	9.17	0.140	0.886	0.000	-0.008	0.000	0.017	-0.016	-0.024	0.041	0.020	0.123	0.050	28.421	47.38	18.16	0.235
Iceland	EIDA	5.128	5.038	229.685	7.73	1.200	0.714	0.286	0.001	-0.001	-0.011	-0.023	-0.019	-0.009	-0.008	-0.024	-0.011	4.632	37.03	17.44	-0.026
Iceland	FLOD	5.577	6.074	194.573	8.05	2.800	0.771	0.686	-0.005	-0.015	0.005	0.044	0.041	0.075	0.003	0.046	0.028	5.684	48.62	18.28	-0.062
Iceland	GALT	6.022	5.013	203.798	7.7	1.200	0.686	0.886	0.006	-0.018	-0.008	0.041	0.050	0.059	0.009	-0.002	-0.031	4.833	41.16	17.38	-0.050
Iceland	GRET	2.486	49.938	227.627	8.59	0.002	0.143	0.000	-0.019	-0.008	0.011	0.033	0.022	0.041	-0.010	-0.007	-0.017	9.789	42.67	17.37	-0.034
Iceland	GRJO	3.925	4.34	213.518	7.45	1.810	0.286	0.657	-0.016	-0.008	0.009	0.001	0.013	0.013	-0.004	0.010	0.001	5.278	42.14	18.11	0.002
Iceland	HOLS	3.569	10.519	191.938	7.53	1.400	0.657	0.571	-0.013	-0.016	0.012	-0.004	0.000	0.016	-0.005	-0.006	0.021	4.353	37.64	16.94	-0.138
Iceland	HRED	3.896	6.933	206.899	7.5	1.100	0.971	0.229	0.016	-0.010	-0.005	-0.027	-0.026	-0.025	-0.002	-0.052	0.022	4.722	42.76	17.94	-0.069
Iceland	KLEI	9.882	10.756	186.013	7.44	10.000	0.462	0.654	-0.020	-0.005	0.007	0.014	-0.001	0.037	0.006	0.020	0.024	6.563	39.98	19.56	-0.075
Iceland	MJOA	5.075	4.612	213.412	7.38	2.900	1.000	0.857	0.012	-0.009	0.005	0.021	0.034	0.045	0.000	0.034	-0.011	6.053	53.22	17.53	-0.026
Iceland	MYVL	22.461	42.501	211.865	8.47	38.400	0.914	0.371	-0.012	0.001	0.011	-0.004	0.000	0.015	0.011	0.060	-0.003	6.111	41.32	20.00	0.039
Iceland	MYVM	8.348	14.686	210.338	9.6	38.400	1.000	0.286	-0.011	-0.011	0.008	-0.006	-0.029	0.012	0.020	0.022	0.004	5.737	43.13	18.84	-0.009
Iceland	SAUR	4.91	13.399	181.474	7.08	0.800	0.143	0.657	-0.017	-0.014	0.015	-0.041	-0.036	-0.057	-0.028	-0.006	-0.021	3.813	41.13	18.27	-0.207
Iceland	SKOR	4.022	6.803	209.832	7.11	14.700	0.650	0.525	0.007	-0.010	0.002	0.051	0.066	0.091	0.004	0.009	0.002	5.526	42.92	18.12	0.148
Iceland	THIN	3.735	7.124	163.347	8.72	83.000	0.914	0.000	-0.007	-0.014	0.005	-0.027	-0.039	-0.002	0.025	0.036	0.112	5.750	41.96	18.35	0.032
Iceland	URR2	8.4	7.084	232.63	7.84	1.000	1.000	0.171	0.004	-0.005	-0.008	-0.022	-0.007	-0.027	0.004	-0.042	-0.023	4.474	38.86	17.58	-0.039
Iceland	URRI	5.686	18.726	223.849	8.05	0.130	1.000	0.029	-0.006	-0.012	0.007	-0.046	-0.036	-0.012	-0.010	0.020	-0.023	4.105	37.98	17.21	-0.107
Iceland	VIFI	9.791	19.503	201.478	9.24	0.300	0.983	0.207	0.012	-0.009	0.020	-0.014	-0.002	-0.317	-0.003	-0.252	-0.108	2.125	37.09	18.15	0.034
Scotland	AONG	4.54	19.17	103.4	6.97	0.096	0.200	0.167	0.018	-0.010	0.002	-0.025	-0.019	-0.027	0.008	0.036	0.009	3.056	28.21	18.50	-0.100
Scotland	AROI	2.897	24.32	56.18	6.48	0.065	0.657	0.029	0.038	0.001	0.000	0.032	0.024	0.067	0.001	0.028	0.005	4.000	44.72	19.00	0.146
Scotland	BHAR	1.472	18.63	82.63	6.03	0.539	0.429	0.514	0.028	-0.006	0.000	-0.025	-0.175	-0.286	-0.033	-0.291	-0.246	0.333	29.22	19.25	-0.058
Scotland	BUAI	2.549	36.14	58.44	6.73	0.017	0.029	0.000	-0.018	-0.003	0.018	0.018	0.021	-0.142	-0.001	-0.049	0.035	3.294	33.62	19.00	-0.056
Scotland	CHRU	2.203	18.77	62.7	6.58	0.021	0.000	0.167	-0.008	-0.002	0.016	0.002	0.000	-0.014	0.004	-0.033	0.023	3.688	33.94	19.18	-0.102

Scotland	DAIM	2.305	24.56	56.3	6.5	0.036	0.000	0.000	0.026	-0.005	0.016	-0.028	0.001	-0.014	0.010	-0.030	-0.017	3.350	32.77	19.14	-0.027
Scotland	EISI	2.813	22.54	79.14	6.82	0.114	0.543	0.143	0.011	-0.005	0.004	0.001	0.000	-0.026	0.005	-0.007	0.021	5.375	34.67	19.67	-0.082
Scotland	FADA	1.809	17.29	90.41	6.71	0.106	0.171	0.000	0.025	-0.003	-0.004	-0.142	-0.149	-0.277	-0.181	-0.295	-0.263	0.067	28.64	19.18	0.091
Scotland	GEIR	1.762	17.17	47.29	6.7	1.882	0.743	0.057	0.020	-0.009	0.001	-0.011	-0.011	-0.028	0.021	0.028	-0.082	1.824	30.75	17.25	-0.059
Scotland	GILL	2.706	21.85	46.04	6.8	0.141	0.875	0.156	0.023	-0.007	0.003	0.072	0.078	0.088	0.045	0.059	0.068	4.176	38.61	19.67	0.071
Scotland	HOST	30.56	27.47	66.52	8.34	0.258	0.886	0.771	0.020	-0.014	0.003	0.019	0.020	0.021	0.009	0.021	-0.008	4.526	39.85	18.80	0.065
Scotland	IALA	2.728	21.4	65.9	6.36	0.005	0.143	0.000	-0.004	-0.004	0.016	-0.011	-0.006	-0.031	0.027	0.026	0.062	4.444	35.31	18.00	0.027
Scotland	MORA	2.505	24.03	58.85	6.35	0.378	0.265	0.000	0.042	0.002	-0.012	-0.176	-0.199	-0.328	-0.055	-0.345	-0.318	0.053	31.89	18.00	0.057
Scotland	REIV	28.6	40.12	58.52	8.95	0.061	0.514	0.057	-0.005	0.010	0.011	0.005	0.006	0.026	0.030	0.061	0.053	5.474	41.00	19.60	-0.022
Scotland	SCAD	1.418	19.75	78.89	6.14	5.516	0.571	0.086	0.038	0.002	0.001	-0.135	-0.157	-0.354	-0.067	-0.367	-0.345	0.176	33.57	17.00	-0.017
Scotland	STRU	3.724	25.05	93.42	7.06	0.192	0.686	0.419	0.008	-0.016	0.009	-0.029	-0.033	-0.033	0.011	-0.041	-0.324	0.250	32.94	20.00	-0.008
Scotland	TORM	4.005	25.43	86.88	6.84	0.211	0.286	0.029	0.020	-0.005	0.010	-0.088	-0.120	-0.077	0.000	-0.156	-0.284	0.235	30.97	17.33	0.032
Scotland	TROS	2.845	26.12	93.32	6.71	0.065	0.686	0.030	0.026	-0.004	0.004	0.061	0.065	0.053	0.024	0.066	0.042	5.350	40.40	16.40	0.082

Supplementary Table 3. Loadings of environmental variables (a), shape markers (b) and armour variables (c) for PCAs used in downstream analyses.

	PC1	PC2	PC3	PC4	Total % variance explained
a) Environment					
pH	**0.579**	-0.168	0.165	0.042	
Zn	0.389	**0.590**	-0.124	0.053	
Na	0.202	0.366	**0.608**	**0.414**	
Ca	**0.404**	**-0.416**	**0.401**	-0.233	
Lake Area	0.255	-0.062	**-0.509**	**0.639**	
Gyro	**0.409**	-0.349	-0.335	-0.078	
Schisto	0.278	**0.437**	-0.236	**-0.596**	
variance explained (%)	31.4	22.4	16.9	14.3	85
b) Body shape					
RegResid1	0.115	-0.217	0.061		
RegResid2	0.058	-0.095	-0.038		
RegResid3	0.154	**-0.417**	-0.023		
RegResid4	-0.073	0.153	-0.093		
RegResid5	**-0.479**	0.024	-0.076		
RegResid6	0.194	-0.047	**0.310**		
RegResid7	0.005	0.007	**0.615**		
RegResid8	-0.028	0.068	-0.079		
RegResid9	**0.262**	-0.047	-0.245		
RegResid10	-0.078	0.106	-0.028		
RegResid11	**0.269**	0.052	**-0.304**		
RegResid12	-0.081	0.079	-0.056		
RegResid13	0.253	-0.038	-0.257		
RegResid14	-0.015	-0.014	-0.040		
RegResid15	-0.039	-0.002	**0.463**		
RegResid16	0.018	-0.104	0.080		
RegResid17	**-0.632**	**-0.369**	-0.169		
RegResid18	0.099	-0.129	-0.069		
RegResid19	-0.001	**0.569**	-0.058		
RegResid20	0.116	-0.251	-0.025		
RegResid21	0.078	-0.026	0.000		
RegResid22	-0.054	0.018	-0.001		
RegResid23	0.115	0.121	0.059		
RegResid24	-0.093	0.041	-0.047		
RegResid25	-0.098	**0.342**	-0.066		
RegResid26	-0.063	0.174	0.084		
variance explained (%)	29.000	20.600	16.500		66.1

c) Armour					
DS1	**0.403**	-0.316	**0.440**	0.201	
DS2	**0.407**	-0.328	**0.428**	0.033	
PS	**0.458**	0.238	0.039	0.152	
LP	0.349	**0.555**	-0.094	-0.014	
HP	**0.432**	0.379	-0.174	-0.076	
BAP	0.294	-0.324	-0.253	**-0.843**	
Plate_N	0.260	**-0.424**	**-0.720**	**0.467**	
variance explained (%)	53.7	14.5	11	10.3	89.5

Supplementary Table 4. Results of ANOVAs for two first PCs of armour and three PCs of body shape for fish from different lakes and radiations. Significant P-values in bold

	Df	Sum Sq	Mean Sq	F-value	Pr(>F)
Armour_PC1					
Radiation	3	331	110.36	180.36	**<0.001**
Lake	69	3805	55.14	90.12	**<0.001**
Residuals	1226	750	0.61		
Armour_PC2					
Radiation	3	146.8	48.94	166.12	**<0.001**
Lake	69	807.5	11.7	39.72	**<0.001**
Residuals	1226	361.2	0.29		
Shape_PC1					
Radiation	3	0.13962	0.04654	686.77	**<0.001**
Lake	69	0.17873	0.00259	38.22	**<0.001**
Residuals	1223	0.08288	0.00007		
Shape_PC2					
Radiation	3	0.06767	0.022555	173.817	**<0.001**
Lake	69	0.05938	0.000861	6.632	**<0.001**
Residuals	1223	0.1587	0.00013		
Shape_PC3					
Radiation	3	0.0542	0.018067	232.41	**<0.001**
Lake	69	0.07891	0.001144	14.71	**<0.001**
Residuals	1223	0.09507	0.000078		

Supplementary Table 5. Mean values of θ (angle between vectors) calculated within (Rad1 == Rad2) and between radiations for marine-freshwater phenotype vectors (armour, shape and gill rakers). P-values were calculated by comparing the distribution of within-radiation vectors (Rad1) compared with between-radiation vectors using T-Tests. Data is missing for Scottish marine gill rakers, therefore these comparisons are absent.

Rad1	Rad2	Mean θ (°)	Trait	P-value
Alaska	Alaska	12.162	Armour	1.000
BC	Alaska	22.635	Armour	0.000
Iceland	Alaska	16.391	Armour	0.000
Scotland	Alaska	16.743	Armour	0.000
Alaska	BC	22.635	Armour	0.000
BC	BC	28.319	Armour	1.000
Iceland	BC	25.901	Armour	0.000
Scotland	BC	26.338	Armour	0.000
Alaska	Iceland	16.391	Armour	0.000
BC	Iceland	25.901	Armour	0.121
Iceland	Iceland	8.963	Armour	1.000
Scotland	Iceland	9.100	Armour	0.643
Alaska	Scotland	16.743	Armour	0.000
BC	Scotland	26.338	Armour	0.201
Iceland	Scotland	9.100	Armour	0.829
Scotland	Scotland	8.896	Armour	1.000
Alaska	Alaska	29.985	Shape	1.000
BC	Alaska	45.123	Shape	0.000
Iceland	Alaska	64.835	Shape	0.000
Scotland	Alaska	44.952	Shape	0.000
Alaska	BC	45.123	Shape	0.000
BC	BC	36.929	Shape	1.000
Iceland	BC	71.354	Shape	0.000
Scotland	BC	57.771	Shape	0.000
Alaska	Iceland	64.835	Shape	0.000
BC	Iceland	71.354	Shape	0.000
Iceland	Iceland	51.227	Shape	1.000
Scotland	Iceland	72.782	Shape	0.000
Alaska	Scotland	44.952	Shape	0.000
BC	Scotland	57.771	Shape	0.000
Iceland	Scotland	72.782	Shape	0.000
Scotland	Scotland	36.019	Shape	1.000
Alaska	Alaska	7.796	Gill rakers	1.000
BC	Alaska	19.515	Gill rakers	0.000
Iceland	Alaska	9.891	Gill rakers	0.011
Scotland	Alaska	NA	Gill rakers	NA
Alaska	BC	19.515	Gill rakers	0.000
BC	BC	27.799	Gill rakers	1.000

Iceland	BC	20.743	Gill rakers	0.000
Scotland	BC	NA	Gill rakers	NA
Alaska	Iceland	9.891	Gill rakers	0.001
BC	Iceland	20.743	Gill rakers	0.003
Iceland	Iceland	12.308	Gill rakers	1.000
Scotland	Iceland	NA	Gill rakers	NA
Alaska	Scotland	NA	Gill rakers	NA
BC	Scotland	NA	Gill rakers	NA
Iceland	Scotland	NA	Gill rakers	NA
Scotland	Scotland	NA	Gill rakers	NA

Supplementary Table 6. ANCOVA modelling of environment x phenotype interactions across adaptive radiations. Each phenotype was modelled against all environment variables, and in each case five models were compared that included the environmental variable and radiation as explanatory variables. Models increased in complexity from null (~1) to full interaction (Env * Radiation). The best model was chosen on the basis of lowest AIC, with a difference of >2 required for a more complex model to be favoured over a simpler model. ANCOVA results are summarised for the best model. NA values here reflect the null model. All p-values were FDR-corrected.

Phenotype	Env.	Null	Intercept (Radiation)	Slope (Env)	Intercept + Slope	Intercept * Slope	Best Model Variables	df	F	p	Variance Explained	fdr
Armour PC1	Ca	295.7	295.7	294.1	293.1	**281.8**	Ca	1,71	4.625	3.52E-02	0.296	4.50E-02
							Radiation	3,68	2.778	4.81E-02	0.296	5.56E-02
							Ca: Radiation	3,65	5.787	1.43E-03	0.296	2.76E-03
Armour PC1	Gyro	**295.7**	295.7	296.3	297.1	301.7	NA	NA	NA	NA	NA	NA
Armour PC1	Na	295.7	295.7	297.7	296.6	**285.7**	Na	1,71	0.002	9.64E-01	0.26	9.64E-01
							Radiation	3,68	2.804	4.66E-02	0.26	5.51E-02
							Na: Radiation	3,65	5.641	1.69E-03	0.26	3.14E-03
Armour PC1	pH	295.7	295.7	288.8	289.8	290.4	pH	1,71	9.2	3.38E-03	0.113	5.86E-03
Armour PC1	Schisto	**295.7**	295.7	297.4	297.4	301.9	NA	NA	NA	NA	NA	NA
Armour PC1	Zn	**295.7**	295.7	297.4	297.1	295.8	NA	NA	NA	NA	NA	NA
Armour PC1	Lake_Area	295.7	295.7	293.7	295.5	**291.5**	Lake_Area	1,71	4.435	3.91E-02	0.204	4.73E-02
							Radiation	3,68	1.49	2.26E-01	0.204	2.35E-01
							Lake_Area: Radiation	3,65	3.174	2.99E-02	0.204	3.99E-02
Armour PC2	Ca	189.9	184.1	189.6	177.4	**171.2**	Ca	1,71	3.191	7.87E-02	0.338	8.53E-02
							Radiation	3,68	7.241	2.89E-04	0.338	6.27E-04
							Ca: Radiation	3,65	3.94	1.20E-02	0.338	1.74E-02
Armour PC2	Gyro	189.9	**184.1**	191.8	185.7	191.5	Radiation	3,69	4.018	1.07E-02	0.143	1.60E-02
Armour PC2	Na	189.9	184.1	187.4	186.1	**178.1**	Na	1,71	5.568	2.13E-02	0.277	2.92E-02
							Radiation	3,68	2.749	4.98E-02	0.277	5.63E-02
							Na: Radiation	3,65	4.59	5.63E-03	0.277	9.44E-03
Armour PC2	pH	189.9	184.1	190.2	180.2	**176.7**	pH	1,71	2.171	1.45E-01	0.289	1.54E-01
							Radiation	3,68	6.038	1.08E-03	0.289	2.17E-03
							pH: Radiation	3,65	3.016	3.62E-02	0.289	4.50E-02
Armour PC2	Schisto	189.9	**184.1**	190.9	185.9	191.1	Radiation	3,69	4.018	1.07E-02	0.143	1.60E-02
Armour PC2	Zn	189.9	**184.1**	189.8	185.8	189.2	Radiation	3,69	4.018	1.07E-02	0.143	1.60E-02
Armour PC2	Lake_Area	189.9	**184.1**	191.9	186.1	188.7	Radiation	3,69	4.018	1.07E-02	0.143	1.60E-02
Shape PC1	Ca	-396.3	**-430.7**	-401.6	-431.5	-425.9	Radiation	3,69	17.004	2.27E-08	0.415	5.61E-08
Shape PC1	Gyro	-396.3	-430.7	-395	-431.2	**-434.8**	Gyro	1,71	1.341	2.51E-01	0.487	2.56E-01
							Radiation	3,68	19.34	4.50E-09	0.487	1.56E-08
							Gyro: Radiation	3,65	3.012	3.63E-02	0.487	4.50E-02
Shape PC1	Na	-396.3	-430.7	-398	**-435.5**	-435.2	Na	1,71	6.51	1.30E-02	0.462	1.82E-02

							Radiation	3,68	18.432	7.40E-09	0.462	2.40E-08
Shape PC1	pH	-396.3	**-430.7**	-402	-429.8	-427.3	Radiation	3,69	17.004	2.27E-08	0.415	5.61E-08
Shape PC1	Schisto	-396.3	**-430.7**	-394.3	-428.7	-423.6	Radiation	3,69	17.004	2.27E-08	0.415	5.61E-08
Shape PC1	Zn	-396.3	**-430.7**	-394.4	-429.2	-424.1	Radiation	3,69	17.004	2.27E-08	0.415	5.61E-08
Shape PC1	Lake_A rea	-396.3	**-430.7**	-395.1	-428.8	-430.6	Radiation	3,69	17.004	2.27E-08	0.415	5.61E-08
Shape PC2	Ca	-461.1	**-511**	-459.6	-509	-509.5	Radiation	3,69	26.464	1.67E-11	0.524	1.24E-10
Shape PC2	Gyro	-461.1	**-511**	-459.7	-510.3	-507.3	Radiation	3,69	26.464	1.67E-11	0.524	1.24E-10
Shape PC2	Na	-461.1	**-511**	-466.3	-512.3	-509.8	Radiation	3,69	26.464	1.67E-11	0.524	1.24E-10
Shape PC2	pH	-461.1	**-511**	-461.7	-509.1	-505.8	Radiation	3,69	26.464	1.67E-11	0.524	1.24E-10
Shape PC2	Schisto	-461.1	-511	-484.5	**-514.6**	-509.8	Schisto	1,71	46.443	3.05E-09	0.555	1.13E-08
							Radiation	3,68	14.473	2.17E-07	0.555	5.13E-07
Shape PC2	Zn	-461.1	-511	-495.6	-509	**-519.4**	Zn	1,71	68.997	8.34E-12	0.605	1.24E-10
							Radiation	3,68	8.247	9.94E-05	0.605	2.25E-04
							Zn: Radiation	3,65	5.473	2.04E-03	0.605	3.67E-03
Shape PC2	Lake_A rea	-461.1	**-511**	-459.8	-509.1	-504.5	Radiation	3,69	26.464	1.67E-11	0.524	1.24E-10
Gill Raker N	Ca	282.1	**235.5**	281.8	236.9	236.8	Radiation	3,69	24.259	7.88E-11	0.503	3.15E-10
Gill Raker N	Gyro	282.1	235.5	282.2	**231.1**	230.9	Gyro	1,71	3.782	5.59E-02	0.54	6.19E-02
							Radiation	3,68	26.917	1.37E-11	0.54	1.24E-10
Gill Raker N	Na	282.1	**235.5**	270.9	237.1	241.3	Radiation	3,69	24.259	7.88E-11	0.503	3.15E-10
Gill Raker N	pH	282.1	**235.5**	283.3	237.4	240.5	Radiation	3,69	24.259	7.88E-11	0.503	3.15E-10
Gill Raker N	Schisto	282.1	**235.5**	276.4	237	238.7	Radiation	3,69	24.259	7.88E-11	0.503	3.15E-10
Gill Raker N	Zn	282.1	235.5	243.9	**232.1**	234.9	Zn	1,71	63.613	2.42E-11	0.534	1.58E-10
							Radiation	3,68	6.289	7.88E-04	0.534	1.64E-03
Gill Raker N	Lake_A rea	282.1	**235.5**	284	235.5	237.5	Radiation	3,69	24.259	7.88E-11	0.503	3.15E-10
Gill Raker L	Ca	**-120.2**	-114.8	-118.3	-112.8	-120.2	NA	NA	NA	NA	NA	NA
Gill Raker L	Gyro	**-120.2**	-114.8	-118.4	-113.2	-109.8	NA	NA	NA	NA	NA	NA
Gill Raker L	Na	**-120.2**	-114.8	-119.3	-115.5	-111.5	NA	NA	NA	NA	NA	NA
Gill Raker L	pH	**-120.2**	-114.8	-118.2	-112.9	-110.8	NA	NA	NA	NA	NA	NA
Gill Raker L	Schisto	**-120.2**	-114.8	-121	-115.3	-110.2	NA	NA	NA	NA	NA	NA
Gill Raker L	Zn	**-120.2**	-114.8	-118.6	-112.9	-108.7	NA	NA	NA	NA	NA	NA
Gill Raker L	Lake_A rea	**-120.2**	-114.8	-119.8	-115.1	-111.2	NA	NA	NA	NA	NA	NA

Supplementary Table 7. F_{ST} values among the four countries based on 8,395 SNPs with no Chr XIX. Within radiations, individuals from different populations were pooled in order to estimate the F_{ST} values between radiations.

	Iceland	B.C.	Alaska
Scotland	0.194	0.338	0.329
Iceland		0.323	0.314
B.C.			0.198

Supplementary Table 8. Results of AMOVA over all populations. Individuals were nested within populations (Pop), within radiations (Rad), within continents.

	Sigma	%
Variations Between Continent	889.741	34.748
Variations Between Rad Within Continent	142.320	5.558
Variations Between Pop Within Rad	366.516	14.314
Variations Between samples Within Pop	228.970	8.942
Variations Within samples	932.972	36.437
Total variations	2560.519	100

Supplementary Table 9. Numbers of SNPs and windows associated with each of 12 phenotypic traits and 7 environmental variables in the four independent adaptive radiations.

Location	Variable	Associated SNP N	Associated Window N				
			50k	75k	100k	200k	0.1 cM
Alaska	Ca	715	84	80	74	51	56
Alaska	Gyro	166	27	27	24	23	23
Alaska	Na	205	40	34	35	31	29
Alaska	pH	305	42	42	40	35	31
Alaska	Schisto	226	43	43	37	33	33
Alaska	Zn	285	43	42	41	34	35
Alaska	Lake_Area	13	13	13	12	9	7
Alaska	Shape_PC1	152	36	36	33	32	23
Alaska	Shape_PC2	242	52	45	39	30	34
Alaska	Shape_PC3	205	43	42	37	29	31
Alaska	DS1	259	50	43	43	37	31
Alaska	DS2	179	33	30	29	28	31
Alaska	PS	470	63	58	59	41	43
Alaska	LP	682	81	70	63	47	59
Alaska	HP	544	65	60	48	36	47
Alaska	BAP	453	62	56	56	41	41
Alaska	Plate_N	424	69	65	59	40	42
Alaska	Gill_Raker_L	344	57	54	49	39	41
Alaska	Gill_Raker_N	104	28	23	20	20	19
BC	Ca	750	75	68	60	41	46
BC	Gyro	457	55	61	53	44	36
BC	Na	921	136	123	109	96	77
BC	pH	620	61	61	53	33	40
BC	Schisto	243	38	38	33	28	34
BC	Zn	96	30	27	23	19	20
BC	Lake_Area	154	34	34	32	30	23
BC	Shape_PC1	116	21	16	12	10	15
BC	Shape_PC2	433	43	45	40	30	31
BC	Shape_PC3	365	45	45	45	36	36
BC	DS1	966	130	120	113	91	85
BC	DS2	875	134	122	115	94	83
BC	PS	991	146	136	126	98	90
BC	LP	942	145	130	119	101	84
BC	HP	641	93	89	77	64	61
BC	BAP	386	54	52	47	31	39
BC	Plate_N	709	129	114	101	79	72

BC	Gill_Raker_L	617	64	69	62	52	46
BC	Gill_Raker_N	936	138	118	113	86	74
Iceland	Ca	142	32	30	29	21	20
Iceland	Gyro	380	45	44	34	26	36
Iceland	Na	180	38	34	29	21	27
Iceland	pH	391	59	57	53	40	43
Iceland	Schisto	432	56	57	53	40	46
Iceland	Zn	395	48	48	40	24	37
Iceland	Lake_Area	400	43	41	37	19	30
Iceland	Shape_PC1	569	59	51	48	32	46
Iceland	Shape_PC2	200	39	34	30	22	31
Iceland	Shape_PC3	215	37	33	27	21	28
Iceland	DS1	158	29	28	25	23	24
Iceland	DS2	148	26	24	20	18	21
Iceland	PS	511	53	51	43	27	38
Iceland	LP	306	38	40	40	29	32
Iceland	HP	252	49	39	43	28	32
Iceland	BAP	332	36	37	31	21	30
Iceland	Plate_N	194	41	37	34	28	26
Iceland	Gill_Raker_L	209	38	34	34	27	27
Iceland	Gill_Raker_N	296	45	46	46	42	35
Scotland	Ca	324	36	37	37	30	30
Scotland	Gyro	301	23	23	20	16	17
Scotland	Na	495	43	38	43	31	34
Scotland	pH	401	42	40	38	30	29
Scotland	Schisto	541	46	35	39	28	28
Scotland	Zn	87	26	19	17	10	20
Scotland	Lake_Area	20	11	10	9	8	6
Scotland	Shape_PC1	127	33	28	20	15	16
Scotland	Shape_PC2	697	51	54	48	40	50
Scotland	Shape_PC3	47	23	20	12	6	20
Scotland	DS1	154	24	23	19	17	22
Scotland	DS2	197	34	34	25	19	33
Scotland	PS	385	37	33	31	33	28
Scotland	LP	204	35	30	26	25	20
Scotland	HP	394	49	43	44	34	25
Scotland	BAP	275	34	34	37	28	40
Scotland	Plate_N	334	41	37	43	36	33
Scotland	Gill_Raker_L	44	25	15	16	8	15
Scotland	Gill_Raker_N	351	44	40	40	32	27

Supplementary Table 10. Results for permuted (10,000 runs) parallelism across all radiations. Results are shown for each group of radiations compared, with the permuted expected, observed parallel, and FDR-corrected p-value. Significant parallelism is assumed when FDR < 0.05.

Variable	Comparison	Expected	Observed	FDR
Ca	All 4	0	0	1
Ca	Alaska & BC & Iceland	0.003	0	1
Ca	Alaska & BC & Scotland	0.005	0	1
Ca	Alaska & Iceland & Scotland	0.002	0	1
Ca	BC & Iceland & Scotland	0.001	0	1
Ca	Alaska & BC	0.94	6	5.00E-04
Ca	Alaska & Iceland	0.368	3	0.0047
Ca	Alaska & Scotland	0.428	1	0.3535
Ca	BC & Iceland	0.325	0	1
Ca	BC & Scotland	0.372	1	0.31
Ca	Iceland & Scotland	0.171	3	7.00E-04
Gyro	All 4	0	0	1
Gyro	Alaska & BC & Iceland	0.001	0	1
Gyro	Alaska & BC & Scotland	0.001	0	1
Gyro	Alaska & Iceland & Scotland	0.001	0	1
Gyro	BC & Iceland & Scotland	0.001	0	1
Gyro	Alaska & BC	0.224	2	0.0216
Gyro	Alaska & Iceland	0.18	0	1
Gyro	Alaska & Scotland	0.086	0	1
Gyro	BC & Iceland	0.353	1	0.2999
Gyro	BC & Scotland	0.18	1	0.1646
Gyro	Iceland & Scotland	0.155	0	1
Na	All 4	0	0	1
Na	Alaska & BC & Iceland	0.004	0	1
Na	Alaska & BC & Scotland	0.004	0	1
Na	Alaska & Iceland & Scotland	0.001	0	1
Na	BC & Iceland & Scotland	0.004	0	1
Na	Alaska & BC	0.803	1	0.5608
Na	Alaska & Iceland	0.209	0	1
Na	Alaska & Scotland	0.229	0	1
Na	BC & Iceland	0.72	1	0.5219
Na	BC & Scotland	0.832	1	0.5686
Na	Iceland & Scotland	0.254	1	0.2275
pH	All 4	0	0	1
pH	Alaska & BC & Iceland	0.003	0	1
pH	Alaska & BC & Scotland	0.002	0	1
pH	Alaska & Iceland & Scotland	0.002	0	1

pH	BC & Iceland & Scotland	0.003	0	1
pH	Alaska & BC	0.375	1	0.3132
pH	Alaska & Iceland	0.333	0	1
pH	Alaska & Scotland	0.252	0	1
pH	BC & Iceland	0.504	2	0.0895
pH	BC & Scotland	0.341	1	0.2921
pH	Iceland & Scotland	0.371	5	1.00E-04
Schisto	All 4	0	0	1
Schisto	Alaska & BC & Iceland	0.002	0	1
Schisto	Alaska & BC & Scotland	0.002	0	1
Schisto	Alaska & Iceland & Scotland	0.002	0	1
Schisto	BC & Iceland & Scotland	0.001	0	1
Schisto	Alaska & BC	0.239	1	0.2166
Schisto	Alaska & Iceland	0.337	1	0.2921
Schisto	Alaska & Scotland	0.278	0	1
Schisto	BC & Iceland	0.289	2	0.0325
Schisto	BC & Scotland	0.244	1	0.2196
Schisto	Iceland & Scotland	0.386	0	1
Zn	All 4	0	0	1
Zn	Alaska & BC & Iceland	0.001	0	1
Zn	Alaska & BC & Scotland	0.001	0	1
Zn	Alaska & Iceland & Scotland	0.001	0	1
Zn	BC & Iceland & Scotland	0	0	1
Zn	Alaska & BC	0.183	1	0.1688
Zn	Alaska & Iceland	0.294	1	0.2553
Zn	Alaska & Scotland	0.16	0	1
Zn	BC & Iceland	0.2	0	1
Zn	BC & Scotland	0.114	1	0.1078
Zn	Iceland & Scotland	0.187	0	1
Lake_Area	All 4	0	0	1
Lake_Area	Alaska & BC & Iceland	0.001	0	1
Lake_Area	Alaska & BC & Scotland	0	0	1
Lake_Area	Alaska & Iceland & Scotland	0	0	1
Lake_Area	BC & Iceland & Scotland	0	0	1
Lake_Area	Alaska & BC	0.064	0	1
Lake_Area	Alaska & Iceland	0.08	0	1
Lake_Area	Alaska & Scotland	0.02	0	1
Lake_Area	BC & Iceland	0.204	0	1
Lake_Area	BC & Scotland	0.056	0	1
Lake_Area	Iceland & Scotland	0.073	0	1
Shape_PC1	All 4	0	0	1

Shape_PC1	Alaska & BC & Iceland	0.001	0	1
Shape_PC1	Alaska & BC & Scotland	0.001	0	1
Shape_PC1	Alaska & Iceland & Scotland	0.001	0	1
Shape_PC1	BC & Iceland & Scotland	0.001	0	1
Shape_PC1	Alaska & BC	0.116	0	1
Shape_PC1	Alaska & Iceland	0.301	0	1
Shape_PC1	Alaska & Scotland	0.162	1	0.1508
Shape_PC1	BC & Iceland	0.167	1	0.1556
Shape_PC1	BC & Scotland	0.098	0	1
Shape_PC1	Iceland & Scotland	0.293	0	1
Shape_PC2	All 4	0	0	1
Shape_PC2	Alaska & BC & Iceland	0.002	0	1
Shape_PC2	Alaska & BC & Scotland	0.003	0	1
Shape_PC2	Alaska & Iceland & Scotland	0.002	0	1
Shape_PC2	BC & Iceland & Scotland	0.003	0	1
Shape_PC2	Alaska & BC	0.33	1	0.2808
Shape_PC2	Alaska & Iceland	0.277	0	1
Shape_PC2	Alaska & Scotland	0.373	0	1
Shape_PC2	BC & Iceland	0.236	1	0.2114
Shape_PC2	BC & Scotland	0.304	0	1
Shape_PC2	Iceland & Scotland	0.299	1	0.2635
Shape_PC3	All 4	0	0	1
Shape_PC3	Alaska & BC & Iceland	0.002	0	1
Shape_PC3	Alaska & BC & Scotland	0.001	0	1
Shape_PC3	Alaska & Iceland & Scotland	0.001	0	1
Shape_PC3	BC & Iceland & Scotland	0.001	0	1
Shape_PC3	Alaska & BC	0.284	1	0.2498
Shape_PC3	Alaska & Iceland	0.216	0	1
Shape_PC3	Alaska & Scotland	0.144	0	1
Shape_PC3	BC & Iceland	0.223	1	0.2023
Shape_PC3	BC & Scotland	0.137	0	1
Shape_PC3	Iceland & Scotland	0.132	0	1
DS1	All 4	0	0	1
DS1	Alaska & BC & Iceland	0.004	0	1
DS1	Alaska & BC & Scotland	0.003	0	1
DS1	Alaska & Iceland & Scotland	0.001	0	1
DS1	BC & Iceland & Scotland	0.002	0	1
DS1	Alaska & BC	0.947	0	1
DS1	Alaska & Iceland	0.2	0	1
DS1	Alaska & Scotland	0.168	1	0.1551
DS1	BC & Iceland	0.519	1	0.4112

DS1	BC & Scotland	0.432	1	0.3517
DS1	Iceland & Scotland	0.107	1	0.1011
DS2	All 4	0	0	1
DS2	Alaska & BC & Iceland	0.002	0	1
DS2	Alaska & BC & Scotland	0.003	0	1
DS2	Alaska & Iceland & Scotland	0	0	1
DS2	BC & Iceland & Scotland	0.003	0	1
DS2	Alaska & BC	0.659	1	0.4845
DS2	Alaska & Iceland	0.122	0	1
DS2	Alaska & Scotland	0.157	1	0.1451
DS2	BC & Iceland	0.486	2	0.0857
DS2	BC & Scotland	0.629	0	1
DS2	Iceland & Scotland	0.131	3	4.00E-04
PS	All 4	0	0	1
PS	Alaska & BC & Iceland	0.01	0	1
PS	Alaska & BC & Scotland	0.007	0	1
PS	Alaska & Iceland & Scotland	0.002	0	1
PS	BC & Iceland & Scotland	0.007	0	1
PS	Alaska & BC	1.347	4	0.0444
PS	Alaska & Iceland	0.455	1	0.3649
PS	Alaska & Scotland	0.323	1	0.275
PS	BC & Iceland	1.061	2	0.2845
PS	BC & Scotland	0.746	3	0.0392
PS	Iceland & Scotland	0.289	0	1
LP	All 4	0	0	1
LP	Alaska & BC & Iceland	0.009	0	1
LP	Alaska & BC & Scotland	0.008	0	1
LP	Alaska & Iceland & Scotland	0.003	0	1
LP	BC & Iceland & Scotland	0.003	1	0.003
LP	Alaska & BC	1.736	2	0.5242
LP	Alaska & Iceland	0.426	4	8.00E-04
LP	Alaska & Scotland	0.389	2	0.0553
LP	BC & Iceland	0.777	0	1
LP	BC & Scotland	0.686	1	0.5057
LP	Iceland & Scotland	0.192	0	1
HP	All 4	0	0	1
HP	Alaska & BC & Iceland	0.007	0	1
HP	Alaska & BC & Scotland	0.006	0	1
HP	Alaska & Iceland & Scotland	0.003	0	1
HP	BC & Iceland & Scotland	0.004	0	1
HP	Alaska & BC	0.889	1	0.5904

HP	Alaska & Iceland	0.458	0	1
HP	Alaska & Scotland	0.434	0	1
HP	BC & Iceland	0.629	1	0.4685
HP	BC & Scotland	0.625	0	1
HP	Iceland & Scotland	0.369	1	0.3091
BAP	All 4	0	0	1
BAP	Alaska & BC & Iceland	0.002	0	1
BAP	Alaska & BC & Scotland	0.003	0	1
BAP	Alaska & Iceland & Scotland	0.001	0	1
BAP	BC & Iceland & Scotland	0.002	0	1
BAP	Alaska & BC	0.489	0	1
BAP	Alaska & Iceland	0.315	0	1
BAP	Alaska & Scotland	0.295	0	1
BAP	BC & Iceland	0.272	0	1
BAP	BC & Scotland	0.247	0	1
BAP	Iceland & Scotland	0.185	0	1
Plate_N	All 4	0	0	1
Plate_N	Alaska & BC & Iceland	0.01	0	1
Plate_N	Alaska & BC & Scotland	0.007	0	1
Plate_N	Alaska & Iceland & Scotland	0.003	0	1
Plate_N	BC & Iceland & Scotland	0.005	0	1
Plate_N	Alaska & BC	1.332	8	1.00E-04
Plate_N	Alaska & Iceland	0.393	0	1
Plate_N	Alaska & Scotland	0.397	0	1
Plate_N	BC & Iceland	0.736	2	0.1689
Plate_N	BC & Scotland	0.719	0	1
Plate_N	Iceland & Scotland	0.248	1	0.2199
Gill_Raker_L	All 4	0	0	1
Gill_Raker_L	Alaska & BC & Iceland	0.003	0	1
Gill_Raker_L	Alaska & BC & Scotland	0.002	0	1
Gill_Raker_L	Alaska & Iceland & Scotland	0.001	0	1
Gill_Raker_L	BC & Iceland & Scotland	0.002	0	1
Gill_Raker_L	Alaska & BC	0.538	1	0.4172
Gill_Raker_L	Alaska & Iceland	0.304	1	0.2643
Gill_Raker_L	Alaska & Scotland	0.193	0	1
Gill_Raker_L	BC & Iceland	0.336	0	1
Gill_Raker_L	BC & Scotland	0.226	1	0.2036
Gill_Raker_L	Iceland & Scotland	0.149	0	1
Gill_Raker_N	All 4	0	0	1
Gill_Raker_N	Alaska & BC & Iceland	0.004	0	1
Gill_Raker_N	Alaska & BC & Scotland	0.004	0	1

Gill_Raker_N	Alaska & Iceland & Scotland	0.001	0	1
Gill_Raker_N	BC & Iceland & Scotland	0.007	0	1
Gill_Raker_N	Alaska & BC	0.567	7	0
Gill_Raker_N	Alaska & Iceland	0.172	0	1
Gill_Raker_N	Alaska & Scotland	0.171	0	1
Gill_Raker_N	BC & Iceland	0.853	0	1
Gill_Raker_N	BC & Scotland	0.827	1	0.5736
Gill_Raker_N	Iceland & Scotland	0.295	1	0.2553

Supplementary Table 11. 50kb Marine - Freshwater (MxF) outlier regions. Parallel windows are grouped and windows are ordered by extent of parallelism. Previous evidence of marine x freshwater association is also highlighted.

Window ID	Radiations	Previous Marine Freshwater evidence?
groupXX:8900000-9000000	Alaska & BC & Iceland & Scotland	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupI:21600000-21700000	Alaska & Iceland & Scotland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Erickson et al. 2016 Evolution/Peichel et al. 2001 Nature/Glazer et al. 2015 G3
groupI:21700000-21800000	Alaska & Iceland & Scotland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Erickson et al. 2016 Evolution/Peichel et al. 2001 Nature/Glazer et al. 2015 G3
groupIV:12800000-12900000	Alaska & Iceland & Scotland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Berner et al. 2014 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Wark et al. 2012 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo
groupI:8600000-8700000	Alaska & Iceland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Peichel et al. 2001 Nature/Glazer et al. 2015 G3
groupI:21800000-21900000	Alaska & Scotland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Erickson et al. 2016 Evolution/Peichel et al. 2001 Nature/Glazer et al. 2015 G3
groupIV:19800000-19900000	Alaska & Iceland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Liu et al. 2014 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupVIII:9300000-9400000	Alaska & BC	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution
groupXI:5400000-5500000	Alaska & BC	Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics
groupXI:5500000-5600000	Alaska & BC	Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Rogers et al. 2012 Evolution/Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics
groupXI:5700000-5800000	Alaska & BC	Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Rogers et al. 2012 Evolution/Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics
scaffold-37:0-100000	Alaska & BC	No
scaffold-37:100000-200000	Alaska & BC	No
scaffold-37:200000-300000	Alaska & BC	No
groupI:21500000-21600000	Iceland & Scotland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Erickson et al. 2016 Evolution/Peichel et al. 2001 Nature/Glazer et al. 2015 G3
groupIV:23900000-24000000	Iceland & Scotland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupXV:7100000-7200000	Iceland & Scotland	Albert et al. 2008 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics
groupXX:200000-300000	Iceland & Scotland	No

scaffold-47:1600000-1700000	Iceland & Scotland	No
groupI:9300000-9400000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Peichel et al. 2001 Nature/Glazer et al. 2015 G3
groupII:4500000-4600000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Rogers et al. 2012 Evolution/Miller et al. 2014 Genetics
groupIV:10500000-10600000	Alaska	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Colosimo et al. 2004 PLoS Biol/Shapiro et al. 2004 Nature/Erickson et al. 2014 Proc R Soc B/Erickson et al. 2016 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:11000000-11100000	Alaska	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Colosimo et al. 2004 PLoS Biol/Shapiro et al. 2004 Nature/Wark et al. 2012 G3/Erickson et al. 2014 Proc R Soc B/Erickson et al. 2016 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:11200000-11300000	Alaska	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Colosimo et al. 2004 PLoS Biol/Shapiro et al. 2004 Nature/Wark et al. 2012 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:11600000-11700000	Alaska	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Colosimo et al. 2004 PLoS Biol/Liu et al. 2014 G3/Shapiro et al. 2004 Nature/Wark et al. 2012 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:12700000-12800000	Alaska	Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Berner et al. 2014 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Wark et al. 2012 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo
groupIV:12900000-13000000	Alaska	Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Berner et al. 2014 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Wark et al. 2012 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo
groupIV:13800000-13900000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Liu et al. 2014 G3/Wark et al. 2012 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:16700000-16800000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Liu et al. 2014 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:18100000-18200000	Alaska	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Liu et al. 2014 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:19200000-19300000	Alaska	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Liu et al. 2014 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:19900000-20000000	Alaska	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Liu et al. 2014 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:20000000-20100000	Alaska	Hohenlohe et al 2010 PLoS Genet/Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Colosimo et al. 2004 PLoS Biol/Liu et al. 2014 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:23800000-23900000	Alaska	Hohenlohe et al 2010 PLoS Genet/Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:25100000-25200000	Alaska	Hohenlohe et al 2010 PLoS Genet/Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Cleves et al. 2014 PNAS/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3

groupIV:25700000-25800000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Cleves et al. 2014 PNAS/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:25800000-25900000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Cleves et al. 2014 PNAS/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:26100000-26200000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Cleves et al. 2014 PNAS/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:26200000-26300000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Cleves et al. 2014 PNAS/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:26300000-26400000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Cleves et al. 2014 PNAS/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:26400000-26500000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIX:8500000-8600000	Alaska	Arnegard et al. 2014 Nature/Rogers et al. 2012 Evolution/Miller et al. 2014 Genetics/Ellis et al. 2015 Development
groupIX:12400000-12500000	Alaska	Arnegard et al. 2014 Nature/Rogers et al. 2012 Evolution/Miller et al. 2014 Genetics/Ellis et al. 2015 Development
groupIX:12800000-12900000	Alaska	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Rogers et al. 2012 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Ellis et al. 2015 Development
groupV:4300000-4400000	Alaska	Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics
groupV:6200000-6300000	Alaska	Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution
groupVII:7300000-7400000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Colosimo et al. 2004 PLoS Biol/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3
groupVII:9300000-9400000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3
groupVII:9400000-9500000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3
groupVII:10100000-10200000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3
groupVII:12500000-12600000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3
groupVII:13400000-13500000	Alaska	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3
groupVII:14300000-14400000	Alaska	Hohenlohe et al 2010 PLoS Genet/Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3
groupVII:14400000-14500000	Alaska	Hohenlohe et al 2010 PLoS Genet/Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3
groupVII:14600000-14700000	Alaska	Hohenlohe et al 2010 PLoS Genet/Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3
groupVII:14700000-14800000	Alaska	Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3
groupVII:16800000-16900000	Alaska	Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Cleves et al. 2014 PNAS
groupVII:17000000-17100000	Alaska	Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Cleves et al. 2014 PNAS

groupVII:17100000-17200000	Alaska	Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Cleves et al. 2014 PNAS
groupVII:17700000-17800000	Alaska	Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Cleves et al. 2014 PNAS
groupVII:17900000-18000000	Alaska	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Cleves et al. 2014 PNAS
groupVII:18900000-19000000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3
groupVII:19500000-19600000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3
groupVII:19800000-19900000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3
groupVII:20000000-20100000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3
groupVIII:7200000-7300000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution
groupVIII:8300000-8400000	Alaska	Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution
groupVIII:8400000-8500000	Alaska	Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution
groupVIII:9600000-9700000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution
groupXI:5600000-5700000	Alaska	Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Rogers et al. 2012 Evolution/Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics
groupXI:6300000-6400000	Alaska	Conte et al. 2015 Genetics/Rogers et al. 2012 Evolution/Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics
groupXI:6500000-6600000	Alaska	Conte et al. 2015 Genetics/Rogers et al. 2012 Evolution/Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics
groupXI:8900000-9000000	Alaska	Conte et al. 2015 Genetics/Rogers et al. 2012 Evolution/Arnegard et al. 2014 Nature/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Glazer et al. 2015 G3
groupXI:9100000-9200000	Alaska	Conte et al. 2015 Genetics/Rogers et al. 2012 Evolution/Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Peichel et al. 2001 Nature/Glazer et al. 2015 G3
groupXI:9500000-9600000	Alaska	Conte et al. 2015 Genetics/Rogers et al. 2012 Evolution/Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Peichel et al. 2001 Nature/Glazer et al. 2015 G3
groupXII:12300000-12400000	Alaska	Albert et al. 2008 Evolution/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Miller et al. 2014 Genetics
groupXII:12400000-12500000	Alaska	Albert et al. 2008 Evolution/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Miller et al. 2014 Genetics
groupXII:14800000-14900000	Alaska	Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Miller et al. 2014 Genetics
groupXIII:11700000-11800000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Peichel et al. 2001 Nature
groupXIII:11800000-11900000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Peichel et al. 2001 Nature
groupXIII:12900000-13000000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Peichel et al. 2001 Nature
groupXX:6200000-6300000	Alaska	Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3

groupXX:8100000-8200000	Alaska	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupXX:9100000-9200000	Alaska	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupXX:9900000-10000000	Alaska	Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupXX:12300000-12400000	Alaska	Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupXX:12500000-12600000	Alaska	Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupXXI:2800000-2900000	Alaska	Erickson et al. 2016 Evolution/Cleves et al. 2014 PNAS/Erickson et al. 2014 Proc R Soc B/Miller et al. 2014 Genetics
groupXXI:5500000-5600000	Alaska	Hohenlohe et al 2010 PLoS Genet/Albert et al. 2008 Evolution/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Colosimo et al. 2004 PLoS Biol/Wark et al. 2012 G3/Ellis et al. 2015 Development/Erickson et al. 2014 Proc R Soc B/Miller et al. 2014 Genetics
scaffold-173:100000-200000	Alaska	No
scaffold-47:100000-200000	Alaska	No
groupII:6100000-6200000	BC	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Shapiro et al. 2004 Nature
groupIX:9900000-10000000	BC	Arnegard et al. 2014 Nature/Rogers et al. 2012 Evolution/Berner et al. 2014 Evolution/Miller et al. 2014 Genetics/Ellis et al. 2015 Development
groupV:3800000-3900000	BC	Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics
groupVII:21300000-21400000	BC	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3
groupXI:5300000-5400000	BC	Conte et al. 2015 Genetics/Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics
groupXI:5800000-5900000	BC	Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Rogers et al. 2012 Evolution/Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics
groupXI:7700000-7800000	BC	Conte et al. 2015 Genetics/Rogers et al. 2012 Evolution/Arnegard et al. 2014 Nature/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Glazer et al. 2015 G3
groupXIII:10600000-10700000	BC	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Peichel et al. 2001 Nature
groupXIII:13200000-13300000	BC	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Peichel et al. 2001 Nature
groupXVI:16900000-17000000	BC	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Ellis et al. 2015 Development
groupXX:7000000-7100000	BC	Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
scaffold-37:1500000-1600000	BC	No
scaffold-56:800000-900000	BC	No
groupI:24400000-24500000	Iceland	Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics
groupIV:22600000-22700000	Iceland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Liu et al. 2014 G3/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:26000000-26100000	Iceland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Cleves et al. 2014 PNAS/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3

groupIX:19800000-19900000	Iceland	No
groupXIV:11200000-11300000	Iceland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics
groupXVI:16400000-16500000	Iceland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Ellis et al. 2015 Development
groupXVIII:11700000-11800000	Iceland	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Miller et al. 2014 Genetics/Ellis et al. 2015 Development
groupXXI:5700000-5800000	Iceland	Hohenlohe et al 2010 PLoS Genet/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Ellis et al. 2015 Development/Erickson et al. 2014 Proc R Soc B/Miller et al. 2014 Genetics
groupXXI:5800000-5900000	Iceland	Hohenlohe et al 2010 PLoS Genet/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Ellis et al. 2015 Development/Erickson et al. 2014 Proc R Soc B/Miller et al. 2014 Genetics
groupXXI:6200000-6300000	Iceland	Hohenlohe et al 2010 PLoS Genet/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Ellis et al. 2015 Development/Erickson et al. 2014 Proc R Soc B/Miller et al. 2014 Genetics
groupXXI:6500000-6600000	Iceland	Hohenlohe et al 2010 PLoS Genet/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Ellis et al. 2015 Development/Erickson et al. 2014 Proc R Soc B/Miller et al. 2014 Genetics
groupXXI:6700000-6800000	Iceland	Hohenlohe et al 2010 PLoS Genet/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Ellis et al. 2015 Development/Erickson et al. 2014 Proc R Soc B/Miller et al. 2014 Genetics
groupXXI:6800000-6900000	Iceland	Hohenlohe et al 2010 PLoS Genet/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Ellis et al. 2015 Development/Erickson et al. 2014 Proc R Soc B/Miller et al. 2014 Genetics
groupXXI:7000000-7100000	Iceland	Hohenlohe et al 2010 PLoS Genet/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Ellis et al. 2015 Development/Erickson et al. 2014 Proc R Soc B/Miller et al. 2014 Genetics
groupXXI:7200000-7300000	Iceland	Hohenlohe et al 2010 PLoS Genet/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Ellis et al. 2015 Development/Erickson et al. 2014 Proc R Soc B/Miller et al. 2014 Genetics
scaffold-27:800000-900000	Iceland	No
groupIII:100000-200000	Scotland	Conte et al. 2015 Genetics
groupIV:10900000-11000000	Scotland	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Colosimo et al. 2004 PLoS Biol/Shapiro et al. 2004 Nature/Wark et al. 2012 G3/Erickson et al. 2014 Proc R Soc B/Erickson et al. 2016 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:22700000-22800000	Scotland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIX:15700000-15800000	Scotland	Arnegard et al. 2014 Nature/Rogers et al. 2012 Evolution/Ellis et al. 2015 Development
groupVII:19200000-19300000	Scotland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3
groupX:10200000-10300000	Scotland	Liu et al. 2014 G3/Colosimo et al. 2004 PLoS Biol/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Rogers et al. 2012 Evolution
groupXIV:8800000-8900000	Scotland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution
groupXX:100000-200000	Scotland	No
groupXX:3600000-3700000	Scotland	Arnegard et al. 2014 Nature/Miller et al. 2014 Genetics/Colosimo et al. 2004 PLoS Biol/Rogers et al. 2012 Evolution/Cleves et al. 2014 PNAS/Glazer et al. 2015 G3
groupXXI:7900000-8000000	Scotland	Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Ellis et al. 2015 Development/Erickson et al. 2014 Proc R Soc B/Miller et al. 2014 Genetics
scaffold-108:0-100000	Scotland	No

groupXX:8900000-9000000	Alaska & BC & Iceland & Scotland	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupI:21600000-21700000	Alaska & Iceland & Scotland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Erickson et al. 2016 Evolution/Peichel et al. 2001 Nature/Glazer et al. 2015 G3
groupI:21700000-21800000	Alaska & Iceland & Scotland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Erickson et al. 2016 Evolution/Peichel et al. 2001 Nature/Glazer et al. 2015 G3
groupIV:12800000-12900000	Alaska & Iceland & Scotland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Berner et al. 2014 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Wark et al. 2012 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo
groupI:8600000-8700000	Alaska & Iceland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Peichel et al. 2001 Nature/Glazer et al. 2015 G3
groupI:21800000-21900000	Alaska & Scotland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Erickson et al. 2016 Evolution/Peichel et al. 2001 Nature/Glazer et al. 2015 G3
groupIV:19800000-19900000	Alaska & Iceland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Liu et al. 2014 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupVIII:9300000-9400000	Alaska & BC	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution
groupXI:5400000-5500000	Alaska & BC	Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics
groupXI:5500000-5600000	Alaska & BC	Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Rogers et al. 2012 Evolution/Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics
groupXI:5700000-5800000	Alaska & BC	Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Rogers et al. 2012 Evolution/Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics
scaffold-37:0-100000	Alaska & BC	No
scaffold-37:100000-200000	Alaska & BC	No
scaffold-37:200000-300000	Alaska & BC	No
groupI:21500000-21600000	Iceland & Scotland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Erickson et al. 2016 Evolution/Peichel et al. 2001 Nature/Glazer et al. 2015 G3
groupIV:23900000-24000000	Iceland & Scotland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupXV:7100000-7200000	Iceland & Scotland	Albert et al. 2008 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics
groupXX:200000-300000	Iceland & Scotland	No
scaffold-47:1600000-1700000	Iceland & Scotland	No
groupI:9300000-9400000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Peichel et al. 2001 Nature/Glazer et al. 2015 G3
groupII:4500000-4600000	Alaska	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Rogers et al. 2012 Evolution/Miller et al. 2014 Genetics
groupIV:10500000-10600000	Alaska	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Colosimo et al. 2004 PLoS Biol/Shapiro et al. 2004 Nature/Erickson et al. 2014 Proc R Soc B/Erickson et al. 2016 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3

groupIV:11000000-11100000	Alaska	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Colosimo et al. 2004 PLoS Biol/Shapiro et al. 2004 Nature/Wark et al. 2012 G3/Erickson et al. 2014 Proc R Soc B/Erickson et al. 2016 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:11200000-11300000	Alaska	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Colosimo et al. 2004 PLoS Biol/Shapiro et al. 2004 Nature/Wark et al. 2012 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:11600000-11700000	Alaska	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Colosimo et al. 2004 PLoS Biol/Liu et al. 2014 G3/Shapiro et al. 2004 Nature/Wark et al. 2012 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
groupIV:12700000-12800000	Alaska	Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Berner et al. 2014 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Wark et al. 2012 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo
groupIV:12900000-13000000	Alaska	Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Berner et al. 2014 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Wark et al. 2012 G3/Erickson et al. 2014 Proc R Soc B/Glazer et al. 2014 EvoDevo

Supplementary Table 12. Summary table with total number of 50kb windows associated with variables in 2 or more radiations. Numbers in the diagonal (scaled green [low] to red [high]) are numbers of genes associated with the same variable (i.e. parallel windows). Table also highlights the number of windows associated with multiple variables (scaled green [low] to red [high]).

			Environmental Variables							Body shape			Armour traits							Trophic traits	
Traits/ variables		MxF	Ca	Gyro	Na	pH	Schisto	Zn	Lake Area	ShPC1	ShPC2	ShPC3	DS1	DS2	PS	LP	HP	BAP	Plate_N	Gill L	Gill N
	Marine - Fresh	21	2	0	1	2	0	0	0	0	0	0	0	0	1	1	1	0	1	0	1
Environment	Ca	0	14	0	1	3	0	0	0	0	0	0	1	1	0	1	0	0	2	0	0
	Gyro	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Na	0	0	0	4	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
	pH	0	0	0	0	9	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
	Schisto	0	0	0	0	0	5	0	0	0	1	0	1	1	0	0	1	0	0	0	0
	Zn	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lake Area	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Body Shape	Shape_PC1	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0
	Shape_PC2	0	0	0	0	0	0	0	0	0	3	0	1	1	0	0	1	0	0	0	0
	Shape_PC3	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Armour	DS1	0	0	0	0	0	0	0	0	0	0	0	4	2	0	0	1	0	0	0	0
	DS2	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	1	0	0	0	0
	PS	0	0	0	0	0	0	0	0	0	0	0	0	0	11	1	2	0	0	0	1
	LP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	1	0	1	0	0
	HP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
	BAP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Plate_N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0
Trophic	Gill_Raker_L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
	Gill_Raker_N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9

Supplementary Table 13. Regions of the genome associated with environmental variables in more than one radiation. Regions were pooled if associated windows were adjacent and associated in different radiations.

Variable	Window ID	Radiations	Previous Marine - Fresh / QTL evidence?
Ca	groupI:21550000-21800000	Alaska & Iceland & Scotland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Erickso
Ca	groupIII:15000000-15100000	Alaska & BC	Albert et al. 2008 Evolution/Miller et al. 2014 Genetics
Ca	groupIX:14800000-14850000	BC & Scotland	Arnegard et al. 2014 Nature/Rogers et al. 2012 Evolution/Liu et al. 2014 G3/Ellis et al. 2015 Development
Ca	groupVII:14750000-14800000	Alaska & BC	Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evo
Ca	groupVII:17800000-17950000	Alaska & BC	Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evo
Ca	groupVIII:9400000-9450000	Alaska & Iceland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution
Ca	groupX:3050000-3100000	Alaska & BC	Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution
Ca	groupXI:9000000-9100000	Alaska & BC	Conte et al. 2015 Genetics/Rogers et al. 2012 Evolution/Arnegard et al. 2014 Nature/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Peichel et
Ca	groupXII:18050000-18150000	BC & Scotland	Liu et al. 2014 G3/Miller et al. 2014 Genetics
Ca	groupXVI:13850000-13900000	Alaska & BC	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Miller et
Ca	groupXX:150000-200000	Alaska & Iceland	No
Ca	groupXX:12900000-12950000	Alaska & BC	Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Glazer
Ca	groupXXI:7900000-7950000	Alaska & Scotland	Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Ellis et al. 2015 Development/Erickson et al. 2014 Proc R Soc B/Miller et al. 2014 Genetics
Gyro	groupIII:11600000-11700000	BC & Iceland	Erickson et al. 2016 Evolution/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics
Gyro	groupVII:7800000-7850000	BC & Scotland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Colosimo et al. 2004 PLoS Biol
Gyro	groupVII:7950000-8000000	Alaska & BC	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Colosimo et al. 2004 PLoS Biol
Gyro	groupVII:21300000-21350000	Alaska & BC	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et
Gyro	groupVIII:10350000-10450000	Alaska & Iceland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution
Gyro	groupVIII:19250000-19300000	BC & Iceland	Peichel et al. 2001 Nature
Na	groupI:21550000-21800000	Iceland & Scotland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Erickso
Na	groupIII:50000-150000	Alaska & Iceland	Conte et al. 2015 Genetics
Na	groupVII:17900000-17950000	Alaska & BC	Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evo

Na	groupVIII:8250000-8300000	BC & Scotland	Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evo
Na	groupXII:12150000-12250000	Alaska & Scotland	Albert et al. 2008 Evolution/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Miller et al. 2014 Genetics
Na	groupXII:13050000-13250000	Alaska & BC	Albert et al. 2008 Evolution/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Miller et al. 2014 Genetics
Na	groupXX:8950000-9050000	Alaska & BC & Iceland	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers
pH	groupI:8550000-8650000	Alaska & BC	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers e
pH	groupI:21550000-21800000	Iceland & Scotland	Jones et al 2012 Nature/Hohenlohe et al 2010 PLoS Genet/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Erickso
pH	groupIV:22100000-22250000	Alaska & BC	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolutio
pH	groupIX:8400000-8450000	BC & Iceland	Arnegard et al. 2014 Nature/Rogers et al. 2012 Evolution/Miller et al. 2014 Genetics/Ellis et al. 2015 Development
pH	groupIX:9300000-9350000	BC & Iceland	Arnegard et al. 2014 Nature/Rogers et al. 2012 Evolution/Berner et al. 2014 Evolution/Miller et al. 2014 Genetics/Ellis et al. 2015 Developme
pH	groupVI:7650000-7750000	Alaska & BC	Arnegard et al. 2014 Nature
pH	groupVI:8000000-8050000	BC & Scotland	Arnegard et al. 2014 Nature
pH	groupVI:13950000-14000000	Iceland & Scotland	Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution
pH	groupVII:26900000-26950000	Iceland & Scotland	Arnegard et al. 2014 Nature/Rogers et al. 2012 Evolution/Cresko et al. 2004 PNAS/Liu et al. 2014 G3/Wark et al. 2012 G3/Miller et al. 2014 G
pH	groupXVIII:12200000-12300000	BC & Iceland	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Miller et al. 2014 Genetics/Ellis et al. 2015 Development
pH	groupXX:11700000-11800000	BC & Iceland	Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution/Glazer
pH	groupXXI:2700000-2750000	Alaska & BC	Erickson et al. 2016 Evolution/Cleves et al. 2014 PNAS/Erickson et al. 2014 Proc R Soc B/Miller et al. 2014 Genetics
pH	groupXXI:7900000-8000000	Alaska & Scotland	Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Ellis et al. 2015 Development/Erickson et al. 2014 Proc R Soc B/Miller et al. 2014 Genetics
Schisto	groupIII:11550000-11650000	Alaska & Iceland	Erickson et al. 2016 Evolution/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics
Schisto	groupIX:8550000-8600000	BC & Iceland	Arnegard et al. 2014 Nature/Rogers et al. 2012 Evolution/Miller et al. 2014 Genetics/Ellis et al. 2015 Development
Schisto	groupIX:14250000-14300000	BC & Scotland	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Rogers et al. 2012 Evolution/Liu et al. 2014 G3/Ellis et al. 2015 Development
Schisto	groupIX:14650000-14750000	Alaska & Scotland	Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Rogers et al. 2012 Evolution/Liu et al. 2014 G3/Ellis et al. 2015 Development
Schisto	groupX:9250000-9300000	Alaska & BC	Liu et al. 2014 G3/Miller et al. 2014 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3
Schisto	groupXVII:6550000-6650000	Alaska & Iceland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Rogers et al. 2012 Evolution/Miller et al. 2014 Genetics/Ellis et al. 2015 Developmen
Schisto	groupXVIII:6450000-6550000	BC & Scotland	Arnegard et al. 2014 Nature/Ellis et al. 2015 Development
Schisto	groupXX:3600000-3650000	BC & Iceland	Arnegard et al. 2014 Nature/Miller et al. 2014 Genetics/Colosimo et al. 2004 PLoS Biol/Rogers et al. 2012 Evolution/Cleves et al. 2014 PNAS/
Schisto	scaffold_27:400000-450000	Alaska & Iceland	No
Zn	groupI:8550000-8600000	Alaska & BC	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers e
Zn	groupIV:19650000-19750000	BC & Iceland	Hohenlohe et al 2010 PLoS Genet/Albert et al. 2008 Evolution/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Ev
Zn	groupIV:21200000-21300000	Alaska & Iceland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolutio

Zn	groupVII:6700000-6750000	BC & Scotland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/Colosimo et al. 2004 PLoS Biol
Zn	groupXVII:4650000-4750000	Iceland & Scotland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Miller et al. 2014 Genetics/Ellis et al.
Zn	groupXVIII:9750000-9850000	Alaska & Iceland	Arnegard et al. 2014 Nature/Miller et al. 2014 Genetics/Ellis et al. 2015 Development
Lake_Area	groupIV:15400000-15500000	Alaska & BC	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/
Lake_Area	groupVII:14950000-15050000	Alaska & BC	Hohenlohe et al 2010 PLoS Genet/Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics/Erickson et al. 2016 Evo
Lake_Area	groupXII:13900000-14000000	BC & Iceland	Albert et al. 2008 Evolution/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Miller et al. 2014 Genetics
Lake_Area	groupXVI:10950000-11050000	BC & Iceland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution/Miller et al. 2014 Genetics/Erickson e
Shape_PC1	groupIV:13000000-13050000	Alaska & Scotland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics/
Shape_PC1	groupXI:650000-750000	Alaska & BC	No
Shape_PC1	scaffold_114:300000-350000	BC & Iceland	No
Shape_PC2	groupIII:8900000-9000000	BC & Scotland	No
Shape_PC2	groupIX:8550000-8600000	Alaska & BC	Arnegard et al. 2014 Nature/Rogers et al. 2012 Evolution
Shape_PC2	groupV:9800000-9850000	BC & Iceland	Erickson et al. 2016 Evolution/Liu et al. 2014 G3
Shape_PC2	groupVI:8700000-8750000	Iceland & Scotland	Arnegard et al. 2014 Nature
Shape_PC2	groupXII:12900000-13000000	Alaska & Iceland	Albert et al. 2008 Evolution/Conte et al. 2015 Genetics/Liu et al. 2014 G3/Rogers et al. 2012 Evolution
Shape_PC2	groupXIII:3750000-3850000	BC & Iceland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics
Shape_PC3	groupIX:17200000-17300000	Iceland & Scotland	Arnegard et al. 2014 Nature/Rogers et al. 2012 Evolution
Shape_PC3	groupVII:6250000-6300000	Alaska & BC	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Miller et al. 2014 Genetics
Shape_PC3	groupVII:19600000-19650000	BC & Iceland	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Malek et al. 2012 Mol Ecol/Miller et al. 2014 Genetics
DS1	groupII:12500000-12600000	Alaska & BC	Conte et al. 2015 Genetics/Miller et al. 2014 Genetics
DS1	groupIII:15000000-15050000	BC & Iceland	Miller et al. 2014 Genetics
DS1	groupIV:12150000-12300000	Alaska & Iceland	Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Colosimo et al. 2004 PLoS Biol/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/
DS1	groupIV:17950000-18050000	Alaska & BC	Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
DS1	groupIV:18450000-18550000	Alaska & BC	Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
DS1	groupIX:8550000-8600000	Alaska & Scotland	Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
DS1	groupVII:11200000-11250000	Iceland & Scotland	Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Miller et al. 2014 Genetics
DS1	groupVIII:5400000-5500000	Alaska & BC	Miller et al. 2014 Genetics
DS1	groupXI:6250000-6350000	Alaska & BC	Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics

DS1	groupXIII:11850000-11900000	BC & Scotland	Miller et al. 2014 Genetics/Peichel et al. 2001 Nature
DS1	groupXXI:6400000-6500000	Alaska & BC	Erickson et al. 2016 Evolution
DS1	scaffold_27:1600000-1700000	BC & Iceland	No
DS2	groupI:7850000-7950000	Alaska & BC	Erickson et al. 2016 Evolution/Peichel et al. 2001 Nature/Shapiro et al. 2004 Nature
DS2	groupIII:15000000-15050000	Iceland & Scotland	Miller et al. 2014 Genetics
DS2	groupIV:7850000-7900000	Iceland & Scotland	Arnegard et al. 2014 Nature/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
DS2	groupIV:12250000-12300000	Alaska & BC	Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Colosimo et al. 2004 PLoS Biol/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/
DS2	groupIV:12950000-13050000	BC & Iceland & Scotland	Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Miller et al.
DS2	groupIV:18450000-18550000	Alaska & BC	Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
DS2	groupIX:8550000-8600000	Alaska & Scotland	Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
DS2	groupXI:7250000-7300000	BC & Iceland	Arnegard et al. 2014 Nature/Liu et al. 2014 G3/Miller et al. 2014 Genetics
DS2	groupXX:12500000-12550000	BC & Iceland	Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
DS2	scaffold_27:1500000-1700000	BC & Iceland	No
PS	groupI:7400000-7600000	Alaska & BC & Iceland	Erickson et al. 2016 Evolution/Peichel et al. 2001 Nature/Shapiro et al. 2004 Nature
PS	groupI:11850000-11900000	BC & Scotland	Erickson et al. 2016 Evolution/Peichel et al. 2001 Nature
PS	groupI:12200000-12250000	BC & Iceland	Erickson et al. 2016 Evolution/Peichel et al. 2001 Nature
PS	groupII:11550000-11600000	Alaska & BC	Conte et al. 2015 Genetics/Miller et al. 2014 Genetics
PS	groupII:14950000-15000000	Alaska & BC	Conte et al. 2015 Genetics/Miller et al. 2014 Genetics
PS	groupIII:11600000-11700000	Alaska & BC	Erickson et al. 2016 Evolution
PS	groupIV:12200000-12300000	BC & Iceland	Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Colosimo et al. 2004 PLoS Biol/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/
PS	groupIV:15150000-15200000	BC & Scotland	Arnegard et al. 2014 Nature/Cresko et al. 2004 PNAS/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et a
PS	groupIV:19850000-19900000	Alaska & BC	Arnegard et al. 2014 Nature/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
PS	groupVII:13500000-13600000	Alaska & BC	Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Miller et al. 2014 Genetics
PS	groupVII:16350000-16400000	BC & Scotland	Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Miller et al. 2014 Genetics
PS	groupX:14450000-14550000	Alaska & Scotland	No
PS	groupXI:6000000-6100000	Alaska & Iceland	Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics
PS	groupXII:14200000-14350000	Alaska & BC	No
PS	groupXVII:5400000-5450000	BC & Iceland	Miller et al. 2014 Genetics

PS	groupXX:12500000-12600000	Alaska & BC	Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
PS	groupXX:15750000-15800000	Alaska & Iceland	No
PS	groupXXI:6400000-6500000	Alaska & BC	Erickson et al. 2016 Evolution
PS	scaffold_48:650000-750000	Alaska & Iceland	No
LP	groupI:21550000-21800000	Alaska & Iceland	Erickson et al. 2016 Evolution/Peichel et al. 2001 Nature
LP	groupIII:11600000-11700000	Alaska & BC & Iceland	Erickson et al. 2016 Evolution
LP	groupIV:12250000-12400000	BC & Iceland & Scotland	Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Colosimo et al. 2004 PLoS Biol/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/
LP	groupIV:14400000-14450000	BC & Iceland & Scotland	Arnegard et al. 2014 Nature/Cresko et al. 2004 PNAS/Erickson et al. 2016 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et a
LP	groupIV:19850000-19900000	Alaska & BC	Arnegard et al. 2014 Nature/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
LP	groupIV:20000000-20050000	Alaska & Scotland	Arnegard et al. 2014 Nature/Colosimo et al. 2004 PLoS Biol/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
LP	groupIV:27250000-27300000	Alaska & Scotland	Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
LP	groupV:6300000-6350000	Alaska & Iceland	Miller et al. 2014 Genetics
LP	groupVII:13650000-13750000	Alaska & BC	Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Miller et al. 2014 Genetics
LP	groupVII:15450000-15550000	Alaska & BC	Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Miller et al. 2014 Genetics
LP	groupXI:6000000-6100000	Alaska & BC	Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Liu et al. 2014 G3/Miller et al. 2014 Genetics
LP	groupXII:14150000-14350000	Alaska & BC & Iceland	No
LP	groupXIII:15550000-15650000	Alaska & BC	Miller et al. 2014 Genetics/Peichel et al. 2001 Nature/Rogers et al. 2012 Evolution
LP	groupXXI:6400000-6500000	Alaska & BC	Erickson et al. 2016 Evolution
LP	groupXXI:6550000-6650000	Alaska & BC	Erickson et al. 2016 Evolution/Liu et al. 2014 G3
HP	groupIV:12950000-13050000	Alaska & BC	Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Miller et al.
HP	groupIV:19850000-19900000	Alaska & BC	Arnegard et al. 2014 Nature/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
HP	groupIX:8550000-8600000	Iceland & Scotland	Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
HP	groupVII:18250000-18350000	Alaska & BC	Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Miller et al. 2014 Genetics
HP	groupXVII:5400000-5450000	BC & Iceland	Miller et al. 2014 Genetics
HP	groupXVII:12500000-12600000	Alaska & Scotland	Miller et al. 2014 Genetics
BAP	groupII:5550000-5650000	Alaska & Scotland	Conte et al. 2015 Genetics/Miller et al. 2014 Genetics
BAP	groupVIII:9750000-9850000	BC & Scotland	Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics
Plate_N	groupI:11850000-12050000	Alaska & BC	Erickson et al. 2016 Evolution/Peichel et al. 2001 Nature

Plate_N	groupI:21550000-21800000	Iceland & Scotland	Erickson et al. 2016 Evolution/Peichel et al. 2001 Nature
Plate_N	groupIV:9750000-9800000	Alaska & BC	Arnegard et al. 2014 Nature/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
Plate_N	groupIV:12750000-12850000	Alaska & BC & Iceland	Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Miller et al. 2
Plate_N	groupIV:13450000-13500000	Alaska & BC	Arnegard et al. 2014 Nature/Berner et al. 2014 Evolution/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Miller et al. 2
Plate_N	groupIV:19800000-19950000	Alaska & BC	Arnegard et al. 2014 Nature/Liu et al. 2014 G3/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
Plate_N	groupIV:23900000-24000000	BC & Iceland	Arnegard et al. 2014 Nature/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
Plate_N	groupIV:25550000-25600000	Alaska & BC	Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
Plate_N	groupVII:14300000-14450000	Alaska & BC	Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Miller et al. 2014 Genetics
Plate_N	groupVII:15450000-15550000	Alaska & BC	Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Glazer et al. 2015 G3/Liu et al. 2014 G3/Miller et al. 2014 Genetics
Plate_N	groupVIII:9400000-9500000	BC & Iceland	Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics
Plate_N	groupXII:12700000-12800000	Alaska & BC	No
Plate_N	groupXX:150000-200000	BC & Iceland	No
Plate_N	groupXX:6150000-6200000	Alaska & BC	Miller et al. 2014 Genetics/Rogers et al. 2012 Evolution
Gill_Raker_L	groupIII:5350000-5400000	Alaska & Iceland	Conte et al. 2015 Genetics/Miller et al. 2014 Genetics
Gill_Raker_L	groupIV:11800000-11850000	BC & Scotland	Arnegard et al. 2014 Nature/Erickson et al. 2014 Proc R Soc B/Erickson et al. 2016 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
Gill_Raker_L	groupIX:14500000-14600000	Alaska & BC	Arnegard et al. 2014 Nature/Ellis et al. 2015 Development/Rogers et al. 2012 Evolution
Gill_Raker_L	groupVII:15000000-15050000	Alaska & BC	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics
Gill_Raker_N	groupIII:10400000-10450000	Alaska & BC	Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics
Gill_Raker_N	groupIV:13350000-13400000	Alaska & BC	Arnegard et al. 2014 Nature/Erickson et al. 2014 Proc R Soc B/Erickson et al. 2016 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3
Gill_Raker_N	groupIV:14150000-14250000	Alaska & BC	Arnegard et al. 2014 Nature/Cleves et al. 2014 PNAS/Erickson et al. 2014 Proc R Soc B/Erickson et al. 2016 Evolution/Glazer et al. 2014 EvoDe
Gill_Raker_N	groupIV:21400000-21500000	Alaska & BC	Arnegard et al. 2014 Nature/Erickson et al. 2016 Evolution/Glazer et al. 2014 EvoDevo/Glazer et al. 2015 G3/Miller et al. 2014 Genetics
Gill_Raker_N	groupIX:8350000-8450000	Iceland & Scotland	Ellis et al. 2015 Development/Rogers et al. 2012 Evolution
Gill_Raker_N	groupVII:14650000-14750000	Alaska & BC	Arnegard et al. 2014 Nature/Conte et al. 2015 Genetics/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics
Gill_Raker_N	groupX:14500000-14550000	Alaska & BC	Rogers et al. 2012 Evolution
Gill_Raker_N	groupXV:7150000-7200000	Iceland & Scotland	Miller et al. 2014 Genetics
Gill_Raker_N	groupXXI:6100000-6200000	Alaska & BC	Ellis et al. 2015 Development/Erickson et al. 2014 Proc R Soc B/Erickson et al. 2016 Evolution/Miller et al. 2014 Genetics
Gill_Raker_N	scaffold_47:100000-200000	BC & Scotland	No

Supplementary Table 14. Counts of windows (associated and non-associated with variables) included in the analysis. Columns represent Venn segments denoting windows common to all combinations of radiations.

	Window Size				
Groupings	50 kb	75 kb	100 kb	200 kb	0.1 cM
All 4	4868	4085	3536	2163	3711
Alaska & BC & Iceland	244	142	83	20	210
Alaska & BC & Scotland	220	141	80	20	187
Alaska & Iceland & Scotland	150	100	58	18	138
BC & Iceland & Scotland	301	177	126	33	215
Alaska & BC	494	274	141	32	498
Alaska & Iceland	23	19	6	4	25
Alaska & Scotland	24	15	4	2	17
BC & Iceland	42	22	13	2	35
BC & Scotland	59	33	18	5	29
Iceland & Scotland	383	216	135	52	361
Alaska	95	51	36	24	83
BC	158	82	57	12	111
Iceland	94	53	31	19	69
Scotland	92	52	24	7	97
Total	7247	5462	4348	2413	5786

Supplementary Dataset 1 (separate file)

All Bayenv2 associated windows for window sizes of a)50kb, b)75kb, c)100kb, d)200kb) and e)0.1cM. Chromosome/ scaffold where the window is located, base pair numbers at start and end of the window, Ensembl ID, the name of the radiation(s) and the associated variable / trait. Full names of traits / variables can be found in Figure 3.

Supplementary Dataset 2 (separate file)

Genes located in Bayenv2 associated windows along with GO information from Biomart. From left to right: Ensembl ID of the gene, gene common name, GO Term, GO name, 50kb window where gene is located, radiation and variables that are associated with windows where gene is located.

Supplementary Dataset 3 (separate file)

Summary table with details of each individual analysed (from left to right): sample code name, country of collection, year sample was collected in, code name for lake where sample was collected, sex, weight and standard length of each individual, RAD tag code and number of reads retained.

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