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Population structure and history of the Welsh sheep breeds determined by whole genome genotyping

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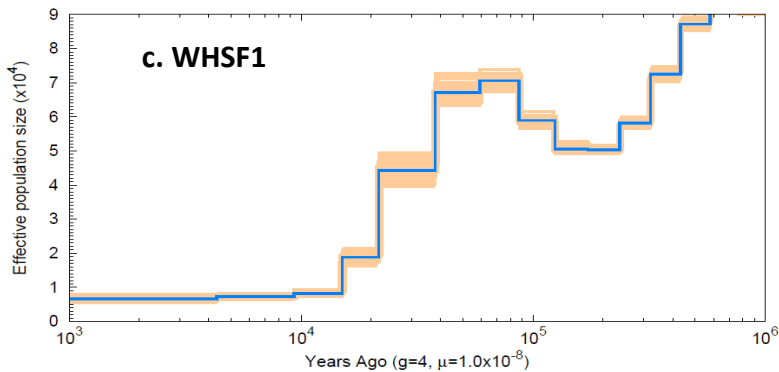
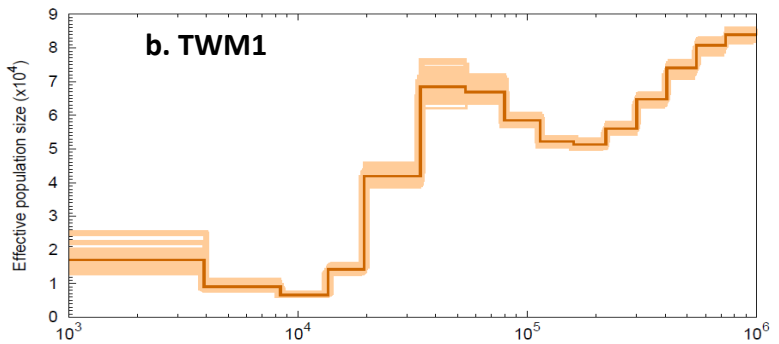
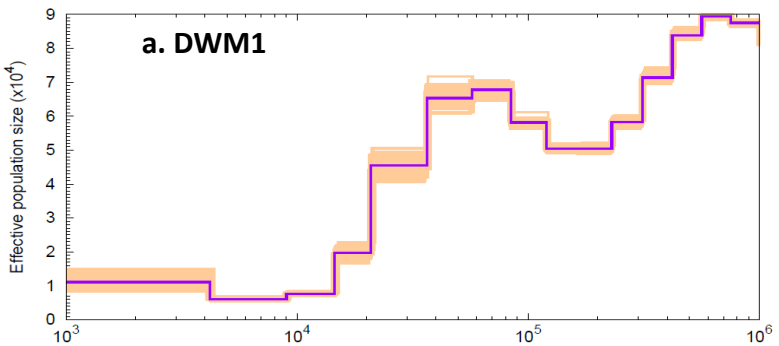
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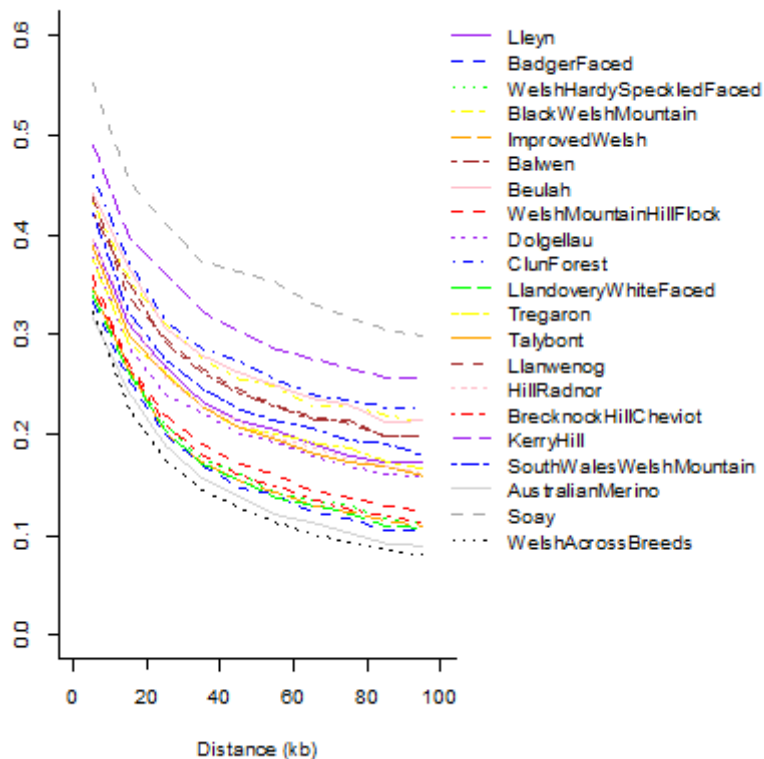
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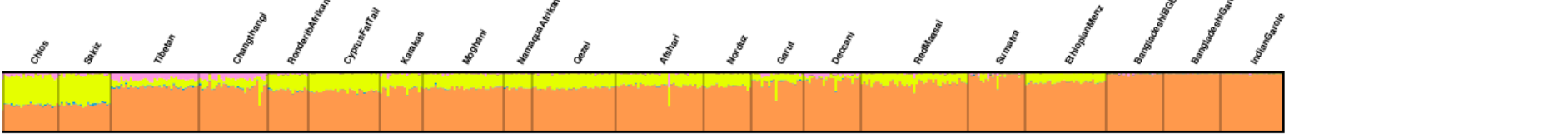
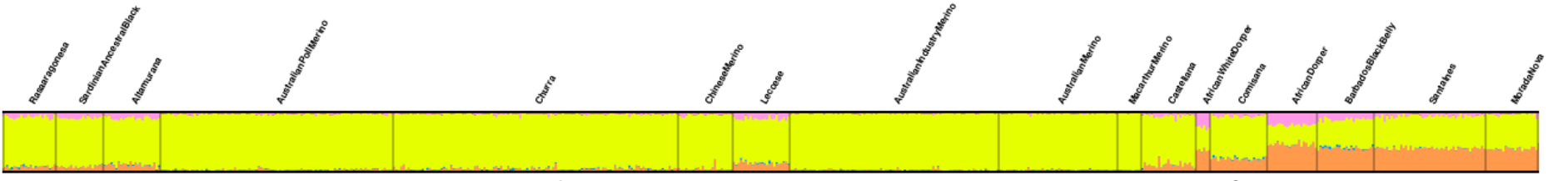
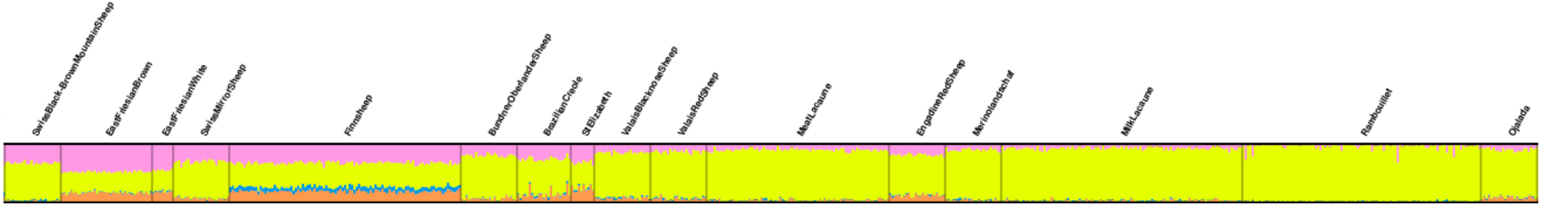
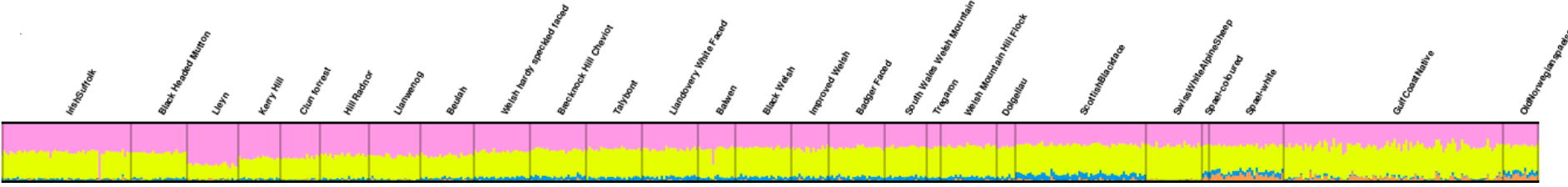
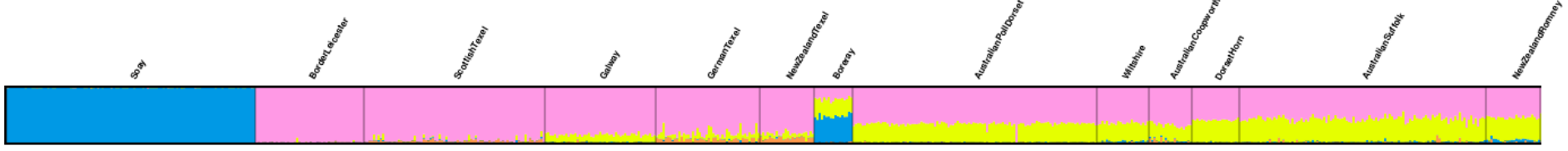
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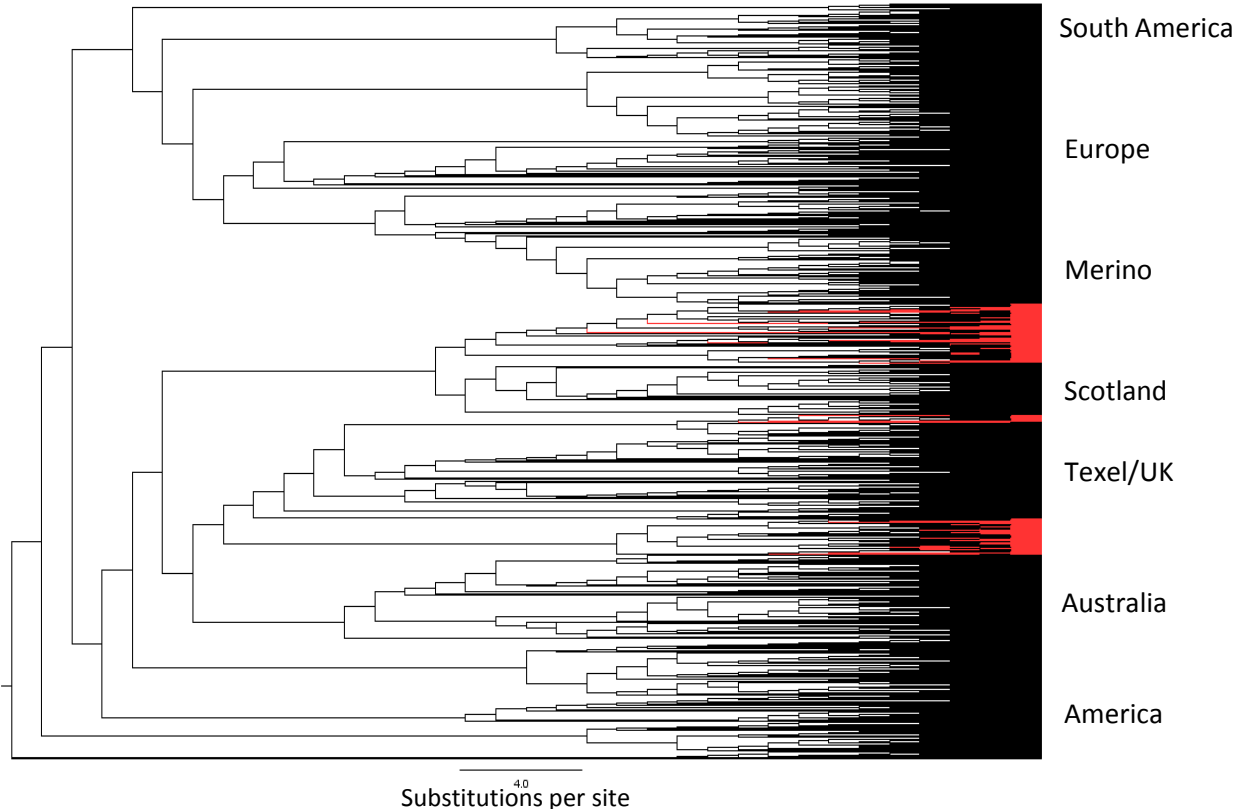
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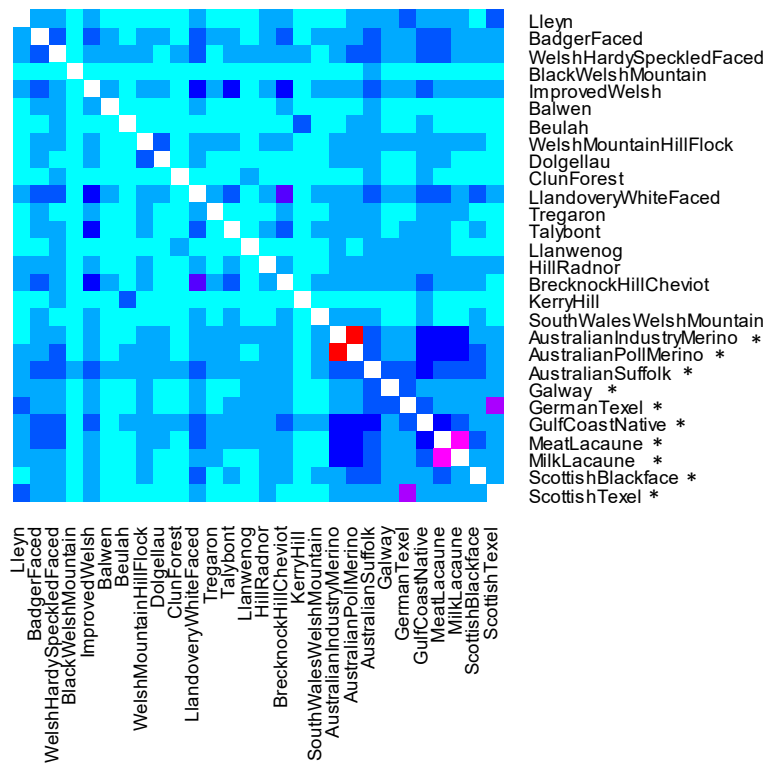
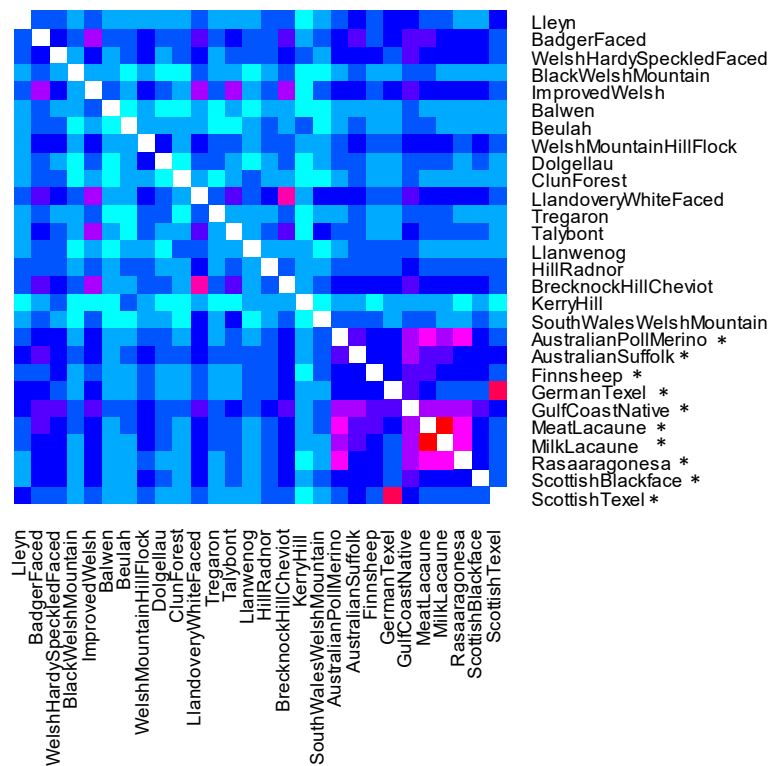
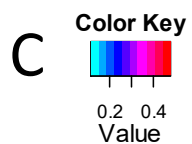
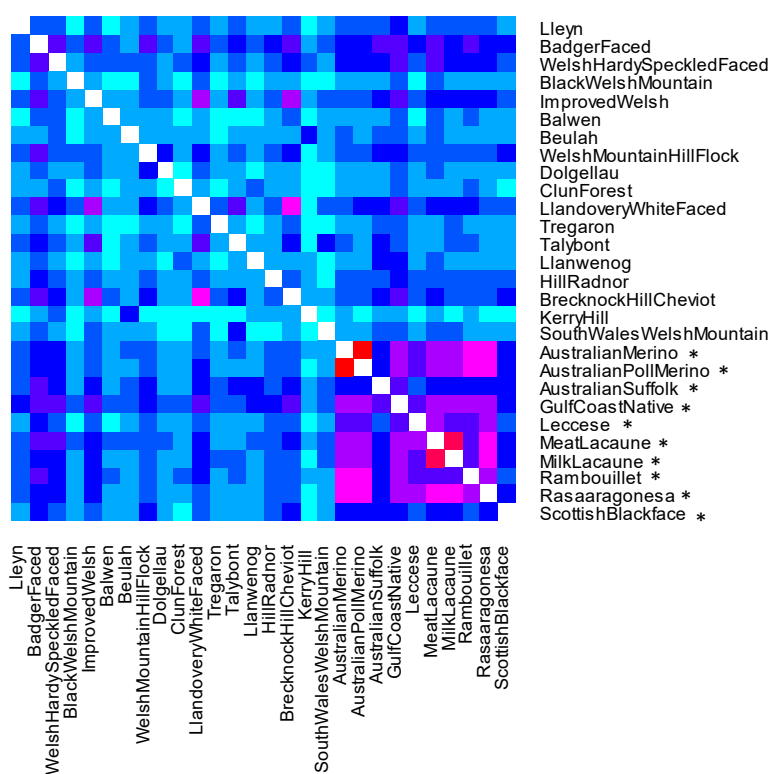
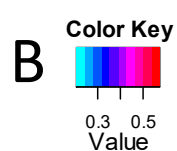
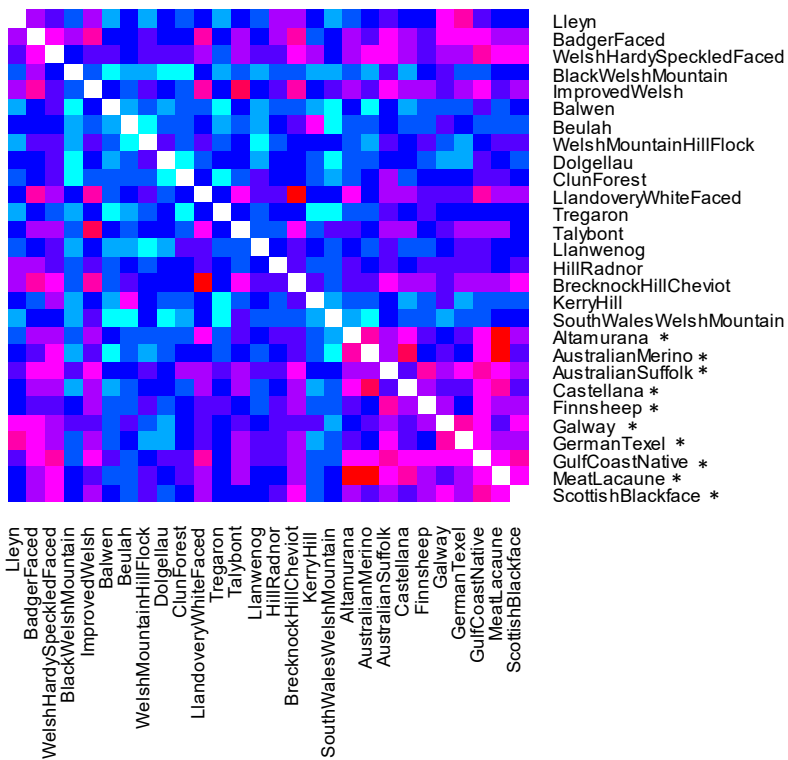
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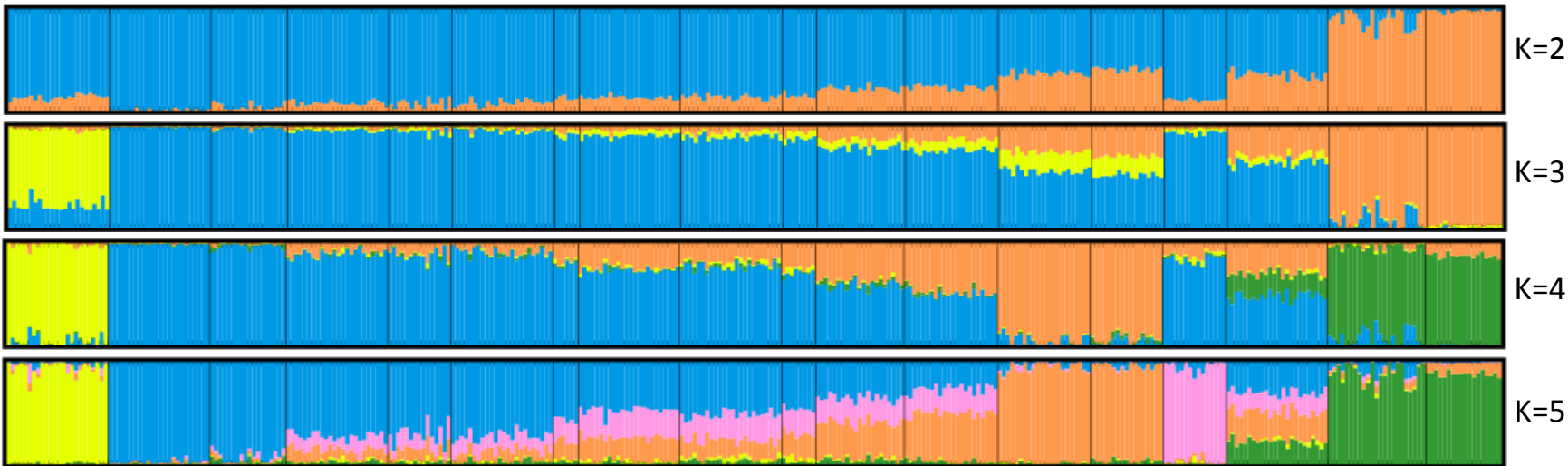


Supplementary Table 1. Haplotype sharing between the 18 Welsh and 10 top worldwide breeds summarised by geographical origin.

	European breeds							USA	Iranian	New Zealand/ Australian
	Scandinavian	Spanish/Portuguese/Italian	Irish	French	UK (non-Welsh)	German	Swiss			
Beulah			+		+			+		+
Kerry Hill		+	+							+
Black Welsh Mountain	+		+	+	+					
Clun Forest				+	+			+		+
Llanwenog		+			+	+		+		+
Badger Faced			+					+		+
Hardy Speckled Faced		+		+	+	+		+		+
Improved Welsh Mountain	+	+			+	+		+		+
Balwen		+			+			+		+
Hill Flock Welsh Mountain	+	+		+						+
Dolgellau Welsh Mountain		+		+				+		+
Llandovery White Faced		+			+			+		+
Tregaron Welsh Mountain	+			+				+	+	
Talybont Welsh Mountain		+		+		+		+		+
Hill Radnor		+	+		+			+		+
Brecknock Hill Cheviot	+				+	+		+		+
South Wales Welsh Mountain				+	+					+
Lleyn			+		+	+		+		+

The International Sheep Genome Consortium (ISCG) breeds with the highest levels of haplotype sharing (top 10) with each of the Welsh breeds are summarised by geographical origin, based on 0-10Kb resolution.

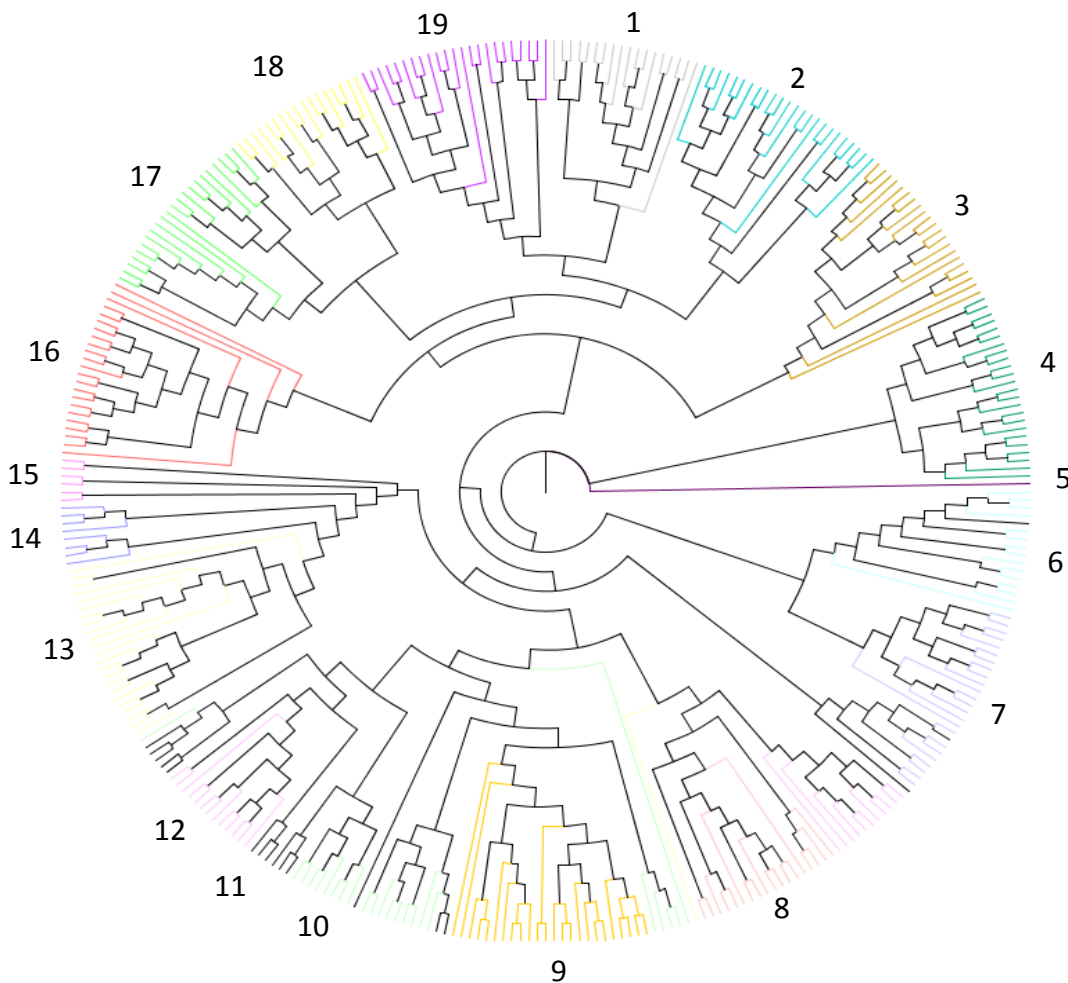
Black Welsh
 Talybont Welsh Mountain
 South Wales
 Welsh Mountain
 Llandovery White Faced
 Improved Welsh Mountain
 Brecknock Hill Cheviot
 Tregaron Welsh Mountain
 Welsh Mountain
 Hill Flock
 Badger Faced
 Dolgellau Welsh Mountain
 Hill Radnor
 Llwyn
 Llanwenog
 Clun Forrest
 Balwen
 Welsh Hardy
 Speckled Faced
 Beulah
 Kerry Hill



Supplementary Table 2. Pairwise genetic differentiation (F_{ST}) between Welsh, British and Asian breeds, Scottish Texel and Indian Garole.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Lleyn	0	0.078	0.082	0.144	0.072	0.130	0.141	0.097	0.088	0.130	0.080	0.072	0.109	0.123	0.108	0.085	0.159	0.126	0.202	0.099
2	Badger Faced	0.078	0	0.051	0.106	0.030	0.091	0.112	0.057	0.047	0.110	0.040	0.031	0.068	0.099	0.078	0.045	0.137	0.084	0.170	0.105
3	Welsh Hardy Speckled	0.082	0.051	0	0.118	0.047	0.108	0.102	0.068	0.057	0.106	0.056	0.043	0.084	0.097	0.084	0.060	0.113	0.098	0.177	0.108
4	Black Welsh Mountain	0.144	0.106	0.118	0	0.104	0.162	0.177	0.126	0.117	0.174	0.113	0.102	0.140	0.163	0.146	0.118	0.201	0.155	0.234	0.171
5	Improved Welsh Mountain	0.072	0.030	0.047	0.104	0	0.085	0.109	0.054	0.044	0.104	0.020	0.022	0.036	0.095	0.074	0.026	0.132	0.074	0.168	0.100
6	Balwen	0.130	0.091	0.108	0.162	0.085	0	0.170	0.116	0.105	0.168	0.104	0.090	0.133	0.155	0.137	0.108	0.193	0.146	0.223	0.161
7	Beulah	0.141	0.112	0.102	0.177	0.109	0.170	0	0.131	0.119	0.163	0.117	0.105	0.146	0.156	0.144	0.121	0.130	0.159	0.237	0.168
8	Hill Flock Welsh Mountain	0.097	0.057	0.068	0.126	0.054	0.116	0.131	0	0.039	0.127	0.065	0.040	0.091	0.116	0.096	0.070	0.155	0.103	0.186	0.125
9	Dolgellau Welsh Mountain	0.088	0.047	0.057	0.117	0.044	0.105	0.119	0.039	0	0.118	0.054	0.025	0.081	0.105	0.086	0.061	0.144	0.094	0.176	0.114
10	Clun Forest	0.130	0.110	0.106	0.174	0.104	0.168	0.163	0.127	0.118	0	0.113	0.102	0.141	0.129	0.135	0.116	0.176	0.155	0.232	0.157
11	Llandovery White Faced	0.080	0.040	0.056	0.113	0.020	0.104	0.117	0.065	0.054	0.113	0	0.027	0.055	0.102	0.082	0.023	0.139	0.082	0.174	0.108
12	Tregaron Welsh Mountain	0.072	0.031	0.043	0.102	0.022	0.090	0.105	0.040	0.025	0.102	0.027	0	0.057	0.092	0.071	0.034	0.129	0.074	0.160	0.099
13	Talybont Welsh Mountain	0.109	0.068	0.084	0.140	0.036	0.133	0.146	0.091	0.081	0.141	0.055	0.057	0	0.131	0.111	0.061	0.170	0.086	0.203	0.137
14	Llanwenog	0.123	0.099	0.097	0.163	0.095	0.155	0.156	0.116	0.105	0.129	0.102	0.092	0.131	0	0.126	0.106	0.171	0.145	0.221	0.149
15	Hill Radnor	0.108	0.078	0.084	0.146	0.074	0.137	0.144	0.096	0.086	0.135	0.082	0.071	0.111	0.126	0	0.087	0.163	0.127	0.205	0.135
16	Brecknock Hill Cheviot	0.085	0.045	0.060	0.118	0.026	0.108	0.121	0.070	0.061	0.116	0.023	0.034	0.061	0.106	0.087	0	0.144	0.094	0.180	0.113
17	Kerry Hill	0.159	0.137	0.113	0.201	0.132	0.193	0.130	0.155	0.144	0.176	0.139	0.129	0.170	0.171	0.163	0.144	0	0.184	0.257	0.186
18	South Wales Welsh Mountain	0.126	0.084	0.098	0.155	0.074	0.146	0.159	0.103	0.094	0.155	0.082	0.074	0.086	0.145	0.127	0.094	0.184	0	0.215	0.154
19	Indian Garole	0.202	0.170	0.177	0.234	0.168	0.223	0.237	0.186	0.176	0.232	0.174	0.160	0.203	0.221	0.205	0.180	0.257	0.215	0	0.223
20	Scottish Texel	0.099	0.105	0.108	0.171	0.100	0.161	0.168	0.125	0.114	0.157	0.108	0.099	0.137	0.149	0.135	0.113	0.186	0.154	0.223	0

^a Scottish Texel and Indian Garole breeds were included in this table to demonstrate F_{ST} ranges with non-Welsh European and Asian breeds.



Supplementary Table 3. Summary statistics for the whole genome sequence of three Welsh sheep after strict quality control.

Animal ID	Uniquely aligned (Mb)	Heterozygous false negative error rate^a	Heterozygous false positive error rate	Mean read depth	Estimated true heterozygosity^b
DWM1^c	30,767	0.422	4.95×10^{-5}	12	0.002773
TWM1^d	27,245	0.533	4.50×10^{-5}	11	0.002836
WHSF1^e	32,368	0.364	6.24×10^{-5}	13	0.002816

^a Calculated as the proportion of heterozygous sites that are missed in the sequence data.

^b True heterozygosity estimated from the observed heterozygosity and corrected for false negative error rate: True heterozygosity = observed heterozygosity/[1-False Negative Error Rate]).

^c Dolgellau Welsh Mountain, ^d Tregaron Welsh Mountain, ^e Welsh Hardy Speckled Faced