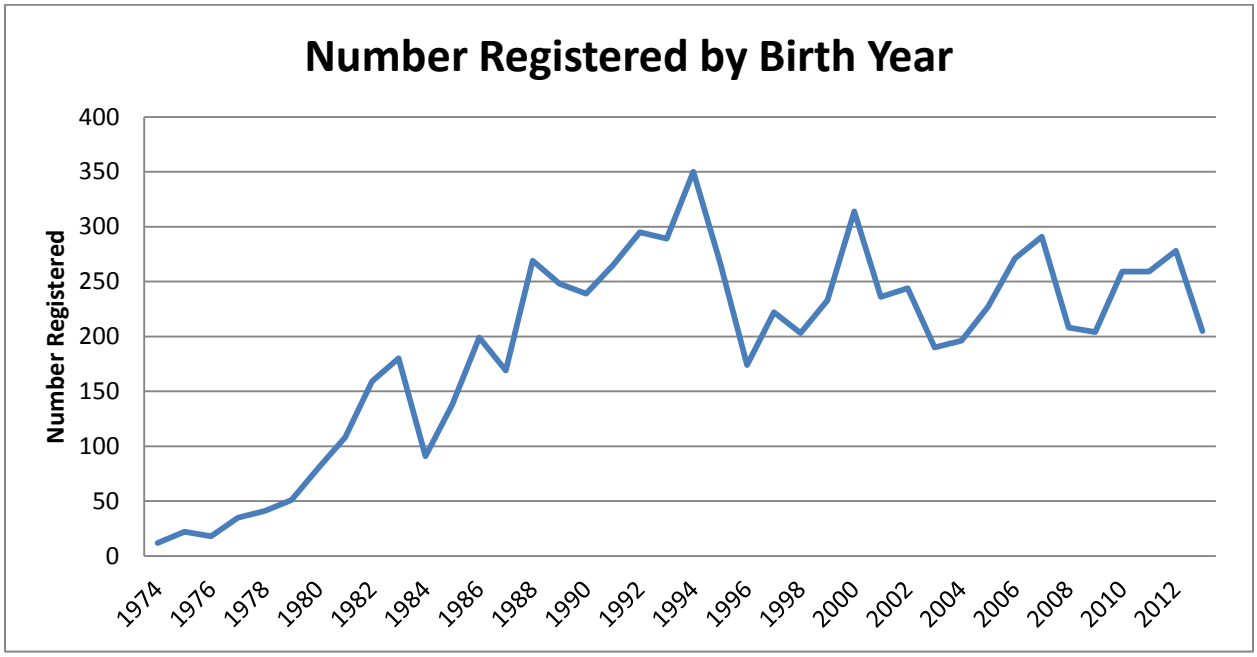
Black Welsh Mountain Sheep Pedigree & Cluster Analysis

USDA-ARS-National Animal Germplasm Program

March, 2014

Data was provided by the American Black Welsh Mountain Sheep Association (ABWMSA), and included pedigree records from 9,054 animals born 1974 to present. Only animals with registered status with ABWMSA were included in the analysis, for a total of 7,773 animals. The number of animals registered by birth year is shown in Figure 1.

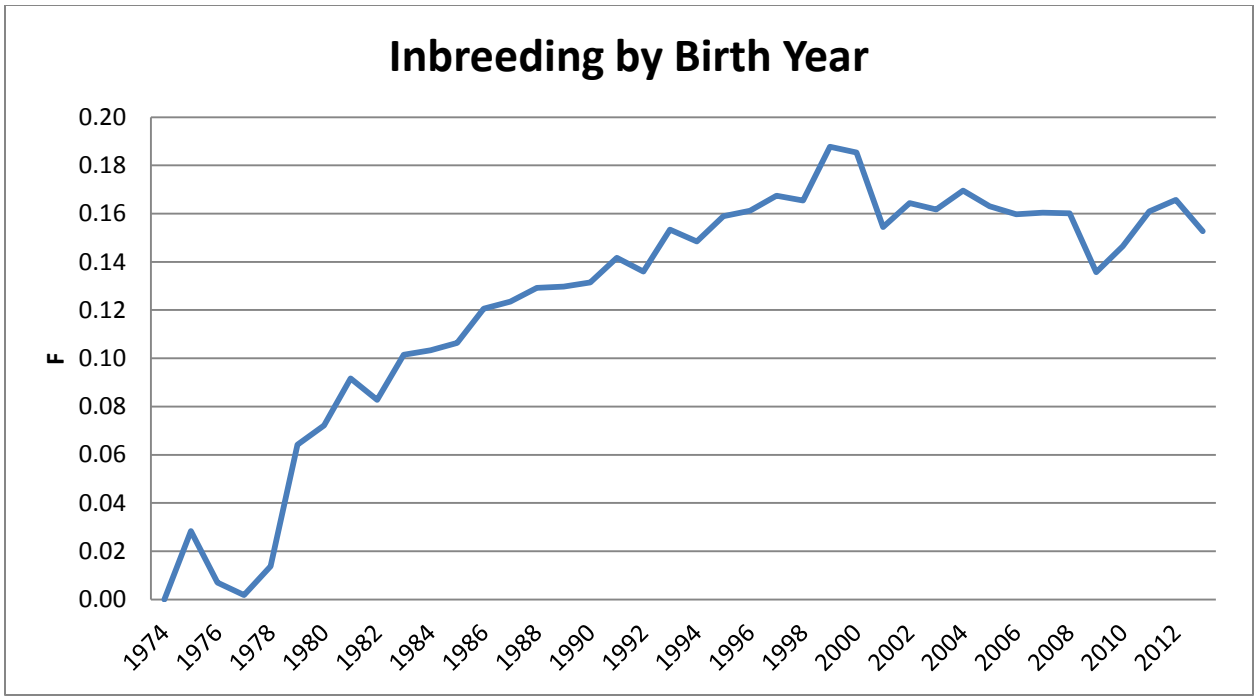
Figure 1. Number of Animals Registered by Birth Year



Inbreeding

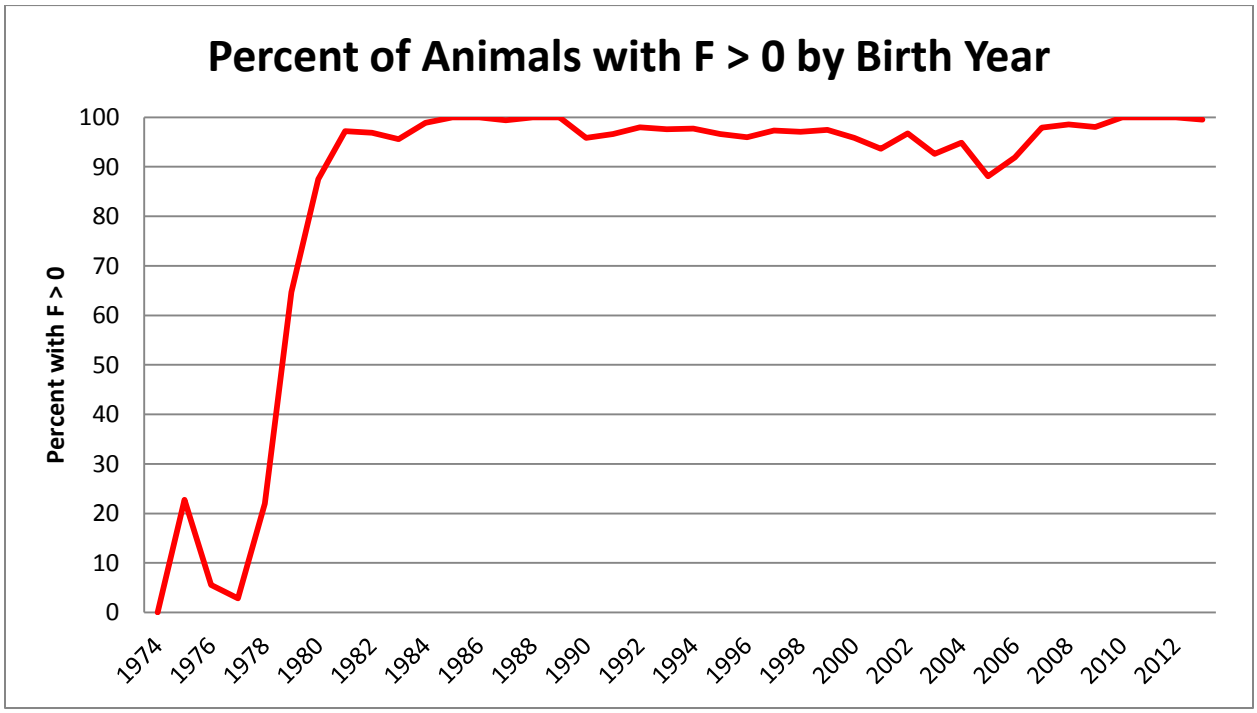
The pedigree file was traced back until all ancestors were unknown. There were 420 unique sires and 2,092 unique dams. Next, inbreeding coefficients were computed for the population. The average calculated inbreeding for all animals was 14.4%, with a range from 0 to 52.0%. The inbreeding trend over time is shown in Figure 2. Although inbreeding levels have increased over time, they have remained steady in recent years and have even decreased from the peak in 1999-2000.

Figure 2. Inbreeding Trend by Birth Year



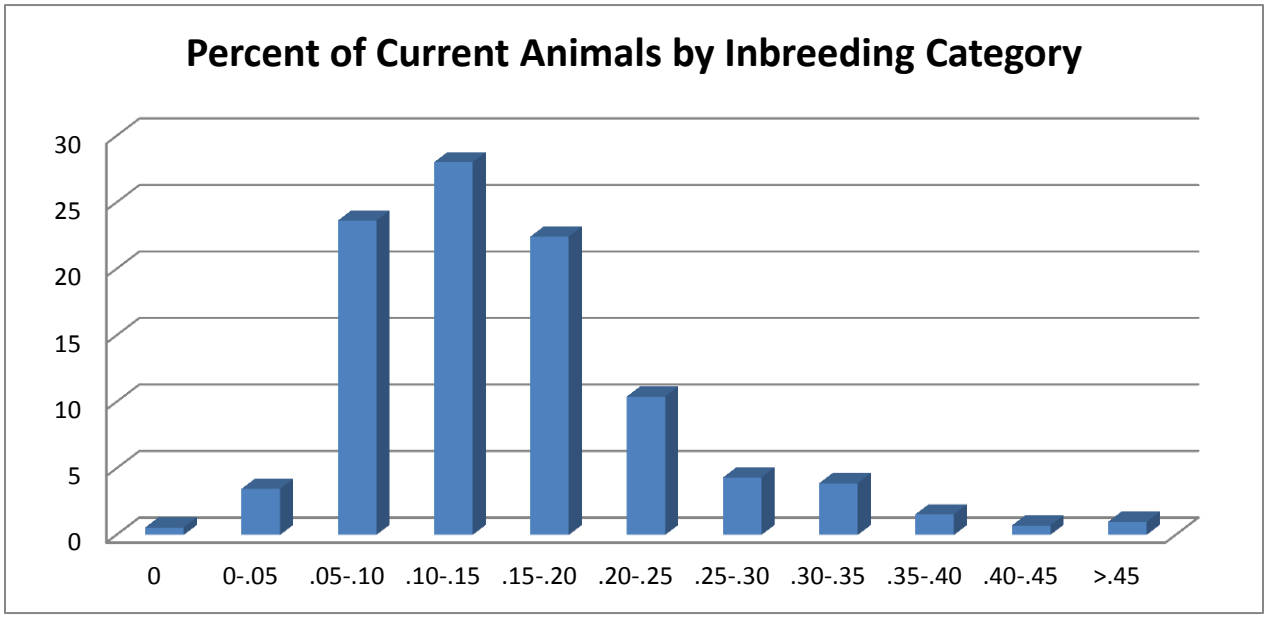
Another statistic of interest is to identify how many animals are non-inbred (an inbreeding coefficient of 0). Figure 3 shows how the number of animals with an inbreeding coefficient greater than 0 has changed over time. In the past 4 years, only 1 animal has had an inbreeding coefficient of 0.

Figure 3. Percent of Animals with an Inbreeding Coefficient Greater than 0 by Birth Year



The frequency distribution of inbreeding percentage for animals born 2008-present (n=1,413) is shown in Figure 4. Such a small pool of non-inbred and lowly inbred animals makes future mating decisions to minimize inbreeding very difficult without the addition of new animals to the population.

Figure 4. Inbreeding Coefficient Frequency Distribution, 2008-Present



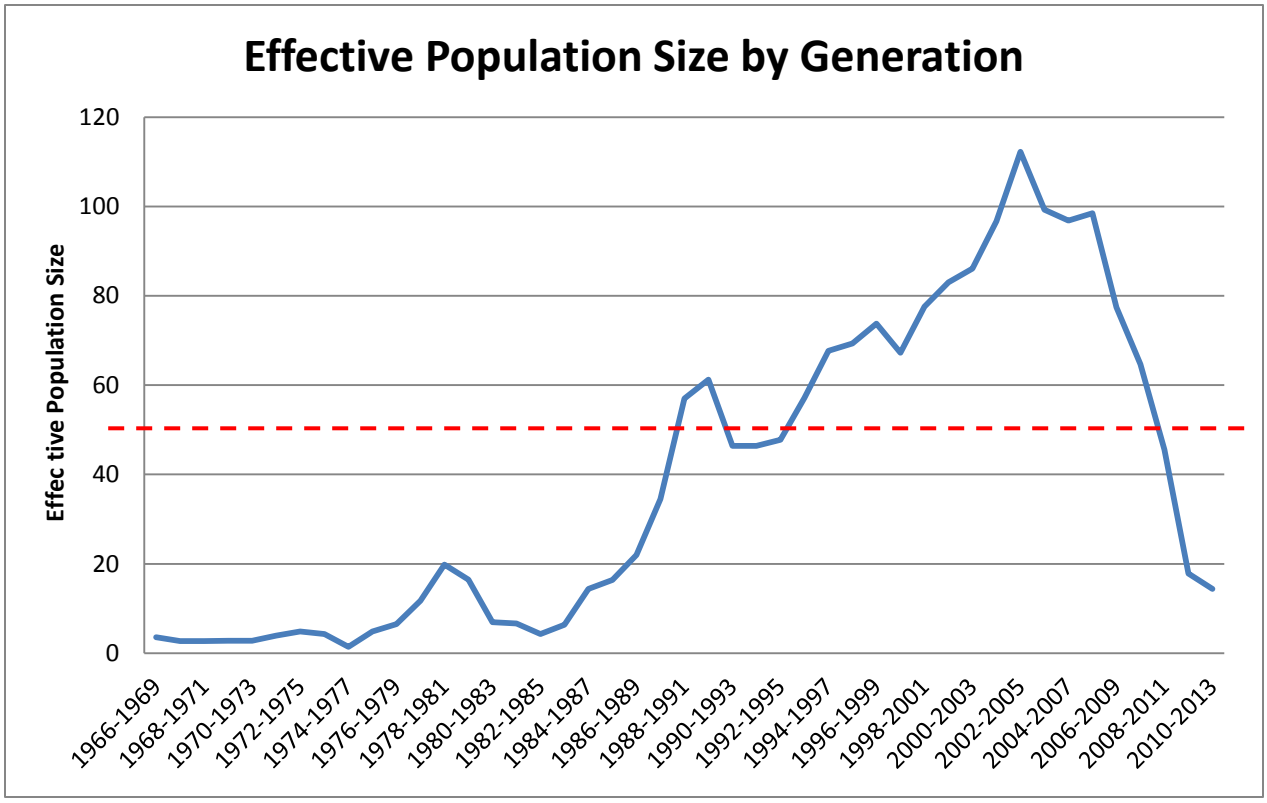
Effective Population Size

The effective population size (N_e) is a tool used to measure the genetic health of a population in terms of the true size of the breeding population. The effective population size is defined as the number of individuals that would generate the current level of inbreeding and is computed as

$$N_e = 1 / (2\ \Delta F)$$

where ΔF is the increase in inbreeding per generation. The Food and Agricultural Organization of the United Nations (FAO) suggests the N_e for a breed be maintained above 50. The N_e for BWM sheep by generation is shown in Figure 5. As shown in Figure 5, the N_e was healthy throughout the late 1990s and 2000s; only in recent years has that number dipped below the FAO threshold.

Figure 5. Effective Population Size by Generation (including the FAO threshold of 50)



Cluster Analysis

Next, cluster analysis was performed in order to determine how well the current BWM population is represented in the NAGP repository. Genetic relationships between rams and ewes born 2010 to present plus rams with semen in the NAGP repository were computed. Even if animals were included that have been removed from the breeding population (for example, via castration), they still represent a theoretical genetic pool for the repository. And, considering the high level of relationship within the breed, a relative is likely to be available if an animal of interest is no longer available.

There were 57 rams with semen in the NAGP repository, with a total of 472 rams included in the cluster analysis. There were 584 ewes included in the analysis, for a total of 1,056 animals clustered. Their relationships were computed using their pedigrees traced back to unknown ancestors. This included a total of 2,330 animals. The PROC CLUS procedure of SAS was used to generate the clusters. T-statistics were compared to determine the number of distinct clusters of BWM sheep that exist in the population. For this analysis, 8 clusters were determined to be the logical number of clusters. This break is shown in Figure 6.

Figure 6. Tree Dendogram showing 8 Clusters for Black Welsh Mountain Sheep

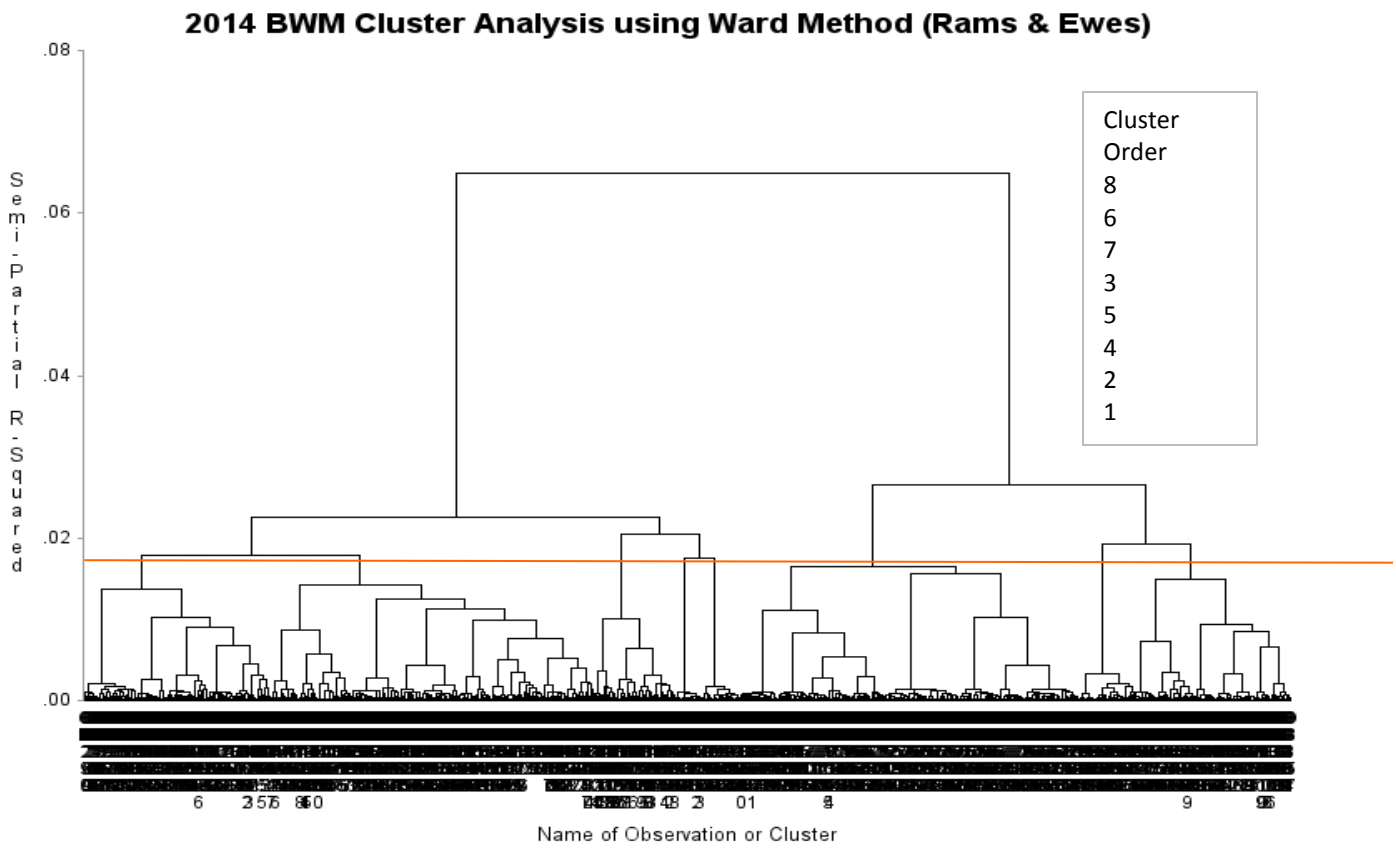


Table 1 shows the relationship within each cluster and the number of rams represented in the repository for each cluster. The average relationship among all animals included in the analysis was 0.211. Considering a half-sib relationship is 0.25 and a parent-offspring or a full-sib relationship is 0.5, the clusters are doing a good job of grouping highly related animals. The rams in the repository are only represented in 2 of the 8 clusters.

Table 1. Relationship with Clusters

	n	Mean	Variance	Rams in Repository
Cluster 1	137	0.280	0.010	
Cluster 2	49	0.454	0.016	
Cluster 3	25	0.583	0.006	
Cluster 4	297	0.338	0.006	
Cluster 5	31	0.458	0.006	
Cluster 6	283	0.234	0.005	39
Cluster 7	70	0.202	0.013	
Cluster 8	164	0.249	0.007	18

Table 2 demonstrates the effectiveness of the clustering procedure. The relationships within clusters (diagonal) should be higher than the relationships between clusters (off-diagonal). The more red the box, the higher the relationship; conversely, the more blue the box, the lower the relationship.

Table 2. Relationship Within and Between Clusters

	1	2	3	4	5	6	7	8
1	0.280	0.232	0.204	0.249	0.167	0.188	0.147	0.186
2		0.454	0.198	0.251	0.165	0.198	0.141	0.198
3			0.583	0.203	0.194	0.180	0.125	0.182
4				0.338	0.170	0.189	0.143	0.212
5					0.458	0.182	0.132	0.174
6						0.234	0.147	0.204
7							0.202	0.131
8								0.249

Although relationships are quite high within and between clusters, the diagonal relationships are higher than the off-diagonal relationships, suggesting the clustering procedure was successful.

The relationship between the repository rams was also computed. The average relationship was 0.212 with a range of 0-0.68.

Pseudo-matings

Pseudo-matings of females in each cluster to males in each cluster were performed in order to compute the average, minimum, and maximum relationship of their potential offspring. The average, minimum, and maximum relationship is shown in Figures 7, 8, and 9, respectively.

Figure 7. Average Relationship of Matings Within and Between Clusters, (pink represents females and blue represents males)

	1	2	3	4	5	6	7	8
1	0.279	0.234	0.205	0.250	0.161	0.185	0.147	0.195
2	0.230	0.458	0.196	0.254	0.158	0.194	0.139	0.204
3	0.205	0.199	0.595	0.203	0.192	0.178	0.124	0.185
4	0.249	0.249	0.203	0.338	0.162	0.186	0.142	0.218
5	0.175	0.172	0.198	0.179	0.451	0.188	0.134	0.177
6	0.190	0.201	0.181	0.192	0.175	0.232	0.144	0.208
7	0.149	0.145	0.127	0.145	0.131	0.153	0.204	0.136
8	0.175	0.189	0.178	0.204	0.173	0.201	0.128	0.245

Figure 8. Minimum Relationship of Matings Within and Between Clusters, (pink represents females and blue represents males)

	1	2	3	4	5	6	7	8
1	0.105	0.124	0.123	0.121	0.084	0.083	0.027	0.078
2	0.111	0.206	0.156	0.142	0.125	0.134	0.028	0.135
3	0.097	0.155	0.405	0.145	0.162	0.111	0.025	0.137
4	0.096	0.139	0.143	0.198	0.123	0.110	0.024	0.112
5	0.081	0.138	0.165	0.138	0.292	0.099	0.020	0.140
6	0.056	0.095	0.086	0.074	0.093	0.082	0.014	0.063
7	0.075	0.080	0.074	0.070	0.055	0.054	0.031	0.051
8	0.000	0.000	0.000	0.000	0.045	0.004	0.000	0.030

Figure 9. Maximum Relationship of Matings Within and Between Clusters, (pink represents females and blue represents males)

	1	2	3	4	5	6	7	8
1	0.806	0.377	0.272	0.472	0.268	0.353	0.378	0.330
2	0.364	0.822	0.257	0.466	0.228	0.268	0.240	0.366
3	0.252	0.242	0.781	0.248	0.247	0.239	0.199	0.237
4	0.469	0.469	0.269	0.769	0.255	0.400	0.252	0.578
5	0.272	0.235	0.250	0.268	0.710	0.302	0.236	0.297
6	0.486	0.359	0.358	0.481	0.408	0.716	0.384	0.629
7	0.296	0.260	0.224	0.254	0.207	0.607	0.690	0.252
8	0.580	0.297	0.252	0.588	0.384	0.590	0.259	0.638

Rams for NAGP

To develop a secure collection of Black Welsh Mountain Sheep semen for the repository, we would like to have 20 to 30 rams from across all clusters. Although the repository already has more than the required number of rams, only 2 clusters are represented. Focus on the remaining clusters is needed, with care taken to collect rams that are as lowly related to one another as possible. A list of animals by cluster is provided in Appendix 1.

Appendix 1. Clustered animals by gender, cluster, inbreeding, and living status (highlighted animals are in NAGP repository)

Registration Number	Gender	Cluster	F	Status
006722	F	1	0.15966	Alive
006723	F	1	0.21446	Alive
006724	F	1	0.38624	Alive
006725	M	1	0.21249	Alive
006726	M	1	0.21249	Alive
006727	M	1	0.20568	Alive
006728	F	1	0.21838	Alive
006729	M	1	0.24196	Alive
006730	M	1	0.20561	Alive

006731	F	1	0.20561	Alive
006764	F	1	0.33288	Alive
006765	F	1	0.33288	Alive
006766	F	1	0.1505	Alive
006767	M	1	0.23575	Alive
006768	F	1	0.14863	Alive
006769	F	1	0.33288	Alive
006770	F	1	0.14929	Alive
006771	F	1	0.14791	Dead
006772	F	1	0.14985	Alive
006773	F	1	0.23022	Alive
006774	F	1	0.51363	Alive
006853	F	1	0.18093	Dead
006854	F	1	0.14119	Dead
006855	F	1	0.14122	Dead
006856	F	1	0.18622	Alive
007032	F	1	0.32443	Alive
007033	M	1	0.20568	Alive
007034	F	1	0.20932	Alive
007035	M	1	0.3794	Alive
007036	F	1	0.29117	Alive
007037	F	1	0.20561	Alive
007043	F	1	0.39824	Alive
007044	F	1	0.39824	Alive
007045	F	1	0.23022	Alive
007090	M	1	0.18303	Alive
007091	M	1	0.17389	Dead
007092	F	1	0.17389	Dead
007093	M	1	0.14122	Dead
007094	F	1	0.14122	Dead
007095	M	1	0.16949	Alive
007096	F	1	0.1495	Dead
007097	M	1	0.1495	Dead
007098	M	1	0.16629	Dead
007099	F	1	0.16629	Dead
007100	M	1	0.16629	Dead
007101	M	1	0.2475	Dead
007102	M	1	0.19787	Dead
007134	F	1	0.50306	Alive
007135	F	1	0.50306	Alive
007136	F	1	0.41211	Alive
007137	F	1	0.43485	Alive
007150	F	1	0.21571	Alive
007151	F	1	0.2103	Alive
007152	F	1	0.1763	Alive

007153	F	1	0.31116	Alive
007154	M	1	0.21486	Alive
007155	F	1	0.21937	Alive
007156	M	1	0.41297	Alive
007157	M	1	0.07424	Dead
007158	F	1	0.14441	Alive
007159	F	1	0.08961	Alive
007160	M	1	0.08961	Alive
007161	M	1	0.14787	Dead
007162	F	1	0.20501	Alive
007163	F	1	0.0952	Alive
007164	F	1	0.10355	Alive
007165	F	1	0.09999	Alive
007166	F	1	0.23022	Alive
007167	F	1	0.45759	Alive
007168	F	1	0.39824	Alive
007169	F	1	0.41211	Alive
007170	F	1	0.39824	Alive
007230	M	1	0.07424	Alive
007231	F	1	0.14123	Alive
007232	F	1	0.06271	Alive
007233	M	1	0.14123	Alive
007234	F	1	0.1545	Alive
007235	F	1	0.1545	Dead
007236	F	1	0.34285	Alive
007237	F	1	0.2096	Alive
007238	M	1	0.34285	Alive
007239	F	1	0.14787	Alive
007240	F	1	0.14787	Alive
007241	F	1	0.10892	Alive
007242	M	1	0.09699	Alive
007243	F	1	0.09999	Alive
007244	F	1	0.10917	Alive
007245	F	1	0.18547	Alive
007246	F	1	0.201	Alive
007247	F	1	0.10229	Alive
007248	F	1	0.10408	Dead
007249	F	1	0.1714	Alive
007250	F	1	0.12183	Alive
007251	F	1	0.19214	Alive
007252	F	1	0.199	Alive
007253	F	1	0.2342	Alive
007254	F	1	0.10229	Alive
007255	F	1	0.12011	Alive
007259	F	1	0.11033	Alive

007260	F	1	0.11327	Alive
007261	M	1	0.11327	Alive
007262	F	1	0.11033	Alive
007263	M	1	0.11033	Alive
007464	F	1	0.49613	Alive
007512	M	1	0.07778	Alive
007513	M	1	0.07855	Alive
007514	F	1	0.07786	Alive
007516	F	1	0.29117	Alive
007517	F	1	0.20568	Alive
007518	F	1	0.32443	Alive
007519	F	1	0.28747	Alive
007520	M	1	0.4574	Alive
007521	M	1	0.20496	Alive
007522	M	1	0.24196	Alive
007523	F	1	0.20561	Alive
007524	F	1	0.39984	Alive
007525	M	1	0.22416	Alive
007644	F	1	0.16274	Alive
007677	M	1	0.07982	Alive
007678	F	1	0.28118	Dead
007679	F	1	0.22283	Alive
007680	F	1	0.32383	Alive
007681	M	1	0.32383	Alive
007682	M	1	0.12535	Alive
007683	M	1	0.2686	Alive
007684	M	1	0.23478	Alive
007685	F	1	0.0802	Alive
007686	M	1	0.27691	Alive
007687	M	1	0.13201	Alive
007707	M	1	0.17977	Alive
007709	F	1	0.18872	Alive
007717	F	1	0.14863	Alive
007718	F	1	0.14886	Alive
007719	F	1	0.14949	Alive
007720	M	1	0.4439	Alive
007721	M	1	0.3521	Alive
007763	M	1	0.17147	Alive
006732	F	2	0.20382	Alive
006775	F	2	0.19557	Alive
006798	F	2	0.30447	Alive
006799	F	2	0.30447	Alive
006800	F	2	0.20731	Alive
006801	F	2	0.13005	Alive
006821	F	2	0.13748	Alive

006822	F	2	0.13748	Alive
006823	F	2	0.2482	Alive
006827	F	2	0.16214	Alive
007038	F	2	0.14536	Alive
007039	M	2	0.14536	Dead
007040	M	2	0.16806	Alive
007041	F	2	0.13127	Alive
007264	M	2	0.30447	Alive
007265	M	2	0.18377	Dead
007266	M	2	0.18377	Dead
007267	M	2	0.13127	Dead
007268	F	2	0.13127	Alive
007269	F	2	0.17481	Alive
007270	F	2	0.17481	Alive
007271	F	2	0.48798	Alive
007272	F	2	0.48798	Alive
007273	F	2	0.48798	Alive
007274	M	2	0.20043	Alive
007275	M	2	0.20043	Dead
007276	M	2	0.19595	Alive
007277	F	2	0.19595	Alive
007278	M	2	0.17474	Dead
007279	F	2	0.28241	Alive
007688	F	2	0.20787	Alive
007689	F	2	0.20787	Alive
007690	M	2	0.45944	Alive
007691	F	2	0.45944	Alive
007692	F	2	0.4309	Alive
007693	F	2	0.13913	Alive
007694	M	2	0.20349	Alive
007695	F	2	0.20349	Alive
007696	F	2	0.28422	Alive
007697	F	2	0.31863	Alive
007698	F	2	0.45944	Alive
007699	F	2	0.21072	Alive
007700	F	2	0.14929	Alive
007701	F	2	0.14929	Alive
007702	F	2	0.21676	Alive
007703	F	2	0.21676	Alive
007704	M	2	0.47371	Alive
007705	M	2	0.34573	Alive
007706	M	2	0.34573	Alive
006712	F	3	0.21762	Alive
006713	M	3	0.19461	Alive
006714	M	3	0.26669	Dead

006715	F	3	0.26669	Alive
007023	M	3	0.25486	Dead
007024	F	3	0.25486	Alive
007025	F	3	0.41008	Alive
007139	M	3	0.28495	Alive
007140	F	3	0.21039	Alive
007141	M	3	0.25486	Alive
007142	F	3	0.25486	Alive
007143	M	3	0.33493	Alive
007144	F	3	0.33493	Alive
007145	F	3	0.3626	Alive
007146	F	3	0.28495	Alive
007147	F	3	0.28495	Alive
007645	M	3	0.38634	Alive
007646	F	3	0.38634	Alive
007647	F	3	0.32437	Alive
007648	F	3	0.32983	Alive
007649	F	3	0.32983	Alive
007650	M	3	0.2192	Alive
007651	F	3	0.2192	Alive
007767	F	3	0.34997	Alive
007768	F	3	0.34997	Alive
006820	F	4	0.15118	Alive
006829	F	4	0.13094	Alive
006830	M	4	0.11563	Alive
006831	M	4	0.16374	Dead
006832	F	4	0.16374	Alive
006834	F	4	0.10019	Alive
006900	F	4	0.14783	Alive
006901	F	4	0.13974	Alive
006902	M	4	0.13974	Dead
006903	F	4	0.16992	Alive
006904	F	4	0.16992	Alive
006905	F	4	0.15267	Alive
006906	M	4	0.14827	Dead
006907	F	4	0.14827	Alive
006908	F	4	0.16949	Alive
006910	M	4	0.1684	Dead
006911	F	4	0.1684	Alive
006912	M	4	0.09721	Alive
006913	M	4	0.09721	Dead
006914	F	4	0.21696	Alive
006915	M	4	0.20136	Dead
006916	F	4	0.20136	Alive
006917	F	4	0.19872	Alive

006918	F	4	0.14004	Alive
006919	M	4	0.14004	Dead
006920	M	4	0.16761	Dead
006921	M	4	0.23962	Dead
006922	F	4	0.17902	Alive
006923	F	4	0.19471	Dead
006924	M	4	0.23012	Dead
006925	M	4	0.23012	Dead
006926	M	4	0.24731	Dead
006927	M	4	0.24731	Dead
006928	M	4	0.21004	Dead
006929	F	4	0.13433	Alive
006930	M	4	0.11467	Dead
006931	M	4	0.09543	Dead
006932	F	4	0.09543	Alive
006933	M	4	0.0962	Dead
006934	M	4	0.0962	Dead
006935	M	4	0.21696	Dead
006936	F	4	0.15529	Alive
006937	F	4	0.20855	Alive
006938	F	4	0.20499	Alive
006939	M	4	0.20499	Dead
006940	F	4	0.16458	Alive
006941	M	4	0.15389	Dead
006942	M	4	0.15389	Dead
006943	M	4	0.19745	Dead
006944	M	4	0.16889	Dead
006945	F	4	0.16889	Alive
006946	M	4	0.10608	Dead
006947	M	4	0.16426	Alive
006948	F	4	0.14576	Alive
006949	F	4	0.12695	Alive
006950	M	4	0.14521	Dead
006951	F	4	0.11466	Alive
006953	M	4	0.17984	Dead
006954	F	4	0.17984	Dead
006955	F	4	0.16508	Alive
007042	M	4	0.15038	Alive
007046	M	4	0.13394	Alive
007047	F	4	0.12917	Alive
007048	M	4	0.12917	Dead
007049	M	4	0.1254	Alive
007050	F	4	0.1254	Alive
007051	F	4	0.11594	Alive
007052	F	4	0.12018	Alive

007053	F	4	0.12018	Alive
007054	M	4	0.11518	Alive
007055	F	4	0.11518	Alive
007056	F	4	0.22865	Alive
007057	F	4	0.12917	Alive
007058	F	4	0.1246	Alive
007059	M	4	0.3446	Alive
007060	F	4	0.33953	Alive
007061	M	4	0.11594	Dead
007062	F	4	0.3449	Dead
007063	M	4	0.3446	Dead
007064	M	4	0.13094	Alive
007065	M	4	0.34402	Alive
007066	M	4	0.34402	Alive
007067	M	4	0.1246	Alive
007068	F	4	0.11518	Alive
007069	F	4	0.33953	Alive
007070	M	4	0.33953	Alive
007071	F	4	0.13584	Alive
007072	M	4	0.3446	Alive
007073	F	4	0.34214	Alive
007197	M	4	0.0868	Dead
007198	M	4	0.0868	Dead
007199	F	4	0.07466	Alive
007200	F	4	0.07466	Alive
007201	F	4	0.09159	Alive
007202	F	4	0.09159	Alive
007203	F	4	0.10657	Alive
007205	M	4	0.06312	Alive
007206	F	4	0.06312	Alive
007207	F	4	0.11466	Alive
007208	M	4	0.11466	Dead
007209	M	4	0.08788	Alive
007210	M	4	0.11669	Alive
007211	M	4	0.11669	Alive
007212	F	4	0.09159	Alive
007213	M	4	0.09159	Alive
007214	M	4	0.07046	Dead
007215	F	4	0.07046	Alive
007219	F	4	0.1542	Alive
007223	F	4	0.08968	Alive
007224	F	4	0.08584	Alive
007225	F	4	0.06503	Alive
007226	M	4	0.06503	Dead
007229	F	4	0.1556	Dead

007298	F	4	0.15118	Alive
007299	F	4	0.15587	Alive
007300	M	4	0.26693	Alive
007301	M	4	0.25943	Dead
007302	M	4	0.26521	Alive
007303	M	4	0.16761	Alive
007304	F	4	0.16761	Alive
007305	F	4	0.19872	Alive
007306	M	4	0.19872	Alive
007307	F	4	0.15507	Alive
007308	M	4	0.19887	Alive
007309	F	4	0.1735	Alive
007310	M	4	0.1735	Dead
007311	M	4	0.2044	Alive
007312	F	4	0.15162	Alive
007313	M	4	0.15162	Dead
007314	F	4	0.15294	Alive
007315	M	4	0.15294	Dead
007316	M	4	0.1735	Dead
007317	F	4	0.1735	Alive
007318	F	4	0.17795	Alive
007319	F	4	0.19556	Alive
007320	F	4	0.19556	Alive
007321	F	4	0.21696	Alive
007322	F	4	0.15806	Alive
007323	F	4	0.18936	Alive
007324	F	4	0.18936	Alive
007325	F	4	0.21289	Alive
007326	M	4	0.21289	Dead
007327	F	4	0.14712	Alive
007328	F	4	0.14712	Alive
007329	F	4	0.25861	Alive
007330	F	4	0.25861	Alive
007331	F	4	0.15861	Alive
007332	M	4	0.15861	Dead
007333	M	4	0.15053	Alive
007334	F	4	0.14464	Alive
007335	M	4	0.183	Alive
007336	M	4	0.183	Alive
007337	M	4	0.18984	Dead
007338	M	4	0.179	Dead
007339	M	4	0.179	Dead
007340	F	4	0.14544	Alive
007341	M	4	0.14544	Alive
007342	M	4	0.14464	Dead

007343	M	4	0.14464	Dead
007344	F	4	0.19328	Alive
007345	F	4	0.19328	Alive
007346	F	4	0.16615	Alive
007347	F	4	0.16615	Alive
007348	M	4	0.15053	Dead
007349	M	4	0.15053	Dead
007350	M	4	0.16992	Dead
007351	M	4	0.16992	Dead
007352	M	4	0.21004	Alive
007353	M	4	0.21004	Alive
007354	M	4	0.18087	Dead
007355	M	4	0.18087	Dead
007356	M	4	0.16092	Dead
007357	M	4	0.17676	Dead
007358	F	4	0.17676	Alive
007359	M	4	0.16018	Dead
007360	F	4	0.16162	Alive
007361	M	4	0.16162	Dead
007362	F	4	0.15357	Alive
007363	M	4	0.15357	Dead
007364	M	4	0.16047	Dead
007365	M	4	0.16047	Dead
007366	F	4	0.17422	Alive
007367	M	4	0.19056	Alive
007368	F	4	0.17948	Alive
007369	M	4	0.17948	Dead
007370	F	4	0.16162	Alive
007371	F	4	0.16162	Alive
007372	F	4	0.16715	Alive
007373	F	4	0.2618	Alive
007374	M	4	0.20951	Alive
007375	M	4	0.20951	Alive
007376	F	4	0.169	Alive
007377	M	4	0.169	Alive
007378	F	4	0.18996	Alive
007379	M	4	0.17122	Dead
007380	M	4	0.17122	Alive
007381	M	4	0.17122	Alive
007382	M	4	0.19201	Dead
007383	F	4	0.19201	Alive
007384	M	4	0.17878	Dead
007385	M	4	0.17878	Dead
007386	M	4	0.20551	Alive
007387	M	4	0.19166	Alive

007388	M	4	0.19887	Dead
007389	M	4	0.19887	Alive
007390	F	4	0.16137	Alive
007391	F	4	0.16137	Alive
007392	M	4	0.17795	Dead
007393	M	4	0.17795	Alive
007394	M	4	0.15162	Dead
007395	M	4	0.15162	Dead
007396	M	4	0.15806	Dead
007397	F	4	0.15806	Alive
007398	M	4	0.15507	Alive
007399	M	4	0.15294	Dead
007400	M	4	0.19554	Dead
007401	F	4	0.19554	Alive
007402	M	4	0.15806	Dead
007403	M	4	0.17011	Alive
007404	F	4	0.17011	Alive
007405	M	4	0.20897	Dead
007406	M	4	0.21495	Dead
007407	M	4	0.17716	Alive
007408	M	4	0.17716	Dead
007409	F	4	0.17716	Alive
007410	F	4	0.19704	Alive
007411	F	4	0.17716	Alive
007412	F	4	0.17716	Alive
007413	F	4	0.17716	Alive
007414	M	4	0.20111	Alive
007415	F	4	0.23966	Alive
007416	M	4	0.20951	Dead
007417	F	4	0.20951	Alive
007418	M	4	0.22077	Dead
007419	M	4	0.21821	Alive
007420	F	4	0.21821	Alive
007421	F	4	0.20272	Alive
007422	F	4	0.18224	Alive
007423	F	4	0.18224	Alive
007424	F	4	0.18685	Alive
007425	F	4	0.18685	Alive
007426	M	4	0.21605	Dead
007427	M	4	0.21605	Dead
007428	M	4	0.21016	Dead
007429	M	4	0.21016	Alive
007430	M	4	0.18372	Dead
007431	M	4	0.18372	Alive
007432	M	4	0.17025	Dead

007433	M	4	0.17025	Dead
007434	F	4	0.21034	Alive
007435	F	4	0.21034	Alive
007436	F	4	0.19074	Alive
007437	F	4	0.19074	Alive
007438	M	4	0.18094	Dead
007439	M	4	0.20566	Dead
007440	F	4	0.20566	Alive
007441	M	4	0.20269	Dead
007442	F	4	0.20269	Alive
007443	M	4	0.17674	Alive
007444	F	4	0.17674	Alive
007445	F	4	0.19162	Alive
007446	M	4	0.19876	Dead
007447	M	4	0.19876	Dead
007448	F	4	0.14506	Alive
007449	F	4	0.14506	Alive
007450	M	4	0.17309	Dead
007451	F	4	0.17309	Alive
007452	M	4	0.21124	Dead
007453	M	4	0.14714	Alive
007454	M	4	0.16753	Alive
007455	F	4	0.16753	Alive
007456	F	4	0.14577	Alive
007457	F	4	0.14577	Alive
007458	F	4	0.18599	Alive
007459	F	4	0.16779	Alive
007460	M	4	0.19115	Alive
007461	M	4	0.19115	Dead
007462	M	4	0.17727	Alive
007463	M	4	0.17727	Dead
007484	F	4	0.14176	Alive
007485	M	4	0.14176	Alive
007486	M	4	0.39673	Alive
007487	M	4	0.39673	Dead
007488	F	4	0.16592	Alive
007489	F	4	0.16592	Alive
007490	M	4	0.15587	Dead
007491	M	4	0.15587	Dead
007492	M	4	0.2618	Dead
007493	M	4	0.2618	Alive
007494	M	4	0.17716	Dead
007495	M	4	0.17716	Alive
007708	F	4	0.13787	Alive
007710	F	4	0.12849	Alive

007711	F	4	0.12849	Alive
007712	F	4	0.14421	Alive
007715	F	4	0.1701	Alive
007716	M	4	0.13156	Alive
006835	F	5	0.08478	Alive
006836	F	5	0.08478	Alive
006837	M	5	0.1051	Alive
006838	M	5	0.1051	Alive
006839	F	5	0.1051	Alive
007496	M	5	0.08478	Alive
007497	M	5	0.08478	Alive
007498	F	5	0.1051	Alive
007499	F	5	0.1051	Alive
007500	F	5	0.31423	Alive
007501	F	5	0.09439	Alive
007502	F	5	0.30407	Alive
007503	F	5	0.20132	Alive
007504	F	5	0.31423	Alive
007505	F	5	0.31423	Alive
007506	F	5	0.31423	Alive
007507	F	5	0.31423	Alive
007653	M	5	0.09646	Alive
007654	F	5	0.09646	Alive
007655	M	5	0.14699	Alive
007656	M	5	0.20027	Alive
007657	M	5	0.20027	Alive
007658	M	5	0.25217	Alive
007659	M	5	0.22553	Alive
007660	M	5	0.2076	Alive
007661	F	5	0.2076	Alive
007662	M	5	0.25725	Alive
007663	M	5	0.20027	Alive
007664	F	5	0.20027	Alive
007665	M	5	0.20027	Alive
007666	M	5	0.20127	Alive
004167	M	6	0.04237	Dead
004188	M	6	0.09009	Dead
004192	M	6	0.15878	Dead
004206	M	6	0.21836	Dead
004555	M	6	0.14341	Dead
004668	M	6	0.09291	Dead
005019	M	6	0.20476	Dead
005214	M	6	0.14868	Alive
005268	M	6	0.12106	Dead
005271	M	6	0.09152	Dead

005275	M	6	0.13423	Dead
005279	M	6	0.11983	Dead
005285	M	6	0.23504	Dead
005659	M	6	0	Alive
005666	M	6	0	Dead
005667	M	6	0	Dead
005905	M	6	0.10024	Dead
005920	M	6	0.1701	Dead
005921	M	6	0.10024	Dead
005927	M	6	0.10202	Dead
005936	M	6	0.17447	Dead
005937	M	6	0.11599	Dead
006044	M	6	0.12519	Dead
006047	M	6	0.0915	Dead
006340	M	6	0.10484	Dead
006341	M	6	0.05544	Dead
006342	M	6	0.05524	Dead
006343	M	6	0.09211	Dead
006344	M	6	0.07566	Dead
006345	M	6	0.06458	Dead
006346	M	6	0.05982	Dead
006354	M	6	0.15167	Dead
006584	M	6	0.09467	Dead
006750	M	6	0.08319	Dead
006751	M	6	0.17397	Dead
006753	M	6	0.08085	Dead
006755	M	6	0.07394	Dead
006756	M	6	0.08269	Dead
006760	F	6	0.15719	Alive
006763	M	6	0.12781	Alive
006776	M	6	0.11263	Alive
006777	F	6	0.11263	Alive
006778	F	6	0.16996	Alive
006779	F	6	0.07554	Alive
006780	F	6	0.07554	Alive
006781	M	6	0.14135	Alive
006782	F	6	0.14135	Alive
006783	F	6	0.09656	Alive
006784	F	6	0.06612	Alive
006785	F	6	0.11894	Alive
006786	F	6	0.1047	Alive
006787	F	6	0.10662	Alive
006788	M	6	0.10163	Dead
006789	F	6	0.14164	Alive
006790	F	6	0.10226	Alive

006791	F	6	0.10226	Alive
006792	F	6	0.07498	Alive
006793	F	6	0.07755	Alive
006794	M	6	0.13348	Alive
006795	F	6	0.104	Alive
006796	F	6	0.10065	Alive
006816	F	6	0.15899	Alive
006817	F	6	0.12966	Alive
006818	F	6	0.07258	Alive
006819	F	6	0.03616	Alive
006840	M	6	0.31204	Dead
006841	F	6	0.31204	Alive
006842	M	6	0.16779	Dead
006843	F	6	0.18728	Alive
006844	M	6	0.18728	Dead
006845	M	6	0.16674	Dead
006846	M	6	0.16674	Dead
006847	M	6	0.17157	Dead
006848	F	6	0.15209	Alive
006849	M	6	0.15209	Alive
006850	M	6	0.21755	Alive
006851	M	6	0.09096	Alive
006857	F	6	0.13348	Alive
006858	M	6	0.06369	Alive
006871	M	6	0.12118	Dead
006872	M	6	0.12118	Alive
006873	F	6	0.104	Alive
006876	M	6	0.08504	Alive
006877	M	6	0.09015	Dead
006878	M	6	0.1463	Dead
006879	M	6	0.14685	Dead
006880	M	6	0.14685	Dead
006881	M	6	0.07983	Dead
006885	M	6	0.15655	Dead
006888	F	6	0.10065	Alive
006889	F	6	0.13884	Alive
006890	F	6	0.08504	Alive
006891	F	6	0.09015	Alive
006892	F	6	0.10278	Alive
006956	M	6	0.08763	Dead
006958	M	6	0.15719	Alive
006961	M	6	0.15655	Dead
006995	M	6	0.07453	Dead
006996	M	6	0.07453	Dead
006997	M	6	0.07453	Alive

006998	F	6	0.10996	Alive
006999	F	6	0.10996	Alive
007000	M	6	0.13035	Dead
007001	F	6	0.13035	Alive
007002	M	6	0.15647	Alive
007003	M	6	0.15647	Alive
007004	M	6	0.16038	Alive
007005	F	6	0.31224	Dead
007006	M	6	0.15152	Alive
007007	M	6	0.15152	Dead
007008	F	6	0.15802	Dead
007009	M	6	0.13331	Dead
007010	F	6	0.11223	Alive
007011	M	6	0.11542	Dead
007012	M	6	0.11542	Alive
007013	F	6	0.0755	Alive
007014	F	6	0.12363	Alive
007015	F	6	0.12363	Alive
007016	M	6	0.13131	Dead
007017	M	6	0.18178	Alive
007018	F	6	0.18178	Alive
007019	F	6	0.09765	Dead
007020	F	6	0.12259	Alive
007021	M	6	0.12259	Alive
007022	M	6	0.12456	Dead
007026	M	6	0.11261	Alive
007027	F	6	0.10968	Alive
007028	F	6	0.11758	Dead
007029	M	6	0.06604	Alive
007031	F	6	0.15899	Alive
007103	F	6	0.08957	Alive
007104	F	6	0.08957	Alive
007105	F	6	0.08957	Alive
007114	F	6	0.17941	Alive
007115	M	6	0.08336	Alive
007116	F	6	0.14725	Alive
007117	F	6	0.14725	Alive
007118	F	6	0.06369	Alive
007119	F	6	0.07498	Alive
007120	F	6	0.21755	Alive
007121	F	6	0.09096	Alive
007122	F	6	0.07755	Alive
007124	F	6	0.13348	Alive
007125	F	6	0.06369	Alive
007126	F	6	0.07087	Alive

007127	F	6	0.11649	Alive
007128	M	6	0.11819	Alive
007129	M	6	0.07554	Dead
007130	F	6	0.07554	Alive
007131	F	6	0.16996	Alive
007132	F	6	0.16996	Alive
007133	M	6	0.06612	Dead
007148	F	6	0.10591	Alive
007149	M	6	0.17941	Dead
007171	M	6	0.0967	Alive
007172	M	6	0.07656	Alive
007173	M	6	0.07656	Dead
007174	F	6	0.06668	Alive
007175	M	6	0.18247	Alive
007176	F	6	0.08958	Alive
007177	M	6	0.16154	Alive
007178	F	6	0.16129	Alive
007179	M	6	0.07046	Alive
007180	F	6	0.07046	Alive
007181	F	6	0.08482	Alive
007182	M	6	0.08482	Alive
007184	F	6	0.13017	Alive
007187	F	6	0.14334	Alive
007189	M	6	0.11491	Alive
007190	M	6	0.11491	Dead
007191	M	6	0.09814	Alive
007194	M	6	0.09207	Alive
007195	M	6	0.12884	Alive
007216	M	6	0.10131	Alive
007217	M	6	0.12196	Alive
007218	F	6	0.1382	Alive
007220	M	6	0.07149	Dead
007221	F	6	0.1018	Alive
007222	F	6	0.1018	Alive
007227	M	6	0.15125	Alive
007228	F	6	0.21569	Alive
007256	M	6	0.06369	Alive
007257	F	6	0.17941	Alive
007258	F	6	0.09278	Alive
007280	F	6	0.16041	Alive
007281	M	6	0.16041	Alive
007282	M	6	0.13831	Alive
007283	F	6	0.13831	Alive
007284	F	6	0.19705	Alive
007285	F	6	0.19705	Alive

007286	F	6	0.14628	Alive
007287	F	6	0.16779	Alive
007288	F	6	0.24568	Alive
007289	F	6	0.24568	Alive
007290	F	6	0.31175	Alive
007291	F	6	0.17491	Alive
007292	F	6	0.17491	Alive
007293	M	6	0.24103	Alive
007294	F	6	0.24103	Alive
007295	F	6	0.15707	Alive
007296	M	6	0.26104	Alive
007297	M	6	0.26104	Alive
007465	M	6	0.21755	Alive
007466	F	6	0.21755	Alive
007467	M	6	0.09101	Alive
007468	F	6	0.09101	Alive
007469	M	6	0.14725	Dead
007470	F	6	0.14725	Alive
007471	F	6	0.07755	Alive
007472	M	6	0.06369	Alive
007473	F	6	0.06369	Alive
007474	F	6	0.17941	Alive
007475	M	6	0.07716	Dead
007476	F	6	0.10226	Alive
007477	M	6	0.06369	Alive
007478	F	6	0.06369	Alive
007479	F	6	0.09096	Alive
007480	F	6	0.09096	Dead
007481	F	6	0.08336	Alive
007482	M	6	0.13348	Alive
007483	F	6	0.13348	Alive
007508	F	6	0.09656	Alive
007509	F	6	0.06612	Alive
007510	F	6	0.14974	Alive
007511	F	6	0.16996	Alive
007515	F	6	0.11562	Alive
007526	F	6	0.11649	Alive
007527	F	6	0.12531	Alive
007528	F	6	0.14542	Alive
007529	F	6	0.0916	Alive
007556	M	6	0.0967	Alive
007557	M	6	0.08958	Alive
007558	M	6	0.08958	Alive
007559	M	6	0.07094	Alive
007561	M	6	0.12574	Alive

007562	M	6	0.12574	Alive
007565	F	6	0.08234	Alive
007566	F	6	0.14152	Alive
007567	M	6	0.14152	Alive
007568	M	6	0.08029	Alive
007571	F	6	0.15634	Alive
007572	M	6	0.08065	Dead
007573	M	6	0.08065	Alive
007574	M	6	0.10637	Alive
007575	M	6	0.10637	Alive
007576	M	6	0.10637	Dead
007577	F	6	0.10637	Alive
007580	F	6	0.11351	Alive
007581	F	6	0.11351	Alive
007584	F	6	0.06718	Alive
007585	F	6	0.06718	Alive
007588	F	6	0.14405	Alive
007589	M	6	0.14405	Alive
007594	M	6	0.14405	Alive
007595	M	6	0.16875	Dead
007596	F	6	0.06718	Alive
007606	M	6	0.19634	Alive
007610	F	6	0.06707	Alive
007611	F	6	0.06707	Alive
007612	M	6	0.08501	Alive
007613	M	6	0.08501	Alive
007614	M	6	0.12574	Alive
007615	M	6	0.12574	Alive
007620	M	6	0.1581	Alive
007621	M	6	0.1581	Alive
007622	M	6	0.07383	Alive
007623	F	6	0.07383	Alive
007626	F	6	0.09728	Alive
007631	M	6	0.13111	Alive
007634	F	6	0.13303	Alive
007635	M	6	0.13303	Alive
007637	M	6	0.13388	Alive
007642	M	6	0.14246	Alive
007744	F	6	0.04912	Alive
007748	F	6	0.04912	Alive
007751	F	6	0.11056	Alive
007758	M	6	0.07755	Alive
007759	M	6	0.08556	Alive
007760	F	6	0.11067	Alive
007761	M	6	0.11067	Alive

007762	F	6	0.07755	Alive
007765	F	6	0.17941	Alive
007766	F	6	0.06357	Alive
006810	F	7	0.05967	Alive
006811	M	7	0.0594	Alive
006812	F	7	0.0594	Dead
006813	F	7	0.05955	Alive
006814	F	7	0.05955	Alive
006815	F	7	0.05955	Alive
006828	F	7	0.125	Alive
006859	F	7	0.01896	Alive
006860	F	7	0.02844	Alive
006861	F	7	0.02844	Alive
006862	M	7	0.1285	Alive
006863	M	7	0.05	Alive
006866	F	7	0.05	Alive
006867	F	7	0.14235	Alive
007106	F	7	0.02844	Alive
007107	M	7	0.27815	Alive
007108	F	7	0.12461	Alive
007109	F	7	0.12461	Alive
007110	F	7	0.14928	Alive
007111	M	7	0.12461	Alive
007112	F	7	0.1478	Alive
007113	M	7	0.0993	Alive
007138	F	7	0.09375	Alive
007530	F	7	0.05186	Alive
007531	F	7	0.03187	Alive
007532	F	7	0.03187	Dead
007533	F	7	0.06067	Alive
007534	F	7	0.05178	Alive
007535	F	7	0.04052	Alive
007536	F	7	0.04052	Alive
007537	F	7	0.04052	Alive
007538	M	7	0.06045	Alive
007539	M	7	0.03883	Alive
007540	M	7	0.03883	Alive
007541	M	7	0.04052	Alive
007542	F	7	0.03902	Alive
007543	F	7	0.05679	Alive
007544	M	7	0.14928	Alive
007652	M	7	0.01578	Alive
007725	F	7	0.01662	Alive
007726	F	7	0.03323	Alive
007727	F	7	0.01662	Alive

007728	F	7	0	Alive
007729	F	7	0.03794	Alive
007730	F	7	0.03794	Alive
007731	M	7	0.04703	Alive
007732	M	7	0.03794	Alive
007733	F	7	0.03794	Alive
007734	F	7	0.02352	Alive
007735	F	7	0.03323	Alive
007736	M	7	0.05586	Alive
007737	M	7	0.05586	Alive
007738	F	7	0.01662	Alive
007739	F	7	0.01662	Alive
007740	F	7	0.07134	Alive
007741	F	7	0.07134	Alive
007742	F	7	0.07134	Alive
007743	M	7	0.05804	Alive
007745	F	7	0.18726	Alive
007746	F	7	0.17307	Alive
007747	F	7	0.14091	Alive
007749	F	7	0.11838	Alive
007750	M	7	0.07688	Alive
007752	F	7	0.12914	Alive
007753	M	7	0.09518	Alive
007754	F	7	0.09158	Alive
007755	M	7	0.05431	Alive
007756	F	7	0.13921	Alive
007757	F	7	0.06629	Alive
007769	F	7	0.13522	Alive
004850	M	8	0.05327	Dead
005025	M	8	0	Dead
005026	M	8	0	Dead
005091	M	8	0.04071	Dead
005652	M	8	0.07193	Dead
005653	M	8	0.0675	Dead
005665	M	8	0.07158	Dead
005671	M	8	0.07023	Alive
005674	M	8	0	Dead
006347	M	8	0.07447	Dead
006350	M	8	0.06884	Dead
006355	M	8	0.04526	Dead
006357	M	8	0.11209	Dead
006358	M	8	0.10197	Dead
006695	M	8	0.09916	Dead
006759	F	8	0.10712	Alive
006761	F	8	0.05955	Alive

006762	F	8	0.09602	Alive
006797	F	8	0.07783	Alive
006824	F	8	0.21911	Alive
006825	F	8	0.25665	Alive
006826	F	8	0.25665	Alive
006833	M	8	0.10019	Alive
006869	F	8	0.09087	Dead
006870	M	8	0.09087	Dead
006874	M	8	0.07783	Alive
006875	F	8	0.12294	Alive
006882	M	8	0.08058	Alive
006883	M	8	0.11965	Dead
006884	M	8	0.11965	Alive
006886	M	8	0.06651	Dead
006887	M	8	0.06651	Dead
006893	F	8	0.12358	Alive
006894	F	8	0.10264	Dead
006895	F	8	0.10264	Dead
006896	F	8	0.07729	Alive
006897	F	8	0.07582	Alive
006898	F	8	0.16329	Alive
006899	F	8	0.13094	Alive
006957	M	8	0.10712	Dead
006959	M	8	0.10712	Dead
006960	M	8	0.02991	Dead
006962	M	8	0.16329	Dead
006963	M	8	0.09602	Alive
006964	M	8	0.06912	Alive
006965	M	8	0.08593	Alive
006966	F	8	0.08593	Dead
006967	F	8	0.10406	Alive
006968	F	8	0.10406	Alive
006969	F	8	0.11444	Dead
006970	F	8	0.12769	Alive
006971	F	8	0.12769	Alive
006972	M	8	0.08879	Alive
006973	M	8	0.09034	Dead
006974	F	8	0.09034	Dead
006975	F	8	0.10839	Alive
006976	F	8	0.08153	Dead
006977	M	8	0.08153	Alive
006978	F	8	0.10782	Alive
006979	F	8	0.08081	Alive
006980	F	8	0.08081	Dead
006981	F	8	0.08674	Alive

006982	M	8	0.08674	Alive
006983	F	8	0.0667	Dead
006984	F	8	0.0667	Alive
006985	F	8	0.09186	Alive
006986	M	8	0.09186	Dead
006987	F	8	0.10904	Alive
006988	M	8	0.10904	Alive
006989	F	8	0.05768	Alive
006990	F	8	0.09845	Dead
006991	F	8	0.09845	Alive
006992	M	8	0.13597	Dead
006993	F	8	0.08153	Alive
006994	M	8	0.1162	Dead
007075	F	8	0.08264	Alive
007081	F	8	0.0856	Alive
007082	F	8	0.0856	Alive
007083	F	8	0.08223	Alive
007084	F	8	0.08223	Dead
007085	F	8	0.08644	Alive
007086	F	8	0.0861	Alive
007087	F	8	0.08516	Alive
007088	F	8	0.08516	Alive
007089	F	8	0.08214	Alive
007123	M	8	0.08414	Alive
007183	F	8	0.1169	Dead
007185	M	8	0.11398	Alive
007186	F	8	0.11398	Alive
007188	F	8	0.15623	Alive
007192	F	8	0.17227	Alive
007193	F	8	0.17227	Alive
007196	M	8	0.10217	Dead
007204	M	8	0.08932	Alive
007545	F	8	0.2172	Alive
007546	F	8	0.23149	Alive
007547	F	8	0.07741	Alive
007548	F	8	0.08554	Alive
007549	F	8	0.08121	Dead
007550	F	8	0.0806	Alive
007551	F	8	0.0825	Alive
007552	F	8	0.0877	Alive
007553	F	8	0.07984	Alive
007554	F	8	0.08554	Alive
007555	F	8	0.08453	Alive
007560	M	8	0.08599	Alive
007563	M	8	0.06825	Alive

007564	F	8	0.06825	Alive
007569	M	8	0.08862	Alive
007570	F	8	0.08862	Alive
007578	F	8	0.09653	Alive
007579	M	8	0.09653	Alive
007582	F	8	0.0918	Alive
007583	F	8	0.0918	Alive
007586	M	8	0.09206	Dead
007587	F	8	0.09206	Alive
007590	F	8	0.09964	Alive
007591	F	8	0.09964	Alive
007592	M	8	0.13062	Alive
007593	F	8	0.12122	Alive
007597	F	8	0.11935	Alive
007598	M	8	0.11935	Alive
007599	M	8	0.09703	Dead
007600	M	8	0.1294	Dead
007601	F	8	0.1294	Alive
007602	M	8	0.0977	Alive
007603	F	8	0.15589	Alive
007604	M	8	0.15589	Dead
007605	F	8	0.08188	Alive
007607	F	8	0.11869	Alive
007608	M	8	0.08437	Alive
007609	M	8	0.0907	Alive
007616	F	8	0.09192	Alive
007617	M	8	0.09192	Dead
007618	M	8	0.10219	Alive
007619	F	8	0.10219	Alive
007624	F	8	0.0977	Alive
007625	F	8	0.12612	Alive
007627	M	8	0.08912	Alive
007628	F	8	0.08912	Alive
007629	F	8	0.08727	Alive
007630	F	8	0.08727	Alive
007632	M	8	0.10114	Alive
007633	F	8	0.10114	Alive
007636	F	8	0.11998	Alive
007638	M	8	0.14727	Dead
007639	M	8	0.11465	Alive
007640	F	8	0.0887	Alive
007641	M	8	0.17385	Alive
007643	M	8	0.13076	Dead
007667	F	8	0.0806	Alive
007668	F	8	0.08148	Alive

007669	F	8	0.0825	Alive
007670	F	8	0.08174	Alive
007671	F	8	0.08121	Alive
007672	F	8	0.08121	Alive
007673	F	8	0.08121	Alive
007674	F	8	0.0877	Alive
007675	F	8	0.08554	Alive
007676	F	8	0.0825	Alive
007713	F	8	0.14317	Alive
007714	F	8	0.12091	Alive
UK-003	M	8	0	Dead
UK-010	M	8	0	Dead