THE KENNEL CLUB
DOG HEALTH

Breed Health and Conservation Plan

Gordon Setter

2019

BHCP/Version 2/May 2019

INTRODUCTION

The Kennel Club launched a dynamic new resource for breed clubs and individual breeders – the Breed Health and Conservation Plans (BHCP) project – in September 2016. The purpose of the project is to ensure that all health concerns for a breed are identified through evidence-based criteria, and that breeders are provided with useful information and resources to support them in making balanced breeding decisions that make health a priority.

The Breed Health and Conservation Plans take a holistic view of breed health with consideration to the following issues: known inherited conditions, complex conditions (i.e. those involving many genes and environmental effects such as nutrition or exercise levels, for example hip dysplasia), conformational concerns and population genetics.

Sources of evidence and data have been collated into an evidence base (Section 1 of the BHCP) which gives clear indications of the most significant health conditions in each breed, in terms of prevalence and impact. Once the evidence base document has been produced it is discussed with the relevant Breed Health Coordinator and breed health committee or representatives if applicable. Priorities are agreed and laid out in Section 2. A collaborative action plan for the health of the breed is then agreed and incorporated as Section 3 of the BHCP. This will be monitored and reviewed.

SECTION 1: EVIDENCE BASE

Demographics

The Gordon Setter is a vulnerable native breed, defined as a breed with fewer than 300 new registrations a year. The numbers of new registrations of the breed have been consistently below this threshold since 2011, but have been relatively stable since this time, although a drop in registrations was seen in 2018, as shown in Figure 1 below.

The trend of registrations over year of birth (1980-2014) was -8.04 per year (with a 95% confidence interval of -10.89 to -5.20), reflecting the general decrease seen over this time period. [Put simply, 95% confidence intervals (C.I.s) indicate that we are 95% confident that the true estimate of a parameter lies between the lower and upper number stated.]

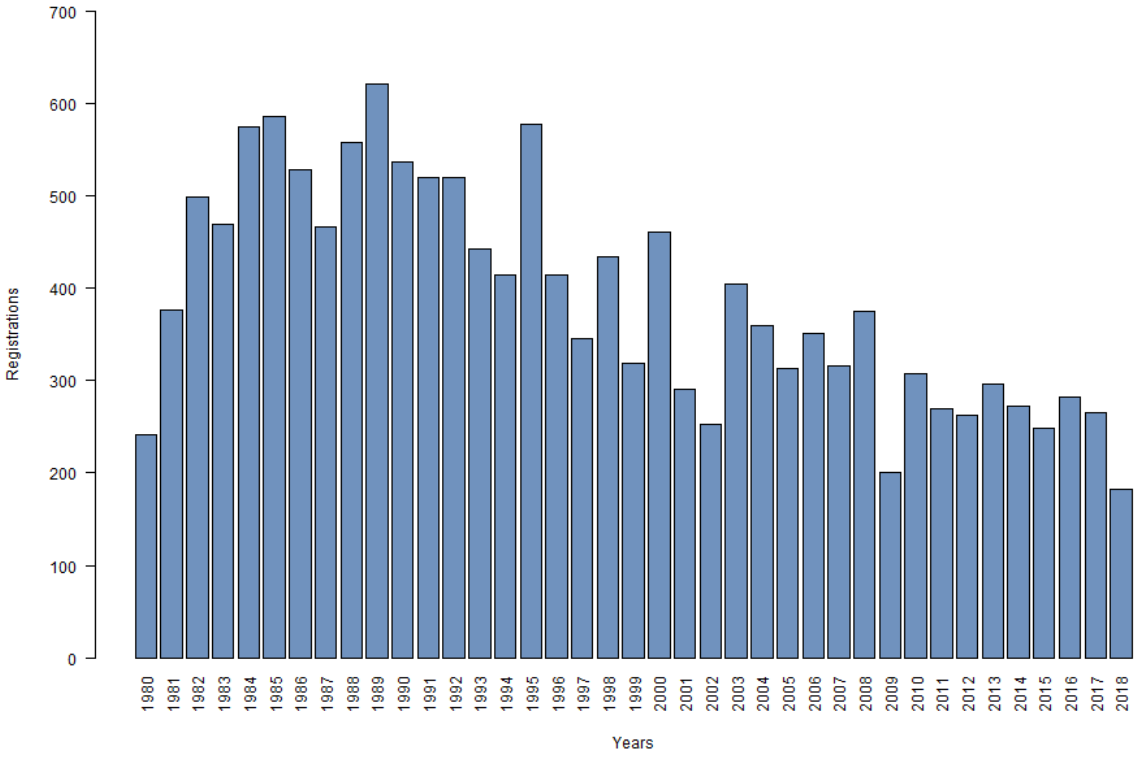

Figure 1: Number of registrations of Gordon Setters per year of birth, 1980 – 2018

BHC annual report

The Breed Health Coordinators' Annual Health Report 2017 yielded the following response to "please list and rank the three health and welfare conditions that the breed considers to be currently the most important to deal with in your breed":

1. Progressive retinal atrophy (PRA)
2. Heart condition concerns

In terms of what the breed has done in the last year to help tackle this listed health and welfare concern, they are continuing to use the DNA scheme they have in place, in which every mating must include a clear. They are also encouraging clinical eye testing. The BHC is keeping carrier/clear figures to monitor our progress since the introduction of the DNA test in 2011. Actions reported over the year were investigation of a second form of PRA at the Animal HealthTrust (AHT), and contact made with Nottingham University who have expressed interest helping the breed in the area of heart conditions.

The Breed Health Coordinators' Annual Health Report 2018 yielded the same top health concerns as the year before, with the breed encouraging breeders to undergo the PRA (rcd4) DNA test and clinical eye test, with two eye testing clinics having been held throughout the year. In addition to this a health survey is being undertaken on heart conditions in the breed, alongside the University of Nottingham.

Purebred/pedigree dog health survey results

2004 Morbidity results: Health information was collected for 293 live Gordon Setters, of which 155 (53%) were healthy and 138 (47%) had at least one reported health condition. The top categories of diagnosis were musculoskeletal (20.0%, 49 of 245 reported conditions), reproductive (11.8%, 29 of 245 reported conditions), dermatologic (9.0%, 22 of 245 reported conditions), immune-mediated (9.0%, 22 of 245 reported conditions) and respiratory (7.8%, 19 of 245 reported conditions). The most frequently reported specific conditions were pyometra (4.4% prevalence, 8 cases in the 182 females in the survey), kennel cough (4.1% prevalence, 12 cases), otitis externa (3.1% prevalence, 9 cases) and lipoma (3.1% prevalence, 9 cases).

2004 Mortality results: A total of 157 deaths were reported for the breed. The median age at death for Gordon Setters was 11 years and 1 months (min = 4 months, max = 16 years and 3 months). The most frequently reported causes of death by organ system or category were cancer (29.3%, 46 of 157 deaths), old age (16.6%, 26 deaths) and cardiac (14.6%, 23 deaths). The most frequently reported specific cause of death behind old age and cancer was heart failure (9.6%, 15 deaths).

2014 Morbidity results: Health information was collected for 173 live Gordon Setters of which 103 (59.5%) had no reported conditions and 70 (40.5%) were reported affected by at least one condition. The most frequently reported specific conditions were skin (cutaneous) cyst (15.6% prevalence, 27 cases), lipoma (6.9%, 12 cases), otitis externa (6.4%, 11 cases), mammary lump (5.8% prevalence, 10 cases) and hypothyroidism (4.1%, 7 cases).

2014 Mortality results: A total of 54 deaths were reported for the breed. The median age at death for Gordon Setters was 12 years (min = 4 years, max = 15 years). The most frequently reported causes of death were old age (20.4%, 11 deaths) and skin tumours (9.3%, 5 deaths).

VetCompass results

No VetCompass data relating to the Gordon Setter were available.

Insurance data

UK Agria data

Insurance data were available for Gordon Setters insured with Agria UK. 'Exposures' are equivalent to one full policy year; in 2017 there were 19 free exposures, 224 full exposures and 220 claims, in 2018 these figures were 15, 198 and 233 respectively. Full policies are available to dogs of any age. Free policies are available to breeders of Kennel Club registered puppies and cover starts from the time the puppy is collected by the new owner; cover under free policies lasts for five weeks from this time. It is possible that one dog could have more than one settlement for a condition within the 12-month period shown.

The top 10 conditions by number of settlements, for authorised claims where treatments started between 1st July 2017 and 31st June 2018 for the Gordon Setter are shown in Table 1 below.

Table 1: Top 10 conditions and number of settlements for each condition between 1st July 2017 and 31st June 2018 for Gordon Setters insured with Agria UK

Condition	**Number of settlements**
Otitis externa chronic	14
Addison's disease (primary hypoadrenocorticism)	14
Cruciate ligament rupture - caudal and cranial	13
Cardiomyopathy - unclassified or class undetermined	10
Atopy finding	9
Cardiomyopathy - Canine dilated cardiomyopathy	9
Wound - laceration	8
Skin (cutaneous) disorder (unspecified)	7
Lameness finding	7
Otitis externa	6

No Swedish insurance data were available for the Gordon Setter.

Breed-specific health surveys

A rolling breed health survey was launched in 2017, which allows Gordon Setters to report health conditions in their dogs as they arise. To date, no results of the survey are available.

Visual health check reports/clinical reports/judges' health monitoring

As a category two breed, judges' health monitoring forms are mandatory. The points of concern reported are shown below in Table 2 below.

Table 2: Judges' health monitoring reports for 2016 to 2018. Those marked with a * indicate newly reported points of concern.

Point of concern	**2016**	**2017**	**2018**
Excessively thick woolly coat	0.10%	0.22%	0.29%
* Unsound movement	0.00%	0.05%	0.00%
Excessive hind angulation	0.10%	0.60%	0.23%
Overlong hip to hock	0.30%	0.82%	0.17%
Sickle hock	0.40%	0.38%	0.17%
* Incorrect dentition	0.00%	0.16%	0.00%
* Overweight	0.10%	0.00%	0.00%
* Other	0.05%	0.05%	1.05%
Total dogs shown	1985	1981	1717

Breed Club health activities

The breed has an active Breed Health Coordinator (BHC), dedicated health sections on the breed clubs' websites and each breed club has a health representative. The BHC continues to monitor emerging conditions within the breed, with reports of inflammatory bowel disease (IBD) having been reported recently.

Assured Breeders Scheme

Currently within the Kennel Club (KC)'s Assured Breeders Scheme (ABS) it is required that Assured Breeders:

- Hip score all breeding stock under the British Veterinary Association (BVA)/KC Hip Dysplasia Scheme
- DNA tested for PRA (rcd4)

The following recommendations also apply:

- Eye tested under the BVA/KC/International Sheepdog Scheme (ISDS) Eye Scheme
- Bitches under 21 months not to produce a litter

DNA test results

Results of the PRA (rcd4) DNA test have been recorded since May 2011 and it was made an ABS requirement in January 2012. The results for dogs which had been DNA tested up to 20/05/2019 are shown in Table 3.

Table 3: PRA (rcd4) DNA test results held by the Kennel Club for Gordon Setters up to 20/05/2019.

Total number of results	**Clear**	**Carrier**	**Affected**	**Hereditarily clear**	**Hereditarily carrier**	**Hereditarily affected**
1744	314 (18.0%)	297 (17.0%)	73 (4.2%)	834 (47.8%)	220 (12.6%)	6 (0.3%)

The DNA test for the rcd4 mutation became available in 2011, and the apparent mutation frequency for Kennel Club registered Gordon Setters born in that year was approximately 27%. For dogs born in 2016, the apparent mutation frequency had dropped to approximately 9% indicating that good progress has been made in just five years.

Canine Health Scheme results and EBVs

Under the ABS, participation in the BVA/KC Hip Dysplasia Scheme is a requirement and eye testing (either through the BVA/KC/ISDS Eye Scheme or the European College of Veterinary Ophthalmologists (ECVO) Scheme) is a recommendation.

All the other BVA/KC Health Schemes are open to dogs of any breed, and the results for Gordon Setters which have been presented for assessment under the schemes are shown below.

HIPS

In total 2,142 Gordon Setters have participated in the BVA/KC Hip Dysplasia Scheme to date (20/05/2019), with the 15 and 5 year median hip score being 10 (range 0-101).

Hip score categories received by Gordon Setters which participated in the BVA/KC Hip Dysplasia Scheme between 1990 and 2016 are shown in five year blocks (which can be considered to approximate to a generation) in Figure 2 below. The categories correspond to those assigned under the FCI (Europe)'s hip grading scheme; for one hip, a 'normal' hip scores 0-3, borderline scores 4-8, mild HD scores 9-18, moderate HD scores 19-30 and severe HD represents a score greater than 30. Further information on these categories can be found here: https://www.bva.co.uk/uploadedFiles/Content/Canine_Health_Schemes/chs-comparison-of-hd-schemes.pdf . Over this time period there appears to be a definite reduction in the proportion of Gordon Setters with mild to severe hip dysplasia and an increase in those with borderline and normal scores.

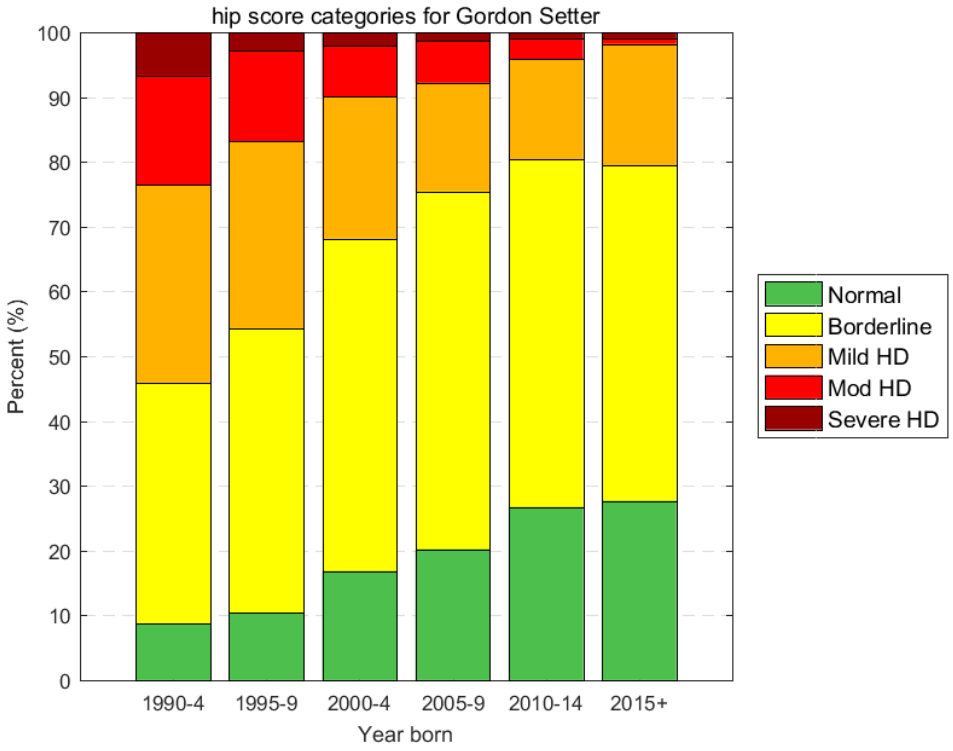

Figure 2 – Hip score categories for Gordon Setters which participated in the BVA/KC Hip Dysplasia Scheme between 1990 and 2016, in 5-year blocks.

Estimated Breeding Values (EBVs) are available for hip scores in this breed. Figure 3 shows the five year rolling trend in EBVs by year of birth in the Gordon Setter. It appears that EBVs have generally decreased since 1990. This indicates a generally improving (lowering) genetic risk of hip dysplasia as determined by the BVA/KC hip score, most likely as a result of selection.

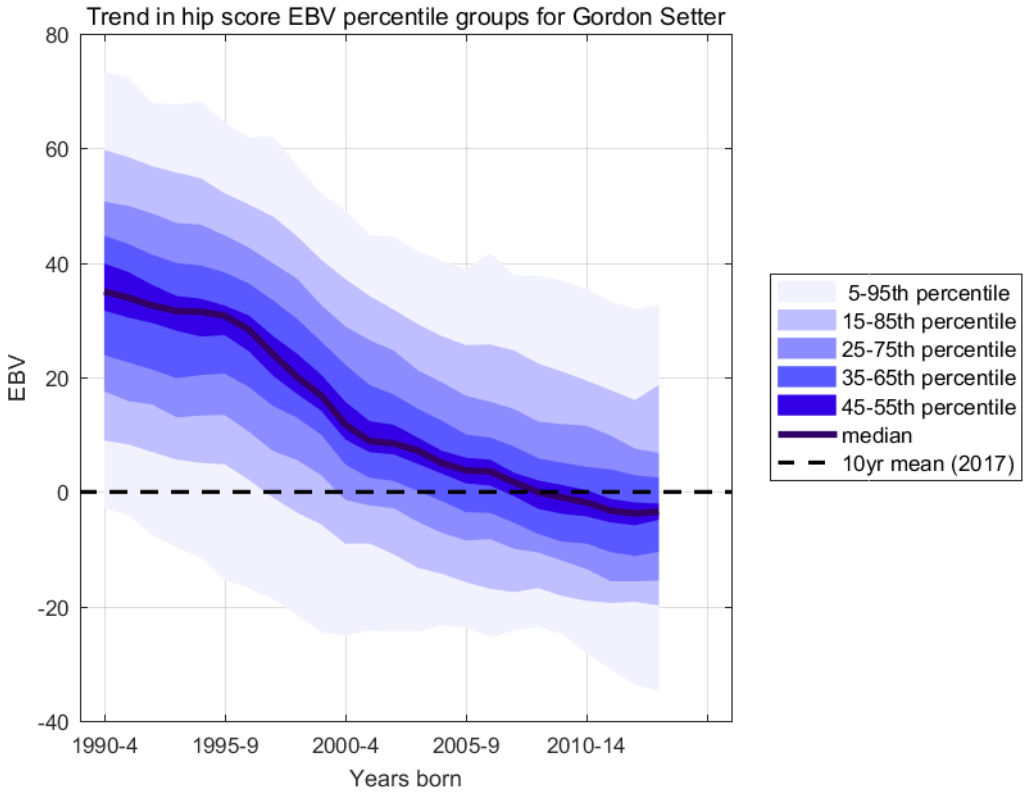

Figure 3: Trend in hip score EBV, with percentile groups, for the Gordon Setter for years of birth since 1990.

ELBOWS

Although participation in the BVA/KC Elbow Dysplasia Scheme is neither an ABS requirement nor recommendation, participation in the schemes is open to dogs of any breed. Elbow scores received by the 19 Gordon Setters scored since the Scheme launched in 1998 are shown in Table 4. Some 36.8% (7 of 19 Gordon Setters of dogs of the breed participating in the Scheme were diagnosed with some degree of elbow dysplasia, however the numbers involved are very small.

Table 4: Elbow scores and number of dogs receiving those scores since 1998 for the 19 Gordon Setters which have participated in the BVA/KC Elbow Dysplasia Scheme.

Elbow score	Number of dogs	Proportion
0	12	63.2%
1	5	26.3%
2	1	5.26%
3	1	5.26%

EYES

The breed is on Schedule A of the BVA/KC/ ISDS Eye Scheme for GPRA. Schedule A lists the known inherited eye conditions in the breeds where there is enough scientific information to show that the condition is inherited in the breed, often including the actual mode of inheritance and in some cases even a DNA test. Schedule B lists those breeds in which the conditions are, at this stage, only suspected of being inherited. The results of Eye Scheme examinations of the breed which have taken place since 2012 are shown in Table 5.

Table 5: Reports on Gordon Setters which have participated in the BVA/KC/ISDS Eye Scheme since 2012

Year	Number seen	Comments
2012	25 adults 0 litters	2 – entropion 1 – nuclear cataract 1 – other cataract
2013	35 adults 0 litters	1 – entropion 1 – Persistent hyperplastic primary vitreous (PHPV) 1 – other cataract
2014	27 adults 0 litters	1 – Posterior polar subcapsular cataract (PPSC) 1 – chorioretinitis 1 – macropalpebral fissure
2015	26 adults 0 litters	1 – PPM 4 – PHPV 1 – nuclear cataract 2 – chorioretinitis
2016	56 adults 0 litters	2 – GPRA affected
2017	52 adults 0 litters	1 – PPM 2 – PHPV 2 – post cataract 1 – nuclear cataract 4 – chorioretinopathy

Other ocular conditions: The American College of Veterinary Ophthalmologists (ACVO) consider the Gordon Setter to be predisposed to ectropion, distichiasis, uveal cysts, persistent pupillary membranes (PPM), cataract, generalised retinal atrophy, retinal atrophy (rcd4), cone-rod dystrophy and retinal dysplasia - folds (Genetics Committee of the ACVO, 2018).

Between 2010 and 2018 760 dogs of the breed were examined by the ACVO and prevalence data are shown in Table 6 alongside data from previous years. Overall, 78.2% (594 of 760) of dogs of the breed examined during 2010 and 2018 had healthy eyes unaffected by any disease conditions. However, it is important to consider that the sample was quite small and the dogs were from America.

Table 6: ACVO examination results for the Gordon Setter, 1991-2018

Disease Category/Name	Percentage of Dogs Affected		
	1991-1999 (n=735)	2000-2009 (n=905)	2010-2018 (n=760)
Eyelids			
Ectropion	3.7%	1.4%	2.0%
Distichiasis	1.2%	2.7%	1.4%
Uvea			
Uveal cyst	0.1%	1.7%	0.7%
Persistent pupillary membranes (iris to iris)	3.5%	5.9%	5.0%
Persistent pupillary membranes (lens pigment foci/ no strands)	0.0%	0.1%	2.4%
Lens			
Cataract (significant)	3.3%	3.9%	4.5%
Retina			
Retinal dysplasia (folds)	1.9%	1.3%	1.7%
Generalised progressive retinal atrophy	1.8%	0.3%	0.1%

Adapted from: https://www.ofa.org/diseases/eye-certification/blue-book

Breed Club Recommendations

The breed clubs recommend that bitches under 21 months are not to produce a litter.

Reported caesarean sections

When breeders register a litter of puppies, they are asked to indicate whether the litter was delivered (in whole or in part) by caesarean section. In addition, veterinary surgeons are asked to report caesarean sections they perform on Kennel Club registered bitches. The consent of the Kennel Club registered dog owner releases the veterinary surgeon from the professional obligation to maintain confidentiality (vide the Kennel Club General Code of Ethics (2)). There are some caveats to the associated data; it is doubtful that all caesarean sections are reported, so the number reported each year may not represent the true proportion of caesarean sections undertaken in each breed. In addition, these data do not indicate whether the caesarean sections were emergency or elective.

The number of litters registered per year for the breed and the number and percentage of reported caesarean sections in the breed for the past 10 years are shown in Table 7.

Table 7: Number and percentage of litters of Gordon Setters registered per year and number of caesarean sections reported per year, 2008 to 2018.

Year	Number of Litters Registered	Number of C-sections	Percentage of C-sections	Percentage of C-sections out of all KC registered litters (all breeds)
2008	49	0	0.00%	0.05%
2009	31	0	0.00%	0.15%
2010	45	1	2.22%	0.35%
2011	32	0	0.00%	1.64%
2012	32	4	12.50%	8.69%
2013	43	11	25.58%	9.96%
2014	32	3	9.38%	10.63%
2015	37	4	10.81%	11.68%
2016	32	6	18.75%	13.89%
2017	33	3	9.09%	15.00%
2018	25	2	8.00%	17.21%

Genetic diversity measures

The effective population size is the number of breeding animals in an idealised, hypothetical population that would be expected to show the same rate of loss of genetic diversity (rate of inbreeding) as the population in question; it can be thought of as the size of the 'gene pool' of the breed. In the population analysis undertaken by the Kennel Club in 2015, an estimated effective population size of 125.2 was reported (estimated using the rate of inbreeding over the period 1980-2014). An effective population size of less than 100 (inbreeding rate of 0.50% per generation) leads to a dramatic increase in the rate of loss of genetic diversity in a breed/population (Food & Agriculture Organisation of the United Nations, "Monitoring animal genetic resources and criteria for prioritization of breeds", 1992).

Annual mean observed inbreeding coefficient (showing loss of genetic diversity) and mean expected inbreeding coefficient (from simulated 'random mating') over the period 1980-2014 are shown in Figure 4. As with most breeds, the rate of inbreeding was at its highest in this breed in the 1980s and 1990s. This represents a 'genetic bottleneck', with genetic variation lost from the population. However, since 2000 the

rate of inbreeding has been negative, implying moderate restoration of genetic diversity (possibly through the use of imported animals).

It should be noted that, while animals imported from overseas may appear completely unrelated, this is not always the case. Often the pedigree available to the Kennel Club is limited in the number of generations, hampering the ability to detect true, albeit distant, relationships. For full interpretation see Lewis et al, 2015 https://cgejournal.biomedcentral.com/articles/10.1186/s40575-015-0027-4.

The current breed average inbreeding coefficient is 10.2%.

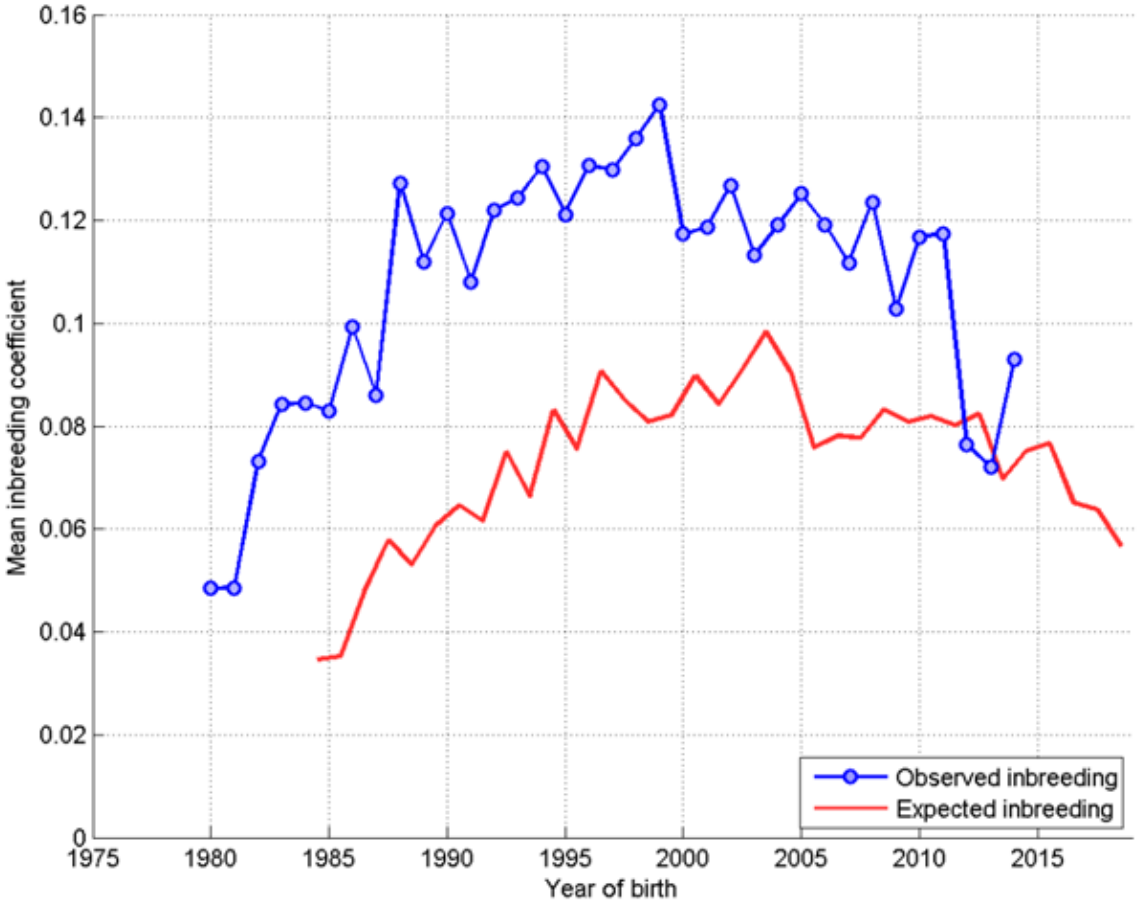

Figure 4: Annual mean observed and expected inbreeding coefficients.

Below is a histogram ('tally' distribution) of number of progeny per sire and dam over each of seven five-year blocks (Figure 5). A longer 'tail' on the distribution of progeny per sire is indicative of 'popular sires' (few sires with a very large number of offspring, known to be a major contributor to a high rate of inbreeding). It appears that the extensive use of popular dogs as sires has eased a little (the 'tail' of the blue distribution shortening in figure 5).

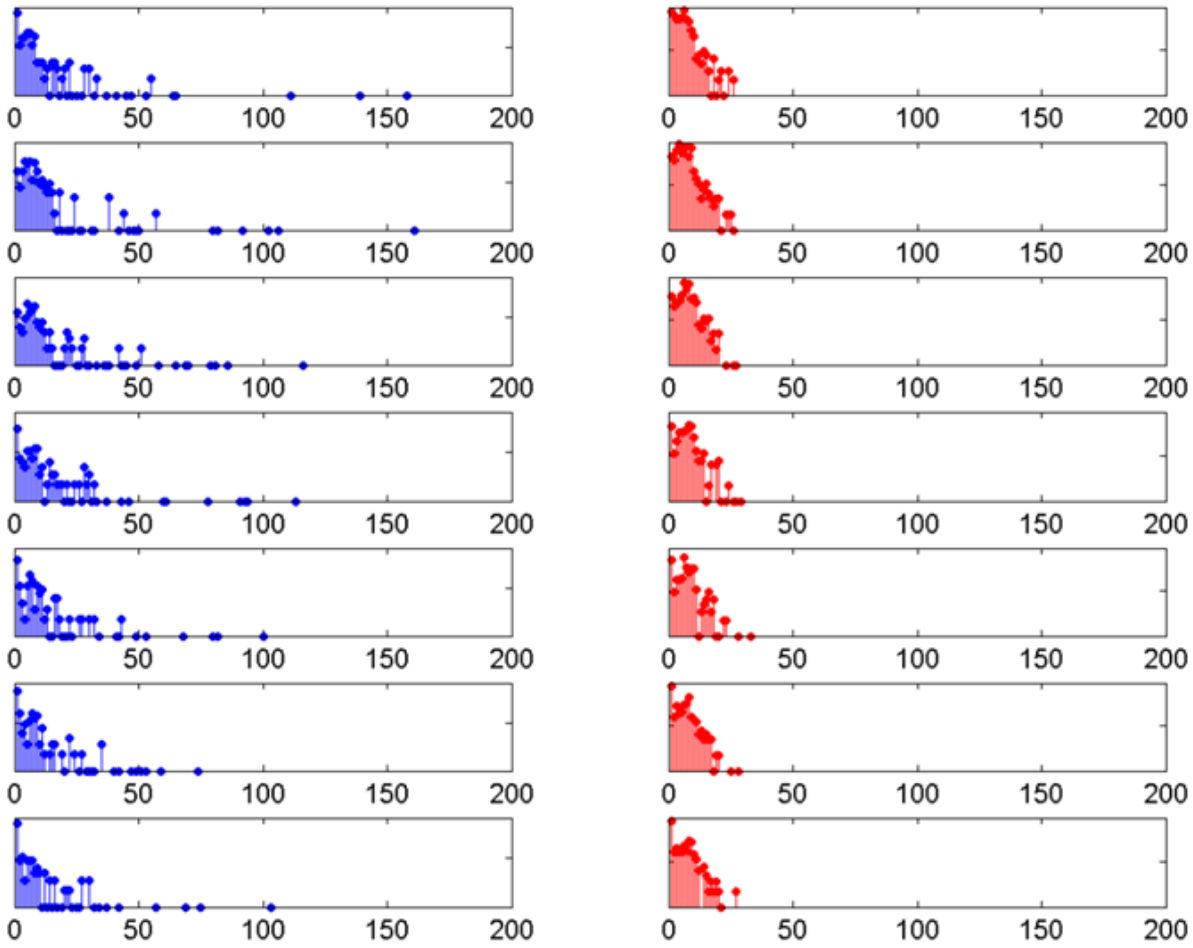

Figure 5: Distribution of progeny per sire (blue) and per dam (red) over 5-year blocks (1980-4 top, 2010-14 bottom). Vertical axis is a logarithmic scale.

Current research projects

The Gordon Setter is one of the breeds in the Animal Health Trust (AHT)'s Give a Dog a Genome project; the health condition given as concerns in the breed was PRA. An affected individual with PRA has been sequenced.

Discussions are underway between the BHC and the University of Nottingham regarding a survey investigating heart conditions in the breed, with the analysis to begin in the summer of 2019.

The breed have also been involved with IBD/protein losing enteropathy(PLE) research in America, and are currently awaiting publication of the study.

SECTION 2: PRIORITIES

A meeting was held with Gordon Setter breed club representatives on 5th June 2018 to discuss Section 1 of the BHCP and agree the priority issues for the health of the breed.

Reports of dermatological conditions in the Gordon Setter in the scientific literature were discussed. Three conditions were listed of which two, SLO and puppy strangles, had been seen in the UK population by the breed health representatives.

The single endocrine condition listed was hypothyroidism; although it had been seen in the UK, it was in a small number of dogs.

There was one gastrointestinal condition listed, gastric dilatation/volvulus syndrome (GDV)/bloat, which appears to be a problem across a number of deep chested larger breeds. The group discussed how it was believed that the incidence of this condition has decreased with increased owner awareness, or certainly reporting of it, as owners are able to recognise and treat symptoms before they progress.

Musculoskeletal conditions listed were elbow and hip dysplasia. Participation in the BVA/KC hip dysplasia scheme is a requirement within the Assured Breeder Scheme, and marked improvement is being seen in both the scores themselves and within estimated breeding values (EBVs). Elbow scoring is neither a recommendation nor requirement under the Assured Breeder Scheme currently. There are only 11 Gordon Setters who have been through the scheme with 63.6% having no signs of elbow dysplasia.

Neurological conditions listed were cerebellar degeneration and lethal astrocytosis; neither have been seen in the UK population, however they have been seen in populations abroad and thus stud dogs are often tested for cerebellar ataxia.

Ocular conditions listed two conditions, progressive retinal atrophy (PRA) and retinopathy. There is a DNA test for PRA (rcd4) and the breed are aware of another form of PRA, which is being investigated.

The 2004 and 2014 Purebred and Pedigree Breed Health Survey results were reviewed. The subsequent insurance data were interesting as the top three causes of claims did not appear in any other evidence source. The BHC annual reports for the past two years have listed PRA as a priority and in 2017 heart conditions were added.

Genetic diversity measures were discussed, the estimated effective population size in the 2015 analysis for Gordon Setters was 125.2, and it was suggested that this figure remains relatively high as this is a breed with good international cooperation.

The group agreed from the information provided and their own experience that the priority for the Gordon Setter was PRA, whilst continuing to monitor emerging conditions and not losing focus on hip dysplasia and genetic diversity.

SECTION 3: ACTION PLAN

- The Kennel Club to investigate the progress with the research into heart conditions at Nottingham University.
- The Kennel Club and breed clubs to monitor the PRA genomic research.
- The breed clubs to continue encouraging uptake of the BVA/KC Hip Dysplasia Scheme and use of the associated EBVs.
- The breed clubs to continue encouraging uptake of the BVA/KC/ISDS Eye Scheme.
- The breed clubs to continue encouraging uptake of the PRA(rcd4) DNA testing.
- The Kennel Club will review progress with the Gordon Setter breed club