THE KENNEL CLUB
DOG HEALTH

Breed Health and Conservation Plan

Bloodhound

2019

BHCP/Version 3/June 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 Bloodhound is a vulnerable native breed, defined as a breed with fewer than 300 new registrations a year. The number of registrations has been low, but relatively stable for the past 10 years, as shown in Figure 1.

The number of Bloodhounds registered by year of birth between 1980 and 2018 are shown in Figure 1 below.

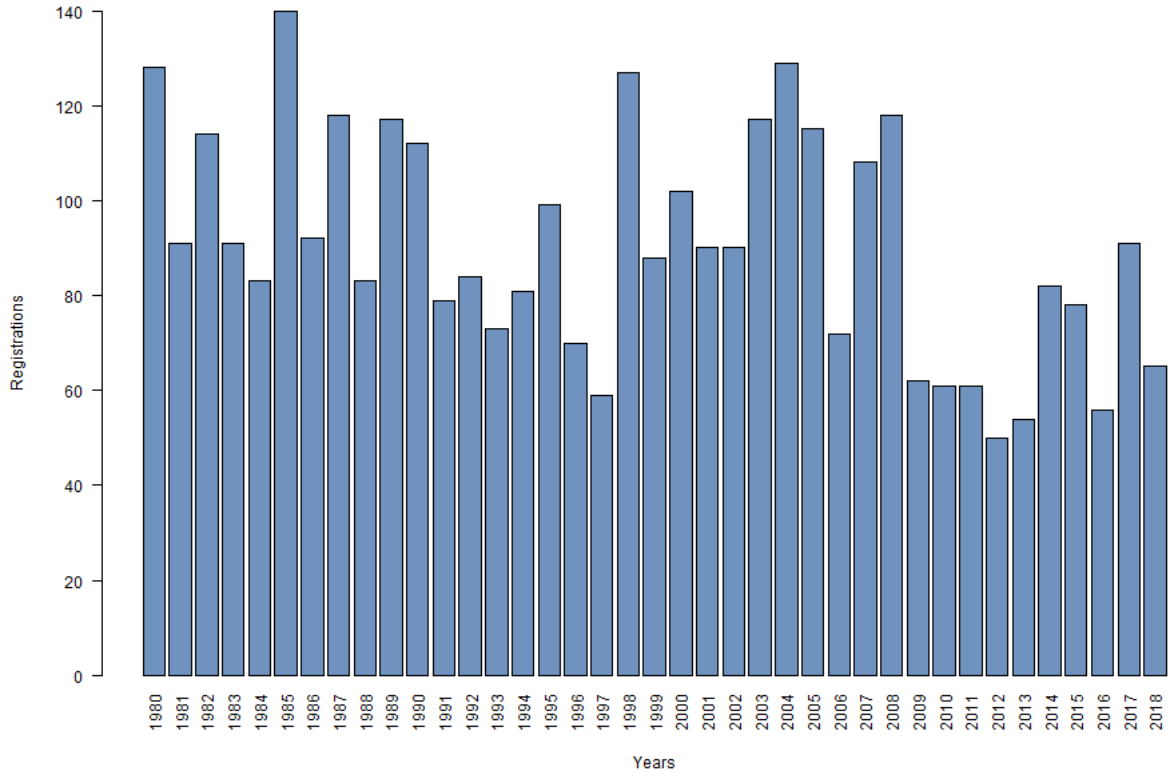

Figure 1: Number of registrations of Bloodhounds per year of birth, 1980 - 2018

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. Cancer
2. Bloat/gastric torsion
3. Epilepsy

In terms of what the breed has done in the last year to help tackle these listed health and welfare concerns, the breed has participated in the 'Give a Dog a Genome.

The Breed Health Coordinators' Annual Health Report 2018 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. Cancer
2. Bloat/gastric torsion
3. Skin conditions

In terms of what the breed has done in the last year to help tackle these listed health and welfare concerns, the breed have monitored results of ongoing studies in other breeds, conducted a breed health survey and include skin conditions as part of the visual health checks.

Purebred/pedigree dog health survey results

2004 Morbidity results: Health information was collected for 112 live Bloodhounds of which 54 (48.0%) were healthy and 58 (52.0%) had at least one reported health condition. The top categories of diagnosis were gastrointestinal (21.4%, 22 of 103 reported conditions), reproductive (17.5%, 18 of 103 reported conditions), ocular (13.6%, 14 of 103 reported conditions), dermatologic (11.7%, 12 of 103 reported conditions) and immune mediated (6.8%, 7 of 103 reported conditions). By far the most frequently reported specific condition was GDV (15.5%, 16 of 103 reported conditions).

2004 Mortality results: A total of 82 deaths were reported. The median age at death for Bloodhounds was six years and nine months (min = 11 months, max = 12 years and 1 month). The most frequently reported causes of death by organ system or category were gastrointestinal (34.1%, 28 of 82 deaths), cancer (26.8%, 22 of 82 deaths), other (7.3%, 6 of 82 deaths), old age (6.1%, 5 of 82 deaths) and cardiac (4.9%, 4 of 82 deaths). The three most frequently reported specific causes of death were gastric dilatation/volvulus (34.1%, 28 of 82 deaths), old age (6.1%, 5 of 82 deaths) and spinal disease (unspecified) (4.9%, 4 of 82 deaths).

2014 Morbidity results: Health information was collected for 24 live Bloodhounds of which 15 (62.5%) had no reported conditions and nine (37.5%) were reported to be affected by at least one condition. The most frequently reported specific conditions were gastric dilatation/volvulus, skin lump, unspecified skin, ear or coat, callouses and chronic itching.

2014 Mortality results: A total of eight deaths were reported in the breed. The range of age at death for Bloodhounds was three to 11 years. The most frequently reported causes of death were cancer (unspecified), enlarged heart, gastroenteritis, lymphoma and old age.

VetCompass results

No VetCompass data relating to the Bloodhound were available.

Insurance data

Insurance data were available for dogs insured with Agria UK. It was difficult to determine the underlying population at risk for these conditions so prevalence estimates are not provided, nevertheless the number of settlements due to particular diagnoses provides useful information about the relative frequency of these conditions. Data relating to two different types of policies were supplied. 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 can be assumed that settlements under full policies, as shown in Table 1, refer to dogs outside of the initial five week free period. No settlements were made under free policies for Bloodhounds. It is possible that one dog could have more than one settlement for a condition within the 12-month period shown.

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

Condition	Number of settlements
Hip dysplasia developmental	20
Neoplasm - splenic	6
Ulcerative keratitis (Corneal ulceration)(unspecified)	5
Neoplasm - eyelid	4
Epilepsy	3
Pyometra	2
Foreign body - intestinal small	2
Osteoarthritis (osteoarthrosis degenerative joint disease (DJD))(unspecified)	2
Gastric (stomach) torsion - chronic	2
Cryptorchidism - unilateral	2

Swedish insurance data were not available for the Bloodhound.

Breed-specific health surveys

The Association of Bloodhound Breeders undertook a health survey in 2013, which gathered information relating to 84 living hounds. A question relating to non-routine veterinary treatment received in 2012 yielded the information shown in Table 2, with ear infection and bloat/torsion being the most frequently reported conditions.

Table 2: Non-routine veterinary treatment reported in 2013 ABB survey.

Cause of vet visit	Number of dogs	Percentage of total sample
Ear infection	4	4.8%
Bloat/torsion (leading to recovery)	4	4.8%
Intestinal obstruction	3	3.6%
Other infection/abscess	3	3.6%
Benign tumour removal (including epulis)	3	3.6%
Corneal ulcer	2	2.4%
Urinary tract infection	2	2.4%
Skin infection	2	2.4%
Weight loss	2	2.4%
Pneumonia	1	1.2%
Eye trauma	1	1.2%
Pericardial rub	1	1.2%
Broken toe	1	1.2%
Pancreatitis	1	1.2%
Wart removal	1	1.2%
Bruising of cruciate ligament	1	1.2%
Bite	1	1.2%
Diarrhoea	1	1.2%
False pregnancy	1	1.2%
Pyometra	1	1.2%
Tail amputation (due to accident)	1	1.2%
Elbow replacement	1	1.2%

Fourteen hounds were reported to have died in 2012, six (43.0%) due to cancer and three (22.0%) due to bloat/gastric torsion. The average age at death was 8.25 years, with a range of 3 years to 10 years.

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

As a category three breed judges' health monitoring forms are mandatory. The points of concern reported are shown below in Table 3.

Table 3: Percentage of Bloodhounds exhibited at Dog shows with points of concern for 2016 to 2018. Those with a * indicate new points of concern.

Point of concern	2016	2017	2018
* Loose eyelids	1.7%	0.0%	0.0%
Excessive facial skin with eyelid defects	4.7%	1.8%	3.5%
Weak hindquarters	3.4%	1.8%	2.0%
Excessive skin on head or body (note to handler)	0.4%	1.2%	0.0%
Signs of dermatitis in skin folds	0.4%	0.0%	0.0%
Nervous temperament	2.6%	3.0%	2.5%
Total dogs shown	**233**	**164**	**198**

Breed Club health activities

The breed has a five person breed health subcommittee, an active Breed Health Coordinator, a dedicated health website (www.bloodhoundhealth.co.uk) and health sections on both breed clubs' websites.

A breed specific breeding strategy has also been developed. http://www.associationofbloodhoundbreeders.co.uk/resources/breed_specific_breeding_strategy_for_the_bloodhound.pdf

Bloodhound Eye Scheme

Professor Peter Bedford helped set up a Bloodhound Club Eye Assessment Scheme in 1992. This involves grading of eyelid conformation on a scale 0-3; 0 indicates normal conformation with no evidence of ectropion/entropion or corneal damage, 1 indicates mild ectropion or entropion but no corneal damage, 2 indicates moderate ectropion or entropion and no corneal damage and 3 indicates ectropion and/or entropion with associated corneal damage. Since 1992, several eye clinics with various Eye Panellists from the BVA/KC/ISDS Eye Scheme, and 259 examinations have been undertaken and it is considered that considerable improvement in eyelid conformation has been seen since the inception of the scheme. The results of examinations undertaken in 2014 are shown in Figure 2. Regular Bloodhound Club eye surveys, with response relating to up to 174 hounds, also support the apparent improvement in Bloodhound eyes.

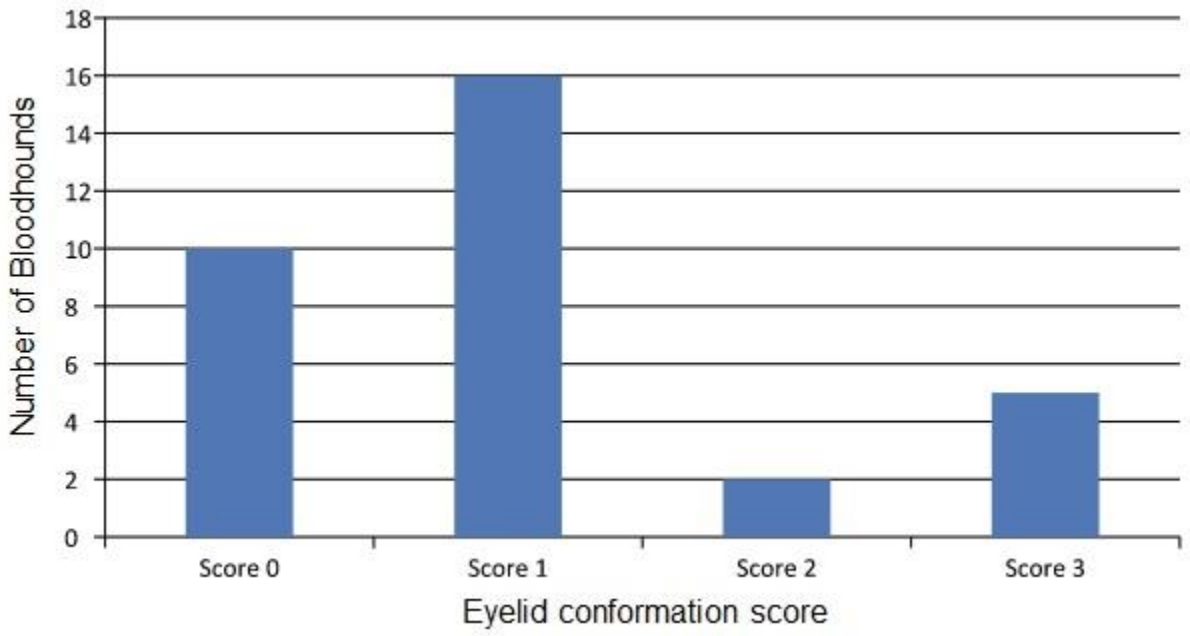

Figure 2: Results of Bloodhound Eye Scheme examinations for 33 Bloodhounds examined in 2014.

Bloodhound Health Award Scheme

The Bloodhound Health Award Scheme is open to anyone in the UK with a registered Bloodhound fitting the required criteria below, they do not need to be a member of the breed clubs or participate in any events, however the Platinum Award does include involvement in working trials and shows.

Bloodhounds must be Kennel Club registered and either micro chipped, tattooed or DNA profiled to participate in the scheme. To be eligible Bloodhounds must be over 12 months old. The requirements for each award are described below:

Bronze

Bronze is awarded when a Bloodhound has obtained a Breed Health Certificate. To qualify for a Breed Health Certificate an assessment form provided by the Health Sub- Committee must be completed by either their own veterinary surgeon or one organised by either breed club at one of their events. The Bloodhound has to pass the criteria set out on the assessment form to obtain the Breed Health Certificate.

The health assessment form requires a veterinary surgeon to perform:

- Visual assessment of the skin, noting in particular any signs of dermatitis, hair loss, scarring or excessive amounts of skin
- Visual assessment of movement, noting in particular presence and severity of any lameness, ataxia, weak hocks and weak hindquarters
- Visual assessment of the eyes, noting in particular presence and severity of ectropion, entropion, damage to the cornea, keratitis, conjunctivitis, epiphora, trichiasis or signs of pain or discomfort
- Body condition score
- Basic assessment of temperament and comment if the dog is excessively shy or aggressive

Silver

In addition to the Breed Health Certificate the Bloodhound will have to attend a Bloodhound Eye Clinic organised by either breed club at one of their events. The Bloodhound will have to pass the eye assessment completed by a veterinary ophthalmologist. Alternatively, if no clinic is available, it may be possible to arrange for an eye examination to be performed by an approved ophthalmologist.

Gold

In addition to the Silver Award the Bloodhound will have to achieve acceptable BVA/KC hip and elbow scores, they will also need to undergo a heart assessment (by auscultation) completed by a veterinary cardiologist.

Platinum

In addition to the Gold Award the Bloodhound has to compete in Bloodhound Working Trials to show that they are fit for purpose and compete in the show ring for conformation assessment.

Stud Dog / Brood Bitch of Merit

To gain this accolade a Bloodhound must have achieved the Bronze, Silver and Gold Awards. In addition they must have achieved a Stud Book Number, and have a minimum of four progeny, two of which have obtained the Bronze Award, one the Silver Award and one the Gold Award.

As of 21st May 2019, 16 Bronze certificates, nine Silver certificates, two Gold certificates and two Platinum awards have been awarded by the Breed Health Sub-Committee, with a further 11 hounds awaiting Bronze certification.

Assured Breeder Scheme

Currently there are no requirements or recommendations under the Kennel Club (KC)'s Assured Breeders Scheme for Bloodhound breeders.

DNA test results

There are no DNA tests currently available for Bloodhounds specifically, although some companies will test dogs for any breeds for a mutation associated with the risk of developing degenerative myelopathy.

Canine Health Scheme results and EBVs

Participation in any of the British Veterinary Association (BVA)/Kennel Club (KC) Canine Health Schemes is not currently a recommendation or requirement for the Bloodhound under the KC's Assured Breeder Scheme. However, the schemes are open to dogs of any breed. Estimated breeding values (EBVs) are currently only available for breeds with large numbers of dogs with hip and elbow scores for the respective EBV.

HIPS

Forty-two Bloodhounds have been hip scored as part of the BVA/KC Hip Dysplasia Scheme since the scheme was launched (up until the 07/05/2019), and the five year and 15 year median hip score received were both 14 (range 10 - 42).

ELBOWS

A total of 41 Bloodhounds have been elbow scored as part of the BVA/KC Elbow Dysplasia Scheme since the scheme launched in 1998; the scores received are shown in Table 4 below. Collectively 41.5% (17 dogs) were affected by elbow dysplasia to some degree based on scores received.

Table 4: Elbow scores and number of dogs receiving those scores since 1998 for the Bloodhound

Elbow score	Number of dogs	Proportion of dogs
0	24	58.5%
1	9	22.0%
2	7	17.1%
3	1	2.4%

EYES

The BVA records dogs which have participated in the BVA/KC/International Sheep Dog Society (ISDS) Eye Scheme which are not on Schedule A. 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. The Bloodhound is currently listed on the Schedule B of the BVA/KC/ISDS Scheme for multiple ocular defects. 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 Bloodhounds which have taken place since 2012 are shown in Table 5. No cases of multiple ocular defects have been diagnosed in Bloodhounds participating in the scheme over this time period.

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

Year	Number seen	Comments
2012	0 adults	No sightings reported
2013	1 adult	No sightings reported
2014	1 adult	1 – ectropion 1 – entropion
2015	3 adults	No sightings reported
2016	3 adults	2 – ectropion
2017	3 adults	3 – ectropion 3 – entropion 1 – PPM

American College of Veterinary Ophthalmologists (ACVO)

Literature produced by AVCO reported the Bloodhound as being predisposed to ectropion, entropion, macroblepharon, prolapsed gland of the third eyelid, persistent pupillary membranes, cataract, and retinal dysplasia (Genetics Committee of the American College of Veterinary Ophthalmologists, 2018).

Throughout 2010 to 2018, 153 Bloodhounds were examined for ocular disorders. The resultant prevalence data is shown in Table 6 below, alongside that for previous time periods. Overall, 60.1% (92 of 153 dogs) of Bloodhounds examined between

2010 and 2018 had normal eyes unaffected by any condition. However, it is important to note that this data is from dogs in the United States.

Table 6: ACVO examination results for Bloodhounds, 1991 - 2018

Disease Category/Name	**Percentage of Dogs Affected**		
	1991-1999 (n=201)	**2000-2009** (n=256)	**2010-2018** (n=153)
Eyelids			
Macropalpebral fissure	17.9%	14.1%	2.0%
Entropion	23.4%	24.2%	15.0%
Ectropion	27.9%	28.5%	18.3%
Distichiasis	1.0%	1.6%	3.3%
Nasolacrimal			
Keratoconjunctivitis sicca	0.0%	0.4%	1.3%
Cornea			
Corneal pannus	1.0%	1.2%	0.0%
Corneal endothelial degeneration	1.0%	0.0%	0.0%
Nictitans			
Prolapsed gland of the third eyelid	0.5%	1.6%	0.7%
Uvea			
Persistent pupillary membranes (iris to iris)	6.5%	1.6%	0.7%
Persistent pupillary membranes (iris to lens)	1.0%	0.8%	0.7%
Persistent pupillary membranes (iris to cornea)	11.4%	5.1%	1.3%
Persistent pupillary membranes (lens pigment foci)	0.0%	0.4%	1.3%
Lens			
Cataracts (significant)	10.0%	8.6%	7.8%
Retina			
Retinal dysplasia	6.0%	7.8%	1.3%

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

Breed Club breeding recommendations

There are not currently any Breed Club breeding recommendations listed on the Kennel Club's website for the breed.

Reported caesarean sections

Veterinary surgeons and breeders are requested to report when a litter is delivered by caesarean section. 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 Bloodhound and the number of reported caesarean sections in the breed for the past 10 years are shown in Table 7.

Table 7: Number of litters of Bloodhounds 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	17	0	0.0%	0.05%
2009	5	0	0.0%	0.15%
2010	6	0	0.0%	0.35%
2011	9	0	0.0%	1.64%
2012	4	0	0.0%	8.69%
2013	12	2	16.7%	9.96%
2014	8	3	37.5%	10.63%
2015	9	0	0.0%	11.68%
2016	3	0	0.0%	13.89%
2017	8	0	0.0%	15.00%
2018	5	1	20.0%	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 890.5 was reported for the Bloodhound (estimated using the rate of inbreeding over the period 1980-2014).

The number of animals of this breed registered with the Kennel Club is consistently small. The small population size and probable use of migrant animals mean there may be large fluctuations in the rate of inbreeding and effective population size. 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 annual breed average inbreeding coefficient is 6.5%.

Below is a histogram ('tally' distribution) of number of progeny per sire and dam over each of seven 5-year blocks (Figure 3). 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). There appears to be only modest use of popular dogs as sires in this breed.

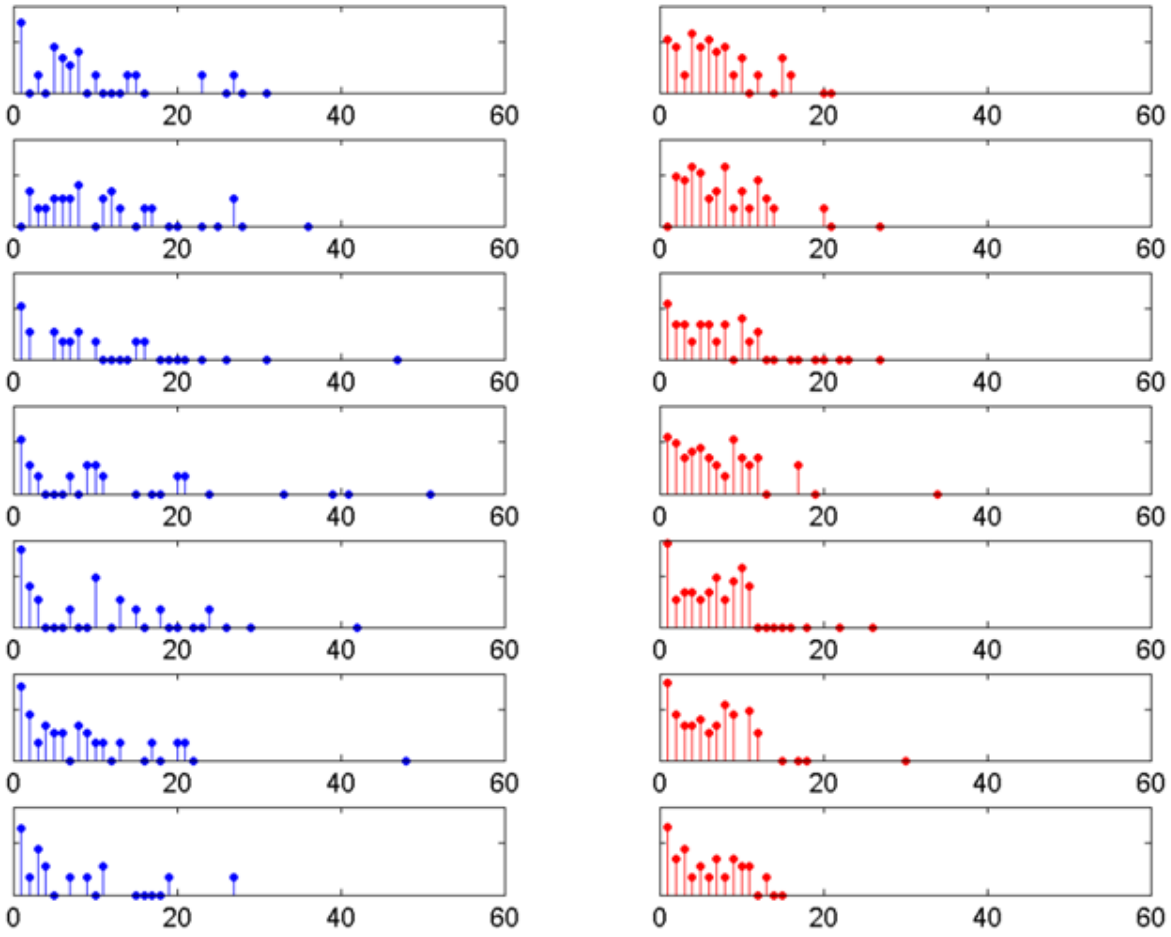

Figure 3: Distribution of progeny per sire (blue) and per dam (red) over 5-year blocks (1980-4 top, 2010-14 bottom). Vertical axis is a logarithmic scale.

Current research projects

The Bloodhound is one of the 75 breeds in the Animal Health Trust's Give a Dog a Genome project; the health conditions given as concerns for the breed were cancers, epilepsy and GDV. A healthy, older representative of the breed has now been sequenced.

SECTION 2: PRIORITIES

A meeting was held with the Bloodhound breed representatives on the 28th May, following the discussion of the breed's BHCP in 2017. An updated evidence base was provided to the group. This meeting was to discuss any further health research or developments in the breed's health that had occurred in the interim and to review the action points and priorities confirmed at the previous meeting.

The updated insurance data was discussed, with the breed representatives noting their concern for the high number of settlements between 2017-2018 for hip dysplasia. The Office highlighted that care should be taken when drawing conclusions from the data as a number of the settlements may relate to the same dog. To gain additional insight, it was agreed that the KC would contact Agria to enquire into the number of dogs represented in the data.

The breed health specific survey results were discussed amongst the group. The breed representatives noted that no additional surveys have been carried out as the breed had chosen to focus on veterinary data. However, the group noted that it would be beneficial for a new survey to be distributed or for the breed to set up an online reporting system, to gather up to date data on the prevalence of any existing conditions and to identify any potential emerging issues. It was noted that the KC can assist with promoting an online reporting system and designing, disseminating and analysing a breed specific survey, and the breed representatives agreed that assistance from the Office would be helpful.

With regard to Breed Watch, the Bloodhound has remained a category three breed, and the data collected from the mandatory breed judges' health monitoring forms for 2018 were discussed. The KC highlighted that dogs with a concern who are repeatedly shown can cause the data to be artificially raised, and that there is also considered to be a recent rise in reporting and increase in judges' awareness over the last few years. With regard to points of concerns, the breed representatives raised that they have observed an increase of weak hindquarters in the ring and that the breed will be closely monitoring the concern in the breed.

The availability of the degenerative myelopathy (DM) DNA test was discussed, with the breed representatives noting that many breeders make use of the test. The breed highlighted the substantial DM prevalence in the USA population and raised concerns with regard to the recent increase in imported dogs. The KC noted that the breed should consider applying for recognition of the DM test, to enable data collection and to facilitate investigation of the prevalence of DM in the UK population and to help identify its emergence. The breed representatives agreed that discussions would be held with the breed clubs concerning recognition, along with the potential for the test to be put forward as a recommendation under the Assured Breeder Scheme (ABS).

Canine Health Schemes data were discussed, and it was noted that to date, only 42 Bloodhounds have been hip scored and 41 elbow scored, with a five year median hip score of 14, and 41.5% being affected by some degree of elbow dysplasia. The

group noted that further investigation is required, and discussed the opportunity for the BVA/KC hip and elbow schemes to become a recommendation under the ABS to increase data collection and facilitate significant analysis. The breed representatives raised their initial apprehensions for making the schemes a requirement with concern that breeders would opt not to register their puppies rather than participate in the schemes. However it was noted that the breed clubs had agreed for the scheme to become a recommendation and an application will be submitted for approval; as this as a minimum would make breeders aware of the schemes.

The breed representatives raised that they would like to develop a heart scheme for the breed with an aim for it to become a breeding recommendation. The KC noted that if the breed clubs set the parameters for the heart testing, then it could be considered as a recommendation under the ABS. Additionally, the KC have recently launched a KC/Veterinary Cardiologist Society (VCS) Cavalier King Charles Spaniel heart scheme which has been developed in conjunction with the Veterinary Cardiovascular Society. The aim is that the new scheme will set a precedent for other breeds in the future, and the relationship with the VCS will facilitate future scheme development.

The group agreed from the data provided in the evidence base and their own experience that the priorities for the Bloodhound remain the same as; cancer, bloat, eye conformation and epilepsy.

SECTION 3: ACTION PLAN

- To continue to improve communication between the Kennel Club and the breed clubs

- The Bloodhound breed clubs to consider making participation in the BVA/KC Hip Dysplasia Scheme a recommendation under the Assured Breeder Scheme

- The Bloodhound breed clubs to consider making participation in the BVA/KC Elbow Dysplasia Scheme a recommendation under the Assured Breeder Scheme

- The Bloodhound breed clubs to consider whether to make participation in the breed clubs' eye scheme or BVA/KC/ISDS Eye Scheme a recommendation under the Assured Breeder Scheme

- The breed clubs to consider making a proposal to incorporate the breed club breeding recommendations under the Assured Breeder Scheme

- The Kennel Club to explore research possibilities into GDV

- The Kennel Club to update the breed on any progress made regarding the KC/Veterinary Cardiologist Society heart scheme

- The breed clubs to consider developing a breed club heart testing scheme

- The Kennel Club to review the funding for the Bloodhound Eye Scheme in comparison to the BVA Eye Scheme

- The Bloodhound breed clubs to ensure each of the points outlined on page nine of the Breed Watch booklet are evidenced when considering reclassification, with the BHC to discuss the process with previously reclassified breeds

- The Bloodhound breed clubs to update their breed specific breeding strategy

- The Kennel Club will review progress with the Bloodhound Breed Health Group in May 2020