



THE KENNEL CLUB
DOG HEALTH

Breed Health and Conservation Plan

Evidence Base

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INTRODUCTION

The Kennel Club launched the Breed Health and Conservation Plans (BHCP) project for breed clubs and individual breeders in September 2016. The purpose of the plans 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 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 Co-ordinator and breed health committee or representatives if applicable. Priorities are agreed based on this data and incorporated into a list of actions between the Kennel Club and the breed to tackle these health concerns. These actions are then monitored and reviewed on a regular basis.

DEMOGRAPHICS

The number of Irish Setters registered by year of birth between 1980 and 2017 is shown in Figure 1. The 1980 registrations figure appears depressed for all breeds due to registrations moving across to the electronic system from paper files.

The trend of registrations over year of birth (1980-2018) was -12.99 per year (with a 95% confidence interval of -17.44 to -8.534), 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.]

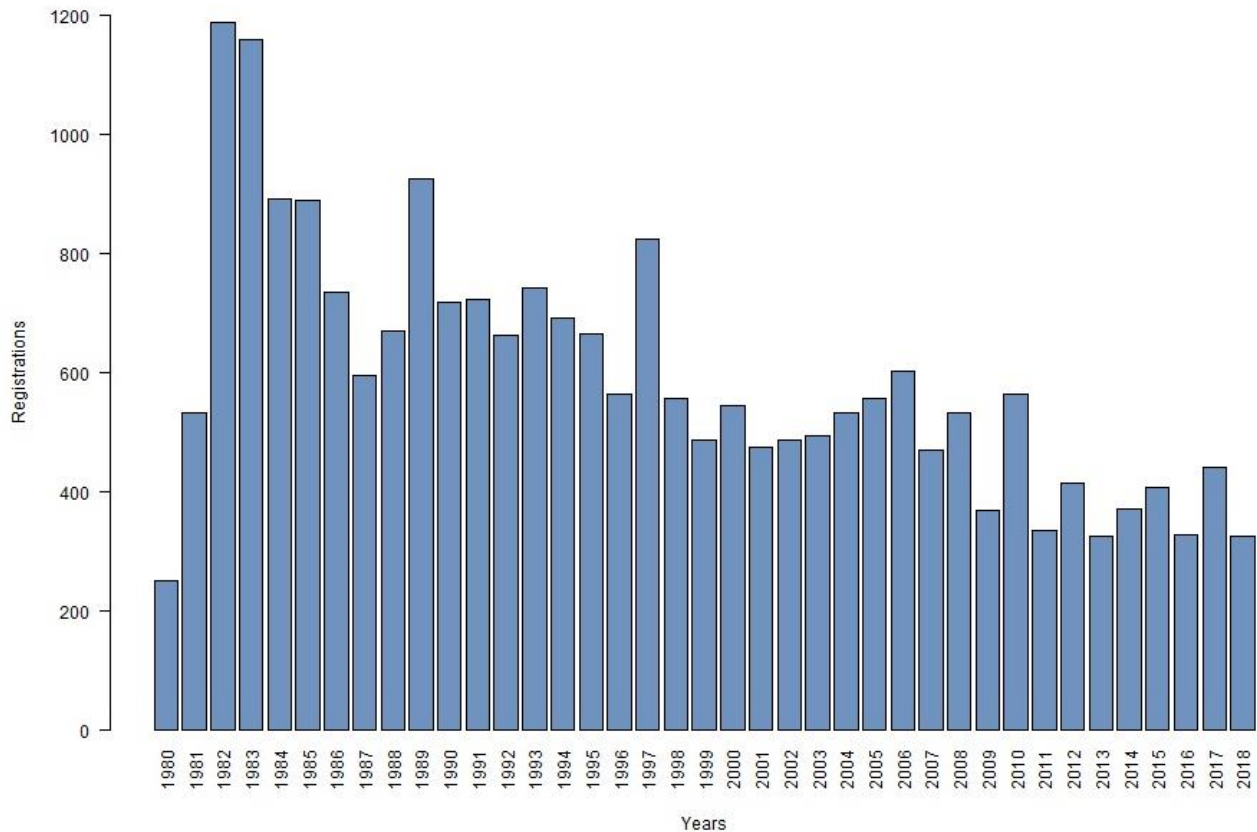


Figure 1: Number of registrations of Irish Setters per year of birth, 1980 – 2018

BREED HEALTH CO-ORDINATOR ANNUAL HEALTH REPORT

Breed Health Co-ordinators (BHCs) are volunteers nominated by their breed to act as a vital conduit between the Kennel Club and the breed clubs with all matters relating to health.

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. Bloat/GDV
2. Epilepsy
3. Megaoesophagus

In terms of what the breed has done in the last year to help tackle these listed health and welfare concerns, they have been collecting DNA samples from epileptics for study at the University of Helsinki; but there have been no actions on bloat/GDV and megaoesophagus since the 2015 KC/Animal Health Trust (AHT) survey. 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.

In the 2018 the Annual Health Report the three listed health and welfare concerns were the same as 2017, with the breed having sent DNA samples to the Finnish DNA study, as well as the AHT.

BREED CLUB HEALTH ACTIVITIES

The breed has a health committee, an active Breed Health Coordinator (BHC) and a dedicated health website: <http://www.irishsetterhealth.info/>.

BREED SPECIFIC HEALTH SURVEYS

2011 Breed Health Survey

In 2011, the Joint Health Coordinators Group set up an anonymous online survey to gather information about the incidence of diseases in the Irish Setter between 2005 and 2010. Diseases that are known or have been suggested to have a genetic basis were specifically investigated.

In fact, two surveys were conducted; one for owners of breeding bitches, and one for owners of stud dogs and pet setters. In total 159 owners of breeding bitches reported on 767 puppies, and 361 stud dog and pet owners reported on 1,031 dogs. The reason for this dual approach was to test the validity of the results. If results between the two surveys were vastly different, it might suggest that one group was being 'economical with the truth'. In fact, the results were, gratifyingly, very comparable. The key results are shown in Table 1 below.

Table 1: Key results of the 2011 Breed Health Survey

Disease category	Breeding bitch survey	Stud dog / non-breeding pet survey
Entropion	9.25%	6.49%
Epilepsy	3.91%	4.46%
GDV/bloat	9.13%	9.99%
Hip dysplasia (causing signs)	1.83%	1.36%
Megaoesophagus	3.91%	2.71%

2014 Animal Health Trust / Kennel Club Bloat Survey

Surveys were completed for 1911 unique animals, from 1091 litters (mean 1.75 animals per litter), with 412 unique sires (mean 4.64 animals per sire) and 848 unique dams (mean 2.25 animals per dam). There was a large range of year of birth (yob), from 1991 to 2013 (the year of survey), with 93% of respondent animals born

between 2000 and 2011. In total, 1,657 of 1,911 animals were reported as never having experienced an episode of bloat (86.71% of animals). 254 animals (13.29%) were reported as having experienced at least one episode of bloat at the time of survey, with details on 472 incidents of bloat supplied. Genetic analyses of the data collected suggested, but did not definitively establish, that risk of bloat is heritable in the Irish Setter.

Additional information relating to both of these surveys can be found here:
<http://www.irishsetterhealth.info/health>

Kennel Club Pedigree/Purebred Dog Health Survey

2004 Morbidity results: Health information was collected for 680 live Irish Setters, of which 372 (55%) were healthy and 308 (45%) had at least one reported health condition. The top categories of diagnosis were reproductive (15.2%, 90 of 591 reported conditions), gastrointestinal (14.4%, 85 of 591 reported conditions), respiratory (9.1%, 54 of 591 reported conditions), dermatologic (8.5%, 50 of 591 reported conditions) and ocular (7.3%, 43 of 591 reported conditions). The most frequently reported specific conditions were false pregnancy (7.4% prevalence, 30 cases in the 403 females in the survey), GDV/bloat (7.1% prevalence, 48 cases), kennel cough (5.0% prevalence, 34 cases), seizures/fits/idiopathic epilepsy (2.8% prevalence, 19 cases) and entropion (2.5% prevalence, 17 cases).

2004 Mortality results: A total of 451 deaths were reported for the breed. The median age at death for Irish Setters was 12 years (min = 4 months, max = 17 years and 2 months). The most frequently reported causes of death by organ system or category were cancer (27.3%, 123 of 451 deaths), old age (22.4%, 101 deaths), cardiac (10.0%, 45 deaths) and gastrointestinal (8.0%, 36 deaths). The most frequently reported specific cause of death behind cancer and old age were GDV/bloat (5.3%, 24 deaths) and heart failure (5.1%, 23 deaths).

2014 Morbidity results: Health information was collected for 382 live Irish Setters of which 231 (60.5%) had no reported conditions and 151 (39.5%) were reported affected by at least one condition. The most frequently reported specific conditions were urinary incontinence (5.8% prevalence, 22 cases), GDV/bloat (5.5%, 21 cases), lipoma (5.2%, 20 cases), skin (cutaneous) cyst (5.0% prevalence, 19 cases) and entropion (3.7%, 14 cases).

2014 Mortality results: A total of 101 deaths were reported for the breed. The median age at death for Irish Setters was 11 years (min = 1 year, max = 18 years). The most frequently reported causes of death were old age (16.8%, 17 deaths), heart failure (7.9%, 8 deaths), cancer – unspecified (5.9%, 6 deaths), GDV/bloat (5.9%, 6 deaths) and unknown (5.9%, 6 deaths).

UK LITERATURE REVIEW

The literature review lays out the current scientific knowledge relating to the health of the breed. We have attempted to refer primarily to research which has been published in peer-reviewed scientific journals. We have attempted to incorporate literature that includes dogs residing within the UK primarily, and literature that was released relatively recently to try to reflect current publications and research relating to the breed.

Patent ductus arteriosus (PDA): This congenital heart condition involves failure of a foetal blood vessel to close after birth, allowing abnormal blood flow between the aorta and the pulmonary artery. The Irish Setter has been suggested to be predisposed to this condition by two British authors (Matic, 1988; Darke, 1989). No prevalence estimates for the condition could be found.

Gastric dilatation/volvulus syndrome (GDV, 'bloat'): Gastric dilatation-volvulus syndrome (GDV) is an acute, life-threatening condition featuring rapid accumulation of air in the stomach, malposition of the stomach to a varying degree and a rise in intragastric pressure, frequently leading to the development of cardiogenic shock (Glickman et al, 2000). In analysis of data collected in the 2004 Purebred Dog Health Survey, the prevalence ratio for GDV morbidity in the Irish Setter was 12.6 (95% C.I. 9.3-17.1) and the prevalence ratio of GDV mortality was 2.3 (95% C.I. 1.5 - 3.4) compared to all other breeds combined; this represented an increased risk of both illness and death due to the condition than dogs of other breeds (Evans et al, 2010).

Most recently, in a VetCompass study of 77,088 dogs attending 50 Vets Now practices in the UK between 1st September 2012 and 28th February 2014, the Irish Setter had a breed-specific prevalence of 7.1% (95% C.I. 3.7-12.1%; 12 cases in 169 dogs of the breed) compared to an all-breed prevalence of 0.64% (95% C.I. 0.5-0.70). The Irish Setter had an odds ratio for GDV of 68.2 (95% C.I. 30.2-154.1) compared with dogs of no recognisable breed (O'Neill et al, 2017a).

Gluten-sensitive enteropathy (GSE): This conditions was first described in Irish Setters in the early 1980s (Hall and Batt, 1991). Probabilistic pedigree analysis of 44 dogs of a six-generation family of Irish Setters with GSE, and 7 healthy dogs of the breed, suggested that the condition has an autosomal recessive mode of inheritance (Garden et al, 2000).

Progressive retinal atrophy (PRA): PRA is the collective name for a group of inherited and progressive retinal diseases characterised by gradual retinal degeneration resulting in initial night blindness and progressing to total vision loss. Two forms have been identified in the Irish Setter. A nonsense mutation causing the first type, rod/cone dysplasia 1 (rcd1), was identified in America in 1993 (Suber et al, 1993), and a DNA test for the mutation became available (Clements et al, 1993). A late onset form, now known as rod-cone degeneration 4 (rcd4), has subsequently

been described in the Irish Setter, and a single-base insertion mutation in *C2orf71* has been identified which is a major susceptibility locus for late-onset PRA in the breed (Downs et al, 2013). A DNA test is available for this mutation. It is possible that other genetic forms of PRA may also exist in the breed.

Urethral sphincter mechanism incompetence: The Irish Setter was reported to be a breed at increased risk of urinary incontinence due to urethral sphincter mechanism incompetence in bitches, in a study of confirmed referral cases at the University of Bristol (Holt and Thrusfield, 1993). A more recent study of 30 cases treated surgically at Dick White Referrals between 2005 and 2012 included 3 cases in the breed which is suggested to support this possible increased risk (Martinoli et al, 2014).

Subsequently, a VetCompass study of 100,397 bitches attending 119 veterinary clinics between 1st September 2009 and 7th July 2013 reported that the Irish Setter had a prevalence of 32.3% (95% C.I. 23.6 - 41.6) for the condition, compared to an all-breed prevalence of 3.14% (95% C.I. 2.97 - 3.33), which was the highest breed-specific prevalence estimate. The Irish Setter had an odds ratio for urinary incontinence of 6.18 (95% C.I. 2.49 – 15.35; 5 cases and 99 non-cases) compared with dogs of no recognisable breed (O'Neill et al, 2017b).

VetCompass results

No VetCompass data relating to the Irish Setter were available, apart from those reported for specific conditions in the literature review above.

INSURANCE DATA

There are some important limitations to consider for insurance data:

- Accuracy of diagnosis varies between disorders depending on the ease of clinical diagnosis, clinical acumen of the veterinarian and facilities available at the veterinary practice.
- Younger animals tend to be overrepresented in the UK insured population.
- Only clinical events that are not excluded and where the cost exceeds the deductible excess are included (O'Neill et al, 2014)

UK Agria data

Insurance data were available for Irish Setters insured with Agria UK. 'Exposures' are equivalent to one full policy year; in 2017 there were 39 free exposures, 90 full exposures and 162 claims, in 2018 these figures were 51, 90 and 127 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 breed are shown in Table 2 below.

Table 2: Top 10 conditions and number of settlements for each condition between 1st July 2017 and 31st June for Irish Setters insured with Agria UK

Condition	Number of settlements
Urinary incontinence	12
Hyperadrenocorticism - adrenal-dependent ("Cushing's")	10
Pancreatitis - chronic	8
Foreign body - cutaneous (skin)	7
Intoxication (poisoning) drug (unspecified)	6
Osteoarthritis (osteoarthrosis degenerative joint disease (DJD))(unspecified)	6
Foreign body - gastric (stomach)	5
Gastric (stomach) dilation	5
Hypertension - pulmonary	4
Hypothyroidism	3

Swedish morbidity and mortality insurance data were also available from Agria for the Irish Setter. Reported rates are based on dog-years-at-risk (DYAR) which take into account the actual time each dog was insured during the period (2006-2011). The number of DYAR for the Irish Setter in Sweden during this period was between 500 and 1,000.

Swedish Agria insurance morbidity data

The most common specific causes of veterinary care episodes (VCEs) for Agria-insured Irish Setters in Sweden between 2006 and 2011 are shown in Figure 2. The top five specific causes of VCEs were vomiting/diarrhoea/gastroenteritis, skin tumour, dermatitis/pyoderma/folliculitis, otitis and pyometra/endometritis.

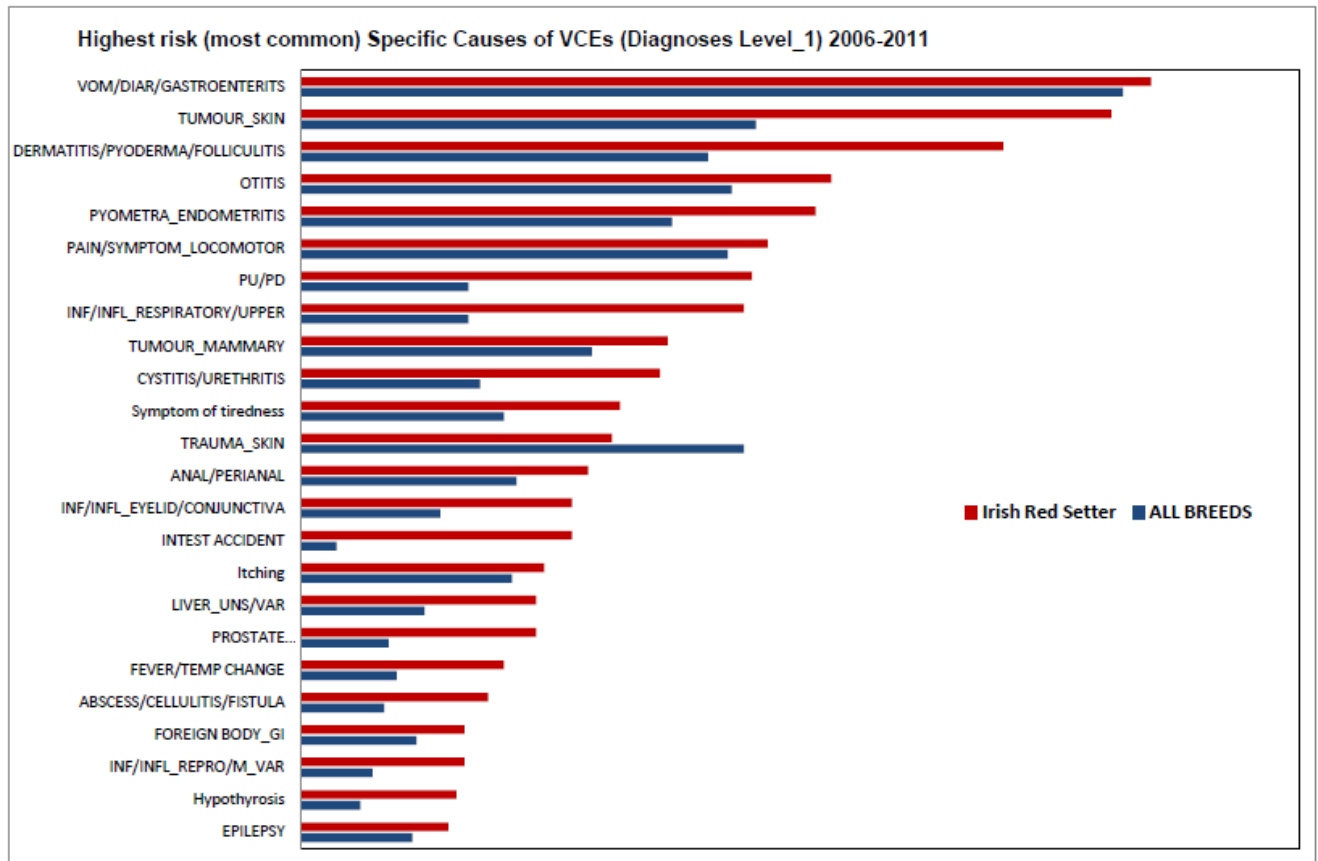


Figure 2: The most common specific causes of VCEs for the Irish Setter compared to all breeds in Sweden between 2006 and 2011, from Swedish Agria insurance data.

When relative risk of specific causes of VCEs was compared for the Irish Setter to all breeds, some interesting findings were reported. The specific causes of VCEs ordered by relative risk are shown in Figure 3. In this analysis, the top four specific causes of VCEs ordered by relative risk were degenerative disease or dysplasia of the shoulder, 'oesophagus', intestinal accident and arrhythmias. 'Intestinal accident' claims include those for GDV, and GDV cases comprise the majority of claims in this category.

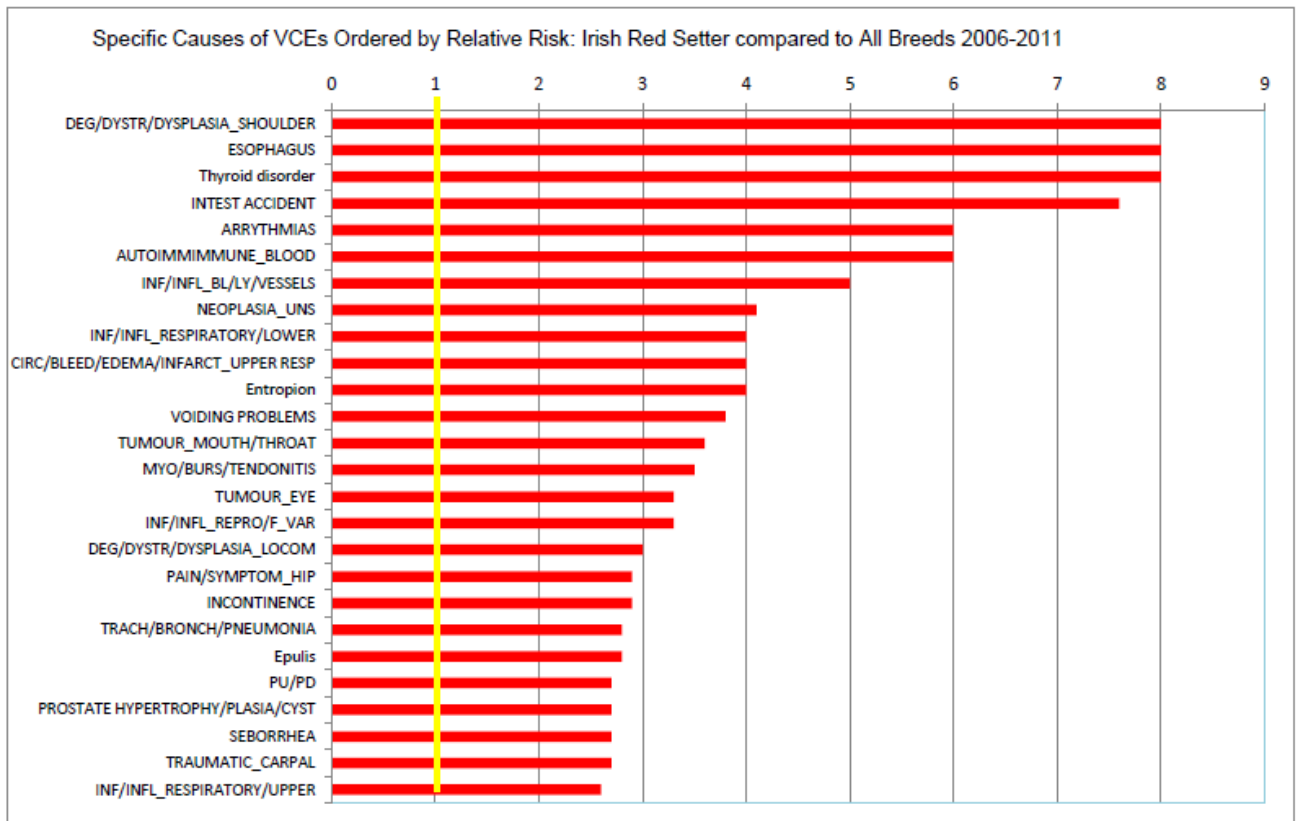


Figure 3: The specific causes of VCEs for the Irish Setter ordered by relative risk compared to all breeds in Sweden between 2006 and 2011, from Swedish Agria insurance data. The yellow line indicates the baseline risk for all breeds.

Swedish Agria insurance mortality data

The most common specific causes of death or euthanasia for Agria-insured Irish Setters in Sweden between 2006 and 2011 are shown in Figure 4. The most common specific causes of death were lymphosarcoma, Cushing’s syndrome, hit by car/train/vehicle and intestinal accident. As with the VCE claims, ‘intestinal accident’ claims include those for GDV, and GDV cases comprise the majority of claims in this category.

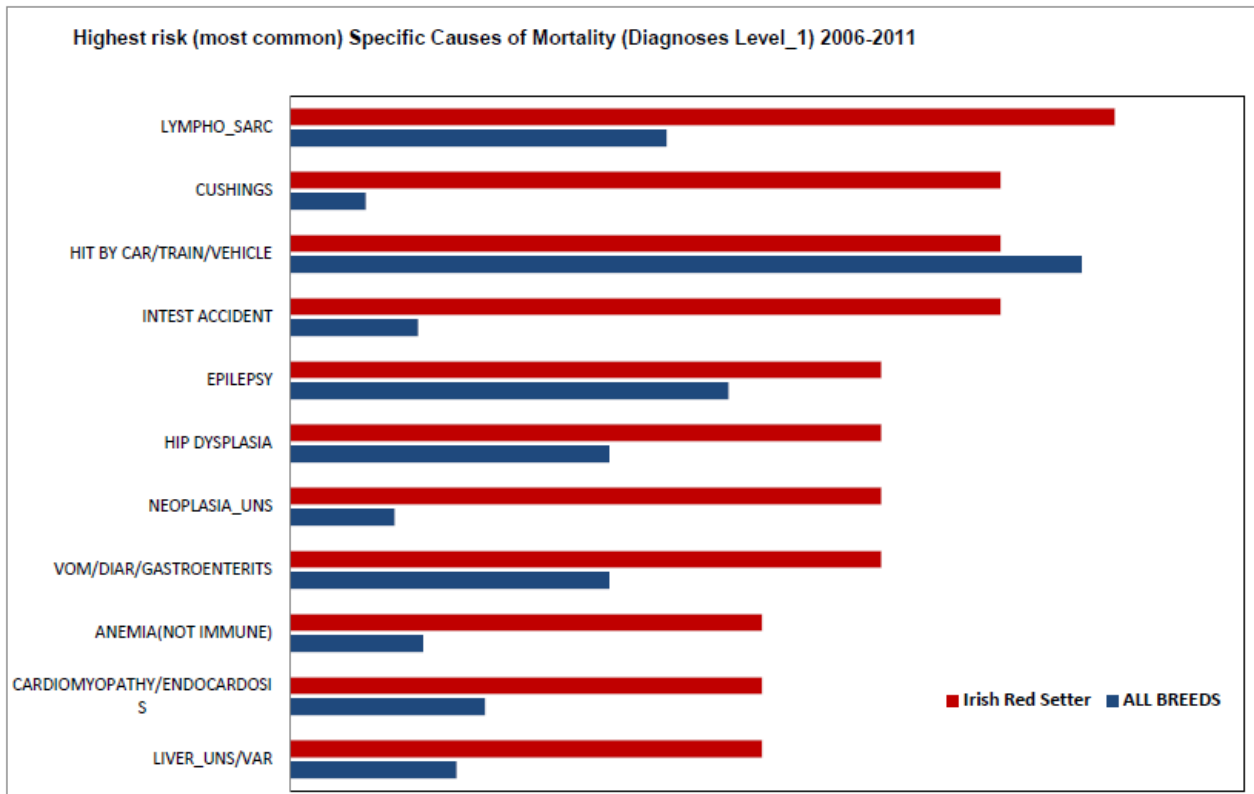


Figure 4: The most common specific causes of death for the Irish Setter compared to all breeds in Sweden between 2006 and 2011, from Swedish Agria insurance data.

BREED WATCH

These are not mandatory for this breed, as they are not on Breed Watch category 2 or 3, and no optional forms have been received.

ASSURED BREEDER SCHEME

Currently it is required that all Assured Breeders complete the following tests prior to breeding:

- Hip scoring under the British Veterinary Association (BVA)/Kennel Club (KC) Hip Dysplasia Scheme
- DNA tested for CLAD
- DNA tested for vWD

It is also recommended that the following tests are completed:

- Dogs are tested annually under the BVA/KC/International Sheepdog Society (ISDS) Eye Scheme
- Bitches under two years not to produce a litter

BREED CLUB BREEDING RECOMMENDATIONS

The breed clubs recommend that bitches under two years are not to produce a litter.

DNA TEST RESULTS

Clear test results (or hereditarily clear status) for CLAD and PRA (rcd1) are mandatory requirements for Irish Setter registrations. Results of these DNA tests have been recorded since July 2000 and have been Assured Breeder Scheme (ABS) requirements since at least 2009. A DNA test for PRA (rcd4) is also available, and results of this test have been recorded since August 2011.

CLAD

Since 1st July 2005 the Kennel Club will only register Irish Setters that are proven clear of the CLAD mutation, either by direct DNA testing or by virtue of having parents that are proven to be clear of the CLAD mutation (i.e. hereditarily clear).

Subsequently, from 1st January 2008 the Kennel Club ceased to routinely accept any new registrations for Irish Setter progeny produced from a CLAD carrier parent mated to a clear parent (either DNA tested clear or hereditarily clear). Breeders wishing to register progeny from a carrier since this date need to apply for permission prior to the proposed mating, and applications will be dealt with on a case-by-case basis, involving input from the breed clubs. If such permission is given and a carrier is mated to a DNA-tested clear, or hereditarily clear, dog, all progeny must be DNA tested and registered with the KC as either CLAD clear or carrier. The Kennel Club will place Kennel Club endorsements on the carrier progeny such that if they are bred from, without the necessary approval sought beforehand, their progeny will not be able to be registered with the Kennel Club.

The results for dogs which had been DNA tested for CLAD up to 01/10/2019 are shown in Table 3.

Table 3: CLAD DNA test results held by the Kennel Club for Irish Setters up to 19/06/2018.

Total number of results	Clear	Carrier	Hereditarily clear
23117	1194 (5.2%)	242 (1.0%)	21681 (93.8%)

The DNA test for the CLAD mutation became available in 2002. The mutation frequency in UK-registered Irish Setters was at its highest in dogs born in 1991, when it was 7%. The mutation frequency dropped rapidly after the launch of the DNA test, and has consistently been at zero for dogs born 2007 onwards.

PRA (rcd1)

Since 1st January 2010, the Kennel Club will only register Irish Setters that are proven to be clear of PRA-rcd 1 or hereditarily clear of PRA e.g. both parents are clear. The results for dogs which had been DNA tested for PRA (rcd1) up to 01/10/2019 are shown in Table 4.

Table 4: PRA (rcd1) DNA test results held by the Kennel Club for Irish Setters up to 01/10/2019.

Total number of results	Clear	Hereditarily clear
20609	1065 (5.2%)	19544 (94.8%)

PRA (rcd4)

The results for dogs which had been DNA tested up to 01/10/2019 are shown in Table 5.

Table 5: PRA (rcd4) DNA test results held by the Kennel Club for Irish Setters up to 01/10/2019.

Total number of results	Clear	Carrier	Affected	Hereditarily clear	Hereditarily carrier	Hereditarily affected
5310	838 (15.8%)	683 (12.9%)	87 (1.6%)	3211 (60.5%)	458 (8.6%)	33 (0.6%)

The DNA test for the rcd4 mutation became available in 2011, and the apparent mutation frequency for Kennel Club registered Irish Setters born in that year was approximately 18%. For dogs born in 2016, the apparent mutation frequency had dropped to approximately 8%, as shown in Figure 5 below, indicating that good progress has been made in just five years.

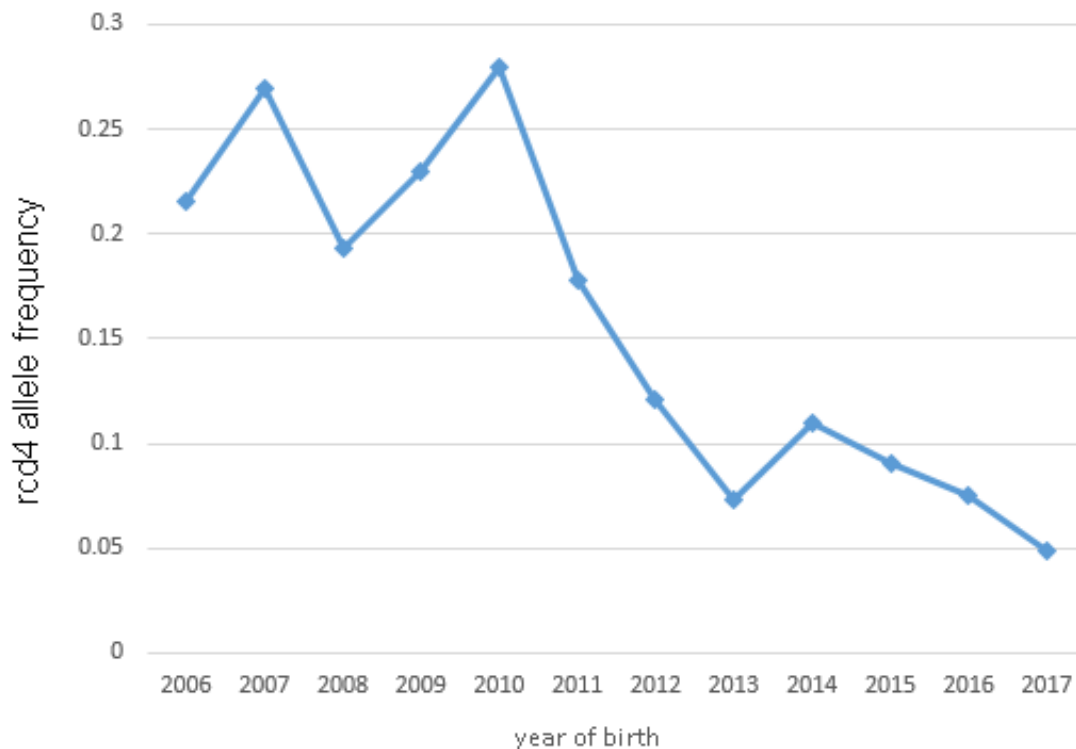


Figure 5: PRA (rcd4) allele frequency, 2006 to 2017, for the Irish Setter

As a note, as of January 2022 hereditarily clear status will no longer apply after two generations and dogs will need to be retested to confirm the status of that individual. This is to prevent the possibility of misclassification of status and therefore unintentional breeding of affected puppies. Where parentage is confirmed by DNA profile, the major contributor to erroneous status will be removed. Therefore, a less stringent restriction for HC status is applied where parentage is confirmed by DNA test.

CANINE HEALTH SCHEMES AND ESTIMATED BREEDING VALUES

Results for Irish Setters which have been presented for assessment under the schemes are shown below.

HIPS

In total 1,710 Irish Setters have participated in the BVA/KC Hip Dysplasia Scheme in the 15 years to the end of 2016, and the median hip score received was 11 (range 0-101). The 5 year median score for the breed was 11.

Hip score categories received by Irish 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 6 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 Irish Setters with mild to severe hip dysplasia and an increase in those with borderline and normal scores.

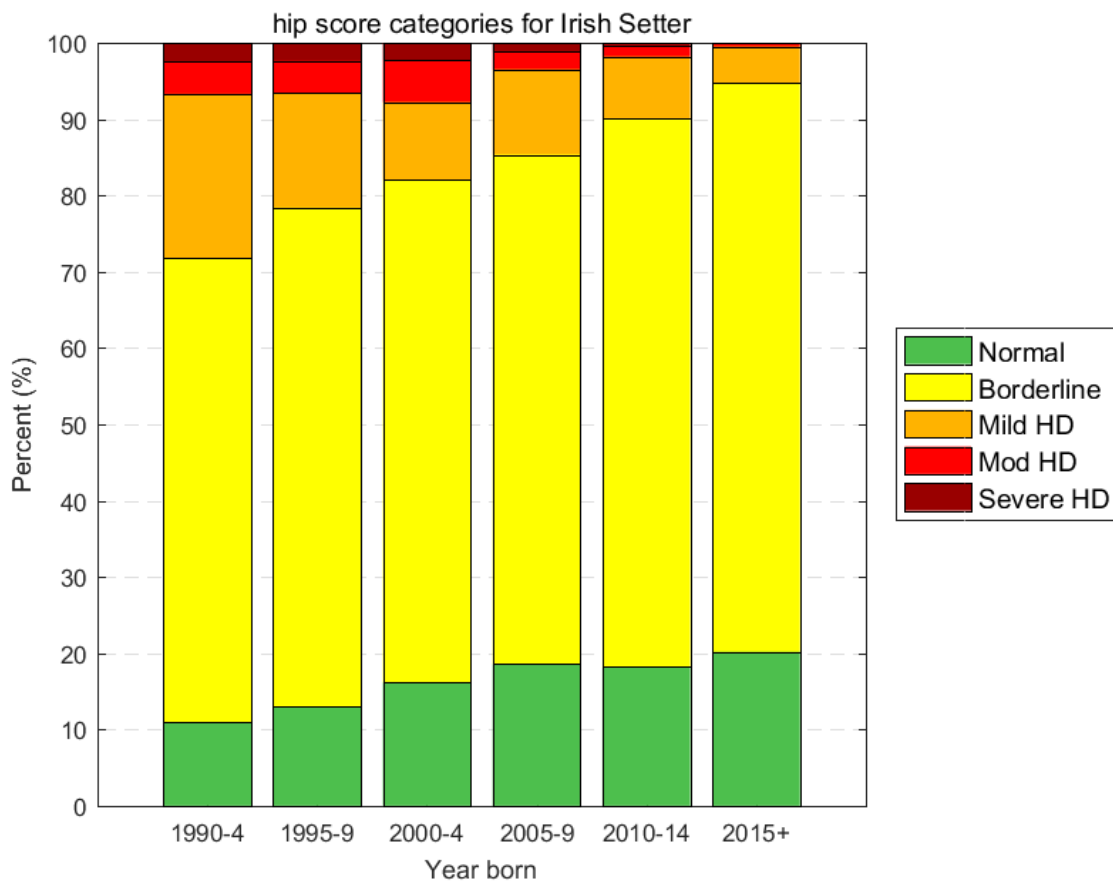


Figure 6: Hip score categories for Irish Setters which participated in the BVA/KC Hip Dysplasia Scheme between 1990 and 2016, in 5-year blocks.

Estimated Breeding Values (EBVs) are available for hip scores in this breed. Figure 7 shows the five year rolling trend in EBVs by year of birth in the Irish 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.

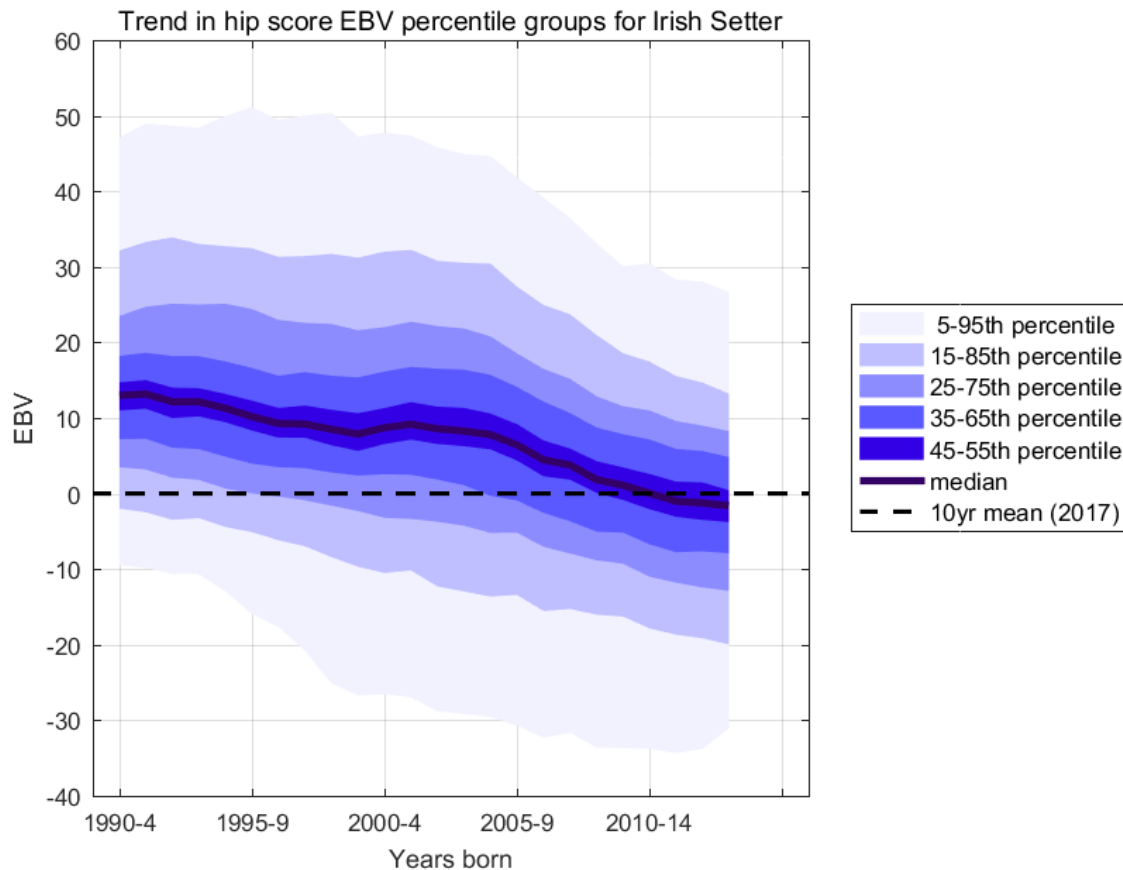


Figure 7: Trend in hip score EBV, with percentile groups, for the Irish Setter for years of birth since 1990.

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. Just seventeen Irish Setters have been elbow scored under the scheme, and all of them received scores of 0 indicating that their elbows were radiographically normal.

EYES

The Irish Setter is on Schedule A of the BVA/KC/ ISDS Eye Scheme for GPRA and Schedule B for late onset 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. To date (01/10/2019) 1,248 Irish

Setters have been tested under the scheme, of which only one was found to be affected.

The results of Eye Scheme sightings reports of the breed which have taken place since 2012 are shown in Table 6, these sightings include any other conditions observed in dogs of the breed during examination.

Table 6: Reports on dogs of the breed which have participated in the BVA/KC/ISDS Eye Scheme since 2012

Year	Number seen	Comments
2012	42 adults 1 litter	1 – GPRA affected 1 – entropion 1 – posterior polar subcapsular cataract (PPSC) 4 – other cataract
2013	22 adults 0 litters	1 – entropion 1 – ectropion 1 – PPSC 1 – other cataract
2014	6 adults 1 litter	1 – entropion
2015	31 adults 0 litters	1 – persistent pupillary membranes 2 – other cataract
2016	8 adults 0 litters	1 – retinal degeneration
2017	21 adults 0 litters	1 – PPM 1 – PHPV 1 – chorioretinopathy

AMERICAN COLLEGE OF VETERINARY OPHTHALMOLOGISTS (ACVO)

Between 2015 and 2019, 226 dogs of the breed were examined by the ACVO and prevalence data are shown in Table 7 alongside data from previous years. Overall, 69.5% (157 of 226) of dogs of the breed examined during this time 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 7: ACVO examination results for the Irish Setter, 1991 - 2019

Disease Category/Name	Percentage of Dogs Affected	
	1991-2014 (n=1995)	2015-2019 (n=226)
Eyelids		
Entropion	2.5%	2.2%
Distichiasis	5.7%	5.3%
Uvea		
Persistent pupillary membranes (iris to iris)	4.0%	7.1%
Lens		
Cataract (significant)	7.4%	7.1%
Vitreous		
Persistent hyaloid artery/remnant	1.1%	1.3%

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

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.
- 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 8.

Table 8: Number and percentage of litters of Irish 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	141	0	0.00%	0.05%
2009	120	0	0.00%	0.15%
2010	134	1	0.75%	0.35%
2011	105	1	0.95%	1.64%
2012	104	10	9.62%	8.69%
2013	104	13	12.50%	9.96%
2014	94	10	10.64%	10.63%
2015	91	13	14.29%	11.68%
2016	84	7	8.33%	13.89%
2017	95	11	11.58%	15.00%
2018	83	4	4.82%	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 27.3 was reported (estimated using the rate of inbreeding over the period 1980-2014). An effective population size lower than 50 (inbreeding rate of 1.0% per generation) indicates the future of the breed may be considered to be at risk (Food & Agriculture Organisation of the United Nations, "Breeding strategies for sustainable management of animal genetic resources", 2010).

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 8. The rate of inbreeding in this breed has remained relatively steady but high over the whole period. This implies genetic variation is steadily being lost from the population. 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://cgjournal.biomedcentral.com/articles/10.1186/s40575-015-0027-4>.

The current annual breed average inbreeding coefficient is 13.5%.

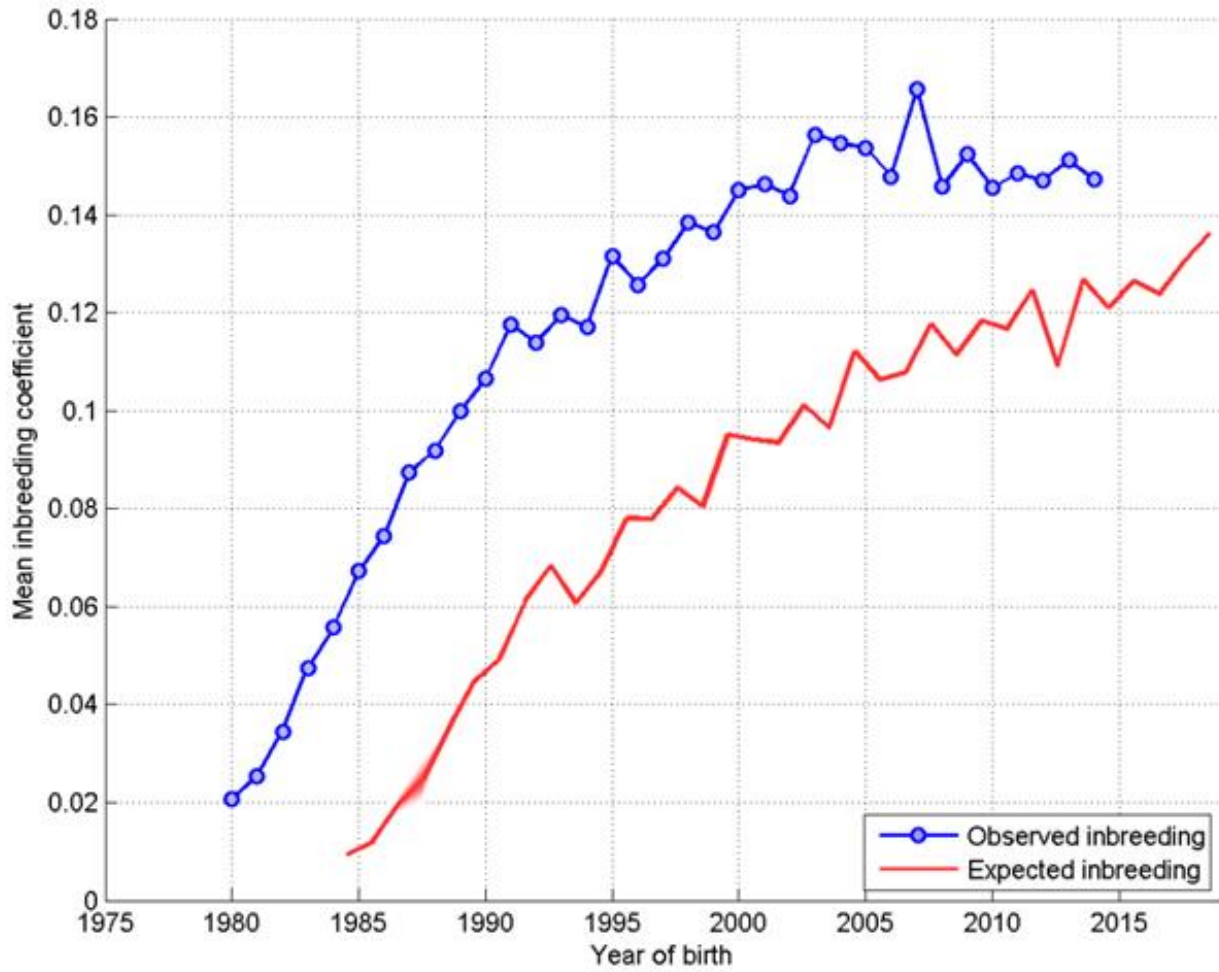


Figure 8: Annual mean observed and expected inbreeding coefficients.

Below is a histogram ('tally' distribution) of number of progeny per sire and dam over each of seven five-year blocks (Figure 9). 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 9).

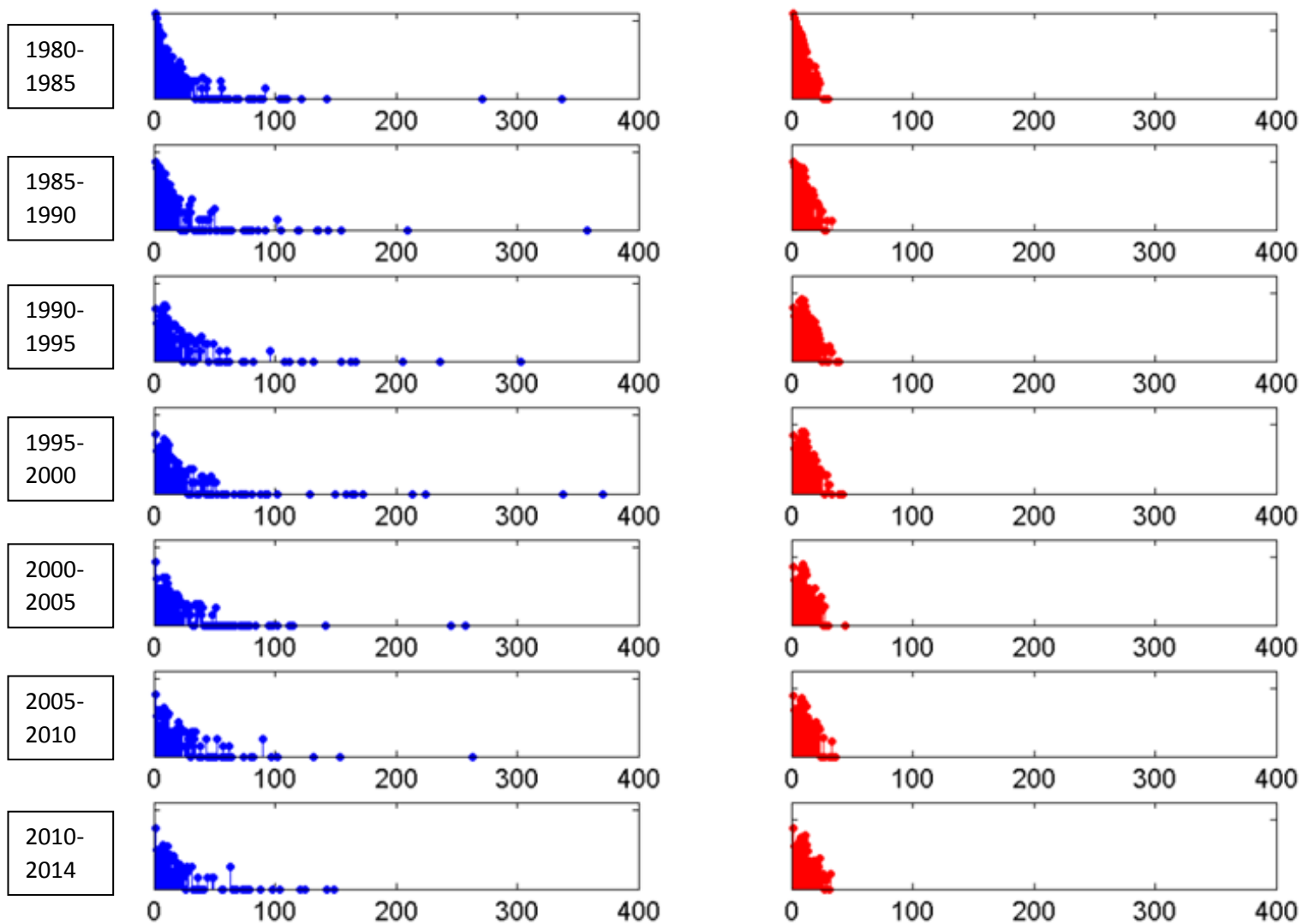


Figure 9: Distribution of progeny per sire (blue) and per dam (red) over 5-year blocks (1980-4 top, 2010-14 bottom). Vertical axis is a logarithmic scale.

CURRENT RESEARCH

The Irish Setter is one of the breeds in the Animal Health Trust (AHT)'s Give a Dog a Genome project; the health conditions given as concerns in the breed were epilepsy, GDV and megaoesophagus. Two affected individuals with epilepsy are being sequenced.

Professor Hannes Lohi at Helsinki University is leading research into epilepsy in the breed.

The AHT hold DNA samples from a small number of Irish Setters with a sound diagnosis of PRA that are free of RCD1 and RCD4, and research is ongoing.

PRIORITIES

A meeting was held with Irish Setter breed club health representatives on 18th June 2018 to discuss Section 1 of the BHCP and agree the priority issues for the health of the breed. The group agreed from the information provided and their own experience that the priorities for the breed were:

- GDV
- Epilepsy
- Megaoesophagus
- Entropion

The following conditions were also agreed to be kept at watch:

- Genetic diversity
- PRA
- CLAD

ACTION PLAN

- The breed clubs to consider requesting that the PRA-rcd4 DNA test should be a requirement under the Assured Breeder Scheme. – **COMPLETE**
- The Kennel Club to revisit the GDV study. – **ONGOING**
- The Kennel Club to provide information on the percentage of breeding stock tested and their results for PRA-rcd4 – **COMPLETE**
- The Kennel Club and breed clubs to monitor GDV study results at Nottingham. – **ONGOING**
- The Kennel Club and breed clubs to monitor epilepsy studies at AHT and Helsinki. – **ONGOING**
- The Kennel Club to investigate the possibility of a VetCompass study, as well as query Wales and Scotland practice availability – **COMPLETE**
- The breed clubs to gather case data on megaesophagus. – **ONGOING**
- The Kennel Club to raise adnexal conditions and how they are dealt with in the BVA/KC/ISDS Eye Scheme with the Eye Panel– **COMPLETE**
- The Kennel Club will review progress with the Irish Setter health representatives in Sept 2021.

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